



Studies in Health Services Organisation & Policy, 17, 2001
Series editors: W. Van Lerberghe, G. Kegels, V. De Brouwere
©ITGPress, Nationalestraat 155, B-2000 Antwerp, Belgium. E-mail : isa@itg.be

Vincent De Brouwere and Wim Van Lerberghe, ed.
Safe Motherhood Strategies : a Review of the Evidence
D/2001/0450/1
ISBN 90-76070-19-9
ISSN 1370-6462

In collaboration with

JSI UK



The UON Network



The EC DG DEV



The publication of this book was made possible through the support of the EC Directorate General DEV (contract nr B7 -6310/98/002).

Safe Motherhood Strategies : a Review of the Evidence

Vincent De Brouwere and Wim Van Lerberghe

Studies in Health Services Organisation and Policy, 17, 2001

Acknowledgements

We are most grateful to the authors of the papers of this book. Without their commitment to extensively review the literature on the specific topics and to draw upon their personal experiences, this volume would not have seen the light. The researchers presented their findings during the November 2000 EC meeting in Brussels offering the basis for the lively discussions and for the EC strategy paper.

We were happy to welcome participants from developing countries who accepted, despite the short notice, to contribute by giving a critical review of every topic: Endang Achadi (University of Indonesia), Mamadou Diallo (UNFPA Senegal), Valérie Gohou (INSP, Côte d'Ivoire), Tamar Kabakian-Kasholian (AUB, Lebanon), Lars Ake Persson (ICDDR Bangladesh) and Joseph Taylor (MOH, Ghana).

We are grateful to Dan Apter (Ministry for Foreign Affairs, Finland), Marilen J. Danguilan (UNICEF, New York), France Donnay (UNFPA, New York), David Daniels (IHSD, UK), Luc de Bernis and Helga Fogstad (WHO, Geneva), Jean De Paepe (Médecins du Monde, Belgium), Kerry Fraser (JSI UK), Petra ten Hoope Bender (IAG for Safe Motherhood), Malayah Harper (DFID, UK), Jean Laruelle (Ministry for Foreign Affairs, Belgium), Anders Molin (SIDCA, Sweden), Michèle Ooms (Ministry for Foreign Affairs, France), Oliver Lulembo (Embassy of Ireland in Zambia), Hermen Ormel (KIT, Netherlands), Nicola Schinaia (ISSLEB, Italy), Maria Theodoridou (Athen University, Greece) and John Worley (DFID, UK), who represented various national and international organisations.

On the organisational level the meeting was a success thanks to the logistic support of Rowena Taylor, Liz Goodburn (JSI UK) and Davy Catherine (EC).

The final versions of the papers took into account the comments of the group of reviewers:

Colin Bullough, Vincent De Brouwere, Paulo Ferrinho, Elisabeth Goodburn, Marilyn McDonagh and Wim Van Lerberghe.

We also wish to thank Rita Verlinden for her editorial assistance and for coordinating the final production process.

Drs Hilde Buttiëns & Vincent De Brouwere
EC Expert Meeting scientific co-ordinators

Foreword

The European Commission's commitment to the reduction of avoidable maternal death is not new. As early as the International Conference on Population and Development (ICPD) in Cairo, 1994, the EC was one of the prominent advocates of Safe Motherhood, and it confirmed this at ICPD+5 in 1999. The Directorate-General for Development, however, recognised that signing up to the *International Development Targets* was only a first step in a long march to success.

Drs. Lieve Fransen and David Daniels realised that a first and major constraint towards achieving these goals was the lack of a clear EC strategy. The failure of the international community to deal with the problem of maternal mortality had shown that there was no simple solution. In order to develop appropriate policies and strategies based on the available evidence they called an expert meeting. One of the expected outcomes was to be a publication that would be convincing enough to persuade the EU members of the urgent need to do something about this continuing human tragedy.

Structuring the discussion was a difficult task. The 17 invited papers cover areas as diverse as historical background and links with poverty and development, technical strategies, constraints and problems in delivering maternal care, cost, financing and policy mobilisation. We asked each expert - or team of experts - to review and assess the evidence in published and grey literature on a particular topic. The first versions of the resulting papers were brought together in a pre-conference book. All topics were presented and discussed during the two-day meeting held on 27-28 November 2000 in Brussels. The papers and the discussions provided the basis for the EC strategy paper, written under the co-ordination of Elizabeth Goodburn and David Daniels.

On EC side the whole process was guided by Lieve Fransen, Stewart Tyson and Angelina Eichhorst. The scientific co-ordination was provided by the Department of Public Health of the Institute of Tropical Medicine in Antwerp; John Snow Inc provided the logistic support and the EC the funds for the preparation and organisation of the meeting and the publication of this book. We hope it may help to bring about more effective ways of dealing with this still underestimated problem.

Reducing maternal mortality in a context of poverty

Wim Van Lerberghe and Vincent De Brouwere

Even champions of Primary Health Care have long had a blind spot for the plight of mothers at childbirth. Only in the mid-eighties activists and enlightened professionals started mobilising around this poorly documented, underestimated and neglected tragedy: “*Every four hours, day in, day out, a jumbo jet crashes and all on board are killed. The 250 passengers are all women, most in the prime of life, some still in their teens...*” (WHO 1986).

Fifteen years after the Safe Motherhood Initiative was launched we have a much clearer picture of what is actually happening throughout the world: figures are more reliable and more readily available. Yet there is little scope for triumphalism. More and better data mean that we now realise that the situation is actually worse than even those who were sounding the alarm bell in the 1980s had been thinking.

These years of efforts, documenting and mobilising have been humbling and often discouraging (AbouZahr 2001, Campbell 2001). The successes are overshadowed by the awareness of the persistence of this tragedy in large parts of the world. Whatever their usefulness may be for other purposes, some of the common-sense activities that had been promoted for decades – risk screening at antenatal consultations, training of traditional birth attendants – proved to be of limited direct effect on maternal mortality (Bergsjø 2001, Bergström & Goodburn 2001, Kolsteren & De Souza 2001). By the time the Safe Motherhood Initiative took stock of ten years of mobilisation in Colombo it had become clear that there were no simple solutions (Starrs & IAGSM 1998). Furthermore, the very real constraints of poverty and lack of resources seemed to make maternal mortality into one of those wicked and untrackable problems that are essentially non-vulnerable. The temptation to sit back and wait with tackling maternal mortality until poverty ‘disappears’ is real. It is not justified.

Most maternal deaths do occur in poor countries, and it is well known that poor countries are also the ones with highest maternal mortality rates. In analogy to the link between poverty and infant mortality the relation poverty-maternal mortality has become part of common wisdom. This being said, there are considerable differences, even among countries that carry similar burdens of poverty, and much of this seems related to poverty-

constrained access to care (Kunst & Houweling 2001).

It is obvious to many practitioners that professionalisation of delivery care is a key to reducing maternal mortality (Graham *et al.* 2001, Kowaleswski & Jahn 2001). Industrialised countries have halved their maternal mortality in the early 20th century through access to professional midwifery care at delivery, and further reduced it to current historical lows through access to effective and safe hospital technology (Loudon 1992). One could imagine trying to reproduce a similar sequence: first develop ambulatory midwifery, and develop hospital care at a later stage. This, would, however, lack political credibility and produce results too slowly: speedy reduction to low levels requires both. Moreover, an exclusive midwifery-based strategy would fuel the latent conflicts between midwives and hospital doctors that have characterised maternal health care in most countries for the whole 20th century. It would be an illusion to hope to promote midwifery without the support and commitment or at least the agreement of hospital doctors. Winning the hospital battle for access to quality referral delivery care is crucial from a strategic point of view (Van Lerberghe & De Brouwere 2001).

Where one can combine access to quality primary and referral delivery care (Jahn & De Brouwere 2001) maternal mortality ratios can drop over what is, all things considered, a relatively short time-span. Many industrialised countries halved ratios in 10 years or less halfway the 20th century.

Table 1 shows that developing countries that make a deliberate effort at providing professional delivery care through midwives and hospitals can go as fast.

Table 1. Number of years to halve maternal mortality in selected countries

	From 400 to 200	From 200 to 100	From 100 to 50
In 11-12 years	Thailand '62-'74		
In 9-10 years	Sri Lanka '56-'65	Honduras '68-'78; Malaysia '65-'75	
In 7-8 years		Sri Lanka: '66-'74 Thailand '74-'81	Malaysia '75-'83
In 4-6 years		Chile '71-'77	Thailand '81-'85

Situations abound, however, where there are hospitals with trained professional staff exist, and mortality yet remains staggeringly high. In 1996, for example, Brazzaville had a maternal mortality ratio of 645 per 100,000, university hospital and health care facilities notwithstanding (Le Coeur *et al.* 1998). Too little, too late and too sloppy: delivery care is not a mere matter having a hospital with trained clinicians, it is also a question of how professional staff perform and behave (Bergström 2001, Buekens 2001).

Problems with accountability have often become so prevalent that they are hardly noticed any more. Epidemiological documentation of their impact is hard to come by, although sensitised professionals are more than convinced by the anecdotal evidence of day-to-day field experience. Their intuition is corroborated if one uses the (admittedly crude) aggregate responsiveness scores developed by WHO as proxy indicators of accountability. Responsiveness – in its WHO operationalisation of respect towards the patient (dignity, confidentiality, autonomy) and attention devoted to the client (promptness, quality of environment, access to social assistance and free choice of provider) – has only an indirect a priori relationship to maternal mortality, and in the present state of affairs its measurement is rather crude. Still, in low-income countries, it has an explanatory power that is significantly superior to that of female literacy rate and wealth expressed as GNP-PPP¹. This puts common wisdom on the role of poverty and female literacy into a somewhat different perspective.

What are the implications? It would seem that at a given income level – which is correlated with the availability of services – how well their staff responds to the expectations and needs of their clients does make a difference. In other words, if countries of comparable wealth or poverty have different maternal mortality ratios, this may well have to do not only with the availability of health services, but also with how services relate to their clients.

The whole issue of accountability for performance and for responsiveness is a delicate one for which evidence-based solutions are not readily available. Quality assurance programmes may play a role (Ronsmans 2001), but if history is anything to go by, peer pressure and, more decisively still, client pressure is what makes professionals behave in a responsible and accountable way.

¹ In a multiple stepwise regression of 68 countries with a GNP < 1,000 US\$ per capita, the most powerful independent variable predicting maternal mortality is the score for responsiveness, yielding a total r^2 of 0.53. Female adult literacy rates increase r^2 to 0.61 ($p < 0.005$) and GNP-PPP further to 0.65 ($p < 0.02$).

The good news is that even in poor countries health services can make a difference to reduce maternal mortality (Mc Donagh & Goodburn 2001). The bad news is that resource mobilisation alone, however necessary, is not enough. If one wants to tackle maternal mortality, investments in health care will only be really worthwhile if they go along with an investment in the civil society's capacity to build up pressure for accountability.

References

- AbouZahr C. 2001. Cautious champions: International agency efforts to get safe motherhood onto the agenda. *Studies in Health Services Organisation and Policy*, 17, 387-414.
- Bergsjø P. 2001. What is the evidence for the role of antenatal care strategies in the reduction of maternal mortality and morbidity? *Studies in Health Services Organisation and Policy*, 17, 35-54.
- Bergström S. 2001. Appropriate obstetric technologies to deal with maternal complications. *Studies in Health Services Organisation and Policy*, 17, 175-194.
- Bergström S, Goodburn E 2001 The role of traditional birth attendants in the reduction of maternal mortality. *Studies in Health Services Organisation and Policy*, 17, 77-96.
- Buekens P. 2001. Over-medicalisation of maternal care in developing countries. *Studies in Health Services Organisation and Policy*, 17, 195-206.
- Campbell O. 2001. What are maternal health policies in developing countries and who drives them? A review of the last half-century. *Studies in Health Services Organisation and Policy*, 17, 415-442.
- Graham WJ, Bell JS & Bullough CH. 2001. Can skilled attendance at delivery reduce maternal mortality in developing countries? *Studies in Health Services Organisation and Policy*, 17, 97-130.
- Jahn A & De Brouwere V. 2001. Referral in pregnancy and childbirth : Concepts and strategies. *Studies in Health Services Organisation and Policy*, 17, 229-246.
- Kolsteren P & De Souza S. 2001. Micronutrients and pregnancy outcome. *Studies in Health Services Organisation and Policy*, 17, 55-76.
- Kowalewki M & Jahn A. 2001. Health professionals for maternity services : Experiences on covering I the population with quality maternity care. *Studies in Health Services Organisation and Policy*, 17, 131-150.

- Kunst A & Houweling T. 2001. A global picture of poor-rich differences in the utilisation of delivery care. *Studies in Health Services Organisation and Policy*, **17**, 297-316.
- Le Coeur S., Pictet G., M'Pelé P., and Lallemand M.. 1998 Direct estimation of maternal mortality in Africa. *Lancet* **352**:1525-1526.
- Loudon I 1992 *Death in childbirth. An international study of maternal care and maternal mortality 1800-1950*, Oxford: Oxford University Press.
- Mc Donagh M & Goodburn E. 2001. Maternal health and health sector reform: opportunities and challenges. *Studies in Health Services Organisation and Policy*, **17**, 371-386.
- Ronsmans C. 2001. What is the evidence of the role of audits to improve the quality of obstetric care? *Studies in Health Services Organisation and Policy*, **17**, 207-228.
- Starrs A. & IAGSM. 1998. *The Safe Motherhood Action Agenda: priorities for the next decade*, Report on the Safe Motherhood Technical Consultation, 18-23 October 1997, Colombo, Sri-Lanka. New York: Inter-Agency Group for Safe Motherhood.
- Van Lerberghe W & De Brouwere V. 2001. Of blind alleys and things that have worked: History's lessons on reducing maternal mortality. *Studies in Health Services Organisation and Policy*, **17**, 7-34.
- WHO 1986 Maternal mortality: helping women off the road to death. *WHO Chronicle*, **40** (5): 175-183.

Of blind alleys and things that have worked: history's lessons on reducing maternal mortality

Wim Van Lerberghe¹ and Vincent De Brouwere²

“It is only in recent years that the significance of the problem of maternal mortality has been clearly realised by the health experts, ...”

Monthly Epidemiological Report
Health Section, Secretariat,
League of Nations,
July 15th, 1930

Summary

As a matter of fact, the patterns of maternal mortality were very different during the 1870-1937 period in industrialised countries such as USA, England and Wales or Sweden. This chapter analyses the conditions under which the industrialised world has reduced maternal mortality over the last hundred years. Preconditions appear to have been early awareness of the magnitude of the problem, recognition that most maternal deaths are avoidable, and mobilisation both of professionals and of the community. Still, there have been considerable differences in the timing and speed of reduction of maternal mortality in different countries. These were related to the way professionalisation of delivery care was determined, first, by the willingness of the decision makers to take up their responsibility; second, by the strategy adopted for making modern obstetrical care available to the population (and particularly by encouragement or dissuasion of midwifery care); and third, by the extent to which professionals were held accountable for addressing maternal health in an effective way. Where preconditions have been met and professionalisation of obstetric care has been adopted in developing countries, the same pattern of reduction of maternal mortality was observed, be the country still poor (Sri Lanka) or wealthier (Malaysia, Thailand).

¹Professor at the Department of Public Health, Institute of Tropical Medicine, Antwerpen, Belgium. Email : wlerberghe@itg.be (correspondence should be addressed to this author).

²Professor at the Department of Public Health, Institute of Tropical Medicine, Antwerpen, Belgium. Email : vdbrouw@itg.be

Introduction

Where nothing effective is done to avert maternal death, “natural” mortality is probably of the order of magnitude of 1,500/100,000. Part of the world now has maternal mortality levels of the order of 5, some 300 times less. Only rich industrialised countries have achieved such stable historical lows, but many middle-income and some poor countries are getting quite close, around or well below 50.

The majority of low-income countries, however, still has a long way to go. Poverty clearly contributes to this sorry state of affairs, but it does not explain everything.

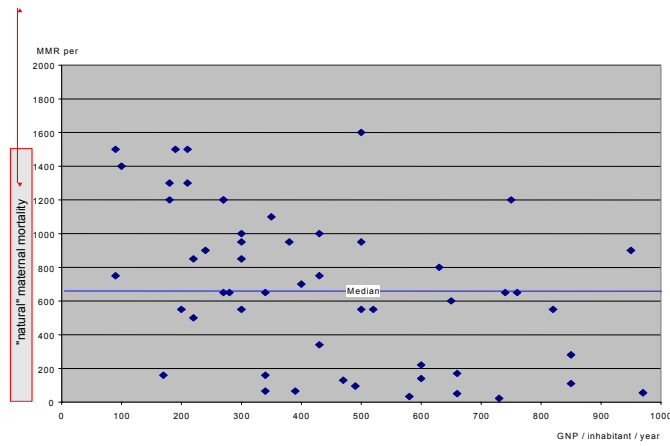
Figure 1 shows that the estimated maternal mortality ratio in countries with a GNP of less than 1,000US\$ ranges between 22 and 1,600. Even if one expresses GNP in purchasing power parity (PPP) terms, large inter-country differences remain: some still have maternal mortality ratios that are roughly equivalent to “natural” maternal mortality, others are way below. For example, in the early 1990s Vietnam, Lesotho, the Central African Republic and Nepal all had a GNP-PPP between US\$ 1,000 and 1,200. Their maternal mortality ratios estimates were 160, 600, 700 and 1,500. Certain countries definitely do better than others, even under severe poverty constraints.

These differences in track record get a different flavour if we compare present mortality levels in poor countries with those of industrialised countries at the beginning of the XXth century (Figure 2).

First, three out of four poor countries today have maternal mortality ratios that are higher than those of Sweden a century earlier, i.e. before caesarean section, blood transfusion or antibiotics, and at a time when nearly all deliveries took place at home. Lack of money for high-tech medicine is thus not the only explanation for the very high levels in some countries today.

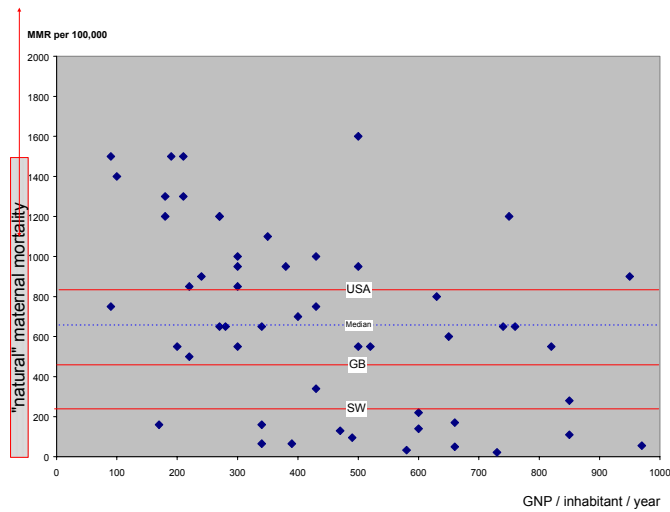
Second, a century ago, there were major inter-country differences in the West - not as large as the disparities in the developing world today, but pretty impressive all the same. In the USA of 1900, for example, there were about 700 maternal deaths for 100,000 births, i.e. three times more than in Sweden. Like in the developing world today, some of the industrialised countries have a better track record and managed to reduce maternal mortality much earlier than others.

Figure 1. Maternal mortality ratios in the poorest countries, 1990 estimates. Ratios are plotted against the countries GNP and compared to “natural maternal mortality”. “Natural maternal mortality” is assumed to range between 1,100 and 2,500



SOURCES: GNP/inhabitant in 1993: World Bank 1995 Estimation of maternal mortality ratios in the 1990s: Stanton *et al.* 1995

Figure 2. The same data as in figure 1, but compared to the 1900 maternal mortality ratios of the USA, England & Wales and Sweden



The history of these relative successes and failures is to a large extent a

history of different approaches to the professionalisation of delivery care, even before technology-assisted hospital delivery became the norm³. In order to make this case, we will look at differences in speed of reduction of maternal mortality in what is now the industrialised world, and attempt to identify the factors for success and failure. We will then look at obstacles faced by developing countries today, and draw some lessons with regard to strategic do's and don'ts in maternal health policy.

Patterns of reduction of Maternal Mortality in the West

Although the historical evidence is patchy, we do know that in countries like England maternal mortality levels were halved – compared to “natural maternal mortality” – towards the beginning of the XIXth century. Progress was in fact much more impressive for maternal than for overall mortality. Loudon explains this “largely in terms of factors specific to childbirth rather than in terms of factors likely to have impinged on mortality of all causes”: “the decline in maternal mortality [between 1750 and 1850] was related both to an increasing proportion of midwife deliveries and to a higher standard of midwifery” (Loudon 1992a). By 1850 maternal mortality was at a level of around 800/100,000 or even lower: levels not unlike the median poor country today.

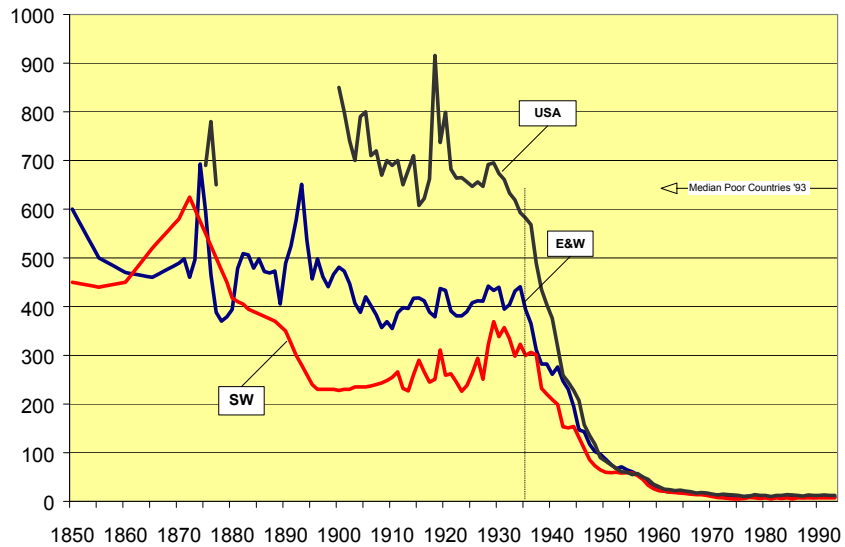
Between the mid-XIXth century and the late 1930s, the patterns of reduction diverge markedly (Figure). On the one hand there are Northern European countries – Sweden is the prototype, but Denmark, Norway or the Netherlands follow roughly the same pattern: a clear downward trend from as early as 1870, stabilising at 250-300 per 100,000 between 1900 and 1940. At the other extreme, maternal mortality ratios in the United States remained in a 600-800 bracket up to the mid-1930s. In-between the Swedish success story and the American failure one finds south-west Europe.

The North European success story is all the more impressive since it was achieved before modern hospital technology, transfusions, caesarean sec-

³ Formal midwifery schooling in Europe had started in the XVIIth century (one of the first manuals was ‘Des Maladies des Femmes grosses et accouchées’, by François Mauriceau (1637-1709)). Towards the midst of the XVIIIth century London became the centre for publication of treatises on midwifery. Midwifery has been a profession for centuries, but only in the XIXth century professional bodies start to claim delivery care as their expert territory. “There were two main stages in what has been termed the ‘medicalisation of pregnancy. The first stage consists of its incorporation into medical discourse in the seventeenth and eighteenth centuries as a ‘natural’ state; the second is its gradual redefinition as pathology – as a medical phenomenon akin to illness: this process has really only become marked in the period since 1950, although it has developed along with the clinical care movement itself.” (Oakley 1984).

tions, or antibiotics became available, and, in the case of Sweden, in a poor rural country with a dispersed population. The circumstances and strategies that made this possible and conversely, that caused the USA to lag behind, may help to understand why many poor countries have failed to reduce maternal mortality at a time when the technology to avoid maternal deaths is well known.

Figure 3. Maternal mortality from 1870 to 1993 in Sweden, the USA and England & Wales



Sweden

Sweden is unusual in the amount of historical information available on its demography. Its General Register has systematically collected individual health data since 1749. Very much in line with the development of vital statistics and quantitative methods in the XVIIIth century (Fox 1993), the Swedish *Sundhetskommisionen* reported that at least 400 women out of 651 dying in childbirth could have been saved if only there had been enough midwives (Högberg *et al.* 1986). This *de facto* introduced the notion of 'avoidable maternal mortality'. The *Sundhetskommisionen* had enough authority to set a policy of training midwives in such numbers as to make sure that all deliveries – home deliveries, of course, were the norm – would be attended by qualified personnel.

Training large numbers of midwives was a slow and progressive process. Results were obtained only because authorities and professionals had a common purpose in tackling the problem of maternal mortality. One century after the report, in 1861, 40% of births were attended by certified professional midwives. The figure would double over the next four decades, to 78% in 1900. In the meantime the number of home deliveries assisted by traditional birth attendants dropped from 60% in 1861 to 18% in 1900. Only a small fraction of births, between 2% and 5%, took place in hospital⁴.

Midwives in Sweden were allowed to use forceps and hooks for craniotomy as early as 1829. They had a great deal of autonomy – in this thinly populated rural country that was a self-evident necessity – but were supervised by the local public health doctor. The latter could be called upon in case of major complication and was held accountable for official reports. The lines of authority were strong enough to generalise the introduction of aseptic techniques as early as 1881 – only a few years after it had been introduced in hospitals. The early adoption of this original combination of professional assistance to home deliveries and use of effective techniques enabled Sweden to achieve the lowest maternal mortality ratios in Europe (228 maternal deaths per 100,000 live births) by the beginning of the XXth century.

The Swedish success was partially a result of scientific and technical advances (Högberg *et al.* 1986) and partially a result of social changes empowered by public authorities. It is the combination of various ingredients that made this success possible (Figure 4). The potential of this recipe was further confirmed by later adopters of the same policy⁵ - i.e. the Netherlands, Denmark and Norway. An active policy of training midwives, selected for their social profile and capacity to introduce modernisation as ‘health missionaries’, with a close follow-up of compliance with hygiene and technical prescriptions (Marland 1997), reduced maternal mortality ratios to below 300 per 100,000 by 1920.

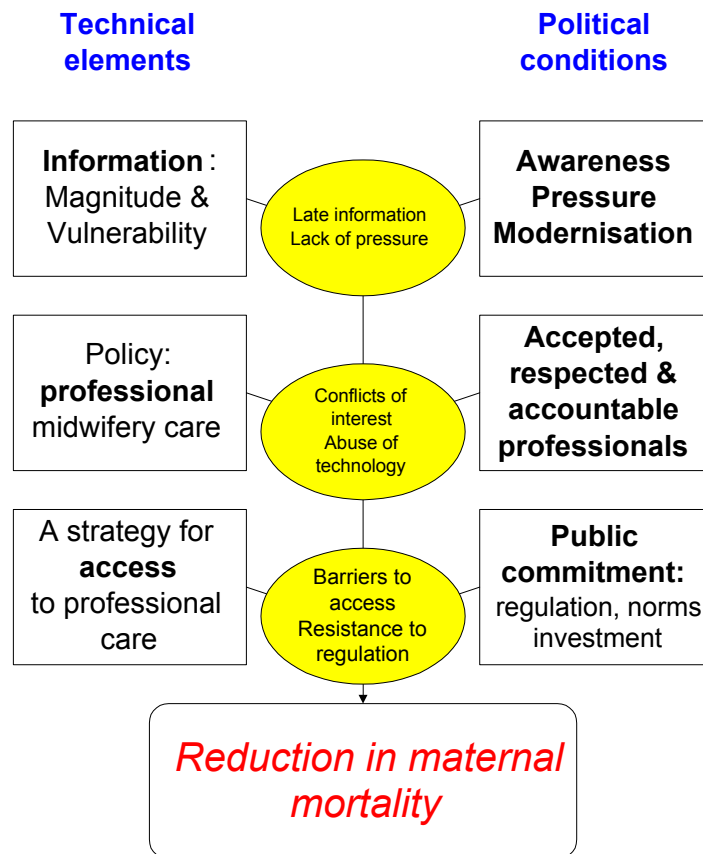
⁴ These figures are quite similar to those in, for example, England. In European history maternities appeared later than general hospitals. They had a (deserved) bad reputation: “*the mortality of maternity hospitals is said to be so great that it is expedient, indeed absolutely necessary, to close them entirely*” (Duncan 1870).

⁵ Japan had a pattern similar to Sweden, albeit delayed. In 1900 maternal mortality had dropped to 436. In 1920 it was 353, 272 in 1930 and 239 by 1940. This was concomitant with professionalisation of home deliveries (MCH Japan 1992).

USA

The situation in the USA was quite different. Information became available only from 1900 onwards (Pearl 1921), much later than in Sweden, and there was no public policy to deal with what was not generally recognised as an issue. The debate was dominated by the (successful) attempts by obstetricians to marginalise midwifery (Declercq & Lacroix 1985, Borst 1988, King 1991, Reagan 1995).

Figure 4. The combination of technical and policy environment factors that made early reduction of maternal mortality in certain countries possible, and the obstacles in other countries



Midwives there were a mixed lot, going from the many untrained 'neighbourhood midwives' to the few highly trained midwives who were mainly recent European immigrants, but left to fend on their own, without support or supervision, despised and professionally isolated. Midwifery was actively discouraged by the lobby of obstetricians. "To the American obstetrician the midwife was 'a relic of barbarism' who must be abolished ... If European countries persisted in employing midwives on a large scale, it only showed how backward Europe was compared to America." (Loudon 1997).

In Sweden the notion of 'avoidable maternal death' had been used since the XVIIIth century and was at the basis of a public policy of midwifery coverage. In the USA this notion was essentially used by doctors for 'scientific' attacks on the market share of midwives (Fraser 1998). "Fear of the midwife's real power, her ability to do the work of obstetrics – translated into a public portrayal of such women as primarily responsible for long labours and puerperal deaths. Physicians, by contrast, associated themselves with painless labour and safe childbirth" (Fraser 1998).

There was evidence that midwifery was a real alternative: where midwives were trained and supervised, as in Newark, they achieved remarkable results: a maternal mortality rate of 150 for midwife deliveries as opposed to 690 for deliveries by physicians (Loudon 1997). Nevertheless, obstetricians were left to effectively block the development of professional midwifery: by the 1920s this had already led to a decreasing pool of midwives in urban areas. In Richmond, for example, the midwife examining board had reduced the number of practising midwives from 105 to 47 in a 3-year period (Fraser 1998) and maternal mortality remained high.

The problem of maternal mortality only came on the policy agenda as a result of the public outcry against differences with Europe, in the early 1930's. The first enquiries into maternal deaths, in New York in 1930-32 (Llewellyn-Jones 1974), led the New York Times to put the blame for avoidable maternal deaths on doctors (Porges 1985). Still, the medical lobby managed to ensure hegemony of hospital delivery. From the late XIXth century until today, the *de facto* policy was to promote institutional delivery by obstetricians. However, without mechanisms to guarantee access or quality standards, this failed to address the problem and actually contributed to mortality through iatrogenesis. The lack of norms and accessibility would only be offset by the Emergency Maternity Care Programme during the 2nd World-War (Schmidt & Valadian 1969).

England & Wales

In England and Wales women fared somewhat better than in the USA. Information had been available since the first half of the XIXth century. However, it was not until 1930 that the concept of 'primary avoidable factor' was identified and confidential investigations⁶ into maternal deaths were organised (Llewellyn-Jones 1974). Things then accelerated, and in 1932, the Ministry of Health sent a mission to Denmark, the Netherlands and Sweden to find out how these countries managed to achieve their low maternal mortality ratios (Oakley 1984).

The explanation had to do with the implementation of midwifery policies. Unlike Sweden, England & Wales had no active policy to generalise and professionalise midwifery before the XXth century, but the information had been available for quite some time and authorities were aware of the problem. Midwives were regulated with a 'Midwives Act' in 1902. In comparison with Sweden and other countries with the same level of technical knowledge, progress was slow. This was certainly due in part to the government's indecision and to the fact that the funding of the necessary measures was left to the local authorities "*who spent as little as possible on maternal and child health*" (Loudon 1992a). The rampant competition between GP's and midwives for access to the delivery-market compounded the insufficient funding (Mottram 1997). In a number of places – Manchester for example – the Medical Officers of Health implemented the Act correctly. Elsewhere, they did little or nothing. In districts where doctors were hostile to midwives, the act was often used "*to harass midwives rather than to encourage their improvement*" (Donnison 1988).

Accessible technology and reliable hospitals

Between 1937 to 1970 maternal mortality dropped steeply throughout the industrialised world. By 1954 the USA and Sweden both reached 60 per 100,000. Further reductions after the 1970s brought maternal mortality ratios to the current low levels of less than 10. This new phase in the reduction of mortality ratios was a consequence of the improvement of techniques (antibiotics, caesareans, transfusions) in a context in which they were made

⁶ The confidential enquiries would eventually play a major role in reducing mortality in England and Wales, but elsewhere – in Australia, for example, where they were introduced in 1939 – as well: they identified potential for improvement and increased accountability.

available to the great majority of women, whether confined in hospital or at home. “Once the medical technology to treat obstetrical complications becomes widely accessible, it seems that the actual place of delivery is not of crucial importance.” (Maine *et al.* 1991). The improvement of financial access to professional care was a key factor, but health care systems also developed a culture of quality of care sustained by a system of control and professional accountability. This, in turn, was fed with information derived from generalised monitoring of mortality ratios and enquiries into maternal deaths.

Success or failure: combining the right ingredients

In the period before hospitals could intervene effectively and safely, the relative successes and failures appear to have depended less on the development of science and technology than on a combination of information, policy and strategy.

The first element was information. Countries with an early reduction in maternal mortality were also the ones where information on the extent of the problem had been around for a long time, and where public authorities reacted on this information. In countries where such information was more recent maternal mortality was not on the agenda, and the development of a control policy was delayed.

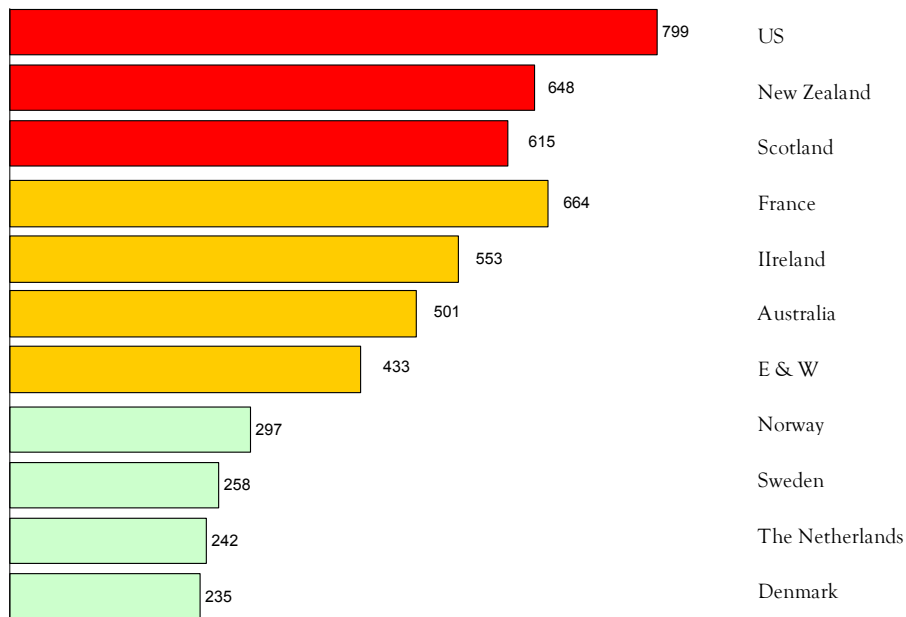
But the information was not enough. The nature of public administration, its commitment to public health and its capacity and willingness to react on information about avoidable deaths was just as important. What is sometimes less appreciated is that in the first half of the XXth century the debate on maternal mortality was not a matter for doctors and administrators alone. In various European countries, from the early XXth century to the late 1930s, committees concerned to improve maternal mortality were formed and associations with the same object, sometimes medical and sometimes lay, were founded. In the UK, for example, this eventually led to the 1938 Conference, attended by women from over 60 local associations, which gave rise to a comprehensive ‘Mothers’ Charter’ (Oakley 1984). In Sweden the concern of the medical establishment with the levels of maternal mortality was sufficient to obtain a public commitment. In many other countries legislation was only introduced and funds made available after pressure mounted from the civil society.

If information and public concern were elements that determined success or failure, another was the choice of policy. With hindsight we can say that before the technological hospital delivery of the second half of the XXth century came of age, the safer and more effective policy was to provide professional midwifery assistance at delivery, supervised, controlled, chosen on basis of a social profile that would promote modernisation (Marland 1997). Where this was the backbone of maternal health policies, mortality ratios dropped. Where it was not, they stagnated (Figure 5).

There is a whole body of evidence, and not only from north-west Europe, that shows that professional midwifery as such makes a difference, even in the absence of modern hospital technology. In the first half of the XXth century delivery was safer with a professional midwife than with a doctor. For example, Mary Beckenridge's Frontier Nursing Service in the USA brought maternal mortality down to 66 in 1935-37 among the population it served, whereas in the same years hospital physicians in Lexington, Kentucky remained with a mortality of 800-900 among their white clientele.

Those countries that managed to get doctors to co-operate with a midwifery-based policy fared relatively well. Where doctors won the battle for professional dominance - and for their share of the market - women died. *"It may be an extraordinary conclusion, but it is likely that [in the 1920s] at least 200,000 lives might have been saved by a maternity system based on trained midwives in the very country [the USA] in which the midwife was branded as a relic of the barbaric past"* (Loudon 1997).

Figure 5. Maternal mortality in 1919-20 in countries with deliveries predominantly assisted by midwives (bottom), by both midwives and doctors (mid) and predominantly by doctors (top)



No country in the Western world has escaped the midwife-doctor debate, “from the violent denunciations of the midwife in the United States, through the struggles for midwife registration in Britain, to the more measured but none the less significant discussions on the place of Dutch midwives in providing obstetric care” (Marland & Rafferty 1997). But the potential of midwives has been realised only where they were well trained, supervised, regulated, and held accountable for results. The relatively poor performance of doctors and hospitals – and their contribution to mortality through iatrogenesis – in the same period can best be explained by the greater difficulty in making them adhere to scientific standards and in holding them accountable for results.

It was not, however, merely a question of public authorities making the right policy choice; it was also a matter of being able to implement such a policy with enough authority to make professional delivery care accessible. North-west Europe adopted different versions of Sweden’s strategy of putting ‘a midwife in every parish’: a strategy based on proximity, geographical, but also cultural and financial, based on a long term effort in financing and

training as well as regulating midwifery. When hospital- and obstetrician-based delivery care came of age in the second half of the XXth century, proximity and access also became the determining factors, as in many developing countries today.

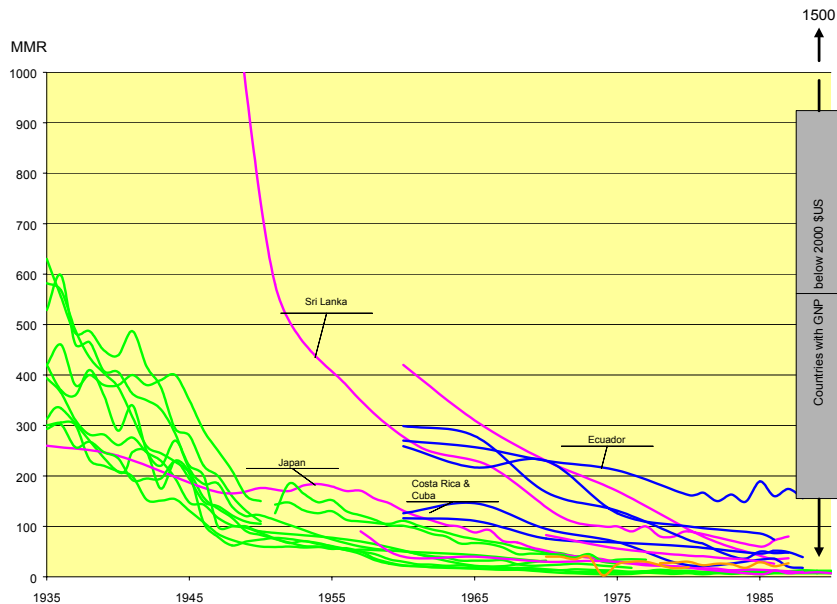
This combination of the technical and political factors (Figure 4) resulted in a significant reduction of the maternal mortality in Sweden, Japan, Denmark, Norway and The Netherlands, even without hospital technology. In countries like the USA, Belgium, Great-Britain, France or Italy ingredients were missing and mortality remained higher until modern hospital technologies became accessible; in those countries medicalisation of delivery would eventually be more pronounced. The commitment and sense of responsibility of health professionals and the State, clearer understanding of the causes of mortality – associated with the advent of effective technologies: caesarean section, antibiotics, blood transfusion – and extension of coverage to the population as a whole enabled the industrialised countries to attain extremely low maternal mortality ratios in some twenty years (between 1937 and 1960). By that time it did not make a difference whether the policy was to promote confinement in hospital (as in the United States) or at home (as in the Netherlands): that became a question of culture and efficiency, not of effectiveness in reducing mortality.

Professionalisation of delivery care and maternal mortality in developing countries

Time series on the evolution of maternal mortality in developing countries are harder to come by than in the West (Figure 6). There is practically no long term trend information on African countries. There is some more information for Latin America in the second half of the XXth century. The earliest and most important reductions were obtained where health services are well organised and accessible, countries like Cuba or Costa Rica. For most other Latin American countries the time series are of questionable reliability. They show slower and later reductions, and now stagnate at levels between 100 and 200. These persistent high levels seem to be related to social inequalities in access to quality health care, compounded by legislation limiting access to safe abortion (Mora & Junes 1993, Paxman 1993, Rendon *et al.* 1993).

Historical data in the poorer countries in Asia, such as Laos or Cambodia, are scarce – a notable exception being Sri Lanka. In Sri Lanka registration of births and deaths has been compulsory since 1897 and it has among the best documented time series in developing countries.

Figure 6. Reduction of maternal mortality after the second World War



What little information there is confirms the importance of information and its utilisation; professional delivery care with accountable and responsive personnel; and a strategy to guarantee access to such professional services. There is negative and positive evidence.

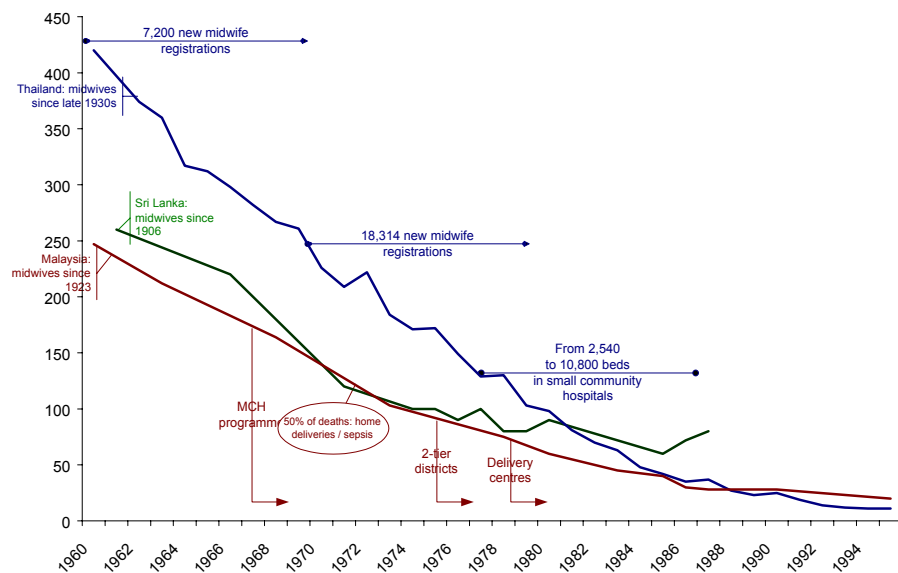
The economic transition in Mongolia, for example, led to the closure of maternities, cut-backs in emergency transport and dwindling hospital supplies. Maternal mortality ratios responded quickly to the breakdown of services, and rose from 120 in 1991 to 210 in 1994 (EA2RS 1996). Likewise, in Iraq the sanctions severely disrupted previously well functioning health care services, and maternal mortality ratios increased from 50 in 1989 to 117 in 1997, and even to 294 in Central and South Iraq (UNICEF 1998).

But there are also examples that confirm that combining a strategy of professionalisation of delivery care with a strong public commitment works (Figure 7). In Sri Lanka maternal mortality levels, compounded by malaria

epidemics, had remained well above 1,500 the first half of the XXth century (twenty years of antenatal care notwithstanding). From around 1947 they started to drop, “closely [following] the development of facilities for health care in the country” (Seneviratne & Rajapaksa 2000). The network of facilities was backed up, in 1960, by a special committee appointed to investigate maternal deaths, whilst professional organisations were involved in establishing training and service links. This brought maternal mortality down to between 80 and 100 as of 1975. Malaysia and Thailand are examples of how one can get further down than that.

In Malaysia maternal mortality was in the 120-200 bracket in the 1970s – the equivalent of the US or the UK in the post World-War II years (Leng 1990). In the 1980s ‘low risk delivery centres’ were created, backed up by good quality referral care, all with close and intensive quality assurance and on the initiative of the public sector authorities (Koblinsky *et al.* 1999). In 1991 Malaysia introduced confidential enquiries (Suleiman *et al.* 1999). All this brought maternal mortality down to 60-80 in 1990 and further to 20 around 1995.

Figure 7. Maternal mortality since the 1960s in Malaysia, Sri Lanka and Thailand



Up to the 1960s Thailand had maternal mortality levels above 400, the equivalent of the UK around 1900 or the USA in 1939. During the next fifteen years the first three health plans (1961-1976) gave priority to the training of paramedical personnel. During the 1960s 7,191 midwives were newly registered: double the number of the previous decade. Gradually TBAs were substituted by certified village midwives. Mortality halved, down to between 200 and 250 in 1970. During the 1970s the registration of midwives was stepped up: 18,314 new registrations. Midwives became a key figure in many villages: it was the heyday of Thai midwives, as respected figures in the villages, and with a high level of professional and social self-esteem. It also was effective: mortality dropped steadily and caught up with Sri Lanka by 1980, at 98 (Wibulpolprasert 2000). The fourth and fifth health plans then put the main thrust on strengthening and equipping district hospitals. In ten years time, from 1977 to 1987, the number of beds in small community hospitals quadrupled, from 2,540 to 10,800. The number of doctors in these districts rose from a few hundred to 1,339. By 1985 mortality had halved again, down to 42. By 1990 it was down to 25 and in 1995 to 11 per 100,000 – the downside being an impressive medicalisation with 28% of deliveries through caesarean section.

A major commitment of the ministries of public health to organise professional assistance to deliveries clearly works. This, however, is not what happens in many poor countries. Apparently the obstacles they face are not unlike those that delayed reduction of maternal mortality in many Western countries in the first half of the XXth century, including the sometimes appallingly bad quality care in hospitals (Prual et al. 2000).

Inadequate information

Clearly maternal mortality was not a matter of public concern up to the late 1970s, in spite of the fact that it was broadly at the level which had given rise to major political pressure in Sweden in the XIXth century and in Britain in the early XXth. Various factors may have contributed to this.

First, information was hard to come by. Vital statistics in developing countries were – and still are – very much incomplete. In 1977 only 66 countries out of 162 provided (incomplete) data on maternal mortality: in Africa 5 out of 52, in Asia 13 out of 43 and in Latin America 19 out of 31 (Rochat 1981). In those days the only data on maternal mortality in developing countries came from hospitals (Kwast 1988), without the denominator that could give a population perspective. Given the weakness of routine registration,

there have been major efforts to provide estimates of maternal mortality through, a.o. the DHS surveys.

This kind of information is, however, much less effective for generating corrective action than, e.g., the confidential enquiries that became routine in the UK at the end of 1950s (Godber 1994). It is even less effective than the data that were available in Sweden in the XIXth century. First, to estimate maternal mortality through surveys is demographers' work, often performed by foreign experts, with little ownership by authorities, national medical establishment or civil society. This greatly reduces their impact. Second, maternal mortality ratios only indicate the magnitude of the problem, not its vulnerability. They do not encompass the notion of avoidable deaths that their combination with clinical experience and enquiries in maternal deaths carried in, e.g., the UK. Third, survey estimates do not provide the degree of disaggregation necessary for planning and priority setting or for mobilising local authorities to respond to their particular situation. To know that 21 women died in a year in one particular district is information of a different kind than to know that MMR is estimated at 530 in the country. The sampling errors are such that even DHS survey estimates cannot be used for more than trend assessment over 10 year-intervals (Stanton *et al.* 2000).

Second, there is what Graham calls the 'measurement trap' (Graham & Campbell 1992) in translating the information into priority setting. Infants under one appear to run a much greater risk of dying than mothers when mortality quotients or rates are measured; for the maternal mortality rates relate to only one pregnancy at a time and not to the total number of pregnancies a mother may have in the course of her life.

As a matter of fact the problem was grossly underestimated. Around 1980 many in academic circles still thought maternal mortality in poor countries was of the order of magnitude of 300/100,000 (Rao 1981, Rosa 1981). Furthermore, donor agencies, planners and a substantial part of the scientific community considered that it was easier to have an impact on the mortality of children than on that of mothers; for child mortality seemed to respond rapidly and visibly responds to a range of vertical programmes (Walsh & Warren 1979). At that time, the 1980s, the international development world was arguing about the correct interpretation of the concept of 'primary health care' (Van Lerberghe 1993, Van Lerberghe & De Brouwere 2000). In the meantime things medical, and especially hospitals, were decidedly unfashionable (Van Lerberghe *et al.* 1997).

If the scientific world and the planners have been slow to appreciate that

they were failing to address a huge problem, the same can be said of the health professionals. In developing countries there have been no pressure groups of health professionals comparable to those which were active in Britain and the United States in the early XXth century. Among specialists in the large hospitals in the capitals quality of care was not a key feature of the medical culture, and it was rare for quality standards to be promoted or monitored. Practitioners in the district hospitals have many priorities, and the lack of resources rapidly leads to fatalism, certainly for problems that are not immediately visible. Health care providers in the hospitals of developing countries do not expect large numbers of maternal deaths. They are statistically rare (Rosenfield 1989) and doctors are not directly confronted with such occurrences: most of the women who die, do so at home, not in the hospital. The lack of visibility (Ebrahim 1989) is quite convenient in a context where women's lives are valued poorly, high fertility is culturally rewarded, and health professionals have little in common with their client populations.

The turning point came with the "*Where is the M in MCH?*" paper of Rosenfield and Maine (Rosenfield & Maine 1985, WHO 1986) and Mahler's appeal for the Safe Motherhood Initiative in 1987 (Mahler 1987). Ten years later it had become difficult to ignore that a major challenge had to be dealt with. But it was clear, too, that many of the past strategies in poor countries had failed.

Ill-informed and ineffective strategies

Alongside family planning, the first WHO expert committee formally put the focus on antenatal clinics and education of the mothers in the early 1950s (OMS 1952). The package of measures introduced to reduce maternal mortality had long remained substantially the same (in actual fact these measures had mainly been directed towards improving the survival prospects of infants).

Nevertheless, there had been evidence in the industrialised West, for as long as since 1932, that screening for maternal death was not very effective: a letter to the Lancet stated that "80 percent of maternal deaths were due to conditions (sepsis, haemorrhage, shock) not detectable antenatally" (Browne & Aberd 1932, Reynolds 1934). Nonetheless, antenatal risk scoring systems were extrapolated from Europe to developing countries in the 1960s. They soon became common wisdom (Lawson & Stewart 1967, King 1970, Van der Does & Haspeh 1972, Cranch 1974) and, during the 1970s and 1980s,

mainstream doctrine with WHO's risk approach (WHO 1978, Backet *et al* 1984).

In the early-1980s the first evidence questioning the cost-effectiveness of antenatal screening in developing countries appeared (Kasongo Project Team 1984), and common wisdom began to be challenged (Smith & Janowitz 1984): "*The ineffectiveness of ANC as an overall screening programme not only renders it less than what it claimed to be; it does not even then say what it is.*" (Oakley 1984). Six years later Maine became explicit: "*No amount of screening will separate those women who will from those who will not need emergency medical care*" (Maine *et al.* 1991). The Rooney report of 1992 formally changed the balance to scepticism⁷ (Rooney 1992). It is hard nowadays to defend antenatal care merely on basis of its potential for screening out preventable maternal death – but many are the administrators or funding organisations that continue thinking that as long as antenatal consultations are being conducted, one has done one's duty. In the meantime a WHO seminar in Malaysia in 1970 had launched the training and promotion of traditional birth attendants as another strategic axis (Mangay-Manglacas 1990). This strategy was further promoted in the influential recommendations of a 1972 inter-country-study. A decade later the initial enthusiasm still persisted (Williams *et al.* 1985, Tafforeau 1989, Sai & Meesham 1992), but it gradually gave way to scepticism (Chen 1981, Mathews 1983, Belsey 1990, Maine 1991, Bryant 1990, Smith *et al.* 2000). Little effect was seen apart from tetanus prevention. The resistance (or inability) to change of TBAs, their lack of credibility in the eyes of the health professionals, the *de facto* impossibility to organise effective and affordable supervision, all have discredited training of TBAs. Whatever its other merits, it is now considered an ineffective strategy to reduce maternal mortality.

⁷ In the industrialised world antenatal care also increasingly meets with scepticism (Jahn *et al.* 1998, Jahn 1999): "*Much of what passes for prenatal care in [the USA] is unduly expensive, unnecessarily high-tech, and serves no beneficial purpose, consisting of infrequently avert the conditions we want our babies to avoid*" (Strong 2000).

Making professional care accessible

It has taken the international community up to the 1990s to realise that the important thing is that deliveries are far safer with professional assistance, and that when a serious problem appears a pregnant woman should have access to an appropriately equipped health service.

Antenatal care or delivery attendance by TBAs without professional obstetric care cannot achieve the same. If the necessity of referral level obstetric care has now become obvious, the need for professional assistance to all deliveries – essential obstetric care – still meets only with limited support, and the medical assistance model clearly is favoured over midwifery. The end result is that some countries have invested all in institutionalisation and medicalisation of childbirth. Others, still put their hopes in antenatal screening and TBAs. Only a minority is investing in the now – at last – WHO-recommended essential obstetric care. EOC is much more credible for and readily accepted by the medical community than the ANC-TBA strategies of the 1970s. Where resources are available EOC expands rapidly and maternal mortality drops. The downside is that it also easily gets translated into institutionalisation and ‘technologisation’ of delivery. In Thailand, for example, the midwifery association has ceased to exist in the early 1990s, and as a rule deliveries now take place in hospitals: 28% through caesarean section.

In countries with severe resource constraints, however, there remain major problems in implementing these strategies. First, because huge investments in time and money are necessary to train the required numbers of professionals: midwives are scarce, 1 per 300,000 inhabitants in a 1990 estimate (Kwast 1991), especially outside the capital cities. Huge investments in time and money are necessary also to provide the necessary referral facilities able to complement a still to be created network of professional assistance to normal deliveries. Resources are not enough, though. Accessibility also has financial, cultural and psychosocial aspects (Jaffré & Prual 1994). Perhaps the most intractable and important issue is that of the accountability of professionals: for the quality of what is done in the hospital, and for what is not done outside (Nasah 1992, Derveeuw *et al.* 1999).

Winning the hospital battle

Historically the concept of avoidable deaths has made it possible for decision makers to realise that the problem is vulnerable. Measuring maternal mortality ratios is not enough. Maternal mortality ratios measurements need to be complemented by information that involves the entire community of maternal care providers, with immediate implications for local action. Various such methods are presently promoted: assessment of Unmet Obstetrical Need (De Brouwere & Van Lerberghe 1998), identification of avoidable deaths through confidential enquiries (Hibbard *et al.* 1996, Bouvier-Colle *et al.* 1995, Cook 1989), audits (Filippi *et al.* 1996), systematic verbal autopsies (Ronsmans 1998, Wessel *et al.* 1999, Langer 1999). These can contribute to generating information in a format that can be used for pressure through professional organisations and public: pressure for resources and pressure for accountability.

Professionalisation of delivery care is the key. In the Swedish model promotion of delivery care has preceded the impact of hospital technology. One could imagine to try to reproduce a similar sequence: first develop ambulatory midwifery, and later add hospital care. Such an approach would however (i) withhold the benefit to be obtained from the mutual potential of both elements; (ii) lack political credibility, and produce results too slowly; (iii) put the medical establishment in a position of conflict such as in the USA or England & Wales of the first half of the century. Winning the hospital battle (access to quality referral delivery care by accountable professionals) first is crucial from a strategic point of view, and a condition in order to get the doctor's collaboration in the promotion of professional midwifery (access to quality primary delivery care).

Thinking back on Morocco's blind spot for maternal health in the 1980s and the reluctance to face the evidence of the dramatic proportions of the problem, one key policy maker observed: "*The problem is really too big, you cannot tackle it with a programme, you need to tackle the whole system. That requires such an amount of resources, and above all of efforts.*": investments in training, in health care networks, in transformation of the system to ensure financial accessibility and accountability of the providers. This is unlikely to happen without public initiatives and pressure from the civil society. But the same Moroccan experience shows that progress is possible. It will take time, as it has done in Sweden and in China, in Sri Lanka and in Cuba. If the various elements are put into place, significant and largely irreversible reductions

should be possible, even with limited resources. Extrapolating from historical and recent experience, reductions of over 50% in well less than ten years are perfectly realistic. With still nearly 600,000 maternal deaths per year at this moment, it seems worth trying.

References

Backett M, Davies AM and Petros-Barvazian A (1984). L'approche fondée sur la notion de risque et les soins de santé. Notamment la santé maternelle et infantile (y compris la planification familiale). Genève:OMS.

Boerma JT and Mati JK (1989). "Identifying Maternal Mortality through Networking: Results from Coastal Kenya." *Stud.Fam.Plann.* 20(5),245-253.

Borst CG (1988). The training and practice of midwives: a Wisconsin study. *Bull. Hist. Med.* 62:606-627.

Bouvier Colle MH, Varnoux N, Bréart G and Medical Expert Committee (1995). "Maternal deaths and substandard care: the results of a confidential survey in France." *Eur. J. Obstet. Gynecol. Reprod. Biol.* 58,3-7.

Browne FJ and Aberd (1932). "Antenatal care and maternal mortality." *Lancet* (July 2),1-4.

Cook R (1989). "The role of confidential enquiries in the reduction of maternal mortality and alternatives to this approach." *Int.J.Gynecol.Obstet.* 30,41-45.

Cranch GS (1974). "The role of nursing/midwifery in maternal and infant care." In: Nursing-midwifery aspects of maternal and child health and family planning, Washington: PAHO, p.30-34.

De Brouwere V & Van Lerberghe W (1998). Les besoins obstétricaux non couverts. Paris: L'Harmattan.

De Brouwere V, Tonglet R & Van Lerberghe W (1997). "La 'Maternité sans Risque' dans les pays en développement: les leçons de l'histoire" *Studies in Health Services Organisation & Policy*, 6, Antwerp, ITGPress.

Declercq E and Lacroix R (1985). The immigrant midwives of Lawrence: the conflict between law and culture in early twentieth-century Massachusetts. *Bull. Hist. Med.* 59,232-246.

Derveeuw M, Litt V, De Brouwere V & Van Lerberghe W (1999). "Too little, too late, too sloppy: delivery care in Africa". *Lancet* 353,409.

Donnison J (1988). *Midwives and Medical Men: A History of the Struggle for the Control of Childbirth.* Hienemann, London.

- Duncan JM (1870). On the mortality of Children and Maternity Hospitals. Edinburgh, Adam and Charles Black.
- EA2RS (1996). Mongolia: poverty assessment in a transition economy. *World Bank*.
- Ebrahim GJ (1989). "Safe Motherhood in the 1990s". *J Trop Pediatr* 935(6),272-273.
- Filippi VG, Alihonou E, Mukantaganda S, Graham WJ and Ronsmans C (1998). "Near misses: maternal morbidity and mortality." *Lancet* 351,145-146.
- Fox DM (1993). "The medical institutions and the state" In Companion encyclopedia of the history of medicine, vol. 2 W. F. Bynum & R. Porter, eds., *Routledge, London & New York*, pp. 1204-1230.
- Fraser GJ (1998). African American Midwifery in the South. Dialogues of birth, race, and memory. *Harvard University Press, Cambridge Mass & London*.
- Godber G (1994). The origin and inception of the Confidential Enquiry into Maternal Deaths. *Br. J. Obstet. Gynaecol.* 101,946-947.
- Graham WJ & Campbell OMR (1992). "Maternal health and the measurement trap." *Soc.Sci. & Med.* 35,967-977.
- Graham WJ, Brass W and Snow RW (1989). "Estimating maternal mortality: the sisterhood method." *Stud.Fam.Plann.* 20 (3),25-135.
- Hibbard BM, Anderson MM, Drife JO, Tighe JR, Gordon G, Willatts S *et al.* (1998). Report on Confidential Enquiries into Maternal Deaths in the United Kingdom 1991-93, *London: HMSO*.
- Högberg U, Wall S and Broström G (1986). "The impact of early medical technology of maternal mortality in late XIXth century Sweden." *Int.J.Gynecol.Obstet.* 24, 251-261.
- Jaffré Y & Prual A (1994). Midwives in Niger: an uncomfortable position between social behaviour and health care constraints. *Soc. Sci. Med.* 38(8),1069-1073.
- Jahn A, Razum O & Berle P (1998). Routine screening for intrauterine growth retardation in Germany: low sensitivity and questionable benefit for diagnosed cases. *Acta Obstet Gynecol Scand.* 77,643-648.
- Jahn A (1999). Is the risk approach in antenatal care still justified? Lessons from Tanzania and Germany. *Gynaecology Forum*, 4(4),14-18.
- Kasongo Project Team, Van Lerberghe W & Van Balen H (1984). "Antenatal screening for fetopelvic dystocias; a cost-effectiveness approach to the choice of simple indicators for use by auxiliary personnel", *J Trop. Med Hyg.* 87,173-183.

- King CR (1991). "The New-York maternal mortality study: a conflict of professionalization." *Bull. Hist. Med.* **65** (3),476-502.
- King M (1970). Medical care in developing countries: a symposium from Makerere, Nairobi: *Oxford University Press*, 309 pages.
- Koblinsky MA, Campbell O & Heichelheim J (1999). Organizing delivery care: what works for safe motherhood? *Bull. World Health Organ* **77**(5),399-406.
- Kwast BE (1988). Unsafe motherhood: a monumental challenge. A study of maternal mortality in Addis Ababa, Leiderdorp, The Netherlands.
- Langer A, Hernandez B, Garcia-Barrios C, Saldaña-Uranga GL and National Safe Motherhood Committee of Mexico (1999). "Identifying interventions to prevent maternal mortality in Mexico: a verbal autopsy study." In: M. Berer and Sundari (eds) *Safe Motherhood Initiatives: critical issues*, 127-136.
- Lawson B and Stewart DB (1967). Obstetrics and Gynaecology in the Tropics and Developing Countries, London: *Edward Arnold*.
- Leng HC (1990). Health and Health Care in Malaysia. Institute for Advanced Studies Monograph Series SM 3. University Malaya.
- Llewellyn-Jones D (1974). Human Reproduction and Society. London: Faber and Faber.
- Loudon I (1992a). Death in childbirth. An international study of maternal care and maternal mortality 1800-1950 *Oxford University Press, London*.
- Loudon I (1992b). "The transformation of maternal mortality." *BMJ* **305**,1557-1560.
- Loudon I (1997). "Midwives and the quality of maternal care." in:Marland H and Rafferty AM, Midwives, Society and Childbirth. Debates and controversies in the modern period. *Routledge, London & New York*, 180-200.
- Mahler H (1987). "The Safe Motherhood Initiative: a call to action." *Lancet*, 668-670.
- Maine D, Rosenfield A, McCarthy J, Kamara A and Lucas AO (1991). Safe Motherhood Programs: options and issues, New-York: *Columbia University*.
- Mangay-Maglacas A (1990). "Traditional birth attendants." In: Health care for women and children in developing countries, edited by H. M. Wallace and K. Giri, Oakland (USA):*Third Party Publishing Company*, p. 229-241.

- Marland H (1997). "The midwife as health missionary: the reform of Dutch child-birth practices in the early twentieth century", In Marland H & A. M. Rafferty, eds.: *Midwives, Society and Childbirth. Debates and controversies in the modern period.*, Routledge, London, pp. 153-179.
- Marland H and Rafferty AM (1997). *Midwives, Society and Childbirth. Debates and controversies in the modern period.* Routledge, London & New York.
- Maternal and Child Health Division Ministry of Health and Welfare of Japan and Mothers' and children's Health and Welfare Association (1992). *Maternal and Child Health in Japan*, Tokyo:Mothers' and Children's Health and Welfare Association.
- Mora G & Yunes J (1993). Maternal mortality: an overlooked tragedy. In: *Gender, women, and health in the Americas*, pp. 62-79, ed E. Gómez Gómez, Washington: *Pan American Health Organization*.
- Mottram J (1997). "State Control in Local Context. Public health and midwifery regulation in Manchester, 1900-1914." in: Marland H and Rafferty AM, *Midwives, Society and Childbirth. Debates and controversies in the modern period.* Routledge, London & New York, 134-152.
- Oakley A (1984). *The capture womb. A history of the medical care of pregnant women.* Basil Blackwell, Oxford.
- OMS (1952). Comité d'experts de la maternité. Premier rapport. Etude préliminaire. SRT n°51, *Organisation Mondiale de la Santé*, Geneva, 28p.
- Paxman JM, Rizo A, Brown L & Benson J (1993). The clandestine epidemic: the practice of unsafe abortion in Latin America. *Stud. Fam. Plann.* 24(4),205-226.
- Pearl R (1921). "Biometric data on infant mortality in the United States Birth Registration Area, 1915-1918." *Am.J.Hyg.* 1,419-439.
- Porges RF (1985). "The response of the New-York Obstetrical Society to the report by the New-York Academy of Medicine on maternal mortality, 1933-34." *Am. J. Obstet. Gynecol.* 152,642-649.
- Prual A, Bouvier-Colle MH, de Bernis L & Breart G (2000). "Severe maternal morbidity from direct obstetric causes in West Africa: incidence and case fatality rates", *Bull.World Health Organ* 78(5),593-602.
- Rao KB (1981). "Maternity care." In: *Maternal and child health around the world*, edited by H. M. Wallace and G. J. Ebrahim, London: *The Macmillan Press Ltd*, p. 76-81.
- Reagan LJ (1995). Linking midwives and abortion in the progressive era. *Bull. Hist. Med.* 69,569-598.

- Rendon L, Langer A & Hernandez B (1993). Women's living conditions and maternal mortality in Latin America. *Bulletin of PAHO* 27(1),56-64.
- Reynolds FN (1934). "Maternal mortality" *Lancet* (29 December):1474-1476.
- Rochat RW (1981). "Maternal mortality in the United States of America". *Wld. Hlth. Statist. Quart.* 34,2-13.
- Ronsmans C, Vanneste A-M, Chakraborty J and van Ginneken JK (1998). "A comparison of three verbal autopsy methods to ascertain levels and causes of maternal deaths in Matlab", Bangladesh. *Int. J. Epidemiol.* 27,660-666.
- Rooney C (1992). Antenatal care and maternal health: how effective is it? A review of evidence, *Geneva: World Health Organization*.
- Rosa FW (1981.) "The status of maternal and child care in developing countries." In: Maternal and child health around the world, edited by H. M. Wallace and G. J. Ebrahim, *London: The Macmillan Press Ltd*, p. 3-16.
- Rosenfield A & Maine D (1985). "Maternal mortality: a neglected tragedy. Where is the M in MCH?" *Lancet* 2 (446),83-85.
- Rosenfield A (1989). "Maternal mortality in developing countries: an ongoing but neglected 'epidemic'." *J.A.M.A.* 262,376-379.
- Schmidt WM & Valadian I (1969). "Maternal and child health activities." In JJ Hanlon ed *Principles of Public Health administration*, The CV Mosby Company, Saint Louis, 367-381.
- Seneviratne HR & Rajapaksa LC (2000). "Safe motherhood in Sri Lanka: a 100-year march", *Int.J.Gynaecol.Obstet.* 70(1),113-124.
- Smith JB, Coleman NA, Fortney JA, De-Graft Johnson J, Blumhagen DW & Grey. TW (2000). The impact of traditional birth attendant training on delivery complications in Ghana. *Health Policy & Planning* 15(3),326-331.
- Smith JS & Janowitz B (1984). "La surveillance prénatale." In: Janowitz B, J Lewis, N Burton and P Lamptey *Santé reproductive en Afrique Subsaharienne: les questions et les choix, USA: Family Health International*, 19-22.
- Stanton C, Hill K, AbouZahr C & Wardlaw T (1995). Modelling maternal mortality in the developing world. *WHO & UNICEF, Geneva*.
- Stanton C, Abderrahim N & Hill K (2000). "An assessment of DHS maternal mortality indicators". *Stud.Fam.Plann.* 31(2),111-123.
- Strong TH Jr (2000). *Expecting Trouble: The Myth of Prenatal Care in America*, New York: *New York University Press*.

- Suleiman AB, Mathews A, Jegasothy R, Ali R & Kandiah N (1999). "A strategy for reducing maternal mortality", *Bull. World Health Organ* 77(2),190-193.
- UNICEF (1998). Situation analysis of children and women in Iraq. *Unicef, New York*.
- Van der Does CD and Haspels AA (1972). "Antenatal care." In: C. D. Van der Does and A. A. Harpels, ed. *Obstetrical and gynaecological hints for the tropical doctor*, Utrecht:A. Oosthoek's, 1-6.
- Van Lerberghe W, de Béthune X & De Brouwere V (1997). "Hospitals in sub-Saharan Africa: why we need more of what does not work as it should?" *Trop Med Int. Health* 2(8),799-808.
- Van Lerberghe W & De Brouwere V (2000). "Etat de santé et santé de l'Etat en Afrique subsaharienne", *Afrique Contemporaine* 135: 175-190.
- Van Lerberghe W (1993). "Les politiques de santé africaines: continuités et ruptures", *Bull Séances Acad R Sci Outre Mer.* 39, 205-230.
- Wessel H, Reitmaier P, Dupret A, Rocha E, Cnattingius S & Bergstrom S (1999). "Deaths among women of reproductive age in Cape Verde: causes and avoidability", *Acta Obstet. Gynecol. Scand.* 78(3),225-232.
- Walsh JA & Warren K (1979). "Selective Primary Health Care: an Interim Strategy for Disease Control in Developing Countries", *N.Engl.J.Med.*, 301:967-974.
- WHO (1986). "Maternal mortality: helping women off the road to death." *WHO Chronicle* 40(5),175-183.
- WHO and UNICEF (1996). Revised 1990 estimates of maternal mortality. A new approach by WHO and UNICEF, *Geneva: WHO*.
- Wibulpolprasert S ed. (2000). Thailand health profile 1997-1998. Ministry of Public Health. Bangkok, *ETO Press*.
- World Bank (1995). World Development Report 1995. Workers in an integrating world. *Oxford University Press, New-York*.

What is the evidence for the role of antenatal care strategies in the reduction of maternal mortality and morbidity?

Per Bergsjø¹

Summary

Antenatal care is practised all over the world, the programmes having essentially similar schedules and content. Adherence to those programmes vary greatly, however, both regarding attendance rates and the time of the first visit, most of the African countries having the poorest records. Little has been done to evaluate antenatal care; its contribution to safer childbirth rests on educated assumptions, not on scientific testing. Some randomised trials have shown no ill-effects of programmes with fewer visits. A large WHO-initiated trial of a new programme with only 4 visits for low-risk pregnant women and interventions scientifically shown to be beneficial has just been completed. Compared to a standard model of antenatal care the new package was equivalent to traditional care in all the pre-selected maternal and child outcomes, besides being cheaper.

By studying preventable factors for each major cause of maternal death, experts have estimated that maternal deaths can be reduced by at least 50%. The relative contribution of antenatal care is difficult to assess. Immunization programmes, iron prophylaxis, early detection of preeclampsia, education, advice and preparation for transport and safe delivery are elements which may make a difference. Inadequate reporting of maternal deaths and causes of death is an obstacle to proper monitoring of the epidemic of maternal death. Revision and upgrading of the systems should go hand in hand with quality improvement of antenatal care programmes.

¹ Professor Emeritus of the University of Bergen, Bergheimveien 11C, N-1367 Snarøya, Norway. Email : p-bergsj@online.no

Antenatal care

In centuries past, maternal mortality loomed large in every society, being 900 per 100 000 live births in Sweden around 1750 (Högberg 1985). During the twentieth century, the maternal mortality ratio in the Nordic countries (Denmark, Norway, Sweden) and the Netherlands fell from 300 to less than 10 per 100 000 births, the most rapid decline appearing after the second world war. The same trend has been observed in most other industrialised countries. The maternal mortality estimate for developed countries in 1990 was 17 per 100 000 births (World Health Organization 1996).

A Memorandum from the British Ministry of Health in 1929 (Ministry of Health 1929) outlined the principles and details of antenatal care, including timing and content of the visits. It prescribed a number of visits, starting as early in pregnancy as possible, continuing at 4-week intervals until the 28th week, then every two weeks until the 36th week, and then weekly until the onset of labour. This programme of prophylactic care continued for about fifty years before anyone thought of evaluating its effectiveness (Chalmers 1989). In addition to a basic set of tests and interventions, others were added according to temporal or permanent need, as defined nationally or locally. Ultrasound is a case in point. In case of complications, care should be delivered according to need.

It follows that there are many different ANC models. Midwives, general practitioner MDs and specialist obstetrician/gynaecologists are ANC caregivers, with no set rule about who does what, except in cases of high risk and complications. A WHO-initiated survey of maternity services in Europe in the early 1980s revealed that the officially recommended number of antenatal visits ranged from 5 or less in Luxembourg and Switzerland to 14 in Finland with a fair degree of compliance (Blondel *et al.* 1986) and that little was known about the actual content of care for pregnant women, except that screening practices varied greatly, as shown in Table 2 (World Health Organization, Regional Office for Europe 1985). A questionnaire survey of prenatal screening for 23 different tests and procedures, covering 67 university units in 9 countries in Europe, revealed substantial practice differences both between countries and in what was recommended versus what was actually done (Heringa & Huisjes 1988).

Antenatal care is one of the “four pillars” of safe motherhood, as formulated by the Maternal Health and Safe Motherhood Programme, Division of Family Health, of the World Health Organization (WHO) (World Health

Organization, 1994). The other three are family planning, clean/safe delivery and essential obstetric care. The package was devised to ensure that women should be able to go safely through pregnancy and childbirth and have healthy infants, in other words, to prevent the dreaded outcomes: maternal death, and perinatal and infant death.

Although there were many more stillbirths than maternal deaths one hundred years ago, the maternal deaths constituted a much larger problem, in society as well as medically. There were 25 stillbirths per 1000 births in Norway in the year 1900, ten times the maternal mortality ratio (Maltau 2000). In 1967 the stillbirth rate for births past 28 weeks was still 11 per 1000 births (Medical Birth Registry of Norway 1997).

With the rapid decline in maternal deaths, the focus of medical attention in developed countries shifted to the offspring. This change of emphasis is apparent in the content of current antenatal care programmes. However, in global context, the situation for mothers is still bleak. Out of the 585 000 mothers who die annually, only 9000, or 1.5%, died in developed countries including Central and Eastern Europe (Table 1). Therefore, reducing maternal deaths to “acceptable” levels must continue to be the top priority global challenge in reproductive health. The question is whether antenatal care programmes as practised in developing countries today are well structured to that end, and if not, how they can be remedied.

Table 1. Estimates of maternal mortality by WHO regions, 1990

WHO region	MMR	N of maternal deaths
Africa	940	213 000
The Americans	140	23 000
Eastern Mediterranean	440	68 000
Europe	59	7 000
South-East Asia	610	235 000
Western Pacific	120	39 000
World total	430	585 000

SOURCE: World Health organization (1996). Maternal mortality ratio (MMR) : maternal deaths per 100 000 live births.

Note: the text reference to developed countries (17 per 100.000 births) refers to another categorization of the countries).

In 1978 the WHO had developed the “risk approach” concept as a managerial tool for maternal and child health care, in particular for countries where access to medical care was limited (World Health Organization 1978). The risk approach was a strategy to identify risk factors for undesirable outcomes, with care to be delivered according to individual needs. However, because there are high levels of false positive and false negative results the approach was not successful as a public health measure. Nevertheless, the risk approach spurred thoughts and was the basis for later attempts to induce changes. Obviously, in individual cases clinicians should identify risk factors and give the advice or take the action that they believe is necessary, but public health physicians should regard every woman as being at risk and work towards a system which will result in emergency obstetric care accessible to all women.

PRACTICE

All over the world antenatal care has been adopted and follows the same principles as in Europe and the U.S.A., at least as far as recommendations on timing and content go. Practice is a different matter. A WHO compilation on coverage of maternity care (World Health Organization 1993b) showed that while 98% of the pregnant women in the developed countries attend the programmes, most of them from the first trimester onwards, less than 70% receive antenatal care in most countries in Africa, in India and Arab-speaking countries in Asia. Many of those who attend, come only once or twice, often late in pregnancy. In the Russian Federation, the proportion of late (after the first trimester) or no attendees has been relatively stable at 28-30% in the period 1985-1995 (U.S. Department of Health and Human Services 1999).

Many factors interfere with satisfactory implementation of antenatal care in developing countries; Nylander & Adekunle (1990) listed some: Inadequate resources, illiteracy and poverty, cultural and traditional practices and religious practices. Eseko (1998) conducted a cross-sectional, population-based study in Arusha region in Tanzania, interviewing 342 women who had given birth within the past two years. Of these, 98% had attended antenatal care services, 27% starting after the 20th week. Non-attendees were mainly grand multiparae (para 7 or higher). When the women were asked to give the reason they thought led to under-utilization of the services, ignorance (“don’t know the purpose of antenatal care”) was given as the main reason, by 57% of the respondents. Of the women living in the rural district, 49% said there

was no money for transport.

Whereas in Europe practice regarding tests and interventions varied greatly between centres (Table 2), the services in antenatal clinics in Arusha, Tanzania, were clearly deficient, according to the women who had attended (Eseko 1998). Blood pressure was never measured in 24% of them, and 61% never had their urine tested. Blood was never examined in 55%, and 71% never had any health education at the clinic. In a pre-trial study in 53 antenatal clinics in Argentina, Cuba, Saudi Arabia and Thailand we registered what was reportedly done and what was actually done (Piaggio et al. 1998) and found much better compliance with the rules than the Arusha study did. There were some deficiencies in weight gain monitoring in Cuba and Thailand, and breast examination was only done on 55% of the women in Argentina. All other tests and examinations were done in 95-100% of the cases.

Table 2. Screening during pregnancy in 24 countries within the European WHO region

Procedure or condition screened for	Number of countries where screening is			
	routine	selective	not done	Not answered
Blood group	21	1	0	2
Toxoplasmosis	3	14	4	3
Rubella	8	13	1	2
Tetanus	1	7	14	2
Syphilis	5	19	0	0
Amniocentesis	0	22	0	2
Ultrasound	3	19	0	2

SOURCE: World Health Organization, Regional Office for Europe (1985)

EVALUATION BY TRIAL AND BY MONITORING

Considering the variant models of antenatal care and their occasional poor delivery, is it at all possible to find out if antenatal care has, in fact, contributed to a decline in maternal mortality, as it was originally designed to do? A prospective trial comparing one programme to no programme is out of the question, for ethical and other reasons. In developed countries maternal mortality is so low that any attempt at reaching the number of participants needed for statistical power is bound to be futile. The five randomised trials which had been performed and published up to 1998 to test the effect of

fewer visits, had different designs, and the outcome measures were typically preterm delivery, low birthweight, Apgar score, caesarean section, pre-eclampsia and other maternal morbidity (Khan-Neelofur *et al.* 1998). None of these studies had the power to study an effect on maternal mortality, which has been the problem of all studies of antenatal care in the aggregate.

Evaluation can also be done by statistical monitoring of events, but it is difficult to draw conclusions about a causal relationship from parallel temporal trends. Biases and confounding are bound to creep in and obfuscate the picture. Statistical monitoring is nevertheless a prerequisite as background information, without it we do not know what goes on, and planning for improvement becomes a hazard.

As antenatal care represents a system of several components: a set of tests and interventions delivered at pre-set intervals, one should consider the objective of each element and decide if it is really effective, and secondly, critically review if that objective has been reached. This was done by an expert panel on the content of prenatal care convened by the U.S. Department of Health and Human Services, which recommended a more goal-oriented programme with fewer visits than that which was advised by the American College of Obstetricians and Gynaecologists at the time (Department of Health and Human Services 1989). McDuffie *et al.* (1996) tested that programme against the traditional one and found on average 2.7 fewer visits, but no significant differences in main outcomes (preterm delivery, low birth weight, preeclampsia, caesarean section).

In 1992 Rooney reviewed the evidence on the effectiveness of antenatal care and stated that it is striking how little is known (Rooney 1992). She made a list of antenatal interventions known to be effective, which is still valid (Table 3). It should be noted, however, that some of the effect measures listed in Table 3 are process and not outcome variables, and therefore not clear indicators of the effectiveness of antenatal care.

Table 3. Antenatal interventions known to be effective (adapted from Rooney 1992)

Condition/stage	Test or treatment	Effect
Prevention of anaemia	Routine iron and folate during pregnancy	Reduces, prevents fall in haemoglobin, reduces percentage of anaemic women
	Malaria chemoprophylaxis	Reduces percentage of anaemic women
Detection, investigation of anaemia	Copper sulphate test	Detects Hb level below chosen cut-off
	Colorimetric tests	Estimate Hb concentration
	Packed cell volume Coulter counter	Measures haematocrit Diagnoses types of anaemia
Treatment of iron-deficiency anaemia	Oral iron	Can raise Hb by 0.40.7g/dL per week
	I.M. or I.V. iron	Can raise Hb, need for trained staff, involves hazards: infection, anaphylaxis
	Packed cell transfusion	Raises Hb immediately, but involves several hazards (as above, and others)
Detection, investigation of PIH	Blood pressure	Detects hypertension
	Testing "clean" urine	Detects proteinuria; preeclampsia
Treatment of severe preeclampsia	Transfer for expert care	Control of disease. Reduced case fatality
Treatment of eclampsia	Supportive first aid	Reduced case fatality
	Speedy transfer to first referral level facility	Reduced case fatality
	Expedited delivery	Definitive treatment
Screening for infection	Magnesium sulphate*	Reduces recurrence risk
	Serology for syphilis	With effective treatment, reduces fetal loss and maternal and infant morbidity
	Microbiology for gonorrhoea	With effective treatment, reduces fetal loss and maternal and infant morbidity
	Bacteruria screening	Appropriate antibiotics prevent pyelonephritis and preterm delivery/ low birth weight
Primary prevention of infection	Tetanus immunization in pregnancy or women of childbearing age	Prevents maternal and neonatal tetanus

*Not in original table; added by Per Bergsjø

Villar & Bergsjø (1997) evaluated recent studies with regard to power for elimination or alleviation of specific adverse maternal and newborn outcomes. There is a number of randomised trials addressing specific adverse end points, but none to evaluate the problem of maternal death. Any statement on possible effects from antenatal care on maternal death is arrived at by inference, not by direct evidence.

Finally, the WHO Reproductive Health Library (World Health Organization 2000) deserves to be mentioned as a unique electronic set of updated reviews focusing on evidence-based solutions to reproductive health problems in developing countries, drawing on the Cochrane database and other sources.

OUTLINING A WORKABLE MODEL

There are several recommendations on how to practise antenatal care, some given by university teachers, others by gynaecological societies and others again by governmental decision. A handful of randomised and other comparative trials have addressed the question if there is a model of antenatal care which is superior to the others, with the qualification that local conditions may dictate specific tests or interventions, e.g. Sikorsky *et al.* (1996) in London and Tucker *et al.* (1996) in Scotland. A randomised controlled trial in Harare is pertinent to the problem of antenatal care delivery in developing countries. Munjanja *et al.* (1996) tested a model of fewer but more objectively oriented visits and fewer procedures per visit. Women in the new programme had fewer visits, less antenatal referrals and significantly less preterm deliveries, and there were no differences in other outcome indicators. There were 6 maternal deaths out of 9394 women in study clinics and 5 out of 6138 in control clinics, which indicates equivalence in this respect but is without statistical significance.

Partly in response to a workshop in Sweden in 1990 (Lindmark & Cnattingius 1991) the World Health Organization in 1991 convened an expert group to work out a new model for antenatal care with emphasis on essential elements that have been demonstrated to improve selected pregnancy outcomes. A radical new model was proposed, with four visits for those at lowest risk, the first as early as possible, preferably before the 12th week, the second at or near week 26, the third near week 32 and the fourth in weeks 36 to 38. One post partum visit should be added. The protocol for a randomised controlled trial was drafted, based on the hypothesis that the new model would be as effective as the traditional one and that it would cost

less. After some years of preparation, this trial took place at 53 antenatal care centres in four countries (Argentina, Cuba, Saudi Arabia and Thailand), randomised to deliver either the new package or the traditional one. Recruitment started in May 1996, and by the end of 1998 all of the nearly 25 000 participating women had delivered or aborted. The completed data file was ready for analysis in September 1999. The overall results are published in the *Lancet* (Villar *et al.* 2001). Briefly told, women in the new model clinics had a median of 5 visits, those in the traditional ones 8. Women in the new model were referred more often to a higher level of care, but the rates of hospital admission, type of admission by diagnosis and length of stay were similar between the groups. The rates of several outcome variables were also similar. Pertinent to the present discussion, there were 7 cases of eclampsia in the new and 8 in the traditional model, and 7 and 6 maternal deaths, respectively. In economic terms, the new model turned out to be cheaper. Regarding user satisfaction (Langer *et al.* 2000) most women in both arms of the trial said they were satisfied with antenatal care. Women in the new model were less satisfied with the fewer visits and longer spacing (differences not significant), but significantly more satisfied with the new model in relation to information on labour, delivery, pregnancy complications and emergency procedures.

It is reasonable to propose this model as a standard for antenatal care, with modifications according to local needs.

Maternal mortality

The reason why so little work has been done in trying to prove that antenatal care is effective is the difficulty in measuring maternal mortality. In countries with good vital registration one should assume that every maternal death would be on record. In practice this is not so. The health worker responsible for notification may forget to put pregnancy after the primary cause of death, which may be haemorrhage or lung embolus, or simply not realise that the woman was pregnant. In some societies or religious groups notification of abortion may be omitted to avoid embarrassing the surviving family (Royston & Armstrong 1989). Official rates are underestimates to varying degrees. In the revised 1990 estimates of maternal mortality (World Health Organization 1996) the reported numbers for developed countries with good vital registration were adjusted by a factor of 1.5 to account for misclassification. Official rates in developing countries are likely to be wider off the mark. Jamaica has a reasonably good registration system. In 1979 the

official ratio was 48 per 100 000 live births, while Walker *et al.*(1986) in a confidential inquiry using various sources identified more than twice as many, to a ratio of 108 maternal deaths per 100 000 live births. Figures from Tanzania are another example. The revised 1990 estimates (World Health Organization 1996) quoted 770 for Tanzania, differing from the official estimates (185) by a factor of 4. Results from a recent study in Arusha region are shown in Table 4, the figures ranged from 320 to 444 by different methods of registration, while the official figure from the same district was 140 (Olsen *et al.* 2001).

Table 4. Estimates of maternal mortality ratios (with 95% confidence intervals) in two divisions in Arusha region, Tanzania 1995 and 1996 (Olsen *et al.* 2001). Different modes of registration.

Mode of registration	Number of maternal deaths	Maternal mortality ratio
Direct registration		
Antenatal cohort	11	320 (160-580)
Multiple sources	26	380 (250-560)
Indirect sisterhood method		
Household sample (15-49)	58	362 (269-456)
Antenatal clinic sample (15-49)	142	444 (371-517)
Official statistics	19	140 (80-210)

Hospital statistics on maternal deaths may also be unreliable, as deaths occurring in surgical and gynaecological wards are often not reported. To find all deaths requires a careful survey of all registers in the hospital including the mortuary. Furthermore, cultural and religious constraints may occasionally lead to underreporting, especially if there is an official inquiry following an unexpected death of a woman of fertile age. However, in geographic areas where almost all the women deliver in hospitals, the maternal mortality figures will reflect the true situation reasonably well.

Bias will increase with the proportion of births outside of hospitals and the direction of the bias is not immediately obvious.

In developing countries with varying degrees of death registration but poor cause of death registration, it is difficult or impossible to obtain national data on maternal deaths with any degree of completeness. One alternative is to follow a cohort of pregnant women and try to ascertain the outcome on each and every one. This is feasible only for ad hoc research surveys. The other possibility is to do household surveys in defined areas, inquiring about pregnancy outcomes. The "sisterhood method" has been devised for this purpose: a set of simple questions about whether or not the sisters of the respondent are still alive, and additional questions on cause of death for those who are not. By combining information from several sources, it is possible to obtain the true number, but this is cumbersome and can hardly be used for continuous monitoring.

CAUSES OF MATERNAL DEATH

The decline of maternal mortality in developed countries in Norway and Sweden was primarily due to falling rates of puerperal infection and post-abortion sepsis, while deaths from eclampsia did not change much (Maltau & Grünfeld 1983, Högberg & Joelsson 1985). Turning to the present-day situation, the Maternal Health and Safe Motherhood Programme (World Health Organization 1994) made an estimate of the global mortality from the main obstetric complications, which is shown in Table 5. As only 1.5% of maternal deaths occur in developed countries, the distribution will reflect the third world situation.

Haemorrhage (from placenta praevia, abruptio placentae, uterine atony, ectopic pregnancy, post partum tears and coagulopathies) is the leading cause. Sepsis continues to take its toll, and a similar number die in consequence of unsafe abortion. Hypertensive disorders of pregnancy can hardly be prevented, but the complications can often be averted or treated successfully. Obstructed labour, as a rule ending with a ruptured uterus, is important as a preventable cause. It is of some interest to note that in the Russian Federation the maternal mortality ratio increased by 12% during the 1990s, to 23 per 100 000 live births, and that the vast majority was due to abortion other than legally induced pregnancy terminations (U.S. Department of Health and Human Services 1999).

Table 5. Estimation mortality from the main obstetric complications worldwide and impact of possibly preventable deaths. The compilation was done before the estimates were revised; hence the lower total number than in Table 1.

Cause of death	Number and % of deaths		Possibly preventable:	
			%	no.
Haemorrhage	127 000	25%	55%	70 000
Sepsis	76 000	15%	75%	57 000
Preeclampsia/eclampsia	64 000	12%	65%	42 000
Obstructed labour	38 000	8%	80%	30 000
Unsafe abortion	67 000	13%	75%	50 000
Other direct causes	39 000	8%	~	~
Indirect causes	100 000	20%	20%	20 000
TOTAL	510 000	100%		269 000

SOURCE: World Health Organization (1994).

In addition to the direct causes listed in Table 5, anaemia and malaria deserve to be mentioned as important indirect causes. Both conditions are prevalent in tropical countries, and both are aggravated by pregnancy. In Moshi, Kilimanjaro region, Tanzania, Bergsjø, Seha & Ole-Kingori (1996) found that 75% of the pregnant women had Hb lower than 110 g/l and 7% below 70 g/l. Bondevik *et al.* (2000), measuring haematocrit (hct) in pregnant women in Kathmandu, Nepal, found anaemia (hct below 34) and severe anaemia (hct below 24) in 62% and 4% respectively. Anaemia figures as a cause of death in many of the studies quoted in the Global Factbook (AbouZahr & Royston 1991). The risks and severity of malaria in pregnant women were analysed by Brabin (1991). In a survey of maternal deaths in 1995 and 1996 in highlands of Arusha region, Tanzania, we found verified cerebral malaria as primary cause in 20 out of 45 cases (Hinderaker *et al.* 2001).

To register the death of a pregnant woman as a maternal death is not always done, as already discussed. Assigning the right cause to a maternal death can be equally problematic, especially for deaths outside of hospitals and in hospitals with poor diagnostic facilities and no autopsy service. In such cases one must resort to verbal autopsy (World Health Organization (1995).

Although it does not satisfy the definition of maternal death, it is impossible not to mention the toll the acquired immuno-deficiency syndrome (AIDS) takes on pregnant women. In several African countries south of the Sahara upwards of 10% of pregnant women at antenatal care centres are

HIV-positive (UNAIDS & WHO 1998). Given the natural course of HIV infection, 5% to 10% of these will succumb to HIV-related disease during pregnancy and puerperum. This problem will be further elaborated in the section on maternal morbidity.

ANTENATAL CARE AS A TOOL TO PREVENT MATERNAL DEATHS

When discussing prevention, a scrutiny of the causes, and in the present context the part played by antenatal care, is paramount.

Haemorrhage may arise at any time during pregnancy, birth and puerperium. Causes differ, and hence the possibility for their prevention. Acute bleeding will commence before or between routine antenatal care visits and as a rule requires emergency consultation. Bleeding due to spontaneous early abortion is generally self-limiting. Major separation of the placenta is life-threatening, because of acute blood loss and later coagulopathy. Patients with placenta previa are also at high risk and in any case need constant surveillance. Proper antenatal care can lead to the earlier diagnosis of placenta previa, and management according to modern principles can reduce maternal mortality. Referral to second or third level centres for sonographic investigation is mandatory. Education may induce women to seek medical care when they start bleeding in late pregnancy. This education should ideally also be given to husbands, friends or other family members. Advice and counselling are therefore key elements which may help women secure rapid hospital treatment. Previous blood group typing may save blood matching time in emergency situations. Certain individual risk factors should induce more intensive monitoring: history of haemorrhage or coagulopathy in previous pregnancy, grand multiparity, polyhydramnios, hypertensive disease of pregnancy and premonitory bleeding in the present pregnancy.

Anaemia will aggravate the effects of bleeding, and iron prophylaxis should be considered in areas of high anaemia prevalence. This will reduce the proportion of women with low Hb levels and the need of blood transfusions post partum, but trials have not been shown to effect maternal, perinatal and long-term outcomes (see Villar & Bergsjø 1997).

Puerperal sepsis is more prevalent in places with high maternal mortality, mainly due to unclean home deliveries, higher rates of pathogenic genital tract infections and poor cleanliness and delay after rupture of the membranes. The main preventive effort is to secure clean delivery, as advised in the Mother-Baby Package (World Health Organization 1994). The role of antenatal care is mainly educational, with emphasis on cleanliness and the

need to seek care in case of spontaneous pre-term rupture of the membranes. Screening for bacteriuria with adequate treatment if positive is a way to possibly eliminate one focus of infection, but its effectiveness in low-income settings in third world countries is far from established (Olsen *et al.* 2000). Other possibilities for prevention of tetanus and other specific infections are outlined in Table 3. A WHO report from 1991 is still a good source of information (World Health Organization 1991).

Preeclampsia will be diagnosed by blood pressure measurement and detection of protein in the urine. Routine weight recording does not add to the diagnostic accuracy. The rationale behind the increasing frequency of visits in the standard antenatal care programmes was to detect preeclampsia as early as possible, but none of the trials testing schedules of fewer visits have shown any differences for detection and outcome complications of preeclampsia. Those at high risk should be followed more closely or referred to higher level of care (very young primigravidae, those with preeclampsia or eclampsia in previous pregnancies. Eclampsia may strike without prior signs of preeclampsia. All pregnant women and their partners (or sisters and mothers) should be told about early signs and how to react. It remains to be demonstrated that antenatal care leads to improved survival when hypertensive disorders are concerned (Rooney 1992).

Obstructed labour by definition manifests itself at birth. The best predictor is obstructed labour during the previous delivery. For primigravidae, maternal height has been used to select those of low stature for hospital delivery and is still useful in places where one has to select cases for hospital delivery. The test sensitivity is low but obviously increases with decreasing cut-off levels of height. Serial measurements of symphysis-to-fundus distance will detect those with large foetuses and will help select those in special need of caesarean section.

Deaths due to unsafe abortion occur all over the world, with notable exceptions for North America and most parts of Europe where abortion is legal, safe and relatively accessible (World Health Organization 1997). This problem must be attacked at parliamentary and governmental levels, all one can give at antenatal care is education about family planning and the dangers of abortion.

Maternal morbidity

Maternal mortality has been likened to the tip of the iceberg, maternal morbidity to its base (Bergström 1994). This implies that many more mothers

experience disease and suffering in consequence of pregnancy than those who die. Maternal disease is often reflected in the offspring: low birth weight, malnutrition, other ailments, which underlines the importance of this issue. Short term illnesses following childbirth can be classified as 1. Puerperal hypertension, 2. Peripartur cardiac failure, 3. Thrombosis and embolism, 4. Acute prolapse of the cervix, 5. Pelvic instability and pain, 6. Psychiatric illness, 7. Sepsis and other infections, and 8. Others. Some of these were discussed in the section of maternal mortality. Most of them are time-limited and not seen as part of the global problem discussed here. Long term sequelae of debilitating proportion were classified by Royston and Armstrong (1989) into 1. Fistula, 2. Neurological dysfunction, 3. Vaginal stenosis, 4. Sheehan's syndrome, 5. Chronic pelvic inflammatory disease, 6. Infertility, 7. Ectopic pregnancy, 8. Anaemia and 9. Uterovaginal prolapse. To these may be added 9. Urinary stress incontinence. Sheehan's syndrome is extremely rare and some of the others are equally common in developed and developing countries.

Rectovaginal and vesicovaginal fistulas are common in Africa but hardly ever seen in Europe and North America. They are caused by delayed obstructed labour and cause immense pain and suffering. Some medical centres have specialised surgical fistula units; treatment periods are long and results not guaranteed. Demand for treatment is much higher than existing resources. Prevention is clearly possible, as outlined in the paragraph on obstructed labour.

Pelvic inflammatory disease, infertility and ectopic pregnancy are parts of the same problem: genito-urinary infections. Bilateral tubal occlusion as demonstrable cause of female infertility is much higher in Africa than in Asia, Latin America, East Mediterranean and developed countries (Cates *et al.* 1988). Africa, therefore, should be specially targeted for preventive action, as outlined in the paragraphs on sepsis and unsafe abortion. This should go concomitantly with HIV and AIDS education. AIDS education is multisectorial (Bergsjø 1996), and the message probably best heeded at individual level. Antenatal care programmes should have family planning and safe sex as integral parts of the package.

Concluding remarks

It should be emphasized that there is very little factual evidence that antenatal care does reduce maternal mortality. In this brief survey of if and how antenatal care reduces maternal mortality we have left several important

points untouched. The organization and distribution of maternal health services and its providers, the role of non-governmental organisations (NGOs), abortion laws and practices, and levels of education among women are relevant factors which should be clarified and evaluated within each third world country. Governments should clarify gaps between central policies and actually delivered health care, and intensify their efforts to improve the quality of services. Maternal health is an integral part of reproductive health and should not be viewed in isolation; the problem is also linked to HIV and its consequences.

In a critical review McDonagh (1996) emphasized that to have any effect antenatal care must be part of a system of care that culminates in good local obstetric facilities with adequately trained staff. It is easy to agree.

To finally quote Rooney (1992), basic research “both epidemiological and operational, on antenatal care is not an academic luxury; improved information on patterns of maternal health and the efficacy of investigation and treatment are essential to rational planning of effective health services to reduce maternal mortality and morbidity from their current alarming levels”.

However, on the assumption that history occasionally repeats itself, the evolution of maternal mortality in the developed countries during the 20th century gives at least a guarded cause for optimism.

Acknowledgement

I wish to thank Dr. Colin Bullough for valuable comments on the text.

References

AbouZahr C & Royston E (1991). *Maternal Mortality. A Global Factbook*. Division of Family Health, World Health Organization, Geneva.

Bergsjø P (1996). *Action against AIDS. The MUTAN report*. Centre for International health, University of Bergen.

Bergsjø P, Seha A & Ole-Kingori N (1996). Hemoglobin concentration in pregnant women. Experience from Moshi, Tanzania. *Acta Obstetrica et Gynecologica Scandinavica* 75, 241-44.

Bergström S (1994). Maternal health: a priority in reproductive health. In: Lankinen KS, Bergström S, Mäkelä PH & Peltomaa M, eds. *Health and Disease in Developing Countries*. The Macmillan Press Limited, London, 305-15.

- Blondel B, Push D & Schmidt E (1986). Some characteristics of antenatal care in 13 European countries. In Phaff JML, ed. (1986). *Perinatal Health Services in Europe. Searching for Better Childbirth*. Croom Helm, London, p. 4.
- Bondevik GT, Ulstein M, Lie RT, Rana G & Kvåle G (2000). The prevalence of anemia in pregnant Nepali women –a study in Kathmandu. *Acta Obstetrica et Gynecologica Scandinavica* 79,341-49.
- Brabin BJ (1991). *The Risks and Severity of Malaria in Pregnant Women*. Applied Field Research in Malaria Reports, No. 1. World Health Organization, Geneva.
- Cates W, Farley TMM, Rowe PJ. (1988). Patterns of infertility in the developed and developing worlds. In: Rowe PJ & Vikhlyaeva EM, eds. *Diagnosis and treatment of infertility*. Hans Huber Publishers, Toronto, Lewiston N.Y., Bern, Stuttgart.
- Chalmers I (1989). Evaluating the effects of care during pregnancy and childbirth. In Chalmers I, Enkin M, Keirse MJNC, eds. *Effective Care in Pregnancy and Childbirth*. Oxford University Press, Oxford, pp. 3-38.
- Department of Health and Human Services (1989). *Caring for Our Future: The Content of Prenatal Care*. A Report of the Public Health Service Expert Panel on the Content of Prenatal Care. Public Health Service, Department of health and Human Services, Washington, DC.
- Eseko N (1998). *Analysis of maternal and perinatal care systems in Tanzania and assessment of the actual situation in Arusha region*. Thesis for Master of Philosophy in Health Sciences. Centre for International Health, University of Bergen, Bergen.
- Heringa M & Huisjes HJ (1988). Prenatal screening. Current policy in EC countries. In: Huisjes HJ, Buekens P & Reid M. *Antenatal screening. Current policies in the EC and evaluation*. Elsevier, Amsterdam, 7-52.
- Hinderaker SG, Olsen BE, Bergsjø P, Lie RT, Gasheka P, Kwale G (2001) Anemia in pregnancy in the highlands of Tanzania. *Acta Obstet Gynecol Scand*, 80(1): 18-26.
- Högberg U (1985). *Maternal mortality in Sweden*. Umeå University Medical Dissertations, New Series No. 156. Umeå University, Umeå.
- Högberg U & Joelsson I (1985). The decline in maternal mortality in Sweden, 1931-1980. *Acta Obstetrica et Gynecologica Scandinavica* 64,583-92.
- Khan-Neelofur D, Gülmezoglu M & Villar J (1998). Who should provide routine antenatal care for low-risk women, and how often? A systematic review of randomised controlled trials. *Paediatric and Perinatal Epidemiology* 12, Suppl. 2,7-26.
- Langer A, Romero M, Nigenda G, Kuchaisit C, Rojas G, Al-Osimi M et al. (2000). Are women and providers satisfied with antenatal care? Views on a standard and a simplified, evidence-based model of care in four developing countries. Submitted.

- Lindmark G, Cnattingius S (1991). The scientific basis of antenatal care. Report from a state of the art conference. *Acta Obstetrica et Gynecologica Scandinavica* **70**, 105-9.
- Maltau JM (2000). Trekk fra fødselshjelpens historie I Norge. In: Bergsjø P, Maltau JM, Molne K & Nesheim B-I, eds. *Obstetikk*. 3rd edition, 2nd printing. Gyldendal Akademisk, Oslo, 11-16. (In Norwegian).
- Maltau JM & Grünfeld B (1983). Mødredødelighet i Norge 1880-1979. Maternal mortality in Norway 1880-1979. *Tidsskrift for Den norske lægeforening* **103**, 522-25. (In Norwegian, with English summary).
- McDonagh M (1996). Is antenatal care effective in reducing maternal morbidity and mortality? *Health Policy and Planning* **11**, 1-15.
- McDuffie RS, Beck A, Bischoff K, Cross J & Orleans M (1996). Effect of frequency of prenatal care visits on perinatal outcome among low-risk women. *Journal of the American Medical Association (JAMA)* **275**, 847-51.
- Medical Birth Registry of Norway (1997). *Births in Norway through 30 years*. Medical Birth Registry of Norway, Bergen.
- Ministry of Health (1929). *Maternal Mortality in Childbirth. Ante-Natal Clinics: Their Conduct and Scope*. His Majesty's Stationery Office, London.
- Munjanja SP, Lindmark G & Nyström L (1996). Randomised controlled trial of a reduced-visit programme of antenatal care in Harare, Zimbabwe. *Lancet* **348**, 364-9.
- Nylander PPS & Adekunle AO (1990). Antenatal care in developing countries. *Baillière's Clinical Obstetrics and Gynaecology* **4**(1), 169-86.
- Olsen BE, Hinderaker SG, Gasheka P, Bergsjø P, Lie RT & Kvåle G (2001). Assessing estimates and sources of information of maternal mortality in northern rural Tanzania. Submitted
- Olsen BE, Hinderaker SG, Lie RT, Gasheka P, Baerheim A, Bergsjø P, Kvåle G (2000). The diagnosis of urinary tract infections among pregnant women in rural Tanzania; prevalences and correspondence between different diagnostic methods. *Acta Obstetrica et Gynecologica Scandinavica* **79**, 729-36.
- Piaggio G, Ba'aqeel H, Bergsjø P, Carroli G, Farnot U, Lumbiganon P, Pinol A & Villar J (1998). The practice of antenatal care: comparing four study sites in different parts of the world participating in the WHO Antenatal Care Randomised Controlled Trial. *Paediatric and Perinatal Epidemiology* **12**, Suppl. 2, 116-141.
- Royston E & Armstrong S, eds. (1989). *Preventing maternal deaths*. World Health Organization, Geneva, 14.

Rooney C (1992). *Antenatal care and maternal health. How effective is it? A review of the evidence*. Maternal Health and Safe Motherhood Programme, Division of Family Health, World Health Organization, Geneva.

Sikorsky J, Wilson J, Clement S, Das S & Smeeton N (1996). A randomised controlled trial comparing two schedules of antenatal visits: the antenatal care project. *British Medical Journal* 312, 546-53.

Tucker JS, Hall MH, Howie PW, Reid ME, Barbour RS & Florey C du V et al. (1996). Should obstetricians see women with normal pregnancies? A multicentre randomised controlled trial of routine antenatal care by general practitioners and midwives compared with shared care led by obstetricians. *British Medical Journal* 312, 554-59.

UNAIDS & WHO (1998). *Report on the global HIV/AIDS epidemic, June 1998*. Joint United Nations Programme on HIV/AIDS and World Health Organization, Geneva.

U.S. Department of Health and Human Services (1999). *Maternal and Child Health Statistics: Russian Federation and United States, Selected Years 1985-95*. Vital and Health Statistics, Series 5: International Vital and Health Statistical Reports No 10. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, Hyattsville, Maryland.

Villar J, Bergsjø P (1997). Scientific basis for the content of routine antenatal care. 1. Philosophy, recent studies, and power to eliminate or alleviate adverse outcomes. *Acta Obstetrica et Gynecologica Scandinavica* 76,1-14.

Villar J *et al.* (2001). The evaluation of anew model of antenatal care: the WHO antenatal care randomised controlled trial. *Lancet* (in press).

Walker GJA, McCaw AM, Ashley DEC & Bernard GW (1986). Maternal mortality in Jamaica. *Lancet* I, 486-8.

World Health Organization (1978). *Risk Approach for Maternal and Child Health Care*. WHO Offset Publication No. 39. World Health Organization, Geneva.

World Health Organization (1991). *Maternal and Perinatal Infections*. Report of a WHO Consultation. Programme of Maternal and Child Health and Family Planning, Division of Family Health, World Health Organization, Geneva.

World Health Organization (1993b). *Coverage of Maternity Care. A Tabulation of Available Information*, 3rd edn. Maternal Health and Safe Motherhood Programme, Division of Family Health, World Health Organization, Geneva.

World Health Organization (1994). *Mother-Baby Package: Implementing safe motherhood in countries. Practical Guide*. Maternal Health and Safe Motherhood Programme, Division of Family Health, World Health Organization, Geneva.

World Health Organization (1995). *Verbal Autopsies for Maternal Deaths*. Report of a WHO workshop, London, 10-13 January 1994. Maternal Health and Safe Motherhood Programme, World Health Organization, Geneva.

World Health Organization (1996). *Revised 1990 Estimates of Maternal Mortality. A New approach by WHO and UNICEF*. World Health Organization, Geneva.

World Health Organization (1997). *Unsafe abortion. Global and Regional Estimates of Incidence of and Mortality due to Unsafe Abortion with a Listing of Available Country Data.. Third Edition*. Maternal and Newborn Health, Safe Motherhood. Division of Reproductive Health (Technical Support). World Health Organization, Geneva.

World Health Organization (2000). *WHO Reproductive Health Library No. 3*. UNDP/UNFPA/WHO/World Bank, Special Programme of Research, Development and Research Training in Human Reproduction, Department of Reproductive Health and Research. World Health Organization, Geneva. (Electronic publication)

World Health Organization, Regional Office for Europe (1985). *Having a baby in Europe*. Public Health in Europe 26. World Health Organization, Regional Office for Europe, Copenhagen, p. 17.

Micronutrients and pregnancy outcome

Patrick W Kolsteren¹ and Sonia De Souza²

Summary

The present paper reviews the available evidence on the effects of micronutrient deficiencies on pregnancy outcome. The largest possible effects are noted on neonatal outcome in terms of low birth weight, preterm delivery, miscarriages and higher risks of morbidity in the first year of life. Evidence is accumulating that a deficiency in β carotene, magnesium, zinc, vitamin C and possibly the B vitamins increase the risk of pre-eclampsia. Whether supplementation on a population based scale will yield improvements in pre-eclampsia incidence remains to be seen. Iron deficiency negatively affects birth weight, increases the chances of prematurity and it is highly likely that there are more complications during delivery for mother and child. Whether there is a direct effect on maternal mortality remains unclear. Iron supplementation during pregnancy is a widely accepted strategy and it will be impossible to set up placebo controlled studies. It is clear that supplements are needed in most regions where the prevalence of iron deficiency is high. It is not so clear whether supplementation is needed in situations where the prevalence is low. The present review supports the view that no single strategy will yield important improvements in birth outcome and that a solution must be sought to improve, in general, the nutritional status of pregnant women.

Introduction

Creating offspring is one of man's most cherished achievements and joys. For many it is the main drive for life and the reason to be. Unfortunately this act of procreation is also in many countries the most dangerous period in life. Maternal mortality remains high in many developing countries and pregnancy is beset with high incidences of miscarriages, pre-term deliveries, low birth weight and birth trauma, which endanger the chances of survival of the newborn.

¹ Professor at the Nutrition Unit, Department of Public Health, Institute of Tropical Medicine, Antwerp, Belgium. Email: pkolsteren@itg.be (correspondence should be addressed to this author).

² Rua Osorio de Almeida 80 apto.301, CEP 22291-000 Urca, Rio de Janeiro - RJ, Brazil. Email : soniamsouza@hotmail.com

The high associated mortality risk of pregnancy together with a low survival chance of the child makes pregnancy a major investment for many women.

During pregnancy the foetus is entirely dependent on his mother for his growth and development. Her general physical status can therefore profoundly affect the health status of the neonate at birth and so his survival chances. It is long known that a low energy intake during pregnancy affects birth weight. During the winter hunger in Holland (Lumey 1988, Lumey 1992) and the siege of Leningrad (Antonov 1947), at the end of the second world war, food rations decreased considerably. Babies born in that period had a birth weight 338 gr lower than before the famine. However, birth weight was little affected if the food ration stayed above 1500 Kcal per day. These findings led to enthusiastic implementation of supplementary food programs during pregnancy in a wide variety of settings. The results were unfortunately rather disappointing. Birth weight increased on average 50 gr. With a few exceptions where the higher increase in birth weight was probably due to the addition of a mineral supplement. These studies also highlighted the existence of adaptation mechanisms. During pregnancy, metabolic changes occur that protect the mother and her pregnancy through an increased metabolic efficiency. The foetus is also relatively protected at the cost of the nutritional status of the mother (Prentice *et al.* 1983, Lechtig *et al.* 1975a, Lechtig *et al.* 1975b, McDonald *et al.* 1981, Adair & Pollit 1985, Mora *et al.* 1979, Mardones-Santander *et al.* 1988). For micronutrients, similar mechanisms seem to be in place. In a deficiency state of the mother, the foetus will be in part protected with a higher stress on the mother.

Since micronutrient deficiencies can affect maternal morbidity and mortality, and are also essential for foetal development, it is difficult to separate the effect of a deficiency between mother and child. Recent research even suggests that after the period of infancy, the health of the child and even the adult can be influenced by the foetal period. Coronary heart disease, hypertension and type 2 diabetes are thought to originate, in part, from impaired intra-uterine growth and development. These diseases may be a consequence of “programming” whereby a stimulus or insult at a critical, sensitive period early in life has permanent effects on structure physiology and metabolism (Godfrey & Barker 2000). Maternal mortality is also very difficult to measure and relate to interventions. More proxy indicators on morbidity can give an idea if an effect on mortality can be suspected.

The present review combines therefore the effects of a deficiency on mortal-

ity, maternal morbidity and effects on the newborn.

Iron

The provision of iron supplements in pregnancy is one of the most widely practised public health measures, yet surprisingly little is known about the benefits of supplemental iron for the mother or her offspring during foetal and postnatal life. A high proportion of women in both industrialised and developing countries become anaemic during pregnancy. Estimates are that 35% to 75% of pregnant women in developing countries and 18% of women in industrialised countries are anaemic (WHO/FAO 1992). The prevalence of anaemia in women increases usually with 15 to 20% during pregnancy. A normal pregnancy needs an investment of 840 mg of iron with the highest needs in the second half. Iron is needed for the placenta, the increase in uterine size, expansion of the red blood cell mass and the foetus. The daily iron needs in the second half of pregnancy are estimated to be 6.7 mg per day even increasing up to 10-12 mg in the last month of pregnancy (Beard 2000, Hallberg 1988) . With a normal average diet the absorption of non-haem iron needs to increase to 50% in order to cover the increased needs (Allen 2000a). Absorption efficiency seems to increase during pregnancy but the studies vary considerably in estimates from 14.3% to 66% at 35 weeks gestation (Svanberg *et al.* 1976, Barrett *et al.* 1994) . After pregnancy the absorption returned to values comparable with those before pregnancy. Given the large discrepancies between the studies is it difficult to conclude whether the needs during pregnancy can be met by the increased absorption. There is definitely a mobilisation of iron reserves during pregnancy and it is most likely that notwithstanding the increased absorptive capacity, stored iron will need to be used. It appears that on average extra iron is needed during pregnancy.

MATERNAL MORTALITY AND ANAEMIA

In a recent review article Allen (Allen 2000a) looked at the evidence for a relationship between maternal mortality and anaemia. Most of the papers describing the relationship do so on the basis of retrospective studies or on associations between haemoglobin levels and outcomes. In most of the studies the relationship was not corrected for health status, environment, nutritional status and health care provision. Many of the authors also believe that the relation of maternal mortality with anaemia reflects the underlying pathology, which also causes anaemia. This causality is more complex than iron

deficiency alone and high prevalences of an associated hookworm infection or megaloblastic anaemia due to folic acid deficiency are usually diagnosed. Many of the authors concluded that mortality was not caused solely by anaemia but that it was a contributing factor (Chi *et al.* 1981, Llewellyn-Jones 1965). Associations are not proof for a causal relationship and need to be substantiated by intervention studies. There are unfortunately no controlled supplementation studies documenting the effect on maternal mortality. Since iron supplementation during pregnancy is a widely accepted public health strategy, it would be not ethical anymore to perform placebo-controlled trials. No conclusive evidence exists on the benefits of iron supplementation in reducing maternal mortality (Steer 2000, Allen 2000a).

MATERNAL HAEMOGLOBIN CONCENTRATIONS AND BIRTH WEIGHT

Changes in haemoglobin values during pregnancy make it difficult to determine anaemia. The plasma volume changes during pregnancy and there is a drop in osmolarity, which reduces blood viscosity and enhances the blood flow in the intervillous space of the placenta. Enhanced blood flow improves foetal growth. Failure to reduce adequately blood viscosity with resulting high haematocrit values impairs foetal development.

The relation between maternal anaemia and birth weight was reviewed extensively (Steer 2000, Ramakrisham *et al.* 1999, Scholl & Hediger 1994) recently, and shows a U shaped relation with risk of low birth weight. Low and high haemoglobin values are associated with an increased risk of low birth weight, with an optimum range in between. In a recent review Steer (Steer 2000) analysed the haemoglobin values of 153 602 pregnancies collected in the Northwest Thames region (UK) between 1988 and 1991. The highest mean birth weight was found in association with a haemoglobin concentration of 85-95 g/L. The minimum incidence of low birth weight (<2.5 kg) and of preterm labour (< 37 weeks gestation) occurred in association with a haemoglobin concentration of 95-105 g/L. These values are below the WHO proposed cut-off values of 110 g/L, to define anaemia in pregnant women (WHO 1968).

In a multivariate analysis of data from 691 women in Nepal, neonatal weight also followed a U shaped relation with haemoglobin concentrations. Lower and higher haemoglobin values increase the odds for low birth weight in a dose related fashion (Dreyfuss 1998) reported in (Allen 2000b). This U shaped relationship between haemoglobin values and birth weight and pre-term delivery was also documented in a study of 44,000 pregnancies from

Cardiff, Wales (Murphy *et al.* 1986).

The evidence from controlled supplementation studies is less straightforward. 20 controlled supplementation studies were reviewed in a Cochrane study. They looked at diverse pregnancy outcomes and the authors had to conclude that: "*supplementation improved haematological indices in women receiving the supplement. No conclusion can be drawn in terms of any effects, beneficial or harmful, on outcomes for mother and baby as data are available from single trials only*" (only two trials reported on birth weight as an outcome). The inclusion criteria for participating in the studies were also very selective (Hb > 10 g/L) and did not include severely anaemic women (Mahomed 2000). Very few studies included women of developing countries.

MATERNAL IRON DEFICIENCY ANAEMIA AND DURATION OF GESTATION

This issue of preterm delivery was extensively reviewed recently in a number of reviews (Allen 2000b, Ramakrisham *et al.* 1999, Steer 2000, Allen 2000a, Scholl & Hediger 1994). There seems a consistency in the findings that iron deficiency anaemia, but not other forms of anaemia increase the risk of preterm deliveries and associated low birth weight. Allen concludes: "*The results are consistent with an association between maternal iron deficiency anaemia in early pregnancy and a greater risk of preterm delivery*". The association disappears in the third trimester of pregnancy.

All the above evidence supports the notion that iron deficiency anaemia affects pregnancy outcome. What the effect on maternal mortality is will most probably never be established given the wide accepted practices of iron supplementation during pregnancy and the inability to do controlled supplementation studies. Normal haemoglobin values and correction of iron deficits improves neonatal health and justifies the correction of the deficits during pregnancy. The exact cut-off values to consider a woman anaemic during pregnancy are, however, not so clear. It is possible that the extent of the problem of anaemia during pregnancy has been overestimated. There is definitely an association between low haemoglobin values and low birth weight, but the anaemia is often either a shared cause or a sign of an underlying pathology. Correcting anaemia might yield better results. The effects of a supplement are probably higher when the supplement is given in the first half or in early pregnancy.

Vitamin A

Retinol metabolites play essential metabolic roles. They maintain nightvision

and the integrity of the cornea. The metabolite, retinoic acid has been shown to play a fundamental role in embryonic development. Retinoic acid receptors have been identified, which activate transcription of genes. In animals, a vitamin A deficient diet induces malformed offspring, mostly affected by microphthalmia and anophthalmia associated with cardiac, lung, and urogenital system defects (Azaïs-Braesco & Pascal 2000). In the light of these findings, a higher incidence of malformed babies would be expected in areas of endemic vitamin A deficiency, but this is not the case.

On the other hand there is now a considerable consensus that vitamin A deficiency, even marginal, can affect survival in children, probably by reducing morbid periods or their effects (Beaton *et al.* 1993). This has triggered supplementation studies in other population groups. In a large vitamin A supplementation trial in Nepal, 44 646 women were followed (West Jr *et al.* 1999). They received either a weekly dose of vitamin A, or placebo. During the follow up period 22 189 pregnancies were recorded. Deaths during pregnancy and up to 12 weeks postpartum were recorded. The mortality was 704 (n=51), 426 (n=33) and 361(n=36) per 100 000 pregnancies in the placebo, vitamin A and β carotene group respectively. This study has raised quite an interest but caution is necessary in the interpretation. All types of deaths were used in the comparison, even if there is no functional explanation to do so. Death due to accidents and chronic illness contributed to a large number of deaths in the placebo group. If one excludes them, the number of deaths in the different groups change (placebo 43 deaths with RR 1.0, vitamin A 33 deaths with RR 0.45-1.18 and β carotene 23 deaths RR 0.31-0.94). Only the carotene group shows significant differences. The period of follow was also much longer than the usually accepted six weeks postpartum. Taking the usual definition of pregnancy related deaths, the results are also no longer significant (Sachdev 1999, Ronsmans *et al.* 1999, Azaïs-Braesco & Pascal 2000). Overall, the evidence is not conclusive enough to warrant a vitamin A supplementation during pregnancy.

The latest theories on the role of oxidative stress in the pathophysiology of pre-eclampsia and eclampsia have triggered the interest in the direct role of β -carotene during pregnancy. Free radicals are proposed as the toxic elements that negatively affect maternal vascular function. Reactive radicals start peroxidation of lipids on cell membranes changing the structure of the cell wall and secondarily the normal function of the cell (Halliwell 1994). Markers of lipid peroxidation are increased in plasma of women with pre-eclampsia, and the low concentrations of water-soluble and lipid-soluble an-

tioxidants in plasma and placenta further suggest a state of antioxidant stress (Yanik *et al.* 1999, Shaarawy *et al.* 1998, Mikhail *et al.* 1994). In these studies lower levels of vitamin E, C and β carotene were also found to be associated with a higher risk of pre-eclampsia. A recent randomised trial seems to confirm this oxidative stress theory as a cause of pre-eclampsia. Participants either received a placebo or a dose of vitamin E and C. In the intention to treat cohort, pre-eclampsia occurred in 24 (17%) of the 142 women in the placebo group and 11 (8%) of the 141 in the vitamin group (adjusted odds ratio 0.39, $p=0.02$). In the cohort who completed the study, the odds ratio for pre-eclampsia was 0.24 (0.08-0.70, $p=0.002$). It needs to be remarked that all the participating women were recruited on the basis of an abnormal uterine artery Doppler at 18-22 weeks of gestation and represent a selective population (Chappell *et al.* 1999). Effects of a supplementation on a population basis will be much smaller.

Vitamin A and β carotene levels in the third trimester or at birth have also been found to be predictive of low birth weight and prematurity (Ramakrishnam *et al.* 1999). So far no supplementation studies during pregnancy are available to determine a causal relationship. In the Nepal study (West Jr *et al.* 1999) these parameters were included but they have not yet been published.

Because of its accepted effects on morbidity and mortality, vitamin A has recently been investigated in relation to HIV infections. Some studies documented an association between serum retinol levels of the mothers and the risk of mother to child transmission of HIV (Greenberg *et al.* 1997). This has triggered controlled supplementation studies in Tanzania (Fawzi *et al.* 1998) and South Africa (Coutsoudis *et al.* 1999). In Tanzania 728 HIV pregnant women received either a daily vitamin A (with β carotene) supplement or a placebo. There was no difference in the risk of HIV infection by 3 months of age between the two groups, nor were there differences in foetal mortality rates. However, vitamin A seemed to protect against pre term deliveries, and the pre term delivered babies were also less likely to be HIV infected. In South Africa, 1075 HIV pregnant women were assigned to either a vitamin A group, a multivitamin group, a multivitamin with vitamin A group or a placebo. In the group who received multivitamins less foetal deaths were recorded giving a relative risk for foetal deaths of 0.61 (0.39-0.94). The multivitamins also decreased the risk of low birth weight by 44%, severe pre term birth (< 34 weeks gestation) by 39% and small size for gestational age at birth by 43%. Vitamin A supplementation alone had no significant effects on these variables. Multivitamins but not vitamin A, resulted in a significant

increase in CD4, CD8 and CD3 counts.

What the exact effect is of a vitamin A deficiency on pregnancy remains up to now unclear. Although there is a theoretical framework to explain the negative effect of a deficiency no studies have been conducted that show beyond doubt that a supplementation program has a benefit on maternal mortality, birth weight or prematurity. In women at risk of pre-eclampsia a supplement does have a benefit. In situations where women are deficient it is warranted to correct the deficit to protect the newborn in the first months of life.

Folic acid

Folate is critically important for foetal development. It is a cofactor essential in the nucleotide biosynthesis and in the metabolism of homocysteine to methionine. Methionine is used in the methylation process of DNA, proteins and lipids with the production of homocysteine as end product (Botto & Yang 2000).

Interference with DNA synthesis gives rise to abnormal cell division. Rapidly dividing cells, such as those in the haematopoietic system, are the most susceptible to irregularities in DNA production. One of the clinical manifestations of folate deficiency is macrocytic anaemia (Scholl & Johnson 2000).

There is no doubt that folic acid deficiency is directly linked to neural tube defects. A recent review studied 35 published studies and found in concordance with a Cochrane review (Lumley *et al.* 2000) that periconceptual folate supplementation reduced the incidence of neural tube defects by as much as 70% (odds 0.28 C.I. 0.15-0.53). The reduction is similar for recurrent as for first defects. The relationship of folate with risk of abortions, preterm delivery and birth weight is not very clear. Many observational studies of folate during pregnancy suggest a potential benefit of good folate status with improvement of birth weight and gestational age. Unlike observational studies, randomised trials of folic acid supplementation have shown less uniform benefit (Scholl & Johnson 2000, Lumley *et al.* 2000).

Folate deficiency increases homocysteine concentrations. Women with habitual abortions had a higher prevalence of hyperhomocysteinemia as compared to controls (Wouters *et al.* 1993, Nelen *et al.* 1998), which is also confirmed by later studies (Scholl & Johnson 2000). Folate supplements reduced significantly the homocysteine concentrations. Homocysteine levels are also higher in women who have given birth to offspring with neural tube

defects.

Although dietary intake is directly responsible for folate levels, the interactions with homocysteine are also mediated through a genetic predisposition. A thermolabile reductase has been identified which decreases the metabolism of folic acid and thus hampers the conversion of homocysteine to methionine. The homozygote frequency ranges from 1% in American blacks to 20% or more among Italians and US Hispanics. Homozygote defects in mothers are associated with a higher risk of neural tube defects. Heterozygote rates range from 5 to more than 40%. It is believed that both homo- and heterozygotes have an increased need for folic acid. The need for a folic acid supplement is thus determined by the prevalence of the genetic defect in the population. We have no information on what this prevalence might be in developing countries. The folic acid supplement needs also to be given in the periconceptual period, which is not a very vulnerable period in operational terms. Improvement in food quality and the use of fortified products seem the only effective strategy.

Zinc

Studies of experimental animals and in humans indicate that severe zinc deficiency can have profound effects on pregnancy outcome. Severe zinc deficiency causes prolonged labour, teratogenesis, and embryonic or foetal death. Acrodermatitis enteropathica is an autosomal genetic recessive defect in zinc metabolism and causes a marked inhibition of zinc absorption (Van Wouwe 1989). The outcomes of pregnancies with acrodermatitis enteropathica ended in spontaneous abortion, anencephaly, achondroplastic dwarfism and low birth weight infants (Hambidge *et al.* 1975). When these patients were given high dosages of oral zinc to maintain normal plasma zinc concentrations throughout gestation, pregnancy outcomes were normal.

Several studies have documented the relation between maternal zinc status and pregnancy outcome. The results are mixed and several adverse effects have been associated with low zinc status. These include congenital anomalies, reduced birth weight for gestational age and preterm delivery. Maternal complications include pregnancy-induced hypertension, pre-eclampsia, intrapartum haemorrhage, infections, and prolonged labour (King 2000). A review (Tamura & Goldenberg 1996) analysed 41 studies of maternal zinc status and birth weight published between 1977 and 1994. Seventeen of the 41 studies recorded a significant relation between an indicator of maternal zinc status and birth weight. To date there are 12 randomised,

controlled supplementation studies published (Jameson 1993, Hunt *et al.* 1984, Hunt *et al.* 1985, Mahomed *et al.* 1989, Cherry *et al.* 1989, Nielsen *et al.* 1992, Fawzi *et al.* 1997, Sautier 1991, Jonsson *et al.* 1996, Osendarp *et al.* 2000). Of the 12 trials 6 found no effect of the zinc intervention on pregnancy outcome. In many of the studies documenting the association between zinc status and maternal health very little confounding has been taken into account. Overall the available evidence points in the direction that zinc deficient women might have a higher risk for themselves and for their offspring. Firm evidence to warrant a supplement during pregnancy is, however, still lacking.

Iodine

Iodine is an essential substrate for synthesis of thyroid hormones. When the physiological requirements of iodine are not met in a given population, a series of functional and developmental abnormalities occur and, when iodine deficiency is severe, endemic goitre and cretinism, endemic mental retardation, decreased fertility rate, increased perinatal death and infant mortality. Endemic cretinism knows a neurological and a myxoedematous form, with mixed forms. In affected populations one finds mental retardation, deafmutism, spastic diplegia, squint, hypothyroidism and dwarfism (Delange 1994). Although the best known clinical sign of iodine deficiency is goitre, this does not represent the mayor health problem. Iodine deficiency during pregnancy is responsible for development defects of the foetus and the pathologies associated with endemic goitre. Iodine supplementation studies have shown beyond doubt that supplementing iodine during pregnancy can reverse the described abnormalities (Pharoah 1993). Maternal health seems not directly affected by iodine deficiency. Salt fortification is now widely practised throughout the world with an impressive decrease in associated morbidity (Delange 1998).

Magnesium

Magnesium is an essential mineral needed in relatively large amounts by humans. In a number of retrospective studies magnesium levels during pregnancy were found to be associated with the risk of seizures in pre-eclampsia, prematurity and low birth weight (Ramakrisham *et al.* 1999, Makrides & Crowther 2000). This promising association has triggered a number of controlled supplementation studies, which have been reviewed lately (Makrides

& Crowther 2000). The authors of the Cochrane review concluded that there is at present not enough evidence to show that dietary magnesium supplementation during pregnancy is beneficial. No studies are available on magnesium supplementation in developing countries, where the deficiency might be more important.

Calcium

High blood pressure with or without proteinuria is a major cause of maternal and perinatal morbidity and mortality worldwide. Preterm birth, a common association with hypertensive disorders, is the leading cause of early neonatal death and infant mortality, particularly in low-income countries. A number of observation studies led to the hypothesis that an increase in calcium intake during pregnancy might reduce the incidence of high blood pressure and pre-eclampsia among women with low calcium intake (Atallah *et al.* 2000). To date 12 randomised placebo controlled calcium supplementation trials during pregnancy have been published (Belizan *et al.* 1991, Viller *et al.* 1987, Purwar *et al.* 1996, Lopez-Jaramillo *et al.* 1997, Sanchez-Ramos *et al.* 1994, Lopez-Jaramillo *et al.* 1990, Lopez-Jaramillo *et al.* 1989, Villar & Repke 1990, Herrera *et al.* 1998, Crowther *et al.* 1999). 10 of them were analysed in a Cochrane review (Atallah *et al.* 2000) and the two more recent, in a recent discussion paper (Villar & Belizan 2000). In the Cochrane analysis, there was a slight reduction in blood pressure with calcium supplementation (RR 0.81 C.I. 0.74-0.89). In women at risk of hypertension and with low calcium intakes the effects were more marked with a RR of 0.35 (C.I. 0.21-0.57) and 0.49 (C.I. 0.38-0.62) respectively. The risk of pre-eclampsia also decreased after calcium supplementation (RR 0.70 C.I.0.59-0.83). Here again the risk decrease was more important when women were either at risk of pre-eclampsia or when they had lower baseline calcium intakes with a RR of 0.22 (C.I. 0.11-0.43) and 0.32 (C.I.0.21-0.49) respectively. There was no evidence that supplements decreased preterm delivery, although there was a reduction in risk among women at risk of hypertension. There was no effect of calcium supplementation on stillbirth or death before discharge from the hospital, but here were fewer babies with a low birth weight. Most of these findings have been replicated in the two more recently published trials (Herrera *et al.* 1998, Crowther *et al.* 1999). The present evidence supports the concept that calcium supplements during pregnancy can reduce pre-eclampsia when given to women with deficient calcium intake or when they are at risk for pre-

eclampsia. The expected effect of supplementation might however be overestimated given that the total number of participants with low calcium intakes in all the analysed studies was rather small. There remains a need to conduct larger scale studies in calcium deficient populations. Calcium supplements during pregnancy seem however also to have a more sustained effect in the neonatal period and infancy. 591 children of a mean age of 7 years were followed up after their mothers were randomly assigned to a calcium supplement or a placebo group during pregnancy. The systolic blood pressure was lower in the children from the calcium supplemented group than in the placebo group. This effect was highest between the children who had a body mass index above the median of the population (Belizan *et al.* 1997).

Vitamin C

A few studies have shown that vitamin C deficiency plays a role in some pregnancy complications, such as premature rupture of membranes (PRM) and pre-eclampsia (Casanueva *et al.* 1991). Recent evidences from two, randomised, double-blind, placebo-controlled trials show how vitamin C (and other natural antioxidants) could be effective in decreasing the oxidative stress and thereby improving the course of pre-eclampsia (Gülmezoglu *et al.* 1997). The proportion preterm deliveries was higher in the placebo group (22/29) than in the antioxidant group (14/27), yielding a relative risk of 0.68 (0.45-1.04). Better results were achieved by Chappell and co-workers (Chappell *et al.* 1999): in the cohort who completed the study (81 placebo and 79 vitamin group) they found that the odds ratio for pre-eclampsia was 0.24 (0.08-0.70). These findings support the hypothesis that oxidative stress is responsible for the characteristic endothelial dysfunction of pre-eclampsia, as has been described by Roberts *et al.* (Roberts & Redman 1993, Roberts & Hubel 1999). A multicentre trial with large numbers of patients is needed, however, before introducing ascorbic acid in the clinical management of either pre-eclampsia or PRM as routine.

Thiamine (vitamin B1), vitamin B6, Vitamin B6 (pyridoxine), vitamin B12 (cobalamin)

Plasma levels of the B vitamins have been related to diverse pregnancy outcomes with varying results. The recognised potential of homocysteine in playing a role in pre-eclampsia has also triggered research in the role of vitamin B12 in pregnancy. Do date no controlled supplementation studies are

available to prove that supplements are needed during pregnancy unless in situations where there is clinical evidence of a specific deficiency where the treatment is needed to correct the clinical picture. Table 1 gives an overview of the available evidence.

Discussion

As can be seen from table one, there is a large body of evidence supporting the concept that deficiencies in micronutrients adversely affect maternal health and pregnancy outcome. It is important to underline here that not one micronutrient alone is responsible for this adverse effect. It is therefore very unlikely that the supplementation or correction of one deficiency will yield high effects, as long as other deficiencies remain. There is no magic bullet to improve maternal and child health through a single nutrition supplement. What the possible effect would be of a multivitamin-mineral supplement, which would cover all needs of pregnant women, is at present impossible to tell. So far no controlled supplementation studies have published their results, and few are under way (Scholl & Reilly 2000).

A second consideration is that most of the described effects and results of supplementation relate to overt deficient subjects. It is therefore difficult to translate the effect of a supplementation to the general population or to make generalisations for all populations. Most of the controlled supplementation studies have also been performed in populations of industrialised countries where deficiency states are less frequent. The observed effects might thus be an underestimation of what one could expect in a developing country. So far very few studies are available in these population groups. For some deficiencies the maximum effect of a correction is found when this happens in early pregnancy. For folic acid the supplement should ideally be given before conception and the highest effects of an iron supplement can be expected when taken in the first trimester. This, however, has major repercussions on the implementation strategies. In developing countries, women usually don't consult for a pregnancy until well in the second half of pregnancy. This is often too late to correct a deficit and find a consequent improvement in maternal and child health. Providing supplements also means that the health system must be able to provide the supplements on a regular basis and with certain continuity. The experience with iron supplements has demonstrated that this is usually where the strategy is flawed. Drug availability is often erratic and health services are not always accessible throughout the year.

Table 1. Overview of the effects of micronutrients on pregnancy outcome

Micronutrient	Maternal mortality	Birth weight	Preterm delivery	Delivery complications	Pre-eclampsia	Remarks
Iron	Possible	Yes, U shaped relation	Yes, U shaped relation	Probable	No info	Lack of controlled supplementation studies
Vitamin A	One study only Not clear	Possible	Possible	Hiv transmission risk decreased	B carotene	
Iodine	Not documented	Yes	Yes	Not documented	Not documented	Important congenital malformations
Zinc	Not documented	Yes	Yes		Yes	Effect is clear in deficiency states
Folate	Not documented	Not documented	Not documented	Abortions Congenital malformations	Not documented	The need for a minimal dietary intake to protect congenital malformations is clearly established
Magnesium	Not documented	Possible	Possible	Decrease documented	Not clear	No evidence enough to support a general supplementation
Calcium	Not documented	Possible	Possible	Possible	yes	Effects found in risk groups or groups with low calcium intake
Vitamin C	Not documented	Not documented	Possible	Abruptio?	Possible	Very few studies
Thiamine B1	Not documented	IUGR?	Not clear	Not clear	Not clear	Very few studies
Pyridoxine B6	Not documented	possible	Possible	Better Apgar scores	Possible	Very few studies
Cobalamin B12	Not documented	Not documented	Not documented	Not documented	Possible	Very few studies

For some deficiencies the maximum effect of a correction is found when this happens in early pregnancy. For folic acid the supplement should ideally be given before conception and the highest effects of an iron supplement can be

expected when taken in the first trimester. This, however, has major repercussions on the implementation strategies. In developing countries, women usually don't consult for a pregnancy until well in the second half of pregnancy. This is often too late to correct a deficit and find a consequent improvement in maternal and child health. Providing supplements also means that the health system must be able to provide the supplements on a regular basis and with certain continuity. The experience with iron supplements has demonstrated that this is usually where the strategy is flawed. Drug availability is often erratic and health services are not always accessible throughout the year.

The cost of a supplement is also not negligible and varies from 1 to 8 US dollars for iron supplementation programs, according to the study and the way the costs are calculated.

The effect of a supplement of iron is also mitigated by the confusion between iron deficiency and anaemia itself, which has a much wider causality. Often the underlying causes of anaemia, other than iron, are poorly addressed and many of the studies suggest that the confounding might be more important than iron deficiency. Low haemoglobin values during pregnancy should be first addressed with a strategy to correct anaemia in a broad sense in which iron deficiency is only one of the many possible factors. It is highly likely that effects on maternal health will be much more important than with provision of iron alone.

It seems thus that apart from an iodine fortification program, there is little scope for improving the micronutrient status of pregnant women with supplementation programs alone. Hope of achieving an improvement must lie in upgrading the nutritional status of women of childbearing age in general and providing nutritional advice during pregnancy. A nutrition approach should be integrated in ante natal care programs. The challenge will be how to define the role of the health services in both specific activities during the ante natal care program, as in a more development directed approach. Judging from the experiences so far, the results will be slow in coming, and they will need an intersectoral approach given the multicausal nature of the problem. It would be good if an intermediate solution could be found. This will need to be found in a supplementation of all micronutrients needed in pregnancy. Since no results of such studies are available, there is an urgent need to do a large scale controlled supplementation intervention study.

References

- Adair LS & Pollit E (1985). Outcome of maternal nutritional supplementation: a comprehensive review of the Bacon-Chow study. *American Journal of Clinical Nutrition* **41**,948-978.
- Allen LH (2000b). Anemia and iron deficiency: effects on pregnancy outcome. *American Journal of Clinical Nutrition* **71**(suppl),1280S-1284S.
- Allen LH (2000a). Pregnancy and iron deficiency: unresolved issues. *Nutrition Reviews* **55**,91-101.
- Antonov AN (1947). Children born during the siege of Leningrad in 1942. *Journal of Pediatrics* **30**,250-259.
- Atallah AN, Hofmeyr GJ & Duley L (2000). Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. *Cochrane Database Systematic Review* pp. CD001059.
- Azaïs-Braesco V & Pascal G (2000). Vitamin A in pregnancy: requirements and safety limits. *American Journal of Clinical Nutrition* **71**(suppl),1325S-1333S.
- Barrett JFR, Whittaker PG, Williams JG & Lind T (1994). Iron absorption during normal pregnancy: a study using isotopes. *British Medical Journal* **309**,79-82.
- Beard JL (2000). Effectiveness and strategies of iron supplementation during pregnancy. *American Journal of Clinical Nutrition* **71**(suppl),1288S-1294S.
- Beaton GH, Martorell R, Aronson KJ, Edmonston B, McCabe GP, Ross AC & Harvey B (1993). *Effectiveness of Vitamin A Supplementation in the Control of Young Child Morbidity and Mortality in Developing Countries*. CIDA, Toronto.
- Belizan JM, Villar J, Bergel E, del Pino A, Di Fulvio S, Galliano SV & Kattan C (1997). Long-term effect of calcium supplementation during pregnancy on the blood pressure of offspring: follow up of a randomised controlled trial [see comments]. *British Medical Journal* **315**,281-285.
- Belizan JM, Villar J, Gonzalez L, Campodonico L & Bergel E (1991). Calcium supplementation to prevent hypertensive disorders of pregnancy [see comments]. *New England Journal of Medicine* **325**,1399-1405.
- Botto LD & Yang Q (2000). 5,10-Methylenetetrahydrofolate reductase gene variants and congenital anomalies: A HuGe review. *American Journal of Epidemiology* **151**, 862-877.

- Casanueva E, Magana L, Pfeffer F & Baez A (1991). Incidence of premature rupture of membranes in pregnant women with low leukocyte levels of vitamin C. *European Journal of Clinical Nutrition* **45**, 401-405.
- Chappell LC, Seed PT, Briley AL, Kelly FJ, Lee R, Hunt BJ, Parmar K, Bewley SJ, Shennan AH, Steer PJ & Poston L (1999). Effects of antioxidants on the occurrence of pre-eclampsia in women at increased risk: a randomised trial. *The Lancet* **354**, 810-816.
- Cherry FF, Sandstead HH, Rojas P, Johnson LK, Batson HK & Wang XB (1989). Adolescent pregnancy: associations among body weight, zinc nutriture, and pregnancy outcome. *American Journal of Clinical Nutrition* **50**,945-954.
- Chi I, Agoestina T & Harbin J (1981). Maternal mortality at twelve teaching hospitals in Indonesia - an epidemiological analysis. *International Journal of Gynecology and Obstetrics* **19**,259-266.
- Coutsoudis A, Pillay K, Spooner E, Kuhn L & Coovadia HM (1999). Randomized trial testing the effect of vitamin A supplementation on pregnancy outcomes and early mother-to-child HIV-1 transmission in Durban, South Africa. *Aids* **13**,1517-1524.
- Crowther CA, Hiller JE, Pridmore B, Bryce R, Duggan P, Hague WM & Robinson JS (1999). Calcium supplementation in nulliparous women for the prevention of pregnancy-induced hypertension, preeclampsia and preterm birth: an Australian randomized trial. FRACOG and the ACT Study Group. *Australian New Zealand Journal of Obstetrics and Gynaecology* **39**,12-18.
- Delange F (1994). The disorders induced by iodine deficiency. *Thyroid* **4**, 107-128.
- Delange F (1998).. Risks and benefits of iodine supplementation. *The Lancet* **351**, 923-924.
- Dreyfuss M (1998). *Anemia and iron deficiency during pregnancy: etiologies and effects on birth outcomes in Nepal. PhD dissertation.* Johns Hopkins University, Baltimore.
- Fawzi WW, Herrera MG, Willett WC, Nestel P, El Amin A & Mohamed KA (1997). Dietary vitamin A intake in relation to child growth. *Epidemiology* **8**,402-407.
- Fawzi WW, Msamanga GI, Spiegelman D, Urassa EJN, McGrath N, Mwakagile D, Antelman G, Mbise R, Herrera G, Kapiga S, Willet W & Hunter D (1998). Randomised trial of effects of vitamin supplements on pregnancy outcomes and T cell counts in HIV-1 infected women in Tanzania. *The Lancet* **351**,1477-1482.
- Godfrey KM & Barker DJP (2000). Fetal nutrition and adult disease. *American Journal of Clinical Nutrition* **71(suppl)**,1344S-1352S.

Greenberg BL, Semba RD, Vink PE, Farley JJ, Sivapalasingam M, Steketee RW, Thea DM & Schoenbaum EE (1997). Vitamin A deficiency and maternal-infant transmission of HIV in two metropolitan areas in the United States. *Aids* **11**,325-332.

Gülmezoglu AM, Hofmeyr GJ & Oosthuisen MM (1997). Antioxidants in the treatment of severe pre-eclampsia: an explanatory randomised controlled trial. *British Journal of Obstetrics and Gynecology* **104**,689-696.

Hallberg L (1988). Iron balance in pregnancy. *Vitamins and minerals in pregnancy and lactation* (ed Berger,H.), pp. 115-127. Nestec Ltd., Vevey/Raven Press Ltd., New York.

Halliwell B (1994). Free radicals, antioxidants, and human diseases: curiosity, cause, or consequence? *The Lancet* **344**,721-724.

Hambidge KM, Nelder KH & Walravens PA (1975). Zinc, and congenital malformations. *The Lancet* **1(7906)**,577-578.

Herrera JA, Arevalo-Herrera M & Herrera S (1998). Prevention of preeclampsia by linoleic acid and calcium supplementation: a randomized controlled trial. *Obstetrics & Gynecology* **91**,585-590.

Hunt IF, Murphy NJ, Cleaver AE, Faraji B, Swendseid ME, Browdy BL, Coulson A H, Clark VA, Settlege RH & Smith JC Jr. (1985). Zinc supplementation during pregnancy in low-income teenagers of Mexican descent: effects on selected blood constituents and on progress and outcome of pregnancy. *American Journal of Clinical Nutrition* **42**,815-828.

Hunt IF, Murphy NJ, Cleaver AE, Faraji B, Swendseid ME, Coulson AH, Clark VA, Browdy BL, Cabalum T & Smith JC Jr. (1984). Zinc supplementation during pregnancy: effects on selected blood constituents and on progress and outcome of pregnancy in low-income women of Mexican descent. *American Journal of Clinical Nutrition* **40**,508-521.

Jameson S (1993). Zinc status in pregnancy: the effect of zinc therapy on perinatal mortality, prematurity, and placental ablation. *Ann.N.Y.Acad.Sci.* **678**,178-192.

Jonsson B, Hauge B, Larsen MF & Hald F (1996). Zinc supplementation during pregnancy: a double blind randomised controlled trial. *Acta Obstet Gynecol Scand* **75**,725-729.

King JC (2000). Determinants of maternal zinc status during pregnancy. *American Journal of Clinical Nutrition* **71**,1334S-1343S.

Kynast G & Saling E (1986). Effect of oral zinc application during pregnancy. *Gynecol Obstet Invest* **21**,117-123.

- Lechtig A, Delgado H, Yarbrough C, Habicht JP, Martorell R & Klein RE (1975b). A simple assessment of risk of low birth weight to select women for nutritional intervention. *American Journal of Obstetrics and Gynecology* **125**,25-34.
- Lechtig A, Habicht JP, Delgado H, Klein RE, Yarbrough C & Martorell R (1975a). Effect of food supplementation on birth weight. *Pediatrics* **56**,508-520.
- Llewellyn-Jones D (1965). Sever anaemia in pregnancy (as seen in Kuala-Lumpur, Malaysia). *Australian New Zealand Journal of Obstetrics and Gynaecology* **5**,191-197.
- Lopez-Jaramillo P, Delgado F, Jacome P, Teran E, Ruano C & Rivera J (1997). Calcium supplementation and the risk of preeclampsia in Ecuadorian pregnant teenagers. *Obstetrics & Gynecology* **90**, 62-167.
- Lopez-Jaramillo P, Narvaez M, Felix C & Lopez A (1990). Dietary calcium supplementation and prevention of pregnancy hypertension [letter] [see comments]. *The Lancet* **335**,293.
- Lopez-Jaramillo P, Narvaez M, Weigel RM & Yopez R (1989). Calcium supplementation reduces the risk of pregnancy-induced hypertension in an Andes population. *British Journal of Obstetrics and Gynecology* **96**,648-655.
- Lumey LH (1988). *Obstetric performance of women after in utero exposure to the Dutch famine (1944-1945)*. Colombia University.
- Lumey LH (1992). Decreased birthweights in infants after maternal in utero exposure to the Dutch famine of 1944-1945. *Paediatr Perinat Epidemiol* **6**,240-253.
- Lumley J, Watson M & Bower C (2000). Periconceptual supplementation with folate and/or multivitamins for preventing neural tube defects (Cochrane review). *The Cochrane Library* Update Software, Oxford.
- Mahomed K (2000). Iron supplementation in pregnancy (Cochrane Review). *The Cochrane Library, Issue 2* Update Software, Oxford.
- Mahomed K, James DK, Golding J & McCabe R (1989). Zinc supplementation during pregnancy: a double blind randomised controlled trial. *British Medical Journal* **299**,826-830.
- Makrides M & Crowther CA (2000). Magnesium supplementation in pregnancy. *Cochrane Database Systematic Review* CD000937.
- Mardones-Santander F, Rosso P, Stekel A, Ahumada EL, laguno S, Pizarro F, Salinas J, Vial I & Walter T (1988). Effect of a milk-based food supplement on maternal nutritional status and fetal growth in underweight Chilean women. *American Journal of Clinical Nutrition* **47**,413-419.

- McDonald EC, Pollit E, Mueller WH, Hsueh AM & Sherwin R (1981). The Bacon-Chow study:maternal nutritional supplementation and birth weight of offspring. *American Journal of Clinical Nutrition* **34**,2133-2133.
- Mikhail MS, Anyaegbunam A, Garfield D, Palan PR, Basu J & Romney SL (1994). Pre-eclampsia and antioxidant nutrients: decreased plasma levels of reduced ascorbic acid, alpha-tocopherol and beta-carotene in women with pre-eclampsia. *American Journal of Obstetrics and Gynecology* **171**,150-157.
- Mora JO, de Paredes P, Wagner M, de Navarro L, Suescun J, Christiansen N & Herrera MG (1979). Nutritional supplementation and outcome of pregnancy. I. Birth weight. *American Journal of Clinical Nutrition* **32**, pp. 455-462.
- Murphy JF, O'Riordan J, Newcombe RG, Coles EC, & Pearson JF (1986). Relation of haemoglobin levels in first and second trimesters to outcome of pregnancy. *The Lancet* **1**, pp. 992-995.
- Nelen WLDM, Blom HJ, Thomas CMG, Steegers EAP, Boers GHJ & Eskens KAB (1998). Methylenetetrahydrofolate reductase polymorphism affects the change in homocysteine and folate concentrations from low dose folic acid supplementation in women with unexplained recurrent miscarriages. *Journal of Nutrition* **128**,1336-1341.
- Nielsen CC, Islam MA, Thilsted SH & Ishrat F (1992). Why do some families become defaulters in a hospital based nutrition rehabilitation follow-up programme? *Tropical and Geographic Medicine* **44**,346-351.
- Osendarp SJM, Baqui AH, Wahed MA, Arifeen SE, van Raaij JMA & Fuchs GJ (2000). A randomized, placebo-controlled trial of the effect of zinc supplementation during pregnancy outcome in Bangladeshi urban poor. *American Journal of Clinical Nutrition* **71**,114-119.
- Pharoah POD (1993). Iodine-supplementation trials. *American Journal of Clinical Nutrition* **57(suppl)**,276S-279S.
- Prentice AM, Whitehead RG, Watkinson M, Lamb WH & Cole TJ (1983). Prenatal dietary supplementation of African women and birthweight. *The Lancet* **i**, 489-492.
- Purwar M, Kulkarni H, Motghare V & Dhole S(1996). Calcium supplementation and prevention of pregnancy induced hypertension. *J Obstet Gynaecol Res* **22**,425-430.
- RamakrishnamU, Manjrekar R, Rivera J, Gonzales-Cosio T & Martorell R (1999). Micronutrients and pregnancy outcome: A review of the literature. *Nutrition Research* **19**,103-159.
- Roberts JM & Hubel CA (1999). Is oxidative stress the link in the two-stage model of pre-eclampsia? [comment]. *The Lancet* **354**,788-789.

- Roberts JM & Redman CW (1993). Pre-eclampsia: more than pregnancy-induced hypertension [published erratum appears in *Lancet* 1993 Aug 21;342(8869):504] [see comments]. *The Lancet* **341**,1447-1454.
- Ronsmans C, Campbell O & Collumbien M (1999). slight modifications in definitions could alter interpretation of results. *British Medical Journal* **319**,1201.
- Ross SM, Nel E & Naeye RL (1985). Differing effects of low and high bulk maternal dietary supplements during pregnancy. *Early Hum Dev* **10**,295-302.
- Sachdev HPS (1999). No magic pills exist for educing mortality related to pregnancy. *British Medical Journal* **319**,1201.
- Sanchez-Ramos L, Briones DK, Kaunitz AM, Delvalle GO, Gaudier FL & Walker CD (1994). Prevention of pregnancy-induced hypertension by calcium supplementation in angiotensin II-sensitive patients. *Obstetrics & Gynecology* **84**,349-353.
- Sautier D (1991). Facteurs associés au retard de taille d'enfants de 0 à 5 ans dans une vallée andine. *Cahiers Santé* **1**,388-396.
- Scholl TO & Hediger ML (1994). Anemia and iron-deficiency anemia: compilation of data on pregnancy outcome. *American Journal of Clinical Nutrition* **59(suppl)**,492S-501S.
- Scholl TO & Johnson WG (2000). Folic acid: influence on outcome of pregnancy. *American Journal of Clinical Nutrition* **71(suppl)**,1295S-1303S.
- Scholl TO & Reilly T (2000). Anemia, iron and pregnancy outcome. *Journal of Nutrition* **130**,443S-447S.
- Shaarawy M, Aref A, Emad Salem M & Sheiba M (1998). Radical scavenging antioxidants in pre-eclampsia and eclampsia. *International Journal of Gynecology and Obstetrics* **60**,123-128.
- Steer PJ (2000). Maternal hemoglobin concentration and birth weight. *American Journal of Clinical Nutrition* **71(suppl)**,1285S-1287S.
- Svanberg B, Arvidson B & Norby A (1976). Absorption of supplemental iron during pregnancy - a longitudinal study with repeated bone-marrow studies and absorption measurements. *Acta Obstet Gynecol Scand* **48(suppl)**,87-108.
- Tamura T & Goldenberg RL (1996). Zinc nutriture and pregnancy outcome. *Nutrition Research* **16**,139-181.
- Van Wouwe JP (1989). Clinical and laboratory diagnosis of acrodermatitis enteropathica. *European Journal of Pediatrics* **149**,2-8.

Villar J & Belizan JM (2000). Same nutrient, different hypotheses: disparities in trials of calcium supplementation during pregnancy. *American Journal of Clinical Nutrition* **71**,1375S-1379S.

Villar J & Repke JT (1990). Calcium supplementation during pregnancy may reduce preterm delivery in high-risk populations. *American Journal of Obstetrics and Gynecology* **163**,1124-1131.

Villar J, Repke JT, Belizan JM & Pareja G (1987). Calcium supplementation reduces blood pressure during pregnancy: results of a randomized controlled clinical trial. *Obstetrics & Gynecology* **70**,317-322.

West KP Jr., Katz J, Khattry SK, LeClerq SC, Pradhan EK, Shrestha SP, Connor PB, Dali SM, Christian P, Pokhrel RP & Sommer A (1999). Double blind, cluster randomised trial of low dose supplementation with vitamin A or β -carotene on mortality related pregnancy in Nepal. *British Medical Journal* **318**,570-551.

WHO (1968). Nutritional Anaemias. Report of WHO Scientific Group (Technical Report Series No.405).

WHO/FAO (1992). *International conference on nutrition. Nutrition and development: a global assessment*. FAO/WHO, Rome.

Wouters MG, Boers GHJ & Blom HJ (1993). Hyperhomocysteinemia: a risk factor in women with unexplained recurrent early pregnancy loss. *Fertil Steril* **60**,820-825.

Yanik FF, Amanvervez R, Yanik A, Celik C & Kokcu A (1999). Pre-eclampsia associated with increased lipid peroxidation and decreased serum vitamin E levels. *International Journal of Gynecology and Obstetrics* **64**,27-33.

The role of traditional birth attendants in the reduction of maternal mortality

Staffan Bergström¹ and Elizabeth Goodburn²

Summary

Throughout history traditional birth attendants (TBAs) have been the main human resource for women during childbirth. Their role varies across cultures and at different times, but even today, they attend the majority of deliveries in rural areas of developing countries. There is little doubt that they have a significant role when it comes to cultural competence, consolation, empathy and psychosocial support at birth with important benefits for the mother and also for the new-born child. In many countries, training TBAs has been an important component of strategies to improve maternal and neo-natal outcomes. However, recent analyses have come to the conclusion that the impact of training TBAs on maternal mortality is low. An emphasis on large scale TBA training efforts could also be counterproductive, by holding back the training of the necessary numbers of medium level providers, particularly midwives. The main benefits from training TBAs appear to be improved referral and links with the formal health care system, but only where essential obstetric services are available. Some studies have observed that formal training is not a requirement for this function. Meeting the needs for medium level obstetric care providers is a tremendous challenge that will be difficult over a limited period of time. Training TBAs should be given a lower priority than developing essential obstetric care services and referral systems. Where TBAs are an important source of delivery care, policy makers need to make the best use of TBAs while simultaneously planning for replacement with skilled attendants.

¹ Professor of International Health, Division of International Health (IHCAR), Karolinska Institutet, SE-171 76 Stockholm, Sweden. Email: Staffan.Bergstrom@phs.ki.se (correspondence should be addressed to this author).

² Reproductive Health Advisor, Centre for Sexual and Reproductive Health, JSI, (UK), 2nd Floor, Block B, Highgate Studios, 53-79 Highgate Road, London NW5 1TL, UK. Email: egoodburn@jsiuk.com

Introduction

Since the Safe Motherhood conference in Nairobi in 1987 increasing attention has been given to the problem of maternal mortality in low-income countries. Several major international meetings, including the International Conference on Population and Development (ICPD) in Cairo in 1994, have produced commitments to reduce maternal mortality (FCI 1994). The goal of reducing maternal mortality by 75% by 2015 has been adopted as an International Development Target (IDT) (OECD 2000). The challenge now is identifying and implementing effective and affordable interventions so that progress towards the goal becomes a reality. One intervention, of which there is now many years of experience in numerous countries is that of training traditional birth attendants (TBAs) in parts of the world where skilled professional attendants are scarce³.

The rationale for TBA training

Three quarters of maternal deaths in developing countries are attributable to direct obstetric causes such as postpartum haemorrhage, postpartum sepsis, eclampsia, obstructed labour, and complications of unsafe abortion (WHO 1996). For many years it has been recognised that the presence of an attendant with professional midwifery skills, who can either provide or ensure access to essential obstetric care, has an important role in preventing maternal deaths from these causes (IAG 2000).

Historical data from currently affluent countries support this view. The marked decline in maternal mortality in Sweden during the period 1750-1900 parallels the development of midwifery as a profession and the increasing use of professional midwives by women in childbirth (De Brouwere *et al.* 1998).⁴ Analysis of contemporary data from demographic health surveys (DHS) reinforces this observation. At national level there is a clear negative correlation between the proportion of deliveries attended by a skilled attendant (midwife, nurse or doctor) and the maternal mortality ratio (Stanton *et*

³ The term 'skilled attendants' refers to people with midwifery skills who have been trained to proficiency in management of normal deliveries and diagnosis, management or referral of obstetric emergencies. The minimum training period required is generally considered to be six months. TBAs, trained or untrained, are not included (WHO1999).

⁴ It is important to note that the development of midwifery in Sweden was not analogous with the development of programmes for training TBAs. In Sweden midwives were formally trained, in midwifery schools with textbooks, to use available technologies and acquired obstetric skills including forceps extraction (Högberg 1985).

al. 1997). There are a few exceptions, but almost all countries where skilled attendance is more than 80% have MMRs below 200 (World Bank 1999). It is in recognition of this relationship, as well as difficulties in measuring maternal mortality, that the proportion of birth with skilled attendance has been adopted as an additional IDT⁵.

Clearly, universal skilled attendance at delivery is a worthy objective. However, in many countries, where professional birth attendants are simply not available to rural populations or the urban poor, this ideal remains a distant goal. DHS analysis has shown that, out of 22 countries surveyed in sub-Saharan Africa, only one (Botswana) had professional birth attendants attending delivery in more than three quarters of cases (Macro International Inc. 1994). It is estimated that, world-wide, two thirds of all births occur outside health facilities (WHO 1997). Of these, midwives, or other professionals, conduct only a small proportion. The majority, around 60 million deliveries per annum, are currently attended by a traditional birth attendant, a relative, or, in some settings, no one (Alto 1991). Achieving skilled attendance at delivery for all is going to be a huge challenge. It has been calculated that, with an assumed load of 150 deliveries annually per midwife, plus associated prenatal and postnatal care, *around 400,000 midwives will have to be trained* (Walraven & Weeks 1999). These estimates can be expected to increase as rising numbers of young women enter the reproductive age group. Significant costs, which include salaries, housing and rural posting allowances, are inevitable. In addition to these direct costs there may be additional costs related to supervision and support. It is against this background that training of traditional birth attendants has been promoted on the basis that they are available, are already engaged in maternity care and appear to present a lower cost alternative (Belsey 1985).

The Role of Traditional Birth Attendants

TBAs are found in most communities of the world although their nature and function vary considerably. The World Health Organisation definition of a TBA is 'a person who assists the mother during childbirth and who initially acquired her skills by delivering babies herself or by working with other TBAs' (Ledham 1985). TBAs are often older women and are generally illiterate (UNFPA 1997). For families, TBAs are a cheaper option than domiciliary professional midwives and will often accept payment in kind. In many coun-

⁵ Increasing the proportion of births attended by a skilled attendant to 80% by 2005.

tries where home delivery is the norm, midwives are only available in health facilities. In many cultures TBAs are respected members of their community, perform important cultural rituals and provide essential social support to women during childbirth (Chalmers 1983, Chen 1981, Aletor 1981, Campero 1998, Carney 1996). However, in some cultures, for example in the Indian sub-continent, TBAs are low caste and lack influence. People believe that body fluids released at childbirth (liquor and blood) are polluting and employ a TBA to carry out polluting tasks on behalf of the rest of the family (Blanchet 1984, Rozario 1995, Bhatia 1981). In all cases their beliefs and practices are influenced by local customs and sometimes by religion (Bulough 2000).

The workload of TBAs varies considerably from place to place and among individuals. Some TBAs, may only attend family members and thus conduct only 2 or 3 deliveries a year while others have a wider clientele and a higher number of deliveries. It is unusual for TBAs to deliver more than 20 women in a year (WHO 1992).

TBA training

The stated goal of TBA training is to contribute to the reduction of maternal and child mortality and morbidity through improved delivery and child care practices by: a) improving the skills, understanding and stature of TBAs; b) increasing the number of births conducted by trained TBAs; and c) improving links between modern health services and the community through TBAs (Kabral *et al.* 1992). Core training generally focuses on teaching TBAs to perform deliveries in a more hygienic and safer fashion, discouraging harmful practices, recognising danger signs and referring women with complications to facilities where essential obstetric care is available. Health education for pregnant women and antenatal and postnatal care are usually included. In some programmes TBA training has assumed a much wider agenda and includes child health intervention, health promotion and family planning. It has even been proposed that training TBAs in anthropometry could help in identification and improved management of pregnant women with malnutrition (Krasovek & Anderson 1991). Training arrangements usually consist of short (about 5 days) basic course followed by regular meetings with mainstream health staff for supervision and on-going education. TBAs may be asked to keep simple records with the intention of allowing the health system to monitor their activities.

NGOs working at community level in resource poor countries frequently

include TBA training in their activities. A number of governments, for example Bangladesh, have also adopted this approach, supported by massive donor funding. International agencies, including WHO, UNICEF and UNFPA have also supported TBA training. However, in recent years the value of TBA training has been increasingly questioned (Maine 1993) although there are still many groups who remain enthusiastic (Greene 1995). There often appears to be little common ground between the proponents and opponents of TBA training.

Evaluation of TBA training programmes

Evaluation of TBA training could potentially take place at several stages in the implementation process. Possible components for evaluation include: inputs (e.g. expenditure, technical assistance; programme management); outputs (e.g. numbers trained; behaviour change; % deliveries with trained TBAs; % and nature of cases referred); and outcomes (i.e. maternal morbidity and mortality or perinatal mortality). Our view is that one of the reasons for continuing debate over TBA training is the haphazard way the programmes have been evaluated. Despite high expenditure on the programmes, there are surprisingly few methodologically sound evaluations, even of programme outputs. Among the many studies documented in the literature problems with sample size, study design, control or comparison groups, and statistical analysis are extremely frequent. The impression overall is that many of these evaluations were not planned as an integral part of the programme process, but initiated as an afterthought. Even evaluation of the TBA training process has not been as frequent or as rigorous as might be expected. Studies that have been done present a mixed picture. Several studies report that TBAs practice what they have learnt during their subsequent work in the community (Lartson *et al.* 1987, Akpala 1994). However, adoption of improved practices is not universal (Bemara *et al.* 1990) and the extra confidence gained from the training experience may lead to a higher incidence of dangerous procedures and sometimes delays in referral (Eades *et al.* 1993). There is also evidence that training does not substantially alter the belief systems of TBAs and will therefore have little impact on practices that are rooted in these beliefs (Goodburn *et al.* 1995).

TBA training as a package of interventions has rarely been submitted to any kind of rigorous assessment in terms of outcomes (Smith 1996). Cost-effectiveness studies, which should take account of impact in relation to limited resources and competing priorities, are even rarer. Many authors clearly

assume that the value of TBA training is self evident (Semali 1992, Amin & Khan 1989, Islam *et al.* 1985, Bayoumi 1976, Mathur *et al.* 1983).

Theoretical considerations in measuring the outcome of training TBAs

This review was asked to focus on maternal mortality as an outcome. However, studies of this nature are few. The main reason for this is that it is difficult and very expensive to prove significant reductions in maternal mortality in the absence of accurate vital events registration, which is absent in most developing countries. Maternal death is a comparatively rare event with an incidence of at most 0.5-1.5%, which implies a wide confidence interval. Huge sample sizes are required to prove any change in maternal mortality. For example, a household survey in Addis Ababa in 1984 estimated a maternal mortality ratio of 566 maternal deaths per 100,000 livebirths. The study was based on 45 maternal deaths identified in a survey of 32,000 households. Even such a huge undertaking has a wide 95% confidence interval, in this study calculated to range from 374 to 758 deaths per 100,000 live births (Kwast *et al.* 1986). It follows that it is impossible to state that a significant reduction has been observed unless the sample size, and the number of deaths, are presented. This is further illustrated in a study of maternal deaths in Kerian District, Malaysia which reported a maternal mortality decline of 41.8% based on a reduction in MMR from 189 maternal deaths per 100,000 livebirths in 1976 to 110 / 100,000 in 1980 (Yadav 1982). However, since the number of maternal deaths in the entire study period was only 35 with a total sample size of 22,977 deliveries, we can see immediately that even such a conspicuous percentage-wise decline hardly reaches statistical significance. This kind of statistical analysis is important for the interpretation of reports in which an alleged "reduction" of maternal mortality has taken place due to a programme effect, but is rarely performed.

Maternal morbidity is both an outcome in its own right and a pre-cursor for maternal death. However, the relationship between maternal morbidity and maternal death is not clear cut (Campbell & Graham 1991). Although some morbidity, e.g. infection and vaginal fistula, may be determined by service delivery practices, there is evidence that some acute maternal morbidity is physiologically inevitable. In these circumstances service availability prevents death but not the morbidity itself. There are also a number of methodological difficulties in measuring morbidity, particularly in community-

based studies, which means that it can be difficult to use maternal morbidity generally to measure success of TBA training programmes (Graham *et al.* 1995).

Perinatal deaths are more frequent than maternal deaths. Smaller sample sizes are needed to detect change and this indicator is more often used in programme evaluations than measures of maternal mortality. However, perinatal outcomes are influenced by a number of factors in addition to obstetric care and the link between perinatal death and maternal death is not always clear cut (Akalin *et al.* 1997). In addition, it can be difficult to measure perinatal deaths in communities where stillbirths and early neonatal deaths are not recorded or reported.

Evidence of maternal mortality reduction from programmes of TBA training

Evidence from selected national programmes provides some indication of what can be achieved of village birth attendants. China is one of very few developing countries which have maintained reasonably accurate records of maternal mortality over a long period of time. From 1950 to 1980 delivery care in China was provided mainly by minimally trained village birth attendants backed up by a strong referral network for women with complications. Using this model China succeeded in reducing the national MMR from 1500 to 115 (Koblinsky *et al.* 1999). This can be contrasted with Bangladesh where, in the absence of accessible essential obstetric care, MMR has remained generally high despite decades of TBA training (Nessa 1995). Countries, such as Malaysia, Sri Lanka and Thailand, which have succeeded in lowering MMR below 100 have all adopted a strategy of progressive increase in coverage by professional attendants backed up by provision of essential obstetric care (Starrs 1998). Malaysia is particularly interesting because they adopted a deliberate policy of gradually replacing TBAs with domiciliary midwives moving eventually to a facility based service (Yadav 1987).

There is also evidence from a number of sub-national programmes. A primary health care programme in Farafenni, Gambia used a prospective pre and post intervention survey design with control areas to assess the impact of training TBAs on the outcome of pregnancy. In the intervention villages, deliveries with trained TBAs increased from 0 to 65%. Deliveries by trained midwives also increased probably as a result of referral by the TBAs. Mater-

nal death rates fell in the intervention villages (from 2716 [11/405] to 1051 [13/1236]) ($p < 0.05$), but falls (from 1498 [4/267] to 963 [7/727]) were also observed in the control villages (n.s.). Improvements in transport were thought to have contributed to the result.

Reports of the TBA training programme in Faisalabad City, Pakistan, attribute falls in MMR to the programme. Before the programme MMR was estimated at 10.1/1000 live births. This had fallen to 1.9/1000 by 1987 and to 0.64/1000 by 1993. However, many other improvements in obstetric services were implemented over the same time period, including an obstetric flying squad service and subsidies for obstetric care in hospital. No statistical analysis are reported (Bashir *et al.* 1995)

A prospective study in Nigeria studied changes in MMR following training of 75 TBAs within a 10 mile radius of a referral hospital. Maternal deaths dropped by 50% (30 to 15) in the 3 years following the training. Non-randomly selected comparison areas were more distant from the hospital. The maternal deaths in these sites dropped by 27%, (34 to 25) in the same time period. Statistical analysis was not performed (Brennan 1989).

A recent study in Senegal has attempted to compare the impact of training professional midwives with training TBAs. Maternal mortality was higher in areas where women gave birth mainly in health care centres assisted by TBAs, than in areas where women gave birth in health facilities assisted by midwives. The researchers postulate that midwives in health facilities detected more obstetric complications than TBAs leading to immediate care and lower case fatality rates (de Bernis *et al.* 2000).

Until recently there were no published reports of maternal morbidity as an outcome of TBA training programmes. However, two recent studies suggest that the impact is not likely to be important. One study in Bangladesh showed that although trained TBAs were significantly more likely to practice hygienic delivery than untrained TBAs (45% v 19.3%, $p < 0.0001$), there was no significant difference in levels of postpartum infection when deliveries by trained TBAs and untrained TBAs were compared (Goodburn *et al.* 2000). In Brong-Ahafo, Ghana a study evaluating the impact of TBA training on the health of mothers and new-borns showed that mothers attended by a trained TBA were less likely to have experienced postpartum fever and retained placenta, but more likely to have had a prolonged labour. No significant association was found between training and other morbidity symptoms or with referral rates (Smith *et al.* 2000).

None of these studies leads to a conclusion that TBA training as a single

intervention can have a significant impact on maternal mortality. However, because of the methodological constraints involved in exploring this issue, it is helpful to briefly review the other possible health benefits from training TBAs, and the experiences of programmes.

Additional health benefits from TBA Training Programmes

In a rural health project in Dana, Ghana, TBAs have been trained and supervised since 1973. Evaluation of this programme has demonstrated that trained TBAs can provide patient education and encourage women to go to health centres for preventive care. However, it has also shown that many TBAs routinely perform high risk deliveries even though they have been taught to refer them to higher level care. When TBAs do refer, a significant proportion of their patients do not comply with the referral advice. Reasons for non-compliance with referral by TBAs included financial constraints, lack of transportation and fear of disrespectful or painful treatment from medical staff. The study concluded that in this rural environment it was important to establish or upgrade referral facilities before training TBAs and that the main contribution of TBAs was probably in health promotion, (Eades *et al.* 1993).

Studies in India have indicated that training TBAs in care and resuscitation can improve neo-natal outcomes (Kumar 1994, Bang *et al.* 1999) and that they can reduce neonatal mortality following training in management of neonatal pneumonia (Bang 1994). At one time it was argued that TBAs could reduce the incidence of neonatal tetanus (WHO 1984). However, vaccination with tetanus toxoid was shown to be overwhelmingly superior (Ross 1986) though there is evidence that TBAs can participate effectively in promoting vaccination (Mathur *et al.* 1979).

Several studies have focused upon the contribution that TBAs can make to fertility regulation activities (Begum 1984, Khan *et al.* 1986, Singh 1994) although it has been shown that TBAs can be quite negative to fertility regulation activity and thereby counteract access to contraceptives (Hitesh 1994, Singh & Kaur 1993).

A Bangladeshi NGO (Gonoshasto Kendra) has provided all maternal health services in one health District for over 20 years. A community-based approach is followed with TBAs and community health workers working as a team. The birth rate and the infant death rate of the district are lower than the national average and there is a higher contraceptive prevalence and immunisation rate. A recent evaluation report stresses the major contribution of the referral hospital, and of the continuing education programme to the

effective functioning of the TBAs (Chowdhury 1998).

Awareness of the perils of overmedicalisation of childbirth (Jordan 1987) have led some authors to support the concept of childbirth with a TBA as a natural process and to question the 'Western' content of the training process (Jordan 1989, McCormack 1989). It would be appropriate to attempt to model the risks and benefits of moves towards more medicalized care for normal childbirth in developing countries and to assess the extent to which training of TBAs might lead them to abandon desirable traditional practices such as an upright position during labour (Goodburn 1997, Chalmers 1993, Lefebvre 1997).

The role of TBAs in referral to essential obstetric care facilities

Access to essential obstetric care appears to be the crucial factor in reducing maternal mortality. In the Matlab region of Bangladesh, falls in maternal mortality in a MCH-FP intervention area were paralleled by falls in parts of the control area. The reductions in maternal mortality have been attributed to the presence of a referral hospital and transport links that were available to all areas (Ronsmans 1997, Maine 1996). A common finding in many studies of the effect of TBA training is the importance of referral to essential obstetric care facilities.

Many programmes have had a specific focus on training TBAs to refer emergency cases appropriately and some have also had major inputs into improving obstetric services, mechanisms for transport and the links between TBAs and professional health staff (Bullough 1989). In a peri-urban area in Brazil it has been shown that TBAs trained to recognise prenatal conditions and complications of pregnancy were successful in identifying them and in making referrals. TBAs were given a small maternity centre to work in and transport was available (Janovitz *et al.* 1988). TBAs in Burkina Faso have been successfully trained to refer seriously ill mothers (Wollast *et al.* 1993) and the MotherCare demonstration projects in Bolivia, Guatemala, Indonesia and Nigeria have shown that addressing issues of referral and emergency obstetric care improved quality of referrals and reduced perinatal mortality (Kwast 1996, Kwast 1995, Alisjahbana *et al.* 1995).

It is important to recognise that improvements in referrals may occur independently of TBA training. Hostility between TBAs and health staff has been found to act as a barrier to referrals (Okafor 1994). A study from Guatemala has demonstrated that hospital staff training can increase referrals from TBAs regardless of whether the TBAs are trained or untrained. Hospi-

tal staff were instructed in standards of care for managing obstetrical and neonatal patients and in the importance of being supportive and understanding of TBAs and of mothers referred by TBAs. Referrals increased by over 200%. (O'Rourke 1995).

These findings and those from similar studies suggest that the crucial intervention for all domiciliary birth attendants is a reliable support system for emergencies with sufficient transport facilities available (Kwast 1992), and skilled, equipped and available support from professional midwives and other staff with life-saving skills (Fleming 1994).

The costs of TBA training

Few attempts have been made to analyse the cost-effectiveness of TBA training programmes (Koblinsky *et al.* 1994). Following the 1987 Nairobi conference, Maine assessed the relative cost-effectiveness of seven hypothetical models of maternity care: conventionally trained TBAs; TBAs with further training; prenatal care for all women; family planning to prevent 20% of pregnancies; health centres with transport to an urban hospital; health centres without transport to an urban hospital; and, finally, health centres with transport to several rural hospitals. In a high maternal mortality situation, where direct obstetric causes account for most maternal deaths, investment in health centres and rural hospitals proved to be the most cost-effective option in terms of deaths averted per dollar spent (Maine 1993) while TBA training was one of the more expensive. It should be noted however that lives saved by TBA referrals and the costs of midwifery training were not included in the model (Bullough 2000).

Apart from the initial costs of TBA training, which can be considerable as so many need to be trained, there are considerable ongoing investments required in refresher training, and supervision. TBA training programmes are almost all supported by donors or NGOs and most governments in less developed countries cannot in fact afford them or manage them. In contrast, investments in health facilities and trained staff such as nurse-midwives are not only more attainable within their limited budgets, but also have tangible benefits for a wide range of health problems.

The debate continues

In the international fora the debate has been and is still hot regarding the

value and justification of training TBAs despite the lack of evidence as to their contribution to reduced maternal mortality (Sai & Measham 1992). TBAs have had many different roles in different cultures but they remain, even today, an important asset for a majority of the world's rural pregnant women. It is beyond doubt that their impact is significant when it comes to empathy, cultural competence, and psychosocial support at birth although many women certainly seem willing to trade this for medical care once it is available (Jordan 1987).

There seems to be consensus that TBAs are generally not able to handle most potentially fatal complications and that many other factors are important, in particular the accessibility and quality of obstetric services. Some sources argue that any attention to less effective strategies diverts attention from development of professional midwifery and hospital delivery care (Maine 1993, De Brouwere *et al.* 1998). Others argue that a switch to the model of "professional midwifery for all" would not be immediately fruitful. They question whether an abandonment of traditional birth attendants is wise and they fear that "we are in danger of a wiping out the useful work along with the weaknesses, rather than building on strength and correcting shortcomings" (Walraven & Weeks 1999).

In an attempt to accommodate the conviction of need of training professional midwives and involving TBAs, Sibley and Armbruster have tried to develop an innovative, community-oriented strategy designed to reduce maternal mortality (Sibley & Armbruster 1997). This strategy targets women, families and TBAs and uses two mutually complementary training interventions, reflecting the idea that training of professional and paraprofessional health workers in emergency obstetric care is essential and that the education and mobilisation of families, communities and TBAs must complement it. It certainly seems to be the case that "the challenge for policy makers is to make the best use of this available human resource (TBAs) but simultaneously plan and implement a definite replacement strategy" (Kamal 1998).

Conclusion

In many countries, TBAs are an important source of social and cultural support to women during childbirth and because of economic constraints, and the difficulty in posting trained professionals to rural areas, many women will continue to deliver with TBAs. However, there is no conclusive evidence that trained TBAs can prevent maternal deaths unless they are closely linked with the health services, and are supported to refer women to functioning

hospitals providing essential obstetric care. The role of TBAs should not be ignored but TBA training should be given low priority and precedence given to other programme options that are based on stronger evidence of effectiveness including the provision of essential obstetric care and of a skilled attendant at delivery.

References

- Akalin M, Maine D, Francisco A and Vaughan R (1997). Why perinatal mortality cannot be a proxy for maternal mortality. *Studies in Family Planning*. 28(4),330-335.
- Akpala CO (1994). An evaluation of a knowledge and practices of trained traditional birth attendants in Bodinga, Sokoto State, Nigeria. *Journal of Tropical Medicine and Hygiene* 97,46-50.
- Aletor GA (1981). Domiciliary midwifery care, including traditional birth attendants. In: *Maternal and child health around the world*, Eds. H. M. Wallace and G. J. Ebrahim, London: The Macmillan Press Ltd, 89-98.
- Alisjahbana, Williams C, Dharmayanti R, Hermawan D, Kwast B.E. and Koblinsky M (1995). An integrated village maternity service to improve referral patterns in a rural area in West-Java. *Int. J. Gynecol. Obstet.* 48(Suppl.),S83-S94, 1995.
- Allotey PK (1999). Where there's no tradition of traditional birth attendants: Kasena Nankana District, Northern Ghana. In: *Safe Motherhood Initiatives: critical issues*, Eds. Berer & Sundari, Blackwell Science, Oxford,147-154.
- Alto WA, Albu RE, Irabo G (1991). An alternative to unattended delivery. A training programme for village midwives in Papua New Guinea. *Social Science & Medicine* 32(5),613-618.
- Amin R & Khan AH (1989). Characteristics of traditional midwives and their beliefs and practices in rural Bangladesh. *Int. J. Gynecol. Obstet.* 28,119-125.
- Bang AT, Bang RA, Sontakke PG (1994). Management of Childhood Pneumonia by traditional birth attendants. *Bulletin of the World Health Organisation* 72(6),897-905.
- Bang AT, Bang RA, Baitule SB, Reddy MH, Deshmukh MD (1999). Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India. *Lancet* 354,1955-61.
- Bashir M Aleem and Mustansar M(1995). A 5-year study of maternal mortality in Faisalabad City Pakistan. *Int. J. Gynecol. Obstet.* 50(Suppl. 2),S93-S96.
- Bayoumi (1976). The training and activity of village midwives in the Sudan. *Trop. Doct.* 6:118-125.

- Begum SF (1984). Role of TBA infertility control programme in Bangladesh. *Mother and Child* 21,10-12.
- Belsey MA (1985). Traditional Birth Attendants: A Resource for the Health of Women. *Int. J. Gynaecol. Obstet.* 23,247-248.
- Bemara SK, Chaturverdi SK (1990). Impact of training on the performance of traditional birth attendants. *Journal of Family Welfare* 36(4),32-35.
- Bhatia S (1981). Traditional childbirth practices: implications for a rural MCH programme. *Studies in family planning*. 12(2),66-75.
- Blanchet T (1984). *Meanings and Rituals of Births in Rural Bangladesh*. University Press: Dhaka.
- Brennan M (1989). Training traditional birth attendants. *Postgraduate Doctor Africa*. 11(1),16-18.
- Bullough CH (1989). Maternal mortality in developing countries. *British journal of obstetrics and gynaecology* 96,1119-20.
- Bullough CH (2000). A assessment of the effectiveness of traditional birth attendants. A Review for DfID, New Delhi, India. John Snow International, London.
- de Bernis L, Dumont A, Bouillin D, Gueye A, Dompnier JP, Bouvier-Colle MH (2000). Maternal morbidity and mortality in two different populations of Senegal: a prospective study (Moma survey). *British journal of obstetrics and gynaecology* 107, 68-74.
- De Brouwere V, Tonglet R, Van Lerberghe W (1998). Strategies for reducing maternal mortality in developing countries: what can we learn from the history of the industrialized west? *Tropical medicine & international health* 3,771-82.
- Cabral M, Kamal I, Kumar V and Mehra L (1992). Training of Traditional Birth Attendants (TBAS). A Guide for Master Trainers. WHO/MCH/FPP/92.4. World Health Organisation, Geneva.
- Campbell O and Graham W (1990). *Measuring Maternal Mortality and Morbidity: Levels and Trends*. Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine, London.
- Campero C, Garcia, Diaz C, Ortiz O, Reynoso S and Langer A (1998). "Alone, I wouldn't have known what to do": a qualitative study on social support during labor and delivery in Mexico. *Soc. Sci. Med.* 47(3),395-403.
- Castañeda X, Garcia C, Romero X, Nuñez-urquiza RM, Gonzalez D and Langer A (1996). Traditional birth attendants in Mexico: advantages and inadequacies of care for normal deliveries. *Soc. Sci. Med.* 43(2),199-207.

- Chalmers B (1993). Traditional Indian customs surrounding birth. *S. African Medical Journal*. 83,200-203.
- Chalmers B & Meyer D (1993). Adherence to traditional Indian customs surrounding birth. *S. African Medical Journal*. 83,204-206.
- Chen. P (1981). Social background, customs and traditions. In: *Maternal and child health around the world*, Eds H. M. Wallace and G. J. Ebrahim, London: The Macmillan Press Ltd, 71-75.
- Chowdhury M (1998). The role of traditional birth attendants in a safe delivery programme in Bangladesh. *Trop. Doct.* 28,104-106.
- Eades CA, Brace C, Osei L, LaGuardia KD (1993). Traditional birth attendants and maternal mortality in Ghana. *Social science & medicine* 36,1503-7.
- Family Care International(1994). *Action for the 21st Century: Reproductive Health and Rights for All. Cairo International Conference on Population and Development Programme of Action, September 1994*. New York: Family Care International.
- Fleming JR (1994). What in the world is being done about TBAs? An overview of international and national attitudes to traditional birth attendants. *Midwifery* 10, 142-7.
- Goodburn EA, Gazi R, Chowdhury M (1995). Beliefs and practices regarding delivery and postpartum maternal morbidity in rural Bangladesh. *Studies in family planning* 26,22-32.
- Goodburn EA (1997). A prospective study of maternal morbidity related to delivery and the puerperium in Bangladesh. PhD Thesis. London University.
- Goodburn EA, Chowdhury M, Gazi R, Marshall T and Graham W (2000). Training traditional birth attendants in clean delivery does not prevent postpartum infection. *Health Policy and Planning* 15(4),394-399.
- Graham WJ, Ronsmans CCA, Filippi VGA, Campbell OMR, Goodburn EA, Marshall TF de C, Shulman C, Davies JL (1995). *Asking questions about women's reproductive health in community-based surveys: guidelines on scope and content*. Maternal and Child Epidemiology Unit, Publication No. 6. London School of Hygiene and Tropical Medicine, London.
- Greene P (1995). TBA Training Programmes: Discussion. *Int. J. Gynecol. Obstet.* 50 (Suppl.),S141-S143.

- Greenwood AM, Bradley AK, Byass P, Greenwood BM, Snow RW, Bennet S et al. (1990). Evaluation of a primary health care programme in the Gambia. I. The impact of trained traditional birth attendants on the outcome of pregnancy. *Journal of Tropical Medicine and Hygiene* **93**,58-66.
- Hitesh J (1994). Traditional birth attendants: family planning awareness, attitudes and advocacy. *Journal of family welfare* **40**,32-36.
- Högberg U (1985). Maternal mortality in Sweden. *Thesis*, University of Umeå.
- Interagency Group for Safe Motherhood (2000). *Skilled Attendance at Delivery: A Review of the Evidence*. Family Care International, New York.
- Islam MS., Shahid NS, Haque ME & Mostafa G (1984). Characteristics and practices of traditional birth attendants in Matlab, Bangladesh. *J Preventive and Social Medicine* **3**(2),23-31.
- Janovitz B, Bailey PE, Dominik RC, Araujo J (1988). TBAs in rural north east Brazil: referral patterns and perinatal mortality. *Health Policy and Planning* **3**,48-58.
- Jordan B (1989). Cosmopolitical obstetrics: some insights from the training of traditional midwives. *Soc. Sci. Med.* **28**(9),925-944.
- Jordan B (1987). High technology: the case of obstetrics. *World Health Forum* **8**,312-319.
- Kamal IT (1998). A traditional birth attendant: a reality and a challenge. *International journal of gynaecology and obstetrics* **63**, suppl 1, S43-52.
- Khan AR, Rochat RW, Jahan FA, Begum SF (1986). Induced abortion in rural area of Bangladesh. *Studies in family planning* **17**,95-99.
- Koblinsky M, Tinker A, and Daly P (1994). Programming for Safe Motherhood: a guide to action. *Health Pol Plann* **9**(3),252-266.
- Koblinsky MA., Campbell O and Heichelheim J (1999). Organizing delivery care: what works for safe motherhood? *Bulletin of the World Health Organization*; **77**(5),399-406.
- Krasovek K, Anderson MA (1991). Maternal anthropometry for prediction of pregnancy outcomes: memorandum from a USA idea WHO/PAHO MotherCare meeting. *Bulletin of the World Health Organization* **69**,523-32.
- Kwast BE (1992). Midwives: key rural health workers in maternity care. *International journal of gynaecology and obstetrics* **38**, suppl, S9-15.
- Kwast BE (1995). Building a community-based maternity program. *Int. J. Gynecol. Obstet.* **48** (Suppl.),S67-S82.

- Kwast BE (1996). Reduction of maternal and perinatal mortality in rural and peri-urban settings: what works. *European journal of obstetrics, gynecology, and reproductive biology* 69,47-53.
- Kwast BE, Kidane Mariam A, Rochat R (1986). Maternal mortality in Addis Ababa, Ethiopia. *Studies in Family Planning* 17,288-301.
- Lartson LI, Sodipe OA, Ebrahim GJ, Abel R (1987). The trained traditional birth attendant: a study of her role in two cultures. *Journal of tropical pediatrics* 33,29-34.
- Leedam E (1985). Traditional Birth Attendants. *Int. J. Gynaecol. Obstet.* 23,249-274.
- Lefèber Y and Voorhoever H (1997). Practices and beliefs of traditional birth attendants: lessons for obstetrics in the north? *Trop. Med. & Int. Health* 2(12),1175-1179.
- Maine D (1993). *Safe Motherhood Programmes: options and issues*. Centre for Population and Family Health, School of Public Health, Columbia University, New York.
- Maine D, Akalin M, Chakraborty J, Francisco A and Strong M (1996). Why did maternal mortality decline in Matlab? *Studies in Family Planning* 27(4),179-187.
- Mathur HN, Damodar & Sharma PN (1979). The impact of training traditional birth attendants on the utilisation of maternal health services. *J. Epidemiology & Community Health*. 33,142-144.
- Mathur HN, Sharma PN, and Tain TP (1983). Traditional way of maternal and child health care in Rajasthan, India. In: *Primary maternal and neonatal health: a global concern*, Eds del Mundo F, Ines-Cuyegkeng E, and Aviado DM. New-York: Plenum Press. p. 473-481.
- MacCormack C (1989). Status and the training of traditional midwives. *Soc. Sci. Med.* 28(9),941-943.
- Nessa S (1995). Training of traditional birth attendants: success and failure in Bangladesh. *Int. J. Gynecol. Obstet.* 50(Suppl.),S135-S139.
- O'Rourke K (1995). The effect of hospital staff training on management of obstetrical patients referred by traditional birth attendants. *Int. J. Gynecol. Obstet.* 48 (Suppl.),S95-S102.
- Okafor B and Rizzuto RR (1994). Women's and health-care providers' views of maternal practices and services in rural Nigeria. *Stud. Fam. Plann.* 25(6),353-361.
- Organisation for Economic Co-operation and Development (OECD) (2000). *A Better World for All: Progress towards the International Development Goals*. OECD, Paris.
- Ronsmans C, Vanneste AM, Chakraborty J, van Ginneken J (1997). Decline in maternal mortality in Matlab, Bangladesh: a cautionary tale. *Lancet* 350(9094), 1810-4.

- Ross D (1986). Does training TBAs prevent neonatal tetanus? *Health Policy and Planning* 1(2),89-98.
- Rozario S (1995). Traditional birth attendants in Bangladeshi villages: cultural and sociologic factors. *Int. J. Gynecol. Obstet.* 50(Suppl. 2),S145-S152.
- Sai F and Measham DM (1992). Safe Motherhood Initiative: getting our priorities straight [see comments]. *Lancet* 339(8791),478-480.
- Semali I (1992). Some aspects of traditional birth attendants practice in a rural area in Tanzania. *Transactions Royal Society Tropical Medicine & Hygiene* 86,330-331.
- Sibley L, Armbruster D (1997). Obstetric first aid in the community-partners in safe motherhood. A strategy for reducing maternal mortality. *Journal of nurse midwifery* 42,117-21.
- Singh A (1994). Profile of traditional birth attendants in rural area of north India. *Journal of nurse midwifery* 39,119-23.
- Singh A, Kaur A (1993). Perceptions of traditional birth attendants regarding contraceptive methods. *Journal of family welfare* 39, 6-39.
- Smith JB, Fortney JA eds.(1996). *Traditional Birth Attendants*. North Carolina: Family Health International.
- Smith JB, Coleman NA, Fortney JA, De-Graft Johnson J, Blumhagen DW, and Grey TW (2000). The impact of traditional birth attendant training on delivery complications in Ghana. *Health Policy & Planning* 15(3),326-331.
- Stanton C, Abderrahim N and Hill K (1997). *DHS Maternal Mortality Indicators: An Assessment of Data Quality and Implications for Data Use*. DHS Analytical Reports No. 4. Calverton, Maryland: Macro International Inc.
- Starrs A. (1998). The Safe motherhood Action Agenda: Priorities for the Next Decade. *Report on the Safe motherhood Technical Consultation, 18-23 October, 1997, Colombo, Sri Lanka*. New York: Family Care International and the Inter-Agency Group for Safe Motherhood.
- UNFPA (1997). Support to Traditional Birth Attendants. *Evaluation Report*, 12. UNFPA, New York.
- Walraven G, Weeks A (1999). The role of (traditional) birth attendants with midwifery skills in the reduction of maternal mortality. *Tropical medicine & international health* 4,527-529.
- Wildshut HI (1992). Safe motherhood initiative: the art of the feasible. *Nederlands tijdschrift voor geneeskunde* 136,2340-3.

Wollast E, Renard F, Vandenbussche P, Buekens P (1993). Detecting maternal morbidity and mortality by traditional birth attendants in Burkina Faso. *Health Policy and Planning* 2,161-8.

World Bank (1999). *Safe motherhood and the World Bank: Lessons from 10 Years of Experience*. Washington: The World Bank.

World Health Organization (1997). *Coverage of Maternity Care. A listing of Available Information*. World Health Organization, Geneva. WHO/RHT/MSM/96.28.

World Health Organization and UNICEF (1996). *Revised 1990 Estimates of Maternal Mortality*. World Health Organization, Geneva. WHO/FRH/MSM/96.11.

World Health Organization (1983). *Programming in maternal and childhealth and family planning*. Report of the second meeting of the WHO Programme Advisor Committee and Maternal and Childhealth, Geneva, 21-25 November 1983.

Yadav H (1982). Study of maternal death in Kerian (1976-1980). *The Medical journal of Malaysia* 37,165-9.

Yadav H (1987). Utilization of traditional birth attendants in MCH care in rural Malaysia. *Singapore Medical Journal* 28(6),520-5.

Can skilled attendance at delivery reduce maternal mortality in developing countries ?

Wendy J Graham¹, Jacqueline S Bell² and Colin HW Bullough³

Summary

This paper explores the scientific justification for the key action message “ensure skilled attendance at delivery.” Many governments and other provider agencies in poor countries will need to commit additional health resources in order to respond to this message, and opportunity costs will be incurred. Achieving targets will take time, and benefits in terms of maternal mortality may not be detected for several years. It is therefore crucial to review the basis for prioritising skilled attendance. This paper examines the historical and epidemiological evidence at both the individual and population levels of analysis.

The lack of a clear definition has been, and continues to be, the cause of much confusion over the role, and thus the potential, of skilled attendants. Recent initiatives to specify minimum and additional skills have improved understanding not only of training requirements but also of the wider environment which is required for skilled attendants to function effectively. This paper proposes that skilled attendance be conceived as encompassing 1) a partnership of skilled attendants (health professionals with the skills to provide care for normal and/or complicated deliveries), AND 2) an enabling environment of equipment, supplies, drugs and transport for referral.

At the individual level, there are sound clinical reasons for believing that the risk of maternal death can be reduced by skilled attendance, particularly as the causal pathways can be specified. However, this theory of how skilled attendance could work has not been rigorously tested, and the available empirical evidence – both historical and epidemiological, is flawed, either owing to weak study designs which fail to control for key confounding factors and/or inadequate power. Insights from modeling can be used to complement an empirical approach and in this paper a preliminary model is pre-

¹ Professor of Obstetric Epidemiology, Director, Dugald Baird Centre for Research on Women's Health, Department of Obstetrics and Gynaecology, Aberdeen Maternity Hospital, Cornhill Road, Aberdeen AB25 2ZL, Scotland. Email: w.graham@abdn.ac.uk (correspondence should be addressed to this author).

² Dugald Baird Centre for Research on Women's Health, Department of Obstetrics and Gynaecology, Aberdeen Maternity Hospital, Cornhill Road, Aberdeen AB25 2ZL, Scotland

³ Dugald Baird Centre for Research on Women's Health, Department of Obstetrics and Gynaecology, Aberdeen Maternity Hospital, Cornhill Road, Aberdeen AB25 2ZL, Scotland

sented. This estimates that around 16% to 33% of all maternal deaths may be avoided through the primary or secondary prevention of four main complications (obstructed labour, eclampsia, puerperal sepsis and obstetric haemorrhage) by skilled attendance at delivery. The model highlights the importance of considering the potential of skilled attendance to impact not only on maternal mortality but also morbidity, and emphasises their primary prevention role through effective and appropriate management of normal labour and delivery.

At the population or aggregate level, correlational analysis has been the major stimulus for prioritising skilled attendance. The paper discusses two drawbacks to this – the intrinsic inability of this type of analysis to make causal connections, and the problems of the data – its varying reliability and the limitations of the independent and dependent variables correlated, such as the institutional delivery rate and the maternal mortality ratio. In particular, the reliance on the crude indicator “percentage of deliveries with health professionals” which groups together doctors, midwives and nurses, is challenged and an alternative independent variable – the Partnership Ratio – proposed. Correlational analysis highlights the inconsistencies in the postulated link between maternal mortality and skilled attendance, and emphasises the importance of timely access to quality maternity care. In particular, insights from the Partnership Ratio and the modeling approach suggest there is an optimal professional mix for skilled attendance to be effective in different country and service settings.

Introduction

“Having a health worker with midwifery skills present at childbirth, backed-up by transport in case emergency referral is required, is perhaps the most critical intervention for making motherhood safer.”

(Starrs 1997)

This is arguably one of the most influential statements to emerge from the 1997 Technical Consultation on Safe Motherhood. Translated into the action message “ensure skilled attendance at delivery”, it forms the basis of a key proxy indicator for monitoring global progress in reducing maternal mortality (AbouZahr & Wardlaw 2000). Regional and international advocacy meetings are now being held to encourage developing countries to prioritise skilled attendance (Safe Motherhood Inter-Agency Group/ SMIAG 2000a) and to meet the international development target of “80% of all births assisted by skilled attendants” by 2005 (United Nations 1999). The ease and speed with which skilled attendance has been promoted as a global priority is itself an indication of the urgent need to offer key decision-makers

an intervention perceived as feasible, comparatively discrete and intuitively effective. This need arises from the disappointment of earlier priorities – traditional birth attendant (TBA) training and antenatal ‘at risk’ scoring – regarding impact on maternal mortality, and the consequent threat to continuing donor support. The question is **can** skilled attendance at delivery do better?

This is clearly not just an academic question. Many governments and other provider agencies in poor countries will need to use scarce health resources to increase the proportion of deliveries with skilled attendance and opportunity costs will be incurred. Achieving targets will take time and benefits in terms of maternal mortality may not be detected for several years. It is therefore crucial to establish whether the evidence exists to justify this priori-

Box 1. Defining skilled attendant : joint WHO/UNFPA/UNICEF/World Bank statement (1999)

“The term ‘**skilled attendant**’ refers exclusively to people with midwifery skills (for example, doctors, midwives, nurses) who have been trained to proficiency in the skills necessary to manage normal deliveries and diagnose, manage* or refer complications. Ideally, the skilled attendants live in, and are part of, the community they serve. They must be able to manage normal labour and delivery, recognise the onset of complications, perform essential interventions, start treatment, and supervise the referral of mother and baby for interventions that are beyond their competence or not possible in the particular setting.”

Midwifery skills are a defined set of cognitive and practical skills that enable the individual to provide basic health care services throughout the period of the perinatal continuum and also to provide first aid for obstetric complications and emergencies, including life-saving measures when needed.

* “Manage” was added to this definition by the members of the Safe Motherhood Inter-Agency Group, which include WHO/UNFPA/UNICEF/World Bank, in recognition of the fact that skilled attendants include physicians and other medical personnel who may be able to manage complications.

tisation. "Evidence" is an increasingly emotive term, which clearly means different things to different people (Gray 1997). This paper will explore the fundamental question "can skilled attendance at delivery reduce maternal mortality in developing countries" recognising the different requirements on evidence. Firstly, the definition of skilled attendance will be considered. Secondly, the link between skilled attendance and maternal death at the individual level will be explored. Thirdly, the link at the population level will be examined - in other words, between the coverage of delivery care and the scale of maternal mortality. Recommendations for research to fill gaps in knowledge will be included throughout the paper.

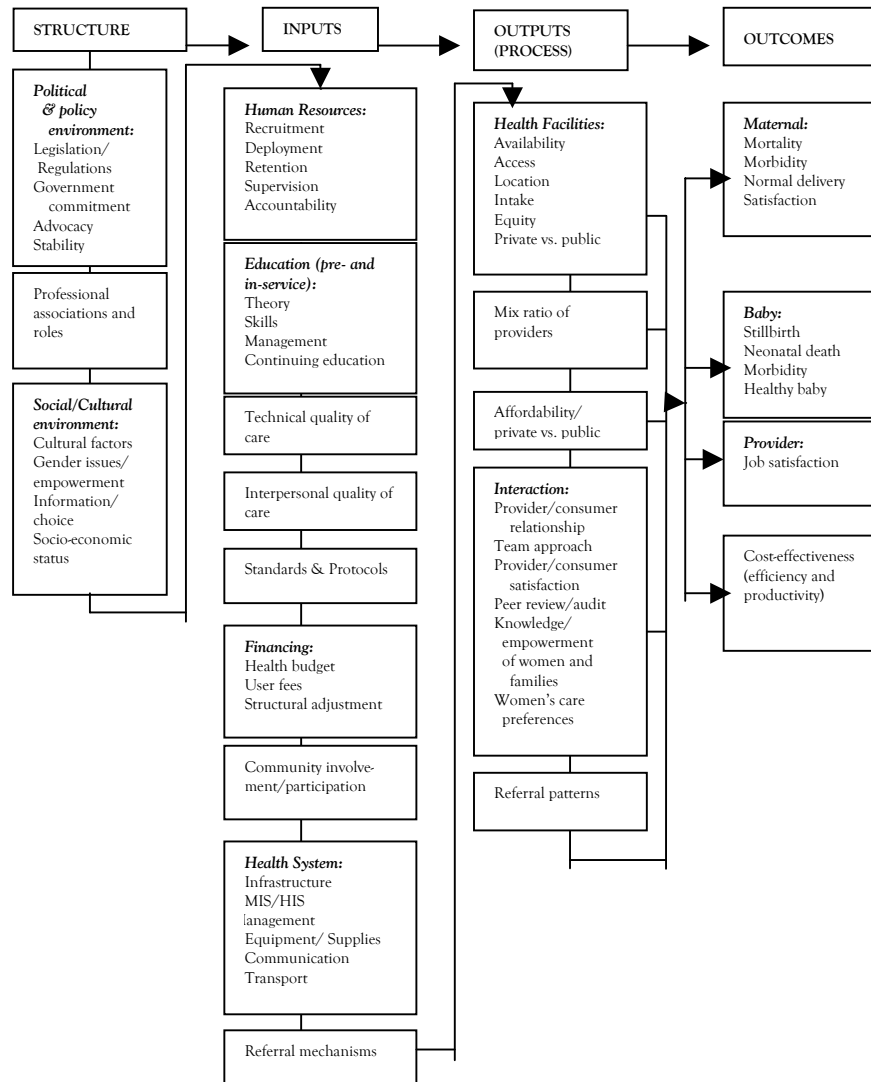
What is skilled attendance ?

The lack of a clear definition has been, and continues to be, the cause of much confusion over the role and thus the potential of a skilled **attendant**. Whilst some feel that an internationally-accepted standard is impossible, it is crucial to acknowledge the implications of the various proposed definitions. Until the mid-1990s, the word "trained attendant" was used by many agencies, and national statistics on coverage tended to group both professionals and non-professionals (e.g. trained TBAs) together as long as they had received some "training". From 1996 onwards, however, the word "skilled" was employed, recognising that someone who has been trained is not necessarily skilled (Starrs 1997). Thus "trained" implies but does not guarantee the acquisition of knowledge and ability, whilst "skilled" implies the competent use of knowledge. In an effort to improve understanding, a joint WHO/UNFPA/UNICEF/ World Bank statement was issued in 1999, as indicated in Box 1.

"Skilled attendance" has only recently been defined explicitly as "the process by which a woman is provided with adequate care during labour, delivery and the early postpartum period" (SMIAG 2000b). This definition goes onto emphasise that the process requires a skilled attendant AND an enabling environment which includes adequate supplies, equipment and infrastructure as well as efficient and effective systems of communication and referral. The "environment" can, however, also be viewed more broadly to include the political and policy context in which skilled attendance must operate, the socio-cultural influences, as well more proximate factors such as pre- and in-service training, supervision and deployment and health systems financing. This constellation of factors can be conceived as the conceptual framework

for skilled attendance, as illustrated in Figure 1.

Figure 1. Conceptual framework for skilled attendance at delivery



*SOURCE : Graham and Bell 2000a

*Box 2. Defining minimum and additional skills required of skilled attendants**

The skilled attendant *at delivery* will have the *minimum set of skills to:*

- Take a detailed history, asking relevant questions, demonstrate cultural sensitivity, and use good interpersonal skills.
- Provide antenatal care throughout pregnancy; provide continuity of care throughout the perinatal period.
- Perform a general examination, identify deviations from normal, and screen for conditions that are prevalent or endemic in the area.
- Take vital signs (temperature, pulse, respiration, blood pressure)
- Auscultate the foetal heart rate.
- Calculate the estimated date of delivery.
- Educate woman and family about danger signs during pregnancy, when and how to seek emergency care.
- Provide appropriate intervention (including referral) for
 - infection
 - intrauterine foetal death
 - malpresentations and abnormal lies at term
 - multiple gestation
 - poor nutrition and anaemia
 - pre-eclampsia and eclampsia
 - rupture of membranes prior to term
 - severe vaginal bleeding (suggesting abruptio placenta)
 - other problems significantly affecting health (e.g. not limited to polyhydramnios, diabetes inadequate foetal growth, preterm labour)
- Perform an abdominal examination identifying abnormalities and factors that place the woman at increased risk.
- Prepare the woman and her family for the birth by providing information and support
- Time and assess the effectiveness of uterine contractions, monitoring the woman's response to pain and increasing pressure on the pelvic floor.
- Perform a vaginal examination, noting the vulva, status of the membranes and colour of amniotic fluid, cervical dilation, and presenting part.
- Provide support and psychological care for the woman and her family.
- Ensure hydration, nutrition, comfort, cleanliness, elimination, and mobility, appreciating and explaining the advantages of these approaches and the risks associated with their omission.
- Recognise delay in labour, prioritise care, take appropriate action, and evaluate the results of the intervention.
- Use the partograph or modified form
- Recognise the presence of meconium in amniotic fluid
- Make appropriate referrals in response to the level of indicated risk.

(Box 2 continued)

- Recognise foetal distress and take appropriate action
- Conduct vertex deliveries, using appropriate hand manoeuvres and aseptic precautions.
- Perform and repair episiotomy to save the life or protect the mother or baby from serious injury.
- Take appropriate care of the cord at birth.
- Manage a cord around the baby's neck at delivery.
- Clamp and cut the cord using aseptic technique.
- Perform physiologic OR active management of the third stage of labour
- Perform controlled cord traction
- Administer oxytocic agents
- Check the placenta and membranes for completeness
- Check that the uterus is well-contracted and estimate total
- Manage postpartum haemorrhage
- Administer oxytocic agents
- Perform aortic compression or internal bimanual compression, depending on country norms
- Perform life-saving skills in cases of
 - convulsions
 - obstructed airway
 - serious infection
 - shock
 - unconsciousness
 - vaginal bleeding (during pregnancy or postpartum)
 - shoulder dystocia
 - cord presentation and cord prolapse
- Provide a safe and warm environment for mother and infant
- Dry the infant.
- Ensure that respirations are established.
- Initiate newborn resuscitative measures when indicated.
- Encourage early and exclusive breastfeeding when health status of mother and baby are appropriate.
- Examine the newborn baby, noting risk factors from the pregnancy and labour history.
- Assess and monitor the infant in the immediate post-birth period for evidence of normal transition to newborn status; refer sick newborns to next level of care, where appropriate.
- Correlate all available information; record all relevant findings on maternal and newborn records; advise when to return for care.
- Perform immediate and periodic assessments of the woman during the postpartum period, assessing all parameters relevant to normal recovery from childbirth, and evidence of deviation from normal (including haematoma and infection).
- Educate woman and family regarding postpartum and newborn care (including care of the umbilical cord stump).
- Insert intravenous (IV) lines and administer IV fluids
- Prescribe and or administer, as appropriate:

(Box 2 continued)

- analgesics

- antibiotics
- anticonvulsants
- antimalarials
- antipyretics
- contraceptive drugs and devices
- immunisation agents
- iron supplements
- oxytocics (post-delivery or post-abortion)
- sedatives
- tetanus toxoid
- Make appropriate and timely referrals for additional and emergency care, arranging for transportation and care during transport.
- Identify breech and other malpresentations, and make timely referrals in early labour.
- Facilitate linkages between the community health facility, referral settings, and the traditional care providers in that community.
- Use appropriate interpersonal communication skills and counselling skills
- Employ critical thinking skills (includes self-assessment on and reflection of own practice)
- Respect diverse cultures and traditions
- Utilise management skills to organise the practice environment and to evaluate the effectiveness of service delivery.

The skilled attendant *at delivery* may have the *additional skills to:*

- Anticipate the need for forceps delivery or vacuum extraction; perform vacuum extraction
- Manage complications of late labour using appropriate interventions and hand manoeuvres.
- Identify and manage foetal distress.
- Identify and manage multiple births.
- Perform manual removal of retained placenta.
- Identify and repair cervical lacerations.

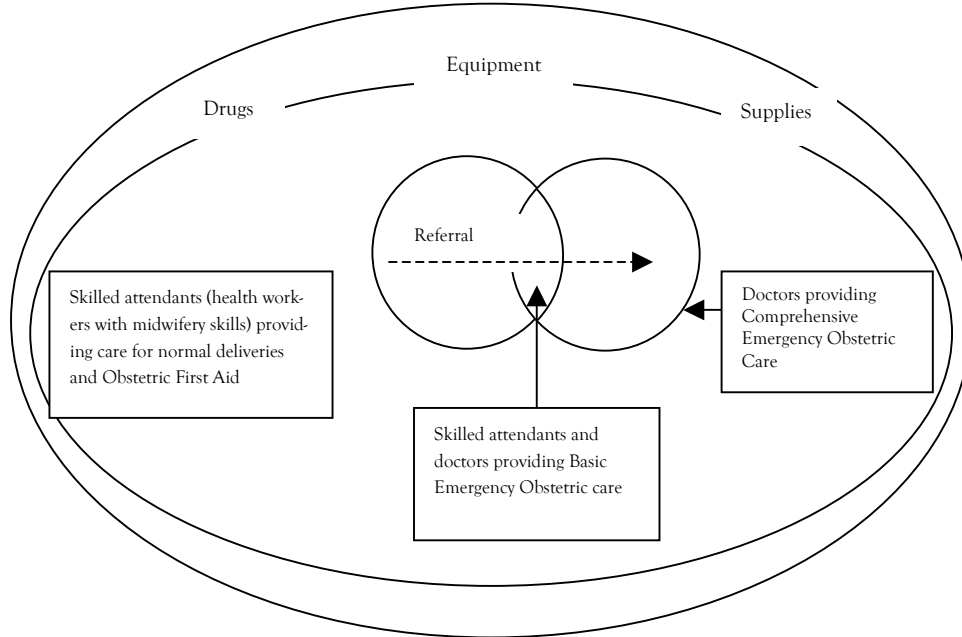
Use managerial skills to improve service delivery

* SOURCE : SMIAG 2000b

The definitions of skilled attendance and attendants are clearly crucial to identifying the potential to impact on maternal mortality. Whilst at the simplest level, a skilled attendant is still often equated with “doctors, midwives and nurses”, particularly in crude coverage statistics (WHO 1997), these professionals usually have very different scopes of work and skills, particularly with regard to surgical procedures. It will be argued later in the paper, that such aggregation is unhelpful and that if professional labels are to be used, these should be differentiated. Recently attempts have been made to refine the definitions in terms of essential or core competencies required for an attendant to be designated as “skilled” (ICM 1999, WHO 1999). These have now been synthesised into a proposed minimum set of skills required and a set of additional or optional skills (SMIAG 2000b), as indicated in Box 2.

Review of these skill sets suggests that “skilled attendant” appears to equate with midwives or nurses with midwifery skills and not to include doctors, since surgical skills are omitted whilst management of normal delivery and supportive nursing care is included. Thus the minimum and additional skills in Box 2 essentially relate to the provision of Basic (BEOC) but not Comprehensive Essential Obstetric Care (CEOC) (UNICEF 1999). This however contradicts the joint WHO/UNFPA/UNICEF/World Bank Statement (1999) referred to earlier which specifically includes doctors as skilled attendants. It may be helpful therefore to conceive of skilled attendance as encompassing a partnership of health professionals with the skills to provide care for normal and/or complicated deliveries, **AND** the enabling environment. This is consistent with the earlier definition of skilled attendance and is shown schematically in Figure 2. The important issue as regards the attendants is the emphasis on the word **skilled** since the professional title alone does not guarantee skills, and on the plural sense since women may need to be referred between different professionals, such as midwives and doctors.

Figure 2. Schematic representation of skilled attendance at delivery



Boxes 1 and 2 also highlight the three other areas of uncertainty regarding skilled attendance:

- The place of attendance: recent documents refer to skilled attendants practising at “the primary or first referral level” (SMIAG 2000b), implying the former refers to domiciliary care and the latter health centres. This terminology is not however consistent with earlier documents, such as the WHO Mother–Baby Package (1994), which propose health centres as the primary tier and district hospitals as the first referral level. The extent to which skilled attendance does or does not include domiciliary care is crucial, since institutionalising all deliveries has profound resource and logistical implications for poor developing countries, as well as raising concerns over the risks of over-intervention and iatrogenicity.
- Time of attendance: the role of the skilled attendant outside the intrapartum and immediate postpartum period is unclear. One recent key document suggests that a skilled attendant serves as a “proxy for a health care professional who can also provide skilled antenatal, postnatal and

neonatal care” (SMIAG 2000b.). However, the extent to which they can impact upon early pregnancy complications, such as ectopic pregnancy or complicated induced abortion, or those occurring after the delivery, such as secondary postpartum haemorrhage, depends on the community’s acceptance and recognition of this role and thus on contact with women outside labour and delivery.

- Extent of attendance: there is ambiguity in the degree of involvement during labour and delivery required to constitute “attendance”. A health professional who only attends the final stages needs to be distinguished from one who is available throughout. Similarly, whether the attendant is physically present or just close-by can also be an important distinction in terms of preserving normality and detecting early warning signs.

Thus in order to identify the potential for skilled attendance to prevent the major causes of maternal death, assumptions must be made about the competency of the provider; the availability of essential drugs, equipment and supplies; the access to referral facilities; the location; and the time and duration of attendance. This assumption-based approach will now be used to consider the effectiveness of skilled attendance at two levels – the individual level, and the population level. The distinction here is crucial. At the former level, the association is considered between cases of maternal death and the type of attendant at delivery or, conversely between types of attendant at delivery and deaths among those they attend. At the population level, associations are considered in the aggregate, in other words between the maternal mortality ratio for the entire population and the proportion of deliveries in the entire population with or without skilled attendance.

How can skilled attendance work at the individual level ?

One of the major rationale often cited for prioritising skilled attendance at delivery is the concentration of maternal deaths around this time, with an estimated two-thirds occurring in late pregnancy through to 48 hours after delivery (AbouZahr 1998a). Assuming therefore that the primary involvement of the skilled attendant is from the onset of labour to the immediate puerperium (up to 48 hours), the four major direct causes of maternal death amenable to intervention are shown in Table 1, along with estimates of their incidence and case-fatality. If this involvement is extended to late pregnancy and the first week after delivery, then the proportion of eclamptic, antepartum haemorrhage and puerperal sepsis cases encountered by the skilled attendant is likely to be increased, but the other major causes - ectopic preg-

nancy and complicated abortion, would remain excluded.

Table 1. Major causes of maternal death close to the time of delivery, for developing countries ~ 1990

Complication	Incidence (Rate per 100,000 females 15-44)		Case-fatality rate ¹ (%)	
	Highest estimate ²	Lowest estimate ³	Highest estimate ²	Lowest estimate ³
Obstructed labour	1422	354	9	0
Eclampsia	1185	442	17	2
Puerperal sepsis	2370	531	11	1
Obstetric haemorrhage	2370	885	17	4

*SOURCES: Data extracted from AbouZahr 1998b,c, AbouZahr and Guidotti 1998, AbouZahr et al. 1998.

¹ Derived from estimated number of deaths divided by estimated number of incident cases.

² Estimates for sub-Saharan Africa

³ Estimates for China

The role of skilled attendance in averting deaths from the causes in Table 1 could be both through primary and secondary prevention. Figure 3 illustrates the main points for intervention along the causal pathway to death. Through appropriate case management (including referral), skilled attendance can prevent complications directly. The scope for primary prevention clearly varies according to the complication, although reliable data on the avoidable fraction is lacking. Table 2 provides first *guess-timates* of these proportions, emerging from a process comparing published incidence rates between developing and transitional countries, combined with expert clinical opinion, and assuming a basic level of health service infrastructure and limited access to care. Further confirmation of these figures can be regarded as a research need. These preliminary estimates give some broad indication of the potential of skilled attendance to impact not only on maternal deaths through primary prevention, but also on the number of women suffering with these complications – a number which is of course considerably greater than the number dying.

Table 2. *Guess-timates of the proportion of complications amenable to primary prevention by*

skilled attendance¹

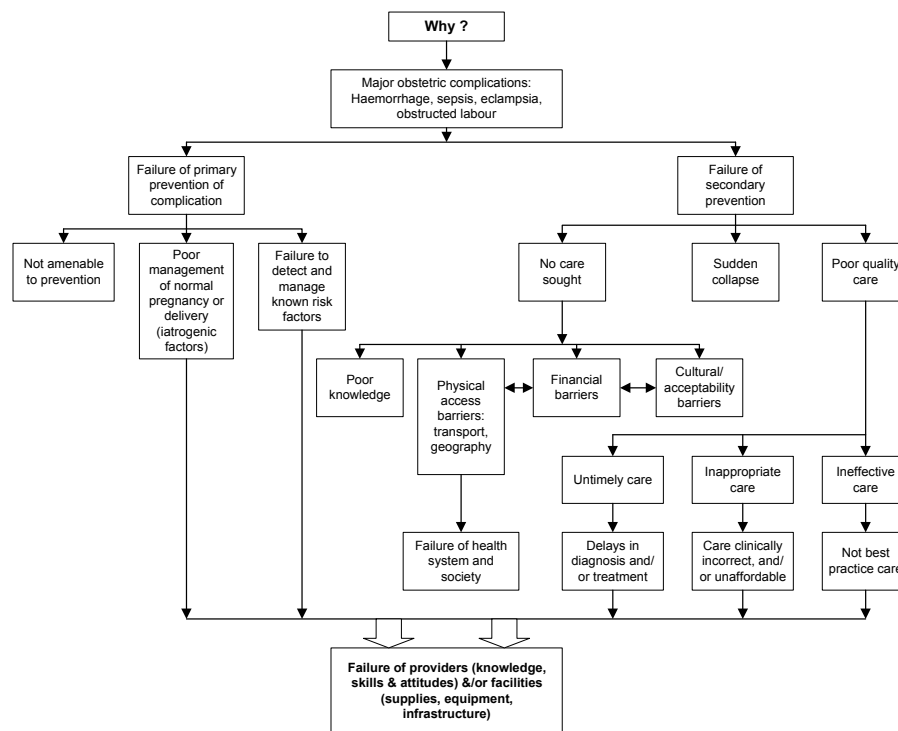
Complication	% complications preventable ²		% change between highest developing country estimate and estimate for Former Soviet Union	% change between lowest developing country estimate and estimate for Former Soviet Union
	Optimistic estimate	Pessimistic estimate		
Obstructed labour	85	70	-80.1	-20
Eclampsia	40	20	-70.3	-21.4
Puerperal sepsis	70	50	-79.2	-7
Obstetric haemorrhage	50	30	-70.2	-20.2

SOURCES: Data extracted from AbouZahr 1998b,c, AbouZahr and Guidotti 1998, AbouZahr *et al.* 1998.

¹ Skilled attendance included skilled attendant (skilled health professional) AND enabling environment of drugs, equipment, supplies, and referral

² Estimated by reviewing incidence rates, combined with expert opinion, and assuming a basic level of health infrastructure and limited access to care.

Figure 3. Why do women in poor countries still die or suffer life-long disability owing to pregnancy or childbirth ?



A similar approach can be applied to assess the potential impact of skilled attendance through secondary prevention – namely effective, appropriate and timely essential obstetric care. Considering the competencies proposed earlier in Box 2, and assuming that the skilled attendant has access to an enabling environment for BEOC and CEOC, it is possible to model a set of management scenarios or algorithms for averting maternal deaths from the 4 main direct obstetric causes. The approach used here should be regarded as tentative, and research is needed to refine and validate the methodology by using, for example, the Delphi technique. Combining the derived figures with those estimated earlier for primary prevention, a crude indication can be gained of the overall impact on maternal mortality, as shown in Table 3.

Table 3. Estimates from preliminary model of maternal deaths averted by skilled attendance

1	2	3	4	5		
	CFR (%)	Range of estimates	% complications averted by primary prevention	Model 1 % deaths averted by secondary prevention		
Complication				OFA only	BEmOC only	CEmOC only
Obstructed labour (7.5%)	100	Optimistic	85	2	3	95
		Pessimistic	70	1.5	2	90
Eclampsia (12.6%)	50	Optimistic	40	2	20	45
		Pessimistic	20	0	15	40
Puerperal sepsis (15%)	50	Optimistic	70	20	40	49
		Pessimistic	50	10	30	45
Haemorrhage (25.1%)	50	Optimistic	50	10	20	46
		Pessimistic	30	5	10	42

	6			7	8	9
	Model 1 Total % deaths averted with primary and secondary prevention			Model 2 % deaths averted by secondary prevention	Model 2 Total % deaths averted with primary and secondary prevention	% of all maternal deaths averted
Complication	OFA only	BEmOC only	CEmOC only			
Obstructed labour (7.5%)	85.3	85.45	99.25	97	99.55	7.47
	70.45	70.6	97	94	98.2	5.28
Eclampsia (12.6%)	21.2	32	47	48	48.8	6.15
	10	22	42	45	46	1.26
Puerperal sepsis (15%)	41	47	49.7	49	49.7	7.46
	30	40	47.5	45	47.5	4.50
Haemorrhage (25.1%)	30	35	48	48	49	12.30
	18.5	22	44.4	46	47.2	4.64

Notes:

¹ Major complications and % contribution to total maternal deaths

² Estimated case fatality rates in the absence of any intervention

³ Upper and lower limits of estimates

⁴ *Guess-timates* of % complications avoided by primary prevention through skilled attendance

⁵ Model assuming that women present with the complication to a skilled attendant and receive one of three types of care, but with no referral between them: OFA Obstetric First Aid, BEmOC Basic Emergency Obstetric Care, CEmOC Comprehensive

sive Emergency Obstetric Care

⁶ Estimates from column 5 combined with the proportion avoided by primary prevention

⁷ Model 2 assumes women present with complication to a skilled attendant and receive OFA, followed by BEmOC, followed by CEmOC.

⁸ Estimates from column 7 combined with the proportion avoided by primary prevention

⁹ Use of highest (optimistic) and lowest (pessimistic) estimates of % averted multiplied by the % of all maternal deaths owing to that complication.

This type of sensitivity analysis is widely used in health economics (Briggs *et al.* 1994) and, as applied here, suggests that between about 16% and 33% of all maternal deaths could be avoided through skilled attendance, assuming certain competencies as well as the availability of essential, drugs, equipment and referral. The model focuses only on skilled attendance impacting only on the four main causes of maternal death close to delivery, and does not allow either for competing risks nor possible multiplicative effects of skilled attendance. The preliminary nature of these figures and the need for further developmental work must be emphasised. However, the optimistic proportion is comparable to the estimated figure of a third of maternal deaths avoidable by the provision of family planning (Winikoff & Sullivan 1997). To have this level of impact assumes that each woman has access to and utilises skilled attendance, which raises issues related to coverage at the population level, as discussed later.

Given this potential, the key question is what is the evidence that this can be achieved – in other words that the efficacy of skilled attendance can be translated into effectiveness – clinical and cost-effectiveness. The most rigorous approach to answering this question is a randomised-controlled trial (RCT) as it enables systematic bias between the intervention and non-intervention group to be eliminated. Whilst a large number of specific midwifery and obstetric practises have been evaluated using this gold-standard design, few have been conducted in developing countries and none have used maternal death as the primary outcome. In other words, there is no Grade 1 evidence (Gray 1997) to show that women delivering with skilled attendance have a lower risk of dying of maternal causes than women delivering without. However, given the proven effectiveness of specific practices, it would now be regarded as unethical to conduct a study in which the control group of women were specifically denied these procedures. It would on the other hand be possible to use a cluster randomised trial design (CRT) to

compare a complete package of skilled attendance (attendant and enabling environment) provided in intervention districts versus the existing maternity care in control districts. A natural opportunity to use this experimental design may arise where countries are committed to skilled attendance as defined above, but are unable to implement this across all districts at the same time. If districts can be randomised in terms of the order in which implementation occurs, then a CRT may be feasible (Graham & Bell 2000a).

In the absence of trial data, there are two main other types of “evidence” which can be used to explore the link between skilled attendance and the risk of maternal death at the individual level: historical and epidemiological. Neither of these can provide proof that there is a lower probability of dying of maternal causes with than without skilled attendance, owing to the difficulty of controlling for confounding factors, such as differences in women’s risk at outset or place of delivery. The majority of historical evidence is in fact relevant to the link between skilled attendance and maternal mortality at the population level, which will be discussed in more detail later. However, the classic work by Loudon, *Death in Childbirth* (1992a), provides examples of data spanning an enormous period (1864 -1939) and across several continents, which show the risk of death by type of birth attendant. A selection of these figures is given in Table 4. Not surprisingly, there is no clear pattern and firm conclusions cannot be drawn, particularly as the crude maternal mortality ratios cannot be disaggregated according to, for example, intended place of delivery or booking status. But what perhaps these data do confirm is that the professional label alone is not a good proxy for skills or competencies and that we should not only consider reduced risk but also the elevated risk of maternal death in the presence of unskilled “professional” attendants. This concept of balancing benefit with harm is crucial in all areas of health care (Gray 1997), and in safe motherhood there are both historical and contemporary reviews of maternal deaths which attribute the fatal outcome to the professional attending the delivery (such as Bobadilla *et al.* 1996, Porges 1985, Egypt Ministry of Health 1994, United Kingdom HMSO 1998). It is of course hard to establish culpability in many situations, and the attendant finally involved in a case may be unfairly blamed when their involvement may have been too late and beyond their control. This sort of detail is lacking from most routine sources of information on coverage and helps to explain some of the patterns observed from correlational analysis which will be discussed later.

Table 4. Selected historical estimates of maternal mortality by place and attendant at deliv-

ery *

Year	Country	Location	Attendant	Maternal mortality ¹	Source table
1864-73	England	Liverpool Lying-in Hospital	Midwives and doctors	1591	12.2
1876-80	England	Birmingham Lying-in Charity (Domiciliary care)	Midwives and General Practitioners	145	12.3
1873	Scotland	Glasgow Maternity (Lying-in) hospital	Midwives and doctors	2500	12.2
1879-81	Scotland	Glasgow Maternity Hospital (Domiciliary care)	Midwives and General Practitioners	875	12.3
1880-84	England	Queen Charlotte's Hospital	Midwives and doctors	1050	12.5
1885-89	England	Queen Charlotte's Hospital	Midwives and doctors	420	12.5
1909-14	England	Provincial Lying-in hospital	Midwives and doctors	5680	13.5
1909-14	England	Provincial Hospital (Domiciliary care)	Midwives and General Practitioners	2960	13.5
1929	Canada	Institutional deliveries	Midwives and doctors	1310	6.2
1929	Canada	Non-institutional deliveries	Midwives and General Practitioners	370	6.2
1931	United States (Ohio)	Maternity hospitals	Midwives and doctors	590	17.4
1931	United States (Ohio)	Domiciliary	Midwives	5142	17.4
1931	United States (Ohio)	Domiciliary	General practitioners	1090	17.4
1931	United States (Ohio)	Maternity hospitals	Obstetricians	734	17.4
1935-39	United States (Michigan)	Home deliveries	Midwives and General Practitioners	130	21.3
1935-39	United States (Michigan)	Hospital deliveries	Obstetricians	1340	21.3

*SOURCE : Loudon 1992

¹ No information is available to disaggregate these maternal mortality ratios according to intended place of delivery or booking status.

In terms of epidemiological evidence, this broadly falls into two categories - quasi-experimental and descriptive. In the former case, control groups are used to assess the effects of specific interventions. Perhaps the most famous - and contested - relevant example of this design is the Maternity Care Program in Matlab, Bangladesh, involving both historical (before-and-after comparison) and contemporary (non-intervention) controls. The intervention comprised increasing the number of skilled attendants (government-trained community midwives), together with the creation of the enabling environment of a referral chain and access to a health centre able to provide

BEOC (Maine *et al.* 1996). Although this data set has the potential and the power to examine the complex link at the individual level between maternal death and the delivery attendant, and indeed to unravel the sequence of caregivers prior to death, these results do not appear to be available. Instead, aggregate analysis is used to show that a statistically significant decline in the level of maternal mortality occurred in the intervention area from 1984-86 to 1987-89 but not in the control area (Fauveau *et al.* 1991). However, subsequent analysis of maternal mortality in a third area – the Comparison Area – found evidence of a fall comparable to that in the intervention area even though it did not receive the Maternity Care Program; this third area did however have access to a district hospital providing CEOC. This suggests that the control area was perhaps not comparable from the outset to the intervention area, and re-emphasises the difficulty of interpreting findings from non-randomly selected groups (Ronsmans *et al.* 1997).

Descriptive study designs consider patterns of maternal mortality relative to other variables, such as place of delivery and type of attendant, but again cannot prove causal connections owing to their inability to control for confounding factors. One of the most well cited examples relevant to skilled attendance is that reported by Kaunitz and colleagues (1984). Here maternal death among the Faith Assembly religious group of Indiana was compared with that for the remainder of the state population. A tenet of the sect is that members should not receive medical care, and thus all women give birth without professional obstetric assistance. The pregnant women in this religious group are widely regarded as “low-risk” with regard to demographic and health characteristics. For the period 1975-1982, the maternal mortality ratio among the Faith Assembly women was 872 per 100,000 live births, compared with 9 among the remainder of the Indiana population (Loudon 1992a). In other words, the risk in the former group delivering without skilled attendance was 92 times (95% CI 19-280) greater than that for the latter who had access to (though not necessarily used) modern maternity care services. Although it is hard to identify potential confounding factors that might explain this huge difference, neither can this study be regarded as providing rigorous evidence of the effectiveness of skilled attendance, particularly in view of the small number of deaths considered.

A more recent and developing country example of a descriptive study is provided by de Bernis and colleagues (2000) as part of the MOMA survey (Bouvier-Colle *et al.* 1997). Within this cohort study of pregnant women, the component conducted in two different areas of Senegal found that among

those delivering in health facilities, there were higher risks of maternal death for those conducted by non-professionals compared to women delivering with health professionals. However, again the number of deaths is extremely small and thus the confidence intervals very wide. Moreover, as for all descriptive studies there is uncertainty about the comparability of the populations in the two areas, since maternal characteristics appeared to differ significantly in a number of respects. Interestingly, for maternal morbidity the reverse pattern was observed – with higher rates recorded in the area where more women delivering in health facilities had professional attendance. Such a finding may be attributed to improved diagnostic techniques among the professionals or to greater iatrogenicity. Further analysis to examine the proportion of women admitted in normal labour and developing complications versus those admitted with complications could help to throw some light on this.

The lack of rigorous data on the effectiveness of skilled attendance in terms of reducing maternal mortality obviously also explains the lack of knowledge on cost-effectiveness. The most frequently used information is that derived from a costing exercise undertaken by WHO in support of the Mother-Baby Package (WHO 1994). This estimated that the maternal component of the package would cost \$2 per capita to deliver in low-income countries, with a cost of \$230 per mother or infant life saved. These figures are suggested to be “lower than or similar to the cost of many other programmes, such as measles immunisation” (Starrs 1997), but do not enable a judgement to be made about the cost-effectiveness of the skilled attendance component versus other elements of the package.

Normal delivery and essential obstetric care are, however, estimated to account for about 44% of the total costs of the Mother-Baby package (Jowett 2000).

There are sound clinical reasons for believing that the risk of maternal death can be reduced by skilled attendance, particularly as the causal pathways can be elucidated. However, the theory of how skilled attendance can work has not been rigorously tested, and the information available is flawed either owing to weak study designs or inadequate power. The former reflects in part the complexities of mounting controlled trials and thus the resort to quasi-experimental and descriptive approaches which cannot allow adequately for the differences between women receiving or not receiving skilled attendance. Case-control studies, for example, have faced huge difficulties in identifying appropriate controls (Abdulghani 1993). Moreover, the data are

often limited to studying the effect of just one type of attendant rather than including all those involved and the timing of their involvement; clearly the risk of maternal mortality can appear higher among doctors simply because they attend the most serious complications. Further explorations of existing data sets may help to establish patterns of attendance involving more than one professional. In summary, we know that skilled attendance could work to reduce maternal mortality at the individual level; we do not know reliably if it can or has.

How can skilled attendance work at the population level ?

A key rationale cited for prioritising skilled attendance is the findings from correlational analysis of historical and contemporary data. There are, however, two drawbacks to this approach which should be acknowledged from the outset: firstly, the intrinsic inability to make causal connections using aggregated data, and secondly, the problems of the data – its reliability as well as the choice of independent and dependent variables. Whilst awareness of the former drawback needs to be raised among those using the findings to advocate skilled attendance, there is no way to overcome it completely, although – as will be shown later – multi-variate analysis can at least offer some control over known confounders. The drawbacks to the data, on the other hand, are not insoluble, and methodological research could help refine the most commonly-used independent variable – “proportion of deliveries with health professionals” (Graham and Bell 2000a).

As for the previous section, it is helpful to distinguish between two types of evidence on the link between maternal mortality and skilled attendance at the population level: historical and epidemiological. There is a comparative wealth of information on the historical trends in maternal mortality in modern day industrialised countries, such as Sweden and the United States, and transitional countries, such as Malaysia and China (De Brouwere *et al.* 1998, Koblinsky *et al.* 1999, Loudon 1992b). Most of these historical series seek to identify the contributory factors in the downward trend and all conclude that no single factor can be held responsible. Having acknowledged the multi-factorial nature of the decline, the concern has been to establish the relative importance of various factors, and skilled attendance – as reflected in a variety of measures, has emerged as of central importance. Beyond this, there has been an attempt to disentangle the elements of skilled attendance, primarily in terms of place of delivery and type of attendant (doctor or midwife). A justification for this is the perceived relevance of the lessons to con-

temporary developing countries. Relevance is however hard to assess, since the historical declines occurred when many other demographic, economic, political, cultural and scientific developments were happening in the countries concerned. Some of these factors can be quantified and allowed for in the interpretation, if not the analysis itself, and so, for example, there are authors who argue that maternal mortality was not reduced by broader socio-economic development (Loudon 1992b). The relevance of the historical lessons is also affected by the complexity of the situation today in developing countries, and particularly the limited availability (rather than technological state) of health resources, the new disease challenge of HIV/AIDS, and the declines in fertility – all of which affect maternal mortality.

The historical series all tend to use the maternal mortality ratio as the dependent variable, and to obtain this from vital registration systems. The reliability of these figures cannot be assumed, although they are likely to compare favourably in terms of accuracy with model-based estimates, which is all that is available for many developing countries. As for the independent variable, time is the one most often used, with the occurrence of particular historic events, such as the English Midwives Act of 1902, indicated on the graph. The other independent variables used are place of delivery, often comparing percentage of deliveries at home with those in different types of health institutions, or the type of attendant, usually differentiating between specialists, general physicians, professional midwives, and “others” (lay persons). The correlation observed, both over time and cross-sectionally, emphasises the crucial importance of quality of care, reflecting both the skills of the provider and the environment in which they practised – including the scientific knowledge and availability of drugs. Thus, for example, Högberg and Wall (1986) shows for Sweden a correlation between falling maternal mortality and increased deliveries by professional midwives between 1861 and 1894, but for deaths excluding puerperal sepsis since the “enabling environment” before 1880 did not include knowledge of asepsis. Loudon (1992a) provides many examples of higher historical rates of maternal mortality in Europe and the United States among institutional rather than home deliveries and among general practitioner rather than midwife deliveries, in periods before the use of asepsis and the availability of antibiotics and before abuse of anaesthesia and instrumental deliveries was addressed (see Table 4). The correlation between the pace and timing of the fall in maternal mortality with the professionalisation and promotion of midwifery care in different industrialised countries is a further indication of the importance of the ena-

bling environment for these skilled attendants (De Brouwere *et al.* 1998).

Turning to the analysis of time trends for more recent periods, Koblinsky and colleagues (1999) identify 4 organisational models for delivery care that they correlate with levels of maternal mortality. In all 4 scenarios, functioning essential obstetric care is assumed to be “available”. Their findings support the conclusions of other studies, namely that in populations where the majority of deliveries are at home with non-professional attendants, the level of maternal mortality appears not to be reducible to below 100 per 100,000 live births, even with BEOC and/or CEOC available. Of course in the sort of population in which such a model prevails, there may be other factors intervening to keep maternal mortality high, such as poor maternal health status and barrier to access to care, but this type of correlational analysis cannot untangle such influences. In a population in which all women deliver in CEOC facilities with a health professional, Koblinsky and colleagues also found that maternal mortality may remain above 100 per 100,000 live births. Although they say that iatrogenic factors are assumed not to operate in any of the 4 models considered, this may in fact be part of the explanation for the level of mortality where all deliveries are in CEOC institutions. Further research is needed to try to gauge the iatrogenic fraction. The two models which correlated with maternal mortality of less than 50 per 100,000 live births both involved professionals (mostly midwives) attending deliveries, in one case at home (model 2) and the other in BEOC facilities (model 3). Interestingly, Koblinsky *et al* (1999) note that all countries in which a model 2 prevailed in the past have now made the transition to model 3, for example Malaysia and Sri Lanka. However they also note that there is insufficient data available to determine which configuration of professional attendance is most cost-effective, and what the constraints are with respect to the enabling environment.

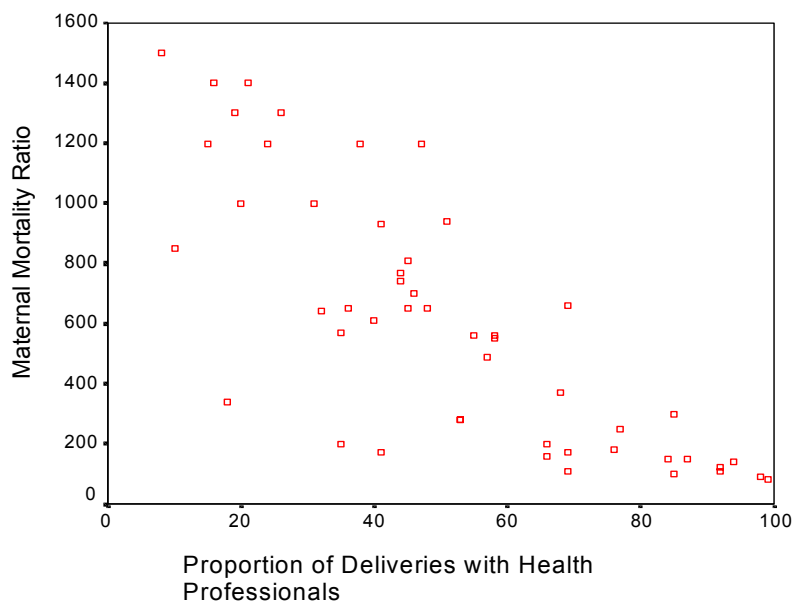
The contemporary epidemiological evidence for the link between maternal mortality and skilled attendance has perhaps been over-interpreted and the constraints of this form of correlational analysis been under-estimated (Graham and Bell 2000a). Figure 4 shows a graphical representation of this link - showing the regression of national estimates of the maternal mortality ratio for developing countries against national coverage statistics, mostly from DHS surveys, on the percentage of deliveries reported by women to have been attended by “doctors, nurses or midwives”. Depending on the countries included, the coefficients for this regression - and thus the strength of the relationship - vary, but its negative nature holds up - coun-

tries with high proportions of deliveries with these professionals tend to have low levels of maternal mortality. Nevertheless, it is important to note that the relationship is considerably weaker if the values for industrialised countries, which all cluster around very low maternal mortality and very high professional attendance, are omitted.

Although this type of exploratory analysis can be helpful in suggesting other relationships to examine, its simplicity also encourages over-interpretation – to infer that increasing the proportion of deliveries with health professionals will itself reduce maternal mortality. There are two inter-related issues here to consider – one to do with the indicators used, and the other the nature of the association between maternal mortality and deliveries with professionals. Whilst it is unlikely that inaccuracies in the dependent and independent variable can totally “explain” the observed pattern, it is important to acknowledge the crudity of the measures used. Maternal mortality ratios for many of the poorest developing countries are derived from modelling methods, which use the percentage of deliveries with health professionals (PDHP) to predict the level. By removing those countries with modelled estimates from the regression, a relationship remains but the explanatory power is not surprisingly reduced; for mortality data for 1990, the adjusted coefficient of variation falls from 65% to 51%. The PDHP has the benefit of being widely available from national surveys, but the extent to which women can and do report reliably on who attended their births has not been established.

Major uncertainty surrounds the effects of only recording the most qualified person, the definition of “attended” (e.g. the person who “caught the baby” or the person attending most of the time), and the confusion over who is a professional in some facility settings. The focus, for example, on recording attendance at delivery only for a woman’s live births, as in the Demographic and Health Surveys, means that stillbirths are omitted. Moreover, the crude PDHP can disguise many other important differentials between and within countries besides socio-economic status – between regions, urban and rural localities, institutional vs. home settings, private and public facilities, doctors and midwives/nurses, as well as maternal characteristics such as age, parity, education, and birth outcomes.

Figure 4. Proportion of deliveries with health professionals¹ and the maternal mortality ratio² for 50 developing countries, ~ 1990

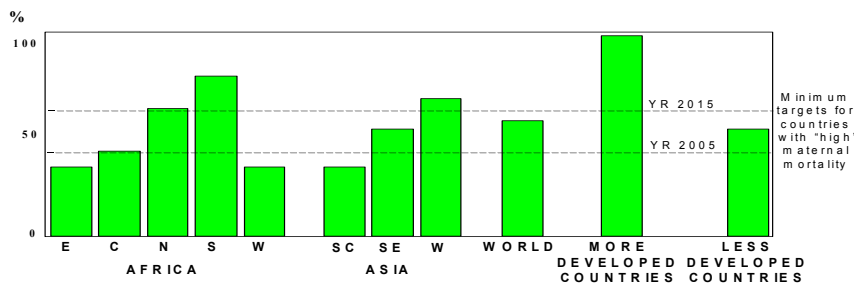


¹ Defined in coverage statistics as “doctors, nurses and midwives” (WHO 1997)

² Maternal deaths per 100,000 live births (WHO 1996)

At the recent five-year review of the programme of action for the International Conference on Population and Development (United Nations 1999), international development targets were set for this indicator, with those for countries with “high” levels of maternal mortality being 40% of deliveries with skilled attendants by 2005 and 60% by 2015. Figure 5 shows the levels of this indicator, as reflected in the proportion of deliveries with health professionals, for selected world regions in 1996, and highlights the targets. The selection of this so-called benchmark indicator was made owing partly to the acknowledged difficulty of measuring maternal mortality, partly the ready availability of data on PDHP, and partly the inferred causal link. Figure 5 itself challenges the link, since several world regions have already achieved or are close to achieving the targets and yet their estimated levels of maternal mortality remain high.

Figure 5. Deliveries with health professionals in 1996, for selected world regions



The crude relationship can be examined further with bi-variate and multivariate analysis, revealing some intriguing findings with important policy and programme implications. We have disaggregated the data for 50 developing countries according to whether the most qualified person present at delivery was a doctor or midwife, as reported by women. Although some countries with modelled estimates of maternal mortality are included, as mentioned earlier, their removal has little impact on this disaggregated analysis. As the proportion of deliveries attended by doctors increases, the level of maternal mortality appears to exponentially decrease (Figure 6). Looking at countries with less than 15% of deliveries with doctors, there is an enormous range from less than 200 maternal deaths per 100,000 live births to about 1500. Alternatively, looking at countries with maternal mortality ratios of less than 200, the proportion of doctors attending deliveries also varies hugely - from 15-90%. For deliveries with midwives, any pattern is less obvious (Figure 7).

From a programme perspective, one possible conclusion from this might be that countries should seek to increase access to doctors for deliveries rather than midwives. Another conclusion might be to dismiss the findings as an artefact - reflecting the intrinsic problems of correlational analysis, of confounding, and of the reliability of the data. But our multivariate analysis shows that an association remains between doctors and maternal mortality after controlling for various factors, including GNP, female literacy, antenatal care, and fertility.

Figure 6. Proportion of deliveries with doctors and the maternal mortality ratio for 50 developing countries, ~ 1990

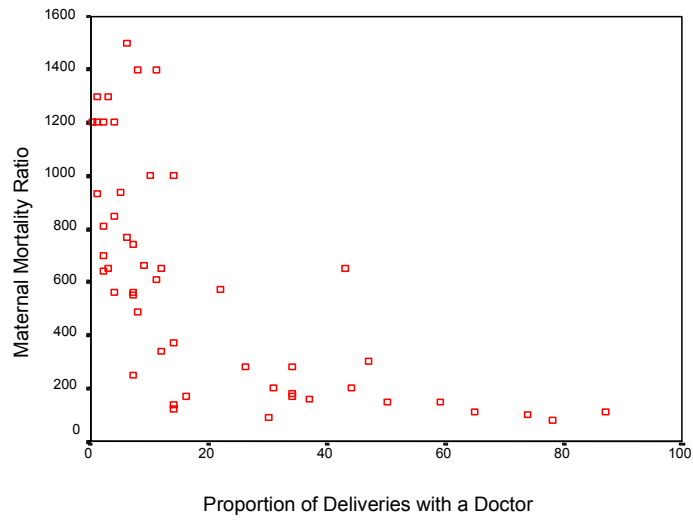
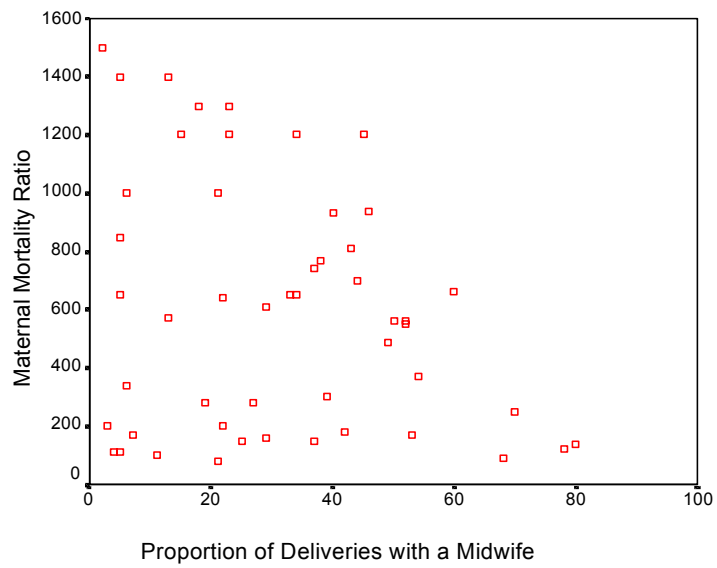


Figure 7. Proportion of deliveries with midwives and the maternal mortality ratio for 50 developing countries, ~ 1990



There is however a further interpretation of Figure 7. The lack of an obvious link between maternal mortality and the proportion of deliveries with midwives hints at the wide variability in the skills of those with this professional label as well as the constraints under which they practice, including inability to refer complicated cases. Merely having a bigger pool of delivery attendants will not work unless they are appropriately skilled, can refer to other professionals as the need arises and have access to an enabling environment. The crucial issue is that a health professional is not necessarily a skilled attendant, and a skilled attendant is not the same as skilled attendance which encompasses both the providers and the environment appropriate to normal as well as complicated cases.

Our analysis also suggests, however, that the mix ratio between medical and midwifery professionals is a powerful correlate of maternal mortality, thus emphasising the importance of partnerships between providers. Figure 8 plots the proportion of deliveries with midwives against those with doctors, and indicates the level of maternal mortality for each country represented. We have called this new indicator the “*Partnership Ratio*” (Graham & Bell 2000b). It is expressed as two mutually exclusive figures: the proportion of deliveries with a doctor and those with a midwife, such as *PR (10, 55)*, with the sum indicating the total proportion of deliveries with professional attendance. The *PR* can also be analysed for key differentials such as region, private/public sector, parity, or maternal education, and so reveal important inequities in access and uptake of delivery care. We acknowledge the need both to avoid overly simple interpretation of this measure and for further developmental work, including case studies of countries with different *PRs*. The *Partnership Ratio* does however have the strong advantages of being easily derived from existing data, so giving countries a tool to use now, and of providing insights on effective mix ratios of medical and midwifery staff.

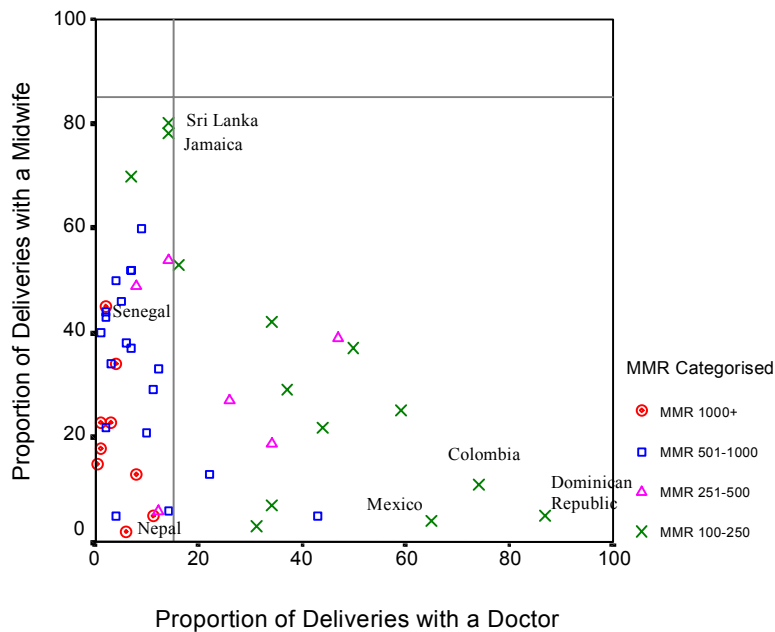
If the goal of 100% of deliveries with health professionals is accepted, along with the need for doctors to attend at least 15% of deliveries (this being the usual estimate of the proportion of cases with life-threatening complications), an “optimum” point can be plotted – at *PR (15, 85)*. The two countries which come closest to this point on Figure 8 are Sri Lanka and Jamaica – countries frequently cited as “success stories” in the reduction of maternal mortality. All countries shown in Figure 8 with very high levels of maternal mortality (>1000 deaths per 100,000 live births) have *Partnership Ratios* lower (for both proportions) than *PR (15, 50)*, and some of these – such as Nepal, have ratios as low as *PR (6, 2)*. It can also be seen that many devel-

oping countries with relatively low maternal mortality have more than a third of deliveries with doctors, and in the case of three Central American countries more than two-thirds. This is not however a realistic or affordable option for the majority of poor countries with high maternal mortality where the *Partnership Ratio* between midwives and doctors needs to be established on a cost minimisation basis. In these countries, some of which already have fairly high proportions of deliveries with midwives, such as Senegal, progress in reducing maternal mortality is more likely to lie in improving the enabling environment, and increasing access to doctors for those women needing emergency obstetric care. The next step in this form of analysis is to look in more detail at those countries which are outliers in terms of the *Partnership Ratio*, and to identify the obstacles and facilitators of their higher or lower than predicted levels of maternal mortality.

Although correlational analysis cannot provide the definitive answer to the question “can skilled attendance reduce maternal mortality”, it does suggest possible mechanisms when combined with our understanding of how skilled attendance may work at the individual level. The earlier diagrams on the *Partnership Ratio* seems to suggest a threshold effect such that ensuring all deliveries in a population take place with a health professional may not by itself be the most effective nor cost-effective route to lower maternal mortality in the immediate term. This argument does not necessarily extend however to maternal morbidity, since the estimates produced earlier (Table 2 and 3) perhaps suggest that the primary prevention role of skilled professionals may be very significant.

There are some populations in which more than a quarter of their deliveries occur without health professionals but the level of maternal mortality is below 250 per 100,000 live births, such as Peru, Tunisia, Egypt and Namibia. Conversely, there are other countries with nearly half of their deliveries with health professionals but maternal mortality remains high – above 500 per 100,000 live births, such as Malawi, Ghana, Bolivia, and Zambia. The key words here are access and quality. Thus those countries with lower than expected maternal mortality may have achieved this not by ensuring that all deliveries occur with skilled attendance but rather that those who need emergency care receive it. Conversely, those countries with higher than expected mortality may have health professionals without a functioning enabling environment and/or professionals who are not in fact skilled.

Figure 8. Proportion of deliveries with midwives and the proportion with doctors for 50 developing countries, ~ 1990



This is not to suggest that skilled attendance for all deliveries should not be a goal, but it does raise questions about the most effective and efficient intermediate steps to reaching it. Childbirth is undeniably a normal physiological process as well as the cause of some tragedies. Many women in poor developing countries will continue to deliver without skilled attendance for the foreseeable future. An impact on maternal mortality may however be possible with improved mechanisms for referral. Those settings in which skilled attendance is not negatively correlated with maternal mortality raise major questions about the quality of care, and bring us back to the question of the definitions. Skilled attendance implies competent attendants AND an enabling environment. The partnership between these attendants is crucial – and particularly between midwives and doctors, so that their different skills can be used appropriately to meet the different needs of women at the time of delivery. A lack of such partnership was historically an obstacle to progress in developed countries (Loudon 1992a) and elements of this competition indeed remain today. This lesson is highly relevant to those countries that continue to face the challenge of maternal mortality.

References

Abdulghani N (1993). Risk Factors for Maternal Mortality among Women using Hospitals in North Yemen. Doctoral dissertation. London School of Hygiene and Tropical Medicine.

AbouZahr C (1998a). Maternal mortality overview. *In: Murray CJL, Lopez, AD. Health Dimensions of Sex and Reproduction. Global Burden of Disease and Injury Series. Volume III.* Geneva: World Health Organization. pp.111-164.

AbouZahr C (1998b). Antepartum and postpartum haemorrhage. *In: Murray CJL, Lopez, AD. Health Dimensions of Sex and Reproduction. Global Burden of Disease and Injury Series. Volume III.* Geneva: World Health Organization. pp.165-190.

AbouZahr C (1998c). Prolonged and obstructed labour. *In: Murray CJL, Lopez, AD. Health Dimensions of Sex and Reproduction. Global Burden of Disease and Injury Series. Volume III.* Geneva: World Health Organization. pp.243-266.

AbouZahr C, Guidotti R (1998). Hypertensive disorders of pregnancy. *In: Murray CJL, Lopez, AD. Health Dimensions of Sex and Reproduction. Global Burden of Disease and Injury Series. Volume III.* Geneva: World Health Organization. pp.219-242.

AbouZahr C, Ahman E, Guidotti R (1998). Puerperal sepsis and other puerperal infections. *In: Murray CJL, Lopez, AD. Health Dimensions of Sex and Reproduction. Global Burden of Disease and Injury Series. Volume III.* Geneva: World Health Organization. pp.191-218.

AbouZahr C, Wardlaw T (2000). Maternal mortality at the end of the decade: what signs of progress. *Bulletin of the World Health Organization* (Forthcoming).

de Bernis L, Dumont A, Bouillin D, Gueye A, Dompnier JP, Bouvier-Colle MH. (2000). Maternal morbidity and mortality in two different population of Senegal: A prospective study. (MOMA survey). *British Journal of Obstetrics and Gynaecology* 107(1), 68-74.

De Brouwere V, Tonglet R, Van Lerberghe W (1998). Strategies for reducing maternal mortality in developing countries: what can we learn from the history of the industrialised West? *Tropical Medicine and International Health* 3(10),771-782.

Bobadilla JL, Reyes Frausto S, Karchmer S (1996). The magnitude and causes of maternal mortality in the Federal District (1988-1989). *Gaceta Médica de México* 132(1),5-18.

- Bouvier-Colle MH, Prual A, de Bernis L et al. (1997). *Maternal morbidity in western Africa: results of a population-based study in Abidjan, Bamako, Niamey, Nouakchott, Ouagadougou, Saint Louis and Kaolack*. Ministère français de la coopération. INSERM-U 149, Paris.
- Briggs A, Sculpher M, Buxton M (1994). Uncertainty in the economic evaluation of health care technologies: the role of sensitivity analysis. *Health Economics* 3,95-104.
- Egypt Ministry of Health (1994). *National Maternal Mortality Study: Findings and conclusions*. Cairo: Child Survival Project. Ministry of Health.
- Fauveau V, Stewart K, Khan SA, Chakraborty J (1991). Effect of mortality of community-based maternity care programme in rural Bangladesh. *Lancet* 338(8781),1183-1186.
- Graham W, Bell J (2000a). Monitoring and evaluating skilled attendance at delivery: trials and tribulations. *Bulletin of the World Health Organization* (Submitted).
- Graham W, Bell J (2000b). Maternal mortality and skilled attendance at delivery. *American Journal of Public Health* (Submitted).
- Gray JAM (1997). *Evidence-based Healthcare*. London: Churchill Livingstone.
- Högberg U, Wall S (1986). Secular trends in maternal mortality in Sweden from 1750 to 1980. *Bulletin of the World Health Organization* 64,79-84.
- International Confederation of Midwives (1999). Provisional essential competencies for basic midwifery practice. Draft document. ICM.
- Jowett M (2000). Cost-effective safe motherhood interventions in low-income countries: a review. Discussion paper 181. York: Centre for Health Economics. University of York.
- Kaunitz AM, Spense C, Danielson TS, RoCHAT RW, Grimes DA (1984). Perinatal and maternal mortality in a religious group avoiding obstetric care. *American Journal of Obstetrics and Gynaecology* 150(7),826-831.
- Koblinsky M, Campbell O, Heichelheim J. Organising delivery care: what works for safe motherhood? *Bulletin of the World Health Organization* 77(5),399-406.
- Koblinsky M (2000). The MotherCare Experience. Presentation at Technical Consultation "Ensure skilled attendance at delivery. Geneva: 25-27 April 2000. New York: SMIAG/FCL.
- Loudon I (1992a). *Death in Childbirth An international study of maternal care and maternal mortality 1800-1950*. Clarendon Press, Oxford..

- Loudon I (1992b). The transformation of maternal mortality. *British Medical Journal* 305,1557-1560.
- Porges RF (1985). The response of the New York Obstetrical Society to the report by the New York Academy of Medicine on maternal mortality, 1933-1934. *American Journal of Obstetrics and Gynaecology* 152,642-649.
- Maine D, Akalin MZ, Chakraborty, J, De Francisco A, Strong M (1996). Why did maternal mortality decline in Matlab? *Studies in Family Planning* 27(4),179-187.
- Ronsmans C, Vanneste AM, Chakraborty J, van Ginneken J (1997). Decline in maternal mortality in Matlab, Bangladesh: A cautionary tale. *Lancet* 350,1810-1814.
- Safe Motherhood Inter-Agency Group (2000a). Technical Consultation "Ensure skilled attendance at delivery. Geneva: 25-27 April 2000. New York: SMIAG/FCI.
- Safe Motherhood Inter-Agency Group (2000b). Skilled Attendance at Delivery: A Review of the Evidence (draft). New York: Family Care International.
- Starrs A (1997). *The Safe Motherhood Action Agenda: Priorities for the Next Decade*. New York: Inter-Agency Group for Safe Motherhood and Family Care International.
- United Kingdom HMSO. Department of Health (1998). *Why Mothers Die. Report on the Confidential Enquiries into Maternal Deaths in the United Kingdom 1994-1996*. London: HMSO.
- United Nations (1999) *Key actions for the further implementation of the Programme of Action for the International Conference on Population and Development*. New York: United Nations. Para 64.
- World Health Organization (1994). *Mother-Baby Package: Implementing safe motherhood in countries*. WHO/FHE/MSM/94.11. Geneva: WHO.
- World Health Organization (1996). *Revised 1990 Estimates of Maternal Mortality. A New Approach by WHO and UNICEF*. World Health Organization. WHO/FRH/MSM/96.11. Geneva: WHO.
- World Health Organization (1997). *Coverage of Maternity Care. A listing of available information*. 4th edition. WHO/RHT/MSM/96.28. Geneva: WHO.
- WHO/UNFPA/UNICEF/World Bank Statement (1999). *Reduction of maternal mortality: a joint statement*. Geneva: WHO.
- World Health Organization (1999). *Essential Care Practice Guidelines*. Draft chart booklets.. Geneva: WHO.
- Winikoff B, Sullivan M (1997). Assessing the role of family planning in reducing maternal mortality. *Studies in Family Planning* 18,128-143.

Health professionals for maternity services: Experiences on covering the population with quality maternity care

Marga Kowalewski¹ and Albrecht Jahn²

Summary

In many developing countries human resources to cover quality maternity care and emergency treatment are very unequally distributed. Due to historical development of medical services the main providers of surgical maternity care are still medical professionals. Most countries have only scarce resources on specialist and these tend, like other medical and high qualified paramedical personnel, to stay in the main cities of the countries. Thus rural areas rely mainly on staff who either are not well prepared, or not allowed by the countries legislation to provide major surgical interventions for obstetric problems. An actual lack of anesthetists adds to the low coverage on major obstetric interventions. The visible negative health impact urged many countries to experiment with alternative strategies to improve the coverage of the population with quality maternity care. Several Asian and African countries (e.g. Ethiopia, Malawi, South Africa, Indonesia) set on upgrading training for general practitioners in rural areas. Vocational training in surgical and obstetric skills was made obligatory in South Africa. Others have experience with training non-academic staff to provide a set of surgical and obstetric interventions or anesthesia (e.g. Tanzania, Burkina Faso, Malawi and Democratic Republic of Congo/Zaire). The training is either professional and last two years, or a on the job training in surgical skills. Both approaches have been evaluated successfully. The outcome of interventions does not differ significantly from care by specialists doctors. Legal constraints and hesitant recognition of upgraded general doctors or non-academic staff by professional organisations are slowing the process to increase the coverage of maternity care to the rural areas. Prerequisites to more equal access to quality maternity care and emergency treatment are clear policies which prioritise rural areas, and governments who can carry through an obligatory, timely limited, service of medical personnel in rural hospitals. An official

¹ MSc in community health and health management, Abteilung für Tropenhygiene und Öffentliches Gesundheitswesen, Im Neuenheimer Feld 324, 69120 Heidelberg, Germany.

² specialist in obstetrics and gynaecology, Abteilung für Tropenhygiene und öffentliches Gesundheitswesen, Im Neuenheimer Feld 324, 69120 Heidelberg, Germany. Email: Albrecht.jahn@urz.uni-heidelberg.de (correspondence should be addressed to this author).

acknowledgement of upgraded medical and non-academic staff in surgery, obstetrics and anaesthesia and the formulation of career-paths and incentives can bring quality maternity service nearer to the communities in many countries.

Historical development of obstetric care

Obstetric care has been in the hands of midwives in Europe until the end of the 19th century. With the development of obstetric surgical procedures the responsibility even for uncomplicated deliveries was shifted to medical doctors (Kutner 1994). From Sweden we have clear evidence that maternal mortality had already drastically declined with the introduction of trained midwives in the rural areas. Surgical delivery, the introduction of blood replacement, antibiotics and intensive care for mothers and new-borns continued the downward trend in maternal and perinatal mortality (De Brouwere *et al.* 1998). In many developing countries modern medicine was first introduced as curative care for colonial settlements and armed forces. Eventually curative medicine was also offered to the native population. Therefore obstetric care relied on medical doctors and well-trained European nurses/midwives who cared mainly for obstetric complications. With the introduction of outreach clinics and preventive care (vaccination, well child clinics, antenatal care) more and more local nurses were trained. The training of medical doctors was limited to very few locals, who had to study abroad. At present most countries have medical personnel either trained in their own country or abroad (within Africa many of them were trained in the States of the former Soviet Union and Cuba). Many of these become specialists and settle in the main towns within their countries. Until the late 20th century the rural areas of most developing countries were largely underserved with medical doctors. To cover the population with preventive and curative services the countries developed different approaches.

Present legal situation of health personnel

PERFORMANCE OF MAJOR OBSTETRIC INTERVENTIONS RESTRICTED TO SPECIALISTS

Some countries allow only specialists to perform surgical obstetric procedures (e.g. China, Indonesia, Pakistan, Madagascar and Morocco). The specialist coverage in each country is different. In Morocco the aim is to post at least one surgeon, one obstetrician and one anaesthetist at each provincial

hospital. Still remote rural areas are not covered. Patients needing caesarean section are therefore referred to regional hospitals.

In Madagascar specialists are only situated in regional hospitals which are usually the only obstetric referral centres. Given the size of the country and the poor infrastructure, it can take many hours to several days to reach one of them, although there are many lower level facilities, staffed with non-specialist medical doctors but not providing obstetric care (centre medical, hospital simple). This situation produces enormous negative health impact (30% perinatal mortality in the provincial hospitals)(Beche & Jahn 1992)(Beche T & Jahn A 1992). In China only 2.7% of senior medical professionals are working in country hospitals (Xiang *et al.* 1996). The health policy emphasises preventive care. The one child policy encourages people to be sensible about antenatal care, this is believed to rule out most emergency situations. In addition pregnant women are expected to take utmost care and to go early to a hospital with specialist care. In reality large rural areas are under served with specialists. In Pakistan flourishing private clinics take advantage of the situation. As they are mainly found in the big cities, the rural areas go virtually unserved. In Indonesia the present specialist care is being gradually replaced by general doctors with vocational training in surgery/obstetrics. The policy makers have reacted in this way to the current situation (Thouw 1992).

PERFORMANCE OF MAJOR OBSTETRIC PROCEDURES BY ALL DOCTORS

Countries like Bangladesh or the Latin American countries (Chile, Peru, Ecuador) allow all medical doctors to perform caesarean sections. In Bangladesh doctors acting as surgeons must upgrading their training, in Latin America a certificate is not necessary (Shaheen 2000). Nepal has a cadre of medical doctors that follows a two years training for general practitioners which includes surgery and obstetrics. They work in rural hospitals and provide emergency obstetric care (Erpelding pers. comm.). In Pakistan the licence to practice medicine (MBBS) implies that you are able to perform surgery including caesarean section and you are allowed to do so. But in governmental hospitals officially caesarean sections are only performed by specialists in obstetrics and gynaecology (Thaver 2000).

PERFORMANCE OF MAJOR OBSTETRIC PROCEDURES BY DOCTORS AND SPECIFICALLY TRAINED NON-ACADEMICS

Some countries chose entirely a different approach to covering the popula-

tion with emergency obstetric care by training non-academic personnel. Tanzania for example has created the assistant medical officers (AMO), who were to work at the district hospital level (Mbaruku pers. comm.). An upgrading system allows a qualified rural medical aid (working in dispensaries) to go for medical assistant training (three years theoretical and practical training). Qualified medical assistants can follow a two year up-grading course to become an assistant medical officer. AMOs perform surgery and obstetric interventions. With the AMOs the Tanzanian health system has been able to bring qualified emergency obstetric care nearer to the population.

In Burkina Faso registered nurses and midwives must work at least two years in the rural area in a dispensary or health centre. After at least 5 years practical work, they can take upgrading courses of 2 years in surgery, anaesthesia, radiology, laboratory etc. Surgical assistants are posted to district and regional hospital. Their main task is minor surgery but they also assist medical doctors in major interventions. They are also trained to perform emergency surgery (mainly caesarean sections and strangulated hernias) and assure service in the absence of medical doctors.

The information in Table 1 is based on personal communications by members of Afronets, former and current students of the Master course Community Health and Health Management, Heidelberg, and collaborating researchers and institutions, who were kind enough to reply to our short questionnaire. Their collaboration is very much appreciated.

Table 1. Provider of caesarean sections (who is legally allowed and who is doing it in common practice)

Country	Legal situation	Common practice	Comments
Bangladesh	Specialists Medical doctors with additional training in surgery	Medical doctors without additional training	Medical doctors without additional training act illegally
Burkina Faso	Specialists Medical doctors Surgical assistants	General doctors with one year training in surgery Surgical assistants	Surgical assistants are allowed to work independently if no doctor is posted or absent
Chile	Specialist Medical doctors	Medical doctors	"Any doctors who feels able to do C/S is allowed to do so"
China	Specialists Medical doctors	Medical doctors General practitioners	
Congo (Zaire)	Specialists Medical doctors	Nurses trained in surgery	Allowed but not officially acknowledged
Ecuador	Specialist Medical doctors	Medical doctors	"Any doctors who feels able to do C/S is allowed to do so"
Ethiopia	Specialists Medical doctors	General practitioners with 6 month course in surgery/obstetrics	GP not legally acknowledged
Kenya	Specialist Medical doctors with additional training in surgery	Medical doctors	
Malawi	Specialist Medical doctors Surgical assistants	Surgical assistants	Anaesthetist assistants assure functioning theatres
Mozambique	Specialists Medical doctors Surgical assistants	Surgical assistants	
Nigeria	Specialists Medical doctors	General practitioners	
Pakistan	Specialists Medical doctors	Specialists	In governmental hospitals only specialists do C/S
Peru	Specialist Medical doctors	Medical doctors	"Any doctors who feels able to do C/S is allowed to do so"
South Africa	Specialists Medical doctors	General practitioners	single handled surgery plus anaesthesia is illegal vocational training for GPs becomes obligatory
Tanzania	Specialists Medical doctors Assistant medical officers	Assistant medical officers	

Distribution problems of health professionals

Important imbalances in human resources are found in the distribution of health personnel. Many developing countries have insufficient primary care providers and too many specialists. Even these are concentrated in urban areas. The rural/urban disparity in qualified personnel trained in obstetrics is further aggravated by migration of medical and paramedical personnel (nurses, midwives) to other countries. South Africa draws many medical people from other southern African countries, as do the Arab countries from East and Central Africa. In the 90s more Sudanese doctors worked in Arabia than in Sudan. This brain drain is damaging health care in their countries of origin and also the home economy. The high input to training of medical personnel is also lost to the country. Career development paths and in-service training are needed to retain staff. For improving the balance, non-physician primary care providers have many advantages: their training cost less (Myanmar, Pakistan and Sri Lanka indicate that 2.5 to 3 nurses can be trained for the cost of training one physician) they receive lower salaries, they are easier to attract to rural areas, and they communicate more efficiently with the patients (World Bank 1993).

In many governmental health systems 60% (SA) to 90% (Senegal, Nigeria) of medical doctors work in the main cities (Solanke 1997). Specialists in surgery or obstetrics and gynaecology are almost never found outside the national hospitals other than in private clinics. In China only 3% of senior medical doctors work in country hospitals (Xiang *et al.* 1996). In the whole country of Malawi only one specialist in anesthesia is working (Adeloye 1993). In Pakistan we find 3 times more registered doctors than registered midwives (Government of Pakistan 1997). Even with 7% of unemployed medical doctors and 11% working outside the medical profession in Mexico, the rural areas go seriously under-served with medical doctors. They are strictly not willing to leave the major cities (World Bank 1993). In Indonesia, Ethiopia, South Africa and even Australia rural hospitals (first referral level) are staffed by general practitioners or midwives, who are either not trained to perform emergency treatment in obstetrics, and are therefore reluctant to intervene, or who are not allowed to do so (Craig & Nichols 1993, Loufti *et al.* 1995, Reid *et al.* 1998, Thouw 1992).

In Tanzania, as in many other countries, the rural areas are served by general practitioners and assistant medical officers. Here most of the population manages to access first line health services. E.g. one dispensary covers on

average 5,000 population and 80% of them live within a 5 km radius (Tanzania / Bureau of Statistics 1996). Obstetric care is provided by a network of regional and district hospitals, with the non-academic assistant medical officers providing the backbone. Still rural areas are underserved as the effective catchment area drops sharply beyond a distance of 10 km (Jahn *et al.* 1998).

MAL-DISTRIBUTION OF FEMALE HEALTH WORKERS

Emergency obstetric care is a male dominated field. Most surgeons the world over are men, only in the states of the former Soviet Union are female obstetricians the rule. At health centre level and dispensaries delivery care is mostly provided by female staff. In China the demand for female rural doctors has led to increased recruitment, training and deployment of female doctors. Since 1997 there is at least one female doctor in every village (Koblinsky *et al.* 1999). In Nepal a cadre of mother child aids was formed to staff dispensaries and health centres. Their tasks include assisting in institutional and home delivery and mobile antenatal clinics. Due to strong caste rules the cadre does not work very efficiently (higher caste can not deliver lower caste)(Dar Iang 1999). In Pakistan “lady health workers” provide antenatal care through home visits. For women living in strict Purdah the visit to the dispensary or hospital is not acceptable (Jahn 1995). In Burkina Faso male midwives (maieuticiens) are trained and work in health centres and hospitals. Training men as midwives has been necessary to fill the gap left by female midwives leaving the rural areas to join their husbands in the major cities (there is a legal right of rejoining families for civil servants) (Hien, pers. comm.). For women living in the big cities female trained assistance at delivery is the rule, for rural settings it is by chance.

Strategies to overcome unequal distribution of professionals

Several approaches have been tested and implemented to cover the population with emergency obstetric care. A very interesting example is the Obstetric flying squad in peninsula Malaysia. For 30 years emergencies in obstetrics have been attended to by this service. The service is available at all hours and staffed with specialists in obstetrics. Nevertheless, with the development of telecommunication, road access and rural hospitals an ambulance service proved to be faster and cheaper for most of the communities. A prerequisite for ambulance service was a training of ambulance drivers in first aid. Only very isolated communities could still use the flying squad (Monga &

Achanna 1999). Outreach services and home deliveries by trained professionals are not very frequent in Africa and Asia. One example is Malaysia where between the mid-1970s and mid-1980s most births occurred at home assisted by a professional midwife, whereas the role of traditional midwives has shifted to a family supportive role. Home providers are well trained and backed up by a strong referral network (see above). Today even women at low risk predominantly give birth at hospitals. The same trend is visible in Sri Lanka (Koblinsky *et al.* 1999). In China the approach was to shorten medical training (3 instead of 5 years) and thus increase the output of medical doctors (World Bank 1993). Other countries including Ethiopia, Indonesia, South Africa, Malawi and even developed countries like Australia, New Zealand, and Canada established training in emergency treatment skills for general practitioners of rural hospitals and family doctors (Adeloye 1993, Craig & Nichols 1993, Krikke & Bell 1989, Loufti *et al.* 1995, Reid *et al.* 1998, Thouw 1992). In Tanzania, Mozambique, Burkina Faso and DRC a paramedical cadre was trained in surgical and obstetric emergency treatment (da Luz & Bergström 1992, Duale 1992, Pereira *et al.* 1996).

DELEGATION OF TASKS

Primary care providers include physicians, nurses, nurse practitioners, and midwives (World Bank 1993). In 1992 the FIGO (International Association of Obstetricians and Gynaecologists) recommended a delegation of functions to various levels of personnel. Currently, in developing countries this delegation of functions occurs in an atmosphere of rigid traditions in both teaching and practice inherited from outdated Western medicine. This delegation is frequently inappropriate for the diverse local situations. The situation is further complicated by different professional groups attempting to protect their turf of clinical functions, despite the clearest evidence that they themselves are unable or reluctant to deliver these services where they are most needed. On the other hand, there are honestly held perceptions that the delegation of some functions will increase morbidity and mortality (Rooth & Kessel 1992).

The argument about delegation and transfer of skills is several centuries old. Defining professional boundaries and the fear of losing professional control has focussed discussions on how to preserve professional status and independence instead of how interdependency of various cadres of health professionals can work. But several studies show that delegation of tasks can work without losing quality of care. In Great Britain nurse practitioners pro-

vide outpatient-care, hospital nurses replace interns in surgery, in the US nurses have been trained in special diagnostic procedures, provide intensive care at neonatal units and non-medically qualified assistants work in cardiac surgery. These examples have been evaluated with no significant difference found to care provided by medical professionals (Hopkins *et al.* 1995). In defining the staff, equipment and responsibilities of the district hospital as first referral level facility, it should be borne in mind that in reality it is often the last referral level too (General Assembly at the XIII World Congress of Gynecology and Obstetrics 1992). Hardee and Yount (Hardee 2000) see the possible advantages of delegation of activities from higher level to lower level staff in overcoming shortage of trained workers, freeing physicians from routine tasks, conserving specialist's time for emergencies, avoiding long delays in care caused by a centralised system, and promoting worker satisfaction.

Different models of training

TRAINING OF NON-ACADEMIC STAFF

Training differs in time and content according to the envisaged tasks of the newly qualified staff. The most complex training is offered in health systems where non-academic staff have been integrated at first and second referral levels already for a longer time, and where the political aim is to offer more and better maternity and surgical services nearer to the communities. In these countries, the non-academic "doctors" are well established with an officially endorsed career path.

Good examples of this are Tanzania and Burkina Faso. In both countries the curricula of assistant medical officers or surgical assistants include theoretical knowledge and practical skills in general surgery and obstetrics/gynaecology focussing on the most frequent causes for emergency interventions. The courses last for 2 years. A precondition for admission to the course in Burkina is registration as a certified nurse or midwife with at least 5 years of practical experience. In Tanzania the course was designed for upgrading medical assistants. In both countries the certificate/licence is officially acknowledged and remuneration higher for such posts (Mbaruku pers. comm., Traoré pers. comm.).

In some health systems paramedical staff are trained to fill the gap left by a lack of physicians without a clear vision for a permanent solution. These courses are often very short. In Malawi medical assistant training lasts one year, the training of surgical technicians in Mozambique lasts 6 months

(Adeloye 1993, da Luz Vaz & Bergström 1992). Common to all these courses is a focus on practical skills in general surgery and obstetric / gynaecological surgery. The only way to learn surgery is to do it. Acquiring practice in case management and learning indications for surgical interventions falls short in all these courses. Reconsideration of curricula are therefore envisaged. Common also to these courses is the lack of official acknowledgement by the medical societies of the concerned countries, and no financial or other incentives for the participants in their future posts.

Since the 1950s selected nurses in Congolese (former Zaire) hospitals received practical, on the job, training to conduct caesarean sections. Initiated by a specialist doctor, these nurses attend more than 80% of all emergency cases in obstetrics. In the 1980s their training was extended to cover also gynaecological and general surgical cases. The nurses are carefully chosen according to their personal experience and are specifically trained on the techniques of a limited set of surgical interventions (Rosenfield 1992, Duale 1992).

In Malawi and Burkina Faso assistant anaesthetists are trained in the same manner as surgical paramedical personnel. Both countries have in common a crucial lack of medical professionals in anaesthesia. Thus the newly qualified cadre does not only serve in rural areas which was the first intention, but covers also regional and even national hospitals (Traoré pers.comm.)(Adeloye 1993). The coverage of rural South Africa with anaesthetist service is as difficult as in the above countries. Until now more than half of the emergency surgical interventions in rural hospitals have been carried out single handed by a general practitioner acting as surgeon and anaesthetist at the same time. Not only is this practice dangerous, it is also not legally covered. Therefore the training of medical assistants in anaesthesia is envisaged (Reid *et al.* 1998).

DISTANCE EDUCATION

Distance education is another approach of training health workers in rural areas. Distance learning started in Tanzania in 1981. Since then more than 3000 learners participated in the programme. Several modules for learning have been developed among these are: management of labour, obstetric emergencies, medical emergencies etc. Upon completion of the module units a certificate is provided. This method is well suited for maternal health teams: first because the instructions occurs in the work place, with the learn-

ing materials readily accessible; second, it provides a stimulus for isolated workers and thereby promotes morale and effectiveness. A serious set back is the lack of supervised practical experience (Burke & Kisimbo 1997, Parry 1992).

TRAINING OF MEDICAL PROFESSIONALS

Indonesia, Ethiopia and South Africa and even Australia identified general practitioners at rural hospitals and health centres as target group for training in surgical/obstetrical skills. They are often the only available and accessible source of care to the community. But the training in medical school does not provide the necessary skills for a rural doctor. The possibility that a rural GP can refer emergency cases is also limited. Indonesia is considering a training in life-saving skills (manual removal of placenta, uterine curettage etc) for general practitioners of rural health centres and hospitals. South Africa based their decision to implement obligatory vocational training in primary surgery for general doctors on their evaluation of common practice in rural hospitals. They found doctors undertaking surgical interventions to save mothers lives depended more on personal courage than on acquired skills. Ethiopia has already initial experiences with a similar 6 month training course for rural GPs.

Even Australia, a country with vast distances and problems to cover the rural population with health care, pursues vocational training modules for family practitioner in various topics including emergency surgery, emergency obstetrics, paediatrics, cardiac emergencies etc (Loufti *et al.* 1995, Thow 1992, Reid *et al.* 1998, Craig & Nichols 1993).

Very important to all short courses is the regular supervision by specialists after their training is finished. This is the most sensible and most difficult requirement to satisfy. The Ethiopian experience of the first course showed that difficulties were encountered in involving the necessary Ethiopian surgical specialists, as rural health services were not felt to be a priority for the university department of surgery (Loufti *et al.* 1995).

To create more job satisfaction new approaches to training of health staff are tested. In Nepal a recent programme of the Safe Motherhood Project used a needs assessment with competency checklists to model the training to the specific individual requirements (Koblinsky *et al.* 1999). World Bank, UNICEF and UNAIDS advocate this kind of training programmes. Because of little experience evaluations are not available. But as long as training is driven by supply-side interests and capacities of institutions the needs of the

trainees are rarely taken as basis for planning new programmes (Daly *et al.* 1994, UNICEF 2000, Walker 1999).

Quality of obstetric care by medical and non-academic staff

A very large cohort study in Canada compared the maternal and foetal outcome for family practitioners and specialist doctors in obstetrics. A significant difference was found in the proportion of primigravid women with spontaneous vaginal delivery, which was higher for family doctors and oxytocin induced labour which was higher in the specialist group. However the results showed no significant difference in maternal and foetal health outcomes (Krikke & Bell 1989).

In Ethiopia a group of general practitioners who underwent surgical training produced high quality results despite their patients being generally in very poor condition. The paramedical personnel in Mozambique was carefully followed and their results evaluated as was the work of the nurse surgeons in DRC (ex-Zaire). All studies show the quality of their work to be satisfactory and in large comparable to specialist care given the same conditions and patient choice (da Luz Vaz & Bergström 1992, Duale 1992, Loufti *et al.* 1995, Pereira *et al.* 1996, Sohler *et al.* 1999).

The costs of training for obstetric emergency care

The costs of training is generally difficult to assess. From Myanmar, Pakistan and Sri Lanka we know that that 2.5 to 3 nurses can be trained for the costs of training one physician (World Bank 1993). In Bangladesh the total costs of the training of one doctor is around 2,500 US\$ and the total cost of training one nurse is around 300 US\$ (Shaheen pers. comm.). In Tanzania the 2 years training for an assistant medical officer is estimated at 1,000 US\$ per person (Mbaruku pers. comm.). In addition the trainees receive their monthly salary. The newly installed 6 months training course for general practitioners in Ethiopia costs 2,000 US\$ per person not counting the salary for two expatriate obstetricians (teaching and supervision). The highest proportion of cost was due to per diems paid to course participants (Loufti *et al.* 1995).

The follow-up costs must not be neglected. Supervision of newly acquired skills is absolutely necessary. For example replacing senior house officers in neonatal care by specially trained nurses in Bristol, UK, showed a complex balance sheet. The savings for one group were offset by the higher

degree of supervision required in the other (Hopkins *et al.* 1995).

Summary of present experience

The unequal distribution of trained medical personnel for obstetric interventions has several reasons. One of the main factors is the influence of politics. Often the political will to staff rural hospitals with qualified medical personnel is not seriously formulated, or the political power to exert such policy is weak. By the example of Norway we can see that a strong government can insist on staffing rural posts. Beneficiaries of state bursaries either go to the Northern provinces or they must reimburse the received money. In Burkina Faso exemptions to the staffing regulations undermine the system. Female staff can apply to be posted near to their husbands (if they are governmental employees too). The law on protection of the family guarantees the relocation. By this practice almost all registered midwives are posted in the two main cities. In other countries e.g. Tanzania influential individuals just do not comply with posting to rural areas without fearing any retribution.

Another reason for unequal distribution of health workers is a shortage in absolute numbers of qualified medical personnel. The debate has been going for more than twenty years on whether training of more medical personnel or non-academic staff will be the solution. In between many countries have experimented with different approaches to cover the under-served rural areas with adequate obstetric care. The results are encouraging. The experiences show that in the absence or scarcity of physicians at first referral level, non-physician teams can be trained to undertake effectively all functions attributed to that level, including emergency operative procedures (General Assembly at the XIII World Congress of Gynecology and Obstetrics 1992).

The World Bank encourages the employment of paramedical staff for several reason, not the least being their training is cheaper and their salaries lower. They are also easier to attract to rural areas, and generally communicate more efficiently with patients (World Bank 1993). Still the recognition of non-academic staff by professional organisations and governmental bodies is missing in many parts of the world.

Proposal for more equal distribution of qualified obstetric care

The different situations of the different countries point to individual and not an uniform strategy. Countries with a high absolute number of medical doctors have different problems assuring maternity care to rural areas than

countries where personnel is scarce. Scarcity of personnel can also be due to the small training capacity of medical schools, economic constraints, or to migration of health personnel to greener pastures abroad.

Considering the evidence described above, we suggest the following scenarios:

1. Countries with enough capacity of medical personnel concentrated in the main cities.

The clear political will should be formulated, that the coverage of the rural areas with quality maternity care is a priority. It should be obligatory for all health workers to work for a period of at least two years in rural areas, before being allowed to settle in the bigger cities or private practice. We have evidence from developed and developing countries where this is functional (e.g. Norway, holders of state bursaries must work for 2 years in the northern provinces, Burkina Faso, all medical and paramedical staff must work for 2 years in the districts).

2. Countries with few qualified health workers due to emigration.

The most important measure is to make working in the country more attractive than working abroad. There are many possibilities apart from financial incentives. Faster advancement in the hierarchy of health services, higher salary grades, public acknowledgement of work, upgrading of training and preferential admission to courses are some examples.

3. Countries with few qualified personnel due to limited training capacities or economic constraints.

Upgrading training for existent staff is the first possibility. As we can see from the experience in Ethiopia, South Africa and others, whole groups of personnel are working without enough background training and practical skills. They are willing and able to learn surgical skills and perform well. Delegation of tasks to other cadres of health personnel is another possibility. On-the-job training of nurses in DRC proved to be very successful and sustainable. The creation of a new cadre is the solution for countries where the official policy supports training non-academic personnel and allows them to perform specific tasks independently (Table 2). Tanzania and Burkina Faso have here advanced experiences and others can learn from their experiences.

Table 2. Suggestions for a better coverage of emergency obstetrics

Main actors for emergency obstetric care	Better coverage of emergency obstetrics
Referral level (dispensaries, health centres)	I. Referral level (dispensaries, health centres)
nurses midwives auxiliary staff	lifesaving skills for nurses and midwives; e.g. manual evacuation of the uterus, bimanual compression of the uterus, repair of lacerations and episiotomies, perfusions, oxytocin post-partum
Referral level (district hospital)	II. Referral level (district hospital)
general practitioner nurses midwives	<p>a) training of general practitioners in surgical procedures for frequent emergency events (caesarean section, strangulated hernias) e.g. Ethiopia, Australia</p> <p>b) training of non-academic cadre in surgical procedures and anaesthesia (e.g. AMO in Tanzania, nurse-surgeon and nurse-anaesthetist in Burkina)</p> <p>c) up-grading training for nurses and midwives in surgical procedures and anaesthesia (e.g. on the job training of surgical nurses in DRC, assistant medical anaesthetist in Malawi, surgical technicians in Mozambique)</p>
Referral level (regional and national hospital)	III. Referral level (regional and national hospital)
specialist in obstetrics and gynaecology senior medical doctor general practitioner	integration of specialists and senior medical staff in practical training and supervision of 2. referral level staff.

References

- Adeloye A (1993). "Surgical services and training in the context of national health care policy: the Malawi experience", *Journal of Tropical Medicine and Hygiene* **96**, 215-221.
- Beche T & Jahn A (1992). *Appraisal of the state of Mother and Child Health Care in Madagascar*, GTZ, Mahajanga.
- Burke M & Kisimbo D "Health in Transition: Opportunities and Challenges", World Federation of Public Health Associations, ed., Trade Service Publication, 102-103.
- Craig M & Nichols A (1993). "Training curricula in surgery, anaesthesia and obstetrics for rural GPs", *Australian Family Physician* **22**(7),1218-1219.
- da Luz Vaz M & Bergström S (1992). "Mozambique - delegation of responsibility in the area of maternal care", *International Journal of Gynecology & Obstetrics* **38**(Supplement),37-39.
- Daly P, Azefor M, & Nasah B (1994). *Safe Motherhood in Francophone Africa: Some Improvements But Not Enough*, World Bank, Washington.
- Dar lang M (1999). "Assessment of antenatal and obstetric services in a rural district of Nepal" In: *Medizin in Entwicklungsländern*, ed: H.J. Diesfeld, vol 45, Peter Lang Verlag, Frankfurt a.M.
- De Brouwere V, Tonglet R & Van Lerberghe W (1998). "Strategies for reducing maternal mortality in developing countries: what can we learn from the history of the industrialised West?", *Tropical Medicine and International Health* **3**(10),771-782.
- Duale S (1992). "Delegation of responsibility in maternity care in Karawa Rural Health Zone, Zaire", *International Journal of Gynecology & Obstetrics* **38**(Supplement), 33-35.
- Erpelding A (2000). Nepal, personal communication.
- General Assembly at the XIII World Congress of Gynecology and Obstetrics 1992. "Recommendations", *International Journal of Gynecology & Obstetrics* **38**(Supplement),79-80.
- Government of Pakistan (1997). *Statistical Supplement - Economic Survey*, Government of Pakistan, Islamabad.
- Hien S (1992). Burkina Faso, personal communication.

- Hardee K, Yount K (2000). *From Rhetoric to Reality: Delivering Reproductive Health Promises through Integrated Services*, UNAIDS.
- Hopkins A, Solomon J & Abelson J (1995). "Shifting boundaries in professional care", *Journal of the Royal Society of Medicine* **89**, 364-371.
- Jahn A and Aslam A (1995). "Fathers' Perception of Child Health: A case study in a squatter Settlement of Karachi, Pakistan". *Health Transition Review* 191-206.
- Jahn A, Kowalewski M & Kimatta SS (1998). "Obstetric care in Southern Tanzania: Does it reach those in need?", *Tropical Medicine and International Health* **3**(11), 926-932.
- Koblinsky M, Campbell O & Heichelheim J (1999). "Organizing delivery care: what works for safe motherhood", *Bulletin of the World Health Organization* **77**(5), 399-406.
- Krikke E & Bell N (1989). "Relation of family physician or specialist care to obstetric interventions and outcomes in patients at low risk: a western Canadian cohort study", *Canadian Medical Association Journal* **140**,637-643.
- Kuntner L (1994). "Die Medikalisierung der Geburtshilfe. Ein Rückblick auf die Entwicklung der Geburtshilfe in der Schweiz". Conference Proceedings, Obstetrics under simple conditions, Heidelberg
- Loutfi A, McLean A & Pickering J (1995). "Training general practitioners in surgical and obstetrical emergencies in Ethiopia", *Tropical Doctor* **25**(Supplement 1), 22-26.
- Mbaruku G (2000). Tanzania, personal communication
- Monga D & Achanna S (1999). "Is there a role for the obstetric flying squad in Peninsula Malaysia", *Singapore Medical Journal* **40**(2),78-80.
- Parry E (1992). "Appropriate training for maternal health and attributes of the trainer", *International Journal of Gynecology & Obstetrics*. **38**(Supplement),49-54.
- Pereira C, Bugalho A, Bergström S, Vaz F & Cotira M (1996). "A comparative study of caesarean deliveries by assistant medical officers and obstetricians in Mozambique", *British Journal of Obstetrics and Gynaecology* **103**,508-512.
- Reid S, Chabikuli N, Jaques P & Fehrsen G (1998). "The procedural skills of rural hospital doctors", *South African Medical Journal* **89**(7),769-774.
- Rooth G & Kessel E (1992). "Foreword", *International Journal of Gynecology & Obstetrics* **38**(Supplement),1-2.
- Rosenfield A (1992). "Maternal Mortality: community-based interventions", *International Journal of Gynecology & Obstetrics*. **38**(Supplement),17-22.
- Shaheen R (2000). Bangladesh, personal communication

Sohier N, Frejacques L & Gagnayre R (1999). "Design and implementation of a training programme for general practitioners in emergency surgery and obstetrics in precarious situations in Ethiopia", *Annals of the Royal College of Surgery England* 81(6),367-375.

Solanke T (1997). "Training of medical practitioners in Nigeria (west Africa) for surgery in the rural areas", *South African Journal of Surgery* 35(3),139-141.

Tanzania/Bureau of Statistics (1996), *Demographic and health survey 1996*, Bureau of Statistics, Dar es Salaam.

Thouw J (1992). "Delegation of obstetric care in Indonesia", *International Journal of Gynecology & Obstetrics* 38(Supplement),45-47.

Traoré C (2000). Burkina Faso, personal communication

UNICEF (2000). *Joint Actions to Reduce Maternal Mortality In Mozambique: Case Study, 1998-99*, UNICEF.

Walker G (1999). "Implementation challenges of reproductive health, including family planning and sexual health: Issues concerning the integration of reproductive health components", United Nations Population Programme.

World Bank (1993). *World Development Report 1993 - Investing in Health*, Oxford University Press, New York.

Xiang X, Wanf L & Xu L (1996). "Obstetric quality investigation on urban and rural area in China", *Chung Hua Fu Chan Ko Tsa Chih* 31(3),138-141.

Maternal mortality and unsafe abortion: a heavy burden for developing countries

Patrick Fernand Thonneau³

Summary

More than ten years after the launch of the Safe Motherhood Initiative in 1987, abortion is certainly the 'poor relation' in the debate concerning ways to reduce the number of deaths from maternity-related causes, even though abortion complications account for about 15% of all maternal deaths, and up to 30% in some countries.

Worldwide, 46 million pregnancies (20% to 25% of all pregnancies) each year end in abortion, 36 million of these abortions occur in developing countries and 10 million in developed countries. The WHO estimates that, worldwide, almost 20 million unsafe abortions take place each year, with 95% of these (19 million) performed in developing countries. The risk of death from unsafe abortion is about 1 in 150 procedures in Africa, and 1 in 150,000 in the USA and Europe. The number of maternal deaths is estimated to be about 80,000; this accounts for about 13% of all maternal deaths in the world, one in eight pregnancy-related deaths.

In this review, we then analyze the several major concerns accounting for abortion being such a huge maternal mortality risk factor in developing countries: abortion laws and regulations, abortion techniques, unplanned pregnancy and family planning. In conclusion, the gap between between developing and developed countries in the risk of death from unsafe abortion have never been so high : 1/150 000 in developing countries versus 1/150 in developed countries. According to that enormous disparity, the international community and organizations from within the United Nations system must play a key role encouraging governments to modify their abortion legislation' and to improve their health system to take more account of women's health rights.

³ Scientific Director, WHO Collaborating Center in Human Reproduction, Human Fertility Research Group/INSERM - Paul Sabatier University, Service d'Urologie-Andrologie, Hôpital La Grave, Place Lange, 31052 Toulouse cedex, France. Email: thonneau.p@chu-toulouse.fr

Introduction

Since the launch of the Safe Motherhood Initiative in 1987 at an international conference in Nairobi, numerous meetings, workshops and programs have been organized by international, governmental and non-governmental agencies, to reduce the burden of maternal mortality throughout the world, particularly in developing countries.

More than ten years later, evaluations contrast (Maine & Rosenfield 1999, Weil & Fernandez 1999, Ronsmans *et al.* 1997, Le Coeur *et al.* 1998). Substantial progress has been made in the investigation and documentation of maternal deaths, in both developing and developed countries. More exhaustive and valid data have been obtained (and regularly updated) by international agencies, via demographic surveys in particular (United Nations 1997, WHO 1998, AGI 1999). Numerous hospital-based and case-control studies have well identified the principal direct and indirect causes of maternal death. Several interesting studies have also generated relevant, but often conflicting, results concerning the role in maternal mortality of traditional birth attendants (TBA), obstetric transfers, prenatal care programs, professional health training, emergency obstetric care, family planning and resource allocation (WHO & UNICEF 1996).

Unfortunately, the reality of the situation with regard to maternal health is still tragic in the vast majority of developing countries. According to the most recent estimates of the World Health Organization (WHO), 600,000 women now die each year of pregnancy-related causes, versus 500,000 in 1980. Obstetric disorders are still the leading cause of deaths among women of child-bearing age (killing far more of these women than tuberculosis, traffic accidents or AIDS (Murray & Lopez 1997)). This figure also reflects the enormous disparity, known as the « health disadvantage », between rich and poor nations: it is thus estimated that 1 West African woman in 12 dies of maternity-related causes, versus 1 woman in 4000 in northern Europe.

Abortion is certainly the 'poor relation' in the debate concerning ways to reduce the number of deaths from maternity-related causes, even though abortion complications account for about 15% of all maternal deaths, and up to 30% in some countries. The recognition by international agencies and the UN system that abortion complications are a major public health problem in developing countries is relatively recent. This issue was addressed principally in 1994, at Cairo, during the International Conference on Population and Development, « to deal with the health impact of unsafe abortion

as a major public health concern and to reduce the recourse to abortion through expanded and improved family-planning services ».

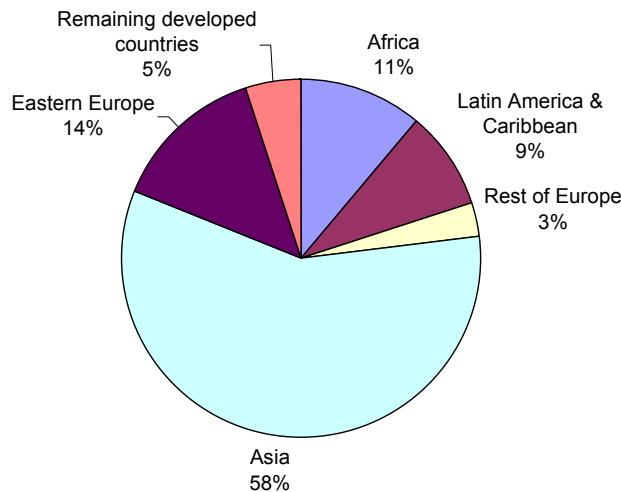
THE MAGNITUDE OF ABORTION

About 210 million pregnancies occur each year throughout the world, 182 million of which occur in developing countries.

It has been estimated from many different sources (official statistics, hospital and population-based studies (United Nations 1997, Henshaw SK et al. 1999)) that, worldwide, 46 million pregnancies (20% to 25% of all pregnancies) each year end in abortion; 36 million of these abortions occur in developing countries and 10 million in developed countries (with a margin of error of a few million, essentially due to possible underreporting in China, India and in the states of the former Soviet Union).

As shown in Figure 1 about 11% of all women undergoing abortions live in Africa, 58% in Asia, 9% in Latin America and the Caribbean, 17% in Europe, and 5% in other developed countries (USA, Canada, Japan, Australia).

Figure 1. Distribution of abortions throughout the world

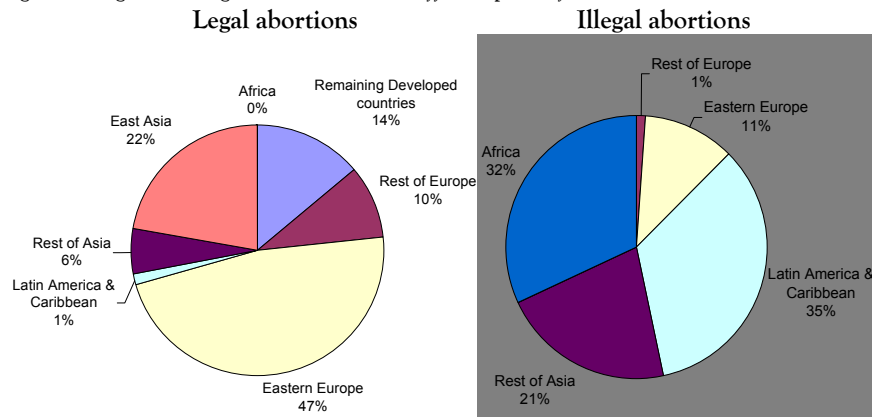


The sex and age distribution of the world population: the 1996 revision, New York; UN, 1997

Of the 46 million abortions performed annually, 26 million are legal and 20 million illegal. Almost half the legal abortions occur in Asia, one fifth in the states of the former Soviet Union and 15% in Europe and other de-

veloped countries. Almost all illegal abortions are performed in developing countries, with 5 million such abortions in Africa, 4 million in Latin America and 10 million in Asia.

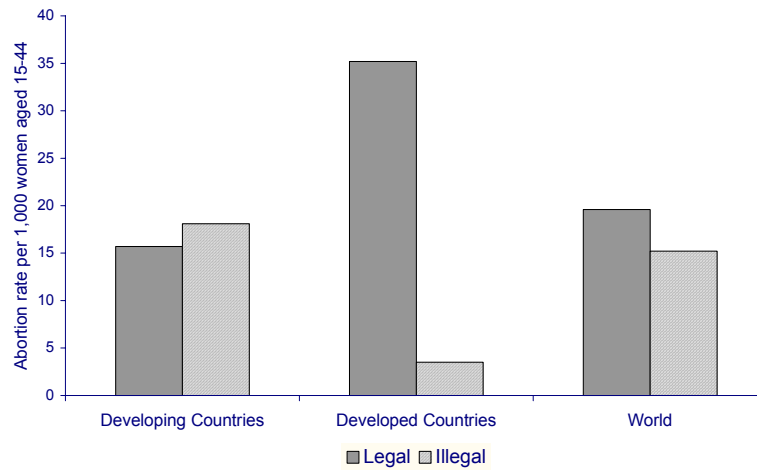
Figure 2. Legal and illegal abortions in the different parts of the world



Using abortion rates (*i.e.* number of abortions each year per 1,000 women aged 15-44) to compare countries or regions regardless of relative population size, we observed an annual worldwide abortion rate of about 35 abortions per 1,000 women aged 15-44, 20 of which were legal and 15 illegal (Figure 3). Global annual abortion rates are very not so different in developed (39 per 1,000 women aged 15-44) than in developing (34 per 1,000 women) countries. The slightly higher level founded in the developed world is definitely linked to the current rates observed in Eastern Europe, the region with the highest level of abortion. Europe include the subregions with the highest and the lowest abortion rates. The states of the former Soviet Union have the highest annual abortion rates, whereas the Netherlands and France have the lowest abortion rates, all countries with liberal abortion laws.

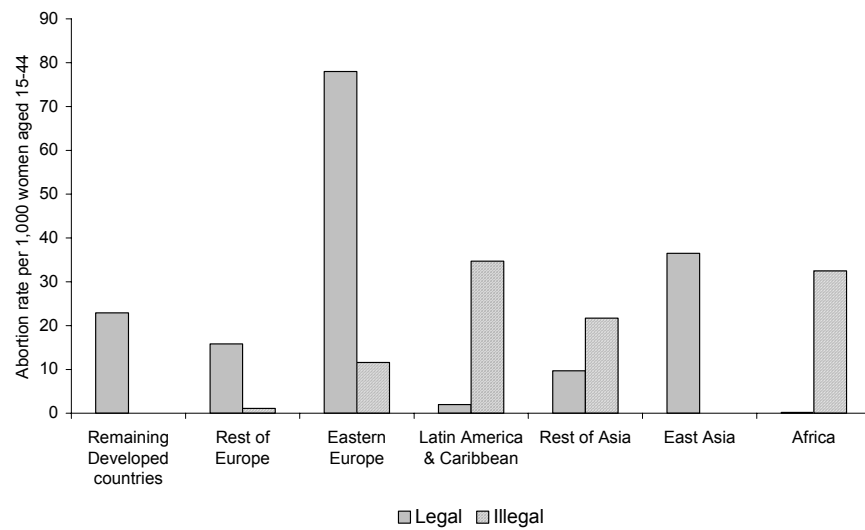
The calculated current worldwide annual abortion rate (35 per 1,000 women) implies a lifetime average of about one abortion per woman. A lower abortion rate (for example of 22 per 1,000 women, as in Australia, the United States and Turkey) implies that the mean number of abortions per woman is less than one (0.7 abortions for the examples given). A higher abortion rate, for example of 50 per 1,000 women (as in Bulgaria or in some West African countries) implies that the mean number of abortions per woman during her reproductive years is greater than one.

Figure 3. Annual abortions per 1,000 women aged 15-44



If the abortion rate is evaluated as a function of the woman's age, we observe that adolescents (less than 20 years old) and women aged 40 or older are the most likely to have an abortion if they become pregnant. Thus, the proportion of pregnancies ended by abortion is greatest at the beginning and end of the woman's reproductive life.

Figure 4. Annual abortion per 1,000 women aged 15-44



THE BURDEN OF UNSAFE ABORTION

The World Health Organization has defined unsafe abortion as an « abortion not provided through approved facilities and/or persons », specifying that this definition « does not take into consideration differences in quality, services available or the other substantial differences between health systems ». Legality and safety usually coincide, although in some countries in which abortion is legal, not all procedures are safe, and in countries in which abortion is illegal, a few women may have abortions carried out by safe procedures.

The WHO, based on information from several sources (hospital admissions, community surveys, abortion provider's surveys, mortality studies) and taking into account the difficulties involved in obtaining exhaustive and valid information on this subject, has published recent data on unsafe abortion and related maternal deaths, according to United Nations regions.

The WHO estimates that, worldwide, almost 20 million unsafe abortions take place each year, with 95% of these (19 million) performed in developing countries. In Africa, 5 million unsafe abortions are performed annually, resulting in an estimated 34,000 deaths, a total number of maternal deaths very similar to that reported for Asia (38,500 deaths), but a much larger number of unsafe abortions are performed each year in Asia (9.9 million). Thus, the mortality ratio (*number of deaths due to unsafe abortion per 100,000 live births during the same period*), which represents the risk of death due to unsafe abortion, exceeds 100 deaths due to unsafe abortion per 100,000 live births in Africa (and may be up to 150 in many West and East African countries), whereas it is less than 50 per 100,000 in Asia or Latin America and the Caribbean.

In other words, the risk of death from unsafe abortion is about 1 in 150 procedures in Africa, and 1 in 150,000 in the USA and Europe !

The relative burden of abortion-related maternal mortality depends on the total maternal mortality rate. It also emphasizes the reduction of other causes of maternal mortality in some regions. The debate is still open concerning the number of maternal deaths resulting annually from unsafe abortion. An estimated 84,000 maternal deaths per year were thought to be due to abortion complications in the late 1970s according to the International Planned Parenthood Federation. This figure was revised upwards to 115,000 in 1988 (WHO), decreasing to 70,000 in 1993 (WHO), and was estimated to be about 80,000 by the Division of Reproductive Health of the WHO in 1997.

This accounts for about 13% of all maternal deaths in the world, one in eight pregnancy-related deaths (Table 1).

Table 1. Global and regional annual estimates of incidence and mortality, unsafe abortions, United Nations regions; 1995-2000

	Estimated number of unsafe abortions	Incidence rate (unsafe abortions per 1,000 women aged 15-49)	Estimated number of deaths due to unsafe abortion	Mortality ratio (deaths due to unsafe abortion per 100,000 live births)	Proportion of maternal deaths (% of maternal deaths due to unsafe abortion)
World total	20,000,000	13	78,000	57	13
More developed regions	900,000	3	500	4	13
Less developed regions	20,000,000	16	77,500	63	13
Africa	5,000,000	27	34,000	110	13
Eastern Africa	1,900,000	36	16,000	153	14
Middle Africa	600,000	28	4,000	98	10
Northern Africa	600,000	15	1,200	24	7
Southern Africa	200,000	16	800	49	19
Western Africa	1,600,000	31	12,000	121	12
Asia	9,900,000	11	38,500	48	12
Eastern Asia	/	/	/	/	/
South-central Asia	6,500,000	19	29,000	72	13
South-eastern Asia	2,800,000	21	8,100	66	15
Western Asia	500,000	12	1,100	20	6
Europe	900,000	5	500	6	17
Eastern Europe	800,000	10	500	15	24
Northern Europe	< 30,000	1	< 20	0.2	2
Southern Europe	< 90,000	2	< 20	1	10
Western Europe	/	/	/	/	/
Latin America & Caribbean	4,000,000	30	5,000	41	21
Caribbean	200,000	17	600	71	18
Central America	900,000	26	700	20	14
South America	3,000,000	34	3,500	47	24
Northern America	/	/	/	/	/
Oceania	30,000	15	150	51	8

However, this global picture masks large differences between regions and countries. In a recent multicenter study we performed in West Africa from 1998 to 1999, we observed that the risk of dying for a woman having a complication during her pregnancy is 10 higher if this complication have happened during the first trimester of the pregnancy (and multiply by 14 in case of abortion complication) (*not yet published data*).

In countries in which overall maternal mortality is high (up to 100 maternal deaths/100,000 live births: Africa, Asia), the proportion of abortion-related deaths is relatively low, at about 12%. In contrast, in Latin American countries, where the level of maternal mortality is much lower (30 to 80/100,000) the relative burden of unsafe abortion is higher, at about 21%.

The situation in Eastern European countries is somewhat surprising, with these countries having the highest proportion of maternal deaths due to unsafe abortion in the world. Although almost all the states of the former Soviet Union have liberal abortion legislation, illegal abortions (i.e. those performed outside the 'official' health care system or within the public health care system but unregistered) account for a substantial proportion of all abortions in these countries (20 to 50%). The official statistics of the USSR Ministry of Public Health reported 536 illegal abortion-related maternal deaths among the total of 2,312 maternal deaths registered in 1988 (27%) (Popov 1991). In a recent study we performed in Kazakhstan (1998), we found that half of all maternal deaths due to abortion complications occurred after illegal abortions, with 20% of maternal deaths due to abortion complications (Kaupova *et al.* 1998).

These maternal deaths are no more than the tip of the iceberg, the underlying rates of morbidity linked to unsafe abortions being very much higher. There is a lack of relevant, regularly collected hospital data in most developing countries, so little has been published on this subject. However, it is clear that in countries in which abortion is illegal, many women (between 20 and 30%) are likely to experience non-lethal complications related to unsafe abortion practices, including major psychological stress, fistulas and chronic pelvic infection resulting in ectopic pregnancy and infertility (Benson *et al.* 1996, Diadhio *et al.* 1999).

The cost to health care systems in developing countries of treating women suffering from abortion-related complications may be substantial, in terms of the number of maternity beds taken up and gynecology budgets (Johnson *et al.* 1993, Sjöstrand *et al.* 1995, Kay *et al.* 1997, Figa-Talamanca *et al.* 1986). In Egypt, in 1996, about one fifth of all admissions to obstetrics and gyne-

colony wards were abortion-related (Huntington *et al.* 1998).

STRATEGIES TO RESOLVE THE DILEMMA OF UNSAFE ABORTION

Worldwide, more than two in ten maternal deaths are due to abortion complications, in most cases in developing countries, where almost all abortions are unsafe.

Around the world, the debate about abortion is heated and passionate, involving both emotional and moral issues. In terms of the mortality and morbidity related to abortion complications, there is a stark division between developed and developing countries. In countries in which abortion is legal, safe and available (mostly developed countries), abortion-related mortality rates are very low, at less than 1 death per 100,000 abortions. In the United States, the risk of dying due to childbirth is 15 times higher than that of dying due to an abortion (9.1 per 100,000 versus 0.6 per 100,000) (Lawson 1994). It could almost be said that abortion is no longer a public health problem in most developed and industrialized countries. In contrast, in most developing countries, it is clear that it will be impossible to achieve low maternal mortality rates without access to safe abortion. In developing countries, several major concerns account for abortion being such a huge maternal mortality risk factor.

ABORTION LAWS AND REGULATIONS

There is no doubt that one of the most significant considerations for a woman contemplating having an abortion is whether the law permits or prohibits abortion where she lives (Kunins & Rosenfield 1991, Singh & Ratnam 1998). About one in four women in the world live in countries with laws that restrict their access to abortion. More than half the women living in developing countries live in countries in which abortion is permitted on general health grounds or for socioeconomic reasons. This relatively optimistic view is counterbalanced by the fact that China, India and Vietnam are in the developing world and all have laws that permit abortion on broad grounds. In countries with liberal laws, restrictions and conditions often limit the woman's access to abortion (gestational limits, facilities and practitioners, consent requirements, counseling and waiting period requirements). The specific limitations of each country may result in an « abortion travel practice », as for example in Europe, where Irish, Polish and French women may be forced to go to England, Germany or the Netherlands to obtain an abortion.

Several recent examples have clearly demonstrated that any sharp modification in abortion law or policy has major consequences for abortion practice, but often also for maternal mortality and morbidity.

One such example is the steep rise registered in Romanian abortion-related mortality just after the Ceausescu decree declaring abortion and modern contraceptive methods illegal: from 30 abortion-related deaths per 100,000 live births in 1965 to 142 per 100,000 in 1989; followed by a drastic fall in abortion-related mortality, to 50 per 100,000, after the restrictions were removed (Stephenson *et al.* 1992, Serbanescu *et al.* 1995).

In Guyana, hospital admissions for septic and incomplete abortions decreased by 41% in the six months following the legalization of abortion complication treatments, in 1995 (Nunes & Delph 1997).

The political changes in South Africa have been followed by a range of legislation placing high priority on sexual equality and reproductive rights. In February 1997, the Choice on Termination of Pregnancy Act was passed. This act permits the 'termination of pregnancy upon the request of the woman up to and including 12 weeks of pregnancy, under certain defined circumstances from the 13th to the 20th week, and after the 20th week in more limited circumstances'. In 1995, 44,686 women were admitted to South Africa's public hospitals with incomplete abortions (one third of which resulted from unsafe abortion) and 425 women died due to abortion-related procedures. To resolve the problems of the lack of health care professionals trained to perform abortions and disparities in geographic accessibility, the National Abortion Care Program was initiated in 1998, providing training in the manual vacuum aspiration (MVA) technique for physicians and midwives. One year after legalization, the frequency of abortion complications had fallen from 51 % to 29% in one reference hospital in Pretoria. Conversely, when this same hospital stopped doing second-trimester abortions, the abortion-related complications rate rose to 36%, demonstrating the importance of accessibility to safe abortion services for all women (Rees *et al.* 1997, De Jonge *et al.* 1999, Dickson-Tetteh & Rees 1999).

In an interesting review of international developments in abortion law from 1988 to 1999, Rebecca Cook observed that since 1987, 26 jurisdictions have extended the grounds for lawful abortion, 4 countries have restricted grounds, and numerous additional limits have restricted access to legal abortion services (service funds, counseling and reflection delay requirements, third-party authorization) (Cook *et al.* 1999).

As stated by Mervyn Susser « the policy changes and the outcome of abor-

tion-related mortality are so sharp and so closely coincident in time that they stand as a persuasive if appalling natural experiment » (Susser 1992).

The question is how can laws and regulation policy be used to lessen the negative effects of unsafe abortion. Faced with the difficulties of a rapid change in the law concerning abortion, several authors have suggested intermediate steps that could lead to the legalization of abortion.

- ❑ in countries in which abortion laws are restrictive, the abortion-related health services should agree to treat women presenting abortion complications. Women should not be deterred from seeking proper medical treatment because they fear punishment, and health workers should not be reluctant to proceed with treatment because they think it is illegal or because they are biased against the women needing treatment for abortion complications.
- ❑ the indications for legal abortion (even if restrictive) should be interpreted in the broadest sense possible (particularly in the medical environment (Rahman *et al.* 1998)), providing a larger number of women with access to abortion services.
- ❑ criminal penalties should not be applied to women who seek abortion because, in the face of such penalties, women tend to postpone seeking medical attention if they suffer complications.

In addition to legal restrictions, two others factors must be considered: accessibility and acceptability. Accessibility to abortion facilities may be limited by several factors, which may be geographic (such as the low availability of services in rural areas, as is currently the case in South Africa (Varkey 2000)) or financial nature. In the United States, one in every four women has no health insurance and some private health insurance plans will not pay for abortions, forcing women, especially those who are poor, to pay out of their own pocket (increasing the length of the pregnancy and therefore the risk of complications) (Gober 1997). This financial aspect is a particular problem in all the states of the former Soviet Union, in which abortion is legal and available but only on payment of a surcharge. This excludes a large and increasing proportion of the population, obliged to use clandestine 'babouskas' for unsafe abortion practices.

Another point concerns the acceptability to the scientific community and health professionals of providing abortion procedures. In many countries, even those in which abortion is legal, many doctors refuse to perform abor-

tion for religious, personal or ethical reasons. In developing countries in which abortion is illegal, attitudes are often negative (rejection) and the treatment of abortion complications is delayed, providing evidence of a non-acceptability to health professionals of treating women admitted for abortion complications (Makinwa-Adebusoye *et al.* 1997, Singh *et al.* 1997).

ABORTION TECHNIQUES

Epidemiological studies and mortality data have shown that the risk of maternal mortality and morbidity is very low for the endouterine vacuum aspiration (suction curettage) method (WHO 1995). For abortions in the first three months of pregnancy, the incidence of minor complications is estimated to be 2 to 3%, with one major complication per 1,000 abortion procedures. In the United States, the fatality rate is 0.4 deaths per 100,000 abortion procedures, mainly linked to complications of general anesthesia (Council on Scientific Affairs 1992, Hakim-Elahi *et al.* 1990, Henshaw & Van Vort 1994). We reported a low incidence of immediate complications (< 1.7%) in a prospective study conducted in France on abortions performed under local anesthesia (Thonneau *et al.* 1998).

Techniques for second-trimester abortions are much more difficult and harmful than those used in the first three months. They require highly skilled staff and well-equipped facilities. For example, the US case fatality rate for abortions performed between 16 to 20 weeks is 6.9 deaths per 100,000 live births, versus 0.4 per 100,000 at 8 weeks.

In developing countries in which abortion is legal and performed by health professionals, dilatation and curettage with metal instruments are often used in preference to vacuum aspiration or MVA, increasing iatrogenic morbidity.

In developing countries in which abortion is illegal or very restricted, various methods are used to induce abortion (Rogo 1993, Paxman *et al.* 1993, Faundes & Hardy 1997). In a recent study we performed in women admitted to an obstetrics department in Abidjan (Ivory Coast) for abortion complications, we found that 'introduction of plant stems into the uterus', 'use of vaginal preparations' and 'ingestion of plants' were the most common abortion methods. Seventeen abortion-related deaths were registered, giving a hospital case fatality rate as high as 3.6%. The ingestion of plants was the major death risk factor (probably due to neurological disorders linked to plant effects) (Goyaux *et al.* 1999).

In many cases, the 'abortionist' is an unskilled health worker or, less fre-

quently, the woman herself (Madebo & Tsadic 1993). Bergström compared women who had undergone induced legal and illegal abortion and who were patients at Maputo Central Hospital, Mozambique. He found that more than one third of illegal abortions were carried out by health workers (similar results have been reported in Nigeria, Bolivia, and Mexico). One third of the women admitted for illegal abortion complications had initially undergone curettage, strongly suggesting a professional approach to the intervention, providing a way for these health workers to top up the low wages they receive (Machungo *et al.* 1997).

At the dawn of the twenty-first Century, the technique of abortion by vacuum aspiration during the first three months of pregnancy is perfectly well known and mastered. This technique is easy to perform and the vacuum required may be generated by an electric pump or a hand-held syringe (manual vacuum aspiration, MVA; an outpatient procedure with potential for use in developing countries). Menstrual regulation, MVA, done within a few weeks of amenorrhea without confirmation that the woman is pregnant, is used in Bangladesh, Indonesia, and in some other developing countries in which abortion is not allowed.

We should also mention the recent development of the antiprogesterone Mifepristone* (in association with prostaglandin) which has been shown to be effective and safe for the induction of abortions until 12 weeks of amenorrhea (Silvestre *et al.* 1990, Misago *et al.* 1998).

In an interesting and recent review done by Blanchard *et al.* in the use of Misoprostol alone, the authors concluded that this regimen could be a safe and effective method for early pregnancy termination. Misoprostol is widely marketed in the world, really inexpensive (especially comparing with Mifepristone) simple to administer, and stable in tropical climates. Thus, Misoprostol-alone regimen could be a real alternative for medical abortion for women living in developing countries (Blanchard *et al.* 1999).

Emergency contraception could also be used to prevent pregnancy after unprotected sexual intercourse (when no contraceptive method was used or after a fail of the method). The Yuzpe regimen (two pills comprising 100 microg. ethinylestradiol + 500 microg. Levonorgestrel, or 1 mg dl-norgestrel, initial dose followed by a similar dose 12 hours later) developed 25 years ago, have been now frequently replaced by the levonorgestrel regimen, (two 0.75 mg dosed 12 hours apart). A recent publication (1998) have reported significant lower pregnancy rate among women assigned to levonorgestrel regimen (1.1%) comparing to those with Yuzpe regimen (3.2 %) (Programme's task

force on postovulatory methods of fertility regulation 1998). Recently, Mifepristone have been also tested for emergency contraception. Comparison in effectiveness have been also performed between Yuzpe regimen, levonorgestrel, and Mifepristone, without any clear advantage between the three methods (delayed menstruation in mifepristone group; levonorgestrel must be taken two doses 12 hours apart)(Webb AMC *et al.* 1992, Glasier *et al.* 1992). Nevertheless, it is important to mention that these emergency contraception methods have been able to prevent 85 % of expected pregnancies.

The complex relationship between abortion, unplanned pregnancy, and family planning

Attitudes concerning ideal family size and the best time to have children are the complex product of social expectations, cultural values and politico-economical circumstances. The desire to have a small family (between 2 and 3 children) has clearly become more common, even in developing countries.

A study based on Demographic and Health Surveys and Contraceptive Prevalence Surveys in 41 developing countries showed that the demand for family limitation is increasing throughout the developing world. The women of Asia, North Africa, Latin America, and the Caribbean tend to want to limit the number of births and family size, whereas those from Sub-Saharan Africa wish simply to space births (Westoff & Bankole 2000).

Unfortunately there is a wide gap between these fertility aspirations and reality, and there are therefore many unwanted or unplanned pregnancies (Bankole *et al.* 1998).

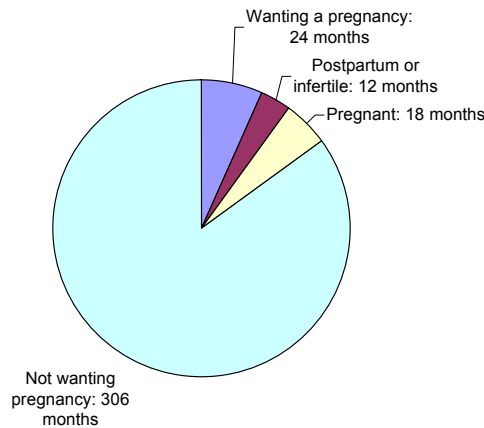
Worldwide, an estimated 38% of the 210 million pregnancies each year are unplanned, and 22% end in abortion. In Africa, 30% of the 40 million pregnancies each year are unplanned, and 12% end in abortion. In Eastern Europe, 63% of the 11 million pregnancies are unplanned, and 57% end in abortion. By analyzing data from the National Survey of Family Growth, Henshaw found that 49% of the pregnancies that ended in 1994 in the United States were unintended, and that 54% of these ended in abortion (Henshaw 1998).

It therefore appears obvious that reducing the number of 'unplanned pregnancies' by family planning methods would reduce the total number of pregnancies and the number of abortions. Unfortunately, things are not that simple.

Firstly, exposure to the risk of an unwanted pregnancy is as high as the

number of children desired is small. As shown in Figure 5, a women who aims to limit her family to two children without requiring an abortion, must successfully practice birth control for 25 of her 30 child-bearing years.

Figure 5. Number of months a women should use a birth control method if she wishes to have only two children



Regarding exposure to the risk of becoming pregnant, sexual relations are beginning increasingly early in adolescents (Görge *et al.* 1993, Berglund *et al.* 1997)(with frequent ambivalence towards the question of pregnancy at this age)(Manning *et al.* 2000), and extra-marital sexual relation frequently occur phenomenom in married couples (information brought to light by studies on AIDS).

Family planning methods are certainly the most efficient way, to avoid ‘unplanned’ pregnancy during this long period of exposure to the risk of pregnancy.

Nevertheless, the failure rates of the various family planning methods are non-negligible, associated with methods themselves or with their discontinuation (Skeldjestad 1997). These failures in family planning methods result in a large number of unplanned and unwanted pregnancies, and consequently in numerous abortions (Fu *et al.* 1999). In France, where more than 1 million women use the IUD, the frequency of unplanned pregnancies linked to IUD failure is estimated at 15 to 20,000 (giving an IUD failure rate of about 1.5%). Around two thirds of these IUD failure end in abortion, accounting for more than 5% of the 200,000 abortions registered annually in France. In Denmark, where the abortion rate has been constant since the early 1980s, half the women undergoing abortions became pregnant despite

contraceptive use (Knudsen 1997). In USA, 58% of women having abortions had experienced contraceptive failure, 31% had used a method in the past but were not using contraception during the month in which they conceived, and 11% had never used any method. The proportion of abortion patients whose pregnancy resulted from condom failure increased from 15% in 1987 to 32% in 1994! (Henshaw & Krost 1996)

Although improvements have been made in delivery systems, widespread availability and the broad acceptability of methods remain elusive goals in many developing countries (especially in countries with disorganized and inefficient health systems), contributing to discontinuous use, and resulting in substantial numbers of unplanned pregnancies (Ali & Cleland 1995). In the countries of Central and Eastern Europe, the high cost and poor availability of modern methods of contraception almost certainly account for the high frequency of abortion.

Finally, of course, a large number of men, women and couples not wishing to have children have sexual relations with no contraception, thereby exposing themselves to the risk of unwanted pregnancy and abortion. It is clear that these populations "at risk of unwanted pregnancies" account for a large proportion of the total number of abortions. In the US, women using contraception are only 15% as likely as women using no method to have an abortion.

Considering the consequences of unplanned pregnancy (particularly in developing countries) it is surprising that couples take so high risk by neglecting or refusing to use a family planning method. However, the decision as to whether or not to use a fertility regulation method is associated with numerous complex factors such as the perceived risk of pregnancy, the openness of communications between partners, the support of parents and peers, desensitization society towards of sex as a taboo topic, the community's attitude towards sex education and the influence of specific guidance by health staff (Shapiro & Tamashe 1994, Renne 1996).

In industrialized countries in which family planning has long been available and accessible, abortions still take place, the rate depending on the country (low in the Netherlands and Scandinavian countries, higher in France, Great Britain and the USA) with no clear tendency to decrease observed. In developing countries, several different patterns are observed simultaneously. In some developing countries (South America and South-East Asia (Singh & Sedgh 1997)), the desire to have small families is leading to the extensive use of contraceptive methods and abortion. In countries in

which access to modern methods of contraception is limited (as in Central and Eastern Europe (Johnson *et al.* 1993, Kulczycki 1995)) and in countries in which the acceptability of modern methods of contraception is low (Sub-Saharan African countries (Shapiro & Tamashe 1994)) many families use abortion as a means of regulating their fertility.

As stated by Henri David, 'the evidence is persuasive that people can be motivated to prevent unwanted pregnancies when they perceive themselves as playing an active role in determining their own future and in improving their own and their family's quality of life' (David 1992).

So, could family planning decrease the number of unwanted pregnancies? The answer is of course "yes" but is almost certainly also "not completely". No matter how effective family planning services and practices become, unwanted pregnancies will still occur and there will therefore always be a need for access to safe abortion services.

Conclusion

Abortion, due to its frequency worldwide, its often illegal nature, its major contribution to maternal mortality and its social implications, is a major public health issues in most developing countries. The gap between between developing and developed countries in the risk of death from unsafe abortion have never been so high: 1/150 000 in developing countries versus 1/150 in developed countries.

Ways of reducing the burden of unsafe abortion are well known, although their implantation is rather difficult, as has recently been illustrated by the situation in South Africa.

The international community and organizations from within the United Nations system must play a key role encouraging governments to modify their abortion legislation' and to improve their health system to take more account of women's health rights.

References

Ali M, Cleland J (1995). Contraceptive discontinuation in six developing countries: a cause-specific analysis. *Int Fam Plann Perspec* 21(3),92-97.

Bankole A, Singh S, Haas T (1998). Reasons why women have induced abortions: evidence from 27 countries. *International Family Planning Perspectives* 24(3),117-127 & 152.

- Benson J, Nicholson LA, Gaffikin L, Kinott SN (1996). Complication of unsafe abortion in sub-Saharan Africa: a review. *Health Policy Plann* 11,117-31.
- Berglund S, Liljestrand J, Marin FdM, Salgado N, Zelaya E (1997). The background of adolescent pregnancies in Nicaragua: a qualitative approach. *Soc Sci Med* 44(1),1-12.
- Blanchard K, Winikoff B, Ellertson C (1999). Misoprostol used alone for the termination of early pregnancy. *Contraception* 59,209-217.
- Cook RJ, Dickens BM, Bliss LE (1999) International developments in abortion law from 1988 to 1998. *Am J Public Health* 89,579-586.
- Council on Scientific Affairs, American Medical Association. Induced termination of pregnancy before and after Roe v Wade: trends in the mortality and morbidity of women. *JAMA* 1992, 268,231-39.
- David HP (1992). Abortion in Europe, 1920-91: a public health perspective. *Stud Fam Planning* 23(1),22.
- De Jonge ETM, Pattison RC, Mantel GC (1999). Termination of pregnancy (TOP) in South Africa in its first year: is TOP getting on top of the problem of unsafe abortion. *Sexual and Reproductive Health Bulletin* 7,14-15.
- Diadhiou F, Goyaux N, Faye O, Thonneau P (1999). A neglected but prevalent tragedy. *BMJ* 318,1526.
- Dickson-Tetteh K, Rees H (1999). efforts to reduce abortion-related mortality in South Africa. In *Safe Motherhood Initiatives: critical issues* by M Berer and TKS Ravindran, Reproductive Health Matters, Blackwell Sciences Limited, London, 190-197.
- Faundes A, Hardy E (1997). Illegal abortion: consequences for women's health and the health care system. *Int J Gynecol Obstet* 58,77-83.
- Figa-Talamanca I, Sinnathuray TA, Yusof K *et al.* (1986). Illegal abortion: an attempt to assess its cost to the health services and its incidence in the community. *International Journal of Health Services* 16(3),375-389.
- Fu H, Darroch JE, Haas T, Ranjit N (1999). Contraceptive failure rates: new estimates from the 1995 national survey of family growth. *Family Planning Perspectives* 31(2),56-63.
- Glasier *et al.* (1992). Mifepristone compared with high-dose estrogen and progestogen for emergency postcoital contraception. *N Engl J Med*;327 :1041-1044.
- Gober P (1997). The role of access in explaining state abortion rates. *Soc Sci Med* 44(7),1003-1016.

- Görgen R, Maier B, Diesfeld HJ (1993). Problems related to schoolgirl pregnancies in Burkina Faso. *Studies in Family Planning* 24(5),283-294.
- Goyaux N, Yace-Soumah F, Welffens-Ekra C, Thonneau P (1999). Abortion complications in Abidjan (Ivory Coast). *Contraception* 60,107-109.
- Hakim-Elahi E, Tovell HMN, Burnhill MS (1990). Complications of first-trimester abortion: a report of 170,000 cases. *Obstet Gynecol* 76,129-35.
- Henshaw S, Van Vort J (1994). Abortion services in the United States, 1991 and 1992. *Family Planning Perspectives* 26,100-106 & 112.
- Henshaw SK (1998). Unintended pregnancy in the United States. *Family Planning Perspectives* 30,24-29 & 46.
- Henshaw SK, Krost K (1996). Abortion patients in 1994-1995: characteristics and contraceptive use. *Family Planning Perspectives* 28,40-147 & 158.
- Henshaw SK, Singh S, Haas T (1999). The incidence of abortion worldwide. *International Family Planning Perspectives* 25(S),S30-S38.
- Huntington *et al.* (1998). The postabortion caseload in Egyptian hospitals: a descriptive study. *Int Fam Plann Persp* 24(1),25-31.
- Johnson BR *et al.* (1993). Costs and resource utilization for the treatment of incomplete abortion in Kenya and Mexico. *Soc Sci Med* 36(11),1443-1453.
- Johnson BR, Horga M, Andronache L (1993). Contraception and abortion in Romania. *Lancet* ;341 :875-78.
- Kaupova N, Nukusheva S, Biktasheva H, Goyaux N, Thonneau P (1998). Trends and causes of maternal mortality in Kazakhstan. *International Journal of Gynecology & Obstetrics* 63,175-181.
- Kay BJ *et al.* (1997). An analysis of the cost of incomplete abortion to the public health sector in South Africa. *South African Medical Journal* 87(4),442-447.
- Knudsen LB (1997). Induced abortions in Denmark. *Acta Obstetrica & Gynecologica Scandinavia Suppl.*76(164),54-59.
- Kulczycki A (1995). Abortion policy in postcommunist Poland. *Population and Development Review* 21(3),471-505.
- Kunins H, Rosenfield A (1991). Abortion: a legal and public health perspective. *Annu Rev Publ Health* 12,361-82.
- Lawson PHW (1994). Abortion mortality, United States 1972 - 1987. *Am J Obstet Gynecol* 171(5),1365-1372.

- Le Cœur S, Pictet G, M'Pelé P, Lallemand M (1998). Direct estimation of maternal mortality in Africa. *The Lancet* **352**,1525-1526.
- Machungo F, Zanconato G, Bergstöm S (1997). Reproductive characteristics and post-abortion health consequences in women undergoing illegal and legal abortion in Maputo. *Soc Sci Med* **45**(11),1607-1613.
- Madebo T, Tsadic TG (1993). A six month prospective study on different aspects of abortion. *Ethiop Med J* **31**,165-172.
- Maine D and Rosenfield A (1999). The safe motherhood initiative: why has it stalled? *Am J Public Health* **89**,480-482.
- Makinwa-Adebusoye P, Singh S, Audam S (1997). Nigerian health professionals' perceptions about abortion practice. *Int Fam Plann Pers* **23**,155-161.
- Manning WD, Longmore MA, Giordano P (2000). The relationship context of contraceptive use at the first intercourse. *Family Planning Perspective* **32**(3),104-110.
- Misago C, Fonseca W, Correia L, Fernandes LM, Campbell O (1998). Determinants of abortion among women admitted to hospitals in Fortaleza, North Eastern Brazil. *Int J Epidemiol* **27**,833-839.
- Murray CJL, Lopez AD (1997). Mortality by cause for eight regions of the world: global burden of disease study. *Lancet* **349**,1269-76.
- Nunes FE, Delph YM (1997). Making abortion law reform work: steps and slips in Guyana. *Reproductive Health Matters* **9**,66-76.
- Paxman JM, Rizo A, Brown L, Benson J (1993). The clandestine epidemic: the practice of unsafe abortion in Latin America. *Studies Family Planning* **24**(4),205-226.
- Popov AA (1991). Family planning and induced abortion in the USSR: basic health and demographic characteristics. *Studies in Family Planning* **22**,368-377.
- Programme's Task Force on Postovulatory Methods of Fertility Regulation/ WHO Special programme of Research, Development and Research training in Human Reproduction (1998). *Lancet* **352**,428-433.
- Rahman A, Katzive L, Henshaw SK (1998). A global review of laws on induced abortion, 1985-1997. *International Family Planning Perspectives* **24**(2),56-64.
- Rees H *et al.* (1997). The epidemiology of incomplete abortion in South Africa. *South African Medical Journal* **87**(4),432-437.
- Renne E (1996). The pregnancy that doesn't stay: the practice and perception of abortion by Ekiti Yoruba women. *Soc Sci Med* **42**(4),483-494.
- Rogo KO (1993). Induced abortion in Sub-Saharan Africa. *East Afr Med J* **70**,386-95.

- Ronsmans C, Vanneste A-M, Chakraborty J, van Ginneken J (1997). Decline in maternal mortality in Matlab, Bangladesh: a cautionary tale. *Lancet* **350**,1810-14.
- Serbanescu F, Morris L, Stupp P, Stanescu A (1995). The impact of recent policy changes on fertility, abortion, and contraceptive use in Romania. *Stu Fam Plann* **26**,76-87.
- Shapiro D, Tamashe BO (1994). The impact of women's employment and education on contraceptive use and abortion in Kinshasa, Zaire. *Stud Fam Plann* **25**(2),96-110.
- Shapiro D, Tamashe O (1994). The impact of women's employment and education on contraceptive use and abortion in Kinshasa, Zaire. *Stud Fam Planning* **25**(2),96-110.
- Silvestre L, Dubois C, Renault M, Rezvani Y, Beaulieu E-E, Ulmann A (1990). Voluntary interruption of pregnancy with mifepristone (RU486) and a prostaglandin analogue: a large-scale French experience. *N Engl J Med* **332**,645-48.
- Singh K, Ratnam SS (1998). The influence of abortion legislation on maternal mortality. *Int J Gynecol Obstet* **63** (Suppl.1),S123-S129.
- Singh S, Sedgh G (1997). The relationship of abortion to trends in contraception and fertility in Brazil, Colombia and Mexico. *Int Fam Plann Perspec* **23**(3),4-14.
- Singh S, Wulf D, Jones H (1997). Health professionals' perceptions about induced abortion in South Central and Southeast Asia. *Int Fam Plann Persp* **23**,59-67 & 72.
- Sjöstrand M, Quist V, Jacobson A, Bergström S, Rogo KO (1995). Socio-economic client characteristics and consequences of abortion in Nairobi. *East African Medical Journal* **72**(5),325-332.
- Skjeldestad FE (1997). Increased number of induced abortions in Norway after media coverage of adverse vascular events from the use of third-generation oral contraceptives. *Contraception* **55**,11-14.
- Stephenson P, Wagner M, Badea M, Serbanescu F (1992). The public health consequences of restricted induced abortion - lessons from Romania. *Am J Public Health* **82**,1328-31.
- Susser M (1992). Induced abortion and health as a value. *Am J Public Health* **82**,1323-1324. Editorial.
- The Alan Guttmacher Institute (AGI) (1999). Sharing responsibility: women, society and abortion worldwide. New York;AGI.

Thonneau P, Fougereyrollas B, Ducor B, Boubilley D, Dif J, Lalande M, Soulat C (1998). Complications of abortion performed under local anesthesia. *Eur J Obstet Gynecol Reprod Biol* 81,59-63.

United Nations/Department of Economic and Social Information and Policy Analysis (1997). *World population prospects: the 1996 revision*. New York, N.Y., USA, United Nations.

United Nations/Department of Economic and Social Information and Policy Analysis (1997). *World population prospects: the 1996 revision*. New York, N.Y., USA, United Nations.

Varkey SJ (2000). Abortion services in South Africa :available yet not accessible to all. *Int Fam Plann Pers* 26,55-161.

Webb AMC *et al.* (1992). Comparison of Yuzpe regimen, danazol, and mifepristone RU 486 in oral post-coital contraception. *BMJ* 305,927-931.

Weil O and Fernandez H (1999). Is safe motherhood an orphan initiative? *Lancet* 354,940-43.

Westoff CF, Bankole A. (2000). Trends in the demand for family limitation in developing countries. *International Family Planning Perspectives* 26,56-62 & 97.

WHO (1995). Complications of abortion: technical and managerial guidelines. Geneva; WHO.

WHO/Division of Reproductive Health. Unsafe abortion. Global and regional estimates of incidence of and mortality due to unsafe abortion, with a listing of available country data (WHO/RHT/MSM/97.16) (1998). Geneva, Switzerland. World Health Organization (WHO).

World Health Organization and UNICEF (1996). Revised 1990 estimates of maternal mortality. Geneva, Switzerland:WHO & UNICEF ; WHO/FRH/MSM 96.11.

Appropriate obstetric technologies to deal with maternal complications

Staffan Bergström¹

Summary

This overview has its focus on “appropriate” obstetric technologies to meet some prevalent maternal complications. It is argued that “technology” should be defined in management terms and comprise therapeutic management and not only manual maneuvers and interventions. This is particularly relevant when discussing pregnancy malaria. The maternal complications addressed comprise postpartum haemorrhage, obstructed labour, genital sepsis, pregnancy-induced hypertension/eclampsia and cerebral malaria. Among them postpartum haemorrhage and obstructed labour have been given more attention than the others. Active management of third stage of labour is documented along with current manual and pharmacological management rules for handling postpartum haemorrhage. Focus here is on the “UniJect” device, on misoprostol and on abdominal compression of the aorta.

The problem of obstructed labour is discussed in two categories, abdominal delivery and vaginal delivery. Caesarian section (CS) under local anesthesia, the Misgav Ladach method, delegation of performing the CS to non-doctors are issues addressed. Appropriate technologies for vaginal delivery in cases of obstructed labour comprise symphysiotomy and vacuum extraction. Reasons for focusing specifically on these two entities are given.

In conclusion, it is argued that each era and each setting have their specific demands on “appropriateness” of obstetric technologies to deal with serious maternal complications. The importance of non-prejudiced opinions (symphysiotomy, CS under local anesthesia) is underscored. A corresponding need of strictly evidence-based clinical practice is emphasised.

¹ Professor of International Health, Division of International Health (IHCAR), Karolinska Institutet, SE-171-76 Stockholm, Sweden. Email : Staffan.Bergstrom@phs.ki.se

Introduction

The Greek word "obstetrix" means "standing besides and wait", implying primarily a non-intervention attitude but certainly a preparedness if complications would arise. When we speak about "technology" we tend to imply more than a mechanical handling of events. Rather, the technology is now by and large corresponding to management practices. This understanding is underlying the current attempt to outline "obstetric technologies". When it comes to the concept "appropriate" it might imply a number of eventually positive characteristics. For the author of this paper it implies a number of subordinate attributes, e.g., available, acceptable, adequate, affordable, sustainable, attractive and meeting people's needs.

For this review there are the following terms of reference:

What is the evidence of the effectiveness and relevance of obstetrical technologies used nowadays to deal with maternal complications? In some settings, the answer for any obstetric complication is the caesarean section; in other settings vacuum extractors are still not known and therefore not used; symphysiotomy is a forgotten technique. Which are the possible appropriate obstetric technologies for obstetric complications and clarify the evidence for using them appropriately?

The concept "obstetric complications" is very wide. We shall here, within the very limited space available for this review, focus on those more life-threatening complications that we normally refer to when we discuss severe maternal morbidity and maternal mortality. In so doing we have a number of significant "obstetric complications". Among those most important ones we have focused on the following entities:

1. Postpartum haemorrhage;
2. Obstructed labour;
3. Puerperal sepsis;
4. Pregnancy-induced hypertension/ eclampsia;
5. Cerebral malaria.

Infections and hypertension

In the list of major obstetric complications presented here there are two, that are more directly related to the birth itself, postpartum haemorrhage and obstructed labour. The other three, genital sepsis, pregnancy induced hypertension/eclampsia and cerebral malaria are not directly related to the birth process itself but occur commonly associated with the peripartal period.

Puerperal sepsis as consequence of postpartum endometritis-myometritis occurs typically several days up to two weeks after delivery (Libombo *et al.* 1994). New evidence regarding the etiology of genital sepsis indicates that unhygienic handling of the birthing process itself (repeated vaginal examinations with poor manual hygiene) is not the only or even predominant cause of this pathology. An unexpected association between low birth weight deliveries and childbed fever/ genital sepsis has been demonstrated in Mozambique (Bergström & Libombo 1995). It appears that sub-clinical intrauterine infections during pregnancy provoke preterm birth of low birth weight newborns with high risk of congenital foetal infection, leaving behind an infected uterine cavity with ensuing clinical endometritis-myometritis, which may deteriorate in puerperal sepsis (Nadisauskiene *et al.*, 1996). One interesting feature is the suggestion that the birth canal might benefit from washing with antiseptic solutions, whereby a vulnerable, low birth weight newborn might not be further infected by vaginal pathogens. Some studies indicate that a routine using vaginal washing might be beneficial (Stray-Pedersen *et al.* 1999). If both endometritis and congenital infection of the newborn are related to subclinical, antenatal intrauterine infection such vaginal washing would offer insufficient protection. Against the additional danger of ascending, vaginal pathogens postpartum (associated or not associated with the manual hygiene of the birth attendant) such flushing may potentially provide some additional protection for the mother and also for the newborn. There have been doubts expressed, however, regarding this routine (Rouse *et al.* 1997) and more research remains to be carried out particularly in settings where puerperal sepsis is prevalent.

Cerebral malaria is coming up as a major maternal killer and contributor to severe maternal morbidity in several countries in sub-Saharan Africa and in southern Asia (Brabin 1991). It might be argued that “appropriate obstetric technology” is not relevant when discussing treatment of cerebral malaria during pregnancy. However, as has been stated already, we have opted to consider “technology” in a broad sense and we do think that the specific therapeutic requirements in pregnancy malaria make it necessary to mention these management aspects here. The increasing drug resistance (above all to chloroquine but also in some areas to sulfadoxine-pyrimethamine/Fansidar) has made more and more countries reluctant to provide conventional chloroquine prophylaxis during pregnancy. Instead the concept of repeated therapeutic treatments (clearance of parasitaemia) has won more and more acceptance. Intermittent sulfadoxine-pyrimethamine treatment in pregnancy

has shown that such a regime will lead to a highly significant reduction in the incidence of LBW in infants born to primigravidae, even if the women have HIV infections (Verhoeff *et al.*, 1998). The pregnancy malaria situation in the world is by and large deteriorating and frustrated attempts are legion to curb the growing threat of malaria maternal mortality (Granja *et al.* 1998). There are no immediately available “appropriate obstetric technologies” to manage this growing malaria threat. New drugs are not available or accessible for wide utilization in the countries most affected or they are too expensive to be considered “appropriate”.

Pregnancy-induced hypertension/eclampsia is a major contributor to severe maternal morbidity and maternal mortality. The management routines have been quite variable over the last decades but hopeful signs of a scientific approach have emanated from the multicentre study comparing magnesium sulphate and diazepam (Anonymous 1995). This study indicates that the drug of choice in treating eclamptic patients should be magnesium sulphate, since this drug gives fewer recurrent convulsions than diazepam. Still, several centres, above all in the UK prefer other drugs than magnesium sulphate. The understanding of the pathophysiology of pregnancy-induced hypertension/ eclampsia has contributed largely to the choice of magnesium sulphate with concurrent volume substitution to maintain optimum circulation in the vasospastic, and hypovolemic disease of eclampsia, where hemoconcentration and hypoperfusion are important characteristics.

Postpartum haemorrhage

In many studies on maternal mortality postpartum haemorrhage (PPH) is the predominant cause of death. PPH is thus a major challenge in programmes aiming at reducing maternal mortality. There are two major lines of thinking in the management of PPH.

Still, the first line of thinking addresses the problem of bleeding after delivery by trying to avoid drugs and just try to use “natural methods”. The proponents of this line of thinking argue that drugs may be disposable and not necessary if proper handling of the birthing process takes place. Examples of such handling is putting the newborn baby to the nipples and stimulating it to suck, whereby endogenous oxytocin will be released from the pituitary, giving uterine contraction and less risk of PPH.

This approach has been tested in settings, where it has been used by traditional birth attendants (Bullough *et al.* 1989). It has been found inefficient even if theoretically attractive and potentially appropriate.

The second line of thought is promoting active management of third stage of labour, comprising three different components:

- a) injection of oxytocin;
- b) early cord clamping;
- c) controlled cord traction.

It has been convincingly demonstrated that the use of oxytocin injection significantly reduces the risk of PPH (Prendiville *et al.* 1999). There is a widespread consensus that early cord clamping and controlled cord traction contribute to the prevention of PPH, though this has not been subject to scientific scrutiny. The principal problem here is that the drug (oxytocin) is seldom readily available for routine use during labour.

A substitute for oxytocin is methylergometrine. Its use to pregnant women with hypertension is not recommended but the risks of deteriorating vasospastic disease should be balanced against the potential benefit of achieving a uterine contraction in case of impending or obvious PPH. The major drawback with methylergometrine is, however, that it is unstable in daylight and in adverse environmental circumstances. Studies have indicated that much of its effect is lost under the circumstances prevailing in most low-income countries (de Groot 1996). There is no doubt that oxytocin should be promoted as the drug of choice in preventing and treating abundant bleeding after delivery.

Oxytocin injection requires syringe and needle, which are largely unavailable in many settings in rural areas. There is also a risk of re-utilization of used syringes and needles in areas where HIV infection is prevalent. In order to overcome this hurdle we have tested the device "Uniject" in Angola for its appropriateness to prevent PPH. The preliminary results clearly indicate that this device, filled with 10 IU of oxytocin, used intramuscularly immediately after expulsion of the newborn significantly reduces the prevalence of PPH (da Silva *et al.*, unpublished). The acceptability of this routine among midwives and parturient women is good (Jangsten *et al.*, unpublished) and a mass production of this oxytocin-filled device is a promising new appropriate technology for the years to come.

A new interesting technology for PPH prevention has recently emanated. The prostaglandin E₁ analogue misoprostol is subject to a multicentre trial to test its advantages/disadvantages in relation to oxytocin given as described above. Preliminary results from several smaller studies indicate that misoprostol is not of greater benefit than oxytocin for the prevention of PPH.

However, misoprostol can be given orally, vaginally or rectally and is heat-stable and not requiring injection (syringe and needles) and will for that reason remain as an attractive and potentially appropriate method for the prevention of PPH. Presumably there is much more to be said about misoprostol as an appropriate obstetric technology, since appropriate dosage has not been researched completely (Bugalho *et al.* 1995). It is further probable that other prostaglandin analogues will appear, since the need for a cheap, temperature-stable and orally active prostaglandin, like misoprostol, is obvious.

A forgotten highly appropriate management principle in PPH is manual compression of the abdominal aorta, a technique that by and large seems to be forgotten in big textbooks. It is described in some literature (Bergström *et al.* 1994) and should be given renewed attention. It can be used immediately after delivery as a bimanual technology, using one hand at the level of the umbilicus to compress the abdominal aorta between the closed fist and the vertebral column, and using the other hand in the groin to confirm that the pulsations of the femoral artery are vanishing. It can also be used as an internal preoperative procedure, by which the assistant compresses the abdominal aorta above the uterine level and below the liver level across the bowels. In either case the maternal blood flow will be efficiently stopped above the aortic bifurcation, which implies reduced or stopped blood flow to the uterine artery with ensuing reduced uterine bleeding. Direct compression of the abdominal aorta is presumably much more efficient than packing the vagina with cloth, since this does not control the arterial blood flow above the lesion or from the non-contracted uterus.

Even if the clinical experience of applying compression of the abdominal aorta is massive, the efficacy of this manoeuvre is seldom addressed in scientific studies (Kinsella *et al.* 1990, Riley & Burgess 1994, Keogh & Tsokos 1997).

Obstructed labour

From the terms of reference given for this review it is obvious that “appropriate obstetric technologies” refer mostly to this entity. For all obstetricians the “pandemic” of rising CS rates in the world should be a matter of concern (Vimerkati *et al.* 2000). It is obvious that centres with low CS rates do not automatically have higher perinatal mortality rates than centres with higher CS rates (Bergström *et al.* 1994). This “pandemic” may be acceptable, adequate and affordable in some settings but is certainly not affordable, available and sustainable in other, poorer settings.

Obstructed labour is defined from observing the process of labour from the first stage of cervical dilatation through the second stage of expulsion. The diagnostic technology implicit in the *partogram* is particularly appropriate (WHO 1994). There is no doubt that the partogram has meant dramatic if not revolutionary improvement in the perception of the birthing process in countries where no such notion was present before. Some recent reports have elaborated on modifications of the conventional WHO partogram with alleged advantages. In one study the action line was subject to a randomised trial, indicating that the CS rate was lower when labour was managed using a partogram with a four hour action line (Lavender *et al.* 1998). In other studies innovative reconstructive steps have been taken to facilitate partogram use (Wacker *et al.* 1998, Tay & Yong 1996). It has been alleged that its use is complicated, since it demands the skill of mathematical abstraction (Dujardin *et al.* 1992, Walraven 1994). Even if it is useful in peripheral units its use in higher-level health care centres has been advocated (Lennox 1981).

Obstructed labour – *sensu strictiori* – implies an obstacle to deliver via the vaginal route. Since both the mechanical components in this process, the foetal head and the mother’s pelvis, are both to some extent malleable, obstructed labour can be overcome by a variety of means. In the following we are going to make a distinction between management of obstructed labour by abdominal delivery and by vaginal delivery.

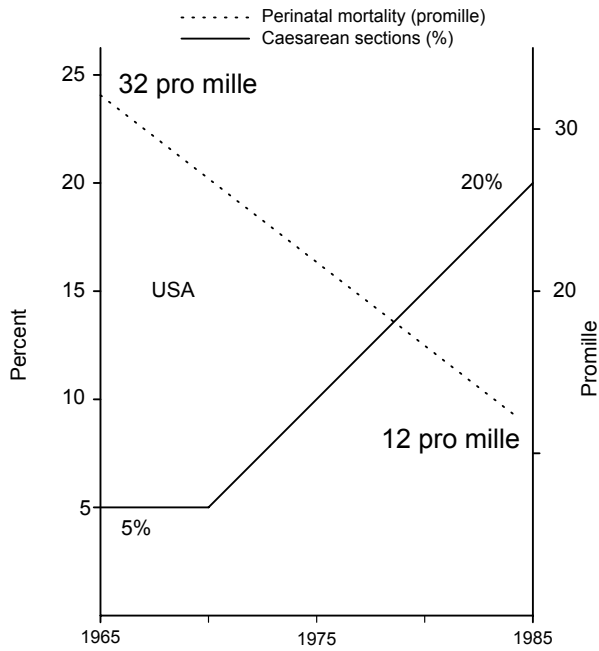
ABDOMINAL DELIVERY

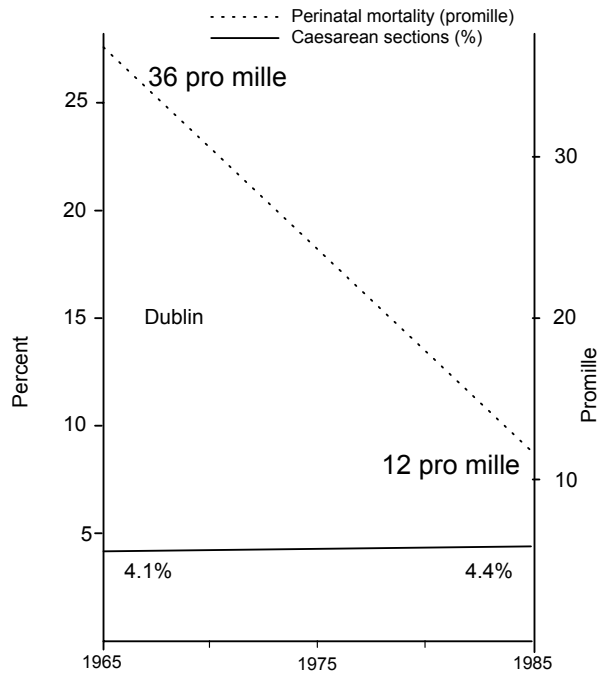
While general agreement seems to prevail in most settings that a minimum CS rate might be of the order of 5% many studies now reveal that the CS rate may be well below 1% in many settings. Calculations on “unmet obstetrical needs” can use the verified CS rate as against the calculated need of CSs in a defined population. The difference in such settings from the reality in

more affluent settings is striking considering CS rates in the order of 50-70% in some urban settings. The reasons for this “pandemic” in current CS practices have been ascribed to fear of legal consequences of alleged mismanagement and to proper commercialisation of obstetric practice (Vimerkati *et al.* 2000).

International comparisons have shown that there has been no improvement in perinatal mortality that parallels the steep increase in CS rate (Figure 1). An increasing number of unnecessary CSs will also lead to an increasing number of unnecessarily ruptured uteri in subsequent pregnancies.

Figure 1. The upper diagram reflects the tendency in the USA towards high frequency of Caesarean sections, while the lower diagram shows the situation in Dublin, Ireland where a very low frequency of Caesarean sections has been maintained. The perinatal mortality has undergone a more or less identical development in Ireland as in the USA.





In many cultures CS is regarded as a reproductive defeat. There is a high risk that such women will not come back for institutional (potentially abdominal) delivery and will give birth at home, with an increased risk of uterine rupture.

Almost all CSs in low income countries are emergency interventions and most of them take place with IV anaesthesia or with spinal anaesthesia. The obvious need to decentralize CS to the first referral level and, potentially, even to more remote health units brings CS in local anaesthesia into focus. Since this technique is not well known among doctors trained in well-equipped hospitals it will be addressed here.

Evidence-based opinions are scarce in the field of CS carried out with infiltration anaesthesia, particularly under conditions prevalent in low-income countries. The practice described below might be a point of departure for further research (Moir 1986, Hood 1988).

Caesarean section under local anaesthesia

Surgical interventions, like the one to be described under this heading, are for natural reasons seldom subject to controlled trials. It is a life-saving intervention in remote, resource-poor settings, where abdominal delivery with general anaesthesia is impossible or dangerous. For these reasons the intervention will be described in some detail, since it appears to be underutilized in most hospital settings, in low-income countries.

For local anaesthesia of the abdominal wall a solution of e.g. lidocaine-adrenaline is infiltrated in the midline from the umbilicus to the symphysis. In addition to these midline doses four points should be selected a thumb-width from the midline on each side. These four points should correspond to the extension of the incision. At each point the local anaesthetic is injected to reach the rectus sheath. Once this infiltration is complete, the abdominal wall is cut open down to the linea alba and the solution is infiltrated through the midline and in the parietal peritoneum immediately below the linea alba along the planned incision. The peritoneal cavity is opened and additional solution infiltrated just above the upper border of the bladder along the line of peritoneal incision. If pain is provoked on the upper part of the symphysis a few mls of solution are injected into the rectus insertion in the superior pubic periosteum.

A good alternative to infiltration anaesthesia is spinal anaesthesia. In some cases, however, the patient's circulation may be in danger and any hypotension provoked by a spinal anaesthesia may be unacceptable. This is particularly true in desolate cases of premature detachment of the placenta, heavy bleeding or other situations giving rise to hypovolemic shock. In such cases local anaesthesia as described above is preferable infiltration.

Misgav-Ladach method

Circumstances for CS surgery prevailing in most low-income countries are characterized by scarce resources. One such scarce resource is time. A second one is material, sutures, transfusion blood, and other theatre necessities. A third one is the human resource (see below).

There are seldom possibilities to take cosmetic aspects in consideration when choosing method of CS incision. Most often a lower midline skin incision is carried out and less often a low, transversal incision (Pfannenstiehl). Another method, which has recently gained much attention, is the Misgav Ladach method, which offers a number of advantages by economising with

operation theatre time and with material resources. The method is briefly a modification of the Pfannenstiehl incision but located at a higher level. It is characterized by much less sharp dissection, taking into account the vascular anatomy of the abdominal wall and it allows for a most significant saving of time and material. This has been clearly shown recently in a randomised trial in Dar-es-Salaam, in which the savings were clearly demonstrated (Björklund *et al.* 2000). Some anecdotal evidence indicates that long-term postoperative abdominal adhesions might be a problem but this remains to be investigated fully.

Abdominal delivery by whom?

One particularly tangible disadvantage of abdominal delivery is that it cannot be carried out in remote rural areas, since there may not be any doctor available capable of carrying out a CS. In most parts of rural Africa this pressing problem has to be solved in the era of "Safe Motherhood". Several African countries (Tanzania, Malawi, RDC) have experience of delegation of responsibility of CS to non-doctors. During the war in Mozambique we had the opportunity to initiate a training of assistant medical officers ("técnico de cirurgia"). This category of surgically trained medical assistants has been very efficient in increasing access to life-saving skills for women previously deprived of them. Two published scientific studies on the quality of care provided by this category of staff have demonstrated that it constitutes a valuable asset in the often frustrated attempts to provide life-saving skills for populations living in remote areas. In the first study approximately 2,000 CSs were followed, half of which were carried out by ob-gyn specialists, with the remaining half being carried out by "técnicos de cirurgia". The postoperative outcomes were compared. No clinically significant differences in postoperative complications occurred (Pereira *et al.* 1996). In the second study more than 10,000 surgical operations were followed, of which 70% were emergency interventions. Obstetric interventions dominated largely and the follow-up results were astonishing. For elective surgical interventions the postoperative mortality was 0.1% and for emergency interventions 0.4% (Vaz *et al.* 1999). It should be added that among the emergency interventions there were quite complicated interventions like total hysterectomy, splenectomy, bowel resection and fetotomy.

VAGINAL DELIVERY

For a large proportion of women with obstructed labour the delayed progress might take place only during the last part of the first stage or to the second stage during labour. Several circumstances may explain such late obstructed labour, e.g., soft tissue obstruction or outlet obstruction. With seemingly sufficient uterine contractions such late obstructed labour may be a problem not automatically necessitating abdominal delivery. In this situation vaginal extraction might be contemplated and particular attention will be given to the appropriateness of two specific interventions, both of which have their proponents and opponents, symphysiotomy and vacuum extraction.

Symphysiotomy

Cutting through the symphysis pubis cartilage as a means of widening the birth canal during protracted deliveries was common in Europe a century ago and has been practised even later. Thanks to improvements in surgery, CS has, however, become much more common in such situations though symphysiotomy is still practised when neither hygiene nor other material resources permit abdominal surgery. It is simple to perform and makes a negligible demand on resources. It is *not*, however, an alternative to CS in general but only in cases with a moderately contracted outlet of the pelvic canal.

Symphysiotomy is controversial most frequently among those who lack personal experience of the method. If indications are strictly adhered to, available evidence is today overwhelmingly in favour of symphysiotomy, particularly in situations when there is no access to CS, as is the case in most rural areas of low-income countries (Seedat & Crichton 1962, Lasbrey 1963, Bird & Bal 1966, Bird & Bal 1967, Gordon 1969, Hartfield 1973, Armon & Philip 1978, Norman 1978, van Roosmalen 1987). For later pregnancies, after a CS carried out for disproportion, the pelvis remains narrow and the woman is left with a uterine scar. Approximately 25% of uterine ruptures can be estimated to be caused by ruptures of old CS scars. The risk of maternal death in vaginal deliveries following a caesarean delivery (for disproportion) is thus obvious. Culturally, obstructed labour is sometimes branded as a punishment for infidelity and CS is often regarded as a reproductive failure on the part of the woman. Once operated upon, the woman may not feel willing to return for a new CS.

Symphysiotomy is less dangerous than CS in countries where resources are minimal. Mortality figures of around 1-3% are common in conjunction

with CS in low-income countries (van Roosmalen 1990). The obstetric situation, in which a mother suffering from obstructed labour, with the foetal head deeply engaged in the pelvis, consults a small, remote hospital after perhaps two to three days of labour, illustrates the value of symphysiotomy. The mother's condition may be poor due to anaemia, dehydration and exhaustion. Symphysiotomy may save the life of both mother and child in such a situation. The problem with symphysiotomy is hardly a technical one: the difficulty lies first and foremost in deciding *at what point* during delivery the operation should be carried out. A fundamental precondition for symphysiotomy is that a moderate disproportion actually exists and manifests itself clinically. Symphysiotomy is thus not recommended as a means of preventing foreseeable disproportion.

It is important to underscore that the normal symphysiolysis occurring at the end of pregnancy allows the pelvis to achieve a certain elasticity, facilitating the passage of the foetus. This stretching of the pelvis is indispensable for birth in the same way as is stretching of the perineum. In both tissue areas, however, the need for surgical support may be indicated and symphysiotomy may be considered as an analogy to perineotomy (episiotomy). There are several overviews depicting the pros and cons of symphysiotomy. Very few of these studies are controlled trials and the current practice is mostly based on relatively limited series of cases (Harfield 1973, van Roosmalen 1990).

Symphysiotomy is indicated in cases with obstructed labour due to a limited fetopelvic disproportion which may be overcome by surgical widening of the symphysis (up to 2.5 cm). The most clear-cut example of proper indication is the situation with fully dilated cervix, the foetal head at or below the spinal level and unsuccessful vacuum extraction in spite of adequate maternal expulsion efforts. Major constrictions of the pelvis (true conjugate less than 8 cm) render symphysiotomy unsuitable, even if all remaining preconditions for such an operation exist. An asymmetrical pelvis resulting in obstructed labour is also an unsuitable indication for symphysiotomy. Likewise, suspicion that a child has a weight > 4500 g makes this operation less suitable. A general rule is that labour should have progressed so far that at least 1/3 of the head has passed the pelvic inlet. The presenting part should ideally be the head, in vertex presentation. Face presentation may be accepted though subsequent use of a vacuum extractor is thereby excluded. Symphysiotomy can be carried out in certain breech cases but only with an aftercoming head (Spencer 1987).

The speed with which the operation must be conducted in such cases necessitates an experienced surgeon. The urgency increases the risk of lesion of the bladder and urethra, particularly since the urethra in these cases cannot be moved digitally from the midline. As an alternative and complement to using forceps on the aftercoming head in breech presentation, symphysiotomy has thus been shown to be of value.

Kenneth Björklund, a Swedish researcher in our department, has currently made a comprehensive review of symphysiotomy practice with emphasis on the last century 1900-1999 (Björklund, unpublished). His findings are noteworthy. During the first half of the century, 41 maternal deaths were reported in 2,515 symphysiotomies (1.6%), sepsis being the main cause and 217 perinatal deaths (9.3%). During the second half of the century, three maternal deaths were reported in 1,929 symphysiotomies, (0.16%), two from eclampsia and one from pulmonary embolism after a complementary caesarean section, and there were 187 perinatal deaths (11.6%).

The outcomes of symphysiotomy and caesarean section were compared in ten studies. During the first half of the century, six studies comprising 490 symphysiotomies and 636 caesarean sections showed 2% maternal and 6.1% perinatal deaths with symphysiotomy, compared to 7.7% maternal and 4.1% perinatal deaths with caesarean section. During the second half of the century, four studies comprising 307 symphysiotomies and 571 caesarean sections showed 0.3% maternal and 12% perinatal deaths with symphysiotomy, compared to 1.8% maternal and 11.6% perinatal deaths with caesarean section. The need for blood transfusions was analysed in a study comprising 210 patients with cephalopelvic disproportion (CPD). In the symphysiotomy group (n=105), eight patients received a blood transfusion (all 1000 ml), compared to 19 patients in the caesarean section group (n=105) (average 1050 ml, range 500 - 2000 ml).

Obstetric fistulae were reported in 26 cases during the first half of the century (1.3%), as compared to 34 cases (1.8%) during the second half, in the main analysis comprising 4,500 cases (percent figures adjusted for missing data). One third of the fistulae were reported as caused by pressure necrosis in the second half of the century. In some cases the fistulae were caused by accidental incision of the bladder or urethra, especially when a urinary catheter was not used. Traumatic forceps delivery preceded the fistulation in a number of cases. In a separate analysis of small series 1902-1985 (twelve papers), seven obstetric fistulae were reported in 131 symphysiotomies (5.3%).

Symphysiotomy was extensively used, reported and analysed during the twentieth century. The findings of Björklund's review indicate that a reappraisal of the position of symphysiotomy is needed in view of the enormous loss of life and the morbidity associated with obstructed labour in today's world.

The aim of a correctly conducted symphysiotomy is to achieve a separation of the symphysis pubis of about 2.5 cm (approximately equivalent to the width of a thumb), thereby increasing the surface area of the pelvic inlet by approximately 20-25%. If no progress occurs despite this increase a more advanced disproportion is probable. Successful vaginal delivery is unlikely and CS will be the only alternative.

Complications are few. The review quoted indicates that symphysiotomy is associated with almost negligible mortality. Postoperative stress incontinence may occur in a few percent of operated cases.

Fistulae at the urethrovaginal or vesicovaginal level rarely occur when symphysiotomy has been correctly carried out. In the review by Björklund 13 references are quoted 1902-1904 comprising 138 symphysiotomies, among which there were seven (5.1%) fistulae after symphysiotomy. As already mentioned, episiotomy is a good prophylaxis. If a fistula is caused by the symphysiotomy itself the chances of its healing are good using only an indwelling catheter since the tissues are not devitalised in the same way as when the fistulation is caused by fetal pressure on the birth canal.

Postoperative difficulty in walking may be caused by some pain and discomfort. According to reports published, difficulty in walking is rare more than 2 months after symphysiotomy. Back pain post-partum seems to be more common after CS than after symphysiotomy. Back pains are probably connected to overstretching of the sacro-iliac joints. This can be prevented by employing a strict upper abduction limit of the hip joints during the operation and by adducting the knees between symphysiotomy and the delivery proper.

In most cases, a symphysiotomy is considered to enlarge the pelvic inlet permanently and subsequent deliveries are usually easier. The cut in the cartilage joint normally heals with a fibrous tissue, which is considered to be stronger than the original cartilage tissue. A symphysiotomy can, however, be carried out even if the urethra lies adherent to the rear of the area being operated on. The urethra will, however, be particularly vulnerable in a subsequent symphysiotomy. In certain cases an ossification of parts of the symphysis pubis joint can also be seen. This can render a renewed symphysiotomy

more difficult.

Vacuum extraction

Instrumental vaginal extraction of the baby, in cephalic presentation, may be undertaken by use of either forceps or vacuum extractor. Safe use of obstetric forceps requires considerable experience from obstetric operations in general and from use of the instrument itself. Most obstetricians consider that forceps should be used solely by obstetrically trained doctors. During their obstetric training the use of this important instrument should be taught and practised. The risks of maternal damage are high if the forceps is used by inexperienced staff, and this cannot be recommended.

The vacuum extractor (VE) has several features especially advantageous in labour wards in the developing world. Correctly utilized, the disadvantages are few (Johansson & Menon 2000). It can be used without hurting the mother and, if correctly applied, does not create disproportion or interfere with the normal mechanism of internal rotation. Unlike obstetric forceps, it does not occupy the vital space between the head of the fetus and the wall of the birth canal.

The fact that the VE is easy to use without hurting the mother may also lead to misuse. Misuse often results in failure, sometimes seriously injuring or killing the baby and discredits the method as it is blamed for the bad results.

Misuse of VE must be avoided and the four principal indications respected:

1. *delay in the pelvic floor phase.* The head has been on or just above the pelvic floor for 60 minutes with full cervical dilatation.
2. *foetal asphyxia.* Vacuum extraction is not too slow if the instrument is already assembled and the operating vacuum induced rapidly. A prerequisite is that there is no access to rapid CS and that the foetal head is at least at the spinal level. Symphysiotomy should be considered as an adjunct measure.
3. *maternal distress.* For termination of the second stage in the case of physical distress, or if an emotionally distressed mother does not respond to customary management.
4. *extraction of second twin with asphyxia.* Foetal distress in the second twin with cephalic presentation should be managed by VE, also if the head is above the spines. Deflection must be avoided at any price and difficulties in positioning the cup motivate internal version and podalic extraction rather

than VE.

All presentations other than cephalic ones are incompatible with the use of VE. Some cephalic positions such as face and brow presentations are also counterindications. It is possible to correct some cephalic deflection positions by positioning the cup close to the small fontanel.

There is wide agreement that VE is safe for the mother (Johanson & Menon 2000). Any complications which may occur in cases where VE has been applied can rarely be attributed to VE itself, provided the indications are observed and the safety rules respected. Vacuum extraction is no substitute for caesarean section. When the latter is not available, however, and it is deemed prudent symphysiotomy should be performed according to good symphysiotomy practice and in combination with careful vacuum extraction. This method will save innumerable lives.

Conclusion

Each era and each setting have their specific demands on “appropriateness” of obstetric technologies. The field is vast indeed and is ready to be invaded by scientists with the intention to strengthen the evidence against and in favour of certain interventions, which have been described above. One of the most important fields to elucidate is obstructed labour in rural areas. There is little room for condemnation of methods like symphysiotomy until we know more about its advantages and disadvantages in relation to CS in controlled, randomised trials. It is obvious that even in affluent settings obstetric practice does not always follow evidence-based rules. There is a much perceived need of scientific rigour in the field of appropriate obstetric technologies. Obstructed labour is one particularly good example in this regard.

References

- Anonymous (1995) which anticonvulsant for women with eclampsia? Evidence rather Collaborative Eclampsia Trial. *Lancet*, June 10, **345**,1455-63.
- Armon PJ, Philip M (1978). Symphysiotomy and subsequent pregnancy in the Kilimanjaro region of Tanzania. *East African Medical Journal* **55**, 306-313.
- Bergström S, Höjer B, Liljestrand J, Tunell R (1994). Perinatal health care with limited resources. MacMillan, Basingstoke.
- Bergström S, Libombo A (1995). Low birthweight and post partum endometritis-myometritis. A case-referent study. *Acta Obstetrica et Gynecologica Scandinavica* **74**, 611-613.
- Bird GC, Bal JS (1967). Subcutaneous symphysiotomy in association with a vacuum extractor. *The Journal of Obstetrics and Gynaecology of the British Commonwealth* **74**,266-269.
- Bird GC, Bal SJ (1966). The vacuum extractor in association with symphysiotomy at a provincial hospital in Kenya. A report on 150 cases. *East African Medical Journal* **43**,51-61.
- Björklund K, Kimaro M, Urassa E, Lindmark G (2000). Introduction of the Misgav Ladach caesarean section at an African tertiary Centre. A randomised controlled trial. *British Journal of Obstetrics and Gynaecology* **107**,209-16.
- Brabin BJ (1991). The risks and severity of malaria in pregnant women. WHO/TDR: Applied field research in malaria reports, no. 1.
- Bugalho A, Bique C, Machungo F, Bergström S (1995). A comparative study of vaginal misoprostol and intravenous oxytocin for induction of labour. *Gynecological and Obstetric Investigation* **39**,252-256.
- Bullough CH, Msuku RS, Karonde L (1989). Early suckling and postpartum haemorrhage: controlled trial in deliveries by traditional birth attendants. *Lancet*, Sept 2 **2**,522-5.
- de Groot AN (1996). The role of oral (methyl) ergometrine in the prevention of postpartum haemorrhage. *European Journal of Obstetrics and Gynaecology and Reproductive Biology*. **69**,31-6.
- Dujardin B, De Champheleire I, Sene H, Ndiaye F (1992). Value of alert and action lines on the partogram. *Lancet* **339**,1336-1338.
- Gordon YB (1969). An analysis of symphysiotomy at Baragwanath Hospital 1964-1967. *South African Medical Journal* May **24**,659-662.

- Granja AC, Machungo F, Gomes A, Bergström S, Brabin B (1998). Malaria-related maternal mortality in Mozambique. *Annals of Tropical Medicine and Parasitology* **92**, 257-263.
- Hartfield VJ (1973). A comparison of the early and late effects of subcutaneous symphysiotomy and of lower segment caesarean section. *The Journal of Obstetrics and Gynaecology of the British Commonwealth* **80**,508-514.
- Hood DD (1988). Anaesthesia for caesarean section: minimizing risk and complications. *Obstetrical and Gynaecological Clinics of North America* **15**,639-55.
- Johansson RB, Menon BK (2000). Vacuum extraction versus forceps for assisted vaginal delivery. Cochrane Database Systematic Reviews CD 000224.
- Keogh J, Tsokos N (1997). Aortic compression in massive postpartum haemorrhage - an old but life-saving technique. *Aust N Z J Obstet Gynaecol* **37**,237-8.
- Kinsella SM, Whitwam JG, Spencer JA (1990). Aortic compression by the uterus: identification with a Finapres digital arterial pressure instrument. *Br J Obstet Gynaecol* **97**,700-5.
- Lasbrey AH (1963). The symptomatic sequelae of symphysiotomy. *South African Journal of Medicine* March 2, 231-234.
- Lavender T, Alfirevic Z, Walkinshaw S (1998). Partogram action line study: a randomised trial. *British Journal of Obstetrics and Gynaecology* **105**,976-80.
- Lennox C (1981). The cervicograph in labour management in the highland of Papua New Guinea. *Papua New Guinea Medical Journal* **24**,286-293.
- Libombo A, Folgosa E, Bergström S (1994). Risk factors in puerperal endometritis-myometritis. An incident case-referent study. *Gynecological and Obstetric Investigation* **38**,198-205.
- Moir DD (1986). Local anaesthetic techniques in obstetrics. *British Journal of Anaesthesiology* **58**,747-59.
- Nadisauskiene R, Bergström S, Kilda A (1996). Ampicillin in the treatment of pre-term labour: a randomized, placebo-controlled study. *Gynecol Obstet Invest* **41**, 89-92.
- Norman RJ (1978). Six years' experience of symphysiotomy in a teaching hospital. *South African Medical Journal* December 30,1121-1125
- Prendiville WJ, Elbourne D, MacDonald S (1999). Active versus expectant management of the third stage of labour (Cochrane Review). In: The Cochrane Library Issue 1, 1999. Oxford: Update Software.

- Riley DP, Burgess RW (1994). External abdominal aortic compression: a study of a resuscitation manoeuvre for postpartum haemorrhage. *Anaesth Intensive Care* **22**, 571-5.
- Rouse DJ, Hauth JC, Andrews WW, Mills BB, Maher JE (1997). Chlorhexidine vaginal irrigation for the prevention of peripartur infection: a placebo-controlled randomized clinical trial. *American Journal of Obstetrics and Gynecology* **176**,617-22.
- Seedat EK, Crichton D (1962). Symphysiotomy. Technique, indications and limitations. *Lancet* March 17,554-559.
- Spencer J (1987). Symphysiotomy for vaginal breech delivery; two case reports. *British Journal of Obstetrics and Gynaecology* **94**,716-718.
- Stray-Pedersen B, Bergan T, Hafstad A, Normann E, Groggaard J, Vangdal M (1999). Vaginal disinfection with chlorhexidine during childbirth. *International Journal of Antimicrobial Agents* **12**,245-51.
- Tay SK, Yong TT (1996). Visual effect of partogram designs on the management and outcome of labour. *Australia and New Zealand Journal of Obstetrics and Gynaecology* **36**,395-400.
- Wacker J, Kyelem D, Bastert G, Gutz B, Lankoande J (1998). Introduction of a simplified round partogram in rural maternity units: Seno province, Burkina Faso, West Africa. *Tropical Doctor* **28**,146-52.
- Walraven G (1994). WHO partograph. *Lancet* **344**,617.
- van Roosmalen J (1987). Symphysiotomy as an alternative to caesarean section. *International Journal of Gynaecology and Obstetrics* **25**,451-458.
- van Roosmalen J (1990). Safe Motherhood: Caesarean section of symphysiotomy? *American Journal of Obstetrics and Gynecology* **163**,1-4.
- Vaz F, Bergström S, Vaz ML, Langa J, Bugalho A (1999). Training of medical assistants for surgery. *Bulletin of the WHO* **77**,688-91.
- Verhoeff FH, Brabin BJ, Chimsuku L, Kazembe P, Russel WB, Broadhead RL (1998). An evaluation of the effects of intermittent sulfadoxine-pyrimethamine treatment in pregnancy on parasite clearance and risk of low birthweight in rural Malawi. *Ann Trop Med Parasitol* **92**,41-50.
- Vimerkati A, Greco P, Kardashi *et al.* (2000). Choice of caesarean section and perception of legal pressure. *Journal of Perinatal Medicine* **28**,111-7.
- World Health Organization. World Health Organization partograph in management of labour. *Lancet* **343**,1399-1404.

Over-medicalisation of Maternal Care in Developing Countries

Pierre Buekens¹

Summary

We reviewed available data on the frequency of obstetrical interventions (C. sections, episiotomies, and oxytocics) in developing countries. Rates of C. sections are increasing and are higher than 15% in a majority of Latin American countries and in some regions of Asia. There is no indication of rising rates of C. sections in Africa, but rates are already higher than 5% in many urban areas of East and Southern Africa. The situation is different in West Africa, where only Ghana has a rate higher than 5% in urban areas.

High episiotomy rates have been reported in Africa and Latin America. Hospitals in Argentina and Nigeria have episiotomy rates higher than 80% among primiparae. A 37% episiotomy rate among primiparae was reported in Burkina Faso.

High rates of use of oxytocin during the first and second stage of labor have also been observed in Africa. In three African urban areas, oxytocin was used in more than 20% of deliveries.

We conclude that the epidemic of C. sections continues in Latin America and extends into Asia. In addition, there are signs of a worldwide epidemic of other obstetrical interventions. There is an urgent need to build strong strategies to promote evidence-based interventions.

Introduction

Developing countries, as other regions of the world, are faced to the challenge of making the best use possible of limited resources to improve the health of women and children. Obstetrical interventions should be evidence-based, and interventions effective only in high-risk groups should not be used routinely. Morbidity and mortality caused by unnecessary interventions could be a significant problem, and a world-wide epidemic of obstetrical interventions could have a serious negative health impact. However, it is unclear if such a world-wide epidemic exists, because studies have generally been focused on one country or region. Our objective is to review available

¹ Professor at the School of Public Health, the University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-7400, USA. Email: Pierre_Buekens@UNC.EDU.

data on the frequency of obstetrical interventions in all regions of the developing world. We will focus this review on three interventions: Caesarean sections (C. sections), episiotomies, and oxytocics. We will also discuss potential strategies to decrease the use of unnecessary interventions.

C-sections

The World Health Organization recommends that rates of C. sections should not be higher than 15% (WHO 1985). However, rates higher than 5% are not justified by well established maternal medical indications (De Brouwere 1997).

It is well documented that C. section rates are very high in many Latin American countries. Belizán *et al.* (1999) estimated that twelve of the nineteen Latin American countries they examined had caesarean section rates above 15%. They calculated that around 850,000 unnecessary caesarean sections are performed each year in the Latin American region. A paper commenting Belizán's data suggested that a world-wide epidemic of C. sections might be going on (Flamm 2000). Data from Asia indeed suggest that the epidemic is not limited to Latin America. In one Chinese hospital, the C. section rate increased from 11.0% in 1990 to 29.9% in 1997 (Wu 2000). A population-based survey conducted in Shanghai, China, showed that C. section rates increased from 4.7% in 1960-1979 to 22.5 % in 1988-1993 (Cai *et al.* 1998). In Thailand, C. section rates increased from 15% in 1990 to 22% in 1996 (Saropala & Suthutvoravut 1999). A 1997 population-based survey from an affluent section of Chennai, India, found a C.section rate of 45% (Pai *et al.* 1999). Household surveys from rural Kerala, India, showed that C.section rates increased from 11.9% in 1987 to 21.4% in 1996 (Thankappan 1999). A hospital-based study performed in one city in Kerala found a 10% C. section rate in government hospitals compared to 30% in private hospitals (Thankappan 1999).

To further explore this issue, we have performed an on-line distance analysis of Demographic and Health Surveys (2000). For each survey for which data were available, we have calculated urban and rural C. section rates for deliveries that occurred during the three years preceding the interviews. The results (Table 1) confirm that rates are higher than 15% in most Latin American urban areas, and are increasing. They also show that urban rates are higher than 5% in the Asian countries for which data were available. No urban area in Africa has rates higher than 15%. However, many countries from East and Southern Africa had C. section rates higher than

5% in urban areas. The situation is clearly different in West Africa, where only Ghana has a rate higher than 5% in urban areas. In several African countries, data are available for two time periods. Urban rates increased very slightly in Niger, Madagascar, and Tanzania, but decreased in Burkina Faso, Ghana, Kenya, and Zambia. There is thus no indication of a rapid epidemic of C. sections in Africa.

Table 1. Percentages of live births with C. section in the last three years preceding the survey

Region	Country	Year	Urban C. section rates (%)	Rural C. section rates (%)
Middle East	Jordan	1990	6.9	4.5
		1997	12.6	6.1
	Yemen	1991	2.9	0.7
North Africa	Egypt	1992	10.1	2.5
		1995	12.0	4.9
	Morocco	1992	4.5	1.1
West Africa	Benin	1996	4.1	1.3
	Burkina Faso	1992	4.5	0.7
		1999	2.3	1.1
	Cameroon	1991	3.4	1.8
	Central African Republic	1994	2.3	1.6
	Chad	1997	1.1	0.1
	Ghana	1993	9.0	2.8
		1998	8.5	2.5
	Guinea	1999	4.0	1.5
	Ivory Coast	1994	3.2	1.0
	Mali	1996	1.6	0.6
	Nigeria	1990	3.1	2.4
	Niger	1992	2.0	0.6
		1998	2.1	0.3
Senegal	1993	3.6	1.7	
Togo	1998	4.6	1.2	
East Africa	Comoros	1996	9.2	4.1
	Kenya	1993	13.4	4.3
		1998	10.5	6.0
	Madagascar	1992	1.5	0.8
		1997	2.2	0.3
	Malawi	1992	7.3	2.9
Rwanda	1992	4.6	1.7	

Region	Country	Year	Urban C. section rates (%)	Rural C. section rates (%)
Southern Africa	Tanzania	1992	4.5	2.1
		1996	4.7	1.6
	Uganda	1995	6.5	2.0
	Mozambique	1997	7.3	1.4
	Namibia	1992	9.8	5.5
	Zambia	1992	4.2	1.4
South East Asia		1996	3.5	0.8
	Zimbabwe	1994	7.0	4.6
	Indonesia	1991	2.2	0.9
Indian Sub-continent		1994	5.2	1.9
		1997	6.1	3.5
	Philippines	1993	8.3	4.6
		1998	9.8	3.0
	Vietnam	1997	12.2	2.0
	India	1992	5.7	1.6
Caribbean	Nepal	1996	5.4	0.7
	Dominican Republic	1991	26.7	15.2
		1996	31.4	20.3
Central America	Haiti	1994	3.9	0.4
	Guatemala	1995	17.1	4.1
South America	Nicaragua	1997	21.6	10.3
	Bolivia	1994	14.8	5.9
		1997	21.4	6.0
	Brazil	1991	28.1	9.4
		1996	41.6	21.4
	Colombia	1990	18.6	8.7
		1995	22.0	10.1
	Peru	1992	14.7	3.1
		1996	14.3	2.7
	Paraguay	1990	21.8	8.3

Sources: *Demographic and Health Surveys (2000)* and *International Institute for Population Sciences (1995)*

Very low rates of C. sections are also a matter of concern. Rates lower than 1% indicate a lack of access to obstetrical care and a risk of maternal death (De Brouwere 1997). Others have suggested that C. section rates should not be lower than 3% (Cisse *et al.* 1998). The most recent data from

Table 1 show that C. section rates were lower than 1% in rural areas in Chad, Mali, Niger, Madagascar, Zambia, Nepal, and Haiti. Data from two time periods were available for Niger, Madagascar, and Zambia. Sadly, C. section rates decreased in rural areas in each of these three countries, suggesting that access to C. sections is worsening in the poorest areas of Africa.

One might wonder if it is possible to increase rates of C. sections in rural areas without overly increasing the rates in urban areas. A few examples suggest that it might be possible to do so. In Burkina Faso, rural C. section rates increased from 0.7% in 1992 to 1.1% in 1999, while urban rates decreased from 4.5% to 2.3%. In Kenya, rural C section rates increased from 4.3% in 1993 to 6.0% in 1998, while urban rates decreased from 13.4% to 10.5%. However, in many other countries, an increase in rural rates was paralleled by an increase in urban rates.

Episiotomies

Episiotomy has been practised with increasing frequency within recent years without strong scientific evidence of its effectiveness. A systematic review of six randomized controlled trials comparing the possible beneficial and harmful effects of selective versus routine use of episiotomy has been recently published (Carroli & Belizán 2000). The selective use of episiotomy shows a lower risk of clinically relevant morbidity including posterior perineal trauma (Relative Risk (RR) 0.88, 95% Confidence Interval (CI) 0.84 to 0.92), a reduced need for suturing perineal trauma (RR 0.74, 95% CI 0.71 to 0.77), and fewer healing complications at seven days (RR 0.69, 95% CI 0.56 to 0.85). The only disadvantage shown in the selective use of episiotomy is an increased risk of anterior perineal trauma (RR 1.79, 95% CI 1.55 to 2.07). There was no difference in the incidence of major complications, such as severe vaginal or perineal trauma nor in pain, dyspareunia or urinary incontinence. There is clear evidence to recommend a selective use of episiotomy.

A recent Editorial of the British Medical Journal strongly advocated the need to decrease the use of routine episiotomies in developing countries (Maduma-Butshe *et al.* 1998). The authors polled 10 midwives from Ghana, Kenya, Malawi, Nepal, Nigeria, and Zambia, attending courses in Liverpool, England. Most respondents indicated that health professionals perform episiotomies routinely on primiparae to prevent third degree perineal tears. Maduma-Butshe *et al.* (1998) also cited a study from Botswana, where one in three mothers having a normal delivery had episiotomy. A study from Burkina Faso reported an episiotomy rate of 37% among primiparae (Lorenz *et al.*

1998). The rate was 46% among primiparae when trained midwives attended the delivery and of 26% among primiparae delivered by auxiliary midwives. A study of all vaginal deliveries performed in 1997 and 1998 at the University of Benin Teaching Hospital, Benin City, Nigeria found episiotomy rates of 46.6% among all deliveries, and of 87.4% among primiparae (Otoide *et al.* 2000).

High frequencies of episiotomies have been reported in Latin America. Several studies from Argentina showed that episiotomy is routinely performed among primiparae. Eight hospitals from the City of Rosario participated in a randomized controlled trial comparing routine and selective use of episiotomies (Argentine episiotomy Trial Collaborative Group 1993). The episiotomy rate among primiparae was 90.7% in the four control hospitals, compared to 39.5% in the four intervention hospitals. A follow up study performed in one of the intervention hospitals showed that the rate of episiotomies among primiparae increased again after the end of the trial, and reached 65.3% in 1996 (Belizán *et al.* 1998). Another Argentine study showed that in the Province of Nequen, the episiotomy rate was 45.9% among all vaginal births, with hospital rates ranging from 33.4% to 62.5% (Cravichik *et al.* 1998). Hospital rates of episiotomies among primiparae ranged from 81.5% to 96.0%, and differences among hospitals were not statistically significant.

The situation might be different in other countries, regions, or hospitals. Women interviewed in a population-based maternal morbidity study from southern India reported that an episiotomy was performed in 9% of deliveries (Bhatia 1995). An episiotomy rate lower than 1% has been reported in a small secondary care facility in Jamaica (Doherty & Cohen 1993). However, a study from the University Hospital of the West Indies showed overall episiotomy rates of 31.5% among low birth weight infants delivered vaginally (The 1990).

Oxytocics

The use of oxytocics is part of the package of basic emergency obstetrical care recommended by international agencies (Donnay 2000). There is very strong evidence in favor of injecting oxytocics routinely during the third stage of labor. A systematic review of four trials that compared active management (including injection of oxytocics) of third stage to expectant management showed that routine active management is superior to expectant management in terms of blood loss, post-partum haemorrhage (RR 0.35 95% CI

0.28-0.42), severe post-partum haemorrhage (RR 0.37 95% CI 0.23-0.61), the need of blood transfusion during the puerperium (RR 0.34 95% CI 0.22-0.54) and postpartum anaemia (RR 0.40 95% CI 0.29-0.55) (Prendiville *et al.* 2000).

Table 2. Use of oxytocics in developing countries

Country (city)	Year	Reference	Oxytocin during 1 st and/ or 2 nd stage of labor (%)	Oxytocics during 3 rd stage of labor or postpartum (%)
Jamaica (Parish A)	1986-1987	Escoffery <i>et al.</i> 1994	14.9	90.4
Jamaica (Parish B1)	1986-1987	Escoffery <i>et al.</i> 1994	11.4	85.2
Jamaica (Parish B2)	1986-1987	Escoffery <i>et al.</i> 1994	10.8	82.5
Jamaica (Parish C)	1986-1987	Escoffery <i>et al.</i> 1994	5.6	80.7
Benin (Abomey)	1990-1991	Dujardin <i>et al.</i> 1995	16.1	NA
Benin (Porto Novo)	1990-1991	Dujardin <i>et al.</i> 1995	24.2	NA
Congo (Loubomo)	1990-1991	Dujardin <i>et al.</i> 1995	5.7	NA
Senegal (Pikine)	1990-1991	Dujardin <i>et al.</i> 1995	10.9	NA
Ivory Coast (Abidjan)	1994-1996	Bouvier-Colle <i>et al.</i> 1998	13.4	35.7
Mali (Bamako)	1994-1996	Bouvier-Colle <i>et al.</i> 1998	26.1	5.7
Niger (Niamey)	1994-1996	Bouvier-Colle <i>et al.</i> 1998	5.7	12.5
Mauritania (Nouakchott)	1994-1996	Bouvier-Colle <i>et al.</i> 1998	13.0	29.3
Burkina Faso (Ouagadougou)	1994-1996	Bouvier-Colle <i>et al.</i> 1998	10.5	23.3
Senegal (St Louis)	1994-1996	Bouvier-Colle <i>et al.</i> 1998	32.9	63.1
Senegal (Kaolack)	1994-1996	Bouvier-Colle <i>et al.</i> 1998	2.5	48.1
Nepal (Kathmandu)	1995-1996	Ellis <i>et al.</i> , 2000	31.1	NA

NA denotes data not available.

How frequently oxytocin needs to be used during the first and second stages of labor is a far more controversial issue. Oxytocin is used both to induce and to augment labor. The administration of excessive doses of oxytocin may cause hyper-stimulation and even uterine contracture (Dujardin *et*

al. 1995). The risk is probably higher in developing countries where the drug is often administered by intra-muscular injection, or without a pump controlling the speed of intravenous infusion. Studies from West Africa and Nepal suggest an increased risk of foetal distress and neonatal morbidity associated with the use of oxytocin during labor (Dujardin *et al.* 1995, Ellis *et al.* 2000).

Data on the use of oxytocics are very limited. However, Table 2 shows large variations of frequencies of use of oxytocin during first and second stage of labor. Interestingly enough, the two extreme values of the distribution were observed in Senegal, with a frequency of 2.5% in Kaolack and of 32.9% in St Louis. The table also shows that active management of the third stage of labor was far more common in Jamaica than in West Africa.

Strategies to decrease the use of unnecessary interventions

Health authorities, agencies, and consumers could all play a role in changing birth practices. However, change will probably not be possible without a very pro-active strategy targeting birth attendants themselves. Many methods to change medical behavior have been used in industrialized countries. A comprehensive review by Oxman *et al.* (1995) examined 102 studies of improving physician practices and concluded that there are no "magic bullets." They suggest that the best approach is to combine several strategies, such as local opinion leaders, workshops, outreach visits (academic detailing), reminders, and audit and feedback.

Several randomized controlled trials have been performed in North America and Europe to evaluate strategies to change behaviors of birth attendants (Lomas *et al.* 1991, Hodnett *et al.* 1996, Wyatt *et al.* 1998, Leviton *et al.* 1999). For example, Lomas *et al.* (1991) conducted a trial in Canada with 76 physicians, to test 3 interventions to increase the number of vaginal births after C. section. The interventions compared were 1) distribution of educational materials, 2) local opinion leaders + distribution of educational materials and 3) audit and feedback + distribution of educational materials. The use of opinion leaders was significantly more effective than audit and feedback and than educational materials alone in increasing the number of women offered a trial of labor and increasing the number of vaginal births.

Unfortunately, very few trials of a similar nature have been performed in developing countries, and they were not focused on birth practices (Ross-Degnan *et al.* 1996, Santoso 1996). There is an urgent need to perform ran-

domized controlled trials to evaluate strategies to change birth practices in developing countries.

Discussion and conclusions

We have found high frequencies of obstetrical interventions in every region of the developing world. There is an ongoing epidemic of C. sections in Asia and Latin America. There is no indication of rising rates of C. sections in Africa, but rates are already high in many countries of East and Southern Africa.

The low rates of C. sections observed in many West African countries might reflect a lack of resources more than a consensus of birth attendants. Episiotomies and oxytocics are used very often in African countries having low C. section rates. This suggests that many birth attendants favor frequent use of interventions. Better availability of operating theaters in such countries could thus trigger the same epidemic of C. sections as the one observed elsewhere. Better availability of operating theaters is of course urgently needed, but should, in our opinion, be accompanied by the promotion of evidence-based practices. This should not be limited to appropriate use of C. sections, episiotomies, and oxytocics. Many other interventions might be overused, even though data are not available to study trends in their use. There is a need for in depth studies on the use of interventions such as perineal shaving, enema, and vacuum and forceps extraction.

We conclude that there is indeed a world-wide epidemic of obstetrical interventions, and that countries that have not observed such epidemic yet will probably face it soon. This should by no mean slow down our efforts to provide better access to obstetrical care. However, it should encourage us to build stronger strategies to promote evidence-based interventions.

References

- Argentine Episiotomy Trial Collaborative Group (1993). Routine versus selective episiotomy: a randomised controlled trial. *Lancet* **342**,1517-1518.
- Belizan JM, Caroli G (1998). Routine episiotomy should be abandoned. *British Medical Journal* **317**,1389.
- Belizan JM, Althabe F, Barros F, Alexander S (1999). Rates and implications of caesarean sections in Latin America: Ecological study. *British Medical Journal* **319**, 1397-1402.
- Bhatia JC (1995). Levels and determinants of maternal morbidity: results from a community-based study in southern India. *International Journal of Gynecology and Obstetrics* **50**(Suppl. 2),S153-S163.
- Bouvier-Colle MH, Prual A, Bernis A et al.(1998). *Morbidité maternelle en Afrique de l'Ouest*. Ministère des Affaires Etrangères - Coopération et Francophonie, Paris, France, pp.1-116.
- Cai WW, Marks JS, Chen CH, Zhuang YX, Morris L, Harris JR (1998). Increased cesarean section rates and emerging patterns of health insurance in Shanghai, China. *American Journal of Public Health* **88**,777-780.
- Caroli G & Belizán J (2000). Episiotomy for vaginal birth (Cochrane Review). In: *The Cochrane Library*, Issue 2. Update Software, Oxford, England.
- Cisse CT, Faye EO, de Bernis L, Dujardin B, Diadhiou F (1998). Césariennes au Sénégal: couverture des besoins et qualité des services. *Santé* **8**,369-377.
- Cravchik S, Munoz D, Bortman M (1998). Indicaciones de episiotomia en maternidades publicas de Neuquen, Argentina. *Revista Panamericana de Salud Publica* **4**,26-31.
- De Brouwere V (1997). *Les besoins obstétricaux non couverts*. Thèse. Université Catholique de Louvain, Brussels, Belgium, pp. 1-225.
- Demographic and Health Survey (2000) August 16.
- Doherty P & Cohen I (1993). Spontaneous vaginal deliveries and perineal trauma in Lucea, Jamaica. *Journal of the Louisiana State Medical Society* **145**,531-533.
- Donnay F. Maternal survival in developing countries: what has been done, what can be achieved in the next decade. *International Journal of Gynecology and Obstetrics* **70**, 89-97.
- Dujardin B, Boutsen M, De Schamphelreire I, Kulker R, Manshande JP, Bailey J, Wollast E, Buekens P (1995). Oxytocics in developing countries. *International Journal of Obstetrics and Gynecology* **50**,243-251.

- Ellis M, Manandhar N, Manandhar D, Costello A (2000). Risk factors for neonatal encephalopathy in Kathmandu, Nepal, a developing country: unmatched case-control study. *British Medical Journal* **320**,1229-1236.
- Escoffery C, Greenwood R, Ashley D, Coard K, Keeling J, Golding J (1994). Deaths associated with intrapartum asphyxia in Jamaica. *Paediatric Perinatal Epidemiology* **8**(suppl 1),119-142.
- Flamm BL (2000). Cesarean section: A worldwide epidemic? *Birth* **27**, 139-140.
- Hodnett ED, Kaufmann K, O'Brien-Pallas L, Chipman M, Watson-MacDonell J, Hunsberger W (1996). A strategy to promote research-based nursing care: effects on childbirth outcomes. *Research in Nursing & Health* **19**,13-20.
- International Institute for Population Sciences (1995). *National Family Health Survey, India 1992-93*. International Institute for Population Sciences, Bombay, India, p. 244.
- Leviton LC, Goldenberg RL, Baker CS, *et al.* (1999). Methods to encourage the use of antenatal corticosteroid therapy for fetal maturation: a randomized controlled trial. *JAMA* **28**,46-52.
- Lomas J, Enkin M, Anderson G, Hannah W, Vayda E, Singer J (1991). Opinion leaders vs. audit and feedback to implement practice guidelines. *JAMA* **265**,2202-2207.
- Lorenz N, Nougara A, Garner P (1998). Episiotomy in Burkina Faso. *Tropical Doctor* **28**, 83-85.
- Maduma-Butshe A, Dyall A, Garner P (1998). Routine episiotomy in developing countries; Time to change a harmful practice. *British Medical Journal* **316**,1179-1180.
- Otoide VO, Ogbonmwan SM, Okonofua FE (2000). Episiotomy in Nigeria. *International Journal of Gynecology and Obstetrics* **68**,13-17.
- Oxman AD, Thomson MA, Davis DA, Haynes RB (1995). No magic bullets: a systematic review of 102 trials of interventions to help health care professionals deliver services more effectively or efficiently. *Canadian Medical Association Journal* **153**,1423-1431.
- Pai M, Sundaram P, Radhakrishnan KK, Thomas K, Muliylil JP (1999). A high rate of Caesarean sections in an affluent section of Chennai: Is it cause for concern? *The National Medical Journal of India* **12**,156-158.
- Prendiville WJ, Elbourne D, McDonald S (2000). Active versus expectant management in the third stage of labour (Cochrane Review). In: *The Cochrane Library*, Issue 2. Update Software, Oxford, England.

- Ross-Degnan D, Soumerai S, Goel PK *et al.* (1996). The impact of face-to-face educational outreach on diarrhoea treatment in pharmacies. *Health Policy and Planning* **11**,308-318.
- Santoso B, Suryawati S, Prawaitasari JE (1996). Small group intervention vs formal seminar for improving appropriate drug use. *Social Sciences and Medicine* **42**,1163-1168.
- Saropala N & Suthutvoravut S (1999). The outcome of the first VBAC program in Thailand. *International Journal of Obstetrics and Gynecology* **64**,307-308.
- Thankappan KR (1999). Caesarean section deliveries on the rise in Kerala. *The National Medical Journal of India* **12**,297.
- The T (1990). Is routine episiotomy beneficial in the low birth weight delivery? *International Journal of Gynecology and Obstetrics* **31**,145-140.
- World Health Organization (1985). Appropriate technology for birth. *Lancet* **ii**,436-437.
- Wu W (2000). Cesarean delivery in Shantou, China: A retrospective analysis of 1922 women. *Birth* **27**,86-90.
- Wyatt JC, Paterson-Brown S, Johanson R, Altman DG, Bradburn MJ, Fisk NM (1998). Randomised trial of educational visits to enhance use of systematic reviews in 25 obstetric units. *British Medical Journal* **317**,041-1046.

What is the evidence for the role of audits to improve the quality of obstetric care

Carine Ronsmans¹

Summary

Medical or clinical audit has become an acquired concept in the context of obstetric and other health care in industrialised countries, but experience in developing countries is scant. In this paper, I will introduce some important concepts and principal methods of audit by examining some of the best known examples of audits in the context of obstetric care. These examples include approaches that aim at assessing and improving obstetric care at national level such as the Confidential Enquiries into Maternal Deaths, as well as facility-based methods such as case note reviews and criterion-based audits. Lessons are drawn for application to developing countries, and examples of audit experiences in developing countries are presented. Finally, the big, and as yet unanswered question of whether audit can improve care, let alone obstetric care, is addressed briefly.

Introduction

In recent years, audit has become an acquired concept in the context of health services, and medical or clinical audit is now an accepted part of routine practice in many hospitals in Western countries. There is still much confusion as to what the word audit actually means however. As Crombie *et al.* (1997, p2) state: "There are many approaches to audit, and almost as many views on how audit should be conducted as there are authors on the subject. The ultimate aim of audit, that it should lead to improvements in patient care, is perhaps the only aspect on which there is consensus" (Crombie *et al.* 1997). Audit, indeed, sets out to raise the quality of health care, and is in many ways similar to quality assurance or total quality management. Audit is about what is or ought to be the most essential concern of any health professional: to optimize clinical performance and provide the best possible services to patients.

¹ MD, Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine, London, UK. Email: Carine.Ronsmans@lshtm.ac.uk

It is not the intention of this paper to provide a comprehensive overview of the history of and approaches to audit, as many excellent overviews already exist (Crombie *et al.* 1997, Smith 1992, Lawrence & Schofield 1993). Instead, by using examples of applications of audit in the context of obstetric care, it will introduce some important concepts and principal methods of audit. Audit is not unique to obstetric care, but one of the oldest and highly influential examples of audit emerged from a desire to improve obstetric care. The Confidential Enquiries into Maternal Deaths, introduced as early as 1952 in the United Kingdom, are one of the first systematic initiatives to improve the quality of health care (Department of Health and Social Security 1982). This and other examples of audits of obstetric care will serve to illustrate the particular concerns that have surrounded obstetric care, and the efforts that have been made to improve it. Lessons will be drawn for application to developing countries, and examples of audit experiences in developing countries will be sought. Finally, the big, and as yet unanswered question of whether audit can improve care, let alone obstetric care, will be addressed briefly.

What is audit ?

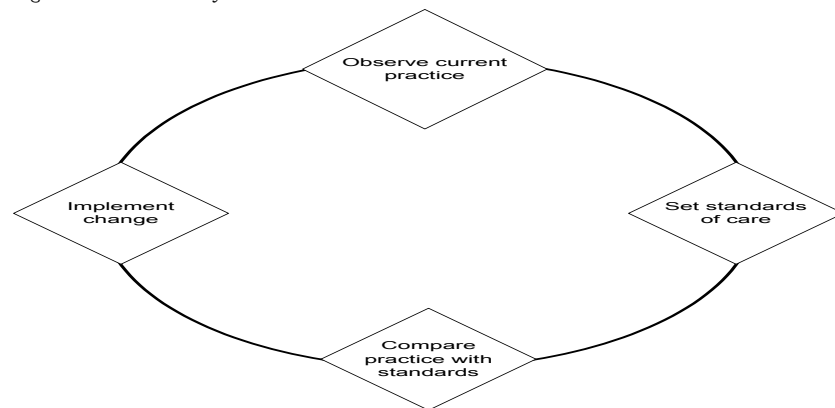
The principal aim of audit is to improve the quality of medical care. The most commonly quoted definition of audit is: "The systematic and critical analysis of the quality of medical care, including the procedures used for diagnosis and treatment, the use of resources and the resulting outcome and quality of life for the patient" (Crombie *et al.* 1997). This definition highlights two key features of the process of audit. First, audit involves a criticism of current practice. Second, audit is not restricted to the technical accuracy of diagnosis or treatment but also involves diverse issues such as for example the timeliness of interventions, the appropriateness of referral, the attitudes of staff, or the information given to the patient. Audit, in other words, crosses professional boundaries and doctors, nurses, social workers and administrators work side by side to improve the quality of care.

The audit process is generally represented in the form of a closed circle, called the audit cycle (figure 1). The natural starting point for the audit is to observe and review current practice. This can be done in a number of ways. The simplest form involves the review of a single case based on case notes, but audit may also encompass more complex data collection mechanisms such as the extraction of a large number of aggregate data from case notes, routine statistics, specially designed data collection forms or other sources.

There is no single best method, each method being suited to certain types of topic and to a particular context.

An important next step in the audit cycle is to set standards against which the practice can be compared, and examples of how standards have been set for obstetric care are reviewed below. The final steps of the cycle are to compare current practice to the standards, suggest solutions for the deficiencies identified and implement the changes to improve the delivery of care. Investigations that have been set up just to explore whether the care is adequate will in general not bring about change should the care prove not to be adequate (Crombie *et al.* 1997). The explicit search for solutions for deficiencies identified and the implementation of these solutions is a crucial, although often overlooked step, of the audit process.

Figure 1. The audit cycle



Topics of audit in obstetric care

In general, all three broad dimensions of health care (structure, process and outcome) can be audited. Structure refers to the question: 'what facilities, equipment, staff etc. were there', process implies 'what was done to the patient' and outcome questions 'what was the result for the patient in terms of mortality, morbidity or patient satisfaction'. The number of potential topics for audit is virtually unlimited and the choice will largely depend on the local relevance of and the extent to which the problem can be successfully tackled. Clinical concern is undoubtedly the most important factor as it is unlikely that the audit group will develop sufficient enthusiasm for topics that they

do not perceive as clinically relevant (Crombie *et al.* 1997).

Adverse outcomes, particularly mortality, have been the focus of obstetric audit for many years. One of the best known examples of audit, the Confidential Enquiries into Maternal Deaths, was primarily concerned with avoidable maternal mortality (Department of Health and Social Security 1982). The Confidential Enquiries, introduced in England in 1952, involve a systematic review of all maternal deaths and are aimed at identifying instances of unsatisfactory management in order to make recommendations for improvements in clinical care and service provision. The aggregate analysis is published at regular intervals (every three years in the United Kingdom) and includes an independent assessment of the nature of and the frequency with which substandard care was present. National or regional enquiries into maternal deaths have now been put into place in many countries, as are national or regional enquiries into stillbirths, neonatal or perinatal deaths (De Reu *et al.* 2000, Richardus *et al.* 1997, Bouvier-Colle *et al.* 1995, Mancey-Jones 1997). Because perinatal deaths are much more common than maternal deaths, they are also seen as a useful topic for obstetric audit at facility level (Mancey-Jones 1997, Ward *et al.* 1995).

In recent years, cases of severe acute maternal morbidity have emerged as a promising alternative to the investigation of maternal deaths. In particular, cases at the very severe end of the morbidity spectrum, the so-called near misses, are seen as a useful outcome measure for the evaluation and improvement of maternal health services (Stones *et al.* 1991, Filippi *et al.* 1996, Baskett & Sternadel 1998, Mantel *et al.* 1998). Severe obstetric complications have the advantage over maternal deaths in that they are more common and possibly less threatening to providers than deaths, and since the woman survives she can be interviewed about the care she received. The latter is important as it reveals aspects of quality of care such as patient satisfaction, that may otherwise be overlooked. However, unlike maternal deaths, severe obstetric morbidity is not so easy to define. Obstetricians may not agree on common criteria of severity and in most countries, severe cases are defined on the basis of management rather than clinical criteria. For obstetric morbidity to become a useful topic for audit, much more work needs to be done in the search for precise and reliable criteria of severity (Filippi *et al.* 1996, Ronsmans & Filippi 2000).

Other than mortality and morbidity, the most common type of audit is that of process, examining what was done to the patient in terms of investigations, diagnosis and treatment. The numbers of examples of process audits

are endless, and only a few are listed here. One of the most prominent examples of process audit in obstetric care is that of caesarean sections. The widely observed increasing trends in caesarean section rates has been a cause for concern, and multiple investigations have compared the clinical indications for caesarean sections across regions or hospitals (Barrett *et al.* 1990, Rosenberg *et al.* 1982, Opit & Selwood 1979). Audit might then be used, for example, to set a desirable rate of caesarean sections in a particular type of health facility or to reduce the number of caesarean sections for specific indications, such as in women with a previous caesarean section (Joffe *et al.* 1994, Lomas *et al.* 1991). Other examples of processes of care that have been the subject of audit include the mode of delivery in breech presentations (Healey *et al.* 1997, Biswas & Johnstone 1993), the use of magnesium sulphate for the treatment of eclampsia (Taylor *et al.* 1998), and the use of a prostaglandin vaginal gel for induction of labour (Somerset *et al.* 1995). Clearly, all these processes represent clinically important problems. Whether or not they are a useful topic for audit largely depends on the willingness and enthusiasm of those involved in the audit to tackle the deficiencies that may emerge as a result of the review.

Setting standards in obstetric care

The use of defined standards of medical care is the hallmark of audit. Their primary purpose is to highlight deficiencies, by comparing the care that was given to the care that ought to have been given. Standards are explicit statements of how a patient should be managed, taking into account the resource context of the care that is under review. Since ownership of the findings is crucial, standards are usually negotiated internally within the audit group, although external bodies such as the government or the World Health Organisation might also set standards. Standards are usually developed through a combination of clinical experience and a review of the available evidence. Clinical judgement can be used as an implicit standard, and can be sufficient when deficiencies are so large as to be self-evident. Where possible however, published research should be used to back up clinical judgement and expert opinion.

One of the main advantages of audits in obstetric care is that evidence-based practice guidelines have been developed based on scientific literature (Chalmers *et al.* 1989). The Cochrane Pregnancy and Childbirth Database, for example, provides access to systematic reviews of randomised trials of

interventions in pregnancy and childbirth that are updated on a six-monthly basis (Cochrane Collaboration 1997). In addition, explicit criteria of quality of obstetric care have been established for those processes for which we have sound scientific evidence or a formal consensus of experts that the criteria, when applied, lead to an improvement in health (Benhow *et al.* 1997). Such process criteria have been developed in a number of countries, including more recently in two developing countries (Graham *et al.* 2000). Although these criteria are by no means exhaustive, they are certainly a useful starting point for establishing criteria of best practice in obstetric care. Based on these external criteria internal standards can be negotiated within the audit group taking into account local circumstances.

Standards are not always made explicit, and a team of experts may ultimately decide whether the care is to be considered as substandard or not. In the Confidential enquiries into Maternal Deaths in England and Wales, for example, a team of experts initially assessed all maternal deaths for their "avoidability" (Department of Health and Social Security 1982). After considering the circumstances of each individual death, the assessors decided whether "an alternative choice of action by any individual would have prevented or reduced the likelihood of death. The factors were classified as "avoidable" or "not avoidable" according to whether there was a departure from generally accepted standards of care" (Department of Health and Social Security 1982). Responsibility for the death was sought at the individual level and factors were classified by the type of person responsible (i.e. patient, general practitioner, obstetrician, midwife, anaesthetist, other hospital staff, other community staff, service manager and politician) and time of occurrence (antenatal period, labour or operative procedure, and puerperium or post-operative period). In 1980, the term "avoidable" was replaced by "substandard care", because the avoidable factors were often wrongly interpreted as meaning that avoiding these factors would necessarily have prevented the death. "Substandard", on the other hand, meant that "the care that the patient received, or that was made available to her, fell below the standard which the authors considered should have been offered to her" (Department of Health and Social Security 1986). Substandard care takes into account not only failure in clinical care, but also actions by the woman herself or her relatives, and factors outside the control of physicians such as shortage of resources or administrative failures.

Methods of audit in obstetric care

A variety of methods can be used to audit care, each appropriate to local circumstances and the particular topic being investigated. These methods include case presentations, case-note reviews, ad hoc studies, criterion-based audit, occurrence screening and use of routinely collected data (Crombie *et al.* 1997). A few examples of methods used in audits of obstetric care follow.

INDIVIDUAL CASE REVIEWS

The simplest form of audit involves reviewing the management of individual cases in health facilities. Although there are very few published examples of this type of audit, reviews of individual maternal deaths (or a variant thereof) form part of routine practice in many maternity units in Western countries. Cases are discussed in a friendly non-confrontational manner, and the quality of care is reviewed using clinical judgement while reviewing the notes, or using a checklist of the processes of care (examining what was done to the patient in terms of investigations, diagnosis and treatment). Meetings need to be structured and members assigned responsibility for specific tasks. A common format is for meetings of up to one or two hours to be held once a month or fortnight.

The main advantage of individual case review is its low cost and simplicity, involving little administrative time and without need for external assistance, computers or statistical analysis. Rather than largely focussing on an aggregate analysis of deficiencies in care in a large number of cases, - as in the confidential enquiries and criterion-based audits presented below -, the emphasis is on the participation of and interaction between all those providing and/or organising obstetric care during each individual case review meeting. The active involvement of care providers and managers in the review process is not only expected to enhance ownership of the findings and accountability, but by encouraging a culture of self-criticism, this process may also bring about a more sustained effect on improvements in the quality of obstetric care.

The main limitation of individual case review is that only a small number of cases can be reviewed and important deficiencies in health care may be missed. In addition, because confidentiality of staff within the discussion group can not be ensured providers may perceive this process as threatening. Audits focusing on near miss obstetric morbidity may overcome some of these shortcomings, as the staff can be congratulated on saving the woman, while deficiencies in patient management can still be reviewed (Ronsmans &

Filippi 2000). Positive outcomes such as near miss can remove the emotion from an incident and allow learning to take place more effectively.

CONFIDENTIAL ENQUIRIES INTO MATERNAL DEATHS

One of the most impressive and sustained examples of audit of obstetric care are the Confidential Enquiries into Maternal Deaths. The key features of the Confidential Enquiries are shown in Box 1. The confidential enquiries are externally organised reviews of all maternal deaths in a region or country, generally instituted by a public health authority or government (Department of Health and Social Security 1982 and 1986, McIlwaine 2000, Department of Health 2000). Data on individual deaths are obtained based on standard collection forms that are sent to all those involved with the care of the woman. All deaths are reviewed individually by independent experts at regional and national level who classify the deaths as “avoidable” or “not avoidable” (more recently as “substandard” or not) according to whether there was a departure from generally accepted standards of care (Department of Health and Social Security 1982). Compliance is enhanced by strict confidentiality ensuring that the findings of the reports are used only for making recommendations for improvements of practice and not for disciplinary action. National results are published in three-yearly reports that are sent out to a large number of providers and all original data are destroyed before releasing the reports.

The main advantages of the confidential enquiries are their comprehensive and representative nature (McIlwaine 2000). Efforts to identify all maternal deaths often lead to a more complete reporting of deaths than that obtained through the routine vital registration system. Comparable data on a large number of deaths over time ensure that trends can be identified at national level. The strict confidentiality for the patients whose care was reviewed and the doctors who managed them ensures that the focus of the investigation is on recommendations rather than on punitive action. Finally, the active involvement of the government reflects a commitment that enhances collaboration between policy makers and those delivering the services and ensures that funds can be made available for changes to take place.

Box 1. The key features of the Confidential Enquiries into Maternal Deaths

- They aim to identify all deaths in each specific category
- Confidential reporting
- Multidisciplinary external review of deaths to discover avoidable factors
- Results are published in periodic reports
- Key themes are identified and recommendations made for improvement
- No mandatory compliance with recommendations
- No systematic monitoring of uptake of recommendations

SOURCE: Department of Health 2000, p62

The main limitations of confidential enquiries include their cost, the tendency to focus on medical factors and the lack of systematic monitoring of uptake of recommendations. First, a confidential enquiry is organisationally and resource intensive. Second, the enquiries have traditionally focused on medical factors, ignoring the socio-economic factors (poverty, geographical location) that may contribute to maternal deaths. Finally, the confidential enquiries have a strong focus on the rigorous analysis of information to derive lessons for practice, but it is usually left to individual services to pick up and implement specific recommendations, with little by way of systematic monitoring of uptake (Department of Health 2000). Some recommendations have resulted in service improvements but others are repeated from report to report without action being taken. The latter tend to be those which would involve substantial changes in patterns of clinical practice, and those aimed at clinicians outside the normal readership of the report such as those in general practice and accident and emergency departments.

Criterion-based audit

In criterion-based audit, agreed standards of care based on explicit criteria are agreed by those involved in the care (Crombie *et al.* 1997, Graham *et al.* 2000, Bullough & Graham 2000). These standards do not only involve the definition of criteria of good management, but also an agreement of the extent to which these criteria ought to be met (i.e the target). For example, in a study in Scotland one of the criteria of good management of induced abortion was that “the woman’s rhesus status should be ascertained and rhesus prophylaxis given after abortion is indicated” (Penney *et al.* 1994). Perform-

ance was considered good (i.e. attaining the target) if more than 90% of cases fulfilled this criterion. This is clearly distinct from the confidential enquiries where recommendations for improvement are made on the basis of the assessment of “substandard care” but no explicit objectives for change are set. Similarly, other review processes such as the individual case reviews often do not specify clear-cut agreed standards of care. The main hypothesis with criterion-based audits is that the knowledge on (not) meeting the agreed levels of care will lead to specific changes in clinical practice.

Criterion-based audit involves a review process whereby clinicians first agree on a number of explicit and realistic criteria of good quality, adapting external guidelines to take into account the local resource context. Rather than being comprehensive, the list of criteria has to be kept short and simple to apply. Criteria are selected based on their relevance to the audited topic, the strength of the research evidence in their support, their ease of measurement using hospital case notes, and the capacity of the facility in terms of human and other resources. To assess current against standard practice an external audit assistant reviews a large number of case notes for their conformity with the set criteria, and the findings are fed back to the providers. Using the proportions of cases in which the relevant criteria are met as a starting point for discussion, improvements in care are recommended and realistic targets set. Changes in care are suggested and the audit cycle is closed by implementing the changes and re-evaluating practice. Carefully designed criterion-based audit may provide one of the most efficient methods of audit (Crombie *et al.* 1997). The approach is relatively simple and the use of trained non-clinical staff for data gathering enables a large number of representative cases to be reviewed. The local staff's involvement in reflecting on their current practice and setting standards is believed to be an effective mechanism for bringing about improvements in care. Even the detailed process of development of criteria may be beneficial, focusing attention on the topic and increasing the sense of ownership of the audit among the clinicians involved. Potential limitations of this approach include the sole reliance on case notes which have to be of sufficient quality, the need for external expertise (for screening case notes and statistical analysis), a tendency to focus mostly on clinical factors and possibly the high cost.

Does (obstetric) audit work?

Many people who have been involved in the development or implementation of audit believe in its potential to improve clinical practice (Halligan *et al.* 1997). Yet there is little scientific evidence to date that the recommendations emanating from audits have actually been implemented (Lord & Littlejohns 1997). Some authors have voiced concern for the lack of proof for the overall cost effectiveness of audits and have called for an “audit of audit” (Maynard 1991).

The gold standard method to prove that an intervention works is the randomised controlled trial. Trials are the only way to remain free from bias and provide definitive answers to questions of effectiveness and cost effectiveness. Controlled trials of audit interventions are difficult for a variety of reasons however. As has been illustrated here, approaches to audit vary tremendously and are highly context specific, and findings from one particular trial are therefore not easy to extrapolate to other settings. Operationalising and defining the outcome of an audit (i.e. what is quality?) is also difficult. In addition, effecting quality takes time. As Crombie (1997) states: “the most likely outcome of even a well conducted audit study is only partial success”. The Cochrane review of randomised controlled trials of audit and feedback also concluded that although the effects may be worthwhile, they are generally small (O’Brien *et al.* 1997). Small effects take large and costly trials to prove that they were due to the intervention.

A rare example of a rigorous evaluation of an audit in obstetric care is the US trial comparing “opinion leaders” with “audit and feedback” as a method to reduce the caesarean section rate in women who had a previous caesarean section. After 24 months the trial of labour and vaginal birth rates in the “audit and feedback” group were no different from those in the control group, but rates were 46% and 85% higher, respectively, among physicians educated by an opinion leader. There were no adverse clinical outcomes attributable to the interventions and the authors concluded that the use of opinion leaders improved the quality of care. While these results are impressive, it is not clear how they can be extrapolated to other settings. What the authors called “audit and feedback”, for example, was very different from clinical audit as routinely practised in the UK. Moreover, the success of the so-called “opinion leader” is contingent on personalities, relationships, professional and organisational structures and processes.

Trials of selected audit interventions in specific circumstances are not easily extrapolated to audit in general.

The most common approach to evaluating audit is by documenting whether the expected changes have occurred over time ("before-and-after" studies)(Lord & Littlejohns 1997). Penney *et al.* (1994), for example, reported in their Scottish study that a criterion based audit of the management of induced abortions led to modest improvements in some criteria of abortion care four months after the introduction of an audit cycle (Penney *et al.* 1994). Similarly, an audit of caesarean sections in a large specialist maternity hospital coincided with a fall in the rate of caesarean sections (Rosenberg *et al.* 1982). Without a truly comparable control group, however, it is never really possible to isolate the effects due to the audit from other changes that occurred at the same time, and it is not possible to attribute the changes to the audit (Lord & Littlejohns 1997). Moreover, it is far from certain whether the effects observed in the context of a research project are reproducible or sustainable over time. Research projects not only come with additional funding, the participation in research per se may be a stimulus for enthusiasm and change, and whether similar successes would be observed in an audit that is incorporated into routine practice remains to be seen.

The difficulty in providing rigorous proof of effectiveness has also plagued the Confidential Enquiries into Maternal Deaths. It is clearly impossible to do controlled trials of large-scale national programmes such as the confidential enquiries.

Implementation of lessons and recommendations is often a very slow process, and meaningful changes can only be brought about over a period of many years. There is no doubt that the periodic enquiries led to a climate in which improvements in care could take place and some recommendations have definitely resulted in service improvements (Department of Health 2000). For example, local protocols for the management of massive haemorrhage and eclampsia have been put in place, and availability of blood transfusion services has improved as a result of specific recommendations (Department of Health 2000, Benbow & Maresh 1998). Other recommendations however are repeated from report to report without action being taken (Department of Health 2000). Whether or not the confidential enquiries have contributed to the current low levels of maternal mortality in the UK is a question that will never be answered convincingly. Other European Countries have clearly achieved similarly low levels of maternal mortality (as low as 6-7 maternal deaths per 100000 births) in the absence of such

systematic enquiries.

It is unlikely that the current methods of evaluation will ever convince the sceptics that clinical audit is worth doing. Lord and Littlejohns (1997) go as far as stating that "Audit will always be an act of faith: a product of personal values, experience, professional loyalties, and anecdotal evidence" (Lord & Littlejohns 1997). Audit can never be the sole stimulus to change as it acts alongside a multitude of other influences. Audit evaluations need to be pursued, but they are likely to remain context-specific exercises aimed at describing the processes involved in a particular setting. By doing so the evaluation will provide a comprehensive picture of the successes and failures, and lessons can be learned from the reasons for these successes and failures.

Audit of obstetric care in developing countries

There is so far very little documented experience with audits of medical care, let alone obstetric care, in developing countries. Applying lessons learned from experiences in Western Countries may not be straightforward, as developing countries face a number of constraints that may prevent the successful implementation of audit (box 2). The magnitude of the resource constraints or inefficiency in resource allocation in the health sector, for example, may hamper effective audit. As resources fall under the responsibility of management their shortage can overshadow problems that can readily be addressed by health providers and the audit team may fail to address deficiencies in clinical care that fall under their responsibility. The strong hierarchical structure of the medical profession may constrain a process of peer review, as not everyone may be invited to express an opinion or take part in proposing solutions. Inadequate access to scientific evidence with an over-reliance on clinical judgement may lead to standards being set on the basis of current rather than best practice, possibly perpetrating inadequate practice. The poor quality of medical case notes may prevent the systematic review of the care given, although a recent study has shown that this may not be the case (Graham *et al.* 2000). Finally, audits are resource intensive, and the limited resources to support audit activities may hamper their sustainability.

Box 2. Possible constraints to the successful implementation of audit in developing countries

- The scale of resource constraints or inefficiency in resource allocation in the health sector.
- The strong hierarchical structure of the medical profession
- Difficult access to scientific evidence
- Poor quality of medical case notes
- Limited resources to support audit activities

Numerous studies in developing countries have collected standard data on the causes of and the factors contributing to maternal death. Such studies have been done at local or national level, and usually involve the use of the “verbal autopsy” (a post-mortem interview of family members) to arrive at the causes and avoidable factors of maternal death (Kwast *et al.* 1989, De Muylder 1990, Fawcus *et al.* 1996, Langer *et al.* 1999, Walraven *et al.* 2000, Ronsmans *et al.* 2000). Although these studies may provide the information needed for audit, they should not be labelled as such. The findings are often interesting but, because an intention to induce change was not built in at the start, few such initiatives lead to the formulation of specific recommendations for change and hence to improvements in care. Often such efforts do not collect the data needed to identify the underlying causes of the problem, particularly when observations rely solely on the family’s account of what happened. Those ascertaining the contributing factors have almost invariably consisted of an external group of obstetricians or researchers, and rarely have managers, decision-makers or other relevant care providers been involved in the review process. Acknowledging the existence of problems is an important first step towards resolving them, but unless efforts are build in to address the problems, change is unlikely to occur.

A number of countries have taken initiatives that go beyond the mere external assessment of substandard care. National confidential enquiries of maternal deaths have been put into place in Jamaica (Walker *et al.* 1986), Egypt (Egypt Ministry of Health 1994), South Africa (Department of Health, South Africa 1998), Malaysia (Suleiman *et al.* 1999), and of perinatal deaths in South Africa (Ghandi *et al.* 1999) and Guadeloupe (De Caunes *et al.* 1990). In Egypt, a confidential enquiry in 1993 concluded that sub-standard care by the obstetrical team was the most important contributing factor to maternal death (Egypt Ministry of Health 1994). While the study did not arrive at explicit recommendations for change, the active involvement of providers and policy makers in the assessment of each individual death has

not only ensured the credibility of the study findings but might also represent a powerful trigger for change.

In Indonesia, the government is committed to undertaking district-level audits with the aim to bring both continuous surveillance of maternal and perinatal mortality and quality assurance of obstetric services under the domain of the district health system (Supratikto *et al.* 2000). While no formal evaluation yet exists, the perceived success of the maternal and perinatal audit has led the Indonesian Government to commit to a country-wide expansion of these activities.

There are also a number of documented experiences of facility-based audits involving cases of maternal deaths (Crichton 1973, Barford & Barkes 1977), perinatal deaths (Bugalho & Bergström 1993), uterine rupture (Zanconato *et al.* 1994), near-misses (Mantel *et al.* 1998, Ronsmans & Filippi 2000) or processes such as vacuum extractions (Bergström & Bugalho 1992). Methods of audit vary, but most audits involve detailed case reviews, sometimes with a compilation of aggregate data on risk factors (Zanconato *et al.* 1994), avoidability (Mantel *et al.* 1998, Crichton 1973, Barford & Barkes 1977) or other contributing factors (Zanconato *et al.* 1994, Bergström & Bugalho 1992). Even though the event occurred in a health facility, it may be worthwhile to identify the factors that contributed to the death at the facility and in the community (Bullough & Graham 2000). The need for a detailed discussion of every individual case with all those involved in the care has been emphasised (Crichton 1973) and it has even been suggested that non-confidentiality may be necessary for a successful audit strategy (Bergström & Bugalho 1992).

Two ongoing research projects may shed some light on the feasibility and effectiveness of audits of obstetric care in health facilities in developing countries. Interestingly, the two studies use quite different methods of audit. In one study, individual cases of near miss are reviewed in detail during monthly meetings with midwives, doctors, social workers and administrators. A limited number of explicit treatment guidelines were established at an initial workshop, and the process of arriving at a subset of standard treatment criteria continues as the case reviews are ongoing. Over time, we hope that the case review itself will induce a shift from implicit rules of best practice to more explicit verifiable standards of obstetric care (Ronsmans & Filippi 2000). This approach is being tested in 12 hospitals in Benin, Morocco, Ivory Coast and Ghana, and the results will be available by mid-2001. In another study in Ghana and Jamaica, a criterion-based audit for the manage-

ment of severe obstetric complications is being used to assess and improve the quality of obstetric care in four district hospitals (Graham *et al.* 2000). Audit criteria were selected on the basis of research evidence and local expert opinion. The findings will be published shortly.

Conclusion

Audit of obstetric care has become routine practice in many Western countries and the concept of audit is slowly taking hold in a number of developing countries. Although audit is clearly about improvements in care, the issue of whether any of it actually results in change is still unresolved and will probably remain so. The lack of evidence that medical audit can be effective should not necessarily be taken to prove that audit does not work however. Audit can never be the sole stimulus to change as it acts alongside other educational initiatives. Ongoing critical enquiries into the quality of care of maternity services are important, as they are an expression of a commitment to the continuous improvement of such services. This is particularly relevant for obstetric facilities in developing countries, where there is increasing evidence that the services offered fall short of acceptable standards.

References

- Barford DA, Barkes JR (1977). Maternal mortality. A survey of 118 maternal deaths and the avoidable factors involved. *S Afr Med J* 51,101-5.
- Barrett JF, Jarvis GJ, Macdonald HN, Buchan PC, Tyrell SN, Lilford RJ (1990). Inconsistencies in clinical decisions in obstetrics. *Lancet* 336,549.
- Baskett TF and Sternadel J (1998). Maternal intensive care and near miss mortality in obstetrics. *British Journal of Obstetrics and Gynaecology* 05,981-984.
- Benbow A, Maresh M (1998). Reducing maternal mortality: reaudit of recommendations in reports of confidential enquiries into maternal deaths. *BMJ* 317,1431-32.
- Benhow A, Semple D, Maresh M (1997). *Effective procedures in maternity care suitable for audit*. UK: Royal College of Obstetricians and Gynaecologists. Clinical audit unit.
- Bergstrom S, Bugalho A (1992). Perinatal audit of one hundred consecutive vacuum extractions in Maputo. *Gynecol Obstet Invest* 34,171-174.
- Biswas A, Johnstone MJ (1993). Term breech delivery: does X-ray pelvimetry help? *Aust N Z J Obstet Gynaecol* 33,150-153.

- Bouvier-Colle MH, Varnoux N, Breart G (1995). Maternal deaths and substandard care: the results of a confidential enquiry in France. Medical experts Committee. *Eur J Obstet Reprod Biol* 58,3-7.
- Bugalho A, Bergstrom S (1993). Value of perinatal audit in obstetric care in the developing world: a ten-year experience of the Maputo model. *Gynecol Obstet Invest* 36,239-43.
- Bullough C, Graham W (2000). Criterion-based audit of maternal deaths and life-threatening complications. In: *Qualitative approaches for investigating maternal deaths*. Geneva: World Health Organisation (In press).
- Bullough C, Graham W (2000). Maternal death case reviews. In: *Qualitative approaches for investigating maternal deaths*. Geneva: World Health Organisation (In press).
- Chalmers I, Enkin M, Keirse MJN eds. (1989). *Effective care in pregnancy and childbirth*. Vol 1. Pregnancy. Oxford, England: Oxford University Press.
- Cochrane Collaboration (1997). *Pregnancy and Childbirth Database*. BMJ Publishing group: London.
- Crichton D (1973). The principles of prevention of avoidable maternal death. A study of 538 consecutive maternal deaths in the obstetric unit, King Edward VIII hospital, Durban 1953-1971. *S Afr Med J* 47,2005-2010.
- Crombie IK, Davies HTO, Abraham SCS, Florey C du V (eds). (1997) *The audit handbook. Improving health care through audit*. New York: John Wiley & Sons.
- De Caunes F, Alexander GR, Berchel C, Guengant JP, Papiernik E (1990). The Guadeloupean perinatal mortality audit: process, results, and implications. *Am J Prev Med* 6,339-45.
- De Muylder X (1990). Maternal mortality audit in a Zimbabwean province. *Arch Gynecol Obstet* 247,131-138.
- De Reu PA, Nijhuis JG, Oosterbaan HP, Eskes TK (2000). Perinatal audit on avoidable mortality in a Dutch rural region: a prospective study. *Eur J Obstet Gynecol Reprod Biol* 88,65-9.
- Department of Health (2000). *An organisation with a memory. Report of an expert group on learning from adverse events in the NHS chaired by the Chief Medical Officer*. The Stationary Office, London.
- Department of Health and Social Security (1982). *Report on Health and Social Subjects 26. Report on confidential enquiries into maternal deaths in England and Wales 1976-1978*. London: Her Majesty's Stationary Office .

Department of Health and Social Security (1986). Report on Health and Social Subjects 29. Report on confidential enquiries into maternal deaths in England and Wales 1979-1981. London: Her Majesty's Stationary Office.

Department of Health, South Africa (1998). *First interim report on confidential enquiries into maternal deaths in South Africa*. National Committee on Confidential Enquiries into Maternal Deaths. April 1998.

Egypt Ministry of Health (1994). *National maternal mortality study: Egypt 1992-1993. Findings and conclusions*. Cairo: Child Survival Project.

Fawcus S, Mbizvo M, Lindmark G, Nystrom L (1996). A community-based investigation of avoidable factors for maternal mortality in Zimbabwe. *Studies in Family Planning* 27,319-327.

Filippi V, Gandaho T, Ronsmans C, Graham W, Alihonou E (1996). The 'near-misses': are life-threatening complications practical indicators for Safe Motherhood programmes? Paper presented in IUSSP seminar on innovative approaches to the assessment of reproductive health, Manila, Philippines, September 24-27, 1996

Ghandi M, Barnard A, West P, Siderfin C, Welz T, Martineau A, Dalrymple A (1999). Audit of perinatal mortality and acute maternal morbidity in Northern KwaZulu Natal. Durban: Health Systems Trust.

Graham W, Wagaarachchi P, Penney G, McCaw-Binns A, Yeboah Antwi K, Hall MH (2000). Criteria for clinical audit of the quality of hospital-based obstetric care in developing countries. *Bull WHO* 78,614-620.

Halligan AWF, Taylor DJ, Naftalin NJ, Homa PM, Crump BJ (1997). Achieving best practice in maternity care [commentary]. *British Journal of Obstetrics and Gynaecology* 104,873-875.

Healey M, Porter R, Galimberti A (1997). Introducing external cephalic version at 36 weeks or more in a district general hospital: a review and an audit. *British Journal of Obstetrics and Gynaecology* 104,1073-9.

Joffe M, Chapple J, Paterson C, Beard RW (1994). What is the optimal caesarean section rate? An outcome based study of existing variation. *J Epidemiol Community Health* 48,406-11.

Kwast BE, Bekele M, Yoseph S, Gossa A, Mehari L, Frost O (1989). Confidential enquiries into maternal deaths in Addis Ababa, Ethiopia 1981-1983. *Journal of Obstetrics and Gynaecology in East and Central Africa* 8,75-82.

- Langer A, Hernandez B, Garcia-Barrrios C, Saldana-Uranga GL, and the National Safe Motherhood Committee of Mexico (1999). Identifying interventions to prevent maternal mortality in Mexico: a verbal autopsy study. In: Berer M, Ravindran TKS (eds). *Safe Motherhood Initiatives: Critical Issues*. Reproductive Health Matters. London: Blackwell Science.
- Lawrence M, Schofield T (ed) (1993). *Medical audit in primary health care*. Oxford: Oxford University Press.
- Lomas J, Enkin M, Anderson GM, Hannah WJ, Vayda E, Singer J (1991). Opinion leaders vs audit and feedback to implement practice guidelines: delivery after previous caesarean section. *JAMA* 265,2202-7.
- Lord J, Littlejohns P (1997). Evaluating healthcare policies: the case of clinical audit. *BMJ* 315,668-671.
- Mancey-Jones M, Brugha R (1997). Using perinatal audit to promote change: a review. *Health Policy and Planning* 12,183-192.
- Mantel GD, Buchmann E, Rees H and Pattinson RC (1998). Severe acute maternal morbidity: a pilot study of a definition of a near miss. *British Journal of Obstetrics and Gynaecology* 105,985-990.
- Maynard A (1991). Case for auditing audit. *Health Services Journal* 18,26.
- McIlwaine G (2000). Confidential enquiries into maternal death. In: *Qualitative approaches for investigating maternal deaths*. Geneva: World Health Organisation (In press)
- O'Brien T, Oxman AD, Davis DA, Haynes RB, Freemantle N, Harvey EL (1997). *Audit and feedback: effects on professional practice and health care outcomes*. The Cochrane Library.
- Opit LJ, Selwood TS (1979). Caesarean section rates in Australia: a population-based audit. *Med J Aust* 2,706-9.
- Penney GC, Glasier A, Templeton A (1994). Multicentre criterion-based audit of the management of induced abortion in Scotland. *BMJ* 309,15-18.
- Richardus JH, Graafmans WC, van der Pal-de Bruin KM, Amelink-Verburg MP, Verlove-Vanhorick SP, Mackenbach JP (1997). A European concerted action investigating the validity of perinatal mortality as an outcome indicator for the quality of antenatal and perinatal care. *Journal of Perinatal Medicine* 25,313-24.

- Ronsmans C, Filippi V. Case study: Improving obstetric care through near miss case reviews. A feasibility study in Benin, Ghana, Ivory Coast and Morocco. In: *Qualitative approaches for investigating maternal deaths*. Geneva: World Health Organisation (In press).
- Ronsmans C, Filippi V (2000). Severe obstetric morbidity. In: *Qualitative approaches for investigating maternal deaths*. Geneva: World Health Organisation (In press).
- Ronsmans C, Filippi V (2000). Improving obstetric care through near-miss audit. *Child Health Dialogue* 18,9.
- Ronsmans C, Walraven G, Etard JF. Verbal autopsies. In: *Qualitative approaches for investigating maternal deaths*. Geneva: World Health Organisation (In press).
- Rosenberg K, Hepburn M, McIlwaine G (1982). An audit of caesarean section in a maternity district. *British Journal of Obstetrics and Gynaecology* 89,787-92.
- Smith R (ed). Audit in action (1992). London: *British Medical Journal*.
- Somerset DA, Das Munshi T, Godman B, Swain I, Dooley MM (1995). Induction of labour using prostaglandin E2 gel: the effect of changing the time of first insertion. *J R Soc Med* 88,105P-107P.
- Stones W, Lim W, Al-Azzawi F, Kelly M (1991). An investigation of maternal morbidity with identification of life-threatening 'near miss' episodes. *Health Trends* 23,13-15.
- Suleiman AB, Mathews A, Jegasothy R, Ali Roslinah, Kandiah N (1999). A strategy for reducing maternal mortality. *Bulletin of the World Health Organization* 77,190-193.
- Supratikto G, Wirth ME, Achadi E, Cohen S, Ronsmans C (2001). A district-based audit into the causes and circumstances of maternal death in South Kalimantan, Indonesia. *Bulletin of the World Health Organization* (in press).
- Taylor GM, McKenzie CA, Mires GJ (1998). The use of audit to improve clinical effectiveness in an infrequent obstetric therapy: magnesium sulphate in severe pre-eclampsia. *Scott Med J* 43,151-3.
- Walker GJ, Ashley DE, McGaw AM, Bernard GW (1986). Maternal mortality in Jamaica. *Lancet* 1,486-8.
- Walraven G, Telfer M, Rowley J, Ronsmans C (2000). Levels of maternal mortality, its causes and contributing factors in rural Gambia. *Bulletin of the World Health Organization* 78,603-613.
- Ward HR, Howarth GR, Jennings OJ, Pattison RC (1995). Audit incorporating avoidability and appropriate intervention can significantly decrease perinatal mortality. *South African Medical Journal* 85,147-150.

Zanconato G, Machungo F, Soler A, Bergstrom S (1994). Audit of uterine rupture in Maputo: a tool for assessment of obstetric care. *Gynecol Obstet Invest* 38,151-156.

Referral in pregnancy and childbirth: Concepts and strategies

Albrecht Jahn¹ and Vincent De Brouwere²

Summary

The referral system is an essential component of district health systems. It is particularly important in pregnancy care and childbirth for providing access to emergency obstetric care and for backing up antenatal and delivery care in first line facilities. However, referral patterns, as reported from referral hospitals in developing countries, show that the actual use of a referral system for obstetric care is inversely related to professional needs assessment. Usually, self-referrals constitute more than 50%, institutional referral around 30% and emergency referral less than 5% of women at referral level. Known determinants of the use of obstetric care at referral include distance, cost, perceived quality of obstetric care, health workers attitude and respect for women's social needs, perceived etiology of complications and socio-cultural preferences. Interventions to improve access and use of the referral system target different elements of the referral chain. Priority should be given to the quality of obstetric care at referral level and this needs to be monitored and improved. Then, local solutions should be sought in participation with the community to secure transport whenever an evacuation is required. Finally, health staff should dialogue with the community in order to raise awareness of complications and danger signs at family level. The long-term objective should be to establish an operational referral system for emergencies and elective referrals as part of the district health system. The referral system should not be restricted to pregnancy-related complications. However, obstetric referral provides a good starting point for improvement, because maternal emergencies comprise a considerable part of overall emergencies, because most maternal deaths can be prevented by timely intervention, and because this is commonly a felt need in the community.

¹ Specialist in obstetrics and gynaecology, Department of Tropical Hygiene and Public Health, University of Heidelberg, Neuenheimer Feld 324, 69120 Heidelberg, Germany. Email : Albrecht.jahn@urz.uni-heidelberg.de (correspondence should be addressed to this author).

² Professor at the Department of Public Health, Institute of Tropical Medicine, Antwerpen, Belgium. Email : vdbrouw@itg.be

Introduction

Linking the different levels of care was an essential element of primary health care (PHC) from the very beginning. The referral system was meant to complement the PHC principle of treating patients as close to their homes as possible at the lowest level of care with the needed expertise (King 1966). As emphasised by the WHO (1994), this back-up function of referral is of particular importance in pregnancy and childbirth, as a range of potentially life-threatening complications require management and skills that are only available at higher levels of care. The following levels of care have been identified: (1) family/community, (2) health centre and (3) district hospital (WHO 1996a).

The first referral level is defined as district or sub-district hospital, to which a woman at high risk is referred prenatally or sent for emergency obstetric care, and where the following essential services should be available: (1) surgical obstetrics, (2) anaesthesia, (3) medical treatment, (4) blood replacement, (5) manual procedures and monitoring labour, (6) management of women at high risk, (7) family planning support and (8) neonatal special care (WHO 1991). Most countries have different types of first line facilities (e.g. dispensary, health post, basic health unit) or intermediate levels of care; however, in practical terms these provide usually similar levels of maternity care and are not qualified to manage obstetric complications adequately. Therefore, for our discussion we will use the 3-level model as outlined in *Figure*, whereby the category health centre comprises all first line health facilities. The paper will start with an outline of current referral patterns, then introduce a model of the referral chain (sender - transport - receiver) and discuss potential strategies and interventions along this pathway. This will be followed by a note on conceptual issues. Finally a strategy for improving obstetric referral will be outlined and put in the context of district health services in general.

Referral and its function in district health systems

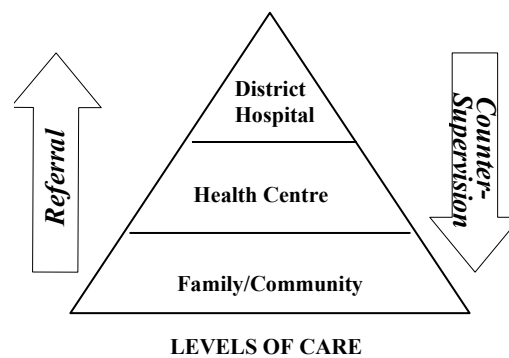
The term referral is used in different ways: For instance, it is used to indicate the advice of a health worker to attend a higher-level health unit, whether followed or not. Here we use the term referral for any upwards movement of health care seeking individuals in the health system (*Figure*). There are many ways to do this with respect to pathway, timing and urgency. Thus, we can categorise referrals in pregnancy and childbirth as (1) institutional or self-

referral, depending on the involvement of first line services; (2) antenatal, delivery or postnatal referral; and (3) elective or emergency referral.

The following data on pregnancy-related referral in Tanzania provide an overview of levels and categories of referral in a rural African district (Jahn *et al.* 1998). Based on the analysis of 415 hospital maternity in-patients, the following referral pattern was observed (values as percentage of all maternity admissions; percentage of expected birth in the catchment area in brackets):

- Self-referral 70% of all maternity admissions (15% of all expected births) vs. institutional referral 30% (6%)
- Referral for delivery 84% (18%) vs. antenatal referral 16% (3%)
- Elective referral (including referral for general safety reasons) 98,8% (20,8%) vs. emergency referrals 1,2% (0,3%).

Figure 1. The health care pyramid at district level (Adapted from the Mother-Baby Package (WHO 1994))

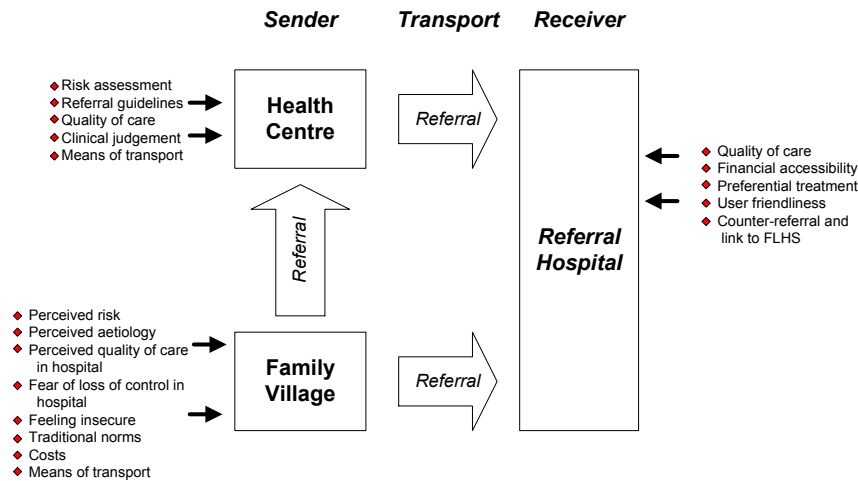


Thus, self-referral for delivery - often without specific medical reason - is the most common mode of referral, while institutional referral is less frequent and emergency referral is very rare. Similar observations have been reported from a rural district in Nepal (Jahn *et al.* 2000) and Burkina Faso (Falkenhorst & Jahn 1997) with population-based rates of emergency referrals of 0,4% and 0,7% respectively. Nkyekeyer (2000) reports from a teaching hospital in Ghana 82% self referrals and 2% emergencies among hospital deliveries. A high proportion of self referrals (80%) has also been observed in Kenya (Norberg *et al.* 1996). From a professional point of view, this skewed referral pattern results in an inappropriate use of referral level care by by-passers of first line services. Measures such as disincentives (e.g. fees) for self-referrals and incentives for institutional referrals have been suggested (Paine

& Siem Tjam 1988), but are problematic as discussed later in the context of informed decision making.

As referral is a dynamic process, we will analyse the current referral pattern and discuss potential interventions along the following model of the referral chain (Figure 2).

Figure 2. The referral chain



While this model identifies the series of actors and links, the current debate on referral is often restricted to the issue of lack of transport and communication. Without denying the importance of this aspect, we want to emphasise the role of all system components (Kowalewski *et al.* 2000). Despite relatively good accessibility of obstetric referral facilities many cities have a high maternal mortality, such as 148 in St Louis (Senegal) to 852 in Kaolack (Senegal) as shown in table 1.

A study from a large referral hospital in Karachi found the 118 mothers brought dead to the hospital maternity had all been residing within a 8 km range. Social and cultural factors played the most significant role (Jafarey & Korejo 1993). A recent maternal death enquiry from South Africa related 18% of avoidable deaths to problems of transport but 57% to problems of the in-service management of emergencies (National Committee on Confidential Enquiries into Maternal death 2000). Similar findings are reported from Ghana (Walraven *et al.* 2000).

Table 1. Maternal mortality ratios in selected African cities

City (country)	Maternal Mortality Ratio per 100,000 live births (C. I. 95%)	Source
Dar Es Salaam (Tanzania)	572	Urassa <i>et al.</i> , 1995
Conakry (Guinea)	559	Touré <i>et al.</i> 1992
Brazzaville (Congo)	645	Le Coeur <i>et al.</i> 1998
Bamako (Mali)	327	Etard <i>et al.</i> 1996
Bamako (Mali)	275 (126-521)	Bouvier-Colle <i>et al.</i> 1998
Abidjan (Côte d'Ivoire)	428 (228-732)	Bouvier-Colle <i>et al.</i> 1998
Niamey (Niger)	371 (149-764)	Bouvier-Colle <i>et al.</i> 1998
Nouakchott (Mauritania)	161 (52-376)	Bouvier-Colle <i>et al.</i> 1998
Ouagadougou (Burkina Faso)	318 (146-604)	Bouvier-Colle <i>et al.</i> 1998
St Louis (Senegal)	148 (31-433)	Bouvier-Colle <i>et al.</i> 1998
Kaolack (Senegal)	852 (453-1,457)	Bouvier-Colle <i>et al.</i> 1998

Referral situation and interventions at community level

Problems of geographical and financial accessibility are well documented reasons for abstaining from or delaying obstetric referral (Thaddeus & Maine 1994, Bouillin *et al.* 1994, Sauerborn *et al.* 1989, Haddad & Fournier 1995). However, these barriers are in most settings not insurmountable. Thus, the final decision for or against referral will often depend on the balance between effort and resources needed for transport and subsequent treatment and the perceived benefit of treatment in hospital. In this decision making process, the perceived quality of care, perceived severity of the condition and local etiological concepts play decisive roles (Dar Iang 1999, Oosterbaan & Barreto da Costa 1995, The prevention of maternal mortality network 1992, Asowa-Omorodion 1997, Campbell & Sham 1995). Often, hospital care is avoided mainly because of poor interpersonal skills and attitudes of health workers and to a lesser degree because of perceived technical incompetence. Rural women in particular fear stigmatisation and discrimination. They are afraid of the unfamiliar environment, the lack of social and emotional support, the loss of dignity, face and control over decisions. In addition, there is a gap between biomedical and traditional concepts of causation of complications. For instance, the risk of repeating adverse outcomes such as perinatal death is well known in communities but often attributed to supernatural powers and thus not seen as reason to attend health services (Kowalewski *et al.* 2000). This has profound implications for the referral behaviour with

referral being more likely when a condition is perceived to have a biomedical background. Pregnancy and birth are embedded in cultural norms and traditions, concerning (among others) the place of birth and the caregivers, thus interfering with referral. For example, in many parts of Tanzania women are expected to go back to their parents home to give birth.

Reported interventions on community level focus (1) on educational activities to raise awareness of danger signs and encourage the use of obstetric services; (2) on reducing geographical and financial barriers through emergency loan schemes and (3) on improving transport and communication. Two studies from Sierra Leone (Kandeh *et al.* 1997) and from Nigeria (Nwakoby *et al.* 1997) report on the promotion of the use of obstetric care through community activists. They were trained to perform health education, mobilise the community and facilitate referral in case of obstetric emergencies. Both studies report an increase in emergency referrals in the initial phase of the project, which could not be sustained. The absolute number of referrals facilitated by the community activists were small in both projects (1 referral per month). Because of missing data about target population and the expected number of deliveries in the project areas, these referrals can not be related to a population base. Promotion of referral has also been part of training of traditional birth attendants. Alisjahbana *et al.* (1995) reported a slight increase in referral rates (6% vs. 13% referral in women with complications), other studies could not detect any substantial impact (Eades *et al.* 1993, Jahn *et al.* 2001). Encouraging experiences are reported from three studies on community loan funds in Nigeria (Essien *et al.* 1997, Chiwuzie *et al.* 1997, Olaniran *et al.* 1997). The idea was apparently well received by the communities and their traditional leaders. All studies focussed exclusively on obstetric emergencies.

The following conditions were set (Essien *et al.* 1997):

- financed and managed by the community
- no interest charged (in other projects interest 2%)
- 6-month grace period and 24-month repayment period
- eligibility requirement of a minimum of 12 month residence prior to loan
- requirement of a resident guarantor with fixed assets
- restriction of loan funds to women with obstetric complications

The approval rate of loans varied from 2 per month in one study to 30

per month in another. There are no clear indications that the use of obstetric services has increased as a result of these schemes. It is acknowledged that sustaining the funds long term will require continuing effort and involvement with the communities.

One of the projects has successfully linked a loan fund with an initiative to involve local car owners in a stand-by transport scheme for emergency referrals (Olaniran *et al.* 1997). Overall, the projects demonstrate that there is a considerable potential to improve the referral system by mobilising and co-ordinating locally available resources. Preliminary experiences from Mali, where referral loan funds are managed by the local health committees, point in a similar direction. After introducing a system of radio calls and ambulances, emergency referral rates increased from 1% to 3% of expected life births in Kolondieba district (De Brouwere 1997) and the C-section rate increased from 0.1% to 1% between 1993 and 1995 in Koulikoro district (Maiga *et al.* 1999).

Another approach has been taken by the RESCUER project in Uganda (Inter-agency group for safe motherhood 1997). Key interventions included upgrading of health units to obstetric referral centres, training of traditional birth attendants and linking them to the referral centres via radio call and walkie talkies, and provision of motorised transport facilities. Since the introduction of this package, obstetric referrals have increased threefold. However, it is not reported to which extent this increase has been due to emergencies and which proportion of all expected pregnancies were referred (population-based referral rate).

Referral situation and interventions on the level of first line health services

Frequently health workers in first line facilities have no access to phones and transport, even in emergency situations (Jahn *et al.* 1998, Jahn *et al.* 2000). Thus, it is up to the mother's family to arrange transport. Health workers will help them depending on their capacity and personal initiative. Occasionally health centres have their own means of transport. In fact, many countries (e.g. Tanzania) had the plan to equip health centres with vehicles but could not sustain the policy due to the high costs.

Despite the high profile of emergency referral we have to keep in mind, that emergency referrals are rare events for first line health facilities. Catering typically to target populations between 5.000 to 10.000 they encounter

about 2 to 10 emergencies per year; in reality the figures are probably even lower, because some cases will bypass first line services and others will not seek modern health care at all. Thus, the vast majority of their referrals are elective referrals triggered by antenatal risk assessment.

In most countries full implementation of national referral guidelines would result in 30% to more than 50% of all pregnant women being referred either antenatally or for delivery (Kulmala *et al.* 2000, Jahn & Kowalewski 1998). For example, the Tanzanian antenatal card stipulates referral for 27 risk factors. In reality 6% to 15% of women attending antenatal care receive a referral advice. However, compliance with this referral advice was only 25% (Jahn & Kowalewski 1998). This is a common observation: reported referral compliance ranges from 12% in Rajasthan (Gupta & Gupta 2000) to 33% in Congo (Dujardin *et al.* 1995), 36% in Nepal (Jahn *et al.* 2000) and 46% in Morocco (Belghiti *et al.* 1998). Referral based on antenatal risk assessment is controversial. Though regarded as an appropriate strategy in the eighties, it has been abandoned by the Safe Motherhood Initiative in 1997 (Inter-agency group for safe motherhood 1997) and emphasis has been shifted to emergency obstetric care. "*The reason for this is that most of these complications cannot be predicted or prevented, but they can be successfully treated. ... The emphasis is on improving the accessibility, quality and utilization of emergency obstetric care for women who develop such complications, rather than on having contact with all pregnant women*" (Maine 1997). Thus, first level health workers find themselves caught between contradicting messages: On one side, they are stipulated to perform antenatal screening and referral according to the national guidelines based on inflated risk categories. On the other side they are told in the new Safe Motherhood slogan "*Every pregnancy faces risks*" that antenatal risk assessment is useless because complications can not be predicted.

Summarising available evidence it can be concluded that routine antenatal screening, as performed in many countries is not very effective because (1) the risk categories are too wide and unspecific, (2) low quality of screening and use of inappropriate screening techniques (3) low acceptability of referral advice and (4) a ritualistic approach to antenatal care (Rooney 1992, Van-neste *et al.* 2000, Dujardin *et al.* 1995, Jahn *et al.* 2000, Jahn *et al.* 1998, Geefhuysen *et al.* 1998). However, there is also evidence that selected screening interventions and referral can be beneficial if implemented properly; examples are taking blood pressure for hypertension and measuring fundal height in order to identify multiple pregnancies (Enkin *et al.* 1995, Villar &

Bergsjö 1997, Villar *et al.* 1998, Vanneste *et al.* 2000, WHO 1996b).

In relation to referral, the crucial question is: Who should be referred? Should it be restricted to women with manifest obstetric complications or is there still a place for elective referral prior to delivery? Based on the above mentioned studies the following core set of maternal and perinatal indications for elective referral can be identified: previous caesarean section, breech presentation, transverse lie, multiple gestation, hypertension and severe anaemia. In rural settings these indications would produce referral rates in the range of 6% to 10%. There is also a need to develop locally adapted and operational referral guidelines, based on the specific epidemiological situation, the capacity of health services and community preferences. The current practice of stereotypical (and often rejected) referral advice should be replaced by a more client centred approach with individual counselling in order to empower mothers and their families to make informed decisions.

We are not aware of interventions addressing specifically these two issues of rationalising risk categories and referral guidelines. Instead interventions focus on improving transport and communication, such as equipping health centres with vehicles and radio calls. However, experience from Safe Motherhood projects in Tanzania show that it is often difficult to keep these vehicles on the road due to the lack of maintenance and fuel. Considering that lack of transport is a big problem in most settings it is also problematic, to restrict the use of such vehicles to referral activities. Another project that distributed bicycles-trailers for referral to first line facilities stopped the practice after realising that the trailers were used for purposes other than referral.

Referral situation and interventions on first referral level

The typical referral pattern among users of hospital-based obstetric care - many self referrals and few emergency referrals - has been outlined in the introductory part.

In order to make referral meaningful and improve survival chances for mother and child, the referral hospital has to provide good quality obstetric care. This is often not the case and a considerable proportion of maternal and perinatal mortality has been attributed to substandard referral level care (Fawcus *et al.* 1996, Urassa *et al.* 1995, Jahn *et al.* 2000). Thus, ensuring quality obstetric care at referral level is a precondition for successful referral.

Accessibility and perceived quality of care have been identified as important determinants for the use of hospital-based obstetric care. One option to increase accessibility is to increase service outlets for obstetric care according

to population size and distribution. Distances in large rural districts are often too large to be covered by one district hospital. Strategically located existing structures, such as health centres, can be up-graded with limited input. Many Safe Motherhood Programmes include this intervention in their programmes (Inter-agency group for safe motherhood 1997, Chiwuzie *et al.* 1997, Nwakoby *et al.* 1997). An additional option is to link health centres and hospital via radio call and send the hospital ambulance in the event of an emergency. However, this intervention needs to be accompanied by measures to ensure financial accessibility. In Burkina Faso, the costs for obstetric emergency transports are covered by the health services through fuel vouchers.

However, utilisation of obstetric care can also be improved with less capital investment through a set of interventions making it more user friendly and receptive to the social and medical needs of potential users (Sabitu *et al.* 1997). These may include interventions such as preferential treatment for referred patients, 24-hours service, culturally appropriate attitudes, provision of privacy and allowing for an accompanying support person (Kowalewski *et al.* 2000).

As mentioned earlier, cost is a crucial factor in referral decision making. It is very difficult to make general statements on cost of referral. In any case these are substantial for users and providers alike. In Tanzania on average 2 US\$ was spend on transport with a maximum of 12 US\$, depending on distance and means of transport (Kowalewski 1996). Hiring a car (if possible at all) is extremely expensive in local terms. The situation in Nepal is similar with average transport costs of 1,5 US\$ and a maximum of 11 US\$ against a basic salary of 1 US\$/day (Dar lang 1999). In addition to these costs, further costs are incurred for treatment, drugs and food which add up to 96 US\$ on average (maximum 230 US\$). In 1997 in Mali, the average cost of transportation with an ambulance called by radio was 63 US\$ and the additional cost of a caesarean section 84 US\$ (De Brouwere 1997). But the cost varies depending on the district; in Kolondieba for instance, the total cost for an emergency referral was 100 US\$ including transportation by ambulance, intervention kit and post-intervention care. Cost was covered by public sources (35%-58%), the community-funded association of health centres (21%-35%) and the patient herself (21%-30%) (Maige *et al.* 1999)Based on experiences from Uganda, health service capital costs for establishing and maintaining a referral system are estimated to be 22% of overall capital costs or 100.000 US\$ per district per year (Weissman *et al.* 1999).

The crucial issues

Given the diversity of health systems, geographical conditions and infrastructure it is impossible to develop a generally applicable blue print for referral systems. However, we can identify the following crucial issues that need to be addressed early on and that require strategic decisions:

Should interventions focus exclusively on referral of emergencies?

The importance of access to obstetric emergency care is undisputed (WHO 1996a). However, there is also evidence to justify elective referral for maternal and perinatal reasons, as outlined earlier (Villar & Bergsjö 1997). This is also acknowledged by the Safe Motherhood Initiative by stating that a minimum of 15% of all pregnant women should deliver in obstetric referral level facilities (Inter-agency group for safe motherhood 1997). Most of these will not be emergencies. In addition there is often no clear line between emergency and elective referral, as in the case of mild antepartum haemorrhage. It may be sensible to start with a focus on emergency referral. Yet, there is a need to also improve and rationalise referral for all pregnancy-related conditions. This could be done, for instance, through locally adapted and operational referral guidelines and related tools such as referral forms and feedback reports, transport arrangements and special admission routines in the referral centre.

Should interventions focus only on complications of pregnancy and childbirth?

There is a general lack of emergency care, which contributes considerably to the high adult mortality in Africa (Nordberg 1984, Adult Morbidity and Mortality Project (AMMP) 1997). As shown earlier, many Safe Motherhood Projects restrict the eligibility to use their emergency referral arrangements to obstetric complications and exclude other medical or surgical emergencies. None of the reported case studies cited earlier comments on conflicts arising from this rule, although they are likely to occur. From a district health perspective, a restrictive approach has several shortcomings: There are maternal emergencies, which are often not recognised as such; e.g. ectopic pregnancy with an estimated prevalence of 1/100 pregnancies (Amoko & Buga 1995). Given the transport problems in most rural African communities, it may simply be unethical to deny assistance in case of any life-threatening condition. Maintaining a system for emergency care (e.g. ambulance, radio call) needs constant attention and inputs, even if it is idle. The rarity of referrals

in most of the studies (1-2 per month) indicates that the emergency referral arrangements are often under-utilised. Our own experience in a series of village meetings on Safe Motherhood in Southern Tanzania suggests that access to emergency care has a very high priority at the community level but comprises all sorts of emergencies.

There are also projects that have focused on emergency referrals in general. Macintyre & Hotchkiss (Macintyre & Hotchkiss 1999) report on an 8 years experience with a health insurance scheme, covering emergency referral. The most frequent causes for referral were trauma, pregnancy-related, complicated malaria, and severe diarrhoea. Therefore we suggest, expanding Safe Motherhood emergency referral initiatives to other areas of emergency care.

Self referral and informed decision making

Referral by health workers is often handled in a rather directive way. Instead, there should be a mutual understanding about the need for, and purpose of the referral between health worker and patient (Paine & Siem Tjam 1988). The mother baby package (WHO 1996a) suggests the antenatal care should be used to help women and their families to develop an appropriate delivery plan (including place of delivery), based on the women's history and health status. The Safe Motherhood Initiative emphasises that women's choices should be respected and ensured (Inter-agency group for safe motherhood 1997). This adds another dimension to the discussion on antenatal risk assessment and referral, because it implies involving the mother in defining the need for referral and shifts the focus from predictive power of risk factors to the risk as perceived by the individual mother. There is a wide gap between these approaches as evidenced by the high rates of self-referral and the low compliance with referral advice given by health workers. Thus a mother with her first uncomplicated pregnancy may prefer to deliver in hospital for safety reasons (and many do so) while a mother with her tenth pregnancy may prefer to deliver at home, because she feels better cared for in her domestic environment. Taking informed decision making seriously would imply to move from rigid application of referral criteria to individual counselling based on professional needs assessment and women's preferences.

Steps in improving the referral system

Referral can only be justified if the referral facility provides a reasonable level quality of care. Therefore, as a first step, the quality of obstetric care at refer-

ral level needs to be ascertained, monitored and improved. The next steps would include raising awareness of complications and danger signs at the community level and assessing locally available resources for emergency transport and communication. These include private cars, buses, lorries and all potential means of communication (e.g. radio call of police station). In a process involving the community and local health workers, feasible and sustainable options for referral can be identified as described earlier. Examples from literature (Essien *et al.* 1997) include arrangements with local owners of transport, provision of means of transport and emergency loan schemes. Then institutional referral policies and guidelines need to be reviewed and rationalised. The long-term objective should be to establish an operational referral system for emergencies and elective referrals as part of the district health system. This should not be restricted to pregnancy-related complications. However, obstetric referral provides a good starting point because maternal emergencies are most often a felt need, because they comprise a considerable part of overall emergencies, because most maternal deaths can be prevented by timely intervention and because unmet obstetric needs can be better quantified and monitored than other life-threatening emergency conditions (De Brouwere *et al.* 1996)

References

- Adult Morbidity and Mortality Project (AMMP) (1997). Policy implications of adult morbidity and mortality - End of phase 1 report, Tanzania/Ministry of Health, Dar es Salaam.
- Alisjahbana A, Williams C, Dharmayanti R *et al.* (1995). An integrated village maternity service to improve referral patterns in a rural area in West-Java. *International Journal of Gynaecology and Obstetrics* **48**(Suppl), S83-S94.
- Amoko DHA & Buga GAB (1995). Clinical presentation of ectopic pregnancy in Transkei, South Africa. *East African Medical Journal* **72**,770-773.
- Asowa-Omorodion FI (1997). Women's perceptions of the complications of pregnancy and childbirth in two Esan communities, Edo State, Nigeria Women's perceptions of the complications of pregnancy and childbirth in two Esan communities, Edo State, Nigeria. *International Journal for Quality in Health Care* **44**(12),1817-1824.
- Belghiti A, De Brouwere V, Kegels G and Van Lerberghe W (1998). Monitoring unmet obstetric need at district level in Morocco. *Tropical Medicine and International Health* **3**(7):584-591.
- Bernard F, De Brouwere V, Laabid A, Dujardin B (1996). L'évaluation des filières dans les systèmes de santé: revue de la littérature. *Santé Publique* **7**,443-459.
- Bouillin D, Fournier G, Gueye A, Diadiou F & Cissé CT (1994). Surveillance épidémiologique et couverture chirurgicale des dystocies obstétricales au Senegal. *Cahiers Santé* 399-406.
- Bouvier Colle M H, Prual A and de Bernis L (1998). *Morbidité maternelle en Afrique de l'Ouest*. Ministère des Affaires Etrangères - Coopération et Francophonie, Paris.
- Campbell M & Sham ZA (1995). Sudan: Situational analysis of maternal health in Bara district, North Kordofan. *World Health Statistic Quarterly* **48**,60-65.
- Chiwuzie J, Okojie O, Okolocha C *et al.* (1997). Emergency loan funds to improve access to obstetric care in Ekpoma, Nigeria. The Benin PMM Team. *International Journal of Gynaecology and Obstetrics* **59** (Suppl 2), S231-S236.
- Dar Iang M (1999). Assessment of antenatal and obstetric care services in a rural district of Nepal, Peter Lang, Bern.
- De Brouwere V, Laabid A & van Lerberghe W (1996). Estimation des besoins en interventions obstétricales au Maroc. Une approche fondée sur l'analyse spatiale des déficits. *Revue Epidemiologie et de Sante Publique* **44**,111-124.

- De Brouwere V (1997). Appui à la mise en oeuvre et à l'évaluation du système de référence avec la périnatalité comme porte d'entrée dans le Cercle, UNICEF Mali.
- Dujardin B, Clarysse G, Criel B, De Brouwere V & Wangata N (1995). The strategy of risk approach in antenatal care: evaluation of the referral compliance. *Social Science and Medicine* **40**,529-535.
- Eades CA, Brace C, Osei L and LaGuardia KD (1993). Traditional birth attendants and maternal mortality in Ghana. *Social Science and Medicine* **36** (11):1503-1507,
- Enkin M, Keirse MJNC, Renfrew M & Neilson JP (1995). A Guide to Effective Care in Pregnancy & Childbirth - 2nd edition, Oxford University Press, Oxford.
- Essien E, Ifenne D, Sabitu K *et al.* (1997). Community loan funds and transport services for obstetric emergencies in northern Nigeria. *International Journal of Gynaecology and Obstetrics* **59** (Suppl 2), S237-S244.
- Etard J F, Balique H, Traore S and Kodio B (1996). Maternal mortality in Bamako, Mali. *Arch. Public Health* **53** (Suppl.1),48-48.
- Falkenhorst G & Jahn A (1997). Qualität der Schwangerenvorsorge in einem Gesundheitsdistrikt in Burkina Faso. Heidelberg, *Jahrestagung der Deutschen Tropenmedizinischen Gesellschaft*.
- Fawcus S, Mbizvo MT, Lindmark G & Nyström LA (1996). Community-based investigation of avoidable factors for maternal mortality in Zimbabwe. *Studies in Family planning* **27**(6),19-327.
- Geefhuysen CJ, Isa AR, Hashim M & Barnes A (1998). Malaysian antenatal risk coding and the outcome of pregnancy. *Journal of Obstetrics and Gynaecology Research* **24**,13-20.
- Gupta J & Gupta H (2000). Perceptions of and constraints upon pregnancy-related referrals in rural Rajasthan, India. *Health Serv.Manage.Res.* **13**,6-15.
- Haddad S & Fournier P (1995). Quality, cost and utilization of health services in developing countries: a longitudinal study in Zaire. *Social Science and Medicine* **40**, 743-753.
- Inter-agency group for safe motherhood (1997). The safe motherhood action agenda: Priorities for the next decade. 1-95. Colombo, Sri Lanka.
- Jafarey SN & Korejo R (1993). Mothers brought dead: An inquiry into causes of delay. *Social Science and Medicine* **36**,371-372.
- Jahn A, Carvalho I & Kalinga MJ (2001). Evaluating Traditional Midwife Training Programs: Lessons learned from Tanzania. *International Journal of Gynaecology and Obstetrics*, **73**(3): 277-278.

- Jahn A, Dar Iang M, Shah U & Diesfeld HJ (2000). Maternity Care in rural Nepal: A health service analysis. *Tropical Medicine and International Health* 5,657-665.
- Jahn A & Kowalewski M (1998). The risk approach in antenatal care: Pitfalls of a global strategy The risk approach in antenatal care: Pitfalls of a global strategy. *Curare* SB15,195-209.
- Jahn A, Kowalewski M & Kimatta SS (1998). Obstetric care in Southern Tanzania: Does it reach those in need? *Tropical Medicine and International Health* 3,926-932.
- Kandeh HB, Leigh B, Kanu MS *et al.* (1997). Community motivators promote use of emergency obstetric services in rural Sierra Leone. The Freetown/Makeni PMM Team. *International Journal of Gynaecology and Obstetrics* 59(Suppl 2), S209-18.
- King M (1966). *Medical Care in Developing Countries*, Oxford University Press, Oxford.
- Kowalewski M (1996). Antenatal referral practices and determinants of parturients compliance with referral advice. University of Heidelberg, Institute of Tropical Hygiene and Public Health. MSc Thesis.
- Kowalewski M, Jahn A & Kimatta SS (2000). Why do at-risk mothers fail to reach referral level care? Barriers beyond distance and cost. *African Journal of Reproductive Health* 4,100-109.
- Kowalewski M, Tautz S, Löhken S & Jahn A (1998). The community perspective of problems in pregnancy and child birth. *Curare* 15,181-193.
- Le Coeur S, Pictet G, M'Pelé P and Lallemand M (1998). Direct estimation of maternal mortality in Africa. *Lancet* 352,1525-1526,.
- Macintyre K & Hotchkiss DR (1999). Referral revisited: community financing schemes and emergency transport in rural Africa *Soc Sci Med* 49,1473-1487.
- Maiga Z, Traoré Nafoussi F & El Abassi A (1999) La réforme du secteur santé au Mali (1989-1996). *Studies in Health Services Organisation & Policy* 12. ITGPress, Antwerpen.
- Maine D (1997). The strategic model for the PMM Network. *International Journal of Gynaecology and Obstetrics* 59 (Suppl 2),23-25.
- National Committee on Confidential Enquiries into Maternal death (2000). A review of maternal deaths in South Africa during 1998. National Committee on Confidential Enquiries into Maternal Deaths. *S.Afr.Med J.* 90,367-373.
- Nordberg E, Holmberg S & Kiugu S (1996). Exploring the interface between first and second level of care: referrals in rural Africa. *Tropical Medicine and International Health* 1(1),107-111.

- Nordberg EM (1984). Incidence and estimated need of caesarean section, inguinal hernia repair, and operation for strangulated hernia in rural Africa. *British Medical Journal* **289**,92-93.
- Nwakoby B, Akpala C, Nwagbo D *et al.* (1997). Community contact persons promote utilization of obstetric services, Anambra State, Nigeria. The Enugu PMM Team. *International Journal of Gynaecology and Obstetrics* **59**(Suppl 2), S219-24.
- Nkyekyer K (2000) Peripartum referrals to Korle Bu teaching hospital, Ghana-a descriptive study. *Tropical Medicine and International Health* **5**, 811-817.
- Olaniran N, Offiong S, Ottong J, Asuquo E, & Duke F (1997). Mobilizing the community to utilize obstetric services, Cross River State, Nigeria. The Calabar PMM Team. *International Journal of Gynaecology and Obstetrics* **59**(Suppl 2),S181-9.
- Oosterbaan MM & Barreto da Costa MV (1995). Guinea-Bissau: What women know about risk- an anthropological study. *World Health Statistic Quarterly* **48**,39-48.
- Paine LHW & Siem Tjam F (1988). Information, financing and referral system: In Hospitals and the health care revolution First edn. eds. Paine LHW & Siem Tjam F, WHO, Geneva, pp.94-100.
- Rooney C (1992). Antenatal care and maternal health: How effective is it?, Maternal Health and Safe Motherhood Programme, WHO, Geneva.
- Sabitu K, Alti-Mu'azu M, Musa AA *et al.* (1997). The effect of improving maternity services in a secondary facility, Zaria, Nigeria. The Zaria PMM Team. *International Journal of Gynaecology and Obstetrics* **59**(Suppl 2), S99-106.
- Sauerborn R, Nougara A, Sorgho G, Tiebelesse L & Diesfeld HJ (1989). Assessment of MCH services in the district of Solenzo; Burkina Faso. II. Acceptability. *Journal of Tropical Pediatrics* **35**,10-13.
- Thaddeus Sa & Maine D (1994). Too far to walk: Maternal Mortality in context. *Social Science and Medicine* **38**,1091-1110.
- The prevention of maternal mortality network (1992). Barrier to treatment of obstetric emergencies in rural communities of West Africa. *Studies in Family Planning* **23**,279-291.
- Toure B, Thonneau P, Cantrelle P *et al.* (1992). Level and causes of maternal mortality in Guinea (West Africa). *International Journal of Gynaecology and Obstetrics* **37**,89-95.
- Urassa E, Lindmark G & Nystrom L (1995). Maternal mortality in Dar es Salaam, Tanzania: Socio-economics, obstetric history, and case accessibility of health care factors. *African Journal of Health science* **2**,242-249.

- Vanneste AM, Ronsmans C, Chakraborty J & de Francisco A (2000). Prenatal screening in rural Bangladesh: from prediction to care. *Health Policy Plan.* 15,1-10.
- Villar J, Bakketeig LS, Donner A *et al.* (1998). The WHO Antenatal Care Randomised Controlled Trial: rationale and study design. *Paediatr Perinat.Epidemiol* 12, 27-58.
- Villar J & Bergsjö P (1997). Scientific basis for the content of routine antenatal care. *Acta Obstetrica et Gynecologica Scandinavica* 76,1-14.
- Walraven G, Telfer M, Rowley J & Ronsmans C (2000) Maternal mortality in rural Gambia: levels, causes and contributing factors. *Bull.World Health Organ* 78,603-613.
- Weissman E, Sentumbwe-Mugisa O, Mbonye AK & Lissner C (1999). Costing Safe Motherhood in Uganda. *Reproductive Health Matters: Safe motherhood Initiatives: Critical Issues*, 85-92.
- WHO (1991). Essential elements of obstetric care at first referral level, Macmillan Press Ltd., London, Basigstoke.
- WHO (1996). Care in Normal Birth: a practical guide, Maternal and Newborn Health / Safe Motherhood Unit, Family and Reproductive Health, WHO, Geneva.
- WHO (1994). Mother-Baby-Package: Implementing safe motherhood in countries, Maternal Health and Safe Motherhood Programme, WHO, Geneva.

What is the cost of maternal health care and how can it be financed ?

Josephine Borghi¹

Summary

This paper reviews the evidence on the cost of providing maternal health services, the use of disability-adjusted life years (DALYs) in the evaluation of the cost-effectiveness of these services, and alternative sources of financing maternal health services. The findings suggest that, for most interventions, care can be provided most cheaply at the primary care level. Personnel and drugs are the main components of cost. Community-based studies indicate that for the provision of emergency obstetric care, the focus should be on improving existing facilities. However, cross-study/country comparisons are difficult due to the inconsistency of costing methods and definitions of maternal health. While the use of DALYs as an outcome measure can help to justify the cost-effectiveness of maternal health interventions, compared to interventions, which target other disease areas, DALYs may underestimate the true burden of maternal mortality and undervalue an intervention's cost-effectiveness due to the infrequency of maternal mortality.

Funding for maternal health services represents approximately 5-11% of total donor contributions to the health sector in developing countries and approximately 4-12% of domestic health expenditure, although it is difficult to determine the trends in these figures over time. The National Health Account framework will facilitate the measurement of expenditure on maternal health and the comparisons across countries. To achieve good maternal outcomes in developing countries, the model of health care financing must facilitate access and guarantee service quality. This can be achieved through a variety of methods: e.g. general taxation and social insurance. The key issue is financial sustainability. At the local level some NGO programmes have been successful in increasing access to essential obstetric care in rural communities and community programmes have been able to generate limited funds to the same end.

¹ MSc in Health Economics. Privada San Miguel n°12, Coyoacan 04030, Distrito Federal, Mexico. Email : jborghi@hotmail.com

Introduction

This review paper is composed of three sections. The first section reviews the evidence on the cost of maternal health services. While the importance of providing maternal health services is universally recognised there is limited information available on the cost of providing these services. Cost information – both measures of unit cost and cost-effectiveness – serves as a critical input into the processes of setting priorities and allocating resources efficiently. Cost studies of maternal health interventions help to assess how well resources are used in different types of health facilities and can provide policymakers with information on how to improve the efficiency and effectiveness of service delivery as well as to assess how adequately funded these services are (Levin, McEuen, Dymatraczenko *et al.* 2000). Hence these studies are useful for the development of health financing schemes in-country. To this end country-specific studies are more useful than global estimates based on hypothetical models.

The second section considers the measurement of the effectiveness of maternal health interventions. We discuss the benefits and disadvantages of using the disability-adjusted life year (DALY) in the evaluation of maternal health programmes and examples of its use in the literature. The third section considers the financing of maternal health services. To understand the viability of specific maternal health interventions in the context of resource constrained economies it is important to consider from where the financing will come. We therefore discuss the trend in government and donor expenditure on maternal and child health care and some examples of alternative ways of financing maternal health care.

Methods

A comprehensive search of Medline and Popline databases was conducted. The results of two reviews were also included: a compilation of studies of reproductive health costs pre-1997 (Mumford, Dayaratna, Winfrey *et al.* 1998) and a review of economic evaluations of antenatal care interventions (Hutton 1996). The web pages of major donors were reviewed along with other unpublished references.

Cost of Maternal Health Services

SCOPE OF ANALYSIS

We begin by presenting the costs of preventative care: antenatal and postnatal visits and, where available, specific components of the visits such as tetanus immunisation. The costs of basic curative care such as normal vaginal delivery are presented as well as those for surgical interventions: caesarean section and abortion. We also discuss the cost data provided in a number of studies relating to the provision of specific essential obstetric services (see Appendix 1) such as setting up blood transfusion facilities, upgrading a health centre for the performance of caesarean sections (c-sections). Although there is an extensive literature relating to other elements of reproductive health, namely family planning services (Janowitz & Bratt 1992), the prevention, detection and treatment of sexually transmitted diseases (STDs) and HIV/AIDS, and breastfeeding promotion, these are not specifically referred to here, but are discussed elsewhere (Mumford, Dayaratna, Winfrey *et al.* 1998, Hutton 1996). This review considers costs to the provider² of providing maternal health services and excludes cost studies from developed countries because of the limited applicability of these studies in developing country settings. Finally, our focus is on the estimated costs of current practice in specific countries or regions, rather than on the cost of 'ideal/standard' practice based on a hypothetical model (Tinker & Koblinsky 1993, Weissman, Sentumbew-Mugisa, Mbonye *et al.* 1999b, Cowley 1995³).

COSTING METHODS USED IN REVIEW STUDIES

Comparisons of costs across studies are difficult because of differences in the methods used to evaluate costs. Cross-country comparisons of cost data are

² Patient costs have been estimated in a number of papers, for example: charges for antenatal care, delivery care (Knowles 1998); charges for antenatal care, delivery care: normal and c-section (Mirembe, Ssengooba & Lubanga 1998); charges and unofficial fees for c-section in Bangladesh (Kawnine, Guinness, Amin *et al.* 1998); direct and indirect costs including charges for antenatal care, vaginal delivery, c-section (Levin, McEuen, Dymatraczenko *et al.* 2000); direct and indirect costs including charges for antenatal care (Borghi, Bastus, Belizan *et al.* 2000).

³ (Tinker & Koblinsky 1993) estimates the public sector costs for possible safe motherhood programmes in three settings: from the weakest health system to the more-developed. (Weissman, Sentumbew-Mugisa, Mbonye *et al.* 1999b) contrasts the costs in Uganda of the 'standard' or 'ideal' practice in order to meet the Safe Motherhood criteria, with the cost of the current practice. (Cowley 1995) develops a hypothetical model to estimate the cost of essential obstetric care.

also problematic as the unit costs of interventions can vary considerably across countries due to differences in resource availability and costs. As indicated in Table 1, the studies included in this review used a variety of different costing methods. Table 1 presents, for each study, the intervention considered, the costing method used, the method of allocating joint⁴ costs, the inclusion or not of indirect⁵ and opportunity⁶ costs, the number of facilities included in the analysis, the type of facility considered and the nature of the service provider. Finally, the table indicates how the costs are presented: total, average and/or marginal⁷ costs, whether costs are disaggregated by input type, whether ranges or confidence intervals are provided for costs, and the year and currency of the costs.

RESULTS

There were 15 studies identified with cost estimates for 16 countries. The majority of estimates refer to countries in Africa (n=7), five in Central and South America and 4 in South and South East Asia. The interventions covered were wide, with 15 country estimates of the average cost of an antenatal care visit, 9 of normal vaginal delivery, 8 of c-section, 4 of abortion, 5 of post-abortion care, 3 of eclampsia and haemorrhage and 2 of sepsis. Estimates are from public, private, mission hospitals and health centres and there is one estimate of home based antenatal and delivery care.

For a number of studies data were not collected or presented in disaggregated form, such as unit costs broken down by resource inputs (prices and quantities). Not all studies clearly report the methods used to calculate costs. Furthermore, methods of costing differed: top-down costing compared to the distribution of a questionnaire to medical staff to identify current practice and then applying costs. Finally the currency and year of cost data are not systematically indicated. The definition of what is being costed is not always clear: a number of studies lump together a range of interventions under the heading maternal and child health or maternal health without specifying the boundaries of the analysis. For all these reasons, caution must be exerted

⁴ Joint costs are the costs of resources which are shared across more than one activity (a typical example are 'overhead' costs).

⁵ These are the costs associated with impaired ability to work or to engage in leisure activities due to morbidity and lost economic productivity due to death (Gold, Siegel, Russell & Weinstein 1996)

⁶ The opportunity cost is the value of time in its next best alternative use death (Gold, Siegel, Russell & Weinstein 1996). A typical example is the valuation of volunteer worker's time.

⁷ Defined here as drugs and medical materials.

when comparing the costs between countries.

COST OF BASIC OBSTETRIC SERVICES

Costs are presented in constant 1998 US Dollars. The methods of conversion were based on (Kumaranayake 2000).

Preventative interventions

Antenatal care (ANC)

Table 2 presents the costs of antenatal care taken from the literature. The range of costs is wide, from US\$2.21 per visit in a public health centre in Uganda to US\$42.41 in a maternity hospital in Argentina⁸. The higher cost in Argentina is reflected by the higher labour costs (>70% of total), with marginal cost (drugs and medical supplies) representing a much smaller proportion of total cost (27%) than most other countries. If we exclude Grenada and Argentina the range of costs narrows to \$2.21-\$15.46. Costs are generally lower in the lower level facilities: at the primary health centre, then at the secondary level hospital and the highest cost is in tertiary facilities, although the differences are not significantly different. Also, there are some exceptions: Argentina, the mission hospitals in Uganda and Ghana, and Bolivia. In Argentina and Ghana this was due to the higher service volume at the hospital level, reducing unit costs. The cost of providing care from a mobile outreach clinic was higher than from a static clinic. There was no difference between the cost of providing care in a private nursing home compared to a public health facility or home-based care. However, the cost of providing care through the private mission facilities was almost consistently higher than in the government facilities. Drugs and medical supplies (indicated by marginal costs) represent a significant proportion of average cost (46.4%). The costs of providing specific components of antenatal care are discussed in Appendix 2.

⁸ The cost estimates for Bangladesh were not comparable due to the chosen outcome measure.

Postnatal care

One study (Anand, Pandav, Kapoor *et al.* 1995) estimated the cost of home-based postnatal care as the same as for antenatal care. Another study (Mitchell, Littlefield & Gutter 1997) estimated the cost at US\$5.43 per visit, similar to that of antenatal care.

Normal Vaginal Delivery

Table 3 illustrates the cost estimates of a normal vaginal delivery. The range of costs is between: US\$2.71 for Uganda and US\$140.41 for Argentina. Costs are significantly lower at the health centre compared to hospital level ($p=0.02$)⁹. The substantially higher cost in Argentina can again be explained by the predominance of labour costs and the fact the deliveries are carried out by obstetricians rather than midwives. The costs are generally higher in the government facilities compared to the private nursing home and the mission hospitals. It is unclear from most of the studies who carries out the delivery (proportion of deliveries carried out by a doctor or a midwife) and so we are not able to establish differences in cost for assistance during delivery by different health staff. The costs of episiotomy figure in Appendix 2.

COST OF COMPREHENSIVE OBSTETRIC SERVICES

Caesarean Section

Table 4 presents the costs of c-section derived from the literature. We were unable to distinguish between emergency and elective c-section. The costs range from US\$46.71 in Uganda to US\$525.57 in Argentina. The cost estimates from the two studies in Bolivia are consistent. The cost of a c-section is on average three times greater than that of a normal vaginal delivery. On average, drugs and medical supplies represent 49.2% of the total cost.

Management of Complications

Post-Operative Infection

A study in Uganda estimated the cost of treatment for postoperative infection with procaine penicillin during an ectopic pregnancy at US\$31.22 and US\$24.50 for ampicillin prophylaxis (including the cost of hospital admission) (Reggiori, Ravera, Coccozza *et al.* 1996). The same study estimated the cost of antibiotic treatment for postoperative infection after c-section, at US\$44.79 for treatment with penicillin and US\$28.06 for ampicillin prophylaxis.

⁹ Independent sample t-test, equal variances not assumed.

laxis. Finally, a study by (Bibi, Megdiche, Ghanem *et al.* 1994) in Tunisia estimated the cost of curative antibiotics for postoperative infection following a c-section, at US\$912.57 compared to US\$91.38 for antibiotic prophylaxis.

Postpartum Haemorrhage

The cost of managing postpartum haemorrhage varied from US\$35.44 in a Ugandan public hospital to US\$114.83 in a mission hospital in Uganda (see Table 5). However, for the lower estimate for Uganda, it was not clear whether the cost corresponded to the management of antepartum or postpartum haemorrhage. Furthermore, this estimate was based on estimated current practice, involving a five-day course of antibiotics and 3-7 days hospital stay, with a small proportion of cases having a blood transfusion (Weissman, Sentumbew-Mugisa, Mbonye *et al.* 1999b). Drugs and medical supplies accounted for 56% of the total cost of patient management.

Pre-eclampsia

The study in Bolivia (Dmytraczenko, Aitken, Carrasco *et al.* 1998) estimates the cost of managing pre-eclampsia at US\$5.59 in a primary health centre, US\$6.74 in a secondary level facility and US\$8.09 at the tertiary level.

Eclampsia

The cost of managing eclampsia ranged from US\$39.88 in Bolivia to US\$159.66 in Uganda (see Table 6). The cost appears to be lower in the secondary compared to the tertiary level hospital in Bolivia. The cost of drugs and medical supplies (22% of the average cost) are secondary to labour costs (up to 68% of the average cost (Weissman, Sentumbew-Mugisa, Mbonye *et al.* 1999b)). A woman with eclampsia will often require attention over several days by well-trained and qualified medical staff, which accounts for the high labour cost.

Sepsis

The cost of managing maternal sepsis ranged from US\$8.76 in Uganda to US\$72.64 in Bolivia (see Table 7). The cost is higher at the tertiary compared to the secondary level in Bolivia.

Abortion Service Delivery

Alternative methods of abortion

Manual Vacuum Aspiration (MVA)

The cost of conducting abortion by MVA varies between US\$2.02 in Tanzania to US\$46.82 in a tertiary level facility in Bolivia (see Table 8). However, the Tanzanian study did not include indirect costs or opportunity costs associated with the intervention, also this study was conducted in a primary level 'medical centre' rather than hospital. The Bolivia study indicates that the cost is lowest in the primary health centre and highest in the tertiary hospital. The cost of drugs and medical supplies, on average, represents 19% of the total cost.

Surgical (dilation and curettage)

The cost of abortion by surgical intervention ranges between US\$2.79 in Kenya to US\$68.96 in Mexico (see Table 9).

Management of post-abortion complications

The cost of managing post abortion complications varies from US\$12.10 in Uganda to US\$304.73 in Nigeria (see Table 10). In the Bolivia study (Rosenthal & Percy 1991) personnel costs are not included, although opportunity costs are measured. However, average costs will vary considerably depending on the extent of complications, as may be expected. Drugs and medical supplies accounted for on average 58% of the total cost.

ESTIMATED COST OF PROVIDING ESSENTIAL OBSTETRIC CARE PACKAGES

Table 1 in Appendix 3 presents the findings of the Prevention of Maternal Mortality Network (PMMN). The alternative models are presented along with the estimated costs and outcomes of the community programmes delivered in hospitals and health centres in West Africa.

Community programmes have a vital place in emergency obstetric care because they can ensure women's access to such care when needed. In general costs are lowest, and sustainability greatest, in programmes that make use of existing capacity. Otherwise stated, the costs of EOC need not be costly when the necessary facilities, equipment and staff are in place. Renovation of facilities, repair of equipment and training of staff, although not without cost, cost substantially less than developing new facilities.

The cost of improving emergency obstetric care by renovating facilities and equipment varied between US\$250 (Leigh, Kandeh, Kanu *et al.* 1997)-US\$1559.3 (Ande, Chiwuzie, Akpala *et al.* 1997) per additional admission with a blood bank, and US\$117 (Oyesola, Shehu, Ikeh *et al.* 1997)-US\$223 (Olukoya, Ogunyemi, Akitoye *et al.* 1997) without. However, the presence of a functioning blood bank enables the safe conduct of obstetric surgery, significantly reducing the risk of maternal death.

One of the barriers to accessing health care for women in rural areas, not well served by health facilities, is transport: the lack of transport or its exorbitant costs. The most cost-effective model was described in Nigeria (Shehu, Ikeh & Kuna 1997), using trained drivers from the local transport union, with the cost per transportation amounting to US\$4.67 per case.

The example of Ghana (Senah, Richardson, Kwofie *et al.* 1997) indicates that the renovation of an abandoned warehouse to serve as a health centre and provide MCH/FP clinics was highly cost-effective. Whereas the maternity waiting home concept, although low in cost was ineffective in mobilising community utilisation (Wilson, Collison, Richardson *et al.* 1997).

The use of DALYs for the evaluation of maternal health interventions

BENEFITS AND DISADVANTAGES OF DALYs¹⁰

Evaluating maternal health conditions/interventions by focusing uniquely on the impact on maternal mortality fails to take into account the losses to health that occur because of morbidity. It is generally accepted that 15% of all live births develop complications which in the absence of treatment, seriously compromise the health of women (AbouZahr 1999). Consequently, narrowing the focus to mortality alone, will underestimate the burden due to pregnancy-related causes. DALYs, avoid this problem, by considering both the morbidity and mortality effects of a disease. DALYs also enable the description of health states in multiple dimensions; they do not rely on self-reported health (which can give counter intuitive results) but on valuations of states provided by experts and the person trade-off (PTO) technique.

However there are a number of problems that have been raised, particularly regarding the evaluation of maternal conditions:

¹⁰ A background to definition and use of DALYs is provided in the Appendix 4.

- The calculation of DALYs is focused on the five main causes of maternal mortality and the associated major morbidity¹¹). No attempt was made to include morbidity arising from other direct causes of maternal death (such as ectopic pregnancy) or indirect causes such as hepatitis or diabetes. Additionally, there is no measure of the burden of the excessive practice of c-section or episiotomy. Furthermore, the calculation of DALYs does not estimate healthy years of life lost for stillbirths because counting can only start at birth, according to the definition. Hence, the burden of disease due to perinatal causes does not include late foetal or intra-partum deaths;
- The DALY methodology does not take into account the everyday burden of certain impeding conditions such as vaginal itching or discharge (AbouZahr 1999);
- The calculations provide general regional estimates of the burden but are not tailored to the conditions in specific countries of the world;
- Disability is based on the ranking of 6 disability states between perfect health '0' and death '1'. They were chosen by a group of predominantly male international clinicians. There was no explicit inclusion of community evaluation or preferences, hence ignoring the impact of social, cultural or economic contexts on the severity of disability;
- A number of conditions arising during pregnancy and the postpartum result in social stigma, such as STDs and abortion. Much psychological distress can result, yet this is not taken into consideration in the calculation of the 'burden' (AbouZahr 1999). An alternative (Hanson 1999) would be to consider the amount of handicap caused by non-fatal outcomes, which would take into account the overall consequences of their impairment as influenced by their social environment (HALY).

BURDEN OF MATERNAL ILL HEALTH USING DALYS

Reproductive ill health accounts for 36% of the total disease burden among women of reproductive age in developing countries (18% for pregnancy-related deaths and disabilities; 10% for sexually transmitted diseases (syphilis, chlamydia, gonorrhoea and pelvic inflammatory disease) and 8% for HIV/AIDS (AbouZahr 1999).

¹¹ Haemorrhage, puerperal infection, eclampsia, obstructed labour and abortion.

THE COST PER DALY FOR MATERNAL HEALTH INTERVENTIONS

The DALY methodology is also used to determine resource allocation and facilitate priority setting. Within the context of economic evaluation, the aim is to minimise DALYs subject to a health budget; hence the outcome of interest is the cost per DALY averted. A comprehensive review of the literature (Mumford, Dayaratna, Winfrey *et al.* 1998) identified 3 studies that estimated the cost per disability-adjusted life year averted: 2 for STDs, 1 for breastfeeding. A more recent review revealed a further 6 related to the vertical HIV-1 transmission. There were no studies identified which present the cost per DALY averted for interventions relating specifically to maternal health, as defined above.

This could be explained by a number of factors. Firstly, there have been very few cost-effectiveness studies of maternal health interventions using any kind of outcome measure (most are cost studies with no outcome data or effectiveness studies with no cost data). This suggests that there has, to date, been little economics research in this area as compared to, for example, HIV/AIDS and malaria. Furthermore, maternal mortality is a relatively infrequent event, and measuring the impact of an intervention in these terms may decrease the apparent cost-effectiveness of maternal health interventions¹².

Trends in domestic and international expenditure on maternal health services

DIFFICULTIES IN OBTAINING DATA

Data on the cost of providing improved maternal health care relative to the available budget are important as these financial figures can assist in closing the gap between what is needed and what is available. An assessment of costs and resource can also help to set priorities.

The analysis of data tracking cash flows and expenditures earmarked for maternal health by governments and donors in the international community will enable the analysis of trends in these expenditures relative to global health spending. This section borrows from a number of studies (Howard 1990, Potts, Walsh, McAninch *et al.* 1999, Zeitlin, Govindaraj & Chen,

¹² There were two interventions in the literature measuring the cost per maternal death averted, the range was between US\$517 and US\$6,677 (27 and 10 respectively)

1994), international donor web sites and National Health Accounts data for Egypt and Sri Lanka (Rannan-Eliya, Berman, Eltigani *et al.* 2000).

First it is necessary to point out the difficulties associated with tracking expenditure flows to a specific component of health care: maternal health. The first issue is definitional, as there are no universally agreed-upon definitions of what activities are included under this heading. Government clinics and health centres are often multipurpose and it is difficult to isolate the costs of one type of service (e.g. maternal health care). Also financial data may be recorded under a variety of categories: e.g. personnel costs, capital etc. without being allocated to specific activities: MCH/FP etc. Figures may be aggregated offering estimates of a package of maternal and child health combined with family planning programmes or just maternal and child health alone and it is not obvious how to disaggregate these figures further¹³. Data on domestic private sector spending are even more difficult to obtain. Furthermore, one study (Howard 1990) found that while data on international funding of population services did exist, information on domestic funding was harder to identify and was not necessarily internationally comparable. Official figures are often not available beyond 1996 and prior to 1993 are incomplete and of dubious quality (Potts, Walsh, McAninch *et al.* 1999).

GENERAL PROJECTIONS

According to ICPD projections, reproductive health costs in developing countries will total US\$17 billion in 2000 and US\$21.7 billion in 2015. Developing countries are expected to meet approximately 2/3rds of the costs and international donors one third (see Table 11).

PAST TRENDS IN EXTERNAL RESOURCES

For multi- and bilateral assistance, data are usually gathered by region or by country, sector specific data are of less operational interest. However, one study (Rannan-Eliya, Berman, Eltigani *et al.* 2000) disaggregated the bilateral and multilateral aid flows by type of activity for 1990. An estimated 44.5% of all external assistance was spent on hospitals and health services, of the rest, 18.8% was allocated to specific health problems, 9.4% to nutrition pro-

¹³ In general, available information of family planning support is the most widespread, followed by STDs and safe motherhood financing data being the most scarce and difficult to interpret.

grammes, 7.6% to maternal and child health programmes and 19.6% to population activities.

It is also interesting to consider the trends over time. A study carried out by the World Bank in 1990 measured the aid flows for the Safe Motherhood Programme before and after the 1987 conference (Howard 1990). For the major bilateral sources, including the European Community, the net trend from 1986 to 1988 showed a gradual increase for total health spending. Projects with direct and indirect effects on maternal health represent about 12% of all bilateral financing, including family planning, primary health care, nutrition, training and disease control. This is illustrated in Table 12. Health sector assistance after stagnating in real terms during the first half of the 1980s has been increasing since 1986 through both bilateral and multilateral channels. During the 1980s multilateral institutions, particularly UNICEF and the World Bank played a larger role in financing health sector assistance than previously.

An updated analysis of financing trends is much needed to illustrate the developments in external assistance during the last decade¹⁴. In the absence of currently available data, the trends for USAID health sector assistance during the 1990s may serve as a rough guide (Table 13). Between 1990-1995, the agency's support for maternal health and nutrition fluctuated between approx. US\$30 million and US\$70 million, but returned to US\$30 million by 1995, demonstrating a lack of serious commitment to increasing resources for basic reproductive health services (Potts, Walsh, McAninch *et al.* 1999).

DOMESTIC RESOURCES

As one author (Howard 1990) points out, there are general difficulties in monitoring health sector expenditures in many countries, with only 20 developing countries reporting to the United Nations system on national accounts in 1990. Furthermore, few governments employ functional accounting enabling the attribution of resource inputs to specific activities.

Table 14 presents the very limited available evidence. It is not possible for any one country to identify the trends in spending over time. For Sri Lanka we have two observations for 1982 and 1997, which apparently suggest that there has been a reduction in spending on maternal health as a proportion

¹⁴ Recognising the need for improved information on international and domestic resources, the UNFPA in collaboration with the Netherlands Interdisciplinary Demographic Institute has started to develop an improved system of annual data collection which should improve the tracking of funding in the future (Potts, Walsh, McAninch *et al.* 1999).

of total health expenditure (from 13% to between 4 and 12%). However, the costing methodologies used and definitions are not consistent between studies. The most recent estimate was derived from the National Health Accounts data¹⁵ (Rannan-Eliya, Berman, Eltigani *et al.* 2000). Depending on the chosen definition of maternal health (a very narrow definition including only antenatal and postnatal care or a wider definition including STD management, family planning services and relevant proportions of hospital care) the figure varies from 1-12%. Unless we can be sure that the definition of maternal health and the method of calculation is consistent over time, across studies, then any comparisons will be potentially misleading. The high estimate of 19% for Bangladesh is based on expenditures for maternal and child health and family planning. The estimate for India includes child health and that of Uganda includes care of the newborn. It seems that overall, the proportion of expenditure on reproductive health is between 12-19%, maternal and child health between 7 and 11% and maternal health about 4%. Studies in Belize, Jamaica, Korea, Malawi and Oman show that the leading use of public hospitals was due to maternal causes, which accounted for between 23 and 43% of all admissions but only 11% of hospital expenditure (Barnum & Kutzin 1993). This suggests that within hospitals maternal health interventions are not receiving an adequate proportion of funds, relative to the number of admissions.

Alternative Financing Methods for Maternal Health Services

Insufficient funding for health services is a nearly universal problem in developing (and developed) countries. In many lower income countries, the percentage of government revenue that has gone into financing health care has declined since the early 1980s (Krasovec & Shaw 2000). In many countries new and increasing demands are being placed on the health system with the increase in population size and rising levels of communication and education levels. There are also competing challenges presented by the rising levels of chronic diseases in urban areas and continually high levels of infectious diseases in rural populations. Funds for health care can be generated by four main sources:

¹⁵ The advantage of using National Health Accounts data is that expenditure is categorised by the type of health facility: hospital /health centre /pharmacy and by the source of finance: government /household /donor. Estimations can be made regarding the proportion of inpatient admissions /outpatient consultations attributed to maternal health, and in this way expenditure can also be allocated.

- Direct government financing;
- Donor financing;
- Private user charges;
- Third party payments (health insurance, community financing or *mutuelle* schemes).

Table 15 indicates three models of health system financing typically encountered.

Here we consider a number of different policies and where possible the impact on maternal health outcomes (either direct morbidity and mortality or utilisation of health services) illustrated in Tables 16, 17 & 18. We consider macro-level financing, the concept of user-fees, at a more micro level, the role that can be played by NGOs in the financing and provision of health services, and a number of community-level financing programmes¹⁶.

MACRO-LEVEL FINANCING

We consider three examples of alternative health system configurations in terms of financing health care at the macro-level as illustrated in Table 16. Sri Lanka provides an example of an largely publicly funded system through general taxation, with an equitable geographic distribution of health care facilities at the primary and secondary levels. The private sector funds 52% of primary care services but only 13% of hospital care. The low level of hospital coverage is due to the failure of the insurance market to provide catastrophic health insurance. Indeed, less than 2% of total health sector financing is from health insurance, and similarly population coverage for health insurance has not increased beyond 2% (Hsiao 2000). For the provision of antenatal care, a group of public health midwives (PHM) associated to a health unit under the supervision of a Medical Officer of Health, provides services at the grass-roots level and is responsible for registering pregnant women and acts as a link between the community and the public health services. This structure may explain the higher proportion of outpatient maternal services provided by the government sector (Rannan-Eliya, Berman, Eltigani *et al.* 2000)

¹⁶ The type of programme considered will affect the type of outcome chosen for evaluation.

The Egyptian case is similar except for the existence of a compulsory social insurance agency operating through the workplace, although this agency is funded almost 50% through the government by general revenues.

Finally, Bolivia a decentralised financing programme, is an example of an insurance programme specifically targeted to Mother and Child health¹⁷. Services are reimbursed on a per service basis by the municipal government. 20% of national revenues are allocated to the municipalities 85% of which are allocated for 'investment purposes'. 3.2% of these investment funds go into a Local Compensatory Health Fund, which reimburse the *Seguro Nacional de Maternidad y Ninez* (SNMN) requests.

In terms of maternal health outcomes and indicators of maternal health, Sri Lanka fares best with 92.2% of pregnant women being attended by a trained birth attendant and 82.2% of live births taking place in government hospitals. However, there are additional non-health system factors which have contributed to this achievement, namely education and the status of women (Samarasinghe 1999). In Egypt, on the other hand, only 28% of mothers receive antenatal care and 30% of women receive trained assistance at delivery. In Bolivia, coverage is also low, but there has been a demonstrated increase in the utilisation of maternal health services (16-39% for antenatal care and 43-50% for delivery care) following the introduction of the SNMN¹⁸.

THE ROLE OF NGOS

There are numerous examples of NGOs working with or in parallel to the government in the provision and/or financing of maternal health services. We consider here examples from Malawi, Bolivia, Brazil and Guatemala, illustrated in Table 17. It is more difficult in these financing programmes, which operate at a more micro-level, to monitor the impact on maternal health outcomes. The study in Guatemala was the only one where an evaluation of impact could be identified. In Malawi and Brazil the government provides subsidies to the NGOs in full or in part for the provision of reproductive health services. In Guatemala the NGOs are contracted by the government to extend basic services to the poor, rural populations. In Bolivia,

¹⁷ Mothers receive treatment free-of-charge for prenatal care, management of pre-eclampsia, eclampsia, delivery (vaginal and c-section), postpartum sepsis and haemorrhage. Neonates are treated for asphyxia, pneumonia and sepsis, and children under five are treated for acute respiratory illnesses and diarrhoea.

¹⁸ Prior to the introduction of SNMN user fees funded maternal and child health services.

PROSALUD is funded by low cost user payments (70%) and international organisations such as USAID.

COMMUNITY-LEVEL FINANCING PROGRAMMES

At the community level projects with varying scope and objectives have been initiated and their success documented. We consider here a number of examples from the African continent: Nigeria, Sierra Leone, The Gambia, Tanzania, Mali and Rwanda (see Table 18). In Nigeria and Sierra Leone the programmes were run by the PMMN and the objective was the provision of funds for emergency care (transport to hospital, drugs and supplies, general treatment) for women during pregnancy, with no pre-payment required, although women were required to repay the loan as soon as possible. Although, the repayment rate was below 100% in each project the impact on utilisation was positive (Chiwuzie, Okojie, Okolocha *et al.* 1997, Fofana, Samai, Kebbie *et al.* 1997) was noted as well as a reduction in the case fatality ratio (Thuray, Samai, Fofana *et al.* 1997). In Mali a similar system was financed partly by the district, partly the community.

In Tanzania, the example is of a health card for reproductive health services funded by households and subsidised by the government. In Rwanda, a similar system targeting farmers, covers preventative and curative care provided by nurses in health centres, providing prepayment is made. However, evidence of the impact was not identified.

Finally, a study in The Gambia (Fox-Rushby & Foord 1996) discusses a system whereby pregnant women have the option of paying a small fee during the antenatal care visit to cover the costs that follow during pregnancy. There was a high uptake, suggesting this was a viable financing option for the women.

USER FEES

Background to user fees

Faced with decreases in both government financing and reduced donor assistance one option for raising funds that has been explored is private user charges for services that were previously provided for free. A 1995 survey of 37 African countries found that 34 governments impose fees of some kind for government provided health services (Samarasinghe 1999). User fees are used in the public sector to generate additional revenue and to improve efficiency by giving consumers appropriate price signals. Experience indicates that they contribute 4-20% to government costs in Sub-Saharan Africa. Some

studies have shown that user fees can increase the use of health services by the poor if they are successfully reinvested at the local facility level and used to improve the quality of services (<http://www.50years.org/update/userfees.html>, Litvack & Bodart 1993). Indeed, the case of Sri Lanka where 60% of patients opt to receive outpatient care in private facilities, indicates that patients are often prepared to pay an affordable fee, with the guarantee of quality care. However, the size of the fee is a determinant factor, depending on whether the charge is purely a nominal amount, or whether the aim is for complete cost recovery through the fee system. The case against user fees is particularly strong for delivery care and life-threatening complications. In these cases the costs can escalate dramatically, placing an unbearable burden on household resources (Hotchkiss 1998). User fees can also be used to support a referral system by charging patients who go directly to tertiary facilities for care that should be provided at lower levels.

Problems with user fees

The user fee structure is inherently regressive and efforts need to be made to ensure that the poor and other vulnerable groups are protected. Cost sharing arrangements are often poorly designed or poorly implemented, thus discouraging the use of reproductive health services, examples include: Kenya, Papua New Guinea, Tanzania, Niger (Grossman, Filippi, De Koninck *et al.* 2000).

Many have argued that user fees should not be used for delivery care as they can serve as a disincentive for hospital deliveries (Stanton & Clemens 1989). The example of South Africa (Schneider & Gilson 1999) indicates the benefits of switching from user fees¹⁹ in 1994, to free provision of maternal and child health care in all government hospitals and health centres. This also led to a reduction in government revenues from fees by 27%, (1.5% of public health budget) and increased drug costs by 1% of recurrent health expenditure. However, utilisation of maternal health services increased: antenatal attendance increased in 8 of the 13 sites by an average of 14.9% and deliveries preceded by an ANC visit increased in 11 of 12 sites by 4.6%. When women are already facing the burden of travel costs, additional fees for the service make the burden of cost insupportable for many women.

¹⁹ With women paying a low, all inclusive, fee (US\$1.50) per outpatient visit and US\$4.40 for inpatient care

Conclusions

There are numerous cost studies of maternal interventions in the literature; however, there is little consistency in the costing methods used making comparisons difficult. Overall, the findings suggest that, for most interventions, care can be provided more cheaply at the health centre rather than the hospital level, so upgrading health centres for the provision of basic EOC is a cost-effective option. However, there were no studies identified which evaluated the costs of home births assisted by skilled personnel. Furthermore, while obstetric surgery often needs a hospital setting, many life-saving procedures can be carried out in health centres and health posts (Maine 1999). However, the more restricted opening hours plus the more limited availability of certain medical staff, might make the health centre less accessible for women to receive emergency treatment. Personnel, drugs and medical supplies are the main contributors to total cost, and for certain interventions (e.g. for postpartum haemorrhage where drugs and medical supplies represent 56% of the total cost) the guaranteed supply of required drugs is essential. As demonstrated by the PMMN studies, in many of the poorest countries, there is an extensive network of health facilities. Therefore, the focus should be on improving the functioning of an emergency obstetric care system, rather than building one up from nothing²⁰.

The cost of a c-section is three times greater than that of a normal vaginal delivery. Hence, the savings from a more rational use of health care can be substantial and support arguments against an over-medicalisation of health care. Similarly, substantial savings can be made by switching from a policy of routine to restrictive episiotomy.

To measure the cost-effectiveness of an intervention, the advantage of the DALY is that it enables comparisons across projects, and can help to justify investments in maternal health projects rather than projects focused on other disease areas. However, maternal mortality is a comparatively rare outcome and the burden of maternal ill-health may be underestimated measured by DALYs. In addition, few economic evaluations have been conducted in this area, which together may explain the lack of evidence in the literature of the use of DALYs for maternal health interventions.

²⁰By improving drug supply, staff training, ensuring the availability of transport to facilities and by promoting educational campaigns to generate community awareness of the availability of service.

There was little evidence in the trends in funding for maternal health although at the donor level the figures were lower than for population programmes. At the domestic level, the adoption of the National Health Accounts framework should facilitate the process of accounting and enable the estimation of comparative expenditure on maternal health care in different settings. A limited review of alternative methods of financing of maternal health care revealed that user fees tend to reduce utilisation (unless there's a parallel improvement in quality). Charges for the treatment of life-threatening complications in particular have been shown to place an enormous financial burden on households. General taxation has worked well if combined with education, although there is the unsolved problem of financing the increasing demand for health services. Large NGOs can play a useful role as can community-based programmes in improving access to health facilities, although the sustainability of funding needs to be considered.

Some recommendations include:

- Ensuring the consistency in the definition of maternal health;
- Developing standard costing methods to facilitate generalisability;
- Encourage consistent national accounting systems, such as the NHA which can be broken down by activity;
- Encourage further cost-effectiveness studies of maternal health interventions, and research into the cost savings associated with increasing the use of evidence based birth practices;
- Ensure the availability of funds to guarantee the availability and efficient use of personnel and drugs / medical supplies within health facilities;
- Further research into alternative methods of financing maternal health services and the impact of each on maternal outcome is essential.

References

- AbouZahr C (1999). Disability Adjusted Life Years and Reproductive Health: A Critical Analysis. *Reproductive Health Matters* 7(14),118-129.
- Anand K, Pandav C, Kapoor S *et al.* (1995). Cost of health services provided at a primary health centre. *The National Medical Journal of India* 8(4),156-161.
- Ande B, Chiwuzie J, Akpala W *et al.* (1997). Improving obstetric care at the district hospital Ekpoma, Nigeria. *International Journal of Gynecology and Obstetrics* 59 (Suppl. 2), S47-S53.
- Argentine Episiotomy Trial Collaborative Group (1993). Routine vs selective episiotomy: a randomised controlled trial. *The Lancet* 42,1517-18.
- Barnum H & Kutzin J (1993). Patterns of hospital resource use. Chapter 2 in *Public Hospitals in Developing Countries*. John Hopkins University Press, Baltimore.
- Berman P (1989). Cost efficiency in primary health care: studies of health facilities in Indonesia *Health Policy and Planning* 4(4),316-322.
- Berman P, Quinley J, Yusuf B *et al.* (1991). Maternal tetanus immunization in Aceh Province, Sumatra: the Cost-effectiveness of alternative strategies. *Social Science and Medicine* 33(2),185-192.
- Bibi-M, Megdiche H, Ghanem H *et al.* (1994). L'antibioprophylaxie dans les Césariennes a Priori sans 'haute infectieux' [Antibiotic infection in a prior caesarean sections without a high risk]. *Journal de la Gynecologie et Obstetrie et de la Biologie Reproductive* 23,451-455.
- Borghi J, Bastus S, Belizan M *et al.* (2000). *Costs of Publicly Provided Maternity Services in Rosario, Argentina*. Submitted to the Pan-American Journal of Public Health.
- Borghi J, Fox-Rushby J, Bergel E, Carroli G, Abalos E & Hutton G (2000b). *Predicting Cost-effectiveness from a Cochrane Review of Effectiveness*. Report submitted to the Global Forum for Health Research.
- Carroli G *et al.* (1999). *Episiotomy for Vaginal Birth*. In Keise MJNC, Renfrew MJ, Neilson JP, Crowther C editors *Pregnancy and Childbirth Database*. Cochrane Database.
- Chiwuzie J, Okojie O, Okolocha C *et al.* (1997). Emergency Loan funds to improve access to obstetric care in Ekpoma, Nigeria. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S231-6.

Cowley P (1995). The Cost of Essential Obstetric Care. In *Issues in Essential Obstetric care. Report of a technical Meeting of the Inter-Agency Group for Safe Motherhood. May 31-June 2, 1995*. New York: Family Care International.

Djan JO, Kyei-Faried S, Twum S *et al.* (1997). Upgrading obstetric care at the health center level, Juaben, Ghana. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S83-S90.

Dmytraczenko T, Aitken I, Carrasco S *et al.* (1998). *Evaluacion del Seguro Nacional de Maternidad y Ninez en Bolivia*. Informe Tecnico 22. Bethesda, MD: Partnerships for Health Reform Project, Abt Associates Inc.

Family Health International. (1996). Manuscript on the methodology and cost analysis for APROFE, the Ecuadorean IPPF affiliate. North Carolina: Family Health International.

Fofana P, Samai O, Kebbie A *et al.* (1997). Promoting the use of obstetric services through community loan funds, Bo, Sierra Leone. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S225-30.

Fox-Rushby J & Foord F (1996). Costs, Effects and Cost-Effectiveness Analysis of a Mobile Maternal Health Care Service in West Kiang, The Gambia. *Health Policy* 35(2),123-143.

Galvez A, Galvez M, Sanabria G *et al.* (2000). *Economic Evaluation Alongside an Antenatal Trial in Developing Countries: Report on Cuba*. University of East Anglia Discussion Document.

Gold MR, Siegel JE, Russell LB & Weinstein MC (1996). *Cost-effectiveness in health and medicine*. Oxford University Press.

Grossman F, Filippi V, De Koninck M *et al.* (2000). *Témoignages de Femmes: l'Expérience de la Maternité chez les Femmes Béninoises*. Submitted to Reproductive Health Matters.

Hanson K (1999). *Measuring Up: Gender, Burden of Disease, and Priority Setting Techniques in the Health Sector*. Prepared under the Global Health Equity Initiative project on 'Gender and Health Equity' based at the Harvard Center for Population and Development Studies.

Hotchkiss D (1998). The tradeoff between price and quality of services in the Philippines. *Social Science and Medicine* 46(2),227-242.

Howard (1990)

Hsiao W (2000). *A Preliminary Assessment of Sri Lanka's Health Sector and Steps Forward*. In conjunction with the Institute of Policy Studies Health Policy Programme, Sri Lanka. Cambridge, Massachusetts, USA.

<http://www.50years.org/update/userfees.html>.

<http://www.phpr.com/publicat/hrps/finan.html>

Hutton G (1996). *A Review of Economic Evaluations of Interventions in Antenatal care in developing countries*. Submitted to the Overseas Development Association.

Janowitz B & Bratt J (1992). Costs of family planning services: a critique of the literature. *International Family Planning Perspectives* 18.

Jinabhai C, Wamukuo J, Bagwande C et al. (2000). *Costs of Antenatal and Delivery Care for Providers and Women in Umlazi Township, Durban, South Africa*. University of East Anglia Discussion Document.

Johnson B, Benson J, Bradley J et al. (1993). Costs and resource utilization for the treatment of incomplete abortion in Kenya and Mexico. *Social Science and Medicine* 36(11),1443-1453.

Kawaine N, Guinness L, Amin M et al. (1998). *Consumer costs of caesarean section in public, private and NGO health care facilities in Bangladesh*. Research paper No. 7. Health Economics Unit, Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh.

Knowles J (1998). *Case Study: Benefit Incidence of Safe Motherhood services in Vietnam*. Presented at the World Bank Institute Course: Adapting to Change.

Konje J, Obisesan K & Ladipo O (1992). Health and economic consequences of septic induced abortion. *International Journal of Gynecology and Obstetrics* 37,193-197.

Krasovec K & Shaw R (2000). *Reproductive health and health sector reform: Linking outcomes to action*. WBI Working Papers. World Bank Institute.

Kumaranayake L (2000). The real and the nominal. Making inflationary adjustments to cost and other economic data. *Health Policy and Planning* 15(2),230-234.

Leigh B, Kandeh H, Kanu M et al. (1997). Improving emergency obstetric care at a district hospital, Makeni, Sierra Leone. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S55-S65.

Levin A, Amin A, Rahman A et al. (1999). Cost-effectiveness of family planning and maternal health service delivery strategies in rural Bangladesh. *International Journal of Health Planning and Management* 14,219-233.

- Levin A, McEuen M, Dymatraczenko T *et al.* (2000). Costs of maternal health care services in three anglophone African countries. *Special Initiatives Report 22*. Bethesda MD: Partnerships for Health Reform Project, Abt Associates Inc.
- Litvack J & Bodart C (1993). User fees plus quality equals improved access to health care: results of a field experiment in Cameroon. *Social Science and Medicine* 37(3),369-383.
- Magotti R, Munjinja P, Lema R *et al.* (1995). Cost-effectiveness of managing abortions: Manual Vacuum Aspiration (MVA) compared to evacuation by curettage in Tanzania. *East African Medical Journal* 72(4),248-251.
- Maine D (1999). The safe Motherhood Initiative: Why has it stalled? *American Journal of Public Health* 89(4),480-482.
- Merrick T (1999). *SWAPs and Reform: A Note on Bangladesh's Experience*. Revised Draft.
- Michaud C & Murray C (1994). External assistance to the health sector in developing countries: a detailed analysis 1972-1990. *Bulletin of the World Health Organisation* 72(4),639-651.
- Mintz P & Savedoff W (2000). *PROSALUD and the insurance program for mothers and children (SNMN)*. The Challenge of health reform: reaching the poor. Europe and the Americas Forum on Health Sector Reform, San Jose, Costa Rica. May 24-26 2000. World Bank.
- Mirembe F, Ssengooba F & Lubanga R (1998). *Cairo in Action: Uganda Profile Report*. Makerere University, Kampala and Population Reference Bureau Inc. Washington D.C.
- Mitchell M, Littlefield J & Gutter S (1997). *Reproductive Health: From Policy to Practice*. Draft manuscript Boston: Management Sciences for Health.
- Mitchell M, Thomason J, Donaldson D *et al.* (1991). The cost of rural health services in Papua New Guinea. *Papua New Guinea Medical Journal* 34,276-284
- Mumford E, Dayaratna V, Winfrey W *et al.* (1998). *Reproductive Health Cost: Literature Review*. Working Paper Series No. 3. Futures Group International, Washington Dc, July.
- Murray C & Lopez A (eds) (1998). *Health Dimensions of Sex and Reproduction*. World Health Organisation, Harvard School of Public Health, World Bank.
- Murray C & Lopez A. (2000). Progress and directions in refining the global burden of disease approach: a response to Williams. *Health Economics* 9,69-82.

- Nieves I & La Forgia G (2000). *Large-scale government contracting of NGOs to extend basic health service to poor populations in Guatemala*. The Challenge of health reform: reaching the poor. Europe and the Americas Forum on Health Sector Reform, San Jose, Costa Rica. May 24-26 2000. World Bank.
- Olukoya A, Ogunyemi M, Akitoye C *et al.* (1997). Upgrading obstetric care at a secondary referral hospital, Ogun State, Nigeria. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S67-S74.
- Ottong J, Asuquo E, Olaniran N *et al.* (1997). Community mobilization for blood donation, Cross River State, Nigeria. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S67-S74.
- Oyesola A, Shehu D, Ikeh A *et al.* (1997). Improving emergency obstetric care at a state referral hospital, Kebbi State, Nigeria. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S75-S81.
- Post M (1997). Preventing Maternal mortality through Emergency Obstetric Care *SAS Issues Paper*
- Potts M, Walsh J, McAninch J *et al.* (1999). Paying for reproductive health care: what is needed, and what is available? *International Family Planning Perspectives* 25 (Suppl.), S10-S16.
- Rannan-Eliya R, Berman P, Eltigani E *et al.* (2000). *Expenditures for Reproductive Health and Family Planning Services in Egypt and Sri Lanka*. Revised Draft. Unpublished.
- Rannan-Eliya R, Nada K, Kamal A *et al.* (1997). *Egypt National Health Accounts 1994/5*. Department of Planning, Ministry of Health and Population. Arab Republic of Egypt; Data for Decision-Making Project, Harvard School of Public Health, Harvard University.
- Reggiori A, Ravera M, Coccozza E *et al.* (1996). Randomized Study of Antibiotic Prophylaxis for General and Gynecological Surgery for a Single Rural Centre in Africa. *British Journal of Surgery*.
- Rosenthal G & Percy A (1991). *Maternity services in Cochabamba, Bolivia: Costs, Cost-recovery and changing markets*. Arlington VA: MotherCare, John Snow Inc.
- Sabitu K, Alti-Mu'azu M, Musa A *et al.* (1997). The effect of improving maternity services in a secondary facility, Zaria, Nigeria. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S99-S106.

- Samai O & Sengeh P (1997). Facilitating emergency obstetric care through transportation and communication, Bo, Sierra Leone. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S157-S164.
- Samarasinghe D (1999). *Women's Health and Quality of Life*. World Bank. Unpublished.
- Schneider H & Gilson L (1999). The impact of free maternal health care in South Africa. *Reproductive Health Matters* 93-101.
- Senah K, Richardson D, Kwofie G *et al.* (1997). From abandoned warehouse to life-saving facility. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S91-S97.
- Sengeh P, Samai O, Sidique S *et al.* (1997). Improving blood availability in a district hospital, Bo, Sierra Leone. *International Journal of Gynecology and Obstetrics* 59 (Suppl. 2), S127-S134.
- Shehu D, Ikeh A & Kuna M (1997). Mobilizing transport for obstetric emergencies in northwestern Nigeria. *International Journal of Gynecology and Obstetrics* 59 (Suppl. 2), S173-S180.
- Stanton B & Clemens J (1989). User fees for health care in developing countries: a case study of Bangladesh. *Social science and medicine* 29(10), 1199-1205.
- Suarez H & Brambila C (1994). *Cost Analysis of Family Planning Services in Private Family Planning Programmes, FEMAP, Mexico*. New York: INOPAL II, The Population Council.
- Thinkamrop J, Thinkamrop B, Kuchaisit C *et al.* (2000). *A study of the costs of antenatal care alongside the WHO trial in Thailand*. University of East Anglia Discussion Document.
- Thuray H, Samai O, Fofana P *et al.* (1997). Establishing a cost recovery system for drugs, Bo, Sierra Leone. *International Journal of Gynecology and Obstetrics* 59 (Suppl. 2), S141-S147.
- Tinker A & Koblinsky M (1993). *Making Motherhood Safe*. World Bank Discussion Papers. The World Bank. Washington DC.
- Weissman E, Sentumbew-Mugisa O, Mbonye A *et al.* (1999b). *Uganda safe Motherhood Programme Costing Study*. Ministry of Health Uganda, World Health Organisation.
- Weissman E, Sentumbwe-Mugisa O, Mbonye A *et al.* (1999a). *Costing Safe Motherhood in Uganda*. *Reproductive Health Matters*. Blackwell Science.

Wilson J, Collison A, Richardson D *et al.* (1997). The maternity waiting home concept: the Nsawam, Ghana experience. *International Journal of Gynecology and Obstetrics* 59(Suppl. 2), S165-S172.

World Bank. (1993) *World Development Report 1993: Investing in Health*.

Zeitlin J, Govindaraj R & Chen L (1994). Financing Reproductive and sexual health services. In *Population policies reconsidered: health, empowerment and rights*.

Table 1. Methodology of relevant cost studies identified

References	Country	Intervention	Costing method	Sample number	Facilities	Cost estimates	Year of costs and currency
Weissman et al. 1999b). Methods in full report (Weissman et al. 1999a)	Uganda	12 interventions contained in the Mother Baby Package ²¹ (MBP)	MBP: interviews with medical personnel on treatment provided, staff time and equipment. Client numbers projected based on DHS and population estimates. Not estimated indirect or opportunity costs.	10 facilities	2 hospitals and 8 health centres. Government facilities in two districts	Total and average costs in hospitals and health centres. Breakdown by input category for hospital costs. No range provided.	1996 US\$
Levin et al. 2000	Ghana, Malawi, Uganda	ANC, vaginal delivery, c-section, postpartum haemorrhage, eclampsia, post-abortion complications	Estimated direct costs: personnel time, drugs, equipment etc. and indirect costs: admin, maintenance, overhead, utilities. Service volume was obtained from facility records.	6 facilities and 20 private midwives.	3 public hospitals and 3 public health centres; 3 mission hospitals and 3 mission health centres, 20 private midwives with 2-3 years training in private nursing homes.	Unit costs of routine services and those relating to obstetric complications. Average for hospital and health centre.	Assumed 1998 US\$
Dmytraczenko 1998	Bolivia	ANC, Delivery, Eclampsia, CS, Sepsis, abortion., episiotomy	Mother-Baby costing package as for Weissman 1999.	31 government facilities in 5 departments in Bolivia	9 facilities are tertiary hospitals: 4 maternity hospitals, 3 paediatrics hospitals, one maternal and child hospital and one general hospital. 8 are secondary level facilities and 14 health posts and health centres in rural and urban areas.	Unit cost of services (average for all facilities, no range provided)	Assumed 1998 in Bolivianos.
Borghi et al. 2000b	Argentina	Episiotomy	Cost of procedure based on questionnaire to 8 obstetricians in Argentina.	2 facilities one in wealthy province of Santa Fe and one in poorer province of Salta.	2 public maternity hospitals.	Unit cost of procedure broken down by resource input. Confidence interval provided.	US\$ 1998
Borghi et al. 2000	Argentina	ANC, vaginal delivery, c-section	Top-down costing and direct allocation of costs. Source: hospital records. Joint costs were allocated based on interviews with personnel. Indirect costs and opportunity costs included.	4 facilities	2 health centres and 2 hospitals	Unit costs are disaggregated by inputs with confidence intervals based on inter-facility variability. Total, average and marginal costs provided.	US\$1998
Galvez et al. 2000	Cuba			13 facilities	12 polyclinics and 1 maternity hospital		
Thinkamr op et al. 2000	Thailand			14 facilities	12 district hospitals and 2 general referral hospitals		
Jinabhai et al. 2000	South Africa			6 facilities	5 health centres and 1 general referral hospital		
Anand et al. 1995	India	Normal vaginal delivery/ANC and postnatal care.	Ingredients approach. Time utilisation study for staff allocation. Other resources allocated based on staff allocation to each activity.	One facility and home.	Primary health centre and home.	Total cost by resource input and unit cost. Marginal cost derived.	Rupees 1991

²¹ Eclampsia, haemorrhage, c-section, neonatal, abortion complications, sepsis, normal delivery, antenatal, family planning, anaemia, syphilis and gonorrhoea.

Family Health International 1996	Ecuador	ANC		10 facilities	Non-governmental clinics		
Suarez & Brambila 1994	Mexico	ANC	Direct and indirect costs. Ingredients approach. Questionnaire to determine time allocation to departments of staff.	6 facilities	Health centres, private not-for profit.	Total and average costs. Total cost broken down by resource input.	US\$ assume 1993-94.
Mitchell M <i>et al.</i> 1997	Mexico	ANC, postnatal care, ultrasound.	NA	2 facilities	NGOs		
Tinker & Koblinsky 1993	Grenada	ANC	NA	36 facilities	7 health centres and 29 visiting stations	Average cost	US\$ 1991
Levin <i>et al.</i> 1999	Bangladesh	ANC	Allocation of staff time, equipment, drugs and overheads to each activity.	2 facilities	'rural sites'	Cost per birth averted.	US\$ year not given.
Rosenthal & Percy 1991	Mexico	Ultrasound	Unable to obtain reference.				
Berman 1989, Berman <i>et al.</i> 1991	Indonesia	Tetanus toxoid immunisation	Costs to the government not including opportunity costs. Expenditures on inputs.	'routine health services' not specified	Government facilities.	Cost per immunised case and per neonatal death averted for routine versus crash programme of tetanus toxoid	US\$ 1985
		MCH/FP visit incl. drugs and staff and capital.	No definition of MCH/FP or how costs were allocated.	6 facilities	2 health centre 4 subcentres	Cost per capita. Total cost broken down by input.	US\$ 1981
Fox-Rushby & Foord 1996	The Gambia	ANC	Direct and indirect costs collected from interviews and records.	2 facilities	A mobile maternal outreach service compared to routine ANC a government health centre.	Total cost and average costs of ANC; cost per maternal death averted and per life year gained (LYG).	US\$ 1991.
Johnson <i>et al.</i> 1993	Mexico and Kenya	Abortion: manual vacuum aspiration and sharp curettage	Rapid assessment methods including qualitative, cross-sectional, limited duration field observations and interviews with small non-representative samples	4 facilities in Kenya and 4 in Mexico	8 government hospitals	Cost per facility per intervention and broken down by input. Hospitalisation costs included.	US\$ 1991
Magotti <i>et al.</i> 1995	Tanzania	Abortion: manual vacuum aspiration and sharp curettage	Questionnaires with medical staff. Not considered cost of medical instruments, transport, overheads, indirect or social costs.	1 government medical centre		Unit cost, cost of hospitalisation, labour cost, equipment cost and drug cost.	Tshs 1992

Note to table: NA: Not Available.

Table 2. Costs of antenatal care (ANC)

Country	Public Hospital		Public Health centre		Private maternity home ^a	At home (MC)
	Average cost (AC)	Marginal cost (%AC)	Average cost	Marginal cost (%AC)	Average cost	
Bolivia (secondary) ^b	7.03 (incl. Lab on 1 st visit)	NA	7.13	NA	NA	NA
Bolivia tertiary level	13.87 (incl. lab on 1 st visit)	NA	NA	NA	NA	NA
Mexico	NA	NA	7.47 ^c 4.74 ^d	NA	NA	NA
Ecuador ^e	NA	NA	3.48	NA	NA	NA
Uganda public	4.18 ^a 2.60 ^f	1.48 ^a (35) 1.25 (55) ^f	2.21 ^a	1.03 ^a (47)	1.39/3.42 (0.71/3.01)	NA
Uganda mission ^a	5.20	4.10 (79)	6.43	1.60 (25)	NA	NA
Malawi public ^a	5.48	4.44 (81)	3.23	2.18(67)	NA	NA
Malawi mission ^a	5.77	5.08 (88)	4.18	2.94 (70)	NA	NA
Ghana public ^a	5.45	2.59 (48)	3.17	1.94 (61)	3.02 (1.13)	NA
Ghana mission ^a	2.97	2.09 (70)	4.03	2.37 (9)	NA	NA
Argentina ^g	28.75 (24.40; 42.51)	7.90 (27)	33.46 (26.44; 31.06)	1.65 (5)	NA	NA
Cuba ^h	12.15 (8.85; 15.46)	4.15 (34)	NA	NA	NA	NA
Thailand ⁱ	6.20 (5.33; 7.06)	1.46 (24)	NA	NA	NA	NA
South Africa ^j	9.05 (7.47; 10.62)	0.95 (10)	7.24 (5.78; 8.70)	0.42 (6)	NA	NA
Bangladesh ^k	NA	NA	17.83-92.74 per QALY gained or 30.12-78.29 per QALY gained	NA	NA	NA
Grenada ^l	NA	NA	25.13-29.92	NA	NA	NA
The Gambia ^m	NA	NA	21.32; 9.93	NA	NA	NA
India ⁿ	NA	NA		NA	NA	4.63 (0.14)
Indonesia ^o	NA	NA	0.82-0.91	NA	NA	NA

Notes to table:

For all figures, the inflation adjustment factor based on the consumer price index. Source: Federal Bank of Minneapolis, the annual percentage change in inflation. CPI base year is chained: 1982-84=100

NA: Not Available..

^a Levin *et al.* 2000. Marginal cost considered as 'materials' (drug and supply costs). Private maternity homes: services provided by a private midwife. The range in Uganda is due to the fact that the private midwives may over-report their use of syndromic management of STDs, so the material costs were estimated with and without this component.

^b Dmytraczenko *et al.* 1998. 1US\$=5.19 Bolivian Bolivianos in 01/01/ 1997 (<http://www.oanda.com> FX Converter). Assume average of 2 ante-natal visits per woman: average between first visit: US\$10.02 and second visit: US\$4.24.

^c Mitchell *et al.* 1997

^d Suarez & Brambila 1994

^e Family Health International 1996

^f Weissman *et al.* 1999b, Weissman E *et al.* 1999a

^g Borghi *et al.* 2000

^h Galvez *et al.* 2000

ⁱ Thinkamrop *et al.* 2000

^j Jinabhai *et al.* 2000

^k Levin *et al.* 1999. The range reflects comparison versus intervention groups in two districts each: the first range is for different frequencies of satellite clinics with addition of EPI services. The second intervention is for increased staffing and time open at health and family welfare centres in districts with satellite clinic intervention. The control is home delivery of services.

^l Tinker & Koblinsky 1993. From MotherCare Project, Laukaran, 1990.

^m Fox-Rushby & Foord 1996. Higher figure reflects the cost for the mobile maternal outreach service compared to traditional ANC in government health centre.

ⁿ Anand *et al.* 1995 Exchange rate for 1991/2: 1US\$ = Rs 32.04. By a female multi-purpose worker.

^o Berman 1989. Higher cost reflects MCH/FP outpatient at subcentre, lower cost at health centre.

Table 3. Costs of Normal Vaginal Delivery

Country	Hospital		Health centre		Private maternity home ^e	At home (MC)
	Average cost	Marginal cost	Average cost	Marginal cost	AC (MC)	
Bolivia (secondary) ^b	12.14 (17.53); 28.55 ^c	NA	10.40 (14.07);	NA	NA	NA
Bolivia tertiary level	11.18 (16.76)	NA	NA	NA	NA	NA
Uganda public	33.90 ^a 8.78 ^d	4.31 ^a (13) 1.01 (12 ^b)	2.71 ^a	1.18 ^a (44)	4.27 (3.10)	NA
Uganda mission ^a	32.89	5.28 (16)	15.31	4.48 (29)	NA	NA
Malawi public ^a	24.03	11.34 (47)	10.22	4.63 (45)	NA	NA
Malawi mission ^a	11.76	6.49 (55)	11.14	4.65 (42)	NA	NA
Ghana public ^a	14.60	7.57 (52)	3.17	1.94 (61)	12.75 (3.55)	NA
Ghana mission ^a	11.89	7.26 (61)	4.03	2.37 (59)	NA	NA
Argentina ^c	105.61 (70.81; 140.41)	5.41 (5)	NA	NA	NA	NA
Cuba ^f	21.32 (16.45; 26.20)	5.83 (27)	NA	NA	NA	NA
Thailand ^e	27.25 (22.01; 32.50)	5.54 (20)	NA	NA	NA	NA
South Africa ^h	81.40 (74.49; 88.30)	5.38 (7)	NA	NA	NA	NA
India ⁱ	NA	NA	NA	NA	NA	4.42 (0.14)

Notes to table:

NA: Not Available.

^a Levin *et al.* 2000. Labour costs were not calculated for private midwives in Uganda because the information for calculation of net profit for these solo practitioners was incomplete.

^b Dmytraczenko *et al.* 1998. Delivery without episiotomy (delivery with episiotomy in brackets).

^c Rosenthal & Percy 1991

^d Weissman *et al.* 1999b, Weissman *et al.* 1999a

^e Borghi *et al.* 2000

^f Galvez *et al.* 2000. The confidence limits are based on variability in average costs between the health facilities in the sample.

^g Thinkamrop *et al.* 2000 Based on average of intervention and control hospitals.

^h Jinabhai *et al.* 2000

ⁱ Anand *et al.* 1995 Delivery conducted by a trained birth attendant.

Table 4. Costs of C-section

Country	Year	Average cost (AC)	Marginal cost (%AC)
Bolivia (secondary) ^a	1998	67.63 incl. Lab;	NA
	1991	57.11-106.23 ^b	
Bolivia tertiary level ^a	1998	70.52	NA
Uganda public	1998	46.71 ^c ; 73.10 ^d	38.39 ^e (53) 9.87 (21) ^d
Uganda mission ^c	1998	86.48	53.15 (61)
Malawi public ^c	1998	102.38	54.72 (53)
Malawi mission ^c	1998	61.39	44.12 (72)
Ghana public ^c	1998	88.83	51.20 (58)
Ghana mission ^c	1998	55.60	38.02 (68)
Argentina ^e	1997	525.57 (452.56; 598.58)	80.28 (15)
Cuba ^f	1998	113.98(70.12; 157.83)	43.73 (38)
Thailand ^g	1998	83.00	46.14 (56)
South Africa ^h	1998	140.60 (105.71; 175.48)	24.91 (18)

Notes to table:

NA: Not Available.

^a Dmytraczenko *et al.* 1998

^b Rosenthal & Percy 1991

^c Levin *et al.* 2000

^d Weissman *et al.* 1999b, Weissman *et al.* 1999a

^e Borghi *et al.* 2000. The confidence limits are based on variability in average costs between the health facilities in the sample

^f Galvez *et al.* 2000. The confidence limits are based on variability in average costs between the health facilities in the sample.

^g Thinkamrop *et al.* 2000. Based on average of intervention and control hospitals.

^h Jinabhai *et al.* 2000. The confidence limits are based on variability in average costs between the health facilities in the sample

Table 5. The cost of postpartum haemorrhage

Country	Year	Average cost (AC)	Marginal cost (% AC)
Uganda public	1998	50.63 ^a ; 35.44 ^b	25.76 (51) ^a 3.98 (11) ^b
Uganda mission	1998	114.83 ^a	52.26 (46) ^a
Malawi public ^a	1998	81.51	51.29 (63)
Malawi mission ^a	1998	67.13	46.31 (69)
Ghana public ^a	1998	92.94	36.48 (39)
Ghana mission ^a	1998	37.57	25.78 (69)

Note to table:

^a Levin *et al.* 2000

^b Weissman *et al.* 1999b, Weissman *et al.* 1999a Not specified if this is antepartum or postpartum haemorrhage.

Table 6. The cost of managing eclampsia

Country	Year	Average cost (AC)	Marginal cost (% AC)
Bolivia (secondary) ^a Levin <i>et al.</i> 2000.	1998	39.88 (with lab)	NA
Bolivia tertiary level	1998	45.86 (with lab)	NA
Uganda public	1998	82.37 ^b ; 56.35 ^c	13.33 ^b (16) 8.89 ^c (7)
Uganda mission	1998	159.66	19.50 (12)
Malawi public ^b	1998	106.58	19.50 (18)
Malawi mission ^b	1998	52.66	21.07 (40)

Note to table:

NA: Not Available.

^a Dmytraczenko *et al.* 1998

^b Levin *et al.* 2000

^c Weissman *et al.* 1999b, Weissman *et al.* 1999a

Table 7. The cost of managing maternal sepsis

Country	Year	Average cost (AC)	Marginal cost (% AC)
Bolivia (secondary) ^a	1998	53.56	NA
Bolivia tertiary level ^a	1998	72.64	NA
Uganda ^b	1998	8.76	0.43 (5)

Note to table:

NA: Not Available.

^a Dmytraczenko *et al.* 1998

^b Weissman *et al.* 1999b, Weissman *et al.* 1999a

Table 8. The cost of Manual Vacuum Aspiration, brackets without hospital stay just procedure

Country	Year	Average cost (AC)	Marginal cost (% AC ^a)
Tanzania ^b	1992	4.03 (2.02)	0.31 (8)
Mexico ^c	1991	78.66 (43.12)	12.05 (15)
Kenya ^c	1991	3.52-6.27 (2.37-3.22)	1.20-1.27 (20-34)
Bolivia ^d	1998	16.76; 28.56; 46.82	NA

Note to table:

NA: Not Available.

^a Marginal cost is presented as a proportion of the average cost including hospitalisation.

^b Magotti *et al.* 1995

^c Johnson *et al.* 1993. The range shows variability between hospitals included in the sample.

^d Dmytraczenko *et al.* 1998. The range is primary, secondary and tertiary level facilities respectively for just the procedure (not hospital stay).

Table 9. The cost of surgical (dilation and curettage), brackets without hospital stay just procedure

Country	Year	Average cost	Marginal cost
Tanzania ^a	1992	9.96 (5.03)	4.54 (46)
Mexico ^b	1991	94.82-282.31 68.96	(58.83- 10.78
Kenya ^b	1991	4.77-18.25 (2.70-5.45)	1.03-2.35
Bolivia ^c	1998	51.06-51.83	NA

Note to table:

NA: Not Available.

^a Magotti *et al.* 1995

^b Johnson *et al.* 1993

^c Dmytraczenko *et al.* 1998. Range is for secondary to tertiary level facilities.

Table 10. The cost of managing post-abortion complications

Country	Year	Average cost	Marginal cost
Uganda public	1998	35.43 ^a ; 12.10 ^b	19.43 (55) ^a
Uganda mission	1998	57.60	36.72 (64)
Malawi pu- blic ^a	1998	41.77	12.87 (31)
Malawi mis- sion ^a	1998	29.95	18.49 (64)
Ghana pub- lic ^a	1998	66.46	43.55 (66)
Ghana mis- sion ^a	1998	63.88	41.80 (65)
Bolivia ^c	1998	89.02-104.05	NA
Bolivia ^d	1991	95.26	NA
Nigeria ^e	1987	304.73	NA

Note to table:

NA: Not Available.

^a Levin *et al.* 2000

^b Weissman *et al.* 1999b, Weissman *et al.* 1999a

^c Dmytraczenko *et al.* 1998. Range is for secondary to tertiary level facilities.

^d Rosenthal & Percy 1991

^e Konje *et al.* 1992

Table 11. Annual projections of reproductive health costs (in \$US billions) for developing countries, by funding source and type of cost, according to year

Source and cost	2000	2005	2010	2015
Total	17.00	18.50	20.50	21.70
Source				
International donors	5.70	6.17	6.38	7.23
Developing country govts.	11.30	12.33	13.67	14.47
Type of cost				
Family Planning	10.20	11.50	12.60	13.80
STD Prevention	1.30	1.40	1.50	1.50
Basic RH ²²	5.00	5.40	5.70	6.10
Research, data, policy analysis	0.50	0.20	0.70	0.30

Table 12. Trends in Bilateral and Multilateral Maternal health expenditure (constant 1990 US\$ (%))

	1986 ^a	1987 ^a	1988 ^a	1990 ^b
Family Planning	470.1	442.9	519.2	936
Other maternal	169.8	156.6	187.8	360
TOTAL direct and indirect	1296.3	1218.2	1432.1	1929

Notes to table:

^a Howard 1990. Figures for 1988, indicated that maternal health was 12% of total direct and indirect health expenditure for bilateral donors and 15% for multilateral aid. For family planning the figures were: 37 and 36%. These proportions were used here in the calculations for 1986 and 1987. FP and maternal health limited to family planning, community-based maternal care, referral facilities for the complications of pregnancy, and communication and transport systems to support referral cases. Direct and indirect includes all programmes that influence maternal mortality and morbidity.

^b Rannan-Eliya *et al.* 2000. Figure for family planning classified as 'Population' in original text which includes the collection and analysis of demographic survey data. Total direct and indirect includes: reproductive health (excluding communicable disease, chronic disease and health services).

²² The authors confess that there is no agreed upon definition of this area of activities, but that Safe Motherhood constitutes the largest part.

Table 13. Trends in USAID assistance to the health sector in developing countries (constant 1995 US\$)

	1986	1987	1988	1990	1992	1995
Safe Motherhood activities	321.8	304.3	297.6	NA	NA	NA
Non-family planning component	43.1	22.8	38.6	30	70	30

Note to table:

1986-1988 (Howard 1990).

1990-1995 (Potts *et al.* 1999).

Table 14. Trends in domestic expenditure on maternal health as a percentage of total health expenditure

Countries	% to maternal health							
	1983	1982	1988	1990	1992	1994/5	1997	1998
Sri Lanka		13					4-12 ^a	
Malawi ^b	4							
Egypt ^c							8	
Bangladesh ^d						19		
India ^e					11			
Uganda ^f								7
Papua new Guinea ^g			8-9(1987)					
Total developing countries ^b				4-17				
Latin American & the caribbean ^b				13				

Notes to table:

^a Rannan-Eliya *et al.* 2000. Estimates that maternal health alone represents 1% of national health expenditure, but if we include other components of reproductive health: infant and child care, family planning services, STDs is 4%, if we consider 15% of hospital inpatient care, 6% of hospital outpatient care, 6% outpatient curative care, 6% other registered medical care professionals, 2% traditional medical advisors, 6% medical goods supplied to outpatients, then the percentage increases to 12.4%

^b Howard 1990. For Malawi this is based on a non-references 'report' and expenditure is attributed to 'maternities and 'dispensary maternities'

^c Rannan-Eliya *et al.* 2000, Rannan-Eliya *et al.* 1997.

^d Merrick 1999. Health Economics Unit estimates suggest that total funding for the health sector was \$855 million in 1994/95, equivalent to \$7.1 per capita or 3.1% of GNP. Expenditures on MCH/FP were estimated at \$1.41 per capita.

^e Anand *et al.* 1995. Cost of MCH as % of total cost of primary health care.

^f Weissman *et al.* 1999b, Weissman *et al.* 1999a. It was found that the Ugandan government

currently spends about US\$ 0.50 per capita on maternal and newborn health care, and we assumed a \$7 per capita total health expenditure (Sentumbwe, <http://www.insp.com/The Structural Adjustment programme and the health Sector in Uganda>).

^g Mitchell *et al.* 1991. Based on government and church facilities: health centres and subcentres.

Table 15. 3 stereotype health systems

	Public sector plays the predominant role in financing and provision	Mixed public-private roles in financing and provision	Strong private sector presence and reliance on market mechanisms
Finance:	General tax revenues, donor funds, user fees	General tax revenues, earmarked social insurance funds	Out-of-pocket payments, social health insurance funds

SOURCE: Krasovec & Shaw 2000.

Table 16. Macro-level Models of Health care Financing

Country/ study	Financing of MCH	Macro implications	•	Maternal outcome
Sri Lanka	<ul style="list-style-type: none"> • Government funds 48% of primary care services and 87% of hospital services. • The private sector funds 52% of primary care services. Only 13% of hospital services are financed by the private sector due to the failure of the insurance market to provide catastrophic health insurance. Less than 2% of total health sector financing is from health insurance, and similarly population coverage for health insurance has not increased beyond 2% (Hsiao 2000). • A recent study reports that public financing accounts for more than 90% of all funding for MCH services, which are mostly prenatal and postnatal care, despite household's willingness to pay for out-patient services (Rannan-Eliya et al. 2000). 	<ul style="list-style-type: none"> • Expansion of service provision during the 1930-40s was financed by increasing taxation of the plantation sector. • 1950-70s public services deliver an increasing volume of services by halving unit costs, hence, using personnel and infrastructure even more intensively (Hsiao 2000) 	•	<ul style="list-style-type: none"> • 96% of women given birth in a hospital • 99.6% antenatal coverage • 90% maternal tetanus immunisation • 0.8/1000 maternal mortality 1999

Egypt (Rannan-Eliya et al. 2000)	<ul style="list-style-type: none"> • Government services are subsidised and provided largely free to all citizens. • Health Insurance Organisation (HIO), established 1964, a compulsory social insurance agency levying payroll contributions on formal sector workers and their employers. Coverage does not extend to dependents. Premiums range from 2.5% of assessed salaries. It also receives ad hoc subsidies from the Egyptian government: so funded part social insurance, part general revenues (50-50%). • A separate HIO program was introduced in 1993, the Student Medical Insurance Programme (SMIP), financed by a mix of individual premiums by enrolled students, earmarked cigarette tax and general revenue (76% in 1994/95 and 14% by premiums). • HIP runs its own service delivery system: 31 hospitals in 1995 and a large number of outpatient clinics. 	<ul style="list-style-type: none"> • Restricted coverage of HIO 9.7% of the population 	<ul style="list-style-type: none"> • 28% of mothers receive regular antenatal care • 43% of mothers received two doses of tetanus toxoid immunisation before giving birth • 1/3rd deliveries took place in a health facility with trained medical personnel
Bolivia (http://www.phpr.com/publicat/hrps/finan.html)	<ul style="list-style-type: none"> • Local governments are required to use 6% of the federal tax dollars they receive to support a maternal and child health insurance fund that provides basic entitlements to primary and curative care (Krasovec & Shaw 2000). • Bolivia's National Mother and Child Health Insurance Program: introduced in 1996; provide free essential medical care for women of child-bearing age, newborns and children up to five years old. • Covers selected priority health needs such as birth and antenatal care. Program financing comes from the municipalities and is earmarked for reimbursing providers for medicines, supplies and hospitalisation. 	<ul style="list-style-type: none"> • Reimbursement rates do not cover the actual cost of drugs, supplies and hospitalisation. Facilities are left short of operating cash for drugs and other supplies. • Facilities are not reimbursed by SNMN for personnel and other indirect costs which are a large proportion of total cost especially in the tertiary facilities 	<ul style="list-style-type: none"> • Use of all covered services increased, at a much faster rate than those services which were not covered (18 months prior and after introduction): <ul style="list-style-type: none"> • Increase 16% to 39% for prenatal visits • Births increased from 43% to 50% • According to patient exit interviews, new users had previously only received health-care at home.

Table 17. The role of NGOs in the financing of Maternal Health Care Services

Country /study	Financing of MCH	Scope of services provided	Maternal outcome
Malawi (Krasovec & Shaw 2000)	<ul style="list-style-type: none"> The government works closely with the Christian Health Medical Association (CHAM) subsidising approx. 15% of the recurrent cost of the mission facilities in return for provision of a range of FP services and IEC 	NA	NA
Bolivia (Mintz & Savedoff 2000)	<ul style="list-style-type: none"> PROSALUD began in 1985 as a non-profit organisation operating in facilities provided by the municipal government but managing its own and operations. Financed from a system of cross-subsidies, where the middle class population of certain clinics would subsidise the lower prices charged in clinics in areas with a lower standard of living. The majority of resources came from users' low cost payments and the rest from outside funding such as USAID. Financed 70% by revenues in 1994²³. 	<ul style="list-style-type: none"> 34 health centres 1 referral hospital 1 child development centre Services cover a population of 400,000 in 6 regions of the country. 	NA
Brazil (Krasovec & Shaw 2000)	<ul style="list-style-type: none"> Governments subsidises non-governmental organisations or traditional medical practitioners to deliver reproductive health services to poor families. About 30% of the municipal governments in Brazil provide funding to the Sociedade Civil Bem Ester Familiar No Brasil (BEMFEM) and NGO that provides services in public-sector health posts and training to public sector health personnel, as well as operating its own clinics providing a broad array of reproductive health services. 	<ul style="list-style-type: none"> Concentrated in poorest regions of the country 	NA
Guatemala (Nieves & La Forgia 2000)	<ul style="list-style-type: none"> Large-scale government contracting of NGOs to extend basic health services to poor populations in Guatemala The programme to extend coverage of basic services (PECSB) aims to extend coverage and reach poor, rural, indigenous populations, who had no regular access to modern health services. The government funds NGOs to provide and administer these services. The payment covers the direct cost of the basic package plus administrative expenses and expenses related to institutional strengthening. In 1999, the average per capita payment was approx. \$6.25. 	<ul style="list-style-type: none"> The programme started at the end of 1997 and by the end of 1999 The total number of contracted NGOS were 89. The level of public spending in coverage by NGOs increased from US\$ 1.7 million in 1997 to US\$ 12.4 million in early 2000. The population that NGOS were contracted to serve reached a total of 3.5 million in 1999. 	<ul style="list-style-type: none"> Substantial increase in coverage and quality of Essential Obstetric care (EOC) Increased hospital based delivery rates Increase in met need (greater % of women with complications seek care)

²³ Sample fees for delivery: between 21.78-27.22 US\$. Prenatal care free of charge.

Table 18. Community-level financing programmes

	Aim	Financing method	Issues	Outcomes
Nigeria (Chiwuzie <i>et al.</i> 1997)	Cost recovery system for emergency transport to health facilities for pregnant women or other funds they might need	<ul style="list-style-type: none"> • A loan fund: donations were made from the heads of 13 clans (65%) and the PMM team (35%). • Women in need of financial assistance for problems relating to pregnancy or delivery an apply • Payback loan with interest of 2%. 	<ul style="list-style-type: none"> • There was a 93% repayment rate. • Need higher interest rate in future. 	<ul style="list-style-type: none"> • 30 pregnancy-related loans administered per month.
Sierra Leone (Thuray <i>et al.</i> 1997)	Cost recovery system for drugs	<ul style="list-style-type: none"> • Drug provision on monthly basis obtained directly from commercial supplier in Amsterdam rather than going through the government • Charges to patients on basis of full cost of obtained drugs, including handling and transportation and a mark-up of 85% to allow for inflation and less than full cost recovery • The patients could receive treatment without advance payment although the family was encouraged to pay all fees before the family was discharged. 	<ul style="list-style-type: none"> • Prices were lower than private pharmacy and hospital pharmacy. 57% cost recovery rate during the study period. 	<ul style="list-style-type: none"> • The case fatality ratio for women in project area fell from 12% in 1992 to 4% in 1993 compared to 13-11% in the non-project area.
Sierra Leone (Fofana <i>et al.</i> 1997)	Community loan fund	<ul style="list-style-type: none"> • 2 chiefdoms were mobilised to establish funds. • The local leadership imposed levies on the adults of the community: 20 cents (1992) for each male and 10 cents for each female. • The loan fund was managed by the village development committee • In an emergency women could receive treatment immediately and at discharge a bill provided. If she was unable to pay she could take it to the loan fund committee. Payment was later enforced. 	NA	<ul style="list-style-type: none"> • Increase in utilisation compared to non-intervention area.
The Gambia (Fox-Rushby & Foord 1996)	Form of insurance paid during ANC visit and ensuring free access to health services that followed	<ul style="list-style-type: none"> • Each pregnant woman was paid US\$3.16 (1992) to the midwife at, or soon after the first consultation. If the woman did not pay she was responsible for her own expenses 	<ul style="list-style-type: none"> • 82% of hospital and health centre drug costs for maternity care were recovered in theory 	<ul style="list-style-type: none"> • Very high insurance uptake (90%)

Tanzania (Krasovec & Shaw 2000)	Community health fund in Igunga District	<ul style="list-style-type: none"> • Cost sharing by house-holds along with government subsidies for a health card entitling households to basic reproductive health and other health services at rural health centres. 	<ul style="list-style-type: none"> • Is now expanding to 6 other districts 	NA
Mali (63)	An emergency referral and evacuation system for obstetric care	<ul style="list-style-type: none"> • 30% financing from district level, 30% from the community and 30% from evacuees who pay user fees 	NA	NA
Rwanda (Krasovec & Shaw 2000)	A prepayment scheme covering preventative and curative care provided by nurses in health centres, essential drugs and hospital cover and ambulance transfer to hospital in case of obstetric emergencies	<ul style="list-style-type: none"> • Enables farmers to access care, when they would typically forgo care in times of need due to the lack of resources to pay (except at specific times: 2 post-harvest periods) 	NA	NA

Appendix 1

DEFINITIONS

We were interested in the evaluation of costs of providing basic and comprehensive essential obstetric care. The definitions considered for this study are provided below:

Basic essential obstetric care: (Post 1997): Includes antibiotics, sedatives for hypertensive convulsions, oxytocics, manual removal of placenta for retained placenta with postpartum haemorrhage, assisted delivery such as vacuum extraction, forceps for prolonged labour and manual vacuum aspiration for management of incomplete abortion. Basic EOC can also be as simple as an obstetric first aid kit to stabilise the patient before referral (just oxytocics, antibiotics, sedatives), necessary for the management of eclampsia, haemorrhage, sepsis and abortion complications (Weissman et al. 1999). Basic essential obstetric care is usually provided by an upgraded health post or a health centre.

Comprehensive essential obstetric care: (Post 1997): Includes basic EOC services plus surgical (caesarean-section) and blood transfusion capabilities: usually in the form of a rural or district hospital with 24-hour care.

Appendix 2. Cost of Specific Components of Maternal Health Care

COMPONENTS OF ANTENATAL CARE

Ultrasound

One study (Rosenthal & Percy 1991) estimated the cost of the ultra-sound procedure in Mexico at US\$41.51 per visit.

Maternal tetanus immunisation

One study (Berman, Quinley, Yusuf *et al.* 1991) estimates the cost per person successfully covered of a mass campaign delivered through the routine health service system compared to the routine programme of tetanus toxoid immunisation. The cost of the routine programme is estimated to range from US\$0.86 - US\$3.63 (average: US\$2.37). The cost of the crash programme was estimated at: US\$2.41. The cost per neonatal death averted through the routine programme was estimated at between: US\$40.87-US\$174.08 (average: US\$113.37) compared to US\$189.22, for the crash programme.

Iron and folic supplementation

One study (Mitchell, Littlefield & Gutter 1997) estimated the cost of iron and folic supplementation in both Mexico and Zimbabwe at US\$1.30.

Management of maternal anaemia:

One study (Weissman, Sentumbew-Mugisa, Mbonye *et al.* 1999b) of Uganda estimated the cost of managing maternal anaemia at US\$3.60.

Comments

Ultrasound is a high cost intervention which is beyond the capacity of many constrained developing country economies at a cost of US\$41.51. One study (Berman 1989) demonstrates the cost-effectiveness of a mass campaign is similar to the routine programme.

COMPONENTS OF NORMAL VAGINAL DELIVERY

Episiotomy

One study (Dmytraczenko, Aitken, Carrasco *et al.* 1998) enabled the estimation of the cost of an episiotomy in Bolivia. The cost of episiotomy was estimated to range from: \$3.66 for delivery in a health post/health centre, \$5.39 in a secondary hospital and \$5.58 in a tertiary hospital. Similarly another study (Borghini, Fox-Rushby, Bergel *et al.* 2000b) estimated the cost of episiotomy in Argentina (including the cost of suturing and anaesthetic): US\$6.01. There has been much debate surrounding the indications for episiotomy and what should be the 'ideal' rate (Carroli *et al.* 1999). In Argentina a randomised controlled trial suggested that a reduction in the episiotomy rate from 80% to 30% would significantly improve maternal health outcome (Argentine Episiotomy Trial Collaborative Group 1993). Hence, there is substantial scope for cost saving by reducing this practice in countries where the rate is higher than optimal. However, in some regions in sub-saharan Africa the concern should be with increasing this practice to a higher level.

Appendix 3

Table 1. Cost of different approaches to improving EOC and outcomes

Study	Country/ time period	Interven- tion	Approach	Health facility type	Total Costs	Outcome	Cost per outcome
(Ade et al. 1997)	Nigeria 1992-95	Improve EOC and blood bank	<ul style="list-style-type: none"> ✧ Restore surgical theatre (repair/ purchase equipment) ✧ Renovate maternity ward ✧ Training physicians/midwives in obstetrics and installed emergen- cy drug pack system and set up revolving drug fund²⁴. Introduce system of blood dona- tion for families of women atten- ding antenatal care. ✧ Additional staff ✧ Repair blood bank and standby generator. 	District hospital	\$12,779 plus \$938 per year recurrent salary. Total \$15,593.	10 more admissions and 7 deli- veries	\$1559.3 per admis- sion and \$2227.6/d elivery
(Djan et al. 1997)	Ghana 1993-95		Also establish running water supply.	Health centre	\$30,316	100 more obstetric admission; 43 delive- ries; 67 cases of ob-stetric sur-gery (OS)	\$301 per admission, \$705 per delivery, \$452.5 per case of OS
(Leigh et al. 1997)	Sierra Leone 1990-95		Posted a physician with obstetric skills and 2 nd physician was trained and nurses and midwives..	District hospital	\$38,957 (incl new generator: \$16,000)	156 more admissions, 464 obste- tric proce- dures ²⁵	\$250 per admission and \$84 per obstetric procedure.
(Oyesola et al. 1997)	Nigeria 1991-95	Improve EOC no blood bank	✧ Set up electric supply.	State referral hospital	\$12,289	105 more admissions and 21 de- liveries.	\$117 per admission and \$585 per delivery.
(Olukoya et al. 1997)	Nigeria 1994-95			Secondary referral hospital	\$45,505	204 more obstetric admissions	\$223 per admission.
(Sabitou et al. 1997)			✧ Restored ambulance	Secondary facility	\$31,827 (incl new staff costs: \$7,270)	1241 more deliveries and 2329 additional atten- dances for ANC ²⁶	\$25.65 per delivery; \$13.67 per ANC visit.

²⁴ Designed for patients with obstetric complications for surgical intervention, containing surgical consumables.

²⁵ Including c-section and abortion.

²⁶ Based on the difference between the average utilisation between 1991-93 and 94-95.

(Gold <i>et al.</i> 1996)	Nigeria 1994	Establishing a bloodbank	<ul style="list-style-type: none"> ✧ Establish blood bank, backup generator, reagents and supplies. ✧ Refresher training to on e laboratory technician. 	Small hospital	\$8,800	14 blood transfusions per	\$628.57 per transfusion
(Sengeh <i>et al.</i> 1997)	Sierra Leone 1992-93		<ul style="list-style-type: none"> ✧ Education campaign to encourage blood donation. 	District hospital	\$9,869	197 additional blood units drawn, case fatality rate reduced by 8	\$50.01/cas e of blood; \$1233 per death averted.
(Ottong <i>et al.</i> 1997)	Nigeria 1991-94		<ul style="list-style-type: none"> ✧ Upgrade blood facilities in teaching hospital and secondary facility. ✧ 15 community mobilisation sessions. 	Teaching hospital & secondary referral hospital	\$17,531	increase 41 pints of blood and 21 additional blood transfusions	\$282.76 per pint referred.
(Senah <i>et al.</i> 1997)	Ghana 1992-95	Establish MCH/FP clinic	<ul style="list-style-type: none"> ✧ Renovate an abandoned warehouse ✧ Equip with beds, refrigerator, safe water supply, drugs and supplies. ✧ Posted community health nurse and senior nurse-midwife. ✧ Training of 10 TBAs. 	Health centre	\$12,550 assume \$3000 per year recurrent staff salaries. Total: \$24,550	702 antenatal registrants; 86 deliveries.	\$34.97 per antenatal registrant; \$285.47 per delivery.
(Samai & Sengeh 1997)	Sierra Leone 1992-93	Improve transport and communication to EOC	<ul style="list-style-type: none"> ✧ 4-wheel drive posted to hospital and radio (x10) linking system to primary health units. ✧ Community education activities. ✧ Bicycles (x2) ✧ Trained drivers from the local transport union ✧ Set up a revolving emergency fuel fund. 	PHU to hospital	\$46,836	21 cases referred with vehicle	\$2230 per referred case;
(Shehu <i>et al.</i> 1997)	Nigeria 1993-95		<ul style="list-style-type: none"> ✧ Trained drivers from the local transport union ✧ Set up a revolving emergency fuel fund. 	Home to hospital	\$268	56 transportations	\$4.79 per case
(Wilson <i>et al.</i> 1997)	Ghana 1992-94	Maternity waiting home	<ul style="list-style-type: none"> ✧ Ward of abandoned hospital renovated and furnished: 8 old beds repaired. 	maternity waiting home	\$10,505	Lack of staff: 25 women referred only 1 stayed.	NA

Note to table: *Assumed material costs are one time investment.

Appendix 4. Background and Approach to Calculation of DALYs

The disability-adjusted life year (DALY) was originally developed in order to calculate the global burden of disease (GBD) initiated by the World Bank and WHO in an attempt to provide information on (a) levels of ill-health from premature mortality and (b) from non-fatal health outcomes, and the contribution of different diseases, injuries and risk factors (Murray & Lopez 1998, Murray & Lopez 2000). This term has been increasingly appearing in health policy discussions since the publication of the 1993 World Development Report (World Bank 1993).

Methods of measuring the total disease burden at the global level and for setting priorities among health interventions using the principles of cost-effectiveness require a 'generic' measure of health status which can be used to aggregate across different disease conditions with differing health outcomes.

The DALY is one such measure. The DALY is a composite measure of health status combining the time lost due to premature mortality (Years of life lost: YLL) and the time lived with a disability (years lived with disability: YLD). The process of calculation is complex, however, broadly defined, there are four main steps:

1. Calculation of the number of years of life lost due to maternal causes;
2. Calculate of the loss in quality of life for those living with the conditions;
3. Application of age weighting: reflecting the social value of people at different ages;
4. Application of a discount rate to reflect the rate of time preference (benefits sooner rather than later).

A global picture of poor-rich differences in the utilisation of delivery care

Anton E Kunst¹ and Tanja Houweling²

Summary

The purpose of this paper is to give a global picture of poor-rich differences in the utilisation of delivery care and other maternal health services. Results published in accessible literature are reviewed and complemented with recent data based on the Demographic and Health Survey (DHS) program.

The results of descriptive and comparative studies are summarised in five points:

In most countries, poor-rich differences in the utilisation of delivery care are huge.

Wealth and delivery care use are associated across the entire wealth hierarchy.

Inequalities in delivery care use are much larger in some countries than in others.

Inequalities tend to be smaller in countries with high female literacy rates.

Large inequalities are observed with respect to most maternal health services.

Results that are relevant to the explanation of inequalities are summarised in four points:

A minor part of poor-rich disparities are due to confounders such as rural vs. urban residence.

Lower use of delivery care by poor mothers is partly due to their lower education.

A wide array of factors mediate the effect of income or education on the use of delivery care.

Poor-rich disparities are strongly sensitive to the national and local context.

The final section of the paper discusses implications for maternal health policies.

Introduction

More than one decade after the Safe Motherhood Initiative was launched (Mahler 1987), maternal mortality still takes a heavy toll in most parts of the developing world (Donnay 2000). There is little doubt that the burden of maternal mortality and morbidity falls disproportionately on poor and low

¹ Department of Public Health, Erasmus University Rotterdam, PO Box 1738, NL-3000 DR Rotterdam. Email : kunst@mgz.fgg.eur.nl (correspondence should be addressed to this author).

² Department of Public Health, Erasmus University Rotterdam, PO Box 1738, NL-3000 DR Rotterdam.

educated women. Underutilisation of maternal health services is likely to be a main factor contributing to maternal mortality among socio-economically disadvantaged women.

The purpose of this paper is to give a global picture of poor-rich inequalities in the utilisation of maternal health services. The overview consists of two parts, the first one being descriptive and the second explanatory.

The descriptive part provides basic information on poor-rich disparities in the utilisation of maternal health services and in particular of delivery care. We will address the question whether similar patterns of inequalities are observed throughout the developing world. Without doubt, lower utilisation by poor educated mothers is a common theme to all developing countries, but is this a theme with major variations?

The explanatory part will assess possible explanations of the link between poverty and maternal health services. We will discuss the role of poverty as compared to other forms of socio-economic disadvantage, especially having no or little education. In addition, we will give a brief overview of the factors have been suggested to mediate the effect of socio-economic disadvantage on the utilisation of delivery care.

This overview is based in part on results of studies that are reported on in accessible publications such as international journals. Unfortunately, this evidence appeared to be fragmentary. The evidence comes from a few countries and -within these countries- often from specific regions, cities or villages. Uncertain is to what extent this evidence can be extrapolated to other areas or countries of the developing world. In order to create a global picture, we therefore relied heavily on data available from recent analyses and reports that were made on the basis of data from the international Demographic and Health Survey (DHS) program. All illustrative figures and tables presented in this paper are based on these DHS analyses. For further illustrative materials, the reader is referred to the publications listed at the end of this paper (available upon request from the second author).

The focus of this paper is on the utilisation of delivery care instead of maternal mortality. The main reason for this is that, to our knowledge, there is hardly any empirical evidence on poor-rich differences in maternal mortality and morbidity. A few studies produce valid estimates (e.g. Kestler 1995) but often estimates of poor-rich differences are notably biased (e.g. Jagdish & Cleland 1996). This dearth of information underlines the 'hidden' nature of maternal health problems (Graham & Campbell 1992, Sadana

2000). Another reason to focus on delivery care is that there is a close link between delivery care and maternal mortality. WHO estimates suggest that 88 to 98 percent of all pregnancy-related deaths are avoidable if all women would have access to effective reproductive health care services. Internationally, there is a strong inverse association between national maternal mortality rates and national levels of delivery care utilisation. We found a correlation of minus 0.71 with the utilisation data that are presented in figure 1.

Descriptions of poor-rich disparities

Several studies document large differences in the utilisation of delivery care according women's educational levels (e.g. Elo 1992, Kuate Defo 1997, Raghupathy 1996, Rasheed & Khan 1990). These inequalities have been demonstrated both for Latin America, Sub Saharan Africa, Northern Africa/Near East, and Asia. Unfortunately, there are less publications on inequalities in delivery care according to measures of poverty or household wealth.

However, a world wide overview has been published this year by the World Bank in co-operation with Macrointernational (Gwatkin *et al* 2000). Reports are made for 44 countries that are covered by rounds 2 or 3 of the DHS program. For each country, DHS data are used to describe socio-economic differences in health, nutrition and population (hnp) status and access to hnp services. Women are classified into 5 quintile groups according to household wealth. Wealth is measured by means of an 'asset index' that is based on principal component analyses on more than 40 'asset variables'. These variables include durable consumption goods (e.g. refrigerator, television, car), housing facilities (e.g. toilet, drinking water) and housing materials (e.g. type of roof, type of floor). The years covered by the DHS data range from 1990 to 1998.

IN MOST COUNTRIES, POOR-RICH DISPARITIES IN THE UTILISATION OF DELIVERY CARE ARE HUGE

Poor-rich disparities in delivery care are presented in figure 1. For each country, the prevalence of delivery attendance by a medically trained person (doctor, nurse or nurse-midwife) is given for the total national DHS sample, for women in the richest quintile and for women in the poorest quintile. It will not come as a surprise that, upon delivery, the richest women were much often attended by a trained person. What is alarming, however, is the

enormous size of the poor-rich gap in many countries. A representative country is Zambia, where the percentage of women receiving medical assistance is about 45 percent for the total sample of women, but about 90 percent for the richest women as compared to only 20 percent for the poorest women.

These poor-rich disparities are much larger than the cross-national differences in overall averages. In terms of delivery care, it is better to be rich in a country with low overall rates than to be poor in a country with high overall rates. It is rare that less than 70 percent of the richest women receive delivery care, as it is rare that more than 70 percent of the poorest receive this care.

Poor-rich disparities are important for national performance rates. This importance can be expressed in terms similar to the population attributable risk (PAR). In the visionary case that all women in a country would enjoy the same degree of delivery attendance as the women in the richest quintile, the overall attendance rate would increase by 30 percent or more in the majority of countries. Even though this estimate is purely hypothetical, it underlines the potentially large benefits of policies that explicitly aim at improving delivery attendance among poorer women.

WEALTH AND DELIVERY CARE USE ARE ASSOCIATED ACROSS THE ENTIRE WEALTH HIERARCHY

Whereas figure 1 distinguished only women in the richest and poorest groups, figure 2 also includes women in the 3 intermediate groups. It is evident from this figure that there is a consistent relationship between wealth and delivery care use: each wealth quintile has higher attendance rates than the next-lower quintile. Thus, wealth is related to the use of delivery care at each step of the wealth hierarchy, and not only at the bottom of this hierarchy. Poor-rich disparities pervade the entire society, and not only affect the poorest women as compared to all other women.

In some countries, however, poor-rich disparities in delivery care utilisation do not resemble a linear gradient, but have a less regular pattern emphasising specific groups. In countries with the lowest national prevalence rates (Bangladesh, Nepal, Chad, Niger), there is a gap between the *elite* with relatively high attendance rates and the rest of population, where delivery attendance by trained persons is rare.

Figure 1. Delivery attendance (%) in the poorest quintile, the richest quintile and the total population

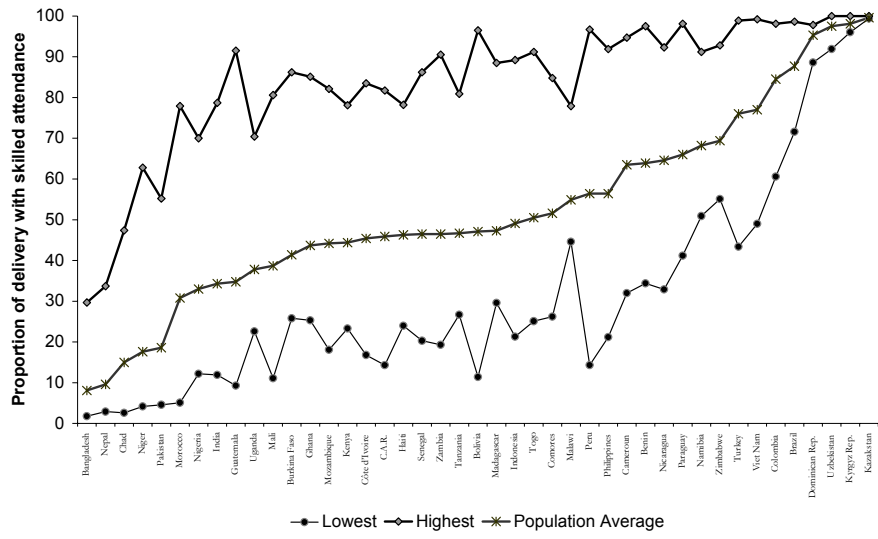
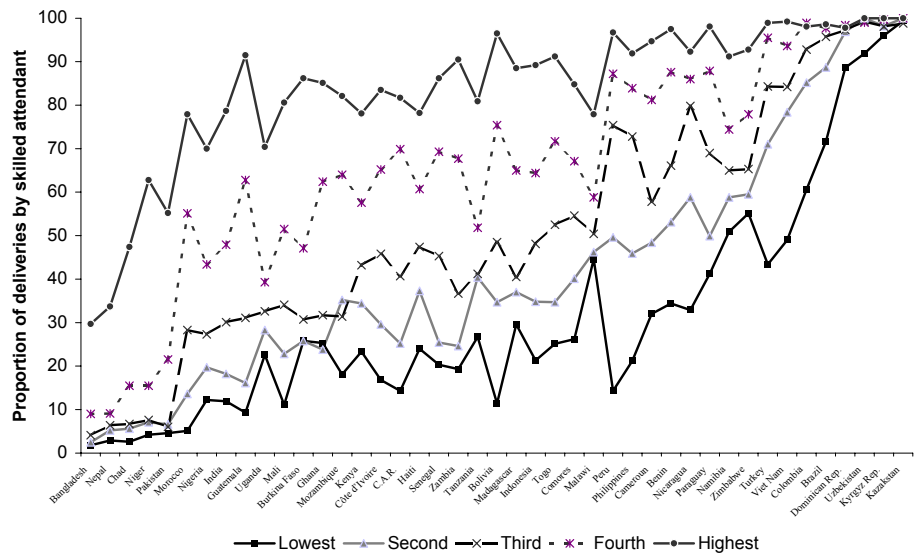


Figure 2. Delivery attendance (%) per wealth quintile



A reverse pattern is observed in some of the countries with high overall rates. In Turkey, Viet Nam, Colombia and Brazil, rates of attendance are fairly high for all women, except for the poorest women. In these countries, of all women who are not attended at delivery by a trained person, about one half fall into lowest wealth quintile.

These results imply that there are variations between countries with regard to the specific groups that need to be targeted by maternal health services. These variations further suggest that the factors and processes causing poor-rich disparities may strongly vary from country to country. We will return to this theme in the part on poor-rich disparities.

INEQUALITIES IN DELIVERY CARE USE ARE MUCH LARGER IN SOME COUNTRIES THAN IN OTHERS

Even though poor-rich inequalities in delivery care use were found to be huge in most countries, the precise magnitude varies between countries. In figure 3, this magnitude is expressed in a simple way as the absolute difference in utilisation rates between the poorest and richest quintiles. In analyses not reported here, we also measured inequalities in *relative* terms, and we calculated sophisticated indices that take into account *all* wealth quintiles. Even though the position of some individual countries depended on the choice of the inequality index, each index showed the same general picture as the one presented in figure 3.

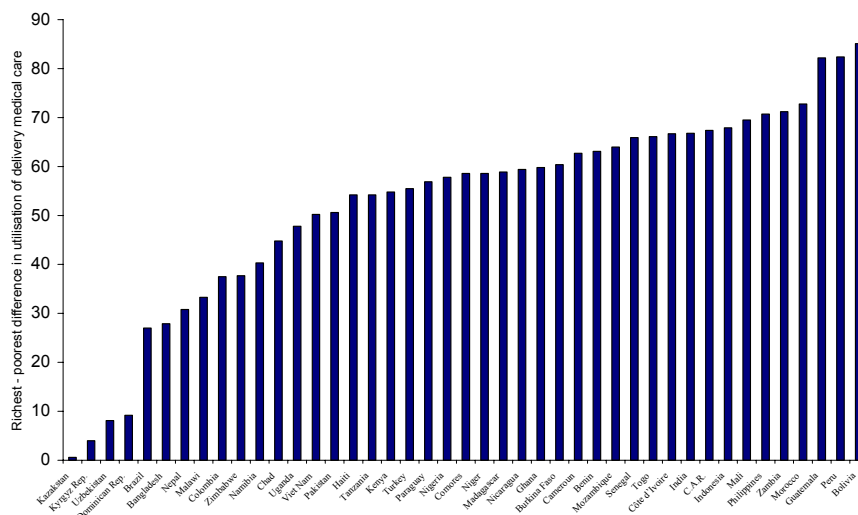
Obviously, there are large variations in the magnitude of inequalities in delivery care utilisation. In a few countries there are virtually no inequalities whereas other countries approach the extreme situation of a 100 percent difference, i.e. nearly all rich women but almost no poor women are attended during delivery.

Some geographical clustering can be observed. The countries with almost maximal inequalities are all in Latin America. The countries with very small inequalities are nearly all central Asian Republics. (It should however, be noted that the data for these countries applied to 1995 to 1997 and that, by the year 2000, inequalities in these countries may have widened substantially). Except for these geographic clusters, there is no clear overall geographic pattern. In both Latin America, Sub Saharan Africa, North Africa/Near East and Asia, there are countries with large inequalities and countries with relatively small inequalities.

This large variability in the magnitude of inequalities illustrate that these inequalities are not a natural, invariable phenomenon. Instead, inequalities

in delivery care are liable to change, also through intervention. This message holds especially for countries with the largest inequalities. For these countries, figure 3 shows that inequalities can be smaller than they are now, and that suggestions on how to achieve a reduction might be obtained by a closer look into the situation of countries with smaller inequalities.

Figure 3. Differences between richest and poorest quintile in % delivery attendance



INEQUALITIES TEND TO BE SMALLER IN COUNTRIES WITH HIGH FEMALE LITERACY RATES

The large variations observed in the part on inequalities in delivery care raise the question what characterises countries with larger or smaller poor-rich differences in delivery care. We have examined three national characteristics that might be relevant to inequalities in delivery care: gross domestic product (GDP) per capita, public health expenditure (as % of GDP) and the female literacy rate. Correlations are shown in the table 1.

The strongest associations are observed with female literacy rates. For women in both the highest quintile and the lowest quintile, delivery attendance rates are generally higher in countries where more women are literate (correlations are 0.66 and 0.69). This suggest that both rich and poor women benefit from an increase in national literacy rates. However, closer inspection of the data showed that the 'timing' of the effect differs.

Table 1. Correlations between delivery attendance rates and national characteristics.

Factor	Pearson correlation with delivery attendance			
	National attendance rate	Rate of richest quintile	Rate of poorest quintile	Poor-rich difference
GDP per capita (in PPP \$, 1995)	0.51 **	0.44 **	0.40 **	-0.15
Adult literacy rate (women, 1995)	0.78 **	0.66 **	0.69 **	-0.33 *
Public health expenditure (% of GDP, 1995)	-0.05	-0.05	0.01	-0.06

* : $p < 0.05$, ** : $p < 0.01$

SOURCE: own calculations based on delivery attendance data given in Gwatkin *et al.* (2000) and data from the Human Development Reports of 1998 and 2000.

Richest women benefit most from an increase in literacy rates until national levels of about 40 percent, whereas the poorest women start to benefit from increases in national literacy rates beyond about 60 percent. Because at higher levels poorest women benefit most, poor-rich differences in delivery use are generally smaller in countries higher literacy rates (correlation is -0.33).

A similar pattern of associations, albeit less pronounced, was observed with GDP per capita. Although no causality can be attributed to these statistical associations, they underline the idea that both increased female education and economic development can promote a more generalised and more equitable utilisation of obstetric care.

LARGE INEQUALITIES ARE OBSERVED WITH RESPECT TO MOST MATERNAL HEALTH SERVICES

Several studies documented that poor women are at a disadvantage not only during childbirth but also in the periods before and afterwards. Inequalities in different maternal and child health services are illustrated below with more data from India. (This country is highlighted here because about one half of all maternal deaths world wide occur in India).

These data do not only illustrate the generalised nature of poor-rich inequalities in service use, but they also show that inequalities are particularly large for antenatal care and delivery care. Inequalities in contraceptive use and immunisation coverage are substantial too, but less dramatic. Also in most other countries covered by the DHS, poor-rich differences were largest for antenatal and delivery care.

Table 2. Inequalities in the utilisation of maternal health services in India in 1992/93

Service indicator	Prevalence (%)					Richest/ poorest difference
	poorest	second	third	fourth	richest	
Delivery						
- by medically trained person	11.9	18.2	30.1	47.9	78.7	66.8
- in public or private facility	6.8	11.9	19.6	36.1	71.0	64.2
Antenatal care visits						
- to medically trained person	24.5	33.5	46.4	65.3	88.6	64.1
- two or more consultations	33.5	42.7	56.1	71.2	90.4	56.9
Use of modern contraceptives	24.9	27.5	36.1	42.0	50.6	25.7
Complete immunisation coverage of children 12-23 months	17.1	21.7	34.7	48.2	65.0	47.9

SOURCE: Gwatkin *et al.* (2000). Report on India.

These particularly large inequalities are probably due to the special difficulties that poor women may experience in utilising health services when they are pregnant or give birth to a child. Several barriers may make these antenatal and obstetric services inaccessible, unaffordable or unacceptable to women with few economic resources. The next part will discuss in more detail the causes of poor-rich disparities in the use of delivery care.

Towards explanations of poor-rich disparities

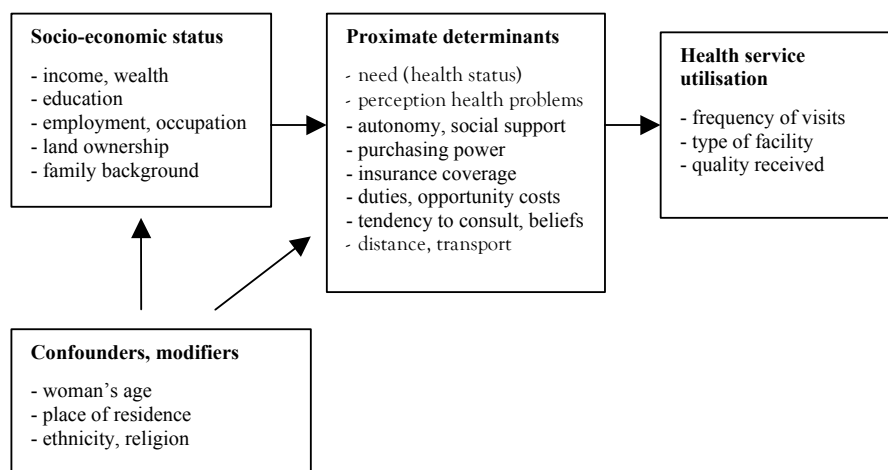
Whereas there is no doubt that poor women utilise antenatal and obstetric services much less than wealthier women, the questions remains *why* they use these services less often. Without doubt, a whole array of factors is involved, ranging from financial barriers to issues of women's status and autonomy. Ideally, this section would come up with an exhaustive overview of these factors, together with a discussion of the ways in which, and extent to which, each of these factors contribute to inequalities in health service use. This knowledge would greatly facilitate the identification of policy measures that can be most effective in tackling poor-rich disparities in service use and maternal mortality.

Unfortunately, the empirical evidence as it is published in the literature

is fragmentary and poorly comparable between countries. Few or no studies have been designed with the explicit purpose to explain inequalities in maternal mortality and morbidity, or inequalities in the utilisation of maternal health services. Pieces of evidence can however be obtained from empirical studies designed for other purposes, as well from insights that were obtained using qualitative methods. This evidence is briefly summarised in this chapter.

We will follow the conceptual scheme presented at the next page (c.f. Kuate Defo 1997). A few words may be needed to clarify this scheme, and especially the concept of socio-economic status (SES). This concept recognises that, within each society, material and other resources are unequally distributed. This inequality can be portrayed as a social ladder or social hierarchy. People attain different positions in the social hierarchy depending on their educational level, income level and other scarce resources. Since these socio-economic factors together determine a person's SES, they should be considered as different indicators of the same basic concept. These indicators are complementary as they cover different dimensions of SES. Therefore, it is advisable to look at the specific pattern of inequalities observed for each of these indicators separately (Kunst & Mackenbach 1994).

Figure 4. A simple conceptual framework for the explanation of socio-economic inequalities in health service utilisation



A MINOR PART OF POOR-RICH DISPARITIES ARE DUE TO CONFOUNDERS SUCH AS RURAL VS. URBAN RESIDENCE

Following the conceptual scheme, the first question to be addressed is whether or not the lower utilisation of delivery care by poor women is due to factors that can be conceived as 'confounders' of the association between socio-economic status and health care utilisation. Potentially important factors are those that, independently from SES, have substantial effects on utilisation rates. For example, in a study from Turkey (Celik & Hotchkiss 2000), utilisation rates were found to differ substantially according to geographic factors (region, rural vs. urban residence), ethnicity (Kurdish vs. Turkish) and the age of the woman.

The evidence from the literature indicates that these potential confounders explain only a minor part of socio-economic inequalities in attendance rates. In each study that is reviewed, socio-economic inequalities persist after control is made for factors such as place of residence, women's age and ethnicity (e.g. Celik & Hotchkiss 2000, Okafor 1991). For example, in a study on Thailand (Raghupathy 1996), large differences between income groups in delivery assistance were observed after controlling for, among other factors, women's age, childhood residence, religion, and rural vs. urban residence.

The role of urbanisation is also evaluated in the table 3, which presents estimates of poor-rich differences in the utilisation of delivery care within the urban areas of 7 countries. In each country, a comparison is made between the wealthier and poorer half of the urban population. If urban vs. rural residence would be a major confounding factor, one would expect to observe much smaller differences *within* urban populations alone. However, substantial differences are observed for each country. In addition, when taking into account that broad (instead of extreme) groups are compared, these differences are not much smaller than those demonstrated in figure 3 for these countries in their entirety.

These results indicate that poor-rich differences in the utilisation of maternal health services do not simply reflect the effect of geographical, ethnic or other confounding factors. There is little doubt that socio-economic disadvantage itself, either at the level of individuals or at the household level, directly affects women's utilisation of maternal health care services.

Table 3. Inequalities in utilisation of delivery care within urban areas of 6 countries

Country	Wealthier half	Poorer half	Difference
Bolivia	97.9	73.3	24.6
Côte d'Ivoire	86.1	70.7	15.4
Morocco	75.6	50.9	24.7
India	89.5	63.0	26.5
Indonesia	94.0	68.8	25.2
Kyrgyz Republic	98.2	98.1	0.1

SOURCE: Own calculations based on data presented by Gwatkin *et al.* (2000).

LOWER USE OF DELIVERY CARE BY POOR MOTHERS IS PARTLY DUE TO THEIR LOWER EDUCATION

The utilisation of delivery care varies according to a wide array of socio-economic indicators. The socio-economic indicator documented most extensively is the women's educational level (Caldwell *et al.* 1983, Elo 1992). Associations have also been shown with, among others, women's occupation (McCaw-Binns *et al.* 1995, Okafor 1991) and the socio-economic status of their parents (Bender & McCann 2000, Elo 1992). Given these associations, it may be expected that several socio-economic factors have contributed to the lower utilisation rates of women living in poverty.

There is some empirical evidence to support this expectation. In multivariate studies that include both income and education, women's education stands out as the most important determinant of the use of maternal health services. Evidence on this comes from, among other countries, Turkey (Celik & Hotchkiss 2000), Thailand (Raghupathy 1996) and Nigeria (Okafor 1991).

Further evidence is presented in table 4 for four other countries. For each country, inequalities according to wealth are compared to the inequalities according to the educational level of women. The latter inequalities are quantified with the Slope Index of Inequality, an index that yields values that are roughly equivalent to estimate of the rich/poor differences. In each of the four countries for which we made these estimates, inequalities according to educational level appeared to be larger than those according to the wealth index.

Despite the importance of other socio-economic factors, the direct effect of income and wealth on (the proximate determinants of) health care utilisation should not be underscored. In most multivariate analyses, an independent effect of wealth or poverty measures remained after control was

made for education and other socio-economic factors (Kuate Defo 1997, Rasheed & Khan 1990). This indicates that poor-rich differences in the use of delivery care also reflect financial and related difficulties that poor women may face when needing maternal health services.

Table 4. Inequalities in the utilisation of delivery care according to wealth and educational level respectively

Country	Magnitude of difference in utilisation	
	Wealth: highest vs. lowest quintile	Education: slope index of inequality
Dominican Republic	8.9	19.0
Uganda	47.8	66.4
Ghana	59.8	68.0
Indonesia	67.9	84.0

SOURCE: Gwatkin *et al.* (2000) for wealth, and own calculations based on DHS files for education.

A WIDE ARRAY OF FACTORS MEDIATE THE EFFECT OF INCOME OR EDUCATION ON THE USE OF DELIVERY CARE

The main challenge of explanatory research is to identify the causal pathways by means of which the socio-economic status of women affects their utilisation of health services. Without doubt, many 'proximate determinants' are involved and they may combine and interact in complex ways. Different determinants have been emphasised by different authors.

Some authors have stressed the direct consequences of financial and related constraints. Among the factors mentioned are lack of adequate transport, no or insufficient health insurance, the high opportunity costs of medical consultations, and reduced opportunities to cope with the emergencies of pregnancy or child delivery. For example, in rural Kenya, travel time and insurance coverage are key constraints determining who deliver at home with traditional birth attendants (Hodgkin 1996). Similar findings were reported on Bangladesh (Nahar & Costello 1998).

Other authors have stressed factors more related to women's education. The positive effect of education on health care utilisation has been attributed to increased autonomy and decision making power, higher ability to acquire and process new information, and changing attitudes towards health problems and health services. For example, the often observed conflict between local cultures and western medicine (Asowa-Omorodion 1997,

Sundari 1992) may be more easily resolved by women with higher levels of education.

To our knowledge, no attempt has been made to empirically assess the extent to which different proximate determinants contribute to the lower level of health care utilisation of poor women. If these attempts would have been made, the results would be strongly dependent on the specific national and local context. Perhaps most fruitful in future research is to recognise the complex interplay of many factors, and to perform observational or experimental studies that focus on a few factors that are amenable to modification through intervention.

POOR-RICH DISPARITIES ARE STRONGLY SENSITIVE TO THE WIDER NATIONAL AND LOCAL CONTEXT

In addition to 'proximate determinants', explanatory research may also focus on the 'contextual determinants' of poor-rich inequalities, i.e. features of the national or local context that may influence the pattern and magnitude of inequalities. This approach may be especially suited for evaluating the role of alternative socio-economic, health care and other policies.

In the parts on wealth and delivery care and inequalities in delivery care, important variations between countries were observed with regard to poor-rich disparities in the utilisation of delivery care. These variations provide an opportunity to explore the role of contextual factors. In the part on inequalities ...female literacy rates, it was observed that female literacy was an important correlate, thus underlining the key importance of women's education for reducing socio-economic inequalities with regard to maternal health services.

In that comparative analysis, the magnitude of inequalities was unrelated to the amount of public health expenditure, when measured as a percentage of GDP. An alternative (and probably far more sensitive) way to evaluate the potential effect of health care systems and policies, is to evaluate the effect of changes over time in the organisation and finance of health care systems. Some trend studies are now underway. For example, one study deals with changes in Tanzania during the early 1990's, when new structures of health care provision were gradually introduced by moving away from the old socialist system. As the data in table 5 illustrate, there was an increase during that period in inequalities in the use of maternal health services. This finding illustrates that changes in health care systems may affect different

socio-economic groups differently, thus either widening or narrowing existing gaps in health and health care.

Table 5. Educational differences in the utilisation of antenatal and delivery care: trends in Tanzania

Service indicator	Relative Index of Inequality	
	1991	1996
Delivery in public or private facility	5.56	8.33
Delivery with trained attendance	6.25	7.14
Two or more antenatal care visits	3.45	5.56

SOURCE: Zuure, Kunst & Van Doorslaer (manuscript)

Implications

Stimulated by the Safe Motherhood Initiative, many efforts were made over the last decade to improve antenatal, obstetric and other reproductive health services (Donnay 2000). However, the persistence of high levels of maternal mortality stresses the need to explore new strategies. What can future efforts in this field learn from the currently available evidence on poor-rich disparities in the use of maternal health services? Below, we will formulate some general implications.

First of all, however, we should stress that we cannot formulate concrete advice on specific policies. This advice is usually strongly dependent on the national and local context, which is at odds with the global picture that we aimed to draw in this paper. In addition, implications for specific policies have to come from operational research or intervention studies that focus explicitly on the poor, but these studies are yet rare and not evaluated in this paper.

EQUITY IN MATERNAL HEALTH AND HEALTH CARE SHOULD BE A MAIN TARGET

Few would dispute that the huge inequalities that are observed for so many countries are unfair and unnecessary. Put briefly, these inequalities represent 'inequities' (Whitehead 1990). Even though a complete elimination of inequalities in health care use may not be a realistic aim for the next years to come, these inequalities can at least be reduced to an important extent.

Therefore, it is highly important that maternal health policies and programs not only focus on poor women in implicit ways, but that they explicitly formulate a reduction of inequalities as one of their key targets.

THE EFFECTIVENESS OF INTERVENTIONS ALSO DEPENDS ON THEIR FOCUS ON THE SITUATION OF THE POOR WOMEN

An interest in poor-rich disparities may not only be driven by a concern for equity and fairness, but may also be motivated by the wish to increase the effectiveness of interventions in terms of population averages. Because problems with maternal mortality and the utilisation of health services are often concentrated among the poorest groups, programs that aims to address these problems may have limited effects if they do not respond to the particular problems and needs of the poorest women. For example, when alternative maternal health care systems are considered (Koblinsky *et al.* 2000), explicit attention should be given to the question which system can be secure that health services are accessible, affordable and acceptable to poor and low educated mothers.

THE BROADER ECONOMIC, SOCIAL AND CULTURAL ENVIRONMENT SHOULD BE ADDRESSED WHERE POSSIBLE

Even though the provision of maternal health service needs to be improved in many respects, better service provision is not the exclusive means to increase utilisation rates and to reduce maternal mortality and morbidity. Several authors have stressed how important it is that women are able to take control over their own lives so that they can better care for their children and themselves, and seek medical care when needed. The huge inequalities according to both income and education underline the importance of the broader economic, social and cultural environment. Where possible, policies should aim to identify and modify economic, social and cultural factors that affect poor and low educated women most.

MONITORING SYSTEMS SHOULD DISTINGUISH SOCIO-ECONOMIC GROUPS

Monitoring progress towards health targets is important for both advocacy, strategic decisions and evaluation. The large inequalities observed in this paper stress that future developments should be monitored not only for the

population as a whole, but also for subgroups defined in terms of education, wealth or other socio-economic terms. Only in this way we can assess whether poor women will be benefiting most from future successes in the battle against maternal mortality.

Acknowledgements

This paper is written while the first author was a consultant for the hnp/poverty thematic group of the World Bank, Washington DC. We are grateful to Davidson Gwatkin and Rohini Pande for giving us access to spreadsheets with the DHS data that are presented in recent World Bank reports (see reference of Gwatkin DR et al. 2000). In addition to the World Bank data, table 4 includes results of analyses performed by Jennifer McGugins and the first author. Table 5 presents unpublished results of a recent study that Marian Zuure performed with Anton Kunst and Eddy van Doorslaer.

References

- Asowa-Omorodion FI (1997). Women's perceptions of the complications of pregnancy and childbirth in two Esan Communities, Edo state, Nigeria. *Social Science and Medicine* **44**,1817-1824.
- Bender DE & McCann MF (2000). The influence of maternal intergenerational education on health behaviors of women in peri-urban Bolivia. *Social Science and Medicine* **50**,1189-1196.
- Caldwell J, Reddy P & Caldwell P (1983). The social component of mortality decline: an investigation in Southern India employing alternative methodologies. *Population Studies* **37**,185-201.
- Celik Y & Hotchkiss DR (2000). The socio-economic determinants of maternal health care utilisation in Turkey. *Social Science and Medicine* **50**,1979-1806.
- Donnay F (2000). Maternal survival in developing countries: what has been done, what can be achieved in the next decade. *International Journal of Gynaecology and Obstetrics* **70**,89-97.
- Elo I (1992). Utilisation of maternal health care services in Peru: the role of women's education. *Health Transition Review* **2**,49-61.
- Graham WJ & Campbell OM (1992). Maternal health and the measurement trap. *Social Science and Medicine* **35**, 967-977.
- Gwatkin DR, Rutstein S, Johnson K, Pande RP, Wagstaff A (2000). Socio-economic differences in health, nutrition and population in [country name]. Washington, World Bank, HNP/Poverty Thematic Group.
- Hodgkin D (1996). Household characteristics affecting where mothers deliver in rural Kenya. *Health Economics* **5**,333-340.
- Jagdish CB & Cleland J (1996). Obstetric morbidity in South India: results from a community survey. *Social Science and Medicine* **43**,1507-1516.
- Kestler EE (1995). Maternal mortality in Guatemala: assessing the gap, beginning to bridge it. *World Health Statistics Quarterly* **48**,28-33.
- Koblinsky MA, Campbell O & Heichelheim J (2000). Organizing delivery care: what works for safe motherhood? *Bulletin of World Health Organisation* **78**, 399-406.
- Kuate Defo B (1997). Effects of socioeconomic disadvantage and women's status on women's health in Cameroon. *Social Science and Medicine* **44**,1023-1042.
- Kunst AE & Mackenbach JP (1994). Measuring socio-economic inequalities in health. Copenhagen, World Health Organisation.

- Mahler H (1987). The Safe Motherhood Initiative: a call to action. *Lancet* 1,268-270.
- McCaw-Binns A, La Grenade J & Ashley D (1995). Under-uses of antenatal care: a comparison of non-attenders and late attenders for antenatal care, with early attenders. *Social Science and Medicine* 40,1003-1012.
- Nahar S & Costello A (1998). The hidden cost of 'free' maternity care in Dhaka, Bangladesh. *Health Policy and Planning* 13,417-422.
- Okafor CB (1991). Availability and use of services for maternal and child health in rural Nigeria. *International Journal of Gynecology and Obstetrics* 34,331-346.
- Raghupathy S (1996). Education and the use of maternal health care in Thailand. *Social Science and Medicine* 43,459-471.
- Rasheed P & Khan A (1990). A multifactorial study of birth place options: improving health care delivery in Saudi Arabia. *International Journal of Gynecology and Obstetrics* 33,229-234.
- Sadana R (2000). Measuring reproductive health: review of community-based approaches to assessing morbidity. *Bulletin of World Health Organisation* 78,640-653.
- Sundari TK (1992). The untold story: how the health care systems in developing countries contribute to maternal mortality. *International Journal of Health Services* 22,513-528.
- Whitehead M (1990). The concepts and principles of equity and health. Copenhagen, World Health Organisation.

How can we monitor progress towards improved maternal health?

Carine Ronsmans¹

Summary

Measuring change resulting from safe motherhood programmes presents its own challenges. Not only are the desired outcomes of mortality and morbidity difficult to ascertain, even the measurement of service utilisation is far from straightforward because of the complex issues related to the conceptualisation and definition of need for obstetric care. Moreover, because evaluation in safe motherhood is concerned with monitoring the achievements of large-scale programmes rather than individual interventions, attributing changes to the programme per se may be difficult, and providing 'scientific' proof of programme effectiveness may not be achievable. This paper is particularly concerned with addressing the monitoring and evaluation of results of large-scale safe motherhood programmes whose components have been shown or are assumed to be efficacious. It will review the overall approach to evaluation of safe motherhood programmes and the strengths and weaknesses of indicators for measuring progress, and will briefly discuss the design implications of assessing large-scale programmes. Examples are drawn from the literature, and from the recent experience of a Safe Motherhood Programme in three districts in South Kalimantan, Indonesia, supported by MotherCare, USA.

Introduction

Since the launch of the Safe Motherhood initiative in 1987, governmental and non-governmental agencies have joined forces to reduce the huge burden of maternal mortality in the world. Awareness has been raised of the extent of maternal ill-health, and knowledge has become available on interventions that are effective in reducing this burden. The task is now to develop effective and affordable programmes that make the interventions accessible to women, and in doing so, to monitor whether the strategies put into place are achieving the goals and objectives specified in the programme.

Measuring change resulting from safe motherhood programmes presents

¹MD, Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine, London, UK. Email: Carine.Ronsmans@lshtm.ac.uk

its own challenges. Not only are the desired outcomes of mortality and morbidity difficult to ascertain, even the measurement of service utilisation is far from straightforward because of the complex issues related to the conceptualisation and definition of need for obstetric care. Moreover, because evaluation in safe motherhood is concerned with monitoring the achievements of large-scale programmes rather than individual interventions, attributing changes to the programme per se may be difficult. Providing 'scientific' proof of programme effectiveness may not be achievable.

This paper is particularly concerned with addressing the monitoring and evaluation of results of large-scale safe motherhood programmes whose components have been shown or are assumed to be efficacious. It will review the overall approach to evaluation of safe motherhood programmes and the strengths and weaknesses of indicators for measuring progress, and will briefly discuss the design implications of assessing large-scale programmes. Examples are drawn from the literature, and from the recent experience of a Safe Motherhood Programme in three districts in South Kalimantan, Indonesia where the author took part in the monitoring and evaluation activities over a five-year period (Mothercare 2000).

What should be evaluated?

The main objective of an evaluation is to influence decisions to continue, change, expand or end a project or programme (Habicht 1999). How complex and precise the evaluation must be depends on who the decision-maker is and on what types of decisions will be taken as a consequence of the findings. Different decision-makers demand not only different types of information but also vary in their requirements of how informative and precise the findings must be. Hospital managers for example, may be interested in knowing what the quality and cost of their services is in order to decide what needs to be done to improve them. District managers, on the other hand, may need data on provision and utilisation of safe motherhood services to plan further amendments to the numbers and types of such services within their district. National agencies may require assessments of coverage or impact to justify further investments in their programme. And finally, international agencies may wish to make global comparisons in coverage and impact to understand global trends in maternal health, for advocacy or to justify continued funding.

It is not possible to design an evaluation strategy that will provide sufficiently valid and precise information for decisions to be taken at all the vari-

ous levels of decision-making (facility, district, regional, national and international). Rather, evaluations need to be tailor-made to satisfy the specific needs of each level of decision-making. Unfortunately, evaluation efforts in Safe Motherhood have for many years searched for a universal blueprint of evaluation, largely focusing on what to measure (i.e. indicators) rather than on what to evaluate (i.e. who is the information for, what will it be used for). This has resulted in an over-emphasis on indicators that may be of little use in designing or managing effective health care strategies within countries. Only recently has there been a shift in emphasis from indicators of health to indicators of use of obstetric care but there is relatively little experience so far with the use and interpretation of such indicators.

Table 1. Example of indicators to evaluate safe motherhood programmes

Indicator	Question	Example of indicators
Provision	Are the services available and accessible?	Number and distribution of Essential Obstetric Care (EOC) facilities EOC functions performed at facilities Cost of services
Quality	Is the quality of the services adequate?	Case fatality rate Proportion of cases fulfilling pre-defined criteria of quality
Utilisation	Are the services being used?	Proportion of births attended by skilled health personnel Proportion of births in EOC facilities Caesarean sections as a proportion of all births
Utilisation by those in need	Are the services being used by the sub-group with specific needs?	Proportion of all women with complications who are treated in EOC facilities Major obstetrical interventions for specific maternal indications, as a proportion of all births Observed versus expected obstetric complications
Impact	Are there improvements in morbidity or mortality?	Proportion of births with severe morbidity Maternal mortality ratio

One of the first questions to address when designing an evaluation is whether one is evaluating the performance of the intervention delivery or its impact on health or behaviour (Habicht 1999). One may evaluate the provision, quality or utilisation of services, their coverage and impact. Table 1 presents in a logical order the types of information that one may wish to gather

on safe motherhood services. First, the services must be available and accessible to the target population, and of adequate quality. Second, the population must accept the services and use them. Third, if service provision, quality and utilisation are high this may result in an impact on health or behaviour. In addition, the recognition that not all women need specialist obstetric care to prevent maternal death has led to the search for indicators measuring the met (or unmet) need for obstetric care in a sub-group of the population. Examples of such indicators are described in detail below.

What can be measured?

PROVISION OF SERVICES

Services must be provided so that they are available and accessible to the target population. It is difficult to assign standard indicators of service availability, although WHO and UNICEF have suggested a few, such as the number of essential obstetric care (EOC) facilities per 500,000 population, or the percentage of hospitals with caesarean section and blood transfusion (UNICEF, WHO and UNFPA 1997). Service availability will clearly be context-specific and a number of tools exist that may guide the assessment of provision of care. WHO, for example, has developed a Safe Motherhood needs assessment for use by managers, policy-makers and other interested parties at national and district level (WHO 1998). This document provides a comprehensive list of survey materials that can be adapted for local use.

Documenting service provision is the cornerstone of programme evaluation as other measures of programme success crucially depend on it. Although this is obvious, service provision is often overlooked in programme evaluation and more efforts should be made to carefully document the inputs in care that will ultimately determine sustained service use and impact. In Indonesia, for example, the Government's commitment to post a trained midwife in each village prompted us to document the service delivery by village midwives as one of the central elements of our evaluation (Mothercare 2000). By the end of the programme, availability of skilled attendants had increased dramatically (to one midwife per 1200 population), attesting to the success of the Government's actions. However, the midwifery programme had a number of features that tempered our expectations of programme success, particularly for the long term. Not only was there a high turnover of midwives (19% left the area within 3 years of employment), their formal contracts were of very short duration and they attended very few deliveries (1 to

2 per month). The lack of stability and clinical experience of the workforce is likely to affect the possible benefits of interventions such as in-service training, and the Government is currently taking these constraints into account in redesigning its programme.

Accessibility of services does not only imply geographical accessibility, - say, the percentage of the population within one hour travel time of an EOC facility, - but also financial access. Although the WHO has specified a tool for the assessment of costs of services in its needs assessment document (WHO 1998), documentation of costs of antenatal and delivery services is remarkably scant. In the current context of nearly universal fee-for-services, the costs to the patient cannot be ignored in any evaluation of safe motherhood services. In Indonesia, women reported a median expenditure of Rp 600,000 (US\$ 240) for a caesarean section. We believe that the high costs of emergency obstetric interventions was one of the main reasons why women failed to use specialised care when they needed it (see below), despite the government's efforts to overcome financial constraints for the poor during the economic crisis.

Quality of services

Increasing access to obstetric care is only a first step towards the reduction in maternal mortality, as the services offered cannot be assumed to be effective. There is increasing evidence that the services offered in obstetric facilities fall short of acceptable standards, and substandard obstetric care is now known to be an important contributor to maternal mortality and near miss morbidity in poor countries (Egypt Ministry of Health 1994, Mantel *et al.* 1998, Filippi *et al.* 1998). Examining the quality of the care is thus an essential part of any programme evaluation.

There is no general agreement as to what constitutes high quality care (Pittrof & Campbell 2000). All definitions of quality of care agree that biomedical outcomes are important, but agree on little else. Over time, definitions of quality of care have become more inclusive, and now address patient and provider satisfaction, social, medical and financial outcomes as well as aspects of equity and performance according to standards and guidelines. Pittroff and Campbell (2000) propose a comprehensive definition of high quality maternity care which includes: (i) the provision of a minimum level of care to all pregnant women and their newborn babies and (ii) a higher level of care to those who need it; (iii) obtaining the best possible medical outcome; (iv) providing care that satisfies women, their families and care

providers and (v) maintaining sound financial performance and developing existing services to raise the standards of care provided to all women. The notion of a minimum level of care for all and a higher level of care for some is an important one, as most users of maternity services are well and do not need specialised care. Unmet need for obstetric care for those who need it might go hand in hand with over-treatment and over-medicalisation for those not needing such care, and quality of care assessments in maternal health have to address both these issues, even where access to care is poor.

In general, our ability to measure the quality of care has advanced substantially and measurement tools are now available (Brook *et al.* 1996). The framework that is most commonly used to assess quality of care is that of structure, process and outcome (Donabedian 1988). Structure refers to the question: 'what facilities, equipment, staff etc. were there', process implies 'what was done to the patient' and outcome questions 'what was the result for the patient'. Examples of outcome indicators in the context of maternity care include the case fatality and perinatal mortality rates. Examples of process data include the proportion of women with eclamptic seizures who have received magnesium sulphate or the proportion of women with severe morbidity in whom an observation chart has been maintained according to protocol. Process data are usually more sensitive measures of quality than outcome data because a poor outcome does not occur every time there is an error in the provision of care and outcome may not always be under the control of the health care providers.

The field of obstetrics has in many ways been privileged because evidence-based practice guidelines have been developed based on scientific literature (Chalmers *et al.* 1989). In addition, explicit criteria of quality of obstetric care have been established for those processes for which we have sound scientific evidence or a formal consensus of experts that the criteria, when applied, lead to an improvement in health (Benhow *et al.* 1997). Such process criteria have been developed in a number of countries, including more recently in two developing countries (Graham *et al.* 2000). Although these criteria are by no means exhaustive, they are certainly a useful starting point for establishing the technical performance of care in EOC facilities.

Apart from the above process criteria there are as yet no satisfactory standard tools to compare the quality of obstetric care across health facilities (Pittrof & Campbell 2000). Ready-to-use tools exist for infrastructure and supplies, but comprehensive testing of management (particularly non-clinical), knowledge, skills, interpersonal relations and attitudes is difficult.

Although UNICEF and WHO advocate the use of health outcome indicators such as the case fatality rate, uncritical interpretation of such indicators in comparisons between health facilities may lead to erroneous conclusions (Richardus *et al.* 1997). Health outcome indicators depend on a number of factors that are unrelated to quality of care and that need to be assessed separately before reaching conclusions about quality of care issues, including the case definition, the efforts put into case finding, and the case mix. In addition, the number of maternal deaths is generally small in any health facility and the lack of precision in the measurement of case fatality rates precludes meaningful comparisons. Although the measurement of severe obstetric or near-miss morbidity has been proposed as a promising alternative outcome measure of quality of obstetric care, experience with such indicators is still in its infancy, and much more work needs to be done in the definition and interpretation of near-miss events and their incidence (Ronsmans & Filippi *in press*).

The search for standard tools for the measurement of quality of care has been largely driven by the highly competitive health care industry in industrialised countries and its relevance for developing countries is questionable. In developing countries, the aim of quality assessment is primarily to improve services rather than acquire the best share in a competitive market. Investigations that have been set up just to explore whether the care is adequate will in general not bring about change should the care prove not to be adequate, and assessments of quality have to be linked to mechanisms for finding and implementing solutions (Crombie *et al.* 1997). Closing the cycle of quality assurance, or in other words auditing care, is now seen as a promising way to improve quality of services, even in developing countries. Preliminary findings from a number of ongoing projects in developing countries suggest that audits of obstetric care in health facilities may indeed induce change in the quality of the services (Graham *et al.* 2000, Ronsmans & Filippi 2000).

Service use

Numerous documents have reviewed indicators of service use for obstetric care, and only two of the most commonly used indicators are reviewed here: the proportion of births attended by skilled health personnel and population-based caesarean section rates.

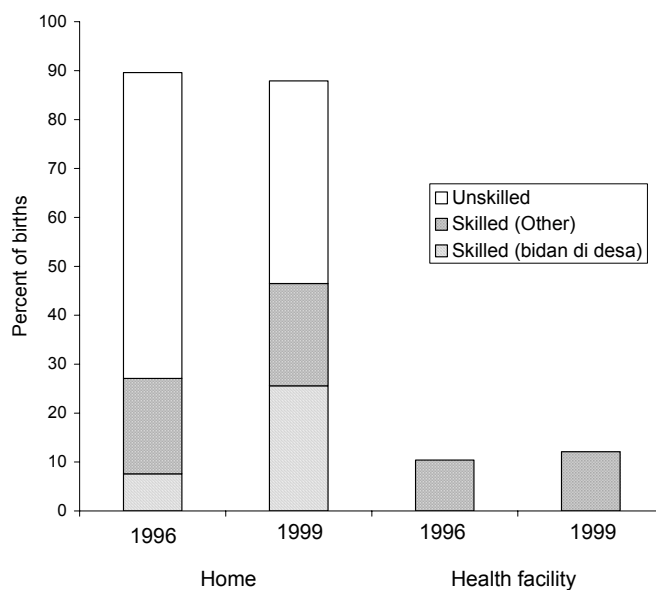
PROPORTION OF BIRTHS ATTENDED BY SKILLED HEALTH PERSONNEL

As it has now become clear that effective delivery care by a skilled attendant is needed to prevent the majority of maternal deaths, the 'proportion of births attended by skilled health personnel' has become one of the most widely promoted indicators of service use. Skilled health personnel refers to doctors or persons with midwifery skills who can manage normal deliveries and diagnose and treat, or refer, obstetric complications (WHO 1997). Trained traditional birth attendants, long seen as one of the cornerstones of maternal health care, no longer qualify as skilled attendants, and are excluded from the numerator (WHO 1997).

This indicator is a valid and useful reflection of global international trends in access to delivery care. It may also provide useful local information in settings where specific efforts have been made to increase skilled attendance at birth, particularly when birth attendance is broken down by type of attendant and place of delivery (Campbell *et al.* 1997). In Indonesia for example, the Government's strategy of a midwife in every village has clearly resulted in a dramatic increase in skilled attendance at birth (Mothercare 2000). In the three districts where we were able to evaluate this strategy, skilled attendance at delivery increased from 37% to 59% and the strongest increase was in home deliveries with a village midwife present (figure 1).

While there is a clear correlation between the proportion of skilled attendants at delivery and maternal mortality when comparing countries at a world scale, it is still uncertain whether relatively small changes in this indicator are a sensitive marker for changes in maternal mortality. Even in Indonesia it remains unclear whether the dramatic increase in skilled attendance at birth has resulted in reductions in maternal mortality, particularly since the substantial need for specialised obstetric care has not yet been met (see below). Changes in this indicator alone should be interpreted with caution, and firm conclusions towards improved health should only be drawn if the reported improvements agree with those observed in service quality and met need for obstetric care.

Figure 1. Trends in percent of births with skilled attendants among home and facility births in three districts in South Kalimantan, Indonesia



CAESAREAN SECTION RATES

Population-based estimates of the proportion of births which are caesarean sections may reflect, at least in part, the extent to which pregnant women have access to life saving obstetric care. In settings where access to surgical facilities is very low, the majority of caesarean sections may well be carried out to save the life of the mother, and caesarean rates may be accurate tracers of use of essential obstetric services². In a study conducted in a refugee population in Guinea, for example, the baseline population-based caesarean section rate (including hysterectomies) was 0.03%, and such procedures were carried out almost entirely for life-threatening maternal complications (Van Damme *et al.* 1998). Implementing a refugee-assistance programme led to a four-fold increase in the caesarean section rates, reflecting clear progress towards meeting the need for obstetric and other care.

² Caesarean sections are not the only interventions with life-saving potential and ideally all major obstetric interventions rather than just caesarean sections should be included in the numerator (e.g. interventions such as a laparotomy to repair a uterine rupture, hysterectomy to stop an unremitting haemorrhage, symphysiotomy, craniotomy or embryotomy). Excluding such interventions under-estimates the use of life-saving delivery care.

As caesarean section rates rise, however, the assumption that the majority are done for maternal reasons is no longer valid. As coverage of services increases there is a broadening of the indications to include a majority of foetal problems and, possibly, unnecessary caesarean sections (Barrett *et al.* 1990). In some countries, up to 80% of caesarean sections may afford no benefit to either mother or baby (LoCicero 1993). Even where caesarean rates are extremely low, a substantial proportion may not have maternal indications (Bouillin *et al.* 1994).

Nevertheless, the WHO and UNICEF promote the use of an all-cause caesarean section rate setting a minimum acceptable level of 5% without any specification of the reasons for the caesarean sections (UNICEF, WHO and UNFPA 1997, WHO 1997). However, examples exist that show that all-cause caesarean section rates much lower than 5% may be sufficient to meet the needs of women and achieve low maternal mortality. The Netherlands had maternal mortality ratios as low as 20 per 100,000 with a caesarean section rate not exceeding 2% (De Brouwere & Van Lerberghe 1998). Similarly, England and Wales reached maternal mortality ratios of 60 per 100,000 with caesarean section rates of 2%. In Harare, Zimbabwe, a maternal mortality ratio of 71 per 100,000 was reported with emergency caesarean section rates of 2.7% (Munjanja *et al.* 1996) and in St Louis, Senegal maternal mortality was 148 per 100,000 with a caesarean section rate of 2.4% (MOMA group 1998). These data suggest that setting an arbitrary minimum caesarean section rate of 5% may enhance an over-interventionist culture, and may cause more harm than good. It is easy to imagine 5% being achieved without reaching those who need it, and data from some settings, for example Egypt, suggest that this is already occurring. For the reasons outlined above, one can not infer from rises in caesarean section rates that progress is made towards reducing maternal mortality.

Service use in a sub-group with specific needs

The recognition that some women need specialist obstetric care to prevent maternal death has led to the search for indicators measuring the met (or unmet) need for obstetric care (WHO 1998, De Brouwere & Van Lerberghe 1998, WHO 1994, De Brouwere *et al.* 1996, Pittrof 1997, Belghiti *et al.* 1998). Such indicators aim to identify the pool of users (or non-users) of obstetric services among the pregnant women thought to require such services. Obstetric service use is measured among a sub-group defined by health pro-

professionals as requiring such services, by virtue of their having a maternal complication, assuming the needs can be met by the stated obstetric service. There are three distinct indicators which deserve attention: the 'proportion of all women with complications who are treated in EOC facilities' suggested by WHO and UNICEF (1997)(UNICEF,WHO & UNFPA 1997, WHO 1997), 'major obstetrical interventions for maternal indications' suggested by De Brouwere and colleagues (1996)(De Brouwere & Van Lerberghe 1998, De Brouwere *et al.* 1996, Belghiti *et al.* 1998) and 'observed over expected complications' suggested by Pittroff (1997).

PROPORTION OF ALL WOMEN WITH COMPLICATIONS WHO ARE TREATED IN EOC FACILITIES

The proportion of all women with complications who are treated in EOC facilities is an indicator which has been widely promoted as an indicator of "Met Need for EOC" (UNICEF,WHO & UNFPA 1997, WHO 1997)). The assumption behind this indicator is that the proportion of the pregnant population expected to have a complication requiring life-saving obstetric care is relatively stable across populations and can be estimated at at least 15% of pregnant women. This enables the need for life-saving obstetric care to be easily quantified across populations. While intuitively appealing, there are a number of problems that warrant caution in the interpretation of this indicator.

First, the conditions that are included as complications vary from one study to the next, and although it is implied that the listed complications are severe, imprecise and unreliable case definitions introduce considerable heterogeneity. The equivocal nature of the definition of entities such as 'dystocia' or 'prolonged labour' is well known (Crowther *et al.* 1991, Lomas & Enkin 1989). Moreover, complications due to abortion and ectopic pregnancy, although important causes of maternal death, are not necessarily appropriate indicators of the need for obstetric care, since their incidence bears little relationship to access to and quality of obstetric care. If the indicator is intended to measure progress towards improved delivery of services, then a more careful selection and definition of life threatening complications is certainly warranted.

Second, the assumption that at least 15% of all births are expected to be 'complicated' has never been empirically verified, nor is there any reason to believe, a priori, that the incidence of obstetric complications is constant

across population groups (even after excluding abortions and ectopic pregnancies). In the National Birth Center study in the US, 8% of the mothers or infants had serious complications in pregnancy; 12% were transferred to higher level care in labour and 4% after delivery (Rooks *et al.* 1992). In a Stockholm trial, 14% of low risk mothers assigned to birthing centre care were transferred antenatally, 23% of the remaining women were transferred in labour and 3% during the postpartum (Waldenstrom *et al.* 1997), bringing the total requiring higher level care to nearly 40%. There are minimal comparable data published for developing countries; one of the few studies, the MOMA study from seven urban sites in West Africa, shows that 3.9% of pregnant women experienced severe obstetric morbidities (MOMA group 1998). In a population-based study from Bangladesh, about one quarter (26.2%) of the women experienced a labour or delivery complication, including 21 women who died as a consequence (Vanneste *et al.* 2000). The range of incidences reported from these studies illustrates that it is simply not known what proportion of women are likely to develop severe morbidities.

Finally, a major flaw in this indicator is the assumption that, for the broad range of complications specified, obstetric care can only be delivered in health facilities. Historical data refutes this assumption. Sweden in the years 1861-1895 reduced maternal mortality from 580 to 230 per 100,000 with only a moderate increase in facility-based births from 1 to 3% (Hogberg *et al.* 1986). If the assumption is made that all births in facilities were complicated this could be interpreted as a modest increase in “met need for EOC” from 5% to 18% (figure 2). The key factor enhancing the decline in mortality appears to be the sharp rise in professional attendance at home births (from 40% to 78%). If the Swedish policy makers in 1861 had taken their indicator of 5% of “met need for EOC” to imply that access to hospital care was greatly deficient, they may have never arrived at their highly effective policy of professionalising midwifery. In settings where qualified midwives perform life-saving actions, the indicator proposed by UNICEF *et al.* may grossly under-estimate the extent to which the need for obstetric care has been met. Although UNICEF *et al.* state that they are not encouraging institutional deliveries, assuming that obstetric care can only take place in health facilities may well do exactly that.

MAJOR OBSTETRICAL INTERVENTIONS FOR MATERNAL INDICATIONS

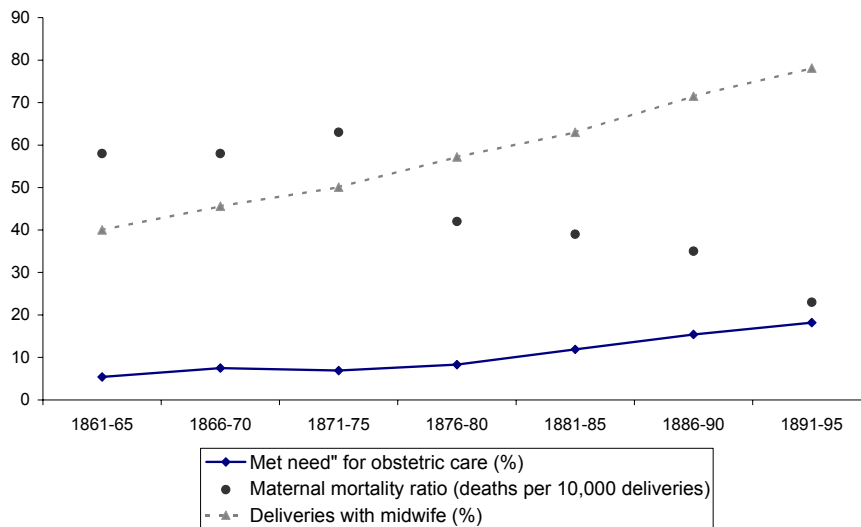
The proportion of major obstetrical interventions (MOI) for so-called “absolute maternal indications” (AMI) among all births is another indicator that

attempts to estimate service use among a sub-group with specific needs. By specifying the indication of the MOI, and selecting only those performed for maternal indications this indicator addresses the concerns raised about caesarean section rates (Bouillin *et al.* 1994, De Brouwere & Van Lerberghe 1998, Van Lerberghe *et al.* 1988, Van den Broek *et al.* 1989, Criel *et al.* 1999). De Brouwere and Van Lerberghe have explicitly used the term “unmet obstetric need” (UON) for this indicator (De Brouwere & Van Lerberghe 1998). The authors also insist on the involvement of health personnel and decision makers in the calculation and interpretation of the indicator, as this may be the most important stimulus for change.

In general, the conditions thought to compromise the mother’s life include severe antepartum haemorrhage due to placenta praevia or abruptio placentae, severe postpartum haemorrhage, major foeto-pelvic disproportion (due to a small pelvis or hydrocephalus; including uterine pre-rupture and rupture), transverse lie and brow presentation (De Brouwere & Van Lerberghe 1998, Belghiti 1998). Whether or not eclampsia should be included as an absolute maternal indication is a matter of debate (Ronsmans *et al.* 1999). While the diagnoses listed as absolute maternal indications are clearly more specific than those suggested by UNICEF and WHO, they may still be dependent on subjective “physician” factors (particularly cephalo-pelvic disproportion) and care has to be taken that standard definitions are agreed.

There exists no absolute target rate for MOI for AMI. De Brouwere and colleagues estimate that between 1% and 2% of pregnant women are expected to need a major intervention to save their lives, based on historical data and observations from areas in developing countries with good access to care (De Brouwere & Van Lerberghe 1998). As with the 15% of women expected to have obstetric complications, it may be inaccurate to assume that the incidence of life-threatening obstetric complications requiring a major intervention is constant across populations. In the absence of universal reference rates, the use of a local reference may be more relevant. In Morocco, for example, the difference in the MOI for AMI rate in urban (0.9%) and rural areas (0.3%) highlights the strong deficits in obstetric care in rural areas (Belghiti 1998). Similar discrepancies were observed in South Kalimantan in Indonesia, where the rate in the most urban district was 1.2%, compared to 0.4 and 0.7% in more remote districts (Ronsmans *et al.* 1999).

Figure 2. Trends in maternal mortality, deliveries by midwives and 'met need' for obstetric care in Sweden (1861-1895)



The MOI for AMI rate is a powerful indicator of need for obstetric care and of the functioning of the health system. By focusing on complications for which - or thresholds of severity above which - facility-based interventions are absolutely needed to save the mother's life, the indicator provides information on one of the most critical components in the reduction of maternal mortality: access to specialised obstetric care. In Indonesia, for example, the picture which emerged from the assessment of met need for specialised obstetric care was very different from that obtained from the trends in skilled attendance at delivery. While the proportion of births with a skilled attendant dramatically increased over time (figure 1), the proportion admitted to hospital with a complication requiring a life-saving intervention declined from 1.1% to 0.7% ($p < 0.001$). Trends were consistent across districts (figure 3). Although the midwives may have treated more complications at home, it is unlikely that they could have prevented most of the severe complications that require a major hospital intervention to save the woman's life. Despite the government's efforts to overcome financial constraints for the poor during the economic crisis, the high costs of emergency obstetric interventions may well have remained the most important obstacle to the use of hospital care.

One drawback to MOI for AMI may be the lack of statistical robustness

for monitoring changes over relatively short periods of time. In RDC, for example, pooling data from extended periods of five years was required to ensure sufficient statistical power (Criel *et al.* 1999). Large populations need to be compared to have sufficient power to measure meaningful changes in this indicator.

OBSERVED VERSUS EXPECTED COMPLICATIONS

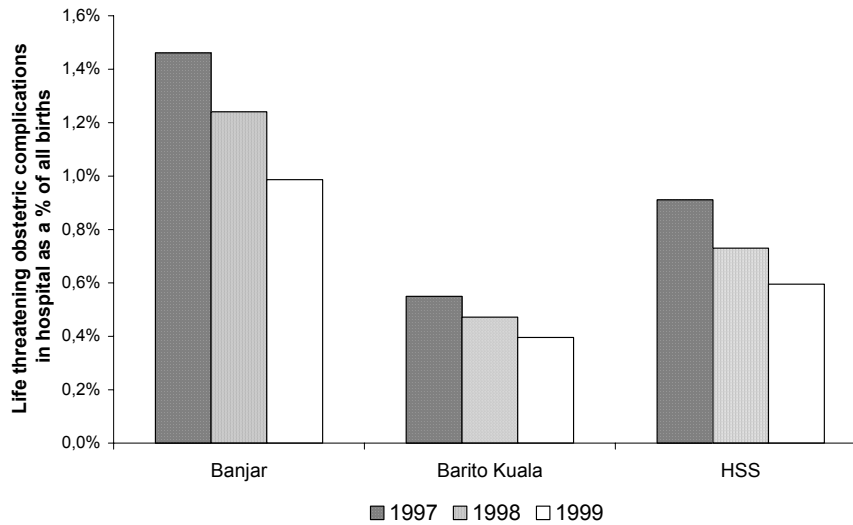
Pittrof provides a simple and conceptually appealing approach for assessing the need for obstetric care (Pittrof 1997). The indicator, called OVER (observed versus expected ratio), measures the ratio of the number of specific obstetric complications presenting at an EOC facility to the numbers expected in the target population. The obstetric complications of interest (breech at delivery, multiple pregnancy, placental abruption, and placenta praevia) were selected because (1) their correct management requires admission to an EOC facility; (2) their incidence may be relatively stable across populations of similar ethnic origin and (3) they are highly specific and can be measured reliably.

The expected numbers of complications are obtained from published data on populations with a similar ethnic background.

The major strength of this indicator is that the frequency of conditions such as breech and multiple pregnancy is largely determined by genetic (as opposed to environmental) factors, and can hence be assumed to be constant within groups of similar ethnic origins. The twinning rate, for example, tends to be higher among black than Caucasian populations, but remains constant within populations. Even if the absolute value of the reference rates is not entirely accurate, the stability of the incidence allows for valid comparisons over time or between groups of a similar ethnic origin. Local reference data from urban populations with good access to EOC may therefore provide highly valid comparison groups.

While management of breech and twin delivery at an EOC facility may only be desirable, it is absolutely mandatory for pregnancies complicated by placenta praevia and placental abruption. For the latter conditions, a lower than expected number of admissions at EOC facilities clearly highlights an unmet need for delivery care. Whether the incidence of placenta praevia and abruptio placentae is constant across population groups is uncertain, however, and caution is required in the interpretation of the magnitude of the unmet need based on arbitrary incidence rates.

Figure 3. Percent of births with a life threatening complication (MOI for AMI) admitted to hospital in three districts in South Kalimantan, Indonesia



The conceptual and practical simplicity of the OVER method make it very attractive. As the definition of complications relies on clear-cut and well-defined medical entities it avoids the intricate investigation of severity and increases credibility among providers. Conditions such as placenta praevia and abruptio placenta may also be less prone to misclassification than, for example, cephalo-pelvic disproportion. Finally, as separate indicators are computed for each indication, large variations in the specific incidence of specific complications can be investigated directly. A major drawback of this method, however, may well be its lack of statistical robustness, as the complications under study are relatively rare.

Multiple indicators of use of and need for obstetric care

Many authors promote the use of a single indicator of use of and need for obstetric care and few studies have assessed how the various indicators compare in their capacity to capture the use and need for obstetric care. In Indonesia, because we were uncertain as to the reliability and precision of any single indicator, we preferred to base our evaluation on a number of indicators. Figure 4 shows a comparison between districts at baseline in the proportion of complications admitted to EOC facilities, caesarean section rates, MOI for AMI rates, and OVER for breech and twin deliveries (figure 4). The

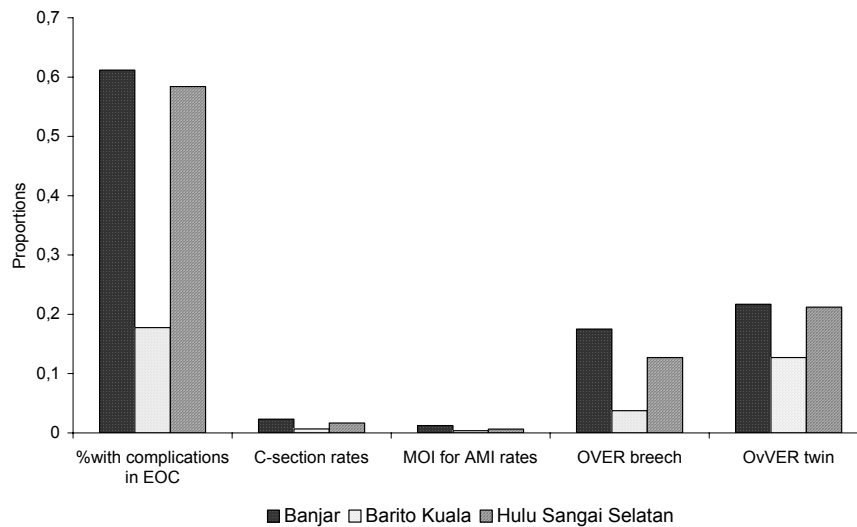
consistency of the pattern across various indicators is striking. All the indicators suggested that there was substantial inequality between districts in the degree to which the need for obstetric care was met, with one of the districts (Barito Kuala) showing a constant deficit compared to the other districts. The consistency of the pattern regardless of indicators strengthened our conclusions when the findings were presented to the health authorities, as weaknesses in one indicator could not be used to explain away the real differences. Since all these indicators rely on data from the same hospital registers, and since the marginal cost of obtaining the data on all rather than one indicator was small, we recommended the use of a number of indicators for continued monitoring of the safe motherhood programme in Indonesia.

Health impact

Maternal mortality, for many years the preferred indicator of success of safe motherhood programmes, is not anymore recommended as an outcome measure against which to assess programme successes (Inter-agency group 1997). The reasons for this are multiple, but mainly relate to measurement issues, including the under-reporting and misclassification of pregnancy as a cause of death and the relatively small numbers of maternal deaths involved (in statistical terms). Many pregnancy-related deaths still go unnoticed or unreported, and substantial errors in the estimates of maternal mortality persist, even in industrialised countries (Bouvier-Colle *et al.* 1991, Campbell & Graham 1991). Correctly measuring maternal mortality not only requires a complete registration of deaths in women of reproductive age, which in many countries may be lacking, but also the recognition that the woman was pregnant or recently delivered at the time of her death.

Deaths during early pregnancy such as those due to abortion or ectopic pregnancy are often not recognised or reported as pregnancy-related, and death certificates often omit the notion of pregnancy. In addition, the verbal autopsy techniques on which many cause of death assignments are based may have poor reliability, and field workers may not correctly identify a pregnancy-related death (Ronsmans *et al.* in press). The main difficulty with the measurement of maternal mortality, however, is its relative rarity, and as a result, the huge populations that have to be surveyed to get accurate estimates.

Figure 4. Multiple indicators of service use in three districts in South Kalimantan Indonesia (December 1996 – November 1997)



Even promising methods such as the sisterhood method are not adequate to monitor programme effectiveness over relatively short time periods because of lack of precision in the levels of mortality, and because the estimates obtained precede the date of the survey by as much as 10 years. WHO and UNICEF are now using models to estimate levels of maternal mortality in countries without reliable data, but these cannot provide information on short term progress in reducing maternal mortality (Inter-agency group 1997).

Although hopes were raised that morbidity would be a good alternative measure for programme effectiveness, it has proven very difficult to measure the prevalence of maternal morbidity at the community level in settings where many women deliver at home (Stewart 1996, Ronsmans 1997). This holds true even when very severe obstetric morbidity – the so-called near-miss – are measured (Filippi in press). In settings where all women deliver in a health facility, facility-based data can be used to study trends in the incidence of severe obstetric or near miss morbidity. However, experience with such indicators has so far been limited and measurement problems persist (Ronsmans & Filippi in press). Conceptually, the interpretation of trends in morbidity is not straightforward as declining trends in mortality may be associated with an increased incidence of severe morbidity.

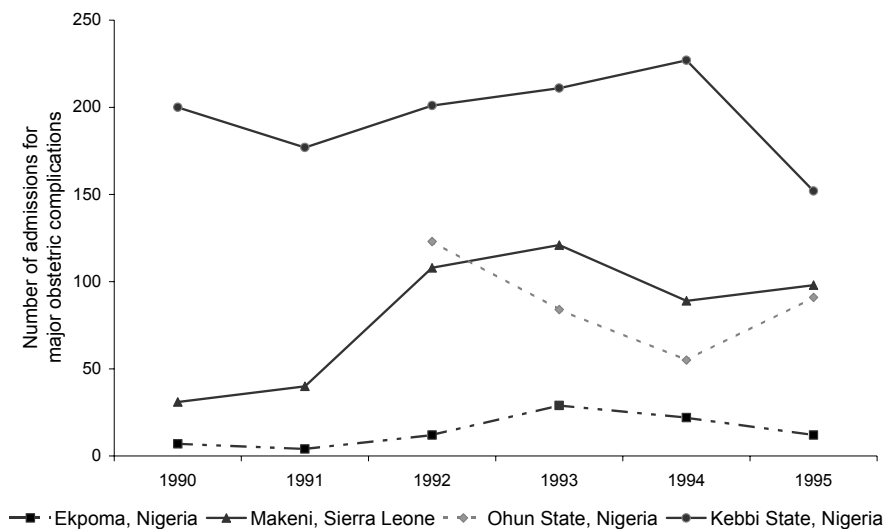
How can we attribute the observed changes to the programme?

The design of an evaluation will largely depend on the kind of inference decision makers wish to make as well as how confident they need to be that any observed effects are in fact due to the project or programme (Habicht *et al.* 1999). For large-scale programmes, the most relevant question is whether the expected changes have occurred. Demonstrating change will largely depend on how easily and accurately the desirable indicators can be measured. Inferences depend on the comparison with previously established criteria, between geographical areas or over time. For example, to determine the trends in met need for specialised obstetric care in the three districts in Indonesia, we compared the observed proportion of admissions for MOI for AMI with the reference standard of 1%, between the districts and over time (figures 3 and 4). This evaluation not only revealed that one of the districts (Barito Kuala) fell far short of the 1% reference and of the rates in the two other districts at baseline but also that there was a worrying decline in the trend in met need for obstetric care over time. Presentation of the findings to the local and national health authorities generated enormous interest and debate. Although the above assessment merely describes whether or not the expected changes have occurred, one may often reasonably ascribe an observed success (or the lack thereof) to the programme being evaluated. In Indonesia, for example, the dramatic increases in skilled attendance at birth over time provided the Government with the necessary reassurance to continue its support for the training and posting of midwives in every village. The failure of the programme to lead to an increase in the use of specialised care in hospitals, on the other hand, highlighted areas for further improvement. The midwives had little in terms of referral support (the ambulance resides at the health centre, but the driver may not always be there), cost of transport is high, and the fees for emergency medical care are high. Policy decisions and actions are still required to increase referral and ensure quality services at referral level. Most importantly, concerted efforts and commitment will be needed to contain costs of maternal health services, and to make services affordable for the poor.

One of the main criticisms of the above design is its inability to causally link programme activities to observed changes since there is no external control group to verify whether these changes would not have taken place anyway. More complex evaluation designs, however, not only demand additional time, resources and expertise, the existence of an external control group does

not necessarily rule out all alternative explanations for the observed changes (Campbell *et al.* 1997). Non-randomly selected control groups are likely to be systematically different from the intervention areas, and efforts to exclude outside influences in both control and intervention groups will still be necessary. Only randomised controlled trials can provide ultimate proof of causality, but these are neither feasible nor desirable for the evaluation of large-scale safe motherhood programmes. From a practical point of view, less stringent designs are often sufficient to decide about the future of a safe motherhood programme.

Figure 5. Annual trends in admissions for obstetric complications in four PMM sites (1990-1995).



While the evaluation should deliver the answers in time for the decision-makers to incorporate the findings in the design and planning of interventions, sufficient time should be given to allow the programme to have an effect. As a general rule, no less than 3-5 years are required for an intervention to have an effect (Habicht *et al.* 1999). Experience from the Prevention of Maternal Mortality (PMM) network suggests that even longer time periods may be needed to substantially increase the numbers of women using obstetric services. Time trends from the 5 hospitals supported by the PMM network show that despite intense efforts to improve delivery care, the annual numbers of admissions for complications did not increase, or observed rises

were not sustained (Ifenne *et al.* 1997, Ande *et al.* 1997, Leigh *et al.*, 1997, Olukoya *et al.* 1997, Oyesola *et al.* 1997)(figure 5). Although this should not be seen as a failure of the intervention, since admissions were influenced by factors beyond their control, such as the general economic status or hospital fees, it illustrates the difficulties in interpreting trends in hospital admission rates for obstetric complications over a relatively short period of time.

Conclusion

There exists no blueprint for the evaluation of safe motherhood programmes and the choice of indicators and evaluation design depends on who the decision-maker is, and on what types of decisions will be taken as a consequence of the findings. Maternal mortality is not anymore recommended as a measure against which to assess the success of safe motherhood programmes, and little is known about the value of morbidity as an alternative indicator. In contrast, adequate tools exist to assess the provision, coverage and utilisation of safe motherhood services. Because none of the indicators are perfect and none are able by themselves to point to the actions required for improving access to and use of obstetric care, the assessment of safe motherhood services must rely on a variety of indicators. For the evaluation of the quality of obstetric care, it may be preferable to focus on small-scale facility based efforts that incorporate mechanisms for improvements rather than attempt to measure complex processes or outcomes across facilities or providers.

References

- Ande B, Chiwuzie J, Akpala W, Oronsaye A, Okojie O, Okolocha C, Omorogbe S, Onoguwe B, Oikeh E (1997). Improving obstetric care at the district hospital, Ekpoma, Nigeria. *International Journal of Gynecology and Obstetrics* 59(Suppl.2), S48-S53.
- Barrett JFR, Jarvis GJ, Macdonald HN, Buchan PC, Tyrell SN, Lilford RJ (1990). Inconsistencies in clinical decisions in obstetrics. *Lancet* 336,549-51.
- Belghiti A, De Brouwere V, Kegels G, Van Lerberghe W (1998). Monitoring unmet obstetric need at district level in Morocco. *Tropical Medicine and International Health* 3,584-591.
- Benhow A, Semple D, Maresh M (1997). Effective procedures in maternity care suitable for audit. Royal College of Obstetricians and Gynaecologists. Clinical audit unit.
- Bouillin D, Fournier G, Gueye A, Diadhiou F, Cisse CT (1994). Surveillance epidemiologique et couverture chirurgicale des dystocies obstetricales au Senegal. *Cahiers Sante* 4,399-406.
- Bouvier-Colle MH, Varnoux N, Costes P, et al (1991). Reasons for the underreporting of maternal mortality in France, as indicated by a survey of all deaths among women of childbearing age. *Inter J Epid* 20,717-721.
- Brook RH, McGlynn EA, Cleary PD (1996). Quality of health care. Part 2: measuring quality of care. *New England Journal of Medicine* 335,966-970.
- Campbell O, Filippi V, Koblinsky M, Marshall T, Mortimer J, Pittrof R, Ronsmans C, Williams L (1997). Lessons learnt. A decade of measuring the impact of safe motherhood programmes. London School of Hygiene and Tropical Medicine, London.
- Campbell OMR. and Graham W (1991). *Measuring maternal mortality and morbidity: levels and trends*. Maternal and Child Epidemiology Unit Publication No. 2.
- Chalmers I, Enkin M, Keirse MJN eds. (1989). *Effective care in pregnancy and childbirth*. Vol 1. Pregnancy. Oxford, England: Oxford University Press.
- Criel B, Van der Stuyft P, Van Lerberghe W (1999). The Bwamanda hospital insurance scheme: effective for whom? A study of its impact on hospital utilisation patterns. *Social Science and Medicine* 48,897-911.
- Crombie IK, Davies HTO, Abraham SCS, Florey C du V (eds) (1997). *The audit handbook. Improving health care through audit*. New York: John Wiley & Sons

- Crowther C, Enkin M, Keirse MJNC, Brown I (1991). Monitoring the progress of labour. In: Chalmers I, Enkin M, Keirse MJNC (eds). *Effective care in pregnancy and childbirth*. Volume 2. Childbirth. Oxford: Oxford University Press.
- De Brouwere V and Van Lerberghe W (1998). *Les besoins obstetricaux non couverts*. Paris: L'Harmattan.
- De Brouwere V, Laabid A, Van Lerberghe W (1996). Estimation des besoins en interventions obstetricales au Maroc. Une approche fondee sur l'analyse spatiale des deficits. *Rev Epidem et Sante Publ* **44**,111-124.
- Donabedian A (1988). The quality of care. How can it be assessed? *JAMA* **260**,1743-1748.
- Egypt Ministry of Health (1994). National maternal mortality study: Egypt 1992-1993. Findings and conclusions. Cairo: Child Survival Project.
- Filippi V, Alihonou E, Mukantaganda S, Graham WJ, Ronsmans C (1998). Near misses: maternal morbidity and mortality (letter) *Lancet* **351**,145-6.
- Filippi V, Ronsmans C, Graham W, Alihonou E, Gandaho T. Validation of near-miss in Benin. *Studies in Family Planning* (In press)
- Graham W, Wagaarachchi P, Penney G, McCaw-Binns A, Yeboah Antwi K, Hall MH (2000) Criteria for clinical audit of the quality of hospital-based obstetric care in developing countries. *Bull WHO* **78**,614-620.
- Habicht JP, Victora CG, Vaughan JP (1999). Evaluation designs for adequacy, plausibility and probability of public health programme performance and impact. *Int J Epidem* **28**,10-18.
- Hogberg U, Wall S, Brostrom G (1986). The impact of early medical technology on maternal mortality in late 19th century Sweden. *International Journal of Gynaecology and Obstetrics* **24**,251-261.
- Ifenne D, Essien E, Golji N, Sabitu K, Alti-Mu'azu M, Musa A, Adidu V, Mukaddas M (1997). Improving the quality of obstetric care at the teaching hospital, Zaria, Nigeria. *International Journal of Gynecology and Obstetrics* **59**(Suppl.2),S37-S46.
- Inter-agency group for safe motherhood (1997). The safe motherhood action agenda: priorities for the next decade. Report on the Safe Motherhood Technical Consultation, 18-23 October 1997. Colombo, Sri Lanka.
- Leigh B, Kandeh HBS, Kanu MS, Kuteh M, Palmer IS, Daoh KS, Moseray F (1997). Improving emergency obstetric care at a district hospital, Makeni, Sierra Leone. *International Journal of Gynecology and Obstetrics* **59**(Suppl.2), S56-S65.

- LoCicero AL (1993). Explaining excessive rates of caesareans and other childbirth interventions: contributions from contemporary theories of gender and psychosocial development. *Social Science and Medicine* 37,1261-69.
- Lomas J, Enkin M (1989). Variations in operative delivery rates. In: effective care in pregnancy and childbirth. Chalmers I, Enkin M, Keirse MJ (eds). London: Oxford University Press. pp.1182-1195.
- Mantel GD, Buchmann E, Rees H and Pattinson RC(1998). Severe acute maternal morbidity: a pilot study of a definition of a near miss. *British Journal of Obstetrics and Gynaecology* 105,985-990.
- MOMA group (1998). Morbidite maternelle en Afrique de l'Ouest. Resultats d'une enquete en population a Abidjan, Bamako, Niamey, Nouakchott, Ouagadougou, Saint-Louis et Kaolack. Paris: Ministere des Affaires Etrangeres - Cooperation et Francophonie
- Mothercare (2000). The Mothercare experience in Indonesia. Final report. Mother-Care: Washington
- Munjanja SP, Lindmark G, Nystrom L (1996). Randomised controlled trial of reduced-visits programme of antenatal care in Harare, Zimbabwe. *Lancet* 348,364-369.
- Olukoya AA, Ogunyemi MA, Akitoye CO, Abudu O, Tijani MA, Epoyun AO, Ahabue CE, Shaba O (1997). Upgrading obstetric care at a secondary referral hospital, Ogun State, Nigeria. *International Journal of Gynecology and Obstetrics* 59 (Suppl.2), S67-S74.
- Oyesola R, Shehu D, Ikeh AT, Maru I (1997). Improving emergency obstetric care at a state referral hospital, Kebbi State, Nigeria. *International Journal of Gynecology and Obstetrics* 59(Suppl.2),S75-S81.
- Pittrof R and Campbell O (2000). Measuring quality of care in maternal health. *Maternal and Child Epidemiology publication* (in press)
- Pittrof R (1997). Observed versus expected obstetric complications: an assessment of coverage of obstetric care in developing countries. *Tropical Doctor* 27,25-29.
- Richardus JH, Graafmans WC, Verloove-Vanhorick SP, Mackenbach JP (1997). The perinatal mortality rate as an indicator of quality of care in international comparisons. *Medical Care* 36,54-66.
- Ronsmans C, Achadi E, Cohen S, Zazri A (1997). Women's recall of obstetric complications in South Kalimantan, Indonesia. *Studies in Family Planning* 28,203-214.

- Ronsmans C, Achadi E, Sutratikto G, Zazri A, McDermott J (1999). Use of hospital data for Safe Motherhood Programmes in South Kalimantan, Indonesia. *Tropical Medicine and International Health* 4,514-521.
- Ronsmans C, Filippi V (2000). Improving obstetric care through near-miss audit. *Child Health Dialogue* 18,9
- Ronsmans C, Filippi V. Severe obstetric morbidity. In: Qualitative approaches for investigating maternal deaths. Geneva: World Health Organisation (In press)
- Ronsmans C, Walraven G, Etard JF. Verbal autopsies. In: Qualitative approaches for investigating maternal deaths. Geneva: World Health Organisation (In press)
- Rooks JP, Weatherby NL, Ernst EK (1992). The National Birth Center Study. Part III-Intrapartum and immediate postpartum and neonatal complications and transfers, postpartum and neonatal care, outcomes, and client satisfaction. *J-Nurse-Midwifery*, Nov-Dec 37(6),361-97.
- Stewart MK, Stanton CK, Festin M, Jacobson N (1996). Issues in measuring maternal morbidity: Lessons from the Philippines Safe Motherhood Survey Project. *Studies in Family Planning* 27,29-35.
- UNICEF, WHO and UNFPA (1997). Guidelines for monitoring the availability and use of obstetric services. New York, UNFPA.
- Van Damme W, De Brouwere V, Boelaert M, Van Lerberghe W (1998). The host population can benefit from a refugee assistance programme. *Lancet* 351,1609-13.
- Van den Broek N, Van Lerberghe W, Pangu K (1989). Caesarean sections for maternal indications in Kasongo (Zaire). *International Journal of Gynaecology and Obstetrics* 28,337-342.
- Van Lerberghe W, Pangu KA, Van Den Broek N (1988). Obstetrical interventions and health centre coverage : a spatial analysis of routine data for evaluation. *Health Policy and Planning* 3,308-314.
- Vanneste AM, Ronsmans C, Chakraborty J, de Francisco A (2000). Prenatal screening in rural Bangladesh: from prediction to care. *Health Policy and Planning* 15,1-10.
- Waldenstrom U, Nilsson CA, Winblad B (1997). The Stockholm birth centre trial: maternal and infant outcome. *Br J ObstetGynaecol*, Apr; 104(4),410-8.
- World Health Organization (1994). Indicators to monitor maternal health goals. Report of a technical working group. Geneva 8-12, November 1993. WHO/FHE/MSM/94.14
- World Health Organization (1997). Monitoring reproductive health: selecting a short list of national and global indicators. WHO/RHT/HRP/97.26.

World Health Organization (1998). Safe Motherhood needs assessment World Health Organization, Maternal and Newborn Health / Safe Motherhood, Division of Reproductive Health. WHO/RHT/MSM/96.18.

Is there a case for privatising reproductive health? Patchy evidence and much wishful thinking

Paulo Ferrinho¹, Ana Margarida Bugalho² and Wim Van Lerberghe³

Summary

There are a number of more or less explicit assumptions that provide a seemingly “rational” basis for the appeals to complement or substitute the provision of maternal health care by governmental services with services offered by “private for profit sector” (PFP) and “private not for profit non-governmental organisations” (PNFP-NGO). This paper reviews the evidence-basis of these assumptions.

The first assumption has it that private providers capture a significant and growing share of the service delivery market for maternal health care. With the notable exception of China, PNFP-NGO play an important role in health care in general. To a varying degree these services also include reproductive health services. For many populations, especially in rural areas, PNFP organisations are the main if not the only providers of reproductive health care. In urban areas PNFP-NGO usually share the work with PFP providers and government services. PNFP organisations seem to have an important role in the diffusion and adoption of fertility control. PNFP-NGO provide a wide range of services and their intervention strategies take multiple forms. PFP health providers are also an important source of ambulatory care throughout the developing world. These private practices in most developing countries are notoriously unregulated.

The second assumption claims better quality of care and greater efficiency. Relevant evidence on differences in quality of care and of other determinants of health-seeking behaviour is hard to come by. Common wisdom has it that patients would prefer private providers for reproductive health problems since these are supposed to dispense better quality care. Perhaps their most visible comparative advantage is their client-friendliness. Supply induced demand has resulted in a problem of iatrogenesis, exemplified in the epidemic of caesarian sections. Over-intervention is compounded by the

¹ President of the Associação Garcia de Orta, Lisboa, Portugal. Email: nop05938 @ mail.telepac .pt (correspondance should be addressed to this author)

² Associação para O Desenvolvimento e Cooperação Garcia de Orta, Rua Frederico Perry Vidal, Bloco 9, 1º piso, P-1900-275 Lisboa. Email : anabugalho@fm.ul.pt

³ Professor at the Department of Public Health, Institute of Tropical Medicine, Antwerpen, Belgium. Presently working at the Office of Health Care Reform, Ministry of Public Health, Thailand. Email : wlerberghe@itg.be

tendency of PFP providers to specialise and deliver only part of reproductive health packages. The lack of integration automatically leads to sub-optimal care.

The claim for greater efficiency is not based on empirical evidence. It often merely refers to a higher efficiency per output unit, not per outcome unit. At times, one definitely gets the impression that efficiency is defined, not in terms of getting most value for money, but in terms of the possibility of running a service on basis of cost-recovery.

Obviously resources make a difference. An under-funded public service without drugs, equipment and adequately trained and paid staff will not provide as a good a service as a well capitalised private one. If resources are adequate and the range of services comprehensive, the quality and efficiency comparison hinges on the (visible) productivity and client-friendliness of the staff, and on the (less evident, at least to the patient) justification of the care. Some of the evidence presented justifies a cautious claim that PFP providers may be less efficient than PNFP or public providers, in as much as they can shift the risk and the consequences of their inefficiency to the client. On the other hand, the evidence does not allow for conclusions regarding the efficiency of PNFP providers.

The third assumption claims that by ensuring uptake of services PFP and PNFP providers complement government services and ensure a more comprehensive and equitable distribution of the uptake of services. The private sector would indeed contribute most to equity in situations where public sector would act as the first mover and choose its level of investment in the health sector. The private sector would then observe the level of public investment and would invest to meet the residual demand. This in turn would allow the public sector to make the most of its limited resources, whilst still responding to its political responsibility of delivering care to its population. But the empirical evidence suggests a scenario of substitution rather than complementary. In the best of cases this means filling the void left by failing public services. Often, however, it becomes a reality of competition and poaching.

No blanket recommendations. It may be a seductive solution to have reproductive care provided through PNFP – or even PFP – organisations, when the weight of history and public perception of government failure is so strong as to make recovery of failing public services unlikely. However, the fragmentary evidence shows that blanket recommendations are inappropriate. The problem is to specify the conditions under which this can be done without loss of quality, efficiency and equity. In this context six issues needing the policy maker's attention are addressed in the paper.

The most pressing problem is the lack of regulation of service provision by the private sector. Clients are not protected against the consequences of the asymmetry of information they face – with health and financial consequences. As the recent evolution in a number of middle income countries points out, perhaps the most effective way to

help the State to regulate the private sector is to increase pressure from civil society. From a public health point of view, privatisation only makes sense if the State and civil society are strong enough.

Introduction

In many developing countries, and particularly in Africa, maternal health care was not particularly high on the list of public health priorities in the first three quarters of the XXth century. "For many years colonial medicine had but few obstetrical problems to resolve" (Amy 1992). That did not mean there were no problems, but these were grossly underestimated and disregarded (De Brouwere & Van Lerberghe 1998). Maternal health care most often was a mere sideline in childcare programmes (Rosenfield & Maine 1985), and essentially provided in the clinics and maternities of missions, foundations and charitable voluntary groups. In contrast, maternal health care today has become a priority of its own in a context of reproductive health.

Perhaps more important, it has become a legitimate and explicit concern of many governments. This is in line with the emphasis on the development of the government-owned health services after the colonial period. The various crises developing countries underwent have led to conspicuous failures of governments to provide good coverage with care of adequate quality (Van Lerberghe 1993, Van Lerberghe & De Brouwere 2000). This has paved the way for appeals to "privatisation". Privatisation has, for two decades, been a major item on the agenda of structural adjustment programmes in poor countries (Alubo 1990, Evans 1995). The World Bank, the World Health Organization and the United Nations Population Fund, all participated in developing recommendations on the role of the private sector in general and in reproductive health care provision (World Bank 1993, UNFPA 1999 a & b): governments had failed, as the Safe Motherhood Programme pointed out, to address maternal health effectively.

Current conventional wisdom is nicely summed up in a paper in the World Report on Women's Health 2000, a special issue of the International Journal of Gynecology & Obstetrics. Following the observation that programme approaches after the Cairo Conference on Population and Development in 1994 has shifted from largely government provision to "significant involvement of non-governmental organisations including the private sector", the paper states that "NGOs have proven their capability to complement the efforts of government and to implement innovative approaches. NGOs have the following special advantages: flexibility of operations, relevance to the broader context of development,

ability to innovate, and effectiveness at the grassroots for targeting services to disadvantaged groups, such as the poor" (Edouard *et al.* 2000).

There are a number of more or less explicit assumptions that provide a seemingly "rational" basis for the largely ideological blanket appeals to complement or substitute the provision of maternal health care by governmental services with services offered by "private" "non-governmental" providers and organisations.

First, private services are said to capture a significant and growing share of the service delivery market for maternal health care.

Second, they are assumed to provide their clients with more accessible and better services in terms of quality, effectiveness and efficiency.

Third, by doing so they are said to complement government services resulting in a more comprehensive and equitable distribution of the uptake of services.

This paper reviews the evidence-basis of these assumptions. Before doing so, however, it is necessary to revisit the notions of "private sector" and "non-governmental organisations". Putting both in the same bag obscures the whole debate on privatisation, the supposed advantages of the latter becoming justification for the deregulation of the former.

Private for profit and private non for profit

Not until the 1990s was it possible to discuss these problems in other terms than thatcherite or statist ideological statements. However, there is no such thing as a pure dichotomy between public and private sector. A first step that has helped was the public/private mix framework of the early 1990s (Table 1), that distinguished the functions of provision and financing of care.

Table 1. The 1990's framework for analysing the public/private mix

		FINANCING	
		Public	Private
PROVISION	Public	ex: Classic "free" national public health care systems	ex: Cost-recovery systems in public facilities; Private beds in public hospitals
	Private	ex: Contractual arrangements; district designated hospitals	ex: Private health care with fee for service and private health insurance

A further distinction has to do with the mission of the non-state health care provision organisations (Giusti *et al.* 1997). Some have an administrative stewardship and/or institutional identity that results in a social perspective:

non-discrimination, population-basis, guidance by government policy, non-lucrative goals, social advocacy (Box 1). These are what one indicates by “NGOs” *strictu sensu*. Others have profit as their *raison d’être*, rather than an agenda of public service. These are what one indicates by private sector *strictu sensu*.

The distinction is not always clear-cut (Van Lerberghe *et al.* 1997) and often a matter of judgement. In Dar Es Salaam, Tanzania, for example, a number of such NGOs providing reproductive health services are owned by private entrepreneurs whose affiliation with religious groups allows them to register as voluntary, and to benefit from favourable tax concessions. For all due purposes they function as for-profit organisations, NGO status notwithstanding (Kanji *et al.* 1995).

The blurring of the distinction between for-profit and non-for-profit is compounded by the different hats worn by individual providers. Private and non-governmental providers include large numbers of (on- or off-duty) government officials. This results in formal or informal sharing of human (Asiimwe *et al.* 1997, Ferrinho *et al.* 1998, Backström *et al.* 1997, Roenen *et al.* 1997, Damasceno *et al.* 2000, Mcpake *et al.* 2000), pharmaceutical (Asiimwe *et al.* 1997) and other resources between different “sectors” of health care provision, including, sometimes, “traditional” health care (Adam *et al.* 1997, Backström *et al.* 1997). Whether regulated and controlled or not officially acknowledged and “wild”, passive privatisation over the last decades has changed the picture of health care provision.

Even if it is difficult to make, this distinction has such consequences for service delivery that it is necessary to specify what we talk about. In this paper we use the terminology of private-for-profit (PFP) and private-non-for-profit (PNFP) organisations to distinguish those for whom profit is a dominant *raison d’être* from those for whom the accent is on delivering a service to the public. PFP then corresponds to the entrepreneurial private sector *strictu sensu*, and PNFP to what commonly goes under the label of NGOs, and may include family planning institutions, medical associations, universities and research institutions, solidarity groups, religious, international or locally based welfare groups, unions, professional associations and the proliferation of organisations in rather small communities.

A large and growing share of the market

The first assumption has it that private providers capture a significant and growing share of the service delivery market for maternal health care, and ensure an important part of the uptake of services. This is certainly correct for health care in general. For a sample of 40 developing countries, a sample average of 55% of physicians worked in the private sector and a sample average of 28% of health care beds were private beds (21% private for profit) (Hanson & Berman, 1998). In Asia, for example, the percentage of private hospital beds ranges from 22 to 77% in six countries, and their share is growing (Newbrander & Moser 1997). The assumption is probably also basically correct for maternal health care. Nevertheless, actual documentation supporting this statement is scanty and patchy. There are wide differences between and within countries. Also, much depends on what maternal or reproductive health activities one considers: overall the market share is smaller for inpatient than for ambulatory care, and limited for preventive and public health services (Hanson & Berman 1998).

Moreover, the few data available usually fail to distinguish between PFP and PNFP. For example, the analysis of the data from the 1988-90 Demographic and Health Surveys programme in 11 countries could only classify providers in public, private (including pharmacies) or others (traditional healers, schools, churches, families and friends). Even so, there were large variations: in Morocco and Tunisia 48,2% and 25% of ante-natal care was private, but only 4,6% and 4,2% of delivery care (76,5% and 31,7% were home based). Private sector providers were the source of family planning in 7% of cases in Botswana, 21% in Morocco, 22% in Tunisia, 28% in Kenya, 36% in Sudan and 44% in Uganda (Berman & Rose 1996).

PRIVATE-NON-FOR-PROFIT PROVIDERS

With the notable exception of China, *PNFP-NGOs play an important role in health care in general*: for example, they provide more than 10% of clinical services in India and Indonesia, and are very important in Africa (Table2).

Box 1. *Setting up gender-sensitive practices (Doyal 1996)*

At the heart of all feminist critiques of medicine is the recognition that women lack power in health care institutions, limiting their ability to determine priorities and allocation of scarce resources. In this context, in some countries women have set up their own health centres.

In Britain very few services have been created outside the mainstream. This reflects in part the limited market for private care when it is available in the National Health Service without direct cost. But there is also a political reluctance to offer services that many women could not afford to buy. In the United States, the 1970s and early 1980s saw a proliferation of women's health centres offering reproductive care and a range of other services. Women's health centres have been most successful in Australia. This reflects the priority they have been given within the Australian Women's health movement and their subsequent incorporation into the National Women's Health Policy. Though the women involved continue to grapple with the contradictions inherent in any attempt to use state funding for radical initiatives, health centres in Australia do offer important examples of gender-sensitive practice for other health care providers.

In developing countries, women's health centres are not an alternative to the formal system of health care but very often the only option for care. The Bangladesh Women's Health Coalition now runs ten projects providing both reproductive and general health services for women and children. In Peru, Centro Flora Tristan and Vaso de Leche have worked together to create an integrated health service for women living in Lima. In Brazil, an alliance between the Ministry of Health and activists in the Women's Movement led to the creation of the Comprehensive Program for Women's Health Care. In Colombia, women have been able to go to a stage further with the implementation of a national women and health policy.

Table 2. *Health care provided by NGOs in Africa*

<i>Country</i>	<i>Services</i>
Burundi	Missions (PNFP): 30% of PHC facilities
Cameroon	Missions (PNFP): 40% of PHC facilities
Ghana	NGO(PNFP): 35% of ambulatory 30% of beds
Kenya	NGO(PNFP): 35% of services
Malawi	Private Health Association: 40% of all services
Nigeria	NGO(PNFP): 30% of beds
Swaziland	NGO(PNFP): 30% of services
Tanzania	NGO(PNFP): 45% of hospital beds
Uganda	NGO(PNFP): 40% of services
Zambia	Missions(PNFP): 50% of rural and 35% of total population
Zimbabwe	Missions(PNFP): 35% of beds

SOURCES: Hecht and Tanzi (1993) and (Turshen 1999).

To a varying degree these services also include reproductive health services. For example, in a mail survey of 88 non-governmental hospitals in sub-Saharan Africa at the end of the 1980s, 82 provided ante-natal care. All had maternities (with a median of 24 beds and 3 to 6 midwives). They ensured institutional delivery care for a median of 5,8 deliveries per 1 000 inhabitants per year in their districts – probably less than one fifth of the deliveries, but by and large nearly all the professional assistance to deliveries in those areas. Many of these hospitals also conducted major obstetric interventions: all but one performed caesarean sections and curettages, 85% did hysterectomies and 55% repair of vesico-vaginal fistulae (Van Lerberghe & Lafort 1990; Van Lerberghe *et al.* 1992).

For many populations, especially in rural areas, these PNFP organisations are the main if not the only providers of reproductive health care. In the hospital survey mentioned above, 39 were the only service provider in their district. It is also the case, for example, of rural Congo in the 1990s where only NGO supported districts continued working (Porignon *et al.*, 1994). Following the reforms of the early 1990s in Mali most ambulatory reproductive health care – nearly all in rural areas – is now provided by community-owned NFP health centres organised in a non-governmental federation (Maiga, Traoré Nafo, & El Abassi 1999). But these are mainly rural situations.

In urban areas PNFP-NGO usually share the work with PFP providers and government services. In a poor peri-urban township, in South Africa, Alexandra, for example, a PNFP University Clinic, a municipal clinic, and PFP “general dispensing cash practices” or “GP” worked side by side. GP covered 13% of the population receiving ante-natal care, 4% of post-natal care, 9% of family planning and 78% of treatments for sexually transmitted diseases (STD). The balance, including all delivery care as well as activities such as counselling for rape victims, was provided by the PNFP University clinic (Frame *et al.* 1991, Ferrinho 1995). Elsewhere the market share of PNFP is more limited: in Pakistan, for example, 15% of caesarean sections for absolute maternal indications are carried out in the PNFP- NGO hospitals (UON, 1999); and in Lebanon, health care provision, including maternal health, is for more than 80% in the hands of PFP providers (Van Lerberghe *et al.* 1997).

PNFP organisations seem to have an important role in the diffusion and adoption of fertility control (Montgomery & Casterline 1998), particularly through community-based programmes and social marketing (Box 2). In Egypt at least 9% of current family planning users obtain their contraceptive method from the PNFP-NGO sector (UNFPA 1999 b). They have had significant successes

in increasing the uptake, particularly in areas with very low contraceptive prevalence initially (Phillips *et al* 1999).

PNFP NGO provide a wide range of services and their intervention strategies take multiple forms (Box 2). PNFP providers – with different profiles – are found in urban as well as in rural areas. Obviously PNFP are far from homogeneous in their motivations (e.g. religious, feminist activism, serving the public) and in the range of services they provide. Consequently, they may be focused on family planning, or provide comprehensive ambulatory and hospital care in districts, and often support government policies and services.

PRIVATE-FOR-PROFIT PROVIDERS

PFP health providers are no doubt an important source of ambulatory care throughout the developing world. The development of private practice in most developing countries is notoriously unregulated. Private practices are not easily forthcoming with information, at times for fear of tax-implications, at times because existing regulations are both accepted, often because of a lack of respect for discredited MOPH and not infrequently because of the non-existence of information systems. In transitional countries, such as Tunisia, Mexico or Thailand, the growth of the entrepreneurial sector is well documented. For example, in Thailand, the number of private clinics doubled from 7,100 in 1984 to 15,700 in 1992; and they increased their share of outpatients from 10 to 23% in a context of overall growing utilisation (Mongkolsmai 1997). Household expenditure on private health care rose faster and overtook expenditure on public services between 1986 and 1996 (HFMS 1999). This pattern is, however, unstable: after the economic crisis of the late 1990s private hospital utilisation dropped, whereas government health facility utilisation increased (Ministry of Public Health 2000). Although hard data are hard to come by for the poorer countries, it is sufficient to walk around Kinshasa or Dar Es Salaam, or to look at the ads sections of any newspaper in Maputo to see that private health care provision is a thriving growth industry.

If there are ever more private providers on the market, not all provide the whole range of reproductive health services. They tend to select niches in function of demand and the competition. In Egypt for example, private physicians provide family planning and ante-natal care but do not attend deliveries (Abu-Zeid & Dann 1985). That does not mean, however, that delivery care is the prerogative of the public sector or PNFP-NGOs: 80% of births are done by dayas in the mother's home, even when trained nurses are available (Roemer

1991). Two other examples of lucrative niches are STD treatment (also for traditional healers: STDs provide their largest group of clients in urban Nigeria (Okonofua *et al.* 1999)) and abortion. Private doctors and midwives (or moonlighting public sector staff) perform abortions at home (Asiimwe *et al.* 1997). This is particularly true in countries where the abortion law is most restrictive. Even in countries where most of the abortions are carried out by non-health practitioners, health professionals (doctors and midwives) are not insignificant providers in illegal private practices (Kamheang *et al.* 1981, Galan 1982). These professional services are usually only available for the economically better off (Dixon-Mueller 1990).

All in all, PFP-providers are an important source of reproductive health care. In Indonesia 45% of ante-natal care in urban areas, and 36% in rural areas is provided by private midwives. These also assist about one delivery in three, one in two being assisted by traditional birth attendants and one in 10 by government services (Gani 1997). In the Philippines 33.8% of urban and 7.3% of rural deliveries were assisted by professional private providers (Schwartz, Akin, & Popkin 1993). In Mexico 32% of ante-natal care is provided by the private sector (Ramirez *et al.* 1997). In Brazil, data from five *favelas* in Rio de Janeiro in 1984 show that 85% of pill users bought them at private drug dealers. National household survey data from 1986 show that 66% of sterilisations were carried out in private institutions (Giggin 1994). Egypt has also a long history of involvement of the PFP and the PNFP-NGO sector in reproductive health (Fox KFA 1988). A household survey found that 80% of women who had given birth during the last 10 years had not received ante-natal care, but that 21% of those who did obtained it from private physicians (Abu-Zeid & Dann 1985): the public sector thus carries the brunt of the (low coverage with) pregnancy care. For family planning, however, 54.63% (according to various estimations) prefer PFP-providers (UNFPA 1999b, Abu-Zeid & Dann 1985), a figure similar to that of the preferences for outpatient care. It seems that a significant proportion of family planning is bought directly from pharmacies (Letarte 1996).

In South Africa, private general practitioners are probably the most frequent source of care for STD (Frame *et al.* 1991, Schneider *et al.* 1999). For example, in Alexandra, a poor peri-urban community, general dispensing cash practices provided 78% of STD treatments (Frame *et al.* 1991, Ferrinho 1995). In Natal/Kwazulu, South Africa, 18% of 56% of peri-urban and rural men reporting a previous STD, declared that they received treatment from traditional healers (Karim *et al.* 1994).

In **Bangladesh** NGO are important providers of many services to the communities. A recent panel study of the rise in contraceptive acceptance after the introduction of a micro-credit programme, suggests that, while programme members already differ from non-members to start out, the introduction of micro-credit in a village leads to a considerable increase in contraceptive use within a short time, suggesting that micro-credit may be contributing to a village environment that it is more open to innovative behaviour (Steele *et al.* 1998).

In **Nigeria** PSI was invited by USAID to enter the market following an earlier failed attempt at a social marketing programme based on a traditional manufacturer's model. PSI maintains that the manufacturer's model was not viable in the Nigerian market because Nigerians did not have sufficient purchasing power to create a viable commercial market. Rather than working exclusively with a local pharmaceutical manufacturer, the project joined with a local NGO, the Society for Family Health (SFH), which became responsible for managing the social marketing programme. SFH handles imports and sales to doctors, hospitals, NGO and wholesalers. SFH's sales representatives are responsible for product promotion. The project, with USAID and DFID support, succeeded in achieving national distribution of its products in both urban and rural areas, including low-income ones. By 1997, SFH was supplying 80% of all contraceptives used in Nigeria. In 1998, it was the largest social marketing programme in sub-Saharan Africa (UNFPA 1999 b).

The **Colombian** Association for the Well-being of the Family (PROFAMILIA) is a private not-for-profit organisation. It was established in 1965 to provide a broad range of reproductive health services. The nation-wide programme includes 40 clinics for women, 7 clinics for men, 13 youth centres and an extensive contraceptive distribution network (United Nations 1998).

In **Bolivia** PROFAMILIA included information, education and communication components as part of a reproductive health service. Started its work with only three clinics, one in each city; within a few years PROFAMILIA clinics were operational in every capital of every province. The major focus in creating awareness in a hostile environment was the utilisation of field workers called motivators. These motivators were backed up by radio support (United Nations 1998).

The Cancer Association of **South Africa** (CANSAs) exists since 1931. It has three aims: to support research, to promote health education on lifestyles and advocate early detection of cancers and, lastly, caring and supporting cancer patients and their families. Reproductive health activities include: advocacy for the provision of early cervical cancer screening facilities; provision of mobile pap smear screening services, TV adds and guides for breast self-examination; self-help and support groups (Westaway 1994).

A particular niche is that of obstetrics, and particularly of technology assisted delivery care. In 1998 in Pakistan 48% of caesarean sections for absolute maternal indications were carried out in PFP hospitals (UON 1999). But their share was not limited to these justified caesarean sections. The role of PFP providers in promoting birth by caesarean section in Brazil is well known (Barros et al. 1991). Similar phenomena are occurring in other countries as well, such as in Mexico (Bobadilla & Walker 1991). In Thailand the chances of getting a caesarean section as a private patient are 5,8 times higher than as a public patient, and the total caesarean section rate increased from 15,2% in 1990 to 22,4% in 1996 (Hanvoravongchai et al. 2000). The problem has become so acute that in 1998 FIGO has issued ethical guidelines regarding caesarean delivery for non-medical reasons (FIGO 2000).

There are huge differences between and within countries. The (patchy and scarce) evidence confirms that both PFP and PNFP providers have a significant and growing share of the market of maternal health care. This statement however needs qualification. There are huge differences between and within countries, and these providers tend mostly to occupy certain market niches rather than providing comprehensive reproductive care.

Accessibility, quality, effectiveness and efficiency.

Surprising as it may seem, relevant evidence on differences in quality of care and of other determinants of health-seeking behaviour is hard to come by, even more so regarding reproductive health differentiated into the three segments being considered.

Two important determinants of treatment choices are the costs of health care alternatives (Young 1980) and distance from the health care provider. But regardless of distance to the provider, households in Africa or Asia chose their provider on the basis of the nature of the health problem and expectations of quality of care (Stock 1983, Colson 1971). These often counterbalance the effect of distance. Common wisdom has it that patients would prefer private providers for reproductive health problems since these are supposed to dispense better quality care. This section reviews the patchy evidence for preference of private providers.

In urban areas, the reason to seek private healthcare is often one of accessibility and convenience. In Thailand, for example, opening hours are a major reason for people to choose private practitioners for ambulatory care. In rural Malaysia private services are more accessible in terms of their operating hours and the flexibility of their clinic schedules. All services are available during

opening hours while in the public sector some services, such as ante-natal care, are available only at certain days of the week (Aljunid and Zwi 1997). In Mexico the 32% of women who chose the private sector for ante-natal care do so according to physical accessibility and to economic and organisational reasons (Ramirez *et al.* 1997). In urban areas the distribution of private providers may be more capillary than that of public services, such as in Dar Es Salaam, where they are geographically more accessible to most people (Wyss *et al.* 1996). In Egypt, although there are 3700 state family planning outlets, the 63% of women prefer private services, because they consider them more accessible, physically and psychologically (Amin and Lloyd 1998). This greater physical availability of private services may, sometimes, be politically motivated, creating a niche that it is then filled by the private sector, as was the case in South Africa in the 1980s (Frame *et al.* 1991, Ferrinho *et al.* 1990, Ferrinho 1995).

Perhaps their most visible comparative advantage of PFP and PNFP providers is their client-friendliness. In Alexandra, South Africa, the staff of a PNFP University Clinic were made to use name tags while on duty to ensure a better rapport with patients (Ferrinho 1995). In Thailand patients almost always know the name of their private doctor, but the treating doctor in public facilities only in one case out of two. When patients feel treated like a client rather than like a number, and they assume that this also translates into better clinical quality. The latter, of course, is prey to asymmetry of information.

Supply induced demand has resulted in an, infrequently mentioned, problem of iatrogenesis. The question of supply induced demand – exemplified in the epidemic of caesarean sections mentioned above – is one of *a priori* reasons to question the supposed better quality of the private sector, especially in the case of PFP providers. Iatrogenesis is likely to be a real consequence. In Brazil the epidemic of caesarean sections is responsible for a not insignificant proportion of maternal morbidity and mortality (Cecatti, personal communication, May 2000).

Overintervention is compounded by the tendency of PFP providers to specialise and deliver only part of reproductive health packages. This represents a second reason to question the supposed better quality of the private sector. The lack of integration automatically leads to sub-optimal care, as in Brazil, where the separation between fertility control and health care for poor women leads to totally uncontrolled and incorrect use of oral contraceptives, resulting in unwanted pregnancies, illegal abortions and clandestine surgical sterilisation (Griffin 1994).

Infrastructural quality may be better in the private sector than in the public sector. In three districts of Tanzania, for example, infra-structural “quality was fair in the voluntary and private dispensaries but tended to be poor in the public ones”. The private dispensaries also employed more doctors than the PNFP and the public sectors (Ahmed *et al.* 1996). But this does not mean that not-public does not always mean better clinical quality, even if one makes abstraction of over-medication and iatrogenesis.

In a large proportion of PNFP consultations care was potentially dangerous or outside established clinical practice. A study in Dar Es Salaam, Tanzania, suggested better clinical performance and interpersonal conduct and overall user satisfaction for PNFP providers as compared to government providers. Despite better performance, however, in a large proportion of PNFP consultations care was potentially dangerous or outside established clinical practice (Kanji *et al.* 1995). In urban Nigeria curative and preventive STD services provided by formal and informal health sectors were substandard. The informal sector (traditional healers and patent medicine dealers) was particularly problematic, as many of the practitioners in this sector provided inappropriate STD treatment and preventive services. By contrast, the formal treatment sector (private and public doctors, pharmacists and laboratory technologists) provided appropriate STD treatment, but they demonstrated substantial inadequacies in several areas. In particular, the private sector and public doctors lacked appropriate diagnostic tools. Many of these doctors were also not familiar with the appropriate treatment protocols, did not include counselling and contact tracing in their care procedures and lacked adequate channels of referral (Okonofua *et al.* 1999). In Alexandra, South Africa, many women booking for ante-natal care at a PNFP NGO providing comprehensive PHC, had previously booked at local GP in private cash practices. Most of the GP failed to conduct ante-natal laboratory screening. They kept patients as ante-natal care clients, only to refer them, near term, to the labour unit of the local PNFP provider, without any referral note (Frame *et al.* 1991, Ferrinho 1995). This type of predatory behaviour by the private for profit practices, is also not conducive to efficiency claims (Ferrinho 1995). Other data from South Africa suggest that PFP-GP offering STD care were providing a low standard of care. STD were a common reason for acute curative care but the management was mostly syndromic, little use was made of diagnostic resources which were readily available, and the therapies chosen were not the most correct considering the local epidemiological profile (Frame *et al.* 1991, Coetzee *et al.* 1994, Ferrinho 1995, Schneider *et al.*

1999). In rural Malaysia, in the public sector, new family planning clients were given a physical examination, a cervical smear and contraceptive advice. Oral contraceptives were given only to those below 35 years of age and their blood pressure was checked during follow up. In the private sector new clients were not usually screened and cervical smears were done only at the patients request. Women taking oral contraceptives could buy them without seeing a clinician. Although STD treatment was provided at the private providers, they were not equipped to handle an anaphylactic shock in reaction to administration of an antibiotic (Aljunid & Zwi 1997).

The claim for greater efficiency is not based on empirical evidence. This claim often merely refers to a higher efficiency per output unit, not per outcome unit. For example, contracted hospitals in South Africa have lower production costs than district public sector hospitals for caesarean sections and normal deliveries. But this was associated with higher perinatal mortality and more avoidable factors in the contractor hospitals than in the public sector hospitals (Broomborg *et al.* 1997). At times, one definitely gets the impression that efficiency is defined, not in terms of getting most value for money, but in terms of the possibility of running a service on basis of cost-recovery. For example, Potts and Walsh “*organisations such as FEMAP in Mexico and Marie Stopes International in Asia, Africa, and Latin America, are developing comprehensive clinics for family planning, maternal and child health, the running costs of which can be wholly or largely recovered from user fees. Such clinics still require capital for start-up costs, but they have great potential, and non-governmental and international donors should explore provision of the needed capital as a cost-effective way of fulfilling the government mission to take services to the poor*” (Potts & Walsh 1999). Apart from the fact that this affirmation still “*needs to be explored*” (in three Tanzanian districts, for example, PFP dispensaries had a lower output of treated outpatients than PNFP and public dispensaries, although their equipment was superior (Ahmed *et al.* 1996) this defines cost-effectiveness in terms of shifting the burden to the client.

Obviously resources make a difference. An under-funded public service without drugs, equipment and adequately trained and paid staff will not provide as a good a service as a well capitalised private one. In Bolivia, injectables are only available in the private sector and access to public sector provided tubal ligation is difficult: this obviously drains people away from the public facilities (WHO 1998).

If resources are adequate and the range of services comprehensive, the quality and efficiency comparison hinges on the (visible) productivity and

client-friendliness of the staff, and on the (invisible, at least to the patient) justification of the care. Some of the evidence presented above justifies a cautious claim that PFP providers may be less efficient than PNFP or public providers, in as much as they can shift the risk and the consequences of their inefficiency to the client. On the other hand, the evidence does not allow for conclusions regarding the efficiency of PNFP providers. But it is not the public or non-public nature of service provision that makes the difference in quality and efficiency.

The “complementing” assumption: of filling gaps, occupying niches and poaching.

The third assumption underlying the calls for privatisation is that by ensuring uptake of services PFP and PNFP providers complement government services and ensure a more comprehensive and equitable distribution of the uptake of services.

The word complementarity is seductive. The private sector would indeed contribute most to equity in situations where public and private sectors are complementary. The public sector would act as the first mover and choose its level of investment in the health sector. The private sector would then observe the level of public investment and would invest to meet the residual demand. This in turn would allow the public sector to make the most of its limited resources, whilst still responding to its political responsibility of delivering care to its population (Hanson & Berman 1998). Such a planner’s heaven assumes a rational, wise and well-meaning private sector, that makes the public agenda its own. This ignores institutional logic and conflicts of interest.

The empirical evidence suggests a scenario of substitution rather than complementary (Hanson & Berman 1998). In the best of cases this means filling the void left by failing public services. In South Africa, for example, private cash practices and PNFP services tend to emerge in areas of State neglect, namely the large sprawling peri-urban squatter areas (Ferrinho 1995) where, many times, they were the only providers of reproductive health care. Often, however, it becomes a reality of competition and poaching.

A two-tier health care system is emerging. This is true in some African countries, as for example in Tanzania, with private care for the wealthy and public services for the poor (Wyss *et al* 1996). The poor are more sensitive to price than the wealthy (Gertler *et al.* 1987). All this would not be so bad if this allowed the State to redirect its resources and the poor could then get good health care at an accessible price. In actual fact this happens only seldom.

Quality in public services does not improve readily, and the price of health care in public facilities is not so low as to compensate for the perceived differences in quality.

Although, in some countries like Kenya (Mbugua *et al.* 1995) and South Africa (Ferrinho 1995) antenatal services and family planning services are exempted, reforms have almost systematically introduced user fees for many health services, including reproductive health services. It is known that user fees may force low-income users out of the public health care system and even out of the modern health care system (Yoder 1989). For example, in Tanzania (Demographic and Health Survey 1991 and 1996) and Kenya (Mbugua *et al.* 1995), deliveries in health facilities dropped by at least 12% after cost-sharing measures were implemented. These fees, and most of all the informal charges demanded by health workers for delivery care, like in Uganda (Asiimwe *et al.* 1997), take away the main perceived comparative advantage of public services, their low price. One consequence is a shift of patients to commercial self-treatment. In Gaza reproductive health problems (infertility, urogenital problems and contraception) are the third most common (the first for women) reason for purchases in private pharmacies (Beckerleg *et al.* 1998). In some African and Asian countries unprescribed purchase of STD treatment in private pharmacies is quite common (Kloos *et al.* 1988, Crabbe *et al.* 1998, Okonofua *et al.* 1999, Phalla *et al.* 1998).

Some see difficulties of accessing the public sector as a necessary stimulus to ensure that the PFP sector gets more involved into the provision of reproductive health care. For example, encouraging commercial family planning services for people who are able to pay is said to be one way to improve services for those who cannot pay, releasing public resources to be used more effectively to serve lower-income clients (Anonymous 1998). Unfortunately, there is no hard evidence that this is a normal course of events, certainly not without a proactive policy.

Privatising with conditionalities

No blanket recommendations. It may be an obvious solution to have reproductive care provided through PNFPP – or even PFP – organisations, when the weight of history and public perception of government failure is so strong as to make recovery of failing public services unlikely. However, one thing that emerges from the fragmentary evidence is that blanket recommendations are inappropriate. There is a case for support of the private sector where this

serves the public's interest and allows redirection of scarce resources. If that is not the case, support has no rationale. The private sector should not be supported merely because that is a fashionable option in international development circles. Support, but also mere control, carries costs for the public sector administrative machinery. The costs of the "new" state responsibilities must be compensated for savings resulting from gains from efficiency improvements (Brugha *et al.* 1999, Mcpake and Hongoro 1995). In short, support of the private sector should be subject to conditionalities.

Conditionalities. If one wants to make sure that the private sector will not in fact siphon off resources from the public sector, the minimum is to make sure that it has infrastructural pre-conditions (Mcpake & Hongoro 1995), that it provides cost-effective interventions (Potts & Walsh 1999), that it has an adequate access to drugs and diagnostic facilities (Brugha *et al.* 1999), and that information systems are adequate to monitor contractual obligations (Mcpake & Hongoro 1995). Preference should be given to private providers with a track record on managing resources efficiently and on tracking service data and finances efficiently and professionally (Potts & Walsh 1999). There are strategic considerations as well. Governments should guard against contracted private providers attaining powerful bargaining positions, if there are no viable competitors and the government does not itself retain capacity to offer an alternative service.

The problem is to specify the conditions under which this can be done without loss of quality, efficiency and equity. In this context six issues need to be addressed.

First, one has to find a way to encourage that PFP and/or PNFP providers provide the *full range* of priority services, preferably in an integrated way. Given the tradition of specialisation and niche-filling of both PFP and PNFP, and the lack of authority of Ministries of Health in many countries, this is no mean task.

Second, one has to find a way to ensure *access for those in need*, including the poor. Many would moreover be reluctant to see this happen in a two tier-system with a perceived quality of care that is different for the rich and the poor.

Third, adherence to *quality standards* has to be ensured, including mechanisms to avoid over-medicalisation and iatrogenesis.

Fourth, *conflicts of interests*, particularly in situations where one sector depends on another for some of its resources need to be acknowledged and explicitly addressed.

Fifth, all efforts should be undertaken to ensure multiple and independent channels of *accountability*, through penalties for not satisfying contractual obligations, through channels of accountability to professionals councils and associations, and to the public.

Lastly, all the effort of investing in the private sector is to *reinvest the gains* of complementarity. Whether this happens in practice is a matter of speculation: empirical evidence is just not available. A government would be expected to make sure that the evidence of real gains can be documented. This is not easy, and the paradox is that precisely those countries whose public services are dysfunctional- and thus are the first-hand candidates for a switch to PNFP or PFP - are also those where the state apparatus, research resources and competencies are in the worst position to make sure that the population actually gains from the switch.

Governments have a number of regulatory tools at their disposal that could be used more effectively. These include accreditation, independent quality assurance testing, but also the power to regulate payments and subsidies and to establish taxes and duties. Good legislation is not enough. The state must have the means to enforce it. In India, for example, private clinics and mobile teams promote pre-natal sex examination by advertising in local newspapers, in spite of government prohibition of the practice (United Nations 1998). There are experiences that point the way to financing schemes that ensure that the private sector has a complementary role to that of the state (Potts & Walsh 1999).

Counter-power. In the past decade the private care agenda gained momentum on the basis of rhetoric and wishful thinking. Nevertheless, it is a fact. The main issue now is that the private sector develops without control and supervision. Clients are not protected against the consequences of the asymmetry of information they face - with health- and financial consequences. The State cannot or does not take advantage of the "complementarity" to reallocate its resources to those most in need. Regulation is something more easily said than done. As the recent evolution in a number of middle income countries such as Thailand (National Forum on Health Care Reform 2000) - and from the history of the workers movement in Europe - points out, perhaps the most effective way to help the State to regulate the private sector is to increase pressure from civil society. From a public health point of view, privatisation only makes sense if the State and civil society are strong enough.

References

- Abu-Zeid HAH and Dann WM (1985). Health services utilisation and cost in Ismailia, Egypt. *Soc Sci Med* 21(4),451-461.
- Adam Y, Gomes A, Cossa A, Naftal A, Conzo S, Coimbra H and Silva B (1997). Estratégias de sobrevivência do pessoal de saúde num hospital público em Maputo. Abstract Qi 32 *Revista Médica de Moçambique* 7(1, 2) Suplemento 1: S62.
- Ahmed AM, Urassa DP, Gherardi E and Game NY (1996). Capabilities of public, voluntary and private dispensaries in basic health service provision. *World Health Forum* 17,257-259.
- Aljunid S and Zwi A (1997). "Public and private practitioners in a rural district of Malaysia: complements or substitutes". Chapter 3, pp 40-53 in Bennet, S., McPake, B. and Mills A. (eds.) (1997) *Private Health Providers in Developing Countries. Serving the Public Interest?* London and New Jersey: Zed Books.
- Alubo SG (1990). Debt crisis, health and health services in Africa *Soc Sci Med* 31(6),639-648.
- Amin S and Lloyd CB (1998). *Women's lives and rapid fertility decline. Some lessons from Bangladesh and Egypt*. Research Division Working Paper no 117. New York: Population Council. <http://popcouncil/pdfs/wp/117.pdf>
- Amy J (1992). "Obstétrique," pp. 825-848. in Janssens, G., Kivits, M. and Vuylsteke, J. (eds) *Médecine et hygiène en Afrique Centrale de 1885 à nos jours*, vol. 2 P. Masson: Paris.
- Anonymous (1994) United Nations International Conference on Population and Development, 5-13 September 1994, Cairo, Egypt. <http://www.iisd.ca/linkages/program/p07007.html>.
- Asiimwe D, McPake B, Mwesigye F, Ofoumbi M, Ørtenblad L, Streefland P and Turinde A (1997). "The private sector activities of public-sector health workers in Uganda". Chapter 9, pp 140-157. in Bennet S, McPake B, Mills A (eds.) (1997) *Private Health Providers in Developing Countries. Serving the Public Interest?* London and New Jersey: Zed Books.
- Backström B, Gomes ADC, Fresta E, Dias F, Gonçalves A, Lerberghe WV and Ferrinho P (1997). The coping strategies of rural doctors in Portuguese speaking African countries. Abstract Te 22. *Revista Médica de Moçambique* 7(1,2) Supplement 1: S13.
- Barros FC, Vaughan JP, Victora CG and Huttly SR (1991). Epidemic of caesarean sections in Brazil. *Lancet* 338(8760),167-169.

- Beckerleg S, Lewando Hundt G, Eddama M, el-Alem AE, Shawa R and Abed Y (1999). Purchasing a quick fix from private pharmacies in the Gaza Strip. *Soc Sci Med* **49**(11),1489-1500.
- Bennet S, McPake B and Mills A (1997). "The public/private mix debate in health care". Chapter 1, pp 1-18 in Bennet S, McPake B and Mills A (eds.) (1997) *Private Health Providers in Developing Countries. Serving the Public Interest?* London and New Jersey: Zed Books.
- Berman P and Rose L (1996). The role of private providers in maternal and child health and family planning services in developing countries. *Health Policy and Planning* **11**(2),142-155.
- Bobadilla JL and Walker G (1991). Early neonatal mortality and Caesarean Delivery in Mexico City. *Am J of Obstetrics and Gynecology* **164**(1),22-28.
- Broomberg J, Masobe P and Mills A (1997) "To purchase or to provide? The relative efficiency of contracting out versus direct public provision of hospital services in South Africa". Chapter 13, pp 214-236 in Bennet S, McPake B, Mills A (eds.) (1997) *Private Health Providers in Developing Countries. Serving the Public Interest?* London and New Jersey: Zed Books.
- Brugha R, Chandramohan D and Zwi A Viewpoint: management of malaria - working with the private sector. *Tropical Medicine and International Health* **4**(5), 402-406.
- Coetzee N, Ahmed N and Kagee M (1994). Sexually transmitted diseases in general practice. *S Afr Med J* **84**,237-238.
- Colson AC (1971). The differential use of medical resources in developing countries *J Hlth Soc Behav* **12**,226.
- Crabbe F, Tchupo JP, Manchester T *et al.* (1998). Pre-packaged therapy for urethritis: the "MSTOP" experience in Cameroon. *Sexually Transmitted Infections* **74**, 249-252.
- Damasceno A, Van Lerberghe W and Ferrinho P (2000). "Coping through private practice. A cardiologist in Maputo, Mozambique". pp 157-162 in Ferrinho, P. and Van Lerberghe, W. (eds.) (2000) *Health Personnel Performance & Providing Health Care under Adverse Conditions. Individual Coping Strategies*. Studies in Health Services Organisation & Policy; 16. Antwerp: ITG Press.
- De Brouwere V and Van Lerberghe W (1998). Les besoins obstétricaux non couverts. *L'Harmattan Paris Montréal*. 1-237.
- Dixon-Mueller, R. (1990) Abortion policy and women's health in developing countries. *In J Hlth Serv* **2**,297-314.

- Doyal L (1996). The politic's of women's health: setting a global agenda. *In J Hlth Serv* 26(1),47-65.
- Edouard L, Dodd N and Bernstein S (2000). The implementation of reproductive health programs: experiences, achievements and challenges. *Int J Gyn Obs* 70,25-34.
- Evans I (1995). SAPping maternal health *Lancet* 346,1046.
- Ferrinho P (1995). *Primary Health Care in Alexandra. A contribution to the Methodology of Primary Health Care*. PhD Thesis, Department of Community Health, Faculty of Medicine, Medical University of Southern Africa.
- Ferrinho P, Barron P, Buch E *et al.*(1990). Some aspects of primary health care in Oukasie SA *Family Practice* 11(9),447-450.
- Ferrinho P and Van Lerberghe W (editors) (2000). *Providing health care under adverse conditions: Health personnel performance & individual coping strategies*. Studies in Health Services Organisation & Policy, 16. Antwerp: ITG Press.
- Ferrinho P, Van Lerberghe W, da Cruz Gomes A (1999). Public and private practice: a balancing act for health staff [editorial] *Bulletin of the World Health Organization* 77(3),209.
- Ferrinho P, Van Lerberghe W, Julien MR *et al.* (1998). How and why public sector doctors engage in private practice in Portuguese-speaking African countries *Health Policy and Planning* 13(3),332-8.
- FIGO (2000), Recommendations on ethical issues in obstetrics and gynecology by the FIGO committee for the ethical aspects of human reproduction and women's health. FIGO, London.
- Finger WR (1998). Commercial sector can improve access. *Network (Family Health International)* 18(2),12-15.
- Fox KFA (1988). Social marketing of oral rehydration therapy and contraceptives in Egypt. *Studies in Family Planning* 19(2),95-108.
- Frame G, Ferrinho P and Wilson TD (1991). The care of STDs in Alexandra: review of previous research and a survey of General Practitioners. *S Afr Fam Pract* 12, 87-92.
- Gallan M (1982). Abortion in the Philippines: a study of clients and practitioners. *Studies in Family Planning* 13,35-44.
- Gani A (1997). "Improving Quality in Public Sector Hospitals in Indonesia," pp. 197-217. in Newbrander W. (ed.) (1997) *Private Health Sector Growth in Asia. Issues and implications*. Wiley: New York.

- Gertler P, Locay L and Sanderson W (1987). Are user fees regressive? *J Economet* 36,67-88.
- Giffin K (1994). Women's health and the privatization of fertility control in Brazil. *Soc Sci Med* 39(3),355-360.
- Gilson L, Adusei J, Arhin D, Hongoro C, Mujinja P and Sagoe K (1997). "Should African governments contract out clinical health services to church providers?" Chapter 17, pp 276-302. in Bennet, S., McPake, B., Mills, A. (eds.) (1997) *Private Health Providers in Developing Countries. Serving the Public Interest?* London and New Jersey: Zed Books.
- Giusti D, Criel B and de Béthune X (1997). Public versus private health care delivery: beyond the slogans. *Health Policy and Planning* 12(3),193-198.
- Hanson K, Berman P (1998). Private health care provision in developing countries: a preliminary analysis of levels and composition. *Health Policy and Planning* 13(3), 195-211.
- Hanvoravongchai P, Letendumrong J, Teerawattananon Y, and Tangcharoensathien V (2000). Implications of private practice in public hospitals on the cesarean section rate in Thailand. *Human Resources for Health Development Journal* 4(1), 2-12.
- Hecht RM and Tanzi VL (1993). *The role of NGO in the delivery of health services in developing countries*. Background paper for the World Development Report. Washington, DC: World Bank.
- HFMS (Health Financing and Management Study Project)(1999). Health Financing in Thailand. Technical report. Mimeo, 146 pp.
- Huber SC and Harvey PD (1989). Family planning programmes in developing countries: cost-effectiveness by mode of service delivery. *J Biosoc Sci* 21,267-277.
- Kamheang C, Tangtrakul S, Pongthai S et al.(1981). Abortion: an epidemiologic study at Ramathibodi hospital, Bangkok. *Studies in Family Planning* 12,257-262.
- Kanji N, Kilima P, Lorenz N, Garner P (1995). Quality of primary outpatient services in Dar Es Salaam: a comparison of government and voluntary providers. *Health Policy and Planning* 10(2),186-190.
- Karim QA, Morar N, Zuma N, Stein Z and Preston-Whyte E (1994). Women and AIDS in Natal/Kwazulu. Determinants of the adoption of HIV protective behaviour. *Urbanisation and Health Newsletter* 20,3-9.

- Kloos H, Getahun B, Tefari A, Tsadik K, Belay S (1988). "Buying drugs in Addis Ababa: a quantitative analysis" in van der Geest, S., Whyte, R.S. (eds.) *The Contest of Medicines in Developing Countries*. Kluwer Academic Publishers, Antwerp, London and Boston.
- Koivusalo M and Ollila E (1997). *Making a Healthy World. Agencies, Actors and Policies in International Health*. Zed Books Ltd: London and New York.
- Letarte C (1996). Health Situation In Egypt. Cairo, Draft, Mimeographed Document.
- Maiga Z, Traoré Nafo F and El Abassi A (1999). La Réforme du Secteur Santé au Mali, 1989-1996. *Studies in Health Services Organisation & Policy* 12,1-132. Antwerp, ITG Press.
- Mbugua JK, Bloom GH and Segall MM (1995). Impact of user charges on vulnerable groups: the case of Kibwesi in rural Kenya. *Soc Sci Med* 41,829-835.
- McPake B, Asiimwe D, Mwesigye F, Ofumbi M, Streefland P and Turinde A (2000) "Coping strategies of health workers in Uganda". pp 157-162 in Ferrinho P and Van Lerberghe W (eds.) (2000) *Health Personnel Performance & Providing Health Care under Adverse Conditions. Individual Coping Strategies*. Studies in Health Services Organisation & Policy; 16. Antwerp: ITG Press.
- McPake B and Hongora C (1995). Contracting out of clinical services in Zimbabwe. *Soc Sci Med* 4(1),13-24.
- Ministry of Public Health (2000). Thailand Health Profile 1997-1998. Bangkok: ETO.
- Mongkolsmai D (1997). "Private Health Sector Growth and Social Security Insurance in Thailand" in Newbrander W. (ed.) (1997). *Private Health Sector Growth in Asia. Issues and implications*. Wiley: New York. pp. 83-107.
- Montgomery MR and Casterline JB (1998). Social Networks and the Diffusion of Fertility Control. Research Division Working Paper no 119. New York: Population Council. <http://popcouncil/pdfs/wp/119.pdf>
- Mwabu G, Mwanzia J and Liambila W (1995). User charges in government health facilities in Kenya: effect on attendance and revenue. *Health Policy and Planning* 10, 164-170
- Newbrander W and Moser P (1997). "The Future of Health Sector Reform in Asia," in Newbrander, W. (ed.) (1997) *Private Health Sector Growth in Asia. Issues and implications*. Wiley, New York, pp. 221-234.

- Okonofua FE, Ogonor JI, Omorodion FI, *et al.*(1999). Assessment of health services for treatment of sexually transmitted infections among Nigerian adolescents. *Sexually Transmitted Diseases* 25(3),184-190.
- Pannarunothai S and Mills A (1997). "Characteristics of public and private health-care providers in a Thai urban setting". Chapter 4, pp 54-70 in Bennet S, McPake B and Mills A (eds.) (1997). *Private Health Providers in Developing Countries. Serving the Public Interest?* London and New Jersey: Zed Books.
- Pannarunothai S and Mills A (1998). Researching the public/private mix in health care in a Thai urban area: methodological approaches. *Health Policy and Planning* 13(3),234-248.
- Phalla T, Leng HB, Mills A, Bennet A, Wienrawee Gorbach P and Chin J (1998). HIV and STD epidemiology, risk behaviors, and prevention and care response in Cambodia. *AIDS* 12, S11-S18.
- Phillips JF, Greene WL, Jackson EF (1999). Lessons from community-based distribution of family planning in Africa. Research Division Working Paper no 121. New York: Population Council. <http://popcouncil/pdfs/wp/121.pdf>
- Porignon D, De Vos P, Hennart P, Van Lerberghe W, and Laurent A (1994). [The health sector in Zaire: towards a new strategy for co-operation] La problématique du secteur santé au Zaïre: vers une nouvelle stratégie de coopération. BADC, 1-145. Report
- Potts M, Walsh J (1999). Making Cairo work. *Lancet* 353,315-318.
- RamirezT, Zurita B, Cruz C, Recio M and Vargas C (1997). "The role of an NGO in the market for maternal and child health-care services in Mexico City". Chapter 11, pp 174-187 in Bennet S, McPake B and Mills A (eds) (1997). *Private Health Providers in Developing Countries. Serving the Public Interest?* London and New Jersey: Zed Books.
- Roemer MI (1991). National Health Systems of the World. Volume I. The Countries. New York: New York University Press.
- Roenen C, Ferrinho P, Van Dormael M, Conceição MC and Van Lerberghe W (1997). How African doctors make ends meet: an exploration. *Tropical Medicine and International Health* 2(2),127-135.
- Rosenfield A and Maine D (1985). Reproductive mortality- A neglected tragedy: Where is the M in MCH? *Lancet* 83-85.
- Schneider H, Blaauw D, Magongo B and Khumalo I (1999). "STD care in the private sector". Chapter 7 in (falta editor) *SA Health Review* (1999). Durban, Health Systems Trust.

Schwartz JB, Akin JS, and Popkin BM (1993). "Economic determinants of demand for modern infant-delivery in low-income countries: the case of the Philippines." in Mills, A. and Lee K. (eds.) *Health economics research in developing countries*. Oxford University Press: Oxford. pp. 165-192.

Steele F, Amin S and Naved RT (1998). The impact of integrated micro-credit program on women's empowerment and fertility behavior in rural Bangladesh. Research Division Working Paper no 115. New York: Population Council. <http://popcouncil/pdfs/wp/115.pdf>

Stock R (1983). Distance and the utilization of health facilities in rural Nigeria. *Soc Sci Med* 17,563.

Turshen M (1999). *Privatizing health services in Africa*. Rutgers University Press: New Brunswick, New Jersey and London.

UNFPA (1999a). Expert Group Meeting on Reproductive Health. Implementing the ICPD Programme of Action in Central and Eastern Europe: Lessons Learnt Post-Cairo. UNFPA/WHO Meeting, Copenhagen, Denmark, 28-30 September 1998.

UNFPA (1999b) The UNFPA private-sector initiative. Exploring ways to facilitate cooperation between governments and the commercial sector to expand access to reproductive health commodities. A project of the UNFPA Global Initiative on Reproductive Commodity Management. United Nations Population Fund, Technical and Policy Division, Technical Branch.

United Nations (1998) World Population Monitoring. Selected Aspects of Reproductive Rights and Reproductive Health. Population Division, United Nations Secretariat, New York.

UON (1999) Unmet Obstetric Needs Network, unpublished report.

Van Lerberghe W and De Brouwere V (2000). Etat de santé et santé de l'Etat en Afrique subsaharienne, *Afrique Contemporaine* 135,175-190.

Van Lerberghe W (1993). Les politiques de santé africaines: continuités et ruptures. *Bull Séances Acad R Sci Outre Mer* 39,205-230.

Van Lerberghe W and Lafort Y (1990). The role of the hospital in the district; delivering or supporting primary health care? *Current Concerns SHS Papers*: 1-36.

Van Lerberghe W, Van Balen H and Kegels G (1992). [Typology and performance of first-referral hospitals in sub-Saharan Africa] Typologie et performances d'hôpitaux de premiers recours en Afrique sub-Saharienne. *Ann.Soc Belg.Med Trop* 72 Suppl 2,1-51

- Van Lerberghe W, Ammar W, el Rashidi R, Sales A and Mechbal A (1997). Reform follows failure: I. Unregulated private care in Lebanon. *Health Policy and Planning* 12, 296-311.
- Westaway M (1994). An interview with Sonja van Oudtshoorn, the Director: Education and Training of the Cancer Association of South Africa (CANSAs). *Urbanisation and Health Newsletter* 20,69-78.
- WHO (1998). Reproductive Health Research: The New Direction. Biennial Report 1996-1997. UNDP/UNFPA/WHO/WB Special Programme of Research, Development and Research Training in Human Reproduction. Geneva.
- World Bank (1993). *Investing in Health*. Oxford University Press: Oxford.
- Wyss K, Whiting D, Kilima P *et al.* (1996). Utilisation of government and private health services in Dar Es Salaam. *East African Medical Journal* 73(6),357-363.
- Yoder R(1989). Are people willing and able to pay for health services? *Soc Sci Med* 29(1),35-42.
- Young JC (1980). A model of illness treatment decisions in a Tarascan town. *Am Ethnol* 7,106.

Maternal health and health sector reform: opportunities and challenges

Marilyn Mc Donagh¹ and Elizabeth Goodburn²

Summary

Over the last decade an increasing number of countries have begun implementing health sector reform programmes. There have been concerns that, in practice, the focus of the reform agenda has been more on process, such as financing and decentralisation, rather than health outcomes. This paper examines the relationship between health sector reform and safe motherhood by exploring the following four questions:

-which aspects of safe motherhood have been integrated into essential packages of health services?

-what effect have changes in financing arrangements, in particular the introduction of user fees, had on access to maternity services?

-how has decentralisation affected the availability of maternity services?

-has the sector wide approach resulted in changes to the quality of maternity care?

Although the review highlights how much we do not know, some interesting themes are emerging.

Many countries are struggling with the introduction of an essential service package. It is clear that current levels of funding are not consistent with universal coverage of an essential service package and this inevitably has implications for extending maternal services. An opportunity presented by decentralisation is the "potential" it has to provide the continuum of care needed for effective referral. A challenge is the need to ensure a consistent policy towards maternal health issues after decentralisation, particularly the provision of sensitive services.

Donors are increasingly moving towards SWAps in order to reduce fragmentation and ensure a coherent policy framework. This provides the opportunity to influence maternal health policies but as yet there is little evidence to suggest that this has translated into improved quality of services and improved maternal health outcomes. The immediate challenge is to initiate operational research which reviews performance and the

¹Technical Adviser, John Snow International, UK (correspondence should be addressed to this author).

²Reproductive Health Adviser, John Snow International,UK.

impact of HSR on maternal health services and outcomes. A number of process indicators, including deliveries conducted by a skilled attendant, can be used to track progress towards maternal mortality reduction goals. These indicators, which measure changes in the availability and quality of services, can potentially be used to measure changes occurring as a result of health systems reform.

Introduction

In the mid eighties a seminal article by Rosenfield and Maine, 'Where is the M in MCH' drew attention to the neglect of maternal health in developing countries (Rosenfield & Maine 1987). Their concern was provoked by a growing awareness of the huge disparity in maternal mortality ratios, and life time risk of maternal death, between developed and developing countries. In 1987 a major international conference in Nairobi launched the global Safe Motherhood Initiative which was charged with improving maternal health and reducing maternal deaths by 50 % by 2000. Ten years later a review of progress at the Safe Motherhood Technical Consultation in Columbo found that, although the Initiative had been successful in increasing awareness of the problem, and, to a lesser extent, in mobilizing resources for safe motherhood activities, only a few countries had made significant progress towards the target.

The Safe Motherhood Initiative, and other advocacy movements related to womens health have had a major influence on policy development at an international level. In 1994 the International Conference on Population and Development (ICPD) recommended that countries move away from the traditional family planning (FP) projects to a broader perspective of reproductive health (RH). Although not primarily focused on maternal health and safe motherhood the Plan of Action developed at ICPD placed, and has helped to keep, maternal health within a Reproductive Health agenda. Encompassing safe motherhood within reproductive health, although welcome, has presented a conceptual problem for governments faced with competing priorities because, unlike most reproductive health services which can be provided on an out patient basis, care for women with obstetric complications is an in-patient activity and requires a functioning health service.

Most technical experts now accept that averting maternal deaths requires that women with life threatening complications of pregnancy and childbirth

have access to appropriate emergency obstetric care. Some of this care can be provided at health centre level if facilities are able to perform basic emergency obstetric functions but because life saving treatment often requires obstetric surgery and blood transfusion, women also need access to the comprehensive services available at first level referral hospitals. Access to both these levels of care requires the existence of a functioning referral system. The quality of care is also crucial. Staff need to be appropriately trained and in post, there needs to be 24hr cover, and essential drugs and supplies need to be available. All these requirements are aspects of health systems that function well. In addition, communities need to have confidence in the ability of the services to meet their needs so that they will use them (Safe Motherhood Technical Consultation 1997, World Bank 1999, Maine, 1997).

By the late nineties, increasing awareness of the problem of maternal mortality on the part of governments and donors led to the initiation of a number of safe motherhood projects designed to improve access to emergency obstetric care (e.g. Malawi, Nepal, Morocco, Ghana, Philippines). Past experience, particularly with family planning programmes, had demonstrated that vertically focused projects could produce good results which have a positive impact on health status and can be targeted at the poor. Most of the safe motherhood pilots followed this pattern. However, the experience of implementation has highlighted a number of drawbacks to this approach. First and foremost a number of project initiatives have been seriously compromised by inherent weaknesses within the health systems in which they operate. These weaknesses include inappropriate deployment and rapid turnover of skilled staff, poor maintenance of equipment, interruptions in essential drug supplies and generally poor management and morale. Lack of sustainability, particularly where there is a high degree of dependence on external donor support, is a major drawback. Other problems are duplication of activities and lack of integration with, and support for, other district level hospital and primary care services.

The experience gained from attempting to implement safe motherhood initiatives within dysfunctional health systems has awakened interest in the handful of countries which have succeeded in achieving significant and sustained falls in maternal mortality ratios. There are several well-documented success stories including Malaysia, Sri Lanka, Kerala State in India, Iran, Cuba, and China. Although some of these countries have quite low GNP,

the common factor seems to be that they have concentrated on meeting the basic health and other needs of the population and have focused investments on health systems development generally and maternal health services specifically (Safe Motherhood Technical Consultation 1997, Koblinsky *et al.* 1999, World Bank 1999). These observations, combined with the growing interest in health system development, have raised questions about the possible opportunities and challenges that health sector reform might present for safe motherhood.

Over the last decade an increasing number of countries have begun implementing health sector reform programmes. The goal of health sector reform is to improve the health status of populations by promoting and enhancing access, equity, quality, sustainability and efficiency in the delivery of health services to the largest possible number of people (Langer *et al.* 2000). There have been concerns that, in practice, the focus of the reform agenda has been more on process, such as financing and decentralisation, rather than health outcomes.

In practice, health sector reform involves multiple interventions, many of which are interdependent and carried out simultaneously. Although there is no standard package of health sector reform, the main strategies involved are:

- improving the efficiency of the public sector through decentralisation;
- concentrating limited government finances on an essential package of services;
- developing alternative financing mechanisms;
- increasing involvement of the private sector through contracting and regulation; and,
- introducing sustainability and greater government ownership through sector wide approaches.

Comparing and contrasting experiences with health sector reform is difficult, both because the components vary from country to country, and because countries are at disparate stages of implementing their reform initiatives. A review of the literature has been used to prepare this paper but it has been complemented by country experience and discussions with key informants to provide a more balanced picture.

Health sector reform is a very broad concept. This paper examines the relationship between health sector reform and safe motherhood by exploring

the following four questions:

- which aspects of safe motherhood have been integrated into essential packages of health services?
- what effect have changes in financing arrangements, in particular the introduction of user fees, had on access to maternity services?
- how has decentralisation affected the availability of maternity services?
- has the sector wide approach resulted in changes to the quality of maternity care?

WHICH ASPECTS OF SAFE MOTHERHOOD HAVE BEEN INTEGRATED INTO ESSENTIAL PACKAGES OF HEALTH SERVICES?

There are two main reasons for developing an essential service package. The first is to assist development partners in setting priorities within fixed financial resources using cost effectiveness as the main criteria (IHSD 1999). The second is to meet the needs of users by providing services together in one place on the same day (UNFPA 1999).

In 1994 WHO published the Mother Baby Package (MBP) bringing in influencing allocations of budget and advocating for more resources (together the basic components of maternal and neonatal care. Components include family planning, antenatal care, clean safe delivery, and access to emergency obstetric care (WHO 1996). Although some of the recommendations included in the MBP, such as the risk approach to antenatal care, are now disputed, the MBP still serves as a practical guide to the minimum services needed to address the needs of pregnant women and their babies. In Uganda, and in some other countries, cost data based on the mother and baby package has been instrumental (WHO 1996).

In most health system reform programmes the essential service package normally contains, as a minimum, immunization, pre and postnatal care, oral rehydration, treatment for malaria and lower respiratory infections, and family planning. Clean safe delivery is sometimes, but not always included however, emergency obstetric care is frequently omitted. A survey by Family Care International identified maternal health components in the essential service package in Zambia, Bangladesh, India, Senegal, South Africa, Uganda and Mexico (Family Care International 1999, Hardee *et al.* 2000).

Delivering an essential service package requires that staff are trained in many different skills. This process is commonly referred to as multi-skilling.

Although multi-skilling is desirable, it is important to recognise that specialised skills continue to be essential for running a health service (Wilkinson 1999). This is particularly important for reducing maternal mortality as health workers with trained in midwifery are needed to ensure the provision of safe delivery and quality maternal health services (Population Council 1998).

Most countries are struggling with the concept of an essential service package because it often represents an increase in the range of services available at the periphery. Existing resources tend to be tied up in salary costs leaving little freedom for expansion. It is clear that current levels of funding are not consistent with universal coverage of an essential service package and this inevitably has implications for extending maternal services (Foster *et al.* 2000b).

WHAT EFFECT HAVE CHANGES IN FINANCING ARRANGEMENTS, IN PARTICULAR THE INTRODUCTION OF USER FEES, HAD ON ACCESS TO MATERNITY SERVICES?

Health Sector Reform programmes usually require examination of, and sometimes changes in, financing arrangements. Three main financing modalities are generally considered: improved mechanisms for public funding; user fees; and, health insurance. Of these, user fees is the one that has been the most enthusiastically embraced by developing country governments (though not necessarily endorsed by donors).

Studies have revealed a number of examples, e.g. Kenya, Tanzania, Papua New Guinea, where the introduction of user fees has been accompanied by a decline in the use of maternal health services, particularly of the poorest (Family Care International 1999, Ambrose 2000). However, some authors argue that this usually reflects poor design, planning and implementation, resulting in inadequate attention to ensuring quality improvements and the design of exemption mechanisms, and insufficient involvement of those who will implement the systems within the wider community (Bennett 2000).

In cases where user fees have been implemented along with fee exemptions and, most importantly quality improvements, use of health services has been observed to increase (Leighton 1999). For example, in Niger, a combination of user fees and improved service delivery resulted in increased use of

antenatal services (Leighton 1998). There is now substantial evidence to suggest that if the health facility is able to retain and reinvest user fees, the quality of services improves with an increased utilisation by the poor (Family Care International 1999, Langer *et al.* 1999, Borghi 2000).

Mechanisms to protect the poor are very difficult to implement in practice and various options have been tried. In Bangladesh and Colombia sliding scales have been introduced to protect the poor but they are subject to favouritism (Borghi 2000). In West Africa various loan schemes have been tried to encourage increased utilisation of emergency services. The schemes allowed payment to be deferred or paid in small instalments (Fofana *et al.* 1997). The result of these schemes found a positive effect on utilisation of emergency services, particularly a reduction in delay. Nevertheless, there were concerns, about the sustainability of the schemes as they were very dependent on strong community leadership, and required substantial community mobilisation (Fofana *et al.* 1997, Chiwuzie *et al.* 1997). Calls for free-to-user services are associated with studies linking free services to increased utilisation of maternal services (Langer *et al.* 1999, Schneider *et al.* 1999). Certainly changing to free MCH services in South Africa resulted in an increased use of antenatal and paediatric services but significantly did not increase the use of facilities for delivery (Schneider 1999). In many countries services are 'free' in name only and the introduction of transparent user fees can actually reduce the cost to consumers as well as making more money available to the health facility as opposed to the individual providers.

HOW HAS DECENTRALISATION AFFECTED THE AVAILABILITY OF MATERNITY SERVICES?

Decentralisation is a process by which authority, functions and financial resources are progressively transferred to lower level units. The aim of decentralization is to improve the effectiveness and efficiency of the health system by developing health systems that are appropriate and accountable to local needs and which allow managers to manage (Bossert 1997). In the health sector, the initial process has usually involved deconcentration³ of powers, with decentralisation only taking place when it is part of the wider political

³ Deconcentration is defined as shifting power from the central offices to peripheral offices of the same administrative structure. (pg 147 Bossert 1995).

agenda of local government (Hardee & Smith 2000).

Decentralisation has been most successful in countries where the process took place slowly in line with improvements in local capacity. This suggests that the process may be better suited to more mature and developed health systems. (Langer *et al.* 2000, Hardee *et al.* 2000, Aitken 1999). There seems to be a tendency to underestimate the complex nature of the decentralisation process and to introduce decentralisation as a reform when the public health system is in crisis. This results in exacerbating the mismanagement problems and the neglect of health services (Population Council 1998, Hardee & Smith 2000, FPLM 2000).

Evidence from Ghana, Indonesia, Papua New Guinea suggests that a positive feature of decentralisation has been the emphasis on development of the district health system (DHS). However, difficulties have been encountered in breaking down the pre decentralization vertical allegiances (WHO 1997, Aitken 1999, Agyepong 1999). Agyepong makes the point that in Ghana utilisation of ante natal care did not increase as expected after decentralisation because MCH services continued to be seen as divisional responsibility rather than a district essential service (Agyepong 1999).

It is difficult to be certain of the extent to which decentralisation has supported maternity services. However, it is argued that a functioning district system has the "potential" to provide the continuum of care needed for effective referral from communities to emergency obstetric care facilities. The World Bank has credited the success of a safe motherhood project in Chad to activities which focused on the development of the health system from the community to the referral centres (WB 1999). Other recent success stories include Iran, the Philippines and Papua New Guinea (WHO 1997, Tinker 1998, Aitken 1999). In Papua New Guinea the impact of decentralization on maternal health was initially limited due to low levels of institutional deliveries and transportation. The situation improved due to economic development, the adoption of standard management protocols, in service training, and radio links, though it was noted that the extent of improvement varied according to the enthusiasm of the provincial health manager (Aitken 1999).

Although there are now a number of positive experiences with decentralisation there may be adverse effects due to local disagreement with progressive central policies. For example, studies in Senegal and Indonesia examining the overall impact of decentralisation found general support for safe

motherhood but local resistance to the delivery of sensitive services such as abortion, adolescent care and prevention of HIV /AIDS (IDRC 1997, Futures 2000). Similar problems have also emerged in Zambia and the Philippines (Population Council 1998).

HAS THE SECTOR WIDE APPROACH RESULTED IN CHANGES TO THE QUALITY OF MATERNITY CARE?

Sector Wide Approaches (SWAs) are being introduced in a number of countries. The aim is to introduce sustainability and national ownership by changing external bilateral and multilateral agencies from donors who invest in projects, to development partners who invest in country strategies and programmes that will deliver the strategy (Mc Donagh *et al.* 2000). Key steps include: a sector strategy that is jointly agreed between the Government, civil society and external development partners; a programme implementation plan or sector investment plan that will deliver that strategy and allocation of funding to support it (Mc Donagh *et al.* 2000). However, there are no blue prints. SWAs are a process approach, as demonstrated by the fact that currently each health SWA has very different funding arrangements (WHO 1999).

Many countries are moving towards SWAs in order to reduce policy fragmentation and the managerial overload placed on governments by disparate projects (Cassels & Janovsky 1998). The overall benefit generally, and specifically for maternal health, is the provision of support within “ a coherent overall budget ensuring that recurrent cost implications and new investment are fully planned for” (Foster *et al.* 2000).

There is currently very little evidence available examining the impact of SWAs on the quality of services or maternal health outcomes and some would argue that it is too early to draw any conclusions (Johanson 2000, Mc Donagh *et al.* 2000). The available literature focuses on the policy process which is developing between donors and government within a sector wide approach and the development of the systems and processes involved (Foster *et al.* 2000b, Johanson 2000). A study by WHO confirmed this by finding that most SWAs have been more successful in tracking process and financial flows than health outcomes (WHO 1999). A review by the World Bank of their safe motherhood projects found that working at sector level had been very important in agreeing maternal health policies and priorities

(World Bank 1999).

A recent study commissioned by WHO reviewed five countries implementing SWAps and found that links between policy and implementation were growing and that progress had been made in the diagnosis of barriers to service utilisation (Foster *et al.* 2000b). It can be legitimately presumed, therefore, that an improvement in quality was not observed. It was felt that the evidence that service delivery had suffered under the transition to SWAps was largely anecdotal but acknowledged that this issue required further investigation (Foster *et al.* 2000b).

Discussion

There is a growing body of literature describing the impact of HSR on Reproductive Health (RH) status (Population Council 1998, Langer *et al.* 2000, Lush *et al.* 1999, Hardee & Smith 2000, Papineau 2000, Langer *et al.* 2000). However, few authors have focused specifically on the impact of HSR initiatives on maternal health and services, although interest does appear to be growing (Goodburn & Campbell 2001, World Bank 1999, Aitkin 1999). Much of the available literature is 'conceptual' in nature with little formally documented operational evidence. The former focus on using maternal mortality to measure the impact of changes in health care systems may be partly to blame for this situation. It is now accepted that measuring maternal mortality is expensive and impractical at programme level, and that proxy, service delivery, indicators are required. However, systems for collecting service delivery data are still in the development phase in many countries, and so these data are often not yet available for use. Perhaps because of this lack of data, the academic literature is distinctly polarised with health reform protagonists and antagonists firmly positioned in their respective camps.

There is no clear definition or universally agreed package of HSR. This means that disparate activities are being grouped together, termed HSR, and then pronounced a success or failure without any consistent definition of cause or effect. There is probably no justification for trying to promote a uniform HSR package, as HSR is a process not a collection of activities. Nevertheless, it is important to disaggregate the individual interventions usually included in HSR and look for evidence of effect so that lessons can be incorporated into future policy and practice. In such a diverse field, clarity of

meaning is important. We noted a number of incidents of confused terminology, particularly between HSR and SWAps. SWAps may be part of a reform agenda or may include reform activities as part of the agreed strategy, but they are not synonymous with HSR.

It is true that many HSR initiatives are more focused on process than health outcomes (WHO 1999, Foster *et al.* 2000b). However, many of the processes involved in HSR also provide opportunities. Evidence from key informants suggests that the process of discussing the components of a sector strategy, or an essential service package, highlights the issues surrounding the delivery of maternal health services, even if these issues are not immediately resolved (McDonagh *et al.* 2000). This means that it is important to participate early and positively in HSR initiatives in order to be strategically positioned to influence the process (McDonagh *et al.* 2000).

One of the most important challenges facing HSR initiatives is to ensure they become more outcome focused. Process indicators, such as deliveries conducted by a skilled attendant and met need for essential obstetric care, can be used to track progress towards maternal mortality reduction goals. These indicators, which measure changes in the availability and quality of services, can potentially be used to measure changes occurring as a result of health systems reform.

Donors are increasingly attracted towards working through SWAps. However, there continues to be considerable misunderstanding and misinformation about this approach. The opportunities and challenges of working within a SWAp merit a particular focus. The philosophy of the SWAp process is that government leads it, as political commitment is an essential ingredient for a successful reform agenda, SWAps have the potential to be an effective process for reform activities (Cassels 1996, World Bank 1999). One of the opportunities of a SWAp is that it provides donors with a greater opportunity to address deeper systemic problems, permitting donors to work within a wider policy context of civil service reform and efforts to improve the budget process. (Foster *et al.* 2000, Johanson 2000).

Donors with a special interest in reproductive health sometimes voice concerns that participation in SWAps will dilute the focus and funding for specific services such as family planning. This concern increases when “pooled or basket funding” is proposed. There is certainly a risk that governments may choose different priorities than donors. This may lead to the view

that the process has been a failure when in reality it is a difference in expectations. The solution is to ensure that mechanisms exist which can be used to protect particular services if necessary, such as ring fencing or ear marking particular funds within the overall budget.

SWAps highlight some of the fundamental weaknesses in the traditional model of funding projects and challenge donors to relinquish some of their power. However, a recent review of SWAp programmes found significant similarities between SWAp programme content and implementation plans between countries, which may suggest that donor agendas are stronger than government leadership (Foster *et al.* 2000b). SWAps require donors to give governments the space to make policy, to support their priorities without imposing their own, and to back off from the detail of decision making and implementation. This process is likely to be slow and many donors still behave as if they are managing projects rather than supporting programmes (Foster *et al.* 2000b).

The role and importance of efficient health systems in reducing maternal mortality is now generally accepted (World Bank 1999, Campbell & Goodburn 2001, Papineau Salim 2000). HSR initiatives, particularly SWAps, provide the opportunity for donors to work together, in support of policies and strategies leading to the development of effective and efficient health systems. There are of course major challenges in working through a reform agenda, one of which is that there are no blue prints or quick fixes. There is no substitute for a good institutional analysis of the health system that seeks out the potential for, and the ability of the system to change (Cassels 1998, Johanson 2000). The result in most cases is likely to be a mix of new reform initiatives and old practices, with a phased implementation approach dependant on the development of capacity and performance.

Conclusion

There is a need for more evidence demonstrating the impact of HSR initiatives on MH status. The immediate challenge is to initiate operational research that investigates the effect of HSR on maternal health service delivery. A number of process indicators, including deliveries conducted by a skilled attendant, can be used to track progress towards maternal mortality reduction goals. These indicators, which measure changes in the availability and

quality of services, can potentially be used to measure changes occurring as a result of health systems reform. The lessons learnt must be incorporated into future policy and practice so that the reform process results in improvements in both quality, and equity of access, to maternal health care.

References

- Agyepong IA (1999). Reforming health service delivery at district level in Ghana: the perspective of a district medical officer. *Health Policy and Planning* 14(1),59–69.
- Ambrose S (2000). 50 years is not enough. US Network for Global Economic Justice.
- Bennett S (2000). Which Financing Mechanisms are Pro-poor?, International Health Sector Development, London (forthcoming)
- Borghi J (2000). The cost of providing maternal health care and alternative ways of financing these services. *European Commission Expert Meeting on Safer Motherhood*, 27-28 November 2000. Brussels. Eds Buttiens H, De Brouwere V, Van Lerberge W. Department of Public Health, Institute of Tropical Medicine, Antwerp.
- Bossert T (1995). Decentralisation in Health Policy and Systems Development, WHO.
- Bossert T (2000). Decentralisation of health Systems in Latin America: A comparative analysis of Chile, Colombia and Bolivia. Harvard School of Public Health.
- Cassels A (1996). Aid Instrument and health systems development : an analysis of current practice. *Health Policy and Planning* 11(4),354 –368.
- CasselsA, Janovsky K (1998). Better Health in developing countries :are sector wide approaches the way of the future? *The Lancet* 352,1777-79.
- Chiwuzie J *et al.* (1997). Emergency loan funds to improve access to obstetric care in Ekpoma, Nigeria. *Int J Gynecology and Obstetrics* 59(Suppl 2).
- Family Care International (1999). Meeting the Cairo Challenge. Family Care International, New York.
- Family Planning Logistics Management Project (2000). The Impact of Health Sector Reform on Service Delivery and Logistics Systems: Synthesis of a Literature Review for the FPLM Project.
- Fofana P, Samai O, KebbieA, Sengh P (1997). Promoting the use of obstetric services through community loan funds, Bo ,Sierra Leone. *Int J Gynecology and Obstetrics* 59(Suppl 2).
- Foster M, Brown A, Norton A, Naschold F (2000a). The status of Sector Wide Approaches. Overseas Development Institute, London.

- Foster M, A Brown, Conway T (2000b). Current Issues in Swaps to Health Sector Development. A synthesis of 6 case studies. WHO
- Futures Group (2000). Implications of Decentralisation in Reproductive Health in Senegal. Policy Matters Futures Group.
- Good burn E & Campbell O (2001). Reducing maternal mortality in the developing world: sector-wide approaches may be the key. *British Medical Journal* **7291**, 917- 920.
- International Development Research Council (1997). Social Sector Decen-tralisation : a double edged sword. The Case of Indonesia., IDRC. Canada.
- Johanson R (2000). Sector Wide Approaches : Education and Health in Sub Sharan Africa. World Bank.
- Koblinsky M, Campbell O, Heichelheim J (1999). Organising delivery care : what works for Safe Motherhood. *Bulletin World Health Organisation* **77**,399-406.
- Hardee K, Smith J (2000). Implementing Reproductive Health Services in an Era of Health Sector Reform. Policy Project ,Futures Group, Washington.
- Langer A, Nigenda G, Catino J (2000). Health Sector Reform and Reproductive Health in Latin America and the Caribbean: strengthening the links. *Bulletin World Health Organisation* **78**(5),667-676.
- Lush L, Cleland J, Walt G, Mayhew S (1999). Integrating Reproductive Health : myth and ideology. *Bulletin World Health Organisation* **77**(9),771- 777.
- Maine D (1999). What's So Special about Maternal Mortality. . In. *Safe motherhood Initiatives: Critical Issues*, Eds: Berer M, Ravindran TKS, Oxford: Blackwell Science. 175-182.
- McDonagh M, Goodburn E, Grant K, Walford V (2000). Reproductive Health and Health Sector Reform: Opportunities and Challenges. John Snow International UK (forthcoming).
- Papineau Salim A (2000). Promoting Reproductive and Sexual Health in the era of Sector Wide Approaches. *Reproductive Health Matters* **15**(8),18 -20.
- Pearson M (2000). Using A Needs Based Approach to the Allocation of Public Resources as a Means of Improving Access by the Poor, International Health Sector Development, (forthcoming)
- Population Council (1998.). The Implications of Health Sector Reform on Reproductive Health and Rights. Centre for Health and Gender Equity.

Schneider H, Gilson L (1999). The Impact of Free Maternal Health Care in South Africa. In: *Safe motherhood Initiatives: Critical Issues*. Eds: Berer M, Ravindran TKS, Oxford: Blackwell Science 93-101.

Tinker A (1998). Improving Women's Health in Pakistan. World Bank, Washington.

United Nations Fund for Population (1999). Report of the Ad Hoc Committee of the Whole of the Twenty - First Special Session of the General Assembly .

UNFPA (1997). Proposals for key actions for the further implementation of the Programme of Action of the International Conference on Population and Development. UNFPA.

Wilkinson D (1999). Tuberculosis and health sector reform: experience of integrating tuberculosis services into the district health system in rural South Africa. *Int Journal of Tuberculosis Lung Disease* 3(10),938 - 943.

World Bank (1999). Safe Motherhood and the World Bank. The World Bank

World Health Organisation (1996). Mother - Baby Package: Implementing safe motherhood in countries. Maternal Health and Safe Motherhood Division.

World Health Organisation (1997). Decentralisation and Health Systems : An Overview of International Experience. Technical Seminar Series

Cautious champions : International agency efforts to get safe motherhood onto the agenda

Carla AbouZahr⁴

Summary

Successful advocacy requires clear messages and effective dissemination. The international health and development agencies have an important role to play in advocacy because of their visibility and access to resources. Yet advocacy for maternal health by the UN and other international agencies efforts has been relatively ineffectual because the messages have not always been clear and unambiguous and the dissemination strategies have been small-scale and sporadic. Messages have focused largely on the size of the problem of maternal mortality and its human rights dimensions. What has been missing until very recently, has been clarity about the interventions that work to reduce unsafe motherhood along with a way of measuring their impact. Dissemination strategies have included major international meetings, involvement of women's health advocates, mobilisation of health care professionals and donor support. Yet on the whole these efforts have lacked conviction. Political commitment has been cautious, ambivalent, and at too low a level to make an impact either nationally or internationally. Alliances have been shifting and unstable and even "natural" allies have lacked conviction. Neither women's advocacy groups nor health care professionals have invested in maternal health with the full force of their numbers or power. Real progress in improving maternal health will require outspoken and determined champions from within the health system and the medical community, particularly the obstetricians and gynaecologists, and from among decision-makers and politicians. But in addition, substantial and long-term funding – by governments and by donor agencies – is an essential and still missing component.

⁴ Senior monitoring and Evaluation Adviser, UNAIDS, 1211 Geneva 27, Switzerland.
Email: abouzahr@who.ch

Introduction

In this paper, I started out with the intention of reviewing what strategies have been successful in getting safe motherhood onto the political agenda at global and national levels. But in trying to get together the documentation, one thing soon became apparent, namely, that very little has been documented. There is plenty of evidence of advocacy efforts – conferences, posters, newsletter etc. But little evidence of any attempt to evaluate their impact. Did the global advocacy efforts result in greater visibility for and commitment to safe motherhood at national level? Conversely, how was it that in some countries sustained safe motherhood programmes were put into place? What was the key motivating factor? There are no simple answers to either of these questions. There are, however, lessons to be learned about factors that may have helped to get safe motherhood on to the agenda and those that have been a hindrance. In this paper I try to summarise some of these lessons and make some suggestions about what is needed if future advocacy for safe motherhood is to be more successful than in the past. I argue that hitherto advocacy by international health and development agencies has focused on a limited range of messages and vehicles for getting the messages across. What is needed now is new, forward looking messages combined with a wider range of vehicles for disseminating them.

The awakening

In February 1987, Hafdan Mahler, the Director-General of the World Health Organization (WHO) in his statement to the Nairobi Safe Motherhood conference, called for the creation of “...an awareness that something can, should – indeed must – be done, starting with the commitment of heads of states and governments” (Mahler 1987). The conference, sponsored by The World Bank and UNFPA along with WHO, represented the starting point of what came to be known as the Safe Motherhood Initiative (SMI). The three original Cosponsors were later joined in the SMI Inter-Agency Group (IAG) by UNDP, UNICEF, IPPF and The Population Council with Family Care International (FCI) serving as an informal secretariat.

The fledgling Safe Motherhood Initiative had two parents and a somewhat disparate set of genes. On the one hand, it was very much a product of the growing confidence of the international women’s movement, galvanised

by the United Nations Decade for Women, 1976-1985, which helped focus attention on women's rights and health. The Decade culminated in the formulation of the "Forward Looking Strategies" which called for a reduction in maternal mortality by the year 2000. A key perception to emerge over this period was the relative neglect of women's health compared with the attention then being given to child survival and health, a point most forcefully made by Allan Rosenfield and Deborah Maine in their seminal article "Where is the M in MCH?" (Rosenfield & Maine 1987).

The other parent was more mathematically oriented. The figure of half a million deaths each year, the first attempt to come to grips with the dimensions of the problem, was produced thanks to the unsung efforts of the late Dr Robert Cook, Deputy Director of WHO's Division of Family Health. He provided modest funding for the first community studies on levels of maternal mortality in developing countries (WHO 1985). The results of these studies were fed into an indicator database maintained by WHO which produced global and regional estimates on a range of maternal health issues including maternal mortality, coverage of maternity care, perinatal mortality and low birth weight (WHO).

These two strands - women's health and rights and the dimensions of the problem - continued to provide the underpinning for maternal health advocacy messages by the international community throughout the 1990s. While both have been of inestimable value in raising safe motherhood to a higher position in international and national consciousness, neither is sufficient as the point of leverage.

Playing the numbers game

In 1987, Dr Mahler asked why maternal mortality had only recently become a cause for concern. His own answer was that the dimensions of the problem had previously remained unknown. "Sound estimates based on new data are ... the foundation of our current understanding and concern" (Mahler 1987). With the perspective of another decade of experience in collecting data on levels and trends in maternal mortality, his confidence seems remarkable. After all, the "sound estimates" were generated on the basis of a mere handful of community studies in developing countries. For many years WHO tabulations of available information were heavily dependent on hospital-based data, known to be problematic because of bias. (WHO 1986, 1991,

1996). Because of this, WHO did not venture into making estimates of the level of maternal mortality for individual countries but confined its estimation activities to regional and global totals.

The global totals served to draw attention to the overall dimensions of the problem but there are limits to such general advocacy. Countries with high levels of maternal mortality could hide with impunity behind relatively lower regional averages. Conversely, countries with maternal mortality levels lower than the regional average – Cuba and Sri Lanka being notable examples – resented being lumped together with countries whose performance in this area was so much inferior to their own. Furthermore, and this is particularly important in the area of advocacy where today's news is tomorrow's history, the constant repetition of the same global totals became self-defeating. It became increasingly difficult to keep maternal health in the public eye when there was nothing new to report.

This changed in 1996 with the publication by WHO and UNICEF of the revised estimates for 1990 which included, for the first time, not only regional and global totals but also the individual country estimates from which they were derived (WHO/UNICEF 1996). These estimates were developed using a variety of adjustment factors designed to account for well-documented problems of underreporting and misclassification. They were in almost all cases, considerably higher than those previously published.

The new numbers were issued with great fanfare, including a joint press release. The powerful UNICEF publicity machine was brought into play with the publication of the estimates in the 1996 *Progress of Nations*, complete with individual country rankings and a leading article by Peter Adamson (UNICEF 1996). Other flagship publications started using the same data set including UNFPA's *State of the World Population* and UNDP's *Human Development Report*.

Nothing before had had such an explosive impact on the awareness of the problem. Reactions of national authorities were frequently critical and questions were asked in the governing bodies of UN agencies. Agency regional and country offices became involved in efforts to explain the origin of the numbers and limit the political fallout (WHO/Regional Office for South East Asia 1997).

As the saying goes, no publicity is bad publicity. The debate provoked by the new estimates was instrumental in ensuring that the issue of maternal

mortality was given greater visibility and attention both at the national level and in international fora. Maternal mortality became a key indicator for assessing country eligibility for donor support.

The shock wave produced by the publication of country estimates of maternal mortality had a number of positive outcomes in terms of drawing attention to the issue.⁵ But the numbers game can be a double-edged sword. In order to ensure that the issue remains at the forefront of people's consciousness, it is necessary to keep producing updated numbers or new variations on the numerical analysis. The Safe Motherhood Initiative proved adept at using the numbers for advocacy- "the equivalent of one jumbo jet full of pregnant women crashing every four hours" (WHO 1986); "every minute of every day a woman dies" (Inter-Agency Group for Safe Motherhood 1990). But other conditions, HIV/AIDS, malaria or tuberculosis, for example, cause more deaths and provide more compelling press copy than maternal mortality. Epidemic diseases subject to global surveillance have a new story to tell on a regular basis. Maternal mortality is neither an emerging epidemic nor one of the world's major killers. Maternal deaths remain singular, individual and silent tragedies.

There are also technical reasons why it is hard to make a case for maternal health using the numbers of deaths alone. Maternal mortality is a difficult to measure outcome. Currently available measurement techniques have wide margins of uncertainty and it is impossible to be certain that observed trends are real rather than artefacts of the data collection methodology (UNICEF/WHO/UNFPA 1997). The most commonly used indicator, the maternal mortality ratio, is technically complex and intuitively hard to grasp. These factors combine to render it difficult to make a convincing and unambiguous case for safe motherhood programmes. Policy-makers and donors are likely to be wary of putting resources into programmes where the baseline point of departure is unknown and where there is no certainty about the direction of change.

Not just another disease

Recognising that reliance on the size of the problem would be inadequate for

⁵ UNAIDS had a similar experience with the publication of the first country estimates of prevalence in 1998.

advocacy purposes, safe motherhood advocates argue that maternal deaths are unlike other deaths. Pregnancy is not a disease but a normal physiological process that women must engage in for the sake of humanity (Fathalla 1997). Whereas the elimination or eradication of disease is a rational and laudable endeavour, the same strategy cannot be applied to maternal mortality. There is no pathogen to control, no vector to eradicate. Women will continue to need care during pregnancy and childbirth as long as humanity continues to reproduce itself. Failure to take action to prevent maternal death amounts to discrimination because only women face the risk. This perception of the different nature of maternal mortality within the general context of illness and disease, has stimulated renewed interest in a rights-based approach to stimulating action.

Defining maternal death as a “social injustice” as well as a “health disadvantage” obligates governments to address the causes of poor maternal death through their political, health and legal systems. This raises the option of using international treaties and national constitutions that address basic human rights to advocate for safe motherhood and to hold governments accountable for their actions - or inaction (Cook 1997). A rights-based approach has proved hugely influential in increasing accountability in the area of child health. The Convention on the Rights of the Child has become a powerful tool for monitoring progress and has been integrated into international human rights machinery as the standard to which all should aspire. The Convention is the most universally accepted human rights instrument in history - it has been ratified by every country in the world except two. By ratifying this instrument, national governments have committed themselves to protecting and ensuring children's rights and they have agreed to hold themselves accountable for this commitment before the international community.

Efforts to resolve the practical challenges of doing the same for maternal health have gathered momentum in recent years but they remain stymied by the difficulty of defining indicators for monitoring progress.

Telling the story

If a rights-based approach is to be useful for getting safe motherhood on to the agenda, clear and unambiguous indicators are needed against which to assess where countries stand and judge progress (Yamin & Maine 1999).

This need for measurable process indicators was absorbed early on by UNICEF in drawing attention to the rights of the child. UNICEF's regular analysis of country progress towards the goals and the World Summit for Children is founded on a systematic review and analysis of key monitoring indicators.⁶ UNICEF has not only worked on the conceptual development of such indicators, but has also invested considerable funding into generating the data, through, for example, its Multi-Indicator Cluster Surveys (MICS).

Unfortunately, we have not reached an equivalent stage in safe motherhood. Although some process indicators have been identified and are currently being promoted for monitoring progress (see for example, UNICEF/WHO/UNFPA 1997), more experience is needed with generating them in diverse country settings and with using them over sustained periods of time. Moreover, whereas there is a clear and unambiguous link between vaccination against measles, for example, and the decline in measles-related mortality, no such link has been scientifically demonstrated between maternal mortality and the most commonly advocated process indicators such as skilled attendant at delivery or access to emergency obstetric care.

The challenge is well illustrated by the example of the skilled attendant at delivery indicator. The indicator is intuitively easy to understand and readily available for many countries. The source of the information is generally the Demographic and Health Surveys, which have the advantage of providing a standardised methodology and sampling framework along with strict criteria regarding the maintenance of data quality. Although efforts are made to standardise definitions of skilled birth attendant, there remain doubts about the comparability of some of the results across countries and within countries at different time periods. One source of potential confusion is the differing interpretations as to who is a skilled attendant, particularly in settings where traditional birth attendants have been trained and where many of them work within a health setting. But more critically, while there is ecological evidence in support of a link between skilled attendant at delivery and reduced maternal mortality, and sound clinical reasons for assuming that the link is real, unequivocal evidence is lacking (AbouZahr & Wardlaw 2000).

⁶ These are largely process rather than impact indicators. Rather than measuring the incidence of specific vaccine-preventable diseases such as measles, attention is directed into monitoring vaccination coverage. Similarly, UNICEF focuses on monitoring access to and use of oral rehydration therapy rather than monitoring mortality due to diarrhoeal diseases.

This problem is not simply of academic interest. It means that it is hard to make a convincing advocacy case for maternal health and for investment in the needed interventions. Decision-makers, whether among governments or donor agencies, want to be able to demonstrate to a sceptical public that their investments are bearing fruit. The need to be able to “tell the story” has been underestimated by many working in the area of safe motherhood and it is a failure that has cost the issue dear in terms of keeping it at the forefront of the health and development agenda.

Getting the message out

So far we have examined the two main messages that have provided the basis for maternal health advocacy – the extent and nature of the problem and its human right dimensions. Let us turn now to the main vehicle for disseminating these messages, the highly mediatised, high level, international meeting.

The 1987 Nairobi Safe Motherhood Conference was the first high level international meeting on the theme of maternal mortality. It was also the last.⁷ That is not to say that safe motherhood no longer appeared on the agenda at international conferences, far from it. But its appearance in such gatherings has been part of a broader agenda for children’s, women’s or reproductive health and rights. This has had important implications for the visibility of safe motherhood within the international context.

High level conferences such as the International Conference on Population and Development in Cairo in 1994, the Fourth World Conference for Women in Beijing in 1995, and the Social Summit in Copenhagen in 1995, have included safe motherhood within a broader reproductive or women’s health context. While this has obvious advantages, it also raises questions about the extent to which safe motherhood can survive and prosper in the absence of a focused and well-financed effort, an issue that is taken up again below.

The contrast between international meetings for child health and maternal health is telling. Shortly after Nairobi, the World Summit for Chil-

⁷ A number of regional conferences had safe motherhood as the principal theme but they were largely replicas of the Nairobi meeting and neither attended at a higher level nor intended to go beyond what had already been achieved in Nairobi.

dren took place in New York in 1989. Unlike the Safe Motherhood Conference, the Children's Summit was attended by heads of state, executive heads of UN agencies, and high level representatives of countries, NGOs and the international development community. The Summit was the culmination of a series of meetings that regularly brought together international development agencies, political leaders from developed and developing countries, key NGOs such as Save the Children, and funding agencies from both the multilateral and bilateral community and the private sector (such as Rotary International). These had been organised by the Task Force for Child Survival, a high level secretariat body created in 1984 with substantial financial and human resources at its disposal and bringing together WHO, UNICEF, The World Bank, UNDP and the Rockefeller Foundation.

The Safe Motherhood Initiative has yet to achieve such a level of visibility and sustained impact, or to identify such vocal and powerful partners. The Initiative's secretariat, unlike the Child Survival Task Force, informally brings together technical staff from the agencies with Family Care International providing administrative support. The group exchanges information and organises meetings of partners to review progress in the initiative. However, it has always lacked decision-making power and access to the kinds of resources needed to sustain high level visibility for the Initiative on a par with those available for children's health.

A new beginning

Awareness of the need to raise the level of discourse on maternal health grew during the late 1990s and in 1996 the SMI Inter-Agency Group embarked upon a two-year effort to bring maternal health to a wider audience and to a higher level of decision-makers. The preparatory phase culminated in an international technical consultation in Colombo, Sri Lanka in October 1997. The consultation brought together safe motherhood specialists, programme planners and decision-makers from international and national agencies. The consensus that emerged from the Colombo meeting helped to forge greater consensus on the interventions needed to reduce maternal mortality. This was extremely valuable in developing a communications campaign on the theme of safe motherhood and in mobilising UN agencies and high level decision-makers and political advocates on World Health Day on 7 April

1998, designated for safe motherhood by WHO. Around the world, street parties, theatrical presentations, marches, media events and poster campaigns, focused on safe motherhood. In Washington D.C., executive heads of major international agencies came together with high level politicians from the developing world and the US first lady to issue a Call to Action for safe motherhood.

There is no question that the 1998 Call to Action represented a significant upgrading of efforts for maternal health. In the years following the Call to Action, a number of new entrants to the safe motherhood field have come to add their weight to the growing movement. These include the White Ribbon Alliance for Safe Motherhood and Safe Motherhood Initiatives USA. Others, already involved in safe motherhood, such as Columbia University, PATH, AVSC and Marie Stopes have increased their existing commitment. UN agencies have promised greater resources and visibility, for example, through WHO's Making Pregnancy Safer Initiative, UNICEF's Women-Friendly Health Services strategy, UNFPA's Programme Advisory Note for Reducing Maternal Mortality and Morbidity, and The World Bank's Safe Motherhood Action Plan. Four agencies - WHO, UNFPA, UNICEF and the World Bank - issued a joint statement on the essential strategies needed to reduce maternal mortality and affirming their collective engagement in support of safe motherhood (WHO/UNFPA/UNICEF/ World Bank 1999). Reduction of maternal mortality: a joint WHO/ UNFPA/UNICEF/World Bank statement.

It is impossible to estimate the extent to which the increased interest in safe motherhood was a direct result of this advocacy campaign or simply the outcome of a gradual increase in interest stimulated by other events such as ICPD. However the activities leading up to the Call to Action, known generically under the title of *Safe Motherhood at 10*, had two important strengths which had not previously characterised international safe motherhood advocacy efforts, namely, focus on effectiveness and high level involvement, particularly among UN agencies. Although by no means on a par with the 1990 Children's Summit, this represented as major step forward in terms of visibility.

At the same time, the success of the 1998 campaign led to questioning among safe motherhood activists. To what extent is appropriate to keep a specific Safe Motherhood Initiative alive at a time when the move in interna-

tional health and development circles is towards horizontal approaches and integration into broader concepts such as reproductive health? It has been suggested that there is a continuing need to focus on safe motherhood because the issue is often under-emphasised or omitted from “reproductive health” programmes. This raises a more general concern about safe motherhood –that of brand recognition, to use a marketing term.

Alphabet soup

Question: What do PHC, MCH, SMI, MMR, MBP, MSM, SRH, MNH, PMM and MPS have in common (apart from being letters of the English alphabet)?

Answer: They are all acronyms for projects and programmes designed to help alleviate women’s suffering and death in the cause of pregnancy and childbirth.

These acronyms fall into two classes. Some represent umbrella concepts within which maternal health and safe motherhood issues should be addressed – PHC (Primary Health Care), MCH (Maternal and Child Health Care) and SRH (Sexual and Reproductive Health). Others relate in a vertical, focused way to maternal mortality reduction – SMI (Safe Motherhood Initiative), MSM (Maternal Health and Safe Motherhood Programme), MBP (Mother-Baby Package), MNH (Maternal and Neonatal Health), PMMN (Prevention of Maternal Mortality Network) and MPS (Making Pregnancy Safer Initiative).

Alternating waves of broad, inclusive approaches and the more narrow focused ones have succeeded one another with predictable regularity. From the establishment of WHO to the late 1980s the strategy was to incorporate maternal health under a broader framework for basic health care for women and children. Starting in 1987 a different strategy was preferred and throughout the late 1980s and early 1990s there was a preference for “vertical” focused programmes, perceived (often correctly) to be more effective in reaching their target audiences and in delivering their promises (Werner & Saunders 1997).

In 1991, concerned about the continuing lack of progress in safe motherhood, several major donors pressed for the establishment of WHO Special Programme for Safe Motherhood, analogous to the Special Programmes for

Research, Development and Research Training in Human Reproduction (HRP), the Special Programme for Research on Tropical Diseases (TDR) and the Special Programme on HIV/AIDS (GPA) (WHO 1991b). The WHOI administration of the time resisted such pressures for “verticalisation” and by the time of the International Conference on Population and Development in 1994, the pendulum had swung back again to favour the inclusive or “horizontal” approach. Safe motherhood programmes were presented as part of the overall concept of sexual and reproductive health (UNFPA 1994), or within a broader agenda of health sector reform (The World Bank 1999). At the start of the new century, concern that safe motherhood tended to disappear within these broad inclusive agendas resurfaced and interest in focusing more specifically on safe motherhood has waxed, for example, under the titles of Making Pregnancy Safer and Maternal and Neonatal Health.

None of this would matter were it not for the confusion it creates in countries. No sooner have the international health and development agencies managed to create brand recognition for one strategy, than the fashion changes and a new approach, new strategy and new set of acronyms is foisted upon the world.

Small wonder, therefore, that so many observers concur that getting safe motherhood onto the agenda and keeping it there has been a difficult challenge.

Ambivalent allies

The frequent name changing that has characterised the recent history of safe motherhood has been symptomatic of another problem, that of weak alliances. The linkages between women’s health and rights and safe motherhood would appear to be natural and unquestioned. But in practice, things are not so simple. Some perceive that attention to maternal health derives more from concern about the impact on children than from the risk to women themselves. In this paradigm, women are seen simply as the vehicles for making children, their own health and rights subsumed to that of their infants. In part, this perception is due to fact that safe motherhood was born in the shadow of child survival. Indeed, during the 1990 Children’s Summit, the issue of maternal mortality was an item for discussion, but almost entirely within the context of ensuring the survival and health of children. As James Grant himself noted, “...the emphasis on goals for maternal mortality

is largely a by-product of child survival efforts” (Grant 1990).

At the start of the Initiative, women’s health activists had the issue of maternal mortality high on their agenda and were working to promote solidarity among women around the world. The Women’s Global Network for Reproductive Rights and the Latin American & Caribbean Women’s Health Network/ISIS International, issued a Call to Action on 28 May 1990, declared International Day of Action for Women’s Health (Women’s Global Network for Reproductive Rights and the Latin American & Caribbean Women’s Health Network/ISIS International 1990). This campaign was instrumental in drawing attention to the issue of maternal mortality, particularly in Latin America. The campaign focused particular attention on unsafe abortion and on the poor quality of care meted out to women (particularly poor or indigenous women) by the formal health care system. Maternal mortality was presented as a political challenge with responsibility firmly attributed to high level decision-makers: “To cure the health problems of women is to acknowledge that oppression – and health problems – are not determined by biology but by a social system based on the power of sex and class” (Araujo and Diniz 1990).

At the same time, NGOs around the world were working in the area of reproductive health and safe motherhood, often at a very local level, engaging in community-based research, participating in awareness-raising or public education campaigns, promoting workshops, meetings or media events, and even delivering care (WHO 1992). The breadth and extent of the types of activities is such that it is impossible to evaluate their impact, particularly at the international level. While they undoubtedly make a contribution, its extent is likely to be limited by the availability of resources – human and material – to sustain a long-term effort.

More recently, the energies of many NGOs have been absorbed by the broadening of the women’s health agenda to address previously neglected problems such as female genital mutilation, violence and trafficking. And among some activists, ambivalence about safe motherhood has strengthened. Even the title is suspect because it draws attention to the outcome of the pregnancy rather than to the choice to become pregnant in the first place.

The women’s movement recognised early on that the abortion issue would be the most contentious aspect of efforts to reduce maternal mortality. Almost universally, they identified societal reluctance to endorse the

right of women to decide whether and when to have children and to provide both contraceptive and abortion services to enable them to do so safely. The “abortion issue” complicated efforts to draw attention to safe motherhood. Among anti-abortionists, safe motherhood was seen as the trojan horse for the introduction of legal abortion. Funders interested in supporting safe motherhood programmes became wary and to this day certain donors cannot be approached for support to projects or programmes that include an abortion-related component.

Problems such as these have added to the ambivalence and hesitation of policy-makers. In some countries, for example, although national plans for the reduction of maternal mortality exist, government officials have an ambivalent attitude towards reproductive health which has hampered implementation (UNFPA 1999).

The complexities of this debate may account for the difficulties that safe motherhood has faced in bringing new partners into the effort, notably the private sector. During the preparations for *Safe Motherhood at 10*, the IAG created a pilot project to attract the support of global business (Safe Motherhood Inter-Agency Group 1999). The project’s goals were modest and did not include fund-raising, focusing instead on raising awareness about the Safe Motherhood Initiative and the issues among an elite group and encouraging businesses to support safer motherhood among their employees and within the communities in which they work.

As a result of the project, 12 businesses publicly endorsed a corporate “charter” and became founding members of the Corporate Council for Safe Motherhood. However, since the 1998 World Health Day event, follow-up activities have been sporadic and there remains much to be done in terms of identifying feasible and appropriate activities for the private sector. Despite its potential benefits, the potential pitfalls of working with the private sector and the strict criteria for corporate involvement imposed by the UN organizations in particular, have put a brake on any major attempt to involve corporations more fully in safe motherhood.

Professional partnerships

Of all the allies that safe motherhood needs, none is as crucial as the medical community and this group has done much to advocate for attention to the

issue and to promote strategies to address it. But although many committed individuals have been active in safe motherhood, the mobilisation of doctors, and especially obstetricians and gynaecologists, midwives and nurses as professional groupings, has been slower in the making, particularly as concerns the professionals at the apex of the maternal health care system, the ObGyns.

International midwifery and nursing professional associations recognised early the potential role of midwifery in safe motherhood. International Nurses Day 1988 was on the theme of safe motherhood. The International Confederation of Midwives has taken on an even more active role, organising pre-congress workshops on different aspects of safe motherhood midwifery prior to the triennial congress since 1987. The 1990 pre-congress workshop was instrumental in opening up debate among midwifery associations about delegation of responsibility and the need for training of midwives to deal with emergency obstetric complications. Later workshops addressed issues of monitoring, quality, abortion and HIV/AIDS.

The WHO and the International Federation of Obstetricians and Gynaecologists (FIGO) Task Force was established in 1982 to draw attention to safe motherhood at both global and regional levels. Pre-congress workshops have tackled a range of reproductive health issues including safe motherhood. But the fine sentiments voiced at such meetings were rarely followed by practical action. A 1998 article in the *Lancet* took the profession to task for failing to assume its responsibilities and leaving Safe Motherhood “an orphan initiative” (Weil & Fernandez 1998).

It was not until 1997 that FIGO moved from words to specific action with the establishment of the FIGO Save the Mothers Fund, a north-south partnership to support direct training projects between ObGyn associations. In addition to support from UNFPA and the World Bank, the Fund receives funds from Pharmacia-Upjohn, a rare instance of private involvement in safe motherhood. This initiative is illustrative of the increasing role of the ObGyn which has grown with the emerging consensus that effectively addressing the challenge of maternal mortality implies doing something to ensure that all women with complications – whether emergency or not – can access the needed medical care. This implies that all labouring women must have the assistance of a skilled health care worker who can manage deliveries in such a way as to minimise the numbers of complications while also being

able to recognise and deal with complications before they become life-threatening emergencies. These new directions in safe motherhood programming focussing on the indispensability of obstetric care have major implications for health care professionals at all levels and in particular for health care professionals at the apex of the system - obstetrician/gynaecologists and senior physicians.

At the same time, the medical profession has to contend with frank mistrust on the part of some women's advocacy groups who have sensed tendency for doctors to overmedicalise a natural process, a diagnosis supported by the inexorably rising rates of caesarean delivery around the world.

Caesarean delivery can be convenient and lucrative for physicians but carries risks for the woman, particularly when conducted in less than optimal conditions. It also imposes additional costs for the woman and her family.

Alternative pathways

Despite all these apparent difficulties, there are a number of countries where safe motherhood has been raised high on the agenda - Bolivia, Ghana, Egypt, Indonesia, Mexico, Morocco, Uganda - to name but a few. And in several countries - China, Cuba, Jamaica, Malaysia, Sri Lanka, Tunisia and Thailand - relatively low levels of maternal mortality have been achieved with little fanfare or international conferences and donor driven incentives. What was the motivating factor in this second group of countries, and can we learn from them how to promote safe motherhood more effectively elsewhere? And looking further back in time, are there lessons to be drawn from the developed countries that achieved remarkable reductions in maternal mortality at the beginning of the last century - Japan, the Netherlands, Sweden, UK?

If we take the group of developed countries first, two factors predominate: the societal recognition that female social, economic and political emancipation was a prerequisite for social development (and its corollary, social peace) and the involvement of medical professionals in promoting that emancipation (De Brouwere *et al.* 1997). In the UK, for example, concern among the medical profession about continuing high levels of maternal mortality resulted in setting up of enquiries into the subject by the Ministry of Health in 1928. These enquiries continued and were eventually turned into

the system of Confidential Enquiries into Maternal Deaths which continues to this day. During the same period, government committees of enquiry were set up to “investigate the general conditions of health among women ... in view of indications that ill-health is more widespread and more serious than generally known” (Spring Rice 1939). Representatives of women’s organizations were included in the Committee “on an entirely non-political basis”.

This combination of the energies of the women’s movement and high level medical professionals, ensured that no government could afford to ignore women’s health particularly during pregnancy and childbirth.

It is difficult to know the precise origins of concern about maternal mortality in the group of developing country success stories but from what one can discern the pattern is similar. In China, Cuba, Jamaica, Malaysia, Sri Lanka, Tunisia and Thailand, maternal health care programmes were part and parcel of a broader movement towards the provision of basic services – health, education, sanitation – for all. Very often, this accompanied profound political changes, the aimed for social objectives being encompassed within the wider political ones. A similar phenomenon emerged more recently in South Africa, where safe motherhood, and safe abortion in particular, was seen as a necessary part of the post-apartheid transformation.

Particularly noteworthy in all countries that have achieved low levels of maternal mortality is the fact that high level political commitment to the issue is sustained over time. Effective safe motherhood programming requires incremental changes over a long period, with the needed infrastructure and skills being gradually extended to cover a broader geographic and social spread (Pathmanathan & Shanti 1990). One of the challenges facing the international community is how to support this sustained level of commitment. What safe motherhood needs is not so much advocacy campaigns, but a long-term social movement.

Countries that have started more recently down the road to safer motherhood have generally followed a different path and it remains to be seen to what extent their current levels of commitment can be maintained in a context of continuous resource constraints. In Bolivia, Egypt, Ghana, Indonesia, Mexico, Morocco, Nepal and Uganda the stimulus for action has come from high level political leadership on the part of the elite allied in some cases (Bolivia, Ghana, Nepal) with strong grassroots support expressed through women’s advocacy groups.

Key decision-makers can make the difference between a safe motherhood programme that falters and one that moves from strength to strength. There is a risk, of course, that the programme will be subject to political changes that are beyond its control, such as the removal of a key political leader from office. Where there is long term stability, on the other hand, political leaders can be powerful advocates for safe motherhood. The support of President Museveni and the First Lady of Uganda, Jerry Rawlings of Ghana and Pascal Mocumbi of Mozambique nurtured the social and economic conditions for sustained progress. By contrast, where such leadership is absent, neither active NGO groups nor high profile actions of international agencies can create the level of sustained interest and commitment that safe motherhood requires. A clear example of this is Kenya, host to the first safe motherhood conference and home to many active women's health groups, but where the absence of high level national political commitment has resulted in relative stagnation of safe motherhood efforts.

To what extent the support of political leaders for safe motherhood has been influenced by the communication campaigns of the Safe Motherhood Initiative and the advocacy activities of international agencies is impossible to say. But experience shows that alongside political commitment, two other factors are determinant. One is the translation of political support into clear and focused national policies and plans which address clearly defined problems and are based on a local analysis of needs and priorities. The other is long term financial inputs, both external and more significantly in the long term, internally generated.

Follow the money

It is often said that if you want to know what is really going on, follow the money. To what extent has funding for safe motherhood projects and programmes grown over recent years and can this increase - if there is one - be attributed to the advocacy efforts of the international health and development community? Answering this turns out to be a difficult task. Back in 1987, WHO estimated that less than US\$2 out of every US\$10 of international resources devoted to health was spent on maternal-child health and family planning (WHO 1987). During the preparations for the 1994 Cairo conference, a similar exercise produced rather similar results (SIDA 1993). But the work was criticised on the grounds that it failed adequately to distin-

guish funds directed specifically to safe motherhood activities and those which fell under a broader umbrella of MCH, reproductive health or women's health.

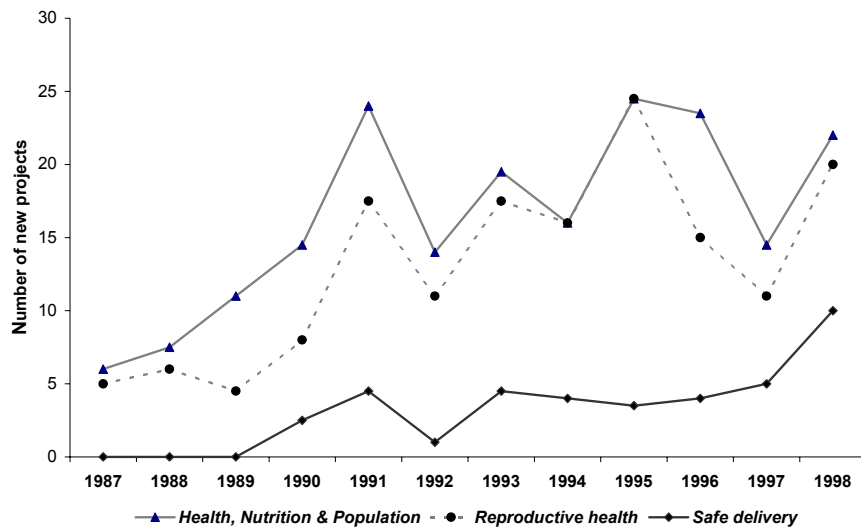
The problem of tracking funding remains as difficult today. The most comprehensive attempt to do so to date, sponsored by UNFPA, categorises population programmes and activities into broad groups, with safe motherhood activities grouped under 'basic reproductive health services given at primary health care level' along with training of traditional birth attendant (TBA's), antenatal care and eradicating female genital mutilation (NIDI 2000). Moreover, there is no attempt to identify funding directed towards the elements of safe motherhood programming known to be most effective, such as skilled attendance at delivery or care for obstetric emergencies.

Several major donors, USAID among them, do not have a separate budget for maternal health. For many years, the MotherCare project was virtually alone among USAID-supported projects in focusing on safe motherhood. This is beginning to change and several USAID-funded projects that hitherto concentrated almost entirely on family planning, including JHPIEGO and Measure, now include a large component of safe motherhood programming. The JHPIEGO supported Maternal and Neonatal Health project, established in 1999, has access to up to US\$50 million over the first five years.

Of the UN agencies, only the World Bank has carried out a systematic analysis of its funding for safe motherhood activities. The Bank is now the largest source of external assistance for safe motherhood. In 1987, it supported only 10 projects dealing with maternal and child health and family planning. In the years since then, there have been 150 such projects. In recent years, the Bank has been instrumental in promulgating a shift from programmes focused almost entirely on child health or family planning activities to programmes comprising activities related to safe delivery and management of obstetric complications, as Figure 1 shows (World Bank 1999).

Despite such progress, there remains a long way to go in terms of translating the global advocacy effort into sustained programming for safe motherhood at national level. Whereas there are many programmes with the title safe motherhood, only a few focus on the interventions known to be effective in reducing maternal mortality.

Figure 1. World bank – Number of new projects with reproductive health, safe delivery and health, nutrition and population activities, 1987-98



SOURCE : The World Bank 1999

In the Bank's review, of 29 countries with high levels of maternal mortality (600 maternal deaths per 100,000 live births or higher) The Bank supported family planning or general maternal health care activities in 22 of them, but safe delivery activities only in seven. Even in countries with the most serious maternal mortality problems, only nine of 24 country-assistance strategies made explicit mention of the issue (World Bank 1999). UNFPA's evaluation of its own safe motherhood efforts came up with similar findings. Priorities were neither clearly defined nor necessarily those known to be effective (UNFPA 1999).

Addressing this problem has become one of the major challenges that governments and external donors need to address and has been one of the main preoccupation of a number of safe motherhood advocates. The evidence indicates that clearly focused and evidence-based strategies will succeed in generating the needed resources. For example, significant new funding for safe motherhood has recently been generated through Columbia University's Joseph L. Mailman School of Public Health with resources from the Bill and Melinda Gates Foundation. For example, UNFPA and Columbia University

have signed a pact through which US\$8 million will be allocated to improving the availability of emergency obstetric care in developing countries.

Funding solutions not problems

One of the most striking recent developments in safe motherhood has been the frank admission that many of the strategies originally put forward were ineffectual, despite the proclamation that “the interventions are known”. This was coupled with a failure to prioritise. Diagnosis of the underlying causes of maternal mortality led to the justifiable conclusion that action was needed on a wide variety of fronts, including strengthening the health system, improving women’s status and education, and addressing gender issues. But it also resulted in a tendency to load safe motherhood programmes with the responsibility for managing primary health care in its entirety.

Not until the 1997 Sri Lanka technical consultation was there greater clarity among international agencies about what works and what doesn’t and even today discussions continue around the expectations of TBA training, the role of risk assessment and the contribution of antenatal care. This poses problems from an advocacy perspective because donors (whether international or national) do not want to fund problems, they want to fund solutions, and they want to fund the kinds of solutions that can be monitored and around which it is possible to tell a story of success. The kind of question that a national level decision-maker, Minister of Finance or Minister of Health want an answer to is “What will be achieved if we invest in this programme? How many lives will be saved?” International donor agencies have much the same concerns. The single most important breakthrough achieved by the Task Force for Child Survival was in developing good responses to these kinds of questions and ensuring that all concerned agencies promoted the same kinds of interventions. Although there has been progress in doing the same in the safe motherhood arena, there is still some way to go and some needless conflicts that need to be resolved (such as the primacy of emergency obstetric care versus essential obstetric care, the role of the skilled attendant).

Conclusions

The success of any advocacy effort depends on achieving the right mix of messages and disseminating them through the most effective means. Recent efforts to get safe motherhood on to the agenda have been sporadic and have had to face many challenges, including lack of high level commitment, mixed messages, lack of prioritisation and focus, frequent changes in direction, absence of strong partnerships or a sufficiently diverse and vocal set of allies. The international agencies have not always been the source of such problems, but there is little doubt that they have contributed to their persistence.

Maternal health messages have focused largely on the size of the problem of maternal mortality and its human rights dimensions. What has been missing has been clarity about the interventions that work to reduce unsafe motherhood. Too many programmes try to do too much while simultaneously failing to focus on the interventions known to be effective. Solutions lie at the heart of any successful advocacy effort. There is today a much greater degree of clarity about what works but there remain many areas of uncertainty about how to implement the interventions successfully and in a sustained manner. The ongoing areas of disagreement need to be resolved as a matter of urgency or they risk distracting attention away from the issue. The positive energies created by the availability of unequivocal solutions have been critical to the success of child survival. Safe motherhood needs to promote such positive messages more aggressively in the future. The international health and development agencies can play a critical role in doing so.

In addition, ways need to be found to monitor progress towards the goal of safe motherhood. Because of the difficulty of measuring maternal mortality, attention has been directed in recent years to using process indicators. However, there is as yet no consensus on which process indicators are most feasible and appropriate for such monitoring. Nor is it clear that the process indicators currently under investigation are unambiguously related to the outcome of interest. Until this issue is resolved, decision-makers and funders will remain unconvinced that their money is being invested wisely. Again, international agencies should put greater energies into the kind of research and programme evaluation that will contribute to solving this conundrum.

Safe motherhood dissemination strategies have included major international meetings, involvement of women's health advocates, mobilising health

care professionals and incorporating specific safe motherhood interventions in donor-funded support. Yet on the whole these efforts have lacked conviction. Safe motherhood meetings tend not to attract the most senior decision-makers.

Political commitment has been cautious, sporadic rather than sustained, and generally not placed at a high enough level either nationally or internationally.

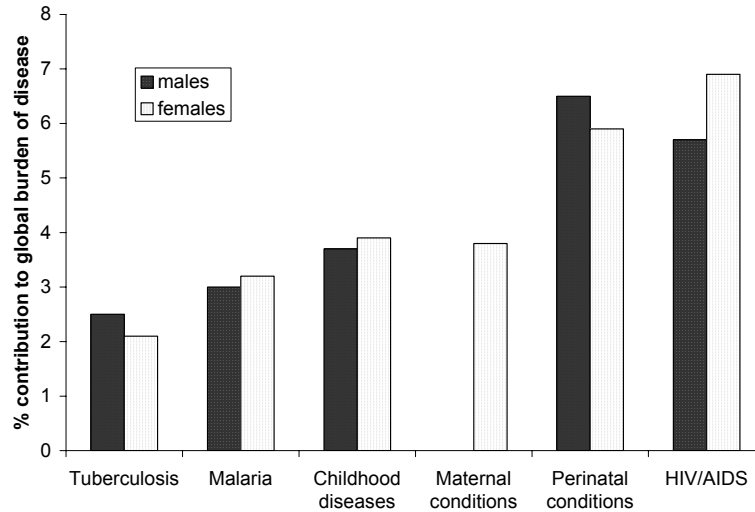
Alliances have been shifting and unstable. Safe motherhood's "natural" allies, women's advocacy groups, have had to contend with a large and ever growing agenda and have had misgivings about focusing on maternal health because of an understandable wish to avoid seeing women only in terms of their reproductive roles. This conflict needs to be resolved if safe motherhood is to be able to count on the support of this key constituency. Maternal health needs outspoken and determined champions from within the health system and the medical community, particularly the ObGyns. The obstetrician has responsibilities not only towards the women to whom they provide clinical care but also to those many millions of women who are beyond their reach. Obstetricians and gynaecologists must become the voices of the voiceless, the champions of the neglected, the militants for the poor.

Their leadership and their social and economic clout are necessary to shift resources at the national level on planning and investing to improve the non-functioning, non-performing health systems. International agencies can help promote and support the forging of such alliances.

For the future, safe motherhood needs greater visibility, at a higher level and more often. We need to harness the energies of well-organised, vocal and powerful advocates who can help mobilise a 'massive effort' of the kind now being directed towards to the trio of diseases which so excited the Group of Eight of G8 Summit in Japan - malaria, tuberculosis and HIV/AIDS. The premise underlying WHO's new 'massive effort' strategy to follow-up the G8 is that malaria, TB and HIV/AIDS are responsible for a significant proportion of the global burden of disease, that they particularly affect the poor, that they exacerbate the cycle of poverty and that cost-effective interventions are available for dealing with them. Exactly the same kind of rationale can be used to justify a 'massive effort' for safe motherhood. Indeed, in terms of total loss of healthy years of life (Disability Adjusted Life Years or DALY's), maternal and perinatal conditions account for

more of the total burden than malaria or TB and only a little less than HIV/AIDS (Figure 2). The fact that to date maternal mortality continues to be excluded from the 'massive effort' speaks volumes.

Figure 2. Contribution of maternal and perinatal conditions to the global burden of disease, 1999



Finally, substantive and long-term funding - by governments and by donor agencies - is needed to oil the wheels of the advocacy effort. Although it is difficult to track the level of funding for maternal health programmes over the past few years, it is clear that the resources available have not been enough to make a difference. The grant of US\$50 million to Columbia University represented the single largest donation to maternal health yet in comparison to the needs, the sum is paltry. Safe motherhood seems to have been afflicted by a problem of underfunding since the start of the Initiative. Only US\$5 million was available for operations research in safe motherhood at the start of the Initiative. WHO's newly established Making Pregnancy Safer Initiative has a mere US\$3 million at its disposal. With resources at these kinds of levels, progress towards safer motherhood will inevitably be limited.

Inadequate resources, lukewarm political commitment, failure to articulate evidence-based interventions, and the inability to tell a story of progress are all aspects of the same mutually reinforcing problem cycle. Maternal

health finds itself in a spiral of uncertainty and under-investment from which it is difficult to extricate itself. Yet progress has been made and much more is known today about what works than was the case a few years ago. The time has come for key actors – governments, civil society and health care workers – to come together in order to break the logjam and permit the implementation and evaluation of meaningful and significant interventions.

References

AbouZahr C and Wardlaw T (2000). Maternal mortality at the end of the decade: what signs of progress? (paper submitted to the WHO Bulletin).

Araujo and Diniz (1990). The campaign in Brazil: From the technical to the Political. In Women's Global Network for Reproductive Rights and the Latin American & Caribbean Women's Health Network/ISIS International (1990) *Maternal mortality and morbidity: a call to women for action*.

Cook R (1997). Advance safe motherhood through human rights, in: Starrs A (1997) *The safe motherhood action agenda: priorities for the next decade. Report on the safe motherhood technical consultation 18-23 October 1997, Colombo, Sri Lanka*.

De Brouwere V, Tonglet R and Van Lerberghe W (1997). La "Maternité sans risque" dans les pays en développement: les leçons de l'histoire *Studies in Health Services Organization and Policy*, 6, Antwerp, Belgium.

Fathalla M (1997). *From obstetrics and gynaecology to women's health: The road ahead*, New York, London, Parthenon.

Grant J (1990). Statement to the Fourth International Child Survival Conference, Bangkok, Thailand, March 1-3 1990.

InterAgency Group for Safe Motherhood (1990). Safe Motherhood Brochure.

Mahler H (1987). *Address to the Nairobi Safe Motherhood Conference*, World Health Organization, Geneva.

NIDI (2000). Manual resource flows for intermediate donors, questionnaire 1999. Resource Flows Team, P.O. Box 11650, The Hague, The Netherlands.

Pathmanathan I and Shanti D (1990). *Malaysia: moving from infectious to chronic diseases in achieving health for all by the year 2000*. Edited by Tarimo E and Creese A, WHO, Geneva.

Rosenfield A and Maine D (1987). Where is the M in MCH? *Lancet*.

Safe Motherhood Inter-Agency Group (1999). *Final report on the program to mark the tenth anniversary of the Safe Motherhood Initiative*.

SIDA (1993). *Population policies reconsidered*.

Spring-Rice M (1939). *Working-class wives: their health and conditions* Pelican Book.

- UNFPA (1994). Programme of Action adopted at the International Conference on Population and Development.
- UNFPA (1999). Safe motherhood evaluation *Evaluation findings* Office of Oversight and Evaluation, issue 10, January.
- UNICEF (1996). *The Progress of Nations*. United Nations Children's Fund, New York, NY.
- UNICEF/WHO/UNFPA (1997). *Guidelines for monitoring the availability and use of obstetric services*.
- Weil O and Fernandez (1999). Is safe motherhood an orphan initiative? *Lancet* 354 (9182) 11 September 1999.
- Werner D and Saunders D (1997). *Questioning the solution: The politics of primary health care and child survival* HealthWrights, Palo Alto, California.
- WHO (1986a). *Prevention of maternal mortality: report of the WHO interregional meeting*, November 1985. WHO/FHE/86.1.
- WHO (1986b). *Maternal mortality rates : a tabulation of available information*. World Health Organization, Geneva (doc.FHE/86.3).
- WHO (1986c). Maternal mortality: helping women off the road to death. *Chronicle* 40(5),175-183.
- WHO (1987). Safe motherhood factsheet prepared for the Nairobi Conference.
- WHO (1991a). *Maternal mortality ratios and rates: a tabulation of available information*. World Health Organization, Geneva (doc.WHO/MCH/MSM/91.6).
- WHO (1991b). Division of Family Health, *Report of the Programme Support Committee (PSC)*. World Health Organization, Geneva.
- WHO (1992). *Women's groups, NGOs and safe motherhood*. World Health Organization, Geneva (doc.WHO/FHE/MSM/92.3).
- WHO/UNICEF (1996). *Revised 1990 estimates of maternal mortality: a new approach by WHO and UNICEF*. World Health Organization, Geneva (doc. WHO/ FRH/MSM/96.11 UNICEF/PLN/96.1).
- WHO/Regional Office for South-East Asia (1997). *Regional Consultation on health indicators: Report of an intercountry meeting*, New Delhi, 18-22 November 1996.

WHO/UNFPA/UNICEF/World Bank (1999). *Reduction of maternal mortality : a joint WHO/UNFPA/UNICEF/World Bank statement*. World Health Organization, Geneva.

Women's Global Network for Reproductive Rights and the Latin American & Caribbean Women's Health Network/ISIS International (1990). *Maternal mortality and morbidity: a call to women for action*.

The World Bank (1999). *Safe Motherhood and The World Bank: Lessons from 10 years of experience*.

Yamin AE and Maine DP (1999). Maternal mortality as a human rights issue: measuring compliance with international treaty obligations. *Human Rights Quarterly* 21,563-607.

What are maternal health policies in developing countries and who drives them? A review of the last half-century

Oona MR Campbell¹

Summary

This paper examines maternal health policies in developing countries and identifies contributions made by policy makers, health professionals and users. It starts by reviewing the broader health systems within which maternity services sit, and the specific maternity-service configurations that appear to lead to low maternal mortality. Next, it lays out the main actors (politicians and policy makers, health professionals and women's groups) operating internationally. This is followed by presenting the maternal health policy agenda at the international level and discussing the ideological paradigms that influenced these policies. Mention of the main actors (as above but including and organised groups of service users) at the national level is more superficial, but examples of the impact of various actors on national-level maternal health policies are given. The overall aim is to better understand how policies have developed and to suggest lessons and ways forward for the future.

Introduction and rationale

Each year around 585,000 women die and many more encounter serious problems in childbirth (WHO 1996, AbouZahr 1998). Furthermore, around 120 million women have unwanted pregnancies and 20 million have unsafe abortions (Ashford 1995). Maternal deaths affect hundreds of thousands of families and communities; several million children are left motherless each year, and an estimated one million young children die soon after the deaths of their mothers. Adding maternal morbidity to mortality, the 1993 World Bank's assessment of the global burden of disease estimated that 18 percent of the disease burden of women aged 15-49 was due to maternal causes, making

¹ Reproductive epidemiologist with degrees in demography, epidemiology and biology, London School of Hygiene and Tropical Medicine, 49-51 Bedford Square, London WC1B 3DP
Email: oona.campbell@lshtm.ac.uk

these the leading cause of illhealth in this age group (World Bank 1993, AbouZahr 1998). The vast majority of these problems occur in low-income countries, where poverty increases sickness and reduces access to care (WHO 1996). They also occur within a context of gender-based economic, political and cultural discrimination and neglect of women's rights to equal status and equitable access to services.

Perhaps the most compelling reason to address maternal mortality is that it is largely avoidable, and the technical interventions needed are well understood (WHO 1994, Starrs 1998). What is less clear is how to create an enabling environment to implement these obstetric care interventions (Koblinsky *et al.* 1999). This paper examines the history of maternal health policies in developing countries, and looks at the roles played by the main actors involved in influencing these policies. The paper starts by reviewing the broader health systems within which maternity services sit, and the specific maternity-service configurations that appear to have led to low maternal mortality. Next, it lays out the main actors (the politicians and policy makers, health professionals and women's groups) operating internationally, and presents the international maternal health policy agenda. It also discusses the ideological paradigms that have influenced these policies. Presentation of the main actors (politicians and policy makers, health providers and organised groups of women's rights activists and consumers), at the national level is by necessity more superficial, but examples of the impact of various actors on national-level maternal health policies are given. The overall aim is to better understand how policies have developed and to suggest lessons and ways forward for the future.

Health system solutions

This section of the paper considers the main types of national health systems through which specific services can be delivered and characterizes specific features relating to maternity care, particularly delivery services. It aims to provide a backdrop for interpreting policies and policy shifts.

Preventing the bulk of maternal deaths requires curative care, i.e. using clinical services to treat conditions as they arise to prevent them from leading to death (WHO 1991). By the early 1990s these were identified and labelled essential obstetric care (WHO 1991). The main challenge for countries is to

organise maternity health services so as to deliver these relevant preventive and curative interventions, particularly around the time of labour and delivery when most deaths occur. Most effective interventions require skilled, often specialized, personnel.

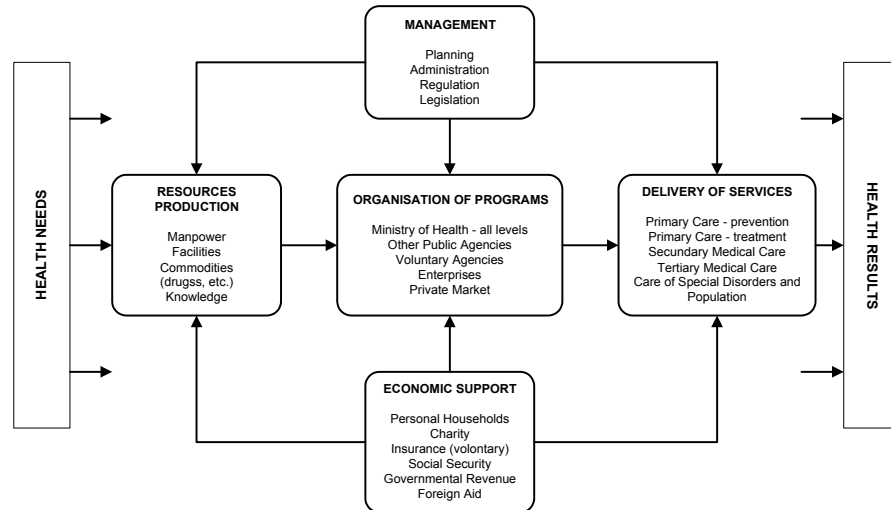
The features of maternity care services are largely determined by the characteristics of the national health systems within in which they are imbedded. National health systems comprise five main interacting components as shown in Figure 1: resources, organization, management, economic support, and, delivery of services (e.g. maternity care) (Roemer 1991). The components are in turn affected by a great multiplicity of social influences that can be grouped as economic, political and cultural.

Roemer (1991) presents the national health systems of the world in a matrix based on the first two, the economic status of the country according to annual GNP (grouped as affluent and industrialized, developing and transitional, very poor, or resource (oil) rich) and its health policy orientation (grouped as entrepreneurial, welfare oriented, comprehensive, or socialist)². Examples of very poor countries with the above four health policy orientations respectively are Nepal, India, Sri Lanka, and China. During the 1980s, most very poor countries were categorized as having welfare-oriented health policies (Roemer 1991). In more recent years, very poor and transitional countries have been pressurized by the economic policies and structural adjustment programmes of the IMF and the World Bank to further reduce government expenditure and to rely more on private services and markets, thus moving more strongly to entrepreneurial and welfare-oriented health

² Health systems with an entrepreneurial orientation have very strong private markets and intervention by government or other entities is minimal. Private care dominates, and government programmes, planning and regulation tends to be weak. Access to health care is uncertain and is the individual's responsibility. In welfare systems, the government and others intervene in the private market, typically by organizing the financing of private care (industrialized countries) or by major efforts to bring services to rural populations (transitional and very poor countries). In comprehensive-type health systems, governments carry this even further by allowing all or nearly all the population equal entitlement to complete health services. There are relatively few examples of very poor countries with comprehensive services. Finally in socialist health systems, market intervention is carries to its furthest point. There is virtually no private health care and the government collectivizes financing, and takes control of human and physical resources (Roemer 1991).

policies. In Zimbabwe for example, progressive erosion of the general standard of health services has been associated with a rising maternal mortality ratio (CSO 1995).

Figure 1. The five main interacting components of national health systems (taken from Roemer 1991)



Within the context of their national health systems, maternal health programmes need to find ways to decrease the gap between women and services so that both respond rapidly and appropriately to the obstetrical complications that cause death. Most countries appear to have developed a least minimal infrastructure for providing antenatal care, but a far bigger challenge is posed by delivery care services. We identify four basic models for organizing maternity care services. These can be described based on where women deliver and who delivers them (Figure 2) (Koblinsky *et al.* 1999). The differences in cost and constraints of the four models, in terms of type of staffing, training, upgrading of skills, type and number of health facilities, supervision, regulation, and fulfilment of mothers' wishes, have not been quantified or described and thus are poorly understood) (Koblinsky *et al.* 1999). Nevertheless the evidence unearthed suggests that where non-professionals (i.e. TBAs or relatives) carry out home deliveries, maternal mortality ratios are usually staggeringly high (often between 500-1000 per

100,000 – e.g. the Gambia) and never fall below 100 deaths per 100,000 women (e.g. rural China and Forteleza, Brazil). When a professional (midwife or doctor) linked up with a strong referral system carries out deliveries, maternal mortality ratios can be reduced to 50 per 100,000 or below, irrespective of whether births takes place at home, in health centres or maternity homes, or in hospitals. However, even where all births take place in a hospital (the fourth and arguably most advanced model), mortality is not necessarily reduced to fewer than 100 per 100,000 (e.g. Mexico City and Former Soviet Union)) (Koblinsky *et al.* 1999).

Figure 2. *Safe Motherhood Care: required features of service delivery models*

Models	Features of service delivery	Maternal mortality ratios/100,000 by country
Non-professional delivery at home	<ul style="list-style-type: none"> • Non-professional recognises complications • Access to EOC organised by family or non-professional • Functioning EOC available 	Rural China: 115 Forteleza, Brazil: 120
Professional delivery at home	<ul style="list-style-type: none"> • Professional recognises complications, provides basic EOC • Access to EOC organised by family or provider • Functioning EOC available 	Malaysia (1970-80s): 50 Netherlands (1983-92): 7
Professional delivery in limited EOC facility (health centre)	<ul style="list-style-type: none"> • Professional recognises complications, provides basic EOC • Facility organises access to EOC • Functioning EOC available 	Malaysia (1985-1990s): 43 Sri Lanka: 30
Professional delivery in full EOC facility (hospital)	<ul style="list-style-type: none"> • Professional recognises complications • Professional provides basic and comprehensive EOC 	UK: 9 USA: 12 Mexico City: 114

EOC = essential obstetric care

A key feature of countries that have lowered maternal mortality to a level of < 100 per 100,000 appears to be that the large majority of births are delivered by professional skilled birth attendants. Where women are geographically isolated, strategies used to increase access to professional care include obligatory rural postings or incentives to health staff in rural areas, use of maternity waiting homes (homes located close to a referral facility where pregnant women can go near term)³ and delegation of life-saving skills to

³ The national programmes of Cuba and Mongolia have used maternity waiting homes. In Ethiopia, projects with maternity waiting homes contributed to reducing maternal mortality

lower level staff.⁴

Where professionally trained birth attendants cannot conduct most deliveries, the appropriate organization of services is not clear. If referral services are accessible and functioning, prenatal screening based on poor obstetric history and identification of present medical problems or complications carried out by a trained nurse-midwife with women and their TBAs in the community, may contribute to reducing local, hospital-based maternal mortality (e.g. Nigeria (Brennan 1989) or Ethiopia (Poovan *et al.* 1990)). TBAs and families can identify early signs of complications during labour and delivery and refer women successfully for treatment (e.g. Indonesia (Alisjahbana 1991) and Guatemala (Schieber 1991)). In Fortaleza Brazil (Koblinsky *et al.* 1999, Janowitz *et al.* 1985) such a TBA based system functioned, but with extraordinary inputs in terms of supervision, referral and free emergency care at the referral hospital. More commonly the necessary supervision and the required linkages to referral services are not available. In such instances, in Indonesia and the Gambia for example, trained TBAs alone, without the support of skilled back-up services, do not decrease the maternal mortality ratio (Alisjahbana 1991, Greenwood *et al.* 1987, Greenwood 1991). Rural China poses an intriguing exception in that it appears to achieve relatively low maternal mortality without a strong referral system or free tertiary level care (Koblinsky *et al.* 1999); much more effort is needed to understand how China is able to achieve such low mortality in its rural areas.

International maternal health actors and policies

This next section reviews the main international actors in maternal health and the main positions they adopted vis-à-vis maternal health over time. This is followed by a review of the main international maternal health policies and the roles played by the various actors in getting them on the policy agenda. Besides the economic status of the country and configuration of the health system described in section II above, Lush and Campbell (2000) iden-

when communities participated in their planning, development and management (Poovan *et al.* 1990). This approach was also used historically in the USA (e.g. in Alaska and Kentucky) and in Australia.

⁴ In Zaire, delegation of certain life savings tasks (manual removal of the placenta and Caesarian section) to trained midwives located close to women saved lives, especially in emergency situations (White *et al.* 1987).

tify four ideologies have influenced maternal health policies: family planning, primary health care (PHC), neo-liberal economics and women's status. These are described in some detail in Annex 1, but their impacts on policy development in maternal health at various points in time are touched on briefly below.

INTERNATIONAL ACTORS

In the first half of the 20th century, there were approximately 60 nation states, and many of the countries now classified as developing countries, especially the poorest, were colonies or protectorates (Zapata & Godue, 1997). The main international actors in health were the colonizing countries, a few international organizations (e.g. the International Sanitary Conference, or the Pan American Sanitary Bureau), foundations (e.g. the International Health commission of the Rockefeller Foundation) and missions. Most tropical medicine or international health efforts were geared around war and trade (Zapata & Godue, 1997) and oriented around the protection of the colonizing population and its workforce (Jolly 1997).

During this period, little attention was given to maternal health internationally, except occasionally where colonized populations appeared to be declining, as for example in Fiji (Jolly, 1997, 1997b) and Tanganyika. By the start of the 20th century, however, Manderson (1997) shows how in Malaya for example, English colonists wives' concern with their own maternity flowed over into concerns with the maternity and mothering of other women, and services were developed in response, in this case by the colonial government. In other settings, such services were largely provided by missions⁵ (see for example in Africa (Chintu & Susu 1994, Beinart 1992, Vaughan 1991) or in Papua New Guinea (Denoon 1989).

The WHO was founded in 1948 to promote and protect the health of all people. It was built on the premise of building sovereign nation states and intended to function as an inter-governmental institution. In the report of the first 10 years of WHO, maternal and child health is a clearly identified area of action and a chapter is devoted to it (WHO 1958). The major thrust

⁵ Jolly (1997) reports that Fijian women who trained as midwives in mission hospitals saw themselves as much servants of God as of science.

in the 1950s was providing technical support to training sufficient number of personnel (including domiciliary training for midwives in order to raise the standards of home births), creating administrative divisions of maternal and child health within national health systems, and integrating maternal and child health services with general health services.

International co-operation in maternal health started somewhat later, mostly in the mid-1960s, when Western donor countries and international agencies first started to fund maternal and child health (MCH) programmes of national Ministries of Health. However, in the report of WHO's second 10 years (1958-67) overlapping this period, maternal health features much less than previously (WHO 1968).

By the 1970s, the family planning movement influenced those involved in maternal health. WHO clearly adopted and prioritised a family planning strategy (WHO 1974). For other actors too, such as UNICEF or USAID, the focus and funding of MCH was actually geared to child health and family planning (Rosenfield & Maine 1985). WHO remained a key actor in maternal health the late 1970s and early 1980s as a new health-care ideology was promoted for developing countries. This involved switching towards PHC and the proposal of "Health For All by the Year 2000" (WHO 1978). WHO's approach to maternal health in the mid-1980s advises training TBAs as one of the most cost-effective strategies to reduce maternal mortality and morbidity (Belsey 1985). TBA training programmes also drew considerable support and funds from UNICEF, UNFPA and USAID, among others, especially since the latter two agencies had a further interest in using TBAs as family planning workers.

During the same period, the international women's health movement, which had emerged in the 1970s in the industrialised West, started leading global campaigns for women's rights and to expand the interest in women's health beyond family planning. Government donor agencies, such as the Swedish Agency for Research Co-operation with Developing Countries (SAREC), foundations and NGOs also supported research and activities in women's health (for example, see the World Federation of Public Health Associations 1986 or Bergstrom *et al.* 1993). The Women in Development programme within USAID also supported research-based activities on women's health issues through an NGO, the International Centre for Research on Women (ICRW). Indeed USAID also initiated some funding of

maternal health programmes through what were to become the MotherCare projects, despite lacking a congressional mandate, on the strength of advice by their technical staff, many of who were women who identified with the aims of the women's movement. The World Bank also played an important role: in the 1980s, they attempted to counterbalance the child survival work that had been led with strong support by USAID, UNICEF and, to a lesser extent, WHO, and to redress the balance in favour of adult health (Reich 1995).

Finally, in 1985, two academics from Columbia University, Rosenfield and Maine (1985) wrote a highly influential paper that galvanised interest and put the issue of maternal mortality on the international health policy agenda. They argued that MCH programmes focused almost exclusively on child health, assuming that "whatever is good for the child is good for the mother" (Rosenfield & Maine 1995: p 83), and called on obstetricians and the World Bank to take the lead in maternal health policy. The first international conference devoted to maternal mortality (Safe Motherhood Conference, Nairobi, Kenya, 10-13 February 1987) was sponsored by the World Bank, WHO and UNFPA and led to the launch of the Safe Motherhood Initiative (SMI).

International agencies involved in the SMI coalition included five UN agencies (WHO, UNDP, World Bank, UNFPA, and UNICEF) and two NGOs (the Population Council and IPPF). Family Care International, another NGO, also came to be involved in organising the first national conferences on safe motherhood. USAID was not a SMI coalition member but was influential through its MotherCare I demonstration projects and research support. Other, mainly research, activities were also launched in response⁶. In 1987 the international women's movement also launched a day of action focussed around maternal mortality (te Pas 2000). The success of this event led to a 10-year campaign coordinated by the Women's Global

⁶ These include the Columbia University Prevention of Maternal Mortality Network in West Africa, funded initially by the Carnegie Foundation (Lucas 1997); the London School of Hygiene and Tropical Medicine Methods for Measuring Maternal Health Programme, supported by Ford Foundation and the UK Overseas Development Administration (now DFID)(Graham & Campbell 1990); and Uppsala University International Maternal Health Care training programme, supported by the Swedish Agency for International, Technical and Economic Co-operation (BITS) (Bergstrom *et al.* 1993).

Network for Reproductive Rights (WGNRR)⁷ to reduce maternal mortality that ended in 1996 (te Pas 2000).

International funding of safe motherhood in 1990 showed that of total external assistance a mere 0.2 percent went to safe motherhood (although a further 16 percent went to MCH services which would mainly have targeted child health) (Zeitlin *et al.* 1994) reflecting a low priority by donors. Indeed it was not until the mid-1990s that international actors funded large-scale programmatic activity. Here the main actors were USAID projects with MotherCare II, and more recently the Maternal and Neonatal Health project, and the World Bank. The UK's Department for International Development (originally ODA) also supported large programmes in Nepal and Malawi, and in some countries UNICEF and UNFPA⁸ also pay considerable attention to maternal health and contributed through national programmes. UNDP appears to have dropped out of the SMI for reasons that are unclear. The International Federation of Gynaecologists and Obstetricians, FIGO, has also started several projects, supported by national societies from industrialized countries. Most recently, in 1999, the Bill and Melissa Gates Foundation has contributed to work in maternal mortality reduction, via Columbia University and Family Care International.

INTERNATIONAL POLICIES

The early international maternal health policies adopted are best summarised by the report of the 1950 WHO Expert Committee on Maternity Care that stated '*In the implementation of a programme of maternity care, expenditure for adequate training of personnel should take precedence over other expenditures if, in fact, a choice has to be made*' (WHO 1958). WHO assigned teaching staff to medical and midwifery schools, and in-service training was organised. Efforts

⁷ But involving women's groups from many developing countries, with strong representation from Latin America, the Philippines, and India.

⁸ UNFPA health programmes typically adopt a reproductive health strategy. In some settings, for example Morocco, the UNFPA reproductive health programme includes a major safe motherhood initiative. Overall though, our perception is that this is an exception; for example in a joint UNFPA/EU reproductive health programme in six Asian countries, only 11 out of 40 NGO projects mentioned any aspect of maternal health. In three countries, there was no mention of safe motherhood activities at all, in two countries there was a minimal mention, and only one country, Nepal, had safe motherhood components in most projects.

were made to include domiciliary training of midwives to raise the standards of home births and many fellowships were awarded for academic study and study tours (WHO 1958). UNICEF assisted by providing equipment and in developing training courses for traditional birth attendants. A 1954 WHO Expert Committee on Midwifery Training described the different types of personnel required, their characteristic functions and their training requirements (WHO 1958).

These policies were translated into activities in various countries. For example, in Kabul Afghanistan, WHO assisted in establishing a maternity hospital, a domiciliary midwifery service and antenatal care, staffed by the first trained midwives to give service in the history of the country (WHO 1958). MCH services were seen as creating appreciation among the national populations for curative and preventive health services and hopes were expressed that such services, particularly the rather limited MCH services in rural areas, would become the nucleus for more comprehensive health services. By the mid 1950s, WHO was also proclaiming the desirability of integrating MCH activities into general public health and medical services where these existed (WHO 1958).

By the 1960s, WHO seems to have lost its focus on maternal health and its policies were less clearly articulated. For example, its summary of the second 10 years (WHO 1968) has no specific chapter heading on maternal and child health, but seems instead to concentrate instead on an expanding range of issues. At national level though, training activities appeared to continue as in the first 10 years. For example, Zambia opened community and professional midwifery schools in 1967 and 1969 respectively with support from WHO (Chintu & Susu 1994). A lack of data may have exacerbated the neglect of maternal health (Graham & Campbell 1992): maternal mortality in the industrialised countries was plummeting, while data from very poor countries was virtually non-existent.

The 1970s saw more reliable maternal mortality estimates for developing countries that made the very high rates in developing countries evident (Vaughan 1987) and the production of one of the first WHO documents to focus exclusively on maternal health (WHO 1974). WHO's document (1974) clearly describes a maternal health strategy that prioritises family planning as a way of improving maternal health. It argues that maternal morbidity and mortality and foetal perinatal and infant mortality

increase with repeated pregnancies and calls for integration of family planning into already existing MCH and family health programmes. This shows the influence of the strong international family planning agenda (see annex 1). At the same time, the 1974 WHO document also makes the statement that '*the training of traditional birth attendants for home deliveries is recommended rather than trying to persuade rural women to go to hospitals or trying to train enough professional midwives*'. This policy shift may have been a pragmatic response to the growing observations that professional midwives and obstetricians were reaching very few women and that hospitals gobbled up huge portions of national health budgets but it was also clearly thought that training TBAs could improve equity in access to health care, one of the key features of the PHC ideology that was emerging at this time (see annex 1).

By the late 1970s and early 1980s, implementing PHC for maternal health in a cost constrained environment translated into a limited set of activities, none of which were particularly effective. The promotion of minimally-trained multipurpose workers at the community level, including traditional and volunteer health cadres that did not need government salaries, was a development very much in harmony with the thrusts of both primary health care and cost-containment. As part of this trend, support for the training of traditional birth attendants (TBAs) increased, whereas training of specialist cadres, those most necessary for preventing maternal deaths, decreased. For example, in the mid 1970s, the Bangladesh government discontinued training women who were in effect specialist community midwives and replaced them with family welfare visitors who were eventually to prioritise the delivery of contraceptives at the community level (Sherratt 1999). Similarly, in Egypt, midwifery schools were closed in the 1970s, and the current shortage of trained personnel with midwifery skills is a consequence that many other countries share today (Kwast 1992).

The influence of PHC and cost containment on the policy focus in maternal health can also be seen in the emphasis on antenatal care (as a preventive rather than costly curative service that could be delivered by relatively untrained health workers), and risk approach (as a way to rationally triage resources in poor environments by paying attention to those in greatest need) (Backett *et al.* 1984). These factors combined, meant that TBA training and antenatal care came to be thought of as the most cost-effective

solutions to the problem of maternal mortality and morbidity until the mid to late 1980s (WHO 1974, Belsey 1985), though they came to be discredited by the 1990s. Global indicators for 'Health for All by the Year 2000' included measures of the proportion of the pregnant population receiving antenatal care, and the proportion delivered by trained attendants (including trained traditional attendants), that reflected these policies. In the poorest countries, coverage of professional delivery care services remained severely restricted; levels of maternal mortality remained very high.

In the early and mid 1980s, the women's movement activities to draw attention to women's health status brought the issue of maternal health successfully to the attention of major international institutions like the WHO and the World Bank. They made a public outcry about the high levels of maternal mortality in the developing world at the Mexico City Population Conference of 1984, and the World Conference to Review and Appraise the Achievements of the United Nations Decade for Women in Nairobi in 1985. The women's movement was also an important influence leading to the 1987 Safe Motherhood Conference in Nairobi. The latter highlighted the persisting tragedy of maternal death in developing countries and set itself a target to halve maternal deaths by the year 2000 (Mahler 1987). The international women's movement's own campaign to prevent maternal mortality and morbidity also had similar goals (te Pas 2000).

Unfortunately, although the women's movement advocated for maternal health, it was never as specific in its demands for delivery services as it was in its demands for abortion services. For example, Correa's (1994) book on feminist perspectives on reproductive health makes only mentions abortion as a cause of maternal mortality. Women's groups may have been fearful of focussing too much on women's traditional value as mothers (Jolly 1998). In her analysis of the contribution of the international women's movement to safe motherhood, te Pas (2000) suggests that factors responsible for this included the diverse nature of the movement membership, their reluctance to being co-opted by engaging too closely with governments and international players like the World Bank. She also points out that the SMI had also failed to pay much attention to the question of how services could be best organised. For their part, some SMI advocates distanced themselves from the feminist agenda and attempted to focus on the technical aspects of Safe Motherhood, rather than diluting it by

addressing women's status and living conditions more broadly: 'SMI is not the women's initiative. It is not intended to meet all of women's medical and social needs' (Law *et al.* 1991). In 1996, the WGNRR decided to end its campaign on maternal mortality, replacing it with two campaigns: one on abortion and the other opposing cuts in health budgets and the World Bank (te Pas 2000).

Women's groups also promoted maternal health within the context of the 1994 ICPD. The 1993 Women's Declaration on Population Policies published prior to the ICPD incorporated previously separate areas of health, including maternal, into the definition of reproductive health. This was despite relatively little involvement of the international maternal health policy community in defining the reproductive health agenda (those involved were mainly concerned with ensuring that maternal health was part of this agenda for advocacy purposes and in the hope of attracting greater financial resources). At ICPD, women's groups saw maternity services as a core element of a comprehensive reproductive health care package. However a conflict remained over how the new ICPD agenda was to be funded (Murphy & Merrick 1996).

Policies within the international Safe Motherhood Initiative evolved slowly over time. Until the early 1990s, the SMI struggled to clarify the paradigms for providing maternal health services. Strong arguments were also made against exclusive reliance on the high risk screening approach and the value of TBA training. Maine (1991) cogently articulated the case for services at the referral hospital level. In an UNDP document with Law and colleagues (Law *et al.* 1991) also argued for a strong focus on maternal mortality and away from maternal health. In 1994, WHO articulated its policies in the form of the Mother -Baby package (WHO 1994), which included four pillars: antenatal care, clean safe delivery, EOC and family planning. The international SMI was not much influenced by the debates within ICPD. Perhaps the most significant shift in policy has occurred with respect to the call that all women have access to a skilled attendant. At the 1997 technical meeting of the SMI in Sri Lanka, Koblinsky and colleagues presented case studies of developing countries that had successfully reduced maternal mortality. In most of these countries skilled attendants were involved. The 1997 Technical conference document (Starrs 1998) presents a

broad spectrum of policies⁹, including one reflecting a growing consensus on the need for skilled attendant for all births. The 1999 World Assembly adopted this goal. The maternal mortality target was also shifted to reducing the maternal mortality ratio by 75% by 2015' (DFID 1999).

National maternal health actors and policies

It is not possible to review the main actors and policies within individual developing countries in the format used in the previous section for international actors. National players parallel the main groups seen internationally. They include politicians and national level policy makers, members of the national ministries of health, professional groups of doctors and midwives, traditional birth attendants, women's and service users' groups. Examples given of the roles they have played in getting various issues on the policy agenda. Some examples are also used from industrialised countries as these are better documented in the literature.

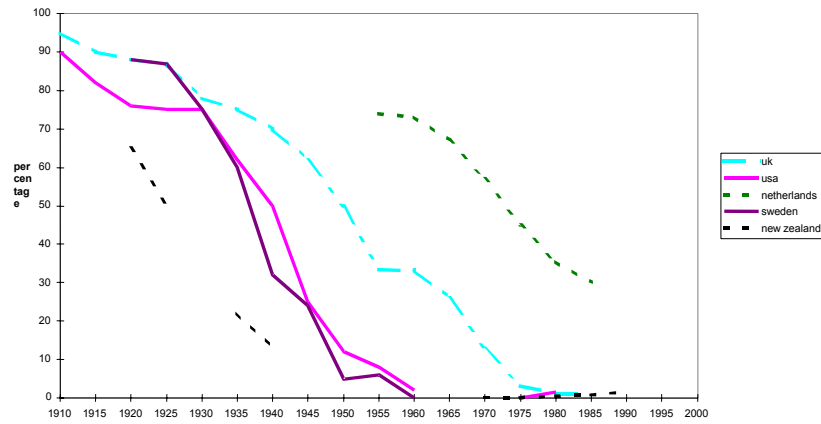
INDUSTRIALISED COUNTRIES

It is difficult to summarize national policies with respect to childbirth. In the West, the development of life-saving technologies occurred at a time when childbirth was professionalised and was becoming increasingly institutionalised (see figure 3). The 1950s and 1960s saw rapid and considerable falls in maternal mortality and maternal deaths ceased to be a big public health concern (Loudon 1992). The concerns in the late 1960s, 1970s and 1980s shifted to perinatal mortality and to issues related women's satisfaction with birth and iatrogenic medical practices.

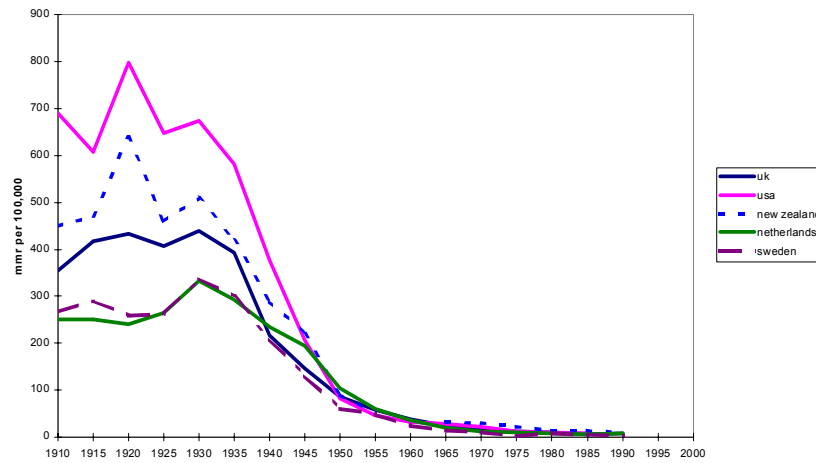
⁹ Other policies include three messages aimed at changing the political environment by advancing safe motherhood through human rights; empowering women; and clarifying safe motherhood as a vital social and economic investment, and six messages aimed at the design and implementation of programmes: delaying marriage and first birth; acknowledge that every pregnancy faces risk, improving access to quality maternal care; preventing unwanted pregnancy and addressing unsafe abortion; the importance of measurement; and the power of partnerships (Starrs 1998).

Figure 3. Percentage home deliveries and maternal mortality ratios for selected industrialised countries

a. Percentage home deliveries



b. Maternal Mortality Rates 1910-1990



GOVERNMENTS AND POLITICIANS

Although Loudon (1992) and Maine (1991) present the declines in maternal mortality as stemming largely from medical advances (including sulpha drugs and antibiotics to treat infection, better medical management of hypertensive

diseases of pregnancy and better blood transfusion technology), De Brouwere and colleagues (1998) convincingly identifies other factors. These include early awareness of the problem, recognition that the deaths were avoidable, and mobilisation of health professionals and the community. They also identify the political contribution to policies that enabled medical advances to be delivered to the population at large, namely by making sure that modern obstetric care (skilled birth attendants were available to all (De Brouwere *et al.* 1998). Similarly, Williams (1997), in her history of maternity care services in the UK in 20th century, provides a rich documentation of the roles of both government and politics in promulgating specific forms of delivery care. She also shows the appeals made to individual women by political parties (e.g. an election poster in 1929 stating 'Women if you want...Medical Care for Mothers and Babies...Vote Conservative'). Even in the USA, with its entrepreneurial health system characterised by negligible government inputs, Margolis and colleagues (1997) argue that Congress passed the Maternity and Infancy Act in 1921 because of international comparisons showing the poor standing of the US, and fear of a feminize voting block backlash (women had just been given the vote).

MINISTRIES OF HEALTH AND HEALTH PROFESSIONALS

In industrialised countries with comprehensive health systems, national ministries of health have played a key role in organizing services. Child-bearing was increasingly institutionalised in most countries in Europe, although some, such as the Netherlands, set about deliberately maintaining home births with midwives (Van Altem *et al.* 1989 & Treffers *et al.* 1990).

In other instances, health professionals have come to the fore as key policy actors. For example, national organizations of midwives have supported policies which retain their professional control as autonomous providers for normal births. In the USA, private markets and the medical profession were much more influential in setting policies than the government. The American Medical Association's political efforts to exclude midwives and the black medical schools from delivery have been well-documented (Margolis *et al.* 1997). Earlier, the AMA actively attempted to restrict government control of services (Margolis *et al.* 1997). More recently, insurance companies and HMO have also played key roles in such issues as the length of hospital stay after normal delivery (Kotagal *et al.* 1999).

Professional bodies have also been influential in determining standard of practices, as for example with the Confidential Enquiry into Maternal Deaths, conducted by the UK Royal College of Obstetrics and Gynaecology.

WOMEN'S GROUPS

Women's groups and users groups have also had an influential role in affecting maternity care policy in later years. In the UK for example, groups like National Childbirth Trust (NCT), Association for the Improvement in Maternity Services (AIMS) Maternity Alliance, and historically, the National Birthday Trust have used a variety of advocacy tools to effect enormous changes in the quality of maternity care delivery in the last 40 years - not least by the skilful use of the media to disseminate and publicise their own and other relevant research findings. For example, The Changing Childbirth policy adopted in the UK government in the 1990s was developed in close concert with the NCT among others. Such user and/or women's groups also occasionally provide services, although they tend to be allied to but not directly maternity care services. For example the NCT provides antenatal care and breastfeeding support classes while in the USA, the Jane Collective in Chicago taught women to become lay abortion providers, at a time before abortion was legal.

DEVELOPING COUNTRIES

Apart from the literature on maternal health services during colonial administrations cited earlier, there is a limited literature on developing countries' maternal health policies prior to the second half of the 20th century. Kuhnke (1990) however, provides a rich description of Muhammed Ali's 19th century attempts to bring midwifery care to Egypt as a response to the problem of under-population. For most countries though, the concept of national policies only becomes meaningful after the end of the Second World War. In countries other than the West, national policies in this period seem to have depended to a great extent on the prevailing political systems and the allegiances held by governments in the Cold War (Zapata & Godue 1997). In general, socialist countries prioritised health care as a human right and made maternal health facilities widely available, including community programmes in the rural areas and, in many cases, abortion services (e.g. Soviet Union, Cuba, Sri Lanka, Kerala). In the Western-

oriented developing countries, maternal health, and access to health-care in general, was less of a priority to policy-makers and donors. Increased training of doctors and midwives and building of large hospitals was probably as much part of a general bid to increase human resources and develop rather than as a deliberate maternal health strategy (Rosenfield & Maine 1985).

GOVERNMENTS AND MINISTRIES OF HEALTH

Some countries did institute successful maternal health programmes, largely through governments and Ministries of Health. These examples of success include China, Malaysia, Sri Lanka, and more recently Iran. These countries boasting low mortality rates share a number of common features that could feed into policy agendas elsewhere. These include strong political support from health ministries and central government and long-term planning, often over 20 to 50 years. There is also efficient co-ordination between all levels of care from non-professional attendance at home to top medical care in hospitals. Accountability of local officials - crucial as a management tool in China and Malaysia and free referral to specialist and essential obstetric care was provided in Fortaleza Brazil, Malaysia, and Sri Lanka. Equity for rural populations was also a major policy thrust, but apparently not at the cost of good quality. In parts of Africa by contrast Kasonde (1994) states that 'The historical background of inequity in most countries led them to emphasise equity even at the risk of reducing the quality of services'.

HEALTH PROFESSIONALS

It has not been possible to date to review literature on the contribution of professional groups in developing countries in setting maternal policies. Groups like the UK Royal College of Obstetricians play a role in framing the issues, largely by convening meetings (Philpott 1979). There are also several examples in the literature of where professional groups, normally doctors, have obstructed delegation of responsibility to other cadres. Also, in some countries, midwives and other staff do not have legal cover (Kasonde 1994).

WOMEN AND USER'S GROUPS

An international workshop¹⁰ on grassroots advocacy for maternity service^s determined that the majority of NGOs in developing countries were involved in a variety of activities that were allied, but secondary, to the provision of functioning delivery care services. These included providing training for traditional birth attendants, antenatal and post-partum care, fertility and abortion services, breastfeeding counselling, community education and sensitisation of health workers and service providers. However, after 10 years of the Safe Motherhood Initiative, experience suggests that such activities in isolation have had a limited impact on reducing maternal mortality, and that improvements in the availability and quality of delivery care are still desperately needed. Few of the NGOs interviewed were actively engaged in service delivery or advocacy activities directly focussed on reducing maternal death. One successful example of the latter though was a coalition of groups of activists and policymakers that worked to change abortion law in South Africa. There were fewer instances of advocacy to lobby for access to delivery care, although Ghana and Nepal provided some examples.

By and large though, most examples of NGO or women's activists organizing for maternity care services have been about getting more humane, responsive services. For example Anganen women in Papua New Guinea who were contacted by a Catholic mission in the mid 1960s willingly shifted from delivering alone to birthing with nuns in the aid post. Yet in the 1970, they staged mass protest with hundreds of women demanding that their placentas be returned. A compromise was reached in that a few inches of umbilical cord were given to new mothers (Merrett-Balkos 1997). In Brazil, groups such as Grupo Curamin and SOS corpo have also worked towards more 'humanized childbirth' services and have also been working with TBAs to demand government reimbursement for delivery services provided. Another Brazilian group has supported legal action in cases of malpractice.

Finally, in developing countries individual, unorganised, users have played an important part. The shift to specialist care in hospitals tends to be demand-driven by, rather than stemming from proactive policy initiatives. In

¹⁰ Feb 14-17 2000, London School of Hygiene & Tropical Medicine, UK. 15 representatives of NGOs in Ghana, Bangladesh, Philippines, Nepal, India, South Africa, Guatemala and the UK attended.

the urban areas of many countries, women are choosing to deliver in hospital, even though their rural counterparts deliver at home alone or with relative or TBAs.

Conclusions

In summary, this paper argues that much known about the technical interventions needed to reduce maternal mortality, but there has been much less study of the features of health systems that promote maternal health. There is some evidence to back the assertion that skilled attendants are a requirement but more data are needed on enabling factors such as resource requirements. Also there needs to be further study of exceptions such as rural China. It is relatively easy to assess the main actors and policies that have influenced international maternal health, but the role of the medical professionals and the reasons for the apparent shift in WHO's policies in the 1960 needs more attention though. In developing countries, more exhaustive case-study reviews of the key players and policies are needed.

Examples should be chosen from countries that developed their own policies as well as those that appeared to go along with international recommendations.

Two surprising features of international policy making for maternal health emerge: how the process of global agenda setting was driven by a relatively small set of international actors with particular ideologies; and second, how, despite relatively simple and cheap technologies being available, this process of agenda setting in fact limited the effectiveness with which appropriate interventions were implemented, largely because the health systems context was not addressed (Lush & Campbell 2000).

At the national level, policies were mostly driven by and politicians and the Ministries of Health, although less is understood of the details of how these policies happened. In general, and unlike the history in the West, service users, women's groups and democratic politics appear to have played a lesser role.

The way forward. Much more research is needed. However, it seems possible to identify a unique window of opportunity to improve maternity care services for women by working with advocates for service users and the sector wide approaches (SWAps) currently being promoted for health. The international Safe Motherhood Initiative has mainly worked with health services

and medical care providers. This is an uphill battle given the entrenched and fossilised nature of many health services. A co-ordinated global campaign by grass roots organisation to tackle the access to and quality of maternity care services in poor countries (along the lines of the breastmilk network IBFAN) may be successful. Many NGOs perceive themselves as being well placed to advocate for appropriate delivery care services to be made universally accessible (Peattie & Campbell 2000).

There are also real opportunities to be had for the Safe Motherhood Initiative by linking it to activities that seek to improve the health sector as a whole. Creating a functioning health system appears to be the most obvious way to provide an enabling environment for maternity services. Most of the inputs needed to improve essential obstetric care already exist as integral parts of district health-systems even if some do not function well, or need updating. Currently donors are interested in SWAps, which are seen to present a major opportunity for donors to support policies leading to development of effective and efficient health systems. (Cassels 1997). There are two main reasons to promote safe motherhood within SWAps (Goodburn & Campbell 2000).

First, considerable donor resources are invested in 'health services' and the health sector generally (Zeitlin *et al.* 1994). For this reason, it may make better tactical sense for maternal health to link-up with, and tap into, the greater funds available for health sector development rather than to compete with an articulate and large constituency for family planning funds. Second, safe motherhood's dependence on the health system configuration means that health sector reforms have huge implications for safe motherhood. For example, the introduction of user fees has been associated with reduced use of maternity care in some situations and an increase in others (e.g. see Borghi 2000 in this conference). Many proposed solutions, such as insurance schemes, fail to cover precisely those interventions that are life-saving (for example, in Yunnan, China, an insurance scheme covered antenatal and postnatal, but not delivery, care (Kaufmann *et al.* 1997)). Linking safe motherhood to SWAps at an early stage can mean the implications for proposed solutions for maternal health can be tested and considered. It also provides an opportunity to test the robustness of SWAps against a few agreed clinical priorities.

In conclusion, long term, sustainable and affordable improvements in

safe motherhood are dependent on policies that improved functioning of health systems as a whole. Gains in countries such as Malaysia, Sri Lanka and Iran were achieved by making maternity care a core activity guiding changes in their health services. Efforts to achieve this in other developing countries need pragmatic support, and SWAps and consumer advocacy are compatible with a focus on maternal health services.

Acknowledgements

Oona Campbell is supported by the UK Department for International Development under the 'Effective Services, Effective Policies: New Knowledge for Safer Motherhood in Poor Countries' Research Programme. I would also like to thank Sanne te Pas, Maia Ambegaokar, Siobhan Peattie, Marge Koblinsky, Laura Rodrigues, Elizabeth Goodburn and Louisiana Lush for helpful discussions on the subject of maternal health policies.

References

- AbouZahr C (1998). Maternal Mortality Overview. In Murray, C.J.L. and Lopez, A.D. (eds). *Health Dimensions of Sex and Reproduction*. Boston: Harvard University Press.
- Agarwal B (1994). The gender and environment debate: lessons from India. In Arizpe L, MP Stone and DC Major. *Population and Environment: Rethinking the Debate*. Boulder: Westview Press, 87-124.
- Alisjahbana A (1991). Regionalisation of Care in West Java. Presentation at the Workshop on Guidelines for Safe Motherhood Programming. The World Bank/MotherCare. Washington DC, November 17-21.
- Ashford L (1995). Implementing Reproductive Health Programmes. London: London School of Hygiene and Tropical Medicine Report of a donor workshop co-sponsored by the UK Overseas Development Administration and the US Agency for International Development, New York, 12-14 June.
- Backett EM, Davies AM and Petros-Barvazian A(1984). The risk approach in health care, with special reference to maternal and child health including family planning. *Public Health Papers* 76,1-113.
- Basu AM (1997). The new international population movement: a framework for a constructive critique. *Health Transition Review* 7(Suppl 4),7-32.
- Beinart J (1992). Darkly through a lens: changing perceptions of the African Child in sickness or in health, 1900-1945. In: R Cooter (ed). *In the name of the child: health and welfare, 1880-1940*. London: Routledge: 220-43.
- Belsey MA (1985). Traditional Birth Attendants: A Resource for the Health of Women. *International Journal of Gynecology and Obstetrics* 23(4),247-248.
- Bergstrom S, Molin A and Povey GW(1993). *International Maternal Health Care. The Challenge beyond the year 2000* Department of Obstetrics and Gynecology, Uppsala University, Uppsala.
- Berman P (1995). *Health Sector Reform in Developing Countries*. Boston: Harvard University Press.
- Boserup E (1989). Population, the status of women and rural development. In McNicoll, G. and M. Cain. *Rural Development and Population*. New York: Population Council, supplement to *Population and Development Review*.

- Brennan M (1989). Training traditional birth attendants. *Postgraduate Doctor Africa* 11(1),16-18.
- Cassels A (1997). A guide to sector-wide approaches for health development. WHO/ARA/97. *World Health Organisation*
- Central Statistical Office (Zimbabwe) and Macro International Inc. (1995). Zimbabwe Demographic and Health Survey, 1994. Calverton, Maryland: Central Statistical Office and Macro International Inc.
- Chen LC (1986). Primary health care in developing countries: overcoming operational, technical, and social barriers. *Lancet* 2(8518),1260-1265.
- Chintu MK & Susu B (1994). The role of the midwife in maternal health care. In: Nasah BT, Mati JKG & Kasonde JM (eds). *Contemporary issues in maternal health in Africa*. Australia: Harewood Academic Publishers.
- Cleland J (1996). ICPD and the feminization of population and development issues. *Health Transition Review* 6(1),107-110.
- Collins C and Green A(1994). Decentralization and primary health care: some negative implications in developing countries. *International Journal of Health Services* 24(3): 459-475.
- Correa SS (1994). *Population and reproductive rights feminist perspectives from the South*. Zed Books: New Delhi.
- De Brouwere V, Tonglet R, Van Lerberghe W (1998). Strategies for reducing maternal mortality in developing countries: what can we learn from the history of the industrialized West? *Tropical Medicine and International Health* 3(10),771-782.
- Denoon D (1989) with Dugan K and Marshall L. *Public Health in Papua New Guinea: medical possibility and social constraint 1884-1984*. Cambridge: Cambridge University Press
- Department for International Development (DFID) (1999). *Health and Population Target Strategy Paper*. Better Health for Poor People.
- Finkle JL and McIntosh A (1996). Cairo revisited: some thoughts on the implications of the ICPD. *Health Transition Review* 6(1)111-113.
- Folbre N (1983). Of patriarchy born: the political economy of fertility decisions. *Feminist Studies* 9, -84.
- Goodburn E and Campbell O (2001). What can a health system deliver if it can't deliver a baby? *British Medical Journal*.

Graham WJ and Campbell OMR (1990). *Measuring Maternal Health: Defining the Issues*. Maternal and Child Epidemiology Unit Report, London: London School of Hygiene and Tropical Medicine.

Graham WJ and Campbell OM (1992). Maternal health and the measurement trap. *Social Science and Medicine* 35(8),967-977.

Greenwood A (1991). "The Farafenni Project." Presentation at the Workshop on Guidelines for Safe Motherhood Programming. The World Bank/MotherCare. Washington, D.C., November 17-21, 1991.

Greenwood AM, Greenwood BM, Bradley AK, Williams K, Shenton FC, Tulloch S, Byass P and Oldfield FSJ (1987). A prospective survey of the outcome of pregnancy in a rural area of the Gambia. *Bulletin of the World Health Organization* 65, 635-643.

Janovsky K (1996). *Health Policy and Systems Development: an Agenda for Research*. Geneva: WHO.

Janowitz B, Wallace S, Araujo G and Araujo L (1985). Referrals by Traditional Birth Attendants in Northeast Brazil. *American Journal of Public Health* 75(7),745-748.

Jolly M (1997). Introduction. Colonial and postcolonial plots in histories of maternities and modernities. In: Ram, K. and Jolly, M. (eds). *Maternities and Modernities: Colonial and postcolonial experiences in Asia and the Pacific*. Cambridge: Cambridge University Press

Jolly M (1997b) Other mothers: maternal 'insouciance' and the depopulation debate in Fiji and Vanuatu 1890-1930. In: Ram K and Jolly M (eds). *Maternities and Modernities: Colonial and postcolonial experiences in Asia and the Pacific*. Cambridge: Cambridge University Press.

Jowett M and Ensor T (1999). Investing in Safe motherhood: Evidence of cost-effectiveness in developing countries, with specific reference to Kenya. 396/98/DFID.

Kabeer N (1994). *Reversed Realities: Gender Hierarchies in Development Thought*. London: Verso Books.

Kalumba K (1997). Towards an equity-oriented policy of decentralization in health systems under conditions of turbulence: the case of Zambia. Geneva: Forum on Health Sector Reform, WHO.

Kasonde JM (1994). Planning and management of national maternal health programmes. In: Nasah BT, Mati JKG & Kasonde JM (eds). *Contemporary issues in maternal health in Africa*. Australia: Harewood Academic Publishers.

- Kaufman J, Kaining Z and F Jing (1997). Reproductive Health Financing, Service Availability and Needs in Rural China. *IDS Bulletin* 28(1),61-65 .
- Koblinsky MA, Campbell O and Heichelheim J (1999). Organizing delivery care: what works or safe motherhood? *Bulletin of the World Health Organisation* 77(5), 399-406.
- Kotagal UR, Atherton HD, Eshett R, Schoettker PJ, Perlstein PH (1999) Safety of early discharge for Medicaid newborns. *JAMA*. 1999 Sep 22-29; 282(12),1150-6.
- Kuhnke L (1990). Lives at risk. Public health in 19th Century Egypt. Cairo: The American University in Cairo Press
- Kwast BE (1992). Midwives: key rural health workers in maternity care. *International Journal of Gynaecology and Obstetrics* 38(June Suppl), S9-S15.
- Lane SD (1994). From population control to reproductive health: an emerging policy agenda. *Social Science and Medicine* 39(9),1303-1314.
- Law M, Maine D and Feuerstein MT (1991). Safe Motherhood, Priorities and Next steps Forward looking assessment on the reduction of maternal mortality and morbidity within the framework of the SMI. April 1991. UNDP.
- Loudon I (1992). Death in Childbirth: an International Study of Maternal Care and Maternal Mortality, 1800-1950. Oxford: Clarendon Press.
- Lucas A (1997). History of the Prevention of Maternal Mortality Network. *International Journal of Gynecology and Obstetrics* 59(Nov Suppl 2), S11-S14.
- Mahler H (1987). The Safe Motherhood Initiative: a call to action. *Lancet*: 668-670.
- Maine D (1991). Safe motherhood programs: options and issues. Center for Population and Family Health, School of Public Health, Faculty of Medicine. Columbia University, New York. pp. 1-61.
- Manderson L (1997). Shaping reproduction: maternity in the early 20th century. In: Ram K and Jolly M (eds). *Maternities and Modernities: Colonial and postcolonial experiences in Asia and the Pacific*. Cambridge: Cambridge University Press.
- Margolis LH, Cole GP and Kotch JB (1997). Historical foundations of maternal and child health. In: JB Kotch (ed.). *Maternal and Child Health: Programs, Problems and Policy in Public Health* (Gaithersburg, Maryland: Aspen Publishers, Inc.).

- McPake B, Hanson K and Mills A (1993). Community financing of health care in Africa: an evaluation of the Bamako initiative. *Social Science and Medicine* 36(11), 1383-95.
- Merrett-Balkos L (1997). Just add water: remaking women through childbirth, Anganen, Southern Highlands, Papua New Guinea. In: Ram K and Jolly M (eds). *Maternities and Modernities: Colonial and postcolonial experiences in Asia and the Pacific*. Cambridge: Cambridge University Press.
- Murphy E and Merrick T(1996). Did "Cairo" delete "population" from population policy? Washington D.C., PATH and the World Bank.
- Oppenheim Mason K (1993). The impact of women's social position on fertility in developing countries. In: Stycos J *Demography as an Interdiscipline*. Oxford: Transaction.
- Peattie S and Campbell O (2000). Viewpoint. Draft
- Petchesky RP (1995). From population control to reproductive rights: feminist fault lines. *Reproductive Health Matters* 6,152-161.
- Poovan P, Kifle F and Kwast B (1990). A maternity waiting home reduces obstetric catastrophes. *World Health Forum* 11,440-445.
- Prendiville WJ, Elbourne D and McDonald S (2000). Active versus expectant management in the third stage of labour (Cochrane Review). In: *The Cochrane Library*, Issue 3. Oxford: Update Software.
- Philpott RH (ed). (1979) Maternity services in the developing world- what the community needs Proceedings of the Seventh Study Group of the Royal College of Obstetricians and Gynaecologists 9-11 September 1979.
- Reich MR(1995). The politics of agenda setting in international health: child health versus adult health in developing countries. *Journal of International Development* 7(3),489-502
- Rifkin SB and Walt G(1986). Why health improves: defining the issues concerning 'comprehensive primary health care' and 'selective primary health care'. *Social Science and Medicine* 23(6),559-566.
- Roemer MI (1991). National health systems of the world. Volume One. The countries. New York: Oxford University Press.
- Roemer MI (1991). National health systems of the world. Volume Two. The issues. New York: Oxford University Press.

- Rooney CIF (1992). Antenatal care and maternal health: how effective is it? Document WHO/MSM/92.4, Geneva: *World Health Organization*. pp. 1-74.
- Rosenfield A and Maine D(1985). Maternal mortality - a neglected tragedy. Where is the M in MCH? *Lancet* 2,83-85.
- Schieber B (1991). The Quetzaltenango Project. Presentation at the Workshop on Guidelines for Safe Motherhood Programming. The World Bank/MotherCare. Washington DC, November 17-21, 1991.
- Semmelweis I (1983). The etiology, concept and prophylaxis of childbed fever. Translated with an introduction by Carter, K.C. Madison: University of Wisconsin Press.
- Sherrat DR (1999). Why women need midwives for safe motherhood. *Reproductive Health Matters. Safe Motherhood Initiatives; Critical Issues*. Edited by M Berer and TKS Ravindran. 227-
- Shulman C, Dorman EK, Cutts F, Kawuondo K, Bulmer J, Peshu N & Marsh K (1999). Preventing severe anaemia secondary to malaria in pregnancy: a double blind randomized placebo controlled trial of sulphadoxine-pyrimethamine. *Lancet* 353(9153),632-636.
- Starrs A and the Inter-Agency Group for Safe Motherhood (1998). *The Safe Motherhood Action Agenda: Priorities for the Next Decade*. New York: Family Care International: 1-96.
- te Pas S (2000) International political action for prevention of maternal mortality and morbidity: the international women`s health movement and the Safe Motherhood Initiative. MSc Thesis. London:London School of Hygiene an Tropical Medicine
- Tinker A (1997). Safe motherhood as a Social and Economic Investment. Paper presented at the Safe motherhood Technical Consultation, 18-23 October, 1997, Colombo, Sri Lanka.
- Treffers PE *et al.* (1990). Letter from Amsterdam: Home births and minimal medical interventions. *JAMA* 264(17),2203-2208 (November 7, 1990).
- van Alten D, Eskes M and Treffers PE (1989). Midwifery in the Netherlands. The Wormerveer study; Selection, mode of delivery, perinatal mortality and infant morbidity. *British Journal of Obstetrics and Gynaecology* 96,656-662.
- van Staveren I (1994). A political economy of reproduction. *Development*: -3.

- Vaughan JP (1987). Background Discussion Paper for the Steering Committee Meeting of the Safe Motherhood Operational Research (SMOR) Programme. *World Health Organization*: Geneva 13-14 July 1987.
- Vaughan M (1991). *Curing their Ills: Colonial Power and African Illness*. Cambridge: Polity Press.
- Walt G (1998). Globalisation of international health. *Lancet* 351(9100),434-437.
- Walt G and Vaughan P(1982). Primary health care: what does it mean? *Tropical Doctor* 12(3),99-100.
- White SM, Thorpe RG and Maine D (1987). Emergency Obstetric Surgery Performed by Nurses in Zaire. *Lancet* 2,612-613.
- WHO (1958). The first ten years of the World Health Organization. Geneva: *World Health Organization*.
- WHO (1968). The second ten years of the World Health Organization. 1958-67. Geneva: *World Health Organization*.
- WHO (1974). Health and Family Planning. World Population Conference, *Working Paper* No. 136 (Geneva: World Health Organization, 1974).
- WHO (1978). International Conference on Primary Health Care: Alma Ata. Geneva: World Health Organisation and United Nations Children's Fund.
- WHO (1991). Essential elements of obstetric care at the first referral level. Geneva: WHO.
- WHO (1994). Mother-Baby package: implementing Safe motherhood in countries. WHO/FHE/MSM/94.11. Geneva: WHO.
- WHO (1994b). World Health Organization partograph in management of labour. World Health Organization Maternal Health and Safe Motherhood Programme. *Lancet* 1994 Jun 4; 343(8910),1399-1404.
- WHO (1996). Revised 1990 Estimates of Maternal Mortality. A new approach by WHO and UNICEF. WHO/FRH/MSM/96.11. Geneva: WHO.
- Williams A.S (1997). *Women and Childbirth in the Twentieth Century*. Stroud: Sutton Publishing. 1-331.
- World Bank (1993). *World Development Report: Investing in Health*. Oxford: Oxford University Press.

World Federation of Public Health Associations (1986). Women and Health. Information for Action Issue Paper. Geneva: World Federation of Public Health Associations.

Zapata BC and Godue CJM(1997). International Maternal and Child Health. In: JB Kotch (ed). *Maternal and Child Health: Programs, Problems, and Policy in Public Health* (Gaithersburg, Maryland: Aspen Publishers, Inc.), pp. 345-379.

Zeitlin J, Govindaraj R and Chen LC (1994). Financing reproductive and sexual health services. In: Sen G, Germain A and Chen LC (eds). *Population policies reconsidered: health, empowerment, and rights*. Boston, Massachusetts, Harvard University, Harvard Center for Population and Development Studies, Mar: 235-248. (*Harvard Series on Population and International Health*).

Annex 1

IDEOLOGIES THAT HAVE INFLUENCED MATERNAL HEALTH POLICIES¹¹

Developments in maternal health have been guided by particular ideological paradigms which have been adopted to varying degrees. Beyond the obvious role played by economic rationales, the most prominent of these have been, first, the need to prioritise interventions that are appropriate for delivery at basic PHC facilities and, second, the desire to address health problems through improving the status of women. To some extent this has been based on political expediency and presentation rather than technical or scientific evidence, a process that has led to problems with implementing effective health programmes at national level.

Family planning

Family planning policy from the 1950s to the late 1980s was driven by a macro-economic agenda of concern over the impact of rapid population growth on developing economies. This concern led to the development of vertically funded and managed family planning programmes, heavily prioritised by international donors, in particular, the United States Agency of International Development (USAID)(Finkle & McIntosh 1994), UNFPA, a number of international family planning NGOs, including the Population Council. The Human Reproduction programme within WHO was also started in the mid 1960s. Large US-based foundations, such as Rockefeller and Ford also took a significant interest in population issues (Finkle & McIntosh 1994).

Primary health care

PHC, since its origins in the 1960s and 1970s was guided by five principles: equitable distribution; community involvement; focus on prevention; appropriate technology; and a multi-sectoral approach (Walt & Vaughan 1982). It was grounded in a broad theory of development that rejected economic modernisation as the only means to human well being and placed good health firmly at the centre of an economic growth-equity-productivity nexus. Furthermore, in the Alma Ata declaration of 1978, the international

¹¹ Based in Lush L and Campbell 2000. International co-operation for reproductive health: too much ideology? In press.

public health community committed to comprehensive PHC as part of a broader political and economic development agenda (WHO 1978).

During the 1980s, PHC ideals ceded to selective care based on what were perceived to be cheap service packages (Walt 1998) (see below). The failures of PHC therefore came under intense scrutiny, especially the unrealistic nature of the original objectives, given levels of public sector expenditure, and the difficulties of ensuring equitable resource allocation (Chen 1986, Rifkin & Walt 1986, McPake *et al.* 1993, Collins & Green 1994, Kalumba 1997). Ironically, many of the PHC concepts were absorbed by those drafting the ICPD Programme of Action (Chapter eight starts with a discussion of PHC (para.8.1)), apparently ignoring 20 years of PHC experience, which suggested that a comprehensive approach was difficult to implement in practice, given low levels of funding (Walt & Vaughan 1982).

Neo-liberal economic policies

The global trend towards neo-liberal economic policies also influenced policy-making at Ministries of Health of developing countries. In the 1980s, cost-effectiveness of health interventions became a priority, necessary for the structural adjustment programmes that the IMF and World Bank recommended to the indebted developing countries. Limiting the costs of healthcare spending was considered essential in globalised competition (Zapata & Godue 1997) and comprehensive PHC pared back. This shift also reflected the growth in influence and financial commitment of richer and more economically-motivated international actors, such as the World Bank (Walt 1998).

More recently, major reforms were initiated in many low income countries to try to increase efficiency in health service financing, expand access to primary level services and improve quality of care (Berman 1995, Janovsky 1996). As part of this effort, international donors emphasised basic packages of care that were considered to be cheap and cost-effective and should therefore be available to all. Two of the top five most heavily promoted cost-effective address preventing unwanted pregnancy and preventing maternal mortality (World Bank 1993).

Tinker states for example that maternal health interventions are cost-effective (3\$ per woman and \$230 per death averted) (Tinker 1997, Jowett & Ensor 1999).

Women's status

Women's status in low-income countries and its relationship with poor health outcomes has long been a cause for concern among Western women's groups and increasingly among low-income country women's groups themselves (Kabeer 1994). There is also a well-documented inter-action between poverty and gender, whereby poor women often live in extremely vulnerable situations (Folbre 1983, Boserup 1989, Oppenheim Mason 1993).

There is considerable debate remains over what the goal with respect to women's status is and what should be the means of achieving it (van Staveren 1994, Basu 1997, Oppenheim Mason 1993, Agarwal 1994). Nevertheless, during the 1980s, improving gender equality and women's rights became a central tenet of women's health activists' arguments (Lane 1994), some going as far as saying that meaningful improvements in reproductive health could only be achieved by improving women's status.

Table of contents

ACKNOWLEDGEMENTS	iii
FOREWORD.....	v
<i>Wim Van Lerberghe and Vincent De Brouwere</i> - REDUCING MATERNAL MORTALITY IN A CONTEXT OF POVERTY	1
<i>Wim Van Lerberghe and Vincent De Brouwere</i> - OF BLIND ALLEYS AND THINGS THAT HAVE WORKED: HISTORY'S LESSONS ON REDUCING MATERNAL MORTALITY	7
<i>Per Bergsjø</i> - WHAT IS THE EVIDENCE FOR THE ROLE OF ANTENATAL CARE STRATEGIES IN THE REDUCTION OF MATERNAL MORTALITY AND MORBIDITY?	35
<i>Patrick Kolsteren and Sonia De Souza</i> - MICRONUTRIENTS AND PREGNANCY OUTCOME	55
<i>Staffan Bergström and Elizabeth Goodburn</i> - THE ROLE OF TRADITIONAL BIRTH ATTENDANTS IN THE REDUCTION OF MATERNAL MORTALITY.....	77
<i>Wendy J Graham, Jacqueline S Bell and Colin HW Bullough</i> - CAN SKILLED ATTENDANCE AT DELIVERY REDUCE MATERNAL MORTALITY IN DEVELOPING COUNTRIES ?	97
<i>Marga Kowalewski and Albrecht Jahn</i> - HEALTH PROFESSIONALS FOR MATERNITY SERVICES: EXPERIENCES ON COVERING THE POPULATION WITH QUALITY MATERNITY CARE	131
<i>Patrick Fernand Thonneau</i> - MATERNAL MORTALITY AND UNSAFE ABORTION: A HEAVY BURDEN FOR DEVELOPING COUNTRIES	149
<i>Staffan Bergström</i> - APPROPRIATE OBSTETRIC TECHNOLOGIES TO DEAL WITH MATERNAL COMPLICATIONS	171
<i>Pierre Buekens</i> - OVER-MEDICALISATION OF MATERNAL CARE IN DEVELOPING COUNTRIES.....	191
<i>Carine Ronsmans</i> - WHAT IS THE EVIDENCE FOR THE ROLE OF AUDITS TO IMPROVE THE QUALITY OF OBSTETRIC CARE	203
<i>Albrecht Jahn and Vincent De Brouwere</i> - REFERRAL IN PREGNANCY AND CHILDBIRTH: CONCEPTS AND STRATEGIES	225
<i>Josephine Borghi</i> - WHAT IS THE COST OF MATERNAL HEALTH CARE AND HOW CAN IT BE FINANCED ?.....	243

<i>Anton E Kunst and Tanja Houweling - A GLOBAL PICTURE OF POOR-RICH DIFFERENCES IN THE UTILISATION OF DELIVERY CARE</i>	<i>293</i>
<i>Carine Ronsmans - HOW CAN WE MONITOR PROGRESS TOWARDS IMPROVED MATERNAL HEALTH?</i>	<i>313</i>
<i>Paulo Ferrinho, Ana Margarida Bulgalho and Wim Van Lerberghe - IS THERE A CASE FOR PRIVATISING REPRODUCTIVE HEALTH? PATCHY EVIDENCE AND MUCH WISHFUL THINKING</i>	<i>339</i>
<i>Marilyn McDonagh and Elizabeth Goodburn - MATERNAL HEALTH AND HEALTH SECTOR REFORM: OPPORTUNITIES AND CHALLENGES</i>	<i>367</i>
<i>Carla AbouZahr - CAUTIOUS CHAMPIONS : INTERNATIONAL AGENCY EFFORTS TO GET SAFE MOTHERHOOD ONTO THE AGENDA</i>	<i>384</i>
<i>Oona MR Campbell - WHAT ARE MATERNAL HEALTH POLICIES IN DEVELOPING COUNTRIES AND WHO DRIVES THEM? A REVIEW OF THE LAST HALF-CENTURY</i>	<i>412</i>

