

# Australian Burden of Disease Study 2023

Web report | Last updated: 14 Dec 2023 | Topic: [Burden of disease](#) | [Media release](#)

## About

Every year in Australia, millions of years of healthy life are lost because of injury, illness or premature deaths. This loss of healthy life is called the 'burden of disease'. Information on burden of disease and injuries is important for monitoring population health and provides an evidence base to inform health policy and service planning.

The Australian Burden of Disease Study 2023 includes national estimates for 220 diseases and injuries in 2023 based on projections using historical trends in data.

Cat. no: BOD 39

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### Findings from this report:

- [In 2023, cancers as a group caused the most burden \(17%\), followed by mental health & substance use disorders \(15%\)](#)
  - [The age-standardised rate of total disease burden decreased by 11% between 2003 and 2023](#)
  - [Burden due to anxiety disorders increased by 33% between 2003 and 2023](#)
  - [Coronary heart disease, dementia, back pain, anxiety disorders and COPD were the top 5 diseases causing burden in 2023](#)
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## Summary

**Burden of disease** is an [Australia's health](#) topic

- [International health data comparisons](#) | 07 Jul 2022
- [Indigenous health and wellbeing](#) | 07 Jul 2022
- [Life expectancy and causes of death](#) | 11 Jul 2023

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Burden of disease measures the impact of diseases and injuries on a population. It combines the years of healthy life lost due to living with ill health (non-fatal burden) with the years of life lost due to dying prematurely (fatal burden). The Australian Burden of Disease Study (ABDS) 2023 includes estimates of disease burden due to 220 diseases and injuries in Australia in 2023.

This report presents findings from the ABDS 2023, with estimates for previous years (2003, 2011, 2015, 2018) for comparison.

### About the ABDS 2023

In the ABDS 2022, for the first time disease burden estimates were projected to the publication year (2022) and included estimates of disease burden due to COVID-19. The ABDS 2023 builds on that Study by refining methods for estimating burden in the year of analysis (2023). The ABDS 2023 also makes use of more recently available data, such as the National Survey of Mental Health and Wellbeing 2020-21.

Burden from COVID-19 was estimated using the most recent data available at the time of analysis, with assumptions made about the period without full data. Given the dynamic and ongoing nature of the COVID-19 pandemic, these estimates may be revised in the future as more data become available for the latter part of 2023.

ABDS 2023 includes a section on the National Preventive Health Strategy 2021-30 burden of disease targets and a new data visualisation on health-adjusted life expectancy (HALE).

For more information on methods used in the Study, refer to the [Technical notes](#).

### What is burden of disease?

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Burden of disease analysis is a way of measuring the impact of diseases and injuries on a population (in this report, the population of Australia). It is the difference between a population's actual health and its ideal health, where ideal health is living to old age in good health (without disease or disability).

Burden of disease is measured using the summary metric of disability-adjusted life years (DALY, also known as the total burden). One DALY is one year of healthy life lost to disease and injury. DALY caused by living in poor health (non-fatal burden) are the 'years lived with disability' (YLD). DALY caused by premature death (fatal burden) are the 'years of life lost' (YLL) and are measured against an ideal life expectancy. DALY allows the impact of premature deaths and living with health impacts from disease or injury to be compared and reported in a consistent manner.

If a disease has a high number of DALY, it is considered to have a high burden on the population. Some diseases have high fatal burden due to the number of premature deaths they cause (for example, cancers) or they cause death at younger ages, while others have high non-fatal burden due to the number of people living with the condition and/or the severity of the illness (for example, musculoskeletal conditions).

Burden estimates can be reported for diseases or injuries, which describe a specific health problem (for example, dementia). Reporting can also be for a disease group (for example, neurological conditions), which consists of a number of related diseases. There are 220 separate diseases and injuries, and 17 disease groups in the ABDS.

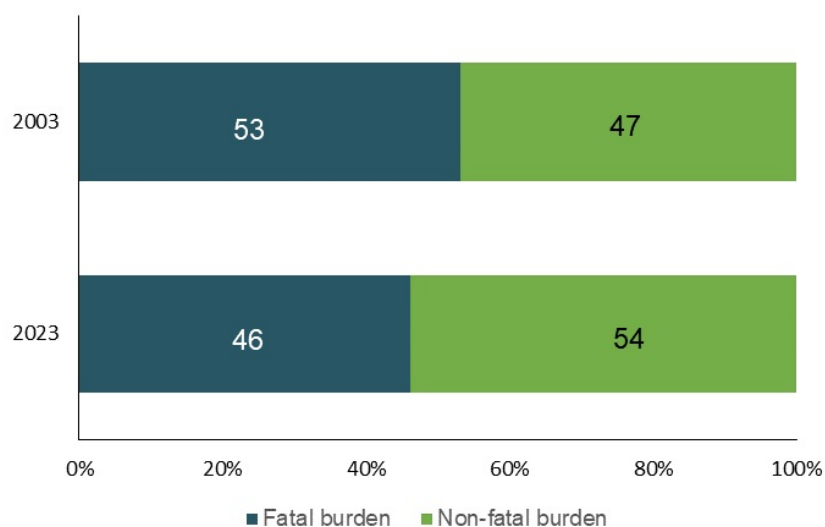
## Living with illness or injury accounts for just over half the burden

In 2023, Australians lost 5.6 million years of healthy life (total burden, DALY) due to:



Living with illness or injury caused more disease burden than dying prematurely. Between 2003 and 2023, there has been a moderate shift from fatal burden to non-fatal burden being the biggest contributor to total burden (Figure 1.1). This is mostly driven by fewer premature deaths in recent years.

**Figure 1.1: Proportion (%) of total burden due to fatal and non-fatal burden in 2003 and 2023**



Source: AIHW Australian Burden of Disease Database.

To further explore the contribution of fatal and non-fatal burden over time, refer to the interactive data visualisations: [Burden of disease in Australia](#) and [Fatal vs. non-fatal burden](#).

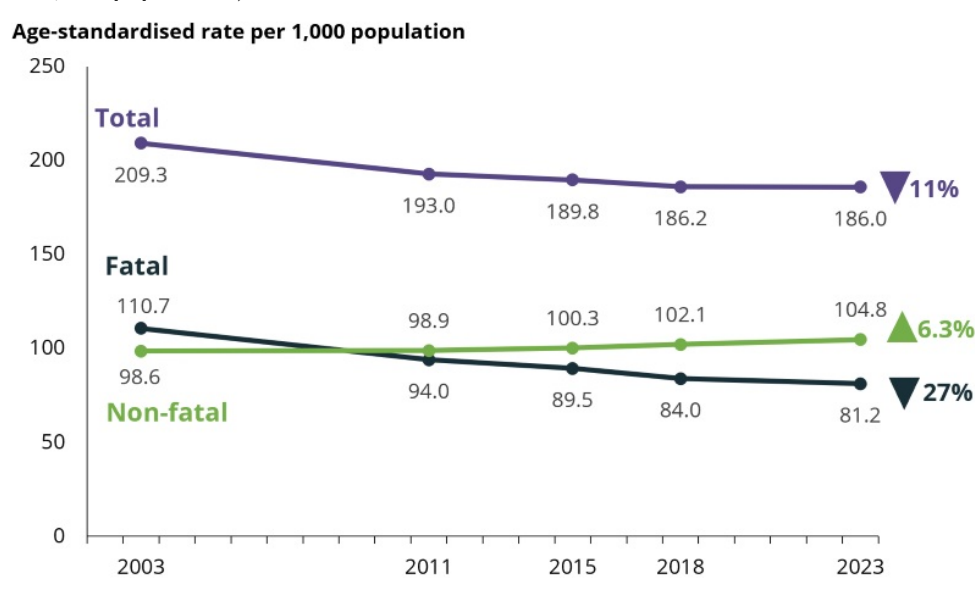
### Long-term improvements in fatal burden but recent increases in non-fatal burden

Over the 20-year period from 2003 to 2023, the rate of total disease burden (the crude rate) was relatively similar (212 DALY per 1,000 population in 2003 compared with 213 DALY per 1,000 population in 2023). Underlying this was a 13% decrease in the rate of fatal burden while the rate of non-fatal burden increased by 15% over that period.

After adjusting for population ageing, there was an 11% decline in the age-standardised rate of total burden between 2003 and 2023 (Figure 1.2). This was driven by a 27% decrease in the rate of fatal burden, as the non-fatal burden rate increased by 6.3%.

Note that when compared with 2018, age-standardised rates for 2023 were higher for non-fatal, lower for fatal burden and similar for total burden. Impacts due to the COVID-19 pandemic may have caused or affected the burden due to other causes, including impacts due to restrictions and lockdowns. Therefore, simply subtracting the disease burden due to COVID-19 from the total burden does not necessarily reflect the true disease burden experienced had the COVID-19 pandemic not occurred.

Figure 1.2: Change in the age-standardised total burden (DALY), fatal burden (YLL) and non-fatal burden (YLD) rate (per 1,000 population) between 2003 and 2023



Source: AIHW Australian Burden of Disease Database.

### Chronic diseases cause most of the burden

In 2023, the 5 disease groups causing the most burden were cancer, mental health conditions & substance use disorders, musculoskeletal conditions, cardiovascular diseases and neurological conditions (Table 1.1).

Together these disease groups accounted for around two-thirds (64%) of the total burden. These disease groups include mostly chronic, or long-lasting, conditions.

Table 1.1: Summary of 5 leading disease groups causing burden in 2023

	Cancer	Mental health & substance use	Musculoskeletal	Cardiovascular	Neurological
% of total DALY	17	15	13	12	8
% of total DALY that was fatal	91	2	3	74	49
Change in age-standardised rates between 2003 and 2023 <sup>(a)</sup>	Decreased	Increased	Decreased	Decreased	Increased

(a) Based on the rate difference; that is, the absolute difference between the age-standardised rate of burden from 2003 to 2023.

Source: AIHW Australian Burden of Disease Database.

See the [Fatal vs. non-fatal burden](#) interactive data visualisation to explore the contribution of fatal and non-fatal burden to total burden by disease group or by specific disease or injury.

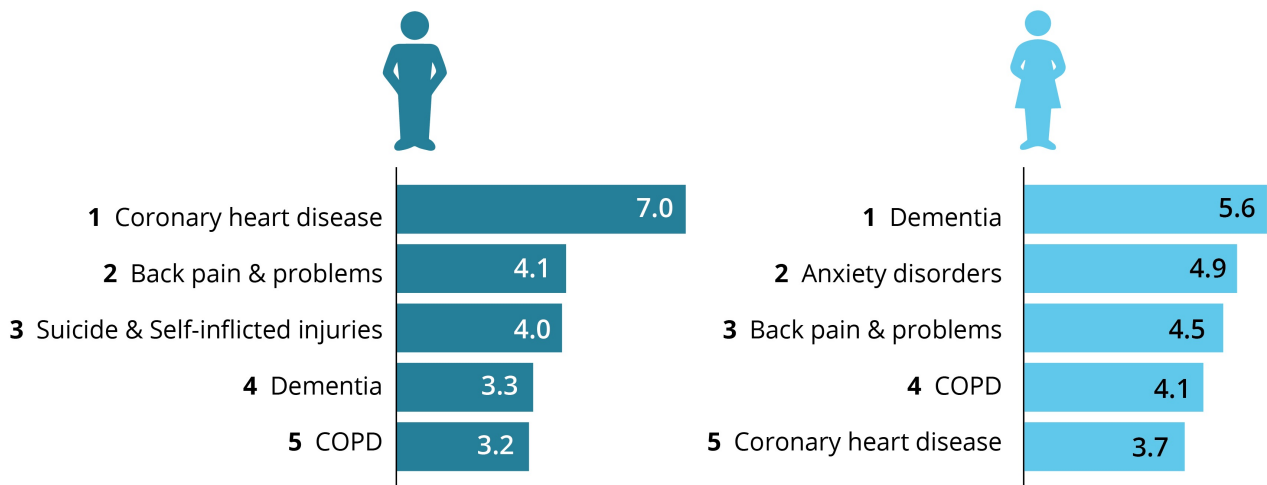
### Males and females experience disease burden differently

Overall and for most age groups, males experienced more total burden than females. This was driven by males having higher rates of fatal burden.

In 2023, the leading causes of total burden among males were coronary heart disease, back pain & problems and suicide & self-inflicted injuries (Figure 1.3). Among females, the leading cause was dementia, followed by anxiety disorders and back pain & problems.

Males experienced 3 times the amount of burden due to suicide & self-inflicted injuries and 2 times the amount of burden from coronary heart disease than females. Females experienced more burden than males from dementia and anxiety disorders.

Figure 1.3: Leading causes of total burden by sex and proportion (%) of total burden, 2023



Source: AIHW Australian Burden of Disease Database.

### Changes in leading specific causes of disease burden over time

Between 2003 and 2023, the crude rate of total burden:

- decreased for coronary heart disease, stroke, lung, bowel and breast cancer and rheumatoid arthritis.
- substantially increased for dementia, and its rank increased from the 12th leading cause of total burden in 2003 to the 2nd leading cause in 2023. However, this increase is partly due to changes in practices of coding deaths due to dementia (refer to [Comparisons over time](#) and [Technical notes](#)).
- increased for back pain & problems, anxiety disorders, chronic obstructive pulmonary disease (COPD), depressive disorders, osteoarthritis, asthma and type 2 diabetes.

### Diseases that caused the most burden over the life course

Australians experience health loss from different diseases and injuries at various stages of life. Respiratory diseases caused burden throughout the life course, especially in children and the elderly. Mental health conditions & substance use disorders dominated the first half of the life course, while musculoskeletal conditions, cardiovascular diseases and cancer feature more prominently in the latter part of the life course. Neurological conditions (namely dementia) are a leading cause of burden in older Australians (aged 65 and over).

For more information, explore the interactive data visualisation for [Leading causes of disease burden](#).

### COVID-19 burden

COVID-19 ranked 30th among the specific diseases causing burden in 2023, accounting for 0.9% of total burden and 1.5% of all fatal burden. The burden from COVID-19 was predominantly fatal (83%).

### Australians living longer but little change in the proportion of life spent in full health

Australians are, on average, living longer and spending more years in full health (meaning no disease or injury). Years lived in full health is also referred to as the health-adjusted life expectancy (HALE).

Males and females born in 2023 could expect to live an average of 88% and 87% of their lives in full health respectively (71.6 years of the 81.3 years of average life expectancy for males and 73.6 years of the 85.1 years of average life expectancy for females).

However, years lived in ill health are also increasing, resulting in little change in the proportion of life spent in full health between 2003 and 2023.

### National Preventive Health Strategy 2021-30: burden of disease targets

The National Preventive Health Strategy 2021-30 (the 'Strategy') outlines the long-term approach to prevention in Australia. The Strategy aims to address the wider determinants of health, promote health equity and decrease the overall burden of disease through a whole-of-systems approach to prevention (Department of Health 2021).

There are 6 burden of disease specific targets in the Strategy and data from the ABDS 2023 can be used to monitor 3 of the 6 targets.

Table 1.2 shows how the burden of disease measures in 2023 compare with the baseline measures (the year 2018) for each reportable target. Between 2018 and 2023, there has been little change in the proportion of the first 25 years and 0-4 years lived in full health (ranging between 91 and 92%). There has also been little change in the average number of years lived in full health (approximately 72 years for males and 74 years for females).

Table 1.2: Selected aims & burden of disease targets in the National Preventive Health Strategy 2021-30: number and proportion (%) of years lived in full health and the percentage point change between 2018 and 2023

Aim	Target	Sex	2018 (baseline)	2023 estimate	Comparison to 2018
All Australians have the best start in life	The proportion of the first 25 years lived in full health will increase by at least 2 percentage points by 2030	Persons	92.1% of first 25 years were lived in full health	91.6% of first 25 years were lived in full health	-0.5 <sup>(a)</sup>
All Australians have the best start in life	The proportion of the first 0-4 years of life lived in full health will increase by at least 3.5 percentage points by 2030	Persons	92.0% of first 5 years were lived in full health	91.4% of first 5 years were lived in full health	-0.6 <sup>(a)</sup>
All Australians live in good health and wellbeing for as long as possible	Australians have at least an additional 2 years of life lived in full health by 2030	Males	71.5 years lived in full health	71.6 years lived in full health	0.1 years
		Females	74.0 years lived in full health	73.6 years lived in full health	-0.4 years

(a) This is the difference in the proportion of the first 25 or 5 years lived in full health between 2023 and the baseline (2018).

Source: AIHW Australian Burden of Disease Database.

Estimates for 2023 are projections so progress against the targets may change as 2023 data becomes available. COVID-19's impacts on burden and the health of the Australian population may affect progress against these targets.

## Where do I go for more information?

### ABDS 2018 - interactive data visualisations

For more information on the burden of disease in Australia, see the following interactive data visualisations from ABDS 2018:

- [State and territory estimates](#)
- [Remoteness areas](#)
- [Socioeconomic groups](#)
- [Risk factor burden](#)
- [Disease burden among Aboriginal and Torres Strait Islander people](#)
- [Risk factor burden among Aboriginal and Torres Strait Islander people.](#)

### Other reports

- [Australian Burden of Disease Study: Methods and supplementary material 2018](#)
- [Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2018](#)

## References

Department of Health (2021) *National Preventive Health Strategy 2021-30*, Department of Health, accessed 17 August 2022.



## Key findings

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- [Living with illness or injury accounts for just over half the burden](#)
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This report presents findings from the ABDS 2023, with estimates for previous years (2003, 2011, 2015, 2018) for comparison. To explore burden of disease estimates with various disaggregations in more detail refer to the [Interactive data visualisations](#) and the downloadable [Data tables](#).

For the latest subnational burden of disease estimates, refer to the ABDS 2018 interactive data visualisations by [State and territory](#), [Remoteness areas](#) and [Socioeconomic groups](#). For the latest estimates of disease burden due to risk factors, refer to the ABDS 2018 Interactive data on risk factor burden.

### About the ABDS 2023

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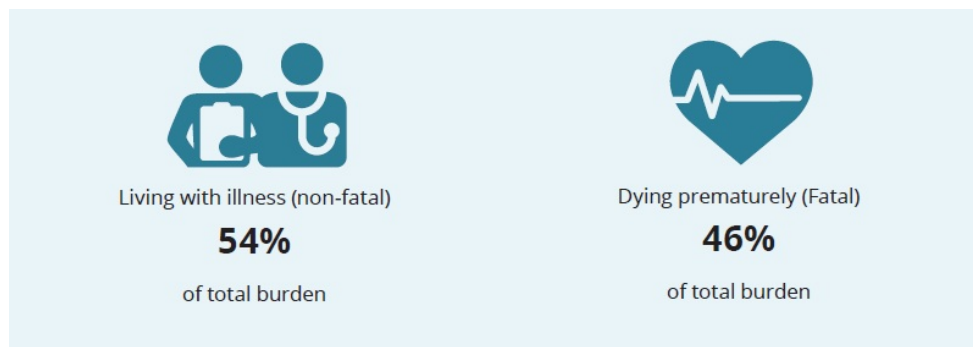
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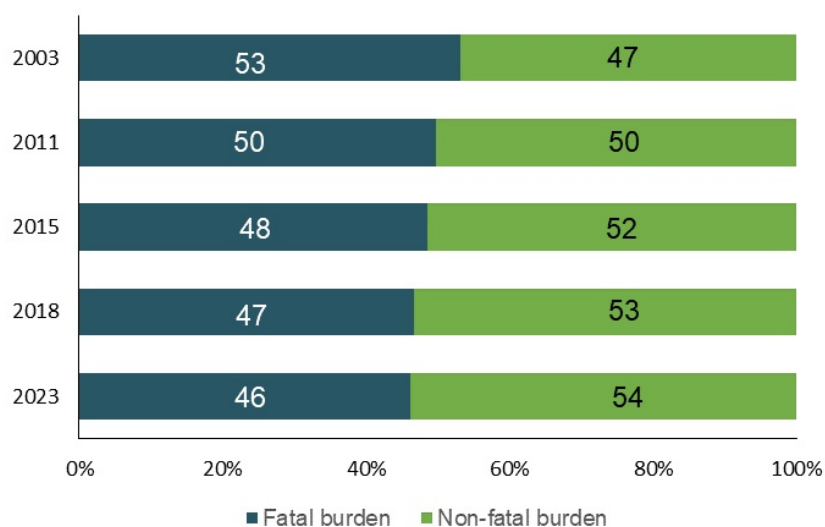
## Living with illness or injury accounts for just over half the burden

In 2023, Australians lost 5.6 million years of healthy life (total burden, DALY) due to:



Living with illness or injury caused more disease burden than dying prematurely. Between 2003 and 2023, there has been a moderate shift from fatal burden to non-fatal burden being the biggest contributor to total burden (Figure 2.1). This is mostly driven by fewer premature deaths in recent years.

Figure 2.1: Proportion (%) of total burden due to fatal and non-fatal burden between 2003 and 2023



Source: AIHW Australian Burden of Disease Database.

To further explore the contribution of fatal and non-fatal burden over time, refer to the interactive data visualisations: [Burden of disease in Australia](#) and [Fatal vs. non-fatal burden](#).

## Long-term improvements in fatal burden but recent increases in non-fatal burden

Over the 20-year period from 2003 to 2023, the rate of total disease burden (the crude rate) was relatively similar (212 DALY per 1,000 population in 2003 compared with 213 DALY per 1,000 population in 2023). Underlying this was a 13% decrease in the rate of fatal burden while the rate of non-fatal burden increased by 15% over that period.

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Note that when compared with 2018, age-standardised rates for 2023 were higher for non-fatal, lower for fatal burden and similar for total burden. Impacts due to the COVID-19 pandemic may have caused or affected the burden due to other causes, including impacts due to restrictions and lockdowns. Therefore, simply subtracting the disease burden due to COVID-19 from the total burden does not necessarily reflect the true disease burden experienced had the COVID-19 pandemic not occurred.

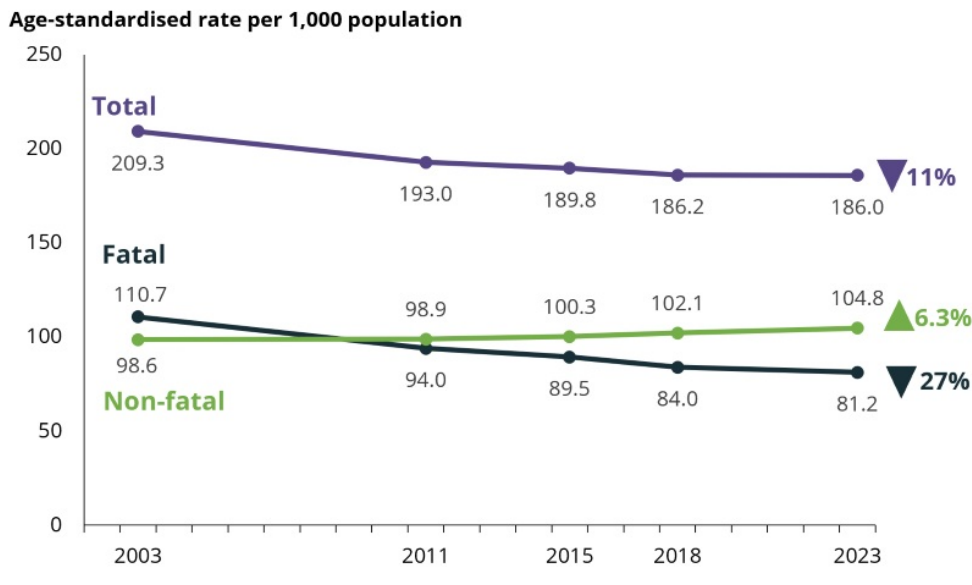
### Interpreting crude and age-standardised rates

Crude rates show the actual rate of disease burden in each year, whereas age-standardised rates show the rate of burden if the population age structure did not change over time. Given that Australia's population is ageing, and the incidence of most chronic diseases increases with age, presenting both crude and age-standardised rates is important to determine whether or not changes in disease burden are largely a result of an ageing population. However, it is important to understand the crude rates to understand the impact on society and on the health system.



To further explore changes over time, refer to the interactive data visualisation: [Comparisons over time](#).

Figure 2.2: Change in the age-standardised total burden (DALY), fatal burden (YLL) and non-fatal burden (YLD) rate (per 1,000 population) between 2003 and 2023



Source: AIHW Australian Burden of Disease Database.

### Chronic diseases cause most of the burden

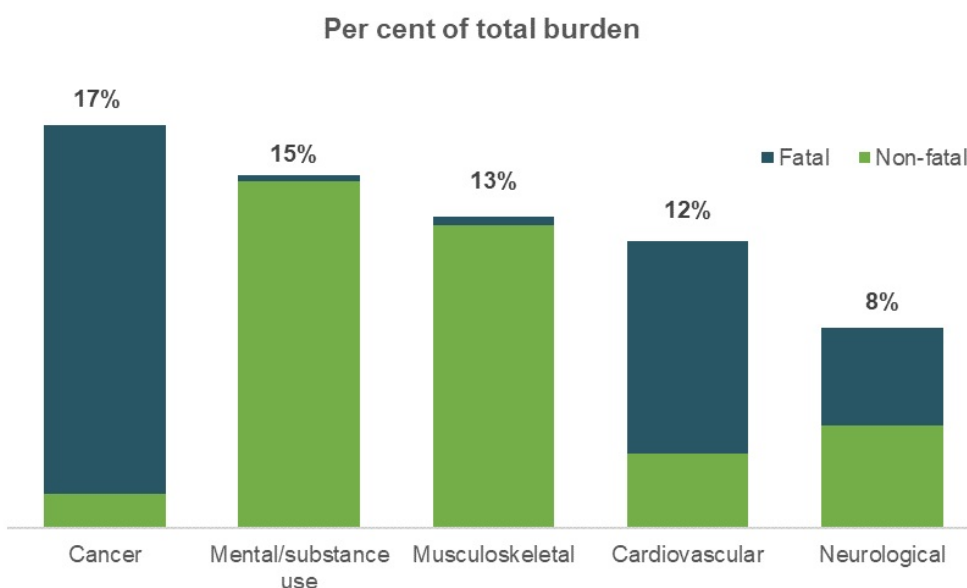
In 2023, the 5 disease groups causing the most burden were cancer, mental health conditions & substance use disorders, musculoskeletal conditions, cardiovascular diseases and neurological conditions (Figure 2.3).

Together these disease groups accounted for around two-thirds (64%) of the total burden. These disease groups include mostly chronic, or long-lasting, conditions.

Cancer as a disease group contributed the most burden across all years of the Study. With the release of the National Survey of Mental Health and Wellbeing 2020-21, burden estimates for depressive disorders, anxiety disorders, bipolar affective disorder and alcohol use disorder were updated for all reference years since the previous ABDS. This, together with improvements to the main data source used to estimate autism spectrum disorders, help us better understand the change in burden due to mental health conditions over time. In 2023, mental health conditions & substance use disorders increased in rank to second place, which was different to the previous ABDS. For more detail on these changes, refer to the [Technical notes](#).

The contribution of fatal and non-fatal burden to the total burden varies by disease and injury. To explore the contribution of fatal and non-fatal burden to total burden by disease group or by specific disease or injury, refer to the interactive data visualisation: [Fatal vs non-fatal burden](#).

Figure 2.3: Proportion (%) of total burden, and fatal and non-fatal composition of total burden, for the leading 5 disease groups in 2023



Source: AIHW Australian Burden of Disease Database.

## Coronary heart disease is the leading specific cause of burden

When considering individual diseases, coronary heart disease was the leading cause of burden for every reference year in the Study. However, the burden from coronary heart disease showed the largest absolute reduction over time and was mainly driven by large declines in fatal burden.

The leading 5 diseases that caused burden (% of total DALY) in 2023:

1. coronary heart disease (5.4%)
2. dementia (4.4%)
3. back pain & problems (4.3%)
4. anxiety disorders (3.9%)
5. chronic obstructive pulmonary disease (COPD) (3.6%).

To explore burden for individual diseases and changes in disease burden over time, refer to the interactive data visualisation: [Disease/injury-specific summary](#).

## COVID-19 burden in 2023

COVID-19 is a disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It is a highly infectious disease and has a wide spectrum of severity.

The total burden from COVID-19 was 48,400 DALY (1.8 DALY per 1,000 population) in 2023. Consequently, 0.9% of all health loss was estimated as being due to the direct effects of COVID-19. It ranked 30th among the specific diseases in 2023. The burden from COVID-19 was predominantly fatal (83%) and was higher in males. The burden was highest in those aged 75-84 years.

Post-COVID-19 condition (also known as 'long COVID') contributed around half (50%) of the non-fatal COVID-19 burden or around 9% of the total burden due to COVID-19.

COVID-19 was the 18th leading cause of fatal burden (contributing 1.5%) and 49th leading cause of non-fatal burden (contributing 0.3% in 2023).

### Note on COVID-19 burden in 2023

Estimates of the disease burden due to COVID-19 in 2023 were based on information and data available at the time of analysis. This included data on deaths, cases and hospitalisations up until August 2023. Assumptions were made on the number and severity of COVID-19 cases, the number of cases who developed long COVID and the number of cases and deaths due to COVID-19 in the latter half of 2023 (including that there are no notable changes due to a new variant).

Additionally, estimates of burden due to COVID-19 were considerably lower in 2023 than what was estimated for 2022 in the previous study. However, the estimates are not strictly comparable due to changes in the data sources and methods used. For more information on how disease burden due to COVID-19 was estimated, refer to the [Technical notes](#).

Given the dynamic and ongoing nature of the pandemic, estimates presented here may be updated in the future when more data for each component (including data on burden due to permanent functional impairment - see [Technical notes](#)) of the COVID-19 model become available, and more is learnt about the disease and its impact on the population.

## Males and females experience disease burden differently

Overall and for most age groups, males experienced more total burden than females. This was driven by males having higher rates of fatal burden.

In 2023, males experienced 1.1 times the rate of total burden and 1.4 times the rate of fatal burden of females (223 and 202 DALY per 1,000 population and 116 and 81 YLL per 1,000 population, respectively), however, females experienced 1.1 times the rate of non-fatal burden of males (121 and 108 YLD per 1,000 population, respectively). After adjusting for different age structures, males experienced 1.2 times the rate of total burden and 1.6 times the rate of fatal burden of females while females experienced 1.1 times the rate of non-fatal burden of males.

Males experienced 1.3 times the rate of total burden due to cancer experienced by females (40 DALY and 31 DALY per 1,000 population, respectively). Males also experienced over 2 times the rate of total burden due to injuries (24 and 11 DALY per 1,000 population, respectively) and 1.5 times the rate of total burden due to cardiovascular diseases (30 and 20 DALY per 1,000 population, respectively) experienced by females. Females experienced 1.3 times the total burden due to musculoskeletal and neurological conditions (31 and 20 DALY per 1,000 population, respectively) experienced by males (24 and 15 DALY per 1,000 population respectively).

In 2023, the leading specific causes of total burden among males were coronary heart disease, back pain & problems and suicide & self-inflicted injuries. Among females, the leading specific cause was dementia, followed by anxiety disorders and back pain & problems.

Males experienced 3 times the amount of burden due to suicide & self-inflicted injuries and 2 times the amount of burden from coronary heart disease than females. Females experienced more burden than males from dementia, anxiety disorders and osteoarthritis.

## **Diseases that caused the most burden over the life course**

Australians experience health loss from different diseases and injuries at various stages of life. Respiratory diseases caused burden throughout the life course, especially in children and the elderly. Mental health conditions & substance use disorders dominated the first half of the life course, while musculoskeletal conditions, cardiovascular diseases and cancer feature more prominently in the latter part of the life course. Neurological conditions (namely dementia) are a leading cause of burden in older Australians (age 65 and over).

Leading causes of burden over the life course can be different for females and males (Figure 2.4).

### **Infants and children aged under 5**

Infant & congenital conditions as a group caused the most burden. Pre-term & low birthweight (lbw) complications, birth trauma & asphyxia, cardiovascular defects, sudden infant death syndrome (SIDS) and asthma were the leading 5 specific causes of burden.

### **Children aged 5-14**

Mental health conditions and respiratory diseases contributed the most burden.

Among girls, asthma was the leading specific cause of burden, followed by anxiety disorders. Among boys, autism spectrum disorders was the leading specific cause of burden followed by asthma. Depressive disorders and conduct disorder were also among the 5 leading causes of burden.

### **People aged 15-24**

Mental health conditions & substance use disorders, and injuries contributed the most burden.

Anxiety disorders was the leading specific cause of burden in females. Suicide & self-inflicted injuries was the leading specific cause of burden in males.

Suicide & self-inflicted injuries and autism spectrum disorders were among the leading 5 causes of burden in males but not females. Eating disorders and bipolar affective disorder were among the leading 5 causes of burden in females but not males.

### **People aged 25-44**

Mental health conditions & substance use disorders, musculoskeletal conditions and injuries contributed the most burden.

Anxiety disorders, back pain & problems and depressive disorders were among the leading 5 specific causes of burden for both men and women in this age group. Suicide & self-inflicted injuries and poisoning were in the top 5 causes of burden for men, whereas asthma and eating disorders were among the top 5 causes for women.

### **People aged 45-64**

Musculoskeletal conditions caused the most burden among this age group.

Back pain & problems was the leading specific cause of burden in women and coronary heart disease was the leading specific cause of burden in men.

For women, osteoarthritis, breast cancer, anxiety disorders and rheumatoid arthritis were among the leading 5 specific causes of burden. For men, back pain & problems, suicide & self-inflicted injuries, lung cancer and chronic liver disease were among the leading 5 specific causes of burden.

### **People aged 65-84**

Coronary heart disease, dementia, COPD and lung cancer were all among the leading specific causes of burden in men and women. Osteoarthritis was among the 5 leading causes of burden for women while type 2 diabetes mellitus was among the 5 leading causes for men.

### **People aged 85 and over**

Dementia was the leading cause of burden in both men and women followed by coronary heart disease, COPD and stroke. Falls was among the 5 leading causes of burden for women while prostate cancer was among the 5 leading causes for men.

**Figure 2.4: Leading causes of total burden (DALY '000; proportion %), by sex and age group, 2023**

		Age group (years)							
		Under 5	5–14	15–24	25–44	45–64	65–84	85+	
Females	1st	Pre-term/lbw complications (8.3; 14.5%)	Asthma (7.2; 11.1%)	Anxiety disorders (28.7; 16.8%)	Anxiety disorders (54.8; 11.5%)	Backpain and problems (43.5; 6.6%)	Dementia (68.0; 7.4%)	Dementia (76.3; 22.0%)	
	2nd	Birth trauma/asphyxia (5.8; 10.1%)	Anxiety disorders (6.8; 10.4%)	Depressive disorders (20.1; 11.8%)	Backpain and problems (36.9; 7.7%)	Osteoarthritis (34.9; 5.3%)	COPD (67.9; 7.4%)	Coronary heart disease (35.1; 10.1%)	
	3rd	Cardiovascular defects (3.5; 6.2%)	Depressive disorders (5.3; 8.2%)	Eating disorders (12.2; 7.2%)	Depressive disorders (36.3; 7.6%)	Breast cancer (32.2; 4.9%)	Coronary heart disease (46.7; 5.1%)	COPD (21.4; 6.2%)	
	4th	SIDS (3.3; 5.9%)	Autism spectrum disorders (4.2; 6.5%)	Bipolar affective disorder (10.2; 5.9%)	Asthma (22.5; 4.7%)	Anxiety disorders (31.0; 4.7%)	Osteoarthritis (44.0; 4.8%)	Stroke (20.3; 5.8%)	
	5th	Asthma (1.7; 3.0%)	Conduct disorder (3.1; 4.8%)	Asthma (8.8; 5.1%)	Eating disorders (21.0; 4.4%)	Rheumatoid arthritis (25.6; 3.9%)	Lung cancer (39.4; 4.3%)	Falls (14.0; 4.0%)	
		Infant/congenital	Respiratory	Mental/substance use	Musculoskeletal	Cancer	Neurological	Cardiovascular	Injuries

		Age group (years)									
		Under 5	5–14	15–24	25–44	45–64	65–84	85+			
Males	1st	Pre-term/lbw complications (11.6; 15.6%)	Autism spectrum disorders (13.6; 15.9%)	Suicide/self-inflicted injuries (22.6; 12.4%)	Suicide/self-inflicted injuries (55.1; 10.5%)	Coronary heart disease (58.6; 7.7%)	Coronary heart disease (102.3; 9.7%)	Dementia (36.5; 14.1%)			
	2nd	Birth trauma/asphyxia (9.0; 12.1%)	Asthma (11.0; 12.8%)	Anxiety disorders (19.0; 10.5%)	Backpain and problems (35.9; 6.8%)	Backpain and problems (44.3; 5.8%)	COPD (62.3; 5.9%)	Coronary heart disease (34.9; 13.5%)			
	3rd	Cardiovascular defects (4.3; 5.8%)	Anxiety disorders (7.8; 9.0%)	Depressive disorders (12.2; 6.7%)	Anxiety disorders (34.0; 6.5%)	Suicide/self-inflicted injuries (30.2; 4.0%)	Dementia (55.3; 5.3%)	COPD (15.0; 5.8%)			
	4th	SIDS (3.6; 4.8%)	Conduct disorder (5.1; 6.0%)	Autism spectrum disorders (8.9; 4.9%)	Depressive disorders (30.1; 5.7%)	Lung cancer (28.9; 3.8%)	Lung cancer (53.7; 5.1%)	Stroke (13.2; 5.1%)			
	5th	Asthma (2.6; 3.5%)	Depressive disorders (4.6; 5.3%)	Asthma (8.6; 4.7%)	Poisoning (28.1; 5.3%)	Chronic liver disease (26.1; 3.4%)	Type 2 diabetes (40.5; 3.9%)	Prostate cancer (11.3; 4.4%)			
		Infant/congenital	Respiratory	Mental/substance use	Injuries	Musculoskeletal	Cardiovascular	Cancer	Gastrointestinal	Neurological	Endocrine

Source: AIHW Australian Burden of Disease Database.

For more information on the leading causes of total, fatal and non-fatal burden in Australia by sex and age and to explore how this has changed over time, refer to the interactive data visualisation: [Leading causes of disease burden](#).

### Changes in leading specific causes of disease burden over time

Over time, the leading individual causes of disease burden in Australia have changed (Figure 2.5). Between 2003 and 2023, the crude rate of total burden:

- decreased for coronary heart disease, stroke, lung, bowel and breast cancer and rheumatoid arthritis
- substantially increased for dementia, and its rank increased from the 12th leading cause of total burden in 2003 to the 2nd leading cause in 2023. However, this increase is partly due to changes in practices of coding deaths due to dementia (refer to [Comparisons over time](#) and [Technical notes](#))
- increased for back pain & problems, anxiety disorders, COPD, depressive disorders, osteoarthritis, asthma and type 2 diabetes.

Coronary heart disease and stroke were the leading causes of fatal burden in 2003, however, premature deaths from these causes have decreased over time. Back pain & problems was the leading cause of non-fatal burden in 2023.

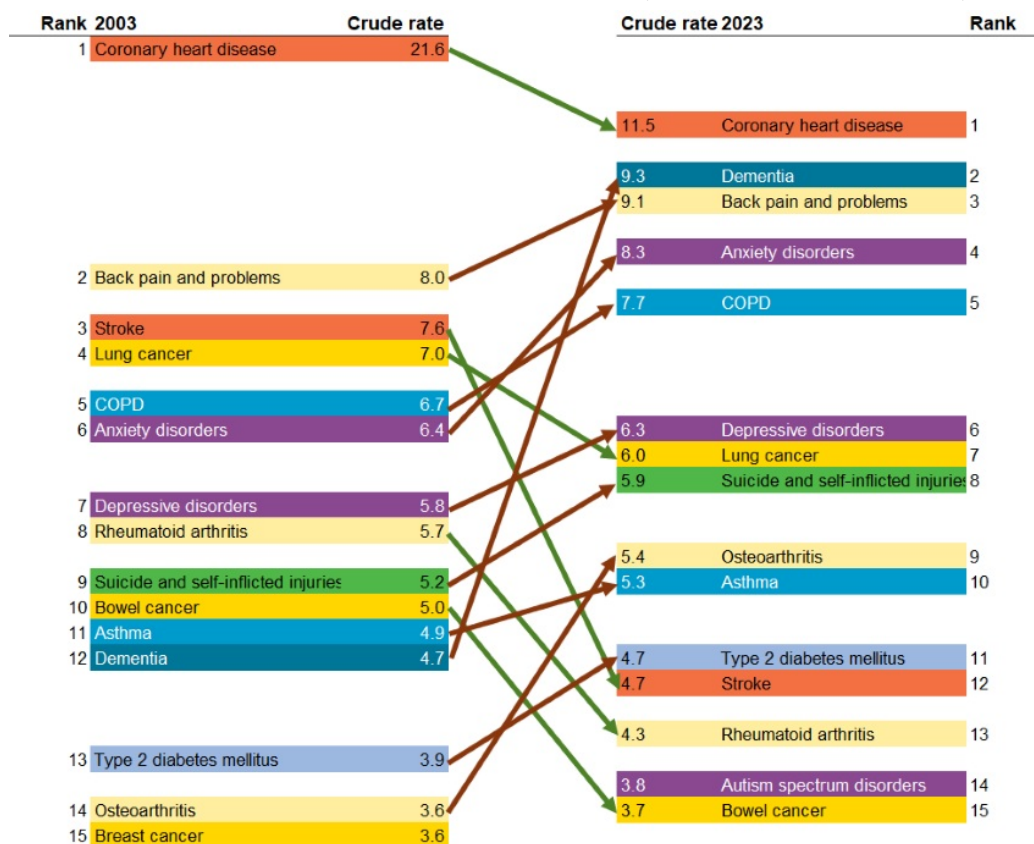
Age-standardised rates show the rate of burden if the population age structure did not change over time, which can indicate whether changes in disease burden are largely a result of an ageing population. This is important, as the rate of many of the leading causes of disease burden in Australia increase with age.

There were differences in the leading causes of total burden and therefore their ranking when looking at age-standardised burden rates compared with crude burden rates. The rankings of age-related conditions (such as dementia, COPD, some cancers and osteoarthritis) were often lower in more recent years when ranking by age-standardised rates compared with crude rates. This indicates that an ageing

population is one of the factors that influence changes to Australia's leading causes of disease burden. Other factors include (but are not limited to) population growth and changes in the amount of disease or injury. For more information on the drivers of change in disease burden over time refer to the [ABDS 2018 Interactive data on disease burden](#).

To explore changes in the leading causes of disease burden over time (by number and age-standardised rate) for 2023 compared with each of the previous years (2003, 2011, 2015 and 2018) refer to the interactive data visualisation: [Leading causes of disease burden](#).

Figure 2.5: Change in disease ranking by total burden (DALY per 1,000 population), 2003 and 2023.



Notes:

1. Diseases are presented in descending order, from highest to lowest DALY per 1,000 population, with arrows indicating either an increase (orange) or decrease (green) in total burden crude rate 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.
4. Since the ABDS 2018, the Intellectual Disability Exploring Answers (IDEA) data has been linked to the National Disability Insurance Scheme (NDIS), resulting in higher ascertainment of individuals with autism spectrum disorders. Estimates for 2018 were revised to allow comparisons with 2023 estimates, however, estimates for 2023 are not comparable to estimates for 2015 and earlier due to the addition of a new ascertainment source to the IDEA.

Source: AIHW Australian Burden of Disease Database.

### Australians living longer but little change in the proportion of life spent in full health

Australians are, on average, living longer and spending more years in full health (meaning no disease or injury). Years lived in full health is also referred to as the health-adjusted life expectancy (HALE). However, years lived in ill health are also increasing, resulting in little change in the proportion of life spent in full health.

#### 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 (Gruenberg 1977).

#### 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. However, as diseases become 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.

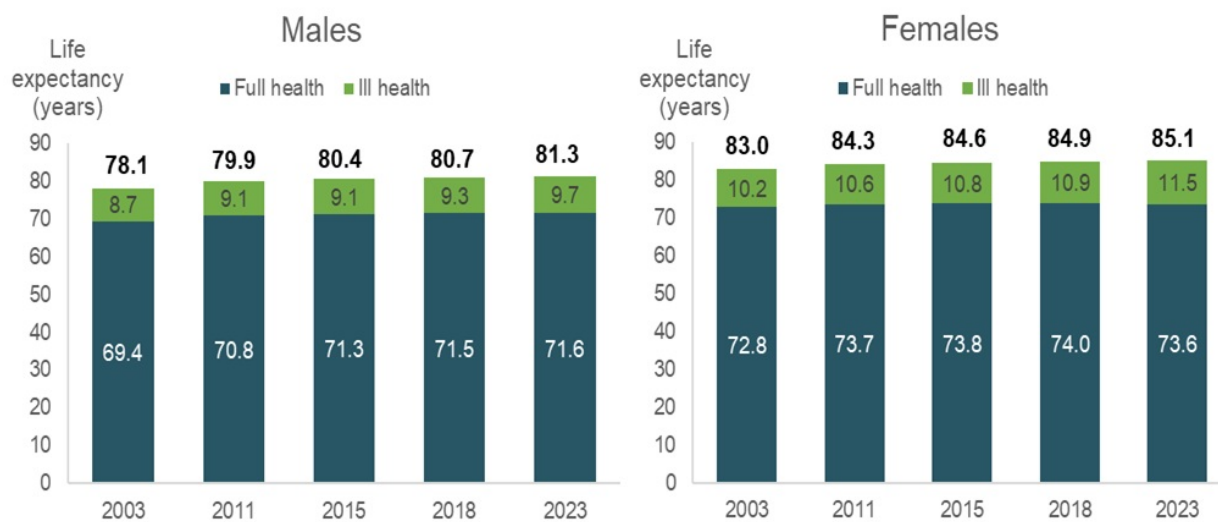
Findings from HALE analysis suggest a scenario of equilibrium between 2003 and 2023.

Males and females born in 2023 could expect to live an average of 88% and 87% of their lives in full health respectively (71.6 years of the 81.3 years of average life expectancy for males and 73.6 years of the 85.1 years of average life expectancy for females).

Between 2003 and 2023, the average proportion of life spent in full health changed little for both males (from 89% to 88%) and females (from 88% to 87%). Over this period, males gained 3.2 years in life expectancy and 2.2 years in HALE (Figure 2.6). The corresponding gains for females were 2.1 years in life expectancy and 0.8 years in HALE. Despite these gains in life expectancy and healthy years (which were greater for males than females), the average time spent in ill health increased by 1.0 years for males and 1.3 years for females.

These changes are illustrated in Figure 2.6, showing the split in life expectancy that is average number of healthy years (HALE) and average years in ill health. The results suggest that, at the national level, gains in healthy years at birth are largely comparable with gains in life expectancy at birth. It suggests an equilibrium of morbidity in Australia over this period.

**Figure 2.6: Life expectancy at birth as years lived in full health (HALE) and years lived in ill health, by sex, between 2003 and 2023**



Note: For more information on HALE and the life expectancies used, refer to [Technical notes](#).

Source: ABS provisional mortality 2023 customised data, AIHW Australian Burden of Disease Database.

Changes over time in HALE and life expectancy at age 65 followed a similar pattern as at birth. Life expectancy and HALE at age 65 increased between 2003 and 2023 by 2.5 and 1.9 years, respectively, for males and by 1.5 and 1.0 years, respectively, for females.

For more detailed data on the proportion of life spent in full health by age and how this has changed over time, refer to the interactive data visualisation: [Health-adjusted life expectancy](#).

### National Preventive Health Strategy 2021-30: burden of disease targets

The National Preventive Health Strategy 2021-30 (the 'Strategy') outlines the long-term approach to prevention in Australia. The Strategy aims to address the wider determinants of health, promote health equity and decrease the overall burden of disease through a whole-of-systems approach to prevention (Department of Health 2021).

To assess progress over the 10-year period, the Strategy outlines several targets to achieve by the year 2030. There are 6 burden of disease specific targets in the Strategy and data from the Australian Burden of Disease Study 2023 can be used to monitor 3 of the 6 targets:

- the proportion of the first 25 years lived in full health will increase by at least 2 percentage points by 2030
- the proportion of the first 0-4 years of life lived in full health will increase by at least 3.5 percentage points by 2030
- Australians have at least an additional 2 years of life lived in full health by 2030.

Estimates for the remaining 3 indicators involve analysis at subnational level, which was not in the scope of the current report (however, these will be reported in the next major ABDS study and First Nations study). These targets are:

- Australians in the 2 lowest socioeconomic groups will have at least an additional 3 years of life lived in full health by 2030
- Australians in regional and remote areas will have at least an additional 3 years of life lived in full health by 2030

- Aboriginal and Torres Strait Islander (First Nations) people will have at least an additional 3 years of life lived in full health by 2030.

For estimates of burden of disease by population group, refer to the *Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018* and the *Australian Burden of Disease Study: impact and causes of illness and death in Aboriginal and Torres Strait Islander people 2018*.

### Australia’s current performance against the targets

Table 2.1 shows how the burden of disease measures in 2023 compare with the baseline measures (the year 2018) for each reportable target. Between 2018 and 2023, there has been little change in the proportion of the first 25 years and 0-4 years lived in full health (ranging between 91 and 92%). There has also been little change in the average number of years lived in full health (approximately 72 years for males and 74 years for females).

Table 2.1: Selected aims and burden of disease targets in the National Preventive Health Strategy 2021-30: number and proportion (%) of years lived in full health and the percentage point change between 2018 and 2023

Aim	Target	Sex	2018 (baseline)	2023 estimate	Comparison to 2018
All Australians have the best start in life	The proportion of the first 25 years lived in full health will increase by at least 2 percentage points by 2030	Persons	92.1% of first 25 years were lived in full health	91.6% of first 25 years were lived in full health	-0.5 <sup>(a)</sup>
All Australians have the best start in life	The proportion of the first 0-4 years of life lived in full health will increase by at least 3.5 percentage points by 2030	Persons	92.0% of first 5 years were lived in full health	91.4% of first 5 years were lived in full health	-0.6 <sup>(a)</sup>
All Australians live in good health and wellbeing for as long as possible	Australians have at least an additional 2 years of life lived in full health by 2030	Males	71.5 years lived in full health	71.6 years lived in full health	0.1 years
		Females	74.0 years lived in full health	73.6 years lived in full health	-0.4 years

(a) This is the difference in the proportion of the first 25 or 5 years lived in full health between 2023 and the baseline (2018).

Source: AIHW Australian Burden of Disease Database.

Estimates for 2023 are projections so progress against the targets may change as 2023 data becomes available. COVID-19’s impacts on burden and the health of the Australian population may affect progress against these targets.

### Where do I go for more information?

#### ABDS 2018 - interactive data visualisations

For more information on the burden of disease in Australia, see the following interactive data visualisations from ABDS 2018:

- [State and territory estimates](#)
- [Remoteness areas](#)
- [Socioeconomic groups](#)
- [Risk factor burden](#)
- [Disease burden among Aboriginal and Torres Strait Islander people](#)
- [Risk factor burden among Aboriginal and Torres Strait Islander people.](#)

#### Other reports

- [Australian Burden of Disease Study: Methods and supplementary material 2018](#)
- [Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2018](#)

### References

Department of Health (2021) *National Preventive Health Strategy 2021-30*, Department of Health, accessed 17 August 2022.

Fries JF (1980) ‘Aging, natural death, and the compression of morbidity’, *The New England Journal of Medicine* 303(3): 130-5.

Gruenberg EM (1977) ‘The failures of success’, *The Milbank Quarterly* 55(1):3-24.

Howse K (2006) *Increasing life expectancy and the compression of morbidity: a critical review of the debate* (Working paper 206), Oxford Institute of Ageing, Oxford University.





## Interactive data on disease burden

The following interactive data visualisations allow users to explore the data in more detail and filter/ customise the data and figures to meet their information needs.

The Australian Institute of Health and Welfare (AIHW) aims to meet the Australian Government's [web accessibility requirements](#). If any of this report is inaccessible to you, or you are experiencing problems accessing content for any reason, please contact us at [burdenofdisease@aihw.gov.au](mailto:burdenofdisease@aihw.gov.au).

### What is included in the Australian Burden of Disease Study 2023 data visualisations?

The interactive data visualisations present estimates of total burden (DALY), non-fatal burden (YLD), fatal burden (YLL) and health adjusted life-expectancy (HALE) in Australia for 2003, 2011, 2015, 2018 and 2023.

The following interactive data visualisations are included:

- [Overview of disease burden, for all diseases and disease groups or for a specific disease/ injury or disease group](#)
- [Contributions of fatal vs non-fatal burden to total burden for a specific disease/ injury or disease group](#)
- [Comparison of disease burden over time for a specific disease/ injury or disease group](#)
- [Changes in the ranking of leading causes \(specific disease/ injury\) of disease burden over time by sex and age](#)
- [Summary of disease burden for a specific disease/ injury](#)
- [Health-adjusted life expectancy by age, sex and over time.](#)

### Data visualisations from previous Australian Burden of Disease Studies

Previous Australian Burden of Disease Studies have estimated burden of disease at a subnational level (by state and territory, remoteness area and socioeconomic group) and the contribution of certain risk factors to disease burden. The latest subnational and risk factor data were published in the *Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018* report. Data visualisations presenting these results can be found at:

- [Australian Burden of Disease Study 2018: Interactive data on disease burden, State and territory estimates](#)
- [Australian Burden of Disease Study 2018: Interactive data on disease burden, Remoteness areas](#)
- [Australian Burden of Disease Study 2018: Interactive data on disease burden, Socioeconomic groups](#)
- [Australian Burden of Disease Study 2018: Interactive data on risk factor burden.](#)

## Interactive data on disease burden

Use the interactive graphs to explore the number or rate of total burden (DALY), non-fatal burden (YLD) and fatal burden (YLL) in Australia by disease group, disease or injury for the most recent year (2023). Results for 2003, 2011, 2015 and 2018 are included for comparison.

### How to navigate the interactive visualisation

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Use the drop-down lists at the top of the visualisation to filter the data by measure of disease burden, year, sex, disease group and disease/injury.

Select from the following:

Measure:	Choose sex view:	Year:	Disease group:	Disease/injury:
DALY	Persons	2023	All disease groups	All causes

Hover over the bars or coloured tiles on the charts for additional information.

The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:



Undo = Undo the latest filter applied.

Redo = Redo the latest filter applied.

Revert = Clears all filters applied and reverts visualisation to default filters.

Refresh = Connects to the underlying data source and updates the visualisation with any changes in the data (*not applicable to this visualisation*).

Pause = Stops the visualisation from updating each time a filter is changed, enabling multiple filters to be changed at once. Clicking 'Resume' will update the visualisation according to the selected filters.

Share = Generates a link that can be shared (note that filters will not be applied when link is shared).

Download = Allows a downloadable file as either an image (PNG), PDF or PowerPoint file. This is a useful way to save a snapshot of the visualisation to include in a document or presentation.

Full screen = Displays the dashboard in full screen mode (press Esc to return to original view).

### Figure 3.1: National overview of the burden of disease in Australia

This interactive visualisation gives an overview of disease burden in Australia, by type of burden, year, sex, disease group and disease.

# Australian Burden of Disease Study 2023

Select from the following:

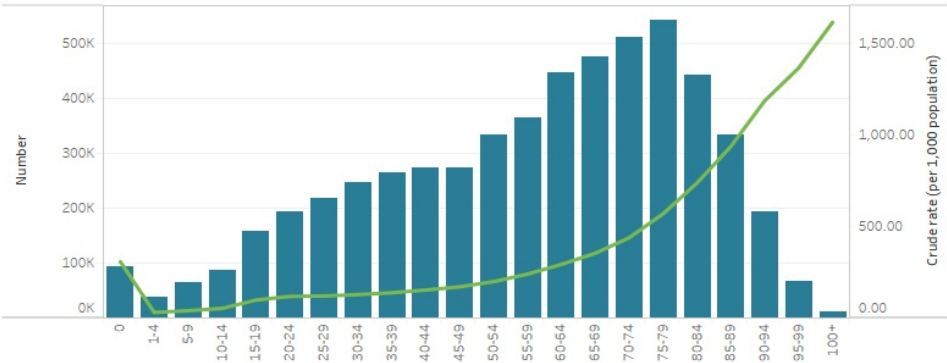
Measure: DALY      Choose sex view: Persons      Year: 2023      Disease group: All disease groups      Disease/injury: All causes

<p>In 2023, there were <b>5,633,926 DALY in Persons</b> from the disease/s selected, equivalent to <b>186.01 per 1,000 population</b> (age-standardised rate) and <b>100.0%</b> of the total burden in Australia.</p>	<p>In 2023, there were <b>2,697,438 DALY in Females</b> from the disease/s selected, equivalent to <b>171.44 per 1,000 population</b> (age-standardised rate) and <b>100.0%</b> of the total burden in Australia.</p>	<p>In 2023, there were <b>2,936,487 DALY in Males</b> from the disease/s selected, equivalent to <b>201.70 per 1,000 population</b> (age-standardised rate) and <b>100.0%</b> of the total burden in Australia.</p>
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Note: Diseases displaying a rate of 0.00 per 1,000 population refer to a rate <0.005 per 1,000 population.

DALY= Disability-adjusted life years; YLD= Years lived with disability; YLL= Years of life lost

## DALY in Persons by age, 2023



## DALY in Persons by disease group, 2023

Select a disease group to view on tile map: All      Sex: Persons

Disease group

- All disease groups
- Blood and metabolic disorders
- Cancer and other neoplasms
- Cardiovascular diseases
- Endocrine disorders
- Gastrointestinal disorders
- Hearing and vision disorders
- Infant and congenital conditions
- Infectious diseases
- Injury (external cause)
- Kidney and urinary diseases
- Mental and substance use disorders
- Musculoskeletal disorders
- Neurological conditions
- Oral disorders
- Reproductive and maternal conditions
- Respiratory diseases
- Skin disorders

Notes: Rates were age-standardised to the 2001 Australian Standard Population and are expressed as per 1,000 population. Estimates for autism spectrum disorders in 2018 and 2023 are not comparable to earlier years due to changes in data source. Refer to the technical notes for more information on data sources and methods used in the Study.  
 Source: AIHW Australian Burden of Disease Database. <http://www.aihw.gov.au>

## Interactive data on disease burden

Burden of disease estimates are one of the few population health measures which combine health loss from living with, and dying prematurely from illness and injury.

The contribution of fatal and non-fatal burden to the total burden experienced in Australia differs by age, sex and disease. Some disease groups such as cancers, contribute substantial fatal burden, whilst diseases which don't usually cause death, such as back pain, contribute substantial non-fatal burden.

Use the interactive graphs to explore the contribution of fatal burden (YLL) and non-fatal burden (YLD) to the total burden of disease (DALY) in Australia by sex, age group and disease or injury for the most recent year (2023). Results for 2003, 2011, 2015 and 2018 are included for comparison.

### How to navigate the interactive visualisation

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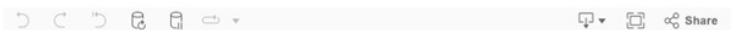
Use the drop-down lists at the top of the visualisation to filter the data by year, sex, disease group and disease/injury.

Select from the following:

Year:	Sex:	Disease group:	Disease or injury:
2023	Persons	All disease groups	All causes

Hover over the bars on the chart for additional information.

The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:



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Full screen = Displays the dashboard in full screen mode (press Esc to return to original view).

### Figure 3.2: Fatal and non-fatal burden in Australia

This interactive visualisation compares the amount and proportion of fatal vs. non-fatal burden, by year, sex, age, disease group and disease.

# Australian Burden of Disease Study 2023

Select from the following:

Year:  
2023

Sex:  
Persons

Disease group:  
All disease groups

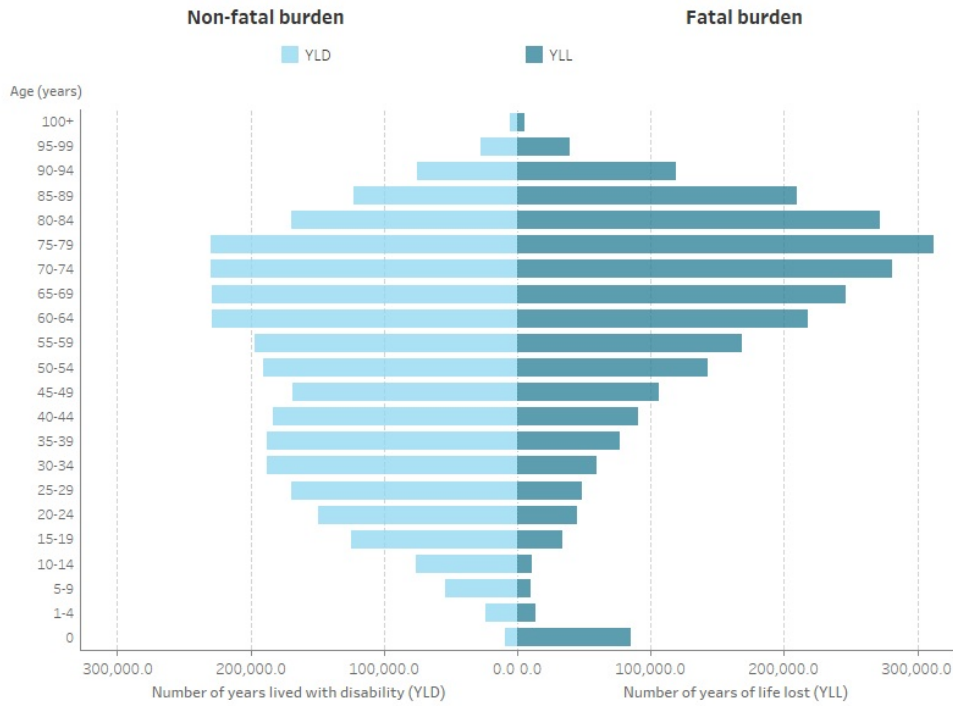
Disease or injury:  
All causes

## Fatal vs. Non-fatal burden in Persons, 2023

53.9% non-fatal

46.1% fatal

## Fatal vs. Non-fatal burden by age, Persons, 2023



Notes: Diseases displaying an estimate of 0.0 refer to an estimate <0.05. Estimates for autism spectrum disorders in 2018 and 2023 are not comparable to earlier years due to changes in data source. Refer to the technical notes for more information on data sources and methods used in the Study.  
Source: AIHW Australian Burden of Disease Database. <http://www.aihw.gov.au>

## Interactive data on disease burden

Changes in burden over time from specific diseases or injuries may be due to changes in population size, population ageing, changes in disease prevalence (including epidemics) or changes to how causes are reported or coded in health data.

For fatal burden (YLL) estimates, notable changes in cause of death coding practices occurred over time for dementia and accidental poisoning. For non-fatal burden (YLD) estimates, morbidity data were drawn from a wide variety of sources, with varying availability and data quality over time. Of note, changes in testing practices and diagnostic criteria occurred over time for gestational diabetes. Therefore, comparisons over time for some causes need to be interpreted with caution.

Use the interactive graphs to explore differences in age-standardised and age-specific rates of burden (DALY, YLD or YLL) in Australia. Estimates are displayed by sex and for disease groups or by specific disease or injury for the most recent year (2023) and for years 2003, 2011, 2015 and 2018 for comparison. Estimates for COVID-19 as an individual cause are not presented as these were only available for 2023 (though it is included in the total 'Infectious diseases' estimates).

### How to navigate the interactive visualisation

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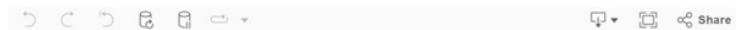
Use the drop-down lists at the top of the visualisation to filter the data by measure of burden, sex, start and end year, disease group and disease/injury.

Select from the following:

Measure:	Choose sex view:	Start year:	End year:	Disease group:	Disease/injury:
DALY	Persons	2003	2023	All disease groups	All causes

Hover over the bars or lines on the charts for additional information.

The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:



Undo = Undo the latest filter applied.

Redo = Redo the latest filter applied.

Revert = Clears all filters applied and reverts visualisation to defaults filters.

Refresh = Connects to the underlying data source and updates the visualisation with any changes in the data (*not applicable to this visualisation*).

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Full screen = Displays the dashboard in full screen mode (press Esc to return to original view).

### Figure 3.3: Comparisons of disease burden in Australia over time

This interactive visualisation compares disease burden in Australia over time for each data year (2003, 2011, 2015, 2018 and 2023), by type of burden, sex, disease group and disease.

# Australian Burden of Disease Study 2023

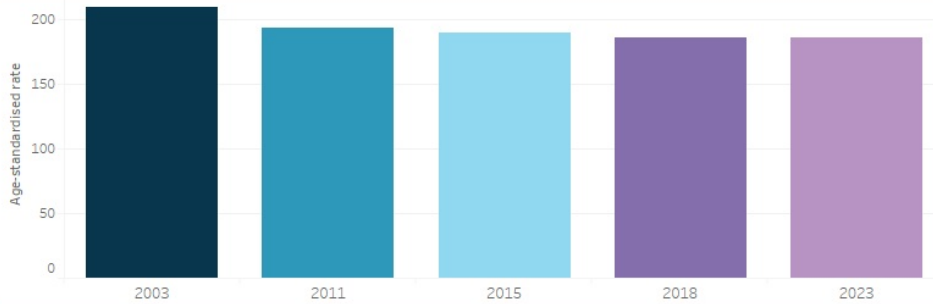
Select from the following:

Measure: DALY      Choose sex view: Persons      Start year: 2003      End year: 2023      Disease group: All disease groups      Disease/injury: All causes

<p><b>11.1% decrease</b> in the age-standardised DALY rate in <b>Persons</b> between 2003 and 2023 for the disease/s selected</p>	<p><b>6.8% decrease</b> in the age-standardised DALY rate in <b>Females</b> between 2003 and 2023 for the disease/s selected</p>	<p><b>15.3% decrease</b> in the age-standardised DALY rate in <b>Males</b> between 2003 and 2023 for the disease/s selected</p>
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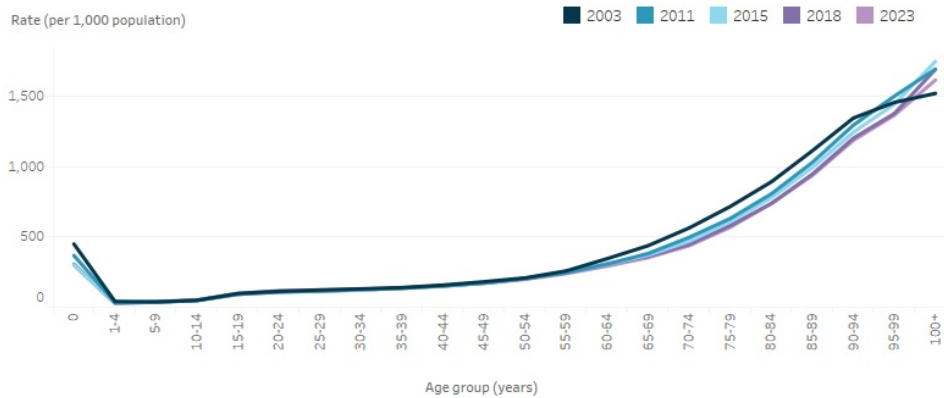
DALY= Disability-adjusted life years; YLD= Years lived with disability; YLL= Years of life lost

## Comparison of age-standardised DALY rates, Persons



## Comparison of age-specific crude DALY rates, Persons

Choose graph scale:  
Linear



Notes: Rates were age-standardised to the 2001 Australian Standard Population and expressed as per 1,000 population. The logarithmic scale allows a wider range of results to be presented on a more compact scale, as the intervals on the vertical axis change by a factor of 10. This differs to the linear scale where intervals on the vertical axis are equally spaced. Diseases displaying a rate of 0.000 per 1,000 population refer to a rate <0.0005 per 1,000 population. Estimates for autism spectrum disorders in 2018 and 2023 are not comparable to earlier years due to changes in data source. Refer to the technical notes for more information on data sources and methods used in the Study. Estimates for COVID-19 as an individual cause are not presented as these were only available for 2023 (though it is included in the total 'Infectious diseases' estimates).  
Source: AIHW Australian Burden of Disease Database. <http://www.aihw.gov.au>

## Interactive data on disease burden

Ranking diseases by burden shows the leading causes of health loss in Australia. Changes in rankings over time may be due to changes in disease prevalence (including epidemics) or changes to how causes of data are collected, reported or coded.

This visualisation shows the leading 25 causes of disease burden (YLL, YLD or DALY) in Australia in 2023 compared with previous years (2003, 2011, 2015 and 2018) ranked by:

- age-standardised rate (ASR) of disease burden, which takes into account differences in population age structure and size between years. This graph can be filtered by sex.
- the number of YLL, YLD or DALY. This graph can be filtered by sex and/or age group.

Note that rankings are a relative measure and changes in rank over time do not always mean the disease or injury has increased or decreased in the population. Leading causes of YLL are based on Australian Burden of Disease Study 2023 methods and will not be comparable to leading causes of death reported elsewhere due to modelling and cause of death alignment to diseases. Further, estimates for COVID-19 have no ranking in previous years which were prior to the pandemic (2003, 2011, 2015 and 2018). For a discussion of results related to leading causes of burden, refer to the [Key findings](#).

### How to navigate the interactive visualisation

Click on the tabs at the top of the visualisation to either view the disease rankings by age-standardised rate of burden or by number of burden.

Rank by ASR  Rank by number

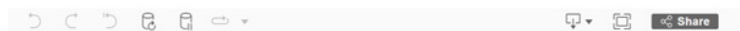
Use the drop-down lists to filter the data by measure of burden, sex and age group (for Rank by number only).

Select from the following:

Measure:  Sex:

Hover over the coloured squares or lines on the charts for additional information.

The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:



Undo = Undo the latest filter applied.

Redo = Redo the latest filter applied.

Revert = Clears all filters applied and reverts visualisation to default filters.

Refresh = Connects to the underlying data source and updates the visualisation with any changes in the data (*not applicable to this visualisation*).

Pause = Stops the visualisation from updating each time a filter is changed, enabling multiple filters to be changed at once. Clicking 'Resume' will update the visualisation according to the selected filters.

Share = Generates a link that can be shared (note that filters will not be applied when link is shared).

Download = Allows a downloadable file as either an image (PNG), PDF or PowerPoint file. This is a useful way to save a snapshot of the visualisation to include in a document or presentation.

Full screen = Displays the dashboard in full screen mode (press Esc to return to original view).

### Figure 3.4: Leading causes of disease burden in Australia

This interactive visualisation compares changes over time in Australia's leading cause of burden rankings by age-standardised rate and burden amount.





## Interactive data on disease burden

Use the interactive graphs to generate a summary of burden of disease in Australia in 2023 for a specific disease or injury (including COVID-19).

Burden from COVID-19 was estimated from data available at the time of analysis. Given the dynamic and ongoing nature of the COVID-19 pandemic, these estimates may be revised in the future as more data become available. For a discussion of results related to specific diseases, such as coronary heart disease (the leading cause of disease burden in 2023) and COVID-19, refer to the [Key findings](#).

### How to navigate the interactive visualisation

Use the drop-down list at the top right of the visualisation to view the data for a specific disease or injury.

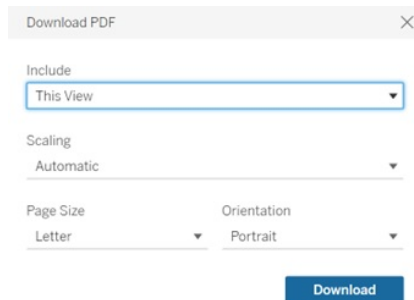
Select a disease or injury:

Coronary heart disease

Click on the 'Download PDF' button to download a 1-page PDF for the selected disease/injury.

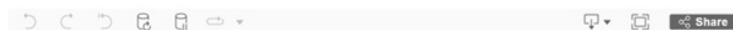
**Download PDF**

Select A4 in the Page Size drop-down.



Hover over the bars or lines on the charts for additional information.

The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:



Undo = Undo the latest filter applied.

Redo = Redo the latest filter applied.

Revert = Clears all filters applied and reverts visualisation to default filters.

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Share = Generates a link that can be shared (note that filters will not be applied when link is shared).

Download = Allows a downloadable file as either an image (PNG), PDF or PowerPoint file. This is a useful way to save a snapshot of the visualisation to include in a document or presentation.

Full screen = Displays the dashboard in full screen mode (press Esc to return to original view).

### Figure 3.5: Disease- or injury-specific summary of disease burden in Australia

This interactive visualisation reports a range of data on the burden of a specific disease or injury in Australia, which can be selected by the user.

# Australian Burden of Disease Study 2023

Select a disease or injury:  
Coronary heart disease

## Coronary heart disease

[Download PDF](#)

DALY = Disability-adjusted life years; YLD = Years lived with disability; YLL = Years of life lost.

**For Persons in Australia in 2023 there were:**  
**304,800 DALY,**  
equivalent to **11.50 per 1,000 population**

**Fatal burden**  
**236,740 YLL,**  
equivalent to **8.93 per 1,000 population**

**Non-fatal burden**  
**68,060 YLD,**  
equivalent to **2.57 per 1,000 population**

### Fatal vs. Non-fatal burden in Persons, 2023

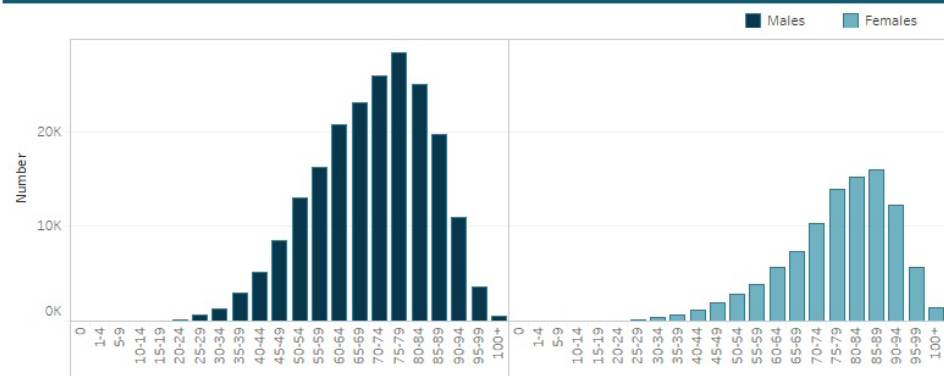
77.7% Fatal

22.3% Non-fatal

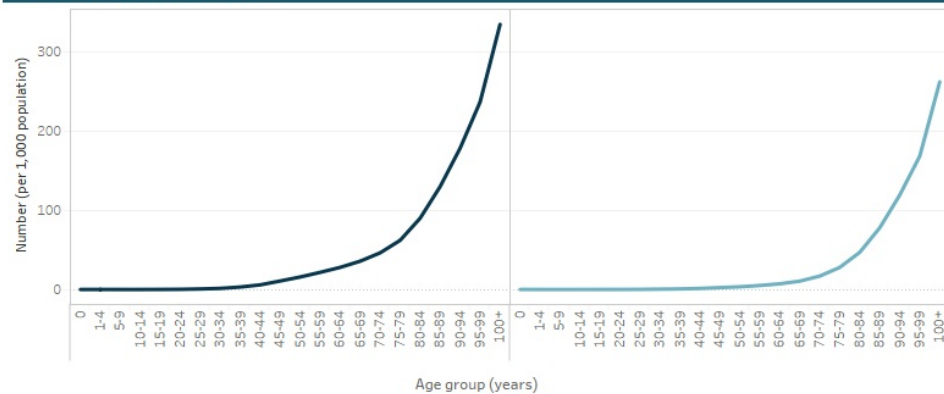
### Age-standardised rates (ASRs) over time

	Males					Females				
	2003	2011	2015	2018	2023	2003	2011	2015	2018	2023
DALY ASR	29.56	20.40	17.23	15.42	13.00	13.49	8.68	7.10	6.16	4.94
YLL ASR	24.51	16.51	14.00	12.37	10.41	10.83	6.65	5.44	4.62	3.65
YLD ASR	5.05	3.89	3.23	3.05	2.59	2.66	2.02	1.65	1.55	1.29

### Number of DALY by sex and age, 2023



### DALY rates by sex and age, 2023



Notes: Rates were age-standardised to the 2001 Australian Standard Population and are expressed as per 1,000 population. Diseases displaying a rate of 0.00 per 1,000 population refer to a rate <0.005 per 1,000 population. Estimates for autism spectrum disorders in 2018 and 2023 are not comparable to earlier years due to changes in data source. Refer to the technical notes for more information on data sources and methods used in the Study.  
Source: AIHW Australian Burden of Disease Database. <http://www.aihw.gov.au>



## Interactive data on disease burden

Health-adjusted life expectancy (HALE) extends the concept of life expectancy (the number of years a person can expect to live) by considering the number of years a person of a particular age could expect to live in full health (without disease and/or injury) and in ill health (with disease and/or injury). For example, a 21-year old male can expect to live 52.0 years (86%) of their remaining life in full health and 8.8 years (14%) of their remaining life in ill health based on estimated age-specific morbidity and mortality rates in 2023. For detailed methods for the estimation of HALE, refer to the [Australian Burden of Disease Study: methods and supplementary material 2018](#) (AIHW 2021b).

Life expectancy and HALE can be measured at any age but are typically reported from birth (which represents the average life expectancy in years for a baby born that year) and at age 65, describing health in an ageing population.

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 time spent in full health or in ill health.

Use the interactive graphs below to explore the health-adjusted life expectancy of Australians, at various ages and by sex, for the most recent year (2023) compared with previous years (2003, 2011, 2015 and 2018). For a discussion of results related to HALE, refer to the [Key findings](#).

For ABDS 2023, a life table for 2023 derived from the ABS provisional deaths and projected 2023 YLD rates were used to calculate HALE. For more information on HALE and the life expectancies used, see [Technical notes](#).

### How to navigate the interactive visualisation

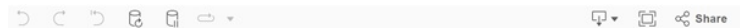
Use the drop-down list above each graph to view the data by age (top graph) or by year (bottom graph).

Select an age (in years):

Select a year:

Hover over the bars on the charts for additional information.

The toolbar at the bottom of the visualisation enables users to interact with the data in different ways:



Undo = Undo the latest filter applied.

Redo = Redo the latest filter applied.

Revert = Clears all filters applied and reverts visualisation to default filters.

Refresh = Connects to the underlying data source and updates the visualisation with any changes in the data (*not applicable to this visualisation*).

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Share = Generates a link that can be shared (note that filters will not be applied when link is shared).

Download = Allows a downloadable file as either an image (PNG), PDF or PowerPoint file. This is a useful way to save a snapshot of the visualisation to include in a document or presentation.

Full screen = Displays the dashboard in full screen mode (press Esc to return to original view).

### Figure 3.6: Health-adjusted life expectancy in Australia

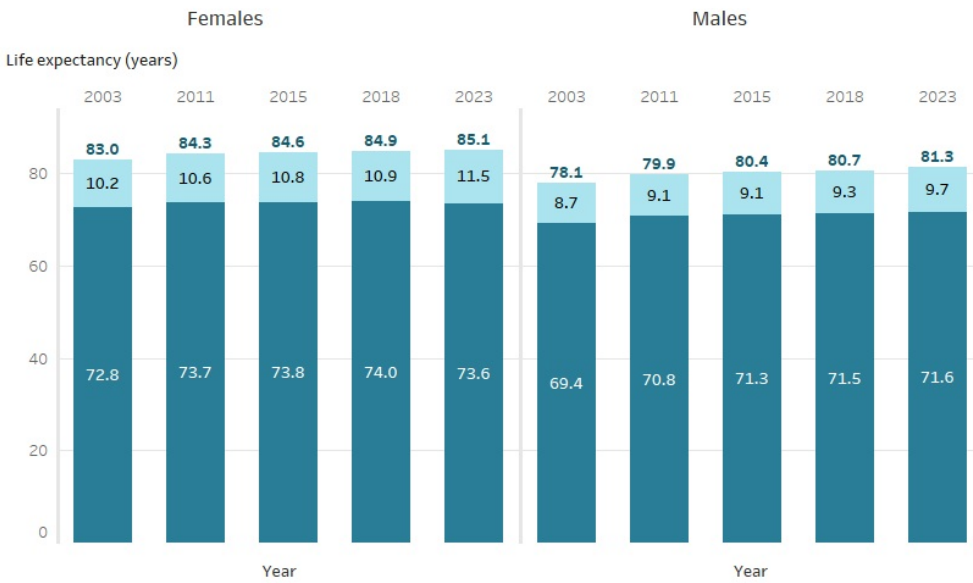
This interactive visualisation shows life expectancy and health-adjusted life expectancy by age and sex for the years 2003, 2011, 2015, 2018 and 2023.

# Australian Burden of Disease Study 2023

## Life expectancy and health-adjusted life expectancy (HALE) over time, by sex, at selected age

Select an age (in years): 0

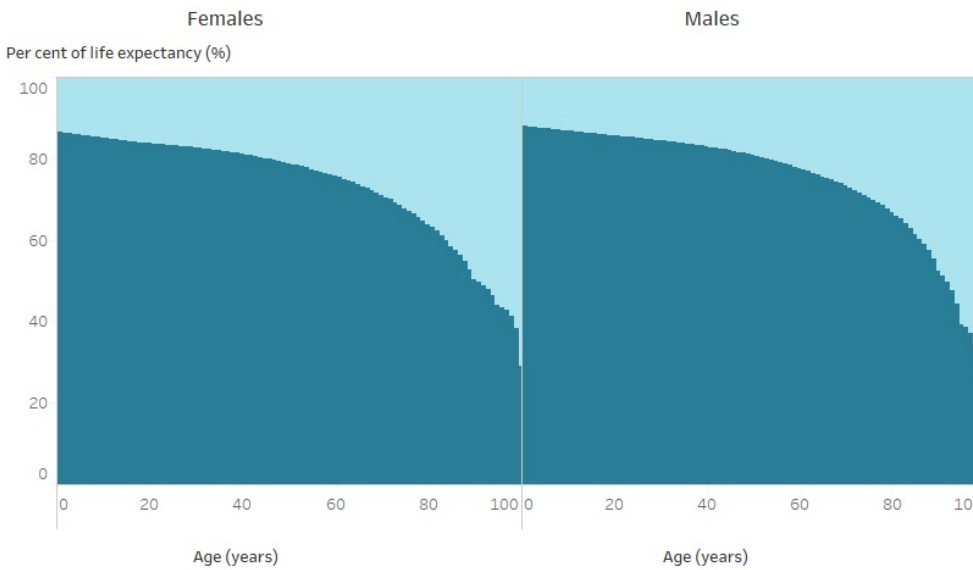
Ill health Full health



## Per cent of remaining life expectancy spent in full health and ill health at each age, by sex, in selected year

Select a year: 2023

Ill health Full health



Notes: For ABDS 2023, a life table for 2023 derived from the ABS provisional deaths and projected 2023 YLD rates were used to calculate HALE. For more information on HALE and the life expectancies used, see Technical notes.  
 Source: ABS provisional mortality 2023 customised data, AIHW Australian Burden of Disease Database. <http://www.aihw.gov.au>



## Technical notes

### On this page:

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- [How the Australian Burden of Disease Study 2023 differs from previous studies](#)
- [Calculation of estimates](#)
- [Examples of changes to disease coding and guidelines over time](#)
- [Earlier reference years](#)
- [Estimation of COVID-19 for 2023](#)
- [Estimation of lower respiratory infections \(including influenza and pneumonia\) for 2023](#)
- [Health-adjusted life expectancy](#)
- [Population data](#)
- [Years of life lost and years lived with disability data quality](#)

### Overarching methods

General methods for estimation of burden of disease can be found in *Australian Burden of Disease Study: methods and supplementary material 2018*. This includes descriptions for years of life lost (YLL), years lived with disability (YLD), disability-adjusted life years (DALY) and health-adjusted life expectancy (HALE).

### How the Australian Burden of Disease Study 2023 differs from previous studies

The ABDS 2023 is different to the 2003, 2011, 2015 and 2018 studies in that estimates have been produced for the current year (2023). It builds on work from the ABDS 2022, which was the first study where burden was estimated for the year of release (2022). ABDS 2023 includes disease burden estimates for the year of release (2023) for 220 diseases and injuries, including estimates of burden for COVID-19. This Study provides burden of disease estimates best matched to the public health context for the Australian population for 2023.

### Updates to estimates for specific mental health conditions

The National Survey of Mental Health and Wellbeing (NSMHW) is the key data source of measured prevalence for a number of mental and behavioural disorders in Australia for persons aged 16-85 years. This includes lifetime and 12-month diagnoses based on DSM-IV and ICD criteria using the World Mental Health Survey Initiative version of the World Health Organisation's Composite International Diagnostic Interview Version 3.0 (WMH-CIDI 3.0) adjusted for the Australian context. In previous ABDS, the latest available survey was the 2007 NSMHW.

At the time of analysis, the NSMHW 2020-21 (Cohort 1) was the most recent source of prevalence data for depressive disorders, anxiety disorders, bipolar affective disorder and alcohol use disorder. Therefore, burden estimates for these conditions were updated using data from the NSMHW 2020-21 unless the lower sample size was an issue (for example, age distributions from the NSMHW 2007 survey were used due to low unweighted counts resulting in no or very minimal age distributions being derived from the NSMHW 2020-21).

In addition to the release of the NSMHW 2020-21 (Cohort 1), the Intellectual Disability Exploring Answers (IDEA) data has been linked to the National Disability Insurance Scheme (NDIS), resulting in higher ascertainment of individuals with autism spectrum disorders. Estimates for 2018 were revised to allow comparisons with 2023 estimates, however, estimates for 2018 and 2023 are not comparable to estimates for 2015 and earlier due to the addition of a new ascertainment source to the IDEA.

### Calculation of estimates

#### 2023 estimates

Estimates of YLL for 2023 were largely based on deaths occurring from 2011 to 2021. The ABS provisional deaths for January to June in 2023 was used to validate and adjust projected deaths where appropriate. For each disease, one of the following projection methods was used to estimate burden in 2023:

- log-linear regression (also called Poisson regression or Poisson linear regression)
- ordinary least-squares regression (also called simple linear regression)
- sex- and age-specific crude rates assumed to be the same between the year with the latest available data (for example, 2021 for YLL) and 2023.

For some diseases, the reference period used to inform the trend was restricted (for example, 2011-2019). For example, for diseases (for example, lower respiratory infections including influenza and road traffic injuries) that were largely impacted by COVID-19, estimates for 2020 were not included as 2020 did not resemble a typical mortality year (ABS 2020). Other years were excluded where data were considered inappropriate for use in trend analysis, such as due to coding changes, or where data in early years were not robust. See the following section for examples of coding changes for selected diseases and how this affected trend analyses.

## Examples of changes to disease coding and guidelines over time

### Substance use disorders and accidental poisoning

In 2014, the ABS implemented the use of new software for coding causes of death, applied International Classification of Diseases 10th revision (ICD-10) updates and reviewed coding practices. These processes impacted the cause of death output from 2013 onwards. Previously, for substance use disorders, where a death was due to an accidental drug overdose for a person with a known addiction to the drug, the addiction was reported as the underlying cause of death (that is, codes F10-F19 Mental and behavioural disorders due to psychoactive substance use). Since the coding changes, the drug overdose is captured as the underlying cause of death (X40-X49 Accidental poisoning) and the addiction is retained as an associated cause of death. The result was an increase in deaths due to Accidental poisoning, and a decrease in the number of deaths due to Mental and behavioural disorders due to psychoactive substance use. These changes will have an impact on comparisons made between 2003 or 2011 and 2015, 2018 or 2023, but not on those made between 2003 and 2011, or between 2015 and 2018 or 2023.

To account for these changes, the 2023 projected estimates of fatal burden (YLL) of substance use disorders were based on trend analysis starting from 2013.

### Dementia and stroke

The number of deaths due to dementia has increased when comparing data before 2006 with data from 2006 onwards. This increase can be attributed to: (1) changes in ICD-10 instructions for coding deaths data, which have resulted in assigning some deaths to vascular dementia (F01) that may previously have been coded to cerebrovascular diseases (stroke) (I60-I69), and (2) the increase in reporting dementia as the underlying cause of death accompanied by the decrease in reporting of dementia as an associated cause (Buckley et al. 2019), and (3) legal changes allowing veterans and members of the defence forces to relate death from vascular dementia to relevant service. This, along with an accompanying promotional campaign targeted at health professionals, is thought to have increased the reported number of dementia deaths among this group (ABS 2014). These changes will have an impact on comparisons made between 2003 and 2011, 2015, 2018 or 2023, but not on those made between 2011 and 2015, 2018 or 2023.

To account for these changes, the 2023 burden estimates (both YLL and YLD) for dementia and stroke were based on trend analysis starting from 2011.

### Gestational diabetes

The International Association of the Diabetes and Pregnancy Study Groups (IADPSG) developed a new consensus guideline for the testing and diagnosis of gestational diabetes in 2010. In 2014, the endorsement of the IADPSG guidelines by the Australasian Diabetes in Pregnancy Society (ADIPS) resulted in a significant change to the practice of testing and diagnosing gestational diabetes in Australia (AIHW 2019). Reflecting international trends, Australian studies found increases in the number of women diagnosed with gestational diabetes following the introduction of the IADPSG guidelines between about 2010 and 2014, of 20% (Laafira et al. 2015), 35% (Moses et al. 2011) and 74% (Cade et al. 2019). A steep increase of the incidence of gestational diabetes was recorded from 2012-13 (AIHW 2019). These changes will have an impact on comparisons made between 2003 or 2011 and 2015, 2018 or 2022, but not on those made between 2003 and 2011, or between 2015 and 2018 or 2023.

To address this change, the 2023 non-fatal burden (YLD) estimates of gestational diabetes were based on trend analysis starting from 2015, which was the closest starting point amongst available Australian Burden of Disease Study (ABDS) estimates.

The COVID-19 pandemic presents an important consideration for the selection of appropriate models given its impacts on the input data sources available, the health system or the disease/injury itself. For example, disease estimates that would otherwise rely on health surveys or screening data sources were likely to be impacted due to restrictions and lockdowns in reference years following the onset of the pandemic. Therefore, selected regression models take into account factors beyond indicators of best fit and incorporate an assessment of appropriateness in consideration of the pandemic data environment. Projections using model inputs only up to and including the year 2019 (that is, prior to the pandemic), are available upon request.

Two regression models were used to accommodate different annual patterns of diseases. The Poisson regression assumed that rates changed at a constant per cent annually, whereas the simple linear regression assumed a constant fixed amount of change (for example, 10 YLD) every year (NCI 2022).

COVID-19 was added to the ABDS 2022 as a new disease, and has since been included in the ABDS. Lower respiratory infections (including influenza and pneumonia) estimates were derived using the most recent available data for 2023. Further details on these diseases, including caveats and assumptions, are presented in the following sections.

### Earlier reference years

Estimates between 2003 and 2018 followed the methodologies developed for ABDS 2018 (AIHW 2021a).

ABDS 2023 used revised mortality data to calculate single-year estimates for YLL from 2011 to 2021 in the trend analysis to reflect changes in mortality coding under the ABS revisions process and to obtain estimates for years in between the ABDS reference years. Updated YLL estimates were used across the years in trend analyses, as the ABS revises mortality information for coroner-certified deaths to improve the accuracy of the coding. These revisions do not increase the overall number of deaths in any year but may change the distribution of the causes of death. Further information on the ABS mortality revisions process is available on the [ABS website](#).

## Estimation of COVID-19 for 2023

### Fatal burden

Methods for calculating fatal burden (expressed as YLL) of COVID-19 used the number of deaths directly due to COVID-19, the ages at which these deaths occurred, and the Global Burden of Disease Study (GBD) standard reference life table.

Definition and coding of COVID-19 deaths

In the International Classification of Diseases 10<sup>th</sup> revision (ICD-10), COVID-19 deaths are coded to:

- ICD-10 code U07.1 - *COVID-19 virus identified* is used when COVID-19 is confirmed by laboratory testing.
- ICD-10 code U07.2 - *COVID-19 virus not identified* is used for suspected or clinical diagnoses of COVID-19 where testing is not completed or inconclusive.
- ICD-10 code U10.9 - *Multisystem inflammatory syndrome associated with COVID-19*. This code is used to identify people who have died from a multi-inflammatory response syndrome associated with COVID-19.
- ICD-10 code U09.9 - *Post COVID-19 condition*. This code is used to link long term conditions including chronic lung conditions that are the result of the virus. These deaths are included as associated cause of death.

In ABDS 2023, deaths coded to U07.1, U07.2 and U10.9 as the underlying cause of death (death directly due to COVID-19) were included in estimating fatal burden.

Data sources

COVID-19 deaths for 2023 were sourced from the ABS death registration data, which is the official Australian deaths data collected via the state/territory Registrars of Births, Deaths and Marriages. It includes death registration data and medical cause of death information completed by a certifying medical practitioner and is considered a high-quality data source. In early-mid 2020, the ABS started releasing provisional deaths data to monitor the impact of the COVID-19 pandemic. Further information about the completeness and timeliness of the ABS provisional deaths data is available on the [ABS website](#).

Estimating fatal burden in 2023

Doctor and coroner-certified COVID-19 deaths by single year age between January and July 2023 were provided by the ABS. As the ABS data were incomplete for June and July 2023, data were inflated to account for incompleteness. The monthly changes of COVID-19 deaths were modelled from previous year but adjusted with an assumption of a gradual decline to December.

The estimated COVID-19 deaths for 2023 were disaggregated by age and sex, using the age and sex distributions from the provisional deaths provided by the ABS. The standard reference life table was then applied to the estimates to derive the YLL at each age.

### Non-fatal burden

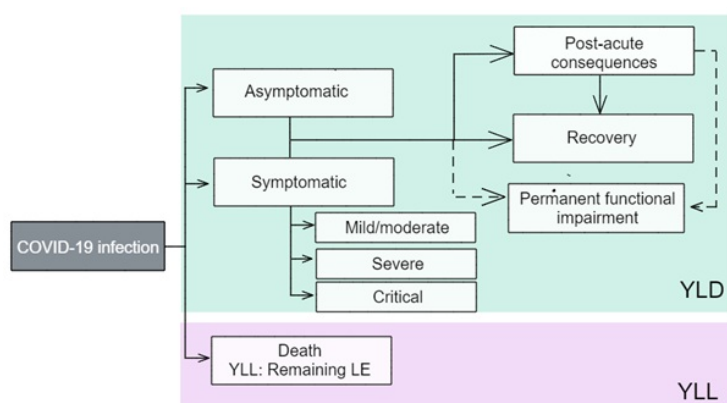
Conceptual model

The conceptual model for COVID-19 is shown in Figure 4.1, which was the consensus model being used by the European Burden of Disease Network (EBDN 2020) to calculate non-fatal burden due to COVID-19 at the time of analysis. Important components of the YLD model which result in health loss (Figure 4.1) include:

- **Mild/moderate cases:** correspond to those not requiring hospitalisation to treat their disease. It is noted that some cases in Australia were hospitalised to maintain strict isolation rather than because of the severity of their disease (particularly at the start of the pandemic).
- **Severe cases:** correspond to those hospitalised to treat their disease, but not requiring admission to intensive care units (ICU).
- **Critical cases:** correspond to people who were treated in ICU.
- **Post-acute consequences:** correspond to cases with post COVID-19 condition (also known as 'long COVID'). As evidence continues to emerge alongside a changing COVID-19 landscape in Australia, a more detailed method for quantifying long COVID non-fatal burden was developed for ABDS 2023.

Permanent functional impairment from COVID-19 was not included in this Study due to a lack of data. More elapsed time is needed to understand these potential consequences.

Figure 4.1: Conceptual model for COVID-19 burden of disease analysis



LE = life expectancy; YLD = years lived with disability; YLL = years of life lost.



Source: EBDN 2020.

Model parameters: disability weights and disease durations

The ‘disability weights’ reflect the severity of the disease and correspond to a ‘health state’ which describes the average experience for people at that severity level. As is the usual approach in the ABDS, the use of GBD disability weights was prioritised. However, an additional disability weight (for critical cases) sourced from the European Disability Weight survey (Haagsma et al. 2015) was used as no corresponding disability weight was available from the GBD at the time of analysis.

Table 4.1 outlines the disability weights for each health state. Disability weights were drawn from EBDN 2020 except for post-acute consequences, which was derived from aggregated disability weights based on data from Howe et al. (2023).

It is important to note that in this Study:

- Asymptomatic cases have no disability weight as these cases are considered to have no health loss. The possible burden of isolation and worry of potential transmission to family members is not counted.
- The model may change in future studies as more evidence and data on COVID-19 and long COVID emerge. The Australian Institute of Health and Welfare (AIHW) continues to liaise with the COVID-19 Epidemiology and Surveillance Team at the Department of Health and Aged Care and the EBDN, as well as review other sources (for example, GBD) and assess international developments in the model for long COVID.

Table 4.1: Health states and corresponding disability weights for COVID-19 analysis

Health state type	Severity level	Health state	Disability weight	Durations
Acute infectious disease	Asymptomatic	Has infection but experiences no symptoms	Nil	Nil
	Mild/moderate	Has a fever and aches, and feels weak, which causes some difficulty with daily activities	0.051	7 days
	Severe	Has a high fever and pain, and feels very weak, which causes great difficulty with daily activities	0.133	Average length of stay
	Critical	Intensive care unit admission	0.655	Average length of stay
Chronic infectious disease	Post-acute consequences	See Table 4.2 for complete list of symptoms (Howe et al. 2023)	0.033	Various (Howe et al. 2023)

The duration used for mild/moderate cases was 7 days due to the shorter duration of Omicron infection, which was the dominant variant in Australia in 2022 and 2023 (Menni et al. 2022). The duration parameters for severe and critical cases are based on empirical data on average length of stay from the National Hospital Morbidity Database (NHMD), using the period from 1 July 2021 to 30 June 2022, which were the latest available data from the NHMD at the time of analysis. It was assumed that the same durations would apply for those hospitalised due to COVID-19 in 2023. Hospitalisations without an ICU admission are used for severe cases, and those with ICU admission for critical cases. Median length of stay for critical cases only includes time spent in ICU - their time spent outside of the ICU is counted under the median length of stay for severe cases.

The duration parameters used for post-acute consequences were based on symptom-level Australia-specific data and varied between 3 and 9 months (Howe et al. 2023).

Data sources

The input data needed to calculate COVID-19 non-fatal burden estimates should ideally reflect the full coverage of cases, with any under-ascertainment adjusted for with appropriate data, if available. Under-ascertainment for COVID-19 is becoming a bigger issue as time goes on due to the move from close contact tracing and strict requirements for PCR-based testing, to rapid antigen testing and reliance on self-reporting.

Due to the easing of reporting requirements since 2022, it was deemed that COVID-19 case numbers would be under-reported in NNDSS data available for 2023. The ABS provisional deaths data were deemed a reliable source of COVID-19 deaths and were used to assist in estimating overall case numbers to try to account for this under-ascertainment. This is discussed further in the mild/moderate severity section below. For mild/moderate, severe and critical cases, detailed age distributions were derived from NNDSS data supplied for available months in 2023 (that is, January to August 2023).

Asymptomatic cases

An AIHW COVID-19 report (AIHW 2021b) used figures from a meta-analysis (Byambasuren et al. 2020) to estimate the proportion of asymptomatic COVID-19 cases. This showed that 17% of cases were truly asymptomatic (for example, excludes pre-symptomatic cases). However, this review was conducted in 2020 and due to the emergence of newer variants and sub-variants, higher vaccination rates and changes in requirements for COVID-19 testing in 2022 and 2023, it is likely this proportion is no longer suitable and was not used for this Study.

#### Mild/moderate cases

Under-ascertainment would be highest in the mild/moderate category given the lower severity (and hence likelihood of reporting) and is likely to be higher in 2023 than previous years of the pandemic due to easing of reporting requirements for 2023. Due to challenges with adjusting for under-ascertainment in COVID-19 reported case numbers with currently available data, and the high quality of deaths data for COVID-19, case fatality rates were used to estimate the total number of mild and moderate severity cases in 2023.

Case fatality rates (CFR) by sex were calculated based on 2022 reported cases and deaths. Applying the CFR to the total modelled deaths due to COVID in 2023 allowed an estimation of total 2023 cases. The key assumption in this method is that CFRs in 2022 were maintained in 2023 as case ascertainment was assumed to be better in 2022.

#### Severe and critical cases

Severe and critical cases were estimated from data on people who were admitted to hospital and to ICU, respectively, from the NNDSS (supplied for January to August 2023). Based on modelling for COVID-19 deaths, it was assumed that monthly changes in hospitalisations and admission to ICU declined gradually to December. The monthly number of hospitalised and ICU cases were added to estimate the total number of severe and critical cases for 2023.

It was assumed that there would be virtually no under-ascertainment among the severe and critical categories as it is unlikely that people who require hospital care would not receive that care in Australia. People admitted would almost certainly have been tested for SARS-CoV-2 if there was any chance they had contracted it. It was also assumed that the number of cases who were admitted to hospital for isolation purposes rather than treatment was minimal.

As there may be people who contracted COVID-19 in hospital (but did not suffer from severe or critical disease), identification of these cases in the data would be useful for burden estimation when more detailed hospitals data become available. However, it is acknowledged that because these cases cannot be identified, it may result in an overestimate of the burden due to severe COVID-19 (though an underestimate of mild/moderate cases).

#### Post-acute consequences

Australian data on those who develop post-acute consequences of COVID-19 are becoming more available (Darley et al. 2021; Liu et al. 2021). However, there was still no standard definition and set of symptoms for long COVID at the time of analysis and reporting. In the previous Study (ABDS 2022), a simple approach that used only one disability weight despite the range of symptoms that manifest from long COVID, was adopted due to limited Australian data. As part of the ABDS 2023, a sensitivity analysis was performed to explore how different the resulting YLD would be when using the single disability weight (0.219) from the ABDS 2022 and when using a weighted average disability weight (0.033) calculated by the AIHW using the inputs and disability weights from Howe et al. 2023 (Table 4.2a, Table 4.2b).

Firstly, YLD from post-acute consequences of COVID-19 in 2022 were estimated using individual symptom prevalence, duration and disability weight values from Howe et al. (2023). These YLD estimates were then compared to the YLD estimates using the ABDS 2022 approach. There was a considerable difference between the two. From this, it was concluded that the disability weight from ABDS 2022 potentially overestimated the YLD due to post-acute consequences of COVID-19. Therefore, for the ABDS 2023, a single, aggregated disability weight was calculated to replace the much higher disability weight used in ABDS 2022. This single, aggregate disability weight was calculated by:

1. calculating the point prevalence of individual symptoms by applying the prevalence and duration from Howe et al. 2023 to the number of COVID-19 survivors for 2022
2. these prevalence estimates by individual symptom were multiplied with the corresponding disability weight from Howe et al. 2023 to estimate the YLD by symptom for 2022
3. the YLD were added into a total YLD value
4. the total YLD was divided by the total prevalence to produce an average weighted disability weight.

For more detail on the sensitivity analyses, see [Updated method for the post-acute consequences of COVID-19](#).

To estimate YLD due to post-acute consequences in 2023, the weighted average disability weight was applied to the projected number of COVID-19 survivors in 2023. Due to the differences in disability weights used, the COVID-19 YLD and DALY estimates from the ABDS 2023 are not comparable to the COVID-19 estimates from ABDS 2022.

Table 4.2a: Symptoms and corresponding disability weights for post-acute consequences of COVID-19 analysis, Adults

Symptom	Disability weight
Dysosmia	0.010
Dysgeusia	0.010
Fatigue	0.051 <sup>a</sup>
Dyspnoea	0.019

Chest pain	0.011
Muscle weakness	0.004
Dizziness	0.032 <sup>a</sup>
Muscle/joint pain	0.023
Headache	0.037
Numb/tingling limbs	0.023
Concentration difficulty	0.069
Memory impairment	0.069
Insomnia	0.030
Anxiety	0.030
Depression	0.145

\* Disability weight applied is not directly taken from a disability weight in the 2019 GBD, instead estimated by adjusting existing disability weights.

Source: Howe et al. 2023

Table 4.2b: Symptoms and corresponding disability weights for post-acute consequences of COVID-19 analysis, Children

Symptom	Disability weight
Dysosmia	0.010
Headache	0.037
Eye soreness	0.011
Sore throat	0.006
Cognitive difficulty	0.045

Source: Howe et al. 2023

## Updated method for the post-acute consequences of COVID 19

As part of the ABDS 2023, one of the aims was to refine how non-fatal burden due to post-acute consequences of COVID-19 was estimated. Limited data and evidence were available on long COVID when undertaking ABDS 2022 and as such a simple conceptual model and a single disability weight were adopted for the Study (Figure 4.1). Since long COVID burden was estimated for the ABDS 2022 last year, studies with more detailed conceptual models and multiple disability weights have been undertaken (Howe et al. 2023). A sensitivity analyses was conducted to explore how these newer studies can be utilised to create a more robust estimate than ABDS 2022.

For this exploratory analysis, the estimated number of survivors from COVID-19 in 2022 were used. The year 2022 was chosen for this exercise as the modelled prevalence and deaths calculated for 2022 (which were estimated before the end of 2022) could be validated against the complete prevalence and deaths for 2022. From the estimated number of survivors in 2022, non-fatal burden from the post-acute sequela of COVID-19 were estimated using 2 models:

1. ABDS 2022 model: the proportion of survivors that developed long COVID were sourced from Antonelli et al. (2022) and ONS (2022). A duration of 4 months (GBD Long COVID Collaborators 2022) and a single disability weight (0.219) based on the GBD disability weight for post-acute consequences of infectious disease.
2. Howe et al. (2023) model: the prevalence rate, duration and disability weights from Howe et al. (2023) were applied to the estimated number of COVID-19 survivors in 2022.

For the ABDS 2022 model, a proportion of 4.5% (for those aged 25 years and older) and a proportion of 1.44% (for those aged under 25 years) were used to estimate the number of cases who developed post-acute consequences from their COVID-19 infection.

For the Howe et al. (2023) model, it was assumed that the large majority of the population are vaccinated. To calculate the prevalence among vaccinated cases, the prevalence proportions by symptom among those Omicron-infected cases were multiplied by an odds ratio of 0.55, based on findings from 2 studies that estimated a reduced odds of symptoms following acute infection of between 49% and 41% for those who had at least 2 COVID-19 vaccines compared with those with one or no vaccinations (Antonelli et al 2022, ONS 2022).

Average durations for each specific symptom were applied to the number of survivors, which was based on the total modelled incidence of COVID-19 minus the modelled number of deaths in 2022. The resultant point prevalence of each individual sequelae were then aggregated to give the overall point prevalence of post-acute consequences for COVID-19 in 2022.

We then simplified the approach for 2023 YLD calculations, by calculating a single, weighted average disability weight. Due to the limited Australian data on each symptom's prevalence for 2023 specifically, it was decided that a disability weight that better reflected the range of symptoms associated with long COVID would be preferable to the one disability weight used in ABDS 2022.

To do this, we used 2022 YLD, estimated using the approach from Howe et al. (2023), divided by the overall point prevalence estimate for post-acute consequences of COVID-19 in 2022 to give a weighted average disability weight, instead of using individual disability weights for each long COVID symptom provided by Howe et al. (2023). This weighted average disability weight incorporates differences in severity among those in the community and those who were hospitalised. Table 4.2 lists the various individual symptoms and their disability weights that were combined to produce the weighted average disability weight, which was then applied to the overall point prevalence in 2023 to determine overall YLD due to post-acute consequences of COVID-19.

A number of limitations exist in using the method for estimating burden due to post-acute consequences of COVID-19 in the ABDS 2023. Firstly, there are inconsistencies in the definition of long COVID, including symptomatology and subsequent sequelae following infection (that is, differing definitions would result in varied adjustment factors). The method also assumes that 'vaccination' refers to a 2-course schedule based on analyses in late 2021 and early 2022, and that the vaccination profile remains the same for 2023. It is therefore unclear how results may change due to waning immunity over time, although there is uncertainty around how booster doses may moderate this in 2023 (Chemaitelly et al. 2021, Levin et al. 2021). The prevalence estimates of long COVID as a single outcome also do not directly equate to the prevalence of the individual symptoms discussed by Howe et al. (2023) given the possibility of people experiencing more than one symptom. Finally, it was assumed that the prevalence, duration and severity of long COVID from 2022 would apply to the COVID-19 survivors in 2023 despite the SARS-CoV-2 virus continuing to evolve and adapt. Therefore, there may be more refinements to these methods in future ABDS.

## Estimation of lower respiratory infections (including influenza and pneumonia) for 2023

### Fatal burden

Deaths due to lower respiratory infections (LRIs), including influenza and pneumonia, were sourced from ABS provisional death registration data for 2023 and the Australian Influenza Surveillance Reports. The Australian Influenza Surveillance Reports are compiled from a number of data sources, including laboratory-confirmed notifications to the NNDSS; sentinel hospital admissions with confirmed influenza; sentinel influenza-like illness (ILI) reporting from general practitioners; ILI-related community level surveys; and sentinel laboratory testing results. See [Department of Health and Aged Care \(DHAC 2023\)](#) for more information.

Deaths for 2023 were first estimated for fatal burden calculations and were derived separately for LRIs and influenza. Provisional doctor-certified deaths by month and age groups from January to June 2023 were provided by the ABS and used as death estimates for the first 6 months of 2023. The number of deaths for June was inflated to account for incomplete registration. For the remainder of 2023, the pattern of monthly doctor-certified deaths in 2019 were used to inform the proportional increase (or decrease) of deaths from one month to the next month. For influenza, monthly deaths from the Australian Influenza Surveillance Reports up to September were compared with the ABS provisional deaths data supplied and validated the trend predicted for July and August.

Using deaths between 2011 and 2019 from the NMD, an average inflation factor from all deaths to doctor-certified deaths for LRIs and influenza was derived. This factor was applied to the number of doctor-certified deaths estimated for 2023 for these causes.

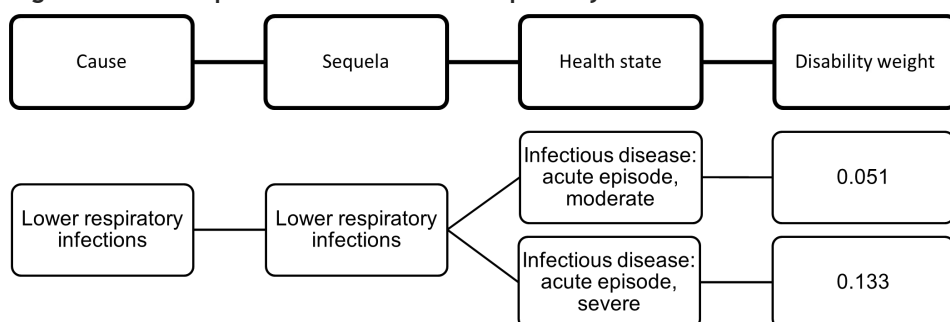
The age distribution from the provisional deaths data provided by the ABS for available months in 2023 was applied to the total number of deaths estimated for LRI and influenza in 2023. The standard reference life table was then applied to the estimates to derive the YLL at each age.

### Non-fatal burden

#### Conceptual models

The following disease model forms the conceptual basis for modelling YLD calculations for lower respiratory infections (LRIs) including pneumonia, including the sequelae, health states and disability weights.

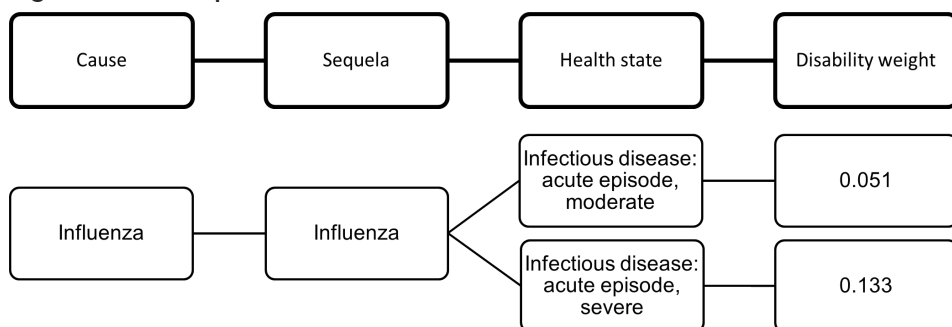
Figure 4.2: Conceptual model for lower respiratory infections



A duration of 2 weeks was used for both health states to estimate point prevalence.

The following disease model forms the conceptual basis for modelling YLD calculations for influenza, including the sequelae, health states and disability weights.

**Figure 4.3: Conceptual model for influenza**



A duration of 2 weeks was used for both health states to estimate point prevalence.

#### Data needs and potential sources

For the ABDS 2018, the following data sets were used for estimating burden from LRIs (including pneumonia) and influenza:

- The Bettering the Evaluation and Care of Health (BEACH) program data were used to estimate the total incidence of LRIs (including pneumonia) and influenza, accounting for the moderate severity in each of the above conceptual models. As the BEACH program last published data for 2016, disease rates for that year were applied to the 2018 population. Influenza is notifiable in all states and territories. However, notifications are ‘strongly influenced by the healthcare seeking behaviour of patients, testing, notification practices and follow-up by jurisdictional health departments’ (Li-Kim-Moy et al. 2016). Notifications are likely to be a significant underestimate of influenza incidence.
- The incidence of severe cases of LRIs and influenza were sourced from the National Hospital Morbidity Database (NHMD). The latest data available for the NHMD are for 1 July 2020 to 30 June 2022.

#### Influenza

For the ABDS 2023, national notifications information published by the Australian Department of Health and Aged Care (DHAC 2023) were used to explore trends in influenza between 2017 and 2023. Based on this, it was assumed that the overall number of influenza cases in the first half of 2023 will be similar to the first half of 2019. There are some limitations with this assumption. Firstly, the degree of under-ascertainment in influenza notifications data in 2017 and 2019 is unknown. The degree of under-ascertainment may also change from year to year depending on factors such as testing rates and severity of disease for that year. Finally, trends in notifications may not necessarily mimic trends in hospitalisation.

With this assumption, severe influenza point prevalence estimates for 2023 were modelled using hospitalisations in the first half of 2019 using the NHMD. Severe influenza for the second half of the year was assumed to be the same as the first half. Moderate influenza point prevalence for 2023 was then modelled using the ratio of moderate point prevalence to severe point prevalence in 2019.

#### Lower respiratory infections (including pneumonia)

There were no national data on incidence of LRIs for 2023 at the time of analysis. However, it was observed that hospitalisations for LRIs were stable between 2017 and 2019. It was assumed that hospitalisations for 2022 would be similar to the hospitalisation trends between 2017 and 2019 following the reduction in public health measures from COVID-19, which had resulted in lower hospitalisations due to LRI in 2020 and 2021.

With this assumption, severe LRI point prevalence estimates for 2023 were modelled using patterns in hospitalisations from 2017, 2018 and 2019. Moderate LRI point prevalence for 2023 was then modelled using the ratio of moderate point prevalence to severe point prevalence in 2019.

Comorbidity bias adjustment is an important step in ensuring non-fatal disease burden does not exceed the aggregate possible YLD that can be experienced. The estimates for COVID-19 and lower respiratory infections (LRIs), including influenza and pneumonia, were therefore each adjusted for comorbidity using the average disability weight change from the comorbidity adjustment for all projected causes in 2020 by sex and age group.

### Health-adjusted life expectancy

To calculate health-adjusted life expectancy (HALE), Sullivan’s method was used (see Jagger et al. 2014). Further information can be found in *Australian Burden of Disease Study: methods and supplementary material 2018*.

For ABDS 2023, the projected 2023 YLD rates by age and sex were used in the calculation of HALE. AIHW calculated its own life table for 2023, derived from the ABS provisional deaths (January to June 2023) by single year of age. The remainder of the year was modelled based on past monthly trends. The age-sex distribution was derived from the ABS provisional deaths data provided. The resulting life table and HALE estimates produced were validated against the Centre for Population’s Australian life tables projections for 2023 produced by the AGA (customised data request).

For other reference years, the 2016-2018 life table (ABS 2019) was used for 2018 HALE estimates, the 2013-2015 life table (ABS 2016) was used for 2015 HALE estimates, the 2010-2012 life table (ABS 2013a) was used for 2011 HALE estimates and the 2002-2004 life table (ABS 2005) was used for 2003 HALE estimates.

## Population data

All Australian population-based rates for 2021, 2020, 2019, 2018 were calculated using populations rebased to the 2016 Census (accessed 15 December 2022) (ABS 2022).

Population-based rates for 2015 were calculated using final population estimates from the 2011 Census (accessed 22 December 2018) (ABS 2018).

Population-based rates for 2011 and 2003 were calculated using final population estimates from the 2011 Census (ABS 2017).

Population data for 2023 were sourced from population projections by the Centre for Population (2022). This was the only available source that accounted for the early impacts of the COVID-19 pandemic on Australia's population. The population under the 'central scenario' was used for this Study, which assumed overseas migration to Australia was significantly affected by the COVID-19 pandemic.

The 2001 Australian Standard Population was used for all age-standardisation, as per AIHW and ABS standards (ABS 2013b).

## Years of life lost and years lived with disability data quality

To provide information on the quality of estimates, a quality index was developed for the ABDS to rate estimates according to the relevance and quality of source data, and methods used to transform data into a form required for analysis. Generally, the higher the rating, the more relevant and accurate the estimate.

To report on the reliability of projected burden of disease measures, the inclusion of confidence intervals associated with regression estimates was explored. However, these were not presented as these relate to the regression models and do not reflect the underlying uncertainty associated with data inputs that inform prevalence estimates. Other outputs of the regression models may indicate the best fit projection based on the set of years of life lost (YLL) and years lived with disability (YLD) crude rates available for each age-sex-cause group. However, these do not necessarily represent the most appropriate projections in the context of the overall epidemiology of a given disease or injury, especially when considering impacts of the COVID-19 pandemic.

The burden estimates for ABDS 2023 were largely based on trend analyses. The quality of input estimates in the ABDS 2023 for earlier reference years (2003, 2011, 2015 and 2018) are the same as the quality presented in the ABDS 2018. The ABDS 2018 estimates were produced using the best data available within the scope and time frame of the study.

Fatal burden (YLL) estimates were considered to have the highest quality rating for both data and methods used, as they used administrative data from the National Mortality Database, or the ABS provisional deaths supplied. The projections for 2023 were largely based on previous mortality trends. The non-fatal burden (YLD) estimates varied depending on the disease or injury, and the data sources used.

Information about the quality of the YLD 2018 estimates and the data and methods used can be found in Appendix B in:

- *Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018*
- *Australian Burden of Disease Study: methods and supplementary material 2018.*

An assessment of the quality of YLD estimates for COVID-19 were not available in the ABDS 2018. Lower respiratory infections (including influenza and pneumonia) were adjusted using recent data due to available evidence that these diseases were impacted by COVID-19. To help users understand the potential sources of uncertainty associated with the estimates, the 2-dimensional index developed for the burden estimates was used for these 2 diseases. This index was derived based on:

- the relevance of the underlying epidemiological data
- the methods used to transform that data into a form required by this analysis.

The index is scored on a scale from A (highest) to E (lowest). The quality of COVID-19 and lower respiratory infections (including influenza and pneumonia) are discussed below.

### COVID-19

Estimates for COVID-19 are considered to be of somewhat reasonable quality. Data sources were considered relevant as they were broadly derived from the NNDSS and ABS. The estimates for post-acute consequences of COVID-19, which is the biggest contributor to non-fatal burden, were calculated using a more detailed approach compared with ABDS 2022 based on Australia-specific data where individual symptomatology proportions and durations were applied to determine point prevalence estimates. Mortality estimates needed to be modelled for the last 5 months of the year, which relied on the assumption that the current decreasing trend in number of cases will continue for the remainder of the year. Therefore, estimates must be used with caution.

Data score = D

Method score = D

### Lower respiratory infections (including influenza and pneumonia)

Estimates for lower respiratory infections (LRIs) are considered to be of reasonable quality. Modelling was based on assumptions that LRIs and influenza were similar to years before the COVID-19 pandemic. These assumptions may not hold once 2023 data are available. Therefore, estimates must be used with caution.

Data score = C

Method score = C

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## Technical notes

**Aboriginal or Torres Strait Islander (First Nations):** In most data collections, a person who identified themselves, or was identified by another household member, as being of Aboriginal or Torres Strait Islander origin. For a few data collections, information on acceptance of a person as being Aboriginal and Torres Strait Islander by a First Nations community may also be required. See also [Indigenous](#) and [First Nations people](#).

**age-standardisation:** A set of techniques used to remove, as far as possible, the effects of differences in the age structure when comparing 2 or more populations.

**age-standardised rate (ASR):** A rate that takes into account the age structure of the population using age-standardisation techniques.

**associated cause(s) of death:** A cause(s) listed on the Medical Certificate of Cause of Death other than the underlying cause of death. Causes include the immediate cause, any intervening causes and conditions that contributed to the death but were not related to the disease or condition causing death. See also cause(s) of death.

**burden of disease (and injury):** The quantified impact of a disease or injury on a population using the [disability-adjusted life years \(DALY\)](#) measure.

**cause(s) of death:** All diseases, morbid conditions or injuries that either resulted in or contributed to death - and the circumstances of the accident or violence that produced any such injuries - that are entered on the Medical Certificate of Cause of Death. Causes of death are commonly reported by the underlying cause of death. See also associated cause(s) of death and underlying cause of death.

**chronic:** Persistent and long-lasting.

**comorbidity:** A health problem/ disease that exists at the same time as (an)other health problem(s).

**conceptual disease model:** A representation of clinical conditions designed to summarise what is known about the disease epidemiology, the nature of the disease (that is, whether it is chronic, acute, episodic or progressive), and its treatment.

**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.

**COVID-19 (Coronavirus disease 2019):** An infectious disease caused by the SARS-CoV-2 virus.

**COVID-19 death:** A death directly due to the SARS-CoV-2 virus. Also referred to as deaths due to COVID-19.

**COVID-19 related death:** A death where there is a disease or injury pathway to death that is not directly caused by the SARS-CoV-2 virus. Also referred to as deaths with COVID-19. For example, a person died from diabetes while exposed to SARS-CoV-2 virus.

**crude rate:** A burden (YLD, YLL or DALY) rate derived from the number of years of healthy life lost recorded in a population during a specified time period divided by the number of people in the population, without adjustments for other factors such as age (see [age-standardisation](#)).

**disability:** In burden of disease analysis, any departure from an ideal health state.

**disability-adjusted life years (DALY):** A measure of healthy life lost, either through premature death or living with disability due to illness or injury. Often used synonymously with [health loss](#).

**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 condition, disorder or problem.

**external cause:** The environmental event, circumstance or condition that causes injury, poisoning and other adverse effects (for example, road traffic accident).

**fatal burden:** The burden from dying prematurely as measured by years of life lost. Often used synonymously with [years of life lost](#), and also referred to as 'life lost'.

**First Nations people:** People of [Aboriginal or Torres Strait Islander](#) descent who identify as an Aboriginal or Torres Strait Islander.

**health-adjusted life expectancy (HALE):** The average number of years that a person at a specific age can expect to live in full health; that is, taking into account years lived in less than full health due to the health consequences of disease and/or injury.

**health loss:** The difference between an individual or group's current state of health and full health, as measured by disability-adjusted life years. Often used synonymously with [burden of disease](#).

**health state:** Reflects a combination of signs and symptoms that result in health loss, and are not necessarily unique to one particular disease. A health state might also be a severity level of a sequela (typically mild, moderate and severe levels are distinguished). For example, the health state 'mild heart failure' is used as a sequela of coronary heart disease, hypertensive heart disease, congenital heart disease and several other conditions. Each health state is associated with a [disability weight](#).

**Indigenous:** A person of [Aboriginal or Torres Strait Islander](#) descent who identifies as an Aboriginal and/or Torres Strait Islander.

**hospitalisation:** An episode of hospital care that starts with the formal admission process and ends with the formal separation process (synonymous with separation).

**incidence:** Refers to the occurrence of a disease or event. The incidence rate is the number of new cases occurring during a specified time period.

**International Classification of Diseases (ICD):** The World Health Organization's internationally accepted classification of diseases and related health conditions. Mortality data sourced from the AIHW's National Mortality Database (NMD) are coded using the ICD-10, 10<sup>th</sup> revision. The 10<sup>th</sup> revision, Australian modification (ICD-10-AM) is currently in use in Australian hospitals for admitted patients.

**morbidity:** Ill health in an individual, and levels of ill health in a population or group.

**mortality:** Death.

**non-fatal burden:** The burden from living with ill-health as measured by years lived with disability. Often used synonymously with [years lived with disability](#).

**post COVID-19 condition:** A condition that occurs in individuals with a history of probable or confirmed SARS CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive dysfunction and others, and generally have an impact on everyday functioning. Symptoms may be new onset following initial recovery from an acute COVID-19 episode or persist from the initial illness. Symptoms may also fluctuate or relapse over time. Also referred to as 'long COVID' or 'post-acute consequences of COVID-19'.

**premature death:** Deaths that occur at a younger age than a selected cut-off. In the ABDS, it is defined as dying before the global ideal life span at the age of death.

**prevalence:** Refers to the existence of a disease or event in a population, whether or not it is newly occurring; the prevalence rate is the number of cases existing at a point in time (point prevalence) or over a specified time period (period prevalence) divided by the number of people in the population.

**rate:** A burden (YLD, YLL or DALY) rate is one number (the numerator) divided by another number (the denominator). The numerator is commonly the number of years of healthy life lost 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 1,000 to create whole numbers.

**redistribution:** A method in a burden of disease study for reassigning deaths with an underlying cause of death that is not in the study's disease list. Typically, the deaths reassigned include: those with a case that is implausible as an underlying cause of death; those that relate to an intermediate cause in the chain of events leading to death; or those for which there is insufficient detail to ascertain a specific cause of death.

**reference life table:** A table that shows, for each age, the number of remaining years a person could potentially live. Used to measure the years of life lost from dying at each age.

**sequelae:** Health consequences of diseases and injuries, such as heart failure due to coronary heart disease. Each sequela may be mapped to one or more [health states](#).

**total burden:** The sum of [fatal burden \(YLL\)](#) and [non-fatal burden \(YLD\)](#), which totals [disability-adjusted life years \(DALY\)](#). See [burden of disease \(and injury\)](#).

**underlying cause of death:** The primary or main cause of death: the condition, disease or injury that initiated the sequence of events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury. See also [cause\(s\) of death and associated cause\(s\) of death](#).

**years lived with disability (YLD):** The number of years of what could have been a healthy life that 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. YLL represent [fatal burden](#).

See also: [First Nations - Glossary](#)

## Technical notes

Table: Abbreviations

Terms	Description
ABDS	Australian Burden of Disease Study
ABS	Australian Bureau of Statistics
ADIPS	Australasian Diabetes in Pregnancy Society
AIHW	Australian Institute of Health and Welfare
ASR	age-standardised rate
BEACH	Bettering the Evaluation and Care of Health program
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus disease 2019
DALY	disability-adjusted life years
EBDN	European Burden of Disease Network
ERP	Estimated Resident Population
GBD	Global Burden of Disease Study
HALE	health-adjusted life expectancy
IADPSG	International Association of the Diabetes and Pregnancy Study Groups
ICD	International Classification of Diseases
ICU	intensive care unit
ILI	influenza-like illness
lbw	low birthweight
LE	life expectancy
LRI	lower respiratory infection
NHMD	National Hospital Morbidity Database
NMD	National Mortality Database
NNDSS	National Notifiable Diseases Surveillance System
RTI	road traffic injuries
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
SIDS	sudden infant death syndrome
YLD	years lived with disability
YLL	years of life lost

## Frequently asked questions

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- [How is health-adjusted life expectancy calculated?](#)
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### What is burden of disease?

Burden of disease analysis measures the impact of disease and injury in a population by estimating the years of life lost (YLL, fatal burden) and years lived with disability (YLD, non-fatal burden). The sum of non-fatal and fatal burden equates to the total burden (disability-adjusted life year, DALY).

1 DALY is equivalent to 1 year of healthy life lost.

Burden of disease studies allow the impact of both deaths and living with illness to be compared and reported in a consistent manner. The health impacts and distribution of diseases and injuries contribute to the evidence base to inform health policy and programs, and service delivery.

### How are burden of disease estimates (DALY, YLD, YLL) calculated?

Disability-adjusted life years (DALY) are estimated by combining the years of life lost (YLL) with the years lived with disability (YLD) in a single reference year for each sex, age group and disease or injury.

$DALY = YLL + YLD$

YLL equals the sum of the number of deaths due to the disease at each age multiplied by the number of remaining years that a person would on average expected to have lived according to an aspirational life expectancy.

YLD is estimated by multiplying the point prevalence of all sequelae (that is, consequences of a disease) by a disability weight which reflects the severity of the health state. A health state reflects a combination of signs and symptoms that result in health loss (for example, end stage of chronic liver disease). The disability weights used in ABDS 2023 were sourced from the Global Burden of Disease Study 2013 (GBD 2013 Collaborators 2015). Point prevalence is defined as the number of people with a condition at a particular point in time, for a reference year.

For 2023, burden estimates were mostly based on trends from previous ABDS reference years, 2020 and 2021 data where available and appropriate. Further detail about the trend analyses can be found in the [Technical notes](#).

### How is health-adjusted life expectancy calculated?

Health-adjusted life expectancy (HALE) extends the concept of life expectancy by considering the time spent living with ill health from disease and injury. HALE is measured using the morbidity and mortality experienced by the population for a particular reference year.

In the ABDS, Sullivan's method was used to calculate HALE (see Jagger et al. 2014). Further information can be found in the [Australian Burden of Disease Study 2018: methods and supplementary material](#) report.

For ABDS 2023, the life table for 2023 derived from the ABS provisional deaths and projected 2023 YLD rates were used to calculate HALE. For more information see HALE in the [Technical notes](#).

### Which diseases are included in the Australian Burden of Disease Study?

Burden of disease analysis provides estimates for an extensive list of diseases and injuries, and the list of diseases has been devised to be mutually exclusive (non-overlapping).

The ABDS 2023 disease list comprises 220 specific diseases or conditions (such as coronary heart disease, stroke, lung cancer or bowel cancer), grouped into 17 disease groups of related diseases or conditions (such as cardiovascular diseases or cancer). Estimates for injuries are calculated from two perspectives - external cause of injury (such as road traffic accident) and nature of injury (such as traumatic brain injury).

Conditions that could not be individually specified are included in a residual category for each disease group (such as 'other cardiovascular conditions').

COVID-19 is a disease under the Infectious diseases group in the ABDS 2023. Further information on the data and methods used for COVID-19 is provided in the [Technical notes](#).

More information on the diseases included in the Australian Burden of Disease studies can be found in the [Australian Burden of Disease Study: methods and supplementary material 2018](#) report.

## How does the Australian Burden of Disease Study 2023 differ from previous studies?

To provide burden of disease estimates best matched to the public health context for the Australian population, previous Australian Burden of Disease Studies started when the key data resources became available for most included diseases. The complexity of the process (including reviewing and improving disease-specific methods and resources, data extraction, analysis and checking) results in a 3-year to 4-year delay between the reference period and release of results.

To address challenges such as timeliness and completeness of available data, the burden estimates for the ABDS 2023 were largely based on trend analyses rather than gathering data for each reference period, as was done in previous studies.

Trend analysis is a method used to evaluate the pattern of burden estimates over time and to predict burden estimates for the period of interest. Trend analysis allows for burden to be estimated for the current year (2023), based on the assumption that past trends have continued. The COVID-19 pandemic may have influenced morbidity and mortality of some diseases. However, for most diseases adjustments due to COVID-19 impacts were not in scope for ABDS 2023 due to limited data availability at the time of analysis.

Estimates from the trend analysis should be interpreted with caution, as the changes in burden due to factors outside disease epidemiology, such as new public health interventions, were not accounted for in this analysis. The early impact of COVID-19 restrictions on Australia's population was accounted for in the population data used for 2023.

This Study includes estimates for COVID-19. Burden from COVID-19 and lower respiratory infections (including influenza and pneumonia) were estimated from 2023 data available at the time of analysis (further detail is provided in the [Technical notes](#)). However, these estimates may be revised in the future, as more data become available for the latter half of 2023.

The ABDS 2023 does not include subnational or risk factor estimates. The most recent estimates are presented in the Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018 report.

Further information on the data and methods used in ABDS 2023 can be found in the [Technical notes](#).

## Which data sources are used in the Australian Burden of Disease Study 2023?

Mortality data to calculate YLL estimates for 2023 were sourced from the AIHW National Mortality Database (NMD) (deaths occurring from 2011 to 2021 were used in trend analysis) and the ABS provisional death registration data for January to June in 2023 (used to validate projected deaths for 2023 and make adjustments where required).

Deaths due to COVID-19 and lower respiratory infections (including influenza and pneumonia) were mainly sourced from the ABS provisional deaths for available months in 2023, with deaths for the remainder of 2023 modelled based on monthly trends (see [Technical notes](#) for further detail).

The YLL estimates for 2023 should be interpreted with caution. Some cause of death information used in the analyses is subject to change pending the status of coroner investigation. The ABS revisions process is described in detail elsewhere (ABS 2021). The YLL estimates presented may be revised for the next Study when more information becomes available for 2023.

For YLD estimates, there is no single comprehensive and reliable source of data for the incidence, prevalence, severity and duration of all non-fatal health conditions. Morbidity estimates were drawn from a wide variety of data sources, and generally based on the best single source. This included administrative data, national surveys, disease registers and epidemiological studies. Potential sources for disease-specific morbidity data were required to:

- have case definitions appropriate to the disease being analysed
- be relevant to the Australian population
- be timely, accurate, reliable and credible.

YLD estimates for 2023 were calculated using trend analysis based on data for previous ABDS reference years (2003, 2011, 2015, 2018, 2019 (calculated as part of ABDS 2022) and updated prevalence data for 2020 where available (for example, hospitalisation and cancer incidence data and data from the National Survey of Mental Health and Wellbeing) and appropriate (for example, for diseases that were not largely impacted by COVID-19 and the pandemic restrictions and pause on non-essential surgeries etc.).

Further information on the data and methods used in ABDS 2023, as well as differences between the ABDS 2023 and the ABDS 2018, can be found in the [Technical notes](#). The overarching methods used for previous ABDS, and more information on the redistribution of deaths, can be found in the [Australian Burden of Disease Study: methods and supplementary material 2018](#) report.

### **Why use estimates from the Australian Burden of Disease Study 2023 instead of the Australian Burden of Disease Study 2018?**

The ABDS 2023 was undertaken to build on the AIHW's previous burden of disease studies and current disease monitoring work. The ABDS 2023 provides an update of burden of disease estimates using the infrastructure developed as part of ABDS 2011, 2015 and 2018.

The ABDS 2023 provides national burden of disease estimates relevant to the public health context for the Australian population for 2023. It includes burden estimates for the year of release (2023) and burden estimates for COVID-19.

Due to different methods used in the ABDS 2023 compared to previous studies, estimates from the ABDS 2023 are not directly comparable, and may differ from, published estimates in previous Australian burden of disease studies.

For further information on the differences between ABDS 2023 and previous studies see [How does the Australian Burden of Disease Study 2023 differ from previous studies?](#)

### **Why use estimates from the Australian Burden of Disease Study 2023 instead of the Australian Burden of Disease Study 2022?**

The ABDS 2023 builds on work from the ABDS 2022, which was the first ABDS to estimate burden for the year of release based on historical trends and to include burden due to COVID-19. Since the ABDS 2022, methods for estimating burden due to COVID-19 have been refined and some estimates from previous years were revised due to updates in key data sources, such as the National Survey of Mental Health and Wellbeing 2020-21. Therefore, estimates from the ABDS 2023 are not directly comparable, and may differ from, published estimates in previous Australian burden of disease studies. However, estimates for different reference years within the ABDS 2023 are comparable.

For further information on the differences between ABDS 2023 and previous studies see [‘How does the Australian Burden of Disease Study 2023 differ from previous studies?’](#)

### **Where do I find subnational estimates, such as by state/territory?**

The ABDS 2023 includes national estimates only. For subnational (state/territory, remoteness area, socio-economic group) estimates, see the [Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018](#) report. Subnational estimates may not add up to the national estimates. Updated subnational estimates are expected to be included in the next major update of the Australian Burden of Disease Study in late 2026.

### **Are risk factors included in the Australian Burden of Disease Study 2023?**

The ABDS 2023 does not include risk factors. For the most recent estimates, see the [Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018](#) report.

### **How does Australia compare to other countries?**

International comparisons are important and can provide a useful perspective of global disease burden. The Global Burden of Disease (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.

Australian estimates can be compared with those for countries and regions as estimated in the GBD 2019. For this comparison, see [Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018](#) report.

### **Why do some diseases have no fatal or non-fatal estimates?**

Some diseases do not have YLL or YLD estimates as either mortality does not occur from that disease (such as hearing loss disorders), or the disease is only fatal and as such there is no morbidity (such as sudden infant death syndrome). For some rare infections, there were no deaths or morbidity associated with the disease in certain reference years.

### **What population data were used?**

All Australian population-based rates for 2021, 2020, 2019, 2018 were calculated using populations rebased to the 2016 Census (accessed 15 December 2022) (ABS 2022).

Population-based rates for 2015 were calculated using final population estimates from the 2011 Census (accessed 22 December 2018) (ABS 2018).

Population-based rates for 2011 and 2003 were calculated using final population estimates from the 2011 Census (ABS 2017).

Population data for 2023 were sourced from population projections by the Centre for Population (2022). This was the only available source that accounted for the early impacts of the COVID-19 pandemic on Australia's population. The population under the 'central scenario' was used for this Study, which assumed overseas migration to Australia was significantly affected by the COVID-19 pandemic.

The 2001 Australian Standard Population was used for all age-standardisation, as per AIHW and ABS standards (ABS 2016).

## What information is available about the quality of estimates in the Australian Burden of Disease Study 2023?

The ABDS 2023 estimates were produced using the best data available in the scope and time frame of the Study.

Disease burden estimates for 2023 were largely based on projecting historical trends. Uncertainty assessments were also conducted alongside trend analysis. To provide information on the quality of input estimates from previous reference years (2003, 2011, 2015 and 2018), a quality index was developed to rate estimates according to the relevance and quality of source data, and methods used to transform data into a form required for this analysis. Generally, the higher the rating, the more relevant and accurate the estimate. For disease burden due to COVID-19 and lower respiratory infections (including influenza and pneumonia), this approach to rating data quality was used to reflect uncertainty.

To report on the reliability of projected burden of disease measures, the inclusion of confidence intervals associated with regression estimates was explored. However, these were not presented as these relate to the regression models and do not reflect the underlying uncertainty associated with data inputs that inform prevalence estimates. Other outputs of the regression models may indicate the best fit projection based on the set of YLL and YLD crude rates available for each age-sex-cause group. However, these do not necessarily represent the most appropriate projections in the context of the overall epidemiology of a given disease or injury, especially when considering impacts of the COVID-19 pandemic.

Fatal burden (YLL) estimates were considered to have the highest rating for both data and methods used, whilst non-fatal burden (YLD) estimates varied depending on the disease or injury and the data sources used.

The quality of input estimates in the ABDS 2023 for earlier reference years (2003, 2011, 2015 and 2018) are the same as the quality presented in the ABDS 2018. Therefore, refer to Appendix B in the *Australian Burden of Disease Study: impact and causes of illness and death in Australia 2018* report (AIHW 2021a) and the *Australian Burden of Disease Study: methods and supplementary material 2018* report (AIHW 2021b) for more detail on the quality of the YLD estimates and the data and methods used for the earlier reference years. The quality statements for COVID-19 and lower respiratory infections (including influenza and pneumonia) for 2023 are presented in the [Technical notes](#).

## Where can I get more information on methods used in Australian Burden of Disease Study 2023?

Information about the methods used for 2023 burden of disease estimates are presented in the [Technical notes](#). Aside from COVID-19 and lower respiratory infections (including influenza and pneumonia), the methods used for the earlier reference years to inform the trend for 2023 are the same as methods used in the ABDS 2018. For information about methods used for specific diseases for earlier reference years (2003, 2011, 2015 and 2018), refer to the *Australian Burden of Disease Study: methods and supplementary material 2018* report.

## Where can I find more information about the Australian Burden of Disease Studies?

Information and reports about burden of disease in Australia, including for Aboriginal and Torres Strait Islander people, are available on the [AIHW website](#).

For further information or for customised data requests please contact the AIHW Burden of Disease team ([burdenofdisease@aihw.gov.au](mailto:burdenofdisease@aihw.gov.au)).

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## Notes

### Acknowledgements

The Australian Burden of Disease Study 2023 was undertaken by members of the Burden of Disease and Mortality Unit of the Australian Institute of Health and Welfare (AIHW).

The Study was undertaken by Vergil Dolar, Julianne Garcia, Wendy Ho, Paula Laws, Yolanda Lovie-Toon, Nick Mann, Matilda Pulford and Anne-Marie Waters, under the guidance of Michelle Gourley and Karen Bishop.

Special thanks to Louise Gates, Justin Harvey and Richard Jukes for reviewing the report.

Oscar Yang and David Whitelaw provided valuable advice on statistical methods for the Study.

The authors acknowledge Health and Vitals Statistics Section in the Australian Bureau of Statistics for providing provisional death registration data.

Kerry Ireland and Michael Phanprachit assisted with publication and the presentation of information.

Analyses were conducted in consultation with the Burden of Disease Expert Advisory Group whose members are Lynelle Moon (Chair), Ching Choi (University of New South Wales), Anthony Barnes (independent consultant), Tony Blakely (University of Melbourne), Annette Dobson (University of Queensland), Tim Driscoll (University of Sydney), Linda Fardell (Australian Bureau of Statistics), John Goss (University of Canberra), Samantha Howe (University of Melbourne), Laura Kirkland (Department of Health Western Australia), Maarit Laaksonen (University of New South Wales), Sharyn Lymer (NSW Health), Bernie Towler (Department of Health and Aged Care), and Mark West (Queensland Health).

Special thanks to Alize Ferrari and Damian Santomauro for providing valuable advice on methods for specific mental health conditions. The authors also acknowledge Samantha Howe and Joshua Szanyi for constructive review and advice regarding methods on non-fatal burden estimation of the post-acute consequences of COVID-19.

We acknowledge the COVID-19 Epidemiology and Surveillance Team in the Office of Health Protection and Response Division for provision of COVID-19 data and advice.

We also acknowledge the Office of Health Protection and Communicable Diseases Network Australia, Department of Health and Aged Care, for provision of influenza notifications data.

The Department of Health and Aged Care funded this Study and provided valuable input during the drafting process.

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# Data

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## Report editions

### This release

Australian Burden of Disease Study 2023 | 14 Dec 2023

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### Previous releases

- Australian Burden of Disease Study 2022 |  
**Web report** | 13 Dec 2022
  - Australian Burden of Disease Study: Impact and causes of illness and death in Australia 2018 |  
**Publication** | 24 Nov 2021
  - Australian Burden of Disease Study: impact and causes of illness and death in Australia 2015 |  
**Publication** | 13 Jun 2019
  - Australian Burden of Disease Study: impact and causes of illness and death in Australia 2011 |  
**Publication** | 10 May 2016
  - The burden of disease and injury in Australia 2003 |  
**Publication** | 25 May 2007
  - The burden of disease and injury in Australia (1996) |  
**Publication** | 16 Nov 1999
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