Burden of Disease Assessment: A Practical Guide

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Preface

Disability-Adjusted Life Years (DALYs) have become a key indicator in descriptive epidemiology. DALYs represent the number of healthy life years lost due to ill health and mortality, and allow comparing the population health impact of diseases, injuries and risk factors.

Although the DALY concept has been introduced nearly 30 years ago, there is still little guidance available on their calculation. This book aims to address this gap, through a combination of theoretical sections, simplified examples, and real-life experiences.

This book is the result of interactions and collaborations within the European Burden of Disease Network (COST Action CA18218), supported by COST (cooperation in science and technology). Further information on the network is available via https://www.burden-eu.net.

Why read this book

This book is primarily intended for students, researchers and public health professionals interested in learning how to calculate DALYs.

However, it should also be noted that the **best way of learning is by doing**. We therefore hope that this book can encourage you to get started with your own calculation examples.

Structure of the book

The first part of the book is dedicated to the basic concepts of DALY calculations. Starting from simple examples, different layers of complexity will be introduced.

The second part of the book is dedicated to national burden of disease studies.

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Part I

Calculating DALYs

Chapter 1

Introduction

The ultimate goal of public health policy is to protect and promote the population's health (Devleesschauwer et al., 2014a). This requires information on the health status of the population, often referred to as the "burden of disease". In order to make relevant decisions and set appropriate priorities, policy makers need to be informed about the size of health problems in the population, the groups that are particularly at risk, and the trends in the state of health over time. In addition, an accurate estimate of the population's health status can be used for determining the expected health care use and is vital for prioritizing effective interventions and evaluating their impact and cost-effectiveness (Tan-Torres Edejer et al., 2003).

As public health is a multifactorial phenomenon with many facets, the disease burden of the population can be described by a variety of indicators. Typical indicators of population health are life expectancy, cause-specific mortality rates, numbers of new and existing cases of specific diseases (i.e., incidence and prevalence), perceived health, the occurrence of physical and mental limitations and disability, but also more indirect measures, such as absenteeism, incapacity of work, and the use of medical facilities and the associated costs. However, all these indicators highlight only one facet of public health, i.e., either mortality or morbidity.

Summarizing public health in terms of mortality-based indicators, such as life expectancy, dates from the time when only reliable data for mortality existed. In many countries, however, one has been confronted with ageing populations and an epidemiological transition of public health problems. The importance of early mortality due to plagues and famines has been replaced by chronic, non-communicable diseases, while communicable diseases remain a real threat, causing a "double burden" (Marshall, 2004). Cardiovascular diseases and cancers have replaced infectious diseases as the main causes of death. However, these diseases are also associated with an important morbidity component, due

to the life prolonging effect of continuously improving medical practice (Jelenc et al., 2012). Moreover, not only an extended life expectancy per se is aimed for, living these extra years in good health has become just as important (Bryant et al., 2001). As a result, current health policy requires a global overview of public health, one that combines morbidity and mortality and takes account of health-related quality of life (Robine et al. 2013).

Given the importance of combining morbidity and mortality, several summary measures of population health (SMPH) have been proposed and implemented (Murray et al., 2000; Table 1). SMPHs may be divided into two broad families: health expectancies or experiences and health gaps, but all have in common that they use "time" as the common measure for quantifying health or health loss. The most powerful SMPHs are those that are able to combine morbidity and mortality into a single figure.

Table 1.1: (#smph) Classification of summary measures of population health

	Health Experience	Health Gap
Mortality	Life Expectancy	Potential Years of Life Lost(Years of Potential Life Lost)Standard Expected Years of Life Lost
Morbidity	Quality-Adjusted Life Year	Years Lived with Disability
Morbidity & Mortality	Active Life ExpectancyDisability-Free Life ExpectancyHealthy Life YearsQuality-Adjusted Life ExpectancyDisability-Adjusted Life Expectancy	Disability-Adjusted Life Year

Driven by the influential Global Burden of Disease (GBD) projects initiated in the early 1990s (Murray and Lopez, 1996), the Disability-Adjusted Life Year (DALY) has become the dominant SMPH for quantifying burden of disease. The DALY metric has therefore been selected as key SMPH for the Belgian National Burden of Disease study. DALYs measure the health gap from a life lived in perfect health, and quantify this health gap as the number of healthy life years lost due to morbidity and mortality. Although the basic DALY formulas are rather straightforward, the calculation of DALYs, like any other SMPH, requires several assumptions, some of which are not always obvious. Furthermore, DALY-based burden of disease studies are almost always confronted by uncertainties and almost always require manipulations of epidemiological data.

Chapter 2

Basic concepts

Chapter 3

Data needs

Chapter 4

Disability weights

Chapter 5

Comorbidity

Chapter 6

Residual life expectancy

Chapter 7

Risk factors

Chapter 8

Quantifying uncertainty