Australian Government
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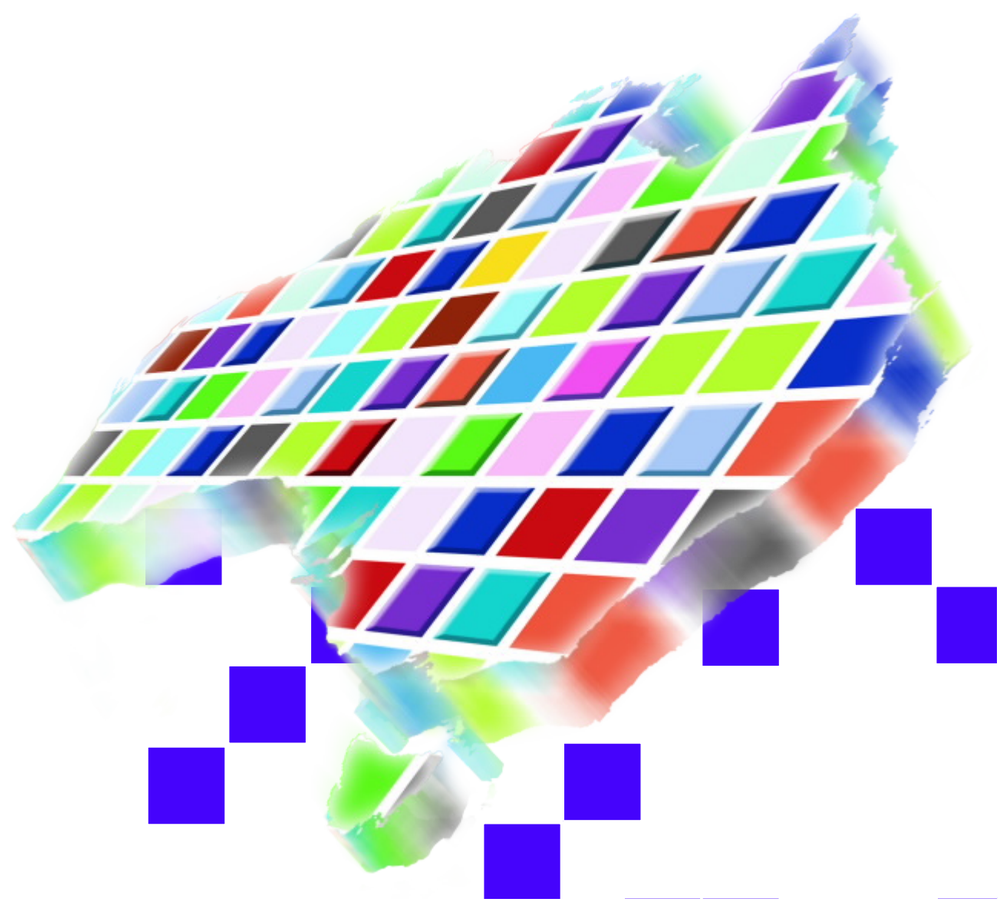
Australian Burden of Disease Study

Impact and causes of illness and death in Australia

2018



This report analyses the impact of 219 diseases and injuries in terms of living with illness (non-fatal burden) and premature death (fatal burden). The study found that:

- chronic diseases such as cancer, musculoskeletal conditions, cardiovascular diseases, and mental & substance use disorders contributed the most burden in Australia in 2018
- 38% of the burden could have been avoided or reduced, being due to modifiable risk factors such as tobacco use and overweight (including obesity).

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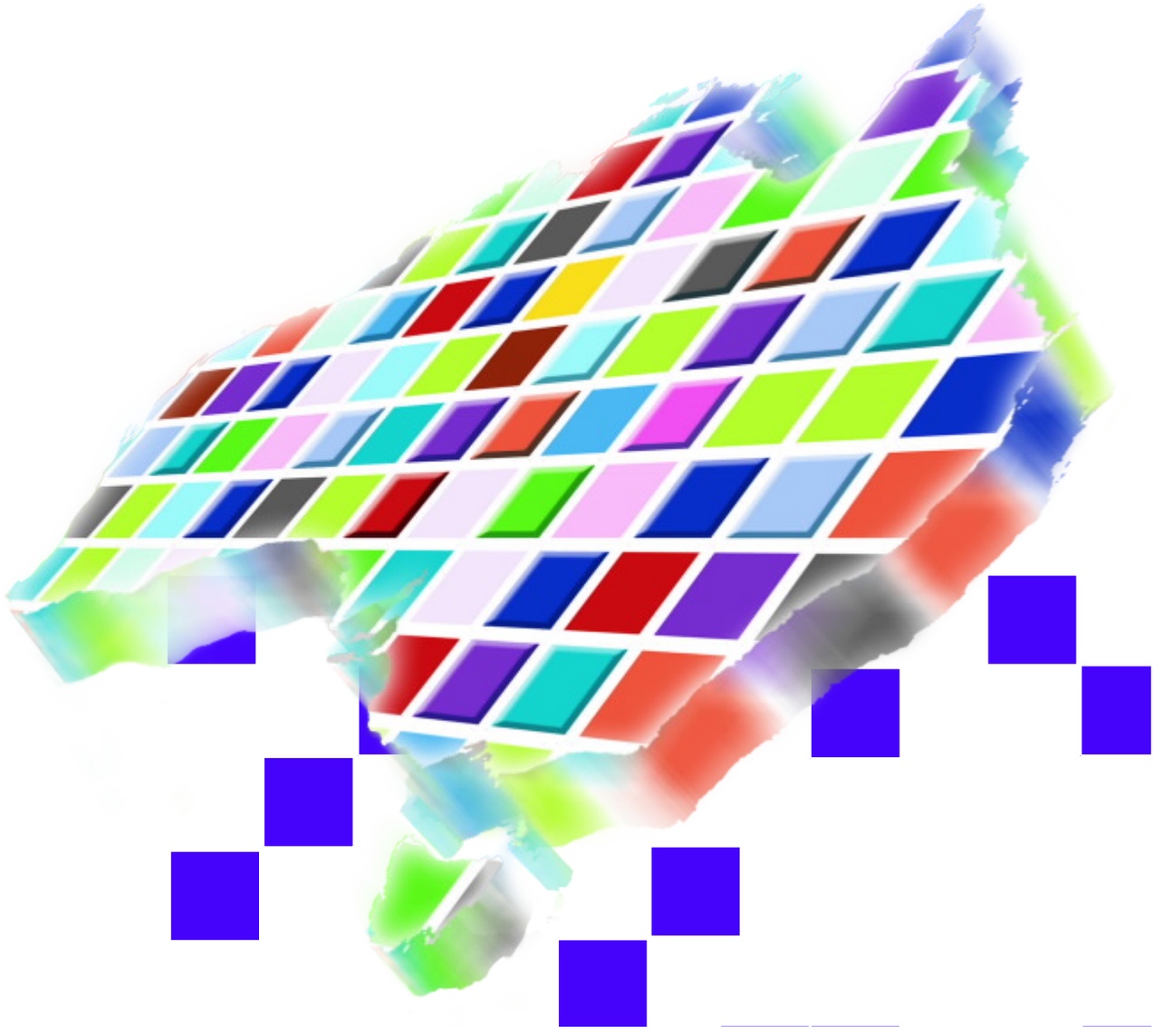

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Please note that there is the potential for minor revisions of data in this report.

Please check the online version at www.aihw.gov.au for any amendment.

Contents

Summary

Every year in Australia, millions of years of healthy life are lost because of injury, illness or premature deaths in the population. This loss of healthy life is called the 'burden of disease' in epidemiological literature.

Burden of disease analysis combines the impact of living with poor health (the non-fatal burden of disease) with dying prematurely (fatal burden). Fatal and non-fatal burden combined is referred to as total burden. Burden of disease is recognised as the best method to measure the impact of different diseases or injuries in a population.

This report provides estimates of the total, non-fatal and fatal burden for the Australian population in 2018, using the disability-adjusted life years (DALY) measure. One disability adjusted life year (or 1 DALY) represents 1 year of healthy life lost, either through premature death ('years of life lost' or YLL) or from living with an illness or injury ('years lived with disability' or YLD).

DALY estimates are presented for 219 diseases, as well as estimates of the burden attributable to 40 individual risk factors, such as tobacco use and physical inactivity. Results are included for 2003, 2011 and 2015 for comparison. Interactive data are available online.

In 2018, Australians lost 5 million years of healthy life (total burden, DALY) due to:

Living with illness (non-fatal)
52% of total burden

Dying prematurely (fatal)
48% of total burden

Chronic disease and injury cause most of the burden of disease

The 5 disease groups causing the most burden in 2018 were cancer, musculoskeletal conditions, cardiovascular diseases, mental health conditions & substance use disorders, and injuries; together, these accounted for around two-thirds (65%) of the total burden.

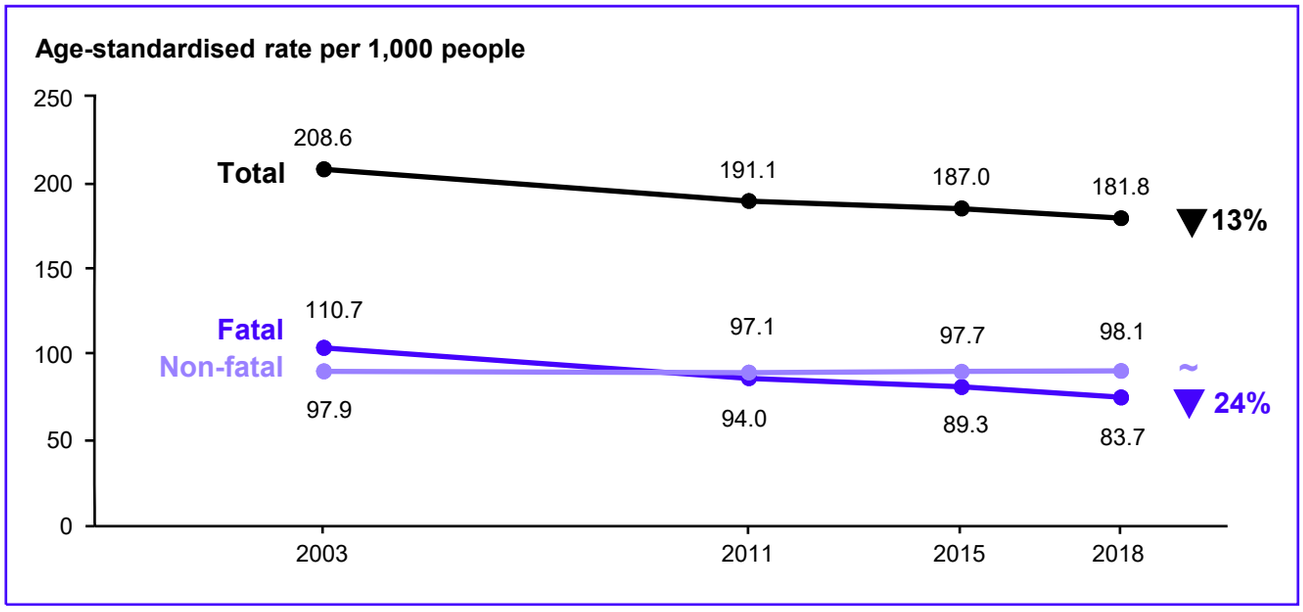
Summary of total burden and 5 leading disease groups, 2018

	Cancer	Musculoskeletal	Cardiovascular	Mental/ substance use	Injuries	Total (all diseases)
Number of DALY ('000)	881	653	646	632	418	4,984
% of total DALY	18	13	13	13	8	100
% of DALY that was fatal	92	3	76	2	82	48
Change between 2003 and 2018[(a)]	↓	↓	↓	—	↓	↓

(a) Based on rate difference; that is, the absolute difference between the age-standardised rate of burden from 2003 to 2018.

Good gains in the health of the population between 2003 and 2018

Overall, the health of the Australian population has improved over the 15-year period from 2003 to 2018. After adjusting for population increase and ageing, between 2003 and 2018 there were decreases in total burden and fatal burden, but no change in non-fatal burden.

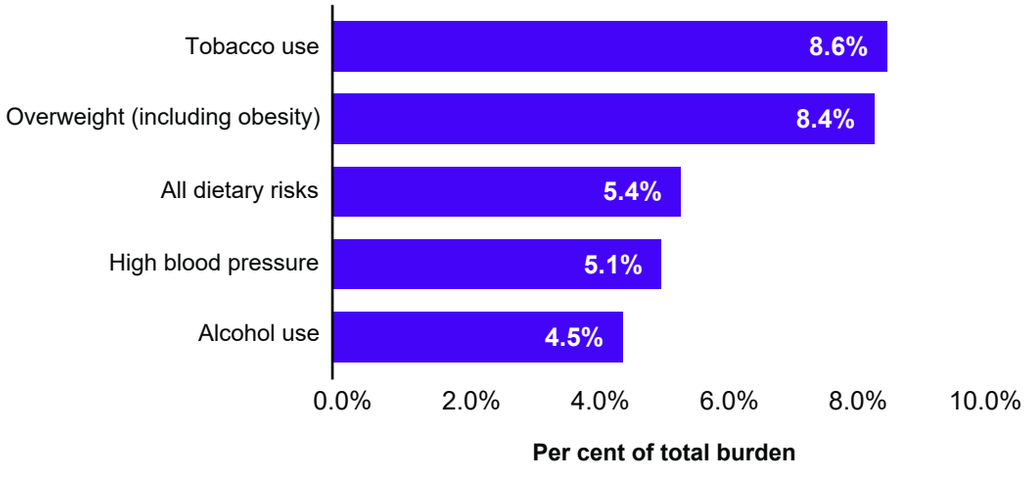


More burden for males

Males experienced more health loss than females overall and for most age groups, and lost a total of around 267,000 more years of healthy life than females. In 2018, males suffered 1.6 times the rate of fatal burden (104 YLL per 1,000 population) experienced by females (65 YLL per 1,000 population). However, females experienced slightly more non-fatal burden than males (contributing to 53% and 47% of the total non-fatal burden, respectively).

Over one-third of disease burden is potentially preventable

In 2018, 38% of the burden of disease could have been prevented by reducing or avoiding the exposure to the modifiable risk factors examined in this study. The risk factors contributing to the most burden were:

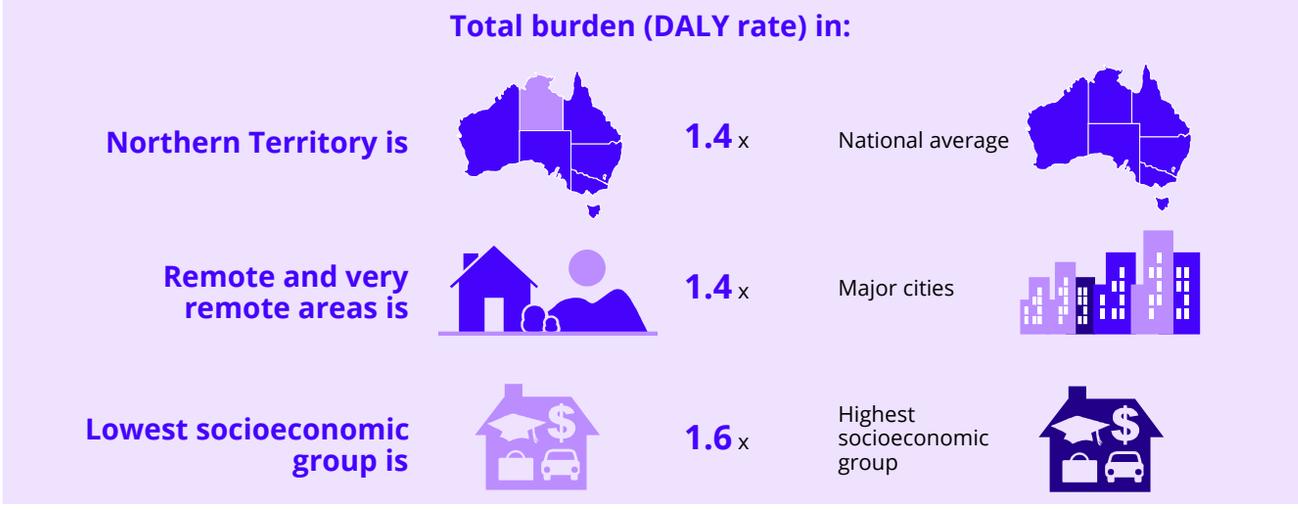


While tobacco use remains the leading risk factor causing burden, the gap between tobacco use and overweight (including obesity) has almost closed.

Disease burden is not shared equally across Australia

The difference in the disease burden across states and territories was most pronounced in the Northern Territory, which had higher burden rates than the other jurisdictions. Large inequalities were also found across socioeconomic groups and remoteness areas.

Burden differs across geographic areas and population groups



A 21% reduction in burden could be achieved if all Australians experienced the same rate of disease burden (DALY) as the most advantaged socioeconomic group. If, however, the rate of burden experienced by all Australians was the same as in *Major cities*, there would be a 4.4% reduction in burden.

Detailed results presenting burden estimates for Aboriginal and Torres Strait Islander and non-Indigenous Australians will be published in 2022.

Cancer still causes more burden than any other disease group

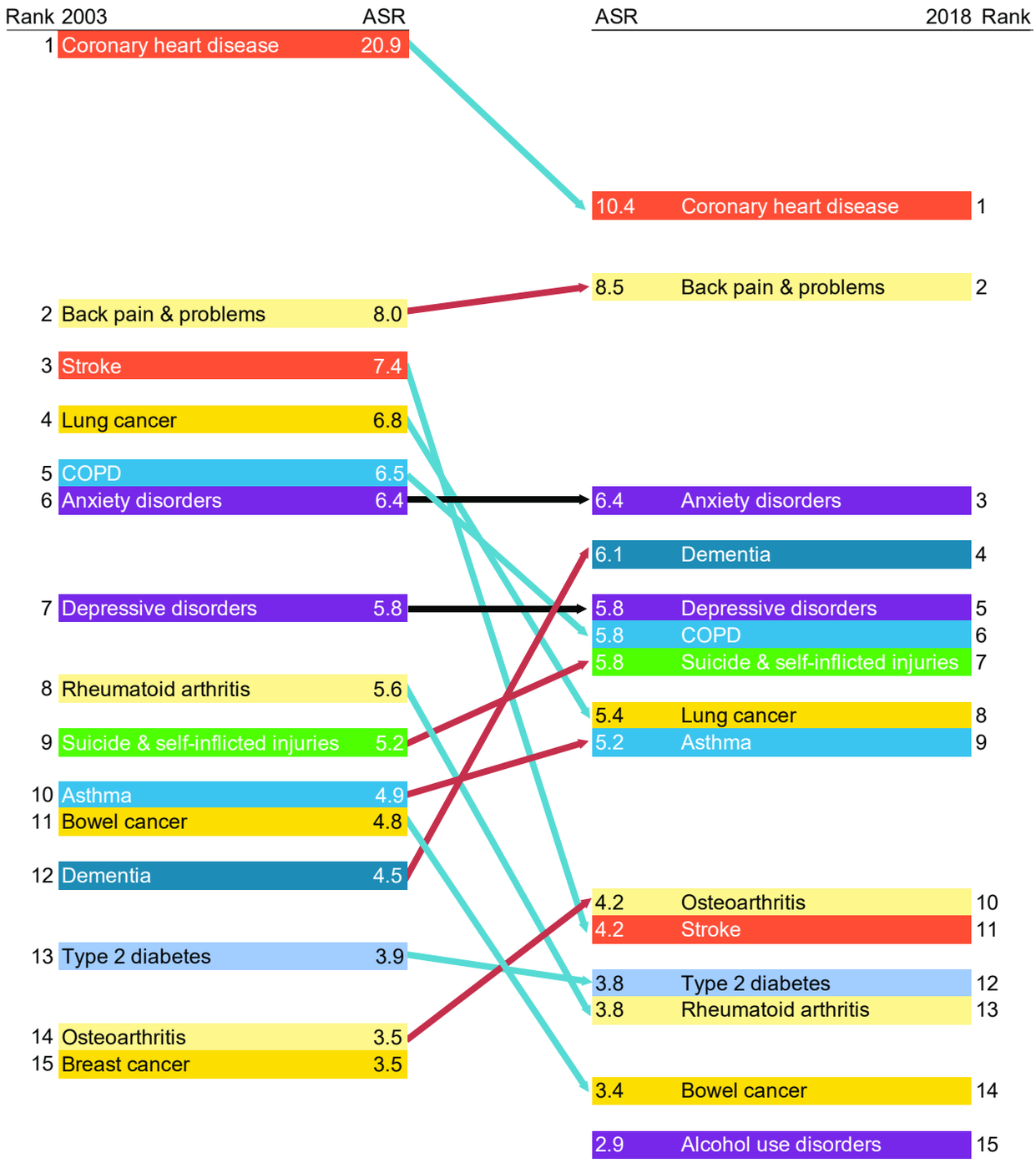
Cancer was the highest ranked disease group (that is, it contributed the most burden) in 2003 and in 2018. Musculoskeletal conditions, cardiovascular diseases and mental health conditions & substance use disorders followed.

Between 2003 and 2018, the rate of total burden (after adjusting for age and population changes) fell for cardiovascular diseases (40% lower rates, from 36 to 22 DALY per 1,000 population) and cancer & other neoplasms (20% lower rates, from 38 to 31), among other disease groups.

For specific diseases, the leading cause of burden was coronary heart disease

For specific diseases, coronary heart disease showed the largest reduction (from 21 to 10 DALY per 1,000 population) between 2003 and 2018; but it remained the leading cause of burden. A decline in total burden was also seen for stroke, chronic obstructive pulmonary disease (COPD), lung and bowel cancer and rheumatoid arthritis. The total burden from dementia increased from 4.5 to 6.1 DALY per 1,000 (partly due to changes in practices of coding deaths due to dementia), and the rank increased from 12 in 2003 to 4 in 2018.

Change in disease ranking and age-standardised DALY rate (DALY per 1,000 population), 2003 and 2018



ASR = age-standardised rate; COPD = chronic obstructive pulmonary disease.

Notes

1. Diseases are presented in descending order, from highest ASR to lowest ASR, with arrows indicating either an increase (red), decrease (blue) or no change (black) in the ASR over time.
2. 'Other musculoskeletal conditions' are excluded from the rankings.
3. There were changes in practices of coding deaths due to dementia; therefore, caution is recommended when interpreting changes over time for dementia burden.

Expected time living in full health is different between population groups

Health-adjusted life expectancy (HALE) was 71.5 years for males and 74.1 years for females born in 2018. HALE reflects the average length of time a person can expect to live in full health and is most meaningful when compared with life expectancy. The proportion of life expectancy at birth spent in full health for the period 2011 to 2018 remained largely the same for males and females in the highest socioeconomic group, and declined for females in the lowest socioeconomic group (there was no change for males). Similar patterns were observed at age 65 except that declines in the lowest socioeconomic group were observed for both males and females.

1 Introduction

Burden of disease analysis measures the impact of fatal and non-fatal burden; that is, both deaths and living with poor health. More than merely counting deaths or disease prevalence, it takes into account age at death and severity of disease.

High-quality information on the health impacts and distribution of different diseases, injuries and risk factors is important in providing an evidence base to inform both health policy and program and service delivery. Burden of disease studies allow deaths and living with illness to be compared and reported in a consistent manner. Estimates produced from a burden of disease study are the best summary measures of a population's health.

The Australian Burden of Disease Study (ABDS) 2018 uses burden of disease analysis to measure the impact of 219 separate diseases and injuries on the health of the Australian population. The study provides a detailed picture of the burden of disease for the Australian population in 2018, including comparisons with 2015, 2011 and 2003. It includes estimates of total, fatal and non-fatal burden for the total Australian population, as well as by state and territory, remoteness areas and socioeconomic groups. It also includes estimates of the contribution made by selected risk factors on the disease burden in Australia, and by socioeconomic groups for some risk factors. The early-release web report (AIHW 2021a) and more detailed summary report (AIHW 2021d) present key findings from the ABDS 2018 study.

Burden of disease estimates for the Aboriginal and Torres Strait Islander population are produced as part of a separate study. Key findings have been released (AIHW 2021b) and detailed 2018 estimates are scheduled for release in 2022 (AIHW forthcoming 2022).

What is burden of disease?

Burden of disease analysis is a technique used to assess and compare the impact of different diseases, conditions or injuries (often referred to in this report as 'diseases' for simplicity) and risk factors on a population. It uses information from a range of sources to quantify the fatal (for example, dying from cancer) and non-fatal (for example, living with back pain) effects of these diseases in a consistent manner so that they can then be combined into a summary measure of health called disability-adjusted life years, or DALY. Simply put, a DALY combines the impact of dying early and living with illness. It combines the estimates of years of life lost due to premature death (YLL) and years lived in ill health or with disability (YLD) to count the total years of healthy life lost from disease and injury. These and other key terms are defined in Box 1.1 and explained further in Appendix A.

Health loss represents the difference between the current health status of the population and the ideal situation where everyone lived a long life, free of disease. Burden of disease estimates capture both the quantity and quality of life, and reflect the magnitude, severity and impact of disease and injury within a population. The analysis also estimates the contribution of various risk factors to health loss, known as the attributable burden.

Burden of disease analysis is a way of collating the best available data on causes of health loss to produce comparable and concise information. The ability to use data from a range of sources to construct an internally consistent measure for all diseases is a key strength of a burden of disease study. The major benefit is that the impact of a disease that may cause death can be compared with one that may not be fatal but may cause great suffering in a large number of people. Similar comparisons and rankings across different diseases or injuries cannot be produced by using separate studies conducted on a disease-by-disease basis, which may use different survey methods and/or disparate data sources.

Box 1.1: Key terms

Attributable burden: The disease burden attributed to a particular risk factor. It is the reduction in fatal and non-fatal burden that would have occurred if exposure to the risk factor had been avoided (or, more precisely, had been at its theoretical minimum).

Burden of disease (and injury): Term referring to the quantified impact of a disease or injury on a population, using the disability-adjusted life years (DALY) measure.

Disability-adjusted life years (DALY): A measure (in years) of healthy life lost, either through premature death, defined as dying before the ideal life span (YLL) or, equivalently, through living with ill health due to illness or injury (YLD). It is often used synonymously with 'health loss'.

Disability weight: A factor that reflects the severity of non-fatal health loss from a particular health state on a scale from 0 (perfect health) to 1 (equivalent to death).

Disease: A broad term that, in this report, is applied to any health problem. It is often used synonymously with illness, condition, disorder or problem.

Fatal burden: The burden from dying 'prematurely' as measured by years of life lost. Often used synonymously with YLL, and also referred to as 'life lost'.

Health-adjusted life expectancy (HALE): The number of healthy years a person of a particular age can expect to live.

Health loss: The total number of healthy years lost from living with disease/injury (YLD) and the total number of years lost from dying early from disease/injury (YLL). It is often used synonymously with DALY.

Health state: Consequences of diseases and conditions reflecting key differences in symptoms and functioning.

Incidence: The number of new cases (of an illness or injury) occurring during a given period.

Life expectancy: The number of years a person of a particular age can expect to live.

Non-fatal burden: The burden from living with ill-health as measured by years lived with disability. It is often used synonymously with YLD.

Prevalence: The number of cases of a disease or injury in a population at a given time.

Reference life table: A term that corresponds to the maximum life expectancy for an individual in good health.

continued

Box 1.1 (continued): Key terms

Risk factor: Any factor that represents a greater risk of a health condition or health event; for example, smoking, alcohol use and high body mass.

Sequela: Consequence of diseases; often used in the plural, sequelae.

Theoretical minimum risk exposure distribution (TMRED): The distribution of exposure to a risk factor that would have the lowest associated population risk.

Years lived with disability (YLD): The number of years of what could have been a healthy life but were instead spent in states of less than full health. YLD represent non fatal burden.

Years of life lost (YLL): The number of years of life lost due to premature death, defined as dying before the ideal life span (see Table A2 in Appendix A). YLL represent fatal burden.

(See Glossary for a full list of definitions).

How can burden of disease studies be used?

Monitoring of population health

Burden of disease analysis is valuable for monitoring population health as it simultaneously quantifies the fatal and non-fatal impact of causes of ill health. It provides summary information on the level and distribution of health in the population, which can be used to measure population health over time and between groups. Further, it maintains comparability of these metrics between diseases and population groups. The contribution of various risk factors can also be described using the same metrics.

Health policy and health service planning

Burden of disease studies provide valuable information to inform health policy formulation and health service planning. By comparing all diseases together, these studies can highlight which diseases and risk factors cause the most burden, which are increasing or decreasing, and which are causing the greatest health inequalities and gaps. For example, they indicate the diseases most likely to have an impact on the health system and services, such as doctor and allied health professional visits, hospital admission or dental care. As well, estimates of the burden attributable to specific risk factors can be used to target prevention policies.

What can’t burden of disease studies tell us?

Burden of disease analysis quantifies the size of health problems. It does not take into account broader factors, such as social impacts, economic impacts or the direct impact on the health system. While it can provide some indication of areas of health workforce demand, it needs to be used together with other information to determine where there are gaps.

Since burden of disease analysis quantifies only the size of a health problem, it should not be used on its own for resource allocation, as it does not show what interventions will work or which are most cost effective. However, as outlined earlier, burden of disease analysis helps to identify which diseases and risk factors might need attention, or those conditions for which the cost-effectiveness of interventions should be investigated, to gain the maximum benefit.

How is burden of disease measured?

Burden of disease quantifies the gap between a population's *actual* health and an *ideal* level of health in the given year—that is, every individual living in full health for an ideal life span. To quantify this gap, it uses a summary measure of health called disability-adjusted life years, or DALY. The more DALY associated with a disease or injury, the greater the burden.

Years of life lost (YLL) measure the years lost between the age at which a person dies and an ideal life span. In this study, the ideal remaining life expectancy varies at each age but starts as a life expectancy at birth of 86.0 years for both men and women (see Appendix Table A2 for the full standard life expectancy). This ideal life span is based on the lowest observed death rates at each age group from multiple countries (Murray, Ezzati et al. 2012). Total YLL are influenced by both the total number of deaths and the ages at which those deaths occur.

Years lived with disability (YLD) measure the number of healthy years of life lost due to living with disease at the population level. This is calculated by estimating the amount of time spent with a condition, multiplied by a disability weight indicating the severity of the condition (see Box 1.2). Total YLD are influenced by the number of people with each disease, the time spent in less than full health and the disability weights defined for each disease. The disability weights represent the health loss caused by the consequences of each disease.

Box 1.2: Disability weights

Disability weights attempt to capture the severity of the effects of a disease or injury on a scale from 0 (perfect health) to 1 (equivalent to death). They aim to quantify societal preferences for different health states. The weights do not represent the lived experience of any health state or imply any societal value of the person in a particular health state. Rather, they quantify societal preference for health states in relation to the 'ideal' of good health.

Disability weights are based on various international surveys of people in the general community. Respondents were given descriptions of individuals with different health states and asked to specify which person was more healthy (Salomon et al. 2015).

For example, *Cancer: metastatic* has a disability weight of 0.451, while *Severe tooth loss* has a weight of 0.067. A total of 235 health states are specified and used in the calculation of YLD (Salomon et al. 2015).

Constructed in this way, the DALY is a summary measure of the overall population health for the year being reported (see Box 1.3 for an example). That is, 1 DALY represents 1 lost year of 'healthy life' and is equal to YLL plus YLD. The DALY measure enables comparison of specific diseases, population groups and points in time.

Box 1.3: Example of calculating disability-adjusted life years

Burden of disease analyses estimate health loss from living with or dying from disease and injury in a single year—measured as DALY.

Joe, aged 65, has angina. Joe suffers health loss from living with angina; in burden of disease analyses, this impact is measured using a 'disability weight'. Angina has a disability weight of 0.2 and, as it is a chronic condition, it would affect Joe for the entirety of that year (0.2 x 1 year = 0.2 YLD). However, if Joe then has a heart attack in the same year, he would also experience short-term health loss (for about a month) with a disability weight of 0.5 (0.5 x 1/12 = 0.04). This gives Joe a total of 0.24 YLD for his health loss due to coronary heart disease (that is, angina or heart attack).

If Joe then dies at the end of the year, he will lose a number of years by dying early. A man aged 65 would (according to the theoretical life tables maximum life span) live until he is 88. If Joe dies at 65, he will have lost 23 years due to dying prematurely (or 23 YLL).

Joe's total DALY will therefore be 0.24 YLD plus 23 YLL, making 23.24 DALY.

Measuring the contribution of risk factors

Information on the impact of various risk factors (such as smoking, physical inactivity, high blood pressure) on the health of the population can be used to measure the proportion of the burden of disease due to these risk factors. These estimates show how much of the disease burden could have been averted if the population's actual exposure to the risk had been modified to the lowest level (known as the theoretical minimum risk exposure distribution, or TMRED)—for example, if smoking were eliminated or if sodium intake were reduced to a minimum level.

The calculations use information on which diseases are linked to the various risk factors, the amount of extra risk of developing or dying from that disease caused by exposure to the risk factor (relative risks), and the number of people in the population exposed to the risk factor.

What is the history of burden of disease analysis?

The first global burden of disease study—for the year 1990—developed the DALY metric and quantified the global disease burden (and attribution to risk factors) reported for 8 regions of the world (Murray & Lopez 1996). Since then, more global and country studies have been undertaken and methods have been further developed. Before this study, in Australia, 4 major national burden of disease studies were conducted (AIHW 2016b, 2019; Begg et al. 2007; Mathers et al. 1999). In addition, there have been 2 studies for Indigenous Australians released (AIHW 2016a; Vos et al. 2007), with a third to be released soon after the ABDS 2018 (AIHW 2021b; AIHW forthcoming 2022). Some states and territories have also completed burden of disease work. Table 1.1 provides a summary of global and national Australian studies. Further information about the history of burden of disease assessment in Australia has been published in the academic literature (Moon et al. 2020).

Table 1.1: Summary of global and Australian burden of disease studies

Study	Reference year	Reference
Global study: Harvard School of Public Health in collaboration with The World Bank and the World Health Organization (WHO)	1990	Murray & Lopez 1996
First Australian study: Australian Institute of Health and Welfare (AIHW)	1996	Mathers et al. 1999
Global study: The World Bank	2000–2002	Lopez et al. 2006
Second Australian study: AIHW and The University of Queensland	2003	Begg et al. 2007
First Indigenous Australian study: The University of Queensland	2003	Vos et al. 2007
Global study: WHO	2004 with projections to 2030	WHO 2009a
Global study: Institute for Health Metrics and Evaluation (IHME)	2010	Murray, Vos et al. 2012
Global study: WHO	2011	WHO 2014
Global study: IHME	2013	GBD 2013 DALYs and HALE Collaborators 2015
Third Australian study: AIHW	2011	AIHW 2016b
Second Indigenous Australian study: AIHW	2011	AIHW 2016a
Fourth Australian study: AIHW	2015	AIHW 2019
Global studies: WHO	2015; 2016; 2019	WHO 2017; WHO 2018; WHO 2020a
Global study: IHME (annual updates from reference year of 2015 onwards)	2015; 2016; 2017; 2019	GBD 2015 DALYs and HALE Collaborators 2016; GBD 2016 DALYs and HALE Collaborators 2017; GBD 2017 DALYs and HALE Collaborators 2018; GBD 2019 Diseases and Injuries Collaborators 2020
Third Indigenous Australian study: AIHW	2018	AIHW 2021b; AIHW forthcoming 2022

The Global Burden of Disease Study (GBD)—conducted by the Institute for Health Metrics and Evaluation (IHME) (located at the University of Washington) and other academic partners—was first published in December 2012 (Murray, Vos et al. 2012). It used substantially revised methods from those of earlier studies to generate DALY for 2010 and revised estimates for 1990 and 2005 (see AIHW 2014 for further detail on method changes). The IHME has since updated its estimates for the reference years 2013, 2015, 2016, 2017 and 2019, along with revised estimates for 2010 and earlier years (respectively, GBD 2013 DALYs and HALE Collaborators 2015; GBD 2015 DALYs and HALE Collaborators 2016, GBD 2016 DALYs and HALE Collaborators 2017, GBD 2017 DALYs and HALE Collaborators 2018, GBD 2019 Diseases and Injuries Collaborators 2020).

Following the GBD 2010 study, the World Health Organization (WHO) applied GBD methods (with some modifications) to produce global burden of disease estimates for 2000–2012 (WHO 2014), then for 2015 and 2016 (WHO 2017, 2018). The WHO published its latest global health estimates for 2000–2019, using the latest available national data for mortality and YLL estimates along with the GBD 2019 YLD estimates, with some adjustment to the disability weights for certain diseases (WHO 2020a, WHO 2020b). Due to the changes in methods, the global health 2019 estimates are not comparable to WHO's previously published DALY estimates.

The previous Australian study included estimates for 2015 with revised estimates for 2011 and 2003 (AIHW 2019). The ABDS uses Australian data sources and adapts the methods of global studies to quantify burden of disease. Further information and international comparisons are presented in Chapter 9.

What's new in the Australian Burden of Disease Study 2018 and this report?

The ABDS 2018 was undertaken to build on the AIHW's previous burden of disease studies and current disease monitoring work. It updates burden of disease estimates, using the infrastructure developed as part of the ABDS 2011, and includes several improvements since the 2011 and 2015 Australian studies. This study provides burden of disease estimates best matched to the Australian context for the Australian population (including sub-national estimates) for 2018. It also provides estimates for 2015, 2011 and 2003, revised using the same methods as for 2018, to enable direct comparisons.

The chosen reference period (2018) reflects the data availability from key data sources (such as the National Health Survey, deaths data, hospital admissions data and various disease registers) at the time analyses began.

A number of developments have been made since the ABDS 2015 study was undertaken. See Box 1.4 for a brief list of these developments and Chapter 10 for more detail.

Box 1.4: Developments since the 2015 Australian study

1. A more comprehensive list of diseases, including disaggregation of pneumoconiosis into silicosis, asbestosis and other pneumoconiosis and the addition of scabies, which was previously reported under skin infections.
2. Influenza and pneumonia were combined with lower respiratory infections for reporting purposes.
3. A new conceptual model for otitis media.
4. New or updated data sources for many diseases, notably greater use of linked hospital/deaths data.
5. Use of historical data (incidence and case-fatality) to estimate the long-term health loss for relevant conditions. Previously, a statistical software tool—DisMod II—was used to estimate prevalence based on other epidemiological measures such as incidence, remisson and mortality.
6. Sensitivity analyses looking at the impact of using alternative disability weights on YLD estimates for injury and vision disorders.
7. Bullying victimisation as a new risk factor.
8. Low birthweight & short gestation as a new risk factor.
9. High cholesterol updated to measure low-density lipoprotein (LDL) cholesterol.
10. Intimate partner violence expanded to include attributable burden (using direct population attributable fractions or PAFs) for the linked disease 'homicide & violence' in males; and additional estimates calculated using direct PAFs for 'homicide & violence' by perpetrator type (e.g. intimate partner, family member, stranger, acquaintance).
11. Revised risk factor calculations and an increased number of linked diseases for selected risk factors due to increased evidence.

Estimates for 2003, 2011 and 2015 have been recalculated, where methods were updated, to enable comparison with 2018 estimates (see Chapter 7). The published estimates from previous Australian studies are not directly comparable with those for the ABDS 2018 due to the method changes.

Further information on these developments can be found in Chapter 10 and Appendix A.

Data sources

The ABDS 2018 reports estimates for 219 diseases and injuries. For non-fatal burden, this involved the calculation of prevalence estimates for 745 sequelae (consequences of disease). Estimates were also calculated for 40 risk factor components or exposures that are combined into 20 individual risk factors for reporting. National estimates were produced for 4 reference years and sub-national estimates for 3 years.

Data to develop the ABDS 2018 estimates were obtained from many different sources. Deaths data for the fatal burden were sourced from the National Mortality Database. Data for the non-fatal burden came from a variety of sources: national data sets with complete coverage (such as the National Hospital Morbidity Database and the Australian Cancer Database), national surveys (such as the National Health Survey 2017–18), linked hospitals and deaths data, and a number of epidemiological studies, to comprise around 45 key data sources. Data for risk factor attributable burden also came from a number of sources such as national surveys, disease registries and epidemiological studies.

Where possible and appropriate, other inputs for the ABDS 2018 were obtained from the GBD studies. The standard life table for fatal burden, health states and disability weights for the non-fatal burden were obtained from the GBD 2013. Relative risks and the TMRED for the risk factor attribution were obtained from the GBD 2017, GBD 2019 and the AIHW's review of the literature.

Population estimates underpinning all estimates were sourced from the Australian Demographic Statistics from the Australian Bureau of Statistics (ABS).

Details on the various data sources, including standard inputs, are in Appendix B and in *Australian Burden of Disease Study 2018: methods and supplementary material* (AIHW 2021c).

Additional tables/information to accompany this report, as well as data visualisations showing burden of disease and attributable burden estimates, are provided on the AIHW website http://www.aihw.gov.au/burden-of-disease/.

What about the burden due to COVID-19?

As this study (ABDS 2018) aims to provide estimates of disease burden for the 2018 reference year, estimates of the burden due to COVID-19 are not included. However, as part of a separate project, the AIHW has calculated estimates of the fatal and non-fatal burden due to COVID-19 in Australia for 2020 using Australian deaths and notifications data, and largely drawing on methods and development work internationally. These estimates were published in a synthesis report on COVID-19 in Australia (AIHW 2021e). Further information on this report and potential future work on the burden due to COVID-19 can be found in Chapter 10.

2 Total burden of disease

Key results

- In 2018, Australians lost 5.0 million years of healthy life due to living with and dying early from disease and injury.
- Australians suffered more burden from living with illness (52% of total burden) than burden from premature death (48% of total burden).
- Overall, males experienced more burden (53% of total burden) than females (47%). Dying from disease and injury accounted for more burden in males, while living with illness accounted for more burden in females.
- The rate of burden (number of DALY per 1,000 population) increased with age, with older Australians experiencing a substantial proportion of the total burden despite having a smaller population.
- Chronic diseases and injuries dominated total burden in Australia. In 2018, the 5 conditions causing the most burden were coronary heart disease, back pain & problems, dementia, chronic obstructive pulmonary disease (COPD) and lung cancer.
- The disease groups which caused the most burden for children, adolescents and young adults were injuries (mainly suicide & self-inflicted injuries) and mental health conditions & substance use disorders (mainly anxiety disorders and depressive disorders).
- Musculoskeletal conditions (back pain & problems) and cancer (mainly lung) were leading causes of total burden for adults in the 45–74 age group.
- Cardiovascular diseases (coronary heart disease and stroke), dementia and COPD were the major causes of total burden in older Australians.

Burden of disease measures the health impact of disease and injury on a population in a given year—both from dying prematurely and living with disease and injury. Total burden (DALY) is the sum of fatal burden (YLL) and non-fatal burden (YLD) (see Chapter 1 for more information).

What is the total burden of disease in Australia?

In 2018, Australians lost 5.0 million years of healthy life due to living with and dying from disease and injury. This is equivalent to 199 years of healthy life lost per 1,000 population.

Australians experienced lower rates of burden over time. After accounting for population changes and age structure differences, total burden decreased by 13% between 2003 and 2018 (see Chapter 7 for more information on changes in disease burden over time).

Living with disease caused over half of the total burden

In 2018, Australians lost more healthy years of life from living with disease and injury (which accounted for 52% of the total health loss) than from dying prematurely (which accounted for the remainder, 48%). By comparison, in 2003 dying prematurely caused more burden (53%) than living with illness (47%).

Males experienced more burden than females

For all 4 years analysed in this study (2003, 2011, 2015 and 2018), males accounted for more than half of the total burden (around 53%). This means that, in 2018, males lost around 267,000 more years of healthy life than females.

Males experienced a higher proportion (53%) of their total burden (DALY) due to dying early from disease and injury while females experienced more of their burden from living with disease (58%).

How does total burden vary across the life course?

Health loss (DALY) in Australians varied across the different stages of life. Figure 2.1 compares the proportion of people in different age groups in 2018 with the proportion of health loss experienced by each age group.

Infants (aged under 1) accounted for a smaller proportion of the total population than young children (aged 1–4) but experienced greater burden. This is mainly because infants had a much larger amount of fatal burden than young children.

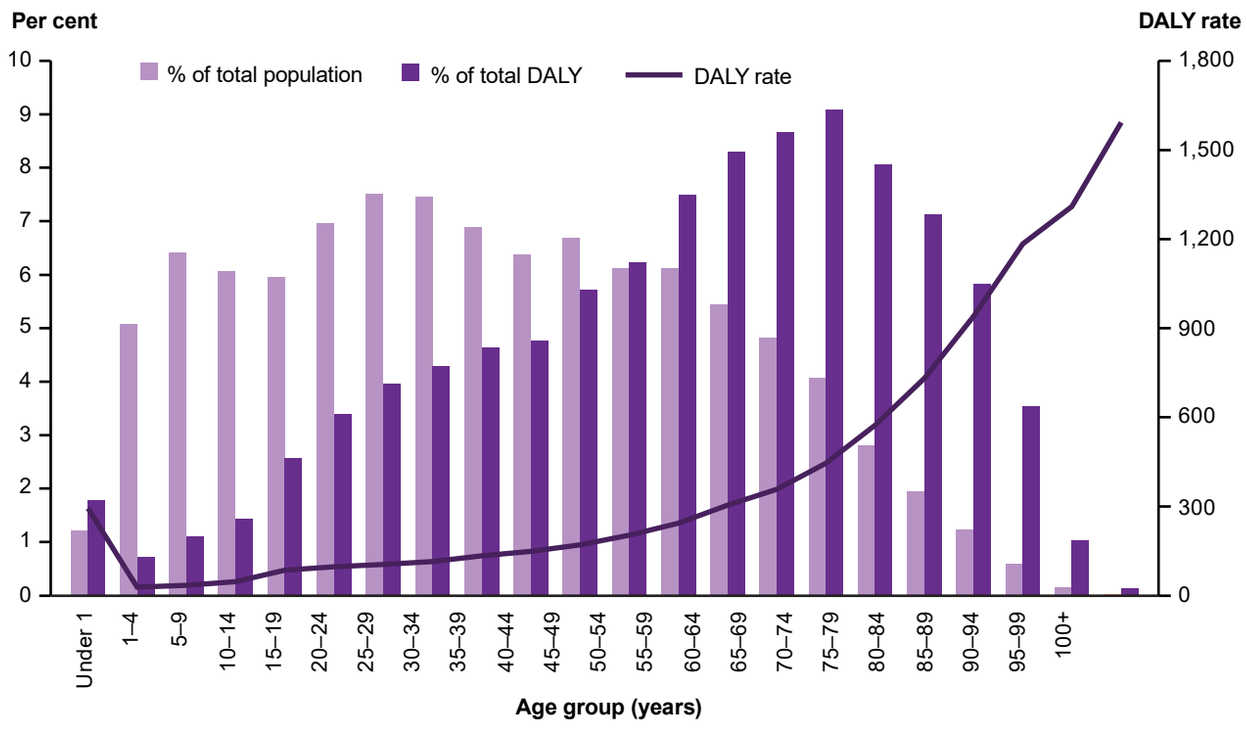
Australians aged under 40 (excluding infants) experienced less burden than those aged 40 and over. The under 40 age group (excluding infants) comprised 53% of the Australian population but only contributed to 22% of the total burden, mainly from the burden of living with illness.

With ageing, total burden rose substantially in the older age groups of the population. Australians aged 70–74 made up 4.1% of the population and experienced more burden than any other 5-year age group, contributing to 9.1% of the total burden.

Older Australians aged 70 and over comprised a small proportion of the population (11%) but contributed to a substantial amount (35%) of the total burden. Dying from disease and injury (fatal burden) caused more burden than living with illness (non-fatal burden) for this group.

The rate of health loss (the number of DALY per 1,000 population, depicted as a line in Figure 2.1) was high in infants but much lower in the 1–4 age group. The rate began increasing from early childhood, continuing throughout life course, and was highest in the oldest Australians who are the most burdened by diseases and injuries.

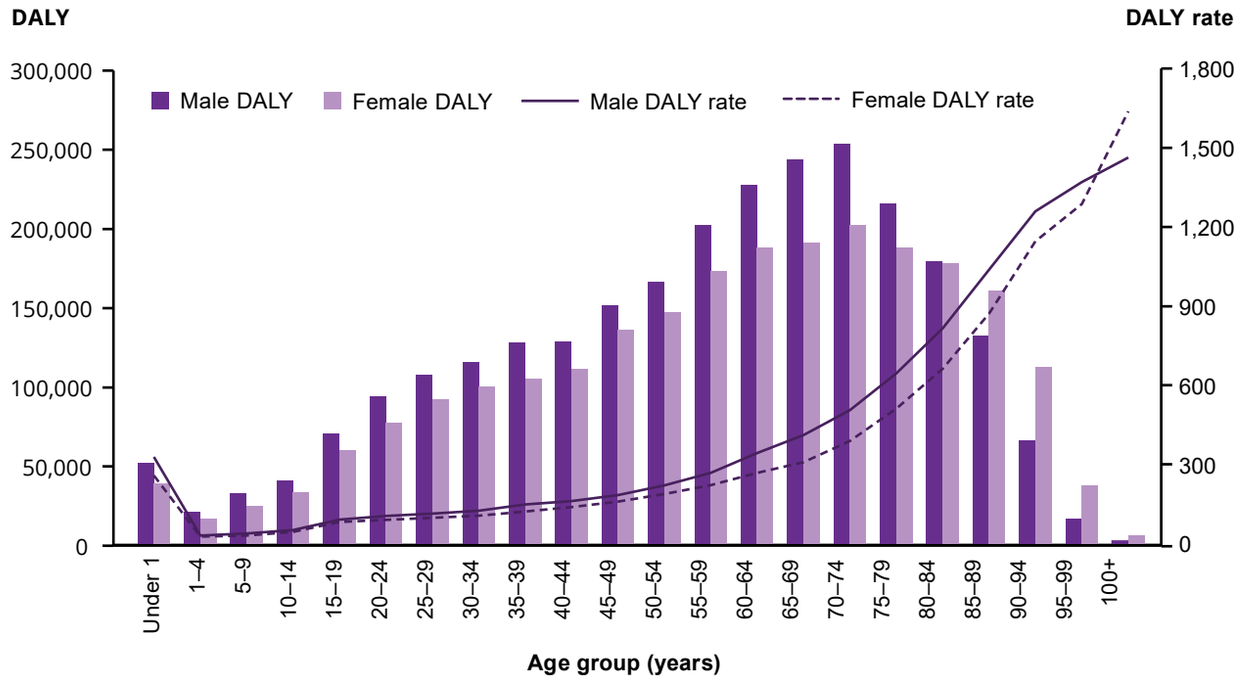
Figure 2.1: Age distribution (%) of the Australian population and contribution (%) to total burden (DALY), 2018



Note: DALY rate is expressed as DALY per 1,000 population.

Both males and females experienced similar patterns of health loss throughout the life course (as shown in Figure 2.2), although males suffered a higher amount (and rate) of burden than females for most age groups. In older Australians aged 85 and over, men suffered a considerably lower amount of burden than women due to having a smaller population.

Figure 2.2: Number and rates of total burden (DALY, DALY per 1,000 population), by age group and sex, 2018



Which disease groups cause the most burden?

Australians experienced the majority of burden from chronic diseases and injuries rather than acute illness. The total burden (DALY) caused by specific disease groups is described in this section. For information relating to the reporting of disease groups and individual diseases in the ABDS 2018, refer to Box 2.1.

Box 2.1: How are diseases and disease groups assigned in the Australian Burden of Disease Study 2018?

The ABDS 2018 estimated the years of healthy life lost due to living with illness (YLD) and the years of life lost due to dying from illness (YLL) for 219 separate diseases and injuries, which can be grouped into 17 disease groups—16 disease groups and 1 alternative reporting disease group (nature of injury or injury by external cause).

Disease

Disease is a term that describes a health problem. The ABDS 2018 disease list was developed to reflect the needs of health reporting and monitoring in Australia; it listed mutually exclusive diseases and injuries (defined according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, or ICD-10) that collectively reflected the total disease burden in Australia.

continued

Box 2.1 (continued): How are diseases and disease groups assigned in the Australian Burden of Disease Study 2018?

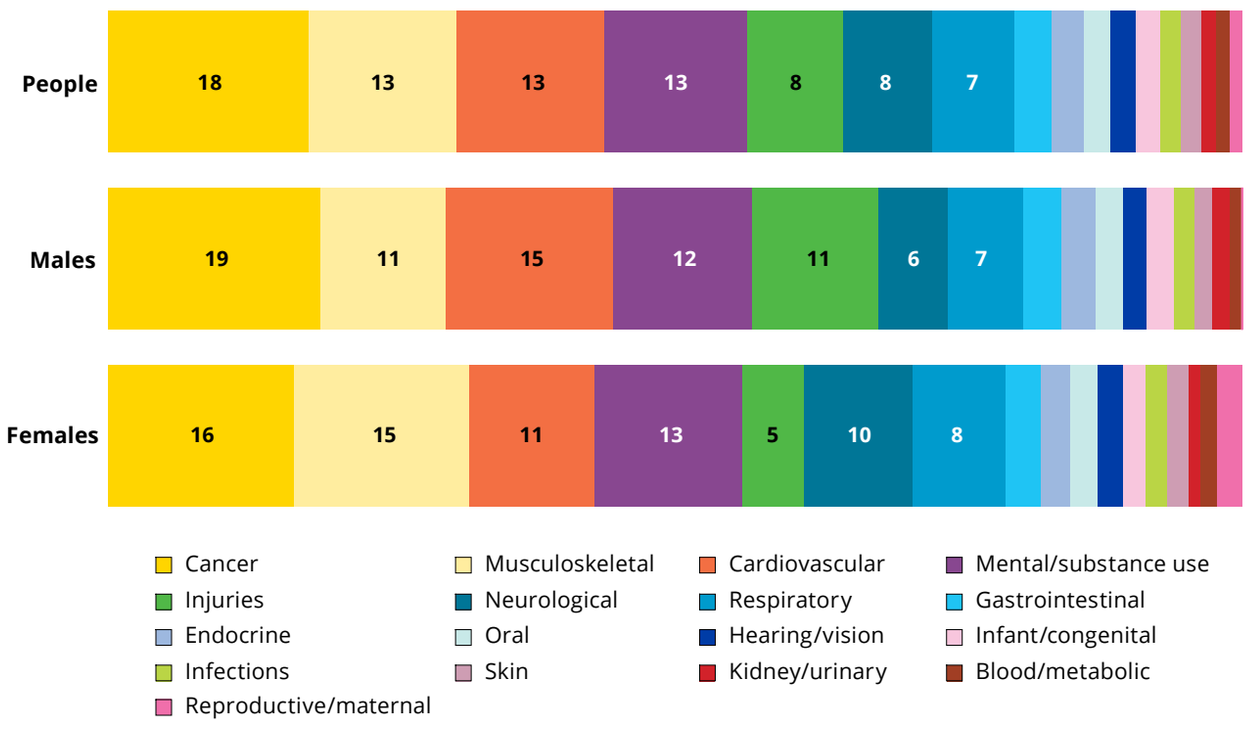
Disease group

A disease group consists of a number of related diseases/conditions. Each of the 219 diseases was assigned to a disease group, based on the chapter structure of ICD-10 codes (WHO 2016). For injuries, the conditions were grouped by both external cause (presented in this chapter) and nature of injury (see Appendix D). Conditions that could not be individually specified for analysis were grouped into the residual ('other') category of each disease group.

For example, musculoskeletal conditions is a disease group that includes back pain & problems, osteoarthritis, rheumatoid arthritis and gout. A number of conditions (such as fibromyalgia, tendonitis) were grouped into the residual category—'other musculoskeletal conditions'—and are collectively analysed and reported in the study. Another example of a disease group is the mental health conditions & substance use disorders group, which includes mental health conditions like depressive disorders, anxiety disorders and schizophrenia, as well as substance use disorders like alcohol use disorders and drug use disorders. For brevity, the label for this group is shortened to 'mental & substance use disorders' for the majority of the report.

The leading causes of total burden (DALY) in 2018 were cancer (18% of total burden), followed by musculoskeletal conditions, cardiovascular diseases, mental & substance use disorders (each 13%) and injuries (8.4%)—see Figure 2.3. Together, these disease groups caused around two-thirds of the burden in Australia and have been consistently the main contributors since 2003.

Figure 2.3: Proportion (%) of total burden (DALY), by disease group and sex, 2018



Burden from 'living with disease' and 'dying from disease' is shared differently across disease groups

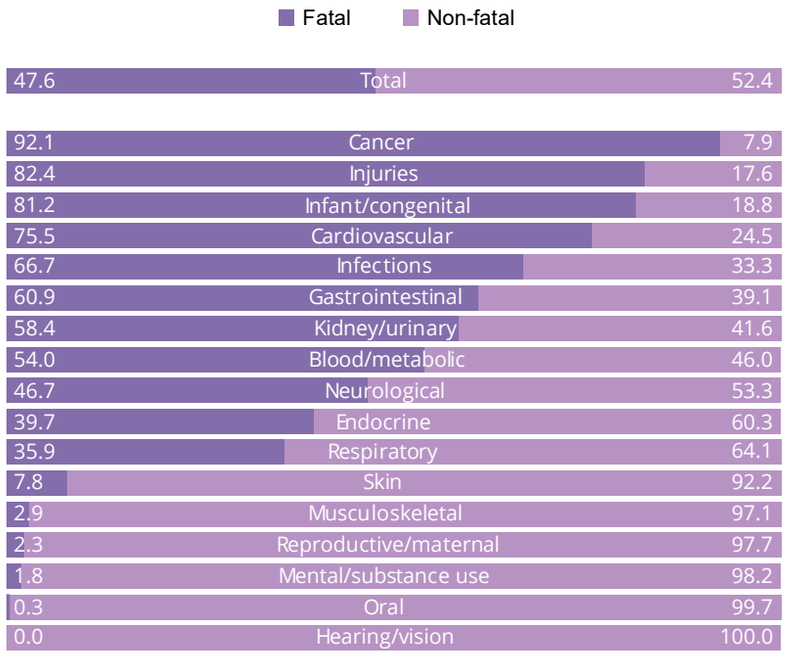
The contribution to total burden due to dying prematurely (fatal burden) and living with illness (non-fatal burden) differed greatly for each disease group (Figure 2.4).

Australians lost many more years of life due to dying from cancer (92% of total cancer burden), injuries (82%), infant & congenital diseases (81%) and cardiovascular diseases (76%) than healthy years lost from living with the impacts of these diseases.

For mental & substance use disorders and for musculoskeletal conditions, health loss was predominantly caused by living with the impacts of disease (98% and 97% of the total burden, respectively) rather than dying from the disease.

These results highlight that disease groups (and individual diseases) cause different types of health loss. It is important to consider the drivers of burden (fatal and non-fatal) when analysing the total burden for disease groups in Australia.

Figure 2.4: Proportion (%) of total burden (DALY) by fatal burden (YLL) versus non-fatal burden (YLD), by disease group, 2018



Disease groups had different impacts on males and females

Males and females experienced health loss from the same leading disease groups (Table 2.1). Cancer (19% of total male burden), cardiovascular diseases (15%) and injuries (11%) contributed to greater proportions of the total burden (DALY) in males whereas musculoskeletal conditions (15% of total female burden) and neurological conditions (9.6%) contributed to higher proportions of the burden in females.

Males and females experienced different rates of burden (reported as age-standardised rates, or ASRs; see Box 2.2 for more information) for each disease group. In particular, males suffered much higher rates of burden (DALY per 1,000 population) due to injuries, cardiovascular diseases, cancer and kidney & urinary diseases than females. Females suffered higher rates of burden from blood & metabolic disorders and slightly more burden from musculoskeletal conditions and neurological conditions compared with males.

Which diseases and injuries cause the most burden?

Box 2.2: Age-standardised rates (ASRs)

The ABDS 2018 compares the rate of disease burden between different population groups and different time periods using ASRs. ASRs seek to allow like-for-like comparisons.

Firstly, the ASR expresses the burden in terms of the number of years lost per 1,000 population (the 'rate' part) to remove differences in burden that are just due to the different sizes of the 2 populations.

Secondly, it adjusts for differences in the age structure between the 2 populations. The burden of both living with illness and dying from disease is influenced by age. Different population groups (for example, males versus females, 2003 versus 2018 population) have a different composition of age groups. For example, the 2018 Australian population had a higher proportion of older Australians aged 65 and over (16%) than the 2003 population (13%).

Using ASRs ensures the rate of each comparison group is based on a standard population with consistent age structure (to remove differences in burden due to differences in age composition) and allows for accurate comparison of disease burden between 2 groups.

Table 2.1: Comparison of total burden (DALY, DALY%, DALY ASR), by disease group and sex, 2018

	Males				Females			
Rank	Disease group	DALY	Proportion (%)	ASR	Disease group	DALY	Proportion (%)	ASR
1	Cancer	492,416	18.8	35.5	Cancer	388,678	16.5	26.1
2	Cardiovascular	385,005	14.7	28.2	Musculoskeletal	362,075	15.4	25.7
3	Mental/substance use	323,562	12.3	26.8	Mental/substance use	308,006	13.1	25.1
4	Musculoskeletal	291,012	11.1	22.1	Cardiovascular	260,975	11.1	15.6
5	Injuries	290,422	11.1	23.6	Neurological	226,925	9.6	14.2
6	Respiratory	172,793	6.6	13.0	Respiratory	191,283	8.1	13.1
7	Neurological	162,223	6.2	12.2	Injuries	127,785	5.4	9.7
8	Gastrointestinal	89,384	3.4	6.8	Gastrointestinal	74,433	3.2	5.1
9	Endocrine	79,782	3.0	5.8	Endocrine	59,749	2.5	3.9
10	Infant/congenital	63,333	2.4	5.2	Oral	56,864	2.4	4.1
11	Oral	62,062	2.4	4.8	Hearing/vision	54,669	2.3	3.4
12	Hearing/vision	54,572	2.1	4.0	Reproductive/ maternal	52,218	2.2	4.1
13	Infections	47,250	1.8	3.6	Skin	45,307	1.9	3.6
14	Skin	42,707	1.6	3.4	Infant/congenital	45,110	1.9	3.9
15	Kidney/urinary	41,353	1.6	3.0	Infections	44,662	1.9	3.0
16	Blood/metabolic	24,832	0.9	1.9	Blood/metabolic	34,509	1.5	2.5
17	Reproductive/ maternal	2,453	0.1	0.2	Kidney/urinary	25,109	1.1	1.6
	Total	**2,625,162**	**100.0**	**200.2**	**Total**	**2,358,358**	**100.0**	**164.6**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population (DALY ASR).
2. Numbers and percentages shown for disease groups may not add up to the total due to rounding.

Of the 219 individual diseases analysed, the leading 20 diseases and injuries together caused 53% of the total burden (DALY). Rankings for diseases that caused the largest amount of burden in males and females are shown in Table 2.2. The majority of these belonged to the 5 leading disease groups of total burden, although COPD, dementia and type 2 diabetes were notable exceptions.

Coronary heart disease, back pain & problems and COPD were leading causes of total burden in both males and females. However, males suffered almost 3 times the amount of burden due to suicide (ranked third in males) and more burden from lung cancer than females, while females experienced substantially more healthy years lost from dementia (ranked first in females), anxiety disorders, depressive disorders and osteoarthritis.

Stroke was another high-burden disease and caused a similar amount of health loss in both males and females. Despite this, stroke was ranked much higher in males (eighth) than in females (12th). As rankings show only the relative position of individual disease burden compared with other diseases, it is important to look at the actual amount of burden caused by the disease to understand its impact on the population.

Table 2.2: Leading 20 causes of total burden (DALY), by sex, 2018

Rank	Males	DALY	% of total	Females	DALY	% of total	People	DALY	% of total
1	Coronary heart disease	207,974	7.9	Dementia	122,610	5.2	Coronary heart disease	312,045	6.3
2	Back pain & problems	111,468	4.2	Back pain & problems	110,889	4.7	Back pain & problems	222,357	4.5
3	Suicide & self-inflicted injuries	105,937	4.0	Coronary heart disease	104,071	4.4	Dementia	197,955	4.0
4	Lung cancer	92,115	3.5	Anxiety disorders	94,709	4.0	COPD	176,479	3.5
5	COPD	83,586	3.2	COPD	92,893	3.9	Lung cancer	159,723	3.2
6	Dementia	75,345	2.9	Depressive disorders	82,453	3.5	Anxiety disorders	156,737	3.2
7	Type 2 diabetes mellitus	65,646	2.5	Osteoarthritis	76,437	3.2	Depressive disorders	142,799	2.9
8	Stroke	62,148	2.4	Asthma	72,087	3.1	Suicide & self-inflicted injuries	140,737	2.8
9	Anxiety disorders	62,028	2.4	Breast cancer	70,508	3.0	Asthma	130,886	2.6
10	Depressive disorders	60,347	2.3	Lung cancer	67,608	2.9	Stroke	125,006	2.5
11	Asthma	58,799	2.2	Rheumatoid arthritis	64,038	2.7	Osteoarthritis	119,989	2.4
12	Bowel cancer	55,005	2.1	Stroke	62,858	2.7	Type 2 diabetes mellitus	112,467	2.3
13	Alcohol use disorders	52,364	2.0	Type 2 diabetes mellitus	46,821	2.0	Rheumatoid arthritis	106,303	2.1
14	Prostate cancer	51,305	2.0	Bowel cancer	42,598	1.8	Bowel cancer	97,603	2.0
15	Poisoning	49,927	1.9	Falls	37,099	1.6	Hearing loss	78,569	1.6
16	Osteoarthritis	43,552	1.7	Hearing loss	36,935	1.6	Falls	74,920	1.5
17	Rheumatoid arthritis	42,265	1.6	Suicide & self-inflicted injuries	34,800	1.5	Breast cancer	71,248	1.4
18	Hearing loss	41,634	1.6	Migraine	33,246	1.4	Alcohol use disorders	69,910	1.4
19	Chronic liver disease	38,310	1.5	Eating disorders	30,537	1.3	Poisoning	69,657	1.4
20	Falls	37,821	1.4	Atrial fibrillation & flutter	27,184	1.2	Atrial fibrillation & flutter	58,522	1.2
	Leading 20 diseases	*1,397,575*	*53.2*	*Leading 20 diseases*	*1,310,381*	*55.6*	*Leading 20 diseases*	*2,623,912*	*52.7*
	All other diseases	*1,227,587*	*46.8*	*All other diseases*	*1,047,976*	*44.4*	*All other diseases*	*2,359,607*	*47.3*
	Total	**2,625,162**	**100.0**	**Total**	**2,358,358**	**100.0**	**Total**	**4,983,519**	**100.0**

Colour legend: % of total burden. ≥ 5% 4–5% 3–4% 2–3% 0–2%

COPD = chronic obstructive pulmonary disease.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Due to rounding, the sum of the DALY shown for males and females may not equal the DALY shown for people.

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How does disease burden change across the life course?

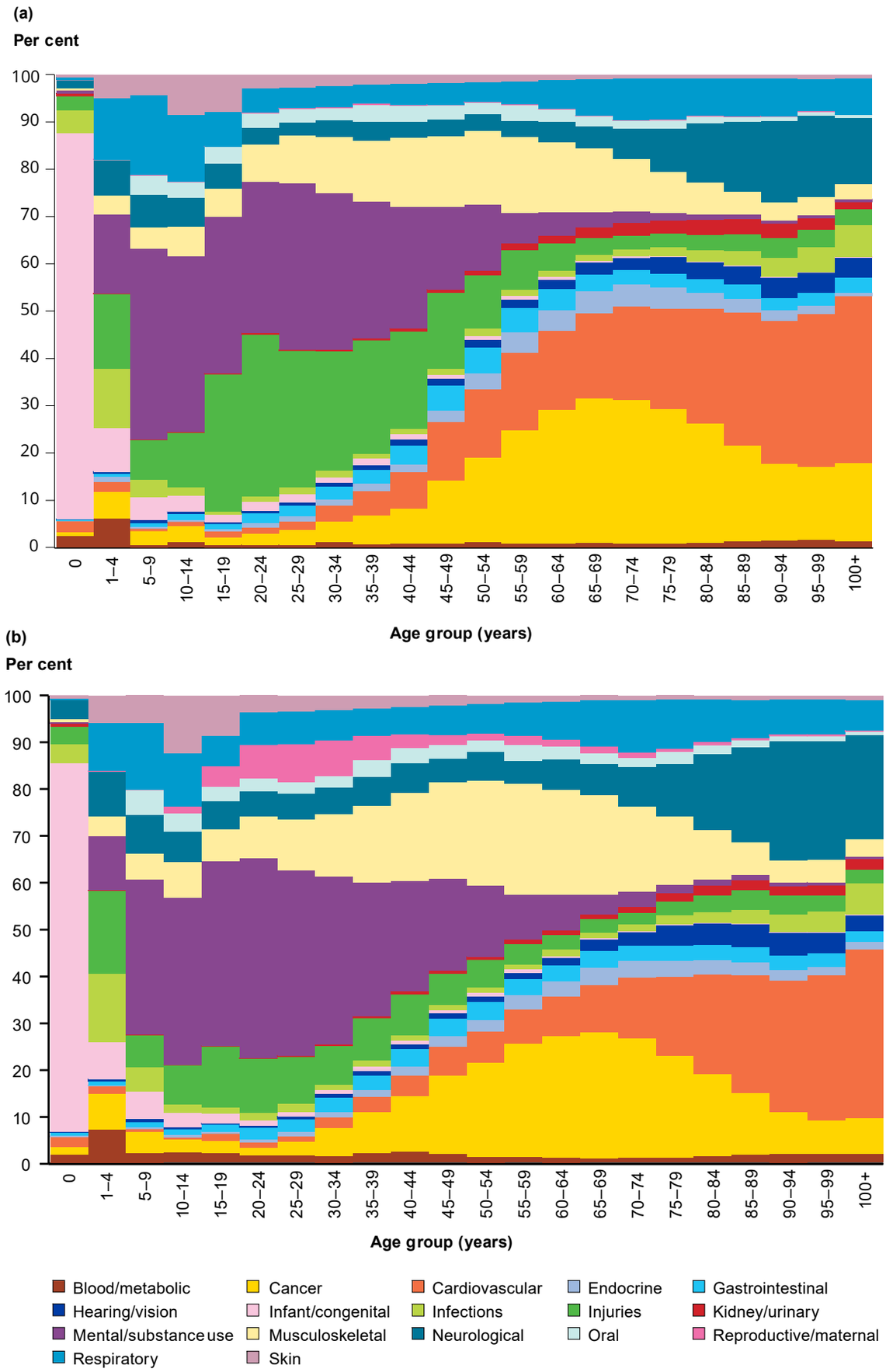
Australians experienced major health loss from different types of disease groups and specific diseases throughout the life course.

Trends in burden for main disease groups

Figure 2.5 shows the relative proportion of total burden (DALY) contributed by each disease group throughout the life course for (a) males and (b) females in 2018.

- Respiratory diseases caused burden throughout the entire life course and more burden in children. These diseases collectively contributed to 15% of the total burden in boys aged 1–14 and 12% in girls the same age.
- Mental & substance use disorders caused predominant burden in Australians aged under 50 (except for infants and children aged under 5) and collectively contributed 29% and 31% of the total burden in males and females, respectively. However, burden due to this disease group declined substantially from age 55.
- Injuries was among the leading disease groups causing total burden for males aged under 50 (except infants) and caused 23% of their total burden. For females of the same age group, injuries contributed to a much lower proportion (9.3%) of the total burden.
- Musculoskeletal conditions caused substantial total burden in Australians aged from 10 to 84, more so for females than males. In particular, women aged 35–74 experienced 21% of their total burden from these conditions, and for men of the same age group, 14%.
- Cancer and cardiovascular diseases were 2 dominant causes of total burden in older Australians aged 50 and over (together accounting for 46% of male burden, and 36% of female burden). Cancer contributed the largest proportion of burden in Australians aged 65–69 while cardiovascular diseases contributed to more of the burden with ageing.
- Neurological conditions (which includes dementia) was among the leading disease groups causing burden in Australians aged 75 and over (13% in men, 18% in women). The proportion of burden from neurological conditions increased with older age for both sexes.

Figure 2.5: Relative proportion (%) of total burden (DALY) for males (a) and females (b), by disease group and age group, 2018



Leading causes of total burden at different stages of life

A ranking of the leading 10 causes of total burden (DALY) in males and females of different age groups is shown in figures 2.6 and 2.7, respectively. As the amount of burden varies greatly by age, the same leading causes may have very large differences in burden across age groups (for example, asthma in infants versus in children). Conversely, causes that are not ranked among the leading 10 for some age groups may still be high-burden diseases.

Infants and young children (aged under 5)

- Infants and young children experienced total burden mainly from a range of infant & congenital conditions, including pre-term & low birthweight complications, birth trauma & asphyxia, cardiovascular defects and sudden infant death syndrome (SIDS).
- Other high-burden diseases for this group were asthma, neonatal infections, lower respiratory infections (including influenza and pneumonia), epilepsy and dermatitis & eczema.

Children (aged 5–14)

- Asthma was the leading cause of burden in all children aged 5–14 and contributed to 14% and 11% of the total burden in boys and girls, respectively.
- Boys and girls experienced burden from a range of mental & substance use disorders including anxiety disorders, depressive disorders, conduct disorder, and autism spectrum disorders. Attention deficit hyperactivity disorder was ranked eighth for boys, but not ranked in the top 10 for girls.
- Dental caries, epilepsy and acne were among the top 10 causes of total burden for both boys and girls.

Adolescents and young adults (aged 15–24)

- Among those aged 15–24, suicide & self-inflicted injuries caused the most burden in males, while anxiety disorders was the leading cause of burden in females.
- Alcohol use disorders and depressive disorders were ranked second and third for males, while for females depressive disorders and eating disorders were ranked second and third.
- Asthma was ranked fifth in males and fourth in females.
- Motor vehicle accidents were in the top 10 for males (ranked fourth), but not for females. Polycystic ovarian syndrome was in the top 10 for females (ranked eighth).

Adults (aged 25–44)

- As for the younger age group, suicide & self-inflicted injuries caused the most burden in men aged 25–44, while anxiety was the leading cause of burden in women.
- Back pain & problems ranked second for both men and women.
- Mental & substance use disorders dominated the leading causes of burden for this age group. Depressive disorders ranked third in women and fifth in men. Alcohol use disorders were ranked fourth in men, but was not in the top 10 for women. Eating disorders ranked fifth for women, but was not in the top 10 for men.

Adults (aged 45–74)

- Among adults aged 45–74, many chronic conditions emerged as the leading causes of burden and there was lower burden from mental health conditions and injuries.
- Back pain & problems was among the leading causes of total burden for both men and women.
- Men suffered more burden from coronary heart disease (ranked as the leading cause in men), COPD, type 2 diabetes and chronic liver disease than women; women suffered more burden from osteoarthritis and rheumatoid arthritis.
- A range of cancers were among the leading causes of burden for both sexes, in particular, lung, bowel and prostate cancer for men and lung and breast cancer for women.

Older people (aged 75 and over)

- From age 75, coronary heart disease remained as the leading cause of total burden in men, followed by dementia, while dementia was the leading cause of burden in women, followed by coronary heart disease.
- Other causes of total burden that appeared among the top 10 were COPD, stroke, falls, lung cancer for both sexes; and prostate cancer for men, osteoarthritis, and rheumatoid arthritis for women.

Figure 2.6: Leading 10 causes of total burden (DALY '000; proportion %) for males, by age group, 2018

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55-64	65–74	75–84	85+
1st	Pre-term/LBW complications (11.8; 16.6%)	Asthma (10.0; 14.0%)	Suicide/self-inflicted injuries (23.2; 14.3%)	Suicide/self-inflicted injuries (47.6; 10.0%)	Coronary heart disease (25.8; 8.2%)	Coronary heart disease (43.0; 10.1%)	Coronary heart disease (51.5; 10.4%)	Coronary heart disease (45.3; 11.5%)	Coronary heart disease (32.3; 15.1%)
2nd	Birth trauma/ asphyxia (7.6; 10.7%)	Anxiety disorders (7.4; 10.4%)	Alcohol use disorders (11.5; 7.1%)	Back pain and problems (33.4; 7.0%)	Back pain and problems (20.8; 6.6%)	Lung cancer (23.9; 5.6%)	Lung cancer (33.1; 6.7%)	Dementia (27.8; 7.1%)	Dementia (28.2; 13.2%)
3rd	Cardiovascular defects (4.7; 6.7%)	Autism spectrum disorders (5.3; 7.5%)	Depressive disorders (8.5; 5.3%)	Poisoning (29.5; 6.2%)	Suicide/self-inflicted injuries (17.2; 5.4%)	Back pain and problems (22.3; 5.2%)	COPD (29.2; 5.9%)	COPD (23.9; 6.1%)	COPD (12.4; 5.8%)
4th	SIDS (3.2; 4.5%)	Conduct disorder (4.9; 6.9%)	RTI/motor vehicle occupant (8.4; 5.2%)	Alcohol use disorders (28.6; 6.0%)	Anxiety disorders (12.0; 3.8%)	Type 2 diabetes (16.0; 3.8%)	Type 2 diabetes (20.4; 4.1%)	Lung cancer (19.7; 5.0%)	Stroke (11.8; 5.5%)
5th	Asthma (2.3; 3.3%)	Depressive disorders (4.3; 6.1%)	Asthma (8.1; 5.0%)	Depressive disorders (27.0; 5.7%)	Depressive disorders (10.6; 3.4%)	COPD (13.1; 3.1%)	Prostate cancer (17.0; 3.4%)	Stroke (17.7; 4.5%)	Prostate cancer (9.9; 4.6%)
6th	Lower respiratory infections (1.6; 2.3%)	Epilepsy (3.4; 4.8%)	Anxiety disorders (7.3; 4.5%)	Anxiety disorders (23.7; 5.0%)	Poisoning (10.2; 3.2%)	Bowel cancer (12.5; 2.9%)	Back pain and problems (17.0; 3.4%)	Prostate cancer (16.4; 4.2%)	Falls (7.0; 3.3%)
7th	Neonatal infections (1.6; 2.2%)	Dental caries (2.6; 3.6%)	Back pain and problems (7.1; 4.4%)	Drug use disorders (17.9; 3.8%)	Chronic liver disease (9.9; 3.1%)	Chronic liver disease (12.4; 2.9%)	Bowel cancer (16.3; 3.3%)	Type 2 diabetes (14.1; 3.6%)	Atrial fibrillation (6.3; 3.0%)
8th	Neural tube defects (1.2; 1.7%)	Attention deficit hyperactivity disorder (2.1; 2.9%)	Drug use disorders (6.0; 3.7%)	Asthma (15.6; 3.3%)	Lung cancer (8.8; 2.8%)	Rheumatoid arthritis (11.8; 2.7%)	Stroke (14.7; 3.0%)	Bowel cancer (11.2; 2.8%)	Lower respiratory infections (5.1; 2.4%)
9th	Epilepsy (1.1; 1.6%)	Acne (2.0; 2.8%)	Acne (4.5; 2.8%)	Schizophrenia (13.2; 2.8%)	Alcohol use disorders (8.1; 2.6%)	Suicide/self-inflicted injuries (11.4; 2.7%)	Dementia (13.8; 2.8%)	Hearing loss (11.2; 2.8%)	Hearing loss (5.0; 2.3%)
10th	Dermatitis and eczema (1.0; 1.4%)	Dermatitis and eczema (2.0; 2.8%)	Autism spectrum disorders (4.5; 2.8%)	Bipolar affective disorder (10.7; 2.2%)	Asthma (7.4; 2.3%)	Osteoarthritis (11.4; 2.7%)	Osteoarthritis (12.5; 2.5%)	Atrial fibrillation (9.6; 2.4%)	Type 2 diabetes (4.6; 2.2%)

LBW = low birthweight; RTI = road traffic injuries; SIDS = sudden infant death syndrome; COPD = chronic obstructive pulmonary disease. See Appendix D, Box D1 for ABDS 2018 disease group colour legend.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Lower respiratory infections includes influenza and pneumonia.

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Figure 2.7: Leading 10 causes of total burden (DALY '000; proportion %) for females, by age group, 2018

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55-64	65–74	75–84	85+
1st	Pre-term/LBW complications (7.8; 14.5%)	Anxiety disorders (6.4; 11.5%)	Anxiety disorders (14.9; 11.0%)	Anxiety disorders (37.9; 9.4%)	Back pain and problems (20.8; 7.4%)	Back pain and problems (20.7; 5.8%)	COPD (28.3; 7.2%)	Dementia (36.4; 10.0%)	Dementia (65.4; 20.9%)
2nd	Birth trauma/ asphyxia (5.1; 9.5%)	Asthma (6.3; 11.2%)	Depressive disorders (11.8; 8.7%)	Back pain and problems (33.3; 8.2%)	Anxiety disorders (17.6; 6.3%)	Osteoarthritis (19.5; 5.4%)	Lung cancer (22.4; 5.7%)	Coronary heart disease (27.3; 7.5%)	Coronary heart disease (36.9; 11.8%)
3rd	Cardiovascular defects (3.1; 5.7%)	Depressive disorders (5.0; 8.9%)	Eating disorders (9.2; 6.8%)	Depressive disorders (31.6; 7.8%)	Depressive disorders (14.5; 5.2%)	Lung cancer (19.1; 5.3%)	Osteoarthritis (22.0; 5.6%)	COPD (26.4; 7.3%)	Stroke (20.6; 6.6%)
4th	SIDS (1.8; 3.4%)	Conduct disorder (3.0; 5.3%)	Asthma (7.6; 5.6%)	Asthma (21.2; 5.2%)	Breast cancer (14.4; 5.1%)	Breast cancer (18.6; 5.2%)	Coronary heart disease (18.3; 4.7%)	Stroke (17.9; 4.9%)	COPD (19.1; 6.1%)
5th	Asthma (1.5; 2.8%)	Epilepsy (2.9; 5.2%)	Suicide/self-inflicted injuries (7.6; 5.6%)	Eating disorders (18.2; 4.5%)	Osteoarthritis (11.0; 3.9%)	Rheumatoid arthritis (16.7; 4.6%)	Back pain and problems (16.2; 4.2%)	Lung cancer (13.7; 3.8%)	Falls (11.6; 3.7%)
6th	Neonatal infections (1.4; 2.5%)	Acne (2.7; 4.9%)	Back pain and problems (7.1; 5.2%)	Suicide/self-inflicted injuries (14.8; 3.7%)	Asthma (10.8; 3.9%)	COPD (14.3; 4.0%)	Breast cancer (15.5; 4.0%)	Osteoarthritis (12.8; 3.5%)	Atrial fibrillation (10.0; 3.2%)
7th	Epilepsy (1.3; 2.4%)	Dental caries (2.5; 4.4%)	Bipolar affective disorder (6.1; 4.5%)	Migraine (13.6; 3.3%)	Rheumatoid arthritis (9.7; 3.5%)	Coronary heart disease (11.9; 3.3%)	Dementia (15.4; 3.9%)	Hearing loss (12.5; 3.4%)	Hearing loss (8.7; 2.8%)
8th	Lower respiratory infections (1.1; 2.0%)	Dermatitis and eczema (1.9; 3.4%)	Polycystic ovarian syndrome (5.5; 4.0%)	Bipolar affective disorder (11.6; 2.9%)	Migraine (7.1; 2.5%)	Anxiety disorders (11.7; 3.2%)	Rheumatoid arthritis (14.5; 3.7%)	Type 2 diabetes (10.3; 2.8%)	Lower respiratory infections (6.8; 2.2%)
9th	Brain malformations (1.0; 1.9%)	Back pain and problems (1.5; 2.7%)	Alcohol use disorders (5.2; 3.8%)	Polycystic ovarian syndrome (10.8; 2.7%)	Lung cancer (7.1; 2.5%)	Depressive disorders (10.3; 2.9%)	Type 2 diabetes (12.6; 3.2%)	Rheumatoid arthritis (10.0; 2.8%)	Type 2 diabetes (6.6; 2.1%)
10th	Dermatitis and eczema (1.0; 1.8%)	Autism spectrum disorders (1.5; 2.6%)	Acne (4.1; 3.0%)	Drug use disorders (8.8; 2.2%)	Coronary heart disease (6.9; 2.5%)	Asthma (10.1; 2.8%)	Stroke (10.5; 2.7%)	Breast cancer (9.5; 2.6%)	Chronic kidney disease (6.5; 2.1%)

LBW = low birthweight; SIDS = sudden infant death syndrome; COPD = chronic obstructive pulmonary disease. See Appendix D, Box D1 for ABDS 2018 disease group colour legend.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Lower respiratory infections includes influenza and pneumonia.

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3 Non-fatal burden of disease

Key results

- In 2018, Australians lost 2.6 million years of healthy life due to living with the impacts of disease and injury (non-fatal burden).
- The overall rate of non-fatal burden in 2018 was 98 YLD per 1,000 population. This was 17% higher than the rate of fatal burden (84 YLL per 1,000 population).
- Males and females experienced similar rates of non-fatal burden throughout the life course, which was lowest in infants and children and increased with age, peaking in the oldest age group.
- The main disease groups causing non-fatal burden in Australia were musculoskeletal conditions (24%), mental & substance use disorders (24%) and respiratory diseases (8.9%).
- For children, adolescents and young adults, mental & substance use disorders (including anxiety and depressive disorders), respiratory diseases (mostly asthma) and neurological conditions (mostly epilepsy and migraine) caused the most non-fatal burden.
- For middle-aged and older Australians, musculoskeletal conditions (back pain & problems, osteoarthritis and rheumatoid arthritis), cardiovascular diseases (coronary heart disease and atrial fibrillation & flutter), hearing & vision disorders (hearing loss and macular degeneration), and COPD were among the main causes of non-fatal burden.
- For people aged 85 and over, dementia was the leading cause of non-fatal burden.

The population is ageing in Australia and people may be living longer with the effects of disease and injury. The burden of living with illness (discussed in detail in this chapter) has large impacts on the quality of life, with severe diseases having a greater impact on the life of an individual. As substantial resources are devoted to preventing and treating disease/injury, measuring this non-fatal burden has important implications for public health policy and planning.

In this report, the burden of living with illness is measured as the years lived with disability (YLD; see Box 3.1), also expressed as the non-fatal burden—where 1 YLD is 1 year of healthy life lost due to living with the impacts of disease or injury.

What is the overall non-fatal burden in Australia?

In 2018, Australians lost 2.6 million years of healthy life from living with the impacts of disease and injury. After adjusting for age, the rate of non-fatal burden was 98.1 YLD per 1,000 population, 17% higher than the rate of fatal burden (84 YLL per 1,000 population) (Chapter 2), and similar to the rate of non-fatal burden in 2003 (97.9 YLD per 1,000) (Chapter 7).

Overall, females experienced slightly more non-fatal burden than males (contributing to 53% and 47% of the total non-fatal burden, respectively). In total, in 2018, females lost around 143,000 more years of healthy life from living with the impacts of disease and injury than males.

Box 3.1: How is years lived with disability calculated?

The calculation of YLD can be complex, but in simple terms it incorporates:

- the number of people with the disease and the consequences of the disease (the consequences are referred to as 'sequelae') during the reference year
- the duration of the disease sequelae (duration is expressed as a fraction of a year)
- the severity of the ill health associated with the disease sequelae (referred to as the 'disability weight'; see Box 1.2).

The YLD experienced by the Australian population is calculated for each disease in the ABDS 2018, for each of the reference years. The number of people with the disease sequelae is multiplied by the duration of the sequelae to obtain point prevalence. The point prevalence is then multiplied by the disability weight to obtain the YLD.

For example, stroke has 2 sequelae: acute stroke (initial consequence) and chronic stroke (long-term consequence). The YLD for each sequela is estimated as follows: number of people suffering from acute (or chronic) stroke in a reference year x duration (out of 1 year) x disability weight (scale of 0–1). The total number of healthy years lost from living with stroke is obtained by adding the YLD for acute and chronic stroke.

For more detailed information on estimating YLD, see Appendix A.

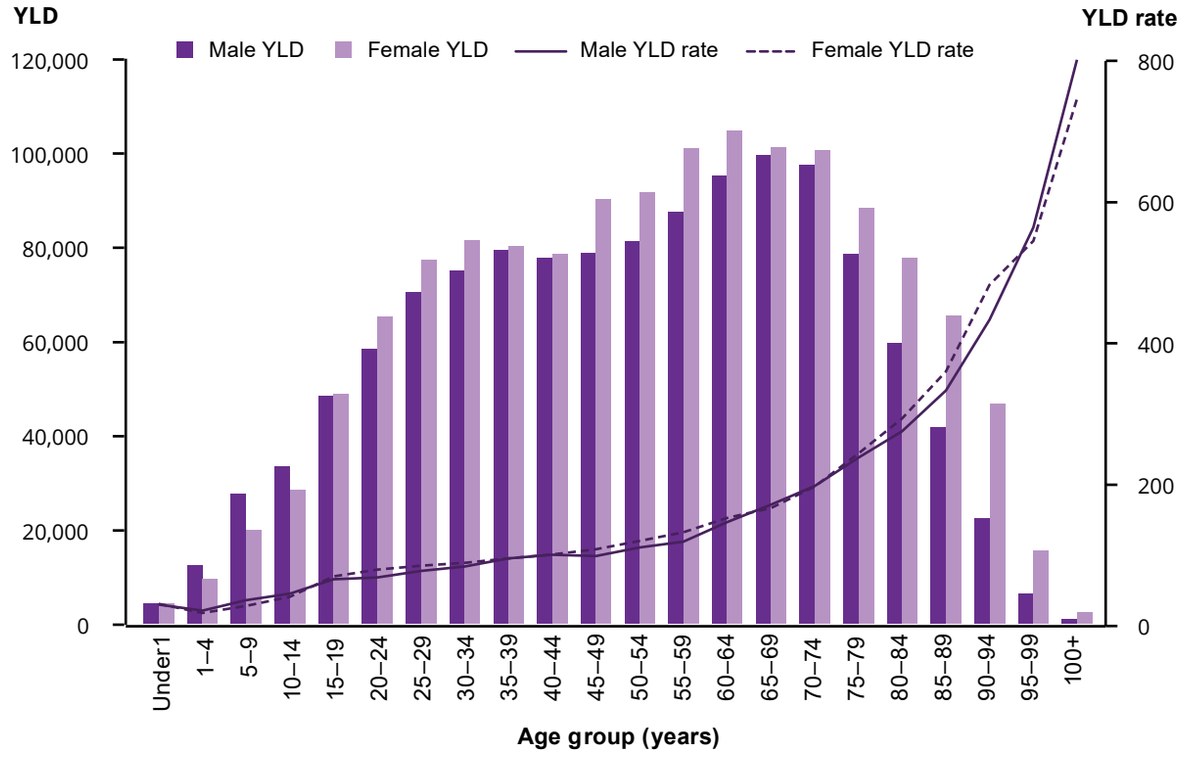
How does living with illness vary across the life course?

Australians experienced more burden from living with disease and injury as they aged. This section describes how the rate of non-fatal burden (expressed as YLD per 1,000 population) changed at various stages of life.

The rate of non-fatal burden was low in infants and children aged 1–4 and increased steadily from childhood through to middle age (Figure 3.1). From age 75, the rate of non-fatal burden rose rapidly and peaked in the oldest Australians who are most burdened by diseases and injuries.

Males and females experienced similar rates of non-fatal burden across the life course (Figure 3.1). Compared with females, though, males lost more healthy years of life in young people aged 1–14 while females lost more healthy years of life in those aged 45–64 and those aged 75 and over.

Figure 3.1: Number and rates of non-fatal burden (YLD, YLD per 1,000 population), by age group and sex, 2018

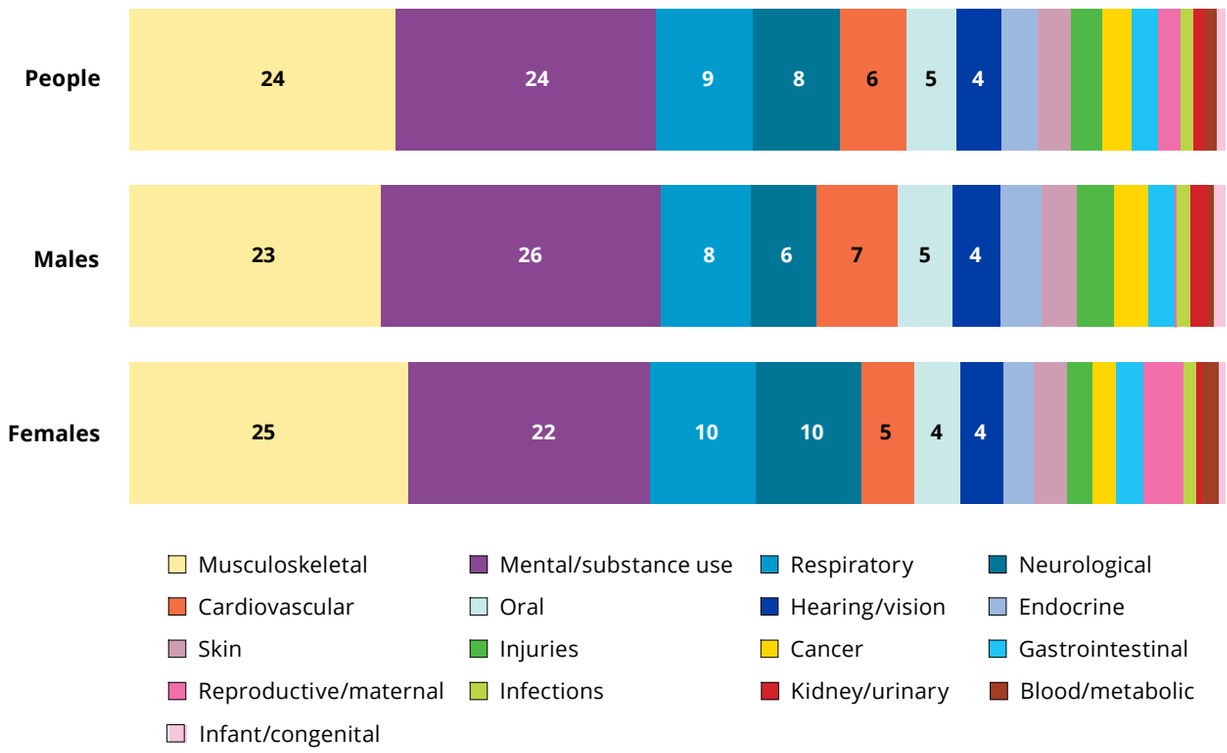


Which disease groups cause the most non-fatal burden?

This section describes non-fatal burden (YLD) for each of the 17 disease groups (comprising related diseases/conditions) in the ABDS 2018. The contribution to non-fatal burden by each disease group is shown in Figure 3.2 and Table 3.1.

Nearly half of the non-fatal burden in Australia was caused by musculoskeletal conditions (24%) and mental & substance use disorders (24%). Other important contributors were respiratory diseases (8.9%), neurological conditions (7.9%) and cardiovascular diseases (6.1%). These disease groups have been the leading 5 causes of non-fatal burden since 2003.

Figure 3.2: Proportion (%) of non-fatal burden (YLD), by disease group and sex, 2018



Males and females are affected differently by disease groups

While both sexes are affected by the same 5 leading disease groups for non-fatal burden as described earlier in this section, they are not affected equally. Mental & substance use disorders and cardiovascular diseases caused a larger proportion of non-fatal burden in males (26% and 7.4%, respectively) than in females (22% and 4.9%, respectively), as shown in Table 3.1. Musculoskeletal conditions, neurological conditions and respiratory diseases caused a larger proportion of the burden in females (25%, 9.7% and 9.6%, respectively) than in males (23%, 6.0% and 8.2%, respectively).

Among the lower ranking disease groups, males and females experienced similar proportions and rates of non-fatal burden due to skin disorders, gastrointestinal disorders, infectious diseases and hearing & vision disorders. However, relative to females, males experienced higher rates of non-fatal burden due to kidney & urinary diseases and infant & congenital conditions. Females experienced higher rates of blood & metabolic disorders compared to males. Females also experienced higher rates of non-fatal burden due to reproductive & maternal conditions, which is expected as most of the diseases within this group only affect females.

Table 3.1: Comparison of non-fatal burden (YLD, YLD%, YLD ASR), by disease group and sex, 2018

	Males				Females			
Rank	Disease group	YLD	Proportion (%)	ASR	Disease group	YLD	Proportion (%)	ASR
1	Mental/substance use	316,414	25.6	26.3	Musculoskeletal	351,335	25.5	25.0
2	Musculoskeletal	283,137	22.9	21.5	Mental/substance use	303,862	22.1	24.8
3	Respiratory	100,947	8.2	7.8	Neurological	133,162	9.7	8.8
4	Cardiovascular	90,997	7.4	6.6	Respiratory	132,515	9.6	9.4
5	Neurological	74,374	6.0	5.7	Cardiovascular	67,100	4.9	4.0
6	Oral	61,894	5.0	4.8	Oral	56,673	4.1	4.1
7	Hearing/vision	54,572	4.4	4.0	Hearing/vision	54,669	4.0	3.4
8	Endocrine	46,337	3.8	3.4	Reproductive/ maternal	51,217	3.7	4.0
9	Injuries	41,864	3.4	3.3	Skin	41,819	3.0	3.4
10	Skin	39,293	3.2	3.2	Endocrine	37,781	2.7	2.5
11	Cancer	38,596	3.1	2.8	Gastrointestinal	33,672	2.4	2.5
12	Gastrointestinal	30,409	2.5	2.4	Injuries	31,688	2.3	2.2
13	Kidney/urinary	19,986	1.6	1.4	Cancer	30,775	2.2	2.0
14	Infections	15,038	1.2	1.2	Blood/metabolic	20,645	1.5	1.5
15	Infant/congenital	12,560	1.0	1.0	Infections	15,551	1.1	1.2
16	Blood/metabolic	6,633	0.5	0.5	Infant/congenital	7,792	0.6	0.6
17	Reproductive/ maternal	2,220	0.2	0.2	Kidney/urinary	7,655	0.6	0.5
	Total	**1,235,270**	**100.0**	**96.1**	**Total**	**1,377,908**	**100.0**	**99.9**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed as YLD per 1,000 population (YLD ASR).
2. Numbers and percentages shown for disease groups may not add up to the total due to rounding.

Which diseases cause the most non-fatal burden?

In 2018, almost two-thirds of the non-fatal burden in Australia was due to the impacts of living with 20 high-burden diseases and injuries. Rankings for these top 20 diseases/injuries are shown in Table 3.2.

For both males and females, the leading causes of non-fatal burden were back pain & problems, anxiety disorders and depressive disorders, followed by asthma (ranked fourth in males and fifth in females). Males and females experienced similar amounts of non-fatal burden due to hearing loss, dental caries and dermatitis & eczema, however, for other diseases there were substantial differences between the sexes.

Compared with females, males experienced 1.6 times the non-fatal burden from coronary heart disease. Whereas, compared with males, females experienced twice the amount of non-fatal burden from dementia, 1.8 times from osteoarthritis, and 1.5 times from both anxiety disorders and rheumatoid arthritis.

Alcohol use disorders, autism spectrum disorders, drug use disorders (excluding alcohol) and schizophrenia were among the 20 leading causes of non-fatal burden for males, but not for females. Migraine, genital prolapse, eating disorders and falls were ranked in the top 20 leading causes of non-fatal burden for females, but not for males.

Table 3.2: Leading 20 causes of non-fatal burden (YLD), by sex, 2018

Rank	Males	YLD	% of total	Females	YLD	% of total	People	YLD	% of total
1	Back pain & problems	110,858	9.0	Back pain & problems	110,164	8.0	Back pain & problems	221,023	8.5
2	Anxiety disorders	62,019	5.0	Anxiety disorders	94,625	6.9	Anxiety disorders	156,644	6.0
3	Depressive disorders	60,200	4.9	Depressive disorders	81,920	5.9	Depressive disorders	142,121	5.4
4	Asthma	55,204	4.5	Osteoarthritis	76,133	5.5	Asthma	123,315	4.7
5	Alcohol use disorders	47,563	3.9	Asthma	68,110	4.9	Osteoarthritis	119,497	4.6
6	Osteoarthritis	43,364	3.5	Rheumatoid arthritis	62,271	4.5	Rheumatoid arthritis	103,464	4.0
7	Coronary heart disease	42,297	3.4	Dementia	57,710	4.2	Dementia	86,483	3.3
8	Hearing loss	41,634	3.4	COPD	51,004	3.7	COPD	84,534	3.2
9	Rheumatoid arthritis	41,193	3.3	Hearing loss	36,935	2.7	Hearing loss	78,569	3.0
10	Type 2 diabetes mellitus	38,173	3.1	Migraine	33,246	2.4	Coronary heart disease	68,843	2.6
11	Autism spectrum disorders	33,773	2.7	Eating disorders	30,312	2.2	Type 2 diabetes mellitus	68,173	2.6
12	COPD	33,529	2.7	Type 2 diabetes mellitus	30,000	2.2	Alcohol use disorders	63,693	2.4
13	Drug use disorders (excluding alcohol)	30,829	2.5	Coronary heart disease	26,547	1.9	Dental caries	48,902	1.9
14	Dementia	28,773	2.3	Bipolar affective disorder	23,307	1.7	Migraine	46,403	1.8
15	Dental caries	26,029	2.1	Dental caries	22,874	1.7	Drug use disorders (excluding alcohol)	46,158	1.8
16	Atrial fibrillation & flutter	24,011	1.9	Genital prolapse	21,651	1.6	Autism spectrum disorders	42,589	1.6
17	Schizophrenia	23,902	1.9	Falls	20,317	1.5	Bipolar affective disorder	42,121	1.6
18	Periodontal disease	23,623	1.9	Periodontal disease	18,417	1.3	Atrial fibrillation & flutter	42,040	1.6
19	Bipolar affective disorder	18,814	1.5	Atrial fibrillation & flutter	18,029	1.3	Periodontal disease	42,040	1.6
20	Dermatitis & eczema	17,738	1.4	Dermatitis & eczema	18,002	1.3	Eating disorders	41,479	1.6
	Top 20 diseases	*803,526*	*65.0*	*Top 20 diseases*	*901,575*	*65.4*	*Top 20 diseases*	*1,668,091*	*63.8*
	All other diseases	*431,744*	*35.0*	*All other diseases*	*476,333*	*34.6*	*All other diseases*	*945,088*	*36.2*
	Total	**1,235,270**	**100.0**	**Total**	**1,377,908**	**100.0**	**Total**	**2,613,178**	**100.0**

Colour legend: % of total non-fatal burden. ≥ 5% 4–5% 3–4% 2–3% 0–2%

COPD = chronic obstructive pulmonary disease.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Due to rounding, the sum of the YLD shown for males and females may not equal the YLD shown for people.

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How does non-fatal disease burden vary across the life course?

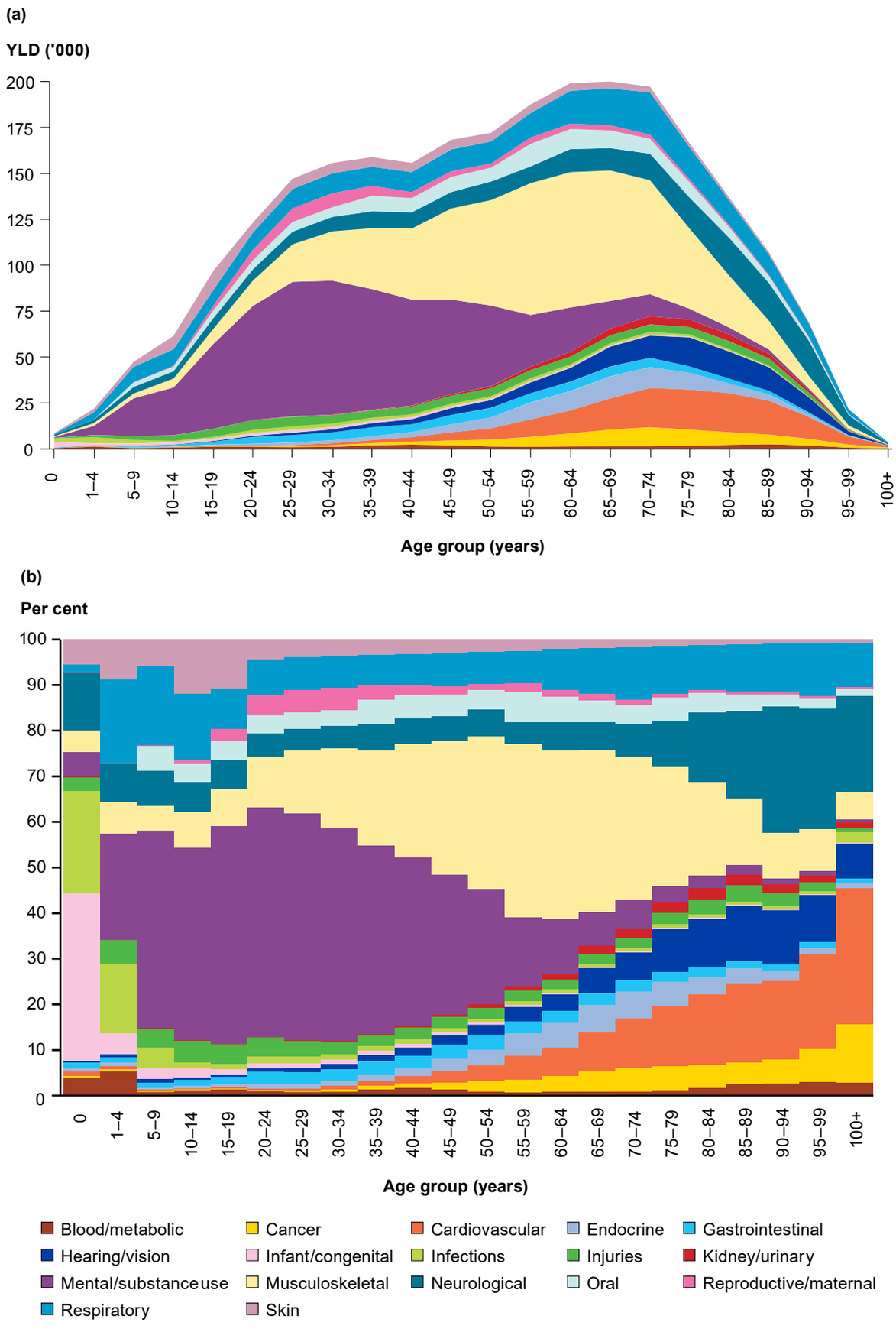
People experience different health problems at different times of their lives—from childhood through to old age. Hence, they have different health needs at different ages and life stages. This section outlines the important disease groups and individual diseases that caused the most non-fatal burden for Australians in different age groups.

Variation by disease group

Figure 3.3 shows the amount (3.3a) and relative proportion (3.3b) of non-fatal burden (YLD) contributed by each disease group across the life course in 2018.

- Infectious diseases caused 17% of the non-fatal burden for infants and young children (those aged under 5), but contributed approximately 1% to non-fatal burden among Australians aged 5 and over.
- Respiratory diseases was among the leading disease groups causing non-fatal burden in Australians, across most age groups. In particular, these diseases caused 16% of the non-fatal burden in young Australians aged 1–14.
- Mental & substance use disorders caused the largest non-fatal burden for Australians aged under 50 (42% of the burden), except for infants. This disease group contributed to a much lower proportion of the non-fatal burden among those aged over 50 (9%).
- Musculoskeletal conditions caused substantial non-fatal burden from age 20 through to the oldest Australians. In particular, this disease group was the predominant cause of non-fatal burden in Australians aged 50–84, contributing to almost one-third of the non-fatal burden for this age group.
- Among Australians aged under 65, cardiovascular diseases and hearing & vision disorders caused 2.3% and 1.9% of the non-fatal burden, respectively. However, among Australians aged 65 and over, this increased considerably to 13% (cardiovascular diseases) and 8.6% (hearing & vision disorders).
- Neurological conditions (which includes dementia) also accounted for greater proportions of non-fatal burden as age increased. For Australians aged 85 and over, neurological conditions were the dominant cause of non-fatal burden (23%).

Figure 3.3: Number (a) and relative proportion (b) of non-fatal burden (YLD), by disease group and age group, 2018



Leading causes of non-fatal burden at various life stages

The leading 10 causes of non-fatal burden for males and females at various life stages are shown in figures 3.4 and 3.5, respectively.

Infants and young children (aged under 5)

- Infants and young children suffered the most non-fatal burden from asthma and dermatitis & eczema, together contributing to around one-fifth of the burden for this group.
- Most of the other leading causes of non-fatal burden in this age group were the same for both boys and girls (epilepsy, anxiety, intellectual disability, protein energy deficiency, falls, conduct disorders and lower respiratory infections, including influenza & pneumonia), however, the causes were ranked differently.
- Notable differences between the sexes were that rheumatoid arthritis was ranked fifth for girls (not in the leading 10 causes for boys) and autism spectrum disorders was ranked sixth for boys (not in the leading 10 causes for girls).

Children (aged 5–14)

- Asthma, anxiety, depressive disorders, conduct disorders and epilepsy caused the highest non-fatal burden in this age group. Girls experienced higher burden from depressive disorders, whereas boys experienced higher burden from asthma and conduct disorders.
- Autism spectrum disorders was ranked as the third highest cause of non-fatal burden for boys, and the 10th for girls. Back pain & problems was ranked ninth for girls, but not ranked in the top 10 for boys.
- Dental caries, acne and dermatitis & eczema were among the top 10 causes of non-fatal burden for both boys and girls.

Adolescents and young adults (aged 15–24)

- The leading cause of non-fatal burden for males was alcohol use disorders (ranked eighth in females), while in females it was anxiety disorders (ranked fourth in males).
- Depressive and bipolar affective disorders were in the top 10 causes for both males and females. Eating disorders was in the top 10 for females, but not for males. Drug use and autism spectrum disorders were in the top 10 for males, but not for females.
- Asthma was once again in the leading 10 causes of non-fatal burden for males and females, however, it contributed proportionally less burden compared to the previous age group (5–14). A similar trend was seen for acne in girls and for dental caries in boys.
- For females in this age group, polycystic ovarian syndrome and migraine appeared in the leading 10 causes, ranked seventh and 10th.

Adults (aged 25–44)

- In this age group, back pain & problems, followed by alcohol use disorders, caused the most non-fatal burden in men, while anxiety disorders, followed by back pain & problems, caused the most non-fatal burden in women.
- For males, the other leading causes of non-fatal burden in this age group were largely the same as in the previous age group (15–24), with the exception of acne which was no longer ranked in the top 10 and schizophrenia which was ranked seventh.
- Similarly, for women, many of the leading causes of non-fatal burden in the previous age group (15–24) remained as leading causes in this age group. Notable changes were that drug use disorders and dental caries appeared in the top 10 for this age group. Additionally, migraine increased in ranking and YLD, while polycystic ovarian syndrome and bipolar affective disorders decreased in ranking but increased in YLD.

Adults (aged 45–74)

- Among adults aged 45–74, back pain & problems was the leading cause of non-fatal burden for men, whereas for women back pain & problems and osteoarthritis were the leading causes of non-fatal burden.
- Asthma, anxiety disorders and depressive disorders continued to be among the leading 10 causes for both men and women but decreased in ranking with increasing age.
- Meanwhile, other chronic conditions appeared among the top 10 causes of non-fatal burden for men and women. Rheumatoid arthritis, COPD and type 2 diabetes had similar rankings between men and women, whereas coronary heart disease and hearing loss were ranked higher for men and migraine, dementia and genital prolapse were ranked higher for women.

Older people (aged 75 and over)

- Older Australians experienced the majority of non-fatal burden from a range of chronic and age-related diseases. For men and women, dementia, coronary heart disease and COPD were in the top 3 causes of non-fatal burden. Hearing loss was also in the top 3 for men, whereas osteoarthritis was in the top 3 for women.
- Other causes of non-fatal burden that appeared among the top 10 were atrial fibrillation, macular degeneration, rheumatoid arthritis and back pain & problems for both sexes; enlarged prostate and prostate cancer for men; and falls and protein-energy deficiency for women.

Figure 3.4: Leading causes of non-fatal burden (YLD '000; proportion %) for males, by age group, 2018

Rank	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
	Age group (years)								
1st	Asthma (2.3; 13.7%)	Asthma (9.7; 15.8%)	Alcohol use disorders (11.5; 10.7%)	Back pain and problems (33.4; 11.1%)	Back pain and problems (20.8; 13.0%)	Back pain and problems (22.1; 12.1%)	Back pain and problems (16.9; 8.6%)	Hearing loss (11.2; 8.1%)	Dementia (10.7; 15.0%)
2nd	Dermatitis and eczema (1.0; 6.1%)	Anxiety disorders (7.4; 12.2%)	Depressive disorders (8.5; 8.0%)	Alcohol use disorders (27.8; 9.2%)	Anxiety disorders (12.0; 7.5%)	Rheumatoid arthritis (11.6; 6.3%)	COPD (13.3; 6.7%)	Coronary heart disease (10.5; 7.6%)	Coronary heart disease (7.6; 10.6%)
3rd	Intellectual disability (1.0; 5.9%)	Autism spectrum disorders (5.3; 8.7%)	Asthma (7.8; 7.3%)	Depressive disorders (27.0; 8.9%)	Depressive disorders (10.6; 6.7%)	Osteoarthritis (11.4; 6.2%)	Type 2 diabetes (12.6; 6.4%)	Dementia (9.4; 6.8%)	COPD (5.2; 7.4%)
4th	Epilepsy (0.8; 5.0%)	Conduct disorder (4.9; 8.1%)	Anxiety disorders (7.3; 6.8%)	Anxiety disorders (23.7; 7.8%)	Alcohol use disorders (7.0; 4.4%)	Type 2 diabetes (10.1; 5.5%)	Osteoarthritis (12.5; 6.4%)	COPD (8.6; 6.2%)	Hearing loss (5.0; 7.0%)
5th	Anxiety disorders (0.8; 4.8%)	Depressive disorders (4.3; 7.1%)	Back pain and problems (7.0; 6.6%)	Drug use disorders (17.6; 5.8%)	Asthma (6.9; 4.3%)	Coronary heart disease (7.7; 4.2%)	Coronary heart disease (12.1; 6.1%)	Type 2 diabetes (7.3; 5.3%)	Atrial fibrillation (3.4; 4.8%)
6th	Autism spectrum disorders (0.8; 4.6%)	Epilepsy (3.0; 5.0%)	Drug use disorders (6.0; 5.6%)	Asthma (14.5; 4.8%)	Rheumatoid arthritis (6.7; 4.2%)	Anxiety disorders (6.9; 3.8%)	Hearing loss (10.4; 5.3%)	Atrial fibrillation (7.3; 5.3%)	Prostate cancer (2.4; 3.4%)
7th	Protein-energy deficiency (0.6; 3.4%)	Dental caries (2.6; 4.3%)	Acne (4.5; 4.3%)	Schizophrenia (12.9; 4.3%)	Osteoarthritis (6.6; 4.1%)	Hearing loss (6.7; 3.7%)	Rheumatoid arthritis (9.6; 4.9%)	Back pain and problems (7.0; 5.1%)	Macular degeneration (2.1; 2.9%)
8th	Conduct disorder (0.5; 3.0%)	Attention deficit hyperactivity disorder (2.1; 3.4%)	Autism spectrum disorders (4.5; 4.2%)	Bipolar affective disorder (10.6; 3.5%)	Type 2 diabetes (4.6; 2.9%)	Asthma (6.4; 3.5%)	Atrial fibrillation (7.1; 3.6%)	Osteoarthritis (6.5; 4.7%)	Rheumatoid arthritis (2.1; 2.9%)
9th	Lower respiratory infections (0.4; 2.3%)	Acne (2.0; 3.3%)	Bipolar affective disorder (4.4; 4.1%)	Autism spectrum disorders (9.9; 3.3%)	Autism spectrum disorders (4.4; 2.7%)	Periodontal disease (5.2; 2.9%)	Dementia (6.2; 3.2%)	Rheumatoid arthritis (5.4; 3.9%)	Back pain and problems (1.8; 2.6%)
10th	Falls (0.4; 2.3%)	Dermatitis and eczema (2.0; 3.2%)	Dental caries (3.6; 3.4%)	Dental caries (8.2; 2.7%)	Drug use disorders (4.4; 2.7%)	Depressive disorders (4.6; 2.5%)	Prostate cancer (4.8; 2.4%)	Enlarged prostate (3.6; 2.6%)	Osteoarthritis (1.8; 2.5%)

COPD = chronic obstructive pulmonary disease. See Appendix D, Box D1 for ABDS 2018 disease group colour legend.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Lower respiratory infections includes influenza and pneumonia.

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Figure 3.5: Leading causes of non-fatal burden (YLD '000; proportion %) for females, by age group, 2018

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Asthma (1.4; 10.6%)	Anxiety disorders (6.4; 13.4%)	Anxiety disorders (14.9; 13.1%)	Anxiety disorders (37.9; 12.0%)	Back pain and problems (20.7; 11.4%)	Back pain and problems (20.6; 10.0%)	Osteoarthritis (22.0; 10.9%)	Dementia (15.7; 9.4%)	Dementia (31.1; 23.9%)
2nd	Dermatitis and eczema (1.0; 7.0%)	Asthma (6.0; 12.4%)	Depressive disorders (11.8; 10.3%)	Back pain and problems (33.2; 10.5%)	Anxiety disorders (17.6; 9.7%)	Osteoarthritis (19.5; 9.5%)	Back pain and problems (16.0; 8.0%)	COPD (14.4; 8.7%)	COPD (12.4; 9.6%)
3rd	Epilepsy (0.9; 6.4%)	Depressive disorders (5.0; 10.4%)	Eating disorders (9.2; 8.1%)	Depressive disorders (31.5; 9.9%)	Depressive disorders (14.5; 8.0%)	Rheumatoid arthritis (16.5; 8.0%)	COPD (14.3; 7.1%)	Osteoarthritis (12.8; 7.7%)	Coronary heart disease (8.9; 6.9%)
4th	Anxiety disorders (0.6; 4.5%)	Conduct disorder (3.0; 6.2%)	Asthma (7.5; 6.6%)	Asthma (20.6; 6.5%)	Osteoarthritis (11.0; 6.1%)	Anxiety disorders (11.7; 5.7%)	Rheumatoid arthritis (13.9; 6.9%)	Hearing loss (12.5; 7.5%)	Hearing loss (8.7; 6.7%)
5th	Rheumatoid arthritis (0.6; 4.1%)	Epilepsy (2.9; 6.0%)	Back pain and problems (7.0; 6.1%)	Eating disorders (18.1; 5.7%)	Asthma (10.3; 5.7%)	Depressive disorders (10.3; 5.0%)	Type 2 diabetes (8.8; 4.4%)	Rheumatoid arthritis (9.5; 5.7%)	Osteoarthritis (4.9; 3.8%)
6th	Protein-energy deficiency (0.5; 4.0%)	Acne (2.7; 5.7%)	Bipolar affective disorder (6.1; 5.3%)	Migraine (13.6; 4.3%)	Rheumatoid arthritis (9.7; 5.3%)	Asthma (9.7; 4.7%)	Dementia (8.1; 4.0%)	Back pain and problems (8.2; 4.9%)	Atrial fibrillation (4.9; 3.8%)
7th	Intellectual disability (0.5; 3.6%)	Dental caries (2.5; 5.1%)	Polycystic ovarian syndrome (5.5; 4.8%)	Bipolar affective disorder (11.6; 3.7%)	Migraine (7.1; 3.9%)	Type 2 diabetes (7.4; 3.6%)	Hearing loss (7.8; 3.9%)	Coronary heart disease (7.0; 4.2%)	Falls (4.5; 3.4%)
8th	Lower respiratory infections (0.4; 2.8%)	Dermatitis and eczema (1.9; 3.9%)	Alcohol use disorders (5.1; 4.5%)	Polycystic ovarian syndrome (10.8; 3.4%)	Dental caries (3.7; 2.0%)	COPD (7.3; 3.5%)	Asthma (7.7; 3.8%)	Atrial fibrillation (6.2; 3.8%)	Macular degeneration (3.7; 2.9%)
9th	Falls (0.3; 2.3%)	Back pain and problems (1.5; 3.2%)	Acne (4.1; 3.6%)	Drug use disorders (8.4; 2.7%)	Type 2 diabetes (3.6; 2.0%)	Genital prolapse (5.9; 2.8%)	Coronary heart disease (5.5; 2.7%)	Type 2 diabetes (5.8; 3.5%)	Rheumatoid arthritis (3.5; 2.7%)
10th	Conduct disorder (0.3; 2.2%)	Autism spectrum disorders (1.3; 2.7%)	Migraine (3.8; 3.3%)	Dental caries (7.4; 2.3%)	Genital prolapse (3.6; 2.0%)	Migraine (4.8; 2.3%)	Depressive disorders (5.5; 2.7%)	Falls (4.4; 2.7%)	Protein-energy deficiency (2.8; 2.1%)

COPD = chronic obstructive pulmonary disease. See Appendix D, Box D1 for ABDS 2018 disease group colour legend.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Lower respiratory infections includes influenza and pneumonia.

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4 Fatal burden of disease

Key results

- In 2018, Australians lost 2.4 million years of life due to dying from disease and injury (fatal burden).
- The overall rate of fatal burden was 84 YLL per 1,000 population in 2018 and had reduced substantially since 2003. Most disease groups had lower rates of fatal burden over time.
- Overall, males experienced a 61% higher rate of fatal burden (104 YLL per 1,000 population) than females (65 YLL per 1,000 population).
- Throughout the life course, the rate of fatal burden was relatively high in infants and dropped in childhood before increasing steadily with age.
- Dying from injuries (mainly suicide & self-inflicted injuries, poisoning and road traffic injuries) was the predominant cause of fatal burden in adolescents and young adults (aged 15–24).
- Injuries were also the leading causes of fatal burden in adults aged 25–44. Some cancers (bowel, breast and brain) also appear in the top 10 for this age group, together with chronic liver disease.
- Coronary heart disease and cancer (mainly lung, breast and bowel) were the leading causes of fatal burden among adults aged 55–74.
- Cardiovascular diseases (mainly coronary heart disease and stroke), dementia and cancer caused the majority of fatal burden in older Australians (aged 75 and over).

Australians are now dying at older ages, reflecting the benefits of better health, hygiene and safety practices as well as improved medical interventions and technology. Measuring mortality from disease and injury and its associated burden on the population (discussed in detail in this chapter) is fundamental to public health planning and interventions.

In this report, the burden of dying prematurely due to disease and injury is measured as the years of life lost (YLL; see Box 4.1), also expressed as the fatal burden—where 1 YLL is 1 year of life lost due to dying from disease and injury. For more information about mortality data and methods, see Appendix A.

What is the overall fatal burden in Australia?

In 2018, Australians experienced 159,300 deaths from disease and injury, causing 2.4 million years of life lost. Over time, fatal burden declined substantially in Australia. There was a 24% reduction in the rate of fatal burden between 2003 and 2018 (from 111 YLL per 1,000 population to 84 after adjusting for age). This decline resulted from lower fatal burden in most of the disease groups. For detailed information on changes in fatal burden over time, see Chapter 7.

Box 4.1: How to interpret the years of life lost

Fatal burden is a measure of the years of life lost in the population due to dying from disease or injury, where 1 YLL is 1 year of life lost. The YLL associated with each death is based on 2 factors: the age at which death occurs and the life expectancy (according to an aspirational life table—see Appendix Table A2), which is the number of remaining years that a person would, on average, expect to live from that age.

At a population level, the total years of life lost for a disease is the sum of the number of deaths from the disease at each age multiplied by the life expectancy for each age of death. Diseases that usually cause deaths at younger ages (for example, birth trauma & asphyxia and cardiovascular defects) have a much higher average YLL per death than diseases that tend to cause deaths at older ages (for example, stroke and chronic kidney disease).

Therefore, a similar amount of fatal burden can result from a small number of deaths occurring at young ages or a large number of deaths occurring at older ages. See Appendix Figure D7 for a comparison of diseases with the highest and lowest average YLL per death.

Males suffered a higher rate of fatal burden

Males experienced substantially more years of life lost due to dying prematurely from disease and injury than females. In 2018, males lost around 409,443 more years of life than females and experienced 59% of the total fatal burden. When adjusted for differences in population size and age structures, males suffered a 61% higher rate of fatal burden (104 YLL per 1,000 population) than females (65 YLL per 1,000 population).

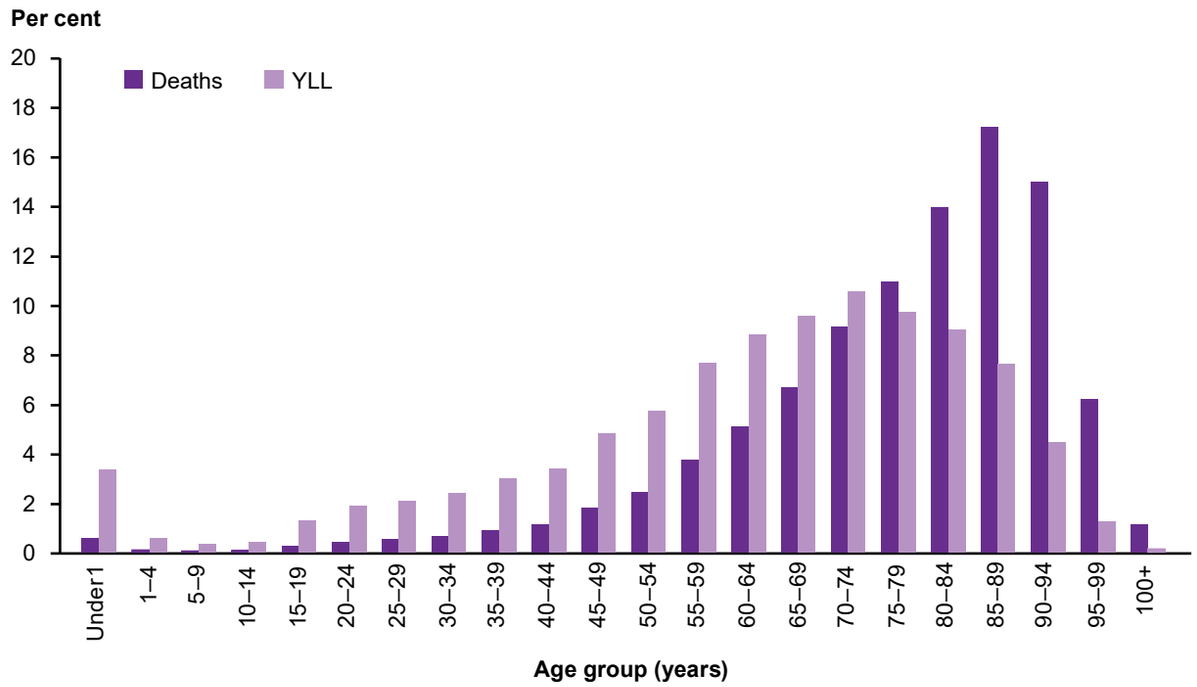
How does years of life lost vary at different ages?

Australians experienced varying numbers of deaths and amounts of fatal burden throughout the life course. Figure 4.1 shows the proportion of total deaths and fatal burden (YLL) contributed by different age groups in 2018.

Deaths among infants (those aged under 1) represented less than 1% of all deaths but contributed to 3.4% of the total fatal burden. As infants have the highest aspirational life expectancy, each death is associated with a large number of years of life lost. Young people (aged 1–14) had very few deaths; even with a high life expectancy for their age, they contributed the lowest amount of fatal burden compared to all other age groups under 100.

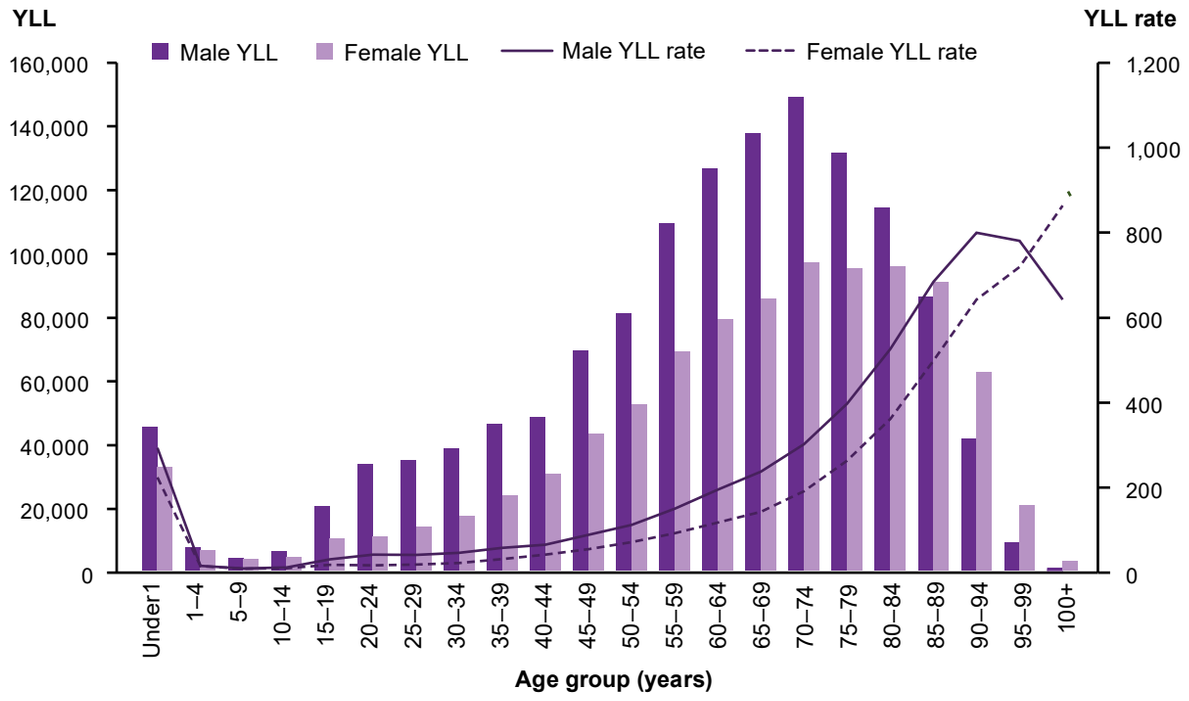
The number of deaths and fatal burden increased with increasing age, with 82% of the deaths and more than half the total fatal burden occurring in people aged 65 and over (see Appendix Table D1). A large number of deaths caused substantial fatal burden in Australians age 65–89, although each death resulted in fewer years of life lost as people approached the ideal life expectancy. The number of deaths reduced substantially in the oldest Australians (especially ages 95 and over) in line with a smaller population in this age group, resulting in lower fatal burden.

Figure 4.1: Proportion of fatal burden (YLL) and deaths, by age group, 2018



Males and females experienced similar patterns of fatal burden across the life course (Figure 4.2). Both sexes experienced high rates of fatal burden in infants and equally low rates of burden in children aged 1–14. As age increased, the rate of fatal burden also rose, especially from age 65 onwards, and was highest in the oldest Australians. Compared with females, males experienced a larger amount of fatal burden for those aged under 85 due to having more deaths, and higher rates of burden for most age groups across the life course. Fatal burden rates for males then decrease in the oldest age groups (95+ years).

Figure 4.2: Number and rates of fatal burden (YLL, YLL per 1,000 population), by age group and sex, 2018

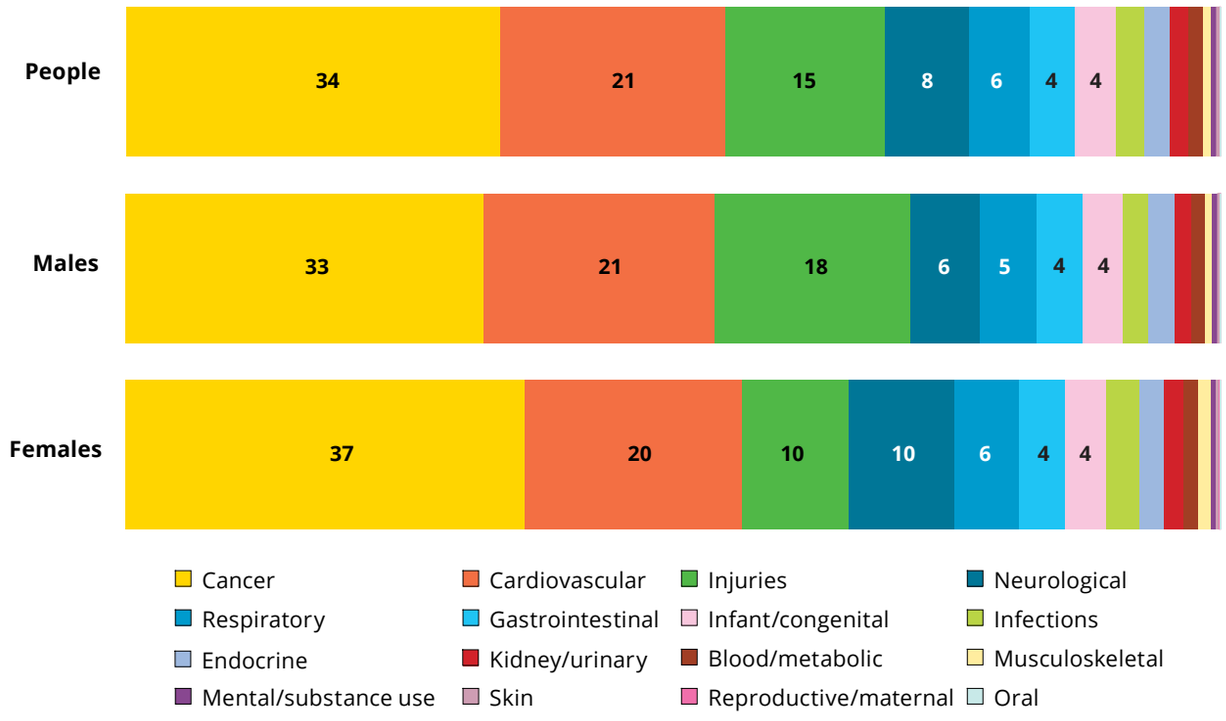


Which disease groups cause the most fatal burden?

The contribution of each of the 17 disease groups to fatal burden (YLL) in Australia is shown in Figure 4.3.

Dying from cancer (34% of total fatal burden) and cardiovascular diseases (21%) caused over half of the total fatal burden in Australia. Other major causes of fatal burden were injuries (15%), neurological conditions (7.7%) and respiratory diseases (5.5%).

Figure 4.3: Proportion (%) of fatal burden (YLL), by disease group and sex, 2018



Note: Hearing & vision disorders are excluded as they did not cause any fatal burden.

'Number of deaths' and 'age of death' influenced fatal burden within disease groups

Since fatal burden is determined by the number of deaths and the age at each death, both must be taken into account when interpreting the fatal burden of individual disease groups.

As an example, both injuries and cardiovascular diseases were leading causes of fatal burden but had substantially different numbers of deaths. For injuries, large fatal burden (18% in males and 9.8% in females) was the result of a small proportion of deaths (8.9% in males, 5.5% in females). These occurred, on average, at younger ages. On the other hand, cardiovascular diseases caused large fatal burden (21% in males and 20% in females) resulting from a much higher proportion of deaths (26% in males and 28% in females). These deaths were more likely to occur in older ages. This means that, on average, deaths from injuries resulted in more years of life lost than deaths from cardiovascular diseases.

Disease group burden differed by sex

Males and females suffered fatal burden from the same leading disease groups, as shown in Table 4.1. Males experienced a higher proportion of their fatal burden due to dying from injuries (18%) than females (9.8%); females experienced higher proportions of their fatal burden due to dying from cancer (37% compared with 33% for males) and neurological conditions (9.6% compared with 6.3% for males).

Males experienced higher rates of fatal burden for most disease groups than females. Notably, males had substantially higher rates from cancer, cardiovascular diseases, injuries and gastrointestinal disorders, while females experienced slightly higher rates from musculoskeletal conditions.

Table 4.1: Comparison of deaths and fatal burden (YLL, YLL%, YLL ASR), by disease group and sex, 2018

	Males						Females					
Rank	Disease group	Deaths (number)	Deaths (%)	YLL (number)	YLL (%)	ASR (YLL)	Disease group	Deaths (number)	Deaths (%)	YLL (number)	YLL (%)	ASR (YLL)
1	Cancer	27,430	33.1	453,820	32.7	32.7	Cancer	21,239	27.8	357,903	36.5	24.1
2	Cardiovascular	21,655	26.1	294,008	21.2	21.6	Cardiovascular	21,403	28	193,876	19.8	11.6
3	Injuries	7,413	8.9	248,558	17.9	20.3	Injuries	4,194	5.5	96,097	9.8	7.4
4	Neurological	8,064	9.7	87,849	6.3	6.5	Neurological	11,535	15.1	93,763	9.6	5.4
5	Respiratory	5,491	6.6	71,846	5.2	5.2	Respiratory	4,825	6.3	58,768	6	3.7
6	Gastrointestinal	3,348	4.0	58,974	4.2	4.4	Gastrointestinal	3,194	4.2	40,761	4.2	2.7
7	Infant/congenital	739	0.9	50,773	3.7	4.2	Infant/congenital	559	0.7	37,318	3.8	3.2
8	Endocrine	2,204	2.7	33,446	2.4	2.4	Infections	3,252	4.3	29,111	3	1.8
9	Infections	2,647	3.2	32,213	2.3	2.4	Endocrine	1,869	2.4	21,968	2.2	1.4
10	Kidney/urinary	1,795	2.2	21,368	1.5	1.6	Kidney/urinary	1,767	2.3	17,455	1.8	1.1
11	Blood/metabolic	890	1.1	18,199	1.3	1.4	Blood/metabolic	907	1.2	13,865	1.4	1.0
12	Musculoskeletal	590	0.7	7,876	0.6	0.6	Musculoskeletal	934	1.2	10,740	1.1	0.7
13	Mental/substance use	301	0.4	7,147	0.5	0.6	Mental/substance use	250	0.3	4,144	0.4	0.3
14	Skin	306	0.4	3,414	0.2	0.3	Skin	414	0.5	3,488	0.4	0.2
15	Reproductive/maternal	17	0.0	233	0.0	0.0	Reproductive/maternal	33	0.0	1,001	0.1	0.1
16	Oral	17	0.0	168	0.0	0.0	Oral	17	0.0	192	0.0	0.0
	Total	**82,909**	**100.0**	**1,389,892**	**100.0**	**104.0**	**Total**	**76,391**	**100.0**	**980,449**	**100.0**	**64.6**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed as YLL per 1,000 population (YLL ASR).
2. Numbers and percentages shown for disease groups may not add up to the total due to rounding.
3. As a result of rounding, very small percentages and rates are expressed as 0.0.
4. Rankings are based on the number of YLL.
5. Hearing & vision disorders are excluded as they did not cause any fatal burden.

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Which diseases cause the most fatal burden?

The leading 20 causes of fatal burden are presented in Table 4.2. Together, dying from these diseases and injuries accounted for 64% of the total years of life lost in Australia in 2018.

Coronary heart disease was the leading cause of fatal burden in both males and females and contributed to 12% and 7.9% of their total fatal burden, respectively. Other leading causes of fatal burden were suicide & self-inflicted injuries (ranked second) among males, and dementia (ranked third) and breast cancer (ranked fourth) among females. Lung cancer, stroke, bowel cancer and COPD featured among the top 10 for both sexes.

Although males and females shared similar leading causes, males experienced around 3 times the burden from suicide & self-inflicted injuries as females and notably more burden from coronary heart disease, poisoning, road traffic injuries to motor vehicle occupants, liver cancer and chronic liver disease. Despite having lower rankings for lung cancer, pancreatic cancer, falls, chronic kidney disease, and lower respiratory infections (including influenza and pneumonia) than females, males still had more years of life lost from these conditions. Among the shared leading 20 diseases, females only experienced more fatal burden from dementia and stroke than males.

Table 4.2: Leading 20 causes of fatal burden (YLL), by sex, 2018

Rank	Males	YLL	% of total	Females	YLL	% of total	People	YLL	% of total
1	Coronary heart disease	165,677	11.9	Coronary heart disease	77,525	7.9	Coronary heart disease	243,202	10.3
2	Suicide & self-inflicted injuries	105,387	7.6	Lung cancer	66,100	6.7	Lung cancer	156,307	6.6
3	Lung cancer	90,207	6.5	Dementia	64,900	6.6	Suicide & self-inflicted injuries	139,489	5.9
4	Stroke	52,848	3.8	Breast cancer	60,802	6.2	Dementia	111,473	4.7
5	Bowel cancer	51,426	3.7	Stroke	55,420	5.7	Stroke	108,268	4.6
6	COPD	50,057	3.6	COPD	41,889	4.3	COPD	91,945	3.9
7	Poisoning	49,589	3.6	Bowel cancer	39,672	4.0	Bowel cancer	91,098	3.8
8	Dementia	46,573	3.4	Suicide & self-inflicted injuries	34,102	3.5	Poisoning	69,049	2.9
9	Prostate cancer	37,979	2.7	Pancreatic cancer	23,595	2.4	Breast cancer	61,430	2.6
10	Chronic liver disease	36,465	2.6	Poisoning	19,461	2.0	Chronic liver disease	54,493	2.3
11	Pancreatic cancer	28,718	2.1	Ovarian cancer	18,335	1.9	Pancreatic cancer	52,313	2.2
12	Liver cancer	28,107	2.0	Chronic liver disease	18,028	1.8	Type 2 diabetes mellitus	44,294	1.9
13	Type 2 diabetes mellitus	27,473	2.0	Type 2 diabetes mellitus	16,822	1.7	Liver cancer	40,226	1.7
14	RTI–motor vehicle occupants	24,102	1.7	Falls	16,782	1.7	Brain & CNS cancer	38,611	1.6
15	Brain & CNS cancer	23,205	1.7	Lower respiratory infections	16,757	1.7	Prostate cancer	37,979	1.6
16	Falls	20,922	1.5	Chronic kidney disease	15,969	1.6	Falls	37,704	1.6
17	Oesophageal cancer	18,914	1.4	Brain & CNS cancer	15,405	1.6	Lower respiratory infections	35,513	1.5
18	Chronic kidney disease	18,793	1.4	Liver cancer	12,119	1.2	Chronic kidney disease	34,762	1.5
19	Lower respiratory infections	18,757	1.3	Unknown primary neoplasm	11,087	1.1	RTI–motor vehicle occupants	33,768	1.4
20	Melanoma of the skin	16,956	1.2	RTI–motor vehicle occupants	9,667	1.0	Melanoma of the skin	25,240	1.1
	Leading 20 diseases	*912,153*	*65.6*	*Leading 20 diseases*	*634,436*	*64.7*	*Leading 20 diseases*	*1,507,165*	*63.6*
	All other diseases	*477,739*	*34.4*	*All other diseases*	*346,013*	*35.3*	*All other diseases*	*863,176*	*36.4*
	Total	**1,389,892**	**100.0**	**Total**	**980,449**	**100.0**	**Total**	**2,370,341**	**100.0**

Colour legend: % of total fatal burden. ≥ 5% | 4–5% | 3–4% | 2–3% | 0–2%

CNS = central nervous system; RTI = road traffic injuries; COPD = chronic obstructive pulmonary disease.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Lower respiratory infections includes influenza and pneumonia.
3. Due to rounding, the sum of the YLL shown for males and females may not equal the YLL shown for people.

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How does fatal disease burden change across the life course?

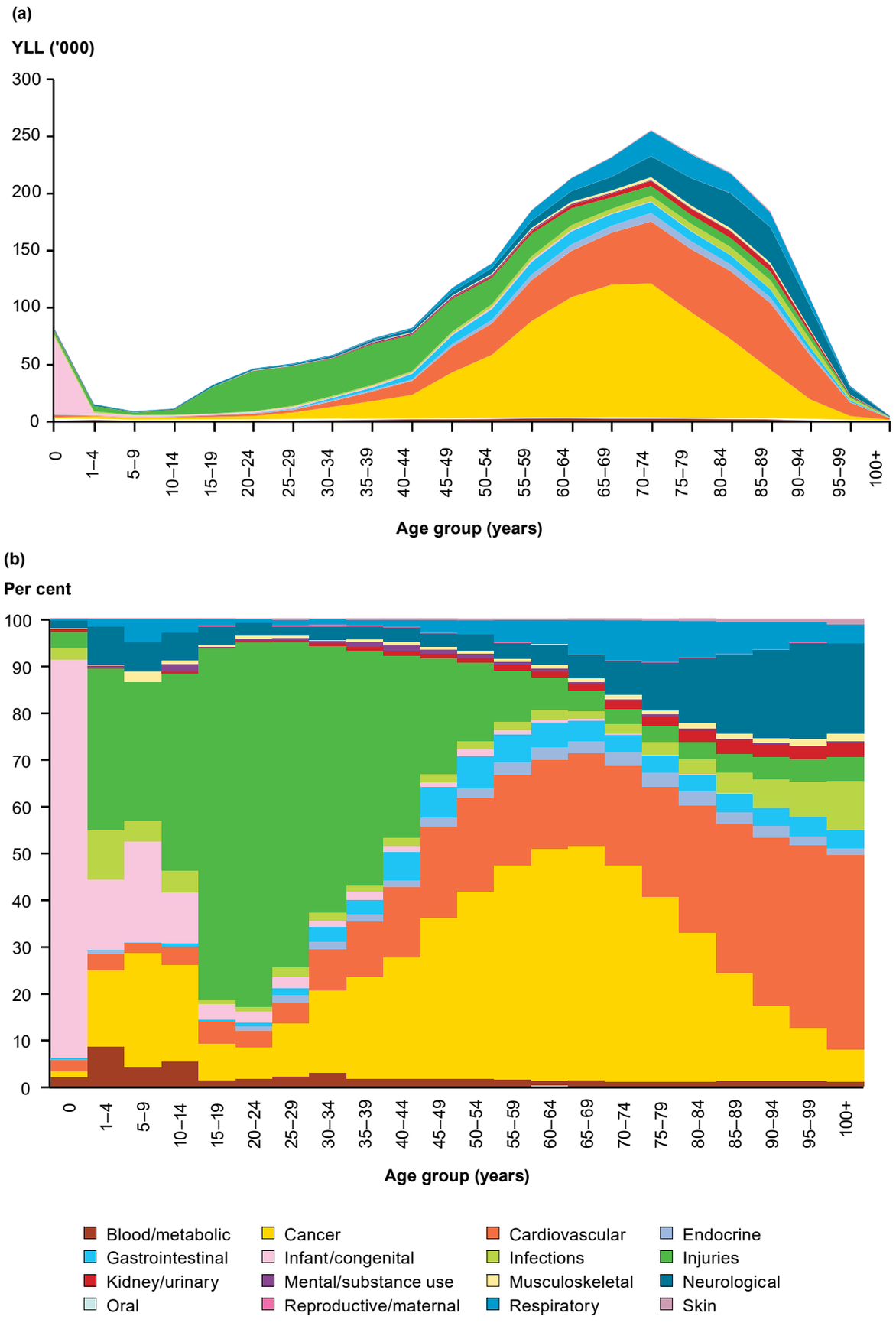
Australians at various stages of life died prematurely from different diseases and injuries. Hence, the patterns of fatal burden for leading disease groups and specific diseases changed throughout the life course.

Trends in burden for main disease groups

Figure 4.4 shows the amount (4.4a) and relative proportion (4.4b) of fatal burden contributed by each disease group across the life course in 2018.

- Infant & congenital conditions were the major cause of fatal burden in infants (aged under 1) (85%).
- Injuries were the predominant cause of fatal burden in Australians aged under 45 (excluding infants). Dying from injuries contributed to more than half (56%) of the total fatal burden in this age group but accounted for a lower proportion of fatal burden in older adults.
- Cancer was among the leading disease groups causing fatal burden in Australians of all ages (except infants). Dying from cancer was the predominant cause (43%) of fatal burden for those aged 45–84, but burden declined sharply from age 85.
- Cardiovascular diseases were a major cause of fatal burden from age 35 and contributed to more of the fatal burden with ageing. In particular, dying from cardiovascular diseases contributed 34% of the total fatal burden in Australians aged 85 and over.
- Neurological conditions (which includes dementia) were among the leading disease groups causing fatal burden in older Australians aged 75 and over and accounted for 15% of the burden in this group.

Figure 4.4: Number (a) and relative proportion (b) of fatal burden (YLL), by disease group and age group, 2018



Leading diseases and injuries causing fatal burden at various stages of life

The leading 10 diseases/injuries causing fatal burden for males and females at different stages of life are described in this section (see figures 4.5 and 4.6).

Infants and young children (aged under 5)

- Infants and young children experienced the majority of fatal burden from infant & congenital conditions, including pre-term & low birthweight complications, birth trauma & asphyxia, cardiovascular defects, SIDS and neonatal infections. Baby boys also had high fatal burden from neural tube defects and girls from brain malformations.
- Other high fatal burden diseases for this group included lower respiratory infections (including influenza and pneumonia) and homicide & violence (girls).

Children (aged 5–14)

- Among children aged 5–14, brain cancer, suicide & self-inflicted injuries, road traffic injury as a pedestrian, motor vehicle accidents, cerebral palsy, homicide & violence and asthma were among the leading causes of fatal burden in both boys and girls.
- For boys, epilepsy emerged among the leading 10 causes of fatal burden while girls experienced more fatal burden from brain malformations.

Adolescents and young adults (aged 15–24)

- A range of injuries caused major fatal burden in adolescents and adults, with suicide & self-inflicted injuries ranked as the leading cause for this group. Other high-burden injuries included road traffic injuries, poisoning, homicide & violence, drowning and falls (males).
- Epilepsy and cerebral palsy were also among the leading causes for this age group for both males and females. Instead of falls, brain malformations were among the leading 10 causes for fatal burden for females.

Adults (aged 25–44)

- A range of injuries continue to cause major fatal burden in adults aged 25–44, with suicide & self-inflicted injuries still ranked as the leading cause for this group. Other high-burden injuries included poisoning, road traffic injuries and homicide & violence (men).
- Both sexes experienced burden from a range of cancers, including bowel (ranked fifth in men and fourth in women) and brain cancer (ranked sixth in men and seventh in women). Breast cancer (ranked third) and cervical cancer (ranked eighth) were also in the top 10 leading causes of fatal burden for women.
- Coronary heart disease, chronic liver disease and stroke were also among the leading causes of fatal burden in adults aged 25–44.

Adults (aged 45–74)

- Among adults aged 45–74, coronary heart disease caused the most fatal burden in men while breast and lung cancer caused the most fatal burden in women.
- Bowel cancer, pancreatic cancer, stroke and chronic liver disease were among the 10 leading causes of fatal burden for both sexes; however, liver and prostate cancer were among the 10 leading causes of fatal burden for men and ovarian cancer for women.
- Although suicide & self-inflicted injuries and poisoning were still ranked among the leading causes of fatal burden, stroke, COPD, dementia and type 2 diabetes emerged as high-burden diseases in this group and contributed to an increasingly higher proportion of fatal burden with ageing.

Older people (aged 75 and over)

- Older Australians experienced the largest amount of fatal burden from coronary heart disease (ranked first for men) and dementia (ranked first for women), stroke and COPD.
- Many cancers (lung, bowel, prostate, breast and pancreatic cancer) were also among the 10 leading causes of fatal burden. Men and women also experienced high fatal burden from falls, lower respiratory infections (including influenza and pneumonia), chronic kidney disease, type 2 diabetes, Parkinson disease (men) and atrial fibrillation & flutter (women).

Figure 4.5: Leading causes of fatal burden (YLL '000; proportion %) for males, by age group, 2018

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Pre-term/LBW complications (11.5; 21.1%)	Brain/CNS cancer (1.1; 11.2%)	Suicide/self-inflicted injuries (23.0; 41.4%)	Suicide/self-inflicted injuries (47.3; 27.3%)	Coronary heart disease (22.4; 14.4%)	Coronary heart disease (35.3; 14.4%)	Coronary heart disease (39.4; 13.2%)	Coronary heart disease (34.7; 13.6%)	Coronary heart disease (24.7; 17.4%)
2nd	Birth trauma/ asphyxia (7.6; 13.9%)	Suicide/self-inflicted injuries (1.1; 10.6%)	RTI/motor vehicle occupant (7.9; 14.1%)	Poisoning (29.4; 17.0%)	Suicide/self-inflicted injuries (17.1; 11.0%)	Lung cancer (23.6; 9.6%)	Lung cancer (32.5; 10.9%)	Lung cancer (19.1; 7.5%)	Dementia (17.5; 12.3%)
3rd	Cardiovascular defects (4.5; 8.2%)	RTI/motor vehicle occupant (0.7; 6.7%)	Poisoning (4.3; 7.8%)	RTI/motor vehicle occupant (9.3; 5.4%)	Poisoning (10.1; 6.5%)	Bowel cancer (11.9; 4.9%)	COPD (16.0; 5.4%)	Dementia (18.4; 7.2%)	Stroke (10.3; 7.2%)
4th	SIDS (3.2; 5.8%)	Homicide/ violence (0.6; 6.2%)	RTI motorcyclist (1.5; 2.8%)	Coronary heart disease (9.0; 5.2%)	Chronic liver disease (9.6; 6.1%)	Chronic liver disease (11.8; 4.8%)	Bowel cancer (15.3; 5.1%)	COPD (15.3; 6.0%)	Prostate cancer (7.5; 5.3%)
5th	Neonatal infections (1.5; 2.8%)	Drowning (0.5; 4.6%)	RTI pedestrians (1.4; 2.6%)	Bowel cancer (4.4; 2.5%)	Lung cancer (8.7; 5.6%)	Suicide/self-inflicted injuries (11.3; 4.6%)	Prostate cancer (12.3; 4.1%)	Stroke (14.9; 5.8%)	COPD (7.1; 5.0%)
6th	Lower respiratory infections (1.2; 2.2%)	Cerebal palsy (0.4; 4.3%)	Homicide/ violence (1.4; 2.6%)	Brain/CNS cancer (4.4; 2.5%)	Bowel cancer (6.1; 3.9%)	Liver cancer (9.7; 4.0%)	Stroke (12.2; 4.1%)	Prostate cancer (13.0; 5.1%)	Falls (5.5; 3.8%)
7th	Neural tube defects (1.1; 2.1%)	RTI pedestrians (0.4; 3.8%)	Drowning (1.3; 2.4%)	Chronic liver disease (4.1; 2.3%)	Brain/CNS cancer (4.3; 2.7%)	COPD (8.6; 3.5%)	Pancreatic cancer (9.4; 3.2%)	Bowel cancer (10.2; 4.0%)	Lower respiratory infections (4.9; 3.5%)
8th	Cardiomyopathy (0.8; 1.4%)	Epilepsy (0.4; 3.7%)	Epilepsy (1.1; 2.0%)	Homicide/ violence (3.7; 2.1%)	Stroke (4.2; 2.7%)	Stroke (7.6; 3.1%)	Liver cancer (8.7; 2.9%)	Type 2 diabetes (6.8; 2.7%)	Lung cancer (4.3; 3.0%)
9th	Brain malformations (0.7; 1.3%)	Cardiovascular defects (0.3; 3.1%)	Falls (0.8; 1.4%)	RTI motorcyclist (3.4; 2.0%)	Pancreatic cancer (3.8; 2.4%)	Pancreatic cancer (7.1; 2.9%)	Type 2 diabetes (7.8; 2.6%)	Pancreatic cancer (5.9; 2.3%)	Chronic kidney disease (3.8; 2.6%)
10th	Urogenital malformations (0.6; 1.2%)	Asthma (0.3; 3.0%)	Cerebal palsy (0.6; 1.1%)	Stroke (2.9; 1.7%)	Liver cancer (3.5; 2.2%)	Type 2 diabetes (5.9; 2.4%)	Dementia (7.6; 2.6%)	Parkinson disease (5.8; 2.3%)	Bowel cancer (3.6; 2.5%)

LBW = low birthweight; CNS = central nervous system; RTI = road traffic injuries; SIDS = sudden infant death syndrome; COPD = chronic obstructive pulmonary disease. See Appendix D, Box D1 for ABDS 2018 disease group colour legend.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Lower respiratory infections includes influenza and pneumonia.

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Figure 4.6: Leading causes of fatal burden (YLL '000; proportion %) for females, by age group, 2018

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Pre-term/LBW complications (7.6; 18.8%)	Brain/CNS cancer (1.0; 13.0%)	Suicide/self-inflicted injuries (7.4; 34.7%)	Suicide/self-inflicted injuries (14.5; 16.6%)	Breast cancer (12.7; 12.8%)	Lung cancer (18.9; 12.3%)	Lung cancer (21.9; 11.6%)	Dementia (20.7; 10.5%)	Dementia (34.3; 18.7%)
2nd	Birth trauma/ asphyxia (5.1; 12.7%)	Suicide/self-inflicted injuries (0.8; 10.4%)	RTI/motor vehicle occupant (3.2; 15.1%)	Poisoning (8.4; 9.6%)	Lung cancer (7.0; 7.1%)	Breast cancer (16.4; 10.7%)	COPD (14.0; 7.4%)	Coronary heart disease (20.3; 10.3%)	Coronary heart disease (28.0; 15.3%)
3rd	Cardiovascular defects (2.8; 6.9%)	Brain malformations (0.6; 7.1%)	Poisoning (1.6; 7.7%)	Breast cancer (7.5; 8.6%)	Bowel cancer (5.7; 5.8%)	Bowel cancer (8.9; 5.8%)	Breast cancer (13.0; 6.9%)	Stroke (15.7; 7.9%)	Stroke (18.8; 10.2%)
4th	SIDS (1.8; 4.5%)	RTI/motor vehicle occupant (0.5; 5.9%)	Homicide/ violence (0.6; 2.8%)	Bowel cancer (4.0; 4.5%)	Poisoning (5.7; 5.7%)	Coronary heart disease (8.7; 5.7%)	Coronary heart disease (12.7; 6.7%)	Lung cancer (13.3; 6.7%)	Falls (7.1; 3.9%)
5th	Neonatal infections (1.3; 3.2%)	Cerebal palsy (0.4; 4.9%)	Brain/CNS cancer (0.3; 1.6%)	RTI/motor vehicle occupant (3.3; 3.7%)	Suicide/self-inflicted injuries (5.6; 5.6%)	COPD (7.0; 4.6%)	Stroke (9.0; 4.7%)	COPD (12.0; 6.1%)	COPD (6.7; 3.6%)
6th	Brain malformations (1.0; 2.4%)	RTI pedestrians (0.3; 3.9%)	Cerebal palsy (0.3; 1.6%)	Chronic liver disease (2.9; 3.3%)	Coronary heart disease (5.5; 5.5%)	Stroke (5.4; 3.5%)	Bowel cancer (8.4; 4.4%)	Bowel cancer (8.1; 4.1%)	Lower respiratory infections (6.7; 3.6%)
7th	Homicide/ violence (0.7; 1.8%)	Asthma (0.3; 3.9%)	RTI pedestrians (0.3; 1.3%)	Brain/CNS cancer (2.5; 2.9%)	Chronic liver disease (4.3; 4.3%)	Pancreatic cancer (5.3; 3.5%)	Pancreatic cancer (8.3; 4.4%)	Breast cancer (7.8; 3.9%)	Atrial fibrillation (5.1; 2.8%)
8th	Lower respiratory infections (0.7; 1.7%)	Homicide/ violence (0.2; 2.9%)	Brain malformations (0.3; 1.3%)	Cervical cancer (2.5; 2.8%)	Stroke (3.9; 4.0%)	Chronic liver disease (5.0; 3.2%)	Dementia (7.2; 3.8%)	Pancreatic cancer (5.0; 2.5%)	Chronic kidney disease (4.7; 2.6%)
9th	Neural tube defects (0.7; 1.7%)	Cardiovascular defects (0.2; 2.2%)	Drowning (0.3; 1.2%)	Coronary heart disease (2.2; 2.5%)	Ovarian cancer (3.1; 3.1%)	Ovarian cancer (4.5; 2.9%)	Ovarian cancer (5.3; 2.8%)	Falls (5.0; 2.5%)	Bowel cancer (4.6; 2.5%)
10th	Drowning (0.7; 1.7%)	Drowning (0.2; 2.0%)	Epilepsy (0.2; 1.0%)	Stroke (2.1; 2.4%)	Brain/CNS cancer (2.7; 2.8%)	Suicide/self-inflicted injuries (3.7; 2.4%)	Type 2 diabetes (3.8; 2.0%)	Type 2 diabetes (4.5; 2.3%)	Type 2 diabetes (3.9; 2.1%)

LBW = low birthweight; CNS = central nervous system; RTI = road traffic injuries; SIDS = sudden infant death syndrome; COPD = chronic obstructive pulmonary disease. See Appendix D, Box D1 for ABDS 2018 disease group colour legend.

Notes

1. Disease rankings exclude 'other' residual conditions from each disease group; for example, 'other musculoskeletal conditions'.
2. Lower respiratory infections include influenza and pneumonia.

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5 Health-adjusted life expectancy

Key results

- Health-adjusted life expectancy (HALE) for males and females born in 2018 was 71.5 and 74.1 years, respectively. On average, males could expect to spend an average of 89% of their lives in full health, and females 87%.
- On average, females born in 2018 expected to live 4.2 years longer and have 2.6 more years of healthy life than males.
- Like life expectancy, HALE increased between 2003 and 2018 and males experienced the greatest gains. Males born in 2018 expected 2.1 more years in full health than males born 15 years earlier in 2003, while females expected 1.2 more years in full health.
- Between 2003 and 2018, the average proportion of life expectancy spent in full health remained largely the same (at birth) or increased slightly (at age 65) for males, but decreased slightly for females.
- Australians aged 65 in 2018 could expect, on average, three-quarters of their remaining life to be lived in full health.
- HALE at birth in 2018 was longest for males in Victoria (72.2 years) and for females in Western Australia (74.8) and shortest for males and females in the Northern Territory (66.2 and 69.5, respectively).

HALE by remoteness area

- HALE at birth for males and females in 2018 in *Remote and very remote* areas was 5.1 and 5.2 years shorter, respectively, than for those in *Major cities*.
- The HALE and life expectancy gap between *Major cities* and *Remote and very remote* areas reduced between 2011 and 2018.

HALE by socioeconomic group

- In 2018, the highest (least disadvantaged) socioeconomic group expected, at birth, to live more healthy years (75.4 for males and 77.3 for females) than those in the lowest socioeconomic group (68.6 for males and 71.4 for females).
- People in the highest socioeconomic group expected more of their life expectancy at birth in full health (90% for males and 89% for females) than those in the lowest socioeconomic group (88% for males and 86% for females).
- Between 2011 and 2018, HALE at birth increased for the highest socioeconomic group (from 74.5 to 75.4 years for males and from 76.3 to 77.3 for females). In the lowest socioeconomic group, HALE increased slightly for males and decreased slightly for females.
- The proportion of life expectancy at age 65 spent in full health remained largely the same for those in the highest socioeconomic group and declined for those in the lowest socioeconomic group for the period 2011 to 2018.

HALE extends the concept of life expectancy by considering the time spent living with ill health from disease and injury. It reflects the length of time an individual at a specific age could, on average, expect to live in full health without disease or injury. It can be measured at any age but is typically reported from birth (which represents the average life expectancy for a baby born that year) and at age 65, describing health in an ageing population. See Appendix A for an overview of methods used to estimate HALE.

HALE as a measure of population health

Measures of HALE show whether longer lives are accompanied by more or less years lived in full health. HALE is comparable across populations and over time; differences in age composition of the populations being compared are overcome as the age-specific health and mortality experiences are applied to a hypothetical population.

HALE is most meaningful when compared with life expectancy. The difference between HALE and life expectancy represents the average number of years that a person can expect to live in less than full health.

The ratio of HALE to life expectancy, expressed as a percentage, represents the proportion of life expectancy that is spent in full health. Comparing the ratio over time can highlight whether or not an increase in life expectancy is accompanied by an increase in ill health. When this ratio increases over time, there may be compression of morbidity (that is, increased life expectancy is accompanied by relatively fewer years in ill health) while decreases may suggest an expansion of morbidity (that is, a higher percentage of life expectancy being in ill health).

On average, almost 90% of years lived are in full health

HALE and life expectancy at birth

Life expectancy and HALE at birth represent the average number of years of life and equivalent years of healthy life, respectively, that a newborn in a particular year could expect to live if mortality and morbidity rates (of that particular year) remained throughout their lives.

Life expectancy in Australia for boys born in 2018 was 80.7 years and 84.9 years for girls (Appendix Table D3). The average number of healthy years (HALE) for these babies was 71.5 years for males and 74.1 years for females. The difference between life expectancy and HALE in this cohort—that is, the time expected in less than full health—was 9.2 years for males and 10.8 years for females.

Looking at the percentage of life expectancy in full health, males and females could expect to spend 89% and 87% of their lives, respectively, in full heath.

While females born in 2018 expected, on average, to live 4.2 years longer than males, they also expected 2.6 more years of healthy life than males.

HALE and life expectancy at older ages

Estimates of life expectancy and HALE at older ages describe the extent to which people spend their final years of life in full health.

Life expectancy in 2018 for men and women aged 65 was 19.9 and 22.6 years, respectively (Appendix Table D3; Figure 5.1). At this age, men could expect 15.1 healthy years and women, 16.6. Accordingly, the average time per person expected to live in less than full health was 4.8 and 6.0 years for men and women, respectively.

At age 65, around three-quarters of life expectancy was healthy years: 76% for men and 74% for women.

Figure 5.1: Percentage of remaining life expectancy in full health and ill health at each age, by sex, 2018

Source: Appendix Table D5.

Years of life gained are healthy years

Monitoring changes over time in HALE alongside life expectancy provides more insight into the net benefit of longer life expectancy; that is, if the years of life gained are healthy years or lived in ill health (Box 5.1).

Box 5.1: Interpreting changes in HALE over time

Whether or not the amount of ill health experienced by older Australians has increased has been the subject of ongoing debate. Assessment of how the relationship between life expectancy and HALE has changed over time (by analysing the ratio and difference between the 2 measures) provides an opportunity to examine which of the scenarios of healthy ageing—compression or expansion of morbidity, or equilibrium—provides the best insight into whether longer lives are healthier lives. These 3 health scenarios are described as follows:

Compression of morbidity

- In this scenario, increasing life expectancy is accompanied by better health. As the population ages, there is also a delay in the age of onset of disease. As such, we can expect a reduction in the proportion of life spent in ill health (Fries 1980) as most morbidity occurs at the end of life.

Expansion of morbidity

- In this scenario, increasing life expectancy is accompanied by more illness and injury before death. As chronically ill people survive for longer, we can expect an increase in the proportion of their lives spent with illness (Greunberg 1975).

Dynamic equilibrium

- In this scenario, the proportion of the lifetime spent living with illness remains relatively constant over time. As life expectancy increases, so does the onset and progression of disease—but as diseases grow more prevalent they may also be less severe (Howse 2006).
- If the ratio of HALE to total life expectancy is constant, there is an equilibrium.

Changes in HALE and life expectancy at birth

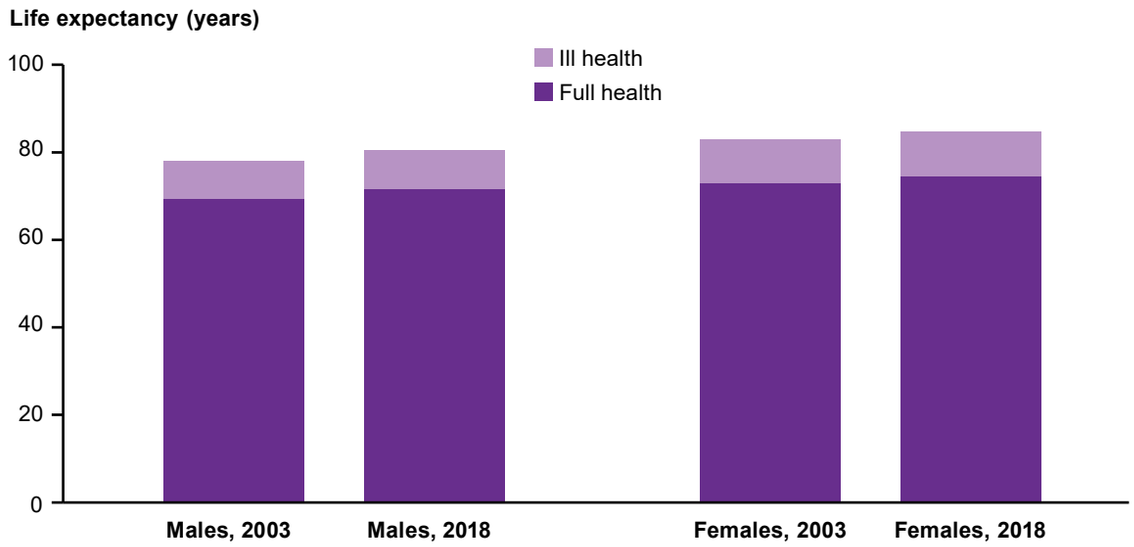
Between 2003 and 2018, life expectancy and HALE at birth increased for males and females. During this 15-year period, life expectancy rose faster than HALE and males experienced the greatest gains in both. Between these years, males gained 2.6 years in life expectancy (from 78.1 years in 2003 to 80.7 in 2018) and 2.1 years in HALE (from 69.4 to 71.5) (Appendix Table D4). The corresponding gains for females were 1.8 years in life expectancy (from 83.0 in 2003 to 84.9 in 2018) and 1.2 years in HALE (from 72.9 to 74.1). The majority of the gains in life expectancy were healthy years; however, the:

- average time spent in ill health increased by 0.5 years for males and 0.7 years for females
- percentage of life expectancy at birth spent in full health remained largely the same between all the years for males (89%), while it decreased slightly over time for females—from 88% in 2003 to 87% in 2018 (Appendix Table D4).

These changes are illustrated in Figure 5.2, showing the split in life expectancy that is average number of healthy years (HALE) and average years in ill health.

These results suggest that, at the national level, gains in healthy years at birth are largely comparable with gains in life expectancy at birth. For males, it reflects a scenario of equilibrium. For females, as the number of healthy years increased, there was a small decrease in percentage of life expectancy as healthy years; a possible sign of relative expansion of morbidity. More time points are needed to continue monitoring of this measure.

Figure 5.2: Life expectancy at birth as years lived in full health (HALE) and years lived in ill health, by sex, 2003 and 2018

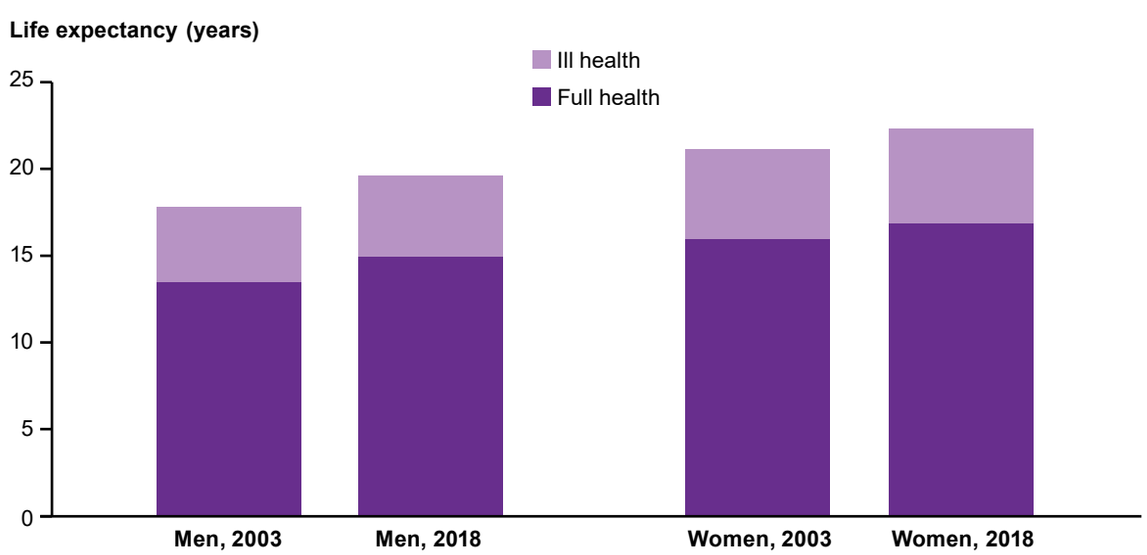


Source: Appendix Table D4.

Changes in HALE and life expectancy at age 65

Changes over time in HALE and life expectancy at age 65 followed the same pattern as at birth described above. For people aged 65, life expectancy and HALE increased between 2003 and 2018, by 2.1 and 1.7 years, respectively, for men and by 1.4 and 0.9 years, respectively, for women (Appendix Table D4; Figure 5.3). Despite women at age 65 having higher life expectancy and HALE than men, there was a small decrease over time for women in the percentage of life expectancy as healthy years (75% in 2003 to 74% in 2018). For males aged 65, there was a slight increase in the percentage of life expectancy as healthy years (75% in 2003 to 76% in 2018) (Appendix Table D4).

Figure 5.3: Life expectancy at age 65 as years lived in full health (HALE) and years lived in ill health, by sex, 2003 and 2018



Source: Appendix Table D4.

HALE is unequal across states and territories

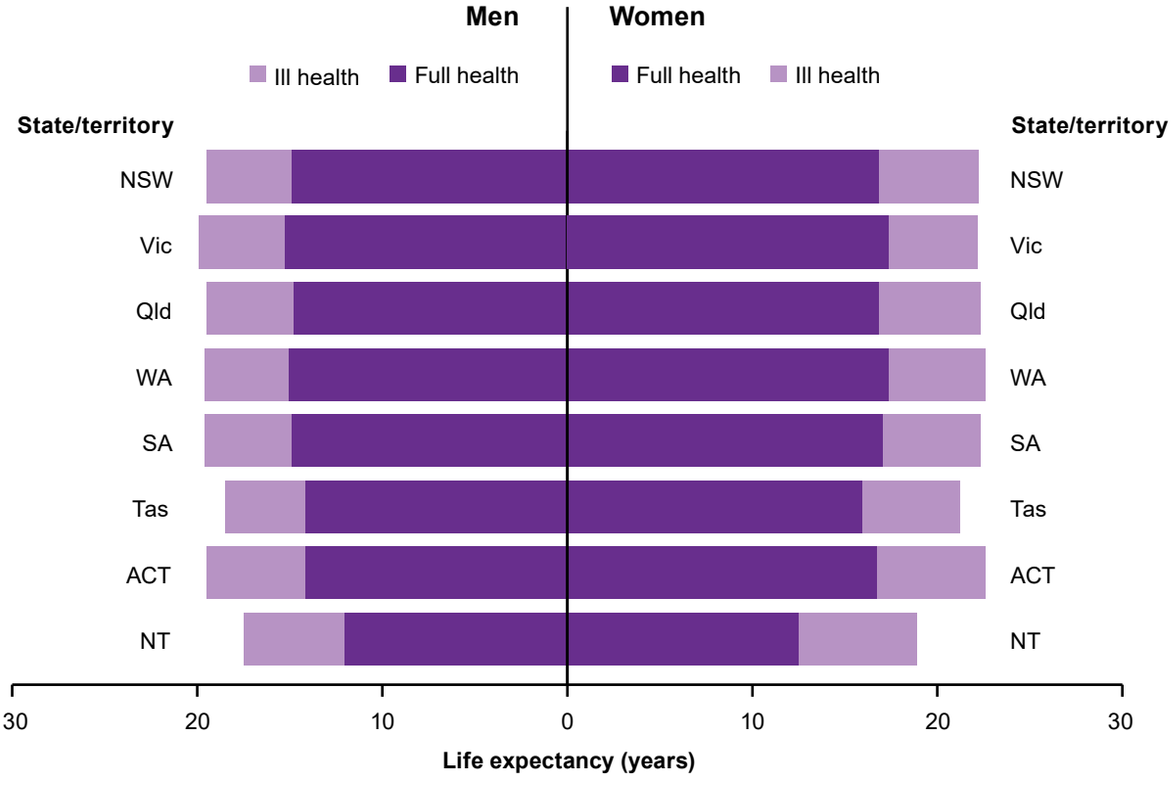
HALE at birth varied across states and territories. HALE at birth in 2018 for males was highest in Victoria (72.2 years) and lowest in the Northern Territory (66.2 years) (Appendix Table D3)—a gap of 6 healthy years between these jurisdictions. For females, the highest HALE was in Western Australia (74.8 years) and the lowest in the Northern Territory (69.5 years)—a gap of 5.3 healthy years (Appendix Table D3).

The variation in HALE between the jurisdictions reflects both geographical variation in life expectancy and variation in disease burden.

The percentage of healthy years of life expectancy at birth for males ranged from 89% in Western Australia and Tasmania to 88% in the Northern Territory (Appendix Table D3). For females, this percentage ranged from 88% in Western Australia to 87% in the Northern Territory.

The results for people aged 65 are shown in Figure 5.4 and Appendix Table D3. The Northern Territory had the lowest HALE for people aged 65 (11.8 years for men and 13.4 years for women) and the lowest percentage of remaining life as healthy years (69% for men and 67% for women) compared with the other jurisdictions. Men and women aged 65 in the other jurisdictions could expect the equivalent of around three-quarters or more of their remaining life as healthy years (Appendix Table D3).

Figure 5.4: Life expectancy at age 65 in full health (HALE) and ill health, by sex and state and territory, 2018



Source: Appendix Table D3.

HALE varies by remoteness of area lived

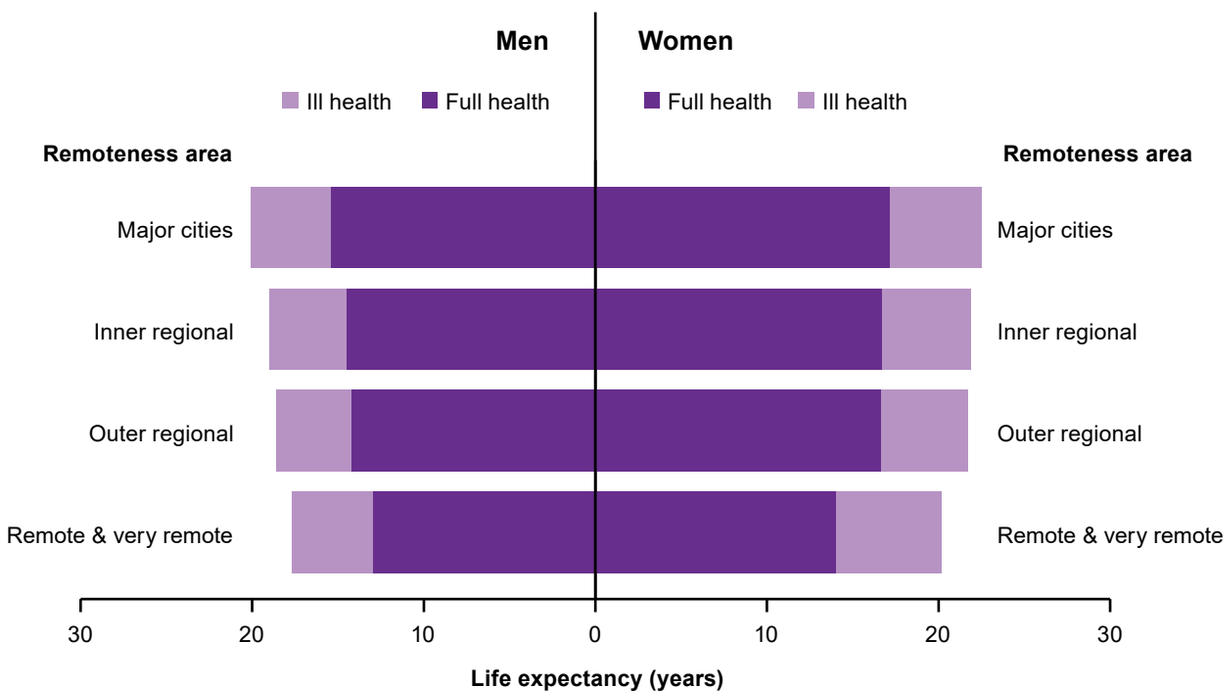
There is considerable variation in the burden of disease by remoteness area (see Chapter 8). Life expectancy and HALE also vary by region of remoteness, with greater differentials for HALE. Life expectancy and HALE at birth in 2018 were highest in *Major cities* and declined with increasing remoteness.

HALE and life expectancy were higher for males and females in *Major cities* than in *Remote and very remote* areas, both at birth and at age 65 (Appendix Table D6; Figure 5.5). In 2018, males and females in *Remote and very remote* areas expected 5.1 and 5.2 fewer years of full health (at birth), respectively, than their counterparts in *Major cities* (Appendix Table D6).

Notably, the percentage of life expectancy as healthy years at age 65 for people in *Major cities* was higher than for those in *Remote and very remote* areas: for men it was 76% and 72%, respectively, and for women, 74% and 67%, respectively.

At age 65, people in *Remote and very remote* areas had shorter life expectancy and at least 2 fewer years of full health (2.4 fewer for men and 3.2 fewer for women) than people in *Major cities*.

Figure 5.5: Life expectancy at age 65 in full health (HALE) and ill health, by sex and remoteness area, 2018



Source: Appendix Table D3.

Gaps in life expectancy and HALE narrow between remoteness areas

The gap in life expectancy and HALE between *Major cities* and *Remote and very remote* areas is reflected by the difference between these areas for each measure. It represents the inequality in the number of healthy years lived between the least remote and most remote areas. The HALE gap is equal to HALE in *Remote and very remote* areas minus HALE in *Major cities*. The life expectancy gap is calculated the same way.

It is important to see how the gap has changed over time; that is, if the disparity in HALE between the least remote and most remote areas has changed and if the changes are consistent with changes in the life expectancy gap.

For males and females, the life expectancy gaps at birth and at age 65 were lower (or the same) in 2018 than in 2011; that is, there was less disparity in life expectancy between the areas in 2018 than in 2011.

The gap in HALE at birth and at age 65 were also lower (or the same) between 2011 and 2018 for males and females (Appendix Table D6). For females, the changes were more noticeable. In 2018, HALE for females in *Remote and very remote* areas was 5.2 years less than their counterparts in *Major cities*, while in 2011 it was 6.9 years shorter. At age 65, the HALE gap also reduced between 2011 and 2018 for women in *Remote and very remote* areas, from 4.2 to 3.2 fewer healthy years than women in *Major cities*.

HALE is unequal between socioeconomic groups

Socioeconomic groups are presented as approximate quintiles in this analysis. The lowest quintile (1) represents the approximate 20% of the population living in areas with the lowest socioeconomic characteristics; that is, it is the most disadvantaged. The level of socioeconomic position increases with each quintile, through to the approximate 20% of the population living in areas with the highest socioeconomic characteristics (5); that is, the least disadvantaged.

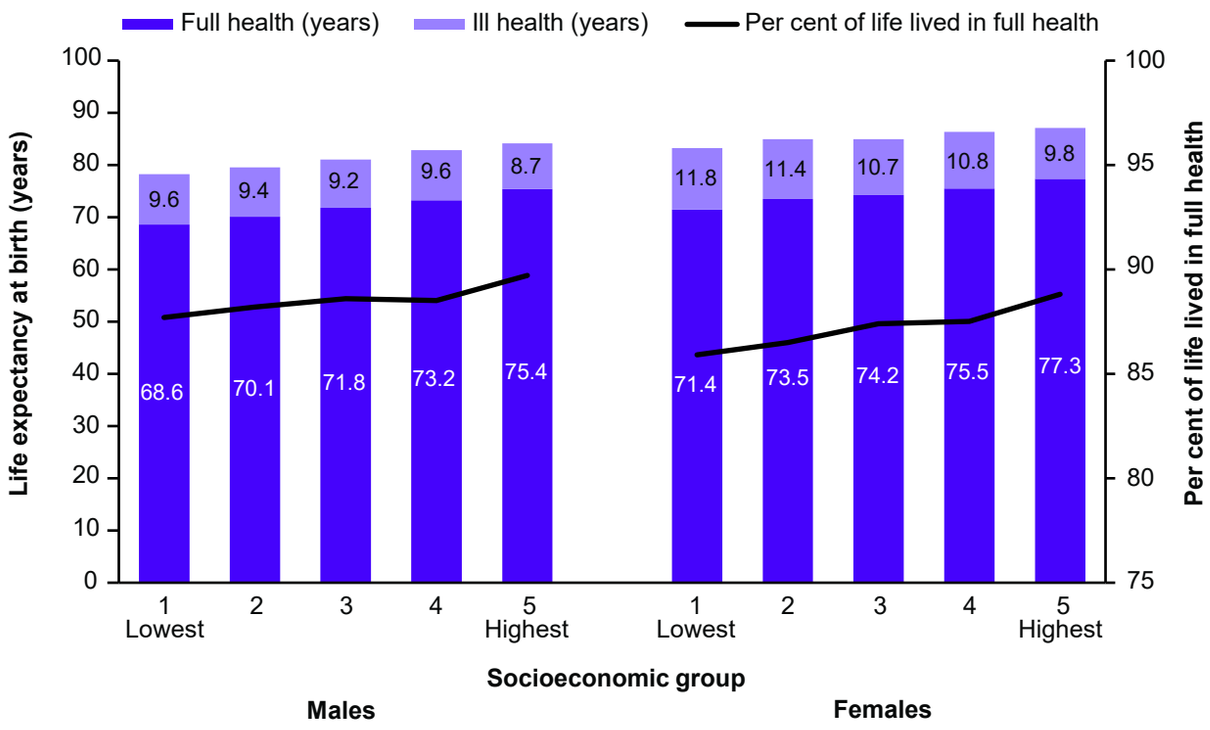
Life expectancy and aspects of health vary by socioeconomic group, with the highest group usually faring better than the lowest. HALE reflects this, with the lowest socioeconomic group expecting to live fewer healthy years and to have a smaller percentage of their remaining life as healthy years than the highest group.

Males and females in the highest socioeconomic group had longer life expectancy and HALE than their counterparts in the lowest group, both at birth and at age 65 (Appendix Table D3; Figure 5.6). The percentage of life expectancy at birth as healthy years was also greater in the highest socioeconomic group (90% for males and 89% for females) than in the lowest group (88% for males and 86% for females).

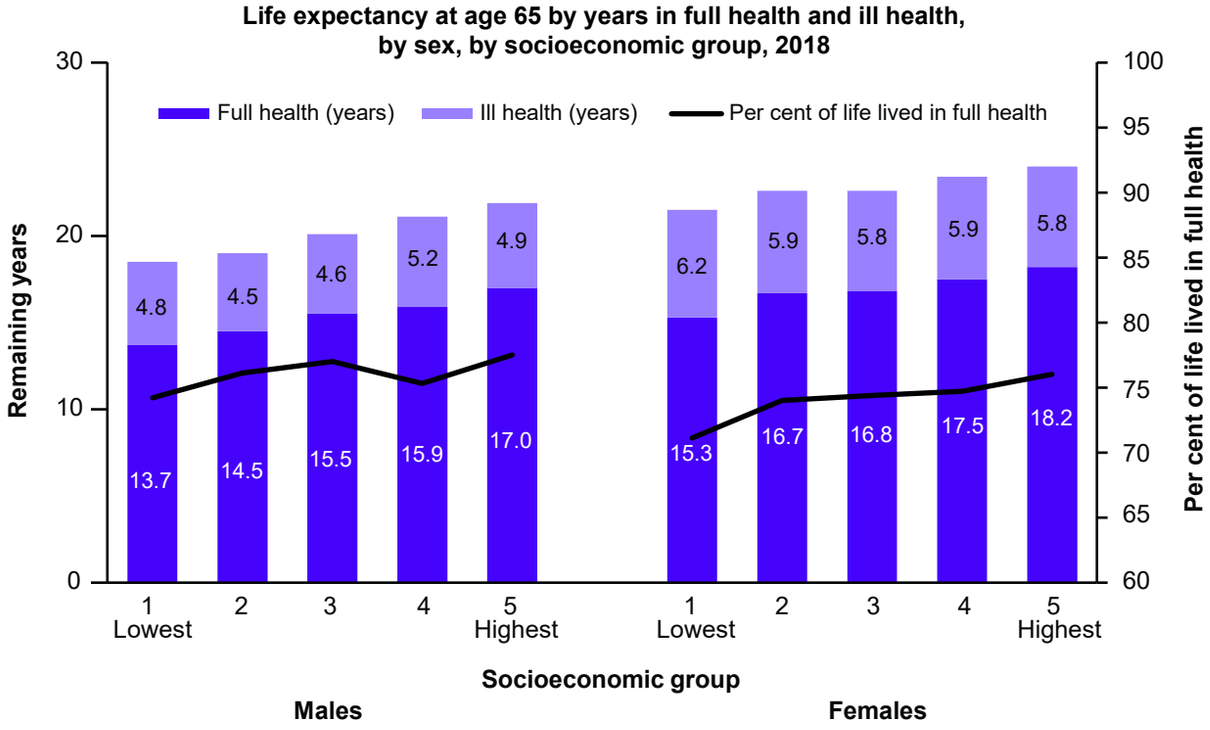
As shown in Figure 5.6, at age 65, there was a greater disparity in the percentage of life expectancy as healthy years between the 2 groups: men in the lowest group expected 74% of life expectancy as healthy years compared with 78% in the highest group, and women expected 71% and 76%, respectively.

Figure 5.6: Life expectancy at birth (a) and at age 65 (b), in full health (HALE) and ill health, by sex and socioeconomic group, 2018

(a) At birth



(b) At age 65



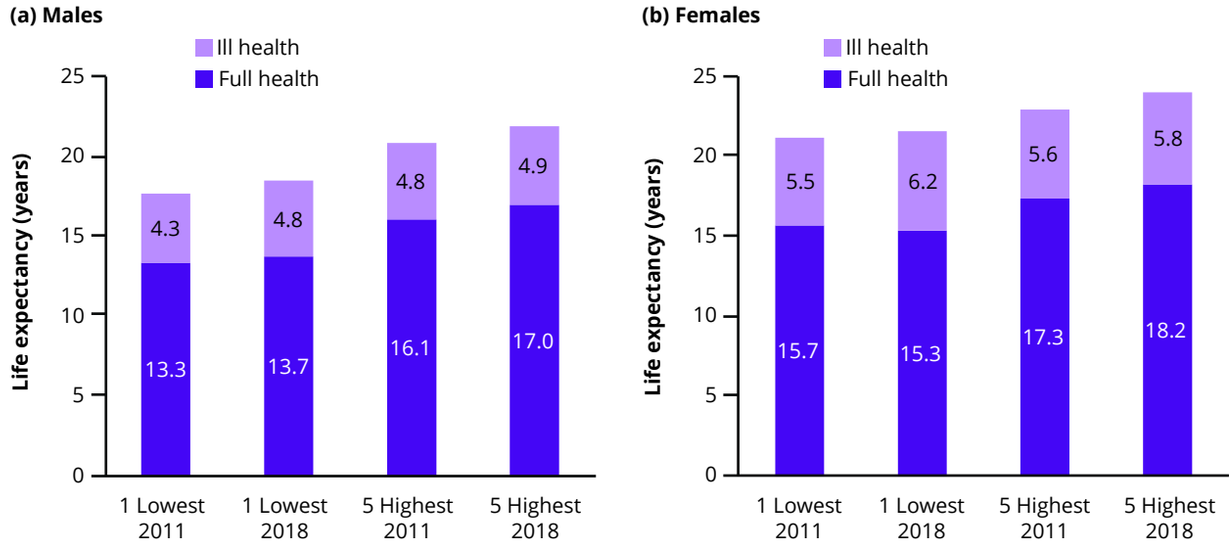
Source: Appendix Table D3.

Changes in life expectancy and HALE over time within socioeconomic group

Between 2011 and 2018, life expectancy increased for both the highest and lowest socioeconomic groups. During this period, HALE at birth increased for the highest socioeconomic group (from 74.5 to 75.4 years for males and from 76.3 to 77.3 for females). For the lowest socioeconomic group, HALE at birth increased slightly for males (from 68.3 to 68.6) and decreased slightly for females (from 71.9 to 71.4).

For people aged 65, HALE increased between 2011 and 2018 in the highest socioeconomic group for both men (from 16.1 to 17.0) and women (from 17.3 to 18.2). For the lowest socioeconomic group, HALE increased for men (13.3 to 13.7), and decreased slightly for women (15.7 to 15.3) (Figure 5.7).

Figure 5.7: Life expectancy at age 65 by years in full health and ill health, for the highest and lowest socioeconomic groups, males (a) and females (b), 2011 and 2018



Source: Appendix Table D7.

Socioeconomic HALE gap widens over time

The gap in life expectancy and HALE between the highest and lowest socioeconomic groups is calculated as the difference in years between the lowest and highest groups on each measure—that is, the HALE gap for socioeconomic groups is the HALE in the lowest group minus the HALE in the highest group. The gap represents the inequality in the number of healthy years lived between the highest and lowest groups. A negative value suggests that the lowest socioeconomic group experiences fewer years (for life expectancy) or fewer healthy years (for HALE) than the highest.

Both the life expectancy and HALE gaps, at birth and at age 65, were larger (wider) in 2018 than in 2011; that is, there was greater disparity between the socioeconomic groups in 2018 than in 2011.

- For HALE at birth, the gap widened by 0.7 years for males (from 6.2 years in 2011 to 6.8 years in 2018) and by 1.5 years for females (from 4.4 to 5.9 years) (Appendix Table D7).
- For HALE at age 65, the gap widened by 0.5 years for males (from 2.7 years in 2011 to 3.2 years in 2018) and by 1.2 years for females (from 1.7 years in 2011 to 2.9 years in 2018) (Appendix Table D7).

The disparity in HALE between the highest and lowest socioeconomic groups is further emphasised by the percentage of life expectancy at age 65 that is expected as healthy years. While this percentage remained largely the same between 2011 and 2018 for those in the highest socioeconomic group (77% to 78% for males, and 76% for females), it declined for those in the lowest group: from 75% to 74% for men, and from 74% to 71% for women. That is, for men and women in the lowest socioeconomic group, the percentage of healthy years fell over time—a possible sign of relative expansion of morbidity in the lowest socioeconomic group (Appendix Table D7).

6 Contribution of risk factors to burden

Key results

- Risk factors included in this study were responsible for 38% of the total burden of disease and injury in Australia in 2018.
- The risk factors contributing the most burden in 2018 were tobacco use (8.6%), overweight (including obesity) (8.4%), dietary risks (5.4%), high blood pressure (5.1%) and alcohol use (4.5%).
- Nearly 20,500 deaths (13% of all deaths) were attributed to tobacco use in 2018. It also contributed the most burden to YLL (13%). Overweight (including obesity) contributed the most non-fatal burden in 2018 (7.4%).
- All risk factors combined contributed substantially to the burden for endocrine disorders (96%), kidney & urinary diseases (74%), cardiovascular diseases (68%), respiratory diseases (52%), injuries (45%) and cancer (42%).
- In males, low birthweight & short gestation was the leading contributor to burden in the 0–14 age group, alcohol use for ages 15–44, overweight (including obesity) for 45–64, tobacco use for ages 65–84 and high blood pressure in the older ages (85 and over).
- In females, low birthweight & short gestation was the leading contributor for ages 0–14 age group, child abuse & neglect for ages 15–44, tobacco use followed by overweight (including obesity) for ages 45–84 and high blood pressure in the older ages (85 and over).

This chapter describes the contribution of selected risk factors to the burden of disease. Attributable burden reflects the direct link between a risk factor (for example, tobacco use) and a disease or injury outcome, referred to in this report as a linked disease (for example, lung cancer). See Box 6.1 for a description of how attributable burden is estimated.

Box 6.1: How is attributable burden measured?

The basic steps for estimating attributable burden are described as follows:

- Select linked diseases for which there is convincing or probable evidence in the literature that the risk factor has a causal association.
- Define the exposure to the risk factor that is not associated with increased risk of the linked disease (the TMRED).
- Estimate the population attributable fractions (PAFs) by either the comparative risk assessment method or the direct method:
  - Comparative risk assessment involves using the amount of increased risk (relative risk) of linked disease morbidity or mortality due to exposure to the risk factor and an estimate of exposure to each risk factor in the population. For most risk factors, exposure to the risk factor was estimated using high-quality survey data. For information about the quality of data inputs, see Appendix B.
  - The direct method uses comprehensive data sources such as registries to estimate the amount of the linked disease due to the risk factor.
- Estimate the attributable burden by multiplying the PAFs by the burden for each linked disease.

How are risk factors selected?

There are 40 risk factor components or exposures included in this report (such as cannabis and cocaine use) that combine into 20 individual risk factors (such as illicit drug use) (Table 6.1). The risk factors are categorised as behavioural, environmental and metabolic/biomedical risks. While this list is extensive, it does not cover all potential risk factors. The risk factors included needed to meet the following criteria:

- have strong evidence of causal association
- are modifiable
- can be measured in the Australian population
- are linked to diseases that occur in Australia, and are measured in the ABDS.

Some changes have been made to the list of selected risk factors compared with that for the ABDS 2015. Low birthweight & short gestation and school-based bullying victimisation have been added, and high cholesterol revised to be based on low-density lipoprotein (LDL) cholesterol instead of total cholesterol.

Risk factors that were social determinants (such as income, employment and education) could not be included. They have not been incorporated into burden of disease studies either here or internationally, and developing methods to do so was outside the scope of this study. However, their importance is clear, and it is hoped that they could be included as risk factors in future burden of disease studies. Chapter 8 contains an analysis of the burden of disease attributed to risk factors by socioeconomic groups.

Detailed estimates of attributable burden due to individual risk factors can be found in data visualisations on the AIHW website http://www.aihw.gov.au/burden-of-disease/.

What is the contribution of all risk factors combined?

Of the total burden of disease and injury in Australia for 2018, 38% (23% fatal and 15% non-fatal) was attributable to all the risk factors included in this study (Table 6.1). This illustrates the potential for health gain in preventing disease and injury by reducing exposure to these risk factors. Although it may not be feasible or achievable to prevent all health loss, it quantifies what is theoretically possible.

Almost half of all deaths (49%) could be attributed to the risk factors included in this study (Table 6.2), as could a similar amount of fatal burden (48%). A smaller proportion of non-fatal burden (28%) was attributable to these risk factors. This is due to a high proportion of leading causes of fatal burden, such as cancer and cardiovascular disease, being attributable to these risk factors (Table 6.3).

Which risk factors contribute the most burden?

The individual contribution of each risk factor was calculated as the number of attributable DALY for each relevant disease. Table 6.1 shows the proportion of the total burden of disease in Australia in 2018 attributed to each risk factor, as well as the contribution from each component of the risk factor (such as the burden from second-hand smoke as part of tobacco use).

The risk factors contributing the most disease burden were tobacco use (8.6%), overweight (including obesity) (8.4%), dietary risks (5.4%), high blood pressure (5.1%) and alcohol use (4.5%). Among the dietary risk factors, a diet low in legumes contributed the most to disease burden (1.2%). This was followed by a diet low in wholegrains & high fibre cereals, diet high in sodium and diet high in red meat (all 0.9%).

Table 6.1: Number and proportion (%) of total burden attributable to each risk factor, 2018

Risk factor	Number	%	Risk factor	Number	%
Behavioural			Physical inactivity	122,683	2.5
Tobacco use	430,903	8.6	Child abuse & neglect	107,170	2.2
Tobacco use	*427,879*	*8.6*	Intimate partner violence	32,881	1.4
Second-hand smoke	*3,024*	*0.1*	Unsafe sex	10,811	0.2
Dietary risks	270,777	5.4	Bullying victimisation	5,207	0.1
Diet low in legumes	*60,035*	*1.2*	**Environmental**		
Diet low in whole grains & high fibre cereal	*46,896*	*0.9*	Occupational exposures & hazards	90,849	1.8
Diet high in sodium	*45,342*	*0.9*	Air pollution	64,001	1.3
Diet high in red meat	*44,795*	*0.9*	High sun exposure	35,330	0.7
Diet low in fruit	*39,676*	*0.8*	**Metabolic/biomedical**		
Diet low in nuts & seeds	*33,819*	*0.7*	Overweight (including obesity)	419,855	8.4
Diet low in vegetables	*28,988*	*0.6*	*Overweight but not obese*	*167,211*	*3.4*
Diet high in processed meat	*15,965*	*0.3*	*Obesity*	*252,644*	*5.1*
Diet low in polyunsaturated fat	*5,559*	*0.1*	High blood pressure	252,813	5.1
Diet low in fish & seafood	*5,306*	*0.1*	High blood plasma glucose	215,099	4.3
Diet high in sugar sweetened beverages	*4,934*	*0.1*	*Intermediate hyperglycaemia*	*20,660*	*0.4*
Diet low in milk	*4,618*	*0.1*	*Diabetes*	*194,440*	*3.9*
Alcohol use	222,108	4.5	High cholesterol	135,066	2.7
Illicit drug use	149,535	3.0	Impaired kidney function	95,697	1.9
Opioid use	*46,915*	*0.9*	*Chronic kidney disease stage 1–3*	*46,194*	*0.9*
Amphetamine use	*35,674*	*0.7*	*Chronic kidney disease stage 4–5*	*49,503*	*1.0*
Cocaine use	*16,278*	*0.3*	Low birthweight & short gestation	33,672	0.7
Cannabis use	*15,265*	*0.3*	Low bone mineral density	21,376	0.4
Other illicit drug use	*8,861*	*0.2*	Iron deficiency	16,805	0.3
Unsafe injecting practices	*26,543*	*0.5*			
			Joint effect		**37.5**

Notes

1. The percentages for individual dietary risk factors do not add up to the overall dietary risk percentage as they were analysed independently.
2. The percentages for the individual risk factors in the table do not add up to the joint effect as the risk factors were analysed independently.
3. The percentage for intimate partner violence represents the proportion of total burden in females only.

The contribution of risk factors to deaths, fatal and non-fatal burden was also calculated as part of this study. Tobacco use contributed the most to deaths and fatal burden with almost 20,500 deaths attributed to it (Table 6.2), which amounts to 13% of all deaths. It also contributed to 13% of fatal burden. Tobacco was then followed by high blood pressure (11% of deaths, 8.1% of fatal burden), overweight (including obesity) (10% of deaths, 9.6% of fatal burden) and dietary risks (9.9% of deaths, 8.8% of fatal burden). The risk factors that contributed the most to non-fatal burden were overweight (including obesity) (7.4%), tobacco use (4.4%), high blood plasma glucose (3.7%), alcohol use (3.4%) and child abuse & neglect (2.7%). Note that these estimates are calculated independently and it is not appropriate to sum them due to the complex interactions between risk factors and disease development (Box 6.2).

Table 6.2: Number and proportion (%) of deaths, fatal burden (YLL) and non-fatal burden (YLD) attributable to each risk factor, 2018

Risk factor	Deaths		YLL		YLD	
	Number	% of total deaths	Number	% of total YLL	Number	% of total YLD
Behavioural						
Tobacco use	20,482	12.9	315,668	13.3	115,234	4.4
Dietary risks	15,802	9.9	208,187	8.8	62,590	2.4
Physical inactivity	8,253	5.2	84,717	3.6	37,966	1.5
Alcohol use	6,512	4.1	132,845	5.6	89,263	3.4
Illicit drug use	2,855	1.8	98,964	4.2	50,571	1.9
Child abuse & neglect	813	0.5	36,099	1.5	71,071	2.7
Unsafe sex	308	0.2	8,176	0.3	2,635	0.1
Intimate partner violence	228	0.3	8,749	0.9	24,132	1.8
Bullying victimisation	0	0.0	0	0.0	5,207	0.2
Metabolic/biomedical						
High blood pressure	17,327	10.9	191,456	8.1	61,357	2.3
Overweight (including obesity)	16,418	10.3	227,660	9.6	192,195	7.4
High blood plasma glucose	9,475	5.9	117,882	5.0	97,218	3.7
High cholesterol	8,044	5.0	108,676	4.6	26,390	1.0
Impaired kidney function	7,150	4.5	67,352	2.8	28,345	1.1
Low bone mineral density	1,373	0.9	10,456	0.4	10,920	0.4
Low birthweight & short gestation	320	0.2	27,526	1.2	6,146	0.2
Iron deficiency	24	0.0	129	0.0	16,675	0.6
Environmental						
Air pollution	3,236	2.0	46,491	2.0	17,510	0.7
High sun exposure	1,933	1.2	30,708	1.3	4,622	0.2
Occupational exposures & hazards	1,744	1.1	35,551	1.5	55,298	2.1
Joint effect	**77,794**	**48.8**	**1,136,178**	**47.9**	**731,962**	**28.0**

Notes

1. The percentages for the individual risk factors in the table do not add up to the joint effect as the risk factors were analysed independently.
2. The percentages for intimate partner violence represents the proportion of total burden in females only.

Linked diseases span a range of disease groups

The proportion of burden attributable to each risk factor within each disease group is presented in Table 6.3. Blank cells indicate that the risk factor was not linked to any diseases or injuries in the disease group in this study. When interpreting this table, note that the number of DALY for each disease group differs, so the percentages need to be considered with the size of the disease group. Also note that the numbers in the table cannot be added together, as the risk factors were analysed independently (Box 6.2).

The burden estimated for each linked disease also influences the amount of burden due to each risk factor in 2018. For example, risk factors linked to cardiovascular diseases have a high attributable burden, partly because there is high burden from these diseases in Australia.

Some risk factors had linked diseases across a large number of disease groups. Tobacco use contributed to the burden for 9 disease groups, including 39% of respiratory diseases, 22% of cancer, 11% of cardiovascular diseases, 6.2% of infectious diseases and 3.2% of endocrine disorders. Overweight (including obesity) also contributed to a range of disease groups, including 44% of the burden for endocrine disorders, 31% for kidney & urinary diseases, 22% for cardiovascular diseases, 8.9% for musculoskeletal conditions and 7.0% for cancer (Table 6.2).

All the risk factors combined (the joint effect) contributed greatly to the burden for endocrine disorders (96%), cardiovascular diseases (68%), kidney & urinary diseases (74%), respiratory diseases (52%), injuries (45%) and cancer (42%) (Table 6.3).

Box 6.2: Why risk factor estimates cannot be added together

For the majority of the analysis in this chapter, the risk factors are analysed independently. It is important to note that it is not possible to add or combine the separate estimates for different risk factors without further analysis, due to complex pathways and interactions between them. For example, if the burden of coronary heart disease attributable to physical inactivity and to high blood plasma glucose were added, the amount of coronary heart disease attributable would be an overestimate. This is because these risk factors can be found along the same causal pathway—for example, where low physical activity increases the risk of having high blood plasma glucose levels, which, in turn, increases the risk of coronary heart disease.

Further analysis is needed to combine risk factors. In this report, this has been done for all the included risk factors to produce an estimate for 'all risk factors combined'. This is referred to as the 'joint effect' of all risk factors in this study.

Table 6.3: Proportion (%) of total burden (DALY) attributable to selected risk factors for each disease group, 2018

Risk factor	Cancer	Cardiovascular	Musculoskeletal	Mental	Injury	Respiratory	Neurological	Gastrointestinal	Endocrine	Infections	Kidney
DALY (number)	**881,100**	**646,000**	**653,100**	**631,600**	**418,200**	**364,100**	**389,100**	**163,800**	**139,500**	**91,900**	**66,500**
DALY (%)											
Tobacco use	21.5	10.7	2.0			39.3	1.3	0.4	3.2	6.2	
Overweight (including obesity)	7.0	21.8	8.9			9.5	10.0	1.6	44.1		31.1
Alcohol use	4.9	4.0		11.1	14.9		1.6	7.2		3.2	
Dietary risks	4.5	30.8							21.0		4.9
High sun exposure	4.0										
High blood plasma glucose	3.1	4.6					3.6		95.9		14.7
Occupational exposures & hazards	2.2		5.6		3.0	4.7					
Physical inactivity	1.8	9.5					5.9		16.5		
Illicit drug use	1.2			7.9	17.5			9.4		0.4	
Unsafe sex	0.8							0.3		3.5	
Air pollution	0.6	5.8				3.2			5.4	2.3	
Intimate partner violence				7.7	7.2						
Child abuse & neglect				11.2	8.7						
Low birthweight & short gestation								—		0.4	
High blood pressure		35.3					1.6				27.5
High cholesterol		20.9									
Impaired kidney function		4.5	0.1				4.3				74.2
Joint effect	**42.2**	**67.7**	**15.7**	**33.3**	**44.6**	**51.5**	**23.6**	**16.9**	**95.9**	**14.8**	**74.2**

Notes

1. Attributable burden is expressed as a percentage of total burden (DALY) for that disease group. Disease groups are ordered by number of total burden and not all are presented here.
2. The percentages in the table cannot be added together by row or column and do not add up to the joint effect row as the risk factors were analysed independently.
3. Blank cells indicate that the risk factor has no associated diseases or injuries in the disease group. '—' indicates rounded to zero.
4. The percentages for intimate partner violence represents the proportion of total burden in females only.

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Box 6.3: Homicide and violence perpetrators

For ABDS 2018, additional analyses were undertaken to assess other perpetrator types and male victims of violence.

Direct PAFs were estimated using data from the National Homicide and Monitoring Program and the National Hospital Morbidity Database to calculate attributable burden for both males and females in the years 2003, 2011, 2015 and 2018 (see Table 6.4).

The total disease burden for male victims of homicide & violence was greater compared with female victims in all years, with the relative contributions to total burden by perpetrator type also differing by sex.

Intimate partners were responsible for the most burden due to homicide & violence among female victims (56% in 2018), followed by family members and acquaintances (20% and 17%, respectively, in 2018). Acquaintances were responsible for the most burden among male victims in all years (44% in 2018), followed by strangers and family members (23% and 22%, respectively, in 2018).

There has been an overall reduction in total burden due to homicide & violence between 2003 and 2018 for both female and male victims (12% decrease).

Table 6.4: Number and proportion (%) of total burden from homicide & violence, by sex and perpetrator type

		2003		2011		2015		2018	
Sex of victim	Perpetrator	Number	% of violence burden	Number	% of violence burden	Number	% of violence burden	Number	% of violence burden
Females	Acquaintance	852	14	1,438	24	477	8.4	921	17
	Family	1,941	32	1,264	21	1,618	28	1,078	20
	Intimate partner	3,037	50	2,936	49	3,343	59	3,013	56
	Stranger	275	4.5	303	5.1	269	4.7	384	7.1
	Total	**6,105**	**100**	**5,941**	**100**	**5,707**	**100**	**5,396**	**100**
Males	Acquaintance	6,217	53	5,926	52	5,486	51	4,566	44
	Family	2,263	19	1,844	16	2,469	23	2,326	22
	Intimate partner	1,187	10	954	8.4	926	8.6	1,118	11
	Stranger	2,139	18	2,581	23	1,946	18	2,348	23
	Total	**11,806**	**100**	**11,305**	**100**	**10,827**	**100**	**10,358**	**100**

Note: Percentages may not add up to the total due to rounding.

How does attributable burden change through the life course?

The health impacts due to risk factors varied by age and sex. Risk factors ranked by their contribution to total burden (DALY) in each age group are shown for males (Figure 6.1) and females (Figure 6.2). The number of attributable DALY and the proportion of attributable burden to the overall DALY by risk factor, age and sex are also shown. Rankings according to contribution to non-fatal and fatal burden for males and females are presented in figures 6.3, 6.4, 6.5 and 6.6.

Exposure to risk factors in the past can influence the proportion of burden attributable in the reference year of the study or for a particular age group. This is because evidence of past exposure can be linked to current burden—for example, to take into account the lag time from exposure through to outcomes such as cancer. The risk factors where past exposure or any exposure during the life course contributes to the calculation of attributable burden are tobacco use, child abuse & neglect, intimate partner violence, high sun exposure, occupational exposures & hazards, alcohol use, illicit drug use, unsafe sex and low birthweight & short gestation. For these risk factors, the onset of linked diseases may not occur until years after initial exposure. For example, the methods for tobacco use incorporated a measure of current smoking where the onset of linked diseases are given a 5-year lag from the time of exposure. Similarly with other risk factors, burden over the lifetime of certain linked diseases is said to be attributable to past exposure, such as depression and anxiety for childhood experiences of abuse and neglect.

Overall, low birthweight & short gestation was the leading contributor to burden for ages under 15, alcohol use for ages 15–44, tobacco use for ages 45–84 and high blood pressure for ages over 85. For those aged 45–84, men experienced a higher amount of attributable burden due to the 3 highest ranking risk factors while from age 85, women experienced higher attributable burden.

Children and young people aged under 15

In children and young people aged under 15, low birthweight & short gestation was the leading risk factor of the total burden in both males (12%) and females (11%), followed by child abuse & neglect (1.0% in males and 1.9% in females). Females experienced 44% more burden from child abuse & neglect than males while males experienced 58% more burden from overweight (including obesity) than females. Note that many other risk factors were not measured in this age group due to low disease burden of linked diseases at this age.

The total burden attributable to low birthweight & short gestation was predominantly due to its contribution to fatal burden, ranking first for both males and females (figures 6.5 and 6.6). When looking at attributable non-fatal burden, child abuse & neglect was the leading risk factor (figures 6.3 and 6.4).

Young people aged 15–24

Males

Alcohol use was the leading risk factor contributing to disease burden in males in this age group (14%)—this was also the case for attributable non-fatal (12%) and fatal burden (18%). Illicit drug use (8.9%) and child abuse & neglect (5.5%) were also leading causes. Males experienced around 3 times the burden from alcohol use and from illicit drug use compared with females.

Females

Child abuse & neglect was the leading risk factor contributing to disease burden in females in this age group (7.7%), followed by alcohol (5.6%) and illicit drug use (4.0%). These were also the same 3 leading risk factors when looking at attributable non-fatal and fatal burden. Intimate partner violence (2.0%) and school-based bullying victimisation (1.8%) were also in the 5 leading risk factors.

Adults aged 25–44

Men

The leading risk factor contributing to disease burden for men in this age group was alcohol use (12%). Illicit drug use (11%), child abuse & neglect (4.6%), overweight (including obesity) (4.3%), and occupational exposures & hazards (4.1%) were also among the leading 5 causes of disease burden. Alcohol use contributed a much higher proportion of the burden in men than in women. Tobacco, diet and metabolic risk factors (high cholesterol, high blood pressure and high blood plasma glucose) made up the 10 leading risk factors causing burden in men in this age group.

Alcohol use was also the leading risk factor contributing to non-fatal burden (11%) but was only second for fatal burden (14%). Illicit drug use was the leading risk factor contributing to fatal burden in this age group (20%).

Women

Child abuse & neglect (6.5%) was the leading risk factor for women aged 25–44. Various behavioural risk factors were included in the leading 10 causes of burden in women in this age group—illicit drug use ranked second (4.5%) while intimate partner violence (3.7%) and alcohol use (3.3%) were in the top 5. Overweight (including obesity) (3.8%) ranked third. Iron-deficiency was ranked 10th in women (1.3%).

Child abuse & neglect was also the leading risk factor contributing to non-fatal burden (6.7%) but was only third for fatal burden (5.8%). Illicit drug use was the leading risk factor contributing to fatal burden in this age group (11%).

Adults aged 45–64

For people aged 45–64, tobacco use, overweight (including obesity) and diet were the leading 3 risk factors contributing to disease burden in both men and women. This age group experienced increased burden from metabolic and dietary risk factors, especially high blood pressure; however, the amount differed by sex.

Men

In men, overweight (including obesity) (12%) ranked first, followed by tobacco use (12%), diet (8.5%), high blood pressure (6.4%) and alcohol use (6.3%). High cholesterol accounted for 5.5% of the burden for men in this age group, and illicit drug use remained within the leading 10 causes (4.1%).

The same leading risk factors contributed to non-fatal and fatal burden. The key differences are that child abuse & neglect (ninth for non-fatal burden) and air pollution (10th for fatal burden) are in the top 10 for attributable non-fatal burden and fatal burden, respectively.

Women

Similar risk factors to those for men made up the leading 3 causes for women; however, the rankings differed between sexes. Tobacco use (8.8%) was ranked first, followed by overweight (including obesity) (8.5%), diet (4.1%), high blood plasma glucose levels (3.8%) and alcohol use (3.1%). The remaining risk factors within the leading 10 for women were similar to those for men, except for intimate partner violence and child abuse & neglect remaining in the top 10 instead of occupational exposures & hazards. Aside from child abuse & neglect and intimate partner violence, women in this age group experienced smaller proportions of burden from these risk factors than men.

The same leading risk factors contributed to non-fatal and fatal burden. The key differences are that occupational exposures & hazards (sixth) and iron deficiency (ninth) appeared in the top 10 contributors to attributable non-fatal burden. Meanwhile, physical inactivity (ninth) and air pollution (10th) were among the leading causes of attributable fatal burden.

Adults aged 65–84

Tobacco use, overweight (including obesity) and high blood pressure were the leading 3 risk factors in adults aged 65–84, where men experienced higher proportions of burden attributable to these risk factors than women.

Men

High blood plasma glucose replaced alcohol use in the leading 5 risk factors causing burden in men aged 65–84. Diet was ranked third and men experienced a higher proportion of burden from dietary risk factors than women.

When looking at leading risk factors contributing to non-fatal burden, overweight (including obesity) ranked first, followed by high blood plasma glucose, in men aged 65–84. The rankings for the leading risk factors contributing to fatal burden were relatively similar to rankings for total burden.

Women

High blood plasma glucose also rose in rank for women and became one of the leading 5 risk factors causing burden in women aged 65–84 (5.6% aged 65–74; 5.8% aged 75–84). Air pollution entered the list of the leading 10 risk factors for women in this age group while child abuse & neglect and intimate partner violence fell out of it.

When looking at leading risk factors contributing to non-fatal burden, overweight (including obesity) ranked first, followed by tobacco use, in women aged 65–84. The rankings for the leading risk factors contributing to fatal burden were relatively similar to rankings for total burden.

Older Australians aged 85+

In older Australians, high blood pressure was the leading cause of disease burden in men and women. The contribution of high cholesterol to burden increased slightly in men with older age, from 4.7% in age group 85–94 to 5.7% in age group 95+; and in women, from 4.3% to 5.7%. The contribution of tobacco decreased from age group 85–94 to age group 95+ for both men and women (9.7% to 8.0% and 8.6% to 7.4%, respectively).

When looking at leading risk factors contributing to non-fatal burden, overweight (including obesity) ranked first for both men and women aged 85 years and over, followed by high blood pressure in men and tobacco use in women.

The rankings for the leading risk factors contributing to fatal burden in this age group were relatively similar to rankings for total burden.

Figure 6.1: Leading risk factor contribution to total burden (DALY '000; proportion %), for males, by age group, 2018

Rank	Age group (years) 0–14	15–24	25–44	45–64	65–74	75–84	85–94	95+
1st	LBW/short gestation (17.1; 12.0%)	Alcohol (23.3; 14.4%)	Alcohol (55.4; 11.7%)	Overweight/obesity (88.5; 11.9%)	Tobacco (73.2; 14.8%)	Tobacco (49.4; 12.6%)	Blood pressure (22.3; 11.3%)	Blood pressure (2.2; 13.0%)
2nd	Child abuse/neglect (1.5; 1.0%)	Illicit drug use (14.4; 8.9%)	Illicit drug use (53.5; 11.2%)	Tobacco (87.0; 11.7%)	Overweight/obesity (63.4; 12.8%)	Overweight/obesity (40.7; 10.3%)	Tobacco (19.1; 9.7%)	Diet (1.9; 10.9%)
3rd	Overweight/obesity (1.1; 0.8%)	Child abuse/neglect (8.9; 5.5%)	Child abuse/neglect (22.0; 4.6%)	Diet (63.0; 8.5%)	Diet (43.7; 8.8%)	Blood pressure (36.7; 9.3%)	Diet (18.9; 9.6%)	Overweight/obesity (1.6; 9.1%)
4th	Bullying victimisation (0.6; 0.4%)	Occupational (4.8; 3.0%)	Overweight/obesity (20.6; 4.3%)	Blood pressure (47.3; 6.4%)	Blood pressure (40.1; 8.1%)	Diet (33.9; 8.6%)	Overweight/obesity (17.4; 8.9%)	Tobacco (1.4; 8.0%)
5th	Kidney function (0.4; 0.3%)	Overweight/obesity (2.7; 1.6%)	Occupational (19.5; 4.1%)	Alcohol (47.0; 6.3%)	Blood glucose (36.1; 7.3%)	Blood glucose (28.6; 7.3%)	Blood glucose (11.0; 5.6%)	Physical inactivity (1.1; 6.3%)
6th	Blood glucose (0.3; 0.2%)	Bullying victimisation (1.5; 0.9%)	Tobacco (12.3; 2.6%)	Cholesterol (40.7; 5.5%)	Alcohol (17.6; 3.6%)	Physical inactivity (18.0; 4.6%)	Physical inactivity (10.9; 5.5%)	Cholesterol (1.0; 5.7%)
7th		Blood glucose (1.2; 0.7%)	Diet (11.9; 2.5%)	Blood glucose (38.1; 5.1%)	Cholesterol (15.9; 3.2%)	Kidney function (15.5; 3.9%)	Cholesterol (9.1; 4.7%)	Kidney function (0.8; 4.7%)
8th		LBW/short gestation (0.6; 0.4%)	Cholesterol (8.4; 1.8%)	Illicit drug use (30.4; 4.1%)	Physical inactivity (15.3; 3.1%)	Cholesterol (13.1; 3.3%)	Kidney function (9.1; 4.6%)	Blood glucose (0.7; 4.2%)
9th			Blood pressure (7.2; 1.5%)	Occupational (27.3; 3.7%)	Kidney function (12.4; 2.5%)	Alcohol (11.2; 2.8%)	Alcohol (5.1; 2.6%)	Alcohol (0.4; 2.5%)
10th			Blood glucose (7.0; 1.5%)	Physical inactivity (15.8; 2.1%)	Air pollution (10.0; 2.0%)	Air pollution (8.0; 2.0%)	Air pollution (3.4; 1.7%)	Sun exposure (0.2; 1.4%)

LBW = low birthweight.

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Figure 6.2: Leading risk factor contribution to total burden (DALY '000; proportion %), for females, by age group, 2018

Rank	Age group (years) 0–14	15–24	25–44	45–64	65–74	75–84	85–94	95+
1st	LBW/short gestation (11.7; 10.6%)	Child abuse/neglect (10.5; 7.7%)	Child abuse/neglect (26.2; 6.5%)	Tobacco (56.5; 8.8%)	Tobacco (54.2; 13.9%)	Tobacco (44.9; 12.3%)	Blood pressure (28.3; 10.4%)	Blood pressure (5.4; 12.8%)
2nd	Child abuse/neglect (2.1; 1.9%)	Alcohol (7.6; 5.6%)	Illicit drug use (18.2; 4.5%)	Overweight/obesity (54.6; 8.5%)	Overweight/obesity (42.9; 11.0%)	Overweight/obesity (36.9; 10.1%)	Overweight/obesity (27.1; 10.0%)	Overweight/obesity (4.5; 10.7%)
3rd	Iron deficiency (0.9; 0.8%)	Illicit drug use (5.4; 4.0%)	Overweight/obesity (15.5; 3.8%)	Diet (26.1; 4.1%)	Blood glucose (21.7; 5.6%)	Blood pressure (28.2; 7.8%)	Tobacco (23.2; 8.6%)	Diet (3.8; 9.1%)
4th	Overweight/obesity (0.7; 0.6%)	Partner violence (2.7; 2.0%)	Partner violence (15.1; 3.7%)	Blood glucose (24.1; 3.8%)	Diet (19.6; 5.0%)	Diet (22.1; 6.1%)	Diet (20.5; 7.6%)	Tobacco (3.1; 7.4%)
5th	Bullying victimisation (0.7; 0.6%)	Bullying victimisation (2.4; 1.8%)	Alcohol (13.3; 3.3%)	Alcohol (19.6; 3.1%)	Blood pressure (18.0; 4.6%)	Blood glucose (21.3; 5.8%)	Physical inactivity (17.0; 6.3%)	Physical inactivity (3.0; 7.3%)
6th	Blood glucose (0.3; 0.3%)	Occupational (2.2; 1.6%)	Occupational (8.4; 2.1%)	Child abuse/neglect (18.5; 2.9%)	Physical inactivity (10.7; 2.7%)	Physical inactivity (16.2; 4.4%)	Blood glucose (16.1; 5.9%)	Kidney function (2.8; 6.8%)
7th	Kidney function (0.3; 0.2%)	Iron deficiency (1.8; 1.4%)	Tobacco (6.6; 1.6%)	Blood pressure (15.3; 2.4%)	Alcohol (7.4; 1.9%)	Kidney function (15.1; 4.2%)	Kidney function (15.9; 5.9%)	Cholesterol (2.4; 5.7%)
8th		Overweight/obesity (1.7; 1.2%)	Blood glucose (5.8; 1.4%)	Illicit drug use (13.9; 2.2%)	Kidney function (6.4; 1.6%)	Cholesterol (10.0; 2.7%)	Cholesterol (11.7; 4.3%)	Blood glucose (2.0; 4.8%)
9th		Blood glucose (0.8; 0.6%)	Diet (5.4; 1.3%)	Cholesterol (13.6; 2.1%)	Cholesterol (6.3; 1.6%)	Alcohol (7.3; 2.0%)	Alcohol (5.7; 2.1%)	Alcohol (1.0; 2.3%)
10th		LBW/short gestation (0.3; 0.2%)	Iron deficiency (5.3; 1.3%)	Partner violence (12.8; 2.0%)	Air pollution (6.0; 1.5%)	Air pollution (6.4; 1.8%)	Bone density (4.4; 1.6%)	Bone density (0.6; 1.4%)

LBW = low birthweight.

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Figure 6.3: Leading risk factor contribution to non-fatal burden (YLD '000; proportion %), for males, by age group, 2018

Rank	Age group (years) 0–14	15–24	25–44	45–64	65–74	75–84	85–94	95+
1st	Child abuse/neglect (1.3; 1.6%)	Alcohol (13.1; 12.3%)	Alcohol (31.7; 10.5%)	Overweight/obesity (35.5; 10.4%)	Overweight/obesity (25.2; 12.8%)	Overweight/obesity (14.8; 10.7%)	Overweight/obesity (5.5; 8.6%)	Blood pressure (0.7; 10.1%)
2nd	Overweight/obesity (1.1; 1.4%)	Illicit drug use (6.6; 6.2%)	Illicit drug use (19.1; 6.3%)	Blood glucose (18.5; 5.4%)	Blood glucose (15.8; 8.0%)	Blood glucose (10.2; 7.4%)	Blood pressure (5.2; 8.1%)	Tobacco (0.6; 8.6%)
3rd	LBW/short gestation (0.8; 1.0%)	Occupational (3.5; 3.3%)	Occupational (13.9; 4.6%)	Tobacco (16.9; 4.9%)	Tobacco (15.1; 7.7%)	Blood pressure (9.7; 7.0%)	Tobacco (4.9; 7.7%)	Diet (0.6; 8.5%)
4th	Bullying victimisation (0.6; 0.8%)	Child abuse/neglect (3.2; 3.0%)	Overweight/obesity (11.6; 3.8%)	Occupational (16.9; 4.9%)	Diet (11.1; 5.6%)	Tobacco (9.2; 6.7%)	Diet (4.1; 6.4%)	Overweight/obesity (0.6; 8.3%)
5th	Blood glucose (0.3; 0.4%)	Overweight/obesity (2.1; 2.0%)	Child abuse/neglect (10.3; 3.4%)	Alcohol (12.8; 3.7%)	Blood pressure (10.6; 5.4%)	Diet (8.3; 6.0%)	Blood glucose (3.0; 4.7%)	Physical inactivity (0.4; 5.5%)
6th		Bullying victimisation (1.5; 1.4%)	Tobacco (5.6; 1.9%)	Diet (12.3; 3.6%)	Physical inactivity (5.0; 2.6%)	Physical inactivity (5.1; 3.7%)	Physical inactivity (2.8; 4.4%)	Cholesterol (0.3; 4.5%)
7th		Blood glucose (0.8; 0.8%)	Blood glucose (4.3; 1.4%)	Blood pressure (9.0; 2.6%)	Cholesterol (3.6; 1.8%)	Kidney function (4.1; 2.9%)	Kidney function (2.2; 3.4%)	Kidney function (0.3; 3.5%)
8th		LBW/short gestation (0.6; 0.5%)	Diet (1.6; 0.5%)	Illicit drug use (6.8; 2.0%)	Kidney function (3.5; 1.8%)	Cholesterol (2.9; 2.1%)	Cholesterol (1.9; 3.0%)	Blood glucose (0.2; 2.9%)
9th			LBW/short gestation (1.2; 0.4%)	Child abuse/neglect (6.5; 1.9%)	Air pollution (2.9; 1.5%)	Alcohol (2.2; 1.6%)	Alcohol (1.0; 1.6%)	Alcohol (0.1; 1.5%)
10th			Blood pressure (1.0; 0.3%)	Cholesterol (6.3; 1.8%)	Alcohol (2.9; 1.5%)	Air pollution (2.1; 1.5%)	Air pollution (0.8; 1.3%)	Air pollution (0.1; 1.0%)

LBW = low birthweight.

Figure 6.4: Leading risk factor contribution to non-fatal burden (YLD '000; proportion %), for females, by age group, 2018

Rank	Age group (years) 0–14	15–24	25–44	45–64	65–74	75–84	85–94	95+
1st	Child abuse/neglect (1.9; 3.1%)	Child abuse/neglect (8.0; 7.0%)	Child abuse/neglect (21.1; 6.7%)	Overweight/obesity (31.3; 8.1%)	Overweight/obesity (22.5; 11.1%)	Overweight/obesity (16.1; 9.7%)	Overweight/obesity (10.6; 9.4%)	Tobacco (1.9; 10.7%)
2nd	Iron deficiency (0.9; 1.4%)	Alcohol (5.6; 4.9%)	Overweight/obesity (11.5; 3.6%)	Tobacco (16.4; 4.2%)	Tobacco (15.6; 7.7%)	Tobacco (14.6; 8.8%)	Tobacco (10.2; 9.1%)	Overweight/obesity (1.7; 9.4%)
3rd	Bullying victimisation (0.7; 1.1%)	Illicit drug use (3.4; 3.0%)	Partner violence (10.9; 3.4%)	Child abuse/neglect (15.4; 4.0%)	Blood glucose (11.0; 5.4%)	Blood glucose (8.4; 5.1%)	Blood pressure (6.6; 5.8%)	Blood pressure (1.4; 7.8%)
4th	Overweight/obesity (0.7; 1.1%)	Bullying victimisation (2.4; 2.1%)	Illicit drug use (9.0; 2.8%)	Blood glucose (13.8; 3.6%)	Diet (6.0; 3.0%)	Blood pressure (7.6; 4.6%)	Blood glucose (5.5; 4.9%)	Physical inactivity (1.1; 6.0%)
5th	LBW/short gestation (0.5; 0.8%)	Occupational (2.1; 1.8%)	Occupational (7.9; 2.5%)	Partner violence (9.8; 2.5%)	Blood pressure (5.6; 2.8%)	Diet (5.6; 3.3%)	Physical inactivity (5.5; 4.9%)	Diet (1.0; 5.9%)
6th	Blood glucose (0.3; 0.5%)	Iron deficiency (1.8; 1.6%)	Alcohol (7.6; 2.4%)	Occupational (9.6; 2.5%)	Physical inactivity (4.1; 2.0%)	Physical inactivity (5.1; 3.1%)	Kidney function (5.3; 4.7%)	Kidney function (0.9; 5.3%)
7th		Partner violence (1.7; 1.5%)	Iron deficiency (5.3; 1.7%)	Alcohol (7.2; 1.9%)	Air pollution (2.1; 1.1%)	Kidney function (4.7; 2.8%)	Diet (4.4; 3.9%)	Blood glucose (0.7; 3.7%)
8th		Overweight/obesity (1.5; 1.3%)	Tobacco (4.0; 1.3%)	Diet (6.6; 1.7%)	Kidney function (2.1; 1.1%)	Cholesterol (2.3; 1.4%)	Cholesterol (2.4; 2.1%)	Cholesterol (0.6; 3.6%)
9th		Blood glucose (0.7; 0.6%)	Blood glucose (3.6; 1.1%)	Iron deficiency (4.1; 1.1%)	Child abuse/neglect (1.9; 0.9%)	Bone density (2.1; 1.3%)	Bone density (1.9; 1.7%)	Alcohol (0.2; 1.3%)
10th		LBW/short gestation (0.3; 0.3%)	Diet (1.1; 0.3%)	Blood pressure (3.6; 0.9%)	Cholesterol (1.8; 0.9%)	Air pollution (2.1; 1.2%)	Air pollution (1.3; 1.2%)	Air pollution (0.2; 1.1%)

LBW = low birthweight.

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Figure 6.5: Leading risk factor contribution to fatal burden (YLL '000; proportion %), for males, by age group, 2018

Rank	Age group (years) 0–14	15–24	25–44	45–64	65–74	75–84	85–94	95+
1st	LBW/short gestation (16.3; 25.3%)	Alcohol (10.2; 18.3%)	Illicit drug use (34.4; 19.8%)	Tobacco (70.1; 17.5%)	Tobacco (58.1; 19.5%)	Tobacco (40.2; 15.8%)	Blood pressure (17.1; 12.9%)	Blood pressure (1.5; 15.2%)
2nd	Kidney function (0.3; 0.5%)	Illicit drug use (7.8; 14.0%)	Alcohol (23.7; 13.7%)	Overweight/obesity (53.0; 13.2%)	Overweight/obesity (38.1; 12.8%)	Blood pressure (27.0; 10.6%)	Diet (14.9; 11.2%)	Diet (1.2; 12.7%)
3rd	Child abuse/neglect (0.2; 0.3%)	Child abuse/neglect (5.7; 10.2%)	Child abuse/neglect (11.7; 6.7%)	Diet (50.7; 12.6%)	Diet (32.7; 11.0%)	Overweight/obesity (25.9; 10.2%)	Tobacco (14.2; 10.7%)	Overweight/obesity (1.0; 9.7%)
4th		Occupational (1.4; 2.4%)	Diet (10.3; 5.9%)	Blood pressure (38.2; 9.5%)	Blood pressure (29.5; 9.9%)	Diet (25.6; 10.1%)	Overweight/obesity (11.9; 9.0%)	Tobacco (0.7; 7.5%)
5th		Overweight/obesity (0.5; 1.0%)	Overweight/obesity (9.0; 5.2%)	Cholesterol (34.4; 8.6%)	Blood glucose (20.4; 6.8%)	Blood glucose (18.4; 7.2%)	Physical inactivity (8.1; 6.1%)	Physical inactivity (0.7; 6.9%)
6th		Blood glucose (0.3; 0.6%)	Cholesterol (7.5; 4.3%)	Alcohol (34.2; 8.5%)	Alcohol (14.7; 4.9%)	Physical inactivity (12.9; 5.0%)	Blood glucose (8.0; 6.0%)	Cholesterol (0.7; 6.6%)
7th			Tobacco (6.7; 3.8%)	Illicit drug use (23.6; 5.9%)	Cholesterol (12.2; 4.1%)	Kidney function (11.4; 4.5%)	Cholesterol (7.2; 5.5%)	Kidney function (0.6; 5.6%)
8th			Blood pressure (6.2; 3.6%)	Blood glucose (19.6; 4.9%)	Physical inactivity (10.3; 3.5%)	Cholesterol (10.2; 4.0%)	Kidney function (6.9; 5.2%)	Blood glucose (0.5; 5.2%)
9th			Occupational (5.7; 3.3%)	Physical inactivity (11.4; 2.8%)	Kidney function (8.9; 3.0%)	Alcohol (9.0; 3.5%)	Alcohol (4.1; 3.1%)	Alcohol (0.3; 3.3%)
10th			Blood glucose (2.6; 1.5%)	Air pollution (11.1; 2.8%)	Occupational (8.0; 2.7%)	Air pollution (6.0; 2.3%)	Air pollution (2.6; 1.9%)	Bone density (0.2; 1.8%)

LBW = low birthweight.

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Figure 6.6: Leading risk factor contribution to fatal burden (YLL '000; proportion %), for females, by age group, 2018

Rank	Age group (years) 0–14	15–24	25–44	45–64	65–74	75–84	85–94	95+
1st	LBW/short gestation (11.2; 23.2%)	Child abuse/neglect (2.5; 11.7%)	Illicit drug use (9.2; 10.5%)	Tobacco (40.0; 15.8%)	Tobacco (38.6; 20.4%)	Tobacco (30.3; 15.3%)	Blood pressure (21.8; 13.7%)	Blood pressure (4.0; 16.6%)
2nd	Kidney function (0.3; 0.5%)	Illicit drug use (2.0; 9.4%)	Alcohol (5.7; 6.5%)	Overweight/obesity (23.4; 9.2%)	Overweight/obesity (20.4; 10.8%)	Overweight/obesity (20.8; 10.5%)	Overweight/obesity (16.6; 10.4%)	Overweight/obesity (2.8; 11.6%)
3rd	Child abuse/neglect (0.2; 0.4%)	Alcohol (1.9; 9.1%)	Child abuse/neglect (5.0; 5.8%)	Diet (19.5; 7.7%)	Diet (13.6; 7.2%)	Blood pressure (20.7; 10.4%)	Diet (16.1; 10.1%)	Diet (2.8; 11.5%)
4th		Partner violence (1.0; 4.5%)	Diet (4.3; 5.0%)	Alcohol (12.4; 4.9%)	Blood pressure (12.4; 6.5%)	Diet (16.5; 8.3%)	Tobacco (13.0; 8.2%)	Physical inactivity (2.0; 8.2%)
5th		Overweight/obesity (0.2; 0.7%)	Partner violence (4.2; 4.8%)	Blood pressure (11.7; 4.6%)	Blood glucose (10.8; 5.7%)	Blood glucose (12.8; 6.5%)	Physical inactivity (11.6; 7.3%)	Kidney function (1.9; 7.9%)
6th		Occupational (0.1; 0.6%)	Overweight/obesity (4.0; 4.6%)	Cholesterol (10.7; 4.2%)	Physical inactivity (6.6; 3.5%)	Physical inactivity (11.1; 5.6%)	Kidney function (10.6; 6.6%)	Cholesterol (1.8; 7.3%)
7th		Blood glucose (0.1; 0.5%)	Tobacco (2.6; 3.0%)	Illicit drug use (10.4; 4.1%)	Alcohol (5.8; 3.1%)	Kidney function (10.4; 5.3%)	Blood glucose (10.5; 6.6%)	Blood glucose (1.3; 5.6%)
8th		Sun exposure (0.1; 0.3%)	Unsafe sex (2.5; 2.9%)	Blood glucose (10.3; 4.1%)	Cholesterol (4.6; 2.4%)	Cholesterol (7.7; 3.9%)	Cholesterol (9.4; 5.9%)	Tobacco (1.2; 5.0%)
9th		Kidney function (0.1; 0.3%)	Cholesterol (2.3; 2.7%)	Physical inactivity (6.9; 2.7%)	Kidney function (4.3; 2.3%)	Alcohol (5.6; 2.8%)	Alcohol (4.4; 2.8%)	Alcohol (0.7; 3.0%)
10th			Blood glucose (2.1; 2.5%)	Air pollution (4.7; 1.9%)	Air pollution (3.9; 2.0%)	Air pollution (4.3; 2.2%)	Air pollution (2.9; 1.8%)	Bone density (0.4; 1.7%)

LBW = low birthweight.

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7 Changes over time

Key results

- Between 2003 and 2018, the total burden of disease rose 20% (from 4.2 million to 5.0 million DALY). Non-fatal and fatal burden increased 34% (from 1.9 to 2.6 million YLD) and 6.8% (from 2.2 to 2.4 million YLL), respectively.
- When the impact of increasing age and size of the population was considered, the rate of burden fell 13% during this period, from 209 to 182 DALY per 1,000 population. Non-fatal burden rates were similar between 2003 and 2018 (97.9 and 98.1 YLD per 1,000 population, respectively) and fatal burden decreased 24% from 111 to 84 YLL per 1,000 population.
- In 2003, dying prematurely caused more burden than the burden caused by living with illness in Australia. There was a shift toward more non-fatal burden between 2003 and 2018.
- ASRs of total burden for most disease groups decreased or were similar between 2003 and 2018, although there was a notable increase for neurological conditions.
- There was a large fall in the rate of fatal burden for cardiovascular diseases, but rates rose for neurological conditions.
- Between 2003 and 2018, there was a small overall decrease in the proportion of burden attributable to the risk factors measured at both time points (from 37% in 2003 to 35% in 2018). This reflects reductions in exposure to the risk factor, or reductions in burden from the linked diseases and injuries, or both.
- There was a substantial drop in total DALY attributable to high cholesterol (down 33%), high blood pressure (down 24%), dietary risks (down 15%) and unsafe sex (down 9.6%) between 2003 and 2018.
- The ASRs for total attributable DALY decreased for high cholesterol by 53%, for high blood pressure by 49%, for dietary risks by 42%, for physical inactivity by 34% and for tobacco use by 32%.
- There were also increases in total attributable DALY for some risk factors, including illicit drug use (up 70%) and overweight (including obesity) (up 38%). The ASR increased for illicit drug use by 35% and remained relatively steady for overweight (including obesity).

This chapter compares the disease burden at 2 points in time: 2003 and 2018. As noted earlier, comparisons can be made within a study only where the same methods have been used to produce the non-fatal, fatal and total burden, and the burden attributed to risk factors.

To ensure comparability, estimates for the years 2003, 2011 and 2015 were calculated using the ABDS 2018 methods. Data for all reference years are available on the AIHW website.

The estimates for 2003, 2011 and 2015 in this report cannot be compared with those for 2003, 2011 and 2015 from previous Australian studies as they are developed using different methods. See Appendix A for further information on the methods used to develop the estimates presented here.

How should changes between time points be interpreted?

When comparing estimates for the same disease between time points, it is important to note that:

- YLD and YLL may change by differing proportions, depending on prevalence and risk factor exposure, thus making different contributions to the change in DALY
- individual diseases within disease groups may have different trends: increases in estimates for specific diseases can be offset by decreases in other diseases, thereby resulting in no change overall at the disease group level
- unless adjusted for, the impact of population changes (for example, ageing and an increase in population size) may mask changes in underlying disease prevalence and/or severity.

Where possible, adjustments were made for definitional changes between time points.

To help interpret the change in disease burden, this section presents changes in DALY, YLD, YLL and attributable burden in multiple ways:

- **Numbers:** show the total *impact* of the disease burden on the population at each time point. Changes are expressed as the absolute change for 2018 compared with 2003 and the relative change expressed as a *percentage*. A negative absolute or relative change indicates a decline between 2003 and 2018 and a positive value indicates an increase.
- **ASRs:** account for changes in population composition over time, such as increasing size and ageing. *Rate ratios* show how many times the rate of burden is in 2018 relative to that in 2003—values greater than 1 indicate an increase in underlying burden (once changes to the population are taken into account), while values less than 1 indicate a decrease in underlying burden. Values close to 1 indicate that there has been minimal change. *Rate differences* show the absolute difference between the ASR of burden from 2003 to 2018. The differences between ASRs are also expressed as a *percentage*.
- **Changes in ranking:** disease rankings are used in burden of disease reporting to describe which diseases contribute the most burden. While they are used in some places in this section, it is important not to place too great an emphasis on changes in rankings as the story can be misleading. Rankings do not provide the reader with context of the size of each estimate, nor of the magnitude of difference between estimates that are adjacent in rank.

How has total burden changed over time?

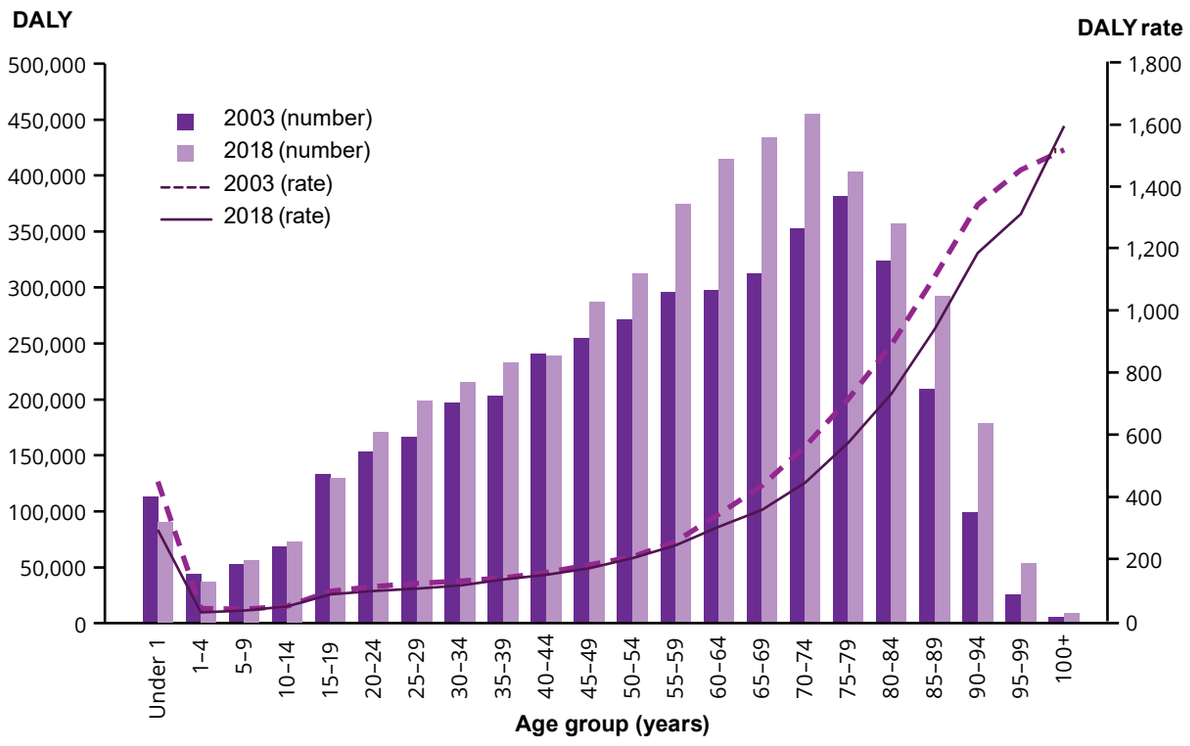
Total burden has increased over time, but rates have decreased

Total DALY increased by 20% between 2003 and 2018, from 4.2 million to 5.0 million DALY, largely reflecting rises in the size of the population (the Australian population increased by 27% between 2003 and 2018).

Age-specific DALY *rates* were lower in 2018 than in 2003 for every age group, except for age 100 and over; however, there was little change in total burden between 2003 and 2018 for ages 1 to 55 (Figure 7.1). The increase in the *number* of DALY experienced in most of those aged 45–99 was due to the increase in population for this age group. Information on the Australian population by age group for each of the reference years is provided in Appendix D (Figure D8 and Table D2).

After taking into account the impact of the increasing age of the population (by using age-standardisation), there was a more pronounced decrease by 27 DALY per 1,000 population (13%) in overall burden, from 209 to 182 (Table 7.1). Most of this decline was observed between 2003 and 2011. There was a 2.8% decrease (from 187 to 182 DALY per 1,000) between 2015 and 2018. For age-specific rates of burden across the 4 reference years, refer to the online supplementary Table S7.1.

Figure 7.1: Number and rates of total burden (DALY per 1,000 population), by age, 2003 and 2018



Note: Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.

What are the drivers of changes observed between 2003 and 2018?

Changes in non-fatal burden and fatal burden

The contributions of fatal burden (YLL) and non-fatal burden (YLD) were closer to one another in 2018 than in 2003 (the YLL to YLD ratio was 53:47 in 2003 compared with 48:52 in 2018). This shows that there has been a shift toward a greater contribution of non-fatal burden to overall burden in 2018.

The higher DALY that occurred in those aged 60–74 (in 2018 compared with 2003) was driven primarily by an increase in YLD in these age groups, along with minor increases in YLL. The increase in DALY for those aged 85 and over was driven by increases in both YLD and YLL (figures 7.3 and 7.4). The changes in YLD and YLL are described in more detail in the following sections.

Disease-specific drivers of change

For most disease groups, age-standardised rates for 2018 were similar to, or slightly lower than, those for 2003. The exceptions were cardiovascular diseases (decrease of 40%), infectious diseases (decrease of 30%) and infant & congenital conditions (decrease of 28%), which had much lower rates. This trend, together with an overall lower rate in 2018 than in 2003 (a rate ratio of 0.9), indicates that there has generally been an improvement in underlying disease epidemiology (Table 7.1).

The most notable increase in age-standardised burden rates was in neurological conditions (9.9%; an increase of 1.2 DALY per 1,000 population). Disease-specific changes are described more fully in the following sections.

Table 7.1: Change in total burden (DALY) between 2003 and 2018, by disease group

Disease group	2003 DALY (number)	2018 DALY (number)	Change in DALY (number)	Change in DALY (%)	2003 DALY ASR	2018 DALY ASR	Change in ASR	ASR rate ratio 2018:2003
Cancer	769,753	881,094	111,341	14.5	38.2	30.5	–7.8	0.8
Musculoskeletal	506,269	653,088	146,819	29.0	25.3	24.0	–1.3	0.9
Cardiovascular	735,947	645,980	–89,967	–12.2	36.4	21.7	–14.7	0.6
Mental/substance use	486,179	631,568	145,389	29.9	24.7	25.9	1.2	1.0
Injuries	356,122	418,206	62,085	17.4	18.1	16.6	–1.5	0.9
Neurological	242,164	389,148	146,984	60.7	12.1	13.3	1.2	1.1
Respiratory	274,712	364,076	89,364	32.5	13.8	13.0	–0.7	0.9
Gastrointestinal	129,496	163,816	34,321	26.5	6.5	5.9	–0.5	0.9
Endocrine	100,349	139,531	39,182	39.0	5.0	4.8	–0.1	1.0
Oral	85,603	118,926	33,324	38.9	4.3	4.5	0.2	1.0
Hearing/vision	66,450	109,241	42,791	64.4	3.3	3.7	0.4	1.1
Infant/congenital	122,251	108,444	–13,807	–11.3	6.4	4.6	–1.8	0.7
Infections	93,267	91,912	–1,354	–1.5	4.7	3.3	–1.4	0.7
Skin	68,690	88,014	19,324	28.1	3.5	3.5	0.0	1.0
Kidney/urinary	46,796	66,463	19,667	42.0	2.3	2.2	–0.1	1.0
Blood/metabolic	44,465	59,341	14,876	33.5	2.2	2.2	–0.0	1.0
Reproductive/maternal	39,128	54,670	15,542	39.7	2.0	2.1	0.2	1.1
Total	**4,167,640**	**4,983,519**	**815,879**	**19.6**	**208.6**	**181.8**	**–26.8**	**0.9**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
2. Change in DALY is 2018 DALY minus 2003 DALY, expressed as a percentage of 2003 DALY.
3. Change in ASR is 2018 ASR minus 2003 ASR.
4. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.

Changes in burden of specific diseases over time

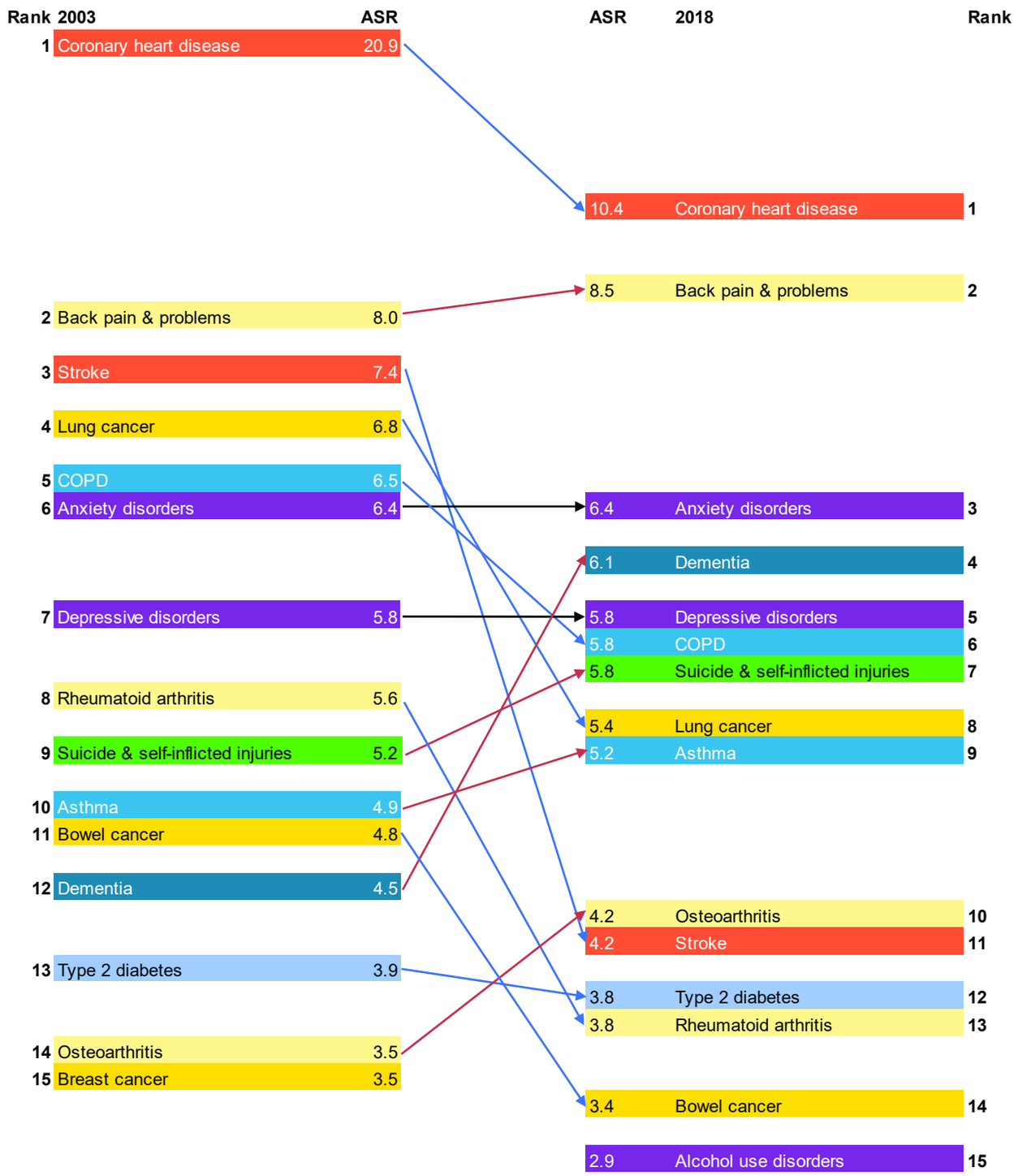
The leading causes of total burden (based on rates) in 2003 and 2018 remained largely the same (Figure 7.2). Although coronary heart disease remained the most burdensome disease in Australia in 2018, the total burden rate fell by 50% between 2003 and 2018 (from 21 DALY per 1,000 population to 10).

Total burden rates also decreased for stroke, lung, bowel and breast cancer, rheumatoid arthritis and COPD, resulting in a drop in the rankings for each disease. While total burden also decreased for alcohol use disorders, its ranking rose between 2003 and 2018.

Australians suffered increased rates of disease burden from back pain & problems, suicide & self-inflicted injuries, asthma, dementia and osteoarthritis. In particular, burden from dementia rose by 33%, from 4.5 DALY per 1,000 population to 6.1. This may be due to an increase in the number of deaths coded to dementia since 2006, which was partly a result of changes to coding practices (see Box 7.2 for more information). This was associated with a rise in ranking from 12th in 2003 to fourth in 2018 for dementia.

Notably, breast cancer caused high rates of burden in 2003, but was no longer ranked among the leading 15 diseases/injuries in 2018. Instead, alcohol use disorders was ranked more highly for the population in 2018 at 15th.

Figure 7.2: Change in disease ranking and age-standardised DALY rate (DALY per 1,000 population) between 2003 and 2018



ASR = age-standardised rate; COPD = chronic obstructive pulmonary disease.

Notes

1. Diseases are presented in descending order, from highest ASR to lowest ASR, with arrows indicating either an increase (red), decrease (blue) or no change (black) in the ASR over time.
2. 'Other musculoskeletal conditions' are excluded from the rankings.
3. There were changes in practices of coding deaths due to dementia; therefore, caution is recommended when interpreting changes over time for dementia burden.

Cardiovascular diseases, neurological conditions and injuries: disease-specific changes

Disease burden from cardiovascular diseases has dramatically decreased since 2003

Cardiovascular diseases was the third largest disease group causing burden in Australia, accounting for 13% of the total burden in 2018. Since 2003, Australians suffered 40% lower rates of disease burden from cardiovascular diseases, from 36 years lost per 1,000 population to 22 years in 2018. This is equivalent to around 90,000 less healthy years of life lost in 2018 than in 2003. This lower burden was a result of reductions in the rate of burden from both dying prematurely (45%; by 13 YLL per 1,000 population) and living with the impacts of cardiovascular disease (22%; 1.5 YLD per 1,000 population).

Most diseases in this group had lower rates of burden since 2003. Coronary heart disease and stroke, the major contributors to cardiovascular disease burden (48% and 19%, respectively), were also the main drivers in reducing this burden as their DALY rates decreased by over 40% each from 2003 to 2018. Despite this reduction, coronary heart disease was still ranked as the disease with the highest burden for Australians, while the ranking for stroke changed from third to 11th.

Disease burden from neurological conditions has increased, mainly due to dementia

Neurological conditions accounted for 7.8% of total burden in 2018. Burden rates increased by 9.9% since 2003 (from 12 DALY per 1,000 population to 13 in 2018) reflecting 147,000 more DALY in 2018. The increase over time was higher among males than females (13% and 8.4%, respectively).

Dementia, the largest contributor to neurological disease burden (51%) was the main driver of this rise in burden. Dementia burden rates were 33% higher in 2018 than in 2003, largely driven by an 80% increase in the rate of fatal burden due to dementia. These changes over time led to a climb in rank for dementia from 12th position in 2003 to fourth in 2018. It is important to note that this rise may be partly due to changes in ICD (International Statistical Classification of Diseases and Related Health Problems) coding practices for dementia, implemented in 2006. See Box 7.2 for further information on this issue.

Disease burden from injuries decreased, especially for road traffic injuries

Overall, injuries accounted for 8.4% of the total disease burden in Australia. The rate of burden for injuries reduced by 8.1% since 2003, an effect seen across a wide range of injury types. Most importantly, burden from road traffic injuries involving motor vehicle occupants reduced by 51% (from 3.2 DALY per 1,000 population to 1.6). Injuries to motor vehicle occupants were ranked 16th in 2003 but were no longer among the leading 20 causes of disease burden in 2018.

However, the overall reduction in injury burden masked increases in burden from falls, poisoning and suicide & self-inflicted injuries, which were high-burden injuries for Australians in 2018. Together, they accounted for 68% of the injury burden and 5.7% of the total burden in Australia. Compared with the situation in 2003, Australians had a higher burden rate from falls (up by 17%), poisoning (55%) and suicide (11%) in 2018. Changes in burden increased rankings for these 3 injuries.

Are changes in burden due to population changes?

ASRs, rate ratios (which show how many times the rate of burden is at 1 time point to another) and rate differences (which show the difference in rate of burden from 1 time point to another) used earlier are helpful to tease out the changes in disease burden, as distinct from the changes in population size and structure.

To help distinguish the impact of population increase compared with population ageing—as well as impacts of epidemiological changes—this study estimated the drivers of change over time. The results for these are presented in the interactive data on disease burden.

How have the non-fatal and fatal burden changed over time?

The following sections describe the changes in non-fatal (YLD) and fatal (YLL) burden between 2003 and 2018.

Changes in non-fatal burden

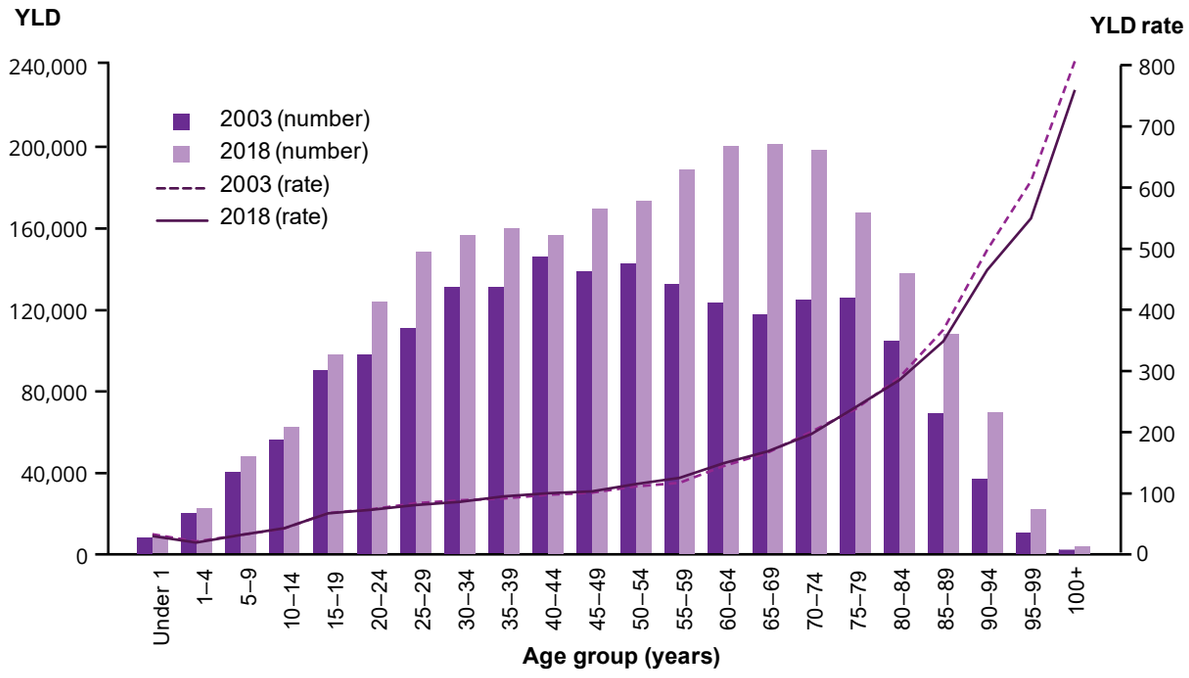
Changes in non-fatal burden (YLD) rates are influenced by changes in the prevalence and/or the severity of the disease.

Overall change in non-fatal burden

There was a 34% increase in the total YLD between 2003 and 2018, from 1.9 million to 2.6 million YLD. The rise in YLD occurred in almost all age groups but was largest in the older age groups. However, there was little difference in age-specific YLD rates for all age groups up to age 85 (Figure 7.3). Beyond age 85, the 2018 rate was slightly lower than that for 2003; factors contributing to this are explored further in this section.

After adjusting for ageing of the population, age-standardised YLD rates were relatively stable between 2003 and 2018, at 97.9 and 98.1 YLD per 1,000 population (rate ratio 1.0), respectively (Table 7.2). Although the rates are similar overall, there are differences in YLD rates between 2003 and 2018 when looking at specific diseases and these are outlined in the next section.

Figure 7.3: Number and rates of non-fatal burden (YLD per 1,000 population), by age, 2003 and 2018



Note: Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.

Changes in non-fatal burden by disease group

All disease groups contributed to the overall rise in the number of YLD, but in differing amounts (Table 7.2). Comparing ASRs, most disease groups showed very little underlying change (as indicated by rate ratios around 1.0).

Increases in non-fatal burden rates were observed for endocrine disorders (22%) and blood & metabolic disorders (20%); however, the rate difference was small for these disease groups (0.5 and 0.2 YLD per 1,000 population, respectively). The rate was lower in 2018 for cardiovascular diseases (22%), and there was a minor decrease for infant & congenital conditions (9.2%) and infectious diseases (8.1%).

Table 7.2: Change in non-fatal burden (YLD) between 2003 and 2018, by disease group

Disease group	2003 YLD (number)	2018 YLD (number)	Change in YLD (number)	Change in YLD (%)	2003 YLD ASR	2018 YLD ASR	Change in ASR	ASR rate ratio 2018:2003
Musculoskeletal	491,353	634,472	143,118	29.1	24.6	23.3	–1.2	1.0
Mental/substance use	469,554	620,276	150,723	32.1	23.9	25.5	1.6	1.1
Respiratory	169,503	233,462	63,959	37.7	8.5	8.6	0.1	1.0
Neurological	150,769	207,536	56,767	37.7	7.5	7.3	–0.2	1.0
Cardiovascular	135,790	158,096	22,306	16.4	6.7	5.2	–1.5	0.8
Oral	85,446	118,566	33,120	38.8	4.3	4.5	0.2	1.0
Hearing/vision	66,450	109,241	42,791	64.4	3.3	3.7	0.4	1.1
Endocrine	48,351	84,117	35,766	74.0	2.4	3.0	0.5	1.2
Skin	64,334	81,112	16,778	26.1	3.3	3.3	—	1.0
Injuries	53,848	73,551	19,704	36.6	2.7	2.8	0.1	1.0
Cancer	45,730	69,371	23,641	51.7	2.3	2.3	0.1	1.0
Gastrointestinal	48,595	64,081	15,486	31.9	2.4	2.4	—	1.0
Reproductive/maternal	38,266	53,437	15,171	39.6	1.9	2.1	0.2	1.1
Infections	25,674	30,588	4,915	19.1	1.3	1.2	–0.1	0.9
Kidney/urinary	19,596	27,640	8,044	41.0	1.0	0.9	—	1.0
Blood/metabolic	16,841	27,278	10,436	62.0	0.8	1.0	0.2	1.2
Infant/congenital	17,953	20,352	2,399	13.4	0.9	0.8	–0.1	0.9
Total	**1,948,054**	**2,613,178**	**665,124**	**34.1**	**97.9**	**98.1**	**0.3**	**1.0**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
2. Change in YLD is 2018 YLD minus 2003 YLD, expressed as a percentage of 2003 YLD.
3. Change in ASR is 2018 ASR minus 2003 ASR.
4. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.

Disease-specific changes in non-fatal burden

There were some differences between 2003 and 2018 for many of the leading ranked causes of non-fatal burden (Table 7.3). Of particular note, YLD rates in 2018 were:

- higher for autism spectrum disorders (62%), periodontal disease (40%), drug use disorders (32%)—notably due to increases in amphetamine dependence—atrial fibrillation & flutter (31%), type 2 diabetes (24%), osteoarthritis (20%) and back pain & problems (7.3%) which had the largest absolute change in YLD number
- lower for coronary heart disease (40%) and rheumatoid arthritis (32%), compared with 2003.

While it is not completely clear why the burden of autism is increasing, both higher levels of diagnosis and heightened awareness of the condition may have contributed to an increase in the reporting of autism-related disorders (AIHW 2017a).

It is important to note that for some diseases the absolute change in ASR between the reference years was small. There was little or no change in the non-fatal burden of the remaining leading 20 ranked diseases; however, prevalence data for some of these conditions in Australia are not readily available over time (see Box 7.1). Further information on the data quality for these diseases can be found in Appendix B.

Table 7.3: Change in leading causes of non-fatal burden (YLD) between 2003 and 2018

Disease	Rank 2003	Change in YLD (number)	Change in YLD (%)	ASR difference	ASR rate ratio 2018:2003	Rank 2018
Back pain & problems	1	63,817	40.6	0.6	1.1	1
Anxiety disorders	2	30,528	24.2	0.0	1.0	2
Depressive disorders	3	28,066	24.6	0.0	1.0	3
Asthma	5	33,854	37.8	0.4	1.1	4
Osteoarthritis	7	49,209	70.0	0.7	1.2	5
Rheumatoid arthritis	4	–6,688	–6.1	–1.8	0.7	6
Dementia	9	32,648	60.6	–0.0	1.0	7
COPD	8	26,222	45.0	–0.2	0.9	8
Hearing loss	11	31,011	65.2	0.3	1.1	9
Coronary heart disease	6	–6,910	–9.1	–1.5	0.6	10
Type 2 diabetes mellitus	13	30,216	79.6	0.5	1.2	11
Alcohol use disorders	10	11,130	21.2	—	1.0	12
Dental caries	15	14,955	44.1	0.2	1.1	13
Migraine	12	7,130	18.2	–0.1	0.9	14
Drug use disorders (excluding alcohol)	20	18,108	64.6	0.5	1.3	15
Autism spectrum disorders	25	21,770	104.6	0.7	1.6	16
Bipolar affective disorder	14	7,906	23.1	0.0	1.0	17
Atrial fibrillation & flutter	24	20,532	95.5	0.3	1.3	18
Periodontal disease	23	19,697	88.2	0.5	1.4	19
Eating disorders	16	11,110	36.6	0.2	1.1	20

COPD = chronic obstructive pulmonary disease

Notes

1. 'Other musculoskeletal conditions' excluded from rankings.
2. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
3. Change in YLD is 2018 YLD minus 2003 YLD, expressed as a percentage of 2003 YLD.
4. Change in ASR is 2018 ASR minus 2003 ASR.
5. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.
6. Ranked by number of YLD.

Box 7.1: Data gaps in non-fatal health loss over time

Unlike mortality data, there is no single reliable source of data on the incidence, prevalence, severity and duration of non-fatal health loss for all conditions. Instead, morbidity data were drawn from a wide variety of sources; however, the availability and quality of data over time varied by disease.

Conditions that require hospitalisation or where a high-quality national disease registry exists provide more reliable data on disease outcomes over time, compared with diseases where data were obtained from a one-off epidemiological study or health survey.

Prevalence or incidence of conditions with limited data over time were assumed to have remained unchanged; therefore, any change to YLD for these conditions reflects population growth and ageing only. Of the leading ranked YLD diseases, this included:

- mental health conditions—depressive disorders, anxiety disorders, schizophrenia and bipolar affective disorders
- dementia
- COPD
- hearing loss in older Australians
- dermatitis & eczema.

Therefore, these diseases will not show changes in rates over time. This highlights the need for more data on these conditions to determine if there are underlying changes in disease epidemiology in Australia.

Endocrine disorders and musculoskeletal conditions: disease-specific changes

Burden from living with type 2 and gestational diabetes increased

Endocrine disorders (comprising type 1, type 2 and other diabetes mellitus; and other endocrine disorders) accounted for over 3% of the non-fatal burden in Australia. Type 2 diabetes typically causes burden in Australians aged over 50 and is the biggest contributor to the endocrine disease group. In 2018, Australians suffered 24% higher non-fatal burden rates from type 2 diabetes than in 2003 (increasing from 1.9 YLD per 1,000 population to 2.3). However, the fatal burden rate for type 2 diabetes fell by 24% between 2003 and 2018 (from 2.0 YLL per 1,000 population to 1.5). This resulted in no change in the total burden rate for type 2 diabetes over time.

The burden rate also increased for gestational diabetes (a condition classified under maternal conditions) with over 3 times the burden in 2018 than in 2003. This is a substantial increase in burden and shows the importance of monitoring the disease in Australia given that it can affect the immediate and longer-term health of both mothers and children (Kampmann et al. 2015). Changes to gestational diabetes testing practices, diagnostic criteria and treatment practices may influence the number of women with gestational diabetes reported in a given year. Due to these factors, comparing the number of women with gestational diabetes over time should be done with caution.

Burden from living with back pain and osteoarthritis increased

Musculoskeletal conditions was the largest contributor of non-fatal burden in Australia, causing around one-quarter of the total burden. Overall, the non-fatal burden rate from musculoskeletal conditions fell by 5% between 2003 and 2018 (from 25 YLD per 1,000 population to 23). Although overall non-fatal musculoskeletal burden rates reduced, some conditions in this group experienced increases. Australians suffered more burden in 2018 than in 2003 from back pain & problems (7.3% rise) and osteoarthritis (20% rise), which together contributed to 54% of the total musculoskeletal burden. The increase in burden of osteoarthritis resulted in an increase in ranking from seventh to fifth, while back pain & problems remained as the leading cause of non-fatal burden in Australia in 2018. On the other hand, burden reduced for rheumatoid arthritis from 5.5 YLD per 1,000 population to 3.7 (32% decrease).

Changes in fatal burden

Changes in fatal burden (YLL) are influenced by both the number of deaths and the ages at which those deaths occur.

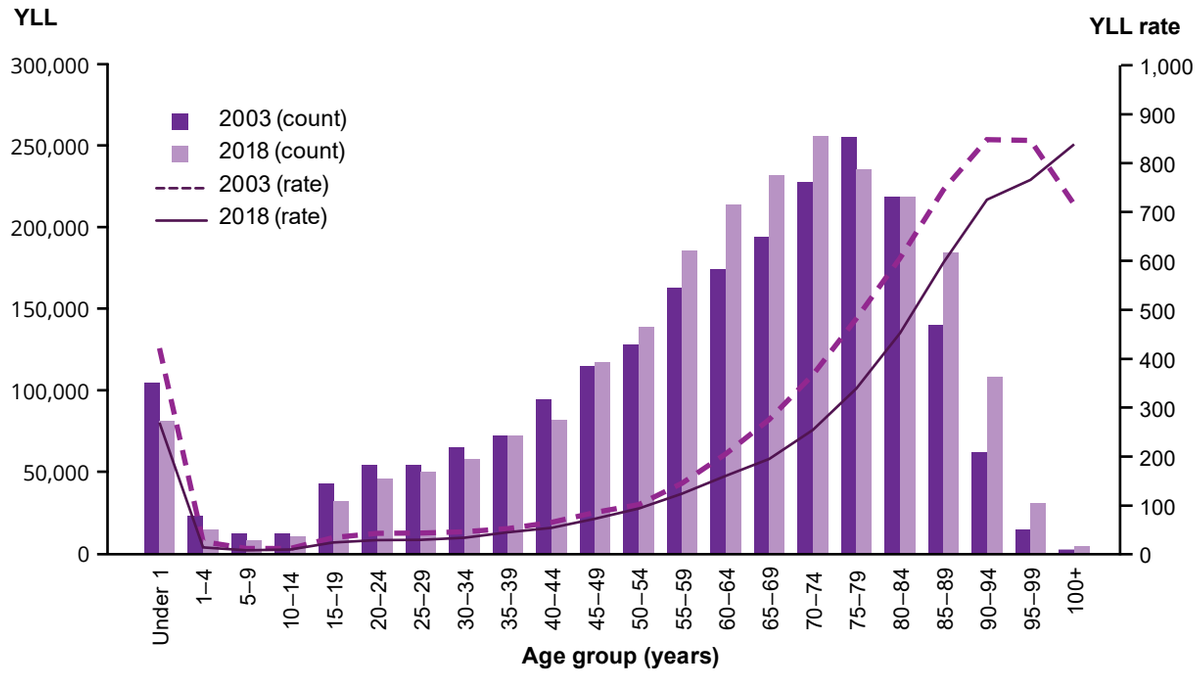
Overall change in fatal burden

The overall YLL was 6.8% higher in 2018 (2.4 million compared with 2.2 million in 2003). The higher number of YLL in 2018 can in part be attributed to the natural rise in the number of deaths associated with population increases.

In the age groups 0–44 and 75–79, there were more YLL in 2003 than in 2018 (Figure 7.4). The YLL rate was similar for both years starting from age 10 years up to age 54, beyond which it remains consistently lower in 2018 than in 2003 until age 94. This reflects a trend in rising age at death.

After adjusting for the ageing population, age-standardised YLL rates decreased by 24% between 2003 and 2018. The rate fell from 111 to 84 YLL per 1,000 population (rate ratio 0.8) (Table 7.4).

Figure 7.4: Number and rates of fatal burden (YLL per 1,000 population), by age, 2003 and 2018



Note: Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.

Changes in YLL by disease group

Fatal burden rates (YLL per 1,000 population) were lower or the same in 2018 for all major causes of death except neurological conditions (which includes dementia), which rose by 31% (Table 7.4). Lower fatal burden rates were observed in 2018 for cardiovascular diseases (45% decrease), infectious diseases (39%), infant & congenital conditions (31%), endocrine disorders (27%) and mental & substance use disorders (49% decrease), compared with 2003.

Table 7.4: Change in fatal burden (YLL) between 2003 and 2018, by disease group

Disease group	2003 YLL (number)	2018 YLL (number)	Change in YLL (number)	Change in YLL (%)	2003 YLL ASR	2018 YLL ASR	Change in ASR	ASR rate ratio 2018:2003
Cancer	724,023	811,723	87,700	12.1	35.9	28.1	–7.8	0.8
Cardiovascular	600,157	487,884	–112,273	–18.7	29.7	16.4	–13.2	0.6
Injuries	302,274	344,655	42,381	14.0	15.4	13.8	–1.6	0.9
Neurological	91,395	181,612	90,217	98.7	4.5	6.0	1.4	1.3
Respiratory	105,209	130,614	25,405	24.1	5.2	4.4	–0.8	0.8
Gastrointestinal	80,900	99,735	18,835	23.3	4.0	3.5	–0.5	0.9
Infant/congenital	104,298	88,091	–16,207	–15.5	5.4	3.7	–1.7	0.7
Infections	67,593	61,324	–6,269	–9.3	3.4	2.1	–1.3	0.6
Endocrine	51,998	55,414	3,416	6.6	2.6	1.9	–0.7	0.7
Kidney/urinary	27,200	38,822	11,623	42.7	1.3	1.3	—	1.0
Blood/metabolic	27,624	32,064	4,439	16.1	1.4	1.2	–0.2	0.8
Musculoskeletal	14,915	18,616	3,700	24.8	0.7	0.6	–0.1	0.9
Mental/substance use	16,625	11,292	–5,333	–32.1	0.8	0.4	–0.4	0.5
Skin	4,356	6,902	2,546	58.4	0.2	0.2	—	1.1
Reproductive/maternal	862	1,234	371	43.0	—	—	—	1.1
Oral	156	360	204	130.5	—	—	—	1.5
Total	**2,219,586**	**2,370,341**	**150,755**	**6.8**	**110.7**	**83.7**	**–27.0**	**0.8**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
2. Change in YLL is 2018 YLL minus 2003 YLL, expressed as a percentage of 2003 YLL.
3. Change in ASR is 2018 ASR minus 2003 ASR.
4. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.
5. Hearing & vision disorders are not included as this disease group did not incur any YLL.

Disease-specific changes in fatal burden

Table 7.5 shows the leading ranked causes of fatal burden in 2018 compared with 2003, including the absolute and relative change in the number of deaths for each cause. There were substantial changes between 2003 and 2018, contributing to the overall decrease in YLL. Changes of particular note are as follows:

- Coronary heart disease, stroke, injuries to motor vehicle occupants and lower respiratory infections (including influenza and pneumonia) had fewer deaths and fewer YLL in 2018 than in 2003.
- Breast cancer, bowel cancer and melanoma of the skin had more deaths, but fewer YLL, in 2018 than in 2003 primarily due to deaths, on average, occurring at older ages.
- Lung, prostate and brain cancers, COPD and type 2 diabetes had more deaths and higher YLL but a slightly lower age standardised YLL rate in 2018 than in 2003. These results reflect the impact of population ageing combined with delayed mortality from these causes.
- Dementia had substantially higher deaths and YLL in 2018 than in 2003, resulting in a substantial increase in fatal burden rate (an 80% increase from 1.9 YLL per 1,000 population to 3.4). This increase is most likely due to a large increase in deaths being coded to dementia as a result of changes in certification practices from 2006 onwards. The ABS has described this coding change (see Box 7.2). The difference in the age-standardised YLL rate between 2011 and 2018 was not as large, with only a 10% increase between these years.

- Poisoning showed a substantial increase in fatal burden rates (a 56% increase from 1.8 YLL per 1,000 population to 2.9). This large difference can in part be explained by changes in coding (see Box 7.2). Like dementia, the difference was not as large between 2011 and 2018 (20% increase).
- Liver cancer had substantially higher deaths and YLL in 2018, which resulted in an increase in the fatal burden rate (a 47% increase from 0.9 YLL per 1,000 population to 1.4). This may be due to the long-term impacts of hepatitis B and C infection in older age groups (Kirby Institute 2016, 2018), which are common risk factors for liver cancer.

Table 7.5: Change in leading causes of fatal burden between 2003 and 2018

Disease	Rank 2003	Change in deaths (number)	Change in YLL (number)	Change in YLL (%)	ASR rate ratio 2018:2003	Rank 2018
Coronary heart disease	1	–7,071	–104,830	–30.1	0.5	1
Lung cancer	3	1,687	20,871	15.4	0.8	2
Suicide & self-inflicted injuries	4	1,029	38,099	37.6	1.1	3
Dementia	12	10,519	72,419	185.4	1.8	4
Stroke	2	–2,074	–27,258	–20.1	0.5	5
COPD	6	1,732	18,931	25.9	0.8	6
Bowel cancer	5	352	–986	–1.1	0.7	7
Poisoning	14	852	33,081	92.0	1.6	8
Breast cancer	7	311	–2,008	–3.2	0.7	9
Chronic liver disease	10	718	14,677	36.9	1.0	10
Pancreatic cancer	15	1,194	17,444	50.0	1.0	11
Type 2 diabetes mellitus	11	546	4,533	11.4	0.8	12
Liver cancer	26	1,215	21,401	113.7	1.5	13
Brain & CNS cancer	16	313	5,781	17.6	0.9	14
Prostate cancer	13	497	589	1.6	0.7	15
Falls	24	2,483	16,563	78.3	1.2	16
Lower respiratory infections	9	–88	–4,630	–11.5	0.6	17
Chronic kidney disease	20	1,191	10,603	43.9	1.0	18
RTI–motor vehicle occupants	8	–402	–23,969	–41.5	0.5	19
Melanoma of the skin	19	273	–493	–1.9	0.7	20

COPD = chronic obstructive pulmonary disease; CNS = central nervous system; RTI = road traffic injuries.

Notes

1. 'Other malignant neoplasms (cancers)' and 'Other cardiovascular diseases' excluded from the rankings.
2. Lower respiratory infections includes influenza and pneumonia.
3. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
4. Change in deaths is 2018 deaths minus 2003 deaths.
5. Change in YLL is 2018 YLL minus 2003 YLL, expressed as a percentage of 2003 YLL.
6. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.
7. Ranked by number of YLL.

Box 7.2: Death data coding changes impacting on trends

Dementia

There has been a substantial rise in the number of deaths coded to dementia since 2006. According to the ABS (2014), there are 2 issues that may be partly responsible for this increase:

- Updates to the ICD-10 coding instructions resulted in deaths that may have previously been coded as cerebrovascular diseases (which includes stroke) being coded as vascular dementia.
- Changes to the *Veterans' Entitlements Act 1986* and the *Military Rehabilitation and Compensation Act 2004*, and a subsequent promotional campaign aimed at health professionals, allowed for death from vascular dementia of veterans or members of the Defence forces to be related to relevant service.

YLL estimates are based on the cause of death data, which are coded by the ABS without any adjustment for this variation. Hence, no adjustments have been made in the ABDS.

These changes will have an impact on comparisons made between 2003 and 2018 but not on those made between 2011 and 2018.

Poisoning

Since newer software for coding cause of death was implemented by the ABS in 2013, there have been some notable changes to causes of death data and, specifically, for some injuries. Previously, where a death was due to an accidental overdose with a known addiction to the drug, it would have been coded to a mental and behavioural disorder. Under the newer coding system, the drug overdose is captured as the underlying cause (accidental poisoning) while the addiction is maintained as an associated cause. As a result, since 2013 some of the increase in deaths (and YLL) due to poisoning may be influenced by these coding changes.

These changes will have an impact on comparisons made between 2003 and 2018 and between 2003 and 2015, but not on those made between 2003 and 2011 or between 2015 and 2018.

Infant & congenital conditions and respiratory diseases: disease-specific changes

Fatal burden from infant & congenital conditions decreased

Although infant & congenital conditions were not ranked highly in Australia's most burdensome diseases, they are the predominant causes of fatal burden (85%) in infants. In 2018, there were good gains in reducing burden of dying prematurely for Australian infants, as they suffered a reduced fatal burden rate (34%) since 2003. Girls had a slightly larger reduction in burden (36%) than boys (33%).

Most diseases in this disease group had lower fatal burden since 2003. Birth trauma & asphyxia and pre-term birth/low birthweight complications were the main causes of infant and congenital burden and, together, accounted for over one-third of the total years of life lost in this group. Since 2003, the rate of years of life lost for these diseases reduced by 48% and 5.5%, respectively. When looking at infants specifically, infants suffered 55% and 28% less fatal burden due to dying from SIDS and congenital cardiovascular defects, respectively.

Fatal burden due to respiratory diseases decreased

Respiratory diseases together contributed to 5.5% of the fatal burden in 2018. Since 2003, overall fatal burden from respiratory diseases decreased by 16% in Australia. Males experienced a substantial reduction in the fatal burden rate (by 24%) while females experienced a smaller change (decrease by 9%) in the rate of years of life lost from respiratory diseases.

The major causes of fatal burden from respiratory diseases in 2018 were COPD (70%), interstitial lung disease (12%) and asthma (5.8%). Females experienced much lower rates of burden from asthma (27% less) and upper respiratory conditions (46% less) in 2018 than in 2003. Males also experienced lower rates of burden from asthma (5.0% less) in 2018 than in 2003. For COPD, males experienced lower burden (27% less) in 2018 than in 2003, while females experienced little change in the burden rate over the same period.

How have risk factors changed over time?

Analyses of the effects of changes in risk factors are provided only for those risk factors that were included in both the 2003 and 2018 estimates. The risk factors that were not measured for 2003 were air pollution, high blood plasma glucose and low birthweight & short gestation.

Results are expressed as changes in the total burden (DALY), non-fatal burden (YLD) and fatal burden (YLL) attributable to each risk factor.

Changes in attributable burden

In this analysis, changes in attributable burden may be due to changes in:

- exposure to the risk factors
- the age at which exposure occurs
- the overall burden for those diseases or injuries that are linked to these risk factors.

Overall change in attributable burden

The risk factors able to be measured in 2003 contributed 37% of the total burden in 2003. These same risk factors contributed to 35% of the total burden in 2018, indicating that there was a small drop in the proportion of burden attributable to these risk factors over the 15 years overall. However, there are differences when looking at individual risk factors over time, as outlined in the sections below.

Changes in attributable burden by risk factor

Tobacco use caused the most burden out of the risk factors in 2003 and in 2018 but the gap between it and the second leading cause of burden, overweight (including obesity) has narrowed. There was only a small difference in the number and proportion of attributable DALY for these 2 risk factors in 2018.

There was a fall in total DALY attributable to high cholesterol (33% decrease), high blood pressure (24%), dietary risks (15%) and unsafe sex (9.6%) between 2003 and 2018 (Table 7.6). The age-standardised attributable burden rate, which adjusts for changes in the structure and size of the population, decreased for high cholesterol by 53%, for high blood pressure by 49%, for dietary risks by 42%, for physical inactivity by 34% and for tobacco use by 32%. These reductions also resulted in a fall in ranking for most of these risk factors, with the exception of tobacco use which retains its rank of first and dietary risks which retains its rank of third (Figure 7.5).

Between 2003 and 2018, there was an increase in total DALY attributable to illicit drug use (70%), overweight (including obesity) (38%), child abuse & neglect (28%), intimate partner violence (22%), impaired kidney function (22%), alcohol use (18%), school-based bullying victimisation (18%) and high sun exposure (11%). However, considering differences between the 2018 and 2003 population size and structure, the attributable burden rates for most of these risk factors either decreased or stayed the same. This indicates that population changes are driving the increase in DALY attributable to these risk factors. The exception is illicit drug use, where the ASR of burden attributable rose by 35% and its ranking rose from eigtht to sixth. This increase in age-standardised rate is primarily driven by an increase in amphetamine use.

There was an increase in total DALY attributable to low bone mineral density (77% increase) and iron deficiency (56% increase) as well as a rise in the ASR and ranking for these risk factors. This is due to changes in the burden from the linked diseases (falls and iron deficiency anaemia, respectively) and not due to changes in exposure to the risk factors, as the same population attributable fractions (PAF) were applied in both years.

It is important to note that these results are summary measures that are influenced by the changes in the fatal or non-fatal burden of the linked diseases so caution should be applied when interpreting the results. For example, the decrease seen in the attributable burden ASR for dietary risk factors is primarily driven by declines in the linked disease burden for coronary heart disease and stroke, rather than changes to risk factor exposure which has increased slightly. Other possible reasons are too complex to unpack within the scope of this report; however, a focus on tobacco and overweight (including obesity) is provided in the section that follows, and further information on specific disease burden attributable to each risk factor can be found via the interactive data on risk factor burden on the AIHW website.

For information on the drivers of change in risk factor attributable burden over time, please see the interactive data on risk factor burden.

Table 7.6: Change in total attributable burden between 2003 and 2018, by risk factor

Risk factor	2003 Attributable DALY	2018 Attributable DALY	Change in Attributable DALY	Change in Attributable DALY (%)	2003 Attributable DALY ASR	2018 Attributable DALY ASR	Change in ASR	Rate ratio 2018:2003
Tobacco use	432,142	430,903	–1,239	–0.3	21.5	14.6	–6.8	0.7
Overweight (including obesity)	304,696	419,855	115,159	37.8	15.2	14.5	–0.6	1.0
Dietary risks	320,103	270,777	–49,325	–15.4	15.8	9.2	–6.6	0.6
High blood pressure	330,813	252,813	–78,001	–23.6	16.3	8.4	–8.0	0.5
Alcohol use	188,151	222,108	33,957	18.0	9.5	8.5	–0.9	0.9
Illicit drug use	87,845	149,535	61,690	70.2	4.5	6.0	1.6	1.3
High cholesterol	202,659	135,066	–67,594	–33.4	10.0	4.7	–5.3	0.5
Physical inactivity	124,524	122,683	–1,841	–1.5	6.1	4.0	–2.1	0.7
Child abuse & neglect[(a)]	83,649	107,170	23,520	28.1	4.2	4.4	0.2	1.0
Impaired kidney function	78,774	95,697	16,923	21.5	3.9	3.1	–0.8	0.8
Occupational exposures & hazards	84,469	90,849	6,381	7.6	4.2	3.5	–0.7	0.8
High sun exposure[(a)]	31,842	35,330	3,488	11.0	1.6	1.2	–0.4	0.8
Intimate partner violence[(b)]	26,960	32,881	5,921	22.0	2.7	2.6	0.0	1.0
Low bone mineral density[(a)]	12,070	21,376	9,306	77.1	0.6	0.7	0.1	1.2
Iron deficiency[(a)]	10,808	16,805	5,997	55.5	0.5	0.7	0.1	1.2
Unsafe sex	11,960	10,811	–1,149	–9.6	0.6	0.4	–0.2	0.7
Bullying victimisation	4,420	5,207	787	17.8	0.2	0.2	0.0	1.0
All risk factors combined[(c)]	**1,555,587**	**1,741,899**	**186,313**	**12.0**	**77.5**	**62.1**	**–15.4**	**0.8**

(a) The same population attributable fractions (PAFs) have been used in 2003 and 2018 and any change in attributable burden is due to changes in the ASRs of the linked disease.

(b) The age-standardised rates for intimate partner violence are based on attributable burden and population estimates in females only.

(c) All risk factors combined estimate excludes high blood plasma glucose, air pollution and low birthweight & short gestation, which were not estimated in 2003.

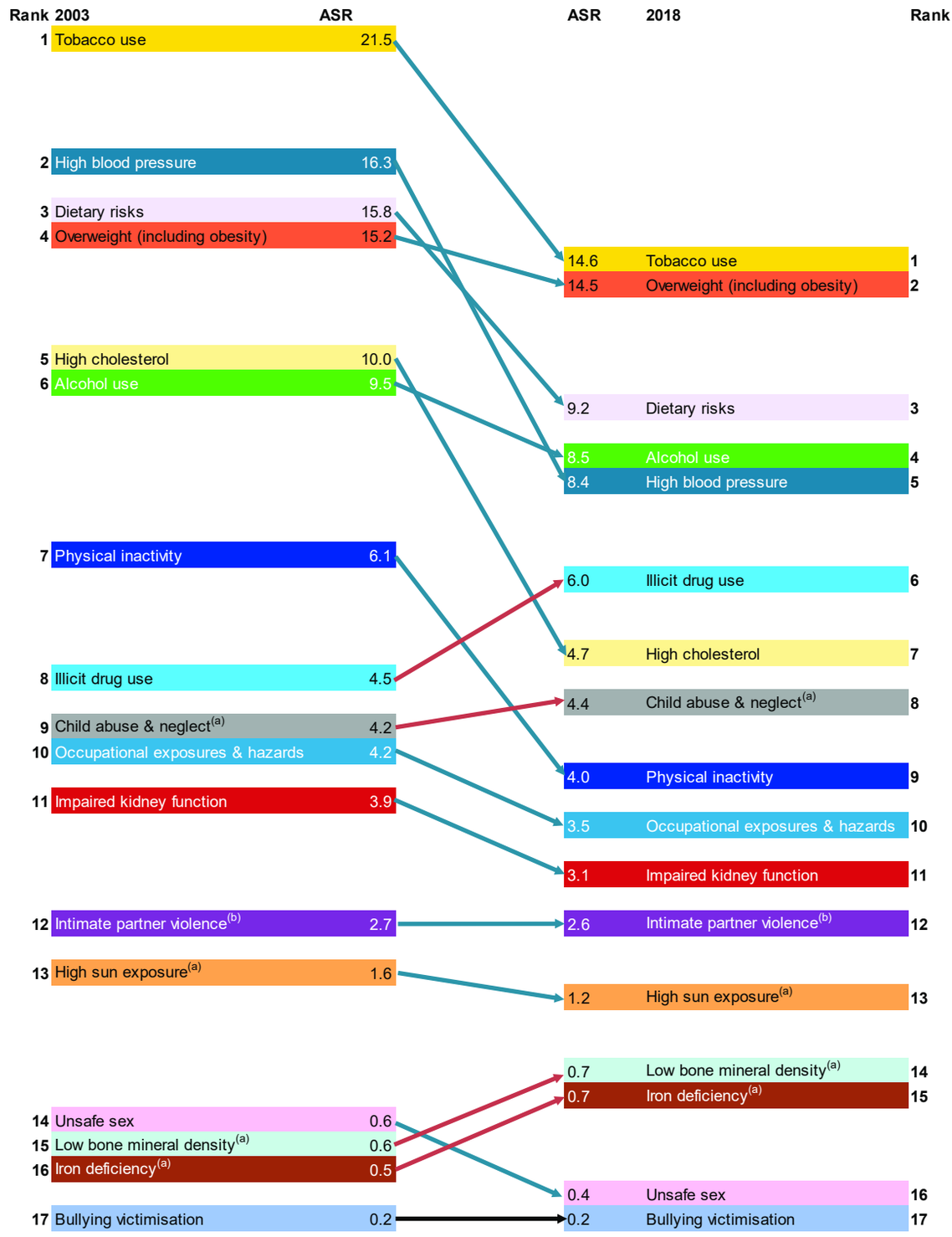
Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
2. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.
3. Rate differences subtract 2018 ASRs from the corresponding 2003 ASRs.

Changes over time

SCI.0001.0031.0109

Figure 7.5: Risk factor rankings by age-standardised attributable burden rate (per 1,000 population), 2003 and 2018



(a) The same population attributable fractions (PAFs) have been used in 2003 and 2018 and any change in attributable burden is due to changes in the ASRs of the linked disease.

(b) ASRs for intimate partner violence are based on estimates in females only.

Notes

1. Risk factors are presented in descending order, from highest ASR to lowest ASR, with arrows indicating either an increase (red), decrease (blue) or no change (black) in the ASR over time.
2. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
3.. Rankings are based on ASRs.
4. High blood plasma glucose, air pollution and low birthweight & short gestation are excluded since these were not estimated for 2003.

Changes in attributable burden: a focus on tobacco use and overweight (including obesity)

Tobacco use

The total burden (DALY) attributable to tobacco use was similar between 2018 and 2003 (0.3% decrease) (Table 7.6). However, analyses of the key drivers of change in tobacco use attributable burden over time indicate that this relatively minor overall decrease was driven by:

- 12% decline due to changes in exposure to tobacco use
- 20% decline due to changes in linked disease burden
- 20% increase due to population growth
- 12% increase due to population ageing.

The largest impact from tobacco use is on cancer, respiratory diseases and cardiovascular diseases. While the burden of cancer and respiratory diseases due to tobacco use rose (approximately 11,600 and 29,400 DALY, respectively), this was outweighed by a large drop in the burden of cardiovascular diseases (around 36,900 DALY).

After taking into account population growth and ageing, the ASR of burden attributable to tobacco use dropped 32% (rate ratio 0.7) in 2018 compared with 2003 (Table 7.6). This change varied between diseases linked to tobacco use. The rate ratios for cancer and respiratory diseases were 0.7 and 0.8, respectively, compared with 0.5 for cardiovascular diseases. This is likely to be due to health improvements from reductions in tobacco use taking longer to become apparent in cancer and chronic respiratory diseases than in cardiovascular diseases (CDC 2015).

The burden attributable to second-hand smoke was 65% lower in 2018 than in 2003. The attributable burden rate was 75% lower (rate ratio 0.2) (Appendix Table D8).

Overweight (including obesity)

The total burden attributable to overweight (including obesity) was 38% higher in 2018 than in 2003. The change over time was larger for the burden attributable to obesity (68% higher in 2018 than in 2003) than to overweight (8.4% higher in 2018 than in 2003) (Appendix Table D8). Analyses of the key drivers of change in overweight and obesity attributable burden over time indicates that this 38% increase was driven by:

- 49% increase due to changes in obesity prevalence
- 8% decline due to changes in overweight prevalence
- 25% decline due to changes in the linked disease burden
- 28% increase due to population growth
- 15% increase due to population ageing.

After taking into account population growth and ageing, the ASR of total burden attributable to overweight (including obesity) was 3.9% lower in 2018 than in 2003 (rate ratio 1.0) (Table 7.6). This includes a higher rate of burden attributable to obesity (17% higher in 2018 than in 2003, rate ratio 1.2) and a lower rate of burden attributable to overweight (25% lower in 2018 than in 2003, rate ratio 0.8) (Appendix Table D8).

Overweight (including obesity) is linked to a number of different diseases, the most prevalent being cardiovascular diseases, followed by cancer, endocrine disorders and musculoskeletal conditions. There was a fall in the age-standardised rate of attributable burden (rate ratio 0.7) for cardiovascular diseases due to overweight (including obesity), but this was balanced by a rise in the attributable burden rate for neurological conditions (rate ratio of 1.7), musculoskeletal conditions (rate ratio of 1.3), respiratory diseases (rate ratio of 1.2), kidney & urinary diseases (rate ratio of 1.2) and endocrine disorders (1.1). There was no change in the age-standardised rate of attributable burden for cancer between 2003 and 2018 (rate ratio of 1.0).

For information on the drivers of change in risk factor attributable burden, please see the interactive data on risk factor burden.

Changes in attributable non-fatal and fatal burden

The following sections describe the changes in the contribution of risk factors to non-fatal (YLD) and fatal (YLL) burden between 2003 and 2018.

Changes in attributable non-fatal burden

There was a fall in YLD attributable to high cholesterol (20% decrease) between 2003 and 2018 (Table 7.7). After adjusting for changes in the age structure and size of the population, the attributable non-fatal burden rate (ASR) decreased for this risk factor (rate ratio of 0.5) and also decreased for high blood pressure (rate ratio of 0.7), tobacco use and dietary risks (rate ratio of 0.8 each).

Between 2003 and 2018, there was an increase in the YLD attributable to overweight (including obesity) (70%), illicit drug use (61%), impaired kidney function (40%), physical inactivity (34%), occupational exposures & hazards (33%), alcohol use (26%), child abuse & neglect (24%) and intimate partner violence (23%). However, considering differences between the 2003 and 2018 population size and structure, the attributable non-fatal burden rates for most of these risk factors either decreased or remained the same. The exceptions are overweight (including obesity) (rate ratio of 1.2) and illicit drug use (1.3). It should be noted that the age-standardised attributable non-fatal burden rate doubled for unsafe sex; it was the smallest risk factor in both 2003 and 2018, and the increase observed was mostly due to changes in the non-fatal burden of the linked diseases. For more information on changes in attributable burden over time and on drivers of change, please see the interactive data on risk factor burden.

As mentioned in the previous section, the increase in YLD attributable to low bone mineral density and iron deficiency are also primarily due to changes in the burden from the linked diseases rather than due to changes in exposure to the risk factors.

There were also subtle changes in the ranking of risk factors between 2003 and 2018. However, the top 3 risk factors contributing to non-fatal burden were consistent between the 2 years.

Table 7.7: Change in attributable non-fatal burden between 2003 and 2018, by risk factor

Risk factor	Rank 2003	Change in Attributable YLD	Change in Attributable YLD (%)	Change in ASR	Rate ratio 2018:2003	Rank 2018
Overweight (including obesity)	1	79,047	69.9	1.1	1.2	1
Tobacco use	2	14,985	14.9	–1.1	0.8	2
Alcohol use	3	18,540	26.2	—	1.0	3
Child abuse & neglect[a]	5	13,701	23.9	—	1.0	4
Dietary risks	6	6,572	11.7	–0.7	0.8	5
High blood pressure	4	–500	–0.8	–1.0	0.7	6
Occupational exposures & hazards	7	13,619	32.7	0.1	1.1	7
Illicit drug use	9	19,088	60.6	0.5	1.3	8
Physical inactivity	10	9,262	32.3	–0.2	0.9	9
Impaired kidney function	11	8,109	40.1	–0.1	0.9	10
High cholesterol	8	–6,623	–20.1	–0.7	0.5	11
Intimate partner violence[b]	12	4,459	22.7	—	1.0	12
Iron deficiency[a]	13	6,086	57.5	0.1	1.2	13
Low bone mineral density[a]	14	4,164	61.6	—	1.1	14
Bullying victimisation	15	787	17.8	—	1.0	15
High sun exposure[a]	16	1,561	51.0	—	1.0	16
Unsafe sex	17	1,584	150.6	0.1	2.0	17
All risk factors combined[c]		**177,703**	**35.1**	**–0.1**	**1.0**	

(a) The same population attributable fractions (PAFs) have been used in 2003 and 2018 and any change in attributable burden is due to changes in the ASRs of the linked disease.

(b) Estimates for intimate partner violence are for females only.

(c) All risk factors combined estimate excludes high blood plasma glucose, air pollution and low birthweight & short gestation, which were not estimated in 2003.

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
2. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.
3. Rate differences subtract 2018 ASRs from the corresponding 2003 ASRs.

Changes in attributable fatal burden

There was a fall in YLL attributable to a number of risk factors, including high cholesterol (36%), high blood pressure (29%), unsafe sex (25%), dietary risks (21%) and occupational exposures & hazards (17%) (Table 7.8). After adjusting for changes in the age structure and size of the population, the attributable fatal burden rate (ASR) decreased for these risk factors as well as for other risk factors, including overweight (including obesity) (rate ratio of 0.8), alcohol use (0.8) and impaired kidney function (0.8).

Between 2003 and 2018, there was an increase in the YLL attributable to illicit drug use (76%), child abuse & neglect (37%), intimate partner violence (20%), overweight (including obesity) (19%), impaired kidney function (15%), alcohol use (13%), and high sun exposure (6.7%). However, considering differences between the 2003 and 2018 population size and structure, the attributable fatal burden rates for most of these risk factors either decreased or remained the same. The exceptions are illicit drug use (rate ratio of 1.4) and child abuse & neglect (1.1).

Table 7.8: Change in attributable fatal burden between 2003 and 2018, by risk factor

Risk factor	Rank 2003	Change in Attributable YLL	Change in Attributable YLL (%)	Change in ASR	Rate ratio 2018:2003	Rank 2018
Tobacco use	1	–16,224	–4.9	–5.8	0.7	1
Overweight (including obesity)	4	36,112	18.9	–1.7	0.8	2
Dietary risks	3	–55,897	–21.2	–5.9	0.5	3
High blood pressure	2	–77,501	–28.8	–6.9	0.5	4
Alcohol use	6	15,417	13.1	–1.0	0.8	5
High cholesterol	5	–60,971	–35.9	–4.6	0.5	6
Illicit drug use	9	42,603	75.6	1.1	1.4	7
Physical inactivity	7	–11,103	–11.6	–1.9	0.6	8
Impaired kidney function	8	8,814	15.1	–0.7	0.8	9
Child abuse & neglect[a]	12	9,819	37.4	0.1	1.1	10
Occupational exposures & hazards	10	–7,238	–16.9	–0.9	0.6	11
High sun exposure[a]	11	1,928	6.7	–0.4	0.7	12
Low bone mineral density[a]	15	5,142	96.8	0.1	1.2	13
Intimate partner violence[b]	14	1,462	20.1	—	1.0	14
Unsafe sex[a]	13	–2,732	–25.0	–0.2	0.6	15
Iron deficiency	16	–89	–40.8	—	0.3	16
All risk factors combined[c]		**8,610**	**0.8**	**–15.2**	**0.7**	

(a) The same population attributable fractions (PAFs) have been used in 2003 and 2018 and any change in attributable burden is due to changes in the ASRs of the linked disease.

(b) Estimates for intimate partner violence are for females only.

(c) All risk factors combined estimate excludes high blood plasma glucose, air pollution and low birthweight & short gestation, which were not estimated in 2003.

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.
2. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.
3. Rate differences subtract 2018 ASRs from the corresponding 2003 ASRs.
4. Bullying victimisation is not included as it does not contribute to fatal burden.

8 Variation across geographic areas and population groups

Key results

- The total burden rates (DALY per 1,000 population) were similar for all states and territories except the Northern Territory, where the rate was around 1.4 times as high as the national average. Total burden rates were exceptionally high in the Northern Territory for kidney & urinary diseases (more than 4.5 times the national rate); blood & metabolic disorders were 2.4 times the national rate, and injuries were more than 2 times the national rate.
- The burden rate in *Remote and very remote* areas was 1.4 times as high as *Major cities*. There were noticeably higher burden rates in *Remote and very remote* areas for kidney & urinary diseases, injuries, infectious diseases, endocrine disorders and cardiovascular diseases.
- Total burden would have been 4.4% lower if all areas had the same rates of burden as *Major cities*.
- Burden rates rose with decreasing socioeconomic group, and non-fatal and fatal rates were 1.4 and 1.9 times as high, respectively, in the lowest group as in the highest.
- The greatest relative differences between the highest and lowest socioeconomic groups were for endocrine disorders (2.3 times), injuries (2.0 times) and kidney & urinary diseases (1.9 times as high in the lowest socioeconomic group as in the highest).
- Total burden would have been 21% lower if all areas had the same rates of burden as the highest socioeconomic group.
- For every risk factor, the lowest socioeconomic group experienced greater burden than the highest socioeconomic group.

Burden of disease by state and territory

Variations in patterns of disease burden across states and territories reflect a complex interaction of a number of factors, such as demographic (including the age structure of the population and the proportion of the population that identifies as Aboriginal and Torres Strait Islander), socioeconomic and environmental differences (Table 8.1). For example, the Northern Territory is quite different from other states and territories. It not only has the smallest population, but also a younger population and a higher proportion identifying as Aboriginal or Torres Strait Islander (around 30% compared with 3.3% in Australia overall; ABS 2018), than in other states and territories. In 2018, Indigenous Australians had total burden rates 2.3 times that for non-Indigenous Australians (AIHW 2021b).

Table 8.1: Demographic characteristics of population, by state and territory, 2018

Jurisdiction	Total population (million)	Proportion living in greater capital city (%)	Median age (years)	Proportion of population aged <15 (%)	Proportion aged 65+ years (%)
NSW	7.98	65	37.5	19	16
Vic	6.46	77	36.7	18	15
Qld	5.01	49	37.3	20	15
WA	2.59	79	36.9	20	14
SA	1.74	78	40.0	18	18
Tas	0.53	44	42.3	18	20
ACT	0.42	100	35.1	19	13
NT	0.25	60	32.9	22	8

Source: ABS 2019, ABS 2020e.

This chapter focuses on the variability of burden across states and territories, rather than on the detailed estimates for each jurisdiction. Results are presented as rates (the number of DALY, YLD or YLL for every 1,000 people in the population) that have been adjusted to remove the influence of differences in age structure between each state and territory, but not other demographic, socioeconomic or environmental factors.

Data quality for these estimates is described at the end of the chapter.

Total burden

Burden of disease rates were similar across states and territories, except for the Northern Territory where total burden (DALY) rates were 1.4 times as high as the national rate (Table 8.2).

The fatal burden rates varied considerably, from 78 YLL per 1,000 population in Victoria to 149 in the Northern Territory. By comparison, non-fatal burden rates showed less variation across jurisdictions, ranging from 94 YLD per 1,000 population in Western Australia to 105 in the Northern Territory (Table 8.2).

Accordingly, the proportion of total burden that was fatal burden ranged from 44% in the Australian Capital Territory to 57% in the Northern Territory. The proportion of fatal burden was greater than that of non-fatal burden in the Northern Territory and Tasmania; it was lower for the other states and territories, consistent with the national proportions.

Table 8.2: Total (DALY), non-fatal (YLD) and fatal (YLL) burden, burden rates and rate ratios, by state and territory, 2018

	Total burden			Non-fatal burden			Fatal burden		
Jurisdiction	DALY ('000s)	Rate	Rate ratio	YLD ('000s)	Rate	Rate ratio	YLL ('000s)	Rate	Rate ratio
NSW	1,586	178.3	1.0	828	96.4	1.0	758	81.9	1.0
Vic	1,248	177.3	1.0	681	99.4	1.0	567	77.8	0.9
Qld	1,021	189.6	1.0	531	100.7	1.0	491	88.8	1.1
WA	490	179.0	1.0	254	94.3	1.0	236	84.7	1.0
SA	388	189.7	1.0	197	101.7	1.0	191	87.9	1.1
Tas	122	192.8	1.1	59	97.9	1.0	63	94.9	1.1
ACT	75	177.9	1.0	42	98.5	1.0	33	79.4	0.9
NT	54	254.8	1.4	22	105.4	1.1	31	149.4	1.8
Australia	**4,984**	**181.8**	—	**2,613**	**98.1**	—	**2,370**	**83.7**	—

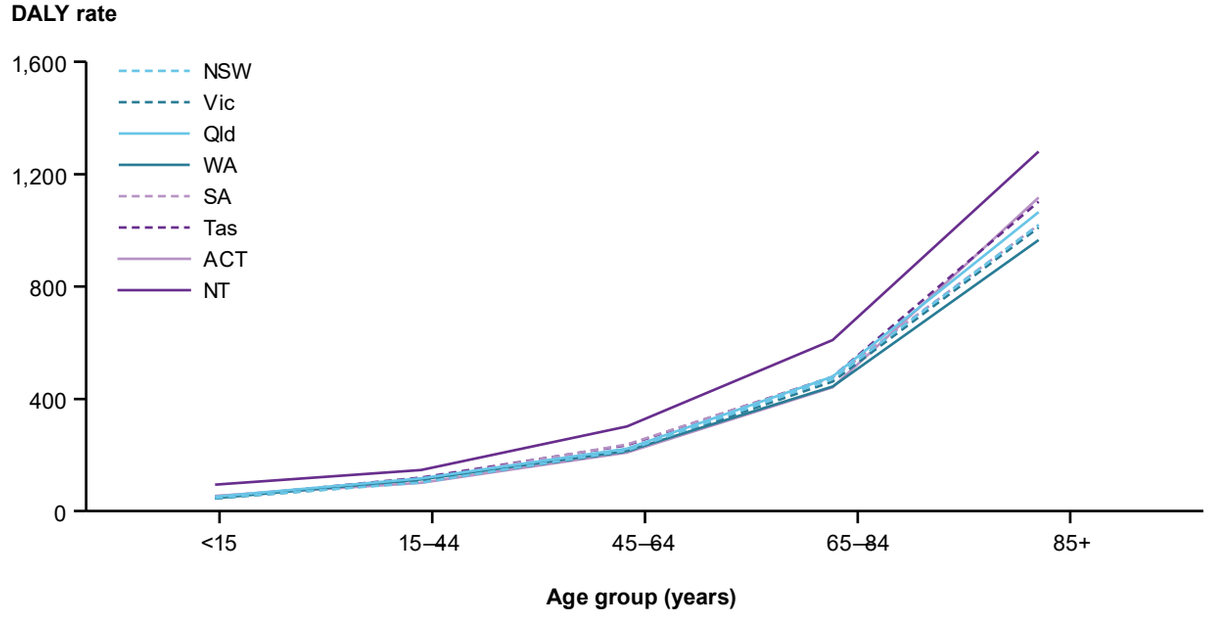
Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed per 1,000 population.
2. Rate ratios compare the state/territory rate of burden with the Australian rate of burden.
3. Non-fatal burden by state/territory may not add up to the Australian total due to modelling and rounding.

Age

States and territories had a similar trend: rate of burden increased with increasing age. Rates were higher in the Northern Territory than in other jurisdictions across all age groups. The gap between rates for the Northern Territory and other jurisdictions increased with increasing age and was most pronounced from age 65 (Figure 8.1).

Figure 8.1: Age-specific total burden (DALY) rates, by life stage and state and territory, 2018



Note: DALY rate is expressed as DALY per 1,000 population.

Disease groups

Total burden per population varied across states and territories for all disease groups. The higher rates for total burden described earlier for the Northern Territory are attributable to higher rates in almost all disease groups, except for mental & substance use disorders, musculoskeletal conditions and reproductive & maternal conditions (Table 8.3). In particular, in the Northern Territory, kidney & urinary diseases were 4.5 times as high as the national rate; blood & metabolic disorders were 2.4 times as high and injuries 2.2 times as high.

Table 8.3: Total burden (DALY) rates, by disease group and state and territory, 2018

Disease group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Blood/metabolic	2.2	1.9	2.5	2.1	2.3	2.7	1.9	5.2	2.2
Cancer	30.4	29.0	31.8	29.5	32.3	31.9	27.5	41.4	30.5
Cardiovascular	21.3	20.8	23.1	20.7	21.9	24.6	20.5	40.6	21.7
Endocrine	5.0	4.4	4.8	4.8	5.3	5.6	4.4	10.0	4.8
Gastrointestinal	6.0	5.6	6.1	5.9	6.3	6.1	6.4	7.7	5.9
Hearing/vision	3.7	3.8	4.0	3.2	3.7	4.1	3.4	3.7	3.7
Infant/congenital	4.3	4.2	5.1	4.3	5.2	5.0	4.6	8.0	4.6
Infections	3.0	3.2	3.4	3.5	3.8	3.5	2.6	6.8	3.3
Injuries	14.7	14.8	19.1	20.1	16.7	18.8	15.6	36.1	16.6
Kidney/urinary	2.2	2.0	2.4	2.6	1.9	2.0	1.8	9.9	2.2
Mental/substance use	25.1	27.8	24.6	26.4	27.5	20.8	26.4	23.7	25.9
Musculoskeletal	23.3	24.4	24.4	23.1	25.0	27.9	26.4	18.1	24.0
Neurological	13.8	12.6	13.9	11.5	14.7	14.8	14.3	17.5	13.3
Oral	4.8	4.5	4.3	4.7	3.4	4.6	3.6	4.5	4.5
Reproductive/maternal	2.1	1.9	2.9	1.7	2.1	1.7	1.8	1.7	2.1
Respiratory	13.0	12.8	13.6	11.5	14.1	15.0	13.4	16.1	13.0
Skin	3.5	3.5	3.6	3.3	3.6	3.8	3.5	3.8	3.5
All diseases	**178.3**	**177.3**	**189.6**	**179.0**	**189.7**	**192.8**	**177.9**	**254.8**	**181.8**

Note: Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.

There was some variation in rates of non-fatal burden across states and territories (Appendix Table D9). For example, the non-fatal burden rate for musculoskeletal conditions was lowest in the Northern Territory (17 YLD per 1,000 population) and highest in Tasmania (27). For mental & substance use disorders, the non-fatal burden rate was lowest in Tasmania (20 YLD per 1,000 population) and highest in Victoria (28).

Fatal burden also differed considerably across states and territories (Appendix Table D10). For the 3 leading causes of fatal burden nationally, cancer rates were lowest in the Australian Capital Territory (25 per 1,000 population) and highest in the Northern Territory (39 per 1,000 population); cardiovascular diseases have the lowest rates in Western Australia (16 per 1,000 population) and highest rates in the Northern Territory (30 per 1,000 population); and injuries have the lowest rates in Victoria (12 per 1,000 population) and highest rates in the Northern Territory (30 per 1,000 population).

Variation by disease

Figure 8.2 describes the 10 leading causes of total burden in 2018, ranked by proportion of total DALY for each state and territory. Note that these rankings may differ slightly to those based on age-standardised rates. Coronary heart disease was the leading cause of total burden in all jurisdictions except for the Australian Capital Territory, where back pain & problems was the leading cause for the first time since 2011. Notably, although back pain & problems was in second place for Victoria, Queensland and Western Australia in 2011 and in 2018, the gap between it and the leading cause (coronary heart disease) has narrowed. COPD, lung cancer and suicide & self-inflicted injuries also featured among the 10 leading causes in all states and territories. Notably, stroke was a leading cause in all jurisdictions except Western Australia, the Northern Territory and Victoria. Dementia and asthma were leading causes in all jurisdictions except the Northern Territory. Depressive disorders was a leading cause in all jurisdictions except Tasmania. Anxiety disorders was a leading cause in all jurisdictions except Tasmania and the Northern Territory.

Several other causes ranked in the leading 10 causes for a state or territory but not nationally: osteoarthritis (Victoria, Tasmania and Australian Capital Territory); rheumatoid arthritis (Tasmania); type 2 diabetes (Western Australia and the Northern Territory); and chronic kidney disease, road traffic injuries to motor vehicle occupants, and alcohol use disorders (all in the Northern Territory).

There were some changes in the 10 leading causes of total burden for states and territories between 2011 and 2018. Of note are:

- Asthma increased in ranking, proportion of total DALY and age-standardised rate in New South Wales and South Australia, ranking eighth in 2018 (it did not feature in the top 10 in 2011 for these states).
- Suicide & self-inflicted injuries increased in ranking, proportion of total DALY and age-standardised rate in New South Wales, Victoria and the Australian Capital Territory, featuring in the top 10 in 2018 (ranking 10th for both New South Wales and Victoria and seventh in the Australian Capital Territory).
- Osteoarthritis increased in ranking, proportion of total DALY and age standardised rate in Victoria, Tasmania and the Australian Capital Territory, featuring in the top 10 in 2018 (ranking ninth for Victoria and the Australian Capital Territory and sixth for Tasmania).

These variations in rankings reflect a complex interaction between factors described at the start of this section. Analyses of burden by remoteness area and socioeconomic group provide further information on how these factors influence the distribution of disease burden in Australia.

Figure 8.2: Leading causes of total burden (proportion %; age-standardised DALY rate), by state and territory, 2018

Rank	State/territory								
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
1st	Coronary heart disease (6.3%; 10.1)	Coronary heart disease (6.1%; 10.0)	Coronary heart disease (6.3%; 11.1)	Coronary heart disease (6.3%; 10.6)	Coronary heart disease (6.3%; 10.1)	Coronary heart disease (7.4%; 12.6)	Back pain and problems (5.2%; 9.2)	Coronary heart disease (8.3%; 21.8)	Coronary heart disease (6.3%; 10.4)
2nd	Dementia (4.3%; 6.3)	Back pain and problems (4.9%; 9.1)	Back pain and problems (4.4%; 8.7)	Back pain and problems (5.1%; 9.2)	Dementia (5.2%; 7.4)	COPD (4.4%; 7.0)	Coronary heart disease (4.9%; 8.7)	Suicide/self-inflicted injuries (4.5%; 9.6)	Back pain and problems (4.5%; 8.5)
3rd	Back pain and problems (4.0%; 7.7)	Dementia (3.9%; 5.9)	Dementia (3.7%; 6.3)	Suicide/self-inflicted injuries (3.5%; 6.8)	Back pain and problems (4.2%; 8.8)	Back pain and problems (4.3%; 9.4)	Anxiety disorders (4.8%; 8.4)	Lung cancer (3.6%; 9.8)	Dementia (4.0%; 6.1)
4th	COPD (3.6%; 5.8)	Anxiety disorders (3.7%; 7.2)	COPD (3.6%; 6.2)	Depressive disorders (3.4%; 6.5)	COPD (3.7%; 5.8)	Dementia (4.2%; 6.5)	Dementia (3.8%; 6.7)	COPD (3.4%; 10.5)	COPD (3.5%; 5.8)
5th	Lung cancer (3.3%; 5.5)	Depressive disorders (3.6%; 7.1)	Suicide/self-inflicted injuries (3.5%; 7.5)	COPD (3.1%; 5.2)	Lung cancer (3.1%; 5.2)	Lung cancer (3.5%; 5.5)	COPD (3.1%; 5.5)	Type 2 diabetes (3.1%; 9.1)	Lung cancer (3.2%; 5.4)
6th	Anxiety disorders (3.1%; 6.4)	COPD (3.4%; 5.5)	Lung cancer (3.4%; 5.9)	Anxiety disorders (3.1%; 5.9)	Anxiety disorders (2.8%; 6.5)	Osteoarthritis (3.2%; 5.7)	Asthma (3.0%; 5.4)	Chronic kidney disease (3.1%; 8.4)	Anxiety disorders (3.1%; 6.4)
7th	Stroke (2.7%; 4.4)	Lung cancer (3.1%; 5.1)	Anxiety disorders (2.8%; 5.9)	Lung cancer (3.0%; 4.9)	Depressive disorders (2.8%; 6.4)	Rheumatoid arthritis (2.9%; 5.3)	Suicide/self-inflicted injuries (3.0%; 5.3)	RTI/motor vehicle occupant (2.7%; 5.5)	Depressive disorders (2.9%; 5.8)
8th	Asthma (2.6%; 5.1)	Asthma (2.8%; 5.3)	Asthma (2.7%; 5.5)	Dementia (2.9%; 4.8)	Asthma (2.7%; 6.0)	Stroke (2.6%; 4.4)	Stroke (2.8%; 5.1)	Back pain and problems (2.5%; 5.8)	Suicide/self-inflicted injuries (2.8%; 5.8)
9th	Depressive disorders (2.5%; 5.1)	Osteoarthritis (2.7%; 4.7)	Depressive disorders (2.5%; 5.2)	Asthma (2.3%; 4.3)	Stroke (2.5%; 4.0)	Asthma (2.6%; 6.1)	Osteoarthritis (2.8%; 5.0)	Alcohol use disorders (2.4%; 5.0)	Asthma (2.6%; 5.2)
10th	Suicide/self-inflicted injuries (2.5%; 5.0)	Suicide/self-inflicted injuries (2.5%; 4.8)	Stroke (2.4%; 4.4)	Type 2 diabetes (2.2%; 3.8)	Suicide/self-inflicted injuries (2.5%; 5.8)	Suicide/self-inflicted injuries (2.4%; 6.0)	Depressive disorders (2.5%; 4.4)	Depressive disorders (1.9%; 4.1)	Stroke (2.5%; 4.2)

RTI = road traffic injuries; COPD = chronic obstructive pulmonary disease.

Note: Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.

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Burden of disease by remoteness areas

In this report, level of remoteness is classified as *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote* areas. These categories are defined by an area's relative distance to services (ABS 2013a). In 2018, most (88%) of Australia's population lived in *Major cities* and *Inner regional* areas. For this analysis, results for *Remote* and *Very remote* areas are combined and presented as *Remote and very remote*.

The key aim of the analysis in this chapter is to assess the variation in disease burden across remoteness areas, rather than to provide detailed estimates (or analysis) for a particular remoteness category. There are some important demographic, socioeconomic and environmental factors that differ by remoteness and influence health status:

- As well as different population sizes, each remoteness area has a different population age structure. Children generally make up a greater proportion of the population in more remote areas than in less remote areas, whereas elderly Australians make up a smaller proportion. Age-standardisation removes the influence of different age structures to allow regions to be compared on a like-with-like basis, rather than just reflecting their different age profiles.
- People living in more remote areas are often disadvantaged with regard to educational and employment opportunities, income, and access to goods and services. Health behaviours and risks may also differ by remoteness. For example, the proportion of people who go to hospital for conditions that are considered potentially preventable with timely and adequate non-hospital care is higher outside *Major cities*. There are also higher proportions of Aboriginal and Torres Strait Islander people in more remote areas (in *Remote* areas, around 18% of the population are Indigenous and in *Very remote* areas, around 47%; AIHW 2020). These factors have not been adjusted for in these comparisons. For information on how burden of disease differs by remoteness area for the Indigenous population see AIHW (forthcoming 2022).
- Geographical dispersion of the population in *Remote* and *Very remote* areas provides an added challenge due to a higher cost of providing health services in more remote areas and the more limited availability of both infrastructure and the workforce required to provide these services.

The following analysis highlights the overarching health inequalities across remoteness areas. While this cannot fully explain *why* such inequalities exist, it does contribute to a more informed and specialised approach to health-care planning, program development and service delivery models outside *Major cities*.

Data quality for estimating total, non-fatal and fatal burden by remoteness area is described at the end of the chapter.

Burden of diseases varies by remoteness

Total burden rates increased with increasing remoteness. *Major cities* experienced the least burden per population (174 DALY per 1,000 population) while *Remote and very remote* areas experienced the most (244 DALY per 1,000 population). The total burden rate in *Remote and very remote* areas was 1.4 times as high as that for *Major cities* (Table 8.4). This pattern was mostly driven by fatal burden: in *Remote and very remote* areas, the rate was 1.8 times as high as in *Major cities* while non-fatal burden was 1.1 times as high.

Table 8.4: Total (DALY), non-fatal (YLD) and fatal (YLL) burden, burden rates and rate ratios, by remoteness area, 2018

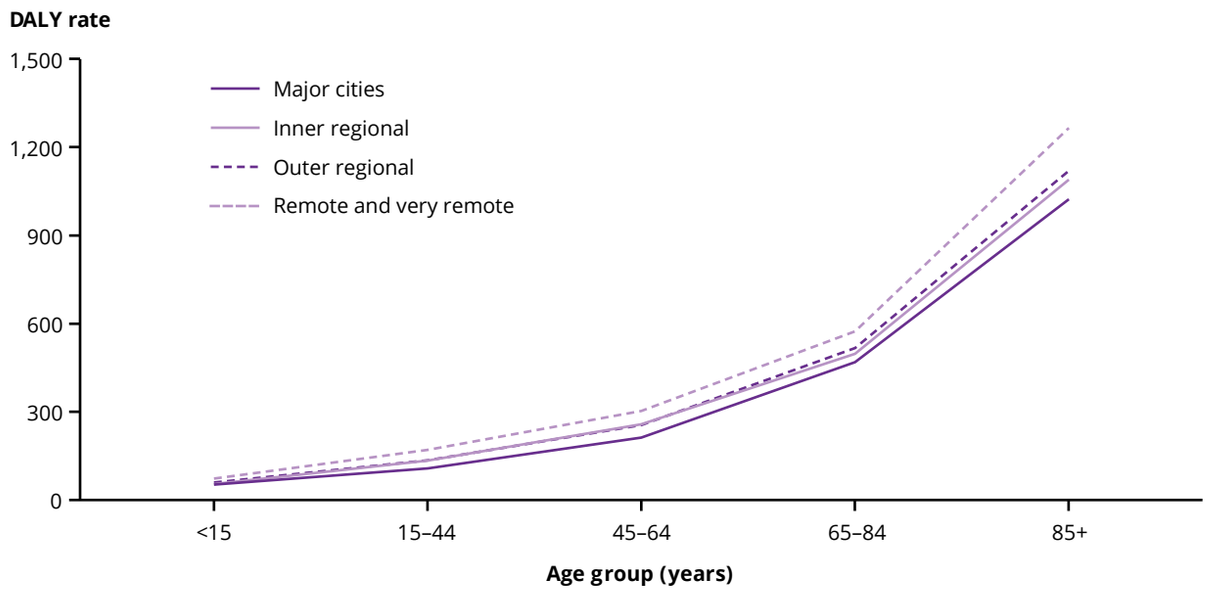
	Total burden			Non-fatal burden			Fatal burden		
Remoteness area	DALY ('000s)	Rate	Rate ratio	YLD ('000s)	Rate	Rate ratio	YLL ('000s)	Rate	Rate ratio
Major cities	3,325	173.7	1.0	1,813	96.5	1.0	1,511	77.2	1.0
Inner regional	1,058	200.0	1.2	521	104.7	1.1	537	95.3	1.2
Outer regional	485	203.6	1.2	227	100.3	1.0	258	103.3	1.3
Remote and very remote	116	243.9	1.4	52	108.8	1.1	64	135.2	1.8
Australia	**4,984**	**181.8**	**—**	**2,613**	**98.1**	**—**	**2,370**	**83.7**	**—**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed per 1,000 population.
2. Rate ratios compare the remoteness area rate of burden with the Major cities rate of burden.
3. Prevalence estimates and deaths with insufficient geographic detail to align to a remoteness area are excluded from the analysis.

Each remoteness area showed a similar pattern of increasing rates of burden in older age groups with *Remote and very remote* areas having the highest rates across all age groups (Figure 8.3). *Inner regional* and *Outer regional* areas experienced similar burden rates for all age groups.

Figure 8.3: Age-specific total burden (DALY) rates, by life stage and remoteness area, 2018



Note: DALY rate is expressed as DALY per 1,000 population.

Excess burden

Based on remoteness areas, 220,000 DALY were considered 'excess' due to remoteness. 'Excess' DALY is the burden that would have been avoided if the burden rate had been the same as the area with the lowest rate (in this case, *Major cities*). As a percentage of the total DALY for Australia, 4.4% was excess. This excess burden was mostly from fatal burden: 177,000 YLL compared with 44,000 YLD (Table 8.5).

Remote and very remote areas had the highest excess: 33,000 (or 29%) of the area's DALY was excess compared with *Major cities*. This excess comprised 5,300 YLD and 28,000 YLL; that is, 10% and 44%, respectively, of the areas' non-fatal and fatal burden would have been avoided if *Remote and very remote* areas experienced the same burden rates as *Major cities* (Table 8.5).

Table 8.5: Distribution of burden and excess burden[(a)] for non-fatal (YLD), fatal (YLL) and total (DALY) burden, by remoteness area, 2018

	Remoteness area				
	Major cities	Inner regional	Outer regional	Remote and very remote	Australia
			Non-fatal burden (YLD)		
YLD ('000s)	1,813	521	227	52	2,613
YLD (% of total)	69.4	20.0	8.7	2.0	100.0
Excess YLD ('000s)[(b)]	—	32	6	5	44
Excess YLD (% of total)[(c)]	—	6.2	2.7	10.3	1.7
			Fatal burden (YLL)		
YLL ('000s)	1,511	537	258	64	2,370
YLL (% of total)	63.7	22.7	10.9	2.7	100.0
Excess YLL ('000s)[(b)]	—	89	60	28	177
Excess YLL (% of total)[(c)]	—	16.6	23.2	43.6	7.5
			Total burden (DALY)		
DALY ('000s)	3,325	1,058	485	116	4,984
DALY (% of total)	66.7	21.2	9.7	2.3	100.0
Excess DALY ('000s)[(b)]	—	121	66	33	220
Excess DALY (% of total)[(c)]	—	11.4	13.6	28.8	4.4

(a) Excess burden in Australia represents all excess burden attributed to remoteness areas outside *Major cities*.

(b) Observed burden for each area compared with the expected burden if age-specific burden rates were the same as for *Major cities*.

(c) The proportion (%) of excess burden is expressed as a percentage of the total observed burden for the remoteness area.

Note: Prevalence estimates and deaths with insufficient geographic detail to align to a remoteness area are excluded from the analysis.

Disease groups

For most disease groups, total burden rates increased with increasing remoteness. Table 8.6 compares rates in the least remote areas (*Major cities*) with the most remote areas (*Remote and very remote*) to show the impact of remoteness for each disease group. For most disease groups, the burden rate was greater in *Remote and very remote* areas than in *Major cities* (represented as rate ratios greater than 1).

The greatest relative differences in total burden rates were for kidney & urinary diseases (*Remote and very remote* areas rate was 2.7 times as high as for *Major cities*), followed by injuries (2.4 times as high) and infectious diseases (2.3 times as high). For diseases with high burden rates, injuries and cardiovascular diseases had the greatest absolute difference in rates between *Major cities* and *Remote and very remote* areas (20 and 18 DALY per 1,000 population, respectively).

Remote and very remote areas had slightly lower total burden rates than *Major cities* for mental & substance use disorders (for which rates were lowest in *Outer regional* areas, followed by *Inner regional* areas), musculoskeletal and neurological conditions (for which rates were highest in *Inner regional*, followed by *Outer regional* areas).

Table 8.6: Age-standardised DALY rates, by disease group and remoteness area, 2018

Disease group	Remoteness area				Australia	Rate ratio	Rate difference
	Major cities	Inner regional	Outer regional	Remote and very remote			
Blood/metabolic	2.1	2.2	2.8	3.5	2.2	1.7	1.4
Cancer	28.7	33.7	34.6	37.1	30.5	1.3	8.4
Cardiovascular	20.2	23.8	25.7	37.9	21.7	1.9	17.7
Endocrine	4.6	4.9	6.1	8.6	4.8	1.9	4.0
Gastrointestinal	5.7	6.3	6.6	8.5	5.9	1.5	2.8
Hearing/vision	3.6	4.0	4.1	5.6	3.7	1.6	2.1
Infant/congenital	4.4	4.8	5.5	6.7	4.6	1.5	2.3
Infections	3.1	3.5	4.2	7.2	3.3	2.3	4.1
Injuries	14.4	21.1	24.3	34.5	16.6	2.4	20.1
Kidney/urinary	2.1	2.1	2.6	5.8	2.2	2.7	3.7
Mental/substance use	26.6	24.7	22.5	25.3	25.9	1.0	–1.3
Musculoskeletal	23.1	27.8	24.6	19.6	24.0	0.9	–3.4
Neurological	13.1	14.9	13.7	12.6	13.3	1.0	–0.5
Oral	4.1	5.2	5.8	6.5	4.5	1.6	2.4
Reproductive/maternal	2.0	2.6	2.2	2.1	2.1	1.0	0.1
Respiratory	12.3	14.6	15.0	18.0	13.0	1.5	5.8
Skin	3.5	3.7	3.4	4.2	3.5	1.2	0.7
All diseases	**173.7**	**200.0**	**203.6**	**243.9**	**181.8**	**1.4**	**70.2**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.
2. Rate ratios calculated as Remote and very remote ASR divided by Major cities ASR.
3. Rate differences calculated as Remote and very remote ASR minus Major cities ASR.
4. Prevalence estimates and deaths with insufficient geographic detail to align to a remoteness area are excluded from the analysis.

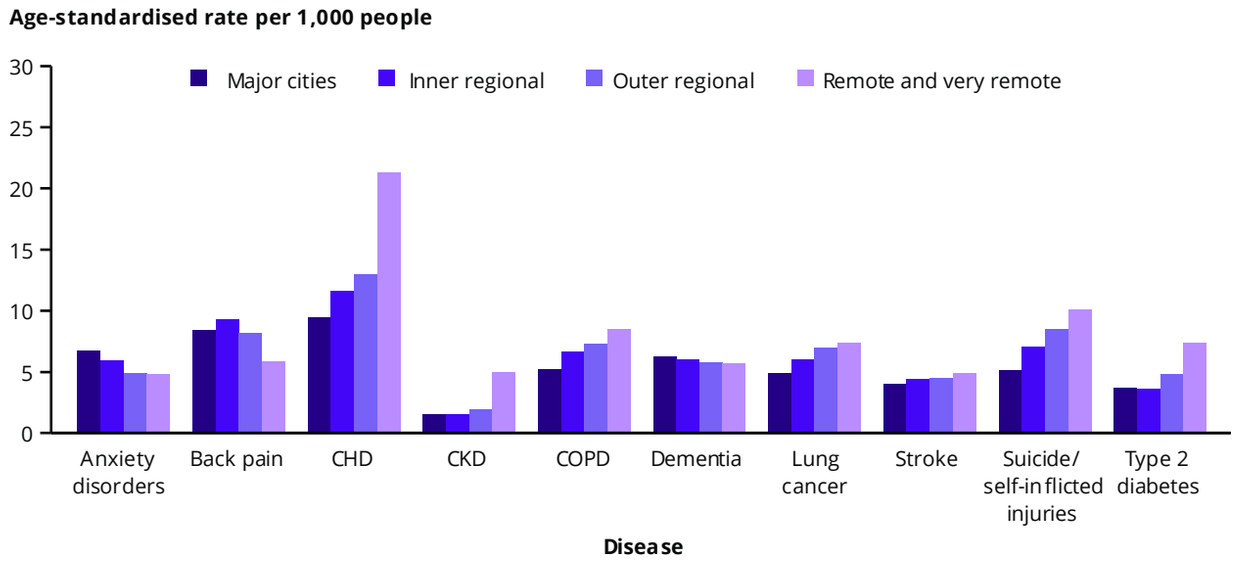
Non-fatal burden rates also varied somewhat between remoteness areas (Appendix Table D11). For example, for mental & substance use disorders, rates were lowest in *Outer regional* areas and highest in *Major cities* (22 and 26 YLD per 1,000 population, respectively). For injuries, rates were highest in *Remote and very remote* areas and lowest in *Major cities* (5.6 and 2.6, respectively).

Fatal burden also differed by remoteness areas (Appendix Table D12). For the 3 leading causes of fatal burden nationally—cancer, cardiovascular diseases and injuries—rates were, respectively, 1.3, 1.9 and 2.4 times as high in *Remote and very remote* areas as in *Major cities*.

Variation by disease

Patterns of age-standardised DALY rates across remoteness areas depend on the disease (Figure 8.4). There is a clear trend of greater burden rates with increasing remoteness for coronary heart disease, chronic kidney disease, COPD, lung cancer, stroke, suicide & self-inflicted injuries and type 2 diabetes. In contrast, anxiety disorders, dementia and back pain & problems showed lower rates of burden in more remote areas.

Figure 8.4: Age-standardised total burden (DALY) rates, for selected diseases, by remoteness area, 2018



CHD = coronary heart disease; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease.

Notes

1. DALY rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.
2. Prevalence estimates and deaths with insufficient geographic detail to align to a remoteness area are excluded from the analysis.

Figure 8.5 describes the 10 leading causes of total burden in 2018, ranked by proportion of total DALY for each remoteness area. Note that these rankings may differ slightly to those based on age-standardised rates. In all remoteness areas, coronary heart disease was the leading cause of burden, with back pain & problems, COPD, asthma, lung cancer and suicide & self-inflicted injuries also in the 10 leading causes. The ranking of suicide & self-inflicted injuries increased with increasing remoteness, whereas the ranking of back pain & problems decreased with increasing remoteness. Notably, dementia and stroke were among the 10 leading causes of burden in all but *Remote and very remote* areas. Anxiety disorders and depressive disorders were ranked in the top 10 only in *Major cities*.

Several other diseases/injuries were leading causes by remoteness area but not nationally. These were type 2 diabetes (*Outer regional* and *Remote and very remote*); chronic kidney disease, road traffic injuries to motor vehicle occupants and alcohol use disorders (all *Remote and very remote*); osteoarthritis (*Inner regional* and *Outer regional*); and rheumatoid arthritis (*Inner regional*).

These variations in rankings reflect a complex interaction between demographic, socioeconomic and environmental factors.

Figure 8.5: Leading causes of total burden (proportion %; age-standardised DALY rate), by remoteness area, 2018

Rank	Remoteness area				
	Major cities	Inner regional	Outer regional	Remote and very remote	Australia
1st	Coronary heart disease (5.8%; 9.5)	Coronary heart disease (6.9%; 11.6)	Coronary heart disease (7.3%; 13.0)	Coronary heart disease (8.8%; 21.3)	Coronary heart disease (6.3%; 10.4)
2nd	Back pain and problems (4.7%; 8.4)	Back pain and problems (4.2%; 9.3)	COPD (4.3%; 7.3)	Suicide/self-inflicted injuries (4.1%; 10.1)	Back pain and problems (4.5%; 8.5)
3rd	Dementia (4.1%; 6.3)	COPD (4.2%; 6.7)	Lung cancer (4.1%; 7.0)	COPD (3.4%; 8.5)	Dementia (4.0%; 6.1)
4th	Anxiety disorders (3.6%; 6.7)	Dementia (4.0%; 6.0)	Back pain and problems (3.8%; 8.2)	Lung cancer (3.2%; 7.4)	COPD (3.5%; 5.8)
5th	Depressive disorders (3.3%; 6.1)	Lung cancer (3.6%; 6.1)	Dementia (3.4%; 5.8)	Type 2 diabetes (3.1%; 7.4)	Lung cancer (3.2%; 5.4)
6th	COPD (3.2%; 5.2)	Osteoarthritis (2.8%; 5.0)	Suicide/self-inflicted injuries (3.2%; 8.5)	Asthma (3.0%; 7.3)	Anxiety disorders (3.1%; 6.4)
7th	Lung cancer (2.9%; 4.9)	Rheumatoid arthritis (2.8%; 5.4)	Type 2 diabetes (2.8%; 4.9)	RTI/motor vehicle occupant (2.6%; 6.7)	Depressive disorders (2.9%; 5.8)
8th	Suicide/self-inflicted injuries (2.8%; 5.1)	Suicide/self-inflicted injuries (2.7%; 7.1)	Osteoarthritis (2.6%; 5.0)	Back pain and problems (2.6%; 5.9)	Suicide/self-inflicted injuries (2.8%; 5.8)
9th	Asthma (2.7%; 5.0)	Stroke (2.6%; 4.4)	Stroke (2.5%; 4.5)	Alcohol use disorders (2.4%; 5.9)	Asthma (2.6%; 5.2)
10th	Stroke (2.5%; 4.0)	Asthma (2.4%; 5.7)	Asthma (2.3%; 5.5)	Chronic kidney disease (2.1%; 5.0)	Stroke (2.5%; 4.2)

RTI = road traffic injuries; COPD = chronic obstructive pulmonary disease.

Note: Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.

Burden of disease by socioeconomic group

This section provides information on the burden of disease across socioeconomic groups by disaggregating the burden estimates for the whole population by socioeconomic group. An alternative method for examining the impact of socioeconomic group on the burden of disease would be to treat social determinants, such as socioeconomic group, as a risk factor. That approach was not in scope for this current study but could be a worthwhile future project. See Chapter 10 for further information.

In this report, socioeconomic groups are based on an index of relative socioeconomic disadvantage defined by the area in which a person lives. This index is determined by factors such as household income, employment and education level, and is developed as part of the Socio-Economic Indexes for Areas by the ABS (ABS 2013c).

Data quality for estimating total, non-fatal and fatal burden by socioeconomic group is described at the end of the chapter.

Socioeconomic groups are presented as approximate quintiles in this analysis. The lowest quintile (1) represents the approximate 20% of the population living in areas with the lowest socioeconomic characteristics; that is, it is the most disadvantaged. The level of socioeconomic position increases with each quintile, through to the approximate 20% of the population living in areas with the highest socioeconomic characteristics (5); that is, the least disadvantaged.

Poorer health outcomes are generally observed as greater rates of burden in lower socioeconomic groups. This disparity is influenced by a complex and interrelated set of social and economic factors, including reduced access to health services, lower resource availability and the influence of uptake of risky behaviours (AIHW 2018a).

The aim of this section is to assess variation of disease burden across socioeconomic groups and to highlight health disparities. This can help inform targeted approaches to the prevention of diseases and health-care planning, program development and service delivery models.

Variation in burden of disease by socioeconomic group

Taking into account the different age structures in the socioeconomic groups, total burden decreased with increasing socioeconomic group: total burden rates were 1.6 times as high in the lowest socioeconomic group (223 DALY per 1,000 population) as in the highest group (142 DALY per 1,000 population) (Table 8.7). There were clear socioeconomic gradients for rates of non-fatal and fatal burden: rates in the lowest group were 1.4 and 1.9 times as high, respectively, as in the highest group.

The contribution of fatal and non-fatal burden to total burden also differed across socioeconomic groups. Fatal burden contributed slightly more to the total burden than non fatal burden in the lowest group (52%), while non-fatal burden contributed to more than 50% of total burden for the remaining groups.

Table 8.7: Total (DALY), non-fatal (YLD) and fatal (YLL) burden, burden rates and rate ratios, by socioeconomic group, 2018

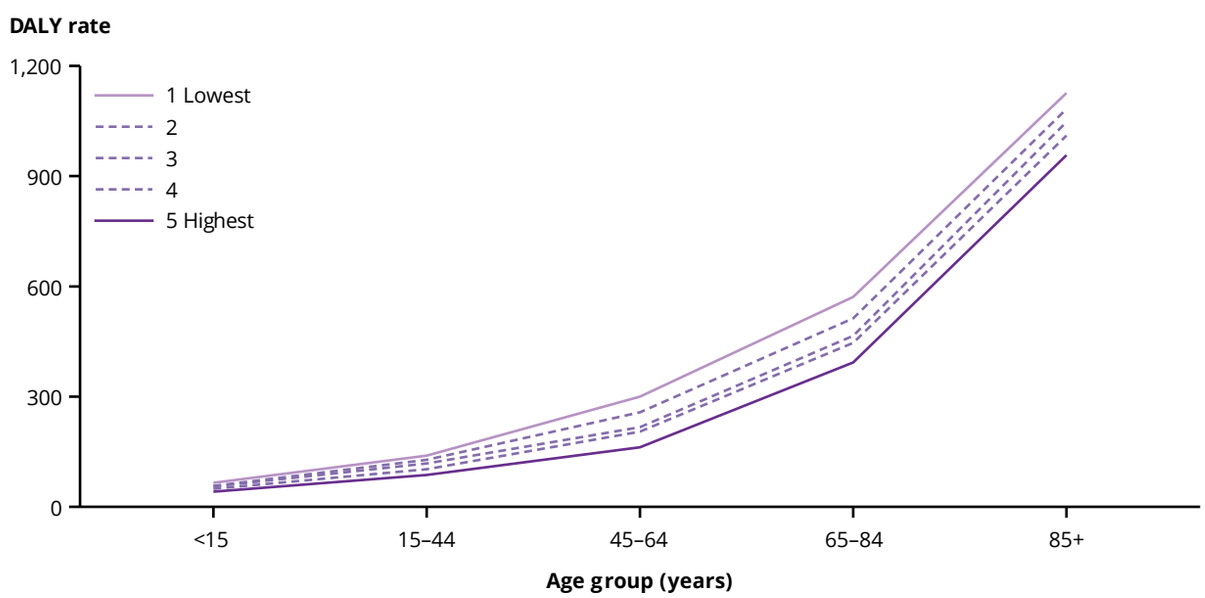
	Total burden			Non-fatal burden			Fatal burden		
Socioeconomic group	DALY ('000s)	Rate	Rate ratio	YLD ('000s)	Rate	Rate ratio	YLL ('000s)	Rate	Rate ratio
1 Lowest	1,231	222.7	1.6	593	111.1	1.4	638	111.6	1.9
2	1,128	199.3	1.4	570	105.5	1.3	558	93.8	1.6
3	969	179.7	1.3	516	98.2	1.2	453	81.4	1.4
4	878	167.0	1.2	495	95.1	1.2	384	71.9	1.2
5 Highest	777	142.1	1.0	439	82.0	1.0	338	60.1	1.0
Australia	**4,984**	**181.8**	—	**2,613**	**98.1**	—	**2,370**	**83.7**	—

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed per 1,000 population.
2. Rate ratios compare the socioeconomic group rate of burden with the rate of burden in the highest socioeconomic group (5).
3. Prevalence estimates and deaths with insufficient geographic detail to align to a socioeconomic group are excluded from the analysis.

Figure 8.6 shows the total burden rate by socioeconomic group and age group. The age pattern of burden rate is similar for all groups, with the rate of burden increasing with older age, coinciding with the onset of many chronic and age-related conditions. The rate of burden decreased as socioeconomic group increased; however, the gap between groups varied across the life course, with the smallest gaps being in the youngest age groups.

Figure 8.6: Age-specific total burden (DALY) rates, by life stage and socioeconomic group, 2018



Note: DALY rate is expressed as DALY per 1,000 population.

Excess burden

'Excess' burden is the burden that would have been avoided if the rate of burden had been the same as the area with the lowest rate of burden, in this case, the highest socioeconomic group (5).

By socioeconomic group, across Australia, 1,065,700 DALY were considered 'excess' due to socioeconomic position; this represents 21% of the total DALY for Australia. The excess burden was mostly from fatal burden: 646,900 YLL compared with 419,300 YLD (Table 8.8).

The lowest group (1) had the highest excess for total burden: 430,000 (or 35%) of the group's DALY was excess compared with the highest group (5). This excess comprised 151,000 YLD and 279,300 YLL; that is, 26% and 44%, respectively, of the group's non-fatal and fatal burden would have been avoided if the lowest group experienced the same burden rates as the highest group (Table 8.8).

Table 8.8: Distribution of burden and excess burden[a] for non-fatal (YLD), fatal (YLL) and total (DALY) burden, by socioeconomic group, 2018

	Socioeconomic group					
	1 Lowest	2	3	4	5 Highest	Australia
			Non-fatal burden (YLD)			
YLD ('000s)	593	570	516	495	439	2,613
YLD (% of total)	22.7	21.8	19.8	18.9	16.8	100.0
Excess YLD ('000s)[b]	151	119	82	67	—	419
Excess YLD (% of total)[c]	25.5	20.9	15.8	13.6	—	16.0
			Fatal burden (YLL)			
YLL ('000s)	638	558	453	384	338	2,370
YLL (% of total)	26.9	23.5	19.1	16.2	14.3	100.0
Excess YLL ('000s)[b]	279	190	115	63	—	647
Excess YLL (% of total)[c]	43.8	34.1	25.3	16.3	—	27.3
			Total burden (DALY)			
DALY ('000s)	1,231	1,128	969	878	777	4,984
DALY (% of total)	24.7	22.6	19.4	17.6	15.6	100.0
Excess DALY ('000s)[b]	430	309	196	130	—	1,066
Excess DALY (% of total)[c]	34.9	27.4	20.3	14.8	—	21.4

(a) Excess burden in Australia represents all excess burden attributed to socioeconomic groups outside of the highest group (5).

(b) Observed burden for each group compared with expected burden if burden rates were the same as the highest group (5).

(c) The proportion (%) of excess burden is expressed as a percentage of the total observed burden for the socioeconomic group.

Note: Prevalence estimates and deaths with insufficient geographic detail to align to a socioeconomic group are excluded from the analysis.

Disease groups

Table 8.9 shows relative and absolute differences in rates of disease burden, comparing the lowest and highest socioeconomic groups by disease group.

The lowest socioeconomic group experienced greater burden than the highest in every disease group except skin disorders, indicated by a rate ratio higher than 1.0. The absolute differences between these 2 socioeconomic groups also varied by disease group.

The greatest relative difference in burden rate was for endocrine disorders (the lowest socioeconomic group had 2.3 times the rate of the highest group), followed by injuries (2.0 times) and kidney & urinary diseases (1.9 times). Other notable differences were for cardiovascular diseases (the lowest group had 1.8 times the rate of the highest group), mental & substance use disorders and respiratory diseases (1.4 times and 1.7 times, respectively) and cancer (1.5 times).

For disease groups with high national rates, there were some large absolute differences in rates between the lowest and highest socioeconomic groups. The greatest difference was for cardiovascular diseases (a difference of 13 DALY per 1,000 population) followed by cancer, injuries and musculoskeletal conditions (having a difference of 12, 11, and 10 DALY per 1,000 population between the lowest and highest socioeconomic groups, respectively).

Table 8.9: Age-standardised DALY rates, by disease group and socioeconomic group, 2018

	Socioeconomic group							
Disease group	1 Lowest	2	3	4	5 Highest	Australia	Rate ratio	Rate difference
Blood/metabolic	2.8	2.2	2.3	1.8	1.9	2.2	1.5	1.0
Cancer	36.5	33.4	29.7	27.8	24.4	30.5	1.5	12.1
Cardiovascular	29.0	23.9	21.0	18.8	15.9	21.7	1.8	13.0
Endocrine	7.2	5.5	4.1	4.3	3.1	4.8	2.3	4.1
Gastrointestinal	7.7	6.5	5.7	5.2	4.6	5.9	1.7	3.1
Hearing/vision	4.4	3.5	3.7	3.7	3.3	3.7	1.4	1.2
Infant/congenital	5.8	4.8	4.6	4.2	3.4	4.6	1.7	2.4
Infections	4.4	3.7	3.0	2.8	2.6	3.3	1.7	1.8
Injuries	22.6	19.0	16.8	13.9	11.5	16.6	2.0	11.1
Kidney/urinary	3.1	2.4	2.1	1.9	1.6	2.2	1.9	1.5
Mental/substance use	27.8	29.1	28.1	25.0	20.1	25.9	1.4	7.6
Musculoskeletal	29.2	25.4	22.1	24.1	19.1	24.0	1.5	10.1
Neurological	14.6	14.8	13.2	12.4	11.9	13.3	1.2	2.7
Oral	5.1	5.6	4.6	3.7	3.5	4.5	1.4	1.6
Reproductive/maternal	2.2	2.2	2.2	2.1	2.0	2.1	1.1	0.2
Respiratory	16.8	14.0	13.0	11.7	9.7	13.0	1.7	7.1
Skin	3.6	3.6	3.3	3.7	3.5	3.5	1.0	0.1
All diseases	**222.7**	**199.3**	**179.7**	**167.0**	**142.1**	**181.8**	**1.6**	**80.6**

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.
2. Rate ratios calculated as the lowest group (1) rate divided by the highest group (5) rate.
3. Rate differences calculated as the lowest group (1) rate minus by the highest group (5) rate.
4. Prevalence estimates and deaths with insufficient geographic detail to align to a socioeconomic group are excluded from the analysis.

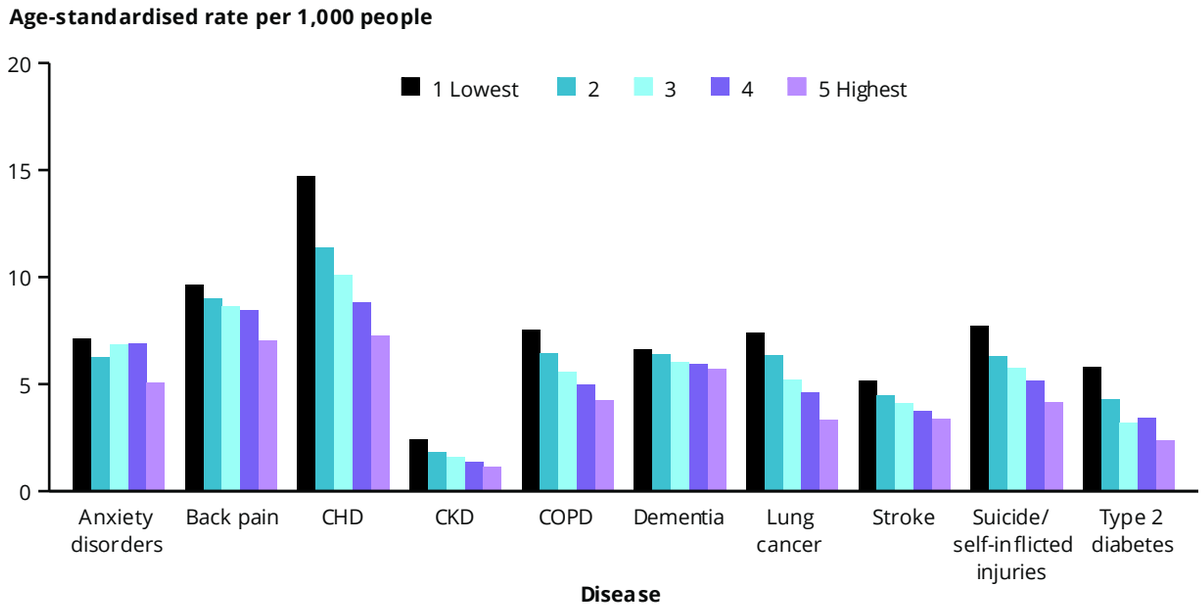
Non-fatal burden rates varied between socioeconomic groups (Appendix Table D13). Rates were greater in the lowest group when compared with the highest group for many disease groups, such as musculoskeletal conditions (28 and 19 YLD per 1,000 population, respectively), mental & substance use disorders (27 and 20) and endocrine disorders (4.0 and 2.1).

Fatal burden also differed by socioeconomic group (Appendix Table D14). For the 3 leading causes of fatal burden nationally—cancer, cardiovascular diseases and injuries—rates were, respectively, 1.6, 2.0 and 2.2 times as high in the lowest socioeconomic group as in the highest.

Variation by disease

Generally, a strong gradient in burden rates is apparent across socioeconomic groups, with higher rates of total burden in the lowest group (Figure 8.7). There was a clear pattern of decreasing rate of burden from back pain & problems, coronary heart disease, chronic kidney disease, COPD, dementia, lung cancer, stroke, suicide & self-inflicted injuries, and type 2 diabetes with increasing socioeconomic group.

Figure 8.7: Age-standardised total burden (DALY) rates, for selected diseases, by socioeconomic group, 2018



CHD = coronary heart disease; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease.

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.
2. Prevalence estimates and deaths with insufficient geographic detail to align to a socioeconomic group are excluded from the analysis.

Figure 8.8 describes the 10 leading causes of total burden in 2018, ranked by the proportion of total DALY for each socioeconomic group. Note that these rankings may differ slightly to those based on age-standardised rates. Despite the variation by socioeconomic group, these selected diseases (excluding chronic kidney disease and type 2 diabetes) were major contributors to total burden in each of the socioeconomic groups. The total burden rates and the ranking, however, varied within each group.

In all socioeconomic groups, coronary heart disease and back pain & problems were the 2 leading causes of burden. Lung cancer ranked higher with decreasing socioeconomic group. Diseases that ranked in the leading 10 causes for a socioeconomic group but not nationally were type 2 diabetes (in the lowest group), rheumatoid arthritis (in the lowest group) and osteoarthritis (in the second and fourth socioeconomic groups). Depressive disorders ranked as 1 of the 10 leading cause in all socioeconomic groups except for the lowest.

Figure 8.8: Leading causes of total burden (proportion %; age-standardised DALY rate), by socioeconomic group, 2018

	Socioeconomic group					
Rank	1 Lowest	2	3	4	5 Highest	Australia
1st	Coronary heart disease (7.2%; 14.7)	Coronary heart disease (6.5%; 11.4)	Coronary heart disease (6.1%; 10.1)	Coronary heart disease (5.5%; 8.8)	Coronary heart disease (5.5%; 7.2)	Coronary heart disease (6.3%; 10.4)
2nd	Back pain and problems (4.0%; 9.6)	Back pain and problems (4.2%; 9.0)	Back pain and problems (4.6%; 8.6)	Back pain and problems (4.9%; 8.4)	Back pain and problems (4.8%; 7.0)	Back pain and problems (4.5%; 8.5)
3rd	COPD (3.9%; 7.5)	Dementia (4.1%; 6.4)	Dementia (3.8%; 6.0)	Anxiety disorders (3.9%; 6.9)	Dementia (4.6%; 5.7)	Dementia (4.0%; 6.1)
4th	Dementia (3.7%; 6.6)	COPD (3.8%; 6.4)	Anxiety disorders (3.5%; 6.8)	Dementia (3.8%; 5.9)	Anxiety disorders (3.3%; 5.1)	COPD (3.5%; 5.8)
5th	Lung cancer (3.7%; 7.4)	Lung cancer (3.6%; 6.3)	COPD (3.4%; 5.5)	Depressive disorders (3.2%; 5.5)	COPD (3.2%; 4.3)	Lung cancer (3.2%; 5.4)
6th	Suicide/self-inflicted injuries (2.9%; 7.7)	Depressive disorders (2.9%; 6.8)	Depressive disorders (3.4%; 6.7)	COPD (3.1%; 5.0)	Suicide/self-inflicted injuries (2.7%; 4.1)	Anxiety disorders (3.1%; 6.4)
7th	Type 2 diabetes (2.9%; 5.8)	Suicide/self-inflicted injuries (2.6%; 6.3)	Lung cancer (3.1%; 5.2)	Suicide/self-inflicted injuries (3.0%; 5.1)	Depressive disorders (2.6%; 4.1)	Depressive disorders (2.9%; 5.8)
8th	Asthma (2.7%; 6.9)	Anxiety disorders (2.6%; 6.2)	Suicide/self-inflicted injuries (2.9%; 5.7)	Lung cancer (2.8%; 4.6)	Stroke (2.5%; 3.3)	Suicide/self-inflicted injuries (2.8%; 5.8)
9th	Anxiety disorders (2.7%; 7.1)	Osteoarthritis (2.6%; 4.9)	Asthma (2.8%; 5.4)	Asthma (2.8%; 4.8)	Lung cancer (2.5%; 3.3)	Asthma (2.6%; 5.2)
10th	Rheumatoid arthritis (2.7%; 5.8)	Stroke (2.6%; 4.4)	Stroke (2.5%; 4.1)	Osteoarthritis (2.5%; 4.1)	Asthma (2.4%; 3.7)	Stroke (2.5%; 4.2)

COPD = chronic obstructive pulmonary disease.

Note: Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.

Risk factors in socioeconomic groups

Table 8.10 shows relative and absolute differences in rates of burden attributable to selected risk factors, comparing the lowest (1) and highest (5) socioeconomic groups by risk factor.

The lowest socioeconomic group experienced greater burden than the highest group in every risk factor, indicated by a rate ratio higher than 1.0. The absolute differences between these 2 socioeconomic groups also varied by risk factor.

The greatest relative difference in burden rate was for tobacco use (the lowest socioeconomic group had 3.0 times the rate of the highest group), followed by intimate partner violence and high blood plasma glucose (both 2.5 times). Other notable risk factors having higher rates in the lowest socioeconomic group compared with the highest were overweight (including obesity), dietary risks, air pollution and impaired kidney function (all 2.2 times), and illicit drug use and high cholesterol (both 2.1 times).

Corresponding to high national rates, tobacco use and overweight (including obesity) risks had high absolute differences in rates between the lowest and highest socioeconomic groups (differences of 16 and 12 DALY per 1,000 population, respectively).

Table 8.10: Age-standardised DALY rates for risk factors, by socioeconomic group, 2018

Risk factor	1 Lowest	2	3	4	5 Highest	Australia	Rate ratio	Rate difference
Tobacco use	23.1	16.4	14.3	11.6	7.7	14.6	3.0	15.5
Overweight (including obesity)	21.3	15.8	13.5	12.6	9.6	14.5	2.2	11.7
Dietary risks	13.3	10.2	8.8	7.8	6.1	9.2	2.2	7.3
Alcohol use	11.3	10.3	8.2	7.3	5.9	8.5	1.9	5.4
High blood pressure	11.4	9.0	8.2	7.3	6.0	8.4	1.9	5.4
High blood plasma glucose	11.2	8.1	6.2	6.3	4.6	7.3	2.5	6.7
Illicit drug use	7.8	8.0	6.4	4.6	3.7	6.0	2.1	4.1
High cholesterol	6.9	5.2	4.5	3.8	3.3	4.7	2.1	3.6
Physical inactivity	5.5	4.4	3.8	3.6	2.9	4.0	1.9	2.7
Occupational exposures & hazards	4.4	4.0	3.5	3.2	2.4	3.5	1.9	2.1
Impaired kidney function	4.5	3.4	3.0	2.6	2.0	3.1	2.2	2.5
Intimate partner violence	3.7	3.2	2.8	2.3	1.4	2.6	2.5	2.2
Air pollution	3.2	2.4	2.1	1.8	1.5	2.2	2.2	1.8
All risk factors combined	**80.4**	**67.0**	**56.9**	**50.2**	**39.0**	**66.8**	**2.1**	**41.4**

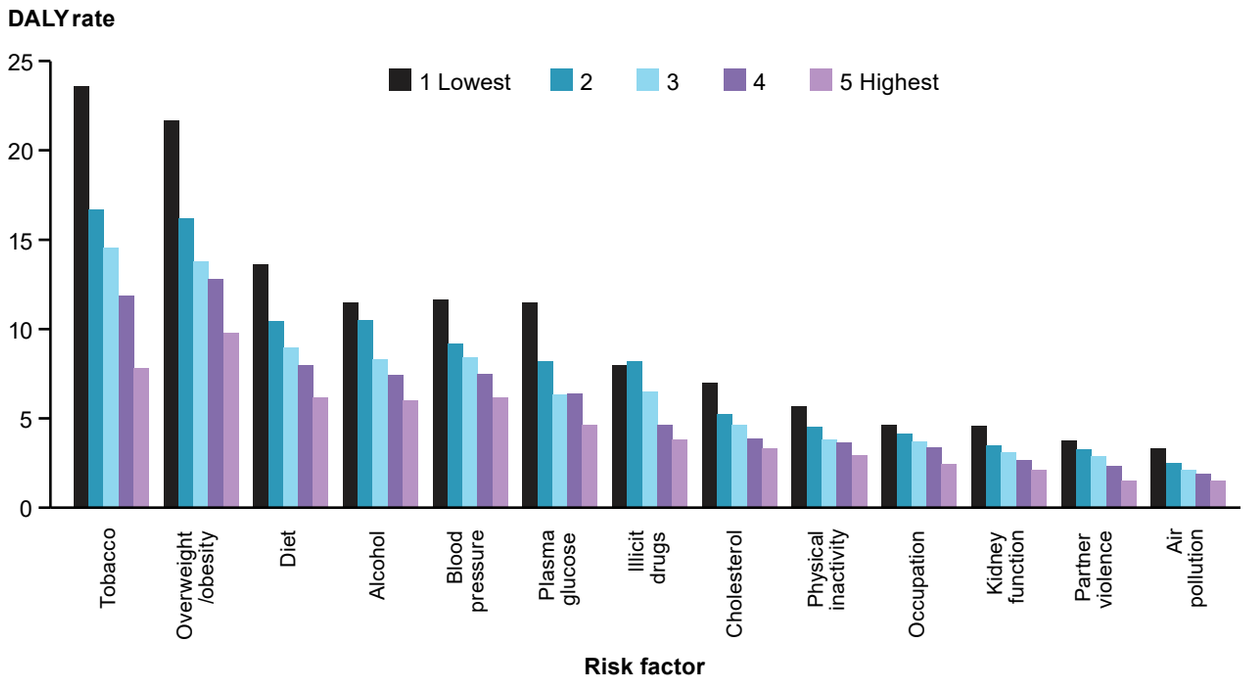
Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed per 1,000 population.
2. Rate ratios calculated as the lowest group (1) rate divided by the highest group (5) rate.
3. Rate differences calculated as the lowest group (1) rate minus by the highest group (5) rate.
4. The rates for intimate partner violence represent estimates in females only.

Variation by risk factor

Generally, a strong gradient in attributable burden rates is apparent across socioeconomic groups, with higher rates of attributable burden in the lowest group (Figure 8.9). There was a clear pattern of decreasing rate of attributable burden from all risk factors with increasing socioeconomic group.

Figure 8.9: DALY age-standardised rate (DALY per 1,000 population) for selected risk factors, by socioeconomic group, 2018



Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed as DALY per 1,000 population.
2. The rates for intimate partner violence represent estimates in females only.

Data quality

Aside from the challenges of estimating burden of disease at a national level, sub-national estimates create new challenges—in particular, with regard to finding data for disease prevalence and for risk factor exposure that can be disaggregated by the sub-national groupings of interest.

States and territories

Data quality for fatal burden was high for all states and territories.

For estimating non-fatal burden, data quality varied across diseases at the jurisdictional level. For some diseases, there were reliable data for all states and territories; for others, there were reliable data for only some jurisdictions. Even when data were available by state and territory, estimates may not have been reliable in jurisdictions with smaller populations (for example, the Northern Territory, Tasmania and the Australian Capital Territory). When appropriate data were not available, adjustments were made to national prevalence rates to produce jurisdiction-specific rates.

Rates for the oldest age groups in the Australian Capital Territory and the Northern Territory may be unreliable due to the small population sizes in the older age groups.

Remoteness areas

Fatal burden estimates by remoteness area were based on geographical alignment of the area of usual residence to a remoteness area. A valid remoteness area is available for more than 99% of deaths in 2018.

Data quality varied substantially across diseases for remoteness estimates. For some diseases, reliable data were available; for others, only some remoteness categories were available, or some remoteness categories were grouped together. Data availability was particularly limited for *Very remote* areas as few large national surveys sampled from these areas. When appropriate data were not available, adjustments were made to national prevalence rates to produce rates by remoteness.

Socioeconomic groups

Fatal burden estimates by socioeconomic groups are based on geographical alignment of the area of usual residence to areas ranked according to an index of relative disadvantage. A valid area alignment is available for more than 99% of deaths in 2018.

Data quality by socioeconomic group varied for non-fatal burden. Where possible, data by socioeconomic group were obtained directly. When appropriate data were not available, adjustments were made to national prevalence rates to produce rates by socioeconomic group, using secondary data sources such as hospitalisations or national survey data.

Similar to estimating burden by remoteness, data availability was particularly limited for *Very remote* areas, which have a high proportion of the population in quintile 1 (most disadvantaged socioeconomic group) compared with other remoteness areas.

Data for risk factor exposure by socioeconomic group were based on data for national estimates. Modelling was used to estimate exposure for each socioeconomic group for dietary and biomedical risk factors. It was also not possible to estimate occupational injuries by socioeconomic group.

Where any component of exposure by socioeconomic status was not available, attributable burden was not calculated and the risk factor was also omitted from estimates for all risk factors combined. These risk factors include iron deficiency, low bone mineral density, sun exposure, child abuse & neglect, unsafe sex, bullying victimisation and low birthweight & short gestation.

9 International context and comparisons

This chapter presents the international context of burden of disease studies and comparisons of Australian burden of disease with other countries using the latest Global Burden of Disease estimates.

What is the international context of burden of disease studies?

While the ABDS is an Australian-specific study, it was developed in a context of several global burden of disease studies whose methods were studied and applied where and as appropriate.

As outlined in Chapter 1, there have been various global burden of disease studies since the first one, published in the 1990s, which developed the DALY metric (Murray & Lopez 1996). These include:

- The first global study was updated for the period 2000–2002, with a more detailed analysis and a more comprehensive risk factor comparison (Lopez et al. 2006).
- The WHO updated the DALY results for 2004 with projections to 2030 (WHO 2009a), and the attribution to risk factors (WHO 2009b).
- The GBD 2010, coordinated by the IHME, was published in 2012 (Murray, Vos et al. 2012). This was the first GBD officially conducted by the IHME. It included a number of revisions to methods, which were then used to calculate DALY for 1990, 2005 and 2010.
- The WHO estimated its own global health estimates for 2012, 2015, 2016 and 2019 (WHO 2014, 2017, 2018, 2020a).
- The IHME produced GBD estimates for 2013 (GBD 2013 DALYs and HALE Collaborators 2015); and has since produced regular (1–2 yearly) updates for its estimates (GBD 2015 DALYs and HALE Collaborators 2016; GBD 2016 DALYs and HALE Collaborators 2017; GBD 2017 DALYs and HALE Collaborators 2018; GBD 2019 Diseases and Injuries Collaborators 2020).

ABDS and GBD

A key role of the GBD study is to provide global estimates, and then disaggregate to global region and country level to support international comparisons and benchmarking. The ABDS starts with Australian-specific data and estimates and then breaks down the estimates of disease burden within the country. Hence, the priority for the Australian study is for the best quality country-level data suited for use in health policy and planning for Australia. The GBD study provides the best basis for international comparisons, as it uses methods applicable to all countries; the ABDS provides the best basis for understanding Australia's burden of disease, and that of sub-national populations within Australia.

Following the GBD 2010 study, the AIHW assessed the methods used to determine how they could be applied to the Australian context (AIHW 2014). There were areas where it was appropriate to use the GBD approach and areas where the GBD method was adapted. Hence, the ABDS is largely based on the GBD framework but with modifications to make it best suited to the Australian context.

The AIHW also examined differences between the ABDS 2015 and GBD 2017 estimates for Australia (Zhao et al. 2021). The comparison study found that differences in the YLL were mainly driven by differences in allocation of deaths to disease categories and the redistribution of implausible causes of death. For YLD, the differences were mainly due to data sources, severity distributions and modelling strategies. However, the top 50 diseases for DALY were similar between the 2 studies.

Why have an Australian-specific study?

Recent global studies have estimated disease burden in Australia; however, they do not fully capture the range and breadth of diseases and risk factors of importance in the Australian context. As well as this, the GBD estimates do not always reflect the high-quality, detailed and up-to-date health data available in Australia. Estimates are also not available for sub national population groups. The primary use of global studies is for international comparison, with methods and assumptions designed to match international data and context.

The ABDS is valuable as it is specifically designed to meet Australia's health policy and service needs and uses the best quality Australian-specific data where available to produce burden of disease estimates more appropriate for use in Australia than the global studies. It also has the advantage over global studies of access to unpublished data sources that can enhance the quality of estimation, particularly for administrative and linked data sets that are difficult to access from outside the country. The ABDS provides the most detailed picture of the disease burden faced by Australia to inform Australian health policy and planning.

Can the ABDS 2018 be compared with international studies?

International comparisons are important and can provide a useful perspective of global disease burden. The GBD studies and the WHO's Global Health Estimates help to inform comparisons that show how health challenges differ globally and regionally. Comparisons are best made with data that are based on consistent definitions and that have similar collection methods and population coverage. In practice, this means that results are comparable within a study but not between studies. Hence, the GBD and WHO results for Australia cannot be compared with results produced in this study. Table 9.1 outlines some of the differences between these studies.

Table 9.1: Comparison of key method choices in the ABDS 2018, GBD 2019 and the WHO 2019 burden of disease estimates

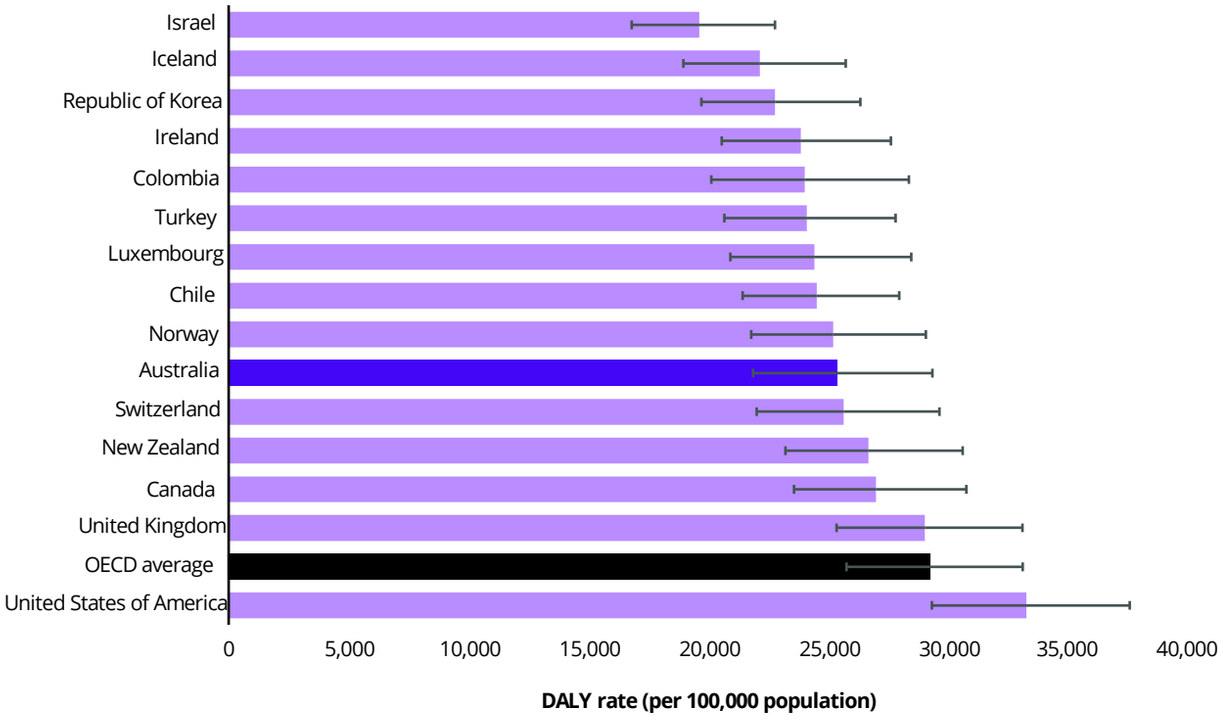
	ABDS 2018	GBD 2019	WHO 2019
Impacts on disease-specific results			
Disease (condition) list and ICD code allocation	Australia specific (grouped for policy relevance)	GBD specific	WHO specific
Impacts on total deaths and YLL results			
Data sources	AIHW National Mortality Database	Modelled from various sources	WHO mortality database
Redistribution	Australia specific	GBD specific	WHO specific
Reference life table	GBD 2010	GBD 2019	WHO specific
Impacts on YLD results			
Data sources	Australia-specific prevalence estimates derived directly where possible	Modelled from various sources	GBD 2019, with some caveats (WHO 2020b)
Conceptual models	Australia specific	GBD specific	GBD/WHO specific
Disability/health state weights	GBD 2013	GBD 2013	GBD 2019 with some modifications
Impacts on risk factor-specific results			
Risk factor list	Australia specific	GBD 2019	—
Linked disease list	Australia specific	GBD 2019	—
Data sources	Australia-specific exposure prevalence estimates	Modelled from various sources	

How does Australian burden of disease compare internationally?

Australian estimates can be compared with those for countries and regions as estimated in the GBD 2019. This section compares disease burden estimates for Australia with those for member countries of the Organisation for Economic Co-operation and Development (OECD) in 2018, using the GBD 2019 results (GBD Collaborative Network 2020). Comparisons have been made with these developed countries as they are considered most comparable to Australia. Global estimates have also been included.

In 2018, Australia had the 10th lowest rate of disease burden of all OECD countries, behind Israel, Iceland, South Korea, Ireland, Colombia, Turkey, Luxembourg, Chile and Norway. The DALY rate for Australia was lower than the OECD average and the USA (Figure 9.1).

Figure 9.1: Total burden rate (DALY per 100,000 population) in Australia compared with that for selected OECD countries and OECD average, 2018



Note: The lines indicate 95% confidence intervals.
Source: AIHW analysis of the GBD 2019 (GBD Collaborative Network 2020).

Australia's lower rates of total burden were driven by notably lower rates of fatal burden in Australia, ranking sixth lowest of all OECD countries. By comparison, Australia was ranked 26th of all OECD countries for rate of non-fatal burden and this was similar to the OECD average.

Figure 9.2 shows the leading causes of burden by GBD disease groupings for Australia, selected countries and globally for the year 2018. Note that these disease groups differ from those reported in the ABDS.

Neoplasms (cancer), cardiovascular diseases, musculoskeletal disorders, mental & substance use disorders and unintentional injuries were the leading 5 disease groupings contributing to burden in Australia. The same top 4 and neurological disorders were the leading 5 disease groups overall for OECD countries. Similarly, nutritional deficiencies, enteric infections, human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) & sexually transmitted infections, other infectious diseases and neglected tropical diseases & malaria were the disease groupings contributing to the least disease burden in these countries.

The types of health issues that affect the higher income countries in the OECD differ from those that afflict many other parts of the world. Globally, the leading 5 disease groupings that contributed to disease burden were cardiovascular disease, neoplasms, maternal & neonatal disorders, respiratory infections & tuberculosis and other non-communicable diseases. Enteric infections, HIV/AIDS & sexually transmitted infections and neglected tropical diseases & malaria also ranked notably higher globally compared with Australia and other OECD countries. This shows that health challenges differ globally. Variations between countries are driven by multiple and complex factors such as country development, health spending, life expectancy, geography, and the quantity and effectiveness of public health intervention.

Figure 9.2: GBD 2019 ranking of the leading causes of total burden, by rate (DALY per 100,000 population) in 2018 for Australia, selected OECD countries and globally

GBD 2019 disease group	Australia	Israel	Iceland	South Korea	Ireland	Norway	New Zealand	Canada	UK	US	OECD	Global
Neoplasms	1	1	1	1	1	1	1	1	1	2	1	2
Cardiovascular diseases	2	3	2	3	2	2	2	2	2	1	2	1
Musculoskeletal disorders	3	2	3	2	3	3	4	3	3	3	3	6
Mental disorders	4	4	4	4	4	4	3	5	4	5	4	7
Unintentional injuries	5	8	7	5	8	7	5	7	9	10	8	9
Neurological disorders	6	6	5	6	6	5	7	4	5	8	5	12
Other non-communicable diseases	7	5	6	8	5	6	6	6	7	9	7	5
Chronic respiratory diseases	8	10	8	11	7	8	8	8	6	6	9	10
Diabetes and kidney diseases	9	7	9	7	9	9	9	9	10	7	6	8
Substance use disorders	10	17	11	16	10	13	14	10	11	4	11	22
Sense organ diseases	11	13	12	12	13	11	10	12	13	13	12	16
Self-harm and interpersonal violence	12	12	14	9	14	14	12	13	15	12	13	15
Digestive diseases	13	11	13	10	12	10	13	11	8	11	10	13
Skin and subcutaneous diseases	14	9	10	15	11	12	11	14	14	15	14	21
Transport injuries	15	16	16	14	17	16	15	15	17	14	16	14
Maternal and neonatal disorders	16	14	17	17	16	17	16	17	16	16	17	3
Respiratory infections and tuberculosis	17	15	15	13	15	15	17	16	12	17	15	4
Nutritional deficiencies	18	19	18	18	18	19	19	19	18	20	18	20
Enteric infections	19	18	19	19	19	18	18	18	19	19	19	11
Other infectious diseases	20	20	20	21	20	20	20	21	20	21	21	19
HIV/AIDS and sexually transmitted infections	21	21	21	22	21	21	21	20	21	18	20	18
Neglected tropical diseases and malaria	22	22	22	20	22	22	22	22	22	22	22	17

Source: AIHW analysis of the GBD 2019 (GBD Collaborative Network 2020).

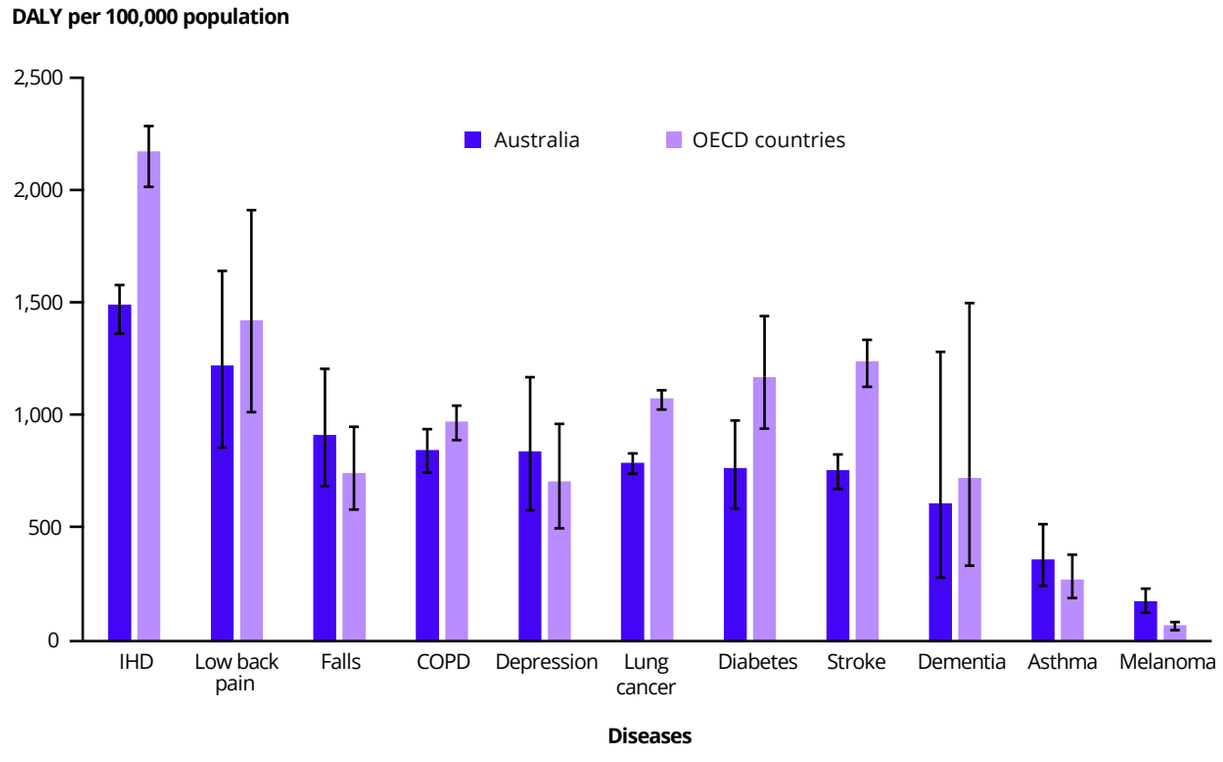
When examining the leading specific diseases contributing to DALY in Australia in 2018 (using the GBD 2019 results), most rates of burden for Australia were slightly lower than the average rates for OECD countries (Figure 9.3).

Compared with other OECD countries, Australia experienced significantly lower rates of burden from:

- ischaemic heart disease (also called coronary heart disease)
- stroke
- lung cancer.

By comparison, rates of burden for falls, depression, asthma and melanoma were higher in Australia. This difference was statistically significant for melanoma only.

Figure 9.3: Total burden rate (DALY per 100,000 population) of selected high-burden diseases in Australia compared with OECD countries, 2018



Dementia = Alzheimer disease and other dementias; Diabetes = diabetes mellitus; Depression = major depressive disorders; IHD = ischaemic heart disease; Lung cancer = tracheal, bronchus and lung cancer; Melanoma = malignant skin melanoma.

Note: The lines indicate 95% confidence intervals.

Source: AIHW analysis of the GBD 2019 (GBD Collaborative Network 2020).

Further information on comparable estimates for global and country-specific disease burden can be found online at www.healthdata.org/gbd/data.

10 Study developments and limitations

It is important that the ABDS evolves and incorporates methodological changes and data improvements. The ABDS 2018 analyses, undertaken in 2019 and 2020, are an update of burden of disease estimates for Australia to add the reference year 2018. The study uses the infrastructure developed as part of the ABDS 2011 but includes developments to reflect improvements in both data and methods for ABDS 2015 and since.

What are the underlying principles of the ABDS?

The principles and requirements developed to guide the ABDS 2011 were adopted for the 2015 and 2018 updates. These were specified in 2014 (AIHW 2014) and included the following principles relevant to this study:

- provide national estimates of fatal, non-fatal and total burden, as well as the attribution to specific risk factors that are up to date, of high quality and meet Australia's needs
- provide sub-national estimates (such as for state/territory, regional, socioeconomic groups) where valid
- maintain comparability with GBD methods as much as possible, with full clarity around any differences
- provide transparency in the data sources, assumptions and methods used, with the ability to replicate the results
- complete the work in an efficient and flexible manner, build national capacity, and set up the relevant infrastructure to enable efficient and timely ongoing updates
- ensure collaboration with the various stakeholders, including other burden of disease experts both nationally and internationally in order to contribute to global burden of disease work.

To ensure transparency in terms of the data sources, assumptions and methods, detailed methods information is provided in the accompanying report *Australian Burden of Disease Study 2018: methods and supplementary material* (AIHW 2021c). Detailed data visualisations are also available on the AIHW website: http://www.aihw.gov.au/burden-of-disease/.

What stayed the same between Australian studies?

The ABDS 2011 study was published in 2016 (AIHW 2016b) and the ABDS 2015 study in 2019 (AIHW 2019). The overarching methods adopted in the ABDS 2011 were used in the ABDS 2018. These include the ABDS disease list structure and groupings, use of GBD 2010 life table for estimation of YLL, methods for redistributing deaths for fatal burden and producing prevalence estimates for non-fatal burden, and the use of the comparative risk assessment method for attributable burden estimates.

As for previous studies, the majority of the estimates for the ABDS 2018 were based on the best available Australian data, using detailed unit record or linked data in many cases. In some instances, a single, high quality data source was identified as being appropriate for the Australian context (such as the mortality data for the fatal burden estimates); in other cases, multiple data sources were used (such as using a primary data source to obtain a total sex-specific prevalence estimate and a secondary data source to obtain age distributions). Use of detailed local data sources has resulted in less modelling than in the GBD studies.

The same disability weights were used as for the ABDS 2011 and ABDS 2015. These were sourced from the GBD 2013 (Salomon et al. 2015) and continue to be used in the most recent GBD studies.

In addition, the same independent comorbidity adjustment algorithm employed in ABDS 2011 and ABDS 2015 was used for ABDS 2018.

What changes were made in the ABDS 2018?

The main method developments in the ABDS 2018 are the addition of new diseases (scabies, asbestosis, silicosis and other pneumoconiosis), improvements to YLL redistribution methods and estimation for specific causes, greater use of linked data, inclusion of 2 new risk factors (bullying victimisation and low birthweight & short gestation), reporting of burden due to 'homicide & violence' by perpetrator type and sex, and revised risk factor models.

Another development was to combine influenza and pneumonia into lower respiratory infections for reporting purposes. To report influenza separately would not give a true estimate of the burden of influenza (rather, it would only include the 'diagnosed' fraction).

Fatal burden

In ABDS 2018, changes were made to the redistribution algorithms for sepsis and for cancers of ill-defined digestive organs, and other ill-defined cancers and cancers of unknown primary site. Changes were also made to the approach for estimating YLL for falls (for further detail, see AIHW 2021c).

Non-fatal burden

Overall, 29% of the disease and injury non-fatal burden estimates were revised due to improvements in data and methods. The majority of these changes involved new data sources or improved modelling. The disease conceptual model (the concepts used to estimate health loss from the disease or injury based on knowledge of disease pathways) for otitis media was revised to include the addition of a new sequela. More recent epidemiological studies were used to update age, sex or severity distributions for some disease estimates where appropriate.

The ABDS 2018 also made more extensive use of state-level linked hospital and deaths data to improve estimates. Linked data were available from the National Health Services Information Analysis Asset (NIHSI AA). The NIHSI AA contains de-identified data from 2010–11 to 2016–17 on admitted patient care services, emergency department services and outpatient services in public hospitals for 4 jurisdictions: New South Wales, Victoria, South Australia and Tasmania. For ABDS 2015, linked data were only available for New South Wales and Victoria.

DisMod II has previously been used in the estimation of long-term health loss from neural tube defects and gastrointestinal malformations among those aged under 1 year, and from injuries. For ABDS 2018, historical data (incidence and case-fatality) was used to model these conditions rather than using DisMod II.

Sensitivity analyses were also undertaken using alternative disability weights for selected causes to examine the impact on resulting YLD estimates (see Box 10.1).

Box 10.1: Sensitivity analyses of YLD estimates for selected causes using alternative disability weights

The AIHW has undertaken sensitivity analyses of YLD estimates using alternative sets of disability weights (DWs) available for selected causes and compared to YLD estimates from ABDS 2018 which use DWs from GBD 2013. A summary of the results of these analyses is provided below.

Injury

YLD estimates for a number of injury causes were produced using injury-specific DWs from a study using patient-reported data from 6 longitudinal data sets in 5 countries (Gabbe et al. 2016). This included 2 Australian data sets—the Victorian State Trauma Registry and the Victorian Orthopaedic Trauma Outcomes Registry. Responses to questions in the 3-level EQ-5D questionnaire from patients with injury in these datasets were used to estimate DWs.

When compared to YLD estimates using GBD DWs, YLD estimates produced using the injury-specific DWs for all injuries included in the analyses were 1.7 times higher. This varied by type of injury, with the greatest differences found for some of the lower burden injuries such as open wound and superficial injuries (13 times higher). YLD estimates using the injury-specific DWs were lower than those using GBD DWs for a small number of injuries such as severe chest injury and abdominal/pelvic injuries (both with a rate ratio of 0.4). See Appendix Table D15 for the full set of results.

Vision disorders

YLD estimates for vision disorders were produced using DWs from the WHO 2010 Global Health Estimates 2000–2011 (WHO 2013) in which DWs were higher than GBD 2013 for all severity levels and have been argued by experts to be more representative of the health loss experienced from vision impairment in Australia.

YLD estimates produced for each of the vision disorders included in ABDS 2018 (glaucoma, refractive errors, age-related macular degeneration, cataracts, and other vision disorders) using the WHO DWs were around twice as high as those using GBD DWs. See Appendix Table D16 for the full set of results.

Risk factors

In the ABDS 2018, new risk factors were included for bullying victimisation and low birthweight & short gestation.

The methods for 4 of the existing 18 risk factors were revised, with the latest evidence including changes to linked diseases, the TMRED (that is, exposure not associated with health loss) and relative risks. Changes include:

- The model for high cholesterol was revised to incorporate a measure of low-density lipoprotein (LDL) cholesterol (compared with total cholesterol previously).
- Dietary risk factors, air pollution and physical inactivity PAF calculations were revised in line with GBD 2019 methods including changes to the TMRED (exposure associated with no increased health loss), categories of exposure associated with health loss and the size of the association between the risk factor and linked diseases (relative risks).
- The methods for the dietary risk factor diet high in sugar sweetened beverages changed to be directly linked to type 2 diabetes and coronary heart disease instead of mediating through overweight and obesity.
- Exposure to air pollution was estimated from satellites calibrated with ground monitoring stations instead of ground monitoring stations alone, improving the coverage of estimates for Australia and type 2 diabetes was added as a linked disease.

Revised methods and inputs developed as part of ABDS extension projects (AIHW 2017b, 2017c, 2018b) and specific changes from the GBD 2019 (GBD 2019 Risk Factors Collaborators 2020) have also been incorporated into the ABDS 2018 where appropriate.

'Homicide & violence' is an external cause of injury linked to intimate partner violence (IPV) and for which direct PAFs are available from Australian data sources (National Homicide Monitoring Program and hospital separations data) to estimate the burden due to this cause attributed to IPV. Data are also available from these data sources for other perpetrator types (e.g. family members (excluding IPV), strangers and acquaintances) and for males and females. In ABDS 2018, additional estimates of the proportion of burden due to homicide & violence that can be attributed to different perpetrators of violence have been presented. This was a recommendation from work undertaken by the AIHW for the Department of Social Services (DSS) to review evidence on the health outcomes of violence (see Box 10.3 for more information on this project).

What are the data gaps?

The ABDS 2018 is based on the best current knowledge, methods and available data, as suited to the Australian context. Yet, undertaking this study highlighted a number of data gaps—particularly in the prevalence of diseases (for example, diseases treated in primary health care), data for some risk factors and Australian-specific severity distributions.

Fatal burden

While Australia has very good quality deaths data, the method for estimating the fatal burden uses information on the underlying cause of death only—extra information contained in the associated causes of death is not currently used to assign the fatal burden. The current method assigns the entire burden to 1 cause of death, and therefore cannot take into account the more complex situation where multiple causes contribute to the death. It also relies on accurate allocation of the underlying cause of death.

Non-fatal burden

For the non-fatal component, as already mentioned, the ABDS 2018 was able to use detailed Australian prevalence data for many diseases and injuries, including unit record data and linked data combining separate data sets. The quality of prevalence data varies across diseases, however, and while the best available data were used, overseas data or older Australian data had to be relied on in some instances. For example, the dementia estimates are based on a published international meta-analysis, and thus the assumption was made that these rates apply in Australia. Further, while linked data have been used in the ABDS 2018, the majority were from linked data from 4 jurisdictions. It would be a notable improvement if linked data were accessible at the national level.

Risk factors

For many of the risk factors it was possible to use high-quality measured or self-reported data on exposure. However, the quality for dietary risks, physical inactivity and those using blood measurements was limited by the data available to inform trends. For example, no data on trends were available to inform estimates for high blood plasma glucose and data were only available for 2 time points to inform trends for the dietary risk factors (from the 1995 and 2011–12 National Nutrition and Physical Activity Survey (NNPAS) for which results are not directly comparable). For low bone mineral density there were no national data available, and low birthweight & short gestation was only estimated for the 2018 reference year.

For many of the dietary risk factors, in particular risks for a diet high in a particular dietary component (e.g. diet high in processed meat), it was not possible to adjust the self-reported exposure estimate to account for under-reporting. In addition, the burden due to high intake of trans fats was not assessed and will be important to consider for future studies. Metrics or diet quality indexes capturing the proportion of dietary energy derived from discretionary foods and drinks or ultra-processed foods could also be assessed for inclusion as dietary risks in future studies, which will enable a more complete assessment of the impact of diet on health.

Mediation factors accounting for the interaction between risk factors were taken from the GBD 2019 though do not include all known associations between risk factors (e.g. associations between diet and overweight).

What are the methodological limitations?

The method used to derive the disability weights remains the subject of international discussion and debate (Haagsma et al. 2015; King et al. 2018; Nord 2013; Voigt & King 2014). The set of disability weights used in this study comes from the GBD 2013; the weights are based on surveys of populations in a number of countries as well as on an internet survey (Salomon et al. 2015) and are still being used in the most recent GBD studies. Analysis of the results suggested that there was little variation between countries in these valuations. However, to date, no specific validation in the Australian context has been undertaken.

Another general area where improvements could be made relates to the 'severity distributions', which represent the proportion of people with a given disease by levels of severity. The ABDS was able to use Australian data for some severity distributions, but relied on the GBD distributions for others, which are assumed to be constant over time and do not vary by geographic location. While the global distribution would be appropriate in some cases, others would be improved with Australian-specific data to better reflect patterns of disease severity in different regions of Australia.

While the ABDS 2018 used the best available data for prevalence, severity, risk relationships and other factors, these are constantly evolving and there is potential for improvement in future studies. As well, there are a number of opportunities to further explore the vast quantity of estimates presented in this report. This is discussed further in the section 'What opportunities are there for further analysis?' later in this chapter.

Quality of ABDS 2018 estimates

Uncertainty bounds have not been included in this study. There are challenges with deriving uncertainty in burden of disease analyses (von der Lippe et al. 2020), including that such estimation of uncertainty would need to take into account the complex analysis and manipulation needed to align the input data to the preferred epidemiological variables, disease definitions, population and time period. This would require a combination of assumptions, models and judgments. Thus, measures of uncertainty would need to take into account uncertainties in both the data (such as standard errors from surveys and misalignment with our preferred case definition) and the models and transformations (such as estimating prevalence from incidence and estimating sub-national estimates). It was not practical to incorporate all imperfections and uncertainties into a single measure, such as an uncertainty interval. Instead, the quality framework developed as part of the ABDS 2011 was used in the study.

A summary of the quality framework and quality information for all disease and risk factor estimates is provided (Appendix B), so that users of the ABDS 2018 can determine the appropriateness (or otherwise) of the estimates for particular purposes. Quality information specific to diseases and risk factors is provided in the accompanying report *Australian Burden of Disease Study 2018: methods and supplementary material* (AIHW 2021c).

What opportunities are there for further analysis?

During consultation with stakeholders, the AIHW identified a range of potential deeper analyses that could be undertaken of particular diseases and disease groups (for example, injuries), of particular risk factors (for example, nutrition) and of particular population groups. With appropriate data, further work could be undertaken to disaggregate sub-national estimates (for example, state by remoteness) or to explore the burden at local levels (for example, by primary health networks). Further work could also provide alternative groupings of diseases within and across disease groups (for example, vascular diseases, septicaemia).

Detailed and comprehensive data are not currently available to enable burden of disease estimates to be calculated for priority populations such as culturally and linguistically diverse (CALD) and lesbian, gay, bisexual, transgender or intersex (LGBTI) populations. Burden of disease estimates for the Aboriginal and Torres Strait Islander population are produced as part of a separate study for which detailed 2018 estimates are scheduled for release in 2022 (AIHW forthcoming 2022).

There is further opportunity to explore the estimates for population health monitoring, including more in-depth expansion of morbidity estimates (for example, analysis in relation to chronic conditions using sequela-level information that distinguishes acute and chronic effects, or detail across age/sex and sub-national groups) or to answer specific research questions (for example, burden in the last year of life for cancer, health of the working-age population).

Additional health conditions for inclusion in future ABDS updates could be considered. COVID-19 would be included for reporting in 2020 (see Box 10.2). Problem gambling would be re-assessed for potential inclusion in future ABDS updates following completion of work being undertaken by the Australian Institute of Family Studies on developing and validating Australian-specific disability weights for different levels of at-risk gambling. Other diseases for which there is a strong policy interest and are not currently included in ABDS 2018 due to lack of reliable data could also be re-assessed for inclusion.

Box 10.2: Estimating the burden of COVID-19 and indirect health effects

COVID-19 would be added to the ABDS cause list for reporting from 2020 onwards in order to monitor the direct fatal and non-fatal impacts of the disease. As mentioned in Chapter 1, the AIHW has published burden of disease estimates for COVID-19 in 2020 as part of a synthesis report (AIHW 2021e). This used the best available data at the time of analyses and largely draws on methods and development work internationally. Estimates are reported at the national level only, and by broad age group and sex. As data on COVID-19 and methods for estimating burden are continuously improving over time, this work would be updated to incorporate improvements in data (e.g. use of linked data) and to reflect the latest understanding of the disease and any further improvements to methods. Estimates could also be extended to be produced at sub-national levels (state/territory, remoteness and socioeconomic group).

Work could also be undertaken to examine the longer-term impacts of COVID-19 (if data are available) and the indirect health effects (such as reductions in diseases and injuries such as influenza, road transport accidents and sporting injuries). In addition, the broader indirect societal effects (such as the unintended consequences of the lockdowns, job losses and social isolation), which can be viewed as risk factors for ill-health, could potentially be analysed as risk factors in future burden of disease analyses.

It is likely that further risk factors could be included in future studies, including heatwaves and violence (total violence and different types of violence), for which a range of work is currently being undertaken in Australia (See Box 10.3).

Box 10.3: National work on the health impact of heatwaves and violence

Heatwaves

A multi-agency partnership project through the Physical Environment Analysis Network (PEAN) under the Data Integration Partnership for Australia (DIPA) was initiated in 2019. The project aims were to investigate the impact of heatwaves on health outcomes in Australia; estimating the relative risk of deaths or use of health-care services during heatwave/non-heatwave periods from all causes. The project used expertise in modelling to correlate health impact of heatwaves with social, environmental and health vulnerabilities of the population. As part of the project a new data set was created—using 10 years of Multi-Agency Data Integration Partnership (MADIP) data linked to the indicator of heat exposure. A final report on the findings from this project was published in June 2021 (PEAN 2021).

An Australian Research Council Discovery Project commenced in 2020 which aims to produce national burden of disease estimates for climate-sensitive and heat-attributable diseases and injuries and project future burden of disease due to climate change under different scenarios. The project is being led by the University of Adelaide and University of Sydney. The AIHW is a collaborating partner and has been providing technical advice, ABDS data and methods to assist with the burden of disease calculations. The project is due for completion in late 2022.

Violence

In 2020, the AIHW undertook a review of data sources for violence prevalence and a literature review on health outcomes of non-partner family violence and community violence.

The 2016 Personal Safety Survey was found to be the most suitable data source to estimate national prevalence of the various forms of violence. The literature review found:

- probable evidence that sexual violence may result in depressive disorders and anxiety disorders (specifically post-traumatic stress disorder or PTSD)
- possible evidence that sexual violence may result in drug use disorders, alcohol use disorders and generalised anxiety disorder
- less convincing evidence for other types of violence (physical and emotional) and other health outcomes such as pre-term birth, attention deficit hyperactivity disorder (ADHD) and diabetes.

There was inconclusive evidence on the association between perpetrator relationship and health outcomes.

continued

Box 10.3 (continued): National work on the health impact of heatwaves and violence

The report (unpublished) made the following recommendations for future ABDSs:

1. Continue reporting on the current risk factor for IPV in women (using the health outcomes and effect sizes from the previous AIHW literature review and latest GBD study) and child abuse and neglect (using the health outcomes and effect sizes from the latest GBD study) (*this has been implemented for ABDS 2018*).
2. Consider reporting 1 or more of the following as additional risk factors on violence against men and women:
   a. sexual violence by any perpetrator with the health outcomes of anxiety disorders and depressive disorders, using a meta-analysis of the effect sizes found in this literature review and relevant effect sizes pertaining to sexual violence from the previous AIHW literature review for IPV in women and most recent GBD meta-analyses (*not able to be implemented for ABDS 2018 as the meta-analysis needed was assessed to require additional resources that were not available*)
   b. family violence using the same health outcomes and effect sizes as used for the IPV risk factor, pending further expert advice as to whether this is appropriate (*advice received from Australia's National Research Organisation for Women's Safety is that this is problematic for a number of reasons and would be misleading. As such the AIHW decided not to implement this recommendation in ABDS 2018 or future studies*).
3. Calculate direct PAFs for the injury-related health outcomes in the ABDS ('homicide & violence' for external cause of injury) by perpetrator type using national hospitalisations data and data from the National Homicide Monitoring Program (*this has been implemented for ABDS 2018; see Box 6.3*).

The report also recommended that consideration be given to future exploratory work that could be undertaken to include an experimental 'total' violence burden estimate which would combine the burden due to existing ABDS risk factors (IPV in women and child abuse & neglect), and new risk factor estimates for types of violence and linked diseases for which there is sufficient evidence in the literature (i.e. sexual violence in men and women linked to anxiety and depression and physical and/or sexual violence by all perpetrator types in men and women linked to homicide & violence).

Social factors (such as income/poverty, education and employment) play an important role in determining the health of a population, and they often have a strong association with health outcomes and health behaviours. The ABDS 2018 disaggregated the fatal, non-fatal and total burden estimates using a measure of socioeconomic group as a way to quantify disparities in fatal and non-fatal burden across different social and economic groups. There is also potential to include socioeconomic factors as risk factors in future burden of disease studies as required inputs and evidence becomes available. For example, fatal burden estimates may be able to be calculated by education level using inputs and data from a National Health and Medical Research Council funded project recently completed using Census–mortality linked data to look at educational inequalities in cause-specific mortality (Welsh et al. 2021).

The ABDS now has consistent, comparable estimates for 2003, 2011, 2015 and 2018 for analysis. Further studies to extend this time period will increase the value of the study by giving an even stronger and more reliable sense of the changes taking place in the health of the Australian population. Now that the necessary infrastructure to develop Australian-specific estimates is in place, regular updates would enable future iterations to produce estimates closer to the current date, improving currency and relevance. Annual updates could be undertaken as data become available for key data sets (e.g. deaths, hospitalisations, cancer incidence, notifiable diseases), with major updates (involving a full review of methods) undertaken every few years.

Another option would be to produce projections from the data. This could include short projections to the current year, which would allow the results to be presented in relation to the year the study is actually published. Longer-term projections may also be useful.

Risk factor and intervention based scenario modelling could also be undertaken (e.g. impact of bowel cancer screening on burden of bowel cancer in Australia). The AIHW has previously undertaken analyses using data from ABDS 2011 to assess the potential impact on future health burden if overweight and obesity and physical inactivity were to increase or decrease under different scenarios (AIHW 2017b, AIHW 2017c). This work could be updated and extended to other risk factors.

There are opportunities to improve the estimates from the ABDS 2018. There are also various areas where refining our current methods would be beneficial; for example:

- validating comorbidity adjustment would provide more information about the reliability of the study's burden estimates. Linked data could be explored for the potential to investigate known comorbidities between diseases to assess the validity and impact of the comorbidity bias adjustment used in the ABDS.
- incorporating multiple causes of death into YLL calculations would allow for further use of the available data to potentially improve YLL estimates.

As outlined in Chapter 9, the AIHW continues to monitor the methods used in other burden of disease studies and to collaborate with colleagues undertaking their own national studies, including as a member of the European Burden of Disease Network. The AIHW will incorporate developments into future iterations of the ABDS, as appropriate in the Australian context, and contribute to the body of knowledge and international expertise in this area.

Appendix A: Methods summary

This appendix summarises the methodological approach of the ABDS 2018. A more detailed methodological description is provided in a separate technical report (AIHW 2021c).

Burden of disease analysis aims to quantify health loss for all health outcomes, both fatal and non-fatal, and attribute it to a disease or injury category. This is achieved by separately estimating the fatal (YLL) and non-fatal (YLD) burden, according to a defined list of diseases, and summing them. The methods for estimating each are described below. This burden can then be attributed to risk factors selected for inclusion in that part of the analysis.

1 Disease and injury (condition) list

The disease and injury list details the specific diseases and causes of injury for which estimates were made. It is a classification which, in principle, is a set of mutually exclusive and collectively exhaustive categories of disease and causes of injury. Accordingly, it covers all fatal and non-fatal health outcomes (for which health loss is measured), with each outcome aligned to an item on the list.

An Australian disease and injury list was developed specifically for this study to reflect the Australian context; that is, the disease and cause groups are tailored to meet the needs of health reporting and monitoring for Australia. The list used in this study was developed with the following considerations:

- Australian policy interests are covered.
- The mortality and prevalence for each cause can be feasibly measured.

The resulting disease and injury list is hierarchical and comprises 2 levels. The highest level contains 17 disease groups under which 219 diseases and injuries are classified. This includes dual reporting of injury by either nature or external cause.

Residual causes are included for each disease group. These account for the health loss from diseases not specifically identified in the disease list and ensure that health loss is captured for all conditions. For example, 'other musculoskeletal conditions' are musculoskeletal conditions not included in arthritis, gout, rheumatoid arthritis and back pain & problems. Other musculoskeletal conditions will include conditions like systemic lupus erythematosus, fibromyalgia and tendonitis.

The disease list is included in Table A1 (see end of this appendix). Definitions of each disease by ICD-10 for mortality or ICD-10-AM (where relevant) for morbidity are in AIHW 2021c.

2 Fatal burden

A complete set of mortality data (by age, sex and geography) and a reference life table are the key requirements for producing estimates of YLL for each disease and injury included in the condition list.

2.1 Reference life table

The reference life table is a key component of the fatal burden analysis. Estimates of life expectancy at each age are used to indicate the number of years of life that are lost by dying at a specific age.

The ABDS 2018 uses the standard life table developed in the GBD 2010 study (Murray, Ezzati et al. 2012). This life table (see Table A2) was derived using the lowest age-specific mortality rates experienced around the world. The result is a hypothetical life table, rather than 1 experienced in any single country. The reference life table estimates life expectancy at birth to be 86.0 years for both males and females—28 years for a person aged 60 and 3 years for a person aged 95. See Table A2 for the reference life table used in this study.

2.2 Mortality data source

Analysis of burden of disease takes into account all deaths that occur in a population during a specified time period. The total number of deaths from all causes comes from the AIHW's National Mortality Database.

Australian deaths data are collected through the vital registration system—a system for collecting and maintaining records of life events, such as births, deaths and marriages, by a government authority. Cause of Death Unit Record File data are provided to the AIHW by the registries of births, deaths and marriages and the National Coronial Information System (managed by the Victorian Department of Justice) and include cause of death coded by the ABS. The data are maintained by the AIHW in the National Mortality Database.

The AIHW website https://www.aihw.gov.au/about-our-data/our-data-collections/national-mortality-database/deaths-data provides detailed information on the registration of deaths and coding of causes of death to the ICD in Australia. The completeness, accuracy and coding of these data are also described elsewhere (ABS 2020a). The deaths data are collated into an administrative data set for analysis. Given the high quality of these data, no modelling had to be undertaken to adjust for coverage or completeness for national estimates. Some transformation of the data has been undertaken to reassign some deaths to better fit the purposes of burden of disease analysis (see Section 2.3 in this appendix).

Although derived from the same source, estimates of deaths by disease or disease group in this study should not be compared with estimates from other sources. This is because grouping of diseases may be different from that used in other studies, and deaths that do not fit within specific disease definitions for the ABDS 2018 have been 'redistributed' to other diseases (see Section 2.3 in this appendix).

Versions of mortality data

The analyses for this report include all deaths occurring during the reference periods (calendar years 2003, 2011, 2015 and 2018) that were registered up to and including 2019. Data were sourced from unit record files in the National Mortality Database and, by including the registrations for 2019, ensured that late registrations of deaths occurring in 2018 were included.

The analysis data set for this study comprised mostly cause of death information based on a final version of data. Specifically, 99% of deaths for the 2003, 2011 and 2015 reference years used a final version of cause of death data, while 95% for 2018 used a revised version of cause of death (that is, the cause is subject to change). Since 2006, deaths certified by a coroner are revised and causes are updated, pending the status of coroner investigation. As such, some cause of death information is subject to change. The ABS revisions process is described in detail elsewhere (ABS 2020a).

2.3 Redistribution methods

There are a number of ICD codes that are not considered appropriate or valid causes of death for a burden of disease study. Some examples are:

- causes that should not be considered as the underlying cause or that are implausible as a cause of death, such as hypertension and paraplegia
- intermediate causes: causes such as septicaemia and pneumonitis that likely had some other precipitating cause
- immediate causes: causes that are generally observed as modes of dying, such as cardiac arrest, heart failure and respiratory failure
- causes that are ill defined or unspecified within a larger cause group; for example, ill defined digestive cancer and ill-defined digestive diseases.

Despite its overall high quality, the Australian deaths data set includes some records with these codes. A list of the ICD-10 codes used to identify deaths for redistribution in the ABDS is shown in Appendix Table A3. For the 4 reference years combined, 9.7% of deaths were identified for redistribution.

The AIHW undertook a series of analyses in investigating methods for redistributing records with codes identified for redistribution. The methods ultimately adopted were, in order of priority, those described here:

- *Direct evidence:* this approach uses direct evidence about the particular deaths identified for redistribution. Information about the more likely cause of death is modelled on results of data linkage studies or sources other than the National Mortality Database. Direct evidence was used where available.
- *Indirect multiple causes of death (MCOD) method:* this method uses the pattern of the underlying causes of death (UCODs) where the cause identified for redistribution was mentioned as an associated cause of death (ACOD). The corresponding UCODs and their proportional distribution provide the redistribution algorithm. For example, to inform the redistribution algorithm for deaths with an underlying cause of pneumonitis, all deaths that mentioned pneumonitis as an ACOD were identified. The UCODs of these records reflect a pattern of underlying causes of death for deaths that involved pneumonitis. This pattern was used to inform the algorithm for redistributing deaths where the underlying cause was coded as pneumonitis. The indirect MCOD method was applied where the redistribution was 1 of the most commonly occurring causes of death, and no direct evidence was available.

  For septicaemia, we used a modified MCOD method due to changes in cause of death coding practices. In recent years, in cases where chronic conditions, such as cancers, are mentioned as an indirect cause of death on the death certificate, they are selected as the underlying cause of death when septicaemia is mentioned as a direct cause on the death certificate. As such, deaths from septicaemia were not redistributed to chronic conditions in the modified MCOD method.
- *Proportional redistribution to specified target causes(s):* this method reassigns deaths across a range of target causes selected according to the existing distribution of underlying cause of death within that disease group, or expert advice or the GBD redistribution algorithms. This method has the advantage of being a conceptually simple approach but may not be well customised to a particular redistribution code. Because of this, it was considered appropriate only for low-volume redistribution causes, and for those that were proportionately allocated by the GBD 2010 study where direct evidence was not available or where the indirect MCOD method was not suitable.

The expert panels for the disease groups assisted in identifying the direct evidence for redistribution causes and reviewed the application of the indirect MCOD and other redistribution approaches.

Applying the redistribution algorithms developed for the ABDS (using the methods described in this section) resulted in 88% of deaths identified for redistribution being reassigned to other causes using empirical evidence (direct evidence, indirect MCOD or a mix of both) (see Appendix Table A4).

2.4 Calculating YLL

YLL is calculated by summing the number of deaths at each single year of age, multiplied by the remaining life expectancy at this age according to the reference life table.

Age at death was missing in 14 records; in these instances, the age at death was set to the median age for the underlying cause of death for that sex.

2.5 Converting injury YLL from external cause to nature of injury

Two reporting perspectives are used for injury burden: external cause and nature of injury. Information pertaining to both perspectives is available in the National Mortality Database: external cause is reported as the UCOD, while information about the nature of injuries contributing to the death may be recorded as ACODs. As each death record comprises a single UCOD and potentially multiple ACODs, a hierarchical list of injuries was developed to map the burden by external cause (the UCOD) to a single nature of injury category (the ACOD). The injury hierarchy was modified from the New Zealand Ministry of Health (unpublished), where injuries were ordered according to the likelihood of causing death, based on the nature of the injury, prognosis and clinical knowledge of injury conditions.

In this study, the links between the external cause and the nature of injury were produced as age- and sex-specific matrixes and used to convert YLL by external cause to YLL by nature of injury. The mapping process maintains internal consistency.

3 Non-fatal burden

The key inputs for estimating YLD are a complete set of point prevalence estimates for each defined outcome of a disease and injury included in the disease and injury list and a set of disability weights indicating the health loss.

3.1 Morbidity data sources

Unlike mortality data, there is no single comprehensive and reliable source of data on the incidence, prevalence, severity and duration of all non-fatal health conditions. Instead, morbidity estimates were drawn from a wide variety of sources, and generally based on the best single source.

Potential sources for disease-specific morbidity data had to have case definitions appropriate to the disease being analysed; had to be relevant to the Australian population; and had to be timely, accurate, reliable and credible. Where possible, national data sources, rather than sources relating to particular regions or sub-populations, were used.

Administrative data sources (for example, disease registers, hospitalisations) were evaluated for their level of ascertainment and coverage. Surveys were evaluated for their representativeness, potential selection bias and measurement bias (validity and reliability of measurement). Epidemiological studies were evaluated for the quality of their study design, their timeliness, credibility, representativeness and sources of bias or error.

All potential data sources (whether published or unpublished) were assessed for their comparability, relevance and representativeness, currency, accuracy, validation, credibility and accessibility/ timeliness. These criteria were incorporated into a quality indicator for each estimate. Appendix B provides a summary of the quality for non-fatal estimates.

3.2 Disease conceptual models, disability weights and severity distributions

For each disease, a conceptual model of health loss was developed, based on models of the natural history of the disease. The conceptual models were developed in conjunction with disease experts. In many cases, a conceptual model was based on similar ones used in previous burden of disease studies. Each model depicts the major sources of health loss (sequelae) caused by different severity levels and stages of a disease, and then maps these to disability weights via corresponding 'health states'.

A health state reflects a combination of signs and symptoms that result in a certain amount of health loss and is not necessarily specific to 1 particular disease. Each health state is associated with a disability weight reflecting the health loss experienced by a person while in that state. The health states and disability weights used in the ABDS 2018 were drawn from the GBD 2013 (GBD 2013 Collaborators 2015; Salomon et al. 2015).

Each sequela may be mapped to 1 or more health states—multiple states often constitute a severity distribution for the sequelae (for example, mild, moderate, severe) or disease progression (such as progression through the various cancer phases). Within each sequela, a person can be in only 1 health state at any given point in time.

The disability weight for the sequela is the weighted average of the constituent disability weights.

3.3 Comorbidity bias adjustment

Comorbidity (the existence of more than 1 disease or injury in an individual at the same time) introduces a potential challenge for burden of disease analysis. As the available prevalence data and disability weights represent the situation without regard to comorbidity, summing YLD estimates without adjustment would lead to an overestimation of the overall non-fatal burden. The unadjusted health loss from some combinations of comorbid causes might even be greater than 1 (that is, worse than death). A method is therefore required to correct for the comorbidity bias.

The ABDS 2018 did not attempt to compile data on the pattern of actual comorbidity within the population. Instead, it accounted for the comorbidity bias in the calculated YLD by adopting the 2 key assumptions used in burden of disease studies: the multiplicative independence model for prevalence of comorbidity, and the multiplicative model for health loss /disability weights associated with comorbidity. It then applied a modified deterministic approach, where all possible combinations of 4 or fewer conditions are taken from the disease sequelae list.

With this approach, the prevalence rate for a particular condition is a proxy for the probability of an individual having that particular condition. The probability of having just 1 condition is calculated by multiplying the probability of having the condition by the probabilities of not having any other condition(s). Similarly, the probability of having a particular combination is calculated by multiplying the probabilities of having each condition by the probabilities of not having any others.

Because of the multiplicative approach, the probabilities associated with each combination shrink rapidly toward zero (0) as the number of co-present sequelae rises. Capping the number of sequelae at 4 accounts for nearly all change in the associated disability weights. The impact of any change on the calculated YLD of the fifth co-present sequela is minimal as the comorbidity bias adjusted disability weight is stable to the fifth decimal point. Any change in the fifth decimal place will only impact the YLD calculated for prevalence estimates greater than 100,000 in a particular age–sex cohort.

The model calculates an adjusted disability weight using all possible combinations of 1 to 4 simultaneous conditions drawn from the 700 conditions. Box A1 shows the calculation of the adjusted disability weight for a condition using all combinations of 2 of 4 conditions as an example.

Box A1: Calculation of an adjusted disability weight

Consider the calculation of the adjusted disability weight for a condition using all combinations of 2 of 4 conditions. Each of the 4 conditions (A–D) has a prevalence rate and an associated disability weight, specified by the following parameters:

4 conditions:	*A*	*B*	*C*	*D*
4 disability weights:	$DW_{(A)}$	$DW_{(B)}$	$DW_{(C)}$	$DW_{(D)}$
4 prevalence rates:	Pr(*A*)	Pr(*B*)	Pr(*C*)	Pr(*D*)

Calculate the probability that a person will have a combination of 2 or fewer conditions, including condition *A*.

The probability of a person in the population having condition *A* is approximated by the prevalence rate of condition A denoted as Pr(*A*).

The probability of a person in the population having ***only*** condition *A* is the probability of having condition A multiplied by the probability of ***not*** having condition *B*, *C* or *D* and is shown by:

Prob(*A*) = Pr(*A*)*(1–Pr(*B*))*(1–Pr(*C*))*(1–(Pr(*D*)).

It follows that the probability of having *A* and *B* only is given by:

Prob(*AB*) = Pr(*A*)*Pr(*B*)*(1–Pr(*C*))*(1–(Pr(*D*))

and, similarly, the probability of having *A* and *C* only is given by:

Prob(*AC*) = Pr(*A*)*Pr(*C*)*(1–Pr(*B*))*(1–(Pr(*D*))

and the probability of having *A* and *D* only is given by:

Prob(*AD*) = Pr(*A*)*Pr(*D*)*(1–Pr(*B*))*(1–(Pr(*C*)).

Combine disability weights:

The disability weight associated with having condition *A* only is shown as $DW_{(A)}$. Using the multiplicative method of combining disability weights, the DW for *A* and *B* combined is:

$DW_{(AB)} = 1–[(1–DW_{(A)})(1–DW_{(B)})]$.

continued

Box A1 (continued): Calculation of an adjusted disability weight

The proportion of this combined disability weight that can be attributed to condition *A* is:

Prob(*A*)/(Prob(*A*)+Prob(*B*)).

Therefore, the disability weight associated with condition A from the population with both conditions (*A* and *B*) is given by:

$DW_{(AB\_A)}$ = Prob(A)/(Prob(A)+Prob(B))* $DW_{(AB)}$

and the disability weight associated with condition B from the population with both conditions (*A* and *B*) is given by:

$DW_{(AB\_B)}$ = Prob(B)/(Prob(A)+Prob(B))* $DW_{(AB)}$.

Adjust disability weight for condition *A*:

The comorbidity adjusted disability weight for condition *A* is a combination of the 4 adjusted disability weights derived from all the possible combinations (that is, $DW_{(A)}$, $DW_{(AB\_A)}$, $DW_{(AC\_A)}$, $DW_{(AD\_A)}$). The contribution of each disability weight is proportional, derived from the probability of each combination. The comorbidity adjusted disability weight for condition A ($adjDW_{(A)}$) is calculated using the following formula:

$adjDW_{(A)}$=[(Prob(A)* $DW_{(A)}$) + (Prob(AB)* $DW_{(AB\_A)}$) + (Prob(AC)* $DW_{(AC\_A)}$) + (Prob(*AD*)* $DW_{(AD\_A)}$)] / [Prob(*A*) + Prob(*AB*) + Prob(*AC*) + Prob(*AD*)]

3.4 Calculating YLD

YLD is calculated at the disease-sequela level (by age and sex) by multiplying the point prevalence of the disease sequela by its comorbidity adjusted disability weight.

Residual causes

Where the prevalence of the residual cause within a disease group cannot be ascertained from data or modelled directly, the YLD for the residual cause is calculated using the ratio of YLDs to YLLs estimated for other conditions in that disease group. This method was used to generate estimates for other cardiovascular, endocrine, gastrointestinal, infectious, congenital, respiratory, kidney and neurological diseases.

4 Total burden of disease

4.1 Calculating burden of disease measures

The DALY for each condition is calculated by summing the YLL and YLD for that condition.
The total burden of disease is calculated by summing DALY across all conditions.

5 Health-adjusted life expectancy

5.1 Overview of HALE methods

In this study, HALE is estimated using Sullivan's method (described by Jagger et al. 2014). This method requires age-specific proportions of time spent in different states of health (in this report, full heath and ill health) and age-specific mortality information from a life table.

To estimate HALE, Australian life table data were adjusted in proportion to the average health of the population in each age group.

YLD is a measure of the years of what could have been healthy life that were instead spent in states of ill health. They represent durations of time spent living with illness, weighted for the severity of the illness, reflecting an equivalent severity weighted duration of health loss. These amounts, summed for all causes of illness, adjusted for comorbidity and averaged for the population, represent the average YLD per person (that is, the average time, per person, lived with disability). Accordingly, the complement of the average time spent in ill health is the average time spent in full health.

Applying the average level of full health per person to the total person-years lived (from a life table) results in the total person-years lived in full health. Subsequent application of life table methods results in a corresponding adjusted life expectancy—the health-adjusted life expectancy, or HALE.

Sullivan's method is used by many countries for estimating HALE. More detail on HALE calculations are described in the methods report (AIHW 2021c).

HALE is used elsewhere as a standard measure of population health. The WHO estimates HALE for member countries with Sullivan's method using the Global Burden of Disease estimates of YLD rates for each country. The European Union also computes and monitors HALE for European Union countries on an annual basis. HALE has been used elsewhere in policy application: in the United Kingdom for monitoring the quality of life and social exclusion of older people and in Canada to compare health status across provinces (Steifel et al. 2010).

5.2 Example of a HALE calculation

HALE calculation using Sullivan's method requires life tables and a measure of the average health of the population. Life expectancy quantifies the mortality experience and the YLD rates quantify the average health. Average health is measured on a scale of 0 to 1 and is represented by the YLD rate per person, or average health per person.

Consider an age-specific YLD rate of 150 YLD per 1,000 population. Out of 1,000 potential person-years, the equivalent of 150 years (weighted for severity of the impact of the health conditions) were spent in less than full health. That is, on average, each person spent

0.150 years or 15% of the year in ill health. Conversely, on average, each person spent the equivalent of 85% of the year in full health. That is, the average health of the population in this age group is 0.85.

The life table for this population describes that, after accounting for mortality, this age group lives a total of 350,000 person-years that year. We know from the YLD rate for this age group there is, on average, full health for 85% of the time lived by the population in this age group.

Therefore 85% of these 350,000 person-years, or 297,500 person-years are lived in full health.

These calculations are applied to each sex and age group, and then life table methods are used to calculate an adjusted person-years lived in full health and the corresponding adjusted life expectancy. The adjusted life expectancy is that which is lived in full health, or HALE. Where life expectancy represents the (average) total years lived regardless of the health state, HALE is the equivalent (average) years of healthy life lived.

6 Risk factors

Quantification of the impact of risk factors assists in making evidence-based decisions about where to direct efforts to improve population health and prevent disease and injury. The comparative risk assessment method has become standard global practice in burden of disease risk factor analysis (Ezzati et al. 2004).

The basic steps to estimate risk factor attributable burden are:

1. Select risk factors
2. Select linked diseases for which there is convincing or probable evidence in the literature that the risk factor has a causal association with increased prevalence or mortality
3. Define the exposure to the risk factor that is not associated with increased risk of disease (the TMRED or the counterfactual)
4. Estimate the PAFs by either the direct method or the comparative risk assessment method
   (a) if PAFs appropriate to the disease and population in question are available from a comprehensive data source (such as a disease register), they are estimated directly from this data source (named a 'direct PAF' in this report) and do not require the following steps
   (b) if not, PAFs are created using the comparative risk assessment method, which involves steps 5, 6 and 7
5. Define the amount of increased risk (relative risk) of linked disease morbidity or mortality due to exposure to the risk factor
6. Estimate exposure to each risk factor in the population
7. Use these inputs to calculate the PAF.

This section describes the method used to quantify the impact of risk factors in the ABDS 2018.

6.1 Linked diseases

A linked disease is a condition in the disease list with a known risk factor for that condition. For example, high fasting blood plasma glucose is a risk factor for type 2 diabetes, ischaemic heart disease, stroke and chronic kidney disease. In this report, such associations are described as diseases or injuries being 'linked to' that risk factor. Thus, these diseases are linked to the risk factor high blood plasma glucose.

Convincing or probable evidence is used to identify linked diseases as defined according to criteria set by the World Cancer Research Fund (WCRF & AICR 2007). The criterion is broken down into 'convincing', 'probable', 'possible' and 'insufficient' evidence. Linked diseases are categorised as convincing or probable based on the robustness and volume of studies showing a relationship. The lists of risk factors, linked diseases and the size of the association (relative risk) changes between successive burden of disease studies as more research evidence becomes available. The risk factors selected for inclusion in the study are shown in Table 6.1.

For those risk factors selected for inclusion in this study, the ABDS 2018 adopted the available relevant linked diseases used in the GBD 2019 (GBD 2019 Risk Factors Collaborators 2020) and those identified by the AIHW from literature reviews undertaken for selected risk factors as part of extension projects (AIHW 2017b, 2017c, 2018b).

The linked diseases were spread across 16 disease groups. Some risk factors were linked to a single disease only, while others had many outcomes within these disease groups.

6.2 Theoretical minimum risk exposure distribution

The estimated contribution of a risk factor to disease burden is calculated by comparing the observed risk factor distribution with an alternative, hypothetical distribution (the counterfactual scenario). This scenario could be an increase or decrease in levels of exposure or changes in behaviour compared with what is currently observed in the population. In the ABDS 2018, as in previous burden of disease studies, a TMRED scenario was adopted. This involved determining the hypothetical exposure distribution that would lead to the lowest conceivable disease burden.

For some risk factors, the choice of the TMRED is obvious, as it involves no exposure to risk—for example, all people are lifelong non-smokers, or all people are highly active. However, for many risk factors, no exposure is not appropriate, either because it is physiologically impossible (for example, blood pressure or body mass index), or because there are lower limits beyond which exposure cannot feasibly be reduced (for example, air pollution). In these cases, epidemiological evidence is used to determine the optimal level of exposure, which reflects either the lowest level at which a dose–response relationship can be observed within a meta-analysis of cohort studies, or the lowest risk factor exposure distribution observed globally (GBD 2019 Risk Factors Collaborators 2020). The counterfactual then becomes a narrow distribution around the optimal level. For example, based on a meta-analysis of global studies, the counterfactual distribution for high body mass index is based on a population mean of a body mass index of 20–25 kg/m2 with a standard deviation of 1.

The TMRED may not be achievable, feasible or economically viable in the Australian population; for example, no unsafe sex.

Where the TMRED is a range, exposure to risk is not dichotomous (that is, at risk or not at risk). In this situation, the measure of attributable burden cannot be estimated by simply comparing each level of exposure in the population with the endpoints. Instead, to determine how much burden each exposure level contributes compared with the TMRED, the relative position in the range of the level of exposure is compared with its relative position in the range of the TMRED. The appropriate TMRED value for each category of exposure depends on the placement of their category within the risk factor exposure distribution of the population, starting at the lowest TMRED possible.

6.3 Direct population attributable fractions

For some risk–outcome pairs, direct evidence is used to calculate the PAFs. This is used:

- for linked diseases where there is evidence from high-quality data sources to attribute a disease outcome to a risk factor in Australia. It is important that the estimate captures all cases of the disease outcome in Australia. An example is the HIV register which collects data on the risk factor exposures that cause HIV (unsafe sex and/or drug use). The direct PAF is calculated as the proportion of the outcome caused by the risk factor
- when exposure to the risk factor is necessary to have the outcome—for example, all of the disease outcome 'alcohol use disorders' is attributable to the risk factor 'alcohol use'. In this case, the PAF is 1, where all of the disease outcome is attributed to the risk factor.

6.4 Population distribution of exposure

To estimate the PAF using comparative risk assessment, the population distribution of exposure needs to be estimated.

A clear and consistent definition of risk factor exposure is a key requirement for estimating the proportion of the population 'at risk.' For the ABDS 2018, the definitions of risk factor exposures have been adopted where possible from the GBD 2019 (GBD 2019 Risk Factors Collaborators 2020) and the AIHW's review of the literature (AIHW 2017b, 2017c, 2018b).

Estimates of distributions of risk factor exposure for the Australian population by age and sex have been based on a variety of data sources, including:

- ABS apparent consumption of alcohol data
- ABS Labour Force Survey
- Australian Health Survey 2011–12
- Census of Population and Housing
- Kirby Institute annual surveillance reports
- National Drug Strategy Household Survey 2019
- National Health Survey 2017–18
- National HIV Register
- National Homicide Monitoring Program
- National Hospital Morbidity Database
- National Mortality Database
- National Perinatal Data Collection
- Personal Safety Survey 2016
- Safe Work Australia
- satellite modelled data calibrated to ground-based air monitoring stations
- epidemiological studies.

For the ABDS 2018 study, empirical survey data were used where possible to determine the exposure to risk factors. The proportion of the population exposed to each risk factor was estimated according to the finest exposure increments supported by the data source.

Where data were extracted directly from a survey (for example, the Australian Health Survey 2017–18), sex, age and exposure categories were extracted at the finest possible level of granularity within an exposure distribution. Where necessary, categories were aggregated into larger cells to conform with requirements for the clearance of minimum cell sizes.

6.5 Estimates of effect size (relative risks)

Comparative risk assessment estimates use relative risks to measure the strength of causal association between risk factors and the linked disease outcomes. The ABDS 2018 has adopted relative risks released by the GBD 2019 or the AIHW's review of the literature (AIHW 2017b, 2017c, 2018b; GBD 2019 Risk Factors Collaborators 2020). The GBD relative risks used were deemed appropriate to be used globally, in different countries and for different ethnicities.

Effect sizes used were adjusted for confounders ('parallel' risk factors) but not for factors that occur successively along the causal pathway. For example, relative risk of coronary heart disease due to physical inactivity was not adjusted for high blood plasma glucose as these risk factors occur along the same causal pathway. This means that their effects cannot be added together, as discussed in Chapter 6.

Where categories of relative risk did not correspond to an equivalent exposure category, the relevant relative risk to apply was determined as the relative risk for the median survey response of that category. When the exposure category included an open-ended range, the median in this range was also used. For example, for the proportion of the population whose low-density lipoprotein (LDL) cholesterol was over 5.1 mmol/L, the relative risk for the median, which was 5.3 mmol/L in this example, was applied.

6.6 Calculation of population attributable fractions

PAFs determine the proportion of a particular disease that could have potentially been avoided if the population had never been exposed to a risk factor (or, rather, had been exposed to TMRED levels). PAFs were calculated for each linked disease by year, sex and age group.

The calculation of PAFs using the comparative risk assessment method requires the input of the relative risk (*RR*) and prevalence of exposure in the population (*P*):

$$PAF = \frac{P(RR - 1)}{P(RR - 1) + 1} \times 100$$

When the risk factor has multiple categories of relative risks and exposure levels, the following formula is used:

$$PAF = \frac{\sum_c P_c\,(RR_c - 1)}{\sum_c P_c\,(RR_c - 1) + 1} \times 100$$

where:

$\sum_c$	is the sum over all categories
c	is an index for category
P	is prevalence
RR	is relative risk.

For selected risk factors, the PAF calculation formula was changed based on GBD 2019. The following formula allows the relative risks to be protective and therefore less than 1:

$$PAF = \frac{\sum_c RR_c P_c - RR_{TMRED}}{\sum_c RR_c P_c} \times 100$$

where:

∑c	is the sum over all categories
c	is an index for category
P	is prevalence
RR	is relative risk.

6.7 Combined risk factor analysis

To combine risk factors, the following formula was used:

$$PAF_i = 1 - \prod_r (1 - PAF_{ir})$$

where:

PAF_i	is the population attributable fraction of burden attributable to a particular disease from those risk factors being combined, such as all risk factors or all dietary risk factors
i	is the linked disease
r	is the individual risk factor for a linked disease being combined
PAF_{ir}	is the population attributable fraction for risk factor *r* for linked disease *i*
Π	is the product over all risk factors *r*.

This formula, which has been used in several other studies, has the desirable property of placing a cap on the estimated combined attributable burden and therefore avoids the possibility of exceeding 100% of the total burden of disease.

However, the formula assumes that risk factors are 'independent'; that is, it does not take into account risk factors that are on the same causal pathway. To account for risk factors on the same causal pathway, attenuation factors were used to attenuate the PAF of the risk factor second to the other factor in the same causal pathway. The attenuation factors were sourced from GBD 2019 (GBD 2019 Risk Factors Collaborators 2020).

7 Overarching methods/choices

7.1 Reference year

The reference year for the estimates is 2018. This was the latest year of data available at the time of analysis for the majority of data sources used to produce burden of disease estimates.

Estimates for the reference years 2015, 2011 and 2003 were also calculated, to supersede burden of disease estimates from previous burden of disease studies, and to allow for comparisons over time.

Where data were not available for the reference year from a particular data source, techniques were used to adjust the counts or rates to the reference year. The first step was to examine historical data over a number of years (if available) to determine if prevalence rates had changed over time. If so, regression techniques were used to model the data point to the reference year. Where this was not possible, or where an examination of historical data suggested that prevalence rates had been stable over the intervening period, prevalence rates from earlier studies were applied to the population in that reference year to derive estimates. The newly derived estimates thus account for population growth and ageing only.

7.2 Age groups

Analysis of age groups

Preparation of input data was undertaken using as fine a disaggregation as the data supported. Analysis of YLL estimates was undertaken using single-year age groups, while YLD analysis was undertaken using 5-year age groups to 100+. DALY estimates were prepared using 5-year age groups to 100+ years.

Where data could not be obtained directly by single year or by the 5-year age groups as required for analysis, modelling was used to derive the required age groups.

Due to small populations in some jurisdictions and remoteness areas, sub-national estimates were prepared using 5-year age groups to age 85+.

Reporting of age groups

Age groups suitable for reporting are different for different aspects of the study. Generally, national estimates for each year have been reported using the analysis age groups, or grouped for issues of practicality (such as describing burden by life stage). While numbers and rates are reported for older age groups (that is, age groups over 85), it should be noted that these are based on much smaller populations and hence are subject to greater variability.

7.3 Sub-national analyses

Analysis for state and territory, remoteness and socioeconomic group was carried out by geographical areas. Where the data source included the geographical information based on the Australian Statistical Geography Standard 2011 (ABS 2013a), estimates were derived using ABS correspondence based on geographic location. Where geographical information was not available, ratios based on associated data sources for that reference year were used to disaggregate national data.

7.4 Reference populations

All Australian population-based rates for 2018 and 2015 were calculated using populations rebased to the 2016 Census (released 27 June 2017) (ABS 2017a). Population-based rates for 2011 were calculated using final population estimates from the 2011 Census (released 15 December 2016) (ABS 2016).

The Australian 2001 standard population (published 15 December 2016) was used for all age-standardisation, as per AIHW and ABS standards (ABS 2016).

Table A1: Disease and injury list

Infectious diseases	Infectious diseases (continued)	Cancer & other neoplasms (continued)
Barmah Forest virus	Upper respiratory infections	Lip & oral cavity cancer
Campylobacteriosis	Urinary tract infections	Liver cancer
Chickenpox (varicella)	**Infant & congenital conditions**	Lung cancer
Chlamydia	Birth trauma & asphyxia	Melanoma of the skin
Dengue	Brain malformations	Mesothelioma
Diphtheria	Cardiovascular defects	Myeloma
Gonorrhoea	Cerebral palsy	Nasopharyngeal cancer
HIV/AIDS	Cleft lip and/or palate	Non-Hodgkin lymphoma
Haemophilus influenzae type-b	Down syndrome	Non-melanoma skin cancer
Hepatitis A	Gastrointestinal malformations	Oesophageal cancer
Hepatitis B (acute)	Neonatal infections	Other benign, in situ & uncertain neoplasms
Hepatitis C (acute)	Neural tube defects	Other leukaemias
Influenza	Other chromosomal abnormalities	Other lymphohaematopoietic (blood) cancers
Lower respiratory infections	Other congenital conditions	Other malignant neoplasms (cancers)
Malaria	Other disorders of infancy	Other oral cavity & pharynx cancers
Measles	Pre-term birth & low birthweight complications	Ovarian cancer
Meningococcal disease	Sudden infant death syndrome (SIDS)	Pancreatic cancer
Mumps	Urogenital malformations	Prostate cancer
Other gastrointestinal infections	**Cancer & other neoplasms**	Stomach cancer
Other infections	Acute lymphoblastic leukaemia (ALL)	Testicular cancer
Other meningitis & encephalitis	Acute myeloid leukaemia (AML)	Thyroid cancer
Other sexually transmitted infections	Benign & uncertain brain tumours	Unknown primary
Otitis media	Bladder cancer	Uterine cancer
Pertussis	Bowel cancer	**Cardiovascular diseases**
Pneumococcal disease	Brain & central nervous system cancer	Aortic aneurysm
Ross River virus	Breast cancer	Atrial fibrillation & flutter
Rotavirus	Cervical cancer	Cardiomyopathy
Rubella	Chronic lymphocytic leukaemia (CLL)	Coronary heart disease
Salmonellosis	Chronic myeloid leukaemia (CML)	Hypertensive heart disease
Shingles (herpes-zoster)	Ductal carcinoma in situ (breast)	Inflammatory heart disease
Syphilis	Gallbladder cancer	Non-rheumatic valvular disease
Tetanus	Hodgkin lymphoma	Other cardiovascular diseases
Trachoma	Kidney cancer	Peripheral vascular disease
Tuberculosis	Laryngeal cancer	Rheumatic heart disease (including acute rheumatic fever)

continued

Table A1 (continued): Disease and injury list

Cardiovascular diseases (continued)	Mental health conditions & substance use disorders	Reproductive & maternal conditions (continued)
Stroke	Alcohol use disorders	Other reproductive conditions
Respiratory diseases	Anxiety disorders	Polycystic ovarian syndrome
Asbestosis	Attention deficit hyperactivity disorder	Uterine fibroids
Asthma	Autism spectrum disorders	**Musculoskeletal conditions**
Chronic obstructive pulmonary disease (COPD)	Bipolar affective disorder	Back pain & problems
Interstitial lung disease	Conduct disorder	Gout
Other pneumoconiosis	Depressive disorders	Osteoarthritis
Other respiratory diseases	Drug use disorders (excluding alcohol)	Other musculoskeletal
Sarcoidosis	Eating disorders	Rheumatoid arthritis
Silicosis	Intellectual disability	**Hearing & vision disorders**
Upper respiratory conditions	Other mental & substance use disorders	Age-related macular degeneration
Gastrointestinal disorders	Schizophrenia	Cataract & other lens disorders
Abdominal wall hernia	**Endocrine disorders**	Glaucoma
Appendicitis	Gestational diabetes	Hearing loss
Chronic liver disease	Other diabetes mellitus	Other hearing & vestibular disorders
Diverticulitis	Other endocrine disorders	Other vision disorders
Functional gastrointestinal disorders (FGID)	Type 1 diabetes mellitus	Refractive errors
Gallbladder & bile duct disease	Type 2 diabetes mellitus	**Skin disorders**
Gastro oesophageal reflux disease (GORD)	**Kidney & urinary diseases**	Acne
Gastroduodenal disorders	Chronic kidney disease	Dermatitis & eczema
Inflammatory bowel disease (IBD)	Enlarged prostate	Other skin disorders
Intestinal obstruction (without hernia)	Interstitial nephritis	Psoriasis
Other gastrointestinal diseases	Kidney stones	Scabies
Pancreatitis	Other kidney & urinary diseases	Skin infections (including cellulitis)
Vascular disorders of intestine	**Reproductive & maternal conditions**	Ulcers
Neurological conditions	Early pregnancy loss	**Oral disorders**
Dementia	Endometriosis	Dental caries
Epilepsy	Genital prolapse	Other oral disorders
Guillain-Barré syndrome	Hypertensive disorders of pregnancy	Periodontal disease
Migraine	Infertility	Severe tooth loss
Motor neurone disease	Maternal haemorrhage	**Blood & metabolic disorders**
Multiple sclerosis	Maternal infections	Cystic fibrosis
Other neurological conditions	Obstructed labour	Haemolytic anaemias
Parkinson disease	Other maternal conditions	Haemophilia

continued

Table A1 (continued): Disease and injury list

Blood & metabolic disorders (continued)	Nature of injury
Iron-deficiency anaemia	Burn injuries
Other blood & metabolic disorders	Dislocations
Protein-energy deficiency	Drowning & submersion injuries
External causes of Injury	Hip fracture
All other external causes of injury	Humerus fracture
Drowning	Internal & crush injury
Falls	Other fractures
Fire, burns & scalds	Other injuries
Homicide & violence	Poisoning
Other land transport injuries	Soft tissue injuries
Other unintentional injuries	Spinal cord injury
Poisoning	Tibia & ankle fracture
Road traffic injuries – motor vehicle occupants	Traumatic brain injury
Road traffic injuries – motorcyclists	
Road traffic injuries – pedal cyclists	
Road traffic injuries – pedestrians	
Suicide & self-inflicted injuries	

Table A2: Standard life table: remaining ideal life expectancy (years), by age for all people

Age	Life expectancy	Age	Life expectancy	Age	Life expectancy	Age	Life expectancy
0	86.02	27	59.43	54	33.32	81	10.32
1	85.21	28	58.44	55	32.38	82	9.65
2	84.22	29	57.45	56	31.47	83	8.98
3	83.23	30	56.46	57	30.55	84	8.31
4	82.24	31	55.48	58	29.64	85	7.64
5	81.25	32	54.49	59	28.73	86	7.12
6	80.25	33	53.50	60	27.81	87	6.61
7	79.26	34	52.52	61	26.91	88	6.09
8	78.26	35	51.53	62	26.00	89	5.57
9	77.27	36	50.56	63	25.10	90	5.05
10	76.27	37	49.58	64	24.20	91	4.70
11	75.28	38	48.60	65	23.29	92	4.35
12	74.28	39	47.62	66	22.42	93	4.00
13	73.29	40	46.64	67	21.55	94	3.66
14	72.29	41	45.67	68	20.68	95	3.31
15	71.29	42	44.71	69	19.80	96	3.09
16	70.30	43	43.74	70	18.93	97	2.88
17	69.32	44	42.77	71	18.10	98	2.66
18	68.33	45	41.80	72	17.28	99	2.44
19	67.34	46	40.85	73	16.45	100	2.23
20	66.35	47	39.90	74	15.62	101	2.11
21	65.36	48	38.95	75	14.80	102	1.99
22	64.37	49	38.00	76	14.04	103	1.87
23	63.38	50	37.05	77	13.27	104	1.75
24	62.39	51	36.12	78	12.51	105	1.63
25	61.40	52	35.19	79	11.75		
26	60.41	53	34.25	80	10.99		

Source: Murray, Ezzati et al. 2012.

Table A3: ICD-10 codes used to identify deaths for redistribution

	ICD-10 code
Redistribution	A40 (excluding A403), A41, A480, A483, B19, B942, C26, C76–C80, E853–E859, E86–E87, F99, G81–G83, H001, H01–H59, H602–H609, H61–H62, H67, H71–H95, I10, I13, I15, I46, I490, I50, I709, J69, J96, K65–K66, K712, K92, L04, L21–L25, L27–L30, L41–L45, L52–L53, L55–L60, L63–L68, L70–L75, L80–L85, L87, L90–L92, L94, L980–L981, L988–L989, N17, N19, N51, N60–N61, N70–N73, N748, N84–N90, O94, Q10–Q18, Q381, Q54, Q65–Q74, Q82–Q84, Q899, Q999, R00–R94, R96–R99, X59, Y10–Y34, Y872, Y899, Y90–Y98

Table A4: Redistribution method for 2018 redistribution causes

Redistribution method	%
Direct evidence	37.5
Mix of direct evidence and indirect MCOD	29.3
Indirect MCOD	20.9
Proportional	12.3
Total	**100.0**

Appendix B: How reliable are the estimates?

All estimates within the ABDS 2018 were produced using the best possible data that were available within the scope and time frame of the study.

A number of actions were undertaken to ensure the accuracy and relevance of the estimates in the ABDS:

- All standard inputs (such as the standard life table, disability weights and relative risks) were reviewed and assessed as appropriate by the study's Expert Advisory Group for relevance and applicability in the Australian context.
- All data used in the ABDS had to meet strict inclusion criteria via protocols endorsed by the study's Expert Advisory Group.
- All models and inputs used in YLL and YLD estimates were reviewed by disease-specific experts and other experts to ensure their appropriateness for Australia. For YLD estimates, models reviewed as part of the ABDS 2015 were used, and where new diseases or models were developed in the ABDS 2018 these were reviewed by disease specific experts. Methods for particular risk factors were also reviewed by experts.
- The quality index used in ABDS 2018 was used to interpret the reliability of estimates within this framework.

ABDS 2018 quality index

Uncertainty (or confidence) intervals—used to describe the reliability of estimates in some burden of disease studies—have not been produced for this study, largely due to the variety of sources of error: in data sources, in conceptual models and in assumptions underpinning the estimates. Confidence intervals are not straightforward to quantify and this was not within the scope of this project.

Instead of uncertainty intervals, guidance is provided to help users understand the quality and limitations of the estimates, especially which patterns and differences are most plausible and those which may reflect errors or uncertainties in the data or methods. This guidance is provided using a 2-dimensional *quality index* based on:

1. The relevance and quality of the source data
2. The methods used to transform that data into a form required for this analysis.

The quality index operates at the disease or risk factor level, and is applied to the YLD, YLL, DALY and attributable burden for the 2018 national estimates. The index is built from the lowest level of estimate using these 2 dimensions, weighted for the contribution to the overall disease level estimate or risk factor level estimate.

Generally, the higher the index, the more relevant and accurate the estimate. The ratings are interpreted as follows:

- A–B: highly relevant/accurate—estimate is derived from comprehensive and highly relevant data / little data transformation was required. The estimates can be considered to be highly indicative of the health loss incurred from these diseases or risk factors.

- C–D: moderately relevant/accurate—estimate is derived from reasonably comprehensive and relevant data / moderate transformations required, taking into account known trends in the underlying data (such as over time or age-distributions). These estimates can be considered to be moderately indicative of the health loss experienced in Australia in 2018 due to these conditions or risk factors.
- E: questionable relevance/accuracy—estimate is derived from less comprehensive or relevant data / moderate transformations required with trends unknown or unaccounted for. These estimates are to be considered as possibly indicative of the health loss in Australia in 2018 and should be used with some caution.

More detailed information on the ABDS Quality Index, and the criteria and methods used, are provided in the *Australian Burden of Disease Study 2018: methods and supplementary material* (AIHW 2021c).

Fatal burden estimates

Using the ABDS Quality Index, all mortality data, and hence all YLL estimates, are considered relevant and accurate and highly indicative of the years of life lost due to these diseases. One exception to this is fatal injury burden by nature of injury, as injury-related deaths are classified by the external cause; subsequent mapping is required to estimate fatal burden by nature of injury.

Fatal estimates account for around 48% of total DALY.

Non-fatal burden estimates

YLD estimates, which also account for around 52% of total DALY, vary in quality as there is no single comprehensive and reliable source of data on the incidence, prevalence, severity and duration of all non-fatal health conditions. The currency, generalisability and specificity of the data also varied, depending on the source.

YLD estimates for most of the major specific causes are considered relevant and accurate.

Relevance and quality of data sources

Nearly two-thirds (62%) of diseases (accounting for 54% of YLD) predominantly derived YLD from diagnostically confirmed disease registers, administrative data or national surveys that were either fully enumerated (or with known gaps in coverage), current and specific to both the disease (or sequela) in question and the population. This includes most cancer, cardiovascular, musculoskeletal, injuries, gastrointestinal and blood & metabolic estimates, as well as estimates for a large number of infections and kidney & urinary diseases.

A further 23% of diseases (accounting for 33% of YLD) predominantly derived YLD either from:

- diagnostically confirmed disease registers, administrative data or national surveys of medium currency/coverage and/or specificity to both the disease (or sequela) in question and the population
- systematic and generalisable meta-analyses of Australian data
- small-area Australian (or generalisable international) studies with good sampling.

The diseases that predominantly derived YLD by these means include type 2 diabetes and dementia, and many mental health conditions & substance use disorders, reproductive & maternal conditions, infant & congenital diseases and most of the remaining infectious diseases.

Only 1.0% of diseases (1.5% total YLD) were predominantly derived from data that were of questionable quality. This included small Australian studies more than 5 years old, or international studies of questionable generalisability to the Australian context; or indirectly from secondary data sources. Diseases meeting these criteria include dermatitis & eczema and benign & uncertain brain tumours.

Methods of transformation to overcome data shortcomings

Around 44% of the diseases estimated (accounting for 40% of YLD) could be derived with no transformation required or using known trends (for example, over time). A further 38% (accounting for 35% of YLD) needed to be derived from data where trends were unknown. A small proportion (15% of diseases, accounting for 24% of YLD) relied on deriving prevalence based on other epidemiological measures, or indirect methods from other (related) data sources. Only 3% of diseases (1.1% of YLD) relied on indirect modelling methods or inferences of distributions from other (unrelated) data sources or expert advice (Table B1).

Table B1: Rating of data relevance, quality and transformation methods for YLD estimates

	Data relevance and quality		Method of transformation	
Rating	% of diseases	% of YLD	% of diseases	% of YLD
A	18.3	3.2	15.7	26.3
B	43.7	50.9	27.9	13.3
C	23.4	32.9	38.1	35.3
D	13.7	11.5	15.2	24.0
E	1.0	1.5	3.0	1.1

Note: The proportions may not add up to 100% due to rounding.

Risk factor estimates

It is possible to assess only the quality of data used to estimate exposure to the risk factors in Australia. The other inputs for this work, such as the relative risk data and the TMREDs, were adopted from the GBD 2019 and the AIHW's review of the literature, which independently and systematically reviewed and calculated appropriate relative risks and TMREDs.

Where the linked diseases were 100% attributable (such as alcohol use disorders attributable to alcohol use) or the exposure to the risk factor was estimated by the prevalence of a cause in the ABDS 2018 study, the quality of the causes was used to estimate the quality of exposure to the risk factor. Quality was assessed for each data source for exposure and weighted by the amount of attributable burden to give a score for each risk factor.

Risk factor exposure is estimated using robust national measured survey data for 70% of risk factors—this accounts for 84% of the attributable DALY. This is lower than in the ABDS 2015 because it was assessed at the data source level, and more consideration has been given to the specificity of self-report data to report the actual exposure to the risk factor.

For 50% of risk factors (accounting for 74% of attributable DALY), exposure was able to be derived with no transformation required or using known trends (Table B2). It was not possible to estimate a quality score for the methods for high sun exposure and child abuse & neglect where the PAFs were applied to this study directly from the source.

It is important to note that the quality of the attributable DALY for each risk factor depends on the quality of the estimate of the linked diseases, and the proportion attributable to YLL or YLD.

Table B2: Rating of data relevance, quality and transformation methods for risk factor estimates

	Data relevance and quality		Method of transformation	
Rating	% of risk factors	% of DALY	% of risk factors	% of DALY
A	20.0	29.4	10.0	23.8
B	50.0	54.8	40.0	49.9
C	20.0	12.8	35.0	19.0
D	5.0	2.3	5.0	2.3
E	5.0	0.8	0.0	0.0
. . [(a)]	0.0	0.0	10.0	5.0

(a) It was not applicable to estimate the quality of the method for the risk factors high sun exposure and child abuse & neglect as they were sourced directly from published studies.

Note: The proportions may not add up to 100% due to rounding.

Older age groups

Care should also be taken when comparing disease level information in age groups over 85 years. Data for this population is often limited, leading to greater variability.

Appendix C: Understanding and using burden of disease estimates

This appendix provides guidance on using and interpreting estimates published in this report.

Different types of estimates presented in this report

There are a number of different estimates produced by a burden of disease study, which are useful for different purposes.

- DALY, YLD and YLL estimates provide a measure of the health impact from disease and injury and describe the overall disease burden in the population being analysed. They are useful for summarising the health of that population at a point in time, and for assessing health-care needs and planning health services.
- Crude rates of DALY, YLL and YLD provide a measure of disease burden against the size of the population, but without taking any other features of the population into account. These are useful for measuring the *relative* impact in 1 age group compared with another by describing the amount of disease burden relative to the size of the age group. They are also useful for assessing health-care needs and planning health services.
- The ASR of DALY, YLL and YLD also provide a measure of the disease burden against the size of the population but take into account the age structure of the population. ASRs have little use in service provision planning but are useful for comparing the impact of various diseases between 2 populations with different age structures (for example, males and females) or between 2 different time points (for example, 2003 and 2018).

As with many other statistics, it is comparisons (between diseases, across population groups, across time), rather than single estimates, that are the most useful. Comparisons are often done using rate ratios and rate differences. A rate ratio shows how many times the rate of burden is relative to another, while a rate difference shows the difference between 1 rate and another. For example, when analysing age-standardised DALY rates of males compared with females, a rate ratio of 1.0 indicates that the burden in males and females is the same; a rate higher than 1.0, that the burden is higher among males; and a rate lower than 1.0, that the burden is lower among males. For example, a rate ratio of 1.6 means that the age standardised DALY rate for males is 1.6 times or 60% higher than that for females.

Both rate ratios and rate differences are useful and have complementary value.

Levels of reporting and alternative reporting categories

Estimates in this study are calculated for individual conditions (for example, lung cancer, anxiety, chronic kidney disease, epilepsy, hip fracture). For some aspects of reporting, conditions that have a similar aetiology, outcomes or treatment are grouped together—generally according to ICD-10 classifications—into 17 *disease groups*. For ease of recognition in this publication, each disease group has been allocated a colour—these are used consistently throughout each overview chapter to identify a disease grouping.

Diseases are grouped in this study to reflect the Australian health context (that is, to meet health reporting and monitoring needs) while also informing policy setting, health planning and research. These groupings may not suit all users. Alternative groupings of individual diseases are possible—these are not included in this report but can be the subject of future analyses.

It is important to be aware that some disease groups—such as injuries, infectious diseases and cancer & other neoplasms—are made up of a large number of separate diseases or injuries, while others—such as endocrine and oral disorders—include only a few specific conditions. Ranking by disease group and ranking by individual conditions may present different stories. For example, cancer is the disease group causing the most burden, but coronary heart disease (within the cardiovascular disease group) is the specific disease causing the most burden. This reflects the level of reporting and the choice as to how the disease group level is constructed. It is important to use the level of reporting that is most suited to a specific purpose.

In this report, YLL, YLD and DALY estimates are presented at 3 levels, each having a different purpose and audience:

1. **Overall burden:** for presenting a picture of the overall health of the population at a given point in time, including age and sex differences, regardless of the disease.
2. **Disease group level:** for understanding the broad patterns in the types of diseases causing health loss in the population. The collective impact of diseases of broadly similar cause assists in identifying large interrelated areas of health loss that might otherwise go unquantified (especially for the rarer and less prevalent diseases—such as blood & metabolic disorders). This is important for broad policy and research setting as well as for advocacy. There are 17 disease groups in the ABDS 2018.
3. **Disease level:** for a more detailed picture of the diseases and injuries that give rise to burden. These represent individual diseases (such as appendicitis, Parkinson disease), or finer aggregations of related diseases (such as gastrointestinal infections—which include salmonella and campylobacter—or dementia—which includes Alzheimer disease, as well as other dementias). Diseases at this level have been chosen to be as policy-relevant as possible, subject to the constraints of data availability. Disease-level estimates are useful for detailed policy setting and research. Burden was estimated for 219 diseases.

Comparing life lost in burden of disease studies with other measures of premature mortality

Different measures are used to highlight the impact of dying prematurely; however, the notion of 'premature' in relation to mortality can be arbitrary. Two of the most commonly used summary measures to describe premature mortality are YLL (as used in burden of disease studies) and potential YLL.

YLL in burden of disease studies assume a potential number of remaining years according to a *life table* (see Appendix Table A2). A life table specifies, for each age, a number of years that, on average, a person could potentially live—the life expectancy. For example, the standard life table from the Global Burden of Disease 2010 and 2013 studies (as used in this study) specifies that a person aged under 1 could potentially live 86.0 more years; a person aged 65, 23.3 more years; and a person aged 100, 2.2 more years. YLL is calculated by summing the number of deaths at each age multiplied by the remaining life expectancy for that age. In this measure, all deaths in a population are counted and accrue some lost years of life.

Potential years of life lost (PYLL), a simpler measure, specifies an *arbitrary age cut-off* to identify early deaths; that is, deaths occurring before the specified age are considered premature. For example, an AIHW report describes PYLLfor deaths occurring before age 75 (AIHW 2015). Using this parameter, death of an infant (aged under 1) loses 75 years of life; death of a person aged 65, 10 years. The death of a person aged over 75 would not be counted in this measure.

Both summary measures provide a means of assessing premature death. YLL, based on all deaths in a population, describes early death according to the life expectancy at each age of death. It uses the same metric as the YLD—a count of the number of years lost. In burden of disease studies, this enables combining measures of fatal and non-fatal effects into a summary measure of health, the DALY. PYLL, on the other hand, considers deaths only within a population younger than the specified age cut-off. In contrast to YLL, it tends to more strongly reflect the magnitude and causes of death that typically affect the younger population.

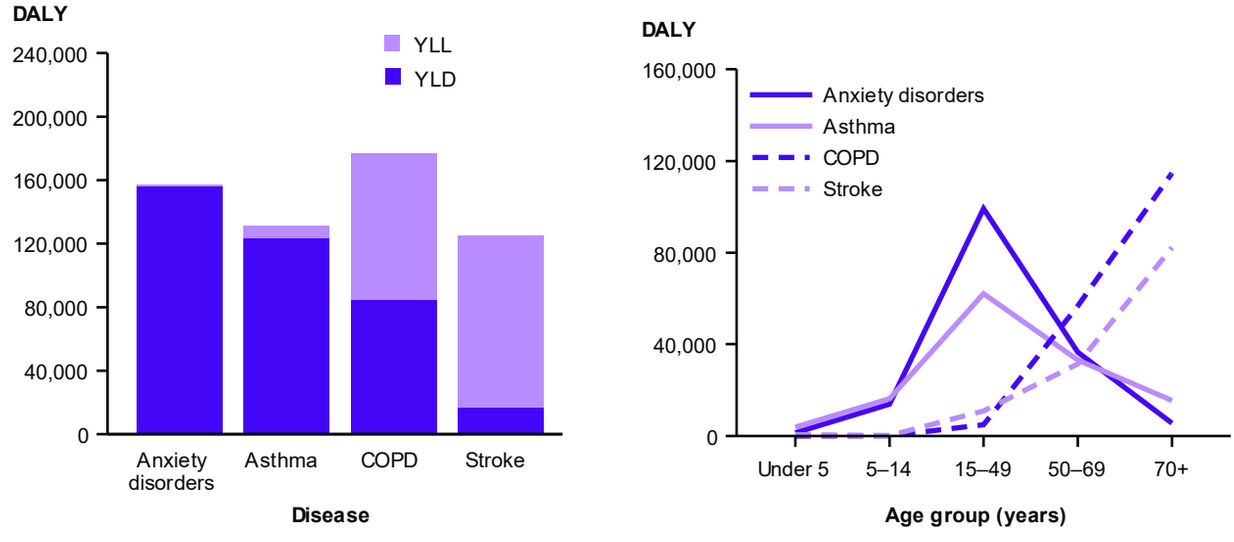
Interpreting estimates

There are many factors that should be taken into account when interpreting or comparing burden of disease estimates. Box C1 lists some general rules.

Interpreting and comparing DALY estimates

When interpreting DALY estimates, it is often useful to look at the relative contribution of each condition to the overall health loss, or the relative contributions of fatal and non-fatal health loss for a given condition, to gain a picture of a population's health. As a DALY is made up of YLL and YLD, diseases can have very similar DALY estimates, but tell very different stories about the relative contribution of YLL and YLD. For example, asthma, COPD, anxiety disorders and stroke could all have a similar number of DALY—but the contribution of fatal and non-fatal burden be quite different, as are the ages at which these diseases affect people (see Figure C1).

Figure C1: Example of different DALY stories



Interpreting and comparing risk factor estimates

Risk factor analysis allows us to estimate how much the disease burden could be reduced if exposure to the risk factor were at or below the theoretical minimum level. Exposure to harmful levels of a risk factor can contribute to deaths and/or ill health resulting from 1 or more diseases. The estimates are presented in the following forms:

- the number of DALY that can be attributed to exposure to each risk factor. This 'attributable burden' is useful for gauging the contribution of each risk factor
- the proportion of disease DALY, disease group DALY or total DALY that can be attributed to the risk factor. This is a useful way of relating the contribution of each risk factor to the burden of the linked diseases, disease groups or to the total burden
- the age-specific rate of DALY attributable to a risk factor. Such a rate is used to compare the relative contribution of the risk in 1 age group with that of another, by depicting the amount of health loss relative to the size of each age group
- the ASR attributable to a risk factor. Such a rate also provides a relative measure of the health loss against the size of the population but takes into account the age structure of the population. This allows comparison of estimates between 2003, 2011, 2015 and 2018.

Exposure to some risk factors is known to cause both ill health and death while exposure to other risk factors may be associated only with ill health or death. This affects the patterns of attributable YLL and YLD across the risk factors and linked diseases.

DALY attributable to a risk factor may also vary by age and sex. These variations may be caused by age and sex differences in:

- amounts of exposure to the risk factor
- the degree of increased risk of the linked disease due to exposure to the risk factor (relative risk)
- patterns of DALY, YLL and YLD for the linked diseases.

Estimates of attributable burden for the different risk factors cannot be simply added together without further analysis, due to complex pathways and interactions between them. This analysis has been undertaken for all risk factors included in this report combined, and it underpins, for example, estimates of combined burden attributable to disease groups.

Interpreting rankings

Rankings are often used to tell the story of which disease or injury causes the biggest burden. However, rankings do not provide the reader with context of the size of each estimate, nor of the difference between adjacent estimates. For example, rankings may give the impression that a disease or injury has increased, but the ASRs can show the opposite. It is important to look at the trend in the ASR to determine how a disease has changed over time as the rankings largely reflect the movement of other diseases and injuries.

Further, the rankings in this report are specific to the level of reporting, as reporting rankings at different levels can be misperceived. For example, as a group, cancer ranks ahead of cardiovascular conditions for both men and women. This is because the cancer group is made up of many different cancer types, some of which have a very high burden. At the individual disease level, however, both coronary heart disease and stroke (part of the cardiovascular disease group) rank ahead of breast cancer and lung cancer in women, and coronary heart disease ranks ahead of lung cancer in men. Therefore, rankings should be interpreted with care.

Groups of residual conditions (e.g. other infections) have been excluded from rankings in most of the ABDS tables and tilemaps. This is because these categories are often made up of several causes and, as a group, are difficult to interpret. Table C1 lists those excluded from rankings in the main ABDS 2018 outputs.

Alternative versions of some tilemaps that include the other residual causes are presented in Appendix D. In addition, the supplementary tables to the online data visualisations include the residual causes.

Table C1: Residual causes excluded from rankings

Cause name
Other infections
Other disorders of infancy
Other chromosomal abnormalities
Other congenital conditions
Other benign, in situ and uncertain neoplasms
Other cardiovascular diseases
Other respiratory disease
Other gastrointestinal diseases
Other neurological conditions
Other mental and substance use disorders
Other endocrine disorders
Other kidney and urinary diseases
Other maternal conditions
Other reproductive conditions
Other musculoskeletal conditions
Other hearing and vestibular disorders
Other skin disorders
Other oral disorders
Other blood and metabolic disorders
All other external causes of injury
Other injuries

Comparing with estimates from other studies

As a general rule, due to the large variety of data sources, possible disease models, assumptions and concepts of 'ideal health', the DALY, YLL and YLD estimates from different studies should not be compared.

For comparing the Australian burden with the burden of other countries, the AIHW recommends using the Australian estimates reported in either the most recent GBD (e.g. GBD 2019 Diseases and Injuries Collaborators 2020) or the Global Health Estimates produced by the WHO (e.g. WHO 2020a).

Which estimate is 'right'?—interpreting multiple results

There are a number of current burden of disease estimates for Australia. As DALY are the final output of a complex set of models and assumptions, there is no 'right' answer. Global studies are designed to enable comparisons across countries and need to account for a large variation in the data availability and quality across countries. Country-based studies (such as the ABDS) are more likely to be designed to meet local needs and use detailed local data. When faced with more than 1 set of estimates, it is important to understand the data sources and assumptions behind the estimates and use the set that most closely matches its purpose and user needs.

Box C1: Dos and don'ts of using burden of disease estimates in this study

Do

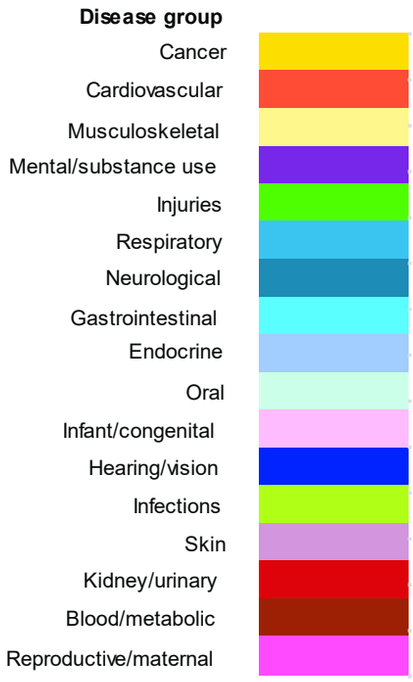
- Use estimates to compare health loss between different diseases, groups of diseases, risk factors or population groups in this study.
- Look beyond the ranking to understand the level of impact of a disease.
- Look beyond the DALY estimate to YLL and YLD to understand the estimate better.
- Be careful comparing groups of diseases with individual diseases.
- Make sure you understand what is being measured and the assumptions that have been used.

Don't

- Compare YLL, YLD, DALY estimates from different burden of disease studies.
- Add together the unadjusted attributable YLL, YLD and DALY estimates across risk factors.
- Compare measures of *mortality* in this study with measures reported elsewhere, as burden of disease methods and grouping of causes are different from those used in other studies.

Appendix D: Additional tables and figures

Box D1: ABDS 2018 disease group colours



Box D2: ABDS 2018 risk factor colours

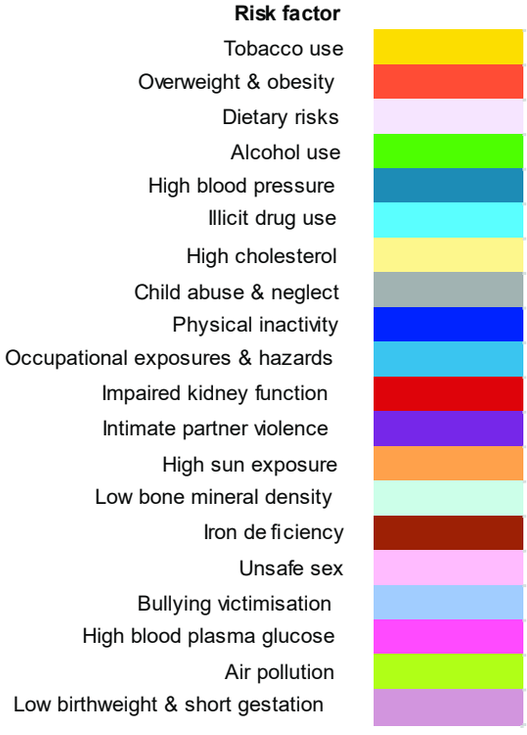


Figure D1: Leading causes of total burden (DALY '000; proportion %), by age group: males, 2018—nature of injury, including other causes

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Pre-term/LBW complications (11.8; 16.6%)	Asthma (10.0; 14.0%)	Other injuries (34.9; 21.5%)	Other injuries (60.9; 12.8%)	Coronary heart disease (25.8; 8.2%)	Coronary heart disease (43.0; 10.1%)	Coronary heart disease (51.5; 10.4%)	Coronary heart disease (45.3; 11.5%)	Coronary heart disease (32.3; 15.1%)
2nd	Birth trauma/ asphyxia (7.6; 10.7%)	Anxiety disorders (7.4; 10.4%)	Alcohol use disorders (11.5; 7.1%)	Poisoning (37.5; 7.9%)	Back pain and problems (20.8; 6.6%)	Lung cancer (23.9; 5.6%)	Lung cancer (33.1; 6.7%)	Dementia (27.8; 7.1%)	Dementia (28.2; 13.2%)
3rd	Other disorders of infancy (6.4; 9.0%)	Autism spectrum disorders (5.3; 7.5%)	Depressive disorders (8.5; 5.3%)	Back pain and problems (33.4; 7.0%)	Other injuries (20.0; 6.3%)	Back pain and problems (22.3; 5.2%)	COPD (29.2; 5.9%)	COPD (23.9; 6.1%)	COPD (12.4; 5.8%)
4th	Cardiovascular defects (4.7; 6.7%)	Conduct disorder (4.9; 6.9%)	Asthma (8.1; 5.0%)	Alcohol use disorders (28.6; 6.0%)	Poisoning (14.4; 4.6%)	Other musculoskeletal (19.4; 4.5%)	Type 2 diabetes (20.4; 4.1%)	Lung cancer (19.7; 5.0%)	Stroke (11.8; 5.5%)
5th	Other congenital conditions (3.6; 5.1%)	Depressive disorders (4.3; 6.1%)	Anxiety disorders (7.3; 4.5%)	Depressive disorders (27.0; 5.7%)	Other musculoskeletal (13.5; 4.3%)	Type 2 diabetes (16.0; 3.8%)	Other musculoskeletal (19.7; 4.0%)	Stroke (17.7; 4.5%)	Prostate cancer (9.9; 4.6%)
6th	SIDS (3.2; 4.5%)	Other injuries (3.5; 4.9%)	Back pain and problems (7.1; 4.4%)	Anxiety disorders (23.7; 5.0%)	Anxiety disorders (12.0; 3.8%)	Other injuries (14.5; 3.4%)	Prostate cancer (17.0; 3.4%)	Prostate cancer (16.4; 4.2%)	Atrial fibrillation (6.3; 3.0%)
7th	Other injuries (2.5; 3.6%)	Epilepsy (3.4; 4.8%)	Poisoning (6.6; 4.1%)	Drug use disorders (17.9; 3.8%)	Depressive disorders (10.6; 3.4%)	COPD (13.1; 3.1%)	Back pain and problems (17.0; 3.4%)	Type 2 diabetes (14.1; 3.6%)	Lower respiratory infections (5.1; 2.4%)
8th	Asthma (2.3; 3.3%)	Dental caries (2.6; 3.6%)	Drug use disorders (6.0; 3.7%)	Other musculoskeletal (17.3; 3.6%)	Chronic liver disease (9.9; 3.1%)	Bowel cancer (12.5; 2.9%)	Bowel cancer (16.3; 3.3%)	Bowel cancer (11.2; 2.8%)	Hearing loss (5.0; 2.3%)
9th	Other gastrointestinal infections (1.8; 2.5%)	Attention deficit hyperactivity disorder (2.1; 2.9%)	Acne (4.5; 2.8%)	Asthma (15.6; 3.3%)	Lung cancer (8.8; 2.8%)	Chronic liver disease (12.4; 2.9%)	Stroke (14.7; 3.0%)	Hearing loss (11.2; 2.8%)	Type 2 diabetes (4.6; 2.2%)
10th	Other blood/ metabolic disorders (1.7; 2.4%)	Acne (2.0; 2.8%)	Autism spectrum disorders (4.5; 2.8%)	Schizophrenia (13.2; 2.8%)	Alcohol use disorders (8.1; 2.6%)	Rheumatoid arthritis (11.8; 2.7%)	Dementia (13.8; 2.8%)	Other musculoskeletal (10.3; 2.6%)	Lung cancer (4.6; 2.2%)

LBW = low birthweight; COPD = chronic obstructive pulmonary disease; SIDS = sudden infant death syndrome. Lower respiratory infections includes influenza and pneumonia.

This figure reports injuries by nature of injury. For external cause of injury see Figure 2.6.

SCI.0001.0031.0182

Figure D2: Leading causes of total burden (DALY '000; proportion %), by age group: females, 2018—nature of injury, including other causes

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Pre-term/LBW complications (7.8; 14.5%)	Anxiety disorders (6.4; 11.5%)	Anxiety disorders (14.9; 11.0%)	Anxiety disorders (37.9; 9.4%)	Back pain and problems (20.8; 7.4%)	Other musculoskeletal (26.0; 7.2%)	COPD (28.3; 7.2%)	Dementia (36.4; 10.0%)	Dementia (65.4; 20.9%)
2nd	Other disorders of infancy (5.5; 10.1%)	Asthma (6.3; 11.2%)	Depressive disorders (11.8; 8.7%)	Back pain and problems (33.3; 8.2%)	Other musculoskeletal (19.1; 6.8%)	Back pain and problems (20.7; 5.8%)	Other musculoskeletal (24.6; 6.3%)	Coronary heart disease (27.3; 7.5%)	Coronary heart disease (36.9; 11.8%)
3rd	Birth trauma/ asphyxia (5.1; 9.5%)	Depressive disorders (5.0; 8.9%)	Other injuries (9.9; 7.3%)	Depressive disorders (31.6; 7.8%)	Anxiety disorders (17.6; 6.3%)	Osteoarthritis (19.5; 5.4%)	Lung cancer (22.4; 5.7%)	COPD (26.4; 7.3%)	Stroke (20.6; 6.6%)
4th	Cardiovascular defects (3.1; 5.7%)	Conduct disorder (3.0; 5.3%)	Eating disorders (9.2; 6.8%)	Asthma (21.2; 5.2%)	Depressive disorders (14.5; 5.2%)	Lung cancer (19.1; 5.3%)	Osteoarthritis (22.0; 5.6%)	Stroke (17.9; 4.9%)	COPD (19.1; 6.1%)
5th	Other injuries (2.7; 5.1%)	Epilepsy (2.9; 5.2%)	Asthma (7.6; 5.6%)	Eating disorders (18.2; 4.5%)	Breast cancer (14.4; 5.1%)	Breast cancer (18.6; 5.2%)	Coronary heart disease (18.3; 4.7%)	Other musculoskeletal (14.5; 4.0%)	Atrial fibrillation (10.0; 3.2%)
6th	Other congenital conditions (2.5; 4.6%)	Acne (2.7; 4.9%)	Back pain and problems (7.1; 5.2%)	Other injuries (16.8; 4.1%)	Osteoarthritis (11.0; 3.9%)	Rheumatoid arthritis (16.7; 4.6%)	Back pain and problems (16.2; 4.2%)	Lung cancer (13.7; 3.8%)	Hearing loss (8.7; 2.8%)
7th	SIDS (1.8; 3.4%)	Dental caries (2.5; 4.4%)	Bipolar affective disorder (6.1; 4.5%)	Other musculoskeletal (15.7; 3.9%)	Asthma (10.8; 3.9%)	COPD (14.3; 4.0%)	Breast cancer (15.5; 4.0%)	Osteoarthritis (12.8; 3.5%)	Lower respiratory infections (6.8; 2.2%)
8th	Other neurological conditions (1.7; 3.2%)	Other injuries (2.2; 4.0%)	Polycystic ovarian syndrome (5.5; 4.0%)	Migraine (13.6; 3.3%)	Rheumatoid arthritis (9.7; 3.5%)	Coronary heart disease (11.9; 3.3%)	Dementia (15.4; 3.9%)	Hearing loss (12.5; 3.4%)	Type 2 diabetes (6.6; 2.1%)
9th	Other gastrointestinal infections (1.7; 3.1%)	Dermatitis and eczema (1.9; 3.4%)	Alcohol use disorders (5.2; 3.8%)	Poisoning (12.6; 3.1%)	Poisoning (8.3; 3.0%)	Anxiety disorders (11.7; 3.2%)	Rheumatoid arthritis (14.5; 3.7%)	Type 2 diabetes (10.3; 2.8%)	Chronic kidney disease (6.5; 2.1%)
10th	Asthma (1.5; 2.8%)	Back pain and problems (1.5; 2.7%)	Acne (4.1; 3.0%)	Bipolar affective disorder (11.6; 2.9%)	Migraine (7.1; 2.5%)	Depressive disorders (10.3; 2.9%)	Type 2 diabetes (12.6; 3.2%)	Rheumatoid arthritis (10.0; 2.8%)	Other musculoskeletal (6.4; 2.0%)

LBW = low birthweight; COPD = chronic obstructive pulmonary disease; SIDS = sudden infant death syndrome. Lower respiratory infections includes influenza and pneumonia.

This figure reports injuries by nature of injury. For external cause of injury see Figure 2.7.

SCI.0001.0031.0183

Figure D3: Leading causes of non-fatal burden (YLD '000; proportion %), by age group: males, 2018—nature of injury, including other causes

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Asthma (2.3; 13.7%)	Asthma (9.7; 15.8%)	Alcohol use disorders (11.5; 10.7%)	Back pain and problems (33.4; 11.1%)	Back pain and problems (20.8; 13.0%)	Back pain and problems (22.1; 12.1%)	Other musculoskeletal (18.2; 9.3%)	Hearing loss (11.2; 8.1%)	Dementia (10.7; 15.0%)
2nd	Other gastrointestinal infections (1.7; 10.4%)	Anxiety disorders (7.4; 12.2%)	Depressive disorders (8.5; 8.0%)	Alcohol use disorders (27.8; 9.2%)	Other musculoskeletal (12.8; 8.0%)	Other musculoskeletal (18.5; 10.1%)	Back pain and problems (16.9; 8.6%)	Coronary heart disease (10.5; 7.6%)	Coronary heart disease (7.6; 10.6%)
3rd	Dermatitis and eczema (1.0; 6.1%)	Autism spectrum disorders (5.3; 8.7%)	Asthma (7.8; 7.3%)	Depressive disorders (27.0; 8.9%)	Anxiety disorders (12.0; 7.5%)	Rheumatoid arthritis (11.6; 6.3%)	COPD (13.3; 6.7%)	Dementia (9.4; 6.8%)	COPD (5.2; 7.4%)
4th	Intellectual disability (1.0; 5.9%)	Conduct disorder (4.9; 8.1%)	Anxiety disorders (7.3; 6.8%)	Anxiety disorders (23.7; 7.8%)	Depressive disorders (10.6; 6.7%)	Osteoarthritis (11.4; 6.2%)	Type 2 diabetes (12.6; 6.4%)	Other musculoskeletal (8.9; 6.5%)	Hearing loss (5.0; 7.0%)
5th	Epilepsy (0.8; 5.0%)	Depressive disorders (4.3; 7.1%)	Back pain and problems (7.0; 6.6%)	Drug use disorders (17.6; 5.8%)	Alcohol use disorders (7.0; 4.4%)	Type 2 diabetes (10.1; 5.5%)	Osteoarthritis (12.5; 6.4%)	COPD (8.6; 6.2%)	Atrial fibrillation (3.4; 4.8%)
6th	Anxiety disorders (0.8; 4.8%)	Epilepsy (3.0; 5.0%)	Drug use disorders (6.0; 5.6%)	Other musculoskeletal (16.9; 5.6%)	Asthma (6.9; 4.3%)	Coronary heart disease (7.7; 4.2%)	Coronary heart disease (12.1; 6.1%)	Type 2 diabetes (7.3; 5.3%)	Other musculoskeletal (2.6; 3.7%)
7th	Other congenital conditions (0.8; 4.7%)	Dental caries (2.6; 4.3%)	Acne (4.5; 4.3%)	Asthma (14.5; 4.8%)	Rheumatoid arthritis (6.7; 4.2%)	Anxiety disorders (6.9; 3.8%)	Hearing loss (10.4; 5.3%)	Atrial fibrillation (7.3; 5.3%)	Prostate cancer (2.4; 3.4%)
8th	Autism spectrum disorders (0.8; 4.6%)	Attention deficit hyperactivity disorder (2.1; 3.4%)	Autism spectrum disorders (4.5; 4.2%)	Schizophrenia (12.9; 4.3%)	Osteoarthritis (6.6; 4.1%)	Hearing loss (6.7; 3.7%)	Rheumatoid arthritis (9.6; 4.9%)	Back pain and problems (7.0; 5.1%)	Macular degeneration (2.1; 2.9%)
9th	Protein-energy deficiency (0.6; 3.4%)	Acne (2.0; 3.3%)	Bipolar affective disorder (4.4; 4.1%)	Bipolar affective disorder (10.6; 3.5%)	Type 2 diabetes (4.6; 2.9%)	Asthma (6.4; 3.5%)	Atrial fibrillation (7.1; 3.6%)	Osteoarthritis (6.5; 4.7%)	Rheumatoid arthritis (2.1; 2.9%)
10th	Other musculoskeletal (0.5; 3.1%)	Dermatitis and eczema (2.0; 3.2%)	Dental caries (3.6; 3.4%)	Autism spectrum disorders (9.9; 3.3%)	Autism spectrum disorders (4.4; 2.7%)	Periodontal disease (5.2; 2.9%)	Dementia (6.2; 3.2%)	Rheumatoid arthritis (5.4; 3.9%)	Back pain and problems (1.8; 2.6%)

COPD = chronic obstructive pulmonary disease.

This figure reports injuries by nature of injury. For external cause of injury see Figure 3.4

SCI.0001.0031.0184

Figure D4: Leading causes of non-fatal burden (YLD '000; proportion %), by age group: males, 2018—nature of injury, including other causes

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Other gastrointestinal infections (1.7; 12.1%)	Anxiety disorders (6.4; 13.4%)	Anxiety disorders (14.9; 13.1%)	Anxiety disorders (37.9; 12.0%)	Back pain and problems (20.7; 11.4%)	Other musculoskeletal (24.6; 12.0%)	Other musculoskeletal (23.2; 11.5%)	Dementia (15.7; 9.4%)	Dementia (31.1; 23.9%)
2nd	Asthma (1.4; 10.6%)	Asthma (6.0; 12.4%)	Depressive disorders (11.8; 10.3%)	Back pain and problems (33.2; 10.5%)	Other musculoskeletal (18.3; 10.1%)	Back pain and problems (20.6; 10.0%)	Osteoarthritis (22.0; 10.9%)	COPD (14.4; 8.7%)	COPD (12.4; 9.6%)
3rd	Dermatitis and eczema (1.0; 7.0%)	Depressive disorders (5.0; 10.4%)	Eating disorders (9.2; 8.1%)	Depressive disorders (31.5; 9.9%)	Anxiety disorders (17.6; 9.7%)	Osteoarthritis (19.5; 9.5%)	Back pain and problems (16.0; 8.0%)	Other musculoskeletal (12.8; 7.7%)	Coronary heart disease (8.9; 6.9%)
4th	Epilepsy (0.9; 6.4%)	Conduct disorder (3.0; 6.2%)	Asthma (7.5; 6.6%)	Asthma (20.6; 6.5%)	Depressive disorders (14.5; 8.0%)	Rheumatoid arthritis (16.5; 8.0%)	COPD (14.3; 7.1%)	Osteoarthritis (12.8; 7.7%)	Hearing loss (8.7; 6.7%)
5th	Other neurological conditions (0.9; 6.3%)	Epilepsy (2.9; 6.0%)	Back pain and problems (7.0; 6.1%)	Eating disorders (18.1; 5.7%)	Osteoarthritis (11.0; 6.1%)	Anxiety disorders (11.7; 5.7%)	Rheumatoid arthritis (13.9; 6.9%)	Hearing loss (12.5; 7.5%)	Osteoarthritis (4.9; 3.8%)
6th	Anxiety disorders (0.6; 4.5%)	Acne (2.7; 5.7%)	Bipolar affective disorder (6.1; 5.3%)	Other musculoskeletal (15.0; 4.7%)	Asthma (10.3; 5.7%)	Depressive disorders (10.3; 5.0%)	Type 2 diabetes (8.8; 4.4%)	Rheumatoid arthritis (9.5; 5.7%)	Atrial fibrillation (4.9; 3.8%)
7th	Rheumatoid arthritis (0.6; 4.1%)	Dental caries (2.5; 5.1%)	Polycystic ovarian syndrome (5.5; 4.8%)	Migraine (13.6; 4.3%)	Rheumatoid arthritis (9.7; 5.3%)	Asthma (9.7; 4.7%)	Dementia (8.1; 4.0%)	Back pain and problems (8.2; 4.9%)	Other musculoskeletal (4.9; 3.7%)
8th	Protein-energy deficiency (0.5; 4.0%)	Dermatitis and eczema (1.9; 3.9%)	Alcohol use disorders (5.1; 4.5%)	Bipolar affective disorder (11.6; 3.7%)	Migraine (7.1; 3.9%)	Type 2 diabetes (7.4; 3.6%)	Hearing loss (7.8; 3.9%)	Coronary heart disease (7.0; 4.2%)	Macular degeneration (3.7; 2.9%)
9th	Other congenital conditions (0.5; 3.8%)	Back pain and problems (1.5; 3.2%)	Acne (4.1; 3.6%)	Polycystic ovarian syndrome (10.8; 3.4%)	Dental caries (3.7; 2.0%)	COPD (7.3; 3.5%)	Asthma (7.7; 3.8%)	Atrial fibrillation (6.2; 3.8%)	Rheumatoid arthritis (3.5; 2.7%)
10th	Intellectual disability (0.5; 3.6%)	Autism spectrum disorders (1.3; 2.7%)	Migraine (3.8; 3.3%)	Drug use disorders (8.4; 2.7%)	Type 2 diabetes (3.6; 2.0%)	Genital prolapse (5.9; 2.8%)	Coronary heart disease (5.5; 2.7%)	Type 2 diabetes (5.8; 3.5%)	Protein-energy deficiency (2.8; 2.1%)

COPD = chronic obstructive pulmonary disease.

This figure reports injuries by nature of injury. For external cause of injury see Figure 3.5.

SCI.0001.0031.0185

Figure D5: Leading causes of fatal burden (YLL '000; proportion %), by age group: males, 2018—nature of injury, including other causes

Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Pre-term/LBW complications (11.5; 21.1%)	Other injuries (3.4; 32.8%)	Other injuries (34.4; 61.8%)	Other injuries (59.4; 34.3%)	Coronary heart disease (22.4; 14.4%)	Coronary heart disease (35.3; 14.4%)	Coronary heart disease (39.4; 13.2%)	Coronary heart disease (34.7; 13.6%)	Coronary heart disease (24.7; 17.4%)
2nd	Birth trauma/ asphyxia (7.6; 13.9%)	Brain/CNS cancer (1.1; 11.2%)	Poisoning (6.5; 11.8%)	Poisoning (37.3; 21.5%)	Other injuries (19.3; 12.4%)	Lung cancer (23.6; 9.6%)	Lung cancer (32.5; 10.9%)	Lung cancer (19.1; 7.5%)	Dementia (17.5; 12.3%)
3rd	Other disorders of infancy (6.0; 11.1%)	Other cancers (0.6; 6.2%)	Drowning/ submersion (1.7; 3.0%)	Coronary heart disease (9.0; 5.2%)	Poisoning (14.3; 9.2%)	Other injuries (13.9; 5.7%)	COPD (16.0; 5.4%)	Dementia (18.4; 7.2%)	Stroke (10.3; 7.2%)
4th	Cardiovascular defects (4.5; 8.2%)	Cerebal palsy (0.4; 4.3%)	Traumatic brain injury (1.5; 2.7%)	Bowel cancer (4.4; 2.5%)	Chronic liver disease (9.6; 6.1%)	Bowel cancer (11.9; 4.9%)	Bowel cancer (15.3; 5.1%)	COPD (15.3; 6.0%)	Prostate cancer (7.5; 5.3%)
5th	SIDS (3.2; 5.8%)	Drowning/ submersion (0.4; 3.8%)	Epilepsy (1.1; 2.0%)	Brain/CNS cancer (4.4; 2.5%)	Lung cancer (8.7; 5.6%)	Chronic liver disease (11.8; 4.8%)	Prostate cancer (12.3; 4.1%)	Stroke (14.9; 5.8%)	COPD (7.1; 5.0%)
6th	Other congenital conditions (2.8; 5.2%)	Epilepsy (0.4; 3.7%)	Other cancers (0.9; 1.6%)	Chronic liver disease (4.1; 2.3%)	Bowel cancer (6.1; 3.9%)	Liver cancer (9.7; 4.0%)	Stroke (12.2; 4.1%)	Prostate cancer (13.0; 5.1%)	Lower respiratory infections (4.9; 3.5%)
7th	Other injuries (2.5; 4.5%)	Cardiovascular defects (0.3; 3.1%)	Other neurological conditions (0.7; 1.3%)	Drowning/ submersion (2.9; 1.7%)	Brain/CNS cancer (4.3; 2.7%)	COPD (8.6; 3.5%)	Pancreatic cancer (9.4; 3.2%)	Bowel cancer (10.2; 4.0%)	Lung cancer (4.3; 3.0%)
8th	Other blood/ metabolic disorders (1.7; 3.1%)	Other blood/ metabolic disorders (0.3; 3.1%)	Burn injuries (0.7; 1.2%)	Stroke (2.9; 1.7%)	Stroke (4.2; 2.7%)	Stroke (7.6; 3.1%)	Liver cancer (8.7; 2.9%)	Type 2 diabetes (6.8; 2.7%)	Chronic kidney disease (3.8; 2.6%)
9th	Neonatal infections (1.5; 2.8%)	Asthma (0.3; 3.0%)	Cerebal palsy (0.6; 1.1%)	Traumatic brain injury (2.6; 1.5%)	Pancreatic cancer (3.8; 2.4%)	Poisoning (7.4; 3.0%)	Type 2 diabetes (7.8; 2.6%)	Pancreatic cancer (5.9; 2.3%)	Bowel cancer (3.6; 2.5%)
10th	Lower respiratory infections (1.2; 2.2%)	Lower respiratory infections (0.3; 2.6%)	Stroke (0.5; 1.0%)	Other cardiovascular diseases (2.5; 1.4%)	Liver cancer (3.5; 2.2%)	Pancreatic cancer (7.1; 2.9%)	Dementia (7.6; 2.6%)	Parkinson disease (5.8; 2.3%)	Type 2 diabetes (3.1; 2.1%)

LBW = low birthweight; CNS = central nervous system; COPD = chronic obstructive pulmonary disease; SIDS = sudden infant death syndrome. Lower respiratory infections includes influenza and pneumonia.

This figure reports injuries by nature of injury. For external cause of injury see Figure 4.5.

SCI.0001.0031.0186

Figure D6: Leading causes of fatal burden (YLL '000; proportion %), by age group: females, 2018—nature of injury, including other causes

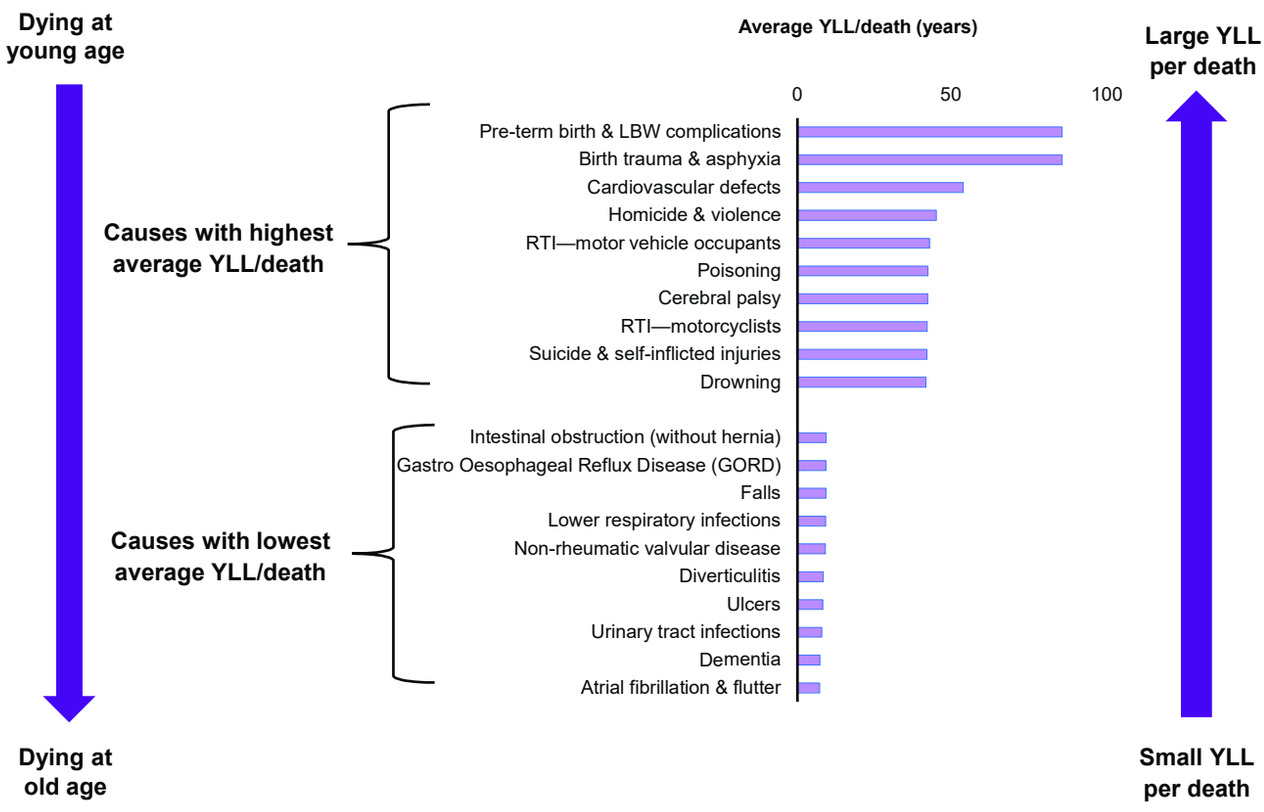
Rank	Age group (years)								
	Under 5	5–14	15–24	25–44	45–54	55–64	65–74	75–84	85+
1st	Pre-term/LBW complications (7.6; 18.8%)	Other injuries (2.1; 27.1%)	Other injuries (9.7; 45.5%)	Other injuries (16.3; 18.6%)	Breast cancer (12.7; 12.8%)	Lung cancer (18.9; 12.3%)	Lung cancer (21.9; 11.6%)	Dementia (20.7; 10.5%)	Dementia (34.3; 18.7%)
2nd	Other disorders of infancy (5.2; 12.9%)	Brain/CNS cancer (1.0; 13.0%)	Poisoning (2.7; 12.6%)	Poisoning (12.4; 14.1%)	Poisoning (8.2; 8.3%)	Breast cancer (16.4; 10.7%)	COPD (14.0; 7.4%)	Coronary heart disease (20.3; 10.3%)	Coronary heart disease (28.0; 15.3%)
3rd	Birth trauma/ asphyxia (5.1; 12.7%)	Brain malformations (0.6; 7.1%)	Other cancers (1.2; 5.7%)	Breast cancer (7.5; 8.6%)	Lung cancer (7.0; 7.1%)	Bowel cancer (8.9; 5.8%)	Breast cancer (13.0; 6.9%)	Stroke (15.7; 7.9%)	Stroke (18.8; 10.2%)
4th	Cardiovascular defects (2.8; 6.9%)	Other cancers (0.5; 6.8%)	Other cardiovascular diseases (0.8; 3.8%)	Bowel cancer (4.0; 4.5%)	Bowel cancer (5.7; 5.8%)	Coronary heart disease (8.7; 5.7%)	Coronary heart disease (12.7; 6.7%)	Lung cancer (13.3; 6.7%)	COPD (6.7; 3.6%)
5th	Other injuries (2.7; 6.7%)	Other blood/ metabolic disorders (0.5; 6.1%)	Traumatic brain injury (0.6; 2.8%)	Chronic liver disease (2.9; 3.3%)	Coronary heart disease (5.5; 5.5%)	COPD (7.0; 4.6%)	Stroke (9.0; 4.7%)	COPD (12.0; 6.1%)	Lower respiratory infections (6.7; 3.6%)
6th	Other congenital conditions (2.0; 4.9%)	Cerebal palsy (0.4; 4.9%)	Other blood/ metabolic disorders (0.4; 1.7%)	Brain/CNS cancer (2.5; 2.9%)	Other injuries (5.0; 5.0%)	Stroke (5.4; 3.5%)	Bowel cancer (8.4; 4.4%)	Bowel cancer (8.1; 4.1%)	Atrial fibrillation (5.1; 2.8%)
7th	SIDS (1.8; 4.5%)	Other neurological conditions (0.3; 4.0%)	Brain/CNS cancer (0.3; 1.6%)	Other cardiovascular diseases (2.5; 2.9%)	Chronic liver disease (4.3; 4.3%)	Pancreatic cancer (5.3; 3.5%)	Pancreatic cancer (8.3; 4.4%)	Breast cancer (7.8; 3.9%)	Chronic kidney disease (4.7; 2.6%)
8th	Neonatal infections (1.3; 3.2%)	Asthma (0.3; 3.9%)	Cerebal palsy (0.3; 1.6%)	Cervical cancer (2.5; 2.8%)	Stroke (3.9; 4.0%)	Chronic liver disease (5.0; 3.2%)	Dementia (7.2; 3.8%)	Pancreatic cancer (5.0; 2.5%)	Bowel cancer (4.6; 2.5%)
9th	Other chromosomal abnormalities (1.3; 3.2%)	Other musculoskeletal (0.2; 3.1%)	Other neurological conditions (0.3; 1.6%)	Coronary heart disease (2.2; 2.5%)	Ovarian cancer (3.1; 3.1%)	Ovarian cancer (4.5; 2.9%)	Ovarian cancer (5.3; 2.8%)	Type 2 diabetes (4.5; 2.3%)	Type 2 diabetes (3.9; 2.1%)
10th	Brain malformations (1.0; 2.4%)	Cardiovascular defects (0.2; 2.2%)	Drowning/ submersion (0.3; 1.5%)	Stroke (2.1; 2.4%)	Brain/CNS cancer (2.7; 2.8%)	Poisoning (4.3; 2.8%)	Type 2 diabetes (3.8; 2.0%)	Chronic kidney disease (4.4; 2.2%)	Non-rheumatic valvular disease (3.8; 2.1%)

LBW = low birthweight; CNS = central nervous system; COPD = chronic obstructive pulmonary disease; SIDS = sudden infant death syndrome. Lower respiratory infections includes influenza and pneumonia.

This figure reports injuries by nature of injury. For external cause of injury see Figure 4.6.

SCI.0001.0031.0187

Figure D7: Causes with the highest and lowest average years of life lost (YLL) per death, 2018



LBW = low birthweight; RTI = road traffic injuries.

Notes

1. Lower respiratory infections includes influenza and pneumonia.
2. Excludes diseases with fewer than 100 deaths and residual ('other') diseases.
3. Average YLL is standardised to the GBD standard reference life table (Murray, Ezzati et al. 2012) with a maximum life expectancy of 86.02 years at birth and a life table cap at age 105 years with a life expectancy of 1.63 years.

Table D1: Number and percentage of YLL and deaths, by age group and sex, 2018

Age group (years)	Males				Females				People			
	Deaths (number)	Deaths (%)	YLL (number)	YLL (%)	Deaths (number)	Deaths (%)	YLL (number)	YLL (%)	Deaths (number)	Deaths (%)	YLL (number)	YLL (%)
Under 1	546	0.7	46,967	3.4	392	0.5	33,720	3.4	938	0.6	80,687	3.4
1–14	89	0.1	7,474	0.5	78	0.1	6,571	0.7	167	0.1	14,045	0.6
15–24	135	0.2	10,225	0.7	103	0.1	7,848	0.8	238	0.1	18,073	0.8
25–34	844	1.0	55,634	4.0	319	0.4	21,225	2.2	1,163	0.7	76,859	3.2
35–54	3,426	4.1	173,500	12.5	1,761	2.3	87,511	8.9	5,187	3.3	261,011	11.0
55–64	13,009	15.7	400,869	28.8	8,194	10.7	252,746	25.8	21,203	13.3	653,615	27.6
65–74	15,649	18.9	297,763	21.4	10,003	13.1	189,501	19.3	25,652	16.1	487,264	20.6
75–84	22,659	27.3	255,157	18.4	17,887	23.4	198,136	20.2	40,546	25.5	453,293	19.1
85–94	23,175	28.0	132,458	9.5	29,128	38.1	159,064	16.2	52,303	32.8	291,523	12.3
95+	3,377	4.1	9,845	0.7	8,526	11.2	24,127	2.5	11,903	7.5	33,972	1.4
Total	**82,909**	**100**	**1,389,892**	**100**	**76,391**	**100**	**980,449**	**100**	**159,300**	**100**	**2,370,341**	**100**

Note: Numbers and percentages for age groups may not add up to the total due to rounding.

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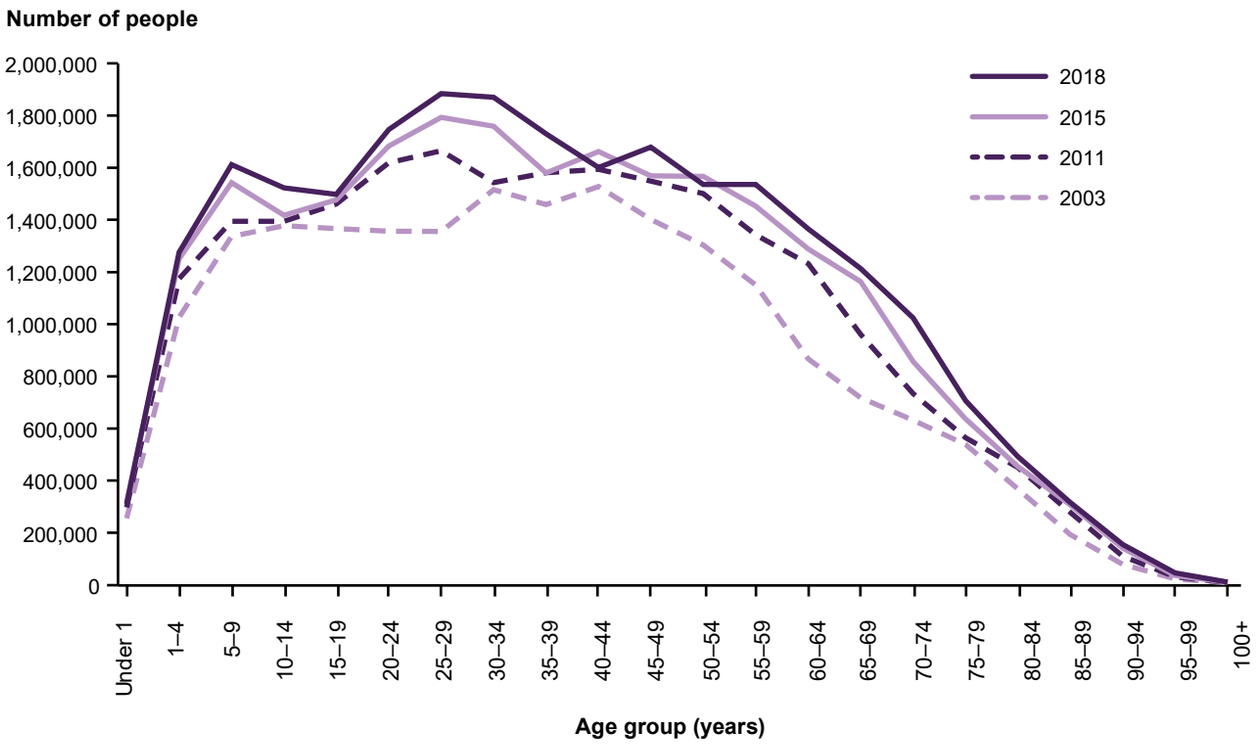
Figure D8: Population of Australia, persons, by age group, 2003, 2011, 2015 and 2018



Source: ABS 2017a.

Table D2: Population of Australia (number and %), persons, by age group, 2003, 2011, 2015 and 2018

Age group (years)	2003		2011		2015		2018	
	Number	%	Number	%	Number	%	Number	%
Under 1	248,959	1.3	290,397	1.3	308,446	1.3	303,407	1.2
1–4	1,020,177	5.2	1,167,717	5.2	1,244,121	5.2	1,268,886	5.1
5–9	1,329,682	6.7	1,387,634	6.2	1,536,262	6.5	1,604,540	6.4
10–14	1,370,851	7.0	1,387,865	6.2	1,410,688	5.9	1,515,917	6.1
15–19	1,360,368	6.9	1,453,459	6.5	1,469,856	6.2	1,490,744	6.0
20–24	1,350,012	6.8	1,611,663	7.2	1,676,279	7.0	1,739,635	7.0
25–29	1,349,310	6.8	1,658,170	7.4	1,786,026	7.5	1,877,318	7.5
30–34	1,508,950	7.7	1,536,161	6.9	1,752,291	7.4	1,862,826	7.5
35–39	1,451,812	7.4	1,573,910	7.0	1,572,958	6.6	1,722,891	6.9
40–44	1,520,976	7.7	1,587,244	7.1	1,655,210	6.9	1,594,055	6.4
45–49	1,395,676	7.1	1,541,837	6.9	1,561,830	6.6	1,672,110	6.7
50–54	1,297,378	6.6	1,494,063	6.7	1,559,927	6.5	1,528,886	6.1
55–59	1,144,182	5.8	1,335,993	6.0	1,445,632	6.1	1,529,435	6.1
60–64	861,077	4.4	1,226,000	5.5	1,282,165	5.4	1,359,063	5.4
65–69	711,646	3.6	954,260	4.3	1,156,379	4.9	1,206,918	4.8
70–74	625,179	3.2	727,671	3.3	850,311	3.6	1,017,126	4.1
75–79	532,369	2.7	558,341	2.5	630,532	2.6	700,028	2.8
80–84	362,670	1.8	444,032	2.0	448,137	1.9	485,840	1.9
85–89	187,557	1.0	272,273	1.2	300,844	1.3	309,768	1.2
90–94	72,895	0.4	103,493	0.5	134,507	0.6	149,167	0.6
95–99	16,707	0.1	24,789	0.1	29,916	0.1	39,704	0.2
100+	2,304	0.0	3,052	0.0	3,678	0.0	4,424	0.0
Total	**19,720,737**	**100**	**22,340,024**	**100**	**23,815,995**	**100**	**24,982,688**	**100**

Source: ABS 2017a.

Table D3: Life expectancy, HALE and HALE (%), at birth and age 65, by sex, jurisdiction, remoteness area and socioeconomic group, 2018

	At birth						At age 65[a]					
	Males			Females			Males			Females		
	LE (years)[b]	HALE (years)	HALE (%)[c]	LE (years)[b]	HALE (years)	HALE (%)[c]	LE (years)[b]	HALE (years)	HALE (%)[c]	LE (years)[b]	HALE (years)	HALE (%)[c]
Jurisdiction												
NSW	80.6	71.6	88.9	84.9	74.3	87.5	19.7	15.0	76.3	22.5	16.6	73.9
Vic	81.7	72.2	88.4	85.3	74.4	87.2	20.3	15.4	75.8	22.7	16.9	74.3
Qld	80.2	70.7	88.3	84.7	73.6	86.9	19.6	14.7	74.8	22.5	16.4	72.7
WA	80.5	71.8	89.1	85.1	74.8	87.9	19.9	15.5	77.7	22.9	17.3	75.5
SA	80.4	71.3	88.7	84.7	73.5	86.8	19.7	15.2	76.9	22.6	16.7	74.0
Tas	79.3	70.6	89.1	83.2	72.9	87.6	19.0	14.8	77.7	21.3	15.8	74.4
ACT	81.2	71.9	88.6	85.3	74.2	86.9	19.8	14.9	75.4	22.6	16.5	72.7
NT	75.5	66.2	87.7	80.2	69.5	86.7	17.1	11.8	69.0	20.1	13.4	66.5
Remoteness area												
Major cities	81.9	72.5	88.6	85.6	74.8	87.4	20.5	15.6	75.9	22.9	17.0	73.9
Inner regional	79.6	70.3	88.3	84.2	73.1	86.7	19.2	14.7	76.4	22.2	16.4	73.9
Outer regional	78.9	69.8	88.5	84.0	73.4	87.4	19.2	14.6	76.0	22.2	16.4	73.9
Remote and very remote	76.8	67.4	87.7	80.8	69.6	86.1	18.2	13.2	72.1	20.5	13.8	67.3
Socioeconomic group												
1 Lowest	78.2	68.6	87.7	83.2	71.4	85.9	18.5	13.7	74.2	21.6	15.3	71.1
2	79.5	70.1	88.2	84.9	73.5	86.5	19.0	14.5	76.1	22.6	16.7	74.0
3	81.0	71.8	88.6	84.9	74.2	87.4	20.1	15.5	77.0	22.6	16.8	74.4
4	82.8	73.2	88.5	86.3	75.5	87.5	21.1	15.9	75.3	23.5	17.5	74.7
5 Highest	84.1	75.4	89.7	87.1	77.3	88.8	21.9	17.0	77.5	24.0	18.2	76.0
Australia	**80.7**	**71.5**	**88.6**	**84.9**	**74.1**	**87.3**	**19.9**	**15.1**	**75.9**	**22.6**	**16.6**	**73.8**

(a) For remoteness area and socioeconomic group, measures for age 65 refer to the age group 65–69.

(b) Life expectancy (LE) from ABS 2020b, 2020c, 2020d.

(c) HALE (%) refers to percentage of life expectancy in full health.

Sources: AIHW analysis of ABDS 2018 database; ABS 2020b, 2020c, 2020d.

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Table D4: Change in life expectancy and HALE and percentage of life expectancy in full health, at birth and age 65, by sex, 2003, 2011, 2015 and 2018

	Males			Females		
Time point	Life expectancy (years)[a]	HALE (years)	LE in full health (%)	Life expectancy (years)[a]	HALE (years)	LE in full health (%)
			At birth			
2003	78.1	69.4	88.9	83.0	72.9	87.8
2011	79.9	70.8	88.7	84.3	73.8	87.6
2015	80.4	71.3	88.7	84.6	73.9	87.4
2018	80.7	71.5	88.6	84.9	74.1	87.3
Change (2003 to 2018)	2.6	2.1	–0.3	1.8	1.2	–0.5
			At age 65			
2003	17.8	13.4	75.3	21.1	15.8	74.6
2011	19.1	14.4	75.4	22.0	16.3	74.2
2015	19.6	14.8	75.6	22.3	16.5	74.0
2018	19.9	15.1	75.9	22.6	16.6	73.8
Change (2003 to 2018)	2.1	1.7	0.5	1.4	0.9	–0.8

LE = life expectancy.

(a) ABS 2005, 2013b, 2017b, 2020b.

Note: A negative number for change between 2003 and 2018 indicates a smaller percentage of remaining life expectancy in full health in 2018 compared with 2003.

*Sources:*AIHW analysis of ABDS 2018 database; ABS 2005, 2013b, 2017b, 2020b.

Table D5: Life expectancy(a), HALE and percentage of life expectancy in full health, at selected ages, by sex, 2018

	Males			Females		
Age (years)	LE (years)	HALE (years)	LE in full health (%)	LE (years)	HALE (years)	LE in full health (%)
0	80.7	71.5	88.6	84.9	74.1	87.3
1	80.0	70.8	88.5	84.1	73.3	87.1
5	76.1	66.9	88.0	80.2	69.4	86.6
10	71.1	62.1	87.4	75.2	64.6	85.9
15	66.1	57.4	86.7	70.2	59.8	85.1
20	61.3	52.8	86.2	65.3	55.2	84.5
25	56.4	48.3	85.5	60.4	50.6	83.9
30	51.6	43.8	84.8	55.4	46.1	83.1
35	46.8	39.4	84.1	50.6	41.6	82.3
40	42.1	35.0	83.3	45.7	37.2	81.4
45	37.4	30.8	82.4	40.9	32.9	80.3
50	32.8	26.6	81.1	36.2	28.6	79.1
55	28.3	22.6	79.7	31.5	24.5	77.6
60	24.0	18.7	77.9	27.0	20.5	75.8
65	19.9	15.1	75.9	22.6	16.6	73.8
70	15.9	11.7	73.5	18.3	13.0	71.0
75	12.3	8.7	70.5	14.3	9.6	67.6
80	9.1	6.1	66.9	10.6	6.7	63.4
85	6.4	3.9	61.4	7.5	4.3	57.7
90	4.4	2.3	52.7	5.0	2.5	49.3
95	3.2	1.3	40.4	3.4	1.4	42.7
100	2.1	0.4	20.2	2.2	0.6	25.7

(a) ABS 2020b.

Table D6: LE[a], HALE, ill health (years) and percentage of life expectancy in full health, at birth and age 65, by sex, *Major cities* and *Remote and very remote* areas, 2011 and 2018

	2011				2018				Change over time			
	LE	HALE	Ill health	%FH	LE	HALE	Ill health	%FH	LE	HALE	Ill health	%FH
						Males						
At birth												
Major cities	80.6	71.6	9.0	88.8	81.9	72.5	9.3	88.6	1.3	0.9	0.3	–0.2
Remote and very remote	75.3	65.8	9.5	87.3	76.8	67.4	9.5	87.7	1.5	1.6	0.0	0.4
Gap	–5.3	–5.8	0.5	–1.5	–5.1	–5.1	0.2	–0.9	0.2	0.7	–0.3	0.6
Age 65												
Major cities	19.4	14.7	4.7	75.9	20.5	15.6	4.9	75.9	1.1	0.9	0.2	0.0
Remote and very remote	17.2	11.8	5.4	68.8	18.2	13.2	5.1	72.1	1.0	1.4	–0.3	3.3
Gap	–2.2	–2.9	0.7	–7.1	–2.3	–2.4	0.2	–3.8	–0.1	0.5	–0.5	3.3
						Females						
At birth												
Major cities	84.8	74.4	10.4	87.7	85.6	74.8	10.8	87.4	0.8	0.4	0.4	–0.3
Remote and very remote	79.7	67.5	12.1	84.8	80.8	69.6	11.2	86.1	1.1	2.1	–0.9	1.3
Gap	–5.1	–6.9	1.7	–2.9	–4.8	–5.2	0.4	–1.3	0.3	1.7	–1.3	1.6
Age 65												
Major cities	22.3	16.6	5.7	74.5	22.9	17.0	6.0	73.9	0.6	0.4	0.3	–0.6
Remote and very remote	20.0	12.4	7.5	62.4	20.5	13.8	6.7	67.3	0.5	1.4	–0.8	4.9
Gap	–2.3	–4.2	1.8	–12.1	–2.4	–3.2	0.7	–6.6	–0.1	1.0	–1.1	5.5

LE = life expectancy; FH = full health.

(a) ABS 2017d, 2020d.

Note: Gap refers to measure in *Remote and very remote* areas minus measure in *Major cities*. A negative number indicates the measure was higher in Major cities.

Sources: AIHW analysis of ABDS 2018 database; ABS 2017d, 2020d.

Table D7: LE[(a)], HALE, ill health (years) and percentage of life expectancy in full health, at birth and age 65, by sex, highest and lowest socioeconomic groups, 2011 and 2018

	2011				2018				Change over time			
	LE	HALE	Ill health	%FH	LE	HALE	Ill health	%FH	LE	HALE	Ill health	% FH
Males												
At birth												
1 Lowest	77.3	68.3	9.1	88.3	78.2	68.6	9.6	87.7	0.9	0.3	0.5	–0.5
5 Highest	83.0	74.5	8.5	89.7	84.1	75.4	8.7	89.7	1.1	1.0	0.1	0.0
Gap	–5.7	–6.2	0.5	–1.4	–5.9	–6.8	0.9	–2.0	–0.3	–0.7	0.4	–0.5
Age 65												
1 Lowest	17.7	13.3	4.3	75.4	18.5	13.7	4.8	74.2	0.8	0.4	0.4	–1.2
5 Highest	20.9	16.1	4.8	77.0	21.9	17.0	4.9	77.5	1.0	0.9	0.1	0.5
Gap	–3.2	–2.7	–0.4	–1.6	–3.4	–3.2	–0.2	–3.3	–0.2	–0.5	0.3	–1.7
Females												
At birth												
1 Lowest	82.7	71.9	10.8	87.0	83.2	71.4	11.8	85.9	0.5	–0.5	1.0	–1.1
5 Highest	86.0	76.3	9.6	88.8	87.1	77.3	9.8	88.8	1.2	1.0	0.1	0.0
Gap	–3.3	–4.4	1.1	–1.8	–3.9	–5.9	2.0	–2.9	–0.6	–1.5	0.9	–1.1
Age 65												
1 Lowest	21.2	15.7	5.5	74.0	21.6	15.3	6.2	71.1	0.4	–0.3	0.7	–3.0
5 Highest	22.9	17.3	5.6	75.6	24.0	18.2	5.8	76.0	1.1	0.9	0.2	0.3
Gap	–1.8	–1.7	–0.1	–1.6	–2.4	–2.9	0.5	–4.9	–0.7	–1.2	0.6	–3.3

LE = life expectancy; FH = full health.

(a) ABS 2017c, 2020c.

Note: Gap refers to measure in the *Lowest* socioeconomic group minus measure in the *Highest* socioeconomic group. A negative number indicates the measure was higher in the *Highest* socioeconomic group.

Source: AIHW analysis of ABDS 2018 database, ABS 2017c, 2020c.

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Table D8: Changes in total attributable burden between 2003 and 2018, by risk factor exposure

Risk factor exposure	2003 attributable DALY	2018 attributable DALY	Change in attributable DALY	Change in attributable DALY (%)	2003 attributable DALY ASR	2018 attributable DALY ASR	Change in ASR	Rate ratio 2018:2003
Tobacco use								
Tobacco use (excluding second–hand smoke)	423,598	427,879	4,281	1.0	21.0	14.5	–6.5	0.7
Second–hand smoke	8,544	3,024	–5,520	–64.6	0.4	0.1	–0.3	0.2
Overweight (including obesity)								
Overweight but not obese	154,234	167,211	12,976	8.4	7.7	5.8	–1.9	0.8
Obesity	150,462	252,644	102,182	67.9	7.5	8.8	1.3	1.2
Dietary risks								
Diet low in legumes	84,985	60,035	–24,950	–29.4	4.2	2.1	–2.1	0.5
Diet low in whole grains & high fibre cereal	52,212	46,896	–5,317	–10.2	2.6	1.6	–1.0	0.6
Diet high in sodium	52,077	45,342	–6,735	–12.9	2.6	1.5	–1.0	0.6
Diet high in red meat	44,732	44,795	63	0.1	2.2	1.5	–0.7	0.7
Diet low in fruit	42,896	39,676	–3,220	–7.5	2.1	1.4	–0.8	0.6
Diet low in nuts & seeds	56,062	33,819	–22,243	–39.7	2.8	1.2	–1.6	0.4
Diet low in vegetables	33,009	28,988	–4,021	–12.2	1.6	1.0	–0.6	0.6
Diet high in processed meat	15,121	15,965	843	5.6	0.7	0.5	–0.2	0.7
Diet low in polyunsaturated fats	7,459	5,559	–1,900	–25.5	0.4	0.2	–0.2	0.5
Diet low in fish	9,260	5,306	–3,954	–42.7	0.5	0.2	–0.3	0.4
Diet high in sugar sweetened beverages	5,183	4,934	–249	–4.8	0.3	0.2	–0.1	0.7
Diet low in milk	4,368	4,618	250	5.7	0.2	0.2	–0.1	0.7
Illicit drug use								
Opioid use	30,461	46,915	16,454	54.0	1.6	1.9	0.4	1.2
Amphetamine use	14,672	35,674	21,001	143.1	0.8	1.5	0.7	2.0
Cannabis use	8,753	15,265	6,512	74.4	0.4	0.6	0.2	1.4
Cocaine use	13,544	16,278	2,734	20.2	0.7	0.7	—	1.0
Other illicit drug use	7,743	8,861	1,118	14.4	0.4	0.4	—	0.9
Unsafe injecting practices	12,672	26,543	13,871	109.5	0.6	0.9	0.3	1.5
Impaired kidney function								
Chronic kidney disease stage 1–3	43,309	46,194	2,886	6.7	2.1	1.5	–0.7	0.7
Chronic kidney disease stage 4–5	35,465	49,503	14,038	39.6	1.8	1.7	–0.1	0.9

Notes

1. Rates were age-standardised to the 2001 Australian Standard Population and are expressed per 1,000 population.
2. Rate ratios divide 2018 ASRs by corresponding 2003 ASRs.
3. Rate differences subtract 2018 ASRs from the corresponding 2003 ASRs.

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Table D9: Age-standardised YLD rates, by disease group and state or territory, 2018

Disease group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Blood/metabolic	0.9	0.9	1.1	1.1	1.3	1.1	0.8	3.5	1.0
Cancer	2.4	2.3	2.5	2.4	2.3	2.3	2.2	2.2	2.3
Cardiovascular	5.2	4.8	6.0	5.0	5.2	4.5	4.3	10.9	5.2
Endocrine	3.0	3.0	2.8	2.8	3.3	2.8	2.9	5.5	3.0
Gastrointestinal	2.4	2.4	2.5	2.4	2.4	2.4	2.4	2.5	2.4
Hearing/vision	3.7	3.8	4.0	3.2	3.7	4.1	3.4	3.7	3.7
Infant/congenital	0.8	0.7	1.0	0.9	0.9	0.8	0.8	0.9	0.8
Infections	1.1	1.2	1.5	0.8	1.6	1.1	0.8	3.1	1.2
Injuries	2.4	2.7	3.3	2.7	2.9	3.0	2.7	6.5	2.8
Kidney/urinary	0.9	0.8	1.0	1.1	0.7	0.6	0.7	2.6	0.9
Mental/substance use	24.6	27.5	24.2	26.1	26.9	20.4	26.1	22.6	25.5
Musculoskeletal	22.7	23.8	23.8	22.6	24.3	27.3	25.2	17.1	23.3
Neurological	7.8	6.9	7.7	5.8	8.1	8.0	8.1	8.5	7.3
Oral	4.8	4.5	4.3	4.7	3.4	4.6	3.6	4.5	4.5
Reproductive/maternal	2.0	1.8	2.9	1.7	1.9	1.7	1.7	1.7	2.1
Respiratory	8.4	8.9	8.8	7.9	9.6	9.6	9.3	6.2	8.6
Skin	3.2	3.3	3.4	3.1	3.4	3.5	3.4	3.3	3.3
All diseases	**96.4**	**99.4**	**100.7**	**94.3**	**101.7**	**97.9**	**98.5**	**105.4**	**98.1**

Note: Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.

Table D10: Age-standardised YLL rates, by disease group and state or territory, 2018

Disease group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Blood/metabolic	1.3	1.0	1.3	1.0	1.0	1.5	1.0	1.7	1.2
Cancer	28.1	26.8	29.3	27.2	30.0	29.6	25.3	39.2	28.1
Cardiovascular	16.1	16.0	17.1	15.7	16.7	20.1	16.2	29.7	16.4
Endocrine	2.0	1.4	2.0	2.0	2.0	2.8	1.5	4.5	1.9
Gastrointestinal	3.5	3.1	3.7	3.5	3.9	3.7	4.1	5.2	3.5
Hearing/vision	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Infant/congenital	3.5	3.5	4.2	3.3	4.3	4.2	3.9	7.2	3.7
Infections	2.0	2.0	2.0	2.7	2.2	2.3	1.7	3.7	2.1
Injuries	12.2	12.1	15.8	17.4	13.8	15.9	12.9	29.6	13.8
Kidney/urinary	1.2	1.2	1.3	1.5	1.1	1.3	1.1	7.3	1.3
Mental/substance use	0.5	0.3	0.4	0.4	0.6	0.3	0.3	1.1	0.4
Musculoskeletal	0.7	0.6	0.6	0.5	0.7	0.7	1.1	1.0	0.6
Neurological	6.0	5.7	6.2	5.7	6.6	6.8	6.2	9.0	6.0
Oral	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reproductive/maternal	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Respiratory	4.5	3.9	4.8	3.6	4.5	5.3	4.1	9.9	4.4
Skin	0.2	0.2	0.3	0.2	0.2	0.3	0.1	0.5	0.2
All diseases	**81.9**	**77.8**	**88.8**	**84.7**	**87.9**	**94.9**	**79.4**	**149.4**	**83.7**

Note: Rates were age-standardised to the 2001 Australian Standard Population and expressed per 1,000 population.

Table D11: Age-standardised YLD rates, by disease group and remoteness, 2018

Disease group	Major cities	Inner regional	Outer regional	Remote and very remote	Australia	Rate ratio	Rate difference
Blood/metabolic	1.0	1.0	1.0	1.2	1.0	1.2	0.2
Cancer	2.4	2.3	2.4	2.7	2.3	1.1	0.3
Cardiovascular	5.0	5.5	6.0	8.4	5.2	1.7	3.4
Endocrine	2.9	2.7	3.7	4.6	3.0	1.6	1.6
Gastrointestinal	2.4	2.4	2.4	2.5	2.4	1.0	0.0
Hearing/vision	3.6	4.0	4.1	5.6	3.7	1.6	2.1
Infant/congenital	0.8	1.0	1.0	1.9	0.8	2.5	1.1
Infections	1.1	1.3	1.4	2.7	1.2	2.4	1.6
Injuries	2.6	3.2	3.7	5.6	2.8	2.2	3.1
Kidney/urinary	0.9	0.9	1.0	1.8	0.9	1.9	0.8
Mental/substance use	26.2	24.2	21.9	24.8	25.5	0.9	−1.4
Musculoskeletal	22.5	27.1	23.9	18.4	23.3	0.8	−4.1
Neurological	7.1	8.7	7.9	6.1	7.3	0.9	−1.0
Oral	4.1	5.2	5.8	6.5	4.5	1.6	2.4
Reproductive/maternal	2.0	2.5	2.1	2.0	2.1	1.0	0.0
Respiratory	8.5	9.2	8.9	10.3	8.6	1.2	1.8
Skin	3.3	3.4	3.1	3.8	3.3	1.2	0.5
All diseases	**96.5**	**104.7**	**100.3**	**108.8**	**98.1**	**1.1**	**12.3**

Notes

1. Rate ratios calculated as *Remote and very remote*rate divided by *Major cities* rate.
2. Rate differences calculated as *Remote and very remote*rate minus *Major cities* rate.
3. Rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 1,000 population.

Table D12: Age-standardised YLL rates, by disease group and remoteness, 2018

Disease group	Major cities	Inner regional	Outer regional	Remote and very remote	Australia	Rate ratio	Rate difference
Blood/metabolic	1.1	1.3	1.7	2.3	1.2	2.2	1.3
Cancer	26.4	31.4	32.2	34.5	28.1	1.3	8.1
Cardiovascular	15.2	18.3	19.7	29.6	16.4	1.9	14.3
Endocrine	1.7	2.1	2.4	4.0	1.9	2.4	2.3
Gastrointestinal	3.3	3.8	4.2	6.1	3.5	1.9	2.8
Hearing/vision	0.0	0.0	0.0	0.0	0.0	—	—
Infant/congenital	3.6	3.8	4.5	4.8	3.7	1.3	1.2
Infections	1.9	2.2	2.8	4.4	2.1	2.3	2.5
Injuries	11.9	17.9	20.6	29.0	13.8	2.4	17.1
Kidney/urinary	1.2	1.2	1.6	4.1	1.3	3.4	2.9
Mental/substance use	0.4	0.5	0.5	0.5	0.4	1.3	0.1
Musculoskeletal	0.6	0.7	0.7	1.3	0.6	2.1	0.7
Neurological	6.0	6.2	5.8	6.5	6.0	1.1	0.5
Oral	0.0	0.0	0.0	0.0	0.0	—	—
Reproductive/maternal	0.0	0.1	0.0	0.1	0.0	2.3	0.1
Respiratory	3.7	5.5	6.1	7.7	4.4	2.1	4.0
Skin	0.2	0.3	0.2	0.4	0.2	1.7	0.2
All diseases	**77.2**	**95.3**	**103.3**	**135.2**	**83.7**	**1.8**	**58.0**

Notes

1. Rate ratios calculated as *Remote and very remote* rate divided by *Major cities* rate.
2. Rate differences calculated as *Remote and very remote* rate minus *Major cities* rate.
3. Rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 1,000 population.

Table D13: Age-standardised YLD rates, by disease group and socioeconomic group, 2018

Disease group	1 Lowest	2	3	4	5 Highest	Australia	Rate ratio	Rate difference
Blood/metabolic	1.1	0.9	1.2	0.9	1.0	1.0	1.1	0.1
Cancer	2.3	2.3	2.3	2.4	2.5	2.3	0.9	−0.2
Cardiovascular	6.2	5.5	5.3	4.8	4.4	5.2	1.4	1.9
Endocrine	4.0	3.3	2.5	2.8	2.1	3.0	1.9	1.9
Gastrointestinal	2.5	2.4	2.4	2.4	2.4	2.4	1.0	0.1
Hearing/vision	4.4	3.5	3.7	3.7	3.3	3.7	1.4	1.2
Infant/congenital	0.9	0.9	0.8	0.8	0.8	0.8	1.2	0.2
Infections	1.5	1.3	1.2	1.1	1.0	1.2	1.5	0.5
Injuries	3.2	3.0	2.8	2.6	2.5	2.8	1.3	0.8
Kidney/urinary	1.1	0.9	1.0	0.9	0.8	0.9	1.4	0.3
Mental/substance use	27.1	28.6	27.7	24.6	19.9	25.5	1.4	7.2
Musculoskeletal	28.2	24.7	21.5	23.6	18.6	23.3	1.5	9.6
Neurological	7.9	8.4	7.2	6.9	6.6	7.3	1.2	1.3
Oral	5.1	5.5	4.5	3.6	3.5	4.5	1.4	1.6
Reproductive/maternal	2.1	2.1	2.1	2.1	2.0	2.1	1.0	0.1
Respiratory	10.1	8.9	8.9	8.4	7.2	8.6	1.4	2.8
Skin	3.2	3.3	3.1	3.5	3.3	3.3	1.0	−0.1
All diseases	**111.1**	**105.5**	**98.2**	**95.1**	**82.0**	**98.1**	**1.4**	**29.1**

Notes

1. Rate ratios calculated as group 1 rate divided by group 5 rate.
2. Rate differences calculated as group 1 rate minus group 5 rate.
3. Rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 1,000 population.

Table D14: Age-standardised YLL rates, by disease group and socioeconomic group, 2018

Disease group	1 Lowest	2	3	4	5 Highest	Australia	Rate ratio	Rate difference
Blood/metabolic	1.7	1.3	1.1	1.0	0.8	1.2	2.1	0.9
Cancer	34.3	31.1	27.4	25.4	21.9	28.1	1.6	12.4
Cardiovascular	22.7	18.3	15.8	13.9	11.6	16.4	2.0	11.2
Endocrine	3.2	2.2	1.7	1.5	0.9	1.9	3.4	2.2
Gastrointestinal	5.2	4.1	3.3	2.7	2.2	3.5	2.4	3.0
Hearing/vision	0.0	0.0	0.0	0.0	0.0	0.0	—	—
Infant/congenital	4.9	3.9	3.8	3.4	2.7	3.7	1.8	2.2
Infections	2.8	2.4	1.9	1.7	1.6	2.1	1.8	1.3
Injuries	19.3	16.1	14.0	11.3	9.0	13.8	2.2	10.3
Kidney/urinary	2.0	1.4	1.2	1.0	0.8	1.3	2.4	1.2
Mental/substance use	0.7	0.5	0.4	0.4	0.2	0.4	3.1	0.4
Musculoskeletal	1.0	0.7	0.6	0.5	0.5	0.6	2.0	0.5
Neurological	6.7	6.4	6.0	5.6	5.3	6.0	1.3	1.4
Oral	0.0	0.0	0.0	0.0	0.0	0.0	—	—
Reproductive/maternal	0.1	0.1	0.0	0.0	0.0	0.0	8.1	0.1
Respiratory	6.7	5.1	4.1	3.3	2.4	4.4	2.8	4.3
Skin	0.3	0.3	0.2	0.2	0.2	0.2	2.1	0.2
All diseases	**111.6**	**93.8**	**81.4**	**71.9**	**60.1**	**83.7**	**1.9**	**51.5**

Notes

1. Rate ratios calculated as group 1 rate divided by group 5 rate.
2. Rate differences calculated as group 1 rate minus group 5 rate.
3. Rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 1,000 population.

Table D15: Sensitivity analyses of YLD estimates for injuries using GBD and alternative disability weights, 2018

Injury	Disability weight (GBD 2013)	Alternative disability weight[(a)]	ABDS 2018 YLD	Alternative YLD	Rate ratio (Alternative:GBD)
Abdominal/pelvic injuries	0.369	0.133	235.6	84.7	0.4
Airways burn	0.376	0.119	5.8	1.8	0.3
All other injuries	0.006	0.083	15.3	211.2	13.8
Burn (non-airway) - minor	0.141	0.139	331.5	325.7	1.0
Burn (non-airway) - severe	0.314	0.301	272.7	261.7	1.0
Dislocation - hip	0.016	0.159	4.9	49.0	10.0
Dislocation - knee	0.113	0.102	189.2	170.6	0.9
Dislocation - shoulder joint	0.062	0.135	317.5	692.3	2.2
Dislocation - shoulder other	0.006	0.065	19.5	210.3	10.8
Dislocations - other	0.008	0.025	105.8	325.9	3.1
Fracture - ankle	0.050	0.107	699.4	1,498.2	2.1
Fracture - clavicle or scapula	0.035	0.051	300.3	441.6	1.5
Fracture - face bone	0.067	0.044	598.8	392.2	0.7
Fracture - foot bone	0.026	0.019	325.3	240.6	0.7
Fracture - hand bone	0.010	0.016	374.6	602.8	1.6
Fracture - humerus	0.035	0.075	250.5	533.4	2.1
Fracture - neck of femur	0.258	0.279	1,338.4	1,447.1	1.1
Fracture - other	0.279	0.159	0.1	0.0	0.0
Fracture - patella	0.050	0.126	129.7	327.7	2.5
Fracture - pelvis	0.279	0.171	612.3	375.0	0.6
Fracture - pelvis (coccyx)	0.006	0.067	2.8	31.3	11.2
Fracture - radius or ulna	0.028	0.020	612.3	441.4	0.7
Fracture - sternum / ribs	0.103	0.140	278.3	377.8	1.4
Fracture - tibia or fibula	0.050	0.124	823.3	2,047.1	2.5
Fracture - vertebral column	0.111	0.145	581.0	756.5	1.3
Injured nerves ST	0.100	0.100	418.6	417.9	1.0
Open wound	0.006	0.075	370.2	4,651.1	12.6
SCI at neck - complete severe	0.589	0.333	7.1	4.0	0.6
SCIbelow neck - complete severe	0.296	0.373	6.7	8.4	1.3
Severe chest injury	0.369	0.134	1,407.1	509.7	0.4
Soft tissue injuries	0.008	0.017	1,246.6	2,577.3	2.1
Superficial injuries	0.006	0.078	193.6	2,525.0	13.0
TBI skull fracture	0.071	0.123	63.7	110.3	1.7
TBI ST minor	0.110	0.107	573.1	557.8	1.0
TBI ST moderate-severe	0.214	0.129	271.0	163.2	0.6
Total[(b)]	**0.032**	**0.054**	**15,487.4**	**25,875.7**	**1.7**

ST = short term; SCI = spinal cord injury; TBI = traumatic brain injury.

(a) Source: Gabbe et al, 2016.

(b) Includes estimates where GBD 2013 Disability weights were used when alternate disability weights were not available.

Table D16: Sensitivity analyses of YLD estimates for vision disorders using GBD and alternative disability weights, 2018

Disease	Severity level	Disability weight (GBD 2013)	Alternative disability weight (WHO 2013)	ABDS 2018 YLD (GBD)	Alternative YLD (WHO)	Rate ratio (WHO:GBD)
Glaucoma	Distance vision: mild impairment	0.003	0.005	45.5	75.8	1.7
	Distance vision: moderate impairment	0.031	0.089	425.2	1,220.7	2.9
	Distance vision: severe impairment	0.184	0.314	1,358.1	2,317.6	1.7
	Distance vision blindness	0.187	0.338	830.1	1,500.4	1.8
Refractive errors	Distance vision: mild impairment	0.003	0.005	844.3	1,407.2	1.7
	Distance vision: moderate impairment	0.031	0.089	2,632.7	7,558.3	2.9
	Distance vision: severe impairment	0.184	0.314	4,273.8	7,293.3	1.7
Age-related macular degeneration	Distance vision: mild impairment	0.003	0.005	61.1	101.8	1.7
	Distance vision: moderate impairment	0.031	0.089	1,053.1	3,023.3	2.9
	Distance vision: severe impairment	0.184	0.314	3,050.0	5,204.9	1.7
	Distance vision blindness	0.187	0.338	4,614.5	8,340.6	1.8
Cataracts and other lens disorders	Distance vision: mild impairment	0.003	0.005	252.8	421.4	1.7
	Distance vision: moderate impairment	0.031	0.089	472.4	1,356.2	2.9
	Distance vision: severe impairment	0.184	0.314	824.9	1,407.7	1.7
	Distance vision blindness	0.187	0.338	2,849.6	5,150.6	1.8
Other vision disorders	Near vision impairment	0.011	0.047	384.7	1,643.8	4.3
	Distance vision: moderate impairment	0.031	0.089	1,099.6	3,156.8	2.9
	Distance vision blindness	0.187	0.338	1,878.3	3,395.0	1.8

Note: YLDs do not apply the comorbidity adjustment.

Sources: GBD 2013 Collaborators 2015; WHO 2013.

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Appendix E: List of expert advisors

This list includes experts consulted for ABDS 2018 only. Methodological advice received from Expert Advisory Group members and other experts for ABDS 2011 and 2015, and development work undertaken by former ABDS staff is gratefully acknowledged. Please see ABDS 2015 (AIHW 2019) for a full list of expert advisors for previous Studies.

Table E1: Disease-specific contributors

Expert (group or person)	Organisation
Blood and metabolic disorders	
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Prof. Amanda Lee	School of Public Health and Social Work and School of Exercise and Nutrition Science, Queensland University of Technology
Dr Simon McRae	Comprehensive Haemophilia Care, Royal Adelaide Hospital/ The Queen Elizabeth Hospital
Dr John Rowell	Queensland Haemophilia Centre, Royal Brisbane and Women's Hospital
Dr Rasa Ruseckaite	Australian Cystic Fibrosis Data Registry, Monash University
Cancer and other neoplasms	
Cancer Data and Monitoring Unit	AIHW
Ms Melissa Goodwin	Consultant
Cardiovascular diseases	
Cardiovascular, Diabetes & Kidney Unit	AIHW
Dr Judith Katzenellenbogen	University of Western Australia
Dr Lee Nedkoff	University of Western Australia
Endocrine disorders	
Cardiovascular, Diabetes and Kidney Unit	AIHW
Assoc. Prof. Wendy Davis	University of Western Australia
Hearing and vision disorders	
Dr Joshua Forman	Research Fellow at the Department of Ophthalmology, Melbourne Medical School at the University of Melbourne
Prof. Hugh Taylor	Melbourne School of Population and Global Health, The University of Melbourne
Infant and congenital conditions	
Maternal and Perinatal Health Unit	AIHW
Infectious diseases	
Office of Health Protection	Department of Health
Dr Richard Gray	The Kirby Institute, University of New South Wales
Mr Jonathan King	The Kirby Institute, University of New South Wales
Dr Skye McGregor	The Kirby Institute, University of New South Wales

continued

Table E1 (continued): Disease-specific contributors

Expert (group or person)	Organisation
Injuries	
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Prof. Belinda Gabbe	School of Public Health and Preventive Medicine, Monash University
Kidney and urinary diseases	
Cardiovascular, Diabetes and Kidney Unit	AIHW
Chronic Kidney Disease Expert Advisory Group	AIHW advisory group
Mental health conditions and substance use disorders	
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Prof. Louisa Degenhardt	National Drug and Alcohol Research Centre
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Population Health Unit	AIHW
Chronic conditions Unit	AIHW
National Centre for Monitoring Arthritis and Other Musculoskeletal Conditions Advisory Group	AIHW advisory group
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Dementia Unit	AIHW
Dementia Working Group	AIHW advisory group
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Prof. Christian Gericke	School of Clinical Medicine, University of Queensland
Prof. Graeme Jackson	Senior Deputy Director, Florey Institute of Neuroscience and Mental Health
Prof. George Mellick	School of Environment and Science, Griffith University
Reproductive and maternal conditions	
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Prof. Tim Driscoll	Sydney School of Public Health, University of Sydney
Prof. Guy Marks	Woolcock Institute of Medical Research, University of Sydney
Ms Leanne Poulos	Woolcock Institute of Medical Research, University of Sydney

Table E2: Mortality contributors

Expert	Organisation
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Ms Lauren Moran	ABS

Table E3: Risk-specific contributors

Expert (group or person)	Organisation
Cardiovascular, Diabetes and Kidney Unit	AIHW
Family, Domestic and Sexual Violence Unit	AIHW
Population Health Unit	AIHW
Tobacco, Alcohol and Other Drugs Unit	AIHW
Maternal and Perinatal Health Unit	AIHW
Chronic Kidney Disease Expert Advisory Group	AIHW advisory group
Mr Paul Atyeo	ABS
Prof. Emily Banks	Australian National University
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Assoc. Prof. Ben Edwards	ANU Centre for Social Research & Methods Australian National University
Assoc. Prof. John Goss	University of Canberra
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Assoc. Prof. Luke Knibbs	University of Queensland
Prof. Amanda Lee	School of Public Health and Social Work and School of Exercise and Nutrition Science, Queensland University of Technology
Prof. Dorothy Mackerras	Food Standards Australia and New Zealand
Prof. George Patton	Centre for Adolescent Health, Royal Children's Hospital
Assoc. Prof. Gavin Pereira	Curtin University
Dr Rosemary Stanton	Nutritionist consultant

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A full list of contributors to disease and risk factor work is provided in Appendix E. Input from all of these individuals and organisations was much appreciated.

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Abbreviations

ABDS	Australian Burden of Disease Study
ABS	Australian Bureau of Statistics
ACOD	associated cause of death
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
ASR	age-standardised rate
COPD	chronic obstructive pulmonary disease
DALY	disability-adjusted life years
DW	disability weight
FH	full health
GBD	Global Burden of Disease Study
HALE	health-adjusted life expectancy
HIV/AIDS	human immunodeficiency virus/acquired immune deficiency syndrome
ICD	International Statistical Classification of Diseases and Related Health Problems
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th revision
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th revision, Australian modification
IHME	Institute for Health Metrics and Evaluation
IPV	intimate partner violence
LE	life expectancy
LBW	low birthweight
METeOR	Metadata Online Registry
MCOD	multiple causes of death
NIHSI AA	National Health Services Information Analysis Asset
NSW	New South Wales
NT	Northern Territory
OECD	Organisation for Economic Co-operation and Development
PAF	population attributable fraction

PEAN	Physical Environment Analysis Network
PYLL	potential years of life lost
Qld	Queensland
RR	relative risk
RTI	road traffic injuries
SA	South Australia
SIDS	sudden infant death syndrome
Tas	Tasmania
TMRED	theoretical minimum risk exposure distribution
UCOD	underlying cause of death
Vic	Victoria
WA	Western Australia
WHO	World Health Organization
YLD	years lived with disability
YLL	years of life lost

Symbols

>	greater than
<	less than
—	nil or rounded to zero
. .	not applicable

Glossary

additional diagnosis: A condition or complaint either coexisting with the principal diagnosis or arising during the episode of admitted patient care, episode of residential care or attendance at a health care establishment. METeOR identifier: 514271.

admitted patient: A patient who undergoes a hospital's admission process to receive treatment and/or care. This treatment and/or care is provided over a period of time and can occur in hospital and/or in the person's home (for hospital-in-the-home patients). METeOR identifier: 268957.

age-standardisation: A set of techniques used to remove, as far as possible, the effects of differences in age when comparing 2 or more populations.

age-standardised rate: A rate that takes into account the age structure of the population.

attributable burden: The disease burden attributed to a particular risk factor. It is the reduction in fatal and non-fatal burden that would have occurred if exposure to the risk factor had been avoided (or more precisely had been at its theoretical minimum).

avoidable burden: The reduction in future burden that would occur if current and/or future exposure to a particular risk factor were avoided. Compare with **attributable burden** .

burden of disease (and injury): The quantified impact of a disease or injury on a population, using the disability-adjusted life year (**DALY**) measure. Referred to as the 'burden' of the disease or injury in this report.

chronic: A term meaning persistent and long-lasting.

chronic condition: A health condition that is persistent and long lasting.

comorbidity: The existence of more than 1 disease or injury in an individual at the same time.

condition (health condition): A broad term that can be applied to any health problem, including symptoms, diseases and certain risk factors, such as high blood cholesterol and obesity. Often used synonymously with disorder or problem.

disability-adjusted life years (DALY): Measure (in years) of healthy life lost, either through premature death, defined as dying before the expected life span at the age of death (**YLL**), or, equivalently, through living with ill health due to illness or injury (**YLD**). It is often used synonymously with 'health loss'.

disability: In burden of disease analysis, any departure from an ideal health state.

disability weight: A factor that reflects the severity of health loss from a particular health state on a scale from 0 (perfect health) to 1 (equivalent to death).

disease: A broad term that can be applied to any health problem, including symptoms, diseases, injuries and certain risk factors, such as high blood cholesterol and obesity. Often used synonymously with illness, condition, disorder or problem.

excess burden: The reduction that would occur in overall disease burden if all groups had the same rate of burden as the least burdened group.

external cause: The environmental event, circumstance or condition as the cause of injury, poisoning and other adverse effect. METeOR identifier: 514295.

fatal burden: The burden from dying 'prematurely' as measured by years of life lost. Often used synonymously with **YLL**, and also referred to as 'life lost'.

health-adjusted life expectancy (HALE): The number of healthy years a person of a particular age can expect to live.

health burden/health loss: The total number of healthy years lost from living with disease/injury (**YLD**) and the total number of years lost from dying early from disease/injury (**YLL**). It is often used synonymously with **DALY**.

health state: Consequences of diseases and conditions reflecting key differences in symptoms and functioning.

hospitalisation: Synonymous with admission and separation; that is, an episode of hospital care that starts with the formal admission process and ends with the formal separation process.

incidence: The number of new cases (of an illness or injury) occurring during a given period.

International Classification of Diseases (ICD): The World Health Organization's internationally accepted classification of diseases and related health conditions. The 10th revision, Australian modification (ICD-10-AM) is currently in use in Australian hospitals for admitted patients.

life expectancy: The number of years a person of a particular age can expect to live.

linked disease: A disease or condition on the causal pathway of the risk factor, which is therefore more likely to develop if exposed to the risk.

morbidity: Ill health in an individual, and levels of ill health in a population or group.

mortality: Death.

non-admitted patient: A patient who does not undergo a hospital's formal admission process. There are 3 categories of non-admitted patient: emergency department patient, outpatient, and other non-admitted patient (treated by hospital employees off the hospital site—includes community/outreach services). METeOR identifier: 268973.

non-fatal burden: The burden from living with ill health as measured by years lived with disability. Often used synonymously with **YLD**.

population attributable fraction (PAF): The proportion (fraction) of a disease, illness, disability or death in a population that can be attributed to a particular risk factor or combination of risk factors.

premature mortality: Deaths that occur at a younger age than a selected cut-off.

prevalence: The number of cases of a disease or injury in a population at a given time.

principal diagnosis: The diagnosis established after study to be chiefly responsible for occasioning an episode of admitted patient care, an episode of residential care or an attendance at the health care establishment. METeOR identifier: 514273.

rate: One number (the numerator) divided by another number (the denominator). The numerator is commonly the number of events in a specified time. The denominator is the population 'at risk' of the event. Rates (crude, age-specific and age standardised) are generally multiplied by a number such as 100,000 to create whole numbers.

reference life table: A table that corresponds to the maximum life expectancy for an individual in good health.

relative risk (RR): The risk of an event relative to exposure, calculated as the ratio of the probability of the event's occurring in the exposed group to the probability of its occurring in the non-exposed group. A relative risk of 1 implies no difference in risk; RR <1 implies the event is less likely to occur in the exposed group; RR >1 implies the event is more likely to occur in the exposed group.

risk factor: Any factor that represents a greater risk of a health condition or health event. For example, smoking, alcohol use, high body mass.

sequela: Consequence of diseases; often used in the plural, **sequelae**.

theoretical minimum risk exposure distribution (TMRED): The distribution of exposure to a risk factor that would have the lowest associated population risk.

years lived with disability (YLD): A measure of the years of what could have been a healthy life but were instead spent in states of less than full health. YLD represent **non-fatal burden**.

years of life lost (YLL): Years of life lost due to premature death, defined as dying before the global ideal life span at the age of death. YLL represent **fatal burden**.

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Australian Government
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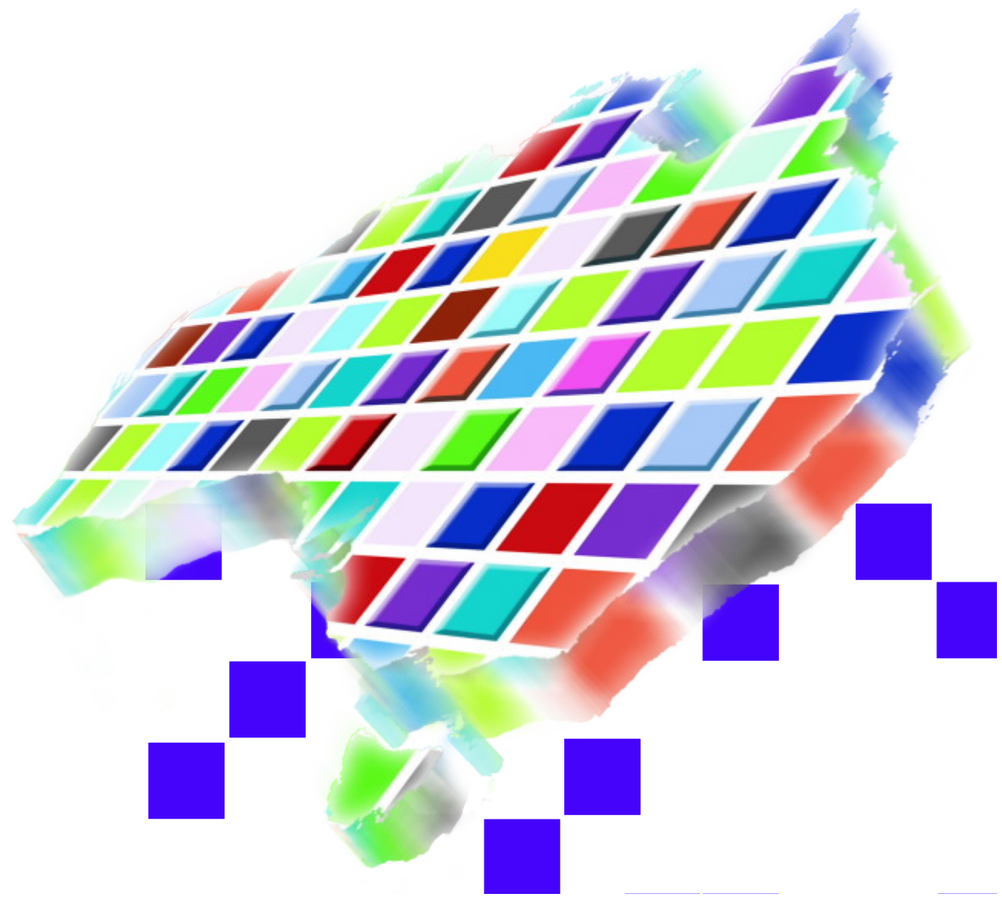
Australian Burden of Disease Study

Impact and causes of illness and death in Australia

2018



This report analyses the impact of 219 diseases and injuries in terms of living with illness (non-fatal burden) and premature death (fatal burden). The study found that:

- **chronic diseases such as cancer, musculoskeletal conditions, cardiovascular diseases, and mental & substance use disorders contributed the most burden in Australia in 2018**
- **38% of the burden could have been avoided or reduced, being due to modifiable risk factors such as tobacco use and overweight (including obesity).**

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