Progress towards Millennium Development Goals 4 and 5 on maternal and child mortality: an updated systematic analysis

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Summary

Background With 4 years until 2015, it is essential to monitor progress towards Millennium Development Goals (MDGs) 4 and 5. Although estimates of maternal and child mortality were published in 2010, an update of estimates is timely in view of additional data sources that have become available and new methods developed. Our aim was to update previous estimates of maternal and child mortality using better data and more robust methods to provide the best available evidence for tracking progress on MDGs 4 and 5.

Methods We update the analyses of the progress towards MDGs 4 and 5 from 2010 with additional surveys, censuses, vital registration, and verbal autopsy data. For children, we estimate early neonatal (0–6 days), late neonatal (7–28 days), postneonatal (29–364 days), childhood (ages 1–4 years), and under-5 mortality. We use an improved model for estimating mortality by age under 5 years. For maternal mortality, our updated analysis includes greater than 1000 additional site-years of data. We tested a large set of alternative models for maternal mortality; we used an ensemble model based on the models with the best out-of-sample predictive validity to generate new estimates from 1990 to 2011.

Findings Under-5 deaths have continued to decline, reaching 7·2 million in 2011 of which 2·2 million were early neonatal, 0·7 million late neonatal, 2·1 million postneonatal, and 2·2 million during childhood (ages 1–4 years). Comparing rates of decline from 1990 to 2000 with 2000 to 2011 shows that 106 countries have accelerated declines in the child mortality rate in the past decade. Maternal mortality has also continued to decline from 409 100 (uncertainty interval 382 900–437 900) in 1990 to 273 500 (256 300–291 700) deaths in 2011. We estimate that 56 100 maternal deaths in 2011 were HIV-related deaths during pregnancy. Based on recent trends in developing countries, 31 countries will achieve MDG 4, 13 countries MDG 5, and nine countries will achieve both.

Interpretation Even though progress on reducing maternal and child mortality in most countries is accelerating, most developing countries will take many years past 2015 to achieve the targets of the MDGs 4 and 5. Similarly, although there continues to be progress on maternal mortality the pace is slow, without any overall evidence of acceleration. Immediate concerted action is needed for a large number of countries to achieve MDG 4 and MDG 5.

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See Comment page 1119

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Introduction

In 2000, 189 heads of state signed the Millennium Declaration committing themselves to achieve eight goals for development.[1] The target for Millennium Development Goal (MDG) 4 was to reduce the under-5 mortality rate by two-thirds between 1990 and 2015 and the target for MDG 5 was to reduce the maternal mortality ratio by three-quarters during the same period.[2] Progress on reducing child and maternal mortality has been substantially slower than the target annual rates of decline of 4·4% and 5·5% for children and mothers respectively.[3,4] In response to slow progress and the moral urgency of reinvigorating efforts to tackle child and maternal mortality, the UN Secretary-General launched the Global Strategy for Women's and Children's Health in September, 2010.[5] Donor nations and other organisations committed US$40 billion to this effort to accelerate progress for MDGs 4 and 5.[6]

To be effective, increased investment to accelerate declines in maternal and child mortality will need intense monitoring of progress over the next 4 years. Understanding who has made progress in the recent past provides opportunities for shared learning on what policies can be the most effective. Tracking progress is crucial to sustaining increased resource mobilisation. In an era of slower growth in development assistance for health, showing the effectiveness of aid is essential.[7] Evidence of effectiveness requires robust data on recent trends as well as accounting for broader drivers of these trends. Perhaps most importantly, data on trends are essential for prioritising where global and national resources should go to achieve an accelerated effect. The importance of good evidence and clear accountability for progress has been recognised by the UN Secretary-General Commission on Information and Accountability for Women's and Children's Health.[3,8,9]

In 2010, several analyses were published tracking trends in maternal and child mortality.[3,4,8,10] Differences between these analyses for children were mostly focused on 32 countries where differences were greater than 20% on

average from 1990 to 2010. Nevertheless, there has been debate on datasets and methods.[11,12] For maternal mortality, there were more substantial differences between estimates for many countries. New data on maternal mortality, particularly the finding that there had been substantial progress in some countries, generated great interest.[13–16] Vigorous debate from academics, government officials, and other analysts on a country-by-country basis has been concentrated on data, HIV-related deaths during pregnancy, and estimation approaches.[17–24] First, many data sources were not included in published analyses such as vital registration, national surveys, censuses, and especially surveillance systems of maternal mortality.[25,26] Second, there has been substantial confusion around the MDG[27] and International Classification of Diseases (ICD)[28] recommendation that all deaths due to HIV during pregnancy or within 42 days of the termination of pregnancy be included in the computation of the maternal mortality ratio. In fact, the UN group chose to include only half the HIV-related deaths during pregnancy in their estimation.[8] Many users would prefer to sharply distinguish obstetric causes of maternal mortality, including direct and indirect causes, from those related to HIV or other causes.[29] Third, several aspects of the estimation of maternal mortality have been discussed including corrections for misclassification, model specification, and uncertainty analysis.[24,30,31] The debate around these three main issues has resulted in many avenues for refining the estimation of child and especially maternal mortality.

In our report, we update the studies of Rajaratnam and colleagues[3] and Hogan and colleagues[4] to produce new estimates for under-5 mortality and maternal mortality from 1990 to 2011. Although we use their same general approach, we incorporate into this cycle of estimation important insights that have emerged in the past year from widespread debate. We take advantage of the many data sources revealed during the debate since the 2010 publications that were not previously included. For maternal mortality, we include in our predictive validity testing the modelling strategy used by the UN in 2010. By assessing evidence on both MDG 4 and MDG 5 in the same study, we are able to compare progress on the two goals country-by-country.

Methods

Child mortality

See Online for webappendix

For our update of the trends in child mortality we use the previously published method.[3] The webappendix (p 18) summarises the estimation process for child mortality beginning with data from vital registration systems, surveillance systems, complete birth histories, summary birth histories, and household recall of deaths through to the synthesis of many sources for a given country over time. The webappendix (pp 13–17) lists the number of data points used in the estimation by country. Compared with our assessment in 2010, we have added 2595 new observations; 163 countries have new data in this analysis. The webappendix provides details of changes in the implementation of the summary birth-history method, the Gaussian Process Regression parameter choice,[32,33] and the identification of outliers on the basis of broad discussion of the results of Rajaratnam and colleagues.[34] The webappendix also provides figures for each country summarising all available data sources and our final estimation with uncertainty for under-5 mortality to 2011.

On the basis of demand from many users, we have included in this update estimates of mortality for early neonatal (0–6 days), late neonatal (7–28 days), post-neonatal (29–364 days), and childhood (ages 1–4 years) age groups. Details of the model including formal assessment of out-of-sample predictive validity used for breaking down under-5 mortality into deaths in these four age groups by sex are provided in the webappendix.

Maternal mortality

We use an approach similar to Hogan and colleagues[4] to estimate maternal mortality for 1980–2011; results are presented only for the MDG period 1990–2011. The key differences, however, are in the datasets used in the analysis and the use of an ensemble modelling strategy. The webappendix (p 23) provides an overview of the key steps in the estimation process, which can be divided into three components: data collection, data processing, and the modelling strategy. We highlight some key developments in each of these components. We provide more extensive detail in the webappendix. In this study, we also expand our analysis to encompass 187 countries. We use the ICD[28] and MDG[27] definition for international comparisons of maternal mortality, which include deaths during pregnancy or within 42 days of termination of pregnancy from direct obstetric causes (ICD10 codes O00–O95), indirect obstetric causes (O98–O99), and all HIV. To facilitate different uses of our results we report maternal mortality from all causes, HIV-related deaths during pregnancy or within 42 days of termination, and direct and indirect obstetric deaths. We define direct and indirect obstetric deaths as all maternal deaths minus the HIV-related deaths during pregnancy.

Data sources and correcting for bias

Based on regional workshops held in Colombo, Sri Lanka (Nov 1–2, 2010) and Sao Paulo, Brazil (Dec 2–3, 2010), published reports,[35–39] direct correspondence, new vital registration data, new surveillance system data, and systematic review of work published in 2008–11, we have identified 1142 additional site-years of data. The webappendix (pp 20–22) provides the number of site-years of observation by country. 138 countries have new data compared with the 2010 analysis and we decreased from 21 to 15 countries without data. In accordance with the convention used by the UN for 2010, we count each sibling history observation averaged over 5 years as 5 site-years.[40] We used updated estimates of HIV

prevalence released by the Joint United Nations Programme on HIV/AIDS (UNAIDS)[41] and population denominators and livebirths from the UN Population Division's World Population Prospects 2010 released in May, 2011.[42] Levels of adult female mortality were based on Rajaratnam and colleagues[3] and updated with new vital registration and survey data.

Correcting vital registration data for misclassification of maternal deaths has been handled in the same way in accordance with published algorithms.[4,43] We estimate the number of maternal deaths that are HIV-related with estimates of HIV-related mortality and the fraction of time spent pregnant or within 42 days of pregnancy. We have taken estimates of HIV deaths by age for women based on UNAIDS estimates of HIV prevalence adjusted by WHO/UNAIDS estimates of access to antiretroviral drugs. The fraction of these deaths that would happen during pregnancy or within 42 days of termination is estimated with the UN Population Division estimates of age-specific fertility based on the assumption that the average livebirth has a 40-week gestation and that the stillbirth rate is about equal to the neonatal death rate (details are provided in the webappendix).

Developing an ensemble model based on predictive validity

Hogan and colleagues[4] chose their final model on the basis of strict out-of-sample predictive validity tests where model performance is assessed by holding out 20% of the data from model estimation. Predictions for country-years were compared with the held-out data to assess how well the model predicts. They evaluated, however, a restricted range of covariates and specifications. For this revision, we used the same construct of selecting a model based on predictive validity but substantially expanded the range of alternative models that were tested. We also added formal assessment of the uncertainty intervals in the predictive validity testing stage.

In terms of expanding the pool of models evaluated, we included linear mixed effects models for rates and cause fractions[40,44,45] as well as spatial-temporal models with Gaussian Process Regression. Our linear mixed-effects models include the basic modelling approach used by the UN analysis in 2010. In addition, we also assessed a broader range of covariates and tested nearly all possible combinations of proposed covariates.

In accordance with work on prediction in other sciences, such as meteorology,[46] or the Netflix challenge,[47] we also assessed the out-of-sample predictive validity of ensemble models, which are weighted averages of individual component models. Ensemble models have the advantage that for most prediction tasks they yield more accurate predictions and provide more accurate uncertainty intervals. Because ensemble models use many different models with different covariates and specifications the results are generally more stable and robust. As outlined in the webappendix (pp 6–7), we assessed the plausibility of 3840 combinations of covariates. We retained 169 sets of covariates with plausible signs and significant coefficients. Each set of covariates was included in both mixed effect and spatiotemporal models.

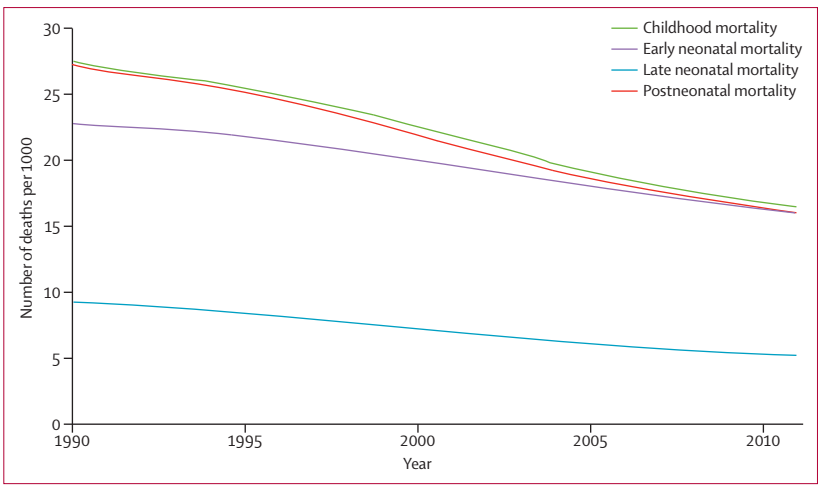

Figure 1: **Worldwide early neonatal, late neonatal, postneonatal, and childhood mortality, 1990–2011**

In terms of model performance, we assessed the predictive validity of each model with the root mean squared error (RMSE) of the log death rates, the frequency of predicting the correct trend in the data and the out-of-sample coverage of the uncertainty intervals of the model. The webappendix (pp 25–47) provides details on the models tested and shows that the ensemble model has the lowest out-of-sample RMSE, predicts the trend well, and has a 95% uncertainty interval that out-of-sample captures 97·4% of the observations.

Estimating the time to achieving MDGs 4 and 5

We used the rate of change in under-5 mortality and the maternal mortality rate from 1990 to 2011 to estimate the time to achieving the MDG 4 and MDG 5 targets. This very simplistic assessment provides an indication of what countries might achieve based on long-term two-decade trends. We tested alternative assumptions such as the use of more recent time trends from 2000 to 2011 or 2005 to 2011. Since rates of change are more difficult to estimate accurately especially for maternal mortality, the use of the longer period 1990–2011 yields the most stable assessment. Most of the countries achieving the targets by 2015 are robust to these changes; the years after 2015 when the targets are achieved are sensitive to the choice of period for predicting probable future trends. We include in the webappendix (pp 49–53), the uncertainty interval in the year of attainment for MDG 4 and MDG 5 for each country that has been calculated with the uncertainty interval in the rates of change from 1990 to 2011 for under-5 mortality and the maternal mortality rate.

	Deaths per 1000 livebirths					Number of under-5 deaths (thousands)	Annualised rate of decline		
	Early neonatal (0–6 days)	Late neonatal (7–28 days)	Postneonatal (29–364 days)	Child (1–4 years)	Under 5 (0–4 years)		1990–2000	2000–11	1990–2011
Worldwide	16·1 (15·0–17·2)	5·2 (4·7–5·8)	16·0 (14·4–17·9)	16·5 (14·6–18·7)	52·8 (47·9–58·3)	7177·4 (6613·8–7848·1)	1·9 (1·6–2·1)	2·6 (1·7–3·3)	2·2 (1·8–2·6)
Developing	17·7 (16·6–19·0)	5·8 (5·2–6·4)	17·8 (16·0–19·9)	18·4 (16·3–20·9)	58·5 (53·1–64·7)	7078·2 (6519·1–7739·2)	1·9 (1·7–2·2)	2·5 (1·7–3·3)	2·2 (1·8–2·7)
Developed	2·6 (2·2–3·1)	0·8 (0·7–0·9)	1·9 (1·7–2·3)	1·2 (1·0–1·5)	6·6 (5·6–7·7)	99·2 (86·5–114·3)	4·1 (3·7–4·5)	3·1 (1·7–4·4)	3·6 (2·9–4·2)
Asia Pacific, high income	0·9 (0·7–1·1)	0·4 (0·3–0·5)	0·9 (0·8–1·1)	0·8 (0·6–1·0)	3·0 (2·5–3·6)	5·0 (4·3–5·8)	3·6 (2·9–4·4)	5·3 (3·7–6·8)	4·5 (3·6–5·4)
Brunei Darussalam	2·2 (1·6–2·9)	0·8 (0·6–0·9)	1·8 (1·3–2·6)	2·2 (1·5–3·0)	6·9 (5·2–8·9)	0·1 (0·0–0·1)	1·8 (−0·1–3·9)	2·9 (−0·1–5·8)	2·4 (0·9–3·8)
Japan	0·8 (0·7–1·1)	0·4 (0·3–0·4)	0·9 (0·7–1·1)	0·8 (0·6–1·1)	2·9 (2·3–3·5)	3·1 (2·3–4·0)	2·9 (2·6–3·3)	4·2 (2·4–6·2)	3·6 (2·6–4·7)
Korea, South	0·9 (0·7–1·2)	0·5 (0·4–0·6)	1·1 (0·9–1·4)	0·8 (0·6–1·1)	3·3 (2·7–4·0)	1·6 (1·2–2·0)	4·2 (2·5–5·8)	7·1 (4·7–9·2)	5·7 (4·4–6·9)
Singapore	1·0 (0·7–1·4)	0·4 (0·3–0·5)	0·7 (0·5–0·9)	0·7 (0·4–0·9)	2·8 (2·0–3·7)	0·1 (0·1–0·1)	7·6 (6·3–8·9)	2·5 (−0·1–5·6)	5·0 (3·5–6·5)
Asia, central	13·6 (11·6–15·9)	3·5 (2·7–4·7)	11·5 (7·9–16·0)	8·7 (6·3–12·3)	36·9 (28·1–48·0)	62·3 (48·2–77·3)	2·0 (1·6–2·3)	3·8 (1·4–6·0)	2·9 (1·7–4·1)
Armenia	6·6 (4·7–8·9)	1·8 (1·4–2·1)	4·3 (3·4–5·4)	3·5 (2·3–5·0)	16·0 (12·6–20·2)	0·8 (0·6–1·0)	4·6 (3·8–5·4)	6·1 (3·8–8·3)	5·4 (4·2–6·5)
Azerbaijan	14·8 (12·4–17·6)	4·0 (2·9–5·5)	14·3 (9·6–21·2)	6·2 (3·9–9·7)	38·8 (29·2–51·3)	7·2 (5·2–9·8)	3·1 (2·2–4·0)	3·6 (0·9–6·1)	3·4 (2·0–4·7)
Georgia	11·4 (8·5–14·0)	2·6 (2·0–3·6)	7·8 (4·9–12·0)	5·9 (3·8–8·7)	27·4 (19·9–36·8)	1·4 (1·0–2·0)	1·2 (0·5–2·0)	3·2 (0·3–6·1)	2·3 (0·8–3·7)
Kazakhstan	12·1 (9·6–14·6)	2·9 (2·1–4·0)	8·9 (5·8–13·5)	6·6 (4·1–10·1)	30·1 (22·4–39·9)	10·5 (7·5–14·7)	1·0 (0·2–1·9)	3·9 (1·1–6·6)	2·5 (1·1–3·9)
Kyrgyzstan	15·3 (12·7–18·2)	4·4 (3·1–6·0)	15·2 (9·8–21·7)	10·0 (6·2–15·3)	44·3 (33·1–58·4)	5·8 (4·1–7·9)	3·0 (2·1–3·9)	1·4 (−1·3–4·1)	2·2 (0·8–3·5)
Mongolia	12·2 (10·0–14·9)	3·0 (2·2–4·2)	9·4 (6·1–14·3)	7·9 (5·0–11·7)	32·2 (24·3–42·7)	2·1 (1·5–2·9)	5·1 (4·3–6·0)	5·2 (2·3–7·7)	5·2 (3·7–6·5)
Tajikistan	15·2 (12·5–18·2)	4·4 (3·1–6·0)	15·0 (9·5–21·7)	9·9 (6·0–15·7)	43·7 (32·0–57·5)	8·4 (5·9–11·7)	3·2 (2·4–4·0)	5·1 (2·4–8·0)	4·2 (2·8–5·6)
Turkmenistan	11·6 (9·4–13·8)	2·7 (2·1–3·5)	8·1 (5·5–11·7)	6·1 (4·1–8·7)	28·2 (22·1–35·7)	3·1 (2·3–4·1)	4·1 (2·9–5·4)	8·4 (6·4–10·2)	6·4 (5·1–7·6)
Uzbekistan	14·6 (11·8–17·5)	3·8 (2·6–5·1)	12·0 (7·5–17·6)	11·2 (7·2–17·3)	41·0 (30·2–54·5)	24·1 (16·7–33·3)	0·8 (0·1–1·5)	2·8 (−0·0–5·4)	1·8 (0·4–3·3)
Asia, east	5·3 (4·2–6·6)	1·4 (1·2–1·6)	3·7 (3·1–4·4)	3·5 (2·4–4·7)	13·8 (10·9–17·2)	233·9 (197·9–268·0)	2·7 (1·7–3·7)	7·3 (5·6–8·8)	5·1 (4·2–6·0)
China	5·2 (4·2–6·6)	1·4 (1·2–1·7)	3·7 (3·0–4·4)	3·5 (2·4–4·7)	13·7 (11·6–16·2)	225·9 (173·4–287·4)	2·7 (1·7–3·7)	7·5 (5·7–9·0)	5·2 (4·3–6·1)
Korea, North	9·6 (8·7–10·4)	2·0 (1·8–2·2)	5·8 (4·8–6·8)	5·8 (4·2–7·7)	23·0 (22·4–23·6)	8·0 (6·7–9·4)	1·8 (1·7–1·9)	3·0 (2·9–3·0)	2·4 (2·4–2·5)
Taiwan	1·7 (1·3–2·2)	0·6 (0·5–0·8)	1·4 (1·1–1·8)	1·8 (1·3–2·4)	5·6 (4·5–6·9)	1·0 (0·8–1·4)	−0·0 (−0·5–0·4)	3·7 (1·7–5·7)	1·9 (0·9–2·9)
Asia, south	25·9 (23·6–28·3)	8·1 (7·1–9·3)	17·6 (14·5–20·8)	14·8 (11·7–19·2)	64·8 (55·8–75·5)	2391·3 (2148·3–2702·5)	2·9 (2·5–3·3)	2·8 (1·6–3·9)	2·9 (2·2–3·4)
Afghanistan	24·5 (19·6–31·4)	14·0 (8·8–21·9)	45·1 (28·4–68·2)	32·5 (16·7–58·0)	111·1 (74·4–165·5)	154·1 (98·0–236·7)	0·2 (−1·5–1·9)	3·1 (−0·8–7·0)	1·7 (−0·3–3·5)
Bangladesh	22·9 (20·2–25·5)	7·7 (6·4–9·1)	13·2 (10·1–16·8)	12·3 (8·6–16·6)	54·9 (47·2–63·9)	165·8 (133·1–203·5)	4·7 (4·3–5·2)	4·1 (2·6–5·4)	4·4 (3·7–5·1)
Bhutan	21·3 (19·0–23·7)	7·5 (6·1–9·0)	17·7 (13·7–22·8)	13·2 (8·7–18·7)	58·4 (49·7–68·6)	0·9 (0·7–1·1)	4·8 (3·8–5·9)	4·1 (2·5–5·5)	4·4 (3·6–5·3)
India	25·7 (22·9–28·6)	7·3 (6·1–8·6)	15·5 (12·1–19·1)	13·6 (9·8–18·9)	60·7 (52·7–69·8)	1647·4 (1333·1–2018·2)	3·0 (2·4–3·6)	3·1 (1·7–4·4)	3·0 (2·3–3·7)
Nepal	20·1 (17·7–22·6)	6·1 (5·1–7·2)	13·7 (10·6–17·2)	11·6 (8·2–15·9)	50·7 (43·3–58·9)	36·5 (29·0–45·0)	5·6 (5·0–6·1)	4·1 (2·6–5·6)	4·8 (4·1–5·6)

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	Deaths per 1000 livebirths					Number of under-5 deaths (thousands)	Annualised rate of decline		
	Early neonatal (0–6 days)	Late neonatal (7–28 days)	Postneonatal (29–364 days)	Child (1–4 years)	Under 5 (0–4 years)		1990–2000	2000–11	1990–2011
(Continued from previous page)									
Pakistan	30·0 (26·5–33·8)	11·9 (9·7–14·3)	25·1 (19·2–31·3)	19·0 (13·5–26·0)	83·4 (70·8–97·5)	396·8 (315·5–490·3)	1·8 (1·1–2·4)	1·2 (−0·3–2·7)	1·5 (0·6–2·3)
Asia, southeast	9·9 (9·0–10·9)	3·3 (2·8–3·8)	8·7 (7·1–10·6)	7·7 (6·3–9·4)	29·3 (25·0–34·3)	331·6 (292·1–381·4)	3·7 (3·4–4·1)	3·6 (2·3–4·8)	3·7 (3·0–4·3)
Cambodia	16·6 (14·3–19·3)	6·2 (4·7–7·9)	18·0 (12·7–24·4)	13·2 (8·5–19·7)	52·9 (41·2–66·8)	16·8 (12·5–22·3)	1·1 (0·4–1·8)	6·1 (3·8–8·4)	3·7 (2·5–4·8)
Indonesia	12·9 (11·1–14·8)	4·4 (3·4–5·6)	12·1 (8·5–16·4)	8·8 (6·0–11·9)	37·6 (30·3–46·6)	163·8 (123·7–210·9)	3·9 (3·4–4·4)	2·8 (0·8–4·8)	3·3 (2·3–4·4)
Laos	19·8 (16·0–24·2)	7·4 (5·0–10·7)	23·4 (14·6–34·3)	20·3 (10·9–34·3)	69·1 (47·1–97·4)	9·7 (6·3–14·2)	3·6 (1·0–5·9)	3·4 (0·6–6·2)	3·5 (1·6–5·3)
Malaysia	1·7 (1·1–2·3)	0·6 (0·5–0·8)	1·1 (0·8–1·6)	1·2 (0·8–1·8)	4·7 (3·4–6·3)	2·7 (1·8–3·8)	6·3 (4·4–8·3)	6·2 (3·0–9·3)	6·3 (4·6–7·9)
Maldives	7·2 (5·6–9·1)	1·6 (1·3–1·8)	2·6 (2·1–3·2)	3·7 (2·7–5·0)	15·0 (12·5–18·2)	0·1 (0·1–0·1)	6·4 (5·5–7·4)	8·7 (6·8–10·5)	7·6 (6·7–8·5)
Burma	17·7 (14·6–21·2)	6·0 (4·2–8·2)	18·2 (11·7–26·7)	15·0 (8·7–24·6)	55·7 (40·1–75·7)	46·1 (31·7–65·6)	3·5 (1·9–5·3)	2·9 (−0·1–5·7)	3·2 (1·6–4·8)
Philippines	9·4 (7·6–11·3)	2·3 (1·9–2·9)	6·4 (4·5–8·9)	8·7 (6·3–11·6)	26·6 (21·2–32·6)	62·2 (47·0–80·6)	3·3 (2·6–4·0)	3·5 (1·5–5·6)	3·4 (2·4–4·5)
Sri Lanka	4·0 (2·6–6·4)	1·4 (1·1–2·0)	2·3 (1·4–3·0)	2·9 (1·9–4·2)	10·6 (7·1–15·0)	4·0 (2·6–5·9)	5·5 (4·0–6·9)	4·4 (1·0–8·0)	4·9 (3·1–6·7)
Thailand	3·8 (2·6–5·4)	1·6 (1·2–2·1)	1·9 (1·3–2·5)	2·7 (1·8–3·7)	10·0 (7·2–13·4)	8·3 (5·8–11·5)	4·6 (3·5–5·8)	3·3 (0·4–6·4)	4·0 (2·5–5·5)
Timor-Leste	15·0 (13·3–16·7)	3·3 (2·7–3·9)	25·6 (20·2–31·8)	9·8 (6·9–13·8)	52·7 (44·6–62·3)	2·3 (1·9–2·9)	1·5 (0·8–2·2)	5·8 (4·2–7·4)	3·8 (2·9–4·6)
Vietnam	3·4 (2·5–4·8)	1·5 (1·2–1·9)	2·3 (1·7–3·0)	3·2 (2·3–4·4)	10·5 (8·3–13·4)	15·4 (11·3–20·8)	5·7 (5·1–6·3)	7·6 (5·3–9·8)	6·7 (5·5–7·8)
Australasia	1·9 (1·5–2·4)	0·5 (0·4–0·6)	1·4 (1·1–1·8)	0·9 (0·7–1·3)	4·8 (3·7–6·0)	1·8 (1·5–2·2)	4·1 (3·6–4·6)	2·9 (1·1–4·8)	3·5 (2·5–4·5)
Australia	1·9 (1·5–2·3)	0·5 (0·4–0·6)	1·3 (1·0–1·6)	0·9 (0·6–1·2)	4·6 (3·7–5·5)	1·4 (1·1–1·8)	4·1 (3·6–4·7)	3·0 (1·3–4·9)	3·5 (2·6–4·5)
New Zealand	1·9 (1·4–2·4)	0·6 (0·5–0·6)	2·2 (1·7–3·0)	1·2 (0·8–1·7)	5·9 (4·5–7·4)	0·4 (0·3–0·5)	4·0 (3·1–4·8)	2·4 (0·2–4·6)	3·1 (2·0–4·3)
Caribbean	11·9 (10·8–13·0)	4·4 (3·9–5·0)	12·3 (10·3–14·6)	9·2 (7·2–11·8)	37·3 (32·0–43·7)	29·6 (26·4–33·0)	3·3 (2·9–3·8)	2·6 (1·5– 3·7)	2·9 (2·4–3·5)
Antigua and Barbuda	5·6 (3·6–8·4)	1·6 (1·2–2·0)	3·2 (2·4–4·2)	2·1 (1·3–3·2)	12·5 (8·8–17·2)	0·0 (0·0–0·0)	−1·1 (−3·5–1·4)	5·0 (1·6–8·5)	2·1 (0·2–3·8)
Bahamas	11·6 (7·9–16·3)	1·0 (0·8–1·2)	2·0 (1·5–2·6)	2·3 (1·5–3·4)	16·7 (12·1–23·0)	0·1 (0·1–0·1)	5·9 (4·3–7·6)	0·7 (−2·5–3·7)	3·1 (1·5–4·8)
Barbados	7·0 (4·4–10·1)	1·8 (1·3–2·2)	3·6 (2·8–4·8)	2·5 (1·6–3·8)	14·9 (10·6–20·3)	0·0 (0·0–0·1)	1·3 (−0·6–3·4)	3·3 (−0·1–6·8)	2·3 (0·7–4·1)
Belize	9·7 (6·7–12·8)	2·2 (1·7–2·7)	4·6 (3·4–6·6)	3·3 (2·1–5·0)	19·7 (14·3–26·1)	0·2 (0·1–0·2)	3·3 (2·2–4·5)	3·4 (0·6–6·2)	3·4 (2·0–4·8)
Cuba	1·7 (1·5–2·0)	0·8 (0·8–0·9)	1·5 (1·2–1·8)	1·0 (0·7–1·3)	5·0 (4·5–5·7)	0·6 (0·5–0·7)	4·7 (3·9–5·5)	4·7 (3·6–5·8)	4·7 (4·0–5·4)
Dominica	9·0 (6·2–12·1)	2·1 (1·7–2·5)	4·3 (3·3–5·9)	3·1 (2·1–4·6)	18·3 (13·8–24·1)	0·0 (0·0–0·0)	−0·4 (−2·7–1·9)	2·0 (−0·9–4·9)	0·9 (−0·6–2·4)
Dominican Republic	12·4 (10·9–14·0)	2·9 (2·5–3·4)	7·3 (5·6–9·3)	5·2 (3·8–7·1)	27·6 (23·7–31·7)	6·0 (4·9–7·3)	4·2 (3·6–4·7)	3·0 (1·6–4·3)	3·5 (2·8–4·2)
Grenada	6·1 (4·0–8·9)	1·7 (1·3–2·1)	3·4 (2·6–4·3)	2·3 (1·5–3·4)	13·4 (9·8–18·0)	0·0 (0·0–0·0)	2·3 (0·2–4·3)	4·3 (1·2–7·5)	3·3 (1·7–5·0)
Guyana	17·2 (14·0–20·4)	4·3 (3·0–5·9)	12·1 (7·7–17·7)	6·1 (3·9–9·3)	39·1 (29·1–51·0)	0·5 (0·4–0·7)	2·5 (1·5–3·5)	1·6 (−1·0–4·4)	2·0 (0·7–3·4)
Haiti	17·8 (15·7–19·9)	8·7 (7·4–10·1)	26·2 (20·7–32·5)	20·7 (14·9–28·2)	71·5 (61·2–82·8)	18·9 (15·1–23·4)	4·0 (3·3–4·6)	3·0 (1·6–4·5)	3·5 (2·7–4·3)

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	Deaths per 1000 livebirths					Number of under-5 deaths (thousands)	Annualised rate of decline		
	Early neonatal (0–6 days)	Late neonatal (7–28 days)	Postneonatal (29–364 days)	Child (1–4 years)	Under 5 (0–4 years)		1990–2000	2000–11	1990–2011
(Continued from previous page)									
Jamaica	7·9 (5·2–11·2)	1·9 (1·4–2·3)	3·9 (2·9–5·5)	4·0 (2·6–5·8)	17·6 (12·7–23·7)	0·9 (0·6–1·2)	2·9 (1·7–4·0)	3·7 (0·8–6·8)	3·3 (1·8–4·8)
Saint Lucia	5·8 (3·6–8·8)	1·6 (1·2–2·1)	3·3 (2·4–4·2)	2·3 (1·4–3·4)	12·9 (8·9–18·0)	0·0 (0·0–0·1)	2·4 (0·6–4·2)	2·1 (−1·2–5·5)	2·3 (0·5–4·1)
Saint Vincent and the Grenadines	10·3 (7·3–13·4)	2·2 (1·8–2·9)	4·9 (3·6–7·2)	3·5 (2·1–5·1)	20·9 (15·5–27·7)	0·0 (0·0–0·1)	0·5 (−1·5–2·5)	1·1 (−1·8–4·1)	0·8 (−0·8–2·4)
Suriname	17·7 (15·7–20·1)	4·3 (3·5–5·4)	12·1 (9·3–15·9)	4·4 (3·0–6·3)	38·1 (32·2–45·6)	0·4 (0·3–0·5)	2·0 (1·1–2·9)	1·0 (−0·8–2·6)	1·5 (0·5–2·3)
Trinidad and Tobago	12·3 (9·1–15·5)	2·6 (2·1–3·4)	6·1 (4·2–9·3)	3·4 (2·3–4·9)	24·2 (17·9–31·9)	0·5 (0·3–0·6)	−0·6 (−1·8–0·5)	2·7 (−0·2–5·6)	1·1 (−0·3–2·5)
Europe, central	2·5 (2·2–2·8)	1·2 (1·1–1·3)	2·6 (2·4–3·0)	1·2 (1·0–1·4)	7·5 (6·6–8·5)	9·3 (8·4–10·4)	4·6 (4·1–5·1)	4·8 (3·8– 5·9)	4·7 (4·2–5·3)
Albania	2·3 (1·6–3·0)	1·3 (1·1–1·6)	6·7 (5·3–8·4)	4·3 (3·1–5·6)	14·5 (11·9–17·5)	0·6 (0·5–0·8)	5·0 (4·3–5·7)	4·8 (2·9–6·7)	4·9 (4·0–5·9)
Bosnia and Herzegovina	2·3 (1·8–2·9)	1·0 (0·9–1·2)	2·1 (1·6–2·7)	0·9 (0·6–1·2)	6·2 (5·0–7·7)	0·2 (0·2–0·3)	5·6 (4·8–6·3)	5·0 (3·0–7·0)	5·3 (4·2–6·3)
Bulgaria	2·6 (1·9–3·6)	1·6 (1·3–2·0)	4·1 (3·0–5·3)	1·8 (1·3–2·5)	10·0 (7·6–12·7)	0·8 (0·6–1·0)	0·7 (0·1–1·3)	5·1 (2·9–7·4)	3·0 (1·8–4·2)
Croatia	2·6 (2·2–3·2)	0·8 (0·7–1·0)	1·3 (1·0–1·6)	0·8 (0·6–1·1)	5·6 (4·7–6·5)	0·2 (0·2–0·3)	4·0 (3·3–4·8)	3·9 (2·4–5·6)	4·0 (3·1–4·8)
Czech Republic	1·2 (0·9–1·5)	0·7 (0·6–0·9)	1·0 (0·8–1·3)	0·6 (0·4–0·8)	3·5 (2·8–4·2)	0·4 (0·3–0·5)	8·3 (7·5–9·1)	4·0 (2·2–6·1)	6·0 (5·1–7·1)
Hungary	2·5 (2·1–3·0)	1·0 (0·9–1·1)	1·4 (1·1–1·7)	0·7 (0·5–0·9)	5·6 (4·8–6·4)	0·6 (0·4–0·7)	5·0 (3·9–6·1)	5·2 (3·7–6·7)	5·1 (4·3–5·9)
Macedonia	4·1 (2·9–5·6)	1·6 (1·3–2·0)	3·6 (2·7–4·4)	1·4 (0·9–1·9)	10·6 (8·0–13·5)	0·2 (0·2–0·3)	3·6 (2·4–4·8)	5·2 (2·8–7·8)	4·5 (3·2–5·7)
Montenegro	2·5 (2·1–3·0)	1·1 (1·0–1·3)	2·4 (1·9–2·9)	1·1 (0·8–1·5)	7·1 (6·1–8·2)	0·1 (0·0–0·1)	6·2 (5·1–7·4)	6·1 (4·7–7·5)	6·2 (5·3–7·0)
Poland	2·7 (2·2–3·3)	1·1 (1·0–1·3)	1·7 (1·3–2·2)	0·8 (0·6–1·1)	6·3 (5·2–7·7)	2·6 (2·0–3·3)	6·3 (6·0–6·7)	3·6 (1·8–5·5)	4·9 (4·0–5·8)
Romania	2·8 (1·9–3·8)	1·9 (1·5–2·3)	6·0 (4·9–7·5)	2·2 (1·6–3·1)	12·8 (10·3–16·0)	2·8 (2·1–3·7)	3·2 (1·6–4·9)	5·1 (2·8–7·4)	4·2 (3·0–5·4)
Serbia	1·9 (1·7–2·1)	0·6 (0·5–0·7)	1·0 (0·8–1·1)	0·6 (0·4–0·8)	4·0 (3·7–4·4)	0·4 (0·4–0·5)	4·7 (4·0–5·5)	6·1 (5·2–7·0)	5·4 (4·9–6·0)
Slovakia	2·5 (1·9–3·1)	1·2 (1·1–1·4)	2·3 (1·7–2·9)	1·1 (0·8–1·5)	7·1 (5·7–8·6)	0·4 (0·3–0·5)	3·9 (3·1–4·7)	2·7 (0·8–4·8)	3·3 (2·3–4·4)
Slovenia	1·2 (1·0–1·5)	0·5 (0·4–0·6)	0·8 (0·6–1·0)	0·5 (0·3–0·7)	2·9 (2·4–3·5)	0·1 (0·0–0·1)	6·4 (5·1–7·6)	5·7 (3·8–7·7)	6·0 (5·1–7·0)
Europe, eastern	5·1 (3·9–6·6)	1·6 (1·3–1·9)	3·7 (3·1–4·4)	2·7 (2·1–3·6)	13·0 (10·3–16·4)	31·7 (26·0–38·6)	1·8 (0·6–2·9)	4·3 (2·3–6·3)	3·1 (2·1–4·1)
Belarus	3·5 (2·6–4·8)	1·3 (1·0–1·5)	3·0 (2·1–3·8)	1·7 (1·1–2·4)	9·4 (7·1–12·2)	1·0 (0·7–1·3)	2·2 (1·0–3·4)	5·7 (3·2–8·2)	4·0 (2·8–5·4)
Estonia	2·5 (2·0–3·1)	0·9 (0·8–1·1)	1·7 (1·3–2·2)	1·4 (1·0–1·9)	6·5 (5·4–7·8)	0·1 (0·1–0·1)	5·2 (3·8–6·6)	6·0 (4·0–7·9)	5·6 (4·6–6·6)
Latvia	2·9 (2·3–3·8)	1·3 (1·1–1·6)	2·6 (1·9–3·3)	2·0 (1·4–2·8)	8·7 (7·0–11·0)	0·2 (0·2–0·3)	2·4 (0·7–4·1)	4·4 (1·9–6·8)	3·5 (2·3–4·7)
Lithuania	2·0 (1·7–2·4)	0·9 (0·8–1·0)	1·9 (1·6–2·4)	1·3 (1·0–1·8)	6·2 (5·4–7·1)	0·2 (0·2–0·3)	3·6 (2·8–4·4)	5·0 (3·6–6·3)	4·4 (3·7–5·0)
Moldova	5·1 (3·7–6·7)	1·4 (1·2–1·8)	3·9 (3·2–4·8)	2·2 (1·5–3·1)	12·6 (10·0–15·6)	0·6 (0·4–0·7)	2·8 (2·0–3·6)	5·6 (3·5–7·7)	4·3 (3·2–5·4)
Russia	5·4 (3·8–7·5)	1·7 (1·3–2·0)	3·8 (3·1–4·7)	2·8 (2·0–4·1)	13·7 (10·8–17·5)	23·2 (17·1–31·1)	2·0 (0·5–3·6)	4·4 (1·8–6·8)	3·3 (2·0–4·5)
Ukraine	4·8 (3·4–6·3)	1·5 (1·2–1·9)	3·5 (2·8–4·3)	2·7 (1·9–3·6)	12·5 (9·8–15·5)	6·2 (4·6–8·0)	0·3 (−0·5–1·1)	4·0 (1·9–6·2)	2·3 (1·2–3·4)

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	Early neonatal (0–6 days)	Late neonatal (7–28 days)	Postneonatal (29–364 days)	Child (1–4 years)	Under 5 (0–4 years)		1990–2000	2000–11	1990–2011
(Continued from previous page)									
Europe, western	1·5 (1·3–1·8)	0·6 (0·5–0·7)	1·2 (1·0–1·3)	0·7 (0·6–0·8)	4·0 (3·4–4·7)	18·4 (16·0–21·0)	5·0 (4·8–5·2)	3·3 (2·1–4·7)	4·1 (3·4–4·8)
Andorra	1·5 (1·0–2·0)	0·5 (0·4–0·7)	1·0 (0·7–1·4)	0·6 (0·4–1·0)	3·6 (2·6–4·8)	0·0 (0·0–0·0)	3·6 (0·5–6·9)	3·7 (0·4–6·8)	3·6 (1·6–5·6)
Austria	1·7 (1·3–2·1)	0·6 (0·5–0·7)	1·2 (0·9–1·5)	0·7 (0·5–0·9)	4·2 (3·3–5·0)	0·3 (0·2–0·4)	5·7 (4·9–6·5)	2·7 (0·8–4·7)	4·1 (3·2–5·2)
Belgium	1·6 (1·2–2·2)	0·5 (0·4–0·7)	1·3 (1·0–1·8)	0·7 (0·5–1·0)	4·2 (3·2–5·6)	0·5 (0·4–0·7)	5·2 (4·5–6·0)	3·5 (0·8–6·1)	4·3 (2·9–5·6)
Cyprus	1·5 (1·1–2·0)	0·6 (0·4–0·7)	1·1 (0·8–1·4)	0·3 (0·2–0·5)	3·5 (2·6–4·6)	0·0 (0·0–0·0)	6·5 (4·7–8·2)	5·6 (2·7–8·4)	6·0 (4·5–7·4)
Denmark	1·9 (1·4–2·4)	0·6 (0·4–0·7)	1·1 (0·8–1·4)	0·8 (0·5–1·1)	4·2 (3·2–5·4)	0·3 (0·2–0·4)	5·1 (4·2–6·0)	2·6 (0·2–5·1)	3·8 (2·6–5·1)
Finland	1·3 (1·0–1·6)	0·4 (0·3–0·4)	0·7 (0·5–0·9)	0·5 (0·4–0·7)	2·9 (2·3–3·5)	0·2 (0·1–0·2)	5·1 (4·0–6·2)	3·4 (1·3–5·6)	4·2 (3·2–5·4)
France	1·3 (0·9–1·6)	0·6 (0·5–0·7)	1·3 (1·0–1·6)	0·7 (0·5–1·0)	3·9 (3·0–4·8)	3·1 (2·3–4·0)	4·9 (4·6–5·3)	3·2 (1·1–5·5)	4·0 (3·0–5·3)
Germany	1·4 (1·0–1·9)	0·5 (0·4–0·6)	1·2 (0·9–1·6)	0·7 (0·5–0·9)	3·8 (2·8–4·9)	2·6 (1·9–3·5)	5·4 (5·1–5·8)	3·4 (0·9–6·0)	4·4 (3·0–5·7)
Greece	1·3 (1·0–1·7)	0·8 (0·6–0·9)	0·9 (0·7–1·1)	0·5 (0·4–0·7)	3·4 (2·8–4·2)	0·4 (0·3–0·5)	5·2 (4·5–6·0)	5·4 (3·5–7·4)	5·3 (4·3–6·4)
Iceland	1·0 (0·7–1·4)	0·4 (0·3–0·5)	0·7 (0·5–1·0)	0·4 (0·3–0·7)	2·6 (1·9–3·4)	0·0 (0·0–0·0)	5·5 (3·0–7·7)	4·0 (0·8–7·1)	4·7 (3·1–6·3)
Ireland	1·7 (1·4–2·0)	0·5 (0·4–0·6)	1·2 (0·9–1·4)	0·7 (0·5–0·9)	4·0 (3·4–4·6)	0·3 (0·2–0·4)	3·2 (2·4–4·0)	5·1 (3·6–6·6)	4·2 (3·4–5·0)
Israel	1·6 (1·3–2·0)	0·7 (0·6–0·8)	1·3 (1·1–1·7)	0·8 (0·6–1·2)	4·5 (3·7–5·3)	0·7 (0·5–0·9)	5·1 (4·5–5·7)	4·5 (2·8–6·2)	4·8 (3·9–5·7)
Italy	1·6 (1·1–2·1)	0·6 (0·5–0·8)	0·7 (0·5–1·0)	0·5 (0·3–0·7)	3·4 (2·5–4·4)	1·9 (1·4–2·5)	5·5 (5·1–6·0)	4·5 (2·0–7·0)	5·0 (3·7–6·3)
Luxembourg	1·1 (0·7–1·5)	0·4 (0·3–0·5)	0·8 (0·6–1·1)	0·5 (0·3–0·7)	2·7 (2·0–3·7)	0·0 (0·0–0·0)	5·7 (3·7–7·8)	6·0 (3·0–9·3)	5·9 (4·3–7·6)
Malta	2·9 (2·0–3·8)	0·9 (0·7–1·1)	2·0 (1·4–2·8)	0·7 (0·4–0·9)	6·4 (4·7–8·6)	0·0 (0·0–0·0)	3·5 (1·6–5·5)	1·2 (−1·9–4·3)	2·3 (0·7–3·8)
Netherlands	1·8 (1·5–2·1)	0·6 (0·5–0·6)	1·0 (0·8–1·2)	0·9 (0·6–1·2)	4·2 (3·6–4·9)	0·8 (0·6–0·9)	3·0 (2·5–3·6)	3·9 (2·5–5·3)	3·5 (2·8–4·2)
Norway	1·4 (1·1–1·7)	0·4 (0·3–0·5)	1·0 (0·8–1·2)	0·7 (0·5–0·9)	3·4 (2·9–4·0)	0·2 (0·2–0·3)	5·9 (5·0–6·7)	3·4 (1·7–4·9)	4·6 (3·8–5·3)
Portugal	1·4 (1·0–1·7)	0·6 (0·5–0·7)	1·1 (0·9–1·4)	0·8 (0·6–1·1)	3·8 (3·0–4·6)	0·4 (0·3–0·5)	6·6 (6·0–7·3)	6·0 (4·1–8·0)	6·3 (5·4–7·3)
Spain	1·3 (0·9–1·8)	0·7 (0·5–0·8)	1·0 (0·7–1·3)	0·7 (0·5–1·0)	3·7 (2·8–4·8)	1·9 (1·3–2·5)	5·5 (5·0–6·0)	3·6 (1·1–6·1)	4·5 (3·2–5·8)
Sweden	1·2 (1·0–1·5)	0·4 (0·3–0·4)	0·7 (0·6–0·9)	0·5 (0·3–0·7)	2·8 (2·3–3·3)	0·3 (0·3–0·4)	5·9 (5·2–6·6)	3·4 (1·9–4·9)	4·6 (3·8–5·4)
Switzerland	1·8 (1·4–2·3)	0·5 (0·4–0·6)	1·1 (0·8–1·3)	0·8 (0·6–1·1)	4·1 (3·3–5·0)	0·3 (0·2–0·4)	4·0 (3·2–4·8)	3·2 (1·1–5·3)	3·6 (2·5–4·7)
UK	2·1 (1·7–2·6)	0·7 (0·6–0·8)	1·6 (1·3–2·0)	0·8 (0·6–1·1)	5·2 (4·3–6·2)	4·0 (3·1–5·0)	4·1 (3·7–4·5)	1·8 (0·2–3·5)	2·9 (2·0–3·8)
Latin America, Andean	9·1 (7·9–10·2)	3·3 (2·9–3·7)	9·9 (8·1–11·8)	7·9 (6·2–9·7)	29·8 (25·0–35·0)	34·2 (30·1–38·6)	4·6 (4·2–5·0)	4·1 (2·8– 5·3)	4·4 (3·7–5·0)
Bolivia	15·0 (13·4–17·0)	5·3 (4·4–6·3)	20·3 (15·5–25·3)	14·6 (10·2–20·5)	54·1 (45·6–64·3)	14·2 (11·1–17·8)	3·9 (3·3–4·4)	3·1 (1·4–4·7)	3·4 (2·6–4·3)
Ecuador	4·2 (3·0–5·4)	2·5 (2·1–2·9)	6·8 (5·1–9·1)	6·0 (4·2–8·1)	19·4 (15·3–24·1)	5·8 (4·3–7·7)	3·3 (2·6–4·0)	5·7 (3·5–7·8)	4·6 (3·5–5·7)
Peru	8·9 (7·2–10·4)	2·9 (2·5–3·4)	6·8 (5·2–8·8)	6·0 (4·2–8·0)	24·3 (20·2–28·6)	14·4 (11·1–18·1)	5·8 (5·2–6·4)	4·6 (2·9–6·3)	5·2 (4·3–6·0)

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	Deaths per 1000 livebirths					Number of under-5 deaths (thousands)	Annualised rate of decline		
	Early neonatal (0–6 days)	Late neonatal (7–28 days)	Postneonatal (29–364 days)	Child (1–4 years)	Under 5 (0–4 years)		1990–2000	2000–11	1990–2011
(Continued from previous page)									
Latin America, central	6·5 (5·7–7·3)	2·2 (2·0–2·3)	6·6 (5·8–7·5)	4·9 (4·2–5·6)	20·1 (17·6–22·6)	96·2 (88·3–106·8)	3·8 (3·4–4·2)	3·2 (2·3–4·1)	3·5 (3·0–4·0)
Colombia	6·7 (5·7–7·7)	2·2 (2·0–2·4)	6·8 (5·5–8·4)	6·3 (4·8–7·8)	21·8 (19·5–24·4)	20·0 (16·2–24·1)	2·3 (1·7–2·9)	1·9 (0·8–3·0)	2·1 (1·5–2·7)
Costa Rica	3·5 (2·7–4·5)	1·0 (0·8–1·1)	2·1 (1·5–2·8)	1·4 (0·9–2·0)	7·9 (6·1–10·1)	0·6 (0·4–0·8)	3·9 (2·5–5·5)	5·4 (2·8–7·7)	4·7 (3·4–5·9)
El Salvador	5·8 (4·4–7·6)	1·8 (1·6–2·1)	5·5 (4·2–7·0)	3·2 (2·4–4·3)	16·3 (13·5–19·7)	2·0 (1·6–2·6)	5·2 (4·5–6·0)	6·8 (4·8–8·6)	6·1 (5·1–7·0)
Guatemala	6·9 (6·0–7·9)	3·0 (2·5–3·6)	12·3 (9·2–15·9)	10·9 (8·2–14·0)	32·8 (27·7–38·9)	15·3 (11·9–19·2)	4·0 (3·4–4·7)	4·1 (2·5–5·7)	4·1 (3·2–4·9)
Honduras	8·5 (6·5–10·4)	2·3 (1·9–2·7)	5·8 (4·2–8·0)	5·3 (3·7–7·3)	21·8 (17·2–27·0)	4·4 (3·3–5·8)	4·1 (3·4–4·8)	5·0 (2·8–7·2)	4·6 (3·5–5·7)
Mexico	6·4 (5·1–7·8)	2·1 (1·9–2·3)	6·0 (4·8–7·4)	3·7 (2·7–4·9)	18·1 (15·4–21·2)	40·0 (31·6–49·5)	4·6 (3·7–5·5)	3·1 (1·4–4·6)	3·8 (3·0–4·6)
Nicaragua	10·1 (8·6–11·6)	3·0 (2·4–3·7)	11·0 (7·7–14·6)	5·3 (3·7–7·5)	29·1 (23·3–35·5)	4·0 (3·1–5·1)	5·0 (4·4–5·6)	3·0 (1·1–5·1)	4·0 (3·0–5·0)
Panama	4·7 (3·2–6·6)	2·0 (1·5–2·3)	4·7 (3·5–6·3)	4·9 (3·5–6·8)	16·2 (12·2–20·8)	1·1 (0·8–1·5)	1·7 (0·5–2·9)	3·3 (0·9–5·9)	2·6 (1·3–3·9)
Venezuela	5·5 (4·0–7·3)	1·8 (1·5–2·1)	4·5 (3·6–5·6)	3·3 (2·3–4·5)	14·9 (11·9–18·6)	8·9 (6·7–11·7)	2·4 (1·2–3·4)	4·0 (1·8–6·2)	3·2 (2·1–4·3)
Latin America, southern	4·8 (3·9–5·7)	1·6 (1·4–1·8)	4·0 (3·5–4·6)	1·8 (1·3–2·3)	12·1 (10·1–14·4)	12·1 (10·6–13·8)	3·9 (3·6–4·2)	3·1 (1·8–4·4)	3·5 (2·8–4·2)
Argentina	5·8 (4·6–7·1)	1·8 (1·6–2·1)	4·5 (3·9–5·3)	2·1 (1·4–2·9)	14·2 (12·0–16·5)	9·9 (7·8–12·1)	3·8 (3·6–4·0)	2·9 (1·4–4·4)	3·3 (2·6–4·1)
Chile	2·1 (1·7–2·6)	0·9 (0·8–1·1)	2·4 (1·8–3·1)	1·0 (0·7–1·4)	6·4 (5·1–7·9)	1·6 (1·2–2·0)	5·1 (3·5–6·6)	4·9 (2·7–7·1)	5·0 (3·8–6·2)
Uruguay	3·7 (2·6–5·3)	1·8 (1·5–2·3)	4·6 (3·5–5·6)	1·3 (0·8–1·9)	11·4 (8·8–14·6)	0·6 (0·4–0·7)	3·7 (3·0–4·4)	3·2 (0·8–5·6)	3·4 (2·2–4·7)
Latin America, tropical	9·0 (7·5–10·5)	2·5 (2·3–2·8)	7·1 (5·8–8·6)	2·5 (1·8–3·4)	21·0 (17·3–25·1)	65·5 (56·7–75·8)	5·1 (4·4–5·8)	3·7 (2·1–5·2)	4·4 (3·6–5·1)
Brazil	9·0 (7·4–10·6)	2·5 (2·3–2·8)	7·1 (5·8–8·7)	2·4 (1·7–3·3)	20·9 (17·7–24·4)	62·5 (50·6–76·4)	5·2 (4·5–5·8)	3·7 (2·1–5·3)	4·4 (3·7–5·3)
Paraguay	8·6 (6·9–10·3)	2·6 (2·3–2·9)	6·0 (4·7–7·6)	4·6 (3·3–6·5)	21·7 (18·1–25·7)	3·4 (2·7–4·3)	3·0 (2·3–3·7)	2·4 (0·7–4·0)	2·7 (1·8–3·5)
North Africa/Middle East	10·3 (8·9–11·7)	3·4 (2·9–4·0)	8·9 (6·9–11·3)	5·0 (4·0–6·2)	27·2 (22·5–32·8)	268·0 (223·4–314·9)	4·5 (4·2–4·8)	4·2 (2·5–5·8)	4·3 (3·5–5·2)
Algeria	8·0 (4·3–11·9)	2·4 (1·6–3·3)	5·3 (3·4–9·1)	3·6 (2·0–5·9)	19·2 (11·5–29·0)	13·7 (8·1–21·5)	4·7 (3·7–5·6)	5·5 (1·4–9·8)	5·1 (2·9–7·4)
Bahrain	3·5 (2·6–4·5)	0·9 (0·7–1·1)	1·4 (1·0–2·0)	1·0 (0·6–1·4)	6·8 (5·0–8·7)	0·2 (0·1–0·2)	5·6 (4·0–7·2)	4·8 (2·0–7·6)	5·2 (3·8–6·6)
Egypt	8·3 (6·4–10·2)	3·3 (2·7–4·0)	6·4 (4·5–9·1)	5·2 (3·6–7·1)	23·0 (17·8–29·1)	43·3 (32·1–57·3)	6·1 (5·5–6·7)	6·2 (4·0–8·6)	6·2 (5·0–7·4)
Iran	10·8 (7·6–14·0)	2·9 (2·3–4·1)	6·7 (4·4–10·6)	4·0 (2·7–6·4)	24·2 (17·4–33·6)	30·8 (21·2–44·2)	4·4 (3·3–5·5)	5·8 (2·6–8·8)	5·2 (3·4–6·7)
Iraq	14·6 (11·1–18·4)	4·6 (3·0–7·0)	10·9 (6·1–18·3)	5·7 (3·3–9·3)	35·3 (23·7–50·7)	40·1 (26·3–59·2)	3·1 (2·2–4·0)	1·8 (−1·8–5·3)	2·4 (0·5–4·2)
Jordan	8·5 (6·8–10·2)	2·4 (2·0–2·9)	5·8 (4·2–7·8)	7·1 (5·2–9·4)	23·6 (19·4–28·6)	3·6 (2·8–4·7)	2·6 (1·9–3·3)	1·3 (−0·7–3·1)	1·9 (0·9–2·9)
Kuwait	4·7 (2·8–7·6)	2·1 (1·6–2·8)	4·4 (3·2–6·1)	2·5 (1·6–3·8)	13·7 (9·6–19·7)	0·7 (0·5–1·0)	2·2 (−1·0–5·2)	2·1 (−1·9–6·2)	2·2 (0·0–4·2)
Lebanon	4·0 (2·2–7·2)	1·5 (1·0–2·2)	3·3 (1·9–4·8)	2·2 (1·3–3·5)	10·9 (6·5–16·8)	0·7 (0·4–1·1)	5·3 (4·1–6·5)	4·8 (0·5–9·3)	5·0 (2·8–7·3)
Libya	4·9 (2·5–8·3)	1·7 (1·1–2·4)	4·0 (2·3–6·2)	2·9 (1·6–4·6)	13·4 (7·8–20·9)	2·0 (1·1–3·1)	5·2 (2·7–7·8)	5·4 (1·5–9·3)	5·3 (3·0–7·7)

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	Deaths per 1000 livebirths					Number of under-5 deaths (thousands)	Annualised rate of decline		
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(Continued from previous page)									
Morocco	12·5 (9·2–15·8)	5·0 (3·2–7·6)	9·8 (5·0–16·7)	6·2 (3·7–9·9)	33·1 (21·7–47·9)	20·6 (13·0–30·9)	4·2 (3·6–4·9)	4·0 (0·2–7·6)	4·1 (2·2–6·0)
Occupied Palestinian Territory	8·9 (5·2–12·6)	2·6 (1·8–3·7)	5·9 (3·7–10·1)	4·1 (2·4–6·8)	21·3 (13·4–31·9)	2·9 (1·7–4·5)	2·1 (0·4–3·9)	4·6 (0·6–8·8)	3·4 (1·4–5·5)
Oman	3·7 (2·6–5·4)	1·4 (1·1–1·8)	3·1 (2·3–4·0)	2·9 (2·0–4·1)	11·1 (8·5–14·5)	0·6 (0·4–0·8)	13·0 (10·6–15·2)	−0·4 (−3·8–2·9)	6·0 (4·4–7·4)
Qatar	4·2 (2·6–6·8)	1·6 (1·2–2·2)	3·4 (2·3–4·5)	2·3 (1·4–3·6)	11·5 (7·7–16·5)	0·2 (0·2–0·4)	1·6 (−1·3–4·5)	3·4 (−0·4–7·4)	2·6 (0·5–4·6)
Saudi Arabia	6·4 (3·5–10·1)	2·1 (1·4–2·8)	4·4 (3·0–6·7)	3·1 (1·8–4·9)	15·9 (10·0–23·5)	9·5 (5·7–14·6)	1·7 (−0·8–4·3)	1·7 (−2·4–6·2)	1·7 (−0·6–4·0)
Syria	3·4 (2·1–5·5)	1·3 (1·0–1·8)	3·7 (2·4–5·1)	2·3 (1·5–3·6)	10·7 (7·3–15·3)	5·0 (3·2–7·5)	5·8 (4·9–6·7)	5·6 (2·1–9·1)	5·7 (3·9–7·5)
Tunisia	4·9 (2·6–8·0)	1·8 (1·2–2·5)	4·0 (2·7–5·7)	3·1 (1·9–4·8)	13·7 (8·5–20·5)	2·5 (1·5–3·8)	5·8 (4·7–7·0)	6·4 (2·7–10·2)	6·1 (4·1–8·4)
Turkey	11·8 (8·4–15·2)	3·6 (2·6–5·5)	11·5 (6·5–19·1)	3·6 (2·1–6·0)	30·2 (19·9–44·6)	39·2 (25·1–59·3)	5·5 (4·7–6·3)	3·0 (−0·8–6·6)	4·2 (2·3–6·1)
United Arab Emirates	1·0 (0·6–1·8)	0·6 (0·3–0·9)	0·9 (0·5–1·6)	0·7 (0·4–1·2)	3·2 (1·8–5·4)	0·3 (0·2–0·5)	6·2 (1·9–10·5)	8·6 (4·1–13·4)	7·5 (4·5–10·1)
Yemen	17·1 (13·8–20·8)	5·4 (3·8–7·5)	23·6 (14·8–34·4)	11·5 (6·5–19·3)	56·4 (39·8–78·0)	52·2 (35·2–74·2)	2·6 (1·8–3·4)	4·9 (1·6–8·0)	3·8 (2·1–5·4)
North America, high income	3·0 (2·3–3·9)	0·7 (0·6–0·9)	2·0 (1·4–2·7)	1·1 (0·8–1·6)	6·9 (5·0–9·1)	33·0 (25·0–41·4)	3·2 (3·1– 3·3)	1·6 (−0·6– 4·1)	2·4 (1·2– 3·7)
Canada	2·1 (1·7–2·4)	0·5 (0·4–0·6)	1·3 (1·1–1·6)	0·8 (0·6–1·1)	4·7 (4·0–5·4)	1·8 (1·4–2·2)	3·2 (2·8–3·6)	2·5 (1·2–3·9)	2·8 (2·1–3·6)
USA	3·1 (2·3–4·0)	0·8 (0·6–0·9)	2·0 (1·4–2·8)	1·2 (0·8–1·7)	7·1 (5·3–9·0)	30·6 (22·0–41·0)	3·2 (3·1–3·4)	1·6 (−0·7–4·2)	2·4 (1·2–3·7)
Oceania	14·5 (12·0–17·4)	4·7 (3·3–6·7)	22·8 (15·1–33·7)	16·5 (9·0–28·1)	57·4 (38·8–83·5)	16·9 (11·9–23·6)	1·3 (−0·3–2·9)	1·3 (−2·2–4·6)	1·3 (−0·4–3·1)
Fiji	8·4 (5·7–10·7)	1·9 (1·4–2·7)	12·3 (7·2–20·4)	5·1 (2·9–8·2)	27·4 (17·8–40·2)	0·5 (0·3–0·8)	0·3 (−2·9–3·8)	1·6 (−2·3–5·4)	1·0 (−1·4–3·4)
Kiribati	13·3 (10·3–16·7)	3·7 (2·2–5·6)	17·1 (9·2–27·4)	11·8 (6·3–21·5)	45·2 (28·6–67·1)	0·1 (0·1–0·2)	3·1 (0·8–5·3)	2·6 (−1·2–6·5)	2·9 (0·7–5·1)
Marshall Islands	12·9 (11·3–14·5)	3·5 (2·7–4·2)	15·6 (11·5–20·1)	10·6 (7·1–15·0)	41·9 (34·6–49·8)	0·1 (0·1–0·1)	0·6 (−0·5–1·7)	−0·2 (−1·6–1·1)	0·2 (−0·8–1·1)
Micronesia, Federated States of	3·7 (2·1–6·6)	1·1 (0·7–1·6)	3·6 (2·1–5·2)	2·8 (1·6–4·4)	11·2 (6·7–17·0)	0·0 (0·0–0·0)	8·0 (4·3–11·9)	6·8 (2·5–11·3)	7·4 (5·2–9·8)
Papua New Guinea	16·0 (12·9–19·5)	5·4 (3·6–7·9)	26·4 (16·9–40·0)	19·4 (9·9–34·2)	65·7 (44·7–95·5)	13·6 (8·8–20·4)	1·7 (−0·1–3·5)	1·3 (−2·3–5·0)	1·5 (−0·3–3·4)
Samoa	5·2 (2·9–7·8)	1·3 (0·9–1·7)	4·3 (2·9–6·2)	6·0 (3·8–9·1)	16·7 (11·0–24·0)	0·1 (0·0–0·1)	1·0 (−2·7–4·8)	3·7 (0·1–7·4)	2·4 (0·0–4·9)
Solomon Islands	9·8 (7·0–12·5)	2·2 (1·6–3·1)	8·4 (5·2–13·5)	6·5 (4·0–10·0)	26·6 (18·4–37·4)	0·5 (0·3–0·7)	0·8 (−1·3–2·9)	2·7 (−0·7–6·0)	1·8 (−0·0–3·6)
Tonga	8·7 (5·7–11·4)	1·9 (1·4–2·8)	7·1 (4·6–11·4)	5·6 (3·4–8·9)	23·1 (15·7–33·5)	0·1 (0·0–0·1)	0·3 (−3·3–4·1)	1·2 (−2·8–5·9)	0·8 (−1·6–3·3)
Vanuatu	11·2 (8·3–14·1)	2·6 (1·8–3·9)	11·2 (6·3–18·0)	8·0 (4·8–13·0)	32·7 (22·0–46·3)	0·2 (0·1–0·3)	−0·6 (−2·2–1·0)	0·5 (−3·1–4·1)	0·0 (−1·9–1·9)
Sub-Saharan Africa, central	26·0 (23·2–29·0)	9·0 (7·8–10·3)	47·3 (39·5–56·1)	55·0 (43·7–68·5)	130·9 (109·7–155·0)	521·9 (469·9–594·8)	1·0 (0·5–1·4)	2·5 (1·4–3·5)	1·8 (1·2–2·3)
Angola	28·7 (24·2–33·6)	10·5 (8·2–13·3)	50·5 (38·5–64·8)	51·0 (34·6–71·8)	133·9 (109·1–162·1)	106·2 (79·6–137·9)	1·8 (0·8–2·8)	3·7 (1·9–5·5)	2·8 (1·8–3·8)
Central African Republic	32·3 (27·5–37·7)	13·2 (10·9–16·2)	58·8 (46·1–74·7)	62·1 (44·5–83·9)	157·0 (132·9–188·1)	24·2 (18·7–30·6)	−0·3 (−1·0–0·4)	1·1 (−0·7–2·7)	0·4 (−0·5–1·2)
Congo	24·6 (21·1–28·3)	7·7 (6·2–9·6)	37·6 (29·1–47·9)	35·8 (25·3–49·5)	101·8 (85·3–121·9)	14·5 (11·2–18·6)	−1·0 (−1·8–−0·1)	1·3 (−0·5–3·0)	0·2 (−0·7–1·0)

(Continues on next page)

	Deaths per 1000 livebirths					Number of under-5 deaths (thousands)	Annualised rate of decline		
	Early neonatal (0–6 days)	Late neonatal (7–28 days)	Postneonatal (29–364 days)	Child (1–4 years)	Under 5 (0–4 years)		1990–2000	2000–11	1990–2011
(Continued from previous page)									
Congo, Republic of the	25·0 (21·2–28·9)	8·4 (6·9–10·0)	46·5 (35·8–58·2)	57·0 (41·8–74·6)	130·6 (111·8–150·7)	374·2 (290·3–469·3)	0·9 (0·3–1·3)	2·3 (0·9–3·7)	1·6 (0·9–2·3)
Equatorial Guinea	35·7 (29·8–42·4)	15·4 (12·0–19·0)	70·2 (52·7–89·3)	84·2 (59·4–115·6)	191·5 (158·6–226·6)	4·9 (3·7–6·3)	−0·3 (−1·3–0·7)	−0·1 (−1·4–1·3)	−0·2 (−1·0–0·7)
Gabon	22·8 (19·2–26·7)	4·0 (3·2–5·1)	20·9 (15·3–27·5)	21·0 (13·8–30·1)	67·0 (54·0–84·0)	2·7 (2·0–3·6)	1·0 (−0·0–2·0)	2·2 (0·2–4·0)	1·6 (0·5–2·7)
Sub-Saharan Africa, east	20·8 (19·6–22·0)	7·1 (6·5–7·8)	31·7 (28·5–35·2)	33·3 (29·4–38·3)	89·9 (81·5–99·6)	1187·3 (1099·4–1286·3)	2·6 (2·3–2·9)	3·2 (2·4–4·0)	2·9 (2·5–3·3)
Burundi	19·6 (16·7–22·7)	9·6 (7·8–11·6)	34·8 (26·4–44·7)	59·7 (46·3–76·3)	118·8 (101·2–139·1)	33·4 (26·0–42·0)	1·5 (0·7–2·3)	2·9 (1·3–4·5)	2·2 (1·3–3·0)
Comoros	21·9 (19·5–24·5)	8·6 (7·3–10·0)	19·1 (14·9–23·8)	14·7 (10·5–20·1)	62·8 (54·4–72·6)	1·7 (1·4–2·1)	3·2 (2·1–4·3)	2·8 (1·5–4·0)	3·0 (2·3–3·7)
Djibouti	18·0 (15·7–20·5)	5·6 (4·6–6·9)	23·4 (17·6–29·8)	23·2 (15·7–32·1)	68·4 (56·7–82·1)	1·8 (1·3–2·2)	2·2 (1·3–3·0)	2·7 (1·0–4·5)	2·4 (1·6–3·4)
Eritrea	17·4 (14·9–20·3)	4·7 (3·7–6·0)	20·1 (14·6–27·0)	29·8 (20·0–42·0)	70·4 (54·8–87·7)	13·4 (9·9–17·7)	4·4 (3·5–5·1)	2·8 (0·8–4·9)	3·5 (2·5–4·7)
Ethiopia	24·9 (21·5–28·3)	8·7 (7·1–10·7)	31·9 (24·4–41·4)	35·2 (25·7–48·8)	97·1 (80·9–116·9)	253·0 (197·0–324·5)	4·1 (3·5–4·8)	3·0 (1·3–4·7)	3·6 (2·6–4·4)
Kenya	19·0 (17·1–21·3)	5·0 (4·4–5·6)	24·9 (19·9–30·4)	22·5 (16·8–28·9)	69·7 (61·5–79·0)	106·7 (86·6–129·1)	0·6 (0·1–1·1)	2·8 (1·6–4·0)	1·8 (1·2–2·4)
Madagascar	14·3 (12·8–16·0)	4·9 (4·4–5·5)	21·5 (17·7–25·9)	19·6 (14·9–25·5)	59·1 (52·5–65·8)	43·2 (35·4–52·0)	4·3 (3·8–4·8)	4·8 (3·7–5·9)	4·6 (4·0–5·1)
Malawi	20·6 (17·9–23·6)	6·6 (5·6–7·9)	35·7 (27·4–44·6)	40·8 (31·4–53·7)	100·1 (86·6–116·1)	66·1 (52·5–82·8)	3·4 (2·9–3·9)	3·7 (2·2–5·0)	3·5 (2·8–4·2)
Mauritius	5·8 (4·6–7·0)	1·6 (1·4–1·9)	3·3 (2·7–3·9)	2·4 (1·7–3·2)	13·1 (11·0–15·2)	0·2 (0·2–0·3)	2·1 (1·5–2·7)	2·5 (1·1–4·0)	2·3 (1·6–3·1)
Mozambique	27·9 (24·5–31·6)	10·8 (9·3–12·5)	59·8 (49·8–71·9)	45·6 (34·0–59·9)	137·0 (120·0–156·9)	120·9 (98·6–147·7)	2·7 (2·2–3·3)	2·1 (0·9–3·4)	2·4 (1·8–3·0)
Rwanda	19·8 (17·1–22·4)	5·9 (5·0–6·9)	22·5 (17·0–28·3)	29·2 (22·0–38·3)	75·4 (64·8–86·7)	32·9 (25·9–40·8)	−0·2 (−1·1–0·6)	7·0 (5·6–8·5)	3·6 (2·9–4·3)
Seychelles	5·2 (3·5–7·3)	1·6 (1·2–2·0)	3·3 (2·5–4·2)	3·2 (2·1–4·7)	13·2 (9·8–17·1)	0·0 (0·0–0·0)	1·7 (−0·5–3·8)	0·9 (−2·0–3·9)	1·3 (−0·2–2·9)
Somalia	17·0 (14·7–19·5)	9·8 (8·0–11·9)	35·4 (27·2–44·6)	40·6 (29·4–54·8)	99·2 (82·5–118·7)	40·3 (31·1–51·1)	2·5 (1·6–3·4)	3·5 (1·7–5·2)	3·0 (2·1–3·9)
Sudan	20·6 (17·9–23·7)	7·4 (6·1–9·0)	25·3 (18·9–32·7)	31·1 (22·6–41·1)	81·9 (67·7–98·1)	116·9 (90·6–147·9)	1·2 (0·2–2·2)	1·9 (0·1–3·7)	1·6 (0·7–2·5)
Tanzania	18·5 (16·4–20·8)	5·8 (5·2–6·6)	31·5 (25·2–38·5)	29·1 (21·8–37·3)	82·5 (73·5–91·9)	153·6 (123·1–186·7)	2·0 (1·6–2·5)	3·8 (2·7–4·9)	3·0 (2·4–3·5)
Uganda	21·1 (18·4–23·7)	6·0 (5·2–7·0)	32·1 (25·0–39·4)	34·7 (26·3–44·0)	90·9 (80·2–102·9)	137·3 (109·5–167·2)	1·9 (1·4–2·4)	3·7 (2·5–4·9)	2·9 (2·2–3·5)
Zambia	17·6 (15·4–19·9)	8·7 (7·6–9·9)	40·0 (32·0–48·7)	49·5 (39·4–61·2)	111·4 (99·7–124·2)	66·3 (53·8–80·1)	1·7 (1·3–2·2)	2·4 (1·4–3·4)	2·1 (1·5–2·6)
Sub-Saharan Africa, southern	13·4 (12·4–14·6)	4·3 (3·8–5·0)	24·9 (21·1–29·3)	16·8 (13·1–21·2)	58·3 (49·5–68·3)	95·0 (84·4–108·0)	2·5 (2·2–2·9)	−1·3 (−2·6–−0·2)	0·5 (−0·2–1·1)
Botswana	15·0 (12·3–17·8)	3·5 (2·4–4·7)	17·4 (10·9–25·5)	11·3 (6·6–18·1)	46·4 (32·8–62·5)	2·2 (1·5–3·1)	−1·6 (−3·5–0·4)	3·2 (0·1–6·5)	0·9 (−0·7–2·6)
Lesotho	30·9 (27·3–35·0)	8·3 (6·9–10·0)	40·7 (32·3–51·0)	26·7 (18·7–36·5)	102·7 (87·4–119·7)	6·2 (4·9–7·7)	−0·9 (−1·6–−0·2)	−0·3 (−1·8–1·2)	−0·6 (−1·4–0·2)
Namibia	18·8 (16·0–21·8)	4·2 (3·2–5·4)	18·5 (12·9–25·1)	17·7 (11·3–26·6)	57·8 (44·5–74·2)	3·5 (2·5–4·6)	1·4 (0·7–2·2)	0·8 (−1·6–3·2)	1·1 (−0·1–2·3)
South Africa	10·8 (9·8–11·8)	3·5 (3·2–3·9)	23·8 (19·8–28·0)	13·5 (10·1–17·6)	50·7 (45·8–56·2)	53·6 (44·1–64·2)	5·1 (4·7–5·6)	−3·1 (−4·0–−2·1)	0·8 (0·3–1·4)
Swaziland	18·4 (15·7–21·4)	5·1 (3·9–6·7)	49·6 (37·0–65·3)	28·3 (17·9–41·9)	98·1 (75·6–126·0)	3·4 (2·5–4·5)	−3·1 (−3·9–−2·3)	0·1 (−2·3–2·6)	−1·4 (−2·7–−0·1)

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	Deaths per 1000 livebirths					Number of under-5 deaths (thousands)	Annualised rate of decline		
	Early neonatal (0–6 days)	Late neonatal (7–28 days)	Postneonatal (29–364 days)	Child (1–4 years)	Under 5 (0–4 years)		1990–2000	2000–11	1990–2011
(Continued from previous page)									
Zimbabwe	16·5 (14·1–19·4)	6·0 (4·6–7·8)	25·6 (18·2–34·9)	24·3 (15·2–36·3)	70·6 (53·3–91·4)	26·3 (18·9–35·7)	−0·2 (−1·0–0·5)	0·6 (−1·9–3·2)	0·2 (−1·0–1·6)
Sub-Saharan Africa, west	27·1 (24·9–29·4)	10·0 (9·0–11·1)	38·3 (33·5–44·0)	62·3 (53·2–72·5)	131·3 (115·6–148·9)	1732·5 (1578·6–1890·7)	1·5 (1·2–1·8)	2·6 (1·7–3·4)	2·1 (1·6–2·5)
Benin	23·4 (20·4–27·0)	5·9 (4·9–7·1)	31·9 (24·4–40·2)	41·8 (31·3–54·5)	99·4 (84·4–116·3)	34·8 (27·3–43·6)	2·5 (1·9–3·1)	3·2 (1·6–4·7)	2·9 (2·1–3·6)
Burkina Faso	25·5 (21·2–30·3)	13·5 (10·6–16·9)	48·4 (35·8–62·7)	79·3 (55·9–105·1)	157·6 (126·9–193·2)	111·8 (83·8–143·9)	1·5 (0·9–2·1)	1·4 (−0·7–3·3)	1·4 (0·4–2·5)
Cameroon	25·9 (22·2–30·2)	8·0 (6·1–9·9)	34·5 (25·1–44·6)	48·6 (33·6–65·4)	112·3 (90·7–135·3)	79·7 (59·3–101·9)	0·2 (−0·4–0·8)	2·3 (0·5–4·2)	1·3 (0·4–2·3)
Cape Verde	11·0 (9·1–12·9)	3·0 (2·4–3·9)	11·0 (7·4–15·4)	7·5 (5·0–10·4)	32·1 (24·6–40·3)	0·3 (0·2–0·4)	2·4 (0·8–3·9)	3·7 (1·6–5·7)	3·1 (1·9–4·4)
Chad	31·7 (27·4–36·9)	14·1 (11·6–16·7)	53·7 (41·8–67·1)	79·4 (59·8–102·7)	168·2 (146·9–192·5)	84·4 (66·4–105·0)	1·1 (0·6–1·6)	1·2 (0·0–2·4)	1·2 (0·5–1·8)
Côte d'Ivoire	26·9 (23·1–31·2)	10·6 (8·1–13·2)	36·9 (27·7–48·1)	36·6 (24·7–51·6)	106·7 (85·8–130·2)	71·7 (54·2–92·5)	0·8 (−0·1–1·7)	2·6 (0·8–4·6)	1·7 (0·8–2·8)
Gambia	23·0 (19·5–26·8)	7·5 (5·8–9·7)	30·1 (22·1–40·1)	38·2 (26·1–52·8)	95·4 (77·4–118·0)	6·3 (4·7–8·2)	1·7 (1·0–2·5)	3·2 (1·1–5·1)	2·5 (1·4–3·5)
Ghana	20·2 (17·7–22·7)	4·8 (4·1–5·7)	14·9 (11·3–19·1)	23·4 (17·5–29·9)	61·9 (54·1–71·0)	47·6 (38·1–58·6)	1·7 (1·3–2·3)	4·6 (3·2–5·9)	3·2 (2·6–3·9)
Guinea	29·2 (25·1–33·4)	10·6 (8·6–12·9)	42·4 (32·7–54·4)	56·0 (41·0–74·3)	131·7 (109·5–155·0)	51·2 (39·6–64·9)	2·5 (1·9–3·2)	2·7 (1·2–4·3)	2·6 (1·8–3·5)
Guinea-Bissau	31·8 (26·7–37·1)	14·2 (11·4–17·4)	54·0 (41·1–68·5)	80·3 (57·8–104·0)	169·6 (143·3–197·8)	9·8 (7·5–12·4)	1·5 (0·7–2·2)	1·7 (0·1–3·3)	1·6 (0·8–2·4)
Liberia	24·1 (21·2–27·0)	7·8 (6·7–9·2)	44·0 (35·7–54·1)	31·1 (22·6–40·7)	103·1 (89·0–118·8)	15·9 (12·8–19·4)	4·2 (3·7–4·6)	4·4 (3·0–5·7)	4·3 (3·6–5·0)
Mali	33·5 (28·1–39·0)	12·4 (9·9–15·5)	42·4 (31·8–55·5)	78·3 (57·9–102·8)	157·5 (129·4–188·2)	112·0 (85·7–143·0)	1·4 (0·8–2·0)	2·9 (1·3–4·8)	2·2 (1·3–3·2)
Mauritania	25·4 (21·2–30·1)	6·5 (4·9–8·2)	18·0 (12·5–24·6)	30·6 (20·1–42·0)	78·2 (61·0–97·0)	9·1 (6·7–12·0)	0·4 (−0·5–1·3)	2·5 (0·6–4·6)	1·5 (0·4–2·7)
Niger	20·5 (17·2–24·3)	11·9 (9·8–14·3)	45·7 (34·9–58·8)	92·0 (70·4–115·1)	161·3 (134·6–189·8)	120·5 (93·4–150·7)	2·8 (2·2–3·3)	3·2 (1·6–4·8)	3·0 (2·1–3·8)
Nigeria	28·7 (24·6–33·0)	10·3 (8·7–12·0)	39·7 (30·9–49·7)	69·9 (54·7–87·1)	141·4 (126·2–160·0)	891·1 (712·3–1088·9)	1·5 (0·9–2·0)	2·5 (1·3–3·7)	2·0 (1·4–2·6)
São Tomé and Príncipe	17·1 (15·1–19·2)	4·2 (3·6–4·8)	15·8 (12·7–19·4)	17·0 (12·6–22·5)	53·0 (47·7–58·5)	0·3 (0·2–0·3)	2·8 (2·2–3·4)	3·8 (2·8–4·8)	3·3 (2·8–3·9)
Senegal	19·5 (16·7–22·5)	6·8 (5·5–8·2)	18·8 (14·0–24·7)	34·3 (25·6–44·3)	77·2 (64·7–91·4)	35·9 (27·8–45·1)	1·4 (0·8–2·0)	4·3 (2·7–5·8)	2·9 (2·1–3·7)
Sierra Leone	27·1 (23·5–31·0)	9·3 (7·7–11·1)	48·0 (37·8–59·8)	47·1 (35·1–62·2)	125·7 (107·0–147·1)	28·5 (22·5–35·5)	1·6 (1·0–2·1)	5·0 (3·5–6·4)	3·3 (2·6–4·1)
Togo	27·4 (23·3–31·8)	7·1 (5·7–8·9)	30·3 (22·5–39·1)	47·6 (34·8–63·4)	108·2 (89·9–128·7)	20·9 (16·0–26·5)	1·9 (1·1–2·6)	1·2 (−0·4–3·0)	1·5 (0·7–2·4)

Data are n or % (uncertainty interval).

Table 1: **Early neonatal, late neonatal, postneonatal, childhood, and under-5 mortality in 2011**

Role of the funding source

The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

The worldwide mortality rate for children younger than 5 years declined continuously from the MDG baseline in 1990 to present at an annualised rate of 2·2% (uncertainty interval 1·8–2·6). By 2011, there were 7·2 (6·6–7·8) million deaths in children younger than 5 years. The fraction of deaths in sub-Saharan Africa has increased from 33% (3·9 million of 11·6 million) in 1990 to 49% (3·5 million of 7·2 million) in 2011. The contribution of deaths in north Africa and the Middle East has declined from 5·7% (0·66 million of 11·6 million) to 3·7% (0·27 million of 7·2 million) over the same period. South Asia still accounts for one-third

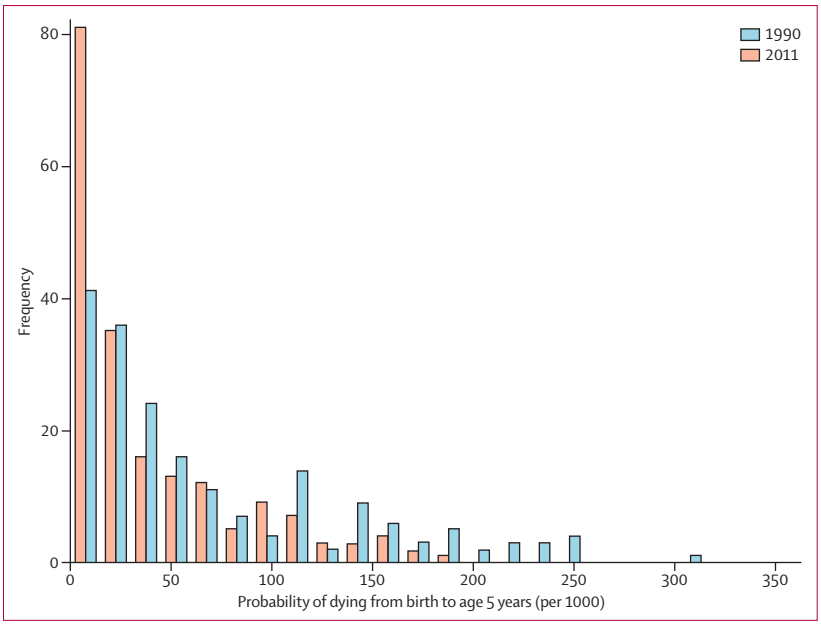

Figure 2: **Distribution of countries by under-5 mortality rate, 1990 and 2011**

of worldwide deaths of children younger than 5 years in 2011. Over the same period, the early neonatal, late neonatal, postneonatal, and childhood (ages 1–4 years) death rates declined annually by 1·7%, 2·7%, 2·5%, and 2·4% respectively (figure 1). Worldwide, early neonatal death rates have been the slowest to decline, although the rate of progress at this age is heterogeneous across regions.

The distribution of deaths at different ages by global burden of disease region in 1990 and 2011 is presented in the webappendix (p 57). Regions have been sorted by under-5 mortality rate as measured by numbers of deaths from birth to age 5 years; the lowest on the top and the highest on the bottom. In 1990, high-income countries in western Europe, Australasia, and Asia Pacific had under-5 mortality of ten per 1000 livebirths. The contribution of mortality in early neonatal, late neonatal, postneonatal, and childhood on average was 37·9%, 10·7%, 31·3%, and 20·1% respectively for 1990. By contrast, in the same year, under-5 mortality was greater than 165 deaths per 1000 livebirths in west, central, and east sub-Saharan Africa. In these regions, childhood mortality accounts for about 42·5% of the under-5 mortality, and early and late neonatal periods combined account for about 26% of the under-5 mortality. Similarly for south Asia, the contribution to under-5 mortality from early neonatal, late neonatal, postneonatal, and childhood was 32·3%, 13·4%, 28·1%, and 26·2% respectively in 1990. In 2011 with lower child mortality worldwide, the age distribution pattern changed slightly in sub-Saharan Africa, but there are important changes in south Asia, Latin America (tropical and southern), and north Africa and the Middle East where about 50% of deaths are in the neonatal period with strong predominance of early neonatal deaths.

Table 1 provides estimates and uncertainty intervals of early neonatal, late neonatal, postneonatal, childhood, and under-5 deaths by country for 2011, as well as the annualised rates of decline from 1990 to 2011, 1990 to 2000, and 2000 to 2011. A full annual sequence of estimates for 1980–2011 is available on demand from the authors. The lowest early neonatal mortality, 0·8 (0·7–1·1) per 1000 livebirths, is in 2011 in Japan and the highest early neonatal mortality rate in 2011 is in Equatorial Guinea at 35·7 (29·8–42·4). For late neonatal mortality, the lowest rates are in Sweden and Finland and the highest in Equatorial Guinea. The highest postneonatal mortality can be found in Equatorial Guinea and Mozambique, where the rates are greater than 60 deaths per 1000 livebirths in 2011. The biggest mortality gap between countries can be found in childhood. In 2011, the childhood mortality in Sweden, Italy, and Greece is about 0·5 deaths per 1000 livebirths, whereas in Niger and Equatorial Guinea it is around 87, a 173-times difference.

Not only have there been shifts in the distribution of countries towards lower rates of child mortality but the width of the distribution has narrowed. 21 years ago the highest level of under-5 mortality was 300·2 per 1000 livebirths and now it has decreased to 191·5. In 1990 only nine developing countries had a rate lower than 20 per 1000 livebirths and in 2011 there were 41—eight in Asia, 18 in Latin America and the Caribbean, and 11 in the Middle East and north Africa. Progress in reducing under-5 mortality is reducing intercountry inequalities. Figure 2 shows the frequency distribution of countries by level of under-5 mortality in 1990 and 2011. The distribution of countries in 2011 has substantially shifted to lower levels of under-5 mortality supporting a view that there is steady, albeit slow, convergence of countries towards lower and more equally distributed levels of child mortality across countries.

To understand better why some countries are likely to make more progress in the coming years than on average over the period 1990–2011, we show in figure 3 the comparison by country of the annualised rate of decline in under-5 mortality from 1990 to 2000 and from 2000 to 2011. The line represents equal rates of decline in the two periods; countries below the equivalence line have faster rates of decline in 2000–11 than 1990–2000. 79 countries show a faster rate of decline during the 1990s and 106 countries show a faster rate of decline in the past 11 years. Accelerated decline from 2000 to 2011 compared with 1990 to 2000 has happened in 39 of 48 countries in sub-Saharan Africa. The same is observed in the Middle East and most of the countries in Asia. In the case of Latin America and the Caribbean, as well as in south Asia, progress was greater during the 1990s. Some countries, such as China, Rwanda, and Botswana, stand out for

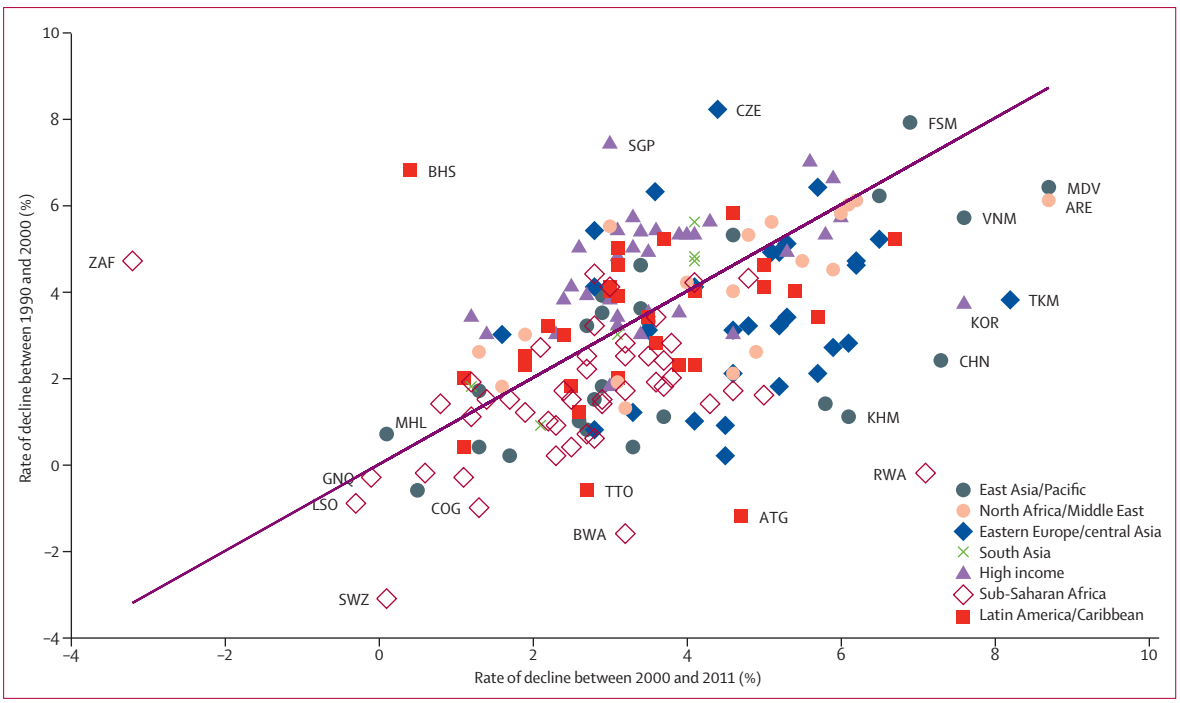

Figure 3: **Annualised rate of decline in under-5 mortality, 1990–2000 and 2000–11**
ARE=United Arab Emirates. ATG=Antigua and Barbuda. BHS=Bahamas. BWA=Botswana. CHN=China. COG=Congo. CZE=Czech Republic. FSM=Federated States of Micronesia. GNQ=Equatorial Guinea. KHM=Cambodia. KOR=South Korea. LSO=Lesotho. MDV=Maldives. MHL=Marshall Islands. RWA=Rwanda. SGP=Singapore. SWZ=Swaziland. TKM=Turkmenistan. TTO=Trinidad and Tobago. VNM=Vietnam. ZAF=South Africa.

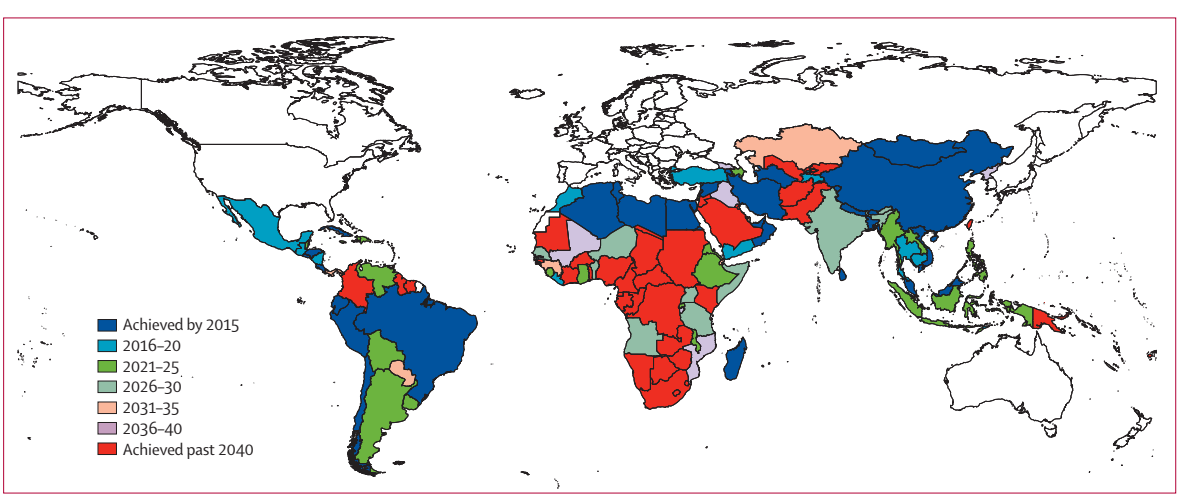

Figure 4: **Millennium Development Goal 4 attainment year based on annualised rates of change, 1990–2011**
For more detail see webappendix.

having substantial acceleration in the recent decade. The highest rates of decline that have been sustained over a decade are as high as 12·9%, showing the potential for rapid declines in under-5 mortality.

Figure 4 shows the year in which countries will achieve the MDG 4 target based on the annual rate of change from 1990 to 2011 for 137 developing countries. Overall, 31 countries will achieve the original target by 2015 with a further 11 countries achieving the target by 2020. In Latin America (Andean, central, southern, and tropical), MDG 4 will be achieved within 10 years of the target deadline for all countries except Colombia, Panama, and Paraguay. In Asia there is more variability. Countries like Pakistan, Afghanistan, Uzbekistan, and Taiwan are delayed by comparison with others such as Armenia, Mongolia, and Turkmenistan, which will reach the goal in 2015. In sub-Saharan Africa, Madagascar is likely to achieve MDG 4 by 2015, whereas eight countries (Eritrea, Ethiopia, Ghana,

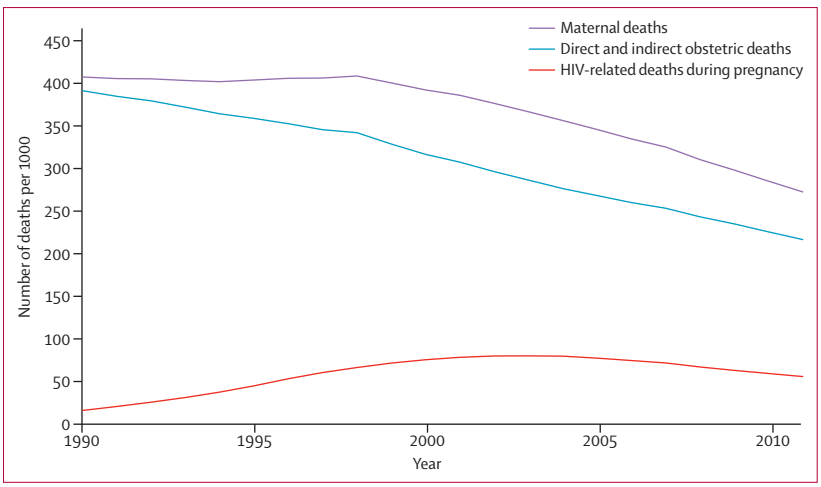

Figure 5: **Worldwide maternal deaths, direct and indirect obstetric deaths, and HIV-related deaths during pregnancy, 1990–2011**

Liberia, Malawi, Rwanda, São Tomé and Príncipe, and Sierra Leone) are likely to achieve it by 2025. 23 countries in sub-Saharan Africa are unlikely at the present pace to achieve MDG 4 before 2040. The 31 countries on track represent 27·4% (33 million of 120·5 million) of livebirths in the developing countries for 2011.

In figure 5, we show the trend in the number of maternal deaths from 1990 to 2011. We also show a breakdown of maternal deaths into the number of maternal deaths from direct and indirect obstetric causes (excluding HIV), and HIV-related deaths during pregnancy. Worldwide death numbers have been declining at 1·9% per year on average from 1990 to 2011, dropping from 409 053 (382 910–437 860) in 1990 to 273 465 (256 332–291 693) in 2011. The subset of maternal deaths due to direct and indirect obstetric maternal deaths declined steadily at an annual pace of 2·8% from 1990 to 2011 from 392 900 to 217 400; over the same period, the number of HIV-related deaths during pregnancy rose to a peak of 80 500 in 2003 and through the scale-up of antiretroviral drugs and the natural epidemic curve for HIV has since declined to 56 100 in 2011. From 2005 to 2011, maternal deaths declined 73 700. 28·6% (21 100 of 73 700) of this decline was in India, whereas Ethiopia, Pakistan, Nigeria, Indonesia, China, and Afghanistan accounted for a further 32·1% (23 600 of 73 700) of the decline.

Table 2 provides estimates of the number of maternal deaths, the maternal mortality ratio, and the annualised rate of decline between 1990 and 2000, and 2000 and 2011 for 187 countries. In 2011, the highest level of maternal mortality was seen in Eritrea, Liberia, Burundi, and Afghanistan, and lowest in Iceland and Austria. In addition to the magnitude, it is becoming increasingly important to measure the annual rate of change and predict whether MDG 5 will be achieved. More than half the countries in the world, including China, India, and some countries of sub-Saharan Africa (such as Kenya, Swaziland, Zimbabwe, and Botswana), have seen acceleration in the past 10 years, whereas others, including South Africa, Mexico, and Brazil, have experienced a reduced pace of decline.

Figure 6 shows a map of when, based on the trend from 1990 to 2011, countries are likely to achieve the MDG 5 target. 13 countries are likely to achieve the target by 2015—China, Egypt, Iran, Jordan, Libya, Maldives, Mongolia, Morocco, Peru, Samoa, Syria, Tunisia, and Turkey. A further 15 countries will achieve the goal between 2015 and 2025. At the present pace, 96 countries will take more than 20 years after 2015 to reach the target. The 13 countries on track represent 19% (22 million of 120·5 million) of livebirths in the developing countries for 2011.

Many aspects of health systems limit the scale-up of child and maternal interventions. Nevertheless, some intervention strategies for children, such as vaccination, distribution of insecticide-treated bednets, vitamin A supplementation, and deworming, can be delivered without a health system that has the capacity for referral and emergency management. Figure 7 compares the pace of progress for MDG 4 and MDG 5 for child and maternal mortality from 1990 to 2011. The rates of decline to achieve the targets (5·5% for MDG 5 and 4·4% for MDG 4) are shown as green lines for reference. Additionally, figure 7 shows the worldwide rate of decline in under-5 mortality rates and the maternal mortality ratio in blue. For child mortality, most countries have a faster rate of decline than the worldwide rate because of the concentration of births and child deaths in key sub-Saharan African countries with slow rates of decline including the Republic of the Congo, Nigeria, and Ethiopia.

Overall, the correlation coefficient between the rates of progress for children and mothers is only 0·42. In other words, there is substantial variation in the rate of decline in the maternal mortality ratio at the same rate of decline in under-5 mortality and vice versa. For countries with a pace of decline in the maternal mortality ratio between 1% and 3% per year, decline in under-5 mortality ranges from under 1% to over 7% per year. For countries with declines in under-5 mortality at or near the MDG 4 pace, the rate of change in maternal mortality ranges from increases in Liberia to decreases over 9% per year in Maldives. Figure 7 shows that although the target for MDG 4 was set lower than for MDG 5, most countries have made faster progress in reducing child mortality compared with maternal mortality.

The shaded area represents where countries have been achieving the pace of progress needed to achieve both MDG 4 and MDG 5. This group comprises 11 countries, of which nine are in the developing world. The developing countries in this high-performing group include China, Egypt, Iran, Libya, Maldives, Mongolia, Peru, Syria, and Tunisia. No country in sub-Saharan Africa is expected to

	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
Worldwide	299·3 (280·2–320·4)	299·5 (286·9–313·0)	201·8 (189·2–215·3)	409 053 (382 910–437 860)	393 830 (377 209–411 556)	273 465 (256 332–291 693)	0·0% (−0·8–0·8)	3·6% (2·9–4·3)	1·9% (1·4–2·3)
Developing	335·8 (314·2–359·6)	332·2 (318·0–347·2)	224·7 (210·3–239·8)	405 605 (379 510–434 426)	390 959 (374 333–408 616)	270 772 (253 486–289 063)	0·1% (−0·7–0·9)	3·6% (2·9–4·3)	1·9% (1·5–2·4)
Developed	21·7 (21·0–22·5)	20·8 (20·1–21·6)	18·0 (16·4–19·8)	3448 (3329–3573)	2872 (2769–2987)	2693 (2453–2968)	0·4% (−0·1–1·0)	1·3% (0·4–2·2)	0·9% (0·4–1·4)
Asia Pacific, high income	14·9 (13·7–16·1)	14·6 (13·6–15·8)	10·1 (8·8–11·4)	300 (277–324)	256 (237–276)	162 (142–183)	0·1% (−1·0–1·3)	3·4% (2·0–4·8)	1·9% (1·2–2·6)
Brunei Darussalam	32·5 (22·7–45·8)	26·6 (19·7–35·6)	23·4 (16·4–32·2)	2 (2–3)	2 (1–3)	2 (1–2)	2·0% (−2·5–6·0)	1·2% (−2·6–4·8)	1·6% (−0·7–3·9)
Japan	12·5 (11·2–14·1)	13·6 (12·3–15·1)	9·5 (8·0–11·2)	160 (143–180)	157 (142–174)	102 (86–121)	−0·9% (−2·5–0·7)	3·3% (1·4–5·2)	1·3% (0·4–2·3)
Korea, South	19·6 (17·4–22·0)	17·0 (15·1–19·2)	11·3 (9·1–13·7)	131 (116–148)	92 (81–104)	54 (44–66)	1·4% (−0·4–3·1)	3·8% (1·6–5·8)	2·6% (1·6–3·9)
Singapore	9·4 (7·8–11·3)	10·1 (8·5–12·0)	6·8 (5·3–8·5)	5 (4–6)	5 (4–6)	3 (2–4)	−0·7% (−3·0–1·6)	3·6% (1·2–6·1)	1·6% (0·2–3·0)
Asia, central	58·5 (55·7–61·5)	53·1 (50·7–55·8)	39·0 (35·1–43·1)	1164 (1107–1222)	795 (759–835)	677 (609–750)	1·0% (0·3–1·6)	2·8% (1·8–3·8)	1·9% (1·4–2·4)
Armenia	36·3 (31·3–41·9)	43·7 (36·8–50·7)	25·0 (18·9–31·7)	27 (23–31)	18 (15–21)	12 (9–15)	−1·8% (−4·0–0·3)	5·1% (2·5–7·7)	1·8% (0·3–3·2)
Azerbaijan	32·0 (28·4–36·5)	50·1 (43·8–56·2)	25·6 (20·1–32·4)	62 (55–71)	71 (62–80)	48 (38–61)	−4·5% (−6·3–−2·7)	6·1% (3·6–8·7)	1·1% (−0·2–2·4)
Georgia	31·6 (27·0–36·6)	27·5 (23·0–32·8)	55·4 (45·1–67·6)	28 (24–33)	16 (13–19)	28 (23–35)	1·4% (−0·8–3·7)	−6·4% (−8·8–−3·9)	−2·7% (−3·9–−1·5)
Kazakhstan	63·4 (57·3–70·3)	63·0 (56·2–70·6)	38·8 (31·9–47·1)	237 (214–263)	150 (134–168)	138 (113–168)	0·1% (−1·6–1·6)	4·4% (2·2–6·5)	2·4% (1·3–3·4)
Kyrgyzstan	60·3 (53·2–68·0)	66·7 (58·7–75·2)	70·7 (58·6–84·2)	83 (73–93)	72 (63–81)	94 (78–112)	−1·0% (−2·6–0·6)	−0·5% (−2·5–1·4)	−0·7% (−1·8–0·3)
Mongolia	203·5 (173·5–239·6)	153·2 (137·8–171·1)	64·7 (51·3–79·8)	142 (121–168)	73 (66–82)	43 (34–53)	2·8% (0·7–4·9)	7·9% (5·7–10·1)	5·5% (4·1–6·7)
Tajikistan	72·8 (65·6–81·0)	50·9 (45·4–57·4)	32·6 (25·4–40·6)	150 (135–166)	97 (86–109)	63 (49–78)	3·6% (2·0–5·2)	4·1% (1·9–6·4)	3·9% (2·7–5·1)
Turkmenistan	59·2 (52·4–67·0)	38·4 (31·8–46·8)	26·4 (19·8–34·1)	76 (67–86)	41 (34–49)	29 (22–37)	4·4% (2·1–6·7)	3·4% (0·9–6·2)	3·9% (2·6–5·3)
Uzbekistan	50·1 (45·5–55·1)	45·4 (40·9–50·5)	37·3 (29·4–47·5)	359 (326–395)	258 (233–287)	221 (174–281)	1·0% (−0·4–2·4)	1·8% (−0·6–4·1)	1·4% (0·2–2·6)
Asia, east	86·4 (73·5–101·1)	56·7 (49·5–64·8)	26·9 (20·4–34·7)	21 623 (18 401–25 294)	10 874 (9488–12 412)	4555 (3461–5879)	4·2% (2·2–6·3)	6·8% (4·0–9·4)	5·6% (4·2–7·0)
China	88·0 (74·7–103·2)	57·5 (50·1–65·8)	26·5 (20·0–34·6)	21 363 (18 127–25 050)	10 612 (9245–12 50)	4348 (3283–5679)	4·2% (2·3–6·3)	7·1% (4·2–9·8)	5·7% (4·3–7·2)
Korea, North	46·0 (31·3–65·5)	51·4 (34·9–74·7)	53·6 (35·9–77·1)	194 (132–275)	212 (144–309)	185 (124–266)	−1·1% (−6·1–3·7)	−0·4% (−4·8–4·1)	−0·7% (−3·3–2·0)
Taiwan	19·7 (12·7–29·0)	17·1 (11·0–25·9)	12·2 (7·8–18·5)	66 (43–97)	50 (32–76)	22 (14–33)	1·4% (−3·4–6·2)	3·1% (−1·9–7·8)	2·3% (−0·5–5·1)
Asia, south	538·8 (471·3–612·3)	410·6 (368·4–455·1)	239·0 (199·5–281·6)	200 064 (174 995–227 367)	153 320 (137 548–169 930)	88 631 (73 963–104 420)	2·7% (1·1–4·4)	4·9% (3·1–6·7)	3·9% (2·8–4·9)
Afghanistan	1046·8 (811·0–1312·2)	1304·0 (1007·2–1643·4)	880·8 (685·4–1104·8)	7803 (6046–9781)	15 393 (11 890–19 400)	12 402 (9651–15 556)	−2·2% (−4·5–0·2)	3·6% (1·2–5·6)	0·8% (−0·5–2·2)
Bangladesh	593·1 (539·3–644·7)	417·1 (381·2–451·5)	247·0 (197·1–309·6)	22 273 (20 251–24 210)	14 727 (13 459–15 941)	7395 (5901–9269)	3·5% (2·2–4·8)	4·8% (2·6–7·0)	4·2% (3·0–5·4)
Bhutan	535·2 (442·7–625·3)	287·7 (241·3–343·9)	189·9 (143·3–250·0)	109 (90–128)	45 (37–53)	28 (21–37)	6·2% (3·9–8·4)	3·8% (0·9–6·7)	5·0% (3·4–6·5)
India	522·7 (428·2–621·4)	355·0 (304·0–409·5)	186·5 (142·2–237·9)	143 042 (117 188–170 037)	96 856 (82 948–111 728)	50 648 (38 624–64 608)	3·9% (1·6–6·1)	5·9% (3·1–8·6)	4·9% (3·4–6·6)

(Continues on next page)

	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
(Continued from previous page)									
Nepal	455·0 (365·0–545·9)	399·7 (346·6–459·2)	315·9 (240·5–407·0)	3362 (2696–4033)	3234 (2804–3715)	2261 (1721–2912)	1·3% (−1·3–3·6)	2·2% (−0·5–4·8)	1·8% (0·2–3·4)
Pakistan	520·9 (442·2–607·3)	510·5 (392·0–636·1)	331·7 (249·7–433·1)	23 476 (19 928–27 372)	23066 (17 709–28 738)	15 896 (11 965–20 755)	0·2% (−2·6–3·1)	3·9% (0·8–7·1)	2·2% (0·7–3·7)
Asia, southeast	315·6 (289·2–343·4)	256·8 (234·4–282·0)	173·3 (149·7–200·9)	39 303 (36 017–42 768)	29 691 (27 104–32 603)	19 524 (16 863–22 632)	2·1% (1·0–3·2)	3·6% (2·0–5·1)	2·9% (2·0–3·7)
Cambodia	412·6 (363·7–465·8)	490·0 (433·4–549·6)	308·2 (234·6–388·4)	1720 (1517–1942)	1648 (1458–1849)	980 (746–1235)	−1·7% (−3·6–0·1)	4·3% (1·8–6·8)	1·4% (0·0–2·8)
Indonesia	404·0 (365·1–445·6)	332·8 (299·2–365·2)	244·7 (188·9–310·8)	19 291 (17 431–21 279)	15 234 (13 695–16 716)	10 600 (8185–13 464)	1·9% (0·5–3·4)	2·9% (0·4–5·3)	2·4% (1·2–3·7)
Laos	471·3 (374·5–576·4)	401·1 (297·9–517·9)	282·8 (179·8–390·1)	824 (655–1008)	649 (482–838)	395 (251–545)	1·6% (−1·3–4·5)	3·3% (0·1–6·6)	2·5% (0·5–4·7)
Malaysia	83·2 (60·7–112·2)	63·6 (54·0–75·3)	48·2 (34·8–63·0)	427 (312–576)	361 (307–427)	279 (201–364)	2·6% (−0·6–5·9)	2·6% (−0·4–5·8)	2·6% (0·6–4·6)
Maldives	352·4 (272·3–433·3)	146·9 (115·8–181·7)	47·2 (34·0–64·7)	32 (24–39)	9 (7–11)	3 (2–3)	8·7% (5·8–11·7)	10·4% (6·9–13·8)	9·6% (7·7–11·4)
Burma	912·3 (692·7–1172·8)	819·0 (582·9–1090·8)	464·3 (331·5–624·5)	9701 (7367–12472)	7567 (5385–10077)	3828 (2733–5149)	1·1% (−2·1–4·4)	5·2% (1·4–8·6)	3·2% (1·2–5·2)
Philippines	189·3 (167·2–211·9)	94·9 (85·1–104·8)	86·4 (64·0–110·6)	3841 (3392–4298)	2183 (1958–2411)	2025 (1501–2593)	6·9% (5·3–8·4)	0·9% (−1·8–3·8)	3·8% (2·5–5·3)
Sri Lanka	73·6 (63·1–84·8)	50·7 (43·9–57·7)	32·6 (24·8–41·7)	261 (224–300)	173 (150–197)	123 (94–158)	3·7% (1·6–5·8)	4·1% (1·3–6·9)	3·9% (2·4–5·3)
Thailand	37·9 (32·6–45·0)	54·2 (47·2–62·2)	40·0 (29·4–53·7)	410 (353–487)	505 (440–579)	331 (243–444)	−3·6% (−5·8–−1·2)	2·8% (−0·3–5·9)	−0·2% (−1·8–1·4)
Timor-Leste	529·0 (416·6–639·2)	403·3 (361·0–446·2)	366·0 (302·7–439·3)	172 (135–207)	153 (137–169)	163 (135–196)	2·7% (0·3–4·8)	0·9% (−1·0–2·9)	1·7% (0·3–3·0)
Vietnam	131·0 (100·1–166·3)	87·8 (63·1–119·6)	54·1 (37·5–77·9)	2624 (2007–3332)	1211 (871–1650)	797 (553–1149)	4·0% (0·0–7·9)	4·4% (0·6–8·2)	4·3% (2·1–6·4)
Australasia	9·0 (7·9–10·2)	7·6 (6·6–8·7)	5·5 (4·7–6·5)	28 (25–32)	23 (20–26)	21 (18–24)	1·6% (0·0–3·3)	2·9% (1·0–4·9)	2·3% (1·2–3·3)
Australia	8·2 (7·0–9·6)	7·4 (6·3–8·7)	4·9 (3·8–6·0)	21 (18–25)	18 (16–21)	15 (12–19)	1·1% (−1·0–3·1)	3·8% (1·4–6·3)	2·5% (1·1–3·8)
New Zealand	12·5 (10·4–14·8)	8·7 (7·1–10·5)	8·6 (6·7–10·9)	7 (6–9)	5 (4–6)	6 (4–7)	3·6% (0·9–6·0)	0·1% (−2·5–2·6)	1·8% (0·4–3·1)
Caribbean	198·5 (176·9–221·6)	246·9 (224·7–271·8)	203·4 (160·4–255·5)	1594 (1421–1779)	1859 (1691–2047)	1443 (1138–1813)	−2·2% (−3·5–−0·8)	1·8% (−0·5–4·2)	−0·1% (−1·3–1·1)
Antigua and Barbuda	49·7 (40·2–60·3)	25·2 (20·6–30·4)	18·1 (14·3–22·9)	1 (0–1)	0 (0–0)	0 (0–0)	6·8% (4·1–9·6)	3·0% (0·5–5·5)	4·8% (3·3–6·2)
Bahamas	48·2 (38·8–60·5)	67·8 (57·2–81·4)	48·4 (38·7–59·2)	3 (2–4)	4 (3–4)	3 (2–3)	−3·4% (−6·0–−1·0)	3·1% (0·8–5·5)	0·0% (−1·5–1·5)
Barbados	56·8 (47·4–67·4)	44·9 (36·6–54·5)	34·4 (27·1–42·3)	2 (2–3)	1 (1–2)	1 (1–1)	2·4% (0·1–4·8)	2·4% (0·0–4·9)	2·4% (1·1–3·8)
Belize	55·8 (46·0–67·5)	76·3 (64·5–90·7)	62·3 (50·5–77·2)	4 (3–5)	6 (5–7)	5 (4–6)	−3·1% (−5·4–−0·7)	1·9% (−0·7–4·2)	−0·5% (−1·9–0·8)
Cuba	48·2 (42·7–54·4)	57·5 (50·7–64·9)	40·2 (33·2–47·9)	85 (76–96)	83 (74–94)	44 (36–52)	−1·8% (−3·4–0·0)	3·3% (1·3–5·3)	0·9% (−0·2–1·9)
Dominica	52·3 (43·8–62·4)	49·2 (40·8–59·9)	35·1 (28·9–42·5)	1 (1–1)	1 (0–1)	0 (0–0)	0·6% (−1·5–3·0)	3·1% (0·9–5·3)	1·9% (0·6–3·2)
Dominican Republic	86·6 (75·4–98·3)	63·3 (56·5–70·5)	58·8 (47·7–72·0)	186 (162–211)	135 (121–151)	127 (103–156)	3·1% (1·5–4·9)	0·7% (−1·4–2·8)	1·9% (0·7–3·0)
Grenada	34·1 (27·9–41·5)	31·0 (25·1–37·7)	24·1 (19·3–29·9)	1 (1–1)	1 (0–1)	0 (0–1)	1·0% (−1·6–3·4)	2·3% (−0·1–4·7)	1·7% (0·3–3·0)
Guyana	146·1 (124·9–169·8)	164·8 (142·3–189·9)	151·8 (121·7–188·3)	27 (23–31)	25 (22–29)	20 (16–25)	−1·2% (−3·3–0·9)	0·8% (−1·5–2·9)	−0·2% (−1·6–1·1)

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	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
(Continued from previous page)									
Haiti	451·7 (390·3–521·4)	578·6 (517·1–647·8)	450·9 (334·5–589·0)	1203 (1040–1389)	1543 (1379–1728)	1202 (892–1570)	−2·5% (−4·2–−0·8)	2·3% (−0·5–5·1)	0·0% (−1·5–1·5)
Jamaica	82·2 (62·4–105·4)	61·5 (50·5–73·4)	50·5 (35·4–68·6)	50 (38–65)	35 (29–42)	25 (18–34)	2·9% (0·0–5·8)	1·9% (−1·6–5·2)	2·3% (0·4–4·5)
Saint Lucia	52·2 (43·0–61·3)	55·0 (45·5–66·3)	38·9 (31·5–48·9)	2 (2–2)	2 (1–2)	1 (1–2)	−0·5% (−2·9–1·7)	3·2% (0·8–5·5)	1·4% (0·0–2·7)
Saint Vincent and the Grenadines	48·8 (39·7–58·8)	45·2 (37·6–53·4)	30·7 (25·0–37·6)	1 (1–2)	1 (1–1)	1 (0–1)	0·8% (−1·7–3·1)	3·5% (1·1–6·0)	2·2% (0·8–3·5)
Suriname	80·0 (66·7–94·1)	94·4 (79·1–110·7)	57·4 (45·7–71·1)	8 (6–9)	10 (8–12)	6 (4–7)	−1·7% (−3·9–0·6)	4·6% (2·2–6·9)	1·6% (0·1–3·0)
Trinidad and Tobago	73·2 (63·0–84·6)	60·8 (52·1–71·5)	37·8 (29·0–47·6)	19 (16–22)	11 (10–13)	7 (6–9)	1·9% (−0·2–3·9)	4·4% (1·9–6·9)	3·2% (1·8–4·6)
Europe, central	41·0 (38·7–43·4)	22·8 (21·7–24·0)	14·6 (13·4–16·0)	701 (662–741)	277 (263–291)	184 (169–202)	5·9% (5·1–6·6)	4·0% (3·1–5·0)	4·9% (4·5–5·4)
Albania	32·8 (27·9–38·5)	11·2 (9·3–13·2)	7·3 (5·7–9·3)	26 (22–30)	6 (5–7)	3 (2–4)	10·7% (8·7–12·8)	4·0% (1·3–6·4)	7·2% (5·7–8·5)
Bosnia and Herzegovina	27·8 (22·2–34·9)	20·3 (13·5–29·0)	15·8 (9·8–25·1)	17 (14–21)	8 (5–12)	5 (3–8)	3·3% (−0·6–7·2)	2·4% (−1·7–6·6)	2·8% (0·3–5·1)
Bulgaria	34·5 (30·0–39·3)	44·2 (38·5–50·9)	25·6 (20·7–31·5)	35 (31–40)	30 (26–34)	19 (16–24)	−2·5% (−4·3–−0·5)	5·0% (2·9–7·3)	1·4% (0·3–2·6)
Croatia	15·3 (13·0–17·9)	16·7 (14·2–19·6)	13·9 (11·3–16·9)	8 (7–10)	7 (6–9)	6 (5–7)	−0·9% (−3·0–1·3)	1·7% (−0·6–3·8)	0·5% (−0·9–1·8)
Czech Republic	15·9 (13·5–18·4)	13·3 (11·3–15·4)	10·3 (8·2–12·7)	20 (17–23)	12 (10–13)	12 (10–15)	1·8% (−0·4–3·9)	2·3% (−0·2–4·6)	2·1% (0·8–3·4)
Hungary	21·3 (18·4–24·8)	15·1 (12·8–17·7)	15·5 (12·5–18·8)	27 (23–31)	15 (12–17)	16 (12–19)	3·4% (1·5–5·4)	−0·2% (−2·3–2·1)	1·5% (0·4–2·7)
Macedonia	19·8 (16·0–24·2)	18·7 (15·8–21·9)	13·9 (11·0–17·1)	7 (5–8)	5 (4–6)	3 (2–4)	0·6% (−1·9–3·2)	2·7% (0·5–5·0)	1·7% (0·3–3·2)
Montenegro	33·7 (22·7–48·6)	33·9 (24·1–48·2)	15·7 (10·7–22·5)	2 (2–3)	3 (2–4)	1 (1–2)	−0·1% (−4·7–4·3)	7·0% (2·9–10·9)	3·6% (1·2–6·2)
Poland	30·2 (27·3–33·5)	19·0 (16·8–21·3)	10·7 (8·8–13·0)	168 (152–186)	71 (63–79)	44 (36–54)	4·6% (3·2–6·3)	5·2% (3·1–7·3)	4·9% (3·9–6·0)
Romania	109·8 (98·9–119·8)	41·6 (37·3–46·3)	24·9 (20·7–29·7)	350 (315–381)	94 (84–104)	55 (46–66)	9·7% (8·2–11·1)	4·7% (2·9–6·6)	7·1% (6·1–8·0)
Serbia	17·3 (13·6–22·3)	14·3 (12·0–16·7)	10·7 (8·6–13·1)	25 (19–32)	18 (15–21)	12 (9–14)	1·9% (−0·9–4·9)	2·6% (0·4–5·0)	2·3% (0·7–3·8)
Slovakia	15·7 (12·6–19·2)	14·1 (12·0–16·5)	10·7 (8·5–13·4)	13 (10–15)	8 (6–9)	6 (5–8)	1·1% (−1·3–3·4)	2·5% (0·0–4·8)	1·8% (0·3–3·3)
Slovenia	17·1 (14·2–20·5)	14·5 (11·9–17·3)	8·5 (6·8–10·5)	4 (3–4)	3 (2–3)	2 (1–2)	1·7% (−0·7–4·1)	4·9% (2·4–7·3)	3·4% (2·0–4·7)
Europe, eastern	45·9 (42·8–49·6)	56·6 (52·5–61·1)	41·7 (34·8–49·8)	1384 (1292–1497)	1098 (1019–1187)	1021 (851–1217)	−2·1% (−3·1–−1·0)	2·8% (1·0–4·5)	0·5% (−0·5–1·4)
Belarus	27·7 (24·2–31·6)	32·3 (27·9–37·2)	21·5 (16·4–27·4)	40 (35–46)	29 (25–34)	23 (18–30)	−1·5% (−3·5–0·3)	3·7% (1·1–6·3)	1·2% (−0·1–2·6)
Estonia	36·4 (30·4–43·8)	20·9 (17·3–24·7)	6·2 (4·9–7·8)	8 (6–9)	3 (2–3)	1 (1–1)	5·5% (3·1–8·0)	11·1% (8·5–13·5)	8·4% (6·9–9·8)
Latvia	38·1 (32·7–44·4)	26·2 (21·7–31·5)	12·6 (9·9–15·8)	14 (12–16)	5 (4–6)	3 (2–4)	3·8% (1·7–6·0)	6·7% (4·1–9·0)	5·3% (3·9–6·6)
Lithuania	25·9 (22·0–30·6)	18·2 (15·4–21·4)	9·7 (7·8–11·9)	14 (12–17)	6 (5–7)	3 (3–4)	3·6% (1·3–5·7)	5·7% (3·3–8·1)	4·7% (3·4–6·0)
Moldova	44·3 (38·3–50·8)	30·4 (25·8–35·8)	20·4 (16·2–25·3)	36 (31–41)	15 (12–17)	9 (7–11)	3·8% (1·6–5·8)	3·7% (1·1–6·2)	3·7% (2·5–5·0)

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	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
(Continued from previous page)									
Russia	51·8 (47·0–57·1)	66·4 (60·7–72·8)	46·3 (36·6–57·0)	1037 (941–1143)	887 (812–973)	792 (626–976)	−2·5% (−3·8–−1·2)	3·3% (1·1–5·5)	0·6% (−0·6–1·7)
Ukraine	34·9 (31·7–38·5)	38·3 (34·5–42·2)	37·4 (30·8–45·1)	236 (214–260)	153 (138–169)	189 (155–227)	−0·9% (−2·4–0·5)	0·3% (−1·8–2·2)	−0·3% (−1·4–0·7)
Europe, western	11·7 (11·2–12·2)	11·0 (10·5–11·5)	8·8 (8·1–9·5)	523 (501–548)	471 (450–493)	398 (367–431)	0·6% (0·0–1·2)	2·0% (1·2–2·9)	1·4% (0·9–1·8)
Andorra	6·2 (4·1–9·1)	6·3 (4·3–9·3)	5·9 (3·7–9·2)	0 (0–0)	0 (0–0)	0 (0–0)	−0·3% (−5·3–4·1)	0·8% (−3·9–5·6)	0·3% (−2·7–2·9)
Austria	10·7 (9·2–12·6)	6·9 (5·8–8·0)	4·0 (3·2–4·9)	9 (8–11)	5 (5–6)	3 (2–4)	4·4% (2·3–6·5)	4·9% (2·5–7·1)	4·7% (3·3–6·0)
Belgium	12·7 (10·9–14·7)	11·5 (9·5–13·8)	8·1 (6·4–10·2)	15 (13–17)	13 (11–15)	10 (8–13)	0·9% (−1·5–3·2)	3·2% (0·7–5·9)	2·1% (0·8–3·4)
Cyprus	6·0 (4·0–8·7)	4·7 (3·5–6·3)	8·4 (5·8–11·8)	1 (1–1)	1 (0–1)	1 (1–2)	2·3% (−1·9–6·6)	−5·2% (−9·3–−1·1)	−1·6% (−4·2–0·9)
Denmark	8·8 (7·4–10·4)	6·3 (5·3–7·6)	5·3 (4·2–6·7)	6 (5–7)	4 (3–5)	3 (3–4)	3·4% (1·2–5·5)	1·6% (−0·9–4·1)	2·4% (1·0–3·9)
Finland	7·5 (6·3–8·9)	6·8 (5·7–8·0)	5·3 (4·3–6·5)	5 (4–6)	4 (3–5)	3 (3–4)	1·0% (−1·3–3·5)	2·2% (−0·2–4·6)	1·6% (0·3–2·9)
France	14·9 (13·4–16·6)	12·6 (11·3–14·1)	10·0 (8·3–11·9)	111 (100–124)	95 (85–106)	79 (66–95)	1·6% (0·0–3·2)	2·2% (0·1–4·1)	1·9% (0·9–2·9)
Germany	13·4 (12·0–15·2)	13·1 (11·8–14·6)	10·8 (8·8–13·2)	112 (100–127)	99 (89–111)	75 (61–92)	0·2% (−1·4–1·8)	1·8% (−0·3–3·9)	1·1% (−0·1–2·1)
Greece	9·2 (7·8–10·8)	7·9 (6·7–9·5)	7·6 (6·1–9·4)	10 (8–11)	8 (7–10)	9 (7–11)	1·4% (−0·8–3·5)	0·4% (−2·1–2·9)	0·9% (−0·4–2·2)
Iceland	4·4 (3·5–5·4)	3·0 (2·4–3·8)	1·5 (1·2–1·9)	0 (0–0)	0 (0–0)	0 (0–0)	3·7% (0·8–6·6)	6·2% (3·5–8·8)	5·0% (3·6–6·4)
Ireland	5·8 (4·8–6·9)	5·1 (4·3–6·1)	4·1 (3·3–5·1)	3 (2–4)	3 (2–3)	3 (2–4)	1·3% (−1·2–3·7)	2·0% (−0·4–4·5)	1·6% (0·3–3·0)
Israel	11·1 (9·3–13·1)	9·8 (8·2–11·6)	6·5 (5·2–8·0)	11 (9–13)	12 (11–15)	10 (8–13)	1·3% (−1·0–3·5)	3·7% (1·2–6·0)	2·6% (1·3–3·9)
Italy	9·5 (8·3–10·7)	7·1 (6·2–8·1)	5·5 (4·4–6·7)	53 (46–60)	37 (32–42)	31 (25–38)	2·9% (1·1–4·7)	2·4% (0·1–4·5)	2·6% (1·4–3·8)
Luxembourg	18·3 (15·2–21·8)	11·0 (8·9–13·2)	6·7 (5·4–8·4)	1 (1–1)	1 (0–1)	0 (0–0)	5·1% (2·8–7·7)	4·5% (2·0–6·9)	4·8% (3·4–6·2)
Malta	17·1 (13·6–21·1)	16·5 (13·6–19·9)	12·1 (9·6–15·2)	1 (1–1)	1 (1–1)	0 (0–1)	0·3% (−2·3–2·8)	2·8% (0·4–5·4)	1·6% (0·2–3·1)
Netherlands	11·5 (9·8–13·3)	13·9 (12·0–16·0)	8·5 (6·9–10·5)	22 (19–25)	28 (24–32)	15 (12–19)	−1·9% (−3·8–0·1)	4·5% (2·2–6·8)	1·5% (0·2–2·7)
Norway	5·9 (4·9–7·0)	6·6 (5·4–7·8)	5·6 (4·5–6·9)	3 (3–4)	4 (3–5)	3 (3–4)	−1·0% (−3·4–1·2)	1·4% (−0·9–4·0)	0·3% (−1·1–1·5)
Portugal	20·4 (17·6–23·7)	16·7 (14·2–19·6)	13·7 (11·1–16·8)	23 (20–27)	19 (16–22)	13 (11–16)	2·0% (−0·1–4·1)	1·8% (−0·3–4·1)	1·9% (0·8–3·1)
Spain	11·1 (9·8–12·6)	9·8 (8·5–11·2)	8·9 (7·3–10·7)	44 (39–50)	39 (34–44)	45 (37–54)	1·2% (−0·5–3·0)	0·9% (−1·2–3·0)	1·1% (0·0–2·2)
Sweden	7·1 (6·0–8·4)	6·3 (5·2–7·5)	4·5 (3·6–5·4)	8 (7–10)	6 (5–7)	5 (4–6)	1·2% (−1·1–3·4)	3·1% (0·7–5·4)	2·2% (0·9–3·5)
Switzerland	8·9 (7·5–10·7)	8·7 (7·2–10·4)	6·7 (5·4–8·2)	7 (6–9)	7 (6–8)	5 (4–6)	0·2% (−2·1–2·6)	2·4% (0·0–4·8)	1·4% (0·1–2·8)
UK	10·1 (8·9–11·3)	12·2 (11·0–13·6)	10·7 (9·1–12·5)	78 (69–88)	85 (76–94)	82 (70–96)	−2·0% (−3·5–−0·4)	1·2% (−0·6–3·1)	−0·3% (−1·3–0·7)
Latin America, Andean	219·6 (207·7–232·7)	139·8 (131·6–148·1)	98·3 (83·2–114·5)	2608 (2467–2764)	1661 (1564–1760)	1133 (958–1319)	4·5% (3·7–5·4)	3·2% (1·7–4·7)	3·8% (3·0–4·7)
Bolivia	407·7 (364·0–456·1)	285·2 (256·4–315·6)	235·4 (179·6–301·7)	991 (885–1109)	747 (671–826)	619 (472–794)	3·6% (2·0–5·1)	1·8% (−0·7–4·3)	2·6% (1·3–4·0)

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	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
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Ecuador	164·0 (148·6–181·1)	84·2 (73·9–95·7)	67·8 (53·9–83·9)	488 (442–539)	257 (225–292)	202 (161–250)	6·7% (4·9–8·2)	2·0% (−0·3–4·4)	4·2% (3·1–5·4)
Peru	174·5 (161·0–187·7)	105·8 (96·9–115·5)	52·7 (38·9–68·7)	1129 (1041–1214)	658 (603–718)	312 (230–406)	5·0% (3·8–6·2)	6·4% (3·7–9·3)	5·7% (4·4–7·1)
Latin America, central	82·4 (78·4–86·5)	74·2 (70·9–77·7)	62·3 (56·7–67·9)	4007 (3808–4204)	3570 (3412–3741)	2988 (2721–3256)	1·1% (0·4–1·7)	1·6% (0·7–2·5)	1·3% (0·9–1·8)
Colombia	68·2 (62·2–74·5)	77·5 (70·9–85·4)	48·2 (40·1–56·8)	617 (563–674)	705 (646–778)	440 (366–519)	−1·3% (−2·6–0·0)	4·3% (2·6–6·0)	1·7% (0·7–2·7)
Costa Rica	28·1 (24·1–32·5)	35·3 (30·5–40·8)	24·6 (19·9–30·3)	23 (20–27)	28 (24–32)	18 (14–22)	−2·3% (−4·3–−0·3)	3·3% (1·1–5·5)	0·7% (−0·5–1·9)
El Salvador	137·9 (124·6–152·6)	66·4 (57·8–75·9)	49·5 (39·6–60·0)	234 (212–259)	97 (84–111)	62 (50–75)	7·3% (5·6–9·1)	2·7% (0·5–5·0)	4·9% (3·8–6·0)
Guatemala	166·7 (149·6–185·1)	102·0 (90·1–115·5)	75·6 (59·4–96·9)	583 (523–648)	421 (372–477)	357 (281–458)	4·9% (3·2–6·6)	2·8% (0·1–5·2)	3·8% (2·5–5·1)
Honduras	147·2 (132·2–162·6)	143·1 (118·0–170·7)	88·8 (63·7–122·9)	277 (249–306)	282 (232–336)	182 (130–251)	0·3% (−1·8–2·3)	4·4% (1·1–7·6)	2·5% (0·7–4·1)
Mexico	71·5 (64·8–78·5)	65·9 (60·2–71·7)	66·6 (57·1–76·6)	1705 (1545–1873)	1505 (1375–1638)	1465 (1257–1687)	0·8% (−0·5–2·3)	−0·1% (−1·7–1·5)	0·3% (−0·4–1·2)
Nicaragua	88·1 (76·5–100·4)	112·8 (98·2–127·1)	86·0 (65·7–111·7)	135 (117–153)	159 (139–179)	119 (91–155)	−2·5% (−4·3–−0·6)	2·5% (−0·3–5·3)	0·2% (−1·3–1·6)
Panama	59·9 (50·6–69·8)	49·5 (42·8–56·6)	41·6 (33·9–50·8)	38 (32–44)	34 (30–39)	29 (24–36)	1·9% (−0·1–3·8)	1·6% (−0·6–3·7)	1·7% (0·5–3·0)
Venezuela	70·0 (62·8–77·4)	59·2 (53·8–64·9)	52·5 (42·6–63·0)	394 (354–436)	340 (309–373)	315 (255–378)	1·7% (0·3–3·0)	1·1% (−0·9–3·1)	1·4% (0·3–2·5)
Latin America, southern	56·8 (53·0–60·7)	50·7 (46·8–54·8)	49·5 (43·5–56·2)	608 (567–650)	509 (469–549)	490 (431–557)	1·1% (0·1–2·2)	0·2% (−1·2–1·7)	0·7% (−0·1–1·3)
Argentina	61·7 (56·3–67·3)	62·3 (56·6–67·8)	61·8 (53·3–71·4)	438 (399–477)	431 (392–469)	430 (371–496)	−0·1% (−1·4–1·2)	0·1% (−1·5–1·7)	0·0% (−0·8–0·8)
Chile	48·7 (44·1–53·8)	23·4 (20·8–26·5)	19·1 (15·6–23·2)	148 (134–164)	60 (53–68)	47 (38–57)	7·3% (5·8–8·9)	1·9% (−0·2–4·1)	4·5% (3·4–5·6)
Uruguay	38·4 (32·9–44·7)	33·2 (27·9–39·4)	27·3 (21·5–34·3)	22 (19–25)	18 (15–21)	13 (11–17)	1·5% (−0·6–3·6)	1·8% (−0·5–4·1)	1·6% (0·3–3·0)
Latin America, tropical	87·9 (78·4–98·3)	69·1 (61·5–77·3)	67·1 (53·9–82·9)	3300 (2944–3689)	2615 (2328–2927)	2093 (1681–2587)	2·4% (0·7–4·0)	0·3% (−2·0–2·6)	1·3% (0·2–2·5)
Brazil	85·9 (76·0–96·6)	67·0 (59·2–75·7)	65·5 (51·6–82·4)	3102 (2745–3490)	2437 (2153–2753)	1940 (1528–2440)	2·5% (0·7–4·1)	0·3% (−2·2–2·7)	1·3% (0·1–2·6)
Paraguay	139·4 (126·5–152·5)	118·5 (105·5–131·0)	97·4 (74·4–123·3)	198 (180–217)	178 (158–196)	153 (117–194)	1·6% (0·1–3·1)	1·8% (−0·6–4·5)	1·7% (0·5–3·1)
North Africa/ Middle East	175·6 (162·5–190·5)	101·3 (93·1–109·1)	76·0 (66·8–86·3)	17089 (15813–18538)	9124 (8393–9833)	7515 (6604–8536)	5·5% (4·6–6·5)	2·6% (1·3–3·9)	4·0% (3·2–4·7)
Algeria	170·3 (123·8–221·0)	93·0 (72·4–117·6)	82·3 (59·9–113·5)	1372 (997–1780)	588 (458–744)	592 (431–817)	6·0% (2·8–9·2)	1·2% (−2·4–4·8)	3·5% (1·3–5·4)
Bahrain	41·3 (32·7–51·2)	33·2 (27·1–40·0)	16·3 (13·2–20·2)	6 (5–7)	5 (4–5)	4 (3–5)	2·2% (−0·5–4·7)	6·4% (3·9–8·9)	4·4% (3·0–6·0)
Egypt	232·6 (193·2–276·0)	80·2 (67·2–94·7)	69·5 (55·7–86·6)	4217 (3502–5003)	1400 (1172–1653)	1315 (1054–1639)	10·6% (8·5–12·9)	1·3% (−1·2–4·0)	5·8% (4·4–7·1)
Iran	56·8 (41·4–75·6)	24·3 (20·9–28·4)	16·4 (11·6–22·4)	1036 (755–1378)	301 (259–352)	209 (148–285)	8·4% (5·0–11·8)	3·7% (0·3–7·1)	5·9% (3·9–8·2)
Iraq	217·0 (180·1–257·2)	166·3 (133·4–199·9)	128·9 (89·9–178·7)	1463 (1214–1734)	1493 (1198–1795)	1479 (1032–2050)	2·7% (0·0–5·5)	2·4% (−0·8–5·6)	2·5% (0·6–4·5)
Jordan	200·3 (168·1–236·4)	94·2 (73·5–117·3)	56·4 (42·0–74·0)	249 (209–294)	137 (107–171)	87 (65–115)	7·6% (5·0–10·3)	4·7% (1·2–7·9)	6·1% (4·4–7·6)
Kuwait	34·2 (27·1–42·2)	20·1 (16·7–23·8)	19·4 (15·6–23·7)	14 (11–17)	8 (7–10)	10 (8–12)	5·3% (2·7–7·6)	0·3% (−2·1–2·7)	2·7% (1·2–4·2)

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	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
(Continued from previous page)									
Lebanon	53·5 (37·1–74·0)	33·3 (22·7–46·9)	26·3 (17·9–37·6)	42 (29–58)	25 (17–35)	17 (12–24)	4·7% (0·5–8·9)	2·2% (−2·1–6·2)	3·4% (0·9–5·9)
Libya	90·9 (63·3–127·7)	42·0 (29·6–58·0)	27·7 (19·0–39·6)	104 (73–147)	52 (37–72)	40 (28–58)	7·7% (3·3–11·4)	3·8% (−0·3–7·9)	5·7% (3·2–8·3)
Morocco	401·8 (366·3–439·4)	204·9 (177·6–235·6)	75·3 (56·2–98·2)	2939 (2680–3214)	1291 (1119–1484)	469 (351–613)	6·7% (5·2–8·4)	9·2% (6·4–12·2)	8·0% (6·5–9·5)
Occupied Palestinian Territory	67·6 (48·9–91·0)	45·3 (40·4–50·5)	43·6 (30·3–60·4)	64 (46–86)	55 (49–61)	59 (41–82)	3·9% (0·9–7·1)	0·5% (−2·7–3·7)	2·1% (−0·1–4·4)
Oman	84·1 (57·8–117·2)	48·3 (34·9–64·8)	30·4 (21·7–41·0)	61 (42–84)	26 (19–35)	15 (11–20)	5·5% (1·6–9·5)	4·2% (0·5–8·0)	4·8% (2·5–7·2)
Qatar	45·0 (29·9–64·5)	38·7 (26·7–55·8)	25·8 (18·7–35·9)	5 (3–7)	4 (3–6)	6 (4–8)	1·5% (−2·9–6·1)	3·7% (−0·7–7·8)	2·6% (0·2–4·9)
Saudi Arabia	20·2 (13·4–29·1)	15·3 (11·1–20·5)	15·6 (11·8–20·3)	116 (77–168)	85 (62–114)	94 (71–122)	2·7% (−1·4–7·0)	−0·2% (−4·1–3·5)	1·2% (−1·1–3·4)
Syria	120·5 (92·2–155·7)	43·2 (33·3–55·2)	20·8 (15·1–28·4)	532 (407–688)	194 (149–248)	97 (70–133)	10·3% (6·9–13·4)	6·7% (3·0–10·4)	8·4% (6·4–10·4)
Tunisia	90·5 (64·5–125·0)	46·1 (29·8–65·1)	27·9 (18·1–40·9)	203 (144–280)	75 (48–106)	51 (33–74)	6·8% (2·4–11·0)	4·6% (0·2–8·7)	5·6% (3·2–8·1)
Turkey	135·5 (92·4–187·4)	59·7 (40·8–85·5)	35·9 (24·5–53·0)	1922 (1310–2659)	797 (544–1141)	466 (318–688)	8·2% (4·1–12·3)	4·6% (0·6–8·4)	6·3% (4·0–8·6)
United Arab Emirates	37·5 (24·4–58·6)	20·8 (13·6–31·8)	15·1 (9·1–23·5)	18 (11–27)	11 (7–16)	15 (9–23)	5·9% (1·5–10·4)	3·0% (−1·3–7·5)	4·3% (1·7–7·3)
Yemen	434·3 (369·2–498·9)	353·6 (296·0–413·7)	264·0 (201·2–332·2)	2726 (2317–3131)	2577 (2158–3015)	2489 (1897–3132)	2·1% (0·0–4·2)	2·7% (0·2–5·4)	2·4% (1·0–3·7)
North America, high income	11·8 (10·8–12·9)	17·4 (16·0–19·0)	19·2 (16·1–23·1)	513 (467–561)	747 (686–816)	907 (758–1091)	−3·8% (−5·1–−2·7)	−0·9% (−2·8–0·8)	−2·3% (−3·3–−1·3)
Canada	7·1 (6·2–8·1)	9·6 (8·4–11·0)	7·9 (6·4–9·9)	28 (24–32)	32 (28–37)	31 (25–39)	−3·1% (−5·0–−1·2)	1·8% (−0·6–4·0)	−0·5% (−1·8–0·7)
USA	12·3 (11·1–13·5)	18·0 (16·5–19·8)	20·2 (16·8–24·5)	485 (439–533)	715 (654–784)	876 (726–1060)	−3·8% (−5·2–−2·6)	−1·0% (−3·0–0·8)	−2·4% (−3·4–−1·4)
Oceania	315·1 (244·1–402·2)	261·3 (190·4–345·4)	243·5 (172·0–341·2)	634 (491–810)	640 (467–846)	647 (457–907)	1·9% (−1·4–5·0)	0·7% (−2·5–3·9)	1·3% (−0·6–3·2)
Fiji	77·8 (48·8–121·4)	73·3 (45·8–116·7)	56·7 (35·1–88·1)	17 (10–26)	15 (9–23)	10 (6–16)	0·6% (−5·1–5·8)	2·3% (−3·2–7·5)	1·5% (−1·8–4·6)
Kiribati	176·1 (141·7–218·1)	78·3 (62·8–97·7)	73·0 (55·1–96·9)	5 (4–6)	2 (2–2)	2 (1–2)	8·1% (5·1–11·0)	0·7% (−2·0–3·6)	4·2% (2·5–5·8)
Marshall Islands	82·2 (56·3–116·2)	99·1 (66·5–142·8)	136·1 (90·5–205·0)	2 (1–2)	2 (1–3)	2 (2–3)	−1·8% (−6·3–2·7)	−2·9% (−7·4–1·7)	−2·4% (−4·8–0·2)
Micronesia, Federated States of	155·2 (107·7–213·3)	103·6 (71·3–154·2)	74·7 (48·5–109·2)	5 (4–7)	3 (2–5)	2 (1–3)	4·1% (−0·3–8·3)	3·0% (−1·4–7·3)	3·5% (1·0–5·9)
Papua New Guinea	388·6 (291·1–509·3)	313·3 (222·4–420·4)	288·9 (196·8–412·3)	568 (425–744)	589 (418–791)	603 (411–861)	2·2% (−1·4–5·6)	0·8% (−2·6–4·2)	1·4% (−0·7–3·5)
Samoa	85·0 (59·8–118·1)	42·0 (27·5–61·4)	26·8 (17·1–40·4)	4 (3–6)	2 (2–3)	1 (1–2)	7·1% (2·6–11·3)	4·1% (0·1–8·4)	5·5% (3·2–8·0)
Solomon Islands	182·2 (126·8–253·8)	125·1 (86·4–174·5)	109·1 (71·3–160·2)	23 (16–32)	18 (13–25)	19 (12–28)	3·8% (−0·1–7·6)	1·3% (−2·9–5·4)	2·5% (−0·2–5·0)
Tonga	160·4 (108·6–225·7)	110·5 (74·2–157·8)	80·8 (55·3–114·6)	5 (3–7)	3 (2–4)	2 (2–3)	3·7% (−0·7–8·1)	2·9% (−1·3–6·9)	3·3% (0·8–5·6)
Vanuatu	123·1 (83·5–171·5)	88·3 (59·5–129·1)	71·0 (46·1–105·1)	7 (4–9)	5 (4–8)	5 (3–8)	3·3% (−1·1–7·3)	2·0% (−2·3–5·9)	2·6% (0·1–5·1)
Sub-Saharan Africa, central	532·4 (445·6–614·1)	526·7 (469·6–583·8)	460·6 (378·8–547·3)	14230 (11 912–16 416)	18 413 (16 416–20 411)	18 801 (15 465–22 342)	0·1% (−1·7–1·8)	1·2% (−0·7–3·2)	0·7% (−0·5–1·8)

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	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
(Continued from previous page)									
Angola	534·1 (362·0–695·6)	639·5 (446·2–845·6)	334·8 (217·6–460·9)	2925 (1983–3810)	4531 (3161–5991)	2682 (1743–3693)	−1·8% (−4·4–0·8)	5·9% (3·2–8·7)	2·2% (0·7–3·9)
Central African Republic	1751·0 (1572·9–1938·7)	1280·0 (1009·6–1570·1)	681·5 (515·3–881·9)	2119 (1903–2346)	1852 (1461–2271)	1059 (801–1370)	3·2% (0·9–5·6)	5·8% (3·3–8·1)	4·5% (3·1–6·0)
Congo	540·1 (432·4–663·8)	747·0 (647·4–847·6)	571·2 (428·1–736·8)	493 (395–606)	876 (760–994)	828 (621–1068)	−3·3% (−5·8–−0·9)	2·5% (−0·3–5·2)	−0·2% (−1·9–1·5)
Congo, Republic of the	453·0 (357·0–557·4)	438·6 (381·2–502·1)	480·6 (371·0–608·1)	8424 (6638–10365)	10 817 (9400–12 383)	13 998 (10 807–17 713)	0·3% (−2·4–2·9)	−0·8% (−3·4–1·9)	−0·3% (−1·9–1·4)
Equatorial Guinea	609·9 (467·7–760·2)	463·3 (334·2–611·6)	211·9 (136·8–325·2)	107 (82–134)	96 (69–126)	56 (36–86)	2·8% (−0·9–6·1)	7·2% (3·6–11·0)	5·1% (2·4–7·4)
Gabon	450·6 (381·8–525·3)	624·0 (518·0–736·3)	430·1 (314·7–552·4)	162 (137–188)	241 (200–285)	178 (130–229)	−3·2% (−5·6–−0·8)	3·4% (0·6–6·2)	0·3% (−1·3–1·9)
Sub-Saharan Africa, east	590·7 (563·7–620·5)	694·7 (665·8–724·0)	411·7 (374·4–454·0)	55 166 (52 650–57 951)	78 407 (75 142–81 709)	55 296 (50281–60 975)	−1·6% (−2·2–−1·0)	4·8% (3·8–5·7)	1·7% (1·2–2·2)
Burundi	854·3 (638·5–1098·8)	1358·1 (1004·6–1745·5)	894·2 (628·4–1181·7)	2183 (1631–2807)	3321 (2456–4268)	2585 (1816–3416)	−4·6% (−7·7–−1·6)	3·8% (0·6–6·9)	−0·2% (−1·9–1·8)
Comoros	395·3 (285·3–528·5)	318·5 (226·5–441·8)	270·9 (193·4–380·0)	65 (47–86)	71 (51–99)	76 (54–106)	2·2% (−1·5–5·7)	1·5% (−1·8–5·0)	1·8% (−0·3–4·0)
Djibouti	381·6 (270·8–487·1)	495·2 (371·4–639·9)	365·2 (261·5–495·2)	87 (61–110)	117 (88–151)	95 (68–129)	−2·6% (−6·0–0·4)	2·8% (−0·5–6·3)	0·2% (−2·1–2·4)
Eritrea	1229·6 (1076·6–1412·3)	1182·4 (972·4–1400·8)	1081·3 (825·3–1360·9)	1544 (1352–1773)	1680 (1382–1990)	2107 (1608–2652)	0·8% (−1·5–3·3)	0·6% (−0·6–1·9)	..
Ethiopia	727·5 (647·4–815·6)	792·7 (711·4–879·8)	528·8 (386·8–681·7)	16 983 (15 112–19 038)	21 611 (19 395–23 984)	13 758 (10 063–17 736)	−0·9% (−2·5–0·6)	3·8% (1·2–6·8)	1·6% (0·2–3·0)
Kenya	383·7 (338·9–435·0)	709·1 (627·6–793·8)	294·2 (227·5–369·7)	3786 (3344–4292)	8516 (7537–9533)	4598 (3555–5778)	−6·1% (−7·7–−4·5)	8·1% (5·5–10·6)	1·3% (0·0–2·6)
Madagascar	441·0 (401·3–484·0)	472·5 (431·7–514·9)	424·4 (336·9–527·6)	2253 (2050–2473)	2978 (2720–3244)	3161 (2509–3929)	−0·7% (−2·0–0·6)	1·0% (−1·2–3·2)	0·2% (−0·9–1·4)
Malawi	606·0 (547·5–668·7)	1396·7 (1263·0–1534·4)	421·6 (315·3–544·8)	2629 (2375–2901)	6926 (6263–7609)	2889 (2161–3734)	−8·4% (−9·8–−6·9)	11·0% (8·4–13·6)	1·8% (0·4–3·2)
Mauritius	70·5 (59·9–82·2)	44·8 (37·8–52·3)	47·5 (38·8–56·7)	16 (14–19)	9 (8–11)	8 (6–9)	4·5% (2·4–6·6)	−0·5% (−2·6–1·5)	1·9% (0·7–3·0)
Mozambique	537·7 (464·6–628·1)	546·5 (468·3–644·6)	509·8 (381·8–668·9)	3257 (2814–3804)	4356 (3732–5137)	4522 (3387–5934)	−0·2% (−2·1–1·7)	0·7% (−1·9–3·5)	0·3% (−1·3–1·8)
Rwanda	712·4 (638·6–788·0)	933·6 (839·3–1035·5)	335·0 (224·7–493·3)	2086 (1870–2308)	2876 (2585–3190)	1512 (1014–2227)	−2·7% (−4·2–−1·2)	9·5% (5·7–13·1)	3·7% (1·7–5·5)
Seychelles	50·0 (39·5–63·5)	114·3 (92·7–138·2)	148·2 (119·4–181·2)	1 (1–1)	2 (1–2)	2 (1–2)	−8·3% (−10·9–−5·5)	−2·4% (−4·8–0·2)	−5·2% (−6·6–−3·7)
Somalia	491·4 (343·6–655·2)	505·9 (359·4–685·9)	478·0 (332·6–652·7)	1453 (1016–1937)	1714 (1218–2325)	1981 (1378–2705)	−0·3% (−3·3–2·7)	0·5% (−2·5–3·6)	0·1% (−1·6–1·9)
Sudan	504·3 (422·7–596·9)	389·6 (300·0–489·5)	273·4 (202·4–358·3)	5494 (4605–6503)	5010 (3858–6295)	3948 (2924–5174)	2·6% (0·1–5·3)	3·2% (0·4–6·1)	2·9% (1·4–4·5)
Tanzania	598·1 (539·0–664·8)	716·3 (654·4–780·7)	417·5 (336·6–510·7)	6733 (6068–7484)	10166 (9288–11081)	7990 (6442–9772)	−1·8% (−3·2–−0·4)	4·9% (2·9–7·0)	1·7% (0·6–2·9)
Uganda	560·6 (500·0–628·1)	461·6 (411·3–514·0)	274·2 (206·2–352·3)	4920 (4389–5513)	5428 (4837–6045)	4249 (3195–5458)	1·9% (0·3–3·6)	4·8% (2·1–7·4)	3·4% (2·0–4·8)
Zambia	490·6 (437·6–552·6)	800·9 (714·9–896·8)	293·0 (223·7–386·7)	1677 (1496–1889)	3629 (3239–4063)	1815 (1386–2396)	−4·9% (−6·6–−3·3)	9·2% (6·4–11·9)	2·5% (1·0–3·9)
Sub-Saharan Africa, southern	170·0 (153·8–188·0)	490·6 (446·6–536·9)	169·4 (140·6–208·9)	2834 (2564–3134)	8237 (7498–9015)	2760 (2291–3403)	−10·6% (−11·9–−9·0)	9·7% (7·5–11·5)	0·0% (−1·1–1·0)
Botswana	327·1 (252·3–426·2)	2592·5 (1821·0–3481·6)	514·6 (362·5–689·6)	157 (121–204)	1220 (857–1638)	244 (172–326)	−20·7% (−23·9–−16·5)	14·7% (11·0–18·5)	−2·1% (−4·0–−0·2)
Lesotho	235·7 (185·6–297·7)	1043·5 (890·2–1214·8)	238·6 (174·6–326·8)	139 (110–176)	657 (560–765)	144 (105–197)	−14·9% (−17·8–−12·0)	13·5% (10·3–16·3)	0·0% (−2·0–1·8)

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	Maternal mortality ratio per 100 000 livebirths			Maternal deaths			Annualised rate of decline		
	1990	2000	2011	1990	2000	2011	1990–2000	2000–2011	1990–2011
(Continued from previous page)									
Namibia	379·8 (327·4–438·5)	506·1 (440·3–583·1)	132·6 (96·7–182·1)	203 (175–234)	299 (260–344)	80 (58–109)	−2·9% (−5·0–−0·9)	12·3% (8·9–15·2)	5·1% (3·4–6·7)
South Africa	119·6 (99·3–145·4)	89·3 (78·1–101·8)	91·3 (68·5–121·1)	1293 (1074–1573)	982 (859–1120)	961 (720–1274)	2·9% (0·6–5·3)	−0·1% (−3·0–2·7)	1·3% (−0·3–2·9)
Swaziland	240·7 (184·2–312·3)	743·6 (591·1–918·2)	281·6 (205·7–376·1)	89 (68–115)	255 (203–315)	98 (72–131)	−11·3% (−14·6–−8·0)	8·9% (5·1–12·4)	−0·7% (−2·7–1·3)
Zimbabwe	245·6 (219·3–272·2)	1283·6 (1137·1–1452·4)	329·2 (231·5–470·0)	953 (851–1056)	4824 (4273–5458)	1234 (867–1762)	−16·5% (−18·1–−14·8)	12·5% (8·7–15·6)	−1·3% (−3·3–0·4)
Sub-Saharan Africa, west	464·4 (432·0–505·8)	654·9 (622·6–687·0)	477·5 (432·0–526·7)	41 383 (38 494–45 074)	71 243 (67 722–74 734)	64 219 (58 104–70 830)	−3·4% (−4·3–−2·5)	2·9% (1·9–3·8)	−0·1% (−0·8–0·5)
Benin	555·4 (495·8–623·7)	420·3 (373·2–471·8)	329·0 (258·3–416·3)	1248 (1114–1401)	1187 (1054–1332)	1176 (923–1488)	2·8% (1·1–4·4)	2·3% (−0·2–4·7)	2·5% (1·3–3·8)
Burkina Faso	457·2 (377·9–543·6)	483·9 (416·7–558·9)	353·6 (287·3–424·6)	2019 (1669–2401)	2705 (2329–3124)	2583 (2099–3102)	−0·6% (−3·0–1·6)	2·9% (0·6–5·1)	1·2% (0·0–2·6)
Cameroon	488·0 (435·2–548·3)	729·7 (653·8–816·5)	531·2 (409·6–689·3)	2504 (2233–2813)	4343 (3891–4860)	3821 (2947–4959)	−4·0% (−5·7–−2·5)	3·0% (0·3–5·4)	−0·4% (−1·7–0·9)
Cape Verde	218·7 (169·7–274·0)	184·5 (136·1–239·6)	127·1 (87·0–177·2)	30 (23–38)	23 (17–30)	13 (9–18)	1·7% (−1·3–4·7)	3·4% (0·0–6·8)	2·6% (0·5–4·7)
Chad	611·4 (552·6–678·6)	862·0 (795·9–930·4)	608·3 (490·9–735·4)	1743 (1575–1935)	3411 (3150–3682)	3119 (2517–3771)	−3·4% (−4·7–−2·1)	3·2% (1·4–5·2)	0·0% (−1·0–1·1)
Côte d'Ivoire	477·7 (422·4–539·7)	793·4 (675·7–928·1)	452·0 (342·1–593·4)	2476 (2189–2797)	4878 (4154–5707)	3062 (2318–4020)	−5·1% (−7·2–−3·1)	5·2% (2·4–8·1)	0·3% (−1·2–1·7)
Gambia	339·6 (262·9–423·5)	313·6 (246·4–389·6)	274·8 (199·5–361·8)	154 (119–192)	178 (140–222)	184 (133–242)	0·8% (−2·2–3·8)	1·2% (−1·5–4·4)	1·0% (−0·7–2·9)
Ghana	394·3 (310·7–498·5)	417·0 (370·1–470·0)	328·3 (247·4–409·5)	2284 (1800–2888)	2748 (2439–3097)	2560 (1929–3192)	−0·6% (−3·0–2·2)	2·2% (−0·2–5·0)	0·9% (−0·8–2·5)
Guinea	731·0 (652·5–817·9)	794·9 (724·7–873·8)	664·1 (525·1–805·7)	2023 (1806–2263)	2819 (2569–3098)	2617 (2069–3175)	−0·8% (−2·4–0·6)	1·7% (−0·4–3·9)	0·5% (−0·6–1·7)
Guinea-Bissau	806·2 (670·8–970·8)	857·5 (691·4–1022·4)	844·1 (649·2–1042·8)	374 (311–451)	446 (360–532)	496 (382–613)	−0·6% (−3·0–1·6)	0·2% (−2·0–2·6)	−0·2% (−1·6–1·3)
Liberia	538·3 (437·7–647·1)	1243·9 (1095·9–1383·2)	906·0 (728·8–1076·7)	526 (428–633)	1468 (1293–1632)	1425 (1146–1693)	−8·4% (−10·8–−6·4)	2·9% (0·9–5·1)	−2·5% (−3·7–−1·1)
Mali	657·1 (593·8–721·6)	683·0 (623·4–745·7)	418·8 (327·5–519·8)	2802 (2532–3077)	3814 (3481–4164)	3056 (2390–3793)	−0·4% (−1·7–0·9)	4·5% (2·2–6·8)	2·2% (1·0–3·4)
Mauritania	874·2 (771·4–993·1)	680·2 (581·2–783·6)	550·1 (409·7–722·4)	712 (629–809)	675 (577–778)	651 (485–855)	2·5% (0·7–4·4)	2·0% (−0·5–4·7)	2·2% (0·8–3·7)
Niger	540·5 (478·9–608·3)	603·1 (543·3–666·8)	522·4 (417·5–633·8)	2365 (2095–2662)	3461 (3118–3827)	4055 (3240–4919)	−1·1% (−2·7–0·4)	1·3% (−0·8–3·6)	0·2% (−0·9–1·4)
Nigeria	393·4 (328·2–475·7)	673·4 (607·6–737·9)	487·1 (398·1–582·4)	16825 (14036–20342)	34968 (31548–38318)	31456 (25710–37614)	−5·4% (−7·4–−3·2)	3·0% (1·2–4·9)	−1·0% (−2·3–0·3)
São Tomé and Príncipe	306·1 (234·6–388·3)	430·0 (352·9–526·8)	266·4 (201·3–338·0)	13 (10–17)	21 (18–26)	14 (10–18)	−3·4% (−6·3–−0·6)	4·4% (1·5–7·1)	0·7% (−1·0–2·4)
Senegal	493·1 (443·6–547·0)	470·8 (415·6–531·6)	368·4 (279·3–464·1)	1572 (1414–1744)	1807 (1595–2041)	1743 (1321–2196)	0·5% (−1·1–2·0)	2·3% (−0·2–4·9)	1·4% (0·1–2·9)
Sierra Leone	648·0 (516·0–783·7)	763·2 (669·9–864·6)	616·4 (485·6–762·1)	1096 (872–1325)	1430 (1255–1620)	1414 (1114–1748)	−1·7% (−4·1–0·7)	2·0% (−0·5–4·5)	0·2% (−1·3–1·7)
Togo	398·0 (338·7–463·7)	484·8 (383·1–604·2)	398·0 (265·5–564·4)	615 (524–717)	860 (679–1071)	775 (517–1099)	−1·9% (−4·7–0·9)	1·9% (−1·6–5·6)	0·1% (−1·9–2·1)

Data are n or % (uncertainty interval).

Table 2: **Maternal mortality ratio per 100 000 livebirths, annualised rate of decline, and maternal deaths by country for 1990, 2000, and 2011**

achieve both MDGs. Five other countries are close to achieving both MDGs: Bhutan, El Salvador, Morocco, Oman, and Turkey.

Discussion

Progress on reducing under-5 and maternal mortality is continuing. In much of sub-Saharan Africa, the pace of

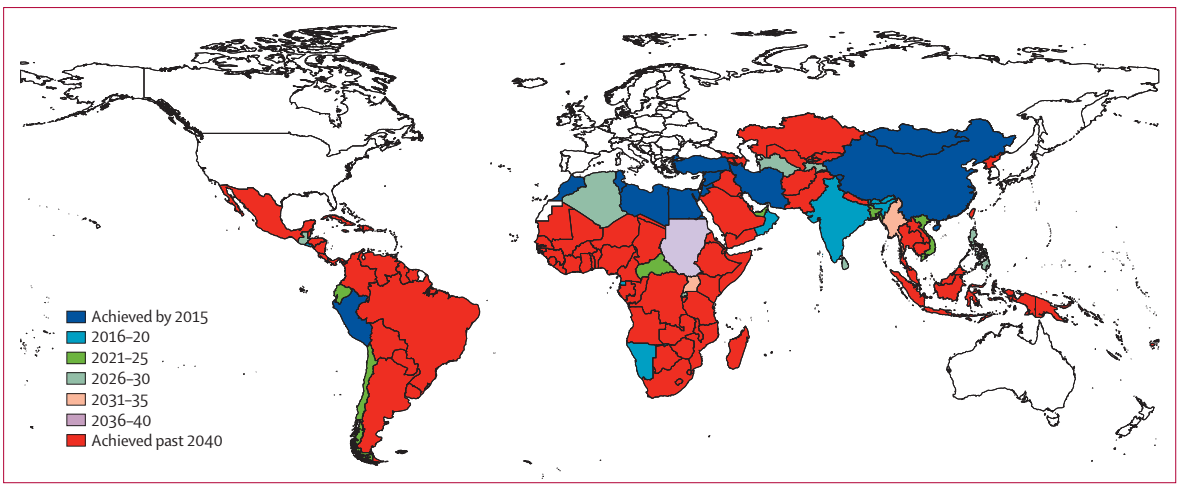

Figure 6: **Millennium Development Goal 5 attainment year based on annualised rates of change, 1990–2011**
For more detail see webappendix.

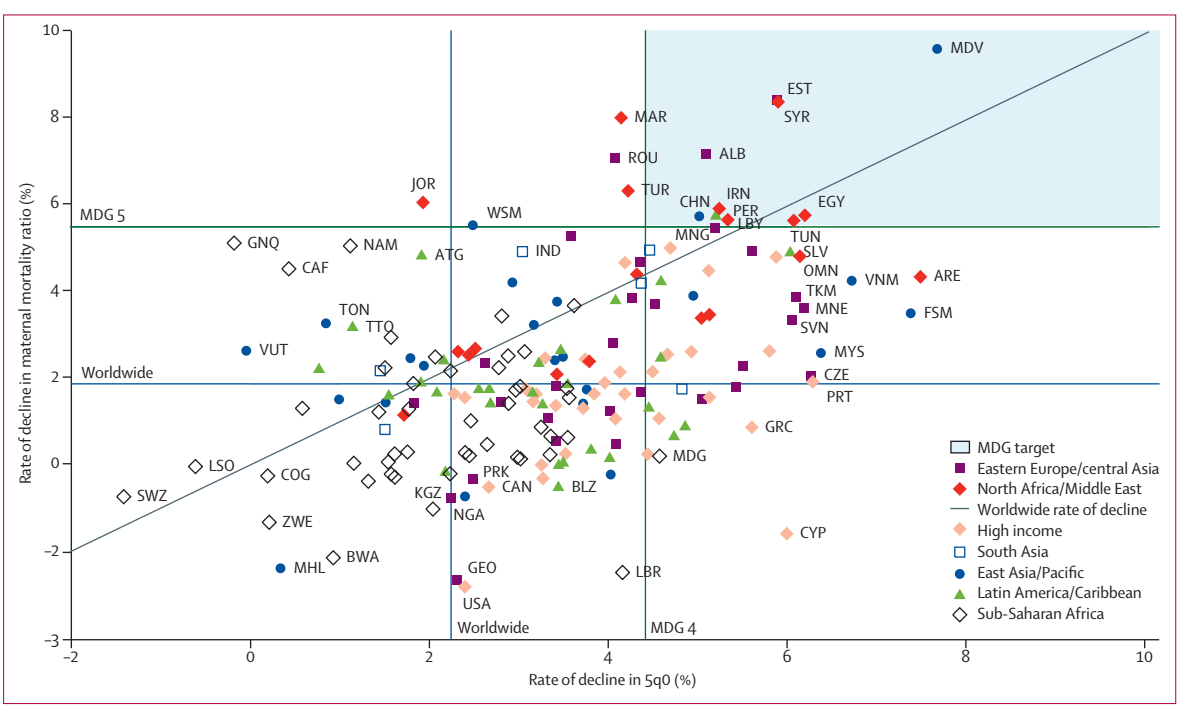

Figure 7: **Annualised rate of change in under-5 mortality and maternal mortality ratio, 1990–2011**
SYC was excluded for visualisation purposes. ALB=Albania. ARE=United Arab Emirates. ATG=Antigua and Barbuda. BLZ=Belize. BWA=Botswana. CAF=Central African Republic. CAN=Canada. CHN=China. COG=Congo. CYP=Cyprus. CZE=Czech Republic. EGY=Egypt. EST=Estonia. FSM=Federated States of Micronesia. GEO=Georgia. GNQ=Equatorial Guinea. GRC=Greece. IND=India. IRN=Iran. JOR=Jordan. KGZ=Kyrgystan. LBR=Liberia. LBY=Libya. LSO=Lesotho. MAR=Morocco. MDG=Madagascar. MDV=Maldives. MHL=Marshall Islands. MNE=Montenegro. MNG=Mongolia. MYS=Malaysia. NAM=Namibia. NGA=Nigeria. OMN=Oman. PER=Peru. PRK=North Korea. PRT=Portugal. ROU=Romania. SLV=El Salvador. SVN=Slovenia. SWZ=Swaziland. SYR=Syria. TKM=Turkmenistan. TON=Tonga. TTO=Trinidad and Tobago. TUN=Tunisia. TUR=Turkey. USA=United States of America. VNM=Vietnam. VUT=Vanuatu. WSM=Samoa. ZWE=Zimbabwe.

progress seems to be accelerating for under-5 mortality and maternal mortality. Substantial progress in the past 5 years in India in reducing maternal mortality is promising. Likewise, several countries in east and southern Africa have had substantial declines in HIV-related deaths during pregnancy because of the expansion of antiretroviral-drug programmes. Despite overall progress, four countries show no progress in reducing under-5 mortality and in fact see actual increases, and 20 developing countries show no progress or increases for maternal mortality. Although there is acceleration in many countries, only nine of 137 developing countries are likely to achieve both the MDG 4 and MDG 5 targets by 2015. On the basis of present trends, 14 countries will achieve both targets by 2020.

The trends we present do not represent the potential of new resources to accelerate the rate of decline in under-5 or maternal mortality. In September, 2010, donors committed $40 billion to save 16 million lives by 2015. However, development assistance for health seems to be growing at a slower pace in recent years, so the potential for the $40 billion to be delivered is unclear.[48–50] If resources were increased, and assuming that they were well spent, we could hope for faster progress. Many proven intervention strategies are available for both children and mothers.[14] The major hindrance to the use of resources effectively to scale up coverage of key interventions is health system bottlenecks such as in the health workforce,[51] health system infrastructure, health information systems, supply chain logistics, and managerial capacity. Some interventions to reduce child mortality such as immunisations or the distribution of insecticide-treated bednets are less dependent on a fully functioning health system, but progress on reducing maternal mortality is likely to require concerted efforts to address some key health system bottlenecks. For new resources to be effective it will be essential to closely monitor progress on both under-5 and maternal mortality. The weak correlation between progress on maternal mortality and under-5 mortality highlights that different factors influence success for each.

In this study, we have systematically tried to collate the evidence on levels and trends in maternal and child mortality and apply reproducible methods to yield predictions for each country for 1990–2011 (panel). Nevertheless, this study has several important limitations. First, despite the substantial effort since publications in 2010 to capture many new data sources, there are probably relevant datasets that have not been published and are not in the public domain that could inform these assessments. Still we are missing data from 15 countries, which represent 1% of livebirths in the world. Second, for maternal mortality, we have used an ensemble modelling strategy that captures uncertainty due to the choice of covariates and model specification in our estimates. There are, however, other sources of uncertainty that we have not captured. These include uncertainty in the corrections of vital registration data for misclassification, uncertainty in levels of adult reproductive-age mortality, uncertainty in levels of HIV, and uncertainty in covariates used in the modelling process. In particular, 2009 was an atypical year for maternal deaths due to the epidemic of H1N1, which had an important role in some countries in increasing the number of maternal deaths. We are expecting new data for 2010 to better evaluate the effect of this pandemic.[52–55] For child mortality, as noted by Rajaratnam and colleagues,[3] the effect of high levels of HIV-related mortality on estimates of under-5 mortality remains unclear; levels and trends in under-5 mortality in countries with large HIV epidemics should be interpreted with caution.

Our estimates of under-5 and maternal mortality accord with the best available evidence from various mortality measurement systems. But even in high-income countries with complete vital registration systems, there is substantial lag between data collection and reporting. For example, in the USA, vital event data for 2007 are not released until 2010. For many countries where measurement depends on the collection of data through household surveys, the average lag is much longer. Since the need to know whether new investments are accelerating progress, it is essential that these lags in measurement and reporting are reduced. Even with existing measurement strategies whether based on surveys, surveillance systems, or vital registration, technology can allow for substantial reductions in the time from data acquisition to processing and reporting. There is no intrinsic reason that data collected in the field cannot be rapidly assessed, processed, and added to the data synthesis approaches included here. Indeed, it should be possible to reduce time lags by 2–3 years through reasonable process engineering. Efforts for timely tracking will also be assisted through more investment in the timing and sample size of data collection efforts.

Many commentators are concerned about the need for estimates, and argue we should only use direct measurements. Nearly all empirical measurements require corrections for known biases. For example, there is substantial debate in the USA about misclassification of maternal mortality and ascertainment bias in the trends due to changes in the death certificate.[56,57] In other countries with household surveys, even with repeated samples such as SUSENAS (the National Socioeconomic Survey) in Indonesia, there is evidence of substantial non-sampling variance even when the same agency with the same instrument collects the data. The reality is that we will always need to correct measurements for known biases and to synthesise multiple data sources to establish robust estimates. In this sense, we will always be using some form of data correction and data synthesis. There is a distinction to be made, however, between corrected data in places with data collection and those strictly based on predictions from data collected in other countries.[58]

Following the work of Hogan and colleagues,[4] in this report we use predictive validity to choose the best model for measuring maternal mortality over time. However, in this assessment we have tested a substantially larger set of alternative models for maternal mortality estimation including the modelling strategy used by the UN in 2010. The use of out-of-sample predictive validity tests to evaluate model performance provides a much more objective approach to model building than subjective preferences for particular covariates or types of models. We use the metrics of RMSE, trend, and uncertainty interval coverage to evaluate models; however, alternative metrics are certainly possible. We believe that moving towards consensus on how we show model performance will help concentrate the debate on the nature of the data going into the assessment, the processing of the data to

correct for known bias, and less on the differences of model building. The ensemble model presented in this report yielded the best performance and uncertainty interval coverage for maternal mortality. Ensemble models because they make predictions with a weighted average of many different models with good performance yield uncertainty intervals that take into account uncertainty due to model specification. These uncertainty intervals in out-of-sample predictive validity testing have been shown to have data coverage of 97·6%, which is slightly higher than the desired 95% interval.

Many readers might be interested in the comparison between our results here and other recent assessments for children and mothers. The webappendix provides detail on the comparison of various sources. The correlation coefficient between the estimate presented here and the estimate for under-5 mortality in 2009 by Rajaratnam and colleagues is 0·985.[3] The correlation coefficient for annualised rates of decline from 1990 to 2009 between our two studies is 0·896. The correlation coefficient in child mortality estimates between our present study and the UNICEF estimates released in 2010[59] for 2009 is 0·961. The correlation coefficient for annualised rates of decline from 1990 to 2009 is 0·748. Since MDG 4 attainment is based on annualised rates of decline, it is not surprising that the set of countries that are judged to be on track differ; 27 of a total of 46 countries are estimated to be on track according to either source. The correlation coefficient between our estimates and the work by Hogan and colleagues[4] for the maternal mortality ratio is 0·896 for 2008. The correlation of the annualised rates of change in the maternal mortality ratio from 1990 to 2008 is 0·725. The analogous comparison with the UN 2010 results is a correlation in 2008 of 0·856 and a correlation of 0·587 for annualised rates of change. Assessments of which countries are on track to achieve MDG 5 have changed substantially over 4 years spanning the UN 2007 study, the UN 2010 study, the report by Hogan and colleagues in 2010, and this report. Compared with the study by Hogan and colleagues, our worldwide maternal mortality estimates are slightly lower; for example we report 311 700 (297 000–327 600) deaths in 2008 compared with 342 900 (302 100–394 300) reported by Hogan and colleagues. Differences in the number of child and maternal deaths for various periods between the different studies in the past 4 years are provided in the webappendix.

Between sources, maternal death numbers for 2005 have changed from a high of 546 000 in the UN 2007 study to 347 000 in this study, a difference of 35%. Between sources the number of child deaths for 2005 have varied from a high of 9·4 million in UNICEF 2009 to 8·1 million in this study, a difference of 13·8% (1·3 of 9·4). The greater stability of the measurements for child mortality relates to the maturity of the dataset and the methods used to evaluate the data; although there remain important differences between studies. Maternal mortality estimation has been developing over the past 4 years. Differences between assessments fall into three broad categories: data inputs, data processing, and the modelling strategy. Increased global attention to the measurement of maternal mortality has led to a more comprehensive worldwide database of maternal mortality measurements shown in the substantially larger database in this study. Substantial changes to other inputs have also happened. For example, the World Population Prospects 2010 changed the number of estimated births in 2008 by more than 10% in 25 countries compared with their 2008 assessment. This has a direct effect on computation of the maternal mortality ratio for countries like Ethiopia, Pakistan, and Mali. With time, we expect that changes to the database will largely accord with new data collection and thus evidence on recent trends. There remain

***Panel:* Research in context**

Systematic review

For child mortality, we expand the database of Rajaratnam and colleagues (2010) of 12 899 measurements by the addition of 2595 observations. These observations were derived from the analysis of microdata from newly available Demographic and Health Surveys, Multiple Indicator Cluster Surveys, national censuses, national surveys, and national and subnational surveillance systems. All new sources were evaluated for plausibility and consistency in the context of all other data sources for that country. For maternal mortality, we expand the database of Hogan and colleagues (2010) of 3502 measurements by the addition of 1142 observations. These additional observations were identified through literature search with the term "maternal mortality" from 2008 to July, 2011; analysis of microdata from newly released Demographic and Health Surveys, various national surveys and newly released census microdata; vital registration data obtained through WHO, Pan American Health Organization, and direct contact with Ministries of Health; sources identified through regional workshops held in Sri Lanka and Brazil with national authorities and researchers; review of online statistical yearbooks from all central statistical offices and Ministries of Health.

Interpretation

Using a larger database and similar analytical methods to Rajaratnam and colleagues, we find that child mortality has continued to decline, reaching 7·2 million deaths in 2011. Compared with the results published in 2010, 31 countries are now seen to be on track to achieve Millennium Development Goal (MDG) 4. Countries changing status are Mexico and Thailand, which are not on track; and Costa Rica, Ecuador, Micronesia, Honduras, Iran, Madagascar, and Bangladesh, which are on track.

Maternal mortality estimates in this study at the worldwide level are lower than in Hogan and colleagues, 311 600 deaths in 2008 compared with 342 900. This study extends the analysis of maternal mortality from 2008 to 2011; estimates for 2011 show continued declines in maternal deaths reaching 273 400. Estimates for many countries have changed due to the substantial addition of new data to the analysis and the adoption of an ensemble modelling strategy. This study finds that only 13 countries are on track to achieve MDG 5 compared to 11 estimated by the UN in 2010 or 19 estimated by Hogan and colleagues.

Continued collection of data through vital registration systems, surveys and the 2010 round of censuses mean that the evidence base for tracking maternal and child mortality is steadily expanding. Assessments of progress towards MDG 4 and MDG 5 need to be regularly updated to take into account new evidence collected by countries and methodological advances in the estimation of both.

important debates on how to process data on maternal mortality such as how to deal with misclassification bias in vital registration data; these are likely to continue for some time until research studies provide better direct assessments. In terms of the modelling strategy, we believe that wider use of out-of-sample predictive validity testing of diverse sets of models will help forge increasing consensus on the most appropriate set of models to use for estimating maternal mortality.

For advocacy purposes, changing figures can present communication challenges. For national authorities, a wide range of new estimates could potentially be equally confusing. However, as a field, we believe we should always use the best available data and most appropriate methods for analysis to generate the best data for under-5 and maternal mortality. To argue that we should use old data or forge premature consensus on methods and data sources for the sake of consensus could undermine real accountability for making progress. We must always use the best evidence for assessing trends in global health. An important antidote to policy concern over the robustness of measurement will be wider discussion of the results' strengths and limitations of different approaches to measurement. We hope the vigorous academic debate on measurement strategies along with enhanced data collection efforts underway in many countries will progressively narrow the legitimate scientific differences between different analyses of levels and trends.

The world set ambitious targets for reducing child mortality at the Millennium Summit and extremely aspirational targets for maternal mortality. These targets have probably been influential in focusing policy attention on a neglected set of global health challenges. The MDG targets have helped rally donors to recognise the urgent need for further investment. Nevertheless, even with major accelerated efforts, most countries are unlikely to achieve both targets. Although some might see this as a failure of global health action, it is perhaps more important to keep track of whether the pace of progress for children and mothers has improved. Accelerated progress should be viewed as an important indicator of success of programmes for maternal and child health even if the pace of this progress is below the MDG 4 or MDG 5 target.

Contributors

RL undertook the research project and wrote the first draft of the report. HW contributed to the methodological approach for child mortality estimation, data management, analysis and interpretation, produced figures, and contributed to the second draft of the report. KJF contributed to the methodological approach and implemented the statistical analysis of maternal mortality data. JKR contributed to data management and analysis. MN interpreted results and did the garbage code redistribution. JRM participated in data management, methods development, and data analysis. LDL participated in data management, analysis and interpretation, methods development, and produced figures for the report. KTL contributed to data management and analysis, and produced tables and figures for the report. DP and CA managed the database, produced tables, and produced and contributed to figures. ADL provided conceptual and technical guidance and made contributions to the revisions of the report. CJLM conceptualised the methodology and guided all aspects of this report.

Conflicts of interest

We declare that we have no conflicts of interest.

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