

1 Introduction

1.1 Purpose

The study upon which this report is based is the first complete assessment of the health of Australians in the new millennium and the second study in this country with comparable objectives. The original study, the results of which continue to be used widely in policy and research environments, was conducted by the Australian Institute of Health and Welfare (AIHW: Mathers et al. 1999) and provided a comprehensive overview of disease and injury burden for the year 1996. Increasing demand for a contemporary picture of health status in Australia led, in 2003, to an Australian Government-funded collaboration between the University of Queensland and the Australian Institute of Health and Welfare (AIHW), the aim of which was to update and expand the original work.

The objectives of this collaboration were to report on the following:

- full burden of disease and injury results for the year 2003 by age group, sex and cause
- projections of disease and injury burden 20 years into the future
- improved models for attributing disease and injury burdens to risk factors
- subnational estimates of burden for state and territory jurisdictions, socioeconomic quintiles, remoteness categories and small areas
- the burden of disease and injury in Aboriginal and Torres Strait Islander populations.

This report presents the main findings of this collaboration and meets the above objectives, except the last which is covered in a separate report.

1.2 Background

Changes in demography and technology are placing increasing pressure on the health budgets of developed countries around the world. Mortality and fertility rates have decreased consistently over recent decades, resulting in increases in life expectancy and the proportion of total population alive at old and very old ages (AIHW 2006). In addition, developments in knowledge and medical technology are contributing to a growing demand for health services and, in many cases, to higher costs of providing these services. In Australia and elsewhere, these factors have brought into focus the need for more rigorous debate about how health systems can achieve their dual objectives of maximising health gains for given levels of expenditure and maintaining fair and equitable access to health services.

Improving the evidence base that informs this debate is critical if health systems are to be meaningfully held to account. Such an agenda requires contributions from a number of areas, including:

- detailed assessments of the size and impact of health problems in a population, including information on the causes of loss of health in the population (in terms of both diseases and injury, and risk factors or broader determinants)

- information on inequalities in health status, health determinants, and access to and use of health services (including prevention and treatment services)
- information on health expenditure and health infrastructure (a national system of health accounts) detailing the availability of resources for health improvement and the current use of these resources
- information on the cost-effectiveness of available technologies and strategies for improving health
- information on current levels of investment in health research and development, and on the opportunities for investment with the greatest likelihood of developing new or improved interventions that best remedy major health problems.

This report contributes to the development of such an agenda in Australia by providing a detailed and internally consistent assessment of the incidence, prevalence, duration, mortality and burden for an exhaustive and mutually exclusive set of major diseases and injuries experienced in this country. The burden from these causes is quantified for various subpopulations, risks to health and points in time using a summary measure of population health that combines both fatal and non-fatal health outcomes, and includes comorbidity adjustments to account for individuals who simultaneously experience multiple conditions.

This assessment provides an unprecedented level of detail on the magnitude and distribution of health problems in contemporary Australia. Although solutions to these problems are not addressed explicitly in the following chapters, the analyses described encompass a methodology that is increasingly being used in Australia and elsewhere to assess health outcomes both for descriptive purposes and in comparative analyses of the costs and effectiveness of particular health interventions. The report can be regarded, therefore, as an important foundation for further work on improving health system performance in Australia.

1.3 Summary measures of population health

Summary measures of population health are measures that combine information on mortality and non-fatal health outcomes into a single number to represent one or more dimensions of health at a population level (Field & Gold 1998). In the past 15 years, there has been a marked increase in interest in the development, calculation and use of summary measures. The range of potential applications includes:

- comparing health conditions or overall health status between two populations or the same population over time
- quantifying health inequalities
- ensuring that non-fatal health outcomes receive appropriate policy attention
- measuring the magnitude of different health problems using a common currency
- analysing the benefits of health interventions for use in cost-effectiveness studies
- providing information to help set priorities for health planning, public health programs, research and development, and professional training (Murray et al. 1999b).

Most summary measures fall into one of two broad groups: health 'expectancies' and health 'gaps'. Both groups use time (either lived in health states or lost through premature death and illness) as the unifying 'currency' for combining the impact of mortality and non-fatal health outcomes. Another common feature is the requirement for explicit or implicit choices

in their application: mortality-based indicators, for example, exclude considerations regarding non-fatal loss of health; indicators of potential years of life lost ignore deaths beyond an arbitrary age (for example 65 years); and indicators of disability-free life expectancy do not place any positive value on years lived with disability.

Health 'gap' measures, in particular, quantify the gap between a population's actual health status and some 'ideal' or reference status. The most widely known example of such a measure, and the one used in this report, is the disability-adjusted life year or DALY. Another measure commonly used in economic evaluations but not in population health status assessments is the Quality Adjusted Life Year (QALY).

1.4 Disability-Adjusted Life Years

The DALY was first developed to provide information to support health policy and priority setting at a global level. The concept was developed as part of a comprehensive assessment of global health for the year 1990 in what became known as the Global Burden of Disease or GBD study (Murray & Lopez 1996a, 1996b; World Bank 1993). It has since become synonymous with 'burden of disease' and the terms tend to be used interchangeably.

The DALY was originally intended to:

- allow estimates of health effects to be mapped to causes, either in terms of disease and injury, or risk factors and broader social determinants
- provide a common measure for estimating population health effects and cost-effectiveness of interventions
- use common values and health standards for all regions of the world
- provide a common measure for fatal and non-fatal health outcomes.

In this way, the DALY extends the concept of potential years of life lost due to premature death (PYLL) by including equivalent years of 'healthy' life lost by virtue of being in states of poor health or disability. A DALY for a disease or health condition is calculated as the sum of the years of life lost due to premature mortality (YLL) in the population and the equivalent 'healthy' years lost due to disability (YLD) for incident cases of the health condition:

$$\text{DALY} = \text{YLL} + \text{YLD}$$

where YLL = number of deaths x standard life expectancy at age of death and

YLD = incidence x duration x severity weight.

The loss of healthy life due to health conditions (YLD) requires estimation of the incidence of the disabling health condition (disease or injury) in the specified time period. For each new case, the number of years of healthy life lost is obtained by multiplying the average duration of the condition (to remission or death) by a severity weight that quantifies the equivalent loss of healthy years of life due to living with the health condition or its sequelae. The YLD is as an incidence-based measure, therefore, which captures the future health consequences of new cases of disease and injury that occur in the baseline year (2003 in this study). Such a measure, when combined with YLL, enables the full 'health loss' of different diseases and injuries to be compared and has most application in planning.

Alternatively, health loss can be measured by counting it at the age it is lived. This is the 'prevalent burden' or prevalent years lost due to disability (PYLD) and is calculated thus:

$$\text{PYLD} = \text{prevalence} \times \text{severity weight}$$

Prevalent burden is useful from a service utilisation or expenditure perspective and measures the amount of disability (but not the fatal burden) being experienced in a population at a point in time.

From the perspective of the International Classification of Functioning, Disability and Health (ICF) (see <www3.who.int/icf/icftemplate.cfm>) the YLD measures the impact of a health condition on an individual's functioning, now and into the future. Functioning includes the functional and structural integrity of the human body as well as activities undertaken by people and participation in life situations.

Interpreting the DALY

The DALY methodology provides a way to link information on disease causes and occurrence to information on both short-term and long-term health outcomes, including activity limitations and restrictions in participation in usual roles, and death. The burden of disease methodology is designed to inform health policy about the prevention and treatment (cure or reduction in severity) of adverse health outcomes. It is not designed to inform policy for the provision of social support or welfare services for people with long-term disability.

When using the DALY for the first time, Murray and Lopez sought to make explicit the value choices that they had to make in their application of a summary measure at a global level. For example, they chose to use the same life expectancy 'ideal' standard for all population subgroups across the globe, whether or not their current life expectancy was lower than that of other groups. They also excluded all non-health characteristics (such as race, socioeconomic status or occupation), apart from age and sex, from consideration in calculating lost years of healthy life. Most importantly, they used the same severity weight for everyone living a year in a specified health state. These and other aspects of the DALY are described in further detail in Chapter 2.

1.5 Burden of disease analysis in Australia

Since its introduction, burden of disease analysis has been applied in an increasing number of international and national settings; for example, it was used for a period by the World Health Organization (WHO) to inform global health planning (WHO 2002). Burden of disease analysis has a particularly strong history in Australia. The first study by the AIHW assessed the burden of disease and injury in Australia for the year 1996 (AIHW: Mathers et al. 1999). Starting in June 1998, the first study was partly funded by the then Commonwealth Department of Health and Aged Care and was conducted in parallel with a state-level analysis for Victoria by the Victorian Department of Human Services (DHS 1999a, 1999b). Both project teams worked together closely on methods and analyses.

This work represented the first attempt to carry out a systematic and comprehensive analysis of over 170 disease and injury categories in this country. It also substantially extended the

international work on burden of disease in many areas, as shown by the fact that a number of its methodological advancements were subsequently picked up in the GBD 2000 work at WHO (Mathers et al. 2004). Since then, burden of disease analysis has been undertaken in most jurisdictions throughout Australia, at varying levels of detail. The update of the Victorian Burden of Disease study for the year 2001 (DHS 2005) deserves special mention as a number of disability models and data sources were shared between the researchers working on that project and those working on the present study.

This study was conducted in close consultation with relevant jurisdictional stakeholders, and the national and jurisdictional estimates in this report are intended to complement existing estimates from individual State and Territory based burden of disease studies. Because of somewhat different estimating methods and data sources, the jurisdictional estimates in this report may differ somewhat from State and Territory based estimates. This does not mean that one estimate is more correct than the other, but reflects the uncertainties inherent in any analysis which attempts to estimate burden for over 170 conditions.

1.6 Burden in Aboriginal and Torres Strait Islander peoples

Findings about Aboriginal and Torres Strait Islander peoples are not covered in this report, the primary focus of which is on the health status of Australians as a whole. This is not a problem for most of the comparisons presented, although special caution should be taken when interpreting the results of Chapter 5 on health differentials, particularly the estimates for remote areas and the Northern Territory. The higher proportion of Indigenous people in these areas explains most of the greater health loss in these areas compared with those where the proportion of Indigenous people is lower. However, the contribution of Indigenous populations to this loss has not been quantified in this report. Readers seeking to know such comparisons are referred to the companion report on the burden of disease and injury in Aboriginal and Torres Strait Islander peoples.

1.7 Structure of report

Details of the specific methodological developments of this study are presented in Chapter 2. Chapter 3 provides an overview of the total burden of disease and injury in Australia, by cause, age and sex. Chapter 4 provides estimates of the burden of disease and injury attributable to selected risk factors in Australia. Chapter 5 shows how the burden of disease and injury across Australia varies according to where people live and their socioeconomic status. Chapter 6 presents the past, present and projected burden of disease and injury in Australia and Chapter 7 provides a general discussion of the major findings.

Technical notes on the methods used for estimating non-fatal health outcomes and attributing risk are presented in Appendixes 1 and 2, respectively. Annex table 1 summarises the disease and injury categories used and their respective International Classification of Diseases codes. Annex table 2 summarises the primary data sources used to construct the core set of results. Tabulations of the core results are included in Annex tables 3 to 9. More detailed tabulations of the core results are available in Annex tables 10 to 25, which are available on the web at <www.aihw.gov.au/bod>.

Readers should note that every attempt was made to identify the best available information in the preparation of this report, and to consult as widely as possible on decisions about methods, assumptions and data sources. For some aspects of the study, however, it was not possible with the resources available to go beyond simple models and assumptions about some key parameters. For many disease models, not all required information was available and analyses drew on information from overseas or expert opinion. In the projections work, trends in disease occurrence were nonexistent for many conditions. The results presented in the following chapters, therefore, represent a complex synthesis of information, judgment and, in some cases, even speculation. It is hoped that further improvements over time in methods, models and data will result in increasing accuracy and certainty in estimates of burden of disease and injury in Australia. The authors at the University of Queensland and the Australian Institute of Health and Welfare welcome suggestions for such improvements.