Disability-adjusted life expectancy: Is it useful?

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In this study, Japanese disability-adjusted life expectancy (DALE) in two methods, was estimated to evaluate the possibilities of the indicator as a policy tool. It was specified that both methods had merits and demerits regarding data collection, calculation, accuracy, and significance. DALE is a summary measure of health outcome for policy evaluation and might be useful for turning policy makers' eyes and capturing public awareness on health. The concept is appropriate and acceptable but more efforts are required to improve its quality and methodology. DALE is still a developing tool.

Keywords: disability-adjusted life expectancy, healthy life expectancy, Japan.

Introduction

Japan launched Healthy Japan 21 (HJ21) in 2000. The basic idea is to promote people's health comprehensively through the decrease in premature death and the extension of the period during which people can live without disability. Although the extension of healthy life expectancy (HLE) should be an overall goal of HJ21, there is no definition of HLE and its measurement. At the same time, the World Health Organization (WHO) proposed disability-adjusted life expectancy (DALE) as a comprehensive measurement of health outcome.¹ Objectives of this report are to review the basic concept of DALE, estimate and evaluate the DALE of Japanese 47 prefectures, and discuss the possibility of DALE as a policy tool.

Basic concept of disability-adjusted life expectancy

DALE is one of the summary measures of population health (SMPH), which combine information on mortality and non-fatal health outcomes to represent the health of a particular population as a single number. SMPH can be broadly divided into health expectancies and health gaps. Disability-free life expectancy (DFLE) and DALE belong to the family of health expectancies, which are population indicators that estimate the aver-

Correspondence: Tomohiro Hirao, Health Policy and Management, Faculty of Medicine, Kagawa University 1750-1 Ikenobe Miki, Kagawa 761-0793, Japan. Email: sharks@kms.ac.jp age years that a person could expect to live in a defined state of health. DFLE uses dichotomous health state which requires the definition of health (0 or 1) and DALE uses continuous 0-1 scale which requires the valuation of health.

Methods

We estimated the DALE of Japanese 47 prefectures in two methods.

Method one

In method one, we followed the WHO method that was used for calculating DALE of 191 member states.¹ Steps of the estimation consist of: construction of life table, estimation of sex, age- and disease-specific disability prevalence, and the application of Sullivan's method. For life table, we used the 1995 prefecture life tables which were officially provided by the Japanese Ministry of Health, Labor and Welfare. In the estimation of disability prevalence, we used WHO estimates of western pacific region A (WPRO-A) Japan, Australia, Brunei Darussalam, New Zealand and Singapore because no Japanese data existed. Actual WPRO-A data were estimated from the Australian Burden of disease study.² We used prevalence years lived with disability/years of life lost (YLD/YLL) ratios and prevalence YLD/population of WPRO-A data, then multiplied prefecture YLL (1995) and population (1995). YLL is years of life lost due to mortality and YLD is equivalent years of healthy life lost due to disability. Both are the components of disability-adjusted life year (DALY). In original DALY

calculation, age–weight and 3% discount rate were applied but for the estimation of DALE we used non-age–weighted – non-discounted YLL. The precise method is reported elsewhere.³

Method two

Steps for the estimation were almost the same as with method one. The difference being the estimation of the prevalence of sex, age- and disease-specific disability. In method two, we defined the place of living as hospital, institution or home. We specified the correspondent official data for each place of living. For inpatient and outpatient, we used patient survey data in 1995. For the institionalized, we used several nursing home surveys in 1995 and 1996. The place of living should be mutually exclusive and collectively exhaustive, but due to the limitation of survey data, information on some parts of the population might be dropped. Then, applied condition-specific disability weights. We used global burden of disease (GBD) weights and Dutch disability weights because these are the only comprehensive condition-specific disability weights in the world. The classification of the condition was different from the Japanese one but most of the conditions were easily matched. For some conditions, we allocated the suitable weights with reference to the Australian burden of disease study.²

Results

In method one, DALE at birth were 70.44 in men and 75.19 in women. Life expectancy (LE)-DALE differences, the years lost due to disability, were 5.94 in men and 7.44 in women. DALE/LE ratios, the proportion of

perfect health in whole life, were 92.2% in men and 90.8% in women. In method two, DALE at birth were 72.63 in men and 78.08 in women. LE-DALE differences were 3.75 in men and 4.77 in women. DALE/LE ratios were 95.1% in men and 94.2% in women. Method two was higher than method one in all age groups, but in both methods the proportion of perfect health was higher in men. The differences were 2.2 in men and 2.9 in women (Table 1).

The correlation between DALE and LE were higher in method one than in method two. In method one, DALE at birth were highly correlated with LE; 0.9771 in men and 0.9355 in women. But in method two, correlations were lower than those of method one; 0.8729 in men and 0.4679 in women. The correlations of two methods were 0.8296 in men and 0.5020 in women (Table 2).

Discussion

Although we estimated Japanese DALE with two approaches, there was 2–3 years difference between them. We thus now evaluate two methods regarding data collection, calculation, accuracy, and significance, then discuss the usefulness of DALE as a policy tool.

In method one, data collection and calculation were easy because the required data were only numbers for death and population. But non-fatal health states were estimated by using the results of the Australian study, which means the disability status of the Japanese are the same as Australians. This assumption must not be acceptable to policy makers. Furthermore, as LE and DALE were highly correlated, method one added little information to the knowledge that was already captured by LE.

 Table 1
 Life expectancy, disability-adjusted life expectancy, life expectancy-disability-adjusted life expectancy

 difference, and disability-adjusted life expectancy/life expectancy ratio of Japan in 1995 (at birth)

	Method one				Method two			
	LE	DALE	LE-DALE	DALE/LE	LE	DALE	LE-DALE	DALE/LE
Men	76.38	70.44	5.94	92.2%	76.38	72.63	3.75	95.1%
Women	82.85	75.19	7.66	90.8%	82.85	78.08	4.77	94.2%

LE, life expectancy; DALE, disability-adjusted life expectancy; LE-DALE, life expectancy-disability-adjusted life expectancy; DALE/LE, disability-adjusted life expectancy/life expectancy.

 Table 2
 Correlation coefficients of life expectancy, method one and method two at birth

	Men Life expectancy	Method one	Method two	Women Life expectancy	Method one	Method two
Life expectancy	1	0.9771	0.8729	1	0.9355	0.4679
Method 1	_	1	0.8296	_	1	0.5020
Method 2	_	_	1	_	_	1

In method two, data collection and calculation were hard because various survey data have to be aggregated. The number of non-fatal health was estimated by using the Japanese official data. But due to the data limitation, the information of some parts of the population might be dropped. This is one of the reasons that the two methods had 2-3 years difference. For disability weights, we applied the GBD weights and Dutch weights which are studies of Western countries, because these are the only data which described comprehensive conditionspecific disability weights. Because correlation coefficients to LE were lower, method two added more information than method one.

DALE itself has common merits and demerits.¹ The concept of DALE is easy to understand for lay people, but the methodology is too complex.² DALE does not describe health in sufficient detail to be useful for policy makers. This is not the problem of DALE but the characteristics of healthy expectancy. If you want to analyze in more detail, you should use the health gap indicators like DALY, PYLL or traditional age-disease-specific mortality and morbidity.³ Epidemiological data were sparse, especially in non-fatal health outcomes. In many cases, sex, age- and disease-specific data in non-fatal condition, prevalence,

incidence or remission are hard to obtain. Valuation of non-fatal health state did not capture all aspects of status across the world. Weights were obtained from a limited group of experts.

Conclusion

DALE is a summary measure of health outcomes for policy evaluation and might be useful for turning policy makers' eyes and capturing public awareness on health. The concept is appropriate and acceptable but more efforts are required to improve its quality and methodology. and it must be remembered that DALE is still a developing tool.

References

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