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Quantifying Burden of Disease to Measure Population Health in Korea

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Quantitative assessments of the health status of a population are essential to make decisions and set priorities in the field of public health. Changing epidemiologic patterns increase the demand for comprehensive estimates of population health across the full health spectrum, including non-communicable diseases and injuries. Burden of disease (BoD) analysis has helped meet this need. With the success of the Global Burden of Disease (GBD) Study, the BoD technique has become predominantly associated with the GBD approach and its methodology using disability-adjusted life year (DALY) has been rapidly disseminated and generally accepted over the last several years. The first Korean BoD study using the DALY metric was presented in 2002. Various BoD studies have since been conducted, but the DALY concept has remained primarily academic and has not yet been actively utilized in the health policy arena. Here, we review the DALY metric and population-based Korean BoD studies using national health data, with the intent of increasing the understanding of their value and their potential role in strengthening future assessments of the Korean population's health status.

Keywords: Burden of Disease; Disability-Adjusted Life Year; Population Health; Korea

INTRODUCTION

Quantitative assessments of the health status of a population are important for decision-making and priority-setting processes in the field of public health (1). The health status and major health problems have traditionally been identified using metrics including cause-specific mortality rates, life expectancies, and incidence and prevalence rates (1). This approach is becoming unwieldy, however, when monitoring and comparing a number of problems over time, or assessing the impact of specific health interventions, as is done in cost-effectiveness analyses (2). Furthermore, recent changes in demographic and epidemiologic factors are having a major impact on the health status of many populations. For example, non-communicable diseases (NCDs) and their often non-fatal but long-term impact on health has become a major concern, leading researchers to question whether the observed gains in life expectancy have been accompanied by improvements in health status (1,3-5). Thus, methods to measure a population's full health spectrum, including NCDs and injuries are required.

Burden of disease (BoD) analysis has helped meet this need (1). The Global Burden of Disease (GBD) study, launched by the World Bank and the World Health Organization (WHO) in 1991 (6-10), represents a major advance in the quantification of the impact of diseases, injuries, and risk factors and its results have increased our understanding of basic descriptive epidemiology of global population health (11). With the success of the GBD study, the BoD technique has become predominantly associated with the GBD approach and its methodology using disability-adjusted life year (DALY) is now widely accepted (1).

The first national BoD study in Korea using the DALY metric was presented in 2002 (12), and many diverse BoD studies have been conducted since (13-35). The DALY concept, however, is primarily used academically and has not yet been actually utilized in the health policy arena. Therefore, in this article, we review the DALY metric and population-based Korean BoD (KBD) studies, with the intent of increasing the understanding of their value and their potential role in strengthening future assessments of the Korean population's health status.

DALY AS A SUMMARY MEASURE OF POPULATION HEALTH

Summary measures of population health (SMPH) combine information on mortality with that on the vast array of non-fatal health outcomes so as to represent a population's health as a single numerical index (3,36). Such summary measures have a range of potential applications, such as comparing the health of one population with that of another, monitoring changes in the health of a given population over time, identifying and quantifying health inequalities within a population, providing appropriate and balanced attention to the effects of non-fatal health

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FUTURE DIRECTIONS

Our recent finding that non-fatal outcomes play a more important role than deaths in the nation's disease burden (29,30) highlights the usefulness of DALYs for describing the overall health status of a population (1,3-5). Furthermore, NCD prevalence is expected to increase over the next decades (65) and concurrently, effective interventions and advances in medical technology are expected to allow those with NCDs to live longer in relatively good health. Thus, assessing the magnitude of a nation's disease burden, rather than calculating the number of deaths, prevalence, or incidence cases, would be a more helpful approach when devising strategies to control population health. Our suggested priorities for future BoD studies in Korea are the following.

Extending the range of DALY analysis

In BoD studies, the burden can be readily disaggregated by cause at the level of diseases and risk factors, and it can be estimated for any population subgroup (66). Linking the burden with risk factors can yield insight into how best to investigate avoidable disease. Several factor- or cause-specific analyses have been conducted, but population-level, comprehensive, and comparative assessments of the disease burden attributable to specific risk factors have not been performed in Korea. The KBD project expects to assess 29 common Korean risk factors in public health. Identifying risk factors and the contribution of those factors to the burden is important, but methods to reduce risk factors at the individual- and population-levels should be studied simultaneously (67). Our KBD project team is also developing a cost-effectiveness analysis model using the CHOosing Interventions that are Cost-Effective (WHO-CHOICE) method (68). Information on intervention effectiveness is expected to provide a useful evidence base for setting priorities to maximize population health with limited resources (68). In addition, regional and socioeconomic analyses can lead to targeted health planning and allow monitoring of inequalities in the distribution of health care services. More broadly, the usefulness of DALYs should be evaluated further as we develop more practical health statistics to meet the nation's specific health planning needs.

Improving estimate precision

The accuracy of DALYs depends primarily on the accuracy of the underlying epidemiologic data (52,69,70). The KBD project is working to address the study's limitations and methodological problems to improve this accuracy (29). We hope to refine the methods and improve the validity of the DALY estimates so we can more precisely measure Korean population health (66).

Producing comparative and consistent evidence

While GBD paints the big picture and compares diseases, injuries, and risk factors in different world populations (57), KBD quantifies the national burden of disease in Korea. The KBD study would be more meaningful if it could track changes that occur over time so that patterns, progress, and new challenges could be identified. Estimates for a wide range of health problems should be produced and updated 6(gful etho)-2(d7(hei9972 /(anin)

risk factors: global burden of disease study. *Lancet* 1997; 349: 1436-42.
10. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: global burden of disease study. *Lancet* 1997; 349: 1498-504.
11. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ, editors. Global Burden of Disease and Risk Factors. Washington, D.C.: World Bank, 2006.
12. Yoon SJ, Lee H, Shin Y, Kim YI, Kim CY, Chang H. Estimation of the burden of major cancers in Korea. *J Korean Med Sci* 2002; 17: 604-10.
13. Lee H, Yoon SJ, Ahn HS. Measuring the burden of major cancers due to smoking in Korea. *Cancer Sci* 2006; 97: 530-4.
14. Park JH, Yoon SJ, Lee HY, Cho HS, Lee JY, Eun SJ, Park JH, Kim Y, Kim YI, Shin YS. Estimating the burden of psychiatric disorder in Korea. *J Prev Med Public Health* 2006; 39: 39-45.
15. Lee H, Yoon SJ, Ahn HS, Moon OR. Estimation of potential health gains from reducing multiple risk factors of stroke in Korea. *Public Health* 2007; 121: 774-80.
16. Yoon SJ, Bae SC, Lee SI, Chang H, Jo HS, Sung JH, Park JH, Lee JY, Shin Y. Measuring the burden of disease in Korea. *J Korean Med Sci* 2007; 22: 518-23.
17. Hong KS. Disability-adjusted life years analysis: implications for stroke research. *J Clin Neurol* 2011; 7: 109-14.
18. Hong KS, Ali LK, Selco SL, Fonarow GC, Saver JL. Weighting components of composite end points in clinical trials: an approach using disability-adjusted life-years. *Stroke* 2011; 42: 1722-9.
19. Hong KS, Kim J, Cho YJ, Seo SY, Hwang SI, Kim SC, Kim JE, Kim A, Cho JY, Park HK, et al. Burden of ischemic stroke in Korea: analysis of disability-adjusted life years lost. *J Clin Neurol* 2011; 7: 77-84.
20. Kim YM, Kim JW, Lee HJ. Burden of disease attributable to air pollutants from municipal solid waste incinerators in Seoul, Korea: a source-specific approach for environmental burden of disease. *Sci Total Environ* 2011; 409: 2019-28.
21. Chung SE, Cheong HK, Park JH, Kim HJ. Burden of disease of multiple sclerosis in Korea. *Epidemiol Health* 2012; 34: e2012008.
22. Oh IH, Yoon SJ, Yoon TY, Choi JM, Choe BK, Kim EJ, Kim YA, Seo HY, Park YH. Health and economic burden of major cancers due to smoking in Korea. *Asian Pac J Cancer Prev* 2012; 13: 1525-31.
23. Kim EJ, Yoon SJ, Jo MW, Kim HJ. Measuring the burden of chronic diseases in Korea in 2007. *Public Health* 2013; 127: 806-13.
24. Kim YM, Park JH, Choi K, Noh SR, Choi YH, Cheong HK. Burden of disease attributable to the Hebei Spirit oil spill in Taean, Korea. *BMJ Open* 2013; 3: e003334.
25. Park JH, Eum JH, Bold B, Cheong HK. Burden of disease due to dementia in the elderly population of Korea: present and future. *BMC Public Health* 2013; 13: 293.
26. Park JH, Lee KS, Choi KS. Burden of cancer in Korea during 2000-2020. *Cancer Epidemiol* 2013; 37: 353-9.
27. Lee KS, Park JH. Burden of disease in Korea during 2000-10. *J Public Health (Oxf)* 2014; 36: 225-34.
28. Lee S, Shin H. Municipal disease burden attributable to heat wave. *J Korean Soc Health Educ Promot* 2014; 31: 51-62.
29. Yoon J, Oh IH, Seo H, Kim EJ, Gong YH, Ock M, Lim D, Lee WK, Lee YR, Kim D, et al. Disability-adjusted Life Years for 313 Diseases and Injuries: the 2012 Korean Burden of Disease Study. *J Korean Med Sci* 2016;31 Suppl 2:S146-57.
30. Yoon J, Seo H, Oh IH, Yoon SJ. e Non-Communicable Disease Burden in Korea: Findings from the 2012 Korean Burden of Disease Study. *J Korean Med Sci* 2016;31 Suppl 2:S158-67.
31. Lee WK, Lim D, Park H. Disability-Adjusted Life Years (DALYs) for Injuries Using Death Certi cates and Hospital Discharge Survey by the Korean Burden of Disease Study 2012. *J Korean Med Sci* 2016;31 Suppl 2:S200-7.
32. Lee YR, Kim YA, Park SY, Oh CM, Kim YE, Oh IH. Application of a Modied Garbage Code Algorithm to Estimate Cause-Speci c Mortality and Years of Life Lost in Korea. *J Korean Med Sci* 2016;31 Suppl 2:S121-8.
33. Lim D, Lee WK, Park H. Disability-adjusted Life Years (DALYs) for Mental and Substance Use Disorders in the Korean Burden of Disease Study 2012. *J Korean Med Sci* 2016;31 Suppl 2:S191-9.
34. Ock M, Lee JY, Oh IH, Park H, Yoon SJ, Jo MW. Disability Weights Measurement for 228 Causes of Disease in the Korean Burden of Disease Study 2012. *J Korean Med Sci* 2016;31 Suppl 2:S129-38.
35. Kim SH, Lee HJ, Ock M, Go DS, Kim HJ, Lee JY, Jo MW. Disability-Adjusted Life Years for Maternal, Neonatal, and Nutritional Disorders in Korea. *J Korean Med Sci* 2016;31 Suppl 2:S184-90.
36. Field MJ, Gold MR; Institute of Medicine (US) Committee on Summary Measures of Population Health. Summarizing Population Health: Directions for the Development and Application of Population Metrics. Washington, D.C. : National Academies Press, 1998.
37. Mathers CD, Sadana R, Salomon JA, Murray CJ, Lopez AD. Estimates of DALE for 191 Countries: Methods and Results. Global Programme on Evidence for Health Policy Working Paper No. 16. Geneva: World Health Organization, 2000.
38. Mahapatra P. Priority-setting in the health sector and summary measures of population health. In: Murray CJ, Salomon JA, Mathers CD, Lopez AD, editors. Summary Measures of Population Health: Concepts, Ethics, Measurement and Applications. Geneva: World Health Organization, 2002, p83-90.
39. Mathers CD, Ezzati M, Lopez AD, Murray CJ, Rodgers A. Causal decomposition of summary measures of population health. In: Murray CJ, Salomon JA, Mathers CD, Lopez AD, editors. Summary Measures of Population Health: Concepts, Ethics, Measurement and Applications. Geneva: World Health Organization, 2002, p273-90.
40. Murray CJ, Salomon JA, Mathers C. A critical examination of summary measures of population health. *Bull World Health Organ* 2000; 78: 981-94.
41. Murray CJ, Acharya AK. Understanding DALYs (disability-adjusted life years). *J Health Econ* 1997; 16: 703-30.
42. Airoldi M, Morton A. Adjusting life for quality or disability: stylistic di erence or substantial dispute? *Health Econ* 2009; 18: 1237-47.
43. Arnesen T, Kapiriri L. Can the value choices in DALYs in uence global priority-setting? *Health Policy* 2004; 70: 137-49.
44. Lyttkens CH. Time to disable DALYs? On the use of disability-adjusted life-years in health policy. *Eur J Health Econ* 2003; 4: 195-202.
45. Nygaard E. Is it feasible or desirable to measure burdens of disease as a single number? *Reprod Health Matters* 2000; 8: 117-25.
46. AbouZahr C, Vaughan JP. Assessing the burden of sexual and reproductive ill-health: questions regarding the use of disability-adjusted life years. *Bull World Health Organ* 2000; 78: 655-66.
47. Williams A. Calculating the global burden of disease: time for a strategic reappraisal? *Health Econ* 1999; 8: 1-8.
48. Sundby J. Are women disfavoured in the estimation of disability adjusted life years and the global burden of disease? *Scand J Public Health* 1999;

 https://doi.org/10.3346/jkms.2016.31.S2.S101