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The Korean National Burden of Disease Study: from Evidence to Policy

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ABSTRACT

Following the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD), disability-adjusted life years (DALYs) have been widely used as a summary measure of population health. The DALY metric is a comprehensive measurement of population health, enabling comparison among groups. However, the available data and reliance on estimates to supplement the data gap require contextualization at the national level, and the outcomes of which are more appropriate for national policymakers. The Korean National Burden of Disease (KNBD) study was initiated by the Research and Development Project of the Ministry of Health and Welfare, funded by a 5-year grant from 2013, to contextualize the GBD method to the Korean population. Here, we provide a comprehensive overview of the KNBD study with its achievements and challenges and discuss the implications for public health policies.

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

INTRODUCTION

The estimation of population health status is essential to prioritize resource allocation in public health policy. Since the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD),^{1,2} disability-adjusted life years (DALYs) have been widely used as a summary measure of population health.

The DALY metric represents an aggregation of disease-specific premature deaths and morbidities, thus enabling the comparison of health gaps among groups. In addition, the GBD provides DALY estimates of all countries to assess health trends from a global viewpoint. However, limited available data and relying on estimates to supplement the data gap requires contextualization at the national level, and such contextualized outcomes are more appropriate for national policymakers.

In Korea, efforts at estimating the national burden of disease have been made by individual researchers since the late 1990s. Although there was no continuous study due to lack of stable funds, the Korean National Burden of Disease (KNBD) study was initiated by the Research

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Author Contributions

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and Development Project of the Ministry of Health and Welfare funded by a 5-year grant from 2013. The project aimed to develop a methodology for evaluating the national burden of disease in the Korean population, expressed as DALYs, and to estimate the indicator in 2012 and 2015. Key findings were published in the supplementary issues of the *Journal of Korean Medical Science* in 2016 and 2018, respectively.

This paper presents a comprehensive overview of the achievements and challenges of the KNBD study and discusses implications for public health policies.

WHERE WE ARE: GENERATING EVIDENCE**Achievements of the KNBD study***Contextualization to the Korean population*

To estimate the burden of disease in the Korean population, the KNBD study followed the approach of the GBD^{2,3} with several modifications: 1) disease classification and data sources were country-specific, 2) years lost due to disability (YLD) were determined using national disability weights, and 3) years of life lost (YLL) were calculated using the national standard life expectancy. Firstly, the study adjusted disease classification according to national representative data sources with expert consultation.⁴ Specifically, data on cancers were obtained from the Korea Central Cancer Registry, which is a national registry. Data from the Korean National Hospital Discharge Survey conducted by the Korea Centers for Disease Control and Prevention were used to estimate injuries. For the other diseases, we used the National Health Insurance Service (NHIS) claims data, which is a highly representative medical use database because NHIS covers approximately 97% of the population as a single insurer. Prevalent cases were defined by the presence of related International Classification of Diseases, tenth revision (ICD-10) codes for each disease, as principal diagnosis during inpatient or outpatient visits, in consultation with specialists. Incident cases were defined as newly diagnosed diseases during the washout period (0–5 years, defined by diseases) to exclude prevalent cases. Cause of death data were obtained from the Statistics Korea.

Secondly, national disability weights, a key variable for YLD estimation, were obtained from a self-administered web-based survey of a total of 496 physicians and medical college students,⁵ 228 causes were evaluated by a paired comparison method. The study provided information on national disability weights with adoption of the GBD methodology, despite the need to improve its validity with revision by the consensus of experts using ranking scale on the different results of previously published disability weights, or by analysis with other methods.

Thirdly, YLL calculations were based on mortality data and national life expectancy estimates, which were determined using age- and gender-specific life tables published by the Statistics Korea. As the life table used in calculating the standard expected YLL is the key variable for estimating the burden of disease due to premature death, contextualization of YLL was performed. Furthermore, deaths assigned to so-called garbage codes have been redistributed to improve the validity of causes of death, as described in detail elsewhere.⁶

Methodological advances

The application of the DALY estimate assuming a single-disease hypothesis fails to account for comorbid conditions.⁷ Even with the assumption of difficulty in identifying temporal

order among the comorbid diseases for individuals, the burden of disease estimation without consideration of coincident illnesses is limited to being used as a summary measure of a multimorbid population.

Through the KNBD, we estimated comorbidity-adjusted DALYs by applying a multiplicative approach to some chronic diseases.⁸ The data were obtained from the Korea National Health & Nutrition Examination Survey, and disability weights of each disease assessed by using the EuroQol-5D (EQ-5D). As the number of comorbid diseases increased, disability weights increased, and the DALYs were the highest in the low-income and low-education level groups. A higher prevalence of comorbidity in the vulnerable group of socioeconomic levels was identified, suggesting the need to consider comorbidities when estimating population health using DALYs. The next KNBD project will aim to expand the diseases to be analyzed.

One of the factors promoting the validity of DALY is that it accounts for the severity level of diseases by using different weights for different stages of the disease. There has been no study on the burden of disease considering disease severity, and previous studies have each focused only on single diseases. The KNBD Study refined disability weights reflecting the severity of 60 causes, including cancers and stroke, by a survey of 605 physicians and medical college students.⁹

Challenges ahead for the KNBD study

Considering that the goal of estimating the burden of disease is to provide evidence for decision-making within the health sector, the KNBD study has faced several challenges.

Approach to estimation: incidence- versus prevalence-based

One of the biggest methodological challenges for the KNBD is deciding whether to convert to a prevalence-based approach or not. Following the publication of the GBD 2010 in 2013,^{10,11} DALYs were calculated based on a prevalence-based approach to model the assumptions for estimation by Bayesian meta-regression tools such as DisMod-MR. In fact, issues with the incidence-based DALY metric, non-reflection of the current burden of sequelae and requiring estimates of both incidence and duration of disease, have led to the use of a prevalence-based approach in the GBD.

The KNBD mainly utilizes an incidence-based approach, because it allows the use of NHIS claims data that represent health status relatively broadly and accurately. From this perspective, although contextualization enhances the national acceptance of the results, it constrains direct international comparisons. The prevalence-based approach enables international comparison because the methodology is the same as that of the GBD. Accordingly, the KNBD 2012 firstly applied prevalence-based DALYs to the Korean population for the 30 leading causes, including cancers.¹² However, the crucial problem was the lack of available national data on the distributions of sequelae and health states. Since the NHIS claims data are based on medical records and only the patients covered by national health insurance can be identified, it is difficult to estimate the probability of sequelae following all severity levels of cases. Although we tried to supplement the data by a systematic review of published literature, limited evidence exists for the distribution of health status. To estimate more reliable and valid prevalence-based DALYs of the Korean population, national epidemiological data resulting from population-based survey would be needed.

Subdividing the population into groups

DALYs for different geographic regions or socioeconomic groups may allow for a more specific view of public health. For this reason, the GBD subdivided its estimations not only by disease classification, but also by subnational level. Previous studies emanating from the UK,¹³ Japan,^{14,15} and China¹⁶ have shown that the subnational analysis of the burden of disease enables region-specific needs to be determined and provides evidence on national health policy. Subnational analysis provides the means to capture disease burden according to socioeconomic factors with regional characteristics and improves its implications to decision makers. Likewise, in Korea, the burden of disease and risk factors should be assessed by subnational and socioeconomic levels in the context of the nation to identify regional health variations. This will require both data availability and the development of methodology.

Besides the regions, variables that cause differences in health inequality are socio-economic factors (Gini coefficient, social trust status, income per capita), demographic factors (percentage of elderly population, fertility rate), health-related factors (prevalence of overweight, smoking, and drinking), and infrastructural factors (the number of physicians and hospital beds per population). Otherwise, a summary index can be developed to track gaps in the health status of the Korean population considering diverse variables, like the socio-demographic index developed by the Institute for Health Metrics and Evaluation.

Timely estimation and production

Since the main data of the KNBD study were obtained from national published sources, including NHIS claim data, access to the database is possible one year after the actual event, and it takes even more time for a researcher to estimate and publish the results. This restricts the use of DALYs in the policy sector. Regularly updating estimates of the burden of disease enables us to monitor the trends of population health over time and assess the effectiveness of policies.¹⁷ Beyond estimations of the burden of disease by individual researchers, a platform for regular (annually, if possible) and timely production should be established as a national task.

WHERE TO GO FROM HERE: GUIDING POLICY

Using the DALYs in health policy

As the primary goal of DALY estimates is to provide policy makers with evidence on population health, the World Health Organization (WHO)¹⁸ and the World Bank¹⁹ use GBD results to set priorities by comparing the magnitude of health gap from diseases, injuries, and risks, in an international context. Since the GBD and DALY metric were initiated by the World Bank's 'World Development Report 1993,' extending the GBD framework to national settings for prioritizing national health expenditures should be reviewed carefully.

Nevertheless, the practical value of DALYs has been proven, as several countries are using DALYs to determine health priorities and to allocate resources for health. Through the international symposium in 2017 as part of the KNBD Study, we confirmed that England and some Asia-Pacific countries are actively using evidence from the DALY estimates in the health sector. In Australia, the Australian Institute of Health and Welfare has analyzed the national burden of disease and supported activities related to population health monitoring, health policy planning, and assessing the impact of diseases and cost-effectiveness of interventions.²⁰ Japan has emphasized the value of sub-national disease burden estimation,

which can offer local policymakers detailed information. The Ministry of Health of New Zealand reports using GBD data to guide the health strategy of the country.²¹ According to the report, titled 'Health Loss in New Zealand: A Report from the New Zealand Burden of Diseases,' the ministry identified health gaps among various groups, such as those divided by gender, age, ethnicity, and socioeconomic status, through the GBD data. In addition, Murray and Lopez²² reported that 156 governments reference the GBD.

Future directions: implications for health policy

The KNBD Study developed Korean-contextualized methodology and estimated the burden of disease in 2012 and 2015. In its last year of the 5-year project, we would like to present the implications of our achievements for the health policy of Korea.

Firstly, DALYs can be used as an official statistic issued by the government. Along with the mortality and life expectancy, YLL, YLD, and DALY can be reported as indicators that measure the national health level. In the context of understanding composite summary indicators for measuring population health, disability-free life expectancy and health-adjusted life expectancy (HALE) can be used as alternatives which are easier to understand by decision makers and the public because they are described as "gain" from an illness or intervention (compared to "loss" in DALYs). In this perspective, the KNBD 2012 also measured HALE from 2005 to 2011 in Korea at both national and regional levels.²³ In addition, the KNBD will be extended by a new Research and Development Project by the Ministry of Health and Welfare named "Development of a Health Status Measurement Platform for Implementation of Precision Public Health in Korea," which is funded by a 3-year grant from April 2018. This project plans to measure the health status of Korea by using DALYs and HALE with the developed methodology.

Secondly, the outcomes of the KNBD study can also be used to set targets and strategies for the national health plan. The Ministry of Health and Welfare has established a national health plan every decade since 2002, as per the National Health Promotion Act. The objective of the Health Plan 2020 is to extend the healthy life expectancy to 75 years. However, estimates vary according to the methods used by different organizations (the WHO and the Statistics Korea), resulting in confusion. Thus, the KNBD Study is expected to provide evidence based on reliable measurements. Moreover, the study will provide information on the predicted trends in health status according to changes in risk factors, which can suggest the indicators needed to build the 5th National Health Plan, called HP2030.

Thirdly, composite summary indicators for measuring population health can also be used for identifying new priorities in Korea, especially national health coverage issues. In Korea, one of the countries achieving population-wide coverage of the three dimensions of universal health coverage via the mandatory National Health Insurance, policymakers are faced with the challenge of providing benefit coverage and cost coverage. To efficiently allocate limited resources with the increasing demands for health services, the government needs to decide what services to cover, who to cover, and what proportion of costs to cover. Apart from the debate on whether the value of summary measure of population health implies differentials in resource availability,⁷ the regular estimation of indicators can be among the systematic processes by which disease and risk factors are prioritized.

Likewise, considering that the primary goal of the burden of disease estimates is for them to be used in practice, it is essential to establish an infrastructure for regular estimation

at the national level. So far, the KNBD Study has focused on contextualizing the method to the Korean population. Now, the study should proceed in the direction of monitoring health trends through continuous estimation and by improving specific methodologies. This requires a platform for accurate estimation based on reliable data, which means that a reliable national system of health data collection must be established through the collaboration of related organizations.

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