



Economic losses and burden of disease by medical conditions in Norway



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ABSTRACT

We explore the correlation between disease specific estimates of economic losses and the burden of disease. This is based on data for Norway in 2013 from the Global Burden of Disease (GBD) project and the Norwegian Directorate of Health. The diagnostic categories were equivalent to the ICD-10 chapters. Mental disorders topped the list of the costliest conditions in Norway in 2013, and musculoskeletal disorders caused the highest production loss, while neoplasms caused the greatest burden in terms of DALYs. There was a positive and significant association between economic losses and burden of disease. Neoplasms, circulatory diseases, mental and musculoskeletal disorders all contributed to large health care expenditures. Non-fatal conditions with a high prevalence in working populations, like musculoskeletal and mental disorders, caused the largest production loss, while fatal conditions such as neoplasms and circulatory disease did not, since they occur mostly at old age. The magnitude of the production loss varied with the estimation method. The estimations presented in this study did not include reductions in future consumption, by net-recipients, due to premature deaths. Non-fatal diseases are thus even more burdensome, relative to fatal diseases, than the production loss in this study suggests. Hence, ignoring production losses may underestimate the economic losses from chronic diseases in countries with an epidemiological profile similar to Norway.

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1. Background

Health expenditures globally are expected to increase from US\$ 8–18 trillion between 2013 and 2040 [1]. Nations are forced to manage this expenditure growth by combining sustainability and cost containment, with the improvements in health technology. By tracking health and expenditures by disease categories policy makers can gain an insight into the underlying health conditions driving total economic losses.

Mortality and non-fatal health loss can be tracked from the Global Burden of Disease (GBD) project, which recently provided country specific estimates for 188 countries, 306 diseases and

injuries from 1990 to 2013 [2]. The goal of the GBD is to synthesize all available epidemiological data of all major diseases and injuries to provide a comprehensive and comparable assessment of the magnitude of diseases and injuries and their associated sequelae and risk factors [2,3]. By publishing results in a series of papers in the Lancet [2–5] and other journals, combined with making detailed results available for the public through their webpages [6] it has created attention from the media, public and policy makers.

Although spending estimates are common in the literature, variations in concepts, data and methods often make them incomparable across disease groups and countries [7]. Furthermore, they often include double counting [8] and estimates of how national spending is distributed across diseases are rare. Recently a few studies have generated comparable results for the US [8–11], the Netherlands, Germany, France and Australia [12,13]. However, little attention has been paid to the association between burden of disease and economic losses across disease categories, i.e. are the

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diseases with the greatest burden in terms of mortality and non-fatal health loss also the most expensive in terms of economic losses?

Such considerations are important given that both disease burden and economic losses are measures of benefits from disease prevention. A high aggregate disease burden does not warrant high expenditures on prevention and treatment of the disease. This depends on the cost-effectiveness of interventions in the area. However, a high aggregate disease burden is frequently used to justify resources aimed at disease specific research or for general regulatory or institutional policies [14,15]. High economic costs of illness may in principle provide further justification for such actions and policies. If health burden and economic losses are correlated they reinforce one another; if they are not correlated they weaken each other.

Norway provides a novel opportunity for assessing the relationship between burden of disease and economic losses. In Norway, both the health service and the labor and welfare administration are centrally organized and publicly financed. Furthermore, the Norwegian government collects data on utilization and expenditures in national registers that cover the full Norwegian population. Based on the registry data one can calculate the direct public expenditures, consisting of the medical care expenditures for diagnosis, treatment, continuing care, rehabilitation, and terminal care [16].

The Norwegian national registers also allows for the calculation of production loss. This is financial losses associated with the production loss and replacement costs due to illness, disability and death of productive persons [16–21]. The inclusion of production losses in economic evaluations remains controversial for two reasons [20–22]. Firstly, it is debated how to correctly estimate the magnitude of the production loss in cost-effectiveness analyses (CEA). Secondly, it is debated whether the production loss should be included when valuing health care interventions in a priority setting context. These two debates must be separated from one another. The first is about the correct methods for estimating the actual production loss. The second is a normative question and it has been argued that if one take account of such losses in the assessment of health services it may lead to favoring of treatments targeting the working population, on the expense of other groups, like the elderly. Such concerns has recently led Norway to follow the UK and exclude such production losses in their national guidelines on priority setting in the health service [23,24]. On the other hand, excluding the economic loss associated with the burden of disease may ignore the consequences of ill health in the society, which may lead to welfare-reducing decisions [20–22]. By estimating the production loss by disease separately, we can explore which disease groups are likely to be affected by the inclusion of production losses when evaluating treatments in CEAs, while also measuring direct health care expenditures.

Studies on health expenditures by medical condition and burden of disease (mortality and non-fatal health loss) are lacking. To the best of our knowledge, only one paper has looked at this. Druss et al. analyzed the association between impairments in activities of daily living and spending on health service use for the fifteen most expensive conditions in the US [25]. They found no significant association between disease severity and expenditures. They reran the analysis with expenditures against mortality and disability adjusted life years (DALYs), though no significant associations were found.

The aim of this study was to explore the relationship between burden of disease (mortality and non-fatal health loss), health expenditures, and production loss in Norway. To measure the economic losses we used disease specific health care expenditures and disease specific production loss in 2013 for the Norwegian population published by the Norwegian Directorate of Health. As measures of burden of disease we used of years of life lost (YLL), years of life

lived with disability (YLD) and disability adjusted life years (DALYs) by disease in 2013.

2. Data and methods

2.1. Burden of disease (mortality and non-fatal health loss)

The estimates of mortality and non-fatal health loss are taken from the GBD 2013 project [2]. This project has published disease specific measures of 2013 disease burden for Norway based on a combination of Norwegian registry data, health surveys and published studies. Data input into the estimation of the Norwegian prevalence estimates were also constructed from non-Norwegian data. Various statistical estimation methods were used depending on the specific disease, where the most common approach being the application of a Bayesian metaregression model [2,26].

To describe the burden of disease in Norway we use YLLs, YLDs and DALYs, which are measured for each of 306 causes of illness, as well as age and sex groups. YLLs were computed by multiplying the number of deaths at each age x by a standard life expectancy at age x , using a reference life table. The standard selected represents the normative goal for survival and the reference life table was computed based on the lowest recorded death rates across countries in 2013. YLDs were computed as the prevalence of different disease and injuries multiplied by the disability weight for that disease or injury. Disability weights were determined in surveys of the general population about the loss of health associated with the health state related to the disease or injury [5,27]. DALYs are the sum of the two components YLL and YLD, and works as a summary measure of public health capturing the effect of both premature mortality and non-fatal health loss in a given year [3].

2.2. Economic losses by medical conditions

Based on the data from the Norwegian directorate of health, the economic loss were categorized into two categories: 1) health care expenditures and 2) production loss [28,29].

2.2.1. Health care expenditures

The national health care expenditure accounts have been decomposed for each year defined by service type. Service types include three parts: a) hospital care; b) primary care; and c) prescription drugs as well as hearing and visual related products. The data for hospital care was taken from the Norwegian patient registry (NPR) [28–30]. NPR provides Diagnosis-Related Groups (DRGs), which allows the estimation of resources needed by disease categories. Data for primary care was based on the registry for reimbursement of primary care physicians, chiropractors and physiotherapists (KUHR), and for prescription drugs a dataset for reimbursement of prescription drugs [28,29]. KUHR and the prescription drug registry consist of reimbursement claims, where the provider sends a disease code in order to be reimbursed. Each of these datasets covers the full Norwegian population.

2.2.2. Production loss

The Human Capital Approach (HCA) has been the most commonly used method for valuing costs and losses related to productivity. This method use gross earnings to value lost productivity and the present value of the future stream of gross earnings becomes one way of measuring the production loss to society of a person's absence from work. However, this method has been criticized for providing exaggerated estimates [22,31,32]. The Washington-panel argued that: one should only count the impact on the rest of society, not including the person suffering from the illness, in models that also includes health outcome units (like QALYs/DALYs) [33,34]. The reason is that parts of the production

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