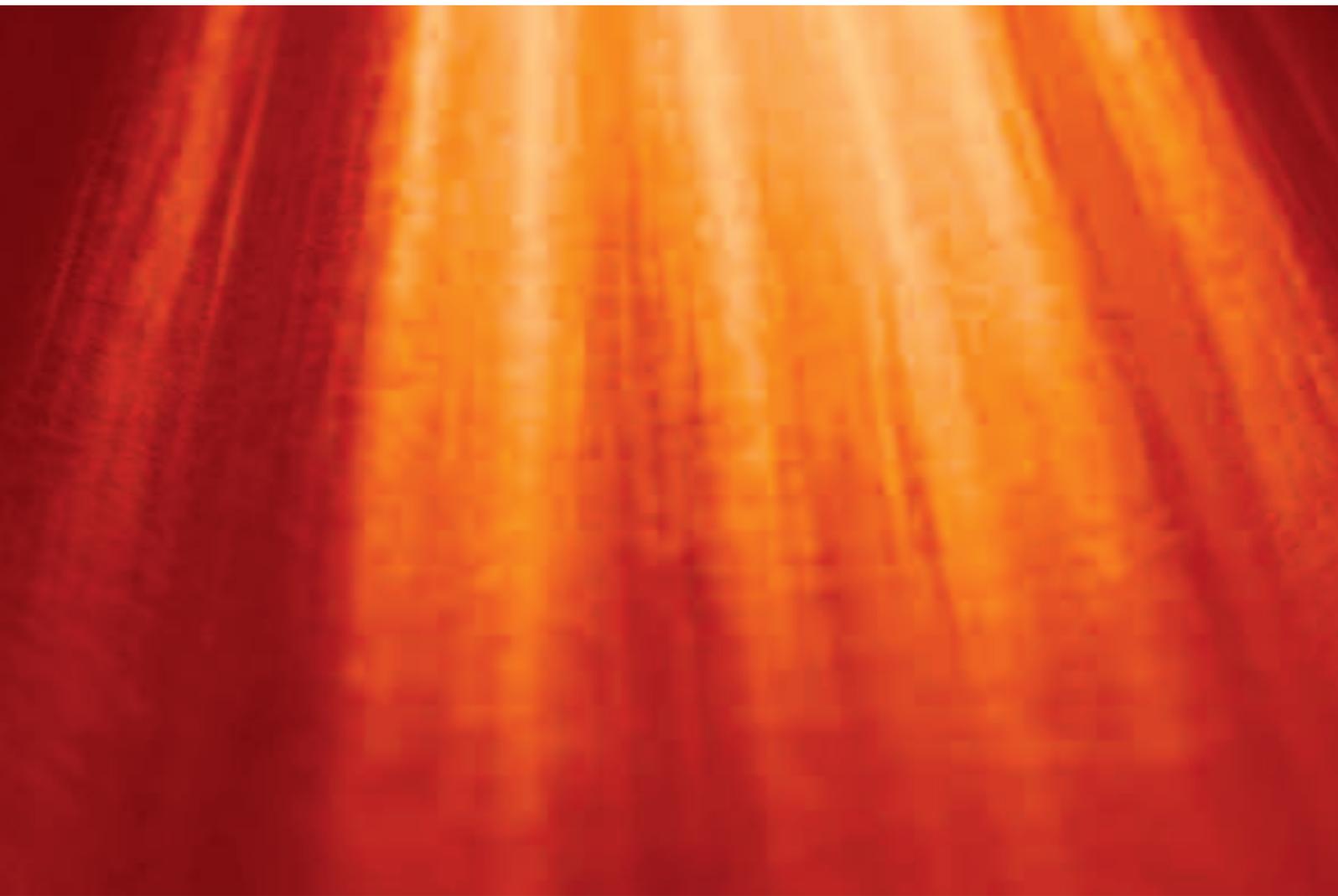
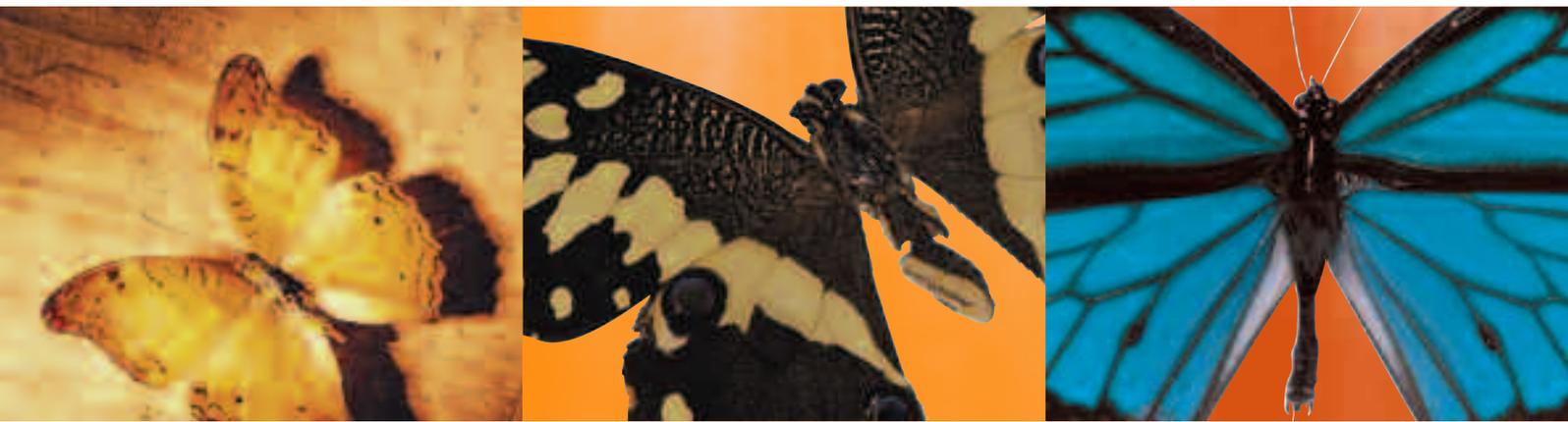


Victorian Burden of Disease Study

Mortality and morbidity in 2001





Victorian Burden of Disease Study

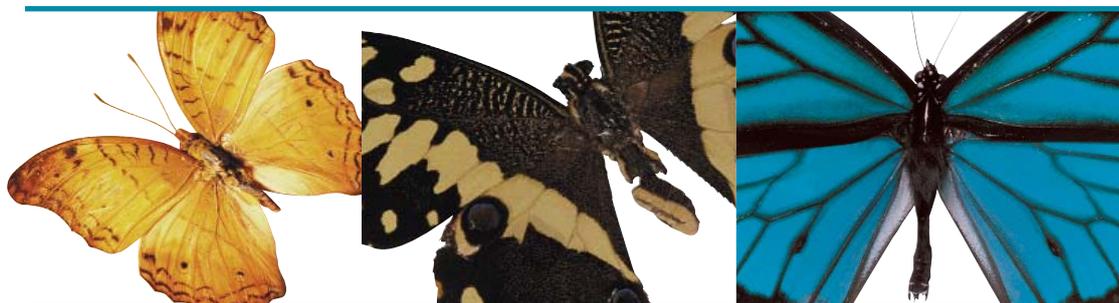
Mortality and morbidity in 2001

Public Health Group

Department of Human Services

The butterfly

In the 1996 Burden of Disease Study, we chose the butterfly as a symbol of what we set out to achieve—that is, to transform complex data into clear, user friendly information about the health of Victorians, akin to the development of a butterfly, which starts as a characterless grub that many would fail to recognise as the eventual creature that is both eye catching and familiar to people of diverse backgrounds. The Burden of Disease Study, like the butterfly, provides information that is highly visible and readily appreciated by a wide audience. The life cycle of the butterfly symbolises our responsiveness to the need for ongoing redevelopment of a system to provide information that is both attractive and relevant.



The butterfly effect

In keeping with the butterfly theme, we would also like to draw the analogy of the Burden of Disease Study 2001 to 'the butterfly effect'. The butterfly effect was first described by Lorenz at the December 1972 meeting of the American Association for the Advancement of Science in Washington DC, and vividly illustrates the essential idea of chaos theory. In a 1963 paper for the New York Academy of Sciences, Lorenz quoted an unnamed meteorologist's assertion that if chaos theory were true a single flap of a single seagull's wings would be enough to change the course of all future weather systems on the earth. By the time of the 1972 meeting, he had examined and refined that idea for his talk, 'Predictability: does the flap of a butterfly's wings in Brazil set off a tornado in Texas?'. The example of such a small system as a butterfly being responsible for creating such a large and distant system as a tornado in Texas illustrates the impossibility of making predictions for complex systems; despite the fact that tornado systems are determined by underlying conditions, we can never sufficiently articulate those conditions to allow long-range predictions.

With the Burden of Disease estimates, we too try to assess many complex diseases and injuries, using the best available data or otherwise incomplete data and even educated guesses where there are no data. Faced with imperfect data, researchers of the burden of disease often face the dilemma of whether to present or abandon an analysis. The general approach is to make estimates if they have at least some degree of plausibility. Given that burden of disease results are intended to contribute to policy decision-making, the alternative of abandoning the analyses would convey the message to policy makers that health problems for which poor information exists are not important. Within this philosophy, we argue that our data sources had enough strengths to warrant completing the analyses, and we hope that the impact of the study is large and no disease is too complex to remain untouched.

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Ministerial foreword

In the past 200 years, human health has improved dramatically in the western world and people now generally live a lot longer than ever before. Most of this improvement can be attributed to the decline in infectious diseases. It has been possible to make substantial improvements in health in the past by improving hygiene, sanitation, immunisation and diet, the major factors influencing these diseases.

Today we are confronted by new epidemics of disease, such as cancer and heart disease, which are the two biggest killers in the western world. These too are largely preventable. Epidemiological (population) studies have identified many of the factors that contribute to, or increase the risk of these and other common diseases. These risk factors include smoking, unhealthy diets high in fats and low in fresh vegetables, and lack of exercise. The poorest social groups suffer more from cancer, heart disease, respiratory and gastrointestinal problems, accidents and violence, and overall have a higher mortality compared with that of the rest of the population. There is a growing awareness that societal and/or environmental factors such as poverty and pollution have a tremendous impact on the frequency of occurrence of more and more diseases. For this reason, studies that provide a detailed analysis of ill health enable public health services to set appropriate priorities and respond more effectively to health inequalities in the community.

In 1999 the Public Health Group of the Department of Human Services began the Victorian Burden of Disease Study—a comprehensive review of the health status of Victorians in 1996. This publication presents the results of the second study, which quantifies the contribution to the ‘burden of disease’ of mortality, disability, impairment, illness and injury in 2001 from over 175 diseases, injuries and risk factors.

The most important aspect of this series of reports, compared with other health status reports, is that estimates are expressed in terms of a summary health-outcome measure that combines both mortality (death) and morbidity (ill health causing disability). The inclusion of non-fatal health outcomes that cause disability provides a substantially different picture from that provided by traditional mortality statistics: mental disorders are now the third leading cause of disease burden after cancers and cardiovascular diseases. Disability also contributes to the prominent position of neurological and sense disorders and chronic respiratory diseases, ahead of the burden from injuries, which has predominantly a mortality component. Such findings are already helping the planning for services that can improve the health status of all Victorians.

This report, in what is now a series of publications on the Victorian burden of disease, represents the next important milestone in the provision of improved information to health service policy makers, planners and managers. In time, we hope to see a more equitable and efficient system of health service delivery in Victoria.

A handwritten signature in black ink, reading 'Bronwyn Pike'.

Minister for Health



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Executive Summary

This report on the Burden of Disease Study 2001 provides the second comprehensive assessment of the health status of the Victorian population. It quantifies the contribution to the ‘burden of disease’ of mortality, disability, impairment, illness and injury in 2001 from over 175 diseases, injuries and risk factors in a single indicator: the disability-adjusted life year (DALY). One DALY can be thought of as one lost year of ‘healthy’ life and is calculated as a combination of (1) years of life lost (YLL) as a result of premature mortality and (2) equivalent ‘healthy’ years of life lost as a result of disability (YLD). The burden of disease, therefore, measures the gap between current health status and an ideal situation in which everyone lives into old age free of disease and disability. As such, it indicates the ‘unfinished’ health agenda, identifying areas in which additional health gains can be made. The study uses the methods developed for the Global Burden of Disease Study, adapted to the Victorian context and drawing extensively on Victorian sources of population health data.

The burden of disease reflects current health status in the context of Victoria’s history of attempts to improve population health. The burden of many diseases in Victoria is small, given the success of ongoing prevention and treatment activities. The relatively small burden for most infectious diseases and maternal and early childhood conditions, for example, should not be taken as a licence to disinvest in the public health effort that has successfully contained the disease burden in these areas.

Key Findings–mortality (YLL)

- Cancer is responsible for about 34 per cent overall of the YLL as a result of premature mortality; cardiovascular disease is responsible for 29 per cent, while injuries are responsible for a further 9 per cent.
- Injuries are a greater cause of [mortality burden](#) in males (13 per cent) than in females (6 per cent).
- Ischaemic heart disease and stroke are the commonest cardiovascular [diseases leading to death](#).
- The lungs, bowel, prostate and breast are the most common sites of fatal cancers.
- Suicide, followed by road traffic accidents, is the main cause of injury mortality.
- Diabetes is ranked ninth in males and seventh in females among the top leading causes of YLL.
- Conditions listed under five national health priority areas in 2001 (cardiovascular disease, cancer, injuries, diabetes and mental health) account for 16 of the top 20 conditions in terms of YLL for males and females.
- Chronic obstructive pulmonary disease (emphysema and chronic bronchitis, both strongly linked to smoking), nephritis and nephrosis, and dementia are the most important fatal conditions not addressed as a national priority.

Key findings–morbidity (YLD)

- Mental disorders are the leading cause of disability, accounting for 26 per cent of the non-fatal burden in Victoria. The next leading main cause groups are nervous system and sense organ disorders, chronic respiratory diseases and cancer. These are responsible for 18 per cent, 9 per cent and 9 per cent of the disability burden respectively.
- In terms of [specific conditions](#), depression is the leading cause of non-fatal burden in Victoria, causing 8 per cent of the disability burden in males in 2001 and 10 per cent in females. Diabetes and hearing loss are the second and third leading contributors to the non-fatal burden for males. Dementia and diabetes are the second and third leading contributors for females.

- In contrast to the mortality burden, [the disability burden](#) is smaller for males than for females. Musculoskeletal disorders are a greater disease burden in females than in males. The male burden is higher for injuries. The proportions of disease burden due to mental disorders, chronic respiratory diseases, diabetes, cancers, neurological and sense disorders, and cardiovascular disease are similar between the sexes.
- In more general terms, females have a greater incidence and prevalence of the more common non-fatal health problems, whereas males have a greater incidence of the major diseases and injuries associated with high case fatality. This means that some of the years of the longer life span females enjoy are lived at the expense of a greater loss of healthy life.
- As well as estimating the burden of non-fatal conditions using the standard DALY incidence-based approach (with 3 per cent discounting), this study also presents prevalence-based YLD. The latter counts each lost year of good health at the age it is lived, rather than discounting it back to the time of incidence and counting it as an incident loss of health at that age. As expected, prevalence-based YLD are lower in childhood and higher at older ages, compared with incidence-based YLD.

Key findings—burden of disease and injury (DALYs)

- The inclusion of non-fatal health outcomes provides a substantially different picture from that provided by traditional mortality statistics: e.g. mental disorders are the third leading cause of burden after cancers and cardiovascular diseases. Disability also contributes to the prominent position of neurological and sense disorders and chronic respiratory diseases ahead of the burden from injuries, which predominantly has a mortality component. [The leading main disease groups contributing to the burden of disease](#) are cancer (21 per cent), cardiovascular disease (18 per cent), mental disorders (14 per cent), neurological and sense disorders (12 per cent), chronic respiratory conditions (7 per cent) and injuries (6 per cent).
- The total burden of disease and injury in Victoria in 2001 amounts to just over 650,000 DALYs, or 136 DALYs lost per 1,000 population. Put simply, for every 1,000 Victorians during 2001, the years of healthy life lost represents about 14 per cent of the total life years lived. The male burden (in total DALYs) is about 11 per cent higher than the female burden.
- In terms of [specific conditions](#), ischaemic heart disease and stroke head the list in females, together causing almost 14 per cent of the total disease burden. In males, ischaemic heart disease and diabetes account for almost 15 per cent of the total disease burden. Dementia, depression and breast cancer are the third, fourth and fifth leading causes in females, together accounting for over 16 per cent of the total female burden of disease and injury. Stroke, lung cancer and depression occupy the third, fourth and fifth ranks for males, together accounting for just over 12 per cent of the total male burden.
- Dementia is the eighth largest cause of disease burden in men and the third in women. Even though dementia is equally common in men and women at any given age, the dementia burden is 66 per cent higher in women than in men, given the much larger number of elderly women in the Victorian population, particularly over the age of 85 years.
- Diabetes is the second and sixth leading cause of disease burden in Victorian males and females respectively, accounting for more DALYs lost than attributed to either chronic obstructive pulmonary disease (COPD), lung cancer or bowel cancer. [Inclusion of the attributable burden](#) of cardiovascular disease due to diabetes doubles the burden of diabetes from 4 to 8 per cent of total DALYs.
- The seven national health priority areas (cardiovascular disease, cancer, mental health, injury, diabetes, asthma and musculoskeletal disorders) account for almost 70 per cent of the total burden of disease and injury in Victoria, comprising 78 per cent of the YLL and 62 per cent of the YLD.



Key findings—attributable burden of risk factors

- [Risk factors](#), including lifestyle factors (such as tobacco smoking, physical inactivity, alcohol consumption, diet, unsafe sex and intimate partner violence), physiological states (such as obesity, high blood pressure and high cholesterol) and societal conditions (such as occupational exposures and air pollution) are responsible for a sizeable proportion of the total burden of disease in Victoria.
- Tobacco use (8.2 per cent of the total disease burden), increased body mass (8.0 per cent), blood pressure (7.3 per cent) and cholesterol (6.1 per cent) are each responsible for a greater burden than that caused by stroke, which is the second leading cause of disease burden. Physical inactivity (4.1 per cent of the total burden), insufficient intake of fruits and vegetables (3.3 per cent), intimate partner violence (3.2 per cent for females) and the harm caused by alcohol (3.2 per cent) rank in size with the top 10 disease conditions, while illicit drugs (1.5 per cent), occupational hazards (1.5 per cent) and unsafe sex (0.4 per cent) are as large as diseases in the second half of the top 20 causes of burden.
- [Tobacco smoking](#) is the risk factor responsible for the greatest burden of disease in Victoria: about 10.0 per cent of the total burden of disease for males and 6.2 per cent for females.
- The net harm associated with [alcohol consumption](#) is around 1.5 per cent of the total burden, because the injury and chronic disease burden associated with harmful and hazardous levels of alcohol consumption is offset by the burden of cardiovascular disease prevented by alcohol consumption. The protective effect is relevant only after age 45 years, however, the harmful effects of alcohol are apparent at all ages.
- HIV/AIDS accounts for 28 per cent of the total burden of disease that is attributable to [unsafe sex](#).
- [Intimate partner violence](#) accounts 3.2 per cent of the total disease burden for females but 9.0 per cent of the burden in women aged 18–44 years.
- Occupational exposures to toxic chemicals and injury risks are responsible for an estimated total of 489 deaths in Victoria in 2001. The total attributable burden of occupational exposures is 1.5 per cent of total DALYs lost in 2001. Cancers are responsible for 48 per cent of this attributable burden, followed by other chronic diseases (30 per cent) and injuries (22 per cent).

Key findings—comparison of 1996 and 2001 studies

- This report provides an improved estimate of the disease burden and importance of risk factors, because we have used more sophisticated techniques and more recent data, than were available in 1996.
- Between 1996 and 2001, the [life expectancy at birth](#) of Victorian men rose by two years from 76.1 to 78.3 years, while for females it improved from 81.8 to 83.4 years.
- Over the same period, the total male [YLL rate per 1,000](#) fell by 16 per cent from 81 to 68 YLL per 1,000, while the improvement for females was smaller at 12 per cent, with 63 falling to 55 YLL per 1,000.
- Improvements in cardiovascular disease and cancer explain over 70 per cent of the total improvement in male YLL rates and nearly 100 per cent for females.
- Approximately 60 per cent of the [improvement in cardiovascular disease](#), for both males and females, is explained by a reduction in the YLL rate for ischaemic heart disease. Stroke contributes the second largest improvement to the total cardiovascular disease YLL rate, at 22 per cent in females and 16 per cent in males.
- Over half of the improvement in the total male [cancer YLL rate](#) is explained by lung cancer. The largest contributor to the improvement in the female cancer YLL rate was the change in breast cancer.

- We cannot directly compare the total DALY rate between the two study years, because the method was changed for the YLD estimations of several diseases. However, we can group all diseases studied into three subgroups according to the ease of comparability of estimates in the 1996 and 2001 studies: high comparability (65 per cent of total DALYs in 2001), moderate comparability with some caution (17 per cent of total DALYs in 2001) and poor comparability where comparisons are not recommended (18 per cent of total DALYs in 2001).
- In the subset of [highly comparable diseases](#) (65 per cent of total 2001 DALYs), there is a 3 per cent fall in the male DALY rate (from 92 to 89 DALYs per 1,000), while there is a 1 per cent change in females from 79 to 78 DALYs per 1,000.
- Disease groups that cannot be compared between 1996 and 2001 include diabetes, neurological and sense disorders and oral diseases.
- The first and second [ranking](#) of cardiovascular disease and cancer in 1996 has been reversed in 2001. Cancer is now the largest contributor to total DALYs (21%) with cardiovascular disease responsible for only 18%.
- The predicted fall (in the 1996 study) in the importance of cardiovascular disease by 2016 has already occurred in both males and females. The ranking of diabetes in females has already risen to 6th, higher than its predicted position of 7th in 2016.
- The relative contribution (slice of the pie) of cardiovascular disease, musculoskeletal disease and injuries to the total DALYs have fallen while the relative contribution of cancer, neurological and sense disorders, diabetes and mental disorders have each slightly increased. The relative contribution of major disease groups to total DALYs have altered since 1996 for three main reasons: due to expansion and ageing of the population, methodology in estimating the morbidity component of the DALY, as well as disease incidence.
- The risk factors contributing most to the total DALYs were tobacco smoking, hypertension, obesity and physical inactivity in 1996. The most important risk factors assessed in 2001 are tobacco smoking, obesity, hypertension, high blood cholesterol and physical inactivity. The relative contribution of the various risk factors have altered due to four main reasons: the relative contribution of major disease groups to total DALYs in 2001 is different, the population is larger and older, risk taking behaviours may be more or less common and the methods of calculating the importance of risk factor contributions have altered considerably.

Key findings—precision of results, data gaps and future plans

- The calculation of the mortality burden (YLL) is straightforward, and the precision of the estimates depends almost entirely on the quality of the data on underlying cause of death.
- The calculation of the disability burden (YLD) requires extensive epidemiological modelling, drawing on a diverse range of data sources, research findings and expert opinion, each with varying levels of uncertainty.
- Overall, about half the burden is contributed by the YLL, where estimates are generally fairly precise. Around 40 per cent of the YLD burden is contributed by a small number of diseases (including ischaemic heart disease, cancers, stroke, diabetes, and affective and anxiety disorders), for which reasonably good Australian or Victorian data are available. This leaves around 30 per cent of the total disease burden with varying levels of uncertainty.



- The extensive epidemiological modelling carried out in this study enabled us to identify many data gaps and deficiencies in Victorian population health data. Incidence or prevalence data for some diseases (for example, cancer and some infectious diseases) are relatively complete, but data for many others are unavailable or have severe limitations. The most important of these diseases, in terms of their contribution to the YLD, are diabetes, musculoskeletal disorders, asthma, hearing loss, COPD and ischaemic heart disease. The data on mental health are now quite 'old' and there is a lack of regular representative measurement surveys. Ideally we should have surveys every 5 years measuring conditions and risk factors where we know there are problems with self-report or there are no other accurate data sources: such as anaemia, diabetes, COPD, hearing and vision loss and risk factors such as blood pressure, body mass and cholesterol. In addition, information on the distribution of severity of disease and case fatality rates is inadequate or lacking for many important conditions.
- There are major inconsistencies between self-reported health data from population surveys and best estimates from epidemiological studies for some important diseases (for example, arthritis, asthma, and upper and lower respiratory conditions). The major limitations of self-reported data on health conditions relate to under-reporting of undiagnosed conditions (for example, many mental health problems and diabetes), over-reporting of some conditions (for example, where symptoms such as joint pain are incorrectly labelled as osteoarthritis, or occasional wheezing as asthma) and lack of information on condition severity (resulting in high prevalence figures due to the inclusion of minor conditions or minor symptoms).
- The paucity of valid risk factor prevalence figures and estimates of relative risk make it difficult to calculate attributable fractions for risk factors. Also, the attribution of disease burden to single risk factors is a simplification of reality. Several risk factors are often present in the same individual, which may increase that person's risk by more or less than the addition of individual risk estimates. We have attempted to account for this problem by performing a rather simplistic joint effects analysis. However, new models, based on surveys and cohort studies that measure multiple risk factors in the same people, are needed to measure the interaction among risk factors and their effects on the calculation of the burden attributable to risk factors.



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The 2001 study was run in parallel with a national analysis of the burden of disease for Australians, under the leadership of Professor Alan Lopez from the School of Public Health, University of Queensland. The two project teams worked closely on the development of common methods. Critical feedback from the research group at the University of Queensland, along with that group's willingness to share its work, has considerably enhanced this study.

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1. Introduction

In the past century, human health improved significantly. During this period, half of all the gains in life expectancy of the past several thousand years occurred. Two successive revolutions drove these improvements. The first was a transformation in public health resulting from new knowledge about the links between the environment, hygiene and disease, which led to improvements in the quality of water, sanitation and housing in industrialised countries. The second revolution, resulting from advances in sciences such as chemistry, biochemistry and medicine, was in the prevention, detection and treatment of diseases through the application of vaccines, diagnostics and drugs (Matlin, 2004). As such, the public has ever-growing expectations of health services. The repertoire of health services to respond to these demands is expanding. Governments are thus under pressure to justify their health resource allocation.

In response to this need for comparable information on health outcomes, the Public Health Group in the Department of Human Services undertook the Victorian Burden of Disease Study 1996 (DHS, 1999a, b). The study used the methodology developed by researchers at Harvard University and the World Health Organisation (WHO) for the World Bank's 1993 World Development Report (World Bank, 1993). The measurement unit used to quantify the burden of diseases, injuries and risk factors on human populations—the disability-adjusted life year (DALY)—is grounded on cogent economic and ethical principles and can guide policies towards delivering more cost-effective and equitable health care (Murray & Acharya, 1997).

This report builds on the work done for the 1999 report on the 1996 study and provides burden of disease estimates for 2001. It aims to provide a comprehensive assessment of premature mortality and disability attributable to diseases, injuries and various risk factors in 2001. To achieve this goal, the study has several objectives:

1. to develop internally consistent estimates of mortality for over 100 causes of disease and injury
2. to develop internally consistent estimates of the incidence, duration and severity of the major non-fatal health outcomes associated with the more than 100 causes of disease and injury
3. to calculate the burden of premature mortality and disability in terms of DALYs
4. to estimate the attributable burden of disease due to several well-recognised risk factors.

Details of the methods are presented in chapter 2. An overview of disease and injury models is presented in chapter 3. Chapter 4 presents the burden of premature mortality and morbidity in 2001. The analysis of the burden attributable to tobacco, alcohol, hypertension, obesity, physical inactivity, high blood cholesterol, intimate partner violence and other risk factors follows in chapter 5. The comparisons with the Burden of Disease Study 1996 (DHS, 1999a, b) are set out in chapter 6. Finally, we discuss the results of the 2001 update and draw conclusions in chapter 7. Detailed tables of methods and results are added as an appendix. This whole report, as well as a more detailed description of methods and results, will be available electronically via the Department of Human Services website www.health.vic.gov.au/healthstatus/

