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Australia's health 2022

data insights







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data insights






The AIHW is an independent statutory Australian Government agency producing authoritative and accessible information and statistics to inform and support better policy and service delivery decisions, leading to better health and wellbeing for all Australians.

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Australian Government
Australian Institute of Health and Welfare

The Honourable Mark Butler MP
Minister for Health and Aged Care
Parliament House
Canberra ACT 2600

Dear Minister

On behalf of the Board of the Australian Institute of Health and Welfare (AIHW), I am pleased to present to you *Australia's health 2022,* as required under subsection 31(1) of the *Australian Institute of Health and Welfare Act 1987.*

This edition continues the AIHW tradition of delivering high quality evidence and value-added analysis on health in Australia. The report provides comprehensive coverage of health topics in online webpages and explores new insights on topical issues in a series of articles. The report includes several articles which closely examine the direct and indirect impacts COVID-19 has had on the health of Australians.

I commend this report to you as a significant contribution to national information on health-related issues, and to the development of health policies and programs in Australia.

Yours sincerely

L Markus

Mrs Louise Markus

Chair
AIHW Board

3 June 2022

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About *Australia's health 2022*

This edition of the AIHW's biennial flagship report on health is comprised of the following product suite:

Australia's health 2022: data insights

This is a collection of 10 in-depth articles on selected health topics, including a focus on the health impacts of COVID-19, the evolution of the health system over the last 100 years, and the importance of a strong evidence base for supporting the health of Australians. It is available as a print report and online as a PDF.

Australia's health: topic summaries

This is a collection of 63 web pages that present key information and statistics on the health system, health of Australians and factors that can influence our health. They are available online in HTML (some updated when new data are available).

Australia's health 2022: in brief

This presents key findings and concepts from the topic summaries and data insights to provide a holistic picture of health in Australia. It is available as a print report and online as a PDF.

All products can be viewed or downloaded at: www.aihw.gov.au/reports-data/australias-health.

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Preface

Each year, the Australian Institute of Health and Welfare (AIHW) produces one of its 2 highly regarded flagship reports: *Australia's health* and *Australia's welfare*.

This year marks the 18th edition in the Australia's health series, *Australia's health 2022*.

Since its first release in 1988, *Australia's health* has been a reliable source of authoritative health information for policy-makers, service providers, researchers and the public.

In each edition, we bring together data from a range of credible sources to show how the health of Australians is faring and to examine our nation's most important health issues.

In 2022, no health issue stands above or has had as wide reaching an effect on our population as COVID-19. The pandemic, now in its third year, has severely challenged the nation's health system. Its effect on this system and on people's health will be felt for many years.

Compared with many countries through 2020 and most of 2021, case numbers in Australia remained low. But fast-forward to mid-2022 and our daily COVID-19 experience since late-2021 – at least in terms of case numbers and deaths – resembles that of many countries.

Three of the 10 articles in *Australia's health 2022: data insights* focus on COVID-19. They describe, respectively, the pandemic's direct health impact on the population, the changes in the overall health of Australians during COVID-19, and how COVID-19 has affected Aboriginal and Torres Strait Islander people's use of health services. We hope that these articles help readers to consider the pandemic in a broader context and see the patterns over the full course of the disease in Australia thus far.

Another 2 chapters examine our health, health care and the COVID-19 pandemic from a historical perspective by contrasting past and current health challenges. One looks at the evolution of our health care system – from the Spanish influenza to COVID-19; the other explores changes to the main causes of death in Australia since 1907. Over the last 100 years, deaths from infectious diseases (such as tuberculosis, polio and diphtheria) have declined due to childhood immunisation and disease control measures, while deaths from chronic conditions, such as cancers and dementia, have increased. Vaccinations have continued to play a key role today in reducing the proportion of deaths and hospital admissions for people with COVID-19.

The COVID-19 pandemic has been one of the biggest public health challenges Australia has faced since the Spanish influenza of 1919. The hard work of a century has forged our health care system into one that can cope with such a major health crisis. Still, many strategies adopted 100 years ago to prevent the spread of Spanish influenza have also been used today during the COVID-19 pandemic – such as controlling population movement, quarantining and mask wearing.

The AIHW aims to improve the evidence base that supports improved health and wellbeing for all Australians. One way to do this is through linked data; studies that use data integration allow us to derive new understandings to fill gaps in what we know. For example, this report describes insights gleaned from the first large-scale study in Australia to analyse health service costs in the last year of a person's life. As a result of this study, which used the National Integrated Health Services Information Analysis Asset, we now know for sure what we suspected – that health costs are much higher in the last year of life. The full findings will help to fill an evidence gap in an area with growing policy relevance in Australia.

In its in-depth articles and online topic summaries, *Australia's health 2022* explores health and health outcomes for several population groups. For instance, the data insights print report presents case study findings on the health of culturally and linguistically diverse populations in Australia – again made possible by using linked data. It also analyses pregnancy and birth outcomes for mothers and their babies living in remote areas and examines the prevalence of mental illness and the use of mental health services by young people.

In covering these topics in depth, this report highlights the critical importance of data and the ongoing need to build an evidence base that can support long-term improvements in health and health care for Australians.

Australia's health 2022 continues the series' recent departure from a single large print book to a more accessible multi-product release that has a greater web presence and leaner print publications. Complementing its comprehensive suite of articles is a holistic summary of health in Australia (in the print report *Australia's health 2022: in brief*) and over 60 topic summaries online, which provide key statistics and supporting information on the health system, the health of Australians and on factors that can influence our health.

The AIHW's core purpose is to produce authoritative and accessible information and statistics. I am confident that data will play an increasing role in assisting us to do this and in informing public discussion.

I would like to thank everyone involved in producing this report and to acknowledge the valuable advice provided by the many experts throughout the drafting and review stages.

We are committed to improving the usefulness and relevance of our flagship reports and welcome your feedback via flagships@aihw.gov.au.

Rob Heferen
CEO

Introduction

> Health is 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO 1946).

Health reflects the complex interplay between a person's genetic make up, family environment, and social and economic conditions. It is also affected by their perceptions, emotions and behaviours.

Health outcomes and experiences of health are not the same for all people and are often shaped by the distribution of wealth and resources at national and local levels. Income, education, conditions of employment, and social support (often known as social determinants of health) are known contributors to health inequalities between population groups.

Most (85%) Australians report that they are in good to very good health. Yet, almost half the population has one or more chronic health conditions, such as mental or behavioural conditions, back problems, cancer, arthritis or asthma.

Health is a feature of life that concerns us all. It is therefore important to keep improving what is known and understood about the health of the population.

To get a clear picture of Australia's health, we depend on data.

We depend on data to measure the conditions in which people are born, grow, live, work and age – or the social determinants of health.

We depend on data to measure the health status of Australians, including the prevalence and impact of diseases such as cancer, dementia and heart disease. It is important to track health status at a nationwide level, as well as to focus on groups who have different health needs or who experience poorer health outcomes than the population as a whole.

We depend on data to monitor the effectiveness, efficiency, appropriateness and quality of the Australian health system – including the health workforce, hospital costs and the provision of health services and medicines.

Together, these data form a wide-ranging, powerful evidence base that can support major advances in health outcomes. Such evidence is used, for example, to improve the development and delivery of health programs and services and deepen the accepted knowledge of the determinants and risk factors that contribute to disease.

The COVID-19 pandemic – and the public health emergency it caused across Australia – have emphasised the health system's need for good-quality health data – data that are timely, reliable, transparent and readily available for decision makers.

At a community level, Australians have become accustomed to daily news reports on the number of new and active COVID-19 cases, hospitalisations and deaths. Many people closely followed the country's vaccination progress.

At a government level, these data have helped to define major policy decisions to control the spread of the virus, including border control measures; international travel restrictions; lockdown and social distancing rules for businesses, households and individuals; health service restrictions; and the vaccine roll-out.

When compared internationally, Australia has fared well on numerous aspects of the COVID-19 crisis. But for many Australians the impact of the pandemic will last a long time.

For years to come, health experts, governments and service providers will scrutinise the data and analysis from this period. The emerging evidence base will reveal many important insights and support ongoing responses and future planning.

The 10 articles that make up this report, *Australia's health 2022: data insights*, explore issues related to health and the health system. They are presented as chapters:

- **Chapter 1** presents an overview on the acute effects of COVID-19 in Australia – including the number of cases, hospitalisations and deaths – from the start of the pandemic until April 2022.
- **Chapter 2** considers how the overall health of Australians changed during the COVID-19 period within the context of pre-existing health trends spanning recent decades.
- **Chapter 3** reports on changes in the use of health services by Indigenous Australians during the first 18 months of the pandemic, focusing on primary health care, emergency department presentations, hospitalisations and elective surgery.
- **Chapter 4** reports on how the leading causes of death in Australia have changed since 1907, focusing on infant and child mortality, infectious diseases, chronic diseases, injuries, tobacco use and the introduction of health screening programs.
- **Chapter 5** recounts the major developments in Australia's health system since the Spanish influenza of 1919, including changes to system administration and funding, medicine and vaccine policies, public health measures and intensive care units.

- **Chapter 6** examines the cost of health services used by Australians in the 12 month period leading up to their death.
- **Chapter 7** shows how linked data can be used to explore variations in the use of common and important health services by different groups of culturally and linguistically diverse Australians.
- **Chapter 8** provides an overview of young Australians' mental health. It examines the prevalence of mental illness, changes in mental health over time and the use of mental health services.
- **Chapter 9** reports on a range of pregnancy and birth outcomes for mothers and babies living in Australia's remote areas, comparing them with outcomes for those in non-remote areas.
- **Chapter 10** describes the Australia's health information environment and the impact of COVID-19 on the data landscape.

In different ways, each article shows the crucial role that data play in measuring, understanding and improving the health of Australians.

References

WHO (World Health Organization) (1946) Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19–22 June 1946, WHO, New York.

List of Australia's health: topic summaries

Australia's health: topic summaries are web pages that present key information and statistics on the health system, health of Australians and factors that can influence our health.

The full list of topic summaries is provided here and content can be viewed at www.aihw.gov.au/australias-health/summaries.

Health status

Burden of disease

Cancer

Causes of death

Chronic conditions and multimorbidity

Chronic kidney disease

Chronic musculoskeletal conditions

Chronic respiratory conditions

Coronary heart disease

Dementia

Diabetes

Health of people experiencing homelessness

Infectious and communicable diseases

Injury

International health data comparisons

Mental health

Oral health and dental care

Physical health of people with mental illness

Profile of Australia's population

Stroke

Suicide and intentional self-harm

What is health?

Determinants of health

Alcohol

Biomedical risk factors

Built environment and health

Diet

Family, domestic and sexual violence

Health literacy

Illicit drug use

Insufficient physical activity

Natural environment and health

Overweight and obesity

Social determinants of health

Stress and trauma

Tobacco

Health system

Alcohol and other drug treatment services

Cancer screening

Digital health

General practice, allied health and other primary care services

Health care safety and quality

Health expenditure

Health promotion and health protection

Health system overview

Health system *(continued)*

Health workforce

Hospitals

Immunisation and vaccination

Medicines in the health system

Mental health services

Palliative care services

Pathology, imaging and other diagnostic services

Referred medical specialist attendances

Health of population groups

Health across socioeconomic groups

Health of children

Health of mothers and babies

Health of older people

Health of people with disability

Health of prisoners

Health of veterans

Health of young people

Rural and remote health

Indigenous health

Determinants of health for Indigenous Australians

Indigenous Australians and the health system

Indigenous health and wellbeing

Profile of Indigenous Australians

The impact of a new disease: COVID-19 from 2020, 2021 and into 2022

1

The impact of a new disease: COVID-19 from 2020, 2021 and into 2022

Key findings

This article examines the direct impacts of Coronavirus disease 2019 (COVID-19) on the Australian population since the start of the pandemic in 2020 through to the first few months of 2022. The timeline of the pandemic is documented, presenting data on cumulative cases, hospitalisations and deaths. Updated burden of disease estimates are presented for 2020 plus preliminary estimates for 2021. Patterns of morbidity and mortality are explored for population groups, including Aboriginal and Torres Strait Islander people, people with disability, aged care facility residents, and people living in rural and remote areas.

The article is a point in time assessment which has been compiled predominantly from data available in the public domain; it should be considered preliminary and may change with future articles.

Key findings are described below:

- Compared with many other countries, the number of COVID-19 cases was very low in Australia until early 2022, when case numbers rose after the Omicron variant was introduced in December 2021. The cumulative incidence by 30 April 2022 was 231,000 cases per million people.
- Hospitalisations and deaths due to COVID-19 in Australia followed trends in cases. The number of people in hospital relative to the number of cases has, to date, been much lower during the Omicron wave than during earlier waves. The case fatality rate of COVID-19 related deaths fell from a peak of 3.3% in October 2020 to 0.1% in April 2022.
- Rapid vaccination rates in the second half of 2021 resulted in Australians now having one of the highest levels of COVID-19 vaccination in the world. However, inequalities in vaccination coverage exist: it is lower among Indigenous Australians, residents of the Northern Territory and participants in the National Disability Insurance Scheme (NDIS) than among the rest of Australians.

(continued)

- The incidence of COVID-19 is highest in people aged 20–39, although deaths in this age range are rare. The cumulative incidence is higher for females in all age groups between 10 and 59, after which it is higher for males. Among people aged 80 and over, the incidence of COVID-19 is lowest but mortality rates from COVID-19 are highest.
- By 30 April 2022, 5,335 deaths from COVID-19 had been registered in Australia, with 3,107 occurring in 2022. In 2021, 0.8% of deaths were from COVID-19, rising to 9.6% of deaths during January and February 2022. Since the largest number of deaths from COVID-19 during the pandemic, to date, has occurred in 2022, the impact on excess mortality in 2022 is likely to be greater than seen for 2020 and 2021.
- COVID-19 accounted for 23,000 disability-adjusted life years (DALY) in 2021. The largest proportion was due to fatal burden, 89% of DALYs for males and 84% for females. Total fatal burden equated to 15 years of life lost per person who died from COVID-19, based the Global Burden of Disease ideal life expectancy.
- The case fatality rate of COVID-19 related deaths in aged care facility residents is 6.3%. In 2020, 75% of all COVID-19 related deaths occurred in aged-care facility residents and fell to 17% in 2021. The cumulative mortality rate for aged care facility residents is 1.0%, which is lower than that observed for several other countries.
- COVID-19 incidence and mortality rates were higher in *Major cities* than in regional or remote areas. For deaths registered by 31 March 2022, people from lower socioeconomic groups and those born overseas, particularly in North Africa and the Middle East, had higher COVID-19 mortality rates than for other Australians.

Introduction

This chapter covers data and information available from the start of the pandemic until the end of April 2022. The data are the most recent available and were accurate when this article was written. However, given the dynamic and ongoing nature of the pandemic, the underlying data and/or information may be updated, changed or revised as more is learnt about the disease and its impact on the population.

COVID-19 emerged as a new disease in late 2019 and the World Health Organization (WHO) declared it a pandemic in March 2020. By 30 April 2022, more than 500 million cases had been confirmed worldwide and more than 6 million COVID-19 related deaths (Ritchie et al. 2022). However, the true numbers are likely to be much higher than these as many cases and deaths from COVID-19 may go undetected and unreported (COVID-19 Excess Mortality Collaborators 2022; Giattino 2020; Lau et al. 2021).

This article presents summary information for Australia on the acute effects of COVID-19, including the number of cases, hospitalisations and deaths from the start of the pandemic until 30 April 2022. Burden of disease estimates for 2020 that were previously published (AIHW 2021b) have been revised and updated to include data for 2021. Information on the COVID-19 vaccination roll-out and the impacts of COVID-19 on high-risk population groups are outlined briefly.

COVID-19 is a highly infectious disease with a wide spectrum of severity. Many people experience mild to moderate disease, but some develop very serious illnesses. Studies based on data from 2020 – early in the pandemic and before vaccines had been developed – showed that COVID-19 led to more severe respiratory illness (requiring hospitalisation) and mortality than influenza (Iacobucci 2021; Piroth et al. 2021). It is spread by both relatively large sized ‘droplets’ and smaller ‘aerosol’ particles that can linger in the air (Wang et al. 2021).

COVID-19 became a worldwide crisis due to its severity, its high transmission rates and because, initially, there was no population immunity or vaccine for it. It is also changing over time. By the start of December 2021, 5 variants of concern had been detected in Australia: Alpha, Beta, Gamma, Delta and Omicron – some of which are associated with increased transmission rates (COVID-19 NIRST 2021e). While the most recent variant (Omicron) is still being studied there is growing evidence that it can evade the immune system and spread rapidly (WHO 2022b). New variants, sub-variants and lineages are likely to continue to emerge, such as the BA.2 Omicron sub-variant for which there is increasing evidence of greater transmissibility than seen with BA.1 (Chen and Wei 2022; Cheng et al. 2022; Lyngse et al. 2022).

As well as the acute effects of COVID-19, it can take many months for some individuals to recover from the disease, with a post-COVID-19 condition (which includes the disorder often termed 'long COVID') being recognised, however the prevalence of persistent symptoms is currently unclear. There is also emerging evidence that people with mild illness can be at higher risk of long-term mental health and cardiovascular outcomes (Xie, Xu, and Al-Aly 2022; Xie, Xu, Bowe, et al. 2022). For more information on 'long COVID', see the section of this article titled 'Long COVID and Post-COVID-19 Syndrome'.

While Australia has not been spared from COVID-19, there has been less of an impact on morbidity and mortality than for many other countries (AIHW 2021b; OECD 2021b). The first case in Australia was identified on 24 January 2020 in a 58-year-old man who arrived from Wuhan, China on 19 January 2020 (Caly et al. 2020). Up until early October 2021, Australia had the second lowest total number of confirmed cases per head of population of all Organisation of Economic Co-operation and Development (OECD) countries (with only New Zealand lower) and the third lowest death rate (with South Korea and New Zealand lower) (OECD 2021b). In early 2022, all 38 OECD countries experienced increases due to Omicron outbreaks and by early March 2022 Australia had dropped to eighth lowest total rate of confirmed cases and the fifth lowest death rate (Ritchie et al. 2022).

Several non-OECD countries in the Asia–Pacific region have also had low numbers. For example, case and death rates in Taiwan and many Pacific Island nations have been very low by world standards; China, Singapore and Thailand also had low rates – though some of these countries experienced increases in early 2022 due to Omicron outbreaks (Ritchie et al. 2022). Many low-income and lower-middle income countries have had lower than expected numbers of COVID-19 cases and deaths due to poor disease surveillance capacity and low death registration rates (WHO 2020). During 2020 and 2021, 15 million excess deaths (the difference between the number of observed and expected deaths in a defined time period) from COVID-19 were estimated globally, 3 times more than the 5 million officially reported (Grimly et al. 2022; WHO 2022c). The largest proportion of excess deaths occurred in lower-middle income countries such as India, Egypt, and Indonesia, and are unreliable for 41 of 54 countries in Africa due to little data on deaths from the region.

A range of public health protection measures have been used in Australia to manage the spread of COVID-19 and protect the healthcare system. These include:

- measures to reduce movement of the population, such as border closures
- measures to promote physical distancing
- quarantine and isolation rules
- mask mandates (COVID-19 NIRST 2021b).

These interventions have had numerous indirect effects on the health of the population and are described in more detail in Chapter 2 'Changes in the health of Australians during the COVID-19 period'. For a discussion of public health protection measures implemented in Australia see 'Health promotion and health protection' at https://www.aihw.gov.au/reports/australias-health/health-promotion.

Vaccination has also been an important tool to protect the population from illness and death. As soon as the genomic sequence of the virus was published in early January 2020 scientists began developing vaccines to protect the population against severe illness. Several different vaccines were shown to be safe and effective and began to be administered in countries across the world in early 2021. Despite challenges with the rollout of the vaccines due to initial supply issues, Australia then had one of the highest vaccination rates in the world with 83% of the total population receiving 2 doses by 30 April 2022 (OWID 2022). Globally, there have been large disparities in the ability of individual nations to vaccinate their populations against COVID-19, with the United Arab Emirates having the highest rate of 97% and low-income countries, particularly those in the African region, having rates below 20% for 2 doses (OWID 2022). For more information on COVID-19 vaccination in Australia see the section titled 'COVID-19 vaccination' later in this article.

Several treatments have been developed to minimise illness and death following COVID-19 infection. The first oral treatments were provisionally approved for use in Australia by the Therapeutic Goods Administration (TGA) on 18 January 2022 (Department of Health 2022k). Lagevrio® (molnupirovar) and Paxlovid® (nirmatrelavir + ritonavir) are effective in treating mild to moderate COVID-19 in adults aged 18 and older, who do not require supplemental oxygen, and who are at increased risk of being hospitalised. These treatments have been added to the National Medical Stockpile for distribution throughout the country, with high-risk groups prioritised for treatment, including people living in residential aged care facilities and in rural and remote communities, Indigenous Australians and people with disability (especially in a supported living setting).

Sources of information used in this article

Data for this section are predominantly compiled from several publicly available sources. For international comparisons of the COVID-19 pandemic over time the "Our World in Data" online resource was used (Ritchie et al. 2022).

To enable specific and more detailed analyses of Australian data, information was obtained from the Department of Health website (Department of Health 2022d, 2022e), the *COVID Live* website (COVID Live 2022), state and territory COVID-19 websites, and the Australian Bureau of Statistics (ABS). *COVID Live* data which are collected from media releases and verified against Australian and state and territory health departments were the main source used in this article to analyse COVID-19 cases, hospitalisations and COVID-19 related deaths in Australia. For more detailed information, see the section titled 'Data notes' later in this article.

Detection of COVID-19 cases

Clinical testing for COVID-19 has been an important part of the public health response in Australia since the start of the pandemic. There are 2 main types of test used to detect COVID-19:

- nucleic acid amplification tests (NAATs), such as polymerase chain reaction (PCR) tests, which detect SARS-CoV-2 genetic material
- rapid antigen tests (RATs) that detect the presence of specific proteins of the virus (Therapeutic Goods Administration 2022b).

NAATs are the 'gold standard' for diagnosing COVID-19 as they are better at detecting the presence of the SARS-CoV-2 virus than RATs, and have been used since the start of the pandemic (PHLN 2022). RATs are most accurate when used in the early stages of symptomatic infection, and a follow-up PCR test is recommended in areas of low community transmission. RATs were approved for use at home without supervision by the TGA from 1 November 2021 and can be used on nasal swabs or saliva in accordance with manufacturer instructions for use (Therapeutic Goods Administration 2022a).

Case definitions for COVID-19 are summarised in Box 1.1. Under the Testing Framework for COVID-19 in Australia, RATs may be used in addition to NAATs when transmission exceeds response capacity without requirement to verify the result by PCR (Department of Health 2022l) and is currently in place in Australia. This means that data presented on confirmed cases currently includes people diagnosed using PCR or RATs, unless they are specifically referred to as PCR-confirmed cases.

Box 1.1 Case definitions for COVID-19

COVID-19 is a notifiable disease. Confirmed cases must be reported to the Department of Health via the National Interoperable Notifiable Diseases Surveillance System (NINDSS). Jurisdictions can determine reporting requirements for probable cases.

Confirmed case

A confirmed case requires laboratory definitive evidence.

Laboratory definitive evidence:

1. Detection of SARS-CoV-2 by nucleic acid amplification testing (NAAT)

OR

2. Isolation of SARS-CoV-2 in cell culture, with confirmation using a NAAT

OR

3. SARS-CoV-2 IgG seroconversion or a 4-fold greater increase in SARS-CoV-2 antibodies of any immunoglobulin subclass including 'total' assays in acute and convalescent sera, in the absence of vaccination.

Probable case

A probable case includes individuals who have laboratory suggestive evidence.

Laboratory suggestive evidence:

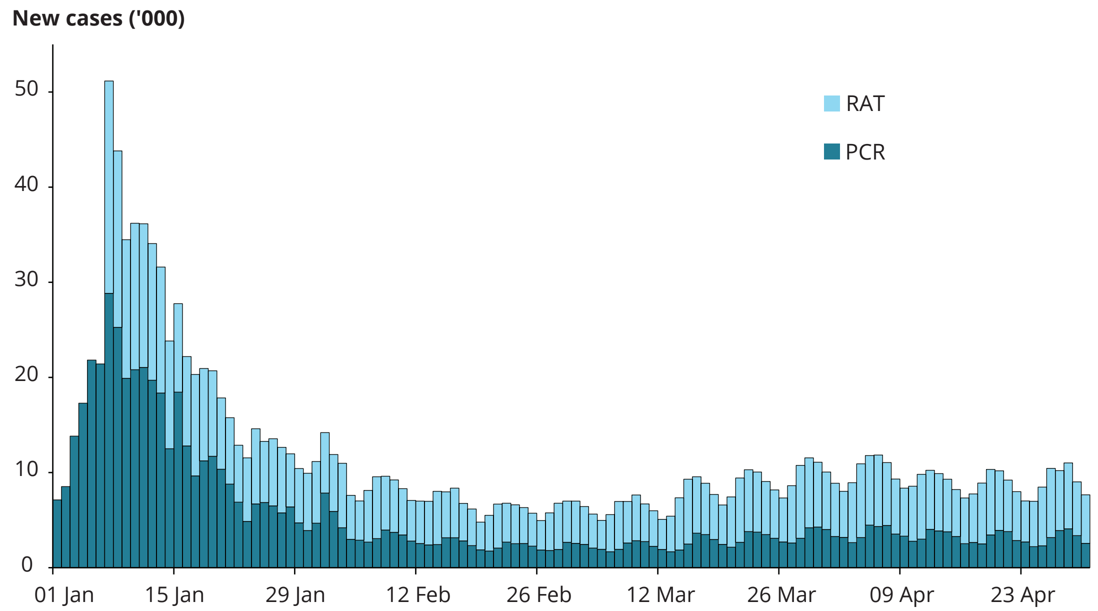
Detection of SARS-CoV-2 by rapid antigen testing (RAT).

Source: Coronavirus disease 2019 (COVID-19): Communicable Diseases Network Australia National Guidelines for Public Health Units, Version 6.7, 22 March 2022.

Since the emergence of the Omicron variant in December 2021, RATs have been increasingly used and have - since that point - accounted for more than half of the total cases reported each day (COVID Live 2022).

- The use of RATs compared to PCR tests also varies with level of geographic remoteness: over the 4 weeks prior to 23 April 2022, 72% of cases in rural areas of New South Wales were detected by RATs compared with 52% in metropolitan areas (NSW Health 2022b).
- Figure 1.1 displays the breakdown of cases according to the type of test used, showing the gradual integration of RATs in Victoria. On 30 April 2022, Victoria reported that 67% of its cases that day were from RATs. Similar patterns exist in other jurisdictions.

Figure 1.1 Rapid antigen self-test versus PCR confirmed cases, Victoria, 1 January to 30 April 2022



Source: State Government of Victoria 2022.

The incorporation of RATs was a response to the substantial pressures placed on the testing system due to the rapid rise in local transmission of the Omicron variant, pathology staff shortages and supply chain issues (Timms and Lloyd 2022). Access to testing was disrupted over the 2021 Christmas holiday season when testing centres and pathology services became overwhelmed with many already operating at reduced capacity over the holiday period (Lu 2021). At the time people required PCR tests for domestic and international travel as demand also rapidly increased for cases and close contacts during the growing Omicron wave. Waiting times were extensive with sites temporarily closing after reaching capacity (Daoud 2021; Vidler et al. 2021). Furthermore, the high temperatures typical of an Australian summer may have prevented people who were feeling particularly unwell from queuing at testing centres (Steger and Luff 2021).

The disruption and changes in laboratory testing experienced in 2022 are likely to result in an underestimate of COVID-19 cases. People with a positive RAT must register their result with their state or territory health department to be included in estimates of case numbers. As well, most jurisdictions experienced issues with the supply of RATs in January 2022, together with a delay between using them to diagnose COVID-19 and setting up reporting systems (Bannister 2022). From 24 January 2022, concession card holders could obtain up to 10 free RATs over a 3-month period to improve access to them for people at higher risk (Department of Health 2022m).

Testing for COVID-19 will continue to be an important tool in monitoring the pandemic going forward; it will also have a role in detecting outbreaks in conjunction with genomic surveillance, identifying new variants when they emerge (Hoang et al. 2022). Genomic sequencing has become a vital tool for detecting and responding to emerging SARS-Cov-2 variants in Australia and for contributing to global surveillance efforts (Andersson et al. 2021). Genomic surveillance can provide important information on genetic relatedness, thus aiding investigations of cluster and outbreak situations, community spread and the detection of new variants (PHLN 2022). In addition, other methodologies are being employed to gain a fuller picture of the pandemic, including seroprevalence studies and wastewater testing. See the section titled 'Novel approaches to understanding the pandemic' later in this article for more information on these methodologies.

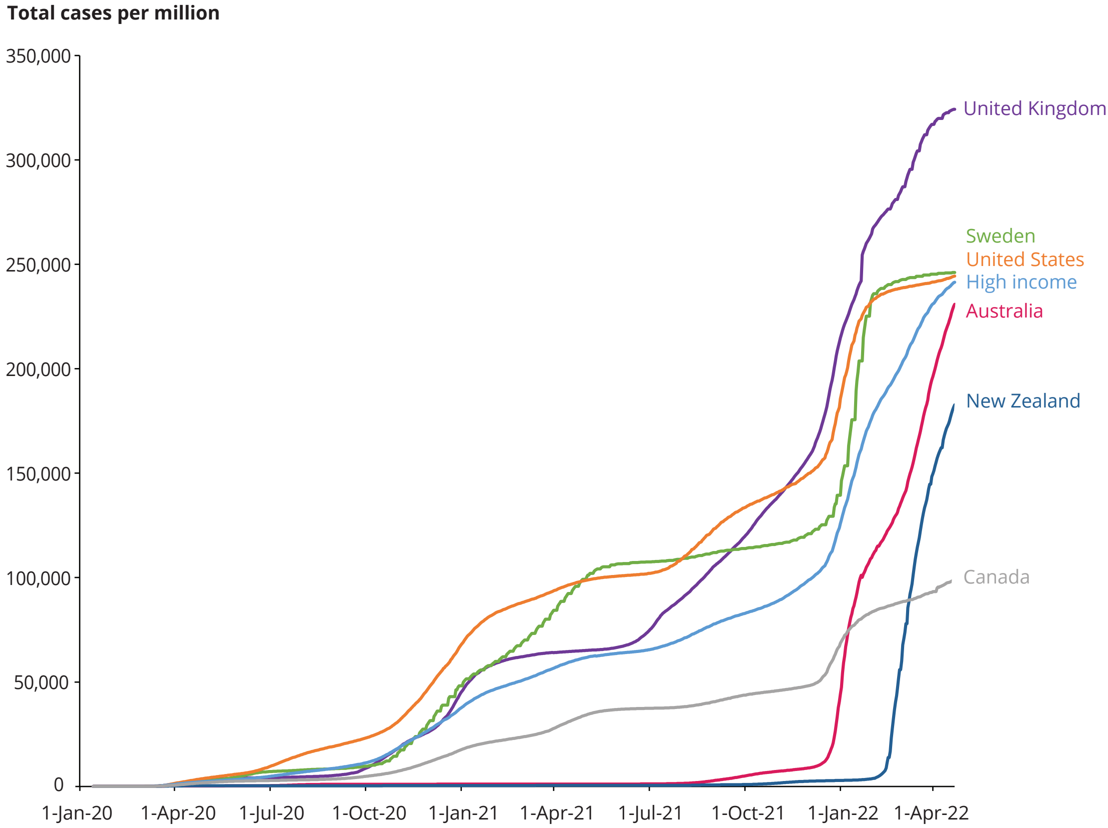
Summary of key patterns in Australia

Timeline of the pandemic

While Australia has fared better than many other countries in relation to the COVID-19 pandemic, the disease has still had a substantial health impact. By 30 April 2022, nearly 6 million cases had been confirmed in Australia since the start of the pandemic, and more than 7,000 COVID-19 related deaths (Department of Health 2022c). Compared with other countries, the number of cases in Australia was far below the average of all high-income countries until early 2022 when it rose rapidly, following the introduction of the Omicron variant and the easing of restrictions (Figure 1.2). By this time, however, vaccination levels were high, with more than 92% of Australians aged 16 and over being fully vaccinated with the initial 2-dose protocol by 2 January 2022, and booster doses were being rolled out (Department of Health 2022j).

During the first few months of 2022, the cumulative incidence of COVID-19 in Australia rose to 231,000 cases per million at 30 April 2022, similar to the average of 241,000 per million for all high-income countries combined, and 29% lower than that for the United Kingdom (Figure 1.2).

Figure 1.2: Country comparison of cumulative confirmed COVID-19 cases per million people, January 2020 to April 2022



Notes

1. Data are obtained from publicly reported daily numbers and should be considered preliminary data that may be subject to changes.
2. High income countries are all countries included in the 'World Bank's Income Groups Classification, 2016', of high income, which is determined by a country's gross national income per capita (in US$).

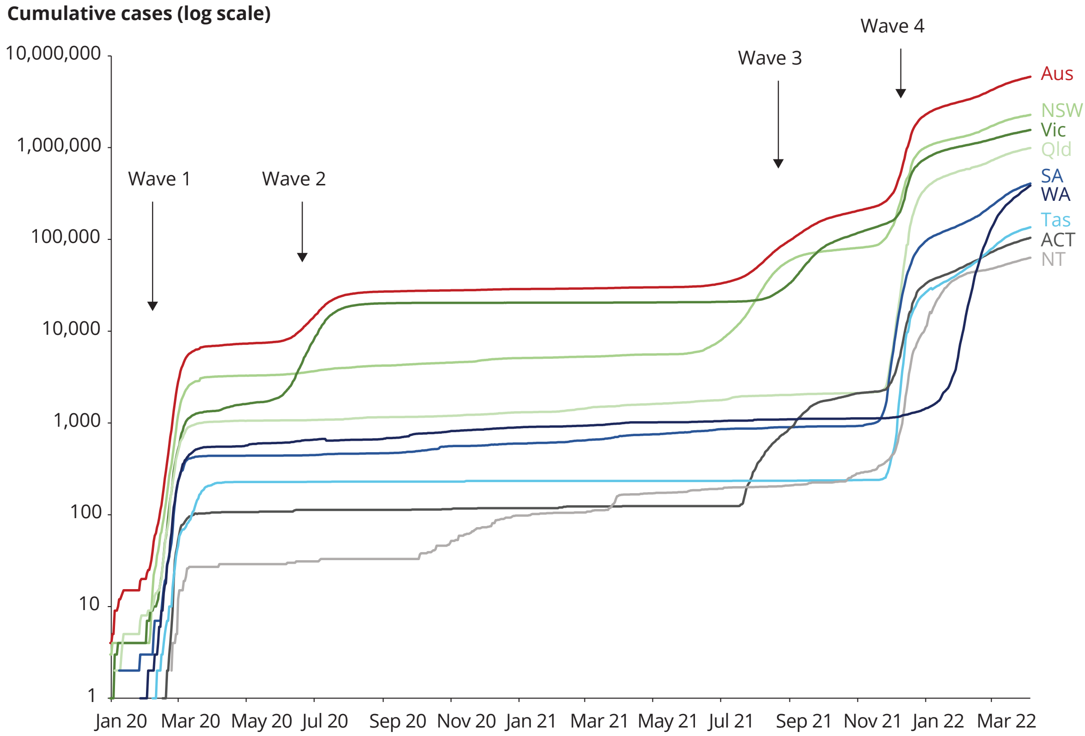
Source: Ritchie et al. 2022.

Figure 1.3 identifies the 4 waves of COVID-19 in Australia and shows the cumulative caseload for each state and territory since the start of the pandemic.

- The first wave occurred from March to April 2020 at the start of the pandemic, with cases in all states and territories.
- The second wave began in the winter of 2020, with most cases in Victoria.
- The third wave started in the winter of 2021 and daily case numbers started to decline from the end of October 2021. While most cases in the third wave were in New South Wales and Victoria, there was also a major outbreak in the Australian Capital Territory.

- The fourth wave started in December 2021 after the introduction of Omicron BA.1. It affected all jurisdictions. International and domestic border restrictions – and a suite of public health restrictions that continued into 2022 – resulted in a delayed but rapid progression of COVID-19 cases during March 2022 in Western Australia. The Omicron wave for Australia flattened from the end of January 2022 but increased again at the end of March 2022 when BA.2 became the dominant sub-variant.

Figure 1.3: Time series of cumulative confirmed COVID-19 cases for Australia and each jurisdiction, 25 January 2020 to 30 April 2022



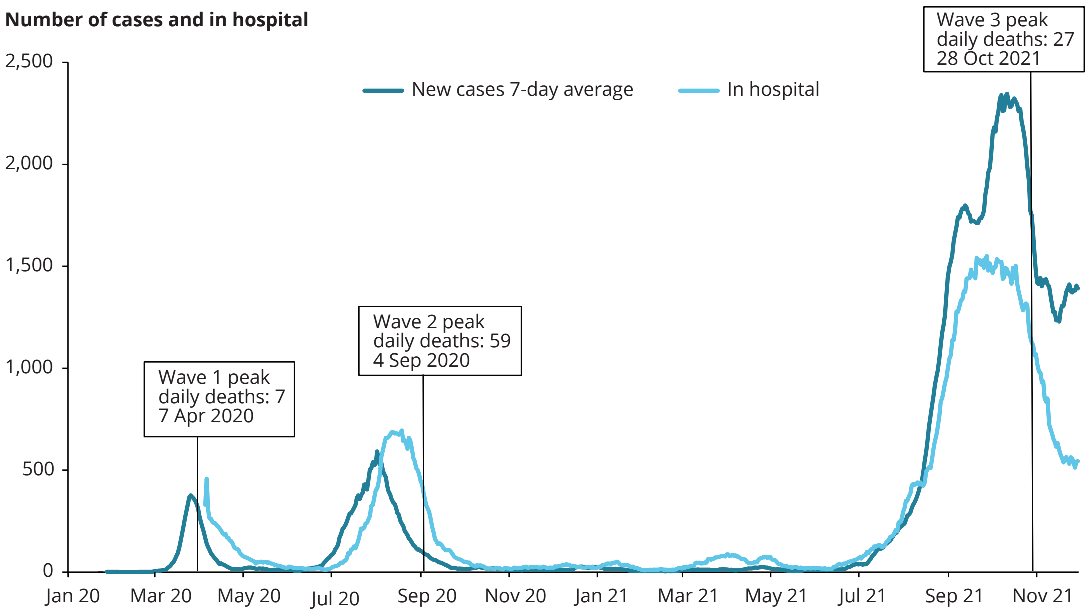
Note: Data are obtained from publicly reported daily numbers and should be considered preliminary data that may be subject to changes.

Source: COVID Live 2022.

Figures 1.4 and 1.5 show the number of new daily confirmed cases, along with counts of people in hospital each day. The peak daily number of deaths are noted for each wave. The number of people in hospital largely follows trends of cases; the peak was around 2 weeks later in the second wave while hospitalisations tracked closer to cases in waves 3 and 4. The number of people in hospital relative to the number of cases is much lower in wave 4 than in earlier waves. For example, on 4 September 2020, when peak deaths were recorded in wave 2, 16% of active cases (357 out of 2,252) were admitted to hospital compared with 1.3% (5,021 out of 373,226) on 28 January 2022 (the date of peak deaths in wave 4) (COVID Live 2022).

The number of deaths also follow the time trends for cases, again with a lag between the peak in cases and the peak in deaths (about 4 weeks in the first 3 waves and 2 weeks in the fourth wave). These observations are consistent with global data analysed up to July 2021 – namely, that a surge in deaths occurred between 6 to 20 days after a surge in cases (Jin 2021).

Figure 1.4: Waves 1-3 daily confirmed cases, hospitalisations and peak deaths.

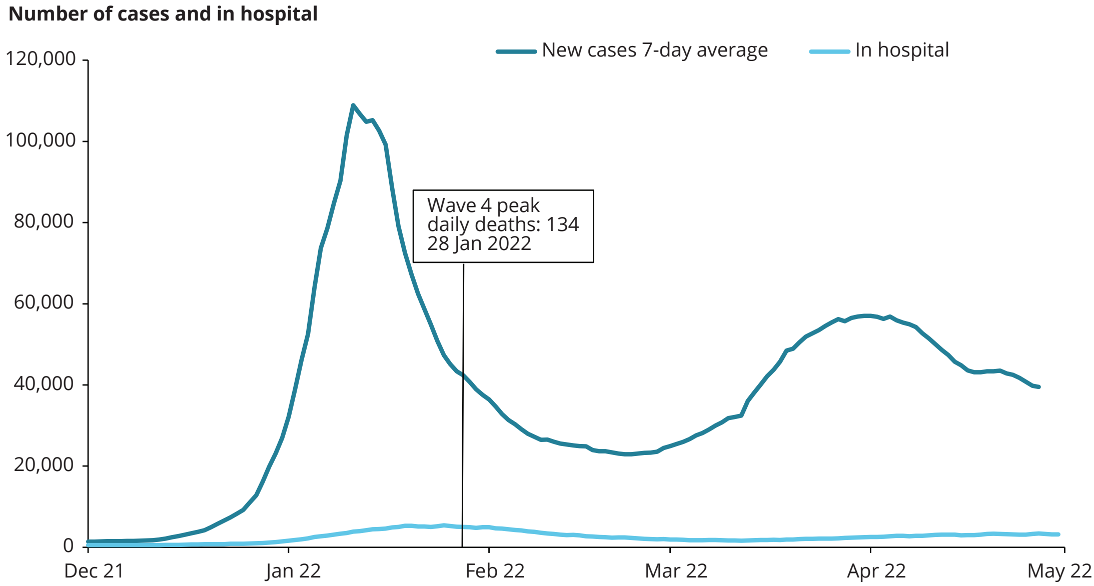


Notes

1. Data are obtained from publicly reported daily numbers and should be considered preliminary data that may be subject to changes.
2. The data presented in the figure is the number of people in hospital on a given day rather than the number of new admissions each day. This measure also reflects severity of the illness as more severe surviving cases generally stay in hospital longer.
3. Counts of deaths are those reported by surveillance systems and comprise deaths due to COVID-19 plus deaths from other causes in COVID-19 patients.

Source: COVID Live 2022.

Figure 1.5: Wave 4 daily confirmed cases, hospitalisations and peak deaths



Notes

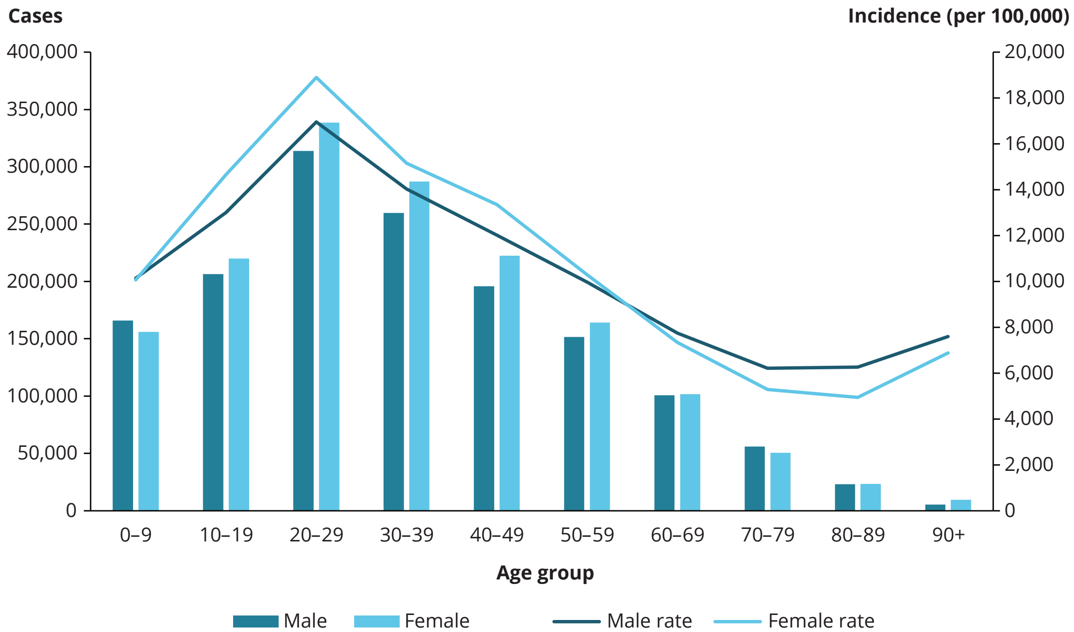
1. Data are obtained from publicly reported daily numbers and should be considered preliminary data that may be subject to changes.
2. The data presented in this figure are the number of people in hospital on a given day rather than the number of new admissions each day. This measure also reflects severity of the illness as more severe surviving cases generally stay in hospital longer.
3. Counts of deaths are those reported by surveillance systems and comprise deaths due to COVID-19 plus deaths from other causes in COVID-19 patients.
4. A total of 331 historical COVID-19 related deaths that occurred between January and March 2022 in NSW were reported on 1 April 2022 following cross-checking of death certificates by NSW Health (NSW Health 2022e).

Source: COVID Live 2022.

Cases by age and sex

The total number of confirmed COVID-19 cases and cumulative incidence varies with age (Figure 1.6). People aged 20–29 had the highest number of cases and incidence followed by people aged 30–39. Overall, the incidence was higher for females (12,200 per 100,000) than for males (11,600), although this varied with age. The incidence was higher for females in all age groups between ages 10 and 59, after which it was higher for males. The age distribution of COVID-19 has changed since 2020, when the cumulative incidence was highest in people aged 80 and over (AIHW 2021b).

Figure 1.6: Total number and cumulative incidence of COVID-19 cases since the start of the pandemic, by age group and sex, as at 1 May 2022.



Notes

1. Data are the total number of confirmed cases reported to the National Notifiable Diseases Surveillance System since the first case was reported.
2. Rates are calculated using the estimated resident population as at 30 March 2020.

Source: Department of Health 2022e.

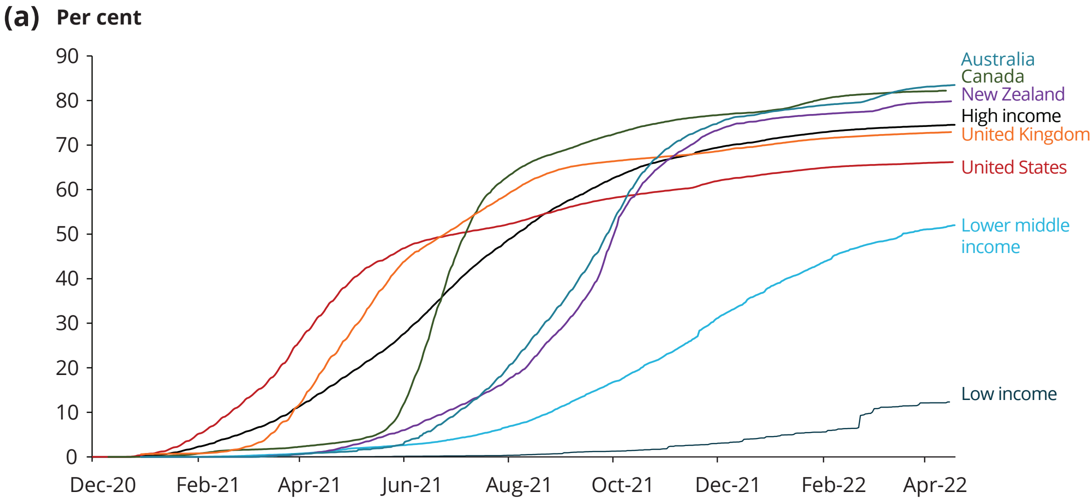
COVID-19 vaccination

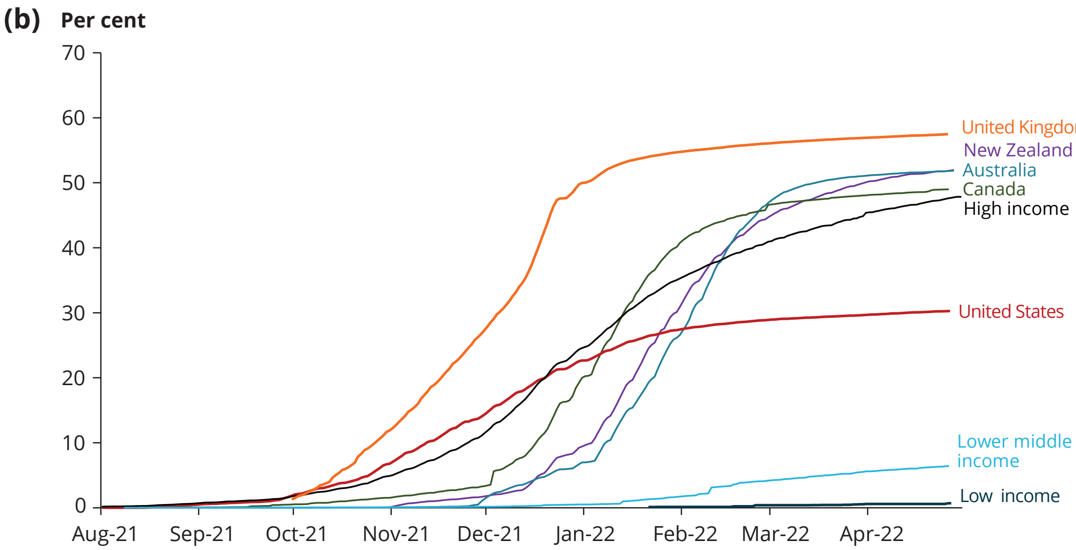
COVID-19 vaccinations began in Australia on 22 February 2021, consisting of a primary 2-dose protocol (Department of Health 2021c). The roll-out strategy took a phased approach – commencing with priority populations, followed by adult populations, and then 12–16-year-olds (Hanly et al. 2022). Vaccinating children aged 5 to 11 years began on 10 January 2022 (Department of Health 2021a). A third 'booster' dose has been available since 8 November 2021 for people aged 16 and over.

An additional 'winter' boost is recommended for specific population groups: people aged 65 and older, residents of an aged care or disability care facility, people who are severely immunocompromised, and Indigenous Australians aged 50 and older (Department of Health 2022a). For more information on COVID-19 vaccines see 'Immunisation and vaccination' and 'Health promotion and health protection' at https://www.aihw.gov.au/australias-health/summaries.

The vaccine roll-out in Australia started later than in other high-income countries, but rapid vaccination rates in the second half of 2021 have resulted in Australia now having one of the highest levels of vaccination in the world (Figure 1.7).

Figure 1.7: International comparison of vaccination levels of people who (a) completed the initial vaccination protocol (2) doses between 1 December 2020 and 30 April 2022 and (b) received a booster (3rd dose) vaccination between 1 August 2021 and 30 April 2022





Source: Ritchie et al. 2022.

By 30 April 2022, more than 95% of the population aged 16 and over were fully vaccinated against COVID-19 under the primary 2-dose protocol (Table 1.1). All jurisdictions except the Northern Territory have more than 90% of their people aged 16 and over fully vaccinated, with Western Australia having the highest booster vaccination coverage (85%). The Australian Capital Territory has the highest percentage of children aged 5–11 fully vaccinated (65%). To date 346,000 people have received a fourth/winter dose (Department of Health 2022i).

Table 1.1: Percentage of people who were fully vaccinated (2 doses) and who have received a booster dose for COVID-19 in Australia, as at 30 April 2022.

	Fully vaccinated (2-doses)			Booster (3rd dose)
Jurisdiction	16 and over	12–15	5–11	Eligible population[(a)]
NSW	94.8	79.5	35.3	66.3
Vic	93.9	85.6	39.8	71.3
Qld	92.1	71.9	29.7	62.6
WA	97.4	80.8	38.2	84.4
SA	93.2	78.4	40.1	72.5
Tas	98.8	83.1	50.2	72.0
ACT	>99.0	>99.0	65.4	77.2
NT	88.8	75.0	32.2	75.8
Australia	**95.5**	**80.4**	**36.9**	**69.3**

(a) Eligible population consists of people aged 16 and over who completed a primary course of vaccination at least 3 months ago (data correct as at 30 April 2022).

Source: Department of Health 2022i.

Progress in vaccination of children in Australia is among the highest in the world, with 53% of children aged 5–11 having received one dose and with 37% being fully vaccinated by 30 April 2022 (Department of Health 2022i).

- In Canada, 57% of 5–11-year-olds had received at least one dose and 41% had received 2 doses by 24 April 2022 (Government of Canada 2022).
- Similarly, Iceland, Portugal and Spain have all vaccinated more than 50% of children aged 5–9 with at least one dose (OWID 2022).
- In the United States, 28% of 5–11-year-olds and 58% of 12–17-year-olds had received 2 doses by 27 April 2022 (AAP 2022).
- Several European countries, including Switzerland, have vaccinated less than 10% of children with their first dose (OWID 2022).

However, COVID-19 vaccination status varies by population groups in Australia. Coverage is high for aged care residents where 97% of residents have received 3 or more doses; however, only 74% of NDIS participants and 53% of Indigenous Australians over the age of 16 had received 3 or more doses by 30 April 2022 (Department of Health 2022i). Only 60% of Indigenous children aged 12–15 are fully vaccinated with 2 doses compared with 80% for all 12–15-year-olds (Department of Health 2022i).

COVID-19 deaths and disease severity

Information on COVID-19 deaths in Australia is available from two sources: the NINDSS which receives data on COVID-19 related deaths from states and territories, and the ABS which compiles death registrations processed by state and territory Registries of Births, Deaths and Marriages.

Defining a COVID-19 related death

The COVID-19 Communicable Diseases Network Australia National Guidelines for public health units define a COVID-19 death as: "a death in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID-19 (for example, trauma). There should be no period of complete recovery from COVID-19 between illness and death" (Department of Health 2022f).

There are two considerations:

- First, under this definition COVID-19 deaths reported in surveillance data will include people who died from COVID-19 as well as people who died with COVID-19, where COVID-19 was not necessarily the cause of death.
- Second, the Registries of Births, Deaths and Marriages include additional information on underlying causes of death and other associated causes sourced from the Medical Certificate of Cause of Death (death certificate) (which is certified by a medical practitioner or coroner).

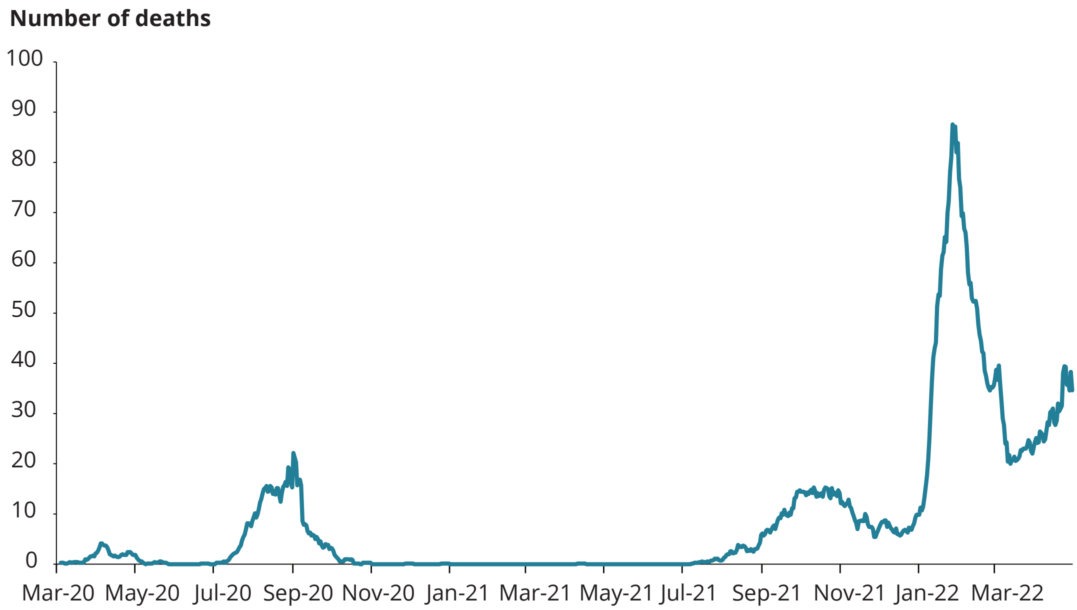
There is a lag between when deaths occur and when they are registered, with around 93% of doctor and coroner certified deaths registered within 2 months of occurrence (ABS 2022c). While death registrations are the official source for reporting on COVID-19 deaths, surveillance data provide rapid information to monitor trends used to inform the public health response and health system preparedness. In this article, surveillance data are used to describe trends in COVID-19 mortality over time and for international comparisons. Death registration data are used to explore demographic differences in mortality due to COVID-19 and report on associated causes of death and comorbidities.

COVID-19 deaths and severity reported by disease surveillance systems

Compared with many other countries, Australia has a relatively low overall COVID-19 related mortality rate. By 30 April 2022, the cumulative mortality rate since the start of the pandemic was 281 per million people, compared with 2,985 for the United States, 2,567 for the United Kingdom, and 1,033 per million for Canada (Ritchie et al. 2022).

Figure 1.8 presents the daily deaths in Australia corresponding to the 4 waves, with the greatest number of deaths occurring in the 4th wave (Omicron).

Figure 1.8 Number of confirmed daily deaths (7-day rolling average) 1 March 2020 to 30 April 2022, Australia



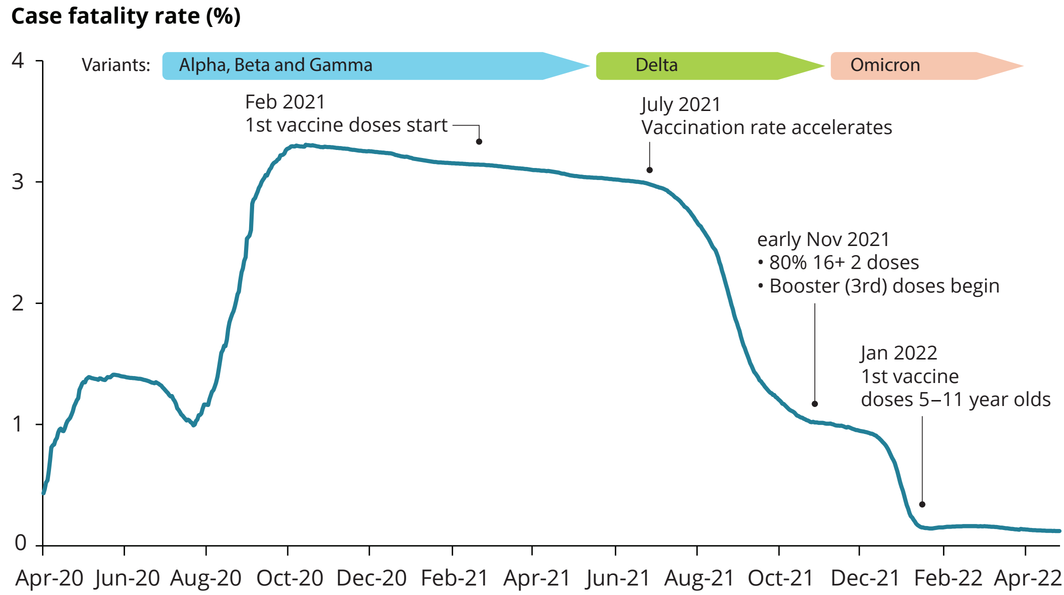
Note: NSW reported 331 additional COVID-19 deaths on 1st April 2022 that are not included in this figure: 270 that occurred between 1 January and 23 March 2022, 58 in 2021 and 3 in 2020 (NSW Health 2022e).

Source: AIHW analysis of COVID Live 2022.

The case fatality rate (CFR) defined as the proportion of cases that result in death is often used as a measure of disease severity. It is important to note that the true total number of cases is likely to be unknown as not everyone with COVID-19 is tested and the CFR will overestimate the true risk of death. Since the start of the pandemic, the CFR in Australia has fluctuated; it peaked at 3.3% in October 2020 and has rapidly declined since July 2021 to 0.1% by 30 April 2022, corresponding to the roll-out of the vaccination program (Figure 1.9). For more detail on vaccination, see the section titled "COVID-19 vaccination" earlier in this article.

The CFR varies with age. Data from New South Wales reported the CFR between 26 November 2021 and 12 February 2022 to be 7.9% in people aged 90 or more, 3.6% for 80–89-year-olds, below 1% for people aged 60–79, and less than 0.1% for all other age groups (NSW Health 2022c).

Figure 1.9: Case fatality rate, 1 April 2020 to 30 April 2022, Australia

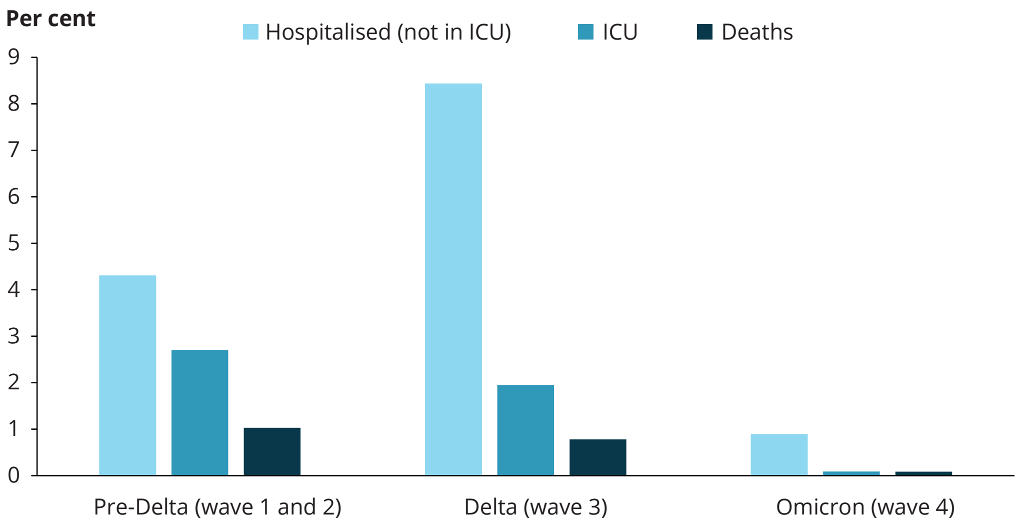


Source: AIHW analysis of COVID Live 2022.

For national reporting purposes, severe cases of COVID-19 are defined as the number of people (cases) admitted to an ICU or who died. The proportion of people with severe COVID-19 per week increased from 0.4 to a peak of 3.7 per 100,000 population nationally between December 2021 and mid-January 2022 in line with the increase in cases over this period (COVID-19 NIRST 2022a, 2022b). This peak was 3 times that of the Delta outbreak, when the proportion reached 1.2 per 100,000 people in the first week of September 2021.

Figure 1.10 compares hospitalisations, ICU admissions and deaths among cases diagnosed with COVID-19 for the Omicron and previous waves in New South Wales. It shows that the proportion of cases experiencing a severe outcome was considerably lower for Omicron than for Delta and earlier waves.

Figure 1.10: Proportion of COVID-19 cases resulting in severe disease (hospitalisation, ICU or death) for Omicron compared with previous waves (NSW), from 1 January 2020 to 23 April 2022



Notes

1. The pre-Delta wave includes cases diagnosed from 1 January 2020 to 15 June 2021. The Delta wave includes cases diagnosed from 16 June 2021 to 25 November 2021. The Omicron wave includes cases diagnosed from 26 November 2021 to 23 April 2022.
2. Categories are not mutually exclusive. Deaths may occur with or without ICU admission.

Source: AIHW analysis of NSW Health 2022a.

Experience in Australia to date reflects growing international evidence that, while Omicron spreads more easily than previous variants, the risk of it causing severe disease resulting in hospitalisation or death is lower than for previous variants (CDC 2022c). The severe case rate nationally depends on the severity of individual cases and the number of cases. The case severity will be determined by several factors including age distribution, vaccination status, and the intrinsic pathogenicity of circulating variants.

When there is a large number of cases associated with a highly transmissible variant such as Omicron, even a small proportion of individuals needing care for severe illness could overwhelm the healthcare system. For example, on 30 April 2022, 3,157 of 329,664 active cases (1.0%) were in hospital, with 144 (4.6%) of these cases in an ICU (Department of Health 2022c).

COVID-19 deaths by vaccination status

Comprehensive analysis of data in Australia on death rates from COVID-19 by vaccination status is forthcoming. South Australia recently reported a death rate of 159.7 per 100,000 COVID-19 cases who were unvaccinated compared with 50 per 100,000 cases who were fully vaccinated and had received a booster (ABC News 2022). Evidence from other countries shows a clear protective effect provided by COVID-19 vaccination (Table 1.2).

Table 1.2 Age-standardised COVID-19 death rates by vaccination status for selected countries

		COVID-19 death rate per 100,000 people		
Country	% of population fully vaccinated	Unvaccinated	Fully vaccinated, no booster	Fully vaccinated plus booster
Switzerland[(a)]	68.8	0.41	0.16	0.11
United States[(b)]	66.5	3.37	0.42	0.20
Chile[(c)]	91.0	1.96	1.23	0.36

(a) As at 1 May 2022.

(b) As at 26 February 2022.

(c) As at 17 April 2022. 'Not fully vaccinated' is included in unvaccinated category.

Notes

1. Fully vaccinated refers to a 2-dose primary protocol.
2. Denominator used to calculate death rate is number of people in each group
3. The main vaccines Switzerland and USA used were Pfizer and Moderna; the main vaccine Chile used was Sinovac.

Source: Mathieu and Roser 2021.

COVID-19 deaths from death registrations

Cause of death data recorded on the death certificate are coded to the WHO International Classification of Diseases and Related Health Problems, 10th Revision (ICD-10). In responding to the pandemic, the WHO issued new codes to be used for coding cause of death for statistical purposes (Box 1.2). Data from the death registration system also provide additional information on comorbidities and consequences of the disease (see section titled 'Associated causes of death and comorbidities' later in this article).

Box 1.2 WHO ICD-10 codes used for classifying COVID-19 deaths from the Medical Certificate of Cause of Death

- U07.1 – COVID-19 virus identified: used when COVID-19 is confirmed by laboratory testing
- U07.2 – COVID-19 virus not identified: used for suspected or clinical diagnosis of COVID-19 where testing is not completed or inconclusive
- U08 – personal history of COVID-19: used when a person has recovered from COVID-19 and no long-term effects have been certified as contributing to an individual's death. These deaths are not included in COVID-19 mortality statistics
- U09 – post-COVID condition: used to link long-term conditions that are a result of the virus, such as chronic lung conditions. These deaths are included in COVID-19 mortality statistics
- U10 – multi-system inflammatory syndrome associated with COVID-19: used to identify people who have died from COVID-19 where the virus has led to a multi-inflammatory response syndrome. These deaths are included in COVID-19 mortality statistics.

By 30 April 2022, there were 5,940 registered deaths where people died either with or from COVID-19 (ABS 2022a). For 5,335 (90%) of these, COVID-19 was determined to be the underlying cause of death; 605 (10%) people died with COVID-19, but it was not the underlying cause of death.

Of the 5,335 deaths due to COVID-19:

- 5,269 were confirmed COVID-19 deaths (99%) with laboratory identification of the virus (ICD-10 code U07.1)
- 19 were suspected COVID-19 deaths (0.4%) with the virus not confirmed in a laboratory at the time of certification (ICD-10 code U07.2)
- 47 were deaths (0.9%) due to long-term effects of COVID-19 (ICD-10 code U09)
- none were due to multi-system inflammatory syndrome.

The following figures and tables in this section report on deaths considered to be due to COVID-19.

From the start of the pandemic to 30 April 2022, most deaths (3,107) from COVID-19 occurred in 2022 (1,323 in 2021, 905 in 2020). Table 1.3 compares the number of deaths for the 10 leading causes of death in 2019 with the number of deaths (including from COVID-19) in 2020, 2021 and 2022 (to 28 February 2022).

- Between 2019 and 2021, dementia and coronary heart disease were the leading causes of death, each accounting for around 10% of deaths each year.
- In 2021, only 0.8% of deaths were from COVID-19.
- This proportion of deaths from COVID-19 rose to 9.6% of deaths during the first 2 months of 2022 compared with 8.4% of deaths from coronary heart disease.

The median age of people who have died from COVID-19 to date is 83.9 compared with 84.1 for coronary heart disease and 89.1 for dementia in 2020 (ABS 2021, 2022a).

It should be noted that the death rate will change depending on the course of the pandemic in 2022, and the relative contribution of COVID-19 as a cause of death is likely to change.

Table 1.3: Number of deaths in 2019 - 2021 and 2022 year to date for top 10 causes of death in 2019 compared with COVID-19 deaths

	2019		2020		2021		January – February 2022	
Cause	Number	%	Number	%	Number	%	Number	%
Dementia including Alzheimer's disease (F01, F03, G30)	14,604	10.1	14,561	10.2	15,473	10.3	2,662	10.1
Coronary heart disease (I20–I25)	14,028	9.7	13,610	9.6	13,921	9.3	2,201	8.4
Cerebrovascular disease (I60–I69)	9,142	6.3	9,046	6.4	9,150	6.1	1,413	5.4
Lung cancer (C33, C34)	8,499	5.9	8,390	5.9	8,562	5.7	1,432	5.4
Chronic obstructive pulmonary disease (COPD) (J40–J44)	7,045	4.9	6,033	4.2	6,537	4.4	946	3.6
Colorectal cancer (C18–C20, C26.0)	5,091	3.5	5,339	3.8	5,230	3.5	825	3.1
Diabetes (E10–E14)	4,524	3.1	4,934	3.5	4,984	3.3	859	3.3
Influenza and pneumonia (J09–J18)	3,806	2.6	2,148	1.5	2,134	1.4	319	1.2
Prostate cancer (C61)	3,493	2.4	3,587	2.5	3,576	2.4	590	2.2
Heart failure and complications and ill-defined heart disease (I50–I51)	3,261	2.3	3,048	2.1	3,501	2.3	489	1.9
COVID-19 (U07.1, U07.2)	0	0.0	854	0.6	1,212	0.8	2,521	9.6
All causes	**144,323**	**100**	**142,345**	**100**	**149,939**	**100**	**26,305**	**100**

Notes

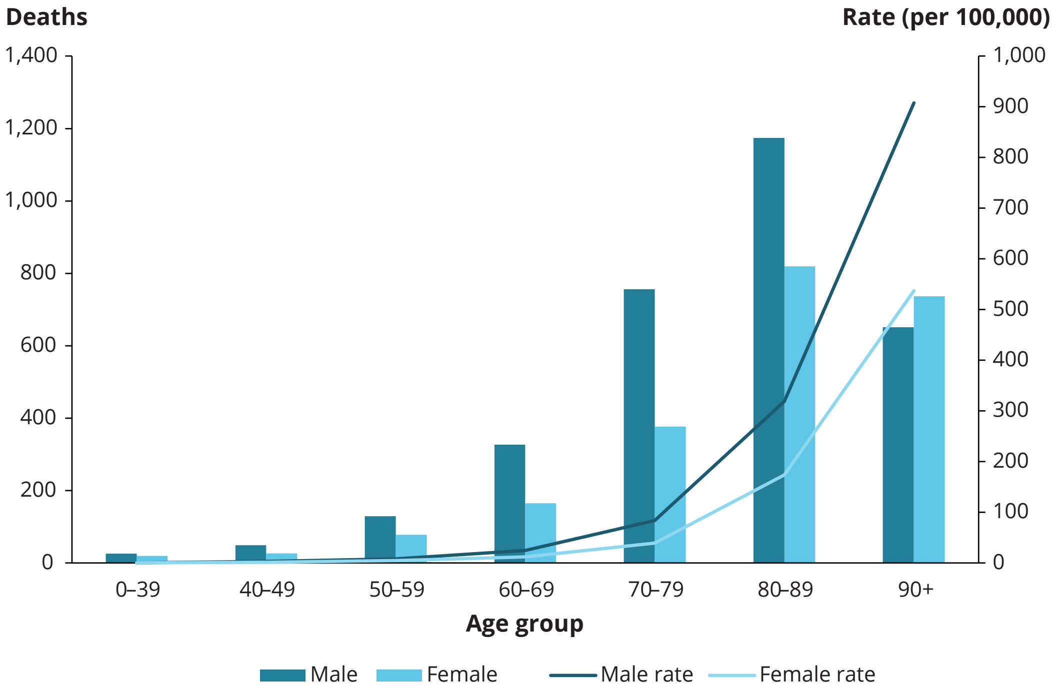
1. Data are doctor certified deaths compiled by the date on which the death occurred. Data are provisional and subject to change as additional data are received.
2. Data for 2022 include deaths occurring until 28 February and registered by 30 April 2022.
3. Data in this table are not comparable to numbers of deaths published in ABS reports 3302.0 Deaths, Australia and 3303.0 Causes of Death, Australia. For scope differences, please refer to the methodology section of Provisional Mortality Statistics, Australia.

Source: ABS customised report.

Deaths by age and sex

The number of deaths and mortality rate increased with age, with the highest rates in the older age groups (Figure 1.11). Overall, the mortality rate from COVID-19 was 1.4 times as high for males (24 per 100,000) as for females (17 per 100,000). However, this varied with age and mortality was significantly higher in males than females from 50 years of age.

Figure 1.11: Number and rates of registered COVID-19 deaths by age and sex, as at 30 April 2022



Notes

1. Data are deaths due to COVID-19 that occurred and were registered by 30 April 2022.
2. Deaths due to COVID-19 have an underlying cause of either ICD-10 code U07.1 COVID-19, virus identified or U07.2 COVID-19, virus not identified.
3. Data are provisional and subject to change as additional data is received.
4. Rates are calculated using the estimated resident population as at 30 March 2020.

Source: AIHW analysis of ABS 2022a.

Deaths by jurisdiction

The overall COVID-19 mortality rate in Australia as at 30 April 2022 was 208 per million population. More than 80% of all deaths occurred in New South Wales and Victoria (Table 1.4). The mortality rate was highest for Victoria, followed by New South Wales, and was lowest in Western Australia.

Table 1.4: Number and mortality rate of COVID-19 deaths, by state or territory of registration, as at 30 April 2022

State/territory	Number	Proportion of total COVID-19 deaths (%)	Deaths per million
NSW	2,026	38.0	248
Vic	2,438	45.7	364
Qld	563	10.6	109
WA	39	0.7	15
SA	168	3.1	95
Tas	39	0.7	72
ACT	52	1.0	121
NT	10	0.2	41
Australia	**5,335**	**100.0**	**208**

Notes

1. Data are deaths due to COVID-19 that occurred and were registered by 30 April 2022.
2. Deaths due to COVID-19 have an underlying cause of either ICD-10 code U07.1 COVID-19, virus identified or U07.2 COVID-19, virus not identified.
3. Data are provisional and subject to change as additional data is received.
4. Rates are calculated using the estimated resident population as at 30 March 2020.

Source: AIHW analysis of ABS 2022a.

Associated causes of death and comorbidities

Most deaths due to COVID-19 (94%) had other associated causes of death listed on the death certificate (ABS 2022a). Associated causes include manifestations of COVID-19 infection such as viral pneumonia and secondary infection (conditions in the causal sequence) and pre-existing chronic conditions that place people at greater risk of developing severe illness from COVID-19.

Of these deaths, 52% had both a condition listed in the causal sequence and a pre-existing chronic condition, 20% had a condition in the causal sequence only, and 22% had a pre-existing chronic condition only. The most common condition in the causal sequence was pneumonia, associated with 69% of COVID-19 deaths (Table 1.5).

Table 1.5: Most commonly certified associated causes of COVID-19 deaths: conditions in the causal sequence as at 30 April 2022

Acute conditions	%
Pneumonia	68.5
Respiratory failure	13.8
Other infections	10.0
Acute renal complications	9.8
Acute cardiac complications	8.4
Other organ failure	8.0
Delirium	3.6
Acute Respiratory Distress Syndrome	3.4

Notes

1. Data are deaths due to COVID-19 that occurred and were registered by 30 April 2022.
2. Deaths due to COVID-19 have an underlying cause of either ICD-10 code U07.1 COVID-19, virus identified or U07.2 COVID-19, virus not identified.
3. Data are provisional and subject to change as additional data is received.
4. Total percentage will exceed 100% as more than one condition can be listed.

Source: ABS 2022a.

Chronic cardiac conditions were the most common comorbidities, recorded in 37% of COVID-19 deaths, followed by dementia which was recorded for 31% of deaths (Table 1.6). The comorbidities present in COVID-19 deaths in Australia are consistent with those reported internationally.

Table 1.6 Most commonly certified associated causes of COVID-19 deaths: pre-existing conditions as at 30 April 2022

Chronic condition	%
Chronic cardiac conditions	37.4
Dementia	31.1
Diabetes	19.1
Chronic respiratory conditions	17.5
Cancer	16.5
Chronic kidney diseases	13.5
Hypertension	13.1
Musculoskeletal disorders	5.3
Chronic cerebrovascular diseases	4.1
Parkinsons disease	3.6

Notes

1. Data are deaths due to COVID-19 that occurred and were registered by 30 April 2022.
2. Deaths due to COVID-19 have an underlying cause of either ICD-10 code U07.1 COVID-19, virus identified or U07.2 COVID-19, virus not identified.
3. Data are provisional and subject to change as additional data is received.
4. Total percentage will exceed 100% as more than one condition can be listed.

Source: ABS 2022a.

Excess mortality

The burden of mortality that can be attributed either directly or indirectly to the COVID-19 pandemic is measured by estimating excess deaths. Excess mortality is the difference between the observed number of deaths in a defined period and the expected number of deaths during that same period. Excess mortality in Australia has been analysed using methodology that forecasts expected mortality based on the previous 5 years of data (ABS 2022b). Results for registered deaths in Australia during 2020 and 2021 that occurred up until 31 December 2021 are summarised in Table 1.7. Key points are:

- During 2020, there were around 1,700 fewer deaths than expected in Australia in total. Most were within expected thresholds, with only 209 during the winter months exceeding the lower threshold.
- During 2020, there were significantly fewer deaths than expected in New South Wales (-2.6%) and Queensland (-2.6%). Victoria had significantly higher deaths than expected (1.1%).
- During 2021, there were around 5,000 more deaths than expected in Australia in total. Most were within expected thresholds, only 108 across a 5-week period exceeded the upper threshold.
- During 2021, there were significantly more deaths than expected in Victoria (8.3%) and South Australia (8.4%).

Table 1.7: Excess deaths in Australia, 2020–2021

	2020		2021	
State/territory	Number	%	Number	%
NSW	–1,292*	-2.6	13	0.0
Vic	382*	1.1	2,782*	8.3
Qld	–786*	-2.6	853	2.8
WA	-63	-0.5	804	6.5
SA	102	0.9	891*	8.4
Tas	–68	-1.8	366	9.8
ACT	24	1.2	102	5.2
NT	18	2.1	–96	-11.0
Australia	–1,734	-1.2	5,090	3.5

* Denotes periods of statistically significant excess mortality or lower than expected mortality (2 weeks or more above or below thresholds). Thresholds are the upper and lower limits of the expected number of deaths in the absence of an influenza epidemic.

Note: Data are doctor certified deaths that had occurred by 31 December 2021 and were registered by 28 February 2022 for which jurisdictional data were available. Updated national-level excess mortality estimates for deaths registered until 30 April 2022 (for which jurisdictional figures are not available) are presented in Chapter 2.

Source: AIHW analysis of ABS 2022b.

In terms of specific causes of death, lower than expected deaths have been observed during the pandemic from 2020 to 2021 for some conditions, including pneumonia and influenza, and diabetes (ABS 2022b). Higher than expected deaths were observed for cancer and chronic lower respiratory conditions in 2021. Since the largest number of deaths from COVID-19 during the pandemic has occurred in 2022, the impact on excess mortality in 2022 is likely to be greater than seen for 2020 and 2021. For more information on excess mortality see Chapter 2 'Changes in the health of Australians during the COVID-19 period'.

Burden of disease

Burden of disease analysis quantifies the gap between a population's actual health and an ideal level of health – that is, every individual living without disease or injury to the theoretical maximum life expectancy – in a given year. Burden of disease is measured using the summary measure disability-adjusted life years (DALYs). One DALY is one year of 'healthy life' lost due to illness and is comprised of 2 components:

- fatal burden estimated by the number of years of life lost (YLL)
- non-fatal burden estimated by the number of years lived with disability (YLD)

The more DALYs associated with a disease or injury, the greater the burden.

Burden of disease analysis compares the impact of different diseases using a common metric, including which diseases are doing the most harm. For information on the methods used for this analysis see *'The first year of COVID-19 in Australia: direct and indirect health effects'* (AIHW 2021b).

It is important to note that some of the data used for the 2021 estimates are preliminary and may change with future articles.

Total burden

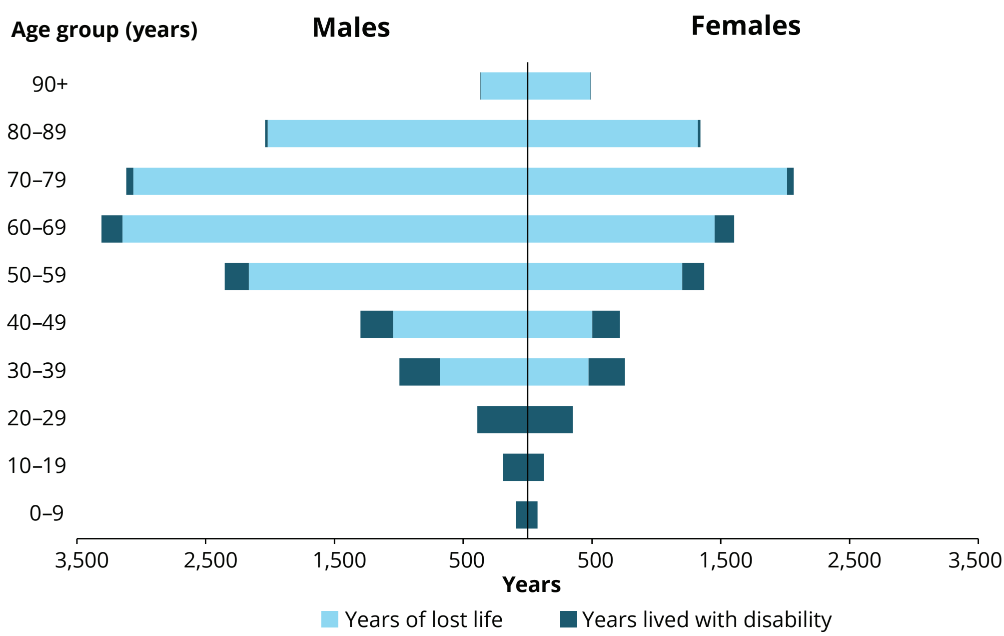
The total burden of disease from COVID-19 was slightly more than 14,100 DALYs for men and 8,900 for women, giving a total of 23,000 DALYs from COVID-19 in Australia in 2021, compared with 8,800 in 2020.

This estimate for Australia in 2021 is much lower than for the leading diseases. For example, coronary heart disease was the leading cause of burden in 2018 (the most recent estimates available) with around 312,000 DALYs (AIHW 2021a). Estimated COVID-19 DALY numbers in 2021 were also fewer than for lower respiratory infections including influenza and pneumonia, responsible for around 40,300 DALYs in 2018 (AIHW 2021a).

Based on 2018 burden of disease estimates, COVID-19 accounted for around 0.5% of the total burden in 2021. In comparison, cancer and other neoplasms accounted for 18% and cardiovascular diseases for 13% of the total burden (AIHW 2021a). The lower burden for COVID-19 in Australia compared with other diseases reflects the relative success Australia had in containing the virus in 2021. Analysis for Scotland using very similar methods to those used in this Australian analysis shows that COVID-19 would likely be the second leading cause of burden in that country in 2020, behind coronary heart disease (Wyper et al. 2022).

Most of the total burden for COVID-19 was due to fatal burden, which contributed 88% of DALYs for males and 84% for females (Figure 1.12).

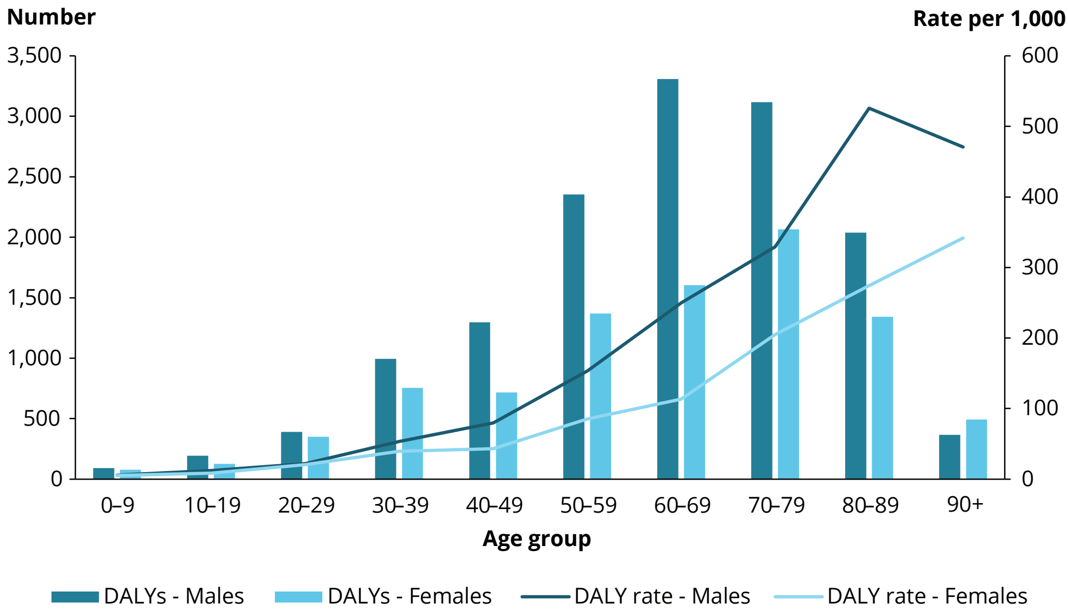
Figure 1.12: Total burden (DALYs) for COVID-19, disaggregated into fatal (YLL) and non-fatal (YLD) burden, by sex, 2021



Source: AIHW analyses as detailed in AIHW 2021b.

While numbers of DALYs were higher in the 60–69 and 70–79 age groups, DALY rates were highest for men aged 80 or more (Figure 1.13). Rates remained relatively low from the youngest to the 40–49 age group for males and females. For men, the rates then increased sharply into the older age groups and were higher than for women. For women, the sharper increases were apparent from the 60–69 age group.

Figure 1.13: Total burden (DALYs) for COVID-19: numbers and rates, 2021



Source: AIHW analyses as detailed in AIHW 2021b.

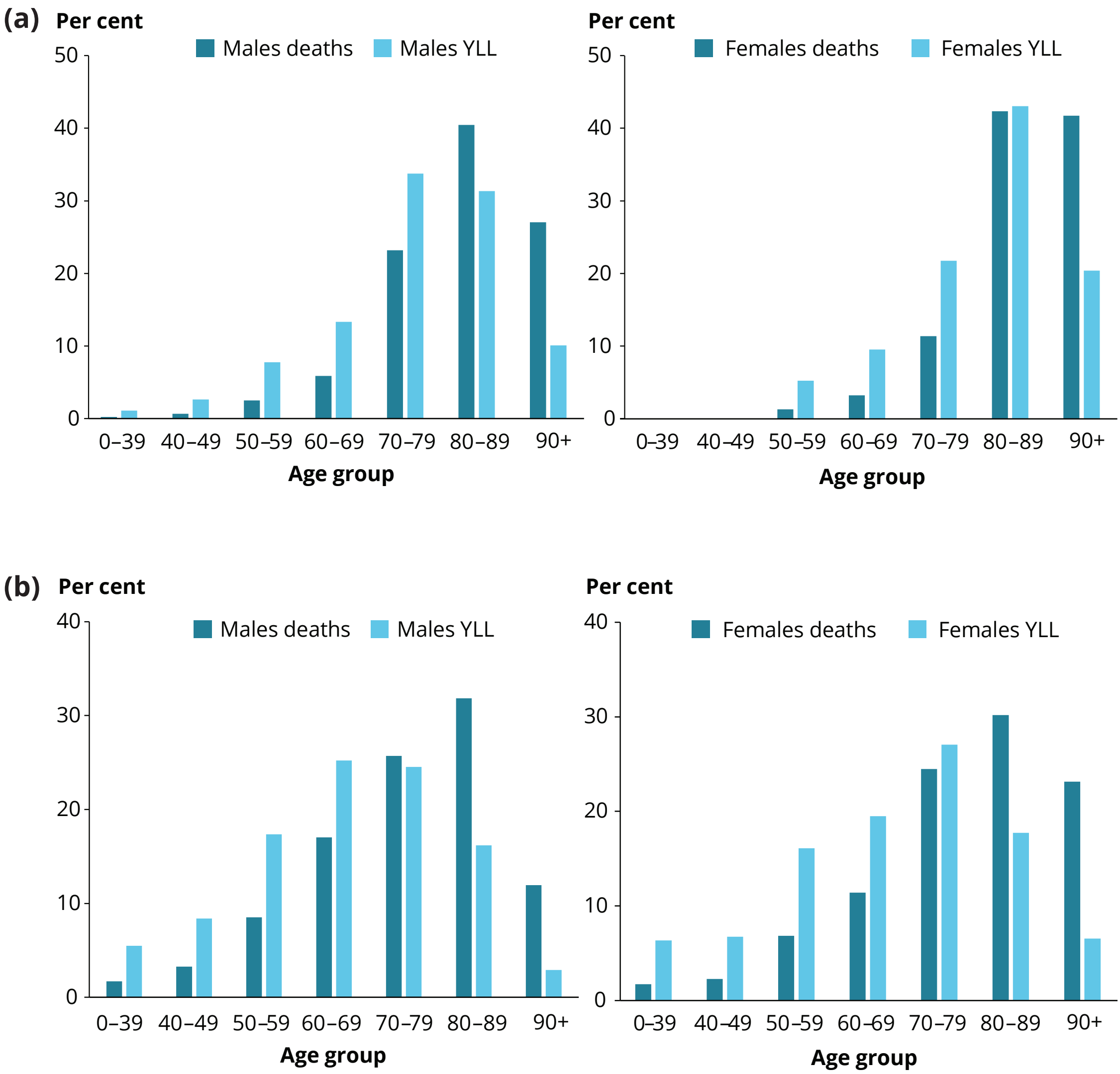
Fatal burden was also found to account for a large proportion (90% or more) of total DALYs in analyses undertaken in many countries, including India (Singh et al. 2022), Mexico (Salinas-Escudero et al. 2021), the Republic of Ireland (Moran et al. 2022), Malta (Cuschieri et al. 2021) and other European countries (Gianino et al. 2021).

The burden of COVID-19 in 2022 will be higher than in 2021 given the increase in the number of cases and deaths since the Omicron wave began in December 2021.

Years of life lost to COVID-19

The YLL per person dying of COVID-19 is estimated to be 15 years (16 and 14 for males and females, respectively) based on the ideal life expectancy used in the Australian Burden of Disease Study (Murray et al. 2012). The percentage of total YLL in people younger than 70 increased from 2020 to 2021 for both males and females (Figure 1.14). Men younger than 70 accounted for 31% of male deaths and 56% of YLLs in 2021 compared with 9.3% of deaths and 25% of YLLs in 2020 (Figure 1.14). The corresponding figures for females were 22% of deaths and 49% of YLLs in 2021 compared with 4.5% of deaths and 15% of YLLs in 2020.

Figure 1.14: Percentage of total COVID-19 deaths and YLL in each age group, by sex, (a) 2020 and (b) 2021



Source: AIHW analyses of ABS deaths data.

Long COVID and Post-COVID-19 Syndrome

Most people who get COVID-19 fully recover within 1–2 weeks. However, some patients experience a range of symptoms that continue for several months after initial infection or appear months after recovery – generally referred to as 'long COVID'. Symptoms that arise after acute infection often include fatigue, 'brain fog' and prolonged loss of taste and smell (Blomberg et al. 2021; Logue et al. 2021; Sudre et al. 2021). However, more severe symptoms – such as delirium, chest pain, heart palpitations and shortness of breath – have been observed in a smaller proportion of COVID-19 patients (Sudre et al. 2021). A recent scoping review indicated that long COVID may encompass a spectrum of more than 100 symptoms (Hayes et al. 2021).

The prevalence of persistent COVID-19 symptoms is unclear. Estimates from early studies varied due to the lack of a universally accepted definition as well as data collection differences, such as the duration of follow-up of patients, and different study populations (for example, hospitalised compared with community cases). One study found that up to 1 in 3 Australian COVID-19 patients experience symptoms up to 4 months after infection (Darley et al. 2021). A similar prevalence has been reported among patients in the United States six months after COVID-19 infection (Logue et al. 2021). In 2021, the WHO reported that around one-quarter of people who have had the virus experience symptoms that continue for at least a month but 1 in 10 are still unwell after 12 weeks (Rajan et al. 2021), while smaller studies in Italy have reported that nearly 9 in 10 patients discharged from hospital were still experiencing at least one symptom 60 days after the onset of COVID-19 (Carfì et al. 2020). A large survey in the United Kingdom found that 22% of people experienced at least one symptom 5 weeks after COVID-19 infection, with 9.8% experiencing symptoms after 12 weeks (Ayoubkhani et al. 2021).

Two clinical case definitions have now been developed that differentiate between ongoing symptomatic COVID-19 where symptoms continue for 4 to 12 weeks after initial infection, and Post-COVID-19 Syndrome where symptoms continue for more than 12 weeks (Box 1.3) (NICE 2021; WHO 2021a). Long COVID is an umbrella term that covers both ongoing symptomatic COVID-19 and Post-COVID-19 syndrome.

Box 1.3: Long COVID clinical case definitions

Long COVID clinical case definitions have been developed to differentiate between ongoing symptomatic COVID-19 symptoms and Post-COVID-19 Syndrome.

National Institute for Health and Care Excellence (NICE) (United Kingdom)

Acute COVID-19

Signs and symptoms of COVID-19 for up to 4 weeks.

Ongoing symptomatic COVID-19

Signs and symptoms of COVID-19 from 4 weeks up to 12 weeks.

Post-COVID-19 Syndrome

Signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are not explained by an alternative diagnosis. It usually presents with clusters of symptoms, often overlapping, which can fluctuate and change over time and can affect any system in the body. Post-COVID-19 Syndrome may be considered before 12 weeks while the possibility of an alternative underlying disease is also being assessed.

In addition to the clinical case definitions, the term 'long COVID' is commonly used to describe signs and symptoms that continue or develop after acute COVID-19. It includes both ongoing symptomatic COVID-19 (from 4 to 12 weeks) and post-COVID-19 Syndrome (12 weeks or more).

World Health Organisation

Post COVID-19 condition 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 and that last for at least 2 months and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive dysfunction but also 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. A separate definition may be applicable for children.

It is not yet clear why long COVID occurs in some patients and not others, though there is some early evidence to suggest that vaccinated people are less likely to experience long COVID than unvaccinated people (Antonelli et al. 2022; Ledford 2021). A study of nearly 300,000 COVID-19 survivors in the United States found that the risk of long COVID was higher in patients who had more severe COVID-19 infection (Taquet et al. 2021), but even mild COVID has been shown to have effects on brain structure and function (Douaud et al. 2022).

It is too early to tell whether Omicron will result in more cases of long COVID than previous variants. It is plausible that any long-term effects of infection will be less serious if Omicron causes less severe illness, however, the sheer volume of Omicron cases alone could translate into a substantial long COVID burden in a community (Downy Jr. 2022; Sakay 2022).

Up to 30 April 2022, 47 deaths in Australia have been attributed to Post Covid-19 condition (ABS 2022a). Ongoing research will be important for understanding the public health impact of long COVID and health system planning and management. The AIHW is developing a national linked COVID-19 data set for research into a broad range of health questions affecting all Australians who have had COVID-19, including prevalence and risk factors for long COVID, health system use, effectiveness of vaccines, and burden of disease.

Population groups

There is strong evidence that people from some population groups are at greater risk of contracting and dying from COVID-19 than the general population. The disparities in COVID-19 morbidity and mortality interact with and exacerbate existing health and social inequalities encountered by:

- minority ethnic groups
- people experiencing economic disadvantage or poverty
- marginalised population groups such as prisoners, people experiencing homelessness, and sex workers (Bambra et al. 2020).

Socioeconomic area

Table 1.8 presents data on registered deaths from COVID-19 from the start of the pandemic until 30 April 2022 across 5 socioeconomic areas. There is a clear gradient across these areas, with higher numbers and mortality rates for people living in the lowest socioeconomic areas for both males and females. The age-standardised mortality rate was nearly 3 times as high for people living in the lowest socioeconomic area as for people living in the highest socioeconomic area, and this difference was similar for males and females. However, for each socioeconomic area (or quintile), the mortality rate was higher for males than females.

Table 1.8: People who died from COVID-19 in Australia, by socioeconomic area, as at 30 April 2022

IRSD quintile	Deaths	Rate (per million)	95% CI	Age-standardised rate (per million)	95% CI
Males					
1 (lowest)	1080	462	434–489	143	130–156
2	676	274	254–295	93	83–104
3	538	211	193–229	80	70–91
4	465	174	158–190	73	63–83
5 (highest)	328	126	112–140	53	44–62
Females					
1 (lowest)	790	331	308–354	77	68–85
2	482	191	174–208	50	43–57
3	420	161	146–177	48	40–55
4	320	117	105–130	39	33–46
5 (highest)	199	75	64–85	26	20–31
Persons					
1 (lowest)	1870	396	378–413	105	98–113
2	1158	232	219–246	69	63–75
3	958	186	174–197	62	56–68
4	785	145	135–155	55	49–60
5 (highest)	527	100	92–109	38	33–43

IRSD = Index of Relative Socio-economic disadvantage; CI = confidence interval.

Notes

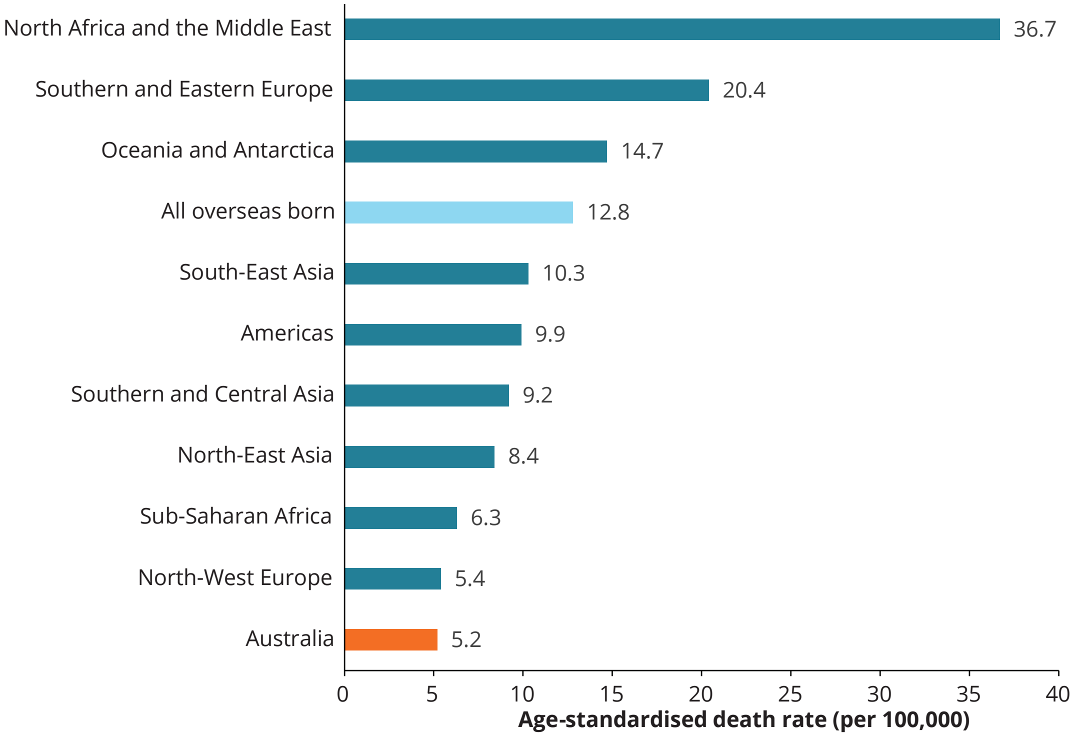
1. This table includes information on doctor or coroner certified deaths registered by 30 April 2022 and numbers will differ from those reported by disease surveillance systems.
2. Deaths due to COVID-19 in this table have an underlying cause of either ICD-10 code U07.1 - COVID-19, virus identified or U07.2 - COVID-19, virus not identified.
3. The analysis uses IRSD, which ranks areas in Australia according to relative socioeconomic disadvantage. Socioeconomic group 1 represents people living in the lowest socioeconomic areas (most disadvantaged) and group 5 represents people living in the highest socio-economic areas (least disadvantaged)
4. The 95% CI is the range of values that are likely to contain the true estimate with 95% confidence.
5. Data are provisional and will change as additional data are received.

Source: ABS customised report.

Region of birth

The age-standardised death rate in the Australian population was 2.5 times as high for people born overseas (12.8 deaths per 100,000) as for people born in Australia (5.2) for COVID-19 deaths registered by 30 April 2022 (Figure 1.15). Of people born overseas, the rate was highest for people born in North Africa and the Middle East (36.7 per 100,000) and lowest for people born in North-West Europe (5.4).

Figure 1.15: Age-standardised COVID-19 death rate in Australia, by region of birth, as at 30 April 2022



Notes

1. Data for Oceania and Antarctica exclude Australia.
2. Data are deaths due to COVID-19 that occurred and were registered by 30 April 2022.
3. Deaths due to COVID-19 have an underlying cause of either ICD-10 code U07.1-COVID-19, virus identified or U07.2-COVID-19, virus not identified.
4. Data are provisional and subject to change as additional data is received.

Source: ABS 2022a.

Rural and remote areas

Large cities with extensive global connections experienced COVID-19 earlier than smaller cities and rural areas (OECD 2021a). For example, in the United States, the cumulative rate of COVID-19 cases in non-metropolitan areas has largely tracked that seen for metropolitan areas; however, since December 2020, the cumulative death rate in non-metropolitan areas has exceeded that of metropolitan areas (CDC 2022a). Factors thought to contribute to the increased mortality risk include lower vaccination coverage and strain on local health systems including hospital closures and staff shortages (Weber 2021).

COVID-19 cases in rural and remote areas of Australia

The spread of cases from urban to rural areas of Australia was of acute concern in August 2021 when cases were confirmed in rural areas of New South Wales despite several weeks of lockdown in Sydney (Malone 2021). There is little information available on COVID-19 cases in rural areas of Australia nationally.

Using New South Wales data reported for individual local government areas (LGAs), cases and rates are calculated for levels of remoteness (Table 1.9). The largest proportion of cases occurred in *Major cities* (81%) and decreased with increasing remoteness in line with Australia's population distribution. The incidence was also highest in *Major cities* (265 per 1,000) and was higher in *Very remote* (183) than in *Remote* areas (157).

Table 1.9: Cumulative number of total COVID-19 cases (confirmed and probable), by remoteness area, New South Wales, as at 26 April 2022

Remoteness Area	Number of cases	Proportion of all cases (%)	Incidence (per 1,000)	95% CI
Major cities	1,652,597	81.2	265	265–266
Inner regional	3,21,968	15.8	204	204–205
Outer regional	57,505	2.8	184	182–185
Remote	3,468	0.2	157	152–162
Very remote	796	0.0	183	172–195

CI = confidence interval.

Notes

1. This table includes cases confirmed with PCR and probable cases identified from RAT results.
2. LGAs were classified into remoteness areas using the Australian Statistical Geographic Standard LGA 2016 to Remoteness Area 2016 correspondences.
3. Rates were calculated using estimated resident population as at 30 June 2020.
4. LGA information was available for a total of 2,036,334 NSW cases that had been reported by 26 April 2022. A further 2,614 were diagnosed in correctional facilities, and 63 in hotel quarantine.
5. The 95% CI is the range of values that are likely to contain the true estimate with 95% confidence.

Source: AIHW analysis of NSW Health 2022d.

COVID-19 deaths in rural and remote areas

The largest proportion of all deaths from COVID-19 registered by 30 April 2022 occurred in *Major cities* (87%). The age-standardised mortality rate was 3 times as high in *Major cities* as in *Inner regional* areas (Table 1.10).

Table 1.10: Number of COVID-19 deaths and mortality rate (per 100,000) by remoteness area to 30 April 2022

Remoteness area	Number of deaths	Rate (per million)	95% CI	Age-standardised rate (per million)	95% CI
Major Cities	4,604	248	241–255	84.9	81.1–88.7
Inner Regional	476	104	95–114	28.2	24.3–32.1
Outer Regional	169	82	70–94	23.7	18.2–29.1
Remote and very remote	14	28	n.a.	n.a.	n.a.

CI = confidence interval

n.a. = not available – due to the small number of deaths in these categories, the 95% CI is not calculated.

Notes

1. This table includes information on doctor or coroner certified deaths registered by 30 April 2022 and numbers will differ from those reported by disease surveillance systems.
2. Deaths due to COVID-19 in this table have an underlying cause of either ICD-10 code U07.1 - COVID-19, virus identified or U07.2 - COVID-19, virus not identified.
3. The 95% CI is the range of values that are likely to contain the true estimate with 95% confidence.
4. Data are provisional and will change as additional data are received.

Source: ABS customised report.

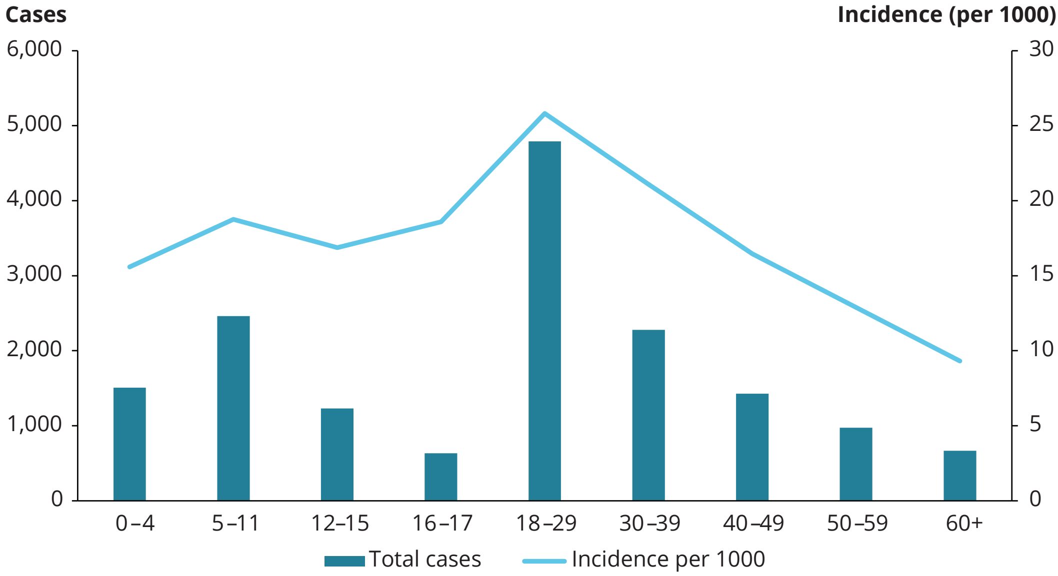
Aboriginal and Torres Strait Islander people

Since the start of the pandemic and, up until 22 May 2022, there have been 175,000 COVID-19 cases among Indigenous Australians (114,000 confirmed by PCR) representing 2.5% of all cases in Australia; most cases (166,000) have occurred since December 2021 during the Omicron wave (NINDSS 2022). The number of COVID-19 cases is likely to be an underestimate as Indigenous status is unknown for 20% of confirmed cases, particularly in 2022 where the rapid increase in cases had an impact on the collection of detailed epidemiological data (COVID-19 NIRST 2022c). For more information on the course of the pandemic among Indigenous people see Chapter 3 'Changes in Aboriginal and Torres Strait Islander people's use of health services in the early part of the COVID-19 pandemic'.

The New South Wales outbreak (which started in late July/early August 2021) showed how quickly COVID-19 can spread through Indigenous communities. As at 31 January 2021, there were 151 confirmed cases of COVID-19, and no deaths reported among Indigenous Australians, representing around 0.5% of all confirmed cases throughout the pandemic (COVID-19 NIRST 2021a). By 24 October 2021, the cases among Indigenous Australians had increased to 6,084, or 4.6% of all confirmed cases (COVID-19 NIRST 2021c).

The age distribution of COVID-19 cases among the Indigenous population was similar to that for the Australian population generally (see section titled 'Cases by age and sex' earlier in this article), with people aged 18–29 having the highest number and incidence of COVID-19 cases (Figure 1.16); 53% of cases were female.

Figure 1.16: Number and cumulative incidence of total PCR-confirmed COVID-19 cases for Indigenous Australians, by age group, 1 January 2021 to 2 January 2022.



Note: Cumulative incidence was calculated as the number of cases divided by the ABS 2016 Census-based population estimates and 30 June 2020 projection (series B).

Source: AIHW analysis of COVID-19 NIRST 2022a.

As at 10 April 2022, 107 deaths had been reported among Indigenous Australians, and 275 cases had been admitted to ICUs (COVID-19 NIRST 2022c). The overall rate of severe disease (defined as ICU admission or death) for Indigenous Australians during the Delta wave (June to December 2021) was 16.2 per 100,000, and rose to 26.9 per 100,000 by 10 April 2022 during the Omicron wave (COVID-19 NIRST 2022b, 2022c). Based on recent surveillance data supplied by the Department of Health and Aged Care, the rate of severe disease during the Omicron wave to 3 July 2022 for Indigenous Australians was 1.4 times as high compared with non-Indigenous Australians (54.0 per 100,000 compared with 37.8 per 100,000 respectively).

Around 42% of Indigenous Australians who contracted COVID-19 (cases) lived in a rural area (regional or remote). The overall COVID-19 rates were highest in people who lived in *Major cities*, with the rate decreasing as the level of remoteness increased (Table 1.11).

For more information on the impact of COVID-19 on Indigenous Australians, see Chapter 3 'Changes in Aboriginal and Torres Strait Islander people's use of health services in the early part of the COVID-19 pandemic.'

Table 1.11: Numbers and incidence of confirmed COVID-19 cases in Indigenous Australians, by area of remoteness, 1 January 2021 to 10 April 2022

	1 January – 5 December 2021		15 December 2021 - 10 April 2022	
Remoteness area	Number	Cases per 1000 (95% CI)	Number	Cases per 1000 (95% CI)
Major cities	5,035	15.3 (14.9–15.8)	39,329	120 (119–121)
Inner and outer regional	3,297	8.7 (8.4–9.0)	31,351	82 (81–83)
Remote and very remote	412	2.7 (2.4–2.9)	6,493	42 (41–43)
Total	8,744	10.1 (9.9–10.4)	77,173	89 (89–90)

CI = confidence interval

Notes

1. Incidence is calculated as the number of cases divided by ABS 2016 Census-based population estimates and 30 June 2020 projection (series B).
2. The 95% CI is the range of values that are likely to contain the true estimate with 95% confidence.
3. Table compiled from published NINDSS data for which breakdown by remoteness was possible. Data incomplete for 6 Dec 2021 to 14 Dec 2021 due to changes in calendar intervals used in published reports. Remoteness information for 63 cases in 2021 and 739 cases in the Omicron wave not available. Data are preliminary and will change as additional data are received.

Source: AIHW analysis of data extracted from COVID-19 NIRST 2021d, 2022c.

People with disability

Some people with disability may be more likely to get infected with COVID-19 or have severe illness if they are less able to physically distance and limit their close contact with others; this is particularly so if they live in congregate settings or have disability support workers (CDC 2021b). They may also have underlying health conditions that make them more susceptible to contracting or dying from COVID-19. As well, the public health response to COVID-19, characterised by lockdowns, has disadvantaged people with disability in several ways, such as in their access to medical care, support for their daily living activities, COVID-19 testing, and vaccination (Shakespeare et al. 2021). The escalating number of cases during the Omicron wave has resulted in staff shortages in health and disability services which is having an effect on access to essential support (CRE-DH n.d.).

Registered NDIS providers report COVID-19 infections in NDIS participants to the NDIS Quality and Safeguards Commission or the National Disability Insurance Agency. The data do not include all participants of the NDIS or people with disability who are not NDIS participants. By 1 May 2022, a total of 12,721 COVID-19 cases had been reported among NDIS participants and 74 COVID-19 related deaths (0.6% of NDIS participant cases) (Department of Health 2022e).

COVID-19 in residential aged care facilities

While the incidence of COVID-19 infection in older people has been relatively low in Australia compared with that for younger age groups, mortality rates were highest in people aged 80 years and over (see the section earlier in this article titled 'COVID-19 deaths from death registrations'). Minimising transmission of COVID-19 in residential aged care facilities and vaccination is important to prevent severe illness or death in this population group.

From the start of the pandemic until 28 April 2022, there have been 34,365 COVID-19 cases among residents of aged care facilities in Australia, which includes 4,096 outbreaks in 2,306 residential aged care facilities (Department of Health 2022h).

From the start of the pandemic until 28 April 2022, 2,181 residents of aged care facilities had died with or from COVID-19 (CFR 6.3%), accounting for 30% of all COVID-19 related deaths in Australia over this time (Department of Health 2022b). Despite most deaths occurring in 2022, the percentage of all COVID-19 deaths that have occurred among aged care residents has fallen over time from 75% in 2020 to 26% in 2022 (Table 1.12).

Table 1.12: COVID-19 related deaths in residential aged care facilities, by year, 2020–2022

Year	COVID-19 aged care deaths	Total COVID-19 deaths	% of total COVID-19 deaths
2020	686	909	75
2021	231	1,330	17
2022	1,264	4,924	26
Total	**2,181**	**7,163**	**30**

Note: Data for 2022 include deaths that have occurred by 28 April 2022 and include deaths both with and from COVID-19 where COVID-19 may not be a cause of death.

Sources: Department of Health 2020, 2021b, 2022b, 2022h.

The cumulative mortality rate is 1.0% of the total number of aged care residents (Department of Health 2022h), which is lower than seen for many other countries, such as Scotland (13%), the United States (13%) and Sweden (8.0%) (Comas-Herrera et al. 2022). It should be noted that the definition of care homes varies in the available international data, and some have both aged and younger residents.

Novel approaches to understanding the pandemic

Seroprevalence studies

Seroprevalence surveys can learn about the total number of people who have been infected, including those infections that might have been missed. This is done by studying the percentage of people who have antibodies in their blood against SARS-CoV-2 Spike (S) and Nucleocapsid (N) proteins at different times. The presence of antibodies indicates that a person has had a previous infection (antibodies against S and N proteins) or has been vaccinated (antibodies against S protein only) (CDC 2022b).

This means increasing levels of vaccination in a population over time can be differentiated from past infection in results from seroprevalence studies. Examples of seroprevalence studies include the WHO Unity studies (WHO 2022a), the United States COVID-19 Serology Surveillance Strategy (CDC 2021a), and the COVID-19 infection survey of the United Kingdom's general population (Walker et al. 2021). Serological surveys in Australia are being co-ordinated by the National Centre for Immunisation Research and Surveillance with The Kirby Institute (The Kirby Institute 2022).

The WHO Unity studies are a set of standardised protocols for conducting sero-epidemiological investigations to collect robust data on the pandemic that can be adapted to any setting (WHO 2022a). The aim is to facilitate international comparisons so that countries and the global community can address knowledge gaps and inform an evidence-based COVID-19 response particularly in resource limited settings. First results from a meta-analysis covering 92 countries including 53 low-to-middle income countries found that 45% of people globally had SARS-CoV-2 antibodies by July 2021 (Bergeri et al. 2022). Seroprevalence rose sharply in the first half of 2021 due to infection in some regions (for example, 30% to 70% in Africa), and vaccination and infection in others (for example, 6% to 95% in North America). In other regions, seroprevalence remained low (for example, 2.5% in the Western Pacific). These findings highlight the inequalities between regions whose populations remain susceptible to infection, and where efforts to scale up vaccination programs need to be prioritised.

Countries such as the United Kingdom that have had a high COVID-19 caseload and access to a comprehensive vaccine roll-out have nearly complete seroprevalence in their populations. Recent data from the COVID-19 infection survey of the United Kingdom's population estimated that around 99% of the adult population in England had antibodies against SARS-Cov-2 in the week starting 28 March 2022 (ONS 2022). This ranged from 95.3% in Northern Ireland to 97.6% in Scotland for children aged 12 to 15 and 83.7% in England to 85.9% in Scotland for children aged 8 to 11.

The only Australian data published to date relate to baseline data collected between 19 June and 6 August 2020 during the first wave of the COVID-19 pandemic and before the SARS-CoV-2 vaccine was available (Vette et al. 2022). Although seroprevalence was very low (<0.5%) the study estimated there were 7 missed infections for every notified case, with a credible range of 0–17 missed infections per case. Undetected transmission was not surprising due to the initially restricted testing policies, continuation of international travel until March 2020, and community transmission of mild disease (Vette et al. 2022).

Future releases from this study will shed further light on undetected transmission through the later waves, particularly during the Omicron wave where Australia experienced its highest case burden and when high vaccine coverage had been achieved in the adult population.

Wastewater-based surveillance testing

Population-wide tracking of the COVID-19 pandemic relies on clinical testing of individuals to identify cases. However, it is difficult to provide information rapidly on large populations through clinical testing alone. Genetic material of the SARS-CoV-2 virus is shed in the faeces of infected asymptomatic and symptomatic individuals which can be detected in wastewater on average 10 days before clinical cases are identified (Shah et al. 2022). Wastewater refers to water from baths, showers, washing machines and toilets that is processed by sewage treatment plants (Australian Academy of Science 2020).

Wastewater-based epidemiology techniques are already widely used for routine surveillance of pathogens, such as polio and norovirus, and for illicit drugs, pharmaceuticals, food consumption, and industrial chemicals (Australian Academy of Science 2020). Using wastewater-based epidemiology to track COVID-19 trends can provide early warnings for an increase in infections and emergence of variants of concern in communities. In the United States, testing wastewater processed by sewage treatment plants for COVID-19 has helped health departments to allocate testing resources, evaluate surveillance irregularities, refine health messaging and forecast clinical resource needs (Kirby et al. 2021). All state and territory health departments in Australia have been monitoring wastewater at sewage plants in support of their COVID-19 response since 2020.

Wastewater surveillance is useful to inform public health action at 3 different stages of a pandemic (WHO 2021b):

- during the *alert phase* when virus circulation is low – to detect early that a virus has entered a community. For example, Australian researchers have tested wastewater from aircraft and cruise ship sanitation systems as an additional means of assessing COVID-19 among people arriving at border entry points (Ahmed et al. 2020; Ahmed et al. 2022)
- during the *pandemic phase* when virus circulation is high – to monitor both the effect of public health measures, and specific settings that may accommodate vulnerable population groups such as schools, hospitals and aged care facilities
- During the *transition* or *interpandemic* phases – to continue ongoing monitoring over the longer term to confirm the absence or resurgence of COVID-19.

Surveillance for new variants of concern can occur at all these 3 stages.

Currently, guidance on the use of wastewater surveillance in Australia depends on 4 levels of community transmission (Department of Health 2022l):

- Epidemiological zone 1 – no community transmission: early warning to detect clusters or outbreaks in communities that have contained transmission
- Epidemiological zone 2 – community transmission: detecting new outbreaks or screening for outbreaks in defined settings (residential aged care facilities, detention facilities, public housing)
- Epidemiological zone 3 – community transmission is placing a burden on response capacity: monitor for genomic variations as outbreak evolves
- Epidemiological zone 4 – community transmission is exceeding response capacity: not recommended except in specific use cases, such as to detect emerging variants of concern.

Many factors influence the practical application of wastewater surveillance, including the sewage network infrastructure, shedding profile of infected individuals, sampling strategy, recovery methods and the detection limit of the instrument (Zhu et al. 2021). To confront these problems, many countries are developing and implementing national testing strategies for a co-ordinated and systematic approach to wastewater-based surveillance for COVID-19 including the ColoSSoS collaboration in Australia (Kayali 2021; Keshaviah et al. 2021; Water Research Australia 2022).

Future global monitoring of COVID-19

The broad impacts of the COVID-19 pandemic have highlighted the importance of open, consistent, and transparent data for evidence-based decision making. To date, non-government organisations such as COVID Live, Johns Hopkins University and Our World in Data have led the collation and publication of global data on COVID-19. The sources of data used to develop these rich resources is variable between countries, ranging from open access repositories, government websites, government social media accounts or press conferences, or little to no reporting (Mathieu 2022). See the next section in this article titled 'Data notes' for more information on the sources of data used in this article.

Despite the extraordinary efforts to track and document the COVID-19 pandemic, the lack of consistent data reporting by individual countries will inevitably result in data of variable quality. For example, there are concerns over the true death toll of COVID-19, with a 2–4 fold discrepancy between reported deaths and studies of excess mortality reported internationally (Adam 2022).

Moving forward, a global commitment to manage long-term pandemic data led by the WHO is needed to allow authorities to continue to collect, improve and provide data in a timely manner (Mathieu 2022). Good-quality data, including the linkage of different data sets, and timely and accurate reporting will be crucial as the pandemic evolves after Omicron, for example, for monitoring the emergence of new variants and studying the impact of long COVID on the Australian population.

Data notes

Data for this article have been obtained from the following publicly available sources:

- **Australian Bureau of Statistics:** death registrations processed by jurisdictional Registries of Births, Deaths and Marriages, and information on cause of death recorded on a Medical Certificate of Cause of Death, completed by a doctor or coroner (ABS 2022a). Registration data provide additional information on the underlying cause of death and other associated causes. It should be noted that the number of deaths from surveillance will differ from the number of registered deaths.
- **Australian Government Department of Health**: information on COVID-19 in residential aged care facilities and among NDIS participants, vaccine coverage from daily updates and weekly epidemiological reports (Department of Health 2022d, 2022e, 2022g).
- **COVID Live:** data collated from media releases, with verification against state and federal health departments. Used to report Australian data on cases, hospitalisations, and deaths collected by disease surveillance. Information on deaths from surveillance systems provide rapid, up-to-date daily information but this information has not yet been processed by jurisdictional Registries of Births, Deaths and Marriages (COVID Live 2022).
- **Our World in Data:** data and information on international comparisons of cumulative infection rates, CFRs and vaccination rates over time (Ritchie et al. 2022). Our World in Data uses raw data sourced from the COVID-19 Data Repository by the Center for Systems Science and Engineering at Johns Hopkins University. Confirmed cases that are collated are identified from aggregated data sources from such bodies as the WHO, ECDC (European Centre for Disease Prevention and Control) and from national, state and county health departments (Dong et al. 2020).
- **NSW Health:** cases by LGA for description of COVID-19 cases by rurality (NSW Health 2022d).

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Changes in the health of Australians during the COVID-19 period

2

Changes in the health of Australians during the COVID-19 period

Key findings

This article examines whether the health of the Australian population changed in 2020, 2021 or in the early months of 2022 compared with pre-existing trends. This analysis provides a context for determining whether the total effect of the COVID-19 pandemic – both direct and indirect effects – has changed population health. Analysis at this stage is restricted to data sets with data available for the pandemic period, along with sufficient comparable earlier data to determine pre-existing trends.

Key findings are outlined here:

Overall mortality

- The age-adjusted rate of deaths from all causes combined continued its long-term decline, with no deviation in 2020 or 2021; there was also no obvious change in rates for any age group.
- Excess mortality – which measures the number of deaths compared with what is expected based on previous trends – showed a period of lower than expected deaths in winter 2020. From the middle of December 2021 to the end of February 2022 there was a substantial increase in excess deaths, when there were nearly 5,400 more deaths than expected.

Diseases and injuries

- Levels of psychological distress worsened for younger age groups (ages 18 to 44) at the start of the pandemic. Some improvement followed but not to pre-pandemic levels.
- The number of respiratory infections during 2020 and 2021 were very low, particularly for influenza, resulting in a substantial fall in death rates for respiratory diseases compared with previous trends.
- Death rates from cardiovascular disease and injury continued previous trends.

Foregone and delayed health care

- Rates of visits to general practitioners (GPs) in 2020 were similar to pre-existing trends but the rates in 2021 were above these trends, coinciding with the large vaccine roll-out; the new telehealth provisions played an important role in maintaining rates that were consistent with previous trends.

(continued)

- Over the 2 years from 2019–20 to 2020–21, there were around 120,000 fewer elective surgery procedures in public hospitals than expected, based on previous trends; for private patients (in public or private hospitals), there were more procedures in 2021 than expected.
- A number of data sources provide evidence of delayed or missed cancer screening and procedures – such as a large decline in colonoscopies – with rates well below what was expected in 2020. However, the impact of COVID-19 on the respective national screening programs cannot be quantified without further years of data.

To broadly assess the mortality benefit of preventing the potentially substantial effects of the COVID-19 pandemic, total excess mortality was compared across selected countries. Australia and New Zealand were 2 of very few Organisation for Economic Co-operation and Development (OECD) countries that kept cumulative excess deaths well below zero from the start of the pandemic until early 2022. This indicates that there were more deaths prevented than occurred.

The period covering 2020, 2021 and into 2022 has been exceptional in terms of public interest in the health of Australians and the efforts and sacrifices made to protect their health. Given the national health challenges faced, and the efforts made to tackle these, this article investigates how Australia's overall health has been affected during the COVID-19 pandemic. Specifically, how different were health outcomes in this period compared with pre-existing trends?

The COVID-19 pandemic has affected, or has the potential to affect, the health of Australians in several ways (AIHW 2021d):

- There are direct effects on health for people who contracted the virus – both the acute effects and, for some, the longer term impacts (for example, long COVID), for more information see 'Chapter 1 The impact of a new disease: COVID-19 from 2020, 2021 and into 2022'.
- There are also potential effects on health from the mitigations put in place to contain the spread of the virus (Meyerowitz-Katz et al. 2021; Pfefferbaum and North 2020; Shah et al. 2020). The stay-at-home orders and associated closure of services have the potential to affect mental, physical and social health (see Box 2.1 for more information).
- Other impacts on the health system and use of health services have been due to the suspension of some services, the extra strain put on hospitals when COVID-19 admissions were higher, and people's hesitancy to seek care due to fear of contracting the virus.

Box 2.1: Indirect effects from public health measures

A range of public health interventions were put in place to help contain the spread of the virus that causes COVID-19. These included border controls; closure of non-essential businesses; work-from-home orders; school closures; density limits within businesses and workplaces; stay-at-home orders; mandated mask use; and test, trace, isolation and quarantine measures. (For the purposes of this discussion, clinical treatments and vaccinations are not included.)

Governments and public health officials aim to balance the benefits from these interventions in reducing harm from the infectious disease with the potential harm caused by the interventions themselves. Some interventions are minimally disruptive to society (such as mask use and density limits). Others have unintended harms – in particular, stay-at-home orders (sometimes referred to as 'lockdowns'). Managing the response to the COVID-19 pandemic has been a complex balancing exercise, made even more so by the difficulty in showing the benefits of preventing harm caused by the spread of the virus (see the section titled 'A window into what could have been' toward the end of this article).

The potential negative effects of these public health interventions is challenging to quantify, as they can result from government directions, or from changed personal behaviour even in the absence of government directions – sometimes referred to as 'shadow lockdowns'. A lockdown is put in place due to high case numbers; this will, in itself, have indirect health effects (reduced health services due to COVID-19 priorities and staff furloughing, and the anxiety people experience due the pandemic's being close at hand). The separate effect of a lockdown on health, over and above any effects caused by the pandemic generally, is difficult to quantify (Holden 2022; Meyerowitz-Katz et al. 2021; Ouakrim et al. 2021).

Previous health crises and patterns seen overseas point to components of health that may worsen during crises such as large outbreaks of an infectious disease with periods of restrictions or other economic downturns – in particular, mental health, domestic violence and delays in accessing needed health care (Douglas et al. 2020; Newby et al. 2020). In contrast, some other aspects of health may improve, such as through reductions in the numbers of injuries or cases of other infectious diseases (Chen et al. 2020; Shilling and Waetjen 2020; Toffolutti and Suhrcke 2014).

Evidence points to some population groups having been disproportionately affected (either directly or indirectly) by the COVID-19 pandemic – making its impact one of inequality. The indirect impacts extend to the social determinants of health, which include adverse effects on income, education, employment, housing and social connections – and these effects can influence health years into the future.

Many vulnerable groups have been at a substantially increased risk during the pandemic, including Aboriginal and Torres Strait Islander people, people with disability and people with pre-existing health conditions. For more information on the impact of COVID-19 on Indigenous Australians, see Chapter 3 'Changes in Aboriginal and Torres Strait Islander people's use of health services in the early part of the COVID-19 pandemic'.

This article looks at available data on the overall health of the population during the COVID-19 pandemic, and compares that picture with trends over recent decades. The intention is to establish if there were any areas where the health of the population changed substantially during 2020 and 2021.

The analysis possible at this stage is somewhat constrained (Box 2.2); when this chapter was finalised, only limited data were available for the period into 2022. Until December 2021, Australia had relatively low infection and death rates from COVID-19, following a broad range of measures put in place to this point. However, toward the end of 2021 and into 2022, this situation changed markedly: the more infectious Omicron variant reached the country around Christmas 2021 and into the summer holiday period, just when public health measures were removed. This resulted in a substantial increase in the number of infections and deaths, though with a lower case-fatality rate than during previous waves of the virus, likely reflecting the relatively high vaccination rates in Australia at that time. For more information, see Chapter 1 'The impact of a new disease: COVID-19 from 2020, 2021 and into 2022'.

Box 2.2: What changes can be determined at this stage?

This article draws on the latest available data; however, there are important limitations on what can be examined at this stage of the pandemic. It is only possible to look at health issues evident in the currently available data. Further, there may be longer term impacts from the disease in the future which, by definition, cannot yet be determined in the data.

The focus of this article – in comparing recent data with pre-existing trends – means that key data sources needed to have data that were relatively up to date and consistently collected over a number of years. Notably, national hospital data have not been extensively used, as data were not available for analysis past June 2020. In addition, the analysis is generally at an aggregate level as it is not possible to analyse detailed breakdowns of data in a contained article. The data presented are mostly at the national level, and their non-geographical breakdowns are limited. Note that these aggregate data can hide differing patterns for different population and geographical groups, and that individual states have also produced analyses for their jurisdiction.

(continued)

Box 2.2 (continued): What changes can be determined at this stage?

Sections focusing on health outcomes use age-standardised rates (ASRs) for long-term trends in deaths. This enables valid comparisons to be made that account for changes in the size and age structure of the populations being compared, both over time and between males and females. Age-specific rates for shorter time spans are also presented, or were calculated but not shown. Crude rates and numbers of services have been used for health service data as an early indication of any changes in health service use during the pandemic. Age patterns may be valuable for future analysis as more data become available.

To establish whether there were deviations from expected trends in 2020 and 2021, short projections have been calculated using exponential smoothing, and displayed on graphs; 95% confidence intervals (CIs) were calculated, and instances where the observed rates fell outside these are noted in the footnotes.

This article has 3 main sections presenting new data:

- The first section focuses on all-cause deaths data.
- The second section presents available information on some key diseases and injuries.
- The last section examines available data on foregone or delayed health care.

The article concludes with discussions of variations across population groups, and of Australia's mortality experience compared with that of other OECD countries – to provide some insight into what was prevented in Australia, at least in terms of deaths.

Trends in population health over 2020 and 2021 in the context of pre-existing trends

As noted earlier, the measures used to control the COVID-19 pandemic, together with changes in people's behaviour – whether caused by these mitigations or unconnected to them (see Box 2.1) – have had indirect health impacts. This section presents several illustrations of these effects, based on available data; however, there are likely to be other health impacts that are not included.

This article concentrates on topics with available longer term trend data, which show whether an aspect of health was already increasing or decreasing before the pandemic. Boxes 2.3a to 2.3c include summaries of selected other important topics for which some data indicate if their trends changed during the COVID-19 period.

Box 2.3a: Health behaviours – some recent data but limited long term trend data

It is challenging to source national data on longer term trends in health behaviours that include those for the COVID-19 period. Available data largely rely on surveys with self-reported responses on whether behaviour changed from that before the pandemic. Data are not yet available using the more standard monitoring approach – that is, information on current behaviours which can then be compared with that in previous surveys using the same methodology. Notably, while the most recent National Health Survey collected data on health behaviours during 2020 and 2021, changed methodology means the results cannot be compared with information in earlier surveys (ABS 2022c).

Two examples using available data on short-term trends are summarised here: physical activity and alcohol use.

Physical activity

During the early period of the COVID-19 pandemic, similar proportions of people either increased or decreased their exercise or other physical activity (AIHW 2021d). For example, based on self-reported data from an Australian Bureau of Statistics (ABS) survey conducted in June 2020, 20.5% of people aged 18 or over increased their time spent on exercise or other physical activity compared with before the pandemic, while 19.2% decreased it (ABS 2020). Other data to July to September 2020 from the AusPlay survey suggest that males may have returned to levels of participation in recreation and fitness activities matching those in 2019, but females maintained higher participation levels (46% participating in 5 or more sessions per week compared with 43% in 2019) (Australian Sports Commission 2021). The same survey revealed a notable increase in the percentage of people engaging in endurance/health activities (includes activities such as walking, running and cycling) – from around 65% for the 4 quarters across 2019 and quarter 1 of 2020 to close to 75% in quarter 2 of 2020. This percentage fell back to around 70% in quarters 3 and 4 of 2020, which was still higher than pre-pandemic levels.

Alcohol use

Alcohol use presented a mixed picture during 2020. Overviews of available data from a range of sources are available elsewhere (AIHW 2022a; Farrugia and Hinkley 2021), and a summary of some key points is included here.

(continued)

Box 2.3a (continued): Health behaviours – some recent data but limited long-term trend data

Data from 2 surveys collected in the early period of the pandemic showed a similar pattern to that for exercise and physical activity: some people increased their consumption of alcohol and others decreased it. For instance, the ANUpoll from May 2020 found that 20% of alcohol drinkers increased their consumption while 27% decreased it. The ABS Household Impacts of COVID-19 Survey from June 2020 indicated that 13.9% of alcohol drinkers increased their consumption compared with their consumption before the pandemic, and 14.7% decreased it.

Data from credit/debit cards show a changed pattern in spending on alcohol. Spending increased between May 2020 and January 2021 compared with the same period in 2019, driven by an increase in spending on alcohol goods (such as those sold at bottle shops). Spending on alcohol services (such as provided by pubs and clubs) declined until mid-November 2020, after which it increased for the first time since the COVID-19 mitigations were introduced.

Box 2.3b: Suicide and intentional self harm – some recent data but limited long-term trend data

Rates of death by suicide have been tracked closely during the pandemic (see AIHW 2022e for a detailed analysis). This monitoring did not identify any increase during 2020 and 2021. State-based suicide registers that compile timely data on suspected deaths by suicide have shown:

- a relatively stable number of deaths across the years from 2016 to 2021 in Victoria
- a relatively stable number of deaths across the years 2019, 2020 and to October 2021 in New South Wales
- similar patterns in ASRs for males and females by month in Queensland, up until August 2020 (data were not available for more recent periods; Leske et al. 2020).

National deaths data on confirmed deaths by suicide in 2020 also do not show an increase compared with recent years. The ASR fell by 6.1% for males between 2019 and 2020, and by 7.9% for females (ABS 2021a).

Trends for ambulance attendances (for 5 states and territories – New South Wales, Victoria, Queensland, Tasmania and the Australian Capital Territory) have largely continued as they were before the pandemic, though with some potentially higher rates for young females (aged under 25). This is reflected in higher presentations for self-harm and suicidal ideation than expected (based on pre-existing trends) by young females aged 13–17 in emergency departments in New South Wales since the pandemic began (Sara et al. 2022).

Box 2.3c: Family and domestic violence - some recent data but limited long-term trend data

Data on self-reported intimate partner violence among women during the pandemic are available from a study conducted by the Australian Institute of Criminology (Boxall and Morgan 2021). These data cannot be used to show how the prevalence of violence has changed from pre-pandemic levels, but they do highlight some key patterns and show where violence might have changed in frequency or severity in the survey population. In the first year of the pandemic, 9.6% of women reported experiencing physical violence and 7.6% sexual violence. Many women reported that violence had increased during the pandemic: 42% said physical violence had increased in frequency or severity, and 43% said sexual violence had increased in frequency or severity. One in 4 women (26%) who had experienced physical or sexual violence said that they had been unable to seek assistance on at least one occasion due to safety concerns.

Compared with numbers for previous years, the number of hospitalisations for assault injuries related to family and domestic violence (FDV) was lower in April 2020 – 514 assaults – compared with April 2019 (582) and April 2018 (558) (AIHW 2021c). However, after April 2020, the number rose again, and was higher than in 2019 and 2018. Across 2019–20, the total number of assault hospitalisations due to FDV (7,256) was still higher than that for 2018–19 (6,786) and 2017–18 (6,538). This is consistent with the general increase over time in hospitalisations for FDV assault but is more than the increase in the population (which rose by around 1.5% each year during this period). Changes in hospitalisations may reflect increased disclosure and/or identification of FDV in hospitals and/or an increase in family and domestic violence events requiring hospitalisation.

Deaths from all causes combined

Data on deaths from all causes (combined) is a key statistic that reflects the overall health of the population. Data presented in this section are from 2 perspectives:

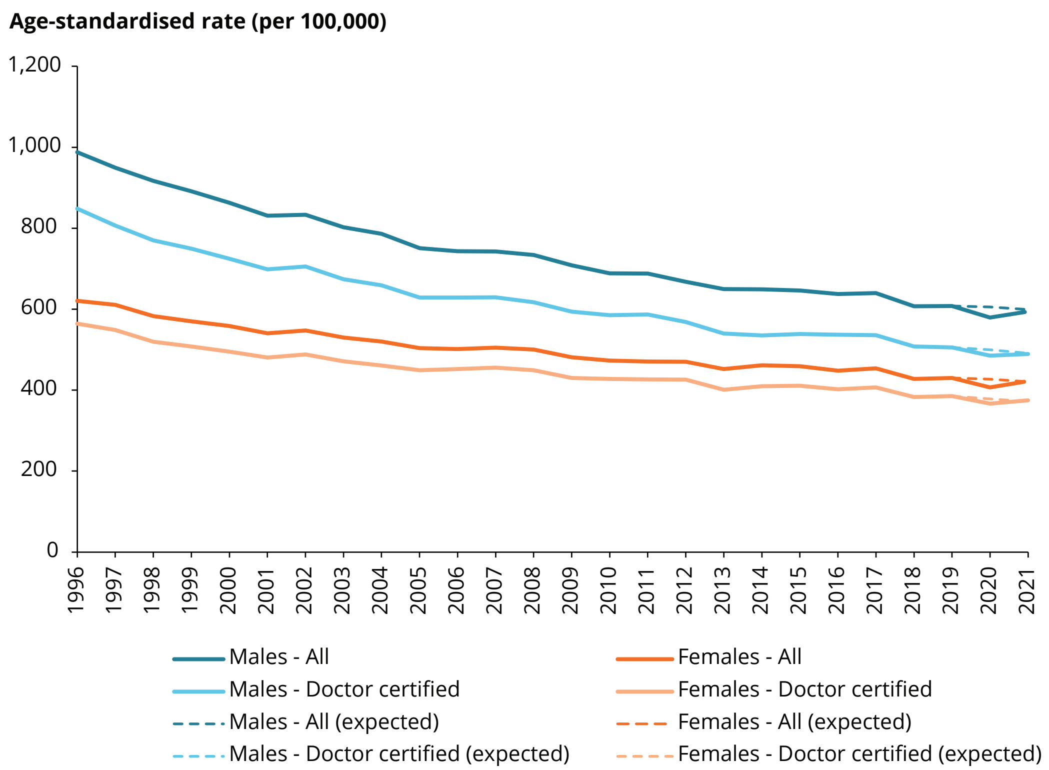
- trends in death rates from all causes to show how rates in 2020, 2021 and early 2022 compared with pre-existing trends
- weekly 'excess deaths' over the pandemic period to provide more detail within the pandemic period, including for the current year.

Much of the data presented here are for the subset of deaths certified by a doctor ('doctor-certified'); these account for 87–89% of all deaths in a year (ABS 2022a). Information on these deaths is available first. The remaining deaths are investigated by the state or territory coroner, resulting in a later finalisation of the cause of death. (Note that data on specific causes of death are reported later in this article, with international comparisons of excess deaths presented in the section titled 'A window into what could have been'.)

Deaths from all causes

The data over the last 25 years show a long-term trend of declining age-standardised death rates (Figure 2.1). Data for 2020 show no substantial change from this pattern for both males and females. Data to 2021 for the subset of doctor-certified deaths also show a continuation of previous trends. Comparing observed rates for 2020 and 2021 with expected rates – based on statistical projections, using the data to 2019 (shown as dotted lines in Figure 2.1) – suggests a somewhat lower rate of death in 2020 than expected. However, those rates are still within the expected band: they are not outside the 95% CIs from the projection models.

Figure 2.1: All-cause death rates, by sex, 1996 to 2021



Notes

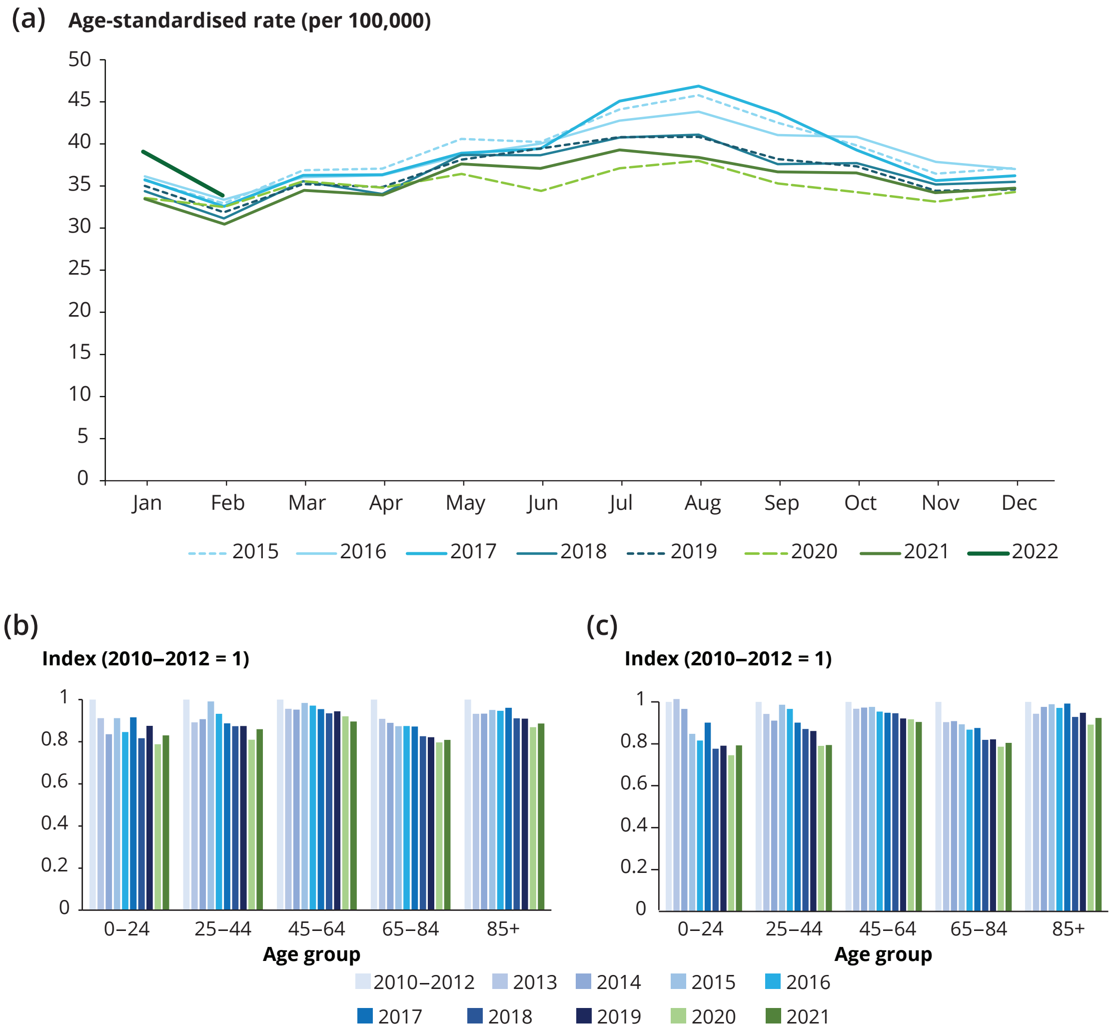
1. Mortality data are stratified by the year of occurrence of death for years up to and including 2021. Data for year 2020 and 2021 are provisional and subject to change.
2. Data are age standardised using the 2001 standard population. See Box 2.2 for context on age-standardisation in this article.
3. Dotted lines are the expected rates based on exponential smoothing projections, using the data to 2019.
4. Observed rates for 2020 and 2021 are within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Looking more closely at recent years by month (Figure 2.2a), the ASR generally fell between 2015 and 2019. Some variation in the winter months is apparent, likely reflecting the severity of infectious diseases that tend to peak then, such as influenza outbreaks (for example, 2017 was a bad year for influenza). Data for 2020 and 2021 show a continuation of the downward trends for each month, most particularly during the winter months. Data for the first two months of 2022 show a higher ASR compared with the same months in previous years. This was much higher in January.

Trends to 2019 by age and sex over the last decade (Figure 2.2b and 2.2c) show continuing declines for both men and women aged 65–84 and for females under 45, with fairly stable rates for other groups. These trends continued into 2020 and 2021.

Figure 2.2: Monthly age-standardised death rates (a), and indexed age-specific death rates for doctor-certified deaths by age group for males (b) and females (c)



Note: Data in b) and c) have been indexed to the mean value for 2010–2012.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Excess mortality

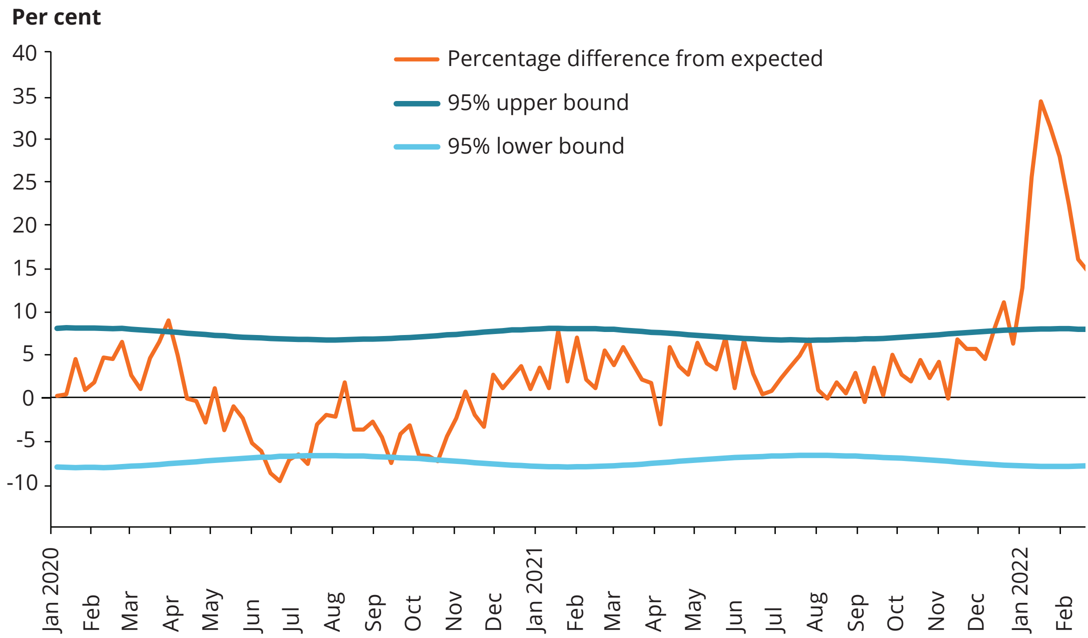
The graphs in Figure 2.1 and Figure 2.2a show that mortality rates were already decreasing before the pandemic, and during 2020 and 2021 this trend continued. A more specific measure to help determine if there were any changes during the year that were larger than expected is excess deaths (which is observed deaths minus expected deaths). This summary measure quantifies the number of observed deaths from all causes during a period of interest (in this case 2020, 2021 and early 2022) and compares it with what would have been expected given recent trends. This measure is of particular interest when comparing the situation during a health challenge with the preceding 'normal' period. It includes both COVID-19 and non-COVID-19 deaths and thus reflects the total impact of the pandemic, including both direct and indirect effects.

The preferred way to compare observed and expected deaths is based on statistical models that reflect patterns in recent data. Based on the Australian Bureau of Statistics (ABS) model of doctor-certified deaths, there were 2,152 fewer deaths than expected in 2020 in Australia and 5,061 more deaths than expected in 2021 (ABS 2022b). However, there was a marked change in January and February 2022 where there were 4,732 more deaths than expected in just those 2 months.

Figure 2.3 presents weekly excess deaths (doctor-certified only) during the pandemic period as a percentage of expected deaths, along with the upper and lower bounds of normal variation. This shows that Australia had a period of lower than expected deaths in the second half of June 2020. For 3 weeks during this time, deaths were 7–10% lower than expected, with the observed rates being statistically lower than expected for at least 2 weeks in a row. This period coincided with continuing public health measures which likely contributed to reductions in deaths for a number of causes, notably respiratory infections (discussed further in this article in the section titled 'Respiratory diseases and infections').

There was a marked change in the pattern in December 2021 and into January and February 2022 (Figure 2.3), with a sharp increase in excess deaths. This began in the second half of December 2021, when there were 2 weeks of excess deaths above the 95% CI. The one week beginning 27 December reverted to excess deaths within the CI, but this was followed by a very large spike during January and February 2022 – peaking nearly 35% above the expected level. This is much larger than spikes since 2016, with the next highest weekly percentage excess being around 15% in 2017 during the large influenza outbreak of that year. From mid-December 2021 to the end of February 2022, there were nearly 5,400 more deaths than expected.

Figure 2.3: Excess mortality from doctor-certified deaths per week, January 2020 to February 2022



Notes

1. Data shown represent the difference between the observed and expected deaths (from models) as a percentage of expected deaths.
2. The model uses historical data to predict current numbers of deaths to enable significant deviations from the expected trend to be identified.
3. At least 2 weeks outside the 95% upper and lower bounds of normal variation indicates statistically significant differences. This occurred for 3 weeks in Jun 2020 (lower than expected), 2 weeks in the second half of Dec 2021 (higher than expected) and all weeks in Jan and Feb 2022 (higher than expected).

Source: ABS 2022b.

COVID-19 accounted for a higher proportion, though not all, of the excess deaths in January and February 2022. COVID-19 accounted for around half (52%) of the excess deaths in 2022, while coronary heart disease (CHD) and dementia accounted for around 10% each (ABS 2022b, 2022d). Over those 2 months, deaths for CHD were 29% higher than expected, and dementia 24% higher. Some other major disease groups with the number of deaths being substantially higher in these 2 months than expected include chronic lower respiratory conditions (23% higher), stroke (20%) and diabetes (14%).

There was, however, variation across states and territories. Notably, Victoria had some further periods of higher than expected deaths, particularly towards the end of 2021 (ABS 2022a).

Australia's favourable excess mortality figures during 2020 and 2021 contrast sharply with the situation in many other countries. This is discussed later in the section titled 'A window into what could have been'.

Early evidence for specific diseases and injuries

Disease-specific data with longer term trends continuing into 2020 and 2021 are mostly limited to deaths data at this stage. Data on the non-fatal components of disease (such as prevalence and hospitalisations) take longer to collect and collate, and are largely not yet available for the pandemic period in a form that can be compared with existing trends.

Three disease and injury groups are presented in this section of the article: respiratory diseases, cardiovascular diseases and injuries. These are major causes of death in Australia and were identified early in the pandemic as ones that may have increasing or decreasing death rates during the pandemic. This section also covers mental health despite it having less time trend data available, as it is a vital disease group to track during the disruption caused by the pandemic.

A number of recent studies have shown adverse effects from COVID-19 after the initial infection, which may affect longer term trends for these diseases but are not yet evident in the data presented in this article.

- A large study in the United States (Xie et al. 2022) showed that the chance of developing a range of sub-types of cardiovascular disease from 30 days after testing positive to COVID-19 were increased compared with the risk before the pandemic. The study also showed that the risks were increased even for people with milder (non-hospitalised) disease, with the risk increasing with the severity of disease.
- A study of participants in the United Kingdom Biobank who had brain scans before and after the pandemic (Douaud et al. 2022) showed that people who had had COVID-19 had changes to the structure of the brain – including a greater reduction in brain size, and a larger cognitive decline than people who had not had COVID-19. These changes were also present in people with milder COVID-19 (not hospitalised).
- A United States study showed that people who had had COVID-19 had an increased risk of developing diabetes (Xie and Al-Aly 2022) – again present in both people who were hospitalised and people who were not.

It is not yet known whether these increases in risk will be sustained, whether they can be reversed, and whether these quantified risks will remain the same following vaccination and/or with new variants of the virus – these questions will require further research. The AIHW is establishing a national COVID-19 linked data set that will support research into the medium and longer term health effects of COVID-19.

Mental health

For some Australians, the COVID-19 pandemic and associated mitigations appear to have had a negative effect on mental health. Negative effects can result from concerns about the virus itself, and the impact of the measures used to contain the spread of the virus (NMHC 2020). Importantly, due to measures that required as many people as possible to stay at home to reduce physical interactions, isolation from family, friends and other support networks increased. Flow-on effects from the pandemic and associated disruptions – such as loss of employment, and pressures in adapting to remote work and schooling – are also part of the picture.

For some people, resulting declines in mental health may be short term; for others, there is potential for the pandemic and associated mitigations to exacerbate pre-existing mental health problems such as depression and substance abuse (WHO 2020).

The potential for negative impacts on mental health was recognised early in the pandemic (Brooks et al. 2020; NMHC 2020). A number of support measures were put in place to reduce these effects. For more information, see AIHW 2022c; NMHC 2020.

Psychological distress

Data on levels of psychological distress in the community provide an indication of the mental health of the population over time. Psychological distress reflects non-specific psychological symptoms of stress, anxiety and depression (Viertiö et al. 2021). There is a correlation between high levels of psychological distress and common mental health disorders (Cuijpers et al. 2009). Psychological distress is commonly measured using the Kessler Psychological Distress Scale, which has 10 items (K10). This K10 questionnaire includes questions about people's level of nervousness, agitation, psychological fatigue and depression over the past 4 weeks. The level of psychological distress of respondents can be grouped into categories ranging from low to very high, based on their responses to the questions.

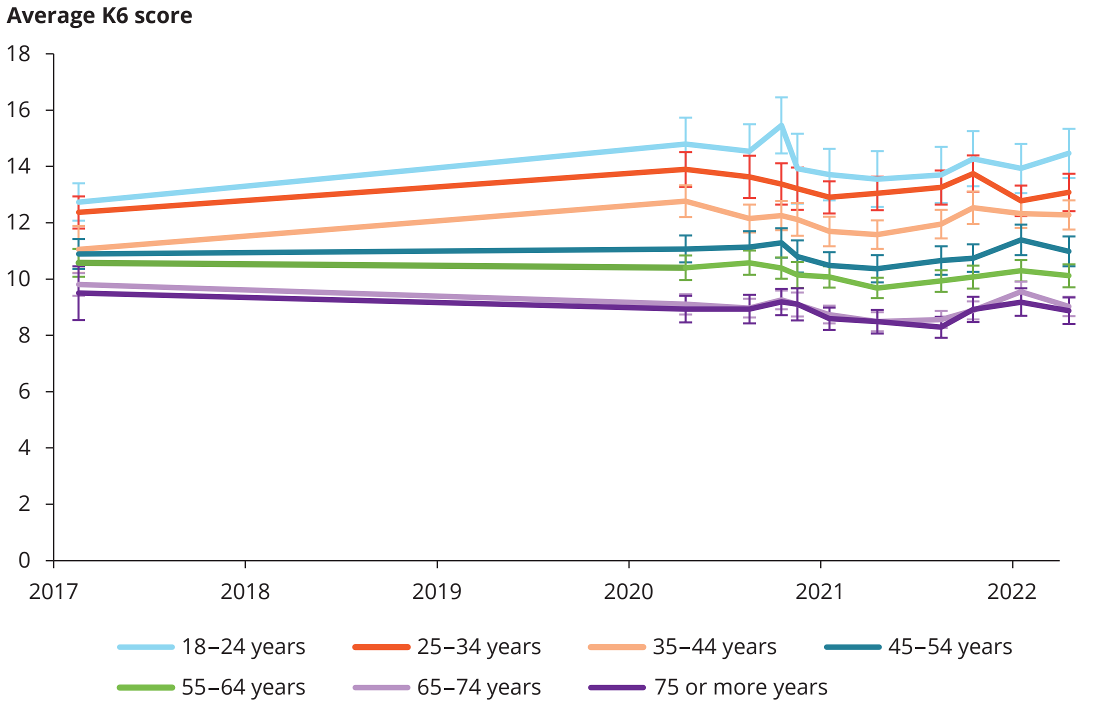
The trend in the proportion of people with high or very high psychological distress based on the K10 scale had been relatively flat for the 15 years before the pandemic, at 9–11% of males and 13–15% of females (AIHW 2022e). Initial results from the ABS 2020–21 National Study of Mental Health and Wellbeing (for data collected between December 2020 and June 2021) showed that 12% of men and 19% of women were classified as having high or very high levels of psychological distress (ABS 2021b). While this appears to indicate an increase in population levels of psychological distress, the most recent data may not be directly comparable with data collected before the pandemic due to differing survey methods and response rates.

While detailed data using the K10 instrument are not available for multiple time points during the pandemic nor by age group, data from an abbreviated version (K6) are available, along with data for one time point in 2017 (Figure 2.4). The data shown here represent the average K6 scores, rather than the proportion of the population with high or very high psychological distress. Data come from ANUpoll surveys, which use sampling methods based on random probability and cover people with and without internet access. Data were collected from 2,500 respondents in 2017 (February), and from more than 3,000 respondents in 2020 (April, August, October and November), 2021 (January, April, August and October) and 2022 (January and April) (AIHW 2022e; Biddle and Gray 2022; Biddle et al. 2022).

For age groups up to 44 years, these data show somewhat higher average scores (indicating higher levels of psychological distress) in April 2020 than in February 2017; however, it is not possible to determine whether or not this is directly due to the pandemic. After April, there was some decline in scores for these age groups over the rest of 2020 and well into 2021, with the decline slower for those aged 18–24. Some older age groups had lower K6 scores during 2021 than the 2017 levels, notably the group aged 65–74.

The scores for many age groups generally increased during the second half of 2021. For the 4 oldest age groups (45 years and over), these increases continued into January 2022 – with scores significantly higher than those in April 2021, though not above the levels of 2017. For younger age groups, there was some levelling off between October 2021 and January 2022; however, scores for the 18–24 and 35–44 age groups remained above the 2017 level. While scores for the youngest age groups continued to be above pre-pandemic levels in April 2022, scores for the 3 oldest age groups (55 years and over) were below 2017 levels (Figure 2.4).

Figure 2.4: Average psychological distress (K6 aggregate scores), 2017 to 2022



Sources: ANUpoll surveys (April, August, October and November 2020; January, April, August and October 2021; and January and April 2022); ANU's Social Research Centre Life in Australia Survey, February 2017.

Other measures of population mental health

While there are only limited national data showing how population mental health has changed in Australia during the pandemic compared with before it, a comprehensive international study provides important modelled data on the situation in Australia (COVID-19 Mental Disorders Collaborators 2021). The study assessed evidence on the mental health impacts of COVID-19 and then modelled the prevalence in 2020. It found that countries with more severe outbreaks:

- had larger increases in the prevalence of major depressive and anxiety disorders
- recorded a greater impact on females than on males
- saw younger age groups more affected than older ones.

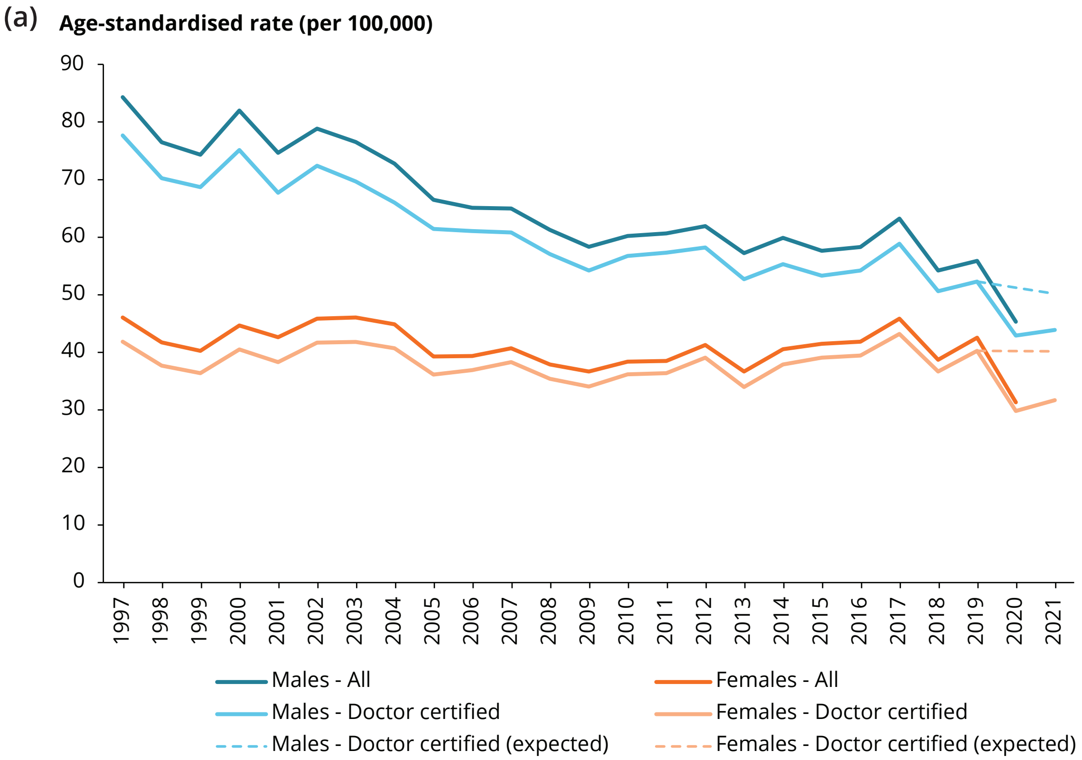
The prevalence of major depressive disorders was modelled to have increased by 27.1% (95% CI: 22.6–31.5) in high-income countries, and anxiety disorders by 25.2% (20.3–30.7). Reflecting the less severe outbreaks in Australia, the modelled change for Australia was lower than the overall change for high-income countries – in the range 10.1% to <13.6% increase in prevalence for major depressive disorders and 9.7% to <14.0% for anxiety disorders.

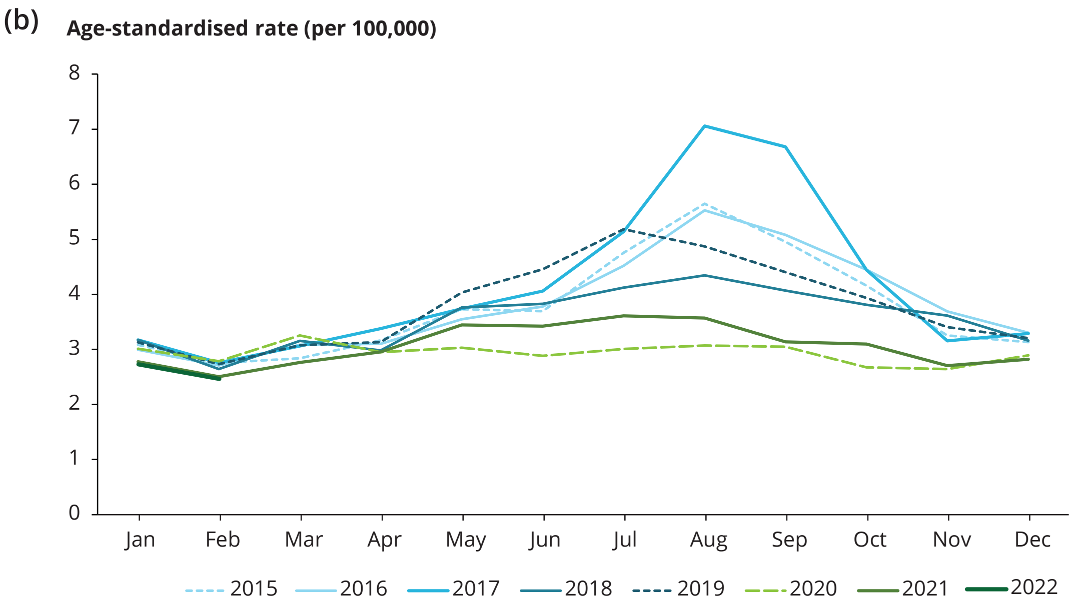
The use of mental health services since the start of the pandemic (as measured by Medicare Benefits Schedule [MBS] claims processed) also increased as have contacts with support organisations (as measured by the number of calls or other contacts, such as webchat or email) (AIHW 2022e).

Respiratory diseases and infections

Death rates from all respiratory diseases combined (Figure 2.5a) showed a substantial fall in 2020 – for females, to a level outside the CIs of the projections. The figures for 2021 were not outside the expected range. The monthly data in Figure 2.5b show the very flat death rates across 2020 and 2021, in sharp contrast to data for previous years where there was a much larger increase in rates during the winter months. The death rates for the first two months of 2022 are similar to the rates for the first two months of 2021. Similar patterns were seen for the subsets of respiratory diseases shown here: chronic lower respiratory diseases, and influenza and pneumonia (figures 2.6 and 2.7, respectively). For chronic lower respiratory diseases, the rates in 2020 and 2021 for females were outside the expected range. For influenza and pneumonia, the rates for females in 2020 were outside the expected range.

Figure 2.5: Age-standardised death rates from respiratory diseases, 1997 to 2021 (a), and monthly for doctor-certified deaths, 2015 to February 2022 (b)



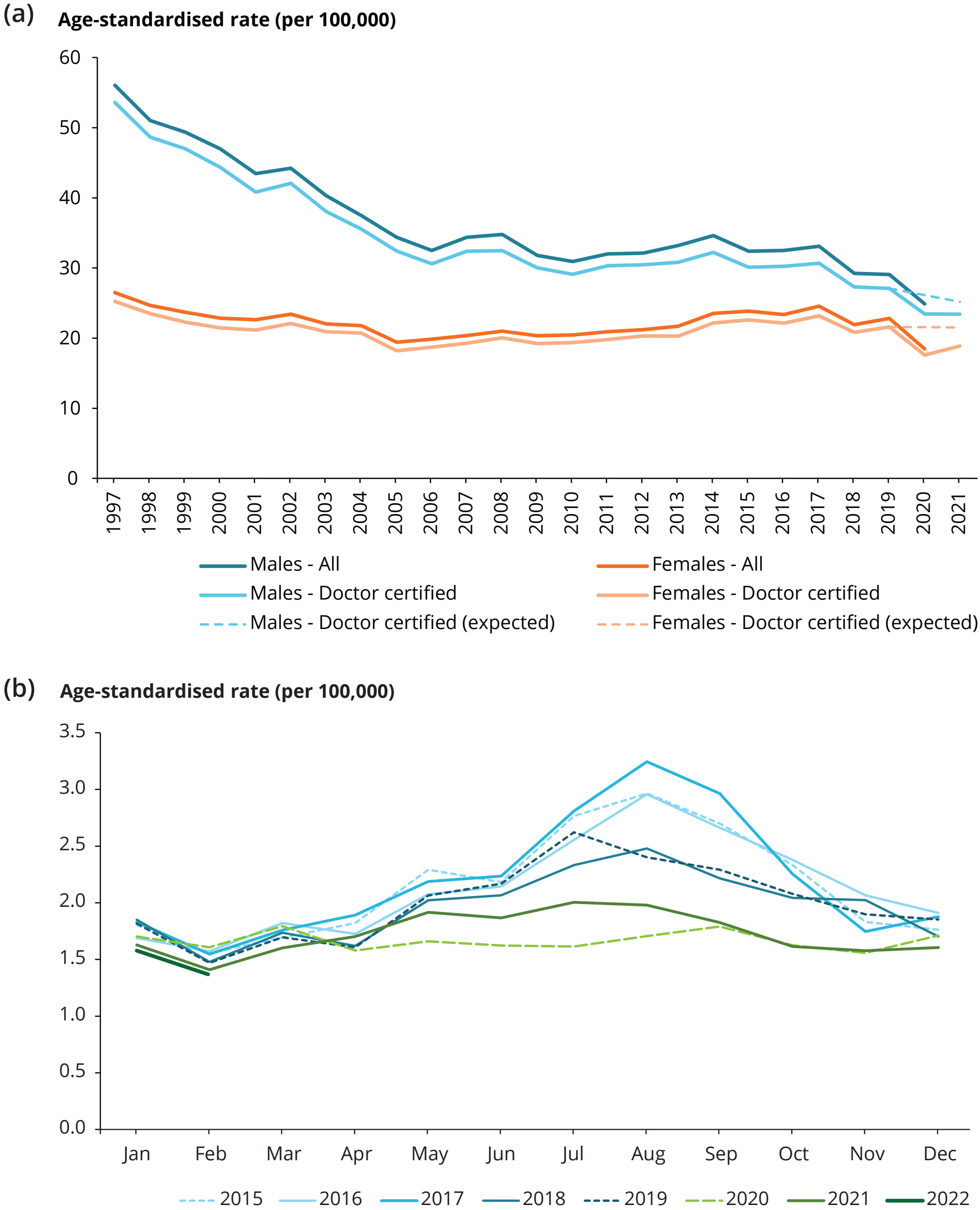


Notes

1. Notes 1–3 in Figure 2.1 also apply here.
2. Observed rates in a) for doctor-certified and all deaths for females in 2020 are lower than the CIs for the projections. All other observed rates in 2020 and 2021 are within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Figure 2.6: Age-standardised deaths rates from chronic lower respiratory diseases, 1997 to 2021 (a), and monthly for doctor-certified deaths, 2015 to February 2022 (b)

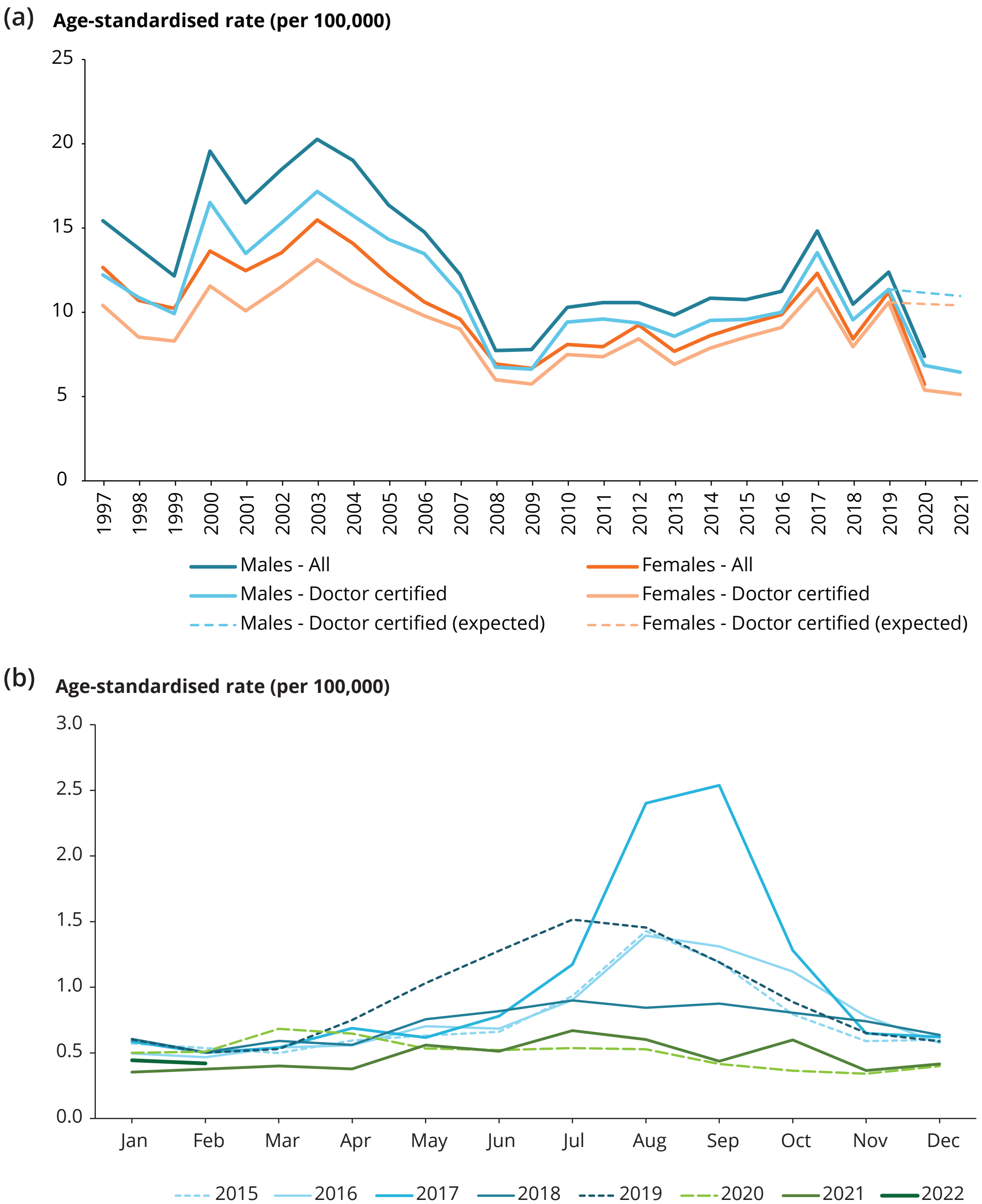


Notes

1. Notes 1–3 in Figure 2.1 also apply here.
2. Observed rates a) for doctor-certified and all deaths for females in 2020 and 2021 are lower than the CI for the projections. Rates for males in 2020 and 2021 are within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Figure 2.7: Age-standardised death rates from influenza and pneumonia, 1997 to 2021 (a), and monthly for doctor-certified deaths, 2015 to February 2022 (b)



Notes

1. Notes 1–3 in Figure 2.1 also apply here.
2. Observed rates in a) for doctor-certified and all deaths for females in 2020 are lower than the CIs for the projections. All other observed rates in 2020 and 2021 are within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Coinciding with these much lower death rates for many respiratory diseases, surveillance data for respiratory infections during 2020 and 2021 declined dramatically compared with data for previous years. This was particularly the case for influenza, with national data for the period to early November 2021 showing very low numbers of laboratory-confirmed cases for all of 2020 and 2021 (Department of Health 2021a).

Coinciding with the substantial reduction in respiratory infections was a sharp fall in the number of prescriptions subsidised for anti-infective medications (largely due to decreased antibiotic use) for all quarters ending June 2020 through to the end of September 2021 (AIHW 2022b). For example, compared with the corresponding 2019 quarter, prescriptions for the June 2020 quarter were 35% lower – and still 21% lower for the June 2021 quarter. The same trends were observed for the September quarters, when dispensed prescriptions were 36% and 31% lower in 2020 and 2021, respectively, compared with the 2019 figure.

Cardiovascular disease

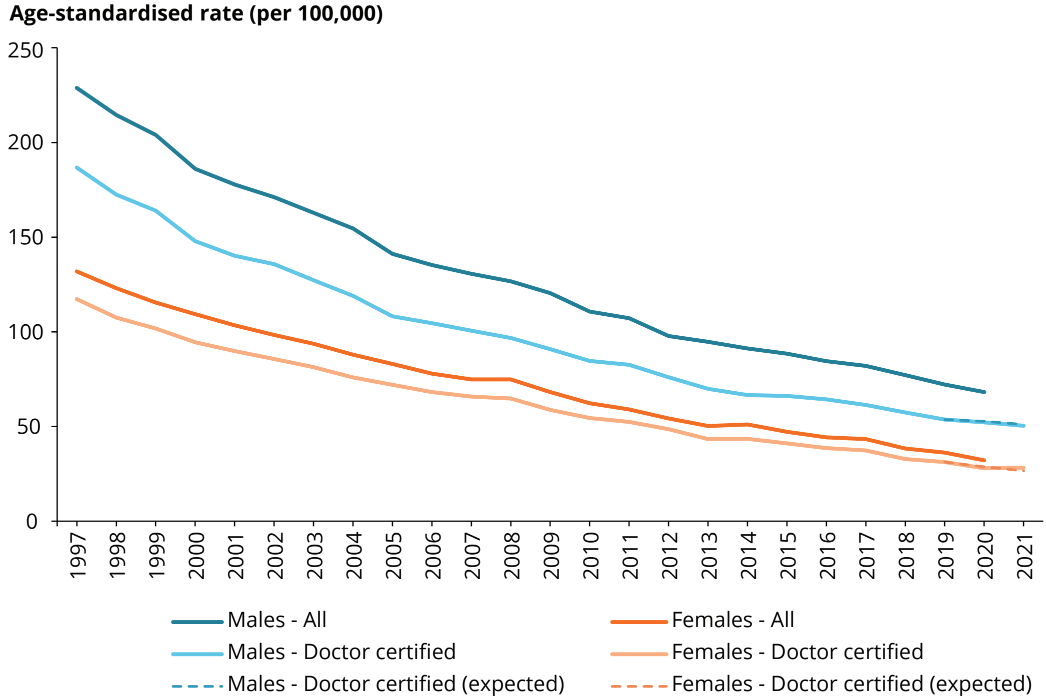
The long-term trend in death rates for the 2 major types of cardiovascular disease – coronary heart disease and stroke – has been decreasing since a peak around the end of the 1960s. For more information, see Chapter 4 'Changing patterns of mortality in Australia since 1900'.

This decline has continued into the 21st century, though at a slower rate. Age-standardised death rates in 2020 – and, for doctor-certified deaths, in 2021 and early 2022 – continued these decreasing trajectories at similar rates to the expected trends (figures 2.8 and 2.9). The monthly data also illustrate the year-on-year declines, though it appears that the usual winter increase in death rates for coronary heart disease was reduced in 2020 and 2021.

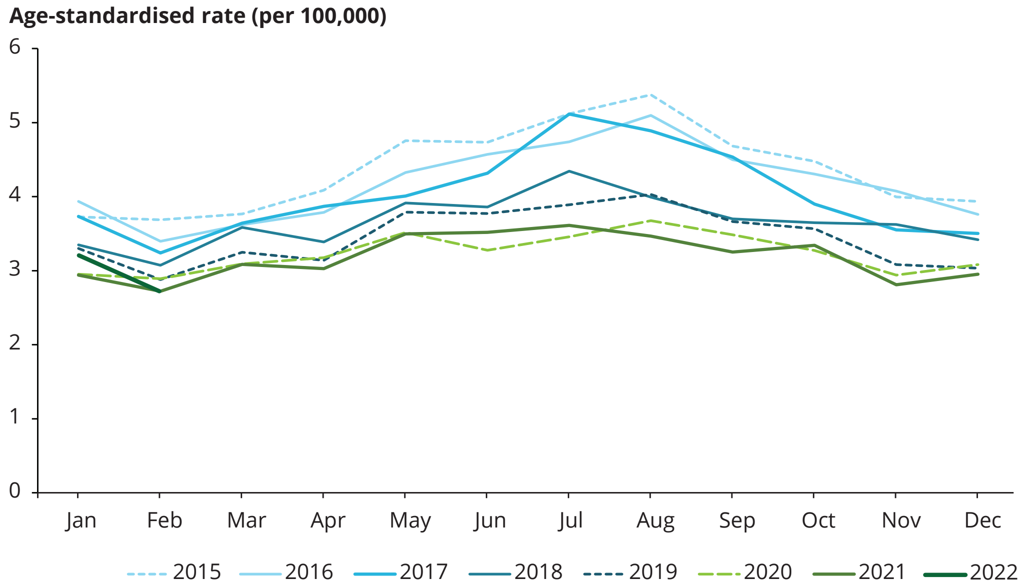
In January 2022, death rates for coronary heart disease were slightly higher compared with January 2020 and 2021. Whereas in February 2022, death rates were similar to that in 2021. Deaths rates for stroke were lower in the first two months of 2022 compared with previous years.

Figure 2.8: Age-standardised death rates from coronary heart disease, 1997 to 2021 (a), and monthly for doctor-certified deaths, 2015 to February 2022 (b)

(a)



(b)

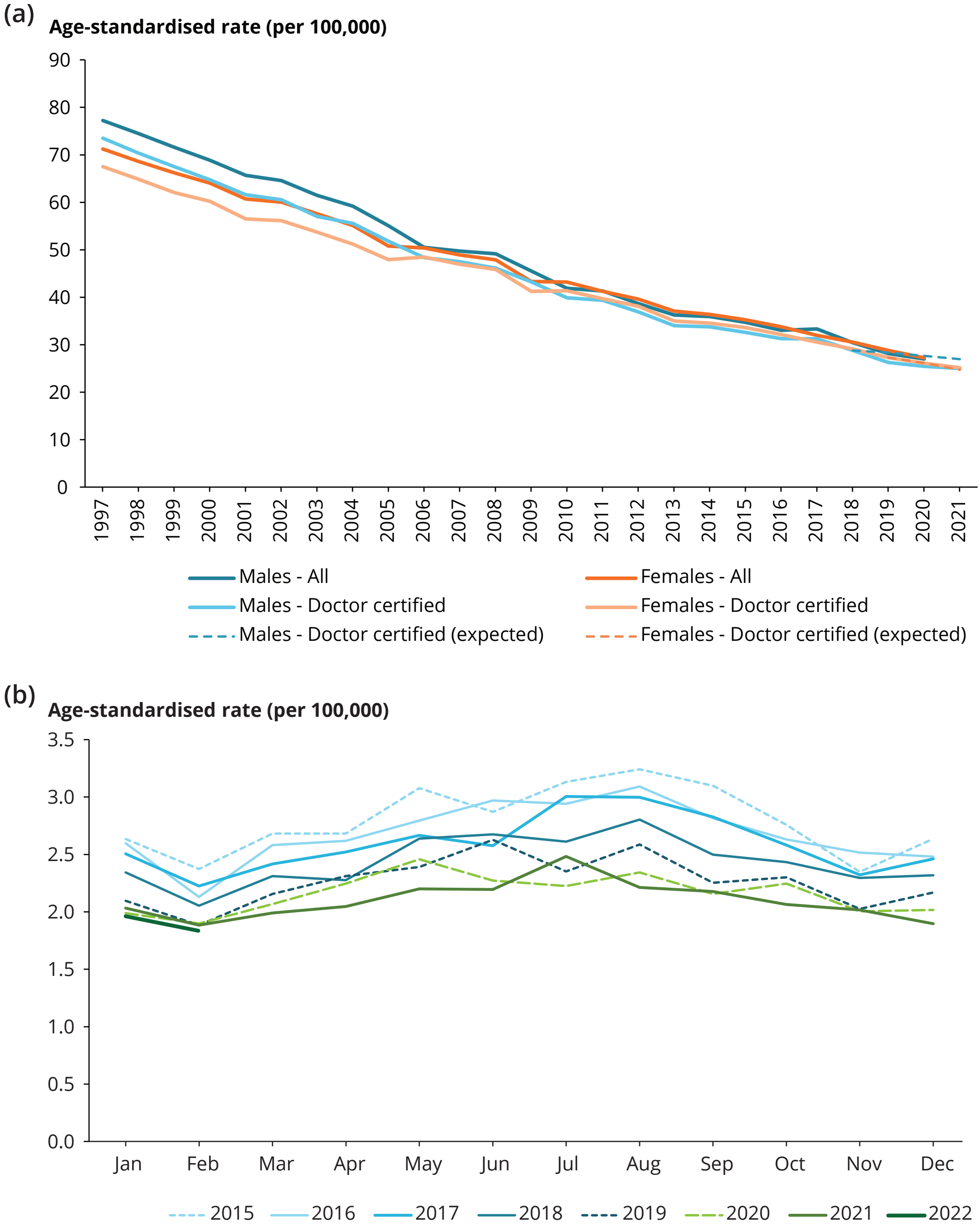


Notes

1. Notes 1–3 in Figure 2.1 also apply here.
2. All observed rates for 2020 and 2021 in a) are within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Figure 2.9: Age-standardised deaths from stroke, 1997 to 2021 (a), and monthly for doctor-certified deaths, 2015 to February 2022 (b)



Notes

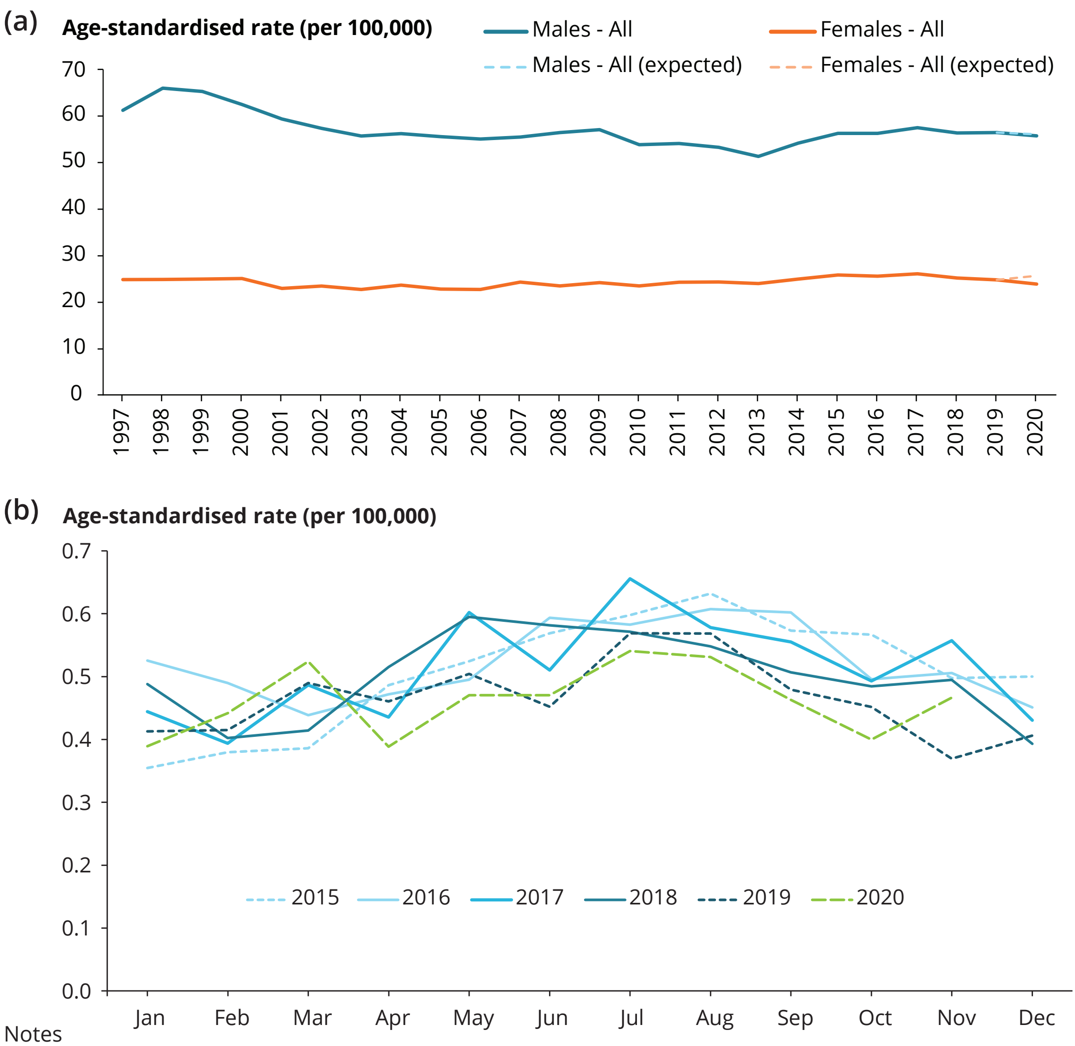
1. Notes 1–3 in Figure 2.1 also apply here.
2. All observed rates for 2020 and 2021 in a) are within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Injuries

During the early stages of the COVD-19 pandemic in Australia, there were signs of reduced injuries (AIHW 2021d). When this report was compiled, national deaths data on injuries were available only to the end of 2020 (as the subset of doctor-certified deaths is not reliable for injuries due to the large number of these deaths being investigated by jurisdictional coroners). To the end of 2020, age-standardised death rates from all injuries continued the flat trends seen over recent years for males, while the rate for females was below the CIs for the expected rate (Figure 2.10). There was also little change in the monthly death rates for all injuries in 2020 compared with recent years.

Figure 2.10: Age-standardised death rates from injuries, 1997 to 2020 (a) and monthly, 2015 to 2020 (b)



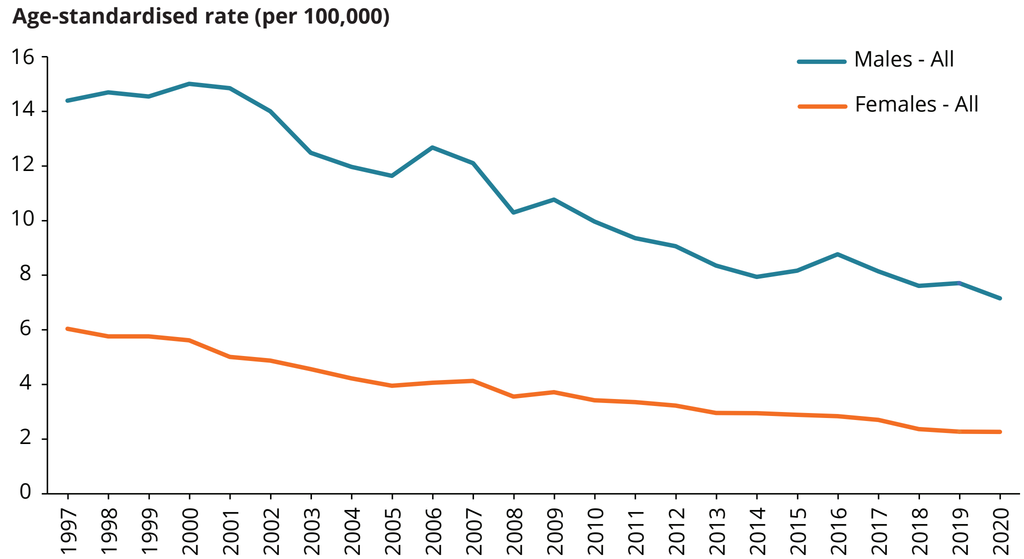
Notes

1. Notes 1–3 in Figure 2.1 also apply here.
2. The observed female rate for 2020 in a) is below the CIs for the projection, and the male rate is within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

The subgroup of injuries – land transport accidents – also continued the decreasing trend seen in recent years (Figure 2.11). More recent data on road deaths confirm no major changes in the trend for this group (BITRE 2022).

Figure 2.11: Age-standardised death rates from injuries in land transport incidents, 1997 to 2020



Notes

1. Notes 1–3 in Figure 2.1 also apply here.
2. Both observed rates in 2020 are within the CIs for the projections.

Sources: AIHW analyses of ABS provisional mortality statistics: customised report; AIHW National Mortality Database.

Foregone and delayed health care

Health services have been affected in several ways during the COVID-19 pandemic, both directly and indirectly:

- Substantial changes have been needed to respond to the direct effects of COVID-19, including public health measures to prevent the spread of the virus and health care for people who develop COVID-19.
- Indirect effects of the pandemic that have affected health services have included:
  - restrictions on some services at various times (for example, elective surgery)
  - increases in the need for some services (for example, mental health) and decreases in the need for others (for example, respiratory infections)
  - people changing their health-seeking behaviour to reduce their chance of contracting the virus.

This section considers whether the combination of these effects may have resulted in people delaying, or even missing, required health care. While it is not possible to categorically determine this, it would be likely suggested by any substantial changes in patterns compared with pre-existing trends. Available national data provide insight into this when looking at patterns over 2020 and 2021 and into 2022 compared with existing longer term trends.

This section examines national patterns; however, there would have been likely differences across the states and territories depending on the level and timing of COVID-19 outbreaks and mitigations. Patterns by age and sex have not yet been examined in detail either, but may benefit from further analysis in the future. In contrast to the data on trends in deaths presented earlier in this article, analysis presented in this section uses a combination of crude rates and numbers of services (see Box 2.2 for more information). While not covered in this article, note that there is detailed analysis of recent changes in the use of mental health services on the AIHW website (www.aihw.gov.au), and Chapter 3 in this report examines the changing use of health services among Aboriginal and Torres Strait Islander people.

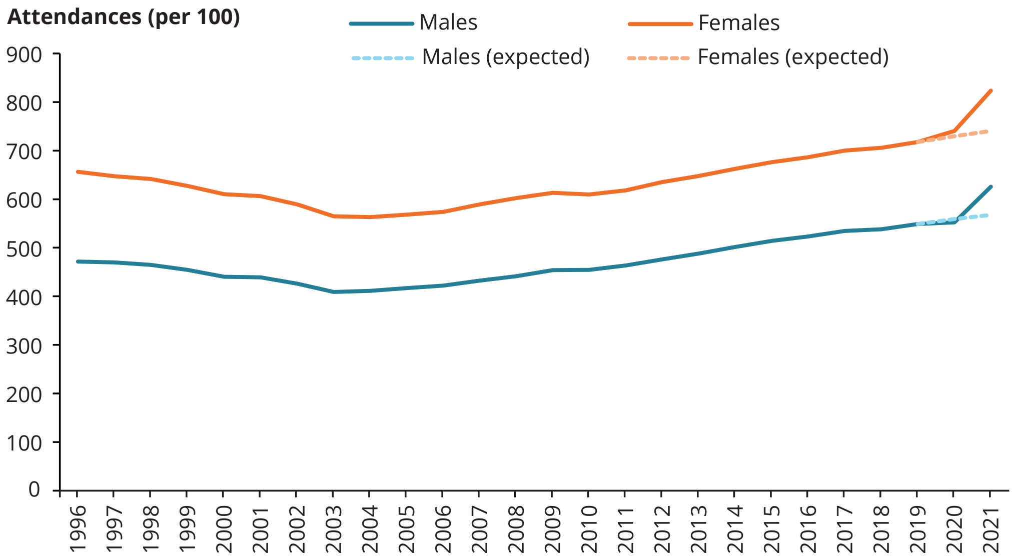
The longer term trend information presented in this section largely comes from administrative data, particularly MBS data for specific categories of services. There are also national survey data available from the ABS 2020–21 Patient Experience Survey which included specific questions on whether people delayed or missed health care because of COVID-19 (ABS 2021d). The results show that 9.8% of people aged 15 and over delayed or missed needed health care from a GP due to COVID-19. The corresponding figures for missed care from dental professionals was 12.2%, and from medical specialists 7.3%. These rates of missed/delayed health care were higher for: females than males; people aged 15–34 than people aged 85 and over; people with long-term health conditions than people without them; and people living in cities than people living in other areas. It is possible that these figures do not include the new telehealth services (AIHW 2022b) as questions remained the same as in previous surveys to preserve comparability. In relation to telehealth, 29% of people had used telehealth in the previous 12 months.

General practitioner visits

During the early period of the COVID-19 epidemic in Australia, there was concern that people may not receive the care they needed for other medical issues. As GPs provide the majority of primary care in Australia, any changes in service use have important implications for the health of the population.

The sustained increase in rates of visits to GPs from the early 2000s to 2019 continued into 2020 (Figure 2.12). However, there was a substantial increase in 2021; it was well above the expected rate, based on projections from data for the period to 2019, and was outside the 95% CIs. This increase was driven by the key role GPs played in the vaccine roll-out. In 2021, 10.3% of all GP attendances were to assess a patient's suitability for the COVID-19 vaccine. When excluding these attendances from the analysis, the rate of GP attendances in 2021 were within the expected range.

Figure 2.12: Rate of non-referred GP attendances, 1996 to 2021



Notes

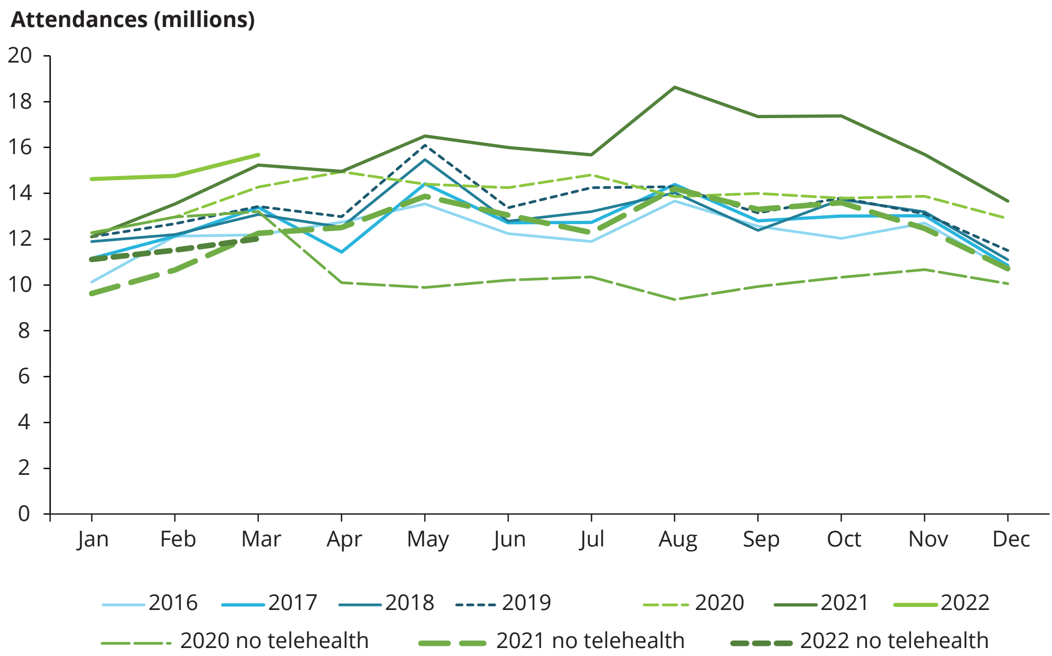
1. Dotted lines are the expected rates based on exponential smoothing projections using the data to 2019. Observed rates for 2021 are above the CIs for the projections, while 2020 estimates are within them.
2. Year is based on the date of processing (processed up until 31 March 2022).

Source: AIHW analysis of MBS data maintained by the Department of Health.

Figure 2.13 presents data on attendances by month over recent years. It shows that the total number of GP visits (the solid lines) remained at the level of recent years during 2020 and the first part of 2021. There was a noticeable increase in the second half of 2021, coinciding with the vaccine roll-out. Numbers were also higher than for previous years between January and March 2022.

The dotted and dashed lines labelled 'no teleheath' in Figure 2.13 show the number of non-referred GP attendances excluding the new telehealth provisions introduced in March 2020. The remaining lines present the same data but with telehealth provisions included – demonstrating their important role telehealth played in maintaining GP care during the pandemic. In 2020, 22% of GP visits were conducted via telehealth, and 20% in 2021. For the first 3 months of 2022, the percentage again increased – to 23%. It is not possible to determine how much of the shift was due to concerns by patients or GPs of spreading the virus, and how much was due to convenience and a preference for particular types of services – and thus whether a similar pattern would have been observed if telehealth provisions were introduced outside the pandemic. It is also not possible to assess whether the reduction in face-to-face attendances affected the quality of care, or whether there were any changes in the reasons for visits.

Figure 2.13: Number of non-referred GP attendances by month, 2016 to March 2022

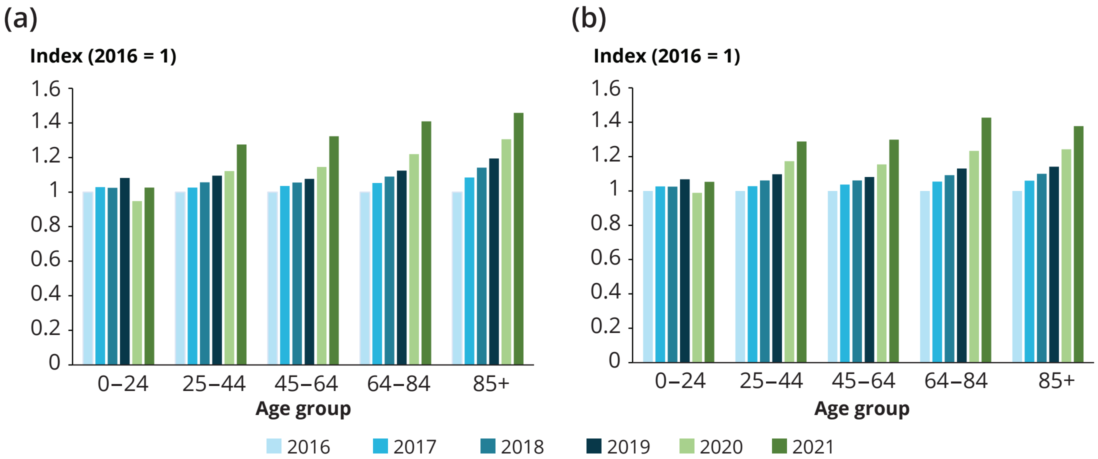


Note: Year and month are based on the date of processing (processed up until 31 March 2022).

Source: AIHW analysis of MBS data maintained by the Department of Health.

Rates of visits by age group and sex (Figure 2.14) also show a continuation of previous trends for most groups into 2020, with larger increases into 2021.

Figure 2.14: Trends in non-referred GP attendances, for males (a) and females (b), by age, 2016 to 2021



Notes

1. Data have been indexed to the mean value for 2016.
2. Year is based on the date of processing (processed up until 31 March 2022).

Source: AIHW analysis of MBS data maintained by the Department of Health.

Elective surgery

At the start of the COVID-19 pandemic in Australia, non-urgent elective surgery was suspended for 1 month, from late March to late April 2020. During this time, only Category 1 (the most urgent) and exceptional Category 2 procedures could be undertaken. These restrictions then started to be eased, though some were reintroduced in various jurisdictions at different times. The long-term health effects of cancelling or postponing non-urgent elective surgeries are not yet known.

Elective surgery occurs in both public and private hospitals, with around two-thirds of elective surgery admissions occurring in private hospitals (AHIW 2019). Elective surgery data in public hospitals are currently available up to the end of 2020–21.

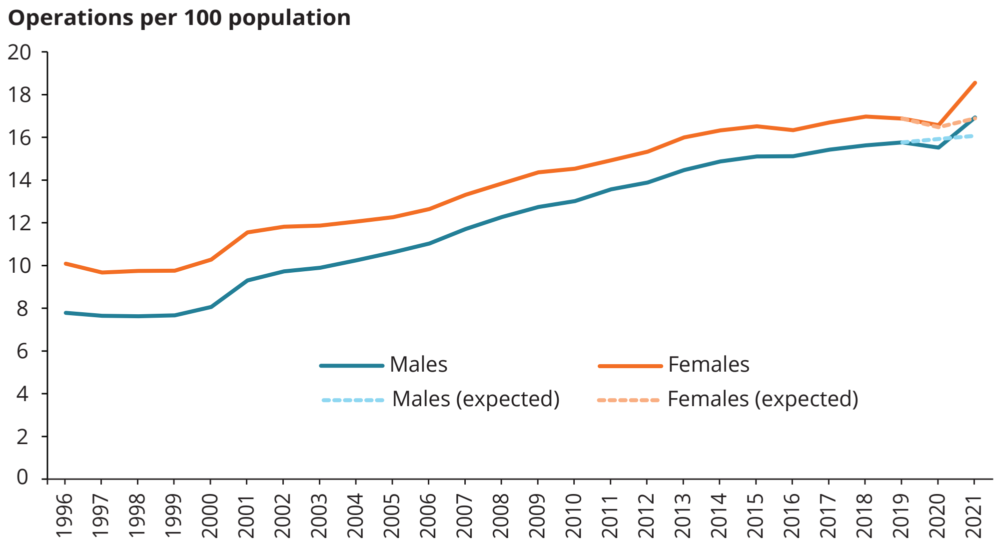
- Before the pandemic, admissions for elective surgery in public hospitals had been increasing steadily, by 2.1% on average each year between 2014–15 and 2018–19 (AIHW 2022d).
- In contrast, between 2018–19 and 2019–20, the number of elective surgery admissions decreased by 9.3% following the restrictions on elective surgery put in place at the start of the pandemic. This suggests that a large number of elective surgery procedures were delayed or treated differently. Due to the nature of the restrictions, reductions were in the less urgent groups. Between 2018–19 and 2019–20, semi-urgent procedures declined by 9.2% and urgent procedures by 18%.

- Elective surgery admissions substantially increased (9.6%) between 2019–20 and 2020–21. This brought the number of admissions close to the level of 2018–19 but around 5% lower than would have been expected if admissions had continued to increase at the same rate as between 2014–15 and 2018–19. Over the 2 years from 2019–20 to 2020–21, there were just over 120,000 fewer admissions for elective surgery in public hospitals than would have been expected.
- Changes between 2019–20 and 2020–21 were not consistent across jurisdictions. In Victoria, admissions continued to fall between 2019–20 and 2020–21, reflecting the ongoing limits in place, which had an impact on the volume, type and timing of elective surgery.

No directly comparable data for elective surgery in private hospitals are available, though data on Medicare-subsidised operations occurring in hospital are provided below (which may also include some non-elective operations). It is important to note that there is some overlap between these Medicare data and the public hospital data – procedures for private patients in public hospitals are included in both data sets.

The rate of Medicare-subsidised operations for private patients (in public or private hospitals) has risen steadily over many years (Figure 2.15). However, in 2020, there was a dip below this trend, followed by a notable increase in 2021 (the rate for females is above the 95% CI for the projection). There may have been a higher number of elective surgery procedures performed in private hospitals to partly compensate for the lower than expected number in public hospitals as described above.

Figure 2.15: Rate of Medicare-subsidised operations for private patients, 1996 to 2021



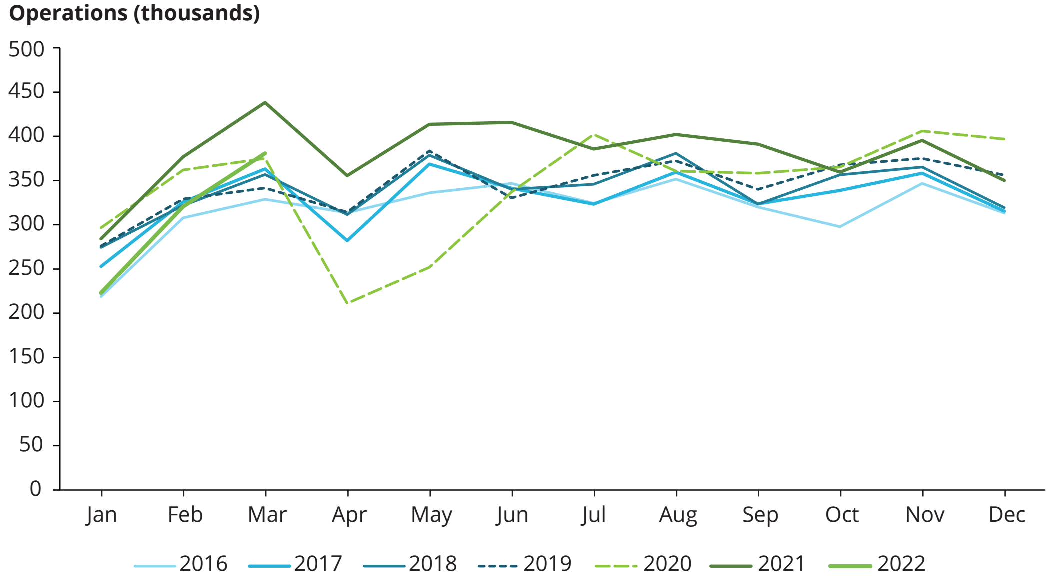
Notes

1. Dotted lines are the expected rates based on exponential smoothing projections using the data to 2019. The observed rate for females in 2021 is above the CIs for the projection. All other rates are within the CIs.
2. Year is based on the date of processing (processed up until 31 March 2022).

Source: AIHW analysis of MBS data maintained by the Department of Health.

Monthly data (Figure 2.16) show the substantial drop in operations in April and May 2020, along with the higher numbers for much of 2021. Data for the early months of 2022 show another drop in the number of operations compared with earlier years – this period coincided with a large surge in COVID-19 cases, resulting in restrictions placed on elective surgery.

Figure 2.16: Number of Medicare-subsidised operations for private patients, by month, 2016 to March 2022



Note: Year and month are based on the date of processing (processed up until 31 March 2022).
Source: AIHW analysis of MBS data maintained by the Department of Health.

Cancer

Cancer needs to be diagnosed early to ensure the best chance of favourable outcomes (WHO 2022). As well, some pre-cancerous changes are able to be detected, enabling procedures to prevent the cancer developing. Delays in screening or early detection services during the COVID-19 pandemic may signal an increased risk of more advanced cancers being diagnosed later, although it is too early to see this potential effect in the data.

Screening

For breast screening, the number of screening mammograms conducted through BreastScreen Australia in 2020 declined (AIHW 2021b). From January to June 2020, there were 145,000 fewer screening mammograms than in the same period in 2018 (2018 was chosen as the comparison year as this is a 2-yearly program). This was largely due to a sharp decline when services were suspended during the earliest part of the pandemic, when the number of mammograms for women aged 50–74 fell from more than 70,000 in March 2020 to just over 1,100 in April 2020.

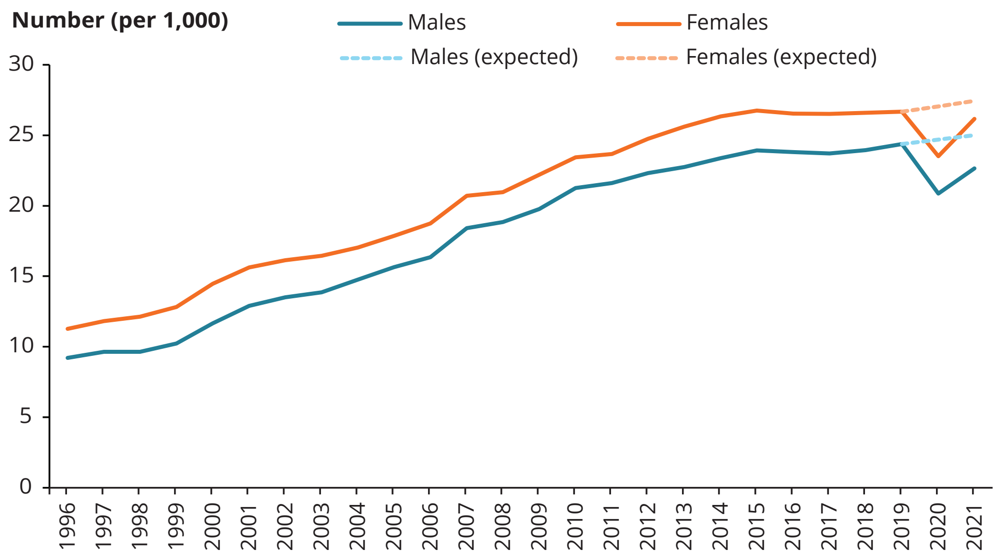
The number of screening mammograms increased as restrictions were eased. During the 3 months from July to September 2020, 12,000 more mammograms were performed than in the same period in 2018. Younger women and women who spoke a language other than English at home were slower to return to screening mammograms after restrictions eased. There was little difference in return to screening across socioeconomic groups.

For both bowel and cervical screening, the impact of COVID-19 cannot be quantified without further years of data due to normal fluctuations in, or changes to, the respective national screening programs (AIHW 2021b).

Procedures related to screening and early detection

Data on Medicare-subsidised procedures related to screening and early detection provide further insight into potential missed care. Analysis indicates that there were unexpected declines in these procedures during the pandemic. The rate at which people received a colonoscopy during the year dropped sharply in 2020, well below the expected rate, based on recent trends (Figure 2.17). While there was some return toward the expected rates in 2021, the rates were still outside the CIs for the expected rates. The number of Medicare-subsidised breast and prostate cancer tests also showed some declines in 2020 compared with earlier years (AIHW 2021a).

Figure 2.17: Rate of patients receiving at least one MBS-subsidised colonoscopy in a year, 1996 to 2021



Notes

1. MBS items included: 32084, 32087, 32088, 32089, 32090, 32093, 32094, 32222, 32223, 32224, 32225, 32226, 32227, 32228.
2. Dotted lines are the expected rates based on exponential smoothing projections using the data to 2019. All observed rates in 2020 and 2021 are below the CIs for the projections.
3. Year is based on the year the service was rendered to the patient (processed up until 11 April 2022).

Source: AIHW analysis of MBS data maintained by the Department of Health.

As well as showing declines in cancer diagnostic tests mentioned above, other analysis showed declines in a number of Medicare-subsidised cancer procedures in 2020 compared with the trend for the previous 3 years (Cancer Australia 2021). Notable reductions occurred for procedures for breast cancer, gynaecological cancers and melanoma.

Missed cancer diagnoses

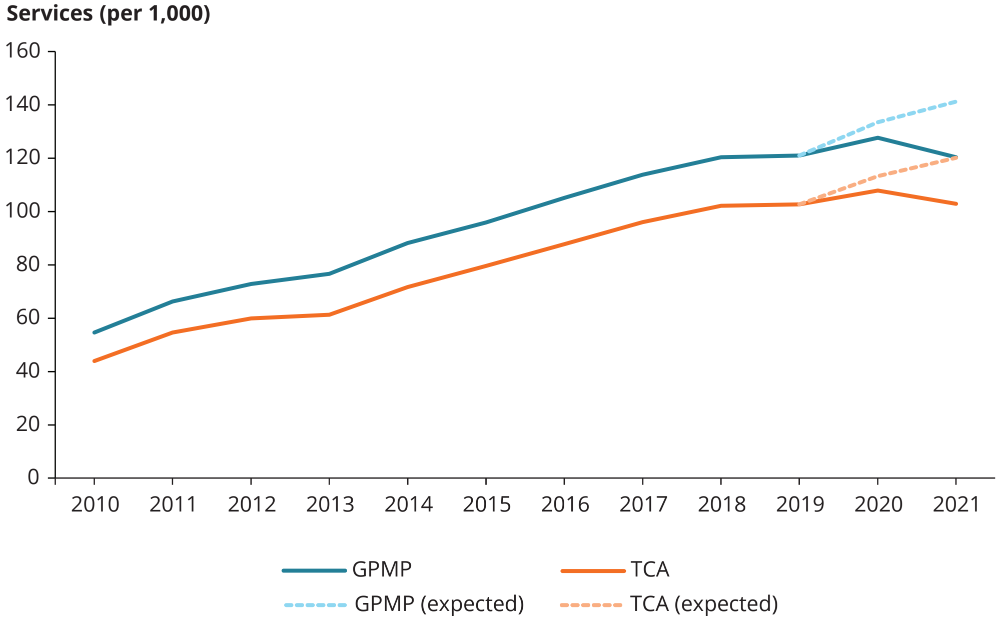
At this early stage, there are only limited data available on the impact of delayed or missed cancer diagnosis. However, data from Victoria show a 10% (95% CI: 9.2–10.8) reduction in notifications of new cancer diagnoses for the period from the start of April 2020 to mid-October 2020 (the period corresponding to the first and second waves in that state) compared with the modelled expected number (Te Marvelde et al. 2021). This equates to an estimated 2,530 (95% CI: 2,327–2,731) undiagnosed cancers that were potentially delayed or missed. The authors note this could be related to changes in care, such as suspension of screening services and outpatient clinics, and postponed surveillance of existing cancers.

Chronic disease management

A population group of particular interest in relation to health care use is people living with chronic conditions. These people are at greater risk of severe disease if they contract the COVID-19 virus (Department of Health 2021b; Ssentongo et al. 2020), making it more important that their conditions are well managed at this time. It is also possible that, because of this risk, people with chronic conditions may have avoided face-to-face medical care during the pandemic.

Services for chronic disease MBS items have been increasing steadily for more than a decade (Figure 2.18). While there was an increase in 2020 compared with earlier years, the rates for that year were still below the expected rates based on the longer term trend. This increase followed a small dip in the rates in 2019 compared with earlier years. In 2021, there was a further fall in the rates to well below the expected rates (and outside the CIs for the projections) – back to around the rates observed in 2019.

Figure 2.18: Rate of services for MBS chronic disease items, 2010 to 2021



Notes

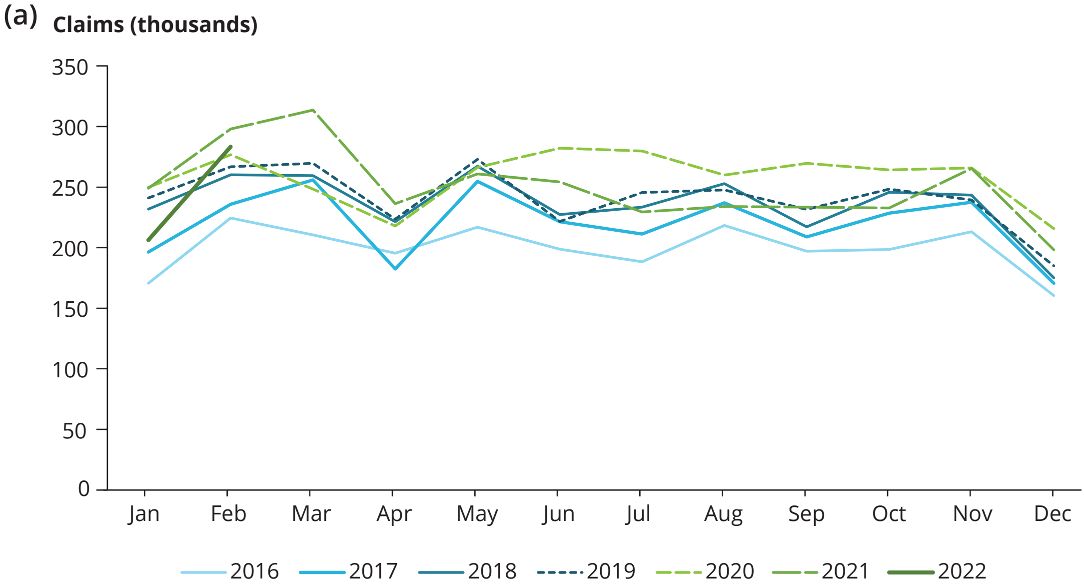
1. GPMP: General Practice Management Plan; TCA: Team Care Arrangement.
2. Includes MBS items 721, 723, 229 and 230.
3. Dotted lines are the expected rates based on exponential smoothing projections using the data to 2019. Observed rates for TCA in 2020 and for both types of services in 2021 are below the CIs for the projections.
4. Year is based on the year the service was rendered to the patient (processed up until 31 March 2022).

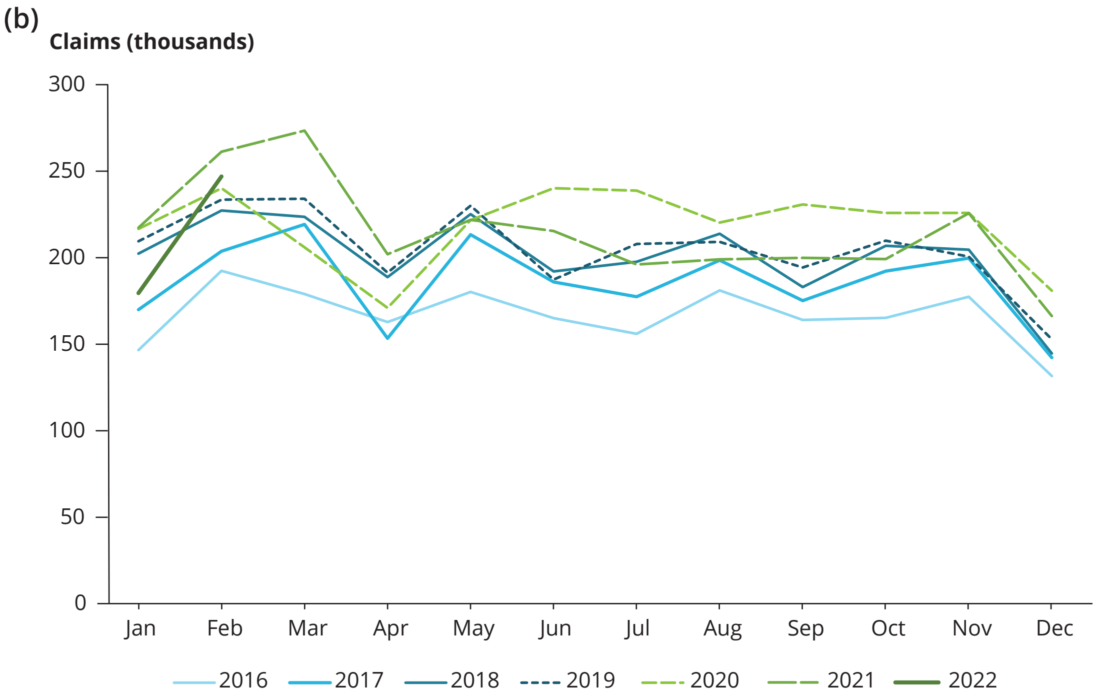
Source: AIHW analysis of MBS data maintained by the Department of Health.

There had been a generally steady increase in the number of services by month across 2016 to 2019 (Figure 2.19), for both types of chronic disease services. The pattern for 2020 was somewhat different – there was a dip below the 2019 numbers in April and May 2020 (during the initial period of stay-at-home orders), followed by higher numbers than in previous years for the remainder of 2020. The number of services in the early months of 2021 remained higher than in previous years. It then fell to below the numbers for 2018 to 2020 for most of the months of 2021 through to October, before again recovering to similar numbers for those in 2020. Numbers for January 2022 were much lower than in previous years – back to 2018 – but then largely recovered to expected levels in February 2022. These periods where numbers were lower than in previous years coincided with outbreaks of COVID-19 and, up until 2022, various stay-at-home orders.

The telehealth provisions were particularly important in the early part of the pandemic, when the percentage of services provided via telehealth was over 30% for both GPMP and TCA services (data not shown). The percentage then fell steadily to between 4% and 8% for all months between July 2021 and February 2022.

Figure 2.19: Number of services for chronic disease services via GPMP (a) and TCA (b), by month, 2016 to February 2022





Notes

1. GPMP: General Practice Management Plan; TCA: Team Care Arrangement.

2. GPMP includes MBS items 721, 229, and from 30 March 2020 onwards telehealth MBS items 92024, 92055, 92068, 92099. TCA includes MBS items 723, 230, and from 30 March 2020 onwards telehealth MBS items 92025, 92056, 92069, 92100.

Source: AIHW analysis of MBS data maintained by the Department of Health.

Changes for key population groups

Data presented in this article show that there were several differences in outcomes for males and females, and across age groups. Females had lower respiratory death rates than males, and had a quicker return than males in 2021 toward expected rates for some procedures (MBS-subsidised colonoscopies and operations in hospitals). In terms of age differences, mental health for younger people suffered more than for older people at the start of the pandemic. There were also differing challenges for age and sex groups during the pandemic that may affect population health in the future, such as employment and school/education changes (Di Gessa and Price 2021; Goldfeld et al. 2022; Risse and Jackson 2021; Seedat and Rondon 2021; Siette et al. 2021; Wood et al. 2021).

This article focused on changes to longer term trends in 2020 and 2021. At this stage, there has been no analysis to disaggregate these longer term trends by population groups other than age and sex. However, there is other evidence of a differential effect of COVID-19 on vulnerable groups, including people from lower socioeconomic groups (OECD 2021a; Roder et al. 2022) and people born overseas in particular countries (see Chapter 1 'The impact of a new disease: COVID-19 from 2020, 2021 and into 2022'). Further analysis will be needed to determine whether these differentials are large enough to affect either overall population health for these groups or the level of inequality between groups.

As mentioned at the start of this article, the impact of changes to social determinants of health – such as income, employment, education, housing and social connections – is another factor with the potential for detrimental impacts now and into the future (Lucyk and McLaren 2017; Marmot and Wilkinson 1999; OECD 2021b).

- Employment changes were substantial for many people during the COVID-19 pandemic, including loss of jobs and businesses, even with substantial mitigation via government support programs (particularly earlier in the pandemic) such as JobKeeper and increases to JobSeeker (AIHW 2021e). Particular groups have faced substantial challenges throughout the pandemic, including health care workers (Bismark et al. 2022; Smallwood et al. 2021) and other front-line workers who were unable to work from home.

- Average income fell at the start of the pandemic and, while it had increased by October 2021, it remained below the pre-pandemic level (Biddle and Gray 2021). Again the averages can hide variation across groups, with some receiving lower incomes than before the pandemic – such as people in employment groups most affected (for example, people working in the entertainment, hospitality and tourism industries) (ABS 2021c).

- There were also a number of education changes which may have health effects in the future, including disruption to face-to-face schooling and higher education.
- Housing arrangements could also have had a detrimental effect on social interactions – such as for people who are isolated (for example, in aged care or living alone).

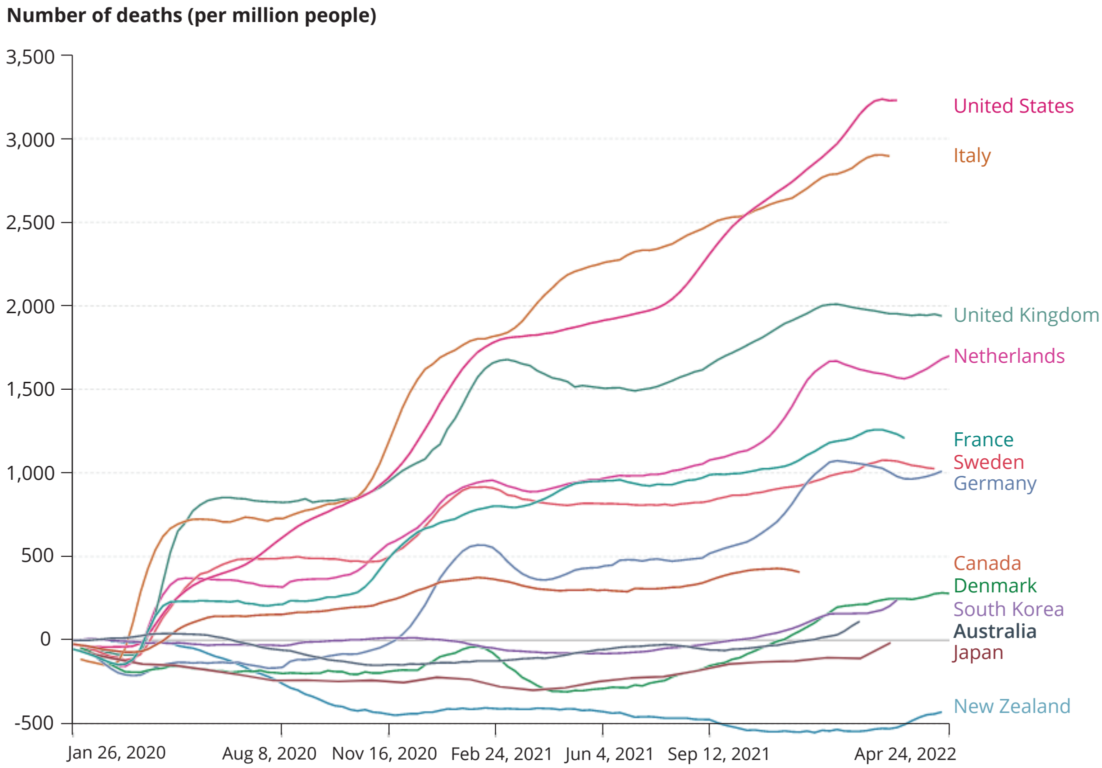
A window into what could have been

Based on the available data presented in this article, the overall population health of Australians did not change substantially during 2020 and 2021. However, some population groups faced major challenges and there were some declines in mental health. There were also a number of areas showing early signs of potential concern, such as missed or delayed health care. These challenges were balanced by some mortality gains, particularly in relation to respiratory diseases and infections. There was, however, a significant increase in deaths in the early part of 2022, with a substantial increase in excess deaths.

Despite no major changes in Australia's overall population health in 2020 and 2021, it is very likely that this would not have been the case without the extensive effort put into preventing the spread of COVID-19 during this period. It is very difficult to quantify the impact of prevention, and that is not the intention here. Nevertheless, one way to provide an insight into Australia's favourable situation is to compare excess mortality with that in other similar countries. That enables a broad assessment of the mortality benefit of preventing the potentially large direct and indirect effects of COVID-19 (Figure 2.20). However, it is not possible from these data to quantify how individual prevention measures contributed to Australia's (and some other countries') favourable situation.

Australia and New Zealand were 2 of very few OECD countries that kept cumulative excess deaths well below zero during 2020 and 2021 (Summers et al. 2022). This indicates that, overall, there were more deaths prevented than occurred from other causes (including COVID-19). In Australia, this was likely to be largely driven by the substantial decline in deaths from respiratory causes. Other countries with excess deaths at or below zero for much of the period included Japan, South Korea and Denmark. Three OECD countries that experienced substantially more excess deaths than others across both 2020 and 2021 were the United States, Italy and the United Kingdom. It is notable that the key driver of the high levels of excess mortality in many of these countries was their relatively high COVID-19 death rates (CDC 2022; COVID-19 Excess Mortality Collaborators 2022; ONS 2022).

Figure 2.20: Cumulative excess mortality compared with projection based on previous years, selected OECD countries



Source: OWID 2022.

Looking further ahead

This article has largely focused on changes in population health in 2020 and 2021 based on currently available information. However, the COVID-19 situation in Australia substantially changed starting in December 2021, with many more cases and deaths recorded than previously (see Chapter 1 'The impact of a new disease: COVID-19 from 2020, 2021 and into 2022'). The total impact of this changed situation will not be known for some time.

It is still unknown what may come next in relation to COVID-19 – how many cases will continue in the community, whether there will be new waves or new variants, and whether new vaccines or treatments will be more effective than those currently available. It is also not fully known what the longer term impacts of COVID-19 will be.

This article examined how population health trends have changed during the COVID-pandemic up until early 2022; however, the impacts of the pandemic are likely to affect population health for many years to come. The longer term impacts of the indirect effects are also not known, such as the impact of any changes in health behaviours or the impact of missed health care. All of this uncertainty highlights the need to continue to monitor these population health impacts into the future.

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Changes in Aboriginal and Torres Strait Islander people's use of health services in the early part of the COVID-19 pandemic

3

Changes in Aboriginal and Torres Strait Islander people's use of health services in the early part of the COVID-19 pandemic

Key findings

During the first 18 months of the pandemic (January 2020 to June 2021), 171 cases of coronavirus disease 2019 (COVID-19) were confirmed among Aboriginal and Torres Strait Islander people (Indigenous Australians), representing less than 1% of all cases in Australia.

This article compares Indigenous Australians' use of selected primary health care services, presentations to emergency departments (EDs), hospitalisations and elective surgeries during this time with pre-pandemic patterns and trends. While data on Indigenous health checks, Indigenous-specific primary health care organisations (ISPHCOs), ED presentations and elective surgeries were available for the full 18 months, hospital admissions and data from the Voluntary Indigenous Identifier (VII) adjusted Medicare Benefits Schedule (MBS) data set (VII adjusts for the under-identification of Indigenous Australians in national MBS data) were available only for 2019–20.

The analyses show that:

- Telehealth accounted for nearly 412,800 of the 4.7 million claims for non-referred general practitioner (GP) consultations in 2019–20 (8.8%), compared with just under 3,300 claims for non-referred GP consultations by videoconference in 2018–19. The increase follows the introduction of MBS rebates for telephone consultations and the expanded eligibility for video conferencing items on or after 13 March 2020.
- Claims for Indigenous health checks declined across all ages, with the decline starting in March 2020 and continuing through 2020–21.
- In March–June 2020 (compared with March–June 2019), ED presentations were 10% lower (around 19,000 fewer ED presentations); hospitalisations (excluding dialysis) were 9.7% lower (around 10,000 fewer hospitalisations); and elective surgeries were 31% lower (about 3,100 fewer elective surgeries), a trend directly related to the restrictions placed on performing surgeries classified as less urgent (categories 2 and 3).
- In the period 1 July 2020 to 30 June 2021, ED presentations and elective surgeries appeared to be in-line with pre-pandemic levels and trends.

Beginning in July 2021, COVID-19 case numbers among Indigenous Australians began to rise due to outbreaks of the Delta and then the Omicron variants. The cumulative number of cases for Indigenous Australians was around 14,400 by the end of 2021, more than 63,800 by the end of January 2022, and nearly 175,000 by 22 May 2022 (PCR confirmed and RAT positive tests). Future work will focus on this period.

For Indigenous Australians, good health is more than just the absence of disease or illness; it is a holistic concept that includes physical, social, emotional, cultural, spiritual and ecological wellbeing, for both the individual and the community. This concept of health emphasises the connectedness between these factors and recognises the impact that social and cultural determinants have on health (Dudgeon et al. 2014; Gee et al. 2014; Parker and Milroy 2014; Social Health Reference Group 2004).

Factors posing risks to good health include the long-term effects of colonisation and its ongoing impact on matters such as self-determination, the disruption of ties to land, and the adverse impact of direct and systemic racism (Osborne et al. 2013; Reading and Wien 2009). This association between health and social and cultural determinants helps to explain and contextualise variation in health-related indicators within the Indigenous Australian population, as well as the 'health gap' between Indigenous and non-Indigenous Australians.

Access to appropriate, high-quality and timely health care throughout life that acknowledges the impact of these social, cultural and historical determinants is essential to improve health outcomes for Indigenous Australians. However, data show that, while access to some health services has improved over time, Indigenous Australians do not always have the same level of access to health services as other Australians (AIHW 2020a). Disparities in access may be due to factors such as remoteness, affordability, and to services that do not provide culturally responsive care (for more information, see Box 3.2, and 'Determinants of health for Indigenous Australians' and 'Indigenous Australians and the health system' at www.aihw.gov.au/australias-health/summaries).

Since the start of the COVID-19 pandemic in January 2020, protecting the health, safety and wellbeing of Indigenous Australians has been a key national priority. The national response has been proactively led by the Aboriginal and Torres Strait Islander Advisory Group on COVID-19, co-chaired by the National Aboriginal Community Controlled Health Organisation (NACCHO) with the Department of Health, working on principles of shared decision-making, power-sharing, two-way communication, self-determination, leadership and empowerment. Many individual communities, particularly in remote and isolated areas, were also empowered to make their own decisions about local restrictions and policies to keep their communities safe, and demonstrated strength and resilience (Crooks et al. 2020; Keene 2020).

The local and national response has included a range of public health measures implemented periodically during the pandemic to prevent the spread of COVID-19: community closures; travel restrictions/border closures; bans on social gatherings; closure of schools, workplaces and retail shops; mask wearing; closures or reduction of key services; and vaccine mandates. (For more details, see 'Chapter 1 The impact of a new disease: COVID-19 from 2020, 2021 and into 2022'; for an overview of Indigenous-specific measures between January and May 2020, see Keene 2020.)

These public health measures and other restrictions may have affected Indigenous Australians' need for, and use of, a broad range of health services. For example, social distancing, stay-at-home orders, mask wearing and encouragement of hand washing/hand sanitising protect against the spread of other illnesses besides COVID-19, thus reducing the need for services. On the other hand, restrictions on social and family gatherings and cultural activities, along with concerns over contracting COVID-19, may have affected the health and wellbeing of Indigenous Australians, and increased their need for services (Follent et al. 2021).

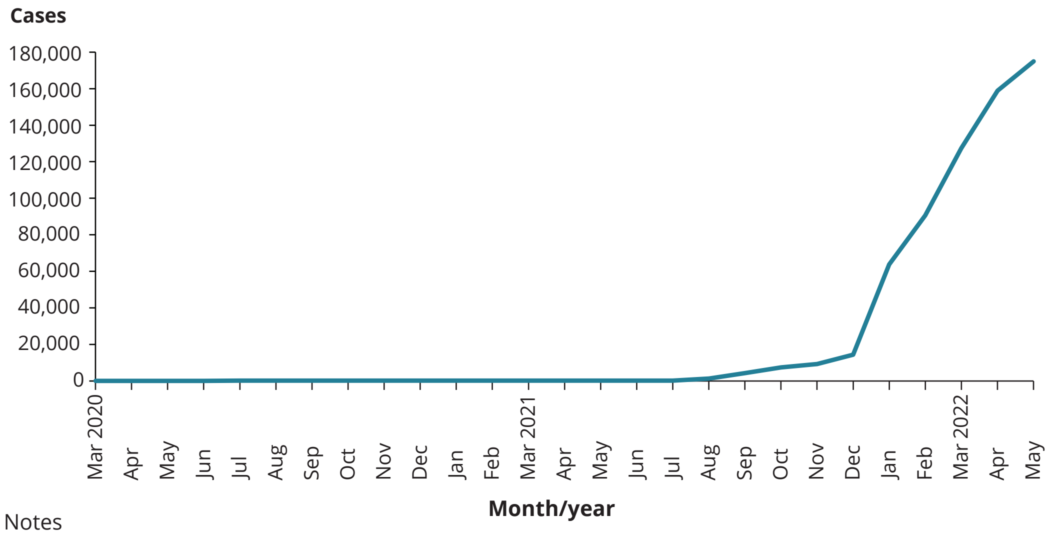
This article highlights changes in primary health care use, presentations to EDs, hospitalisations and elective surgeries for Indigenous Australians in the first 18 months of the pandemic, with a focus on March–June 2020, a period when all states and territories enacted some form of the public health measures and when cases of COVID-19 among Indigenous Australians were low (Box 3.1).

Box 3.1: COVID-19 and Indigenous Australians

Case numbers

During the first 18 months of the pandemic (January 2020 to June 2021), 171 cases of COVID-19 were confirmed among Indigenous Australians, representing less than 1% of all cases in Australia. Case numbers began increasing after this period, due to outbreaks of the Delta and then the Omicron variants. By the end of 2021, the cumulative number of cases among Indigenous Australians was around 14,400; it was more than 63,800 by the end of January 2022, and nearly 175,000 by 22 May 2022 (approximately 2.5% of all cases in Australia).

Figure 3.1: Cumulative number of PCR confirmed and RAT positive COVID-19 cases among Indigenous Australians, by notification date (year and month), 1 March 2020–22 May 2022



Notes

1. Data extracted 23 May 2022 for the reporting period ending 22 May 2022. Due to the dynamic nature of the National Interoperable Notifiable Disease Surveillance System (NINDSS), numbers may be subject to revision and may vary from the numbers previously reported and from case notifications released by states and territories.
2. At the time of data extraction, probable cases were not yet reported to NINDSS from the Northern Territory, Tasmania, Western Australia, or from Victoria since 15 May 2022. Additionally, Queensland only report RAT positive cases that have been conducted in a clinical setting; self-administered RAT positive cases are not reported to NINDSS.

Source: NINDSS.

The accuracy of these counts has varied over the course of the pandemic. There have been variations in the proportion of records of positive cases of COVID-19 that were missing data on Indigenous status: 3% of records when there were relatively few new cases in Australia, at least 19% between September and December 2021, just under half (49%) by mid-January 2022, and 20% by 10 April 2022. There have also been differences in the timing and completeness of jurisdictional reports to the National Interoperable Disease Surveillance System (NINDSS).

(continued)

Box 3.1 (continued): COVID-19 and Indigenous Australians

Deaths

The first recorded death of an Indigenous person due to COVID-19 occurred at the end of August 2021. By 5 December 2021, there had been 20 deaths in total, 31 deaths as at 16 January 2022, and 107 deaths from the beginning of the pandemic to 10 April 2022 (COVID-19 NIRST 2022).

More information on COVID-19 and Indigenous Australians is available in 'Chapter 1 The impact of a new disease: COVID-19 from 2020, 2021 and into 2022'.

Source: Data on the number of confirmed cases of COVID-19 for Indigenous Australians are drawn from the National Interoperable Disease Surveillance System and are based on an Indigenous status identifier (COVID-19 NIRST 2021). Data in Figure 3.1 were supplied by the Department of Health. Aggregate data on cases, hospitalisations and deaths are made publicly available through the Coronavirus disease (COVID-19) epidemiology reports which are published in the journal *Communicable Diseases Intelligence (https://www1.health.gov.au/internet/main/publishing.nsf/Content/cda-pubs-cdi-cdicur.htm).* The first reporting of Indigenous status was in the ninth weekly report (29 March 2020), where a total number to that date was reported (with no breakdown by previous reporting periods). All the subsequent reports include information on the number of deaths from COVID-19. Data on the proportion of cases with unknown Indigenous status have been reported intermittently (report numbers 9–22, 40–43, 45, 50–51, 53–60).

It is important to acknowledge that, even though their case numbers for COVID-19 were low from January 2020 to the end of July 2021, Indigenous Australians were still affected by the overall pressures on the health system due to the total number of COVID-19 cases in Australia.

This article starts with an overview of the factors affecting health service use, and the potential effects of the pandemic. The findings illustrate that there were changes in how health services were delivered/accessed (including more opportunities for telehealth services) as well as changes in the volume of service use.

Factors affecting health service use

Health service use depends on a complex set of factors involving both the location and supply of health services, and circumstances at an individual level. Supply-level factors include whether services are accessible to, and appropriate for, Indigenous Australians (including physical/geographic accessibility, cultural responsiveness, financial accessibility), and the extent to which services are available in a timely fashion – for example, length/timing of waiting lists.

At the individual level, the use of a health service depends on factors such as current health issues, perceived needs for the service, health beliefs, health literacy, previous experiences with the health system (including cultural safety – see Box 3.2), and the ability to access services when needed (including having the resources to pay for private health services if desired).

Statistics on health service use reflect the interaction between these individual and systemic factors (Davy et al. 2016; Levesque et al. 2013). It is important to note, however, that service use statistics are unable to capture people who may have needed a service but were unable to access it (although waiting lists for services such as elective surgery may provide some indication of unmet need).

Box 3.2: Cultural safety and culturally responsive health services

Cultural safety refers to the experiences of Indigenous Australians during their use of, and encounters with, health services and health professionals. It is a 'state where people are enabled and feel they can access health care that suits their needs, are able to challenge personal or institutional racism levels (when they experience it), establish trust in services and expect effective, quality care' (IAHA 2019:4).

A culturally safe health care system is one that respects Indigenous cultural values, strengths and differences, and addresses racism and inequity (AHMAC 2017). Ensuring cultural safety goes beyond cultural awareness and cultural respect; it requires health professionals and health services to be culturally responsive, where actions are taken to overcome racism and power imbalances and there is active engagement with Indigenous clients/patients to ensure that the system meets their needs (Coalition of Peaks 2020; Dudgeon et al. 2010; IAHA 2019).

For more information, see Cultural safety in health care for Indigenous Australians: monitoring framework at https://www.aihw.gov.au/reports/indigenous-australians/cultural-safety-health-care-framework/contents/summary.

The pandemic has resulted in changes at both systemic and individual levels, which have affected the use of health services.

Systemic changes that may have reduced the use of health services include:

- closure of, or restrictions in, some types of health care services (such as cancer screening, non-urgent dental care, elective surgery)
- concentration of in-hospital resources on COVID-19 wards and intensive care units when necessary
- redirection of health staff to COVID-19 testing clinics and, later, to vaccination clinics
- restrictions on who could enter health care facilities because a person had COVID-related symptoms, or was a close contact of someone with COVID-19 (including staff, visitors and potential patients)
- restricted access to interstate, urban based, or international health staff due to border closures and remote community travel restrictions.

Recognising the potential impact of these factors on access to health services, a range of temporary telehealth MBS items were made available, starting in March 2020. These items were to allow continuity of care for patients, as well as to protect both patients and health care providers from the risk of contracting COVID-19. Some of these changes became permanent. (For information on MBS telehealth items and eligibility requirements, see www.mbsonline.gov.au.)

The expansion of telehealth rebates was designed to improve access to services. In practice, however, their use requires both providers and patients to have access to a secure phone or a tablet/computer with reliable connectivity, to have credit on their accounts, the skills to use the technology, privacy, and to feel comfortable using these modes of communication.

Pandemic-related changes for individuals and communities may have affected behaviours in people seeking health services because of:

- worries about contracting COVID-19
- the need for health care (such as reduced infection rates from other illnesses because of public health measures, or increased mental health needs or reduced social and emotional wellbeing due to worries about the disease itself and the impact of restrictions on social, cultural and family gatherings), or
- the ability to access care when needed (travel restrictions).

Approach

The findings include data on selected measures of health service use during the pandemic – including primary health care, presentations to EDs, hospitalisations and elective surgeries – compared with data for previous time periods. Caution needs to be exercised in attributing changes entirely to the pandemic, since:

- health service use may have been already changing before the pandemic
- changes detected during the pandemic may be due to factors other than COVID-19
- increased use may reflect prior unmet need for the service when access to it is expanded (for example, through telehealth).

To that end (where possible), the results include:

- long-term trend data which compare health service use during the pandemic with expected use based on prior trends. Where long-term data are not available, data from 2017–18 and 2018–19 are included for comparison
- breakdowns by key characteristics to examine if changes were concentrated within certain groups (such as young children or people living in remote areas) or were observed more broadly
- comparisons by month or week to examine emerging patterns and provide a more targeted focus on the period March–June 2020
- numeric and percentage changes in the numbers of service users and population-based service use rates. These are important given the variable and sometimes small numbers of Indigenous Australians using specific services.

Primary health care

Primary health care is typically the first contact an individual with a health concern has with the health system. High-quality primary care can contribute to improved health and wellbeing by improving health literacy and the self-management of chronic disease (providing linkages to services within and outside the health system), and by improving screening and treatment of acute and chronic illnesses. For Indigenous Australians, it is essential that care is culturally safe (Dudgeon et al. 2014; Griew et al. 2008).

Indigenous Australians can access primary health care through:

- mainstream services, which are generally funded by a combination of MBS rebates and patient contributions (if a service is not bulk billed) and/or
- ISPHCOs, which receive funding from the Australian Government through the Indigenous Australians' Health Programme to provide comprehensive and culturally safe care to Indigenous clients. Aboriginal Community Controlled Health Organisations (ACCHOs) manage the majority of the funded organisations, which are located throughout Australia (for more information, see AIHW 2022a).

Before the pandemic, nearly all primary care in Australia was delivered through face-to-face consultations, supplemented by some telehealth services in remote and isolated communities.

The potential impact of the pandemic on primary care use is mixed. Seeking medical care was always an exemption to 'stay-at-home' orders. However, during March–June 2020 and in subsequent localised outbreaks and lockdowns, individual medical practices and ISPHCOs instituted changes in the types of services offered and how they were provided to keep their staff and patients safe (such as moving to telehealth where possible or screening patients for COVID-19 symptoms before allowing face-to-face consultations). As well, some preventive and chronic disease care was postponed.

Indigenous health checks

Indigenous Australians can receive a specifically-designed annual Medicare-funded health check. These customised health checks were introduced following calls by Indigenous health leaders, recognising that many Indigenous Australians have increased risk factors for several conditions.

Health checks support engagement in comprehensive primary health care in a culturally safe way and are an opportunity to identify patients' health goals and priorities, provide risk assessment and healthy lifestyle information and supports, and encourage early detection and treatment of common conditions that cause ill health and early death – for example, diabetes and heart disease (AIHW 2021b, 2021d; Butler et al. 2022; NACCHO/RACGP 2019).

Number and timing of health checks

In 2011–12, slightly more than 96,500 health check claims were made, at a rate of 143 per 1,000 Indigenous Australians (crude rate). The number of health check claims grew steadily until 2017–18, when there were slightly more than 237,800, at a rate of 309 per 1,000.

In the year before the pandemic (2018–19), the growth in the number and rate of health check claims stabilised, increasing by about 10,300 to 248,213 (a rate of 316 per 1,000).

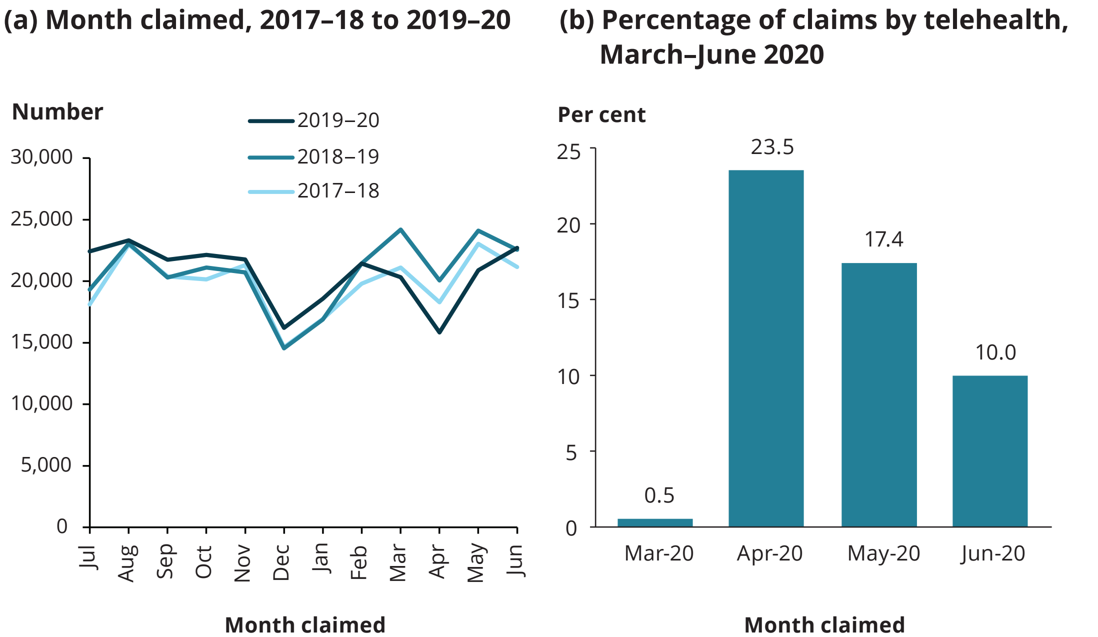
In 2019–20, which encompassed the first 6 months of the pandemic, the number of health check claims fell slightly (by 0.3%) to 247,369 (a rate of 308 per 1,000).

These yearly figures mask a usual seasonal pattern of claims for health checks, with prominent drops in December and January and slight drops in April.

For the March–June period in 2020, the number of health check claims fell in March, April and May by 16%, 21% and 13%, respectively, compared with equivalent months in 2019. By June 2020, however, the number of health check claims was on par with those in June 2019 (Figure 3.2a).

At the same time, there was a high uptake of telehealth items (Figure 3.2b), particularly in April 2020, where 24% of claims for health checks were for items that were not face to face; this proportion fell to 10% in June 2020. The majority of telehealth claims (92%) were by telephone rather than video.

Figure 3.2: MBS Indigenous health check claims by month (a) and telehealth (b)



Notes

1. Month is based on the date the service was claimed, not the date the service was performed. MBS rules allow for an individual to claim a health check every 9–12 months from their last claim, and the number of claims do not equate to the number of people who had a health check.
2. Includes MBS items 715 and 228 from July 2018 plus MBS telehealth items 92004, 92011 (videoconference), 92016 and 92023 (teleconference) from March 2020. Note that the teleconference items (92016, 92023) were removed from the MBS as of 1 July 2021.
3. While many required aspects of the health check can be completed as a remote service via telehealth, some components can be delivered only through face-to-face consultation with the patient. Therefore, for a health check undertaken by telehealth to be processed via Medicare, all components, including checks delivered both remotely and face to face, must be completed, which may mean a delay in completing and claiming for the item.

Source: AIHW analysis of Medicare Benefits Schedule data and Australian Bureau of Statistics population data (ABS 2021).

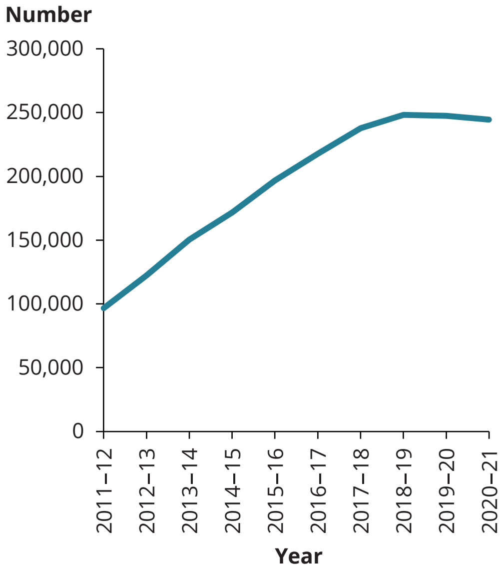
Did the changes continue in 2020–21?

The overall decline in the number and rate of health check claims continued into 2020–21 (Figure 3.3a,b). The number of health check claims in 2020–21 fell by 1.1% from 2019–20 to 244,567 (a rate of 298 per 1,000). Of health checks claimed in 2020–21, 5.1% were for telehealth items (of which 8.5% were for videoconference and the rest for teleconference).

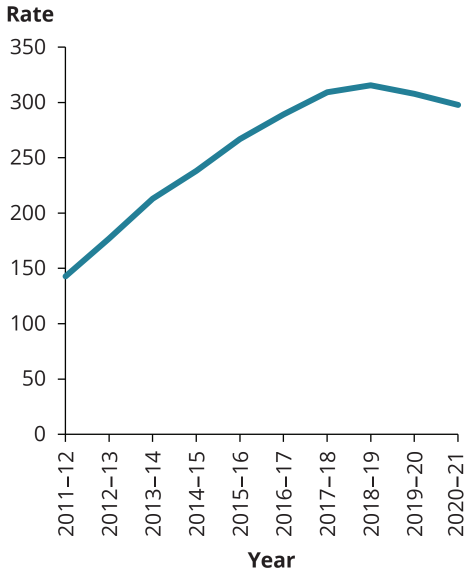
The declines in health check claims were seen across all age groups (Figure 3.3c).

Figure 3.3: MBS Indigenous health check claims over time, by number (a), rate (b) and age group (c)

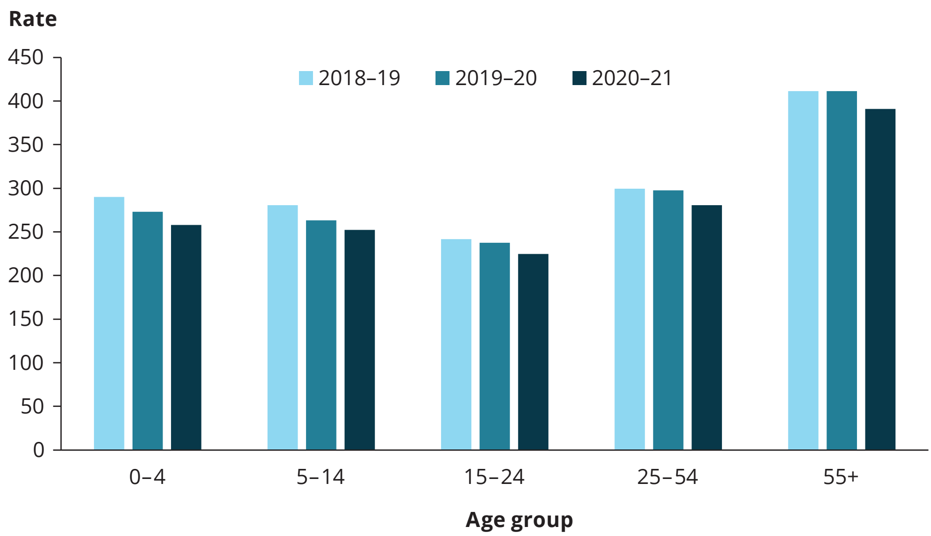
(a) Number of health check claims



(b) Rate (health check claims per 1,000 population)



(c) Rate (health check claims per 1,000 population), by age group



Notes

1. Month is based on the date the service was claimed, not the date the service was performed. MBS rules allow for an individual to claim a health check every 9–12 months from their last claim, and the number of claims do not equate to the number of people who had a health check.
2. Includes MBS items 715 and 228 from July 2018 plus MBS telehealth items 92004, 92011 (videoconference), 92016 and 92023 (teleconference) from March 2020. Note that the teleconference items (92016, 92023) were removed from the MBS as of 1 July 2021.

Source: AIHW analysis of Medicare Benefits Schedule data and Australian Bureau of Statistics population data (ABS 2021).

MBS-rebated GP and practice nurse items

Three MBS-rebated primary health care items are presented in Table 3.1: non-referred (GP) attendances, GP chronic disease management plans, and practice nurse items. They each represent different aspects of primary care – for example, non-referred (GP) attendances include everything from providing health advice; diagnosing medical conditions; ordering tests or following up on test results, repeat or new prescriptions; and managing acute issues (or, for chronic diseases, where there is no MBS chronic disease management in place).

The data are from the Voluntary Indigenous Identifier (VII) adjusted MBS data set (which adjusts for the under-identification of Indigenous Australians in national MBS data). The data are available for financial years only and cannot be disaggregated by month.

Table 3.1: Distribution of selected MBS primary care items for Indigenous Australians, by delivery mode, 2017–18 to 2019–20

	Non-referred (GP) attendance			
Delivery mode	2017–18	2018–19	2019–20	% by mode (2019–20)
Face-to-face	4,567,240	4,599,911	4,282,241	91.2
Videoconference	3,008	3,260	20,484	0.4
Telephone	not rebated	not rebated	392,312	8.4
Number	4,570,249	4,603,171	4,695,036	100.0
Rate (per person)	5.56	5.50	5.50	. .
	GP chronic disease management plans			
Face-to-face	86,523	85,470	79,463	92.3
Videoconference	not rebated	not rebated	513	0.6
Telephone	not rebated	not rebated	6,099	7.1
Total number	86,523	85,470	86,075	100.0
Rate per 1,000 population	105	102	101	. .
	Practice nurse items			
Face-to-face	336,667	369,924	387,325	98.4
Videoconference	1,833	1,796	3,117	0.8
Telephone	not rebated	not rebated	3,315	0.8
Total number	338,501	371,721	393,757	100.0
Rate per 1,000 population	412	444	461	. .

. . not applicable.

Notes

1. Numbers and rates have been adjusted for under-identification in the Medicare Australia Voluntary Indigenous Identifier (VII) database. Indigenous estimates generated by the adjustment methodology for a given period will vary according to the point in time at which they are calculated. The adjustment factors are updated regularly to account for ongoing change in the population coverage of the VII sample.
2. Data are assigned to years based on when a service was claimed.
3. Practice nurse items include MBS numbers 10983, 10984, 10987, 10988, 10989, 10997, 93200, 93201, 93202 and 93203.

Source: AIHW analysis of Medicare Benefits Schedule Voluntary Indigenous Identifier adjusted database and Australian Bureau of Statistics population data.

For the 2 GP items, there were relatively small differences in the numbers and rates of services delivered over the 3 periods; that is, the overall level of service delivery remained steady, even during the first 6 months of the pandemic (January to June 2020). However, the mode of delivery shifted considerably when comparing data for 2019–20 with data for the 2 previous periods. In 2019–20, nearly 412,800 claims for non-referred (GP) consultations and slightly more than 6,600 claims for GP chronic disease management plans were delivered by telehealth, representing 8.8% and 7.7%, respectively, of all claims. More than 90% of the telehealth claims for the 2 GP items in 2019–20 were for services delivered by teleconference rather than videoconference.

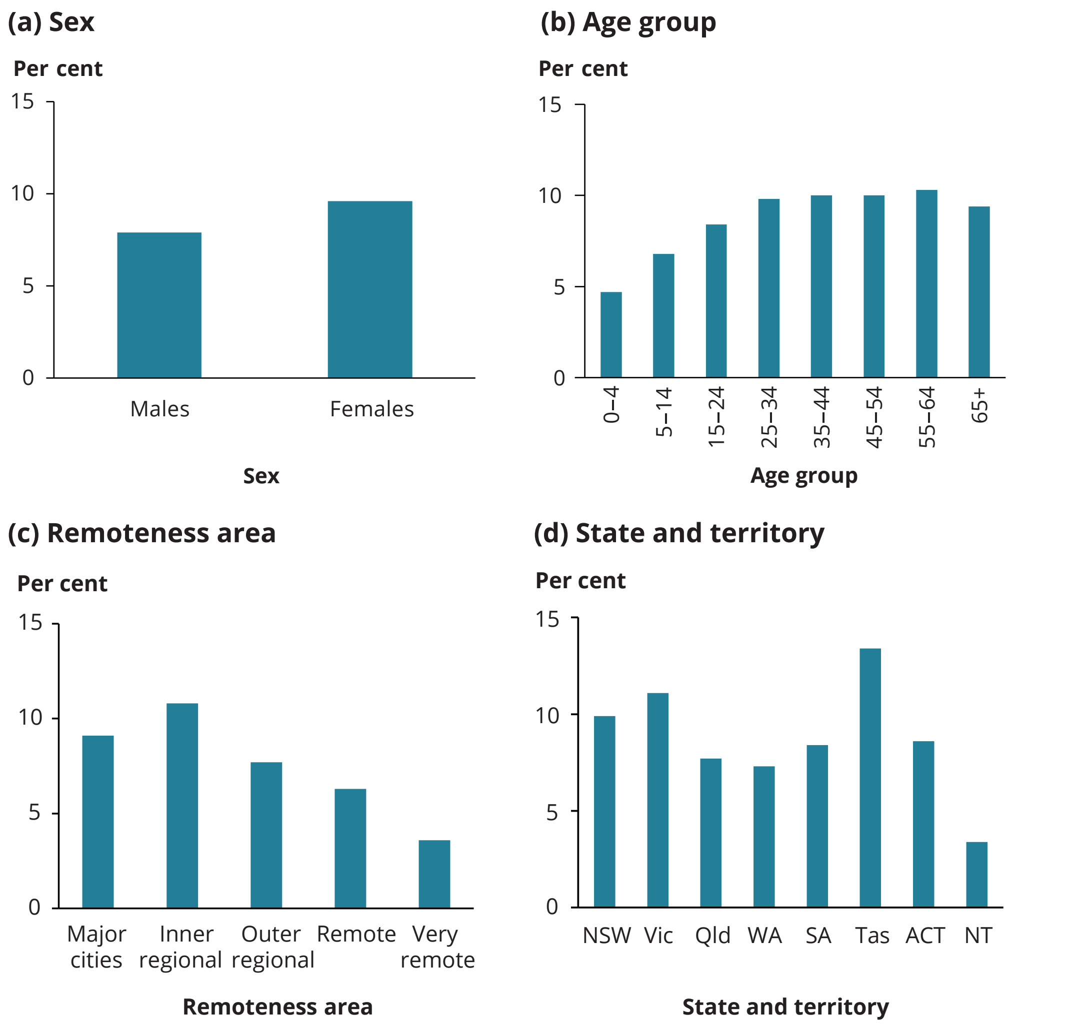
The pattern differed for claims for practice nurse items – the total number and rate of claims increased over each period, with less than 2% of all claims in 2019–20 being for telehealth (likely related to the 'hands-on' nature of practice nurse roles).

It is important to note that there already were MBS-rebated videoconference items before the pandemic, but there were strict eligibility requirements and their use was relatively rare. The increase in telehealth consultations evident in the 2019–20 data is primarily due to the introduction of MBS telehealth items that started being implemented on 13 March 2020 and were fully implemented by the end of that month (RACGP 2022).

For mainstream GPs, the patient had to have been an active client of the service within the preceding 12 months in order to claim telehealth items (ACCHOs were exempt from this requirement). The MBS rebate for GP chronic disease management plans conducted by teleconference was removed as of 1 July 2021 (Department of Health 2022).

Figure 3.4 highlights the distribution of the use of telehealth for non-referred (GP) attendances in 2019–20.

Figure 3.4: Proportion of MBS non-referred (GP) attendances claimed for videoconference or telephone modes for Indigenous Australians, by sex (a), age group (b), remoteness area (c) and state and territory (d), 2019–20



Notes

1. Numbers and rates have been adjusted for under-identification in the Medicare Australia VII database. Indigenous estimates generated by the adjustment methodology for a given period will vary according to the point in time at which they were calculated. The adjustment factors are updated regularly to account for the ongoing change in the population coverage of the VII sample.
2. Data are assigned to years based on when a service was claimed.

Source: AIHW analysis of Medicare Benefits Schedule Voluntary Indigenous Identification adjusted database.

The highest proportions of claims by telehealth were for Indigenous people living in *Inner regional* areas, Indigenous women, and Indigenous people aged 25 and older. The lowest proportions were for Indigenous people living in *Very remote* areas, and for children aged 0–4 for whom less than 5% of consultations were conducted through telehealth.

Indigenous specific primary health services

As noted previously, ISPHCOs are an important provider of comprehensive and culturally appropriate services to Indigenous Australians throughout the country (Box 3.3). A number of organisations within the sector have been substantially involved not only in participating in local and national pandemic-related committees to ensure the safety of their clients, staff and communities, but also in providing on-the-ground services during the pandemic (AHCWA 2020).

Box 3.3: Overview of ISPHCOs

In 2020–21, 191 of the 218 primary health care organisations funded under the Indigenous Australians' Health Programme provided data to the yearly Online Services Report (OSR) collection (covering the financial year). Of these:

- more than one-third (34% or 65) were in the Northern Territory, with another 20% in New South Wales/Australian Capital Territory and 15% in Queensland
- more than one-third (36% or 68) were in *Very remote* areas, with another 20% in *Inner regional* and 19% *in Outer regional* areas
- around two-thirds (65% or 124) were ACCHOs.

In 2020–21, the 191 organisations:

- employed around 8,300 full-time equivalent staff (52% of whom are Indigenous)
- provided care to about 454,000 clients (of whom 81% are Indigenous), at an average of 12.1 contacts per client.

More information is available from AIHW (2022a).

OSR data were used to examine changes in 2 aspects of service delivery/service use (client numbers, client contacts) during the first and second years of the pandemic among a subset of 161 ISPHCOs who reported to each of the 2018–19, 2019–20 and 2020–21 collections. Yearly variations in organisations' data are expected; however, if the reported numbers vary by 20% or more from those in the previous collection, organisations are prompted either to confirm that the data are correct or to resubmit the data if incorrect. These validation rules also provide an opportunity for those organisations to provide further information about the data and reasons for the changes. Some organisations in the 2019–20 and 2020–21 collections used this opportunity to comment on the impact of the pandemic (AIHW 2022a).

Client numbers

The number of clients receiving at least 1 service from the 161 included organisations rose from 388,118 in the 2018–19 collection to 393,146 in the 2019–20 collection, an increase of 1.3%.

This total increase masks variation at the organisation level, however (Table 3.2). There were 5 organisations with more than a 20% decrease in their client numbers (a total of around 2,200 fewer clients than in 2018–19) and 11 organisations with more than a 20% increase in their client numbers (a total increase of around 7,400 clients compared with numbers for 2018–19).

The total number of clients also rose between 2019–20 and 2020–21, but at a slower rate (0.5%), from 393,146 to 394,947. Again, there was variation at the organisation level (Table 3.2). The number of organisations having more than:

- a 20% decrease in their client numbers doubled, from 5 to 10 (a total of around 4,300 fewer clients than in 2019–20)
- a 20% increase in their client numbers remained stable at 11 (for a total of around 8,000 more clients).

Table 3.2: Number of organisations, by degree of variation from previous collection

Degree of variation	Number of organisations: Cited pandemic	Did not cite pandemic	Total	Number of clients: 2018–19	2019–20	Difference
2019–20 compared with 2018–19						
20% or more decrease	3	2	5	8,933	6,707	–2,226
20% or more increase	—	11	11	22,285	29,678	7,393
Less than 20% change	n.a.	n.a.	145	356,900	356,761	–139
Total	**3**	**13**	**161**	**388,118**	**393,146**	**5,028**
2020–21 compared with 2019–20						
Degree of variation	Number of organisations: Cited pandemic	Did not cite pandemic	Total	Number of clients: 2019–20	2020–21	Difference
20% or more decrease	—	10	10	17,287	12,959	–4,328
20% or more increase	—	11	11	23,524	31,480	7,956
Less than 20% change	n.a.	n.a.	140	352,335	350,508	–1,827
Total	**—**	**21**	**161**	**393,146**	**394,947**	**1,801**

– nil or rounded to zero; n.a. not available.

Note: Organisations are those that reported to the OSR collection in 2018–19, 2019–20 and 2020–21 and had no identified data quality issues.

Source: Online Services Report collection.

Three organisations cited the pandemic in explaining the decrease in their client numbers between 2018–19 and 2019–20, but did not provide details. None of the organisations whose client numbers increased by more than 20% in either of the comparison periods offered the pandemic as an explanation for the changes.

Client contacts

Client contacts are a count of the interactions between clients and each type of health worker in an organisation (both employed and visiting health staff) and include those made by drivers and field officers (transport contacts). Client contacts do not include administrative contacts or those relating to groups and residential care.

Contrasting with the findings for client numbers, recorded client contacts (excluding transport contacts) for the 160 included organisations declined between the 2018–19 and 2019–20 OSR collections, from 4.62 million to 4.53 million (a 2.0% decrease) (Table 3.3).

Twelve organisations had decreases in their client contacts of more than 20% (around 158,000 fewer client contacts in total). For this same period, however, another 18 organisations increased their client contacts by more than 20% (around 93,000 more client contacts in total).

Table 3.3: Number of organisations, by degree of variation from previous collection

2019–20 compared with 2018–19						
	Number of organisations			Number of client contacts (excluding transport)		
Degree of variation	Cited pandemic	Did not cite pandemic	Total	2018–19	2019–20	Difference
20% or more decrease	6	6	12	315,208	157,035	-158,173
20% or more increase	2	16	18	270,367	363,442	93,075
Less than 20% change	—	130	130	4,034,576	4,008,035	-26,541
Total	**8**	**152**	**160**	**4,620,151**	**4,528,512**	**-91,639**
2020–21 compared with 2019–20						
	Number of organisations			Number of clients		
Degree of variation	Cited pandemic	Did not cite pandemic	Total	2019–20	2020–21	Difference
20% or more decrease	7	18	25	258,633	189,222	-69,411
20% or more increase	3	13	16	424,872	545,344	120,472
Less than 20% change	26	93	119	3,845,007	3,798,898	-46,109
Total	**36**	**124**	**160**	**4,528,512**	**4,533,464**	**4,952**

– nil or rounded to zero.

Notes

1. Organisations are those that reported to the OSR collection in 2018–19, 2019–20, and 2020–21 and had no identified issues in the comparability of their data over time. One organisation was excluded from the client contacts analysis because its data for one of the collections were excluded.
2. For client contacts, the validation rules trigger for 20% change in individual subcategories of client contacts (by individual professions) as well as the total number of contacts. Thus, while an organisation's overall total may represent less than a 20% variation from their previous total, they may have made a comment against an individual client contact subcategory.

Source: Online Services Report collection.

The total number of recorded client contacts (excluding transport contacts) remained essentially unchanged between the 2019–20 and 2020–21 collections (increasing by only 0.1%). However, the number of organisations with a decrease of 20% or more grew to 25 (for a combined decrease of 69,000 contacts) and the number of organisations whose client contacts increased by 20% or more dropped to 16 (with a combined increase of more than 120,000 contacts).

Impact of the pandemic on client contacts specifically, and ISPHCOs more generally

While only organisations with a 20% or more variation from the previous collection had an opportunity to explain those variations (and should not be considered a representative sample of the reporting organisations), their comments do provide an 'on-the-ground' perspective of the pandemic's impact.

Organisations' comments showed that the pandemic did affect client contacts for at least 8 organisations in 2019–20, and 36 in 2020–21. According to these organisations, the pandemic's role in decreasing recorded client contacts was related to a combination of:

- lockdowns and travel restrictions, which reduced mobility of both clients and staff (resulting in a combination of fewer available staff and an inability or reluctance of clients to attend)
- re-orientation of staff and resources towards pandemic-specific activities (such as vaccination or testing clinics)
- inclusion (or not) of telehealth consultations as contacts in clients' records, with some organisations reporting that they had not been included.

The pandemic was also cited as a reason for increased activities, particularly in the 2020–21 period:

- Some organisations experienced a 'rebound' effect, where they provided additional appointments and services to make up for those that had been restricted during the first wave of the pandemic.
- The need to pre-screen clients for respiratory symptoms or COVID-19 before their face-to-face attendance led to increased contacts.
- Vaccination clinics also contributed to increased activities.

As well, one organisation reported that it had an increase in the presentation of Indigenous clients seeking culturally safe services because of their concerns about COVID-19.

Emergency department presentations

EDs are a critical component of the health system, providing care for patients who have life-threatening (or other) conditions that require urgent medical care. For some people, they provide a gateway to care as an admitted patient in a hospital or to other specialised or ongoing health care. For others, they serve as the first or only point of contact with the health system, due to combinations of patient preference, unavailability of other services, or the lack of need for ongoing care.

Data on ED presentations are available from the AIHW's National Non-Admitted Patient Emergency Department Care Database. For more information, see www.aihw.gov.au/reports-data/myhospitals/sectors/emergency-department-care.

Indigenous Australians use EDs at a higher rate than non-Indigenous Australians, which may be due to a combination of demographic and location factors, differential heath needs and, for some, timely access to primary health services. In 2019–20, women made up slightly more than half (53%) of presentations by Indigenous Australians to an ED. The younger age and geographical distribution of the Indigenous population is reflected in the age and location profile of people who presented to an ED, with 43% under the age of 25. Only 25% of presentations were by people aged 45 and older. Nearly 55% of presentations were by Indigenous Australians living in *Major cities* and *Inner regional* areas (Supplementary Table S3.1).

Three principal diagnostic categories (as represented by ICD-10 codes) accounted for 52% of ED presentations by Indigenous Australians in 2019–20 (Supplementary Table S3.2):

- symptoms, signs and abnormal clinical and laboratory findings (22%)
- injury and poisoning, and certain other consequences of external causes (21%)
- diseases of the respiratory system (8.9%).

Potential effects of the pandemic on ED use

Conceptually, the pandemic had the potential to decrease the use of EDs because of:

- individuals' fears of coming into contact with people infected with COVID-19 (Wong et al. 2020)
- public health messaging encouraging the public to use ED and ambulance services only in emergency circumstances
- lowered needs due to:
  - the health effects of the restrictions
  - the messaging put in place to curb the spread of COVID-19, particularly those measures such as mask wearing and stay-at-home orders that would have reduced the transmission of other infections (George et al. 2022)
  - a reduction in road injuries due to travel restrictions.

The pandemic may also have had a direct impact on ED presentations in 2 ways. First, people with COVID-19 being treated outside hospital settings may have required emergency care and, second, people with symptoms consistent with those of the virus may have presented to the ED for diagnosis and/or treatment.

Number and timing of presentations

In 2013–14, there were nearly 400,000 presentations to EDs by Indigenous Australians, a rate of 516 presentations per 1,000 Indigenous Australians (crude rate). The number of presentations grew by an average of 8.5% per year to around 589,500 in 2018–19, while the crude rate grew by an average of 6.4% per year to 704 per 1,000 in 2018–19 (the last full financial year before the pandemic).

Between 2018–19 and 2019–20, the number and crude rate of ED presentations still increased (which differs from the pattern for non-Indigenous Australians), but the rate of increase was considerably smaller than in the previous years – a 4.4% increase in total presentations (to around 615,400) and a 2.4% increase in the crude rate (to 721 per 1,000). This is around 24,000 presentations fewer than expected had the previous average rate of growth applied.

This 4.4% increase in presentations for the financial year masks variability within the yearly data, which align with the implementation of the COVID-19 related public health measures starting in March 2020:

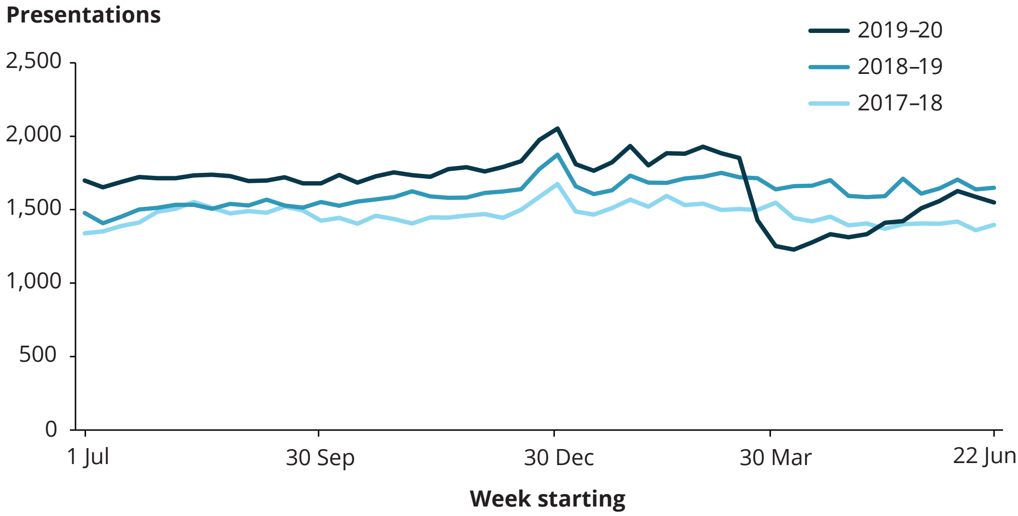
- Between 1 July 2019 and 28 February 2020, the number of ED presentations for Indigenous Australians was 45,000 higher than between 1 July 2018 and 28 February 2019.

- Between 1 March 2020 and 30 June 2020, there were more than 19,000 fewer ED presentations for Indigenous Australians than between 1 March and 30 June 2019.

The impact can also be seen in average daily presentations. Before mid-March 2020, average daily ED presentations by Indigenous Australians in the 2019–20 financial year followed the same general pattern as in the previous collections, just with higher numbers (Figure 3.5).

Starting the week of 23 March 2020, however, average daily ED presentations were 17% lower than for the same week in 2019; they were also 26% lower in the week starting 6 April than for the same week in 2019, but then they rose again. By the end of the financial year (week starting 22 June 2020), the average daily number of ED presentations was 6.1% lower than for the same week in 2019, but higher than for the same week in 2018.

Figure 3.5: Average daily presentations (by week) to EDs, Indigenous Australians, 2017–18 to 2019–20



Note: Dates are assigned based on the day of presentation to the ED, not the day of discharge.

Source: AIHW National Non-Admitted Patient Emergency Department Care Database.

What changed in March–June 2020 compared with March–June 2019?

ED presentations between March and June 2020 were compared with those between March and June 2019 by:

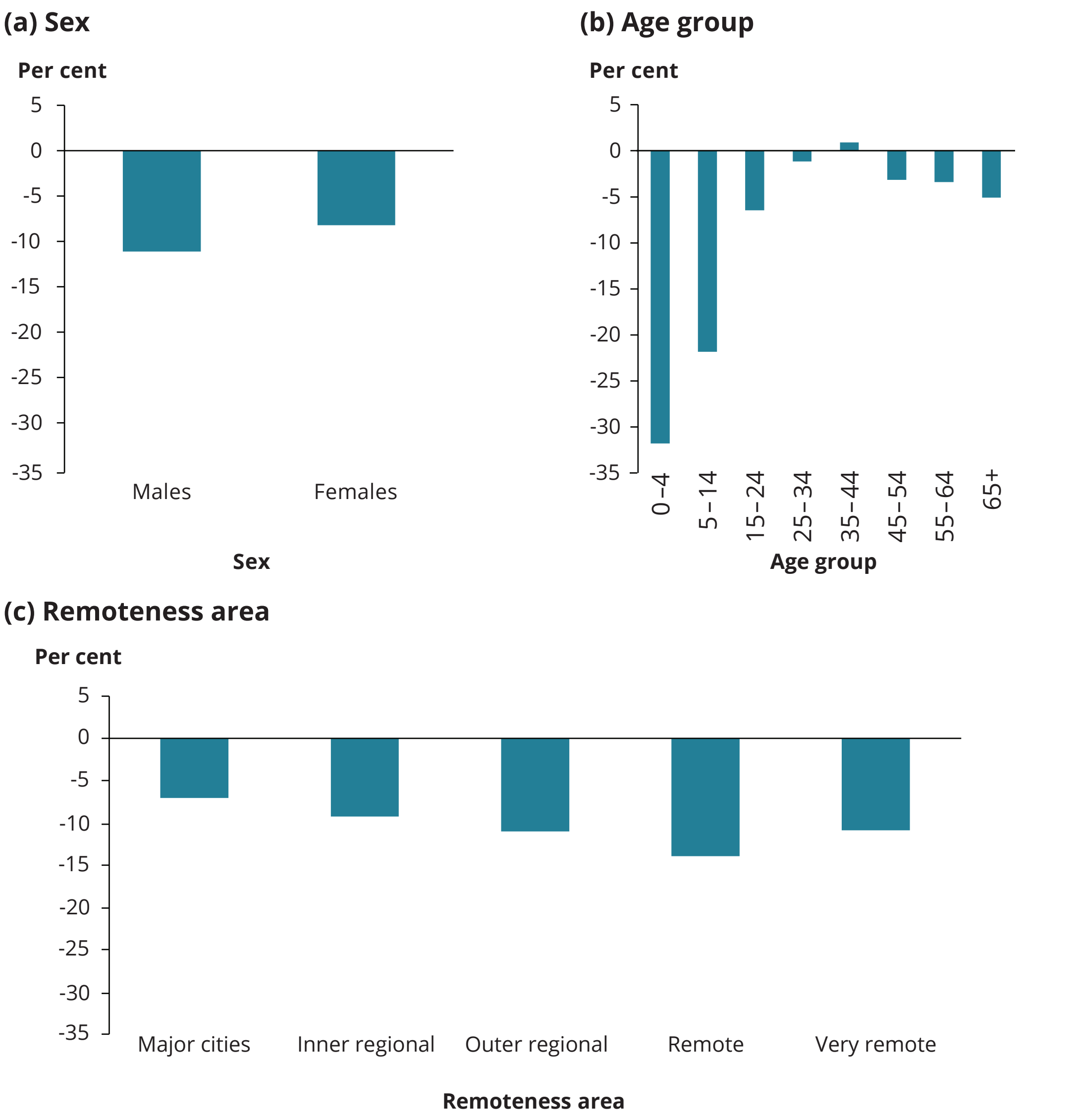
- characteristics such as age group (to see whether the changes were spread equally across all ages – Figure 3.6)
- triage category (see Table 3.4)
- principal diagnoses (to assess whether specific diagnosis categories increased or decreased (see Supplementary Table S3.3).

Characteristics

Declines in ED presentations were slightly higher for Indigenous men than women (11% versus 8.2%). The number of presentations for Indigenous people living in *Remote* areas between March and June 2020 was 14% lower than for the same period in 2019 and, equivalently, 11% lower for Indigenous people in *Outer regional* and *Very remote* areas.

ED presentations for the youngest children (aged 0–4) were 32% lower in March–June 2020 than in March–June 2019, with presentations by 5–14-year-olds also showing a considerable decline (22%). There was less change among older age groups, though presentations for people aged 35–44 were slightly higher in 2020 than in 2019.

Figure 3.6: Percentage change in ED presentations by Indigenous Australians, by sex (a), age group (b) and remoteness area (c), March–June 2020 compared with March–June 2019



Note: Dates are assigned based on the day of presentation to the ED, not the day of discharge.

Source: AIHW National Non-Admitted Patient Emergency Department Care Database.

For Indigenous children aged 0–4, the 32% decline translates to nearly 9,500 fewer ED presentations in March–June 2020 than in March–June 2019. Three principal diagnostic categories accounted for 83% of the difference:

- diseases of the respiratory system (dropped from about 7,500 in March–June 2019 to nearly 3,900 in March–June 2020)

- infectious and parasitic diseases (dropped from slightly more than 4,500 in March–June 2019 to slightly more than 2,200 in March–June 2020)
- symptoms, signs and abnormal clinical and laboratory findings (dropped from nearly 5,500 in March–June 2019 to just under 3,600 in March–June 2020).

Disease of the ear and mastoid, diseases of the eye and adnexa, and diseases of the skin and subcutaneous tissue accounted for an additional 8.4% of the difference for young children (about 800 fewer presentations in March–June 2020 than in March–June 2019).

Triage category

When a patient arrives at an ED, they are assessed (triaged) for urgency, then categorised on a scale from Category 1 (requires resuscitation – immediate treatment) to Category 5 (non-urgent – treatment within 2 hours).

Table 3.4 shows that, overall, the majority of ED presentations by Indigenous Australians in March–June in both 2019 and 2020 were triaged into urgent and semi-urgent categories (less than 1% were Category 1, requiring resuscitation).

The number of semi-urgent presentations was 14% lower in March–June 2020 than in March–June 2019, and urgent presentations dropped by 8.3%. Non-urgent presentations dropped by 6.1%.

Table 3.4: Distribution of ED presentations by Indigenous Australians, by triage category, March–June 2020 compared with March–June 2019

	March–June		Difference between March–June 2020 and March–June 2019	
Triage category	**2019**	**2020**	**Number**	**%**
1 - Resuscitation: requires treatment immediately	1,476	1,547	71	4.8
2 - Emergency: requires treatment within 10 minutes	24,684	23,860	-824	-3.3
3 - Urgent: requires treatment within 30 minutes	70,389	64,532	-5,857	-8.3
4 - Semi-urgent: requires treatment within 1 hour	84,124	72,713	-11,411	-13.6
5 - Non-urgent: requires treatment within 2 hours	22,101	20,748	-1,353	-6.1
Not assigned	118	61	-57	-48.3
Total	**202,892**	**183,461**	**-19,431**	**-9.6**

Note: Dates are assigned based on the day of presentation to the ED, not the day of discharge.

Source: AIHW National Non-Admitted Patient Emergency Department Care Database.

Principal diagnosis

The principal diagnosis is the diagnosis established at the conclusion of the patient's attendance in an emergency department to be mainly responsible for occasioning the attendance. (See AIHW 2022b for more detail on how these data are compiled and on data quality issues.)

Although 2 ICD-10-AM codes were introduced in 2020 to capture presentations to ED of suspected COVID-19 cases, these were not necessarily applied in a consistent manner across health facilities, and the volume of presentations for suspected COVID-19 is likely to have been influenced by the nature of testing arrangements in each location. Data for these 2 ICD-10-AM codes are included in the supplementary tables, but they must be interpreted with caution and should not be used as a proxy for either suspected or confirmed COVID-19 cases (AIHW 2022b).

Comparing ED presentations for March–June 2020 with those for March–June 2019, the largest percentage declines in presentations were for infectious and parasitic diseases, diseases of the respiratory system, diseases of the ear and mastoid and diseases of the eye and adnexa, all of which declined by at least 20% (Supplementary Table S3.3).

The largest numerical drop in ED presentations was for diseases of the respiratory system, which declined by more than 5,800 presentations. This was followed by a decline for injury, poisoning and certain other consequences of external causes, which fell by about 5,300 presentations. Presentations for infectious and parasitic diseases declined by more than 3,000 in March–June 2020 compared with presentations for March–June 2019.

The decline in presentations for diseases of the respiratory system is likely due to several factors, including the impact of public health measures (such as social distancing, isolation, home schooling) and the virtual disappearance of influenza. People with respiratory or flu-like symptoms may also have been directed to attend COVID-19 testing sites rather than EDs.

Six illnesses/diseases were responsible for 90% of the decline in ED presentations from diseases of the respiratory system in March–June 2020 compared with the same period in 2019 (Table 3.5). The large comparative decline in presentations for influenza may also be due to the unusual influenza outbreak in 2019 (Marsh et al. 2022) – that is, the 2019 numbers were unusually high.

Table 3.5: Distribution of detailed ICD-10-AM codes for ED presentations for diseases of the respiratory system, Indigenous Australians, March–June 2019 and March–June 2020

ICD-10-AM code	March–June 2019	March–June 2020	Numerical change	% change
Acute upper respiratory infections (J00–J06)	7,468	5,842	-1,626	-21.8
Other acute lower respiratory infections (J20–J22)	3,072	1,592	-1,480	-48.2
Influenza (J09–J11)	858	115	-743	-86.6
Pneumonia (J12–J18)	2,022	1,485	-537	-26.6
Asthma (J45–J46)	2,136	1,686	-450	-21.1
Other disease of upper respiratory tract (J30.0, J31–J39)	1,689	1,301	-388	-23.0
All other	3,330	2,742	-588	-17.7
Total	**20,575**	**14,763**	**-5,812**	**-28.2**

Note: Dates are assigned based on the day of presentation to the ED, not the day of discharge.
Source: AIHW National Non-Admitted Patient Emergency Department Care Database.

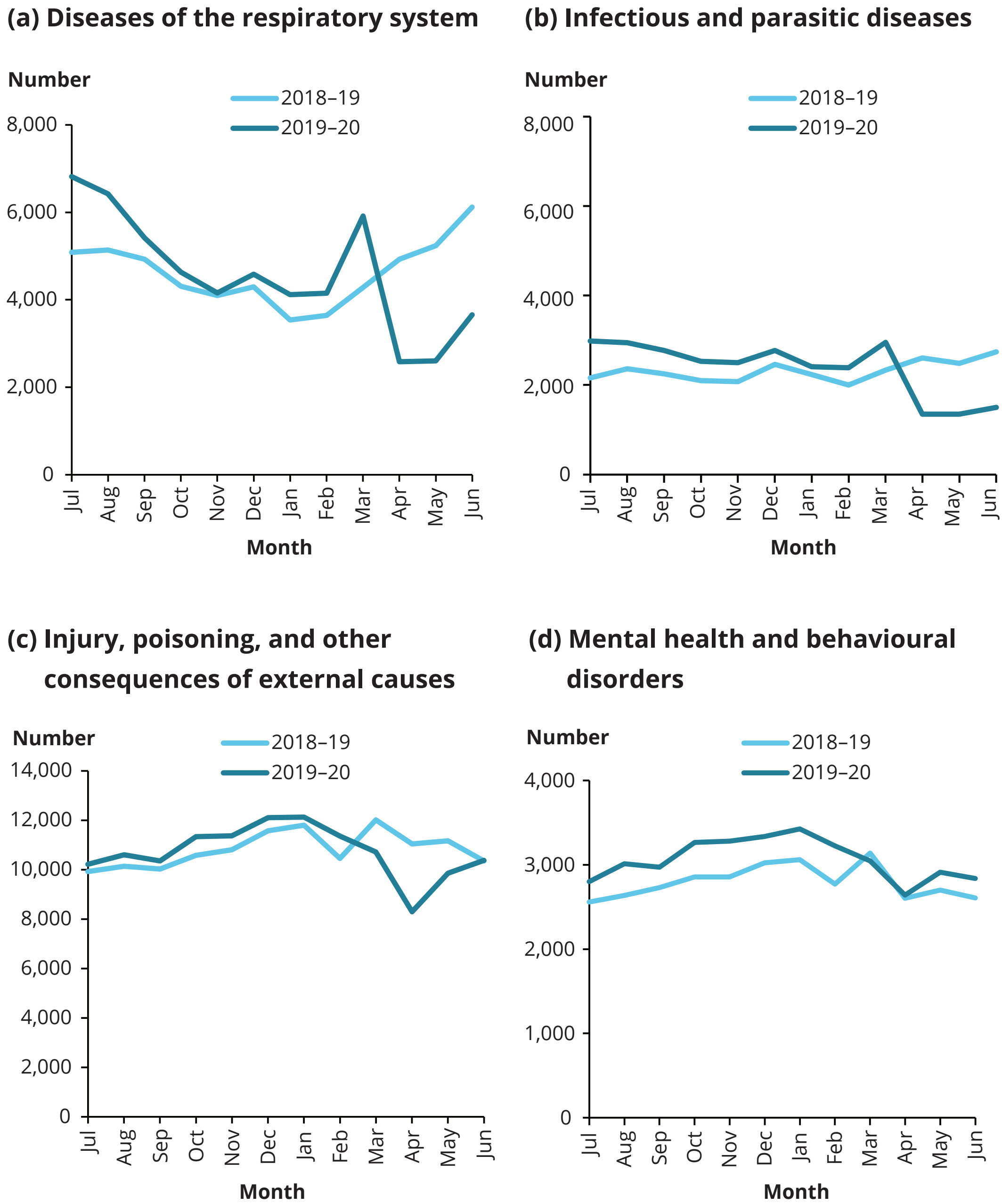
Compared with March–June 2019, the number of ED presentations in March–June 2020 for factors influencing health status and contact with health services (excluding dialysis) increased by about 1,100, and there were slightly more than 380 presentations for mental health and behavioural disorders; however, these numbers must be interpreted with caution as they are likely to be under-counts in both periods (AIHW 2022c). There was also an increase in the number of presentations for external causes of morbidity and mortality.

Changes by month for selected diagnoses

ED presentations by month for diseases of the respiratory system and infectious and parasitic diseases (Figure 3.7) show similar patterns: the numbers are generally higher than for the same month in 2018–19, they spike in March 2020 and then sharply decline and stay below the 2019 numbers between April and June 2020. It is reasonable to attribute at least part of these declines to the protective effects of the social distancing, enhanced hygiene, and mask wearing rules that were instituted during the first wave of the pandemic.

The monthly pattern for ED presentations for injuries, poisoning and external causes is slightly different. Numbers of presentations declined sharply in April 2020 compared with April 2019 but, by the end of June 2020, had returned to June 2019 levels. Presentations for mental health and behavioural disorders were higher across all months in 2019–20 than in 2018–19 (except for March).

Figure 3.7: Number of ED presentations by month, by selected diagnoses, Indigenous Australians, 2018–19 and 2019–20



Note: Dates are assigned based on the day of presentation to the ED, not the day of discharge.

Source: AIHW National Non-Admitted Patient Emergency Department Care Database.

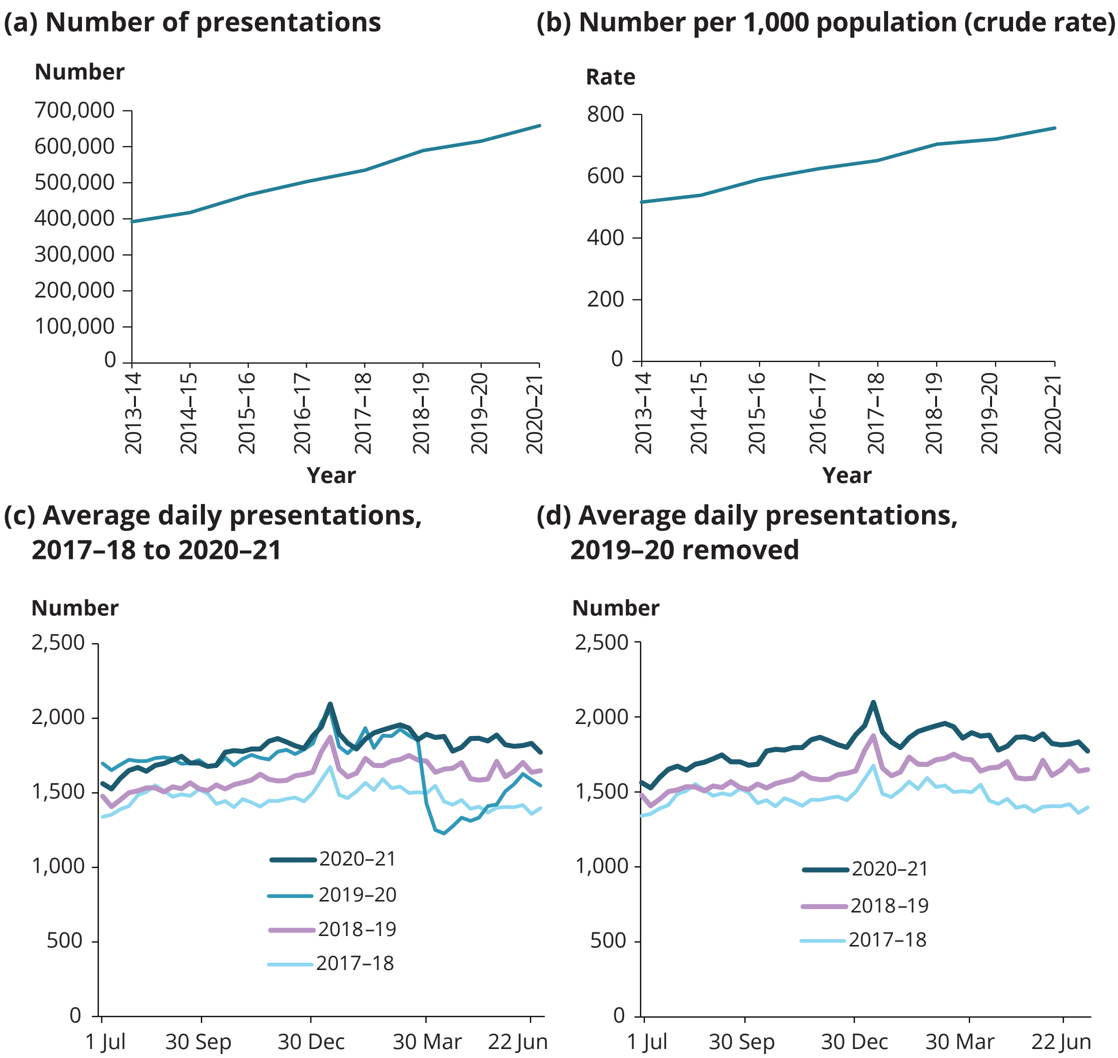
Did the changes continue in 2020–21?

In 2020–21, the number and rate of ED presentations by Indigenous Australians were consistent with pre-pandemic trends (Figure 3.8). Between 2019–20 and 2020–21, the number of ED presentations grew by 7.0% to just under 660,000, a rate of 756 presentations per 1,000.

Average daily presentations in 2020–21 also mirror the pre-pandemic pattern, just with higher numbers. Removing the 2019–20 year from the average daily presentation in Figure 3.8d highlights how different the March–June 2020 period was.

ED presentations generally increased across all age groups, jurisdictions and remoteness area categories except for Indigenous Australians living in *Remote* areas where the number of presentations in 2020–21 was essentially the same as in 2019–20.

Figure 3.8: ED presentations over time, Indigenous Australians



Note: Dates are assigned based on the day of presentation to the ED, not the day of discharge.

Source: AIHW National Non-Admitted Patient Emergency Department Care Database.

The greatest increase by triage category was for presentations in category 2 (requiring treatment within 10 minutes), which rose by 13% between 2019–20 and 2020–21. The increase in the other 4 triage categories ranged between 4.8% and 7.4% (Supplementary Table S3.4).

Presentations for all principal diagnoses increased between 2019–20 and 2020–21 (Supplementary Table S3.5), except for:

- diseases of the respiratory system (fell by 5,113)
- certain infectious and parasitic diseases (fell by 3,465)
- external causes of morbidity and mortality (fell by 1,190)
- diseases of the eye and adnexa (fell by 497).

Hospitalisations

Admitted patient services, or hospitalisations, are provided when a patient is formally admitted to a hospital. Hospitalisations can either be on the same day or involve a stay in hospital of 1 or more nights. A hospitalisation may be for medical, surgical or other acute care, childbirth, mental health care, sub-acute care (for example, rehabilitation or palliative care) or non-acute care (for example, maintenance care for a person suffering limitations due to a health condition). Some admitted patient services can also be provided via 'hospital-in-the-home' programs, where patients receive a combination of in-hospital and outside-hospital care.

Data on hospitalisations are drawn from the National Hospital Morbidity Database – a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. The data are based on the National Minimum Data Set for Admitted Patient Care and include demographic, administrative and length-of-stay data, as well as data on the diagnoses of the patients, the procedures they underwent in hospital and external causes of injury and poisoning. For more information, see www.aihw.gov.au/reports-data/myhospitals/sectors/admitted-patients.

Hospitalisation rates are based on the number of hospital episodes of care rather than on the number of individual people who are hospitalised. A person who has frequent hospitalisations for the same disease is counted multiple times in the hospitalisation rate.

Indigenous Australians have higher hospitalisation rates than non-Indigenous Australians. In 2019–20, women made up more than half (58%) of hospitalisations for Indigenous Australians. Unlike ED presentations, which are skewed to the younger age groups for Indigenous Australians, older age groups make up a higher proportion of hospitalisations: 43% were aged 45–64, and another 17% aged 65 and older. The highest numbers of hospitalisations were for Indigenous Australians living in *Major cities* (157,400), followed by those in *Outer regional* areas (133,500) and *Very remote* areas (115,000) (Supplementary Table S3.6).

Kidney dialysis treatment made up 44% of hospitalisations for Indigenous Australians in 2019–20 (257,000). This number is related to both the high levels of kidney disease in the Indigenous population and the way that hospital data are structured. Each kidney dialysis treatment is counted as a separate hospital episode, so that each person receiving 3 dialysis treatments per week contributes around 150 hospital episodes per year.

The next most common ICD-10-AM diagnostic categories in 2019–20 for Indigenous Australians were:

- injury and poisoning, and certain other consequences of external causes (6.6%)
- symptoms, signs and abnormal clinical and laboratory findings (6.0%)
- pregnancy, childbirth and the puerperium (5.2%) (Supplementary Table S3.7).

Potential effects of the pandemic on hospitalisations

There were several changes to the hospital system during the early part of the pandemic, which may have reduced the numbers of hospitalisations, including:

- cancellations of elective surgeries
- movement of staff and resources within hospitals to cover increased needs of COVID-19 positive patients within the system, and to cover COVID-19 testing clinics.

As highlighted in the previous section on ED presentations, however, there may also have been a decreased need for hospitalisations from infectious and/or respiratory illnesses as well as from the decline in ED presentations from poisoning, injuries and other external causes.

Number and timing of hospitalisations

In 2013–14, there were slightly more than 393,000 hospitalisations (including dialysis) for Indigenous Australians, a rate of 518 hospitalisations per 1,000. By 2018–19, there were around 556,000 hospitalisations, at a rate of 664 per 1,000. The total number of hospitalisations grew by 4.0% (to 578,000) between 2018–19 and 2019–20, while the rate grew by 2.0%.

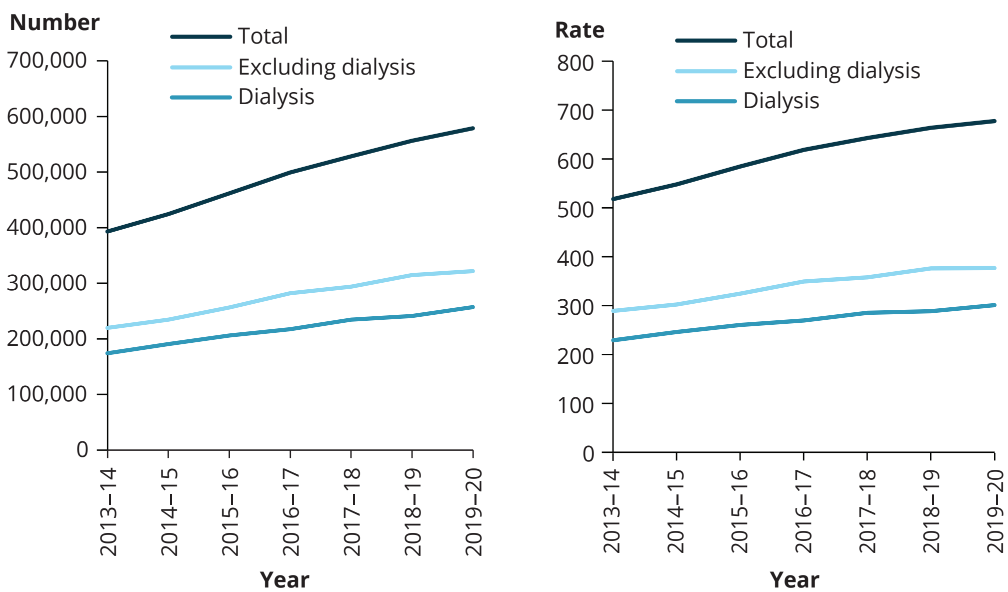
It is important, however, to look at hospitalisations for dialysis separately from other hospitalisations (Figure 3.9). The number of hospitalisations for dialysis in 2019–20 were around 15,700 higher than in 2018–19 (an increase of 6.5%), while the crude rate increased from 288 per 1,000 to 301 (an increase of 4.5%). Analysis of average daily hospitalisations and monthly numbers of hospitalisations showed that hospitalisations for dialysis in 2019–20 were higher than those in every period during 2017–18 and 2018–19.

For hospitalisations excluding dialysis, the total number of hospitalisations grew by 2.1% in 2019–20 compared with 2018–19, and the crude rate grew by 0.2%. While the total number of hospitalisations excluding dialysis was higher in 2019–20 than in 2018–19, there were different patterns throughout the year, which coincided with the first wave of the pandemic:

- Between 1 July 2019 and 28 February 2020, the number of hospitalisations for Indigenous Australians rose by 17,000 on that for the previous year (a rise of 8.2%).
- Between 1 March 2020 and 30 June 2020, the number of hospitalisations for Indigenous Australians was more than 10,000 lower than that for March–June 2019 (a drop of 9.7%).

Figure 3.9: Hospitalisations over time, by whether they were for dialysis, Indigenous Australians

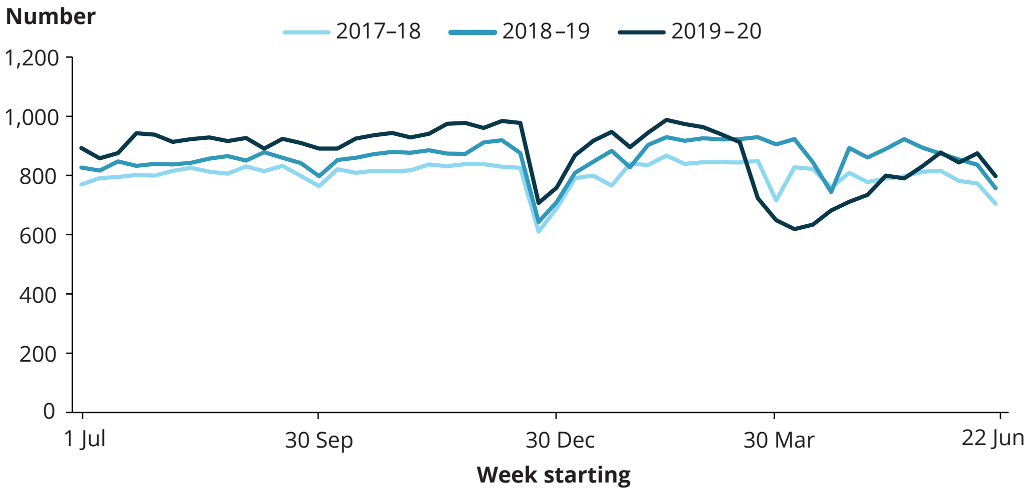
(a) Number of hospitalisations **(b) Number per 1,000 population (crude rate)**



Note: Dates are assigned based on the day of admission, not the day of discharge.
Source: AIHW National Hospital Morbidity Database.

The differences in the March–June period are highlighted in the trends in average daily hospitalisations (Figure 3.10). Until the week starting 16 March 2020, the average number of daily hospitalisations (by week) was higher than in the previous 2 collections. The numbers are lower in March–June 2020 than in 2018 and 2019 for a period of around 11 weeks. By the end of June 2020, hospitalisations were slightly higher than in 2019 and 2018, suggesting that the decrease may have been temporary.

Figure 3.10: Average number of daily hospitalisations excluding dialysis (by week), 2017–18 to 2019–20, Indigenous Australians



Note: Dates are assigned based on the day of admission, not the day of discharge.

Source: AIHW National Hospital Morbidity Database.

What changed in March–June 2020 compared with March–June 2019?

Hospitalisations between March and June 2020 were compared with those between March and June 2019 by characteristics (excluding dialysis, see Figure 3.11) and principal diagnoses (all hospitalisations, see Supplementary Table S3.8).

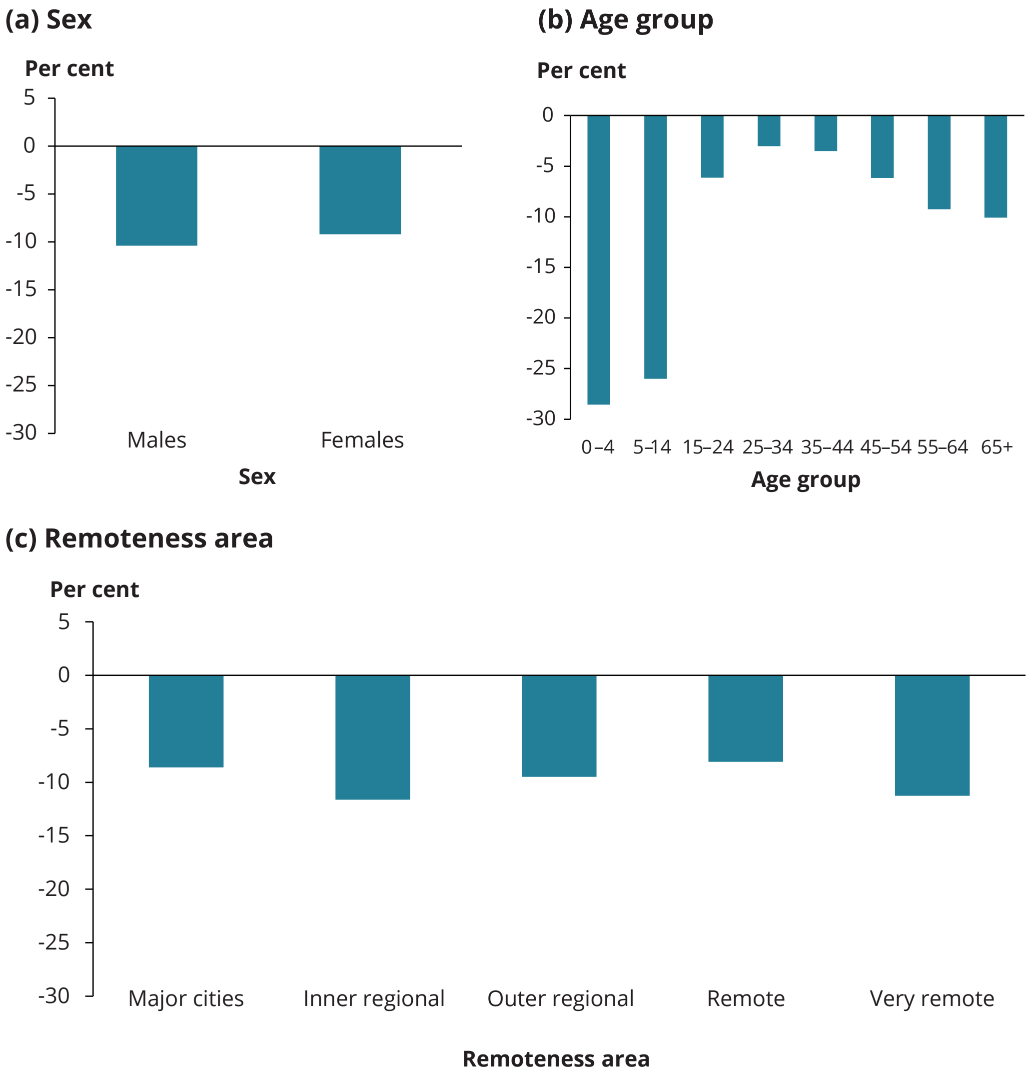
Characteristics

Compared with hospitalisations in March–June 2019 for Indigenous children aged 0–4 and 5–14, hospitalisations in March–June 2020 declined by 29% and 26%, respectively; there were only small declines for Indigenous Australians aged 25–44. Hospitalisations for Indigenous Australians living in *Inner regional* and *Very remote* areas were more than 10% lower in March–June 2020 than in March–June 2019.

For children aged 0–4, the largest numerical declines between March–June 2019 and March–June 2020 were from hospitalisations for:

- diseases of the respiratory system, from 2,963 to 1,241 (58% lower)
- infectious and parasitic diseases, from 922 to 472 (49% lower)
- diseases of the ear and mastoid, from 397 to 201 (49% lower)
- symptoms, signs and abnormal clinical and laboratory findings, from 1,015 to 742 (27% lower).

Figure 3.11: Percentage change in hospitalisations excluding dialysis, by sex (a), age group (b), remoteness area (c), Indigenous Australians, March–June 2020 compared with March–June 2019



Note: Dates are assigned based on the day of admission, not the day of discharge.

Source: AIHW National Hospital Morbidity Database.

Principal diagnosis

Changes in hospitalisations by principal diagnostic category between March–June 2020 and March–June 2019 showed that by far the largest reduction was for hospitalisations involving diseases of the respiratory system, which were 38% lower in March–June 2020 than they were in March–June 2019. Numerically, the next largest reductions were in hospitalisations for diseases of the digestive system and those for musculoskeletal conditions, while hospitalisations for diseases of the ear and mastoid and diseases of the eye and adnexa had the highest proportional declines (along with diseases of the respiratory system) (Supplementary Table S3.8).

Conditions prompting increased hospitalisations in March–June 2020 compared with March–June 2019 were mental health and behavioural disorders, pregnancy/childbirth and conditions originating in the perinatal period.

A closer look at hospitalisations for respiratory conditions reveals that the biggest decline was for admissions related to influenza (Table 3.6). However, the 2019 flu season was unusual in both its timing and in the high number of cases – for that reason, data for the same period in 2018 have also been included in the table for reference.

Table 3.6: Distribution of detailed ICD-10-AM codes for hospitalisations for diseases of the respiratory system, Indigenous Australians, March–June 2018–2020

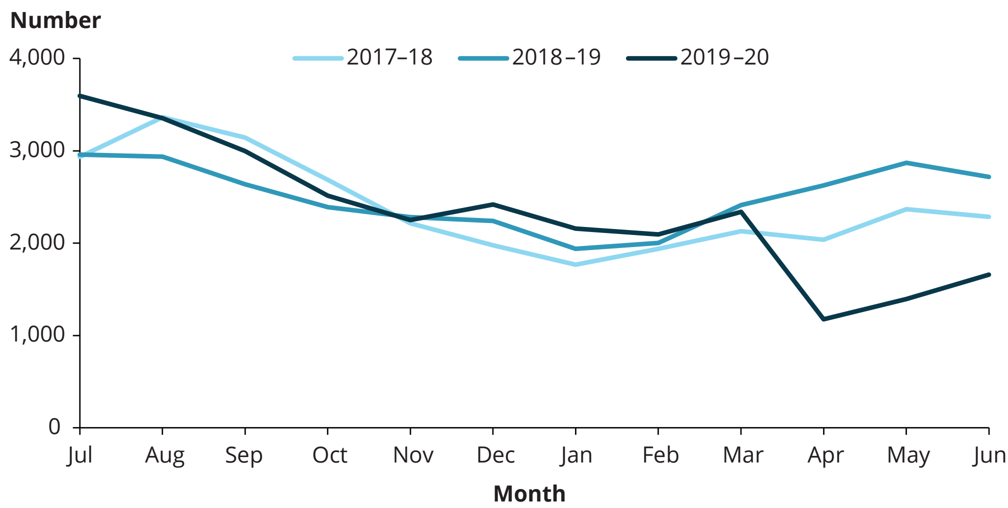
	March–June			Change between March–June 2020 and March–June 2019	
ICD-10-AM code	2018	2019	2020	Number	%
Influenza (J09–J11)	73	849	65	-784	-92.3
Pneumonia (J12–J18)	1,680	1,997	1,476	-521	-26.1
Bronchitis and emphysema (J40–J44, J47)	1,716	2,020	1,535	-485	-24.0
Asthma (J45–J46)	795	905	541	-364	-40.2
Acute upper respiratory infections (J00–J06)	1,241	1,367	888	-479	-35.0
Other acute lower respiratory infections (J20–J22)	1,700	1,725	754	-971	-56.3
Other disease of upper respiratory tract (J30.0, J31–J39)	948	996	654	-342	-34.3
Other diseases of the respiratory system (J65–J99)	599	672	604	-68	-10.1
Chronic sinusitis (J32), Allergic rhinitis ('hay fever') (J30.1–J30.4), Pneumoconiosis (J60–J64)	67	91	47	-44	-48.4
Total	**8,819**	**10,622**	**6,564**	**-4,058**	**-38.2**

Note: Dates are assigned based on the day of admission, not the day of discharge.

Source: AIHW National Hospital Morbidity Database.

Figure 3.12 highlights the monthly pattern of hospitalisations for diseases of the respiratory system between 2017–18 and 2019–20. Although the number of hospitalisations increased again in May 2020 (after a sharp drop in the preceding 2 months), the increase was still lower than for the same period in 2019. Because 2018–2019 might have been an unusual reference period for hospitalisations for respiratory issues because of the flu season, data for 2017–18 are also included in this figure.

Figure 3.12: Number of hospitalisations for diseases of the respiratory system, by month, Indigenous Australians, 2017–18 to 2019–20



Note: Dates are assigned based on the day of admission, not the day of discharge.

Source: AIHW National Hospital Morbidity Database.

Elective surgery

Elective surgery is planned surgery that can be booked in advance as a result of a specialist clinical assessment, with the patient placed on a waiting list.

Due to concerns about the capacity of hospitals to deal with expected COVID-19 related activity during the first wave of the pandemic, restrictions were applied to selected elective surgeries from 26 March 2020. Under these restrictions, only Category 1 and exceptional Category 2 procedures could be undertaken. These restrictions were eased (but not fully lifted) from 29 April 2020, allowing all Category 2 and some important Category 3 procedures to be performed. (See Box 3.4 for an explanation of the different categories.)

Data on elective surgery are available from the National Elective Surgery Waiting Times Data Collection which provides episode-level data on patients added to or removed from elective surgery waiting lists managed by public hospitals. Information is available on waiting times and other characteristics of elective surgery in all public hospitals. The data include private patients treated in public hospitals, and may include public patients treated in private hospitals, but does not include private patients in private hospitals. Removals are counted for patients who have been removed for admission, or for another reason.

The restrictions led to an overall decrease in admissions for elective surgery of 8.4% between 2018–19 and 2019–20 for Indigenous Australians (Table 3.7). Additions to elective surgery waiting lists fell by 3.7%, while there were increases in the number of people on the waiting lists transferred to another hospital's list.

Table 3.7: Additions and removals from public hospital elective surgery waiting lists for Indigenous Australians, 2015–16 to 2019–20

	Number by year					Change (%)	
Status	2015–16	2016–17	2017–18	2018–19	2019–20	Average since 2015–16	Since 2018–19
Additions	**28,790**	**31,638**	**32,745**	**33,786**	**32,535**	**3.2**	**-3.7**
Removals							
Elective admission	24,544	26,322	27,208	28,358	25,988	1.6	-8.4
Emergency admission	273	306	279	331	293	2.6	-11.5
Total admissions	*24,817*	*26,628*	*27,487*	*28,689*	*26,281*	*1.6*	*-8.4*
Not contactable/ died	481	600	641	647	643	8.0	-0.6
Treated elsewhere	805	721	758	871	881	2.7	1.1
Surgery not required	2,726	2,953	3,030	3,116	3,001	2.5	-3.7
Transferred	422	457	640	770	971	23.7	26.1
Not reported	157	195	203	167	175	3.8	4.8
Total removals	**29,408**	**31,554**	**32,759**	**34,260**	**31,952**	**2.2**	**-6.7**

Note: Interpretation of changes since 2018–19 should take into account the impacts of the cancellation of urgency categories 2 and 3 elective surgery in March 2020 due to COVID-19. Interpretation of changes over time in earlier years should take into account changes in coverage as noted in AIHW 2021a.

Source: AIHW National Elective Surgery Waiting Times Data Collection.

Elective surgery procedures are classified based on the recommended time frames in which the patient requires care (Box 3.4).

Box 3.4: Elective surgery urgency categories

Category 1: patients are assessed as requiring surgery within 30 days, including patients whose condition has the potential to deteriorate quickly and require emergency care.

Category 2: patients are assessed as requiring surgery within 90 days, including conditions that cause pain, dysfunction or disability in patients whose condition is unlikely to deteriorate quickly and unlikely to require emergency care.

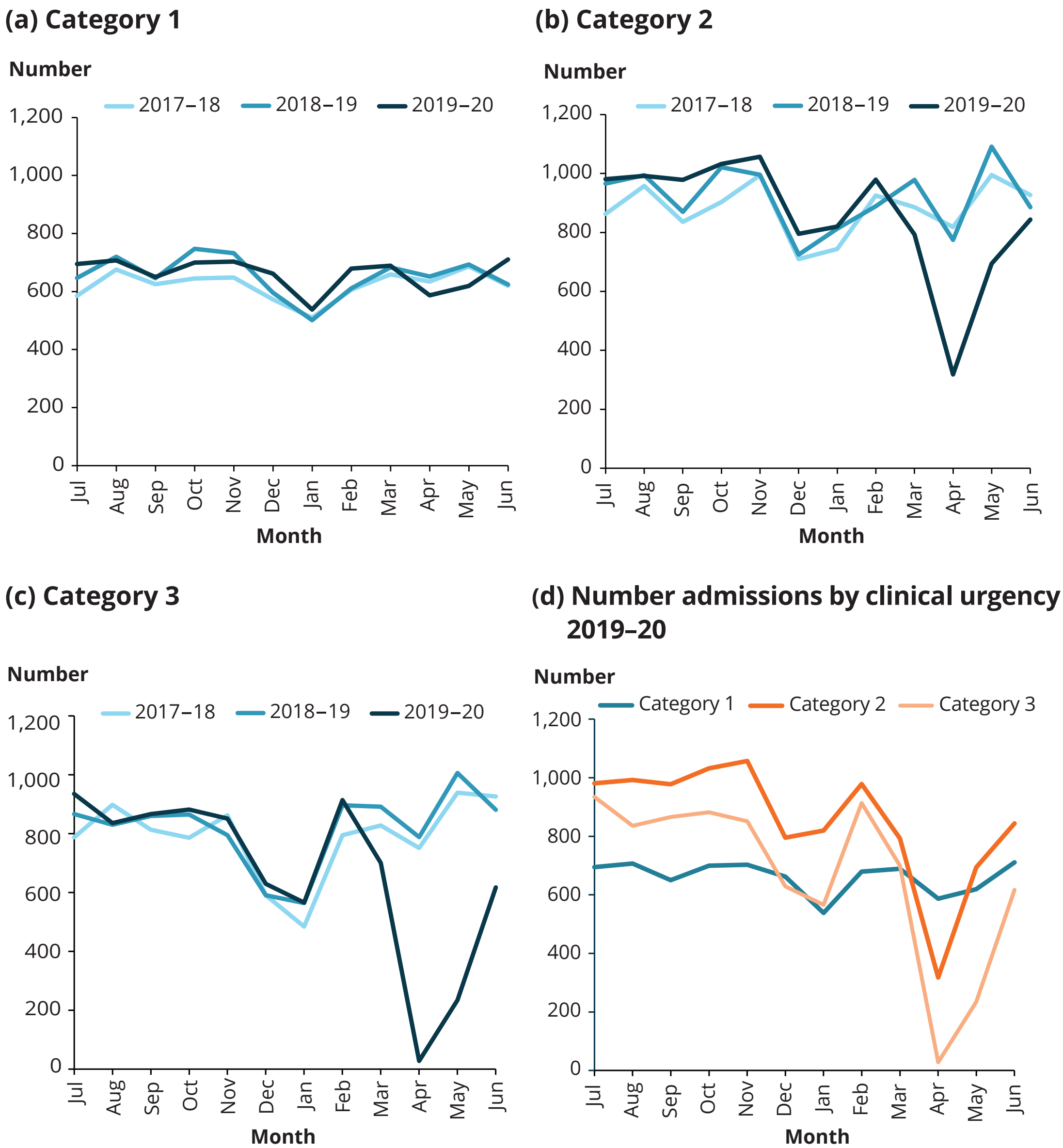
Category 3: patients are assessed as requiring surgery within a year, including conditions that cause pain, dysfunction or disability in patients whose condition is unlikely to deteriorate quickly.

For more information, see https://www.aihw.gov.au/reports-data/myhospitals/sectors/elective-surgery.

Admissions for Category 1 surgeries for Indigenous Australians in 2019–20 increased by 1.1% over those for 2018–19, but admissions for Category 3 surgeries decreased by 18%, and by 6.6% for Category 2 surgeries.

The impact of the restrictions by month and clinical urgency category are shown in Figure 3.13. While Category 1 surgeries dipped in April 2020, by June 2020 they were above the number performed in June 2019 and June 2018. Category 2 surgeries dropped considerably in April 2020 then began to increase again, but were still below the numbers performed in June 2019 and June 2018. As expected, the greatest impact was on Category 3 surgeries: while they did increase again after April 2020, they were still much lower than in the previous 2 years. These patterns are likely the result of the delay in surgeries creating backlogs, not a reduction in the need for the surgeries.

Figure 3.13: Number of monthly elective surgery admissions, by clinical urgency categories, Indigenous Australians, 2017–18 to 2019–20

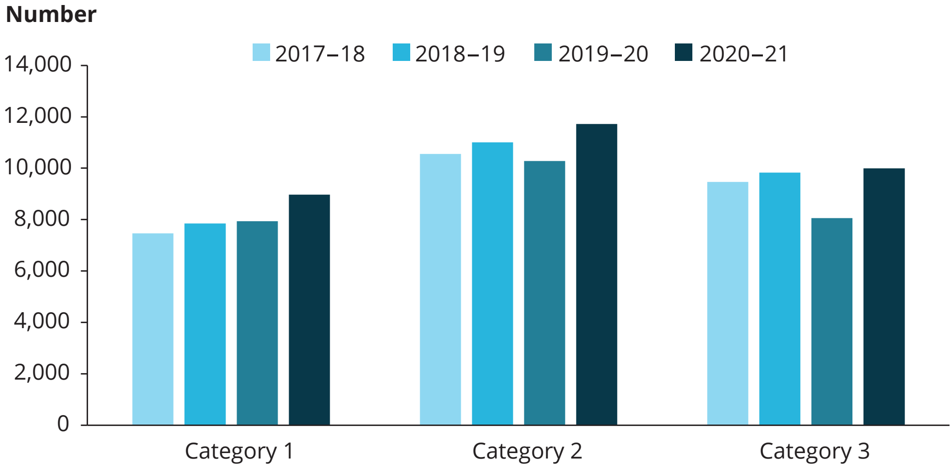


Source: AIHW National Elective Surgery Waiting Times Data Collection.

Did the changes continue in 2020–21?

The number of elective surgeries rose by 17% between 2019–20 and 2020–21, from 26,281 in 2019–20 to 30,687 in 2020–21. The increase was across urgency categories but was largest for Category 3 surgeries (increase of 24%), suggesting that there was some 'catch-up' of the surgeries that had been postponed in the March–June 2020 period (Figure 3.14).

Figure 3.14: Number of admissions for elective surgery, by clinical urgency categories, Indigenous Australians, 2017–18 to 2020–21



Source: AIHW National Elective Surgery Waiting Times Data Collection.

Conclusion

This article highlighted changes in primary care use, ED presentations, hospitalisations and elective surgeries for Indigenous Australians during the first 18 months of the pandemic, complementing the broader body of COVID-19 related analyses by the AIHW (see http://www.aihw.gov.au/covid-19).

These changes are likely to be a result of interactions among a mix of factors: underlying health needs, ability to access services, and adjustments to the health sector itself (some of which may have enhanced access, while others decreased access). Some of these changes are directly linked to pandemic-related policies, such as restrictions in elective surgery and the expansion of MBS rebates for telehealth. Others may have indirect links to the pandemic, such as the decrease in presentations to an ED for infectious illnesses, which are likely due to public health measures and changes in individual behaviours (AIHW 2021c).

Data gaps

This article highlights key data gaps that restrict full examination of health service use during the pandemic. These data gaps include:

- at the time of writing, the only national data on the included health services available from July 2021 onwards (the period that included the outbreaks of the Delta and Omicron variants) were claims for Indigenous health checks.
- the fact that some data (such as the VII-adjusted MBS and the OSR datasets) are available only for full years. As illustrated by the monthly disaggregations of claims for Indigenous health checks, ED presentations, elective surgeries and hospitalisations, full-year data can mask important changes during periods within a year.
- a current lack of surveys and qualitative data focusing on the lived experiences of Indigenous Australians during the pandemic to complement the available quantitative data.

There are also concerns around the ability to accurately count the numbers of COVID-19 infections in Australia generally, and for Indigenous Australians specifically, due to:

- the quality of Indigenous identification on pathology forms for polymerase chain reaction (PCR) tests, which may under-count cases
- potential double-counting of positive results from rapid antigen tests (RATs) and PCR tests for the same individual
- unknown numbers of undiagnosed (and unrecorded) cases (for more information, see 'Chapter 1 The impact of a new disease: COVID-19 from 2020, 2021 and into 2022').

Future work

The data in this article covered only the period when COVID-19 cases were low among Indigenous Australians, and before outbreaks of both the Delta and Omicron variants. Future work will:

- include additional years of data
- analyse data at lower geographies
- examine the impact of the pandemic on health status/health outcomes.

As well, the impact of the pandemic on Indigenous Australians' mental health/social and emotional wellbeing and use of services related to mental health will be examined further.

Further information

Impacts of COVID-19 on data used in this report are explored in more detail in a range of AIHW reports, including:

- *Aboriginal and Torres Strait Islander specific primary health care: results from the nKPI and OSR collections*, at https://www.aihw.gov.au/reports/indigenous-australians/indigenous-primary-health-care-results-osr-nkpi/contents/about
- *Admitted patient activity*, at https://www.aihw.gov.au/reports-data/myhospitals/intersection/activity/apc
- *Elective surgery*, at https://www.aihw.gov.au/reports-data/myhospitals/sectors/elective-surgery
- *Emergency department care*, at https://www.aihw.gov.au/reports-data/myhospitals/sectors/emergency-department-care
- *Impacts of COVID-19 on Medicare Benefits Scheme and Pharmaceutical Benefits Schedule: quarterly data*, at https://www.aihw.gov.au/reports/health-care-quality-performance/impacts-of-covid19-mbs-pbs-quarterly-data/contents/data-overview
- MBS Indigenous-specific health checks in *Tracking progress against the Implementation Plan goals for the Aboriginal and Torres Strait Islander Health Plan 2013–2023*, at https://www.aihw.gov.au/reports/indigenous-australians/tracking-progress-against-ipg-2013-2023/contents/impacts-of-covid-19-on-indigenous-specific-health-checks

For more AIHW data and information that relates to COVID-19, see https://www.aihw.gov.au/covid-19.

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Changing patterns of mortality in Australia since 1900

4

Changing patterns of mortality in Australia since 1900

Key findings

Life expectancy has increased – from age 55 for people born in the early 1900s to age 80 or more for people born after 2010. Many factors, including medical advances, improved living conditions, and health promotion and prevention strategies have contributed to this gain.

Deaths from infectious diseases declined over the 20th century, while deaths from chronic conditions, such as cancers and dementia, have increased.

Key changes in mortality over the 20th century include:

- far fewer deaths in infants and children, as well as fewer maternal deaths
- a 98% decline in the age-standardised mortality rate from infectious diseases between 1907 and 2020. Infectious disease control measures and childhood immunisation led to substantial declines in mortality from tuberculosis, poliomyelitis (polio), diphtheria, tetanus, whooping cough, measles, mumps and rubella
- a rise and then a fall in mortality from cardiovascular diseases, although coronary heart disease continued to be Australia's leading cause of death in 2020
- a reduction in the number of lung cancer deaths due to decreasing prevalence of daily smoking
- notable changes in breast, bowel and cervical cancer incidence and mortality rates since cancer screening programs were introduced
- a reduction in the number of deaths from motor vehicle accidents due to substantial improvements in road and motor vehicle safety over the past 40 years. This trend also partly contributed to improved life expectancy in recent decades
- a decline in the number of workplace fatalities and injuries due to safer work practices and industry-level standards, acts and regulations
- an increase in recent years in the number of deaths of young people from suicide and external causes (such as drug misuse), affecting males more than females
- a marked increase in the number of dementia deaths, which is projected to continue with Australia's ageing population.

Despite achievements in public health in Australia over the 20th century, health inequalities, increased prevalence of chronic conditions, and pandemics are some of the challenges faced in the early 21st century.

Life expectancy in Australia has increased substantially since the start of the 20th century. People born in the early 1900s were expected to live, on average, to around age 55, contrasting markedly with people born after 2010 who are expected to live, on average, to age 80 or more (an increase of around 40% since the start of the 20th century). Life expectancy has increased both at birth, and for all ages. Once a person survives birth, childhood and adolescence, their life expectancy and chance of reaching older age increases.

For example, boys and girls aged 15 in 2018–2020 could expect to live to around 81.6 and 85.7, respectively (an increase of 17.6 and 18.8 years, respectively, since 1901). Men and women aged 65 in 2018–2020 could expect to live until 85.3 and 88.0, respectively (an increase of 9.0 and 10.1 years, respectively, since 1901).

Until 1932, infectious and parasitic diseases caused at least 10% of all deaths each year, with death rates from these diseases highest among the very young and very old (Jain 1994). Improvements in living conditions in the early 20th century – such as better water supplies, sewerage systems, food quality and health education – led to overall lower death rates and longer life expectancy at all ages.

During the 20th century, chronic diseases such as heart disease, stroke and cancer replaced infectious and parasitic diseases as the main causes of death of older people (Olshansky and Ault 1986). Infection control measures had improved in medical facilities, and public awareness of the value of preventive actions (such as hand washing) had grown. Increases in life expectancy at all ages in the second half of the 20th century have been attributed to improving social conditions, advances in medical technology (such as mass immunisation and antibiotics), and promotion and prevention strategies related to public health (Jain 1994).

The first 2 decades of the 21st century have seen even further increases in life expectancy – partially due to lower infant mortality, fewer young people dying in motor vehicle accidents, and fewer older people dying from heart disease. The reduction in deaths from heart disease has been linked to medical advances and behavioural changes, such as improvements in diet and less smoking (ABS 2018a).

With increasing life expectancy, Australians are living more years in full health (meaning no symptomatic disease or injury; also referred to as health-adjusted life expectancy). 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 2018 (AIHW 2021c).

Mortality levels and trends provide important information on the many serious diseases and injuries that affect people. Although information on death and its causes cannot provide a complete picture of Australia's health, it can contribute much to that picture and help in assessing the nature and extent of progress. For background information on the prevalence of selected diseases, see the 'Health status' domain at https://www.aihw.gov.au/reports-data/australias-health/australias-health-snapshots.

Australia saw the transition from infectious to chronic diseases in the first half of the last century, where deaths due to chronic diseases (such as cancer and cardiovascular diseases) were on the rise and deaths due to infectious diseases were declining. Examining trends in mortality statistics such as these can help to explain how the health status of a population is changing and assist in evaluating a health system (see also Chapter 5 'Australia's healthcare system: its evolution from the Spanish influenza to COVID-19').

There have been a number of major developments and transitions in factors affecting the health and mortality of Australians over the 20th century and early 21st century. This article describes several trends that have affected the health of Australians since the start of the 20th century. Long-term trend data with a focus on mortality are examined for the following health topics:

- infant, child and maternal mortality
- infectious diseases, new viruses and vaccinations
- chronic diseases and cardiovascular disease mortality
- smoking, lung cancer and cancer screening programs
- injury (including road traffic accidents, workplace fatalities, accidental poisoning and suicide)
- dementia.

Examining long-term health trends across the entire 20th century (where data are available) through to recent times provides valuable information to researchers, administrators and policymakers. This information can help to identify major turning points where diseases may have increased due to social factors or decreased because of health interventions. It can also reflect Australia's progress and health successes which, in turn, helps to inform what is done in the future.

More recently, the Coronavirus disease 2019 (COVID-19), a viral respiratory infection, spread across the world, causing a major national and international health threat. Deaths from COVID-19 worldwide have exceeded 6.2 million (WHO 2022). Practical ways to contain its spread have included travel bans, physical distancing, personal hygiene and, later, immunisation. Restrictions such as lockdowns have had a serious impact on economies and societies worldwide, affecting travel; trade; and the ability to work, attend school and socialise.

The COVID-19 pandemic has had a number of direct and indirect health effects in Australia (AIHW 2021i). These are explored in Chapter 1 'The impact of a new disease: COVID-19 from 2020, 2021 and into 2022', Chapter 2 'Changes in the health of Australians during the COVID-19 period' and Chapter 3 'Changes in Aboriginal and Torres Strait Islander people's use of health services in the early part of the COVID-19 pandemic'.

Box 4.1: Health disparities between different population groups in Australia

Mortality improvements have not been evenly shared among population groups. Disparities remain for population groups, including Aboriginal and Torres Strait Islander people, rural and remote populations, and migrant populations. For example, there is currently a large gap in life expectancy between Indigenous and non-Indigenous Australians, and mortality rates are higher for Indigenous than non-Indigenous Australians for most causes of death.

Between 2016–2020, after accounting for differences in age structures in the two populations, the overall age-standardised mortality rate for Indigenous Australians was almost twice that for non-Indigenous Australians (960 and 522 deaths, respectively per 100,000).

Over the same period, after accounting for differences in age structures in the populations, mortality rates increased as remoteness increased. Australians living in *Very remote* areas had a mortality rate that was 1.5 times as high as for Australians living in *Major cities*.

Australia's overseas-born population accounted for 33% of deaths registered in 2020 (53,845 deaths), despite making up 30% of the resident population in 2020. This reflects the older age structure of the overseas-born population (median age of 44 in 2020) compared with that of the Australian-born population (median age of 34) (ABS 2021d). When the older age structure of the overseas-born population is taken into account, migrants generally have lower death rates than the Australian-born population (ABS 2021c).

During the COVID-19 pandemic, people who died of COVID-19 with an overseas country of birth had an age-standardised death rate close to 3 times that of people who were born in Australia (6.8 versus 2.3 deaths per 100,000 population) (ABS 2022).

On average, Australian females experience different health outcomes than Australian males. Females have a higher life expectancy than males and are more likely to have multiple chronic conditions (AIHW 2019).

It is acknowledged that some health improvements have not been evident in all population groups in Australia to the same extent, or in the same time frames; however, data on population group health disparities are out of scope for this article. See the 'Health of population groups' and 'Indigenous health' domains for more information: https://www.aihw.gov.au/reports-data/australias-health/australias-health-snapshots.

Over time, the quality of information has improved, and changes in cause of death coding practices will have had an impact on the information reported in this article.

Far fewer infant, child and maternal deaths

Increases in life expectancy in Australia are largely related to the substantial decrease in child and infant mortality (deaths in live born babies up to 1 year) that occurred in the first half of the 20th century. Infant mortality rates were very high in the early 1900s (68 deaths per 1,000 live births in 1915) but declined markedly over the rest of the century. By 1955, the infant mortality rate had fallen to 22 deaths per 1,000 live births (a 67% decline from the early 1900s); it then fell to 5.2 in 2000 (a 92% decline). This fall was largely due to improved medical technology and neonatal intensive care, as well as to education campaigns and immunisation. A national campaign launched in the 1990s increased public awareness of sudden infant death syndrome (SIDS), where the sleeping position of infants was one of the preventable risk factors. This contributed even further to the overall decline of infant mortality in Australia which, today, remains low (3.2 deaths per 1,000 live births in 2020) (Figure 4.1).

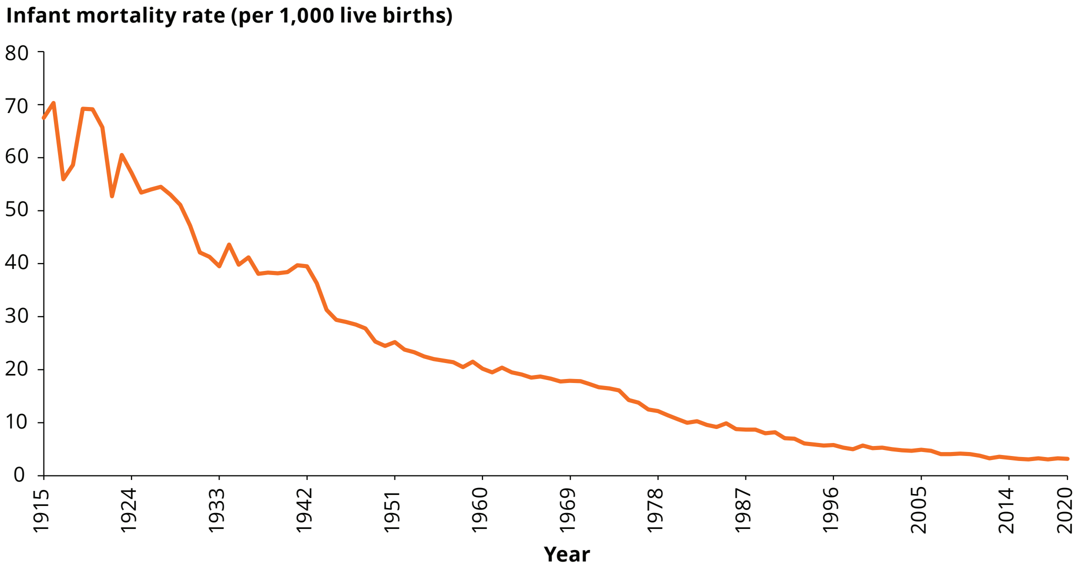
In the first decade of the 20th century, 1 in 10 children died before the age of 5 (or 26% of all deaths), most from infections such as diarrhoeal diseases and enteritis (Cumpston 1989). By 1931, the childhood mortality rate had been halved, with a dramatic decline in deaths from gastrointestinal diseases.

The mortality rate from diarrhoea in children aged 0–4 fell from around 700 per 100,000 population for boys and 580 for girls at the start of the century to under 100 per 100,000 for both sexes by 1935. This decline was linked to improvements in public sanitation and in the quality of drinking water and milk supplies, an increase in breastfeeding, and better health education.

In the 1940s, the availability of vaccines and the use of antibiotics contributed to further declines (Gandevia 1978). By the 1950s, state and local health departments had made substantial progress in food technology and prevention. This included refrigeration and pasteurisation, food safety inspection, and public education about hygienic food storage and handling practices. These improvements all contributed to the decline in foodborne diseases (Gruszin et al. 2012).

Today, there are very few deaths from diarrhoeal diseases and enteritis in Australia. In 2020, 0.7% of all deaths were among children aged under 5, and the child mortality rate was 71 deaths per 100,000 (a decline from 2,412 per 100,000 in 1907).

Figure 4.1: Decline in infant mortality rate (per 1,000 live births), 1915–2020



Note: Births are used in calculating infant mortality rates. There were fewer births registered in 2020 than in recent years.

Sources: ABS 2021a; AIHW 2006; AIHW National Mortality Database.

As well as improvements in infant and child mortality, there has been a dramatic decline in mortality rates in Australia for women during pregnancy, birth or in the period soon afterwards. Maternal deaths were responsible for around 600 deaths per 100,000 live births in the early 1900s. Post-partum infection was responsible for about one-third of these deaths (Cumpston 1989).

Maternal death rates remained relatively high until 1937 then there was a rapid decline: antibacterial drugs became available (Taylor et al. 1998). Over the 20th century, improved nutrition, antenatal and postnatal care, the advent of medical interventions such as antiseptic procedures, a decrease in pregnancies (as a result of contraception and family planning), use of blood transfusions, and training of birth attendants have all contributed to a sustained decrease in maternal deaths (Stanley 2001; Weil and Fernandez 1999).

Today, maternal deaths occur infrequently in Australia (fewer than 9 deaths per 100,000 women who gave birth between 2010 and 2019). Over this period, the main causes of direct and indirect maternal deaths included sepsis, cardiovascular disease, thromboembolism, suicide and non-obstetric haemorrhage (AIHW 2021g).

Box 4.2: Crude rates versus age-standardised rates – assessing changing patterns of mortality over time

A fundamental aim of disease and mortality surveillance is to determine whether levels of mortality are rising or falling over time, or whether they differ between population groups. Numbers alone are insufficient to measure differences because they do not account for population size. Rates, on the other hand, are measures that are scaled to the size of the population.

The simplest rate is the crude rate. For deaths, this reflects the number of deaths in a year divided by the size of the population being measured (and typically multiplied by 100,000). It is an average death rate for the whole population, without taking into account any factors that influence mortality.

The risk of disease and dying varies with many factors, but predominantly with age. A population that has, for example, a larger proportion of older people will experience more deaths than a younger population. Consequently, the usefulness of the crude rate is limited as it does not account for differences in the age composition of the populations being compared, or for changes in the age composition that occur over time.

A statistical method called age-standardisation is used to adjust for these age variations. This method imposes a common (standard) age structure on the populations being compared. The resulting rates reflect those that would have occurred if each population being compared had the same age structure as the standard population, thereby allowing rates to be compared on an equal age basis. In this article, changes in age-standardised mortality rates indicate that factors other than age are contributing to an increase or decrease in deaths in Australia over time.

This article predominantly uses age-standardised rates to report on mortality over time. However, there are limitations to age-standardisation, particularly when the age distribution of the chosen population differs greatly from that of the standard population. It is also important to note that age-standardised rates do not always correspond with the actual rate of mortality at the time. For example, the crude mortality rate from cancer has been steadily increasing in recent decades, but the age-standardised mortality rates have been steadily falling. For this reason, crude rates are also presented in some sections of this article and in the supplementary tables.

Control of infectious diseases

During the first half of the 20th century, infectious diseases predominated as causes of death. Diarrhoeal diseases, tuberculosis, diphtheria, scarlet fever, whooping cough, smallpox and measles were major health concerns. Clean water, improved sanitation and housing conditions, immunisation programs and antimicrobial drugs helped to control these diseases (AIHW 2000; Davis and George 1988). Advancements in science and widespread education also played major roles in their control (Tognotti 2013). Public trust was gained through regular, effective communications that balanced the risks and benefits of public health interventions.

In the following paragraphs, infectious diseases refer to International Classification of Diseases, 10th revision (ICD-10) codes A00–B99. These include conditions such as tuberculosis, polio, smallpox, hepatitis and sexually transmitted diseases such as syphilis and human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS). The category does not include influenza, which is reported on separately in a following section.

From 1907 to 1930, the age-standardised mortality rates from infectious diseases fell by 66% (from 320 to 110 deaths per 100,000 population) and life expectancy at birth rose from age 55 to 64 for males and age 59 to 67 for females (AIHW 2022a).

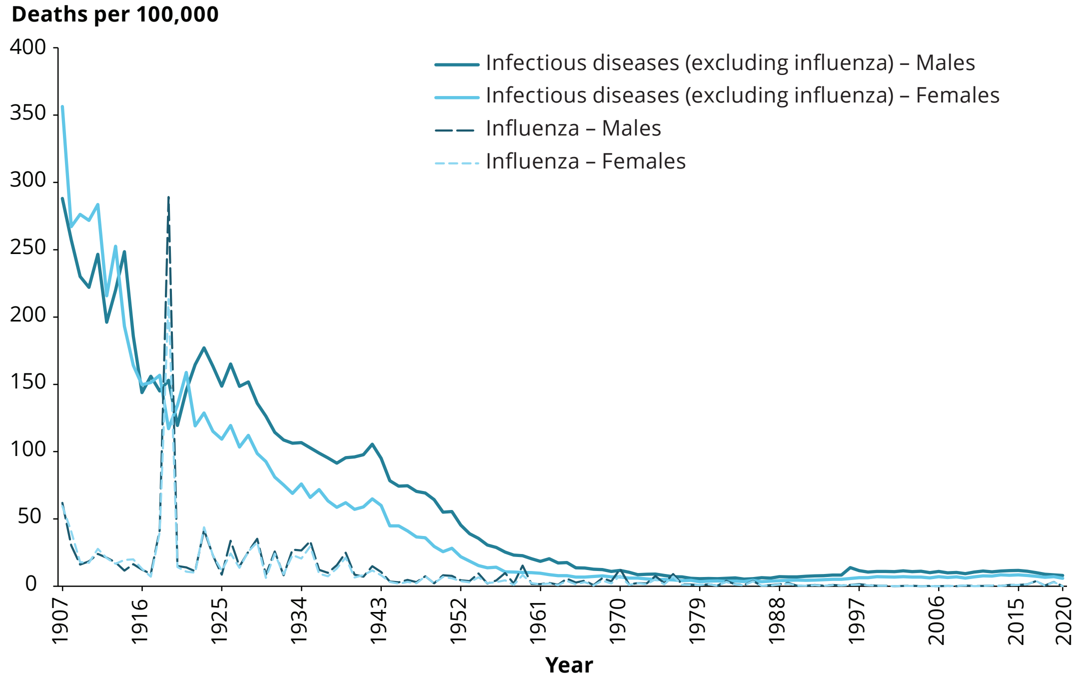
In subsequent decades, from 1931 to 1980, the mortality rate from infectious diseases continued to fall, from 98 to 4.7 deaths per 100,000 population. The mortality rate rose slightly in 1996, to around 9.7 per 100,000, with increases in deaths from HIV/AIDS and hepatitis (Figure 4.2). It fell to between 7.6 and 10 deaths per 100,000 from 1997 to 2019, and to 6.9 in 2020.

There was an overall decline of 98% in the age-standardised mortality rate from infectious diseases between 1907 and 2020.

Influenza

Influenza is a contagious respiratory disease that causes seasonal epidemics in Australia. It spreads from person to person through droplets formed when an infected person coughs, sneezes or talks. Influenza was responsible for many deaths during the 20th century. The greatest number occurred during the Spanish influenza pandemic of 1918–1919, when 12,000 Australians died from a population of 5 million (age-standardised rate of 252 deaths per 100,000) in 1919. After that, influenza deaths declined (to 25 per 100,000 in 1931) and remained low in the second half of the 20th century (fewer than 2 per 100,000 in the 1990s). There was a spike in influenza deaths in 2017 (4.0 per 100,000) due to increased cases and mutation of the influenza virus, which became resistant to the flu vaccine available at the time (Figure 4.2).

Figure 4.2: Age-standardised mortality rates (per 100,000 population) from infectious diseases and influenza (includes 'Spanish flu'), by sex, 1907–2020



Note: Infectious diseases are coded to ICD-10 codes A00–B99. They include conditions such as tuberculosis, polio, smallpox, hepatitis, sexually transmitted diseases such as syphilis and HIV/AIDS, other bacterial diseases and viral infections. Excludes influenza (and 'Spanish flu'). Influenza is coded to ICD-10 codes J09–J11.

Source: AIHW National Mortality Database.

Infectious diseases and influenza during the COVID-19 pandemic

During the COVID-19 pandemic, the mortality rate from infectious diseases has remained low. Deaths from influenza declined dramatically in 2020, likely due to the public health measures put in place to prevent the spread of COVID-19 (such as increased personal hygiene and social distancing). In 2020, 55 people died from influenza compared with 1,080 in 2019 (ABS 2021b).

For more analyses of the impact of COVID-19 on mortality rates in Australia, see Chapter 1 'The impact of a new disease: COVID-19 from 2020, 2021 and into 2022' and Chapter 2 'Changes in the health of Australians during the COVID-19 period'.

Examples of infectious diseases are provided in the following sections to explore mortality improvements seen in Australia.

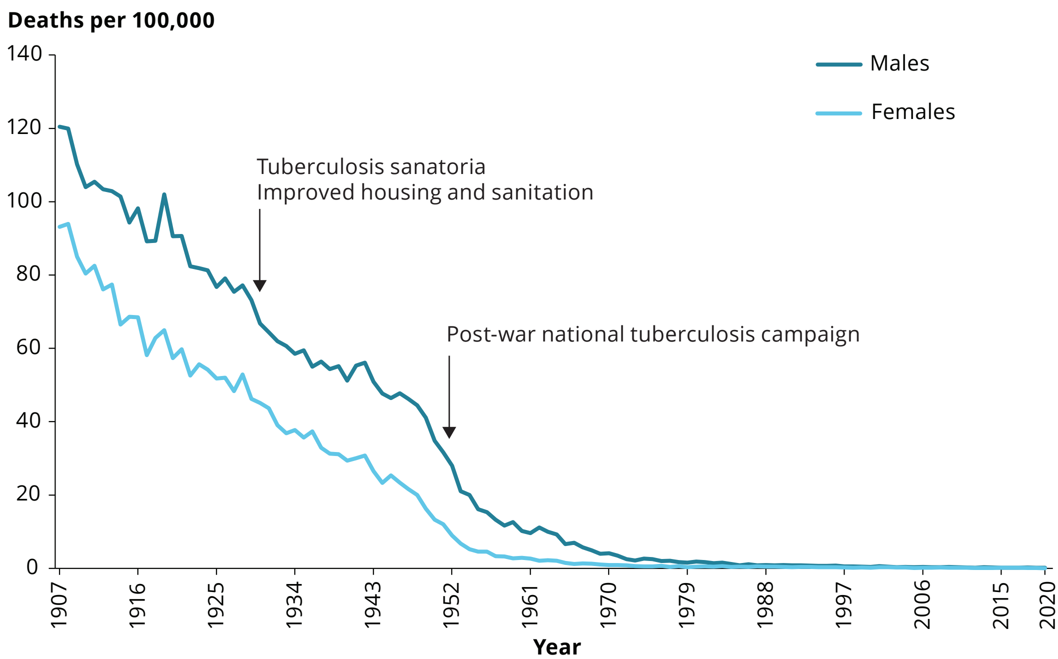
Tuberculosis

Tuberculosis is a contagious bacterial disease that especially affects the lungs, causing fever-like symptoms and destruction of lung tissue. It can also spread to other parts of the body, causing secondary problems and often death if not treated. At the start of the 20th century, tuberculosis was the leading cause of death among females, and the second leading cause of death among males (after heart disease). In 1907, age-standardised mortality rates were 121 per 100,000 population for males, and 93 per 100,000 for females (Figure 4.3).

The rates fell markedly over the century. By the 1980s, deaths from tuberculosis had been virtually eliminated in Australia, with 1 death per 100,000 population. Nowadays, instances of tuberculosis mainly occur in migrant populations and in people with immunity-depressing conditions such as HIV/AIDS. At the end of the century, Australia had one of the lowest rates of tuberculosis infection in the world.

The substantial decline in the mortality rate from tuberculosis was attributed to improved sanitation and housing, tuberculosis sanatoria (establishments for the isolation, treatment and convalescence of people with tuberculosis), effective treatment with antibiotics and the success of the national tuberculosis campaign after World War II, which included immunisation and mass chest X-ray screening (AIHW 2006).

Figure 4.3: Age-standardised mortality rates (per 100,000 population) from tuberculosis, by sex, 1907–2020



Source: AIHW National Mortality Database.

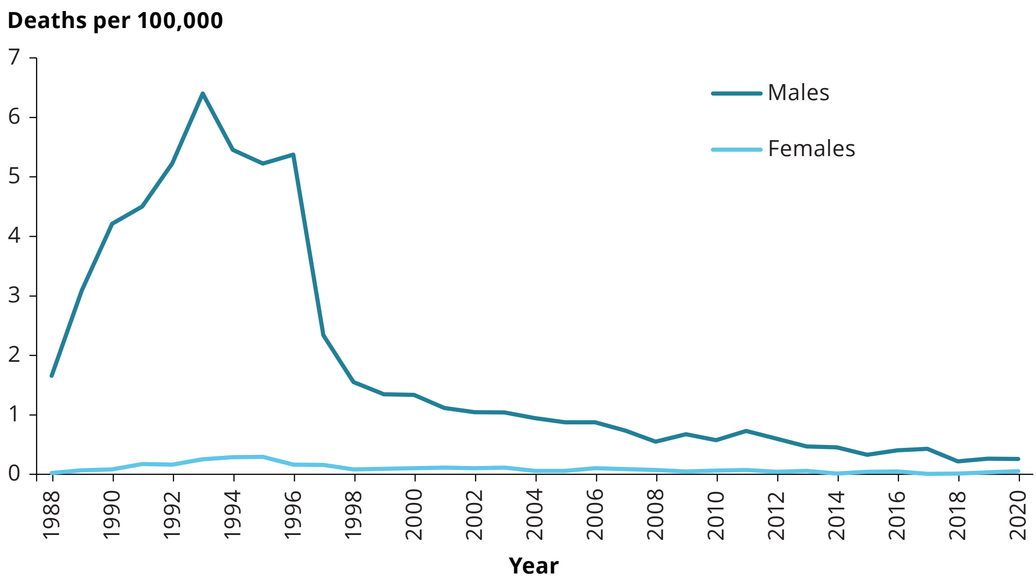
HIV/AIDS

HIV is the virus that causes AIDS. First identified in 1981, HIV became a global epidemic. Between 1996 and 2001, more than 3 million people were infected with HIV every year (Roser & Ritchie 2018). AIDS-related deaths increased throughout the 1990s and reached a peak in 2004–2005 when, in both years, close to 2 million people died worldwide (Danforth et al. 2017).

HIV impairs a person's immunity, making them susceptible to other infections. In Australia, the majority of HIV/AIDS cases occurred in men who have sex with men, with smaller numbers resulting from injecting drugs, contaminated blood or needle stick injury, or heterosexual contact (AIHW 2006; Gruszin et al. 2012).

In Australia, HIV/AIDS was controlled with public health intervention and effective community action (Gruszin et al. 2012). Interventions included safe sex and safer injecting campaigns, screening of blood donors and the blood supply, infection control guidelines and the introduction of antiretroviral treatments from 1996. The age-standardised mortality rate peaked in Australia at 6.4 deaths per 100,000 males in 1993, but slowed substantially after 1994. By 2005, mortality rates from HIV/AIDS had fallen to less than 1 death per 100,000 population for males (Figure 4.4). These falls are evident across the age groups.

Figure 4.4: Age-standardised mortality rates (per 100,000 population) from HIV/AIDS, by sex, 1988–2020



Source: AIHW National Mortality Database.

Recent emergence of new viruses (SARS, COVID-19)

In the early years of the 21st century, the appearance of 'avian flu' and SARS (severe acute respiratory syndrome) attracted worldwide attention, and a fear that some viruses might adapt and mutate to allow human-to-human transmission. In 2020–2021, the worldwide transmission of the SARS 2 (severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2) virus strain caused the COVID-19 pandemic.

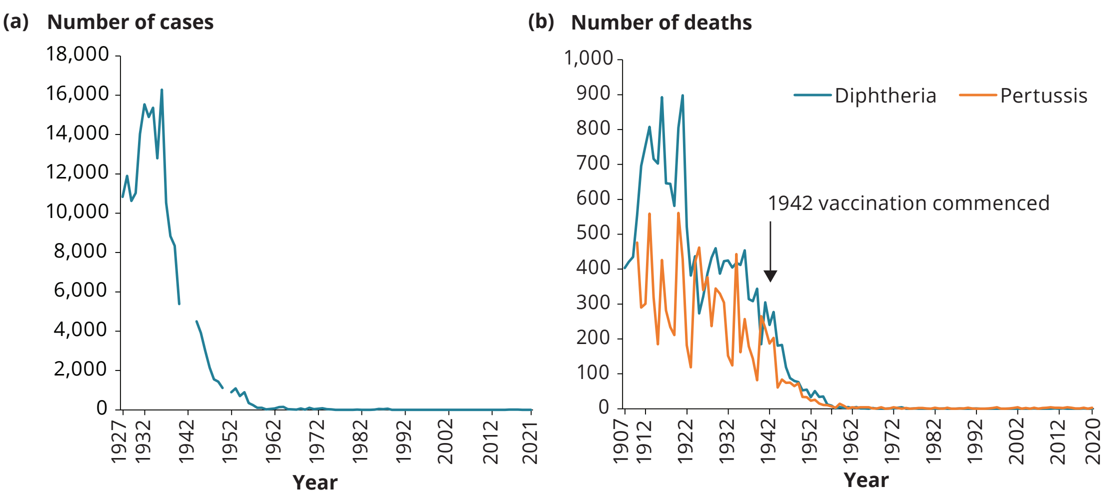
There have been a number of direct and indirect health impacts as a result of the pandemic and the restrictions put in place, which have affected many aspects of daily life (see Chapter 1 'The impact of a new disease: COVID-19 from 2020, 2021 and into 2022' and Chapter 2 'Changes in the health of Australians during the COVID-19 period'; AIHW 2021g). Emergence of these recent infectious diseases illustrate the unpredictability of disease outbreaks and new infective agents.

Role of vaccination

Since World War II, Australia has experienced advances in immunology; the eradication of smallpox; the near eradication of poliomyelitis; and control of diphtheria, pertussis, tetanus, measles, mumps, rubella and, more recently, hepatitis B.

For example, in the decades between the world wars, diphtheria and pertussis vaccines were produced and national school-based vaccinations began. Subsequently, the incidence and deaths from these respiratory diseases declined dramatically (Figure 4.5).

Figure 4.5: Number of cases for diphtheria, 1927–2021 (a) and number of deaths from diphtheria and pertussis, 1907–2020 (b)



Notes

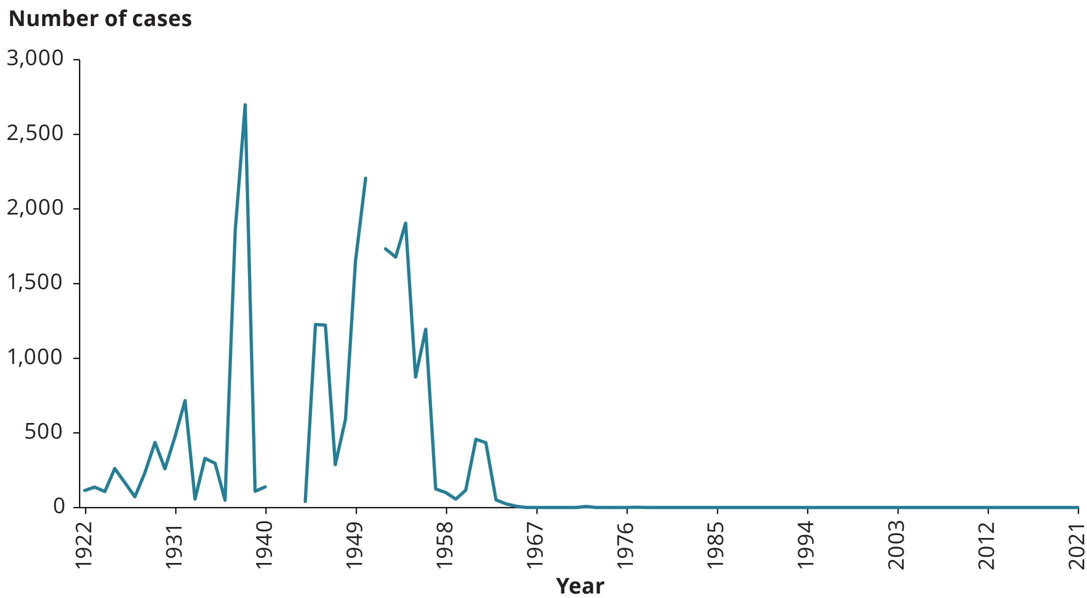
1. Cases are notified nationally and provided to the Australian Government's National Notifiable Diseases Surveillance System (NNDSS). National notifications of pertussis were incomplete before 1990; hence, a long-term trend cannot be presented.
2. Notification data for diphtheria were not available for 1941, 1943 and 1951.

Sources: AIHW analysis of NNDSS data; Hall 1993.

Source: AIHW National Mortality Database.

Also of note were the introduction of polio vaccines in 1956 by Salk and in 1966 by Sabin, followed by mass immunisation programs (Gruszin et al. 2012). With the ongoing immunisation of young children, poliomyelitis (polio) was eradicated in Australia towards the end of the century (Figure 4.6).

Figure 4.6: Number of cases for polio, 1922–2021

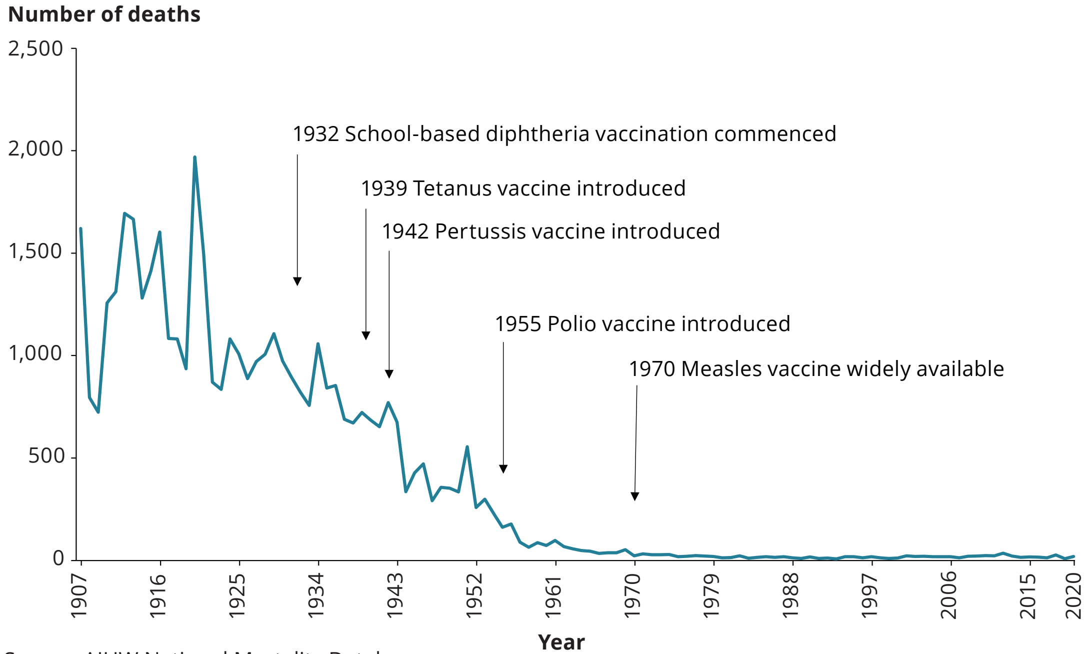


Note: Notification data for polio were not available for 1941, 1943 and 1951.

Sources: AIHW analysis of NNDSS data; Hall 1993.

The introduction of vaccines led to declining deaths in the last century (Figure 4.7). The vaccines for measles, mumps and rubella were developed in the 1960s and became widely available in the following decade. Between 1907 and 1916, there were 2,143 deaths from measles, but only 2 deaths between 2011 and 2020. As measles is highly infectious, maintaining its elimination requires very high vaccine coverage (93% or more). Australia has achieved this coverage through the National Immunisation Program (93% at 2 years of age in 2021).

Figure 4.7: Deaths from vaccine-preventable diseases – diphtheria, tetanus, pertussis, polio, measles, 1907–2020



Source: AIHW National Mortality Database.

Today, Australia is widely regarded as having one of the most robust and comprehensive immunisation systems in the world. This is attributed to the National Immunisation Program, a partnership between Australian and state and territory governments, which provides free vaccines against 17 diseases (including shingles) for eligible people. Fully immunised status is measured at ages 1, 2 and 5 and means that a child has received all the scheduled vaccinations appropriate for their age (Table 4.1).

Table 4.1: Vaccination coverage estimates (per cent) for children at age 1, 2 and 5 in Australia, 2021

Vaccine/antigen	1-year-olds	2-year-olds	5-year-olds
DTP (Diphtheria/tetanus/whooping cough)	95.00	93.71	95.18
Hepatitis B	95.03	96.78	. .
HIB (Haemophilus influenzae type b)	94.96	94.46	. .
IPD (Invasive pneumococcal disease)	96.27	95.74	. .
Meningococcal C	. .	95.69	. .
MMR (Measles/mumps/rubella)	. .	93.89	. .
Polio	94.99	96.78	95.13
Varicella	. .	94.02	. .
Fully immunised[(a)]	**94.61**	**92.60**	**94.98**

(a) The rolling annualised percentage of all children fully immunised by the target age.
Source: National Centre for Immunisation Research and Surveillance online data, updated on 1 April 2022.

Immunisation of young children has increased since the 1990s. The coverage for all recommended vaccines at 2 years of age increased from 74% in 1999 to 93% in 2021. At 5 years of age, coverage for Indigenous children is 97% which exceeds that for children overall (95%). In 2021, the proportion of children fully immunised at 1 year of age was 95% (Table 4.1).

The advent of immunisations has led to the prevention of infectious diseases, and the potential eradication of some. This was a major public health achievement of the 20th century and plays an important role today in the COVID-19 pandemic. As at 27 April 2022, 95% of people aged 16 and over have been fully vaccinated against COVID-19 in Australia (Department of Health 2022).

Shift from infectious diseases to chronic diseases

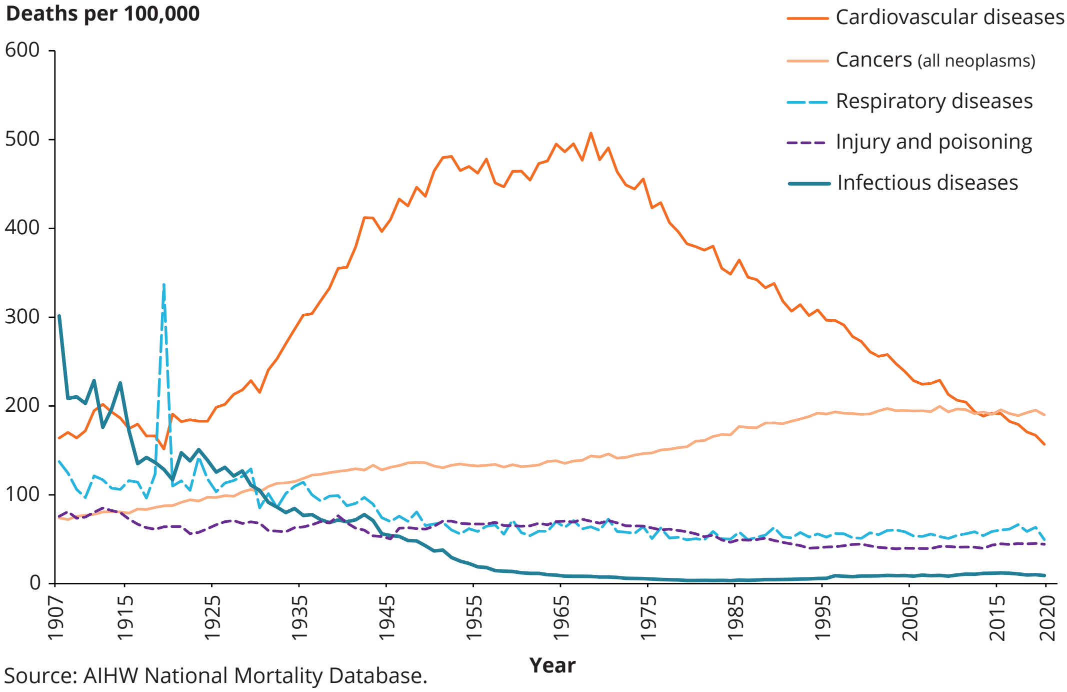
As in many other developed nations, Australia experienced a 'health transition' from infectious to chronic diseases in the mid-20th century, with influenza and tuberculosis being replaced by cardiovascular diseases and cancer as the major causes of death (Beaglehole and Bonita 1997). More specifically, as infectious diseases were coming under control, mortality from cardiovascular diseases and cancers increased from what it was in the 1920s and 1930s.

Since the 1970s, crude mortality rates from cancer have steadily increased while the crude mortality rates from cardiovascular diseases have continued to fall (Figure 4.8a).

Taking into account changes in the age structure of the population over time, cardiovascular diseases were still the major cause of death for most years (Figure 4.8b). Exceptions were the year 1919 – when the Spanish influenza pandemic caused widespread mortality – and from 2010 onwards – when the rate of deaths from cardiovascular diseases dropped below that from cancers, largely due to improvements in cardiovascular disease treatment and management.

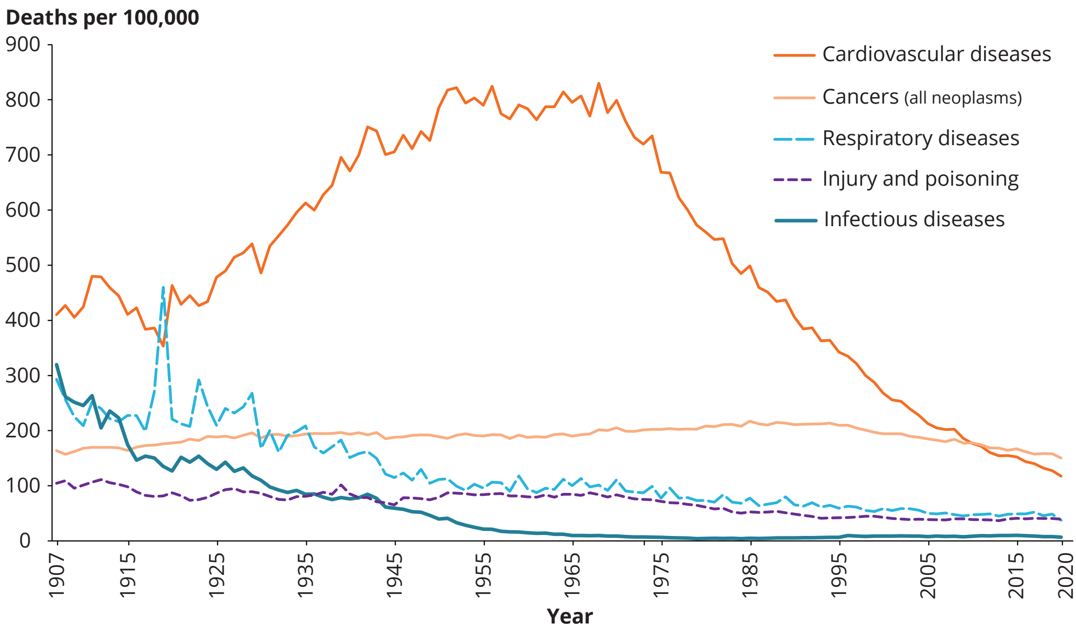
Interestingly, over the last 50 years, crude mortality rates from cancer have steadily increased. However, a different pattern is seen when looking at the age-standardised rates from cancer; age-standardised rates were generally steady between 1970 and 2000 and have decreased since. This suggests changes in the age at death due to cancer over this period.

Figure 4.8a: Crude mortality rates (per 100,000 population), by broad cause of death, 1907–2020



Source: AIHW National Mortality Database.

Figure 4.8b: Age-standardised mortality rates (per 100,000 population), by broad cause of death, 1907–2020



Source: AIHW National Mortality Database.

Age-standardised mortality trends by cancer type show some different patterns over time. For example, stomach cancer was the largest cause of death among cancers in the 1920s, and its mortality rate fell over the century. It is the reverse for lung cancer. Lung cancer mortality rates rose markedly across the century, with a peak in the mid-1980s, after which they began to fall for males.

Later in the 20th century, deaths from prostate cancer increased for males, while the contribution of deaths from cancers of the cervix and uterus fell for females. Mortality rates for bowel cancer (both males and females) and breast cancer (for females) increased in the first half of the century and then fell after national bowel and breast cancer screening programs were introduced. For breast cancer, the mortality rate declined from the 1990s, and for bowel cancer from the 1980s (with larger declines from the early 2000s) – for more detail, see the section 'Impact of screening programs on cancer mortality rates' later in this chapter.

Lung cancer was the leading cause of cancer death in 2020, followed by bowel, pancreatic, prostate and breast cancer. For more information, see *Cancer in Australia 2021* (AIHW 2021d), https://www.aihw.gov.au/reports/cancer/cancer-in-australia-2021/summary.

The observed trends in the age-standardised mortality rates from cancer described in this section could be influenced by multiple factors, such as:

- increased and earlier detection through cancer screening
- changes in risk factor behaviours, such as smoking and dietary risk factors
- data improvements and changes over time, such as changes in mortality coding practices.

Rise and fall of cardiovascular diseases

In the early part of the 20th century, cardiovascular diseases were recognised as substantial contributors to the mortality of Australians. It was the fourth most common cause of death in Australia after pneumonia, tuberculosis, and diarrhoeal disease, and was more common than cancer (Cumpston 1989). By the mid-20th century, cardiovascular diseases accounted for more than half of all deaths, not only in Australia but also in most of the industrialised nations (Braunwald 1997).

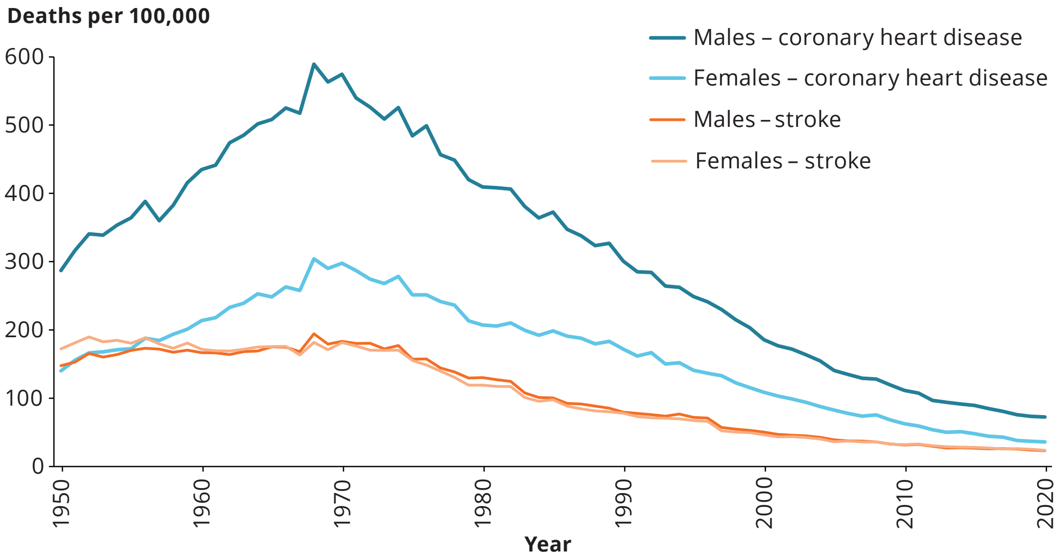
After accounting for changes in the population age structure over time, mortality from cardiovascular diseases rose from 353 deaths per 100,000 population in 1919 to a peak of 830 in 1968. In 1968, coronary heart disease and stroke combined caused 43% of Australian deaths, peaking at a rate of 616 deaths per 100,000. This included 25,522 deaths of people under the age of 75 out of a total 46,624 deaths from these causes

(55%). Due to coding practices, deaths from stroke prior to 1979 were not available. Stroke deaths for these years were estimated using deaths from total cerebrovascular diseases in the following decade.

Age-standardised mortality rates then dropped substantially until the early 2000s (by around two-thirds), after which the rate of decline started to slow (Figure 4.9). By 2020, coronary heart disease and stroke accounted for 15% of all deaths at a rate of 73 deaths per 100,000, with 6,377 deaths (26%) among people aged under 75. The biggest contributor to this trend was coronary heart disease. Mortality from coronary heart disease has fallen dramatically, from a peak of 428 deaths per 100,000 in 1968 to 49 per 100,000 in 2020 – an 89% decline. Despite this improvement, coronary heart disease continued to be Australia's leading cause of death in 2020 and the second leading cause of premature death.

There was also a decline in acute cardiovascular disease outcomes – deaths from acute myocardial infarction fell 93% from 1968 to 2020 (304 deaths per 100,000 population to 19). Deaths from acute rheumatic heart diseases declined by 97%, from a peak in 1936 (3.9 per 100,000) to 2020 (0.1 per 100,000).

Figure 4.9: Age-standardised mortality rates (per 100,000 population) from coronary heart disease and stroke, by sex, 1950–2020



Note: Before 1979, deaths from stroke were not available due to coding practices; for these years, stroke deaths were estimated using the proportion of stroke deaths from overall cerebrovascular disease deaths in the following decade.

Source: AIHW National Mortality Database.

Declining mortality rates for coronary heart disease and stroke have been influenced by improvements in:

- known risk factors (smoking, high cholesterol and dietary risk factors)
- medical interventions, including advancements in pharmaceutical drugs
- diagnosis, and medical and surgical treatments (Ford and Capewell 2011; OECD and The King's Fund 2019).

Despite these gains, in the 21st century, the decline in mortality rates for cardiovascular diseases has slowed. The reason for this is unclear. Possible explanations are plateauing or increases in risk factors, such as the increasing prevalence of overweight/obesity and diabetes; the recent stabilisation of smoking prevalence and blood cholesterol levels after steep declines; and limited improvements in case fatality rates for stroke (Mensah et al. 2017; Shah et al. 2019).

Rise and fall of tobacco use and lung cancer

Tobacco use is the leading cause of preventable diseases and death in Australia, and the major cause of lung cancer deaths.

Tobacco use increased from the early 1900s, reaching a peak in the mid-1960s, when the majority of males (58%), and more than one-quarter of females (28%) aged 16 and over, were current smokers. In the following decades, smoking among men declined, while still having a higher prevalence than for women, and smoking among women continued to increase (Figure 4.11).

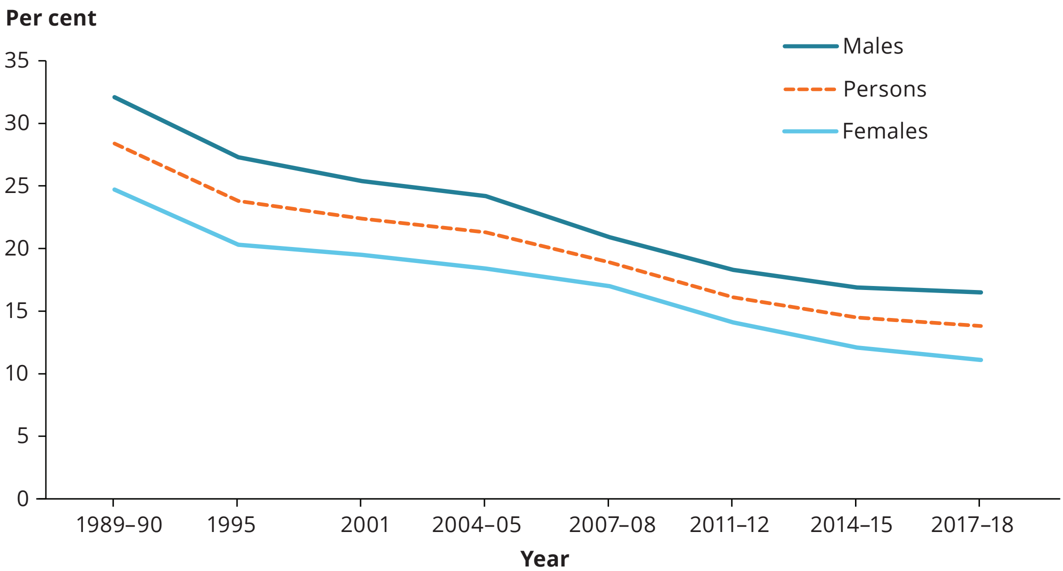
The publication of international reports during the 1960s causally linking tobacco with death and disease stimulated action by Australian health professionals. In the 1970s, advertising bans in the broadcast media were introduced, but were quickly circumvented by the tobacco companies through sport sponsorships (Winstanley and Woodward 1992). However, the 1980s brought increased public awareness about health issues, and legislation on advertising restrictions and other tobacco controls, such as regular increases in tobacco taxes (Scollo and Bayly 2022). Importantly, evidence about the effects of passive smoking also become available in the 1980s, signalling a conflict between public health interests and the tobacco industry.

Legislation and other initiatives to highlight public awareness of the dangers of passive smoking resulted in more public places declared to be free of tobacco smoke. These included workplaces, public spaces and commercial buildings. By 2000, many jurisdictions had controlled exposure to tobacco smoke by regulating against smoking in public buildings, and on public transport, in cinemas, theatres, and, increasingly, in shopping centres and restaurants (Chapman et al. 1999).

The rate of daily smokers has reduced over time, from 28% of adults being daily smokers in 1989–90 to 14% in 2017–18 (Figure 4.10). Today, although the rates of consumption and heart and stroke disease are falling, priority areas for action remain. In 2018, tobacco use contributed to 39% of the total burden from respiratory diseases and 22% of the total burden from cancers (AIHW 2021b).

The latest data from the National Drug Strategy Household Survey estimated that 12% of adults smoked daily in 2019. This rate has declined from an estimated 13% in 2016 and has halved since 1991 (when it was 25%) (AIHW 2020).

Figure 4.10: Proportion of daily smokers aged 18 and over, by sex, 1989–90 to 2017–18



Notes

1. Trend data are based on when survey data are available.
2. In 2017–18, data from National Health Survey and Survey of Income and Housing have been combined to create a much larger sample, which will allow for a more accurate estimate of smoker status.
3. For 1989–90 and 1995, 'current daily smoker' has been reported using the category 'current smoker'. For those years, the definition of 'current smoker' – regularly smoking one or more cigarettes per day on average – aligns with the definition that has been used for the category 'current daily smoker' from 2001 onwards.

Source: ABS 2019.

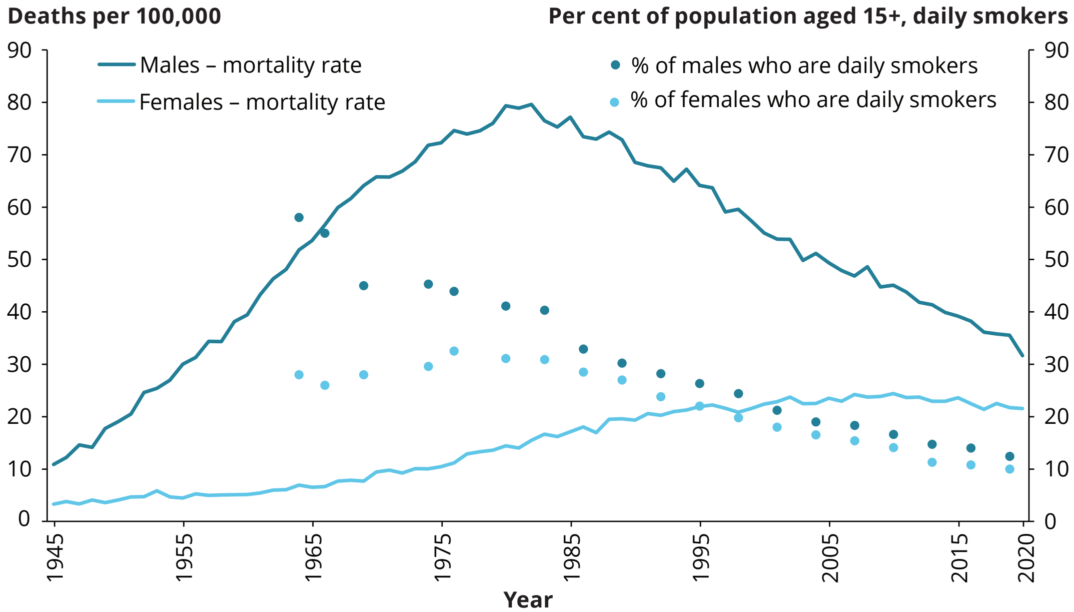
Smoking and lung cancer deaths

Trends in smoking strongly predict lung cancer mortality rates, with a time lag (between exposure to carcinogens in tobacco smoke and the diagnosis of cancer) of 2 to 3 decades (Scollo and Winstanley 2008). Figure 4.11 – which presents age-standardised mortality rates for lung cancer from 1945 to 2020, along with data on smoking prevalence from 1964 to 2019 sourced from the Organisation for Economic Co-operation and Development Health Database (OECD 2021) – shows that the lung cancer mortality rate for males was relatively low in 1945.

It increased sharply in the following years due to an increased uptake of smoking among males in the previous 2 to 3 decades (Scollo and Winstanley 2008), peaking in the early 1980s; it has since fallen markedly, reflecting the steady drop in male smoking rates in the second half of the 20th century (from 58% in 1964 to 12% in 2019). By 2020, the lung cancer mortality rate for males was at the same level as that observed in the mid-1950s.

Females took up smoking later than males and in fewer numbers. As a result, the mortality rates from lung cancer have increased more gradually in females than in males since the mid-1940s. The continued rise in the mortality rates for females over the period may be due to the increased uptake of smoking among females until the mid-1970s, when about 33% of Australian females reported being daily smokers. Since 2010, the female mortality rate from lung cancer has plateaued and more recently begun to decline, compared with what it was in earlier decades. Despite these patterns, the male rate is still 1.5 times as high as the female rate.

Figure 4.11: Age-standardised mortality rates (per 100,000 population) from lung cancer, by sex, 1945–2020, and prevalence of daily smoking, by sex, 1964–2019



Sources: AIHW National Mortality Database; Organisation for Economic Co-operation and Development Health Data 2021.

Impact of screening programs on cancer mortality rates

Three national population-based cancer screening programs were introduced in Australia in the 1990s – BreastScreen Australia and the National Cervical Screening Program in 1991 and the National Bowel Cancer Screening Program in 2006. These programs are run through partnerships between the Australian Government and state and territory governments. The programs aim to reduce illness and death from these cancers through early detection of cancer and pre-cancerous abnormalities, and through effective follow-up treatment. They target specific populations and age groups where evidence shows screening is most effective at reducing cancer-related morbidity and mortality.

These programs have resulted in notable changes in breast, bowel and cervical cancer incidence and mortality rates since their introduction (AIHW 2021d).

Breast cancer

New cases of breast cancer increased rapidly between the 1980s and the late 1990s, which may partly be due to increased detection after the national breast screening program was implemented. The age-standardised incidence rate levelled off at 111 cases per 100,000 women by 2007 and has remained stable since (AIHW 2021d).

Age-standardised breast cancer mortality rates increased between the early 1900s and 1940s, after which they stabilised until the early 1990s. Thereafter, there were substantial reductions in these mortality rates: they fell by almost 40%, from 31 deaths per 100,000 women in 1991 to 19 per 100,000 in 2020 (Figure 4.12a).

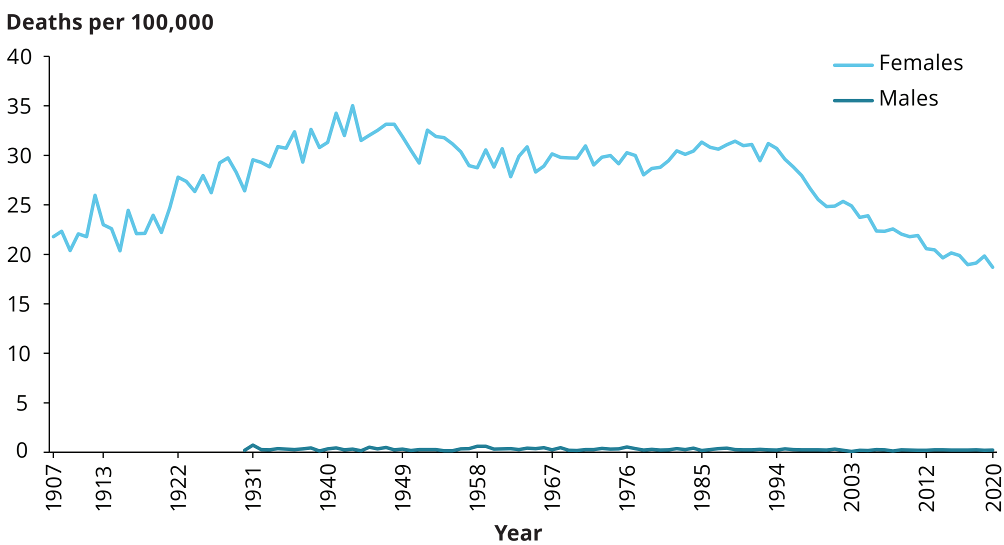
Bowel cancer

Incidence of bowel cancer (which comprises cancers of the colon and the rectum) rose by 14% between 1982 and 2001 (from 58 to 66 cases per 100,000 population) and then declined gradually to 51 cases per 100,000 in 2020 (AIHW 2021d). Age-standardised bowel cancer mortality rates increased for males and decreased slightly for females between 1968 and the early 1980s. They fell by 19% (32 to 26 deaths per 100,000) from 1982 to 2000, before continuing to decline from 26 per 100,000 in 2001 to 17 in 2020 (36% decline) (Figure 4.12b).

The strong declines in both bowel cancer incidence and mortality since 2001 are likely to reflect, to some extent, the success of the National Bowel Cancer Screening Program, which actively recruits and screens the target population for early detection and treatment.

Figure 4.12: Age-standardised mortality rates (per 100,000 population) from breast cancer (a) and bowel cancer (b), by sex, 1907–2020

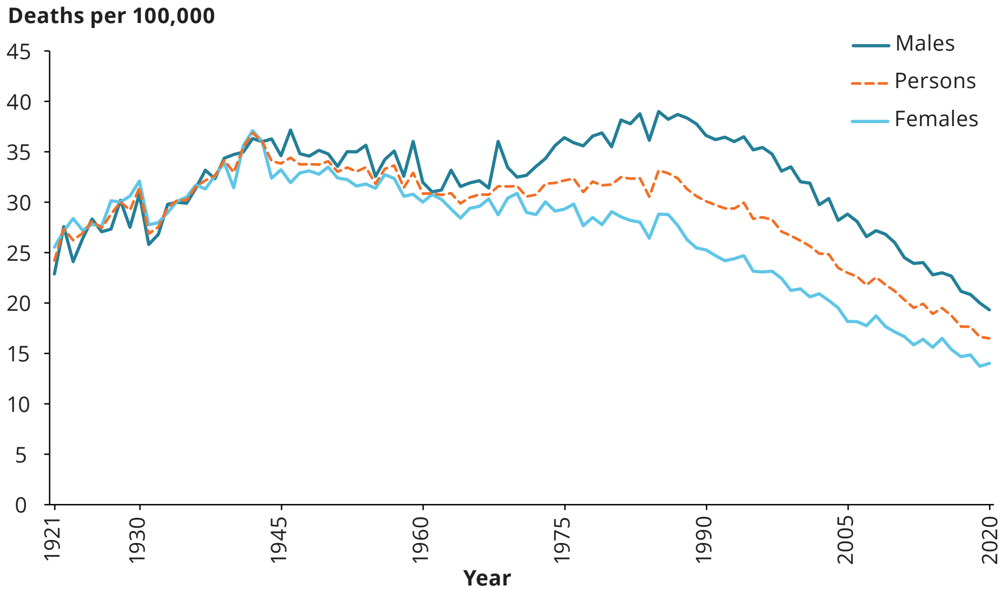
(a) Breast cancer



Note: Data for male deaths from breast cancer are not available before 1930.

Source: AIHW National Mortality Database.

(b) Bowel cancer



Note: There was a change in coding practice for deaths from bowel cancer. Since 1968, the equivalent ICD codes to ICD-10 C26.0 are included where the specific site of the cancer is not known and combined with C18–C20. Before 1968, equivalent ICD codes to ICD-10 C18–C21 were used to give an approximate trend of bowel cancer deaths.

Source: AIHW National Mortality Database.

Cervical cancer

A decrease was observed for both incidence and mortality from cervical cancer. Between 1982 and 2020, the rate of new cases dropped by more than half – from 14 to 6.9 cases per 100,000 women (AIHW 2021d). The age-standardised rate of deaths dropped to 1.6 per 100,000 women – about one-third of the rate when the National Cervical Screening Program began in 1991 (when it was 4.0 per 100,000).

The introduction of a national human papilloma virus (HPV) vaccination program in April 2007 and organised screening are likely to have contributed to the mortality decline and are expected to continue to lead to further reductions in cervical cancer incidence and mortality in the future (Hall et al. 2019). A renewed national cervical screening program began on 1 December 2017 and uses an HPV test as its primary screening test (Hall et al. 2019).

Preventing injury

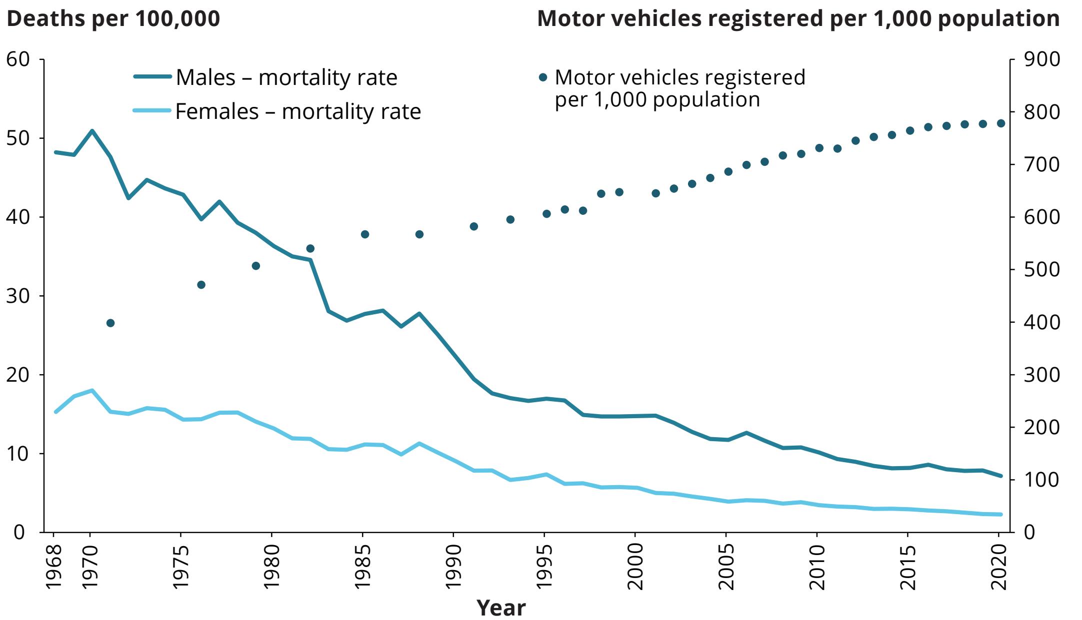
Accidental deaths were relatively common in the early part of the 20th century with drowning, burns, falls, work-related injuries and accidents with horses being the most common contributors to mortality rates (Gordon 1976). Deaths from accidents have always tended to occur more frequently among the younger age groups. In 1925, external causes were the leading cause of death (26%) for people aged 15–24 (Cumpston 1989). This pattern still applies today, particularly to deaths from motor vehicle accidents. Drowning (most commonly in swimming pools) also remains a major cause of injury deaths for children aged 1–4.

Rise and fall of deaths from road traffic accidents

The introduction of motor vehicles at the start of the 20th century had advantages for trade and more rapid transport; however, it has also resulted in a substantial number of deaths as well as disability. Road deaths represented a large proportion of injury deaths in the 1950s and 1960s.

From a peak in 1970 of 51 deaths per 100,000 males and 18 per 100,000 females, age-standardised mortality rates for road accidents fell substantially. In 2000, they were 15 and 5.6 per 100,000 for males and females, respectively. They continued to decline in the 21st century, to 7.2 and 2.3 for males and females, respectively in 2020 (Figure 4.13).

Figure 4.13: Age-standardised mortality rates (per 100,000 population) from land transport accidents, by sex, 1968–2020; motor vehicles on register per 1,000 population, 1971–2020



Sources: ABS Motor Vehicle Census, Australia 1976–2020; AIHW National Mortality Database.

The declines in motor vehicle related mortality rates, especially over the last third of the 20th century, were attributed to government policies, and leadership for motor vehicle safety. Motor vehicle safety programs succeeded through the combined efforts of federal and state governments, academic institutions, community-based organisations and industry – working together to improve the public's health. Improvements in technology and design of motor vehicles contributed to advances in road and car safety, such as seat belts, airbags, anti-lock braking systems, stability and traction control, child seat anchorage and rear-view cameras (ANCAP Safety 2022).

Successful public health measures have greatly improved road and motor vehicle safety over the last 40 years. They have included:

- compulsory seat belts from the 1970s and enforced mandatory wearing of seat belts
- mandatory wearing of motorcycle helmets and bike helmets
- baby capsules and improved occupant restraints in motor vehicles
- reductions in road speed limits
- setting and monitoring blood alcohol limits (for example, via random breath testing)
- road safety campaigns (Delaney et al. 2004).

Changes in suicide rates

Suicide has one of the highest average years of life lost each year from all leading causes of death in Australia (AIHW 2021j). Of the 3,318 people who died from suicide in 2019, on average, each lost an estimated 42 years of life. This average was much higher than years of life lost from other common causes of death, such as coronary heart disease (12 years of life lost), dementia (7 years) and lung cancer (17 years), and was similar to that for road transport injuries and drug use disorders (43 and 41 years, respectively) (AIHW 2021j).

For most of the century, overall suicide rates have been relatively stable; however, different trends have been evident at various points in time. In 1907, the age-standardised suicide rates were 27 and 5.2 deaths per 100,000 population for males and females, respectively. The peak death rate per 100,000 for males was 30 in 1930, with the lowest rate of 12 recorded in 1944. There were consistently around 20 suicide deaths per 100,000 males for the second half of the century.

Over the last 100 years, the age groups affected by suicide deaths have changed (Figure 4.14). Different trends have emerged for different age groups. Until the mid-1960s, suicide occurred mainly among older age groups; since then, there has been a dramatic shift to younger people. Today, it is the leading cause of death among people aged 15–44. Among people aged 15–24, the rate of suicide trebled between 1960 and 2020, from 6.8 to 21 deaths per 100,000 for males and from 2.0 to 6.7 deaths per 100,000 for females.

For females, the suicide rate remained steady for the first half of the 20th century, at around 5 deaths per 100,000 population. It rose rapidly during the 1960s to a peak of 13 deaths per 100,000 in 1967 but returned to around 5 deaths per 100,000 in the 1980s. In 2020, the female suicide rate was 5.8 deaths per 100,000.

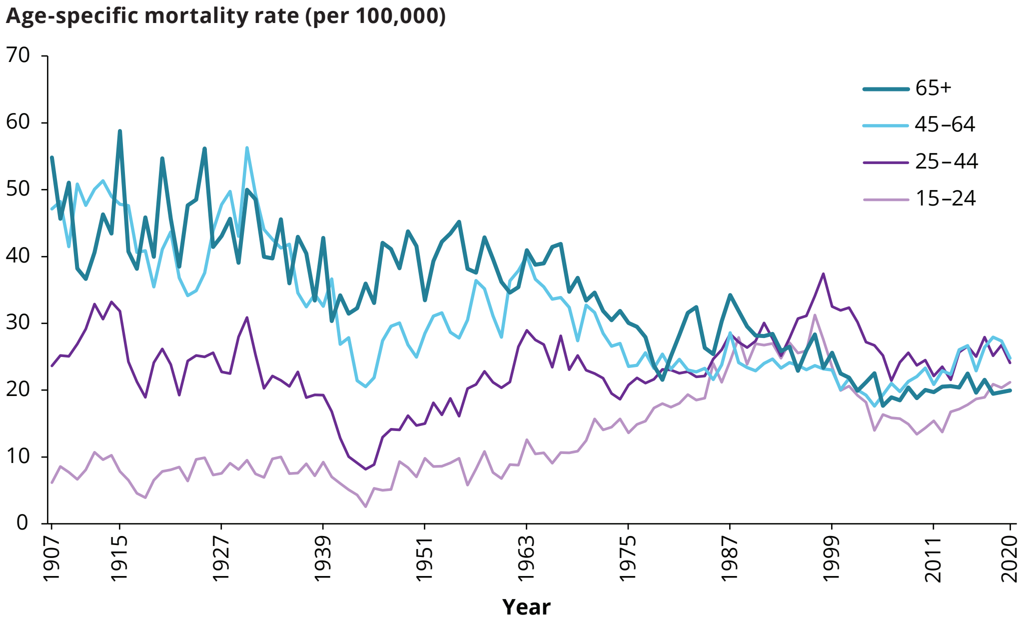
The high suicide rate for males in 1930 occurred during the Great Depression – a period of high unemployment, particularly among males. The rise in both male and female suicide rates in the 1960s has been attributed, in part, to the unrestricted availability of barbiturate sedatives (Oliver and Hetzel 1973; Whitlock 1975). Subsequent falls in the late 1960s and early 1970s have, in turn, been attributed to restrictions on the availability of these drugs, which were introduced in July 1967 (AIHW: Harrison and Henley 2014).

While high rates of suicide in the late 1980s and early 1990s coincided with a period of economic uncertainty in Australia, the social and economic disruption related to the COVID-19 pandemic has not seen an increase in the number of deaths suspected to be by suicide (AIHW 2022b).

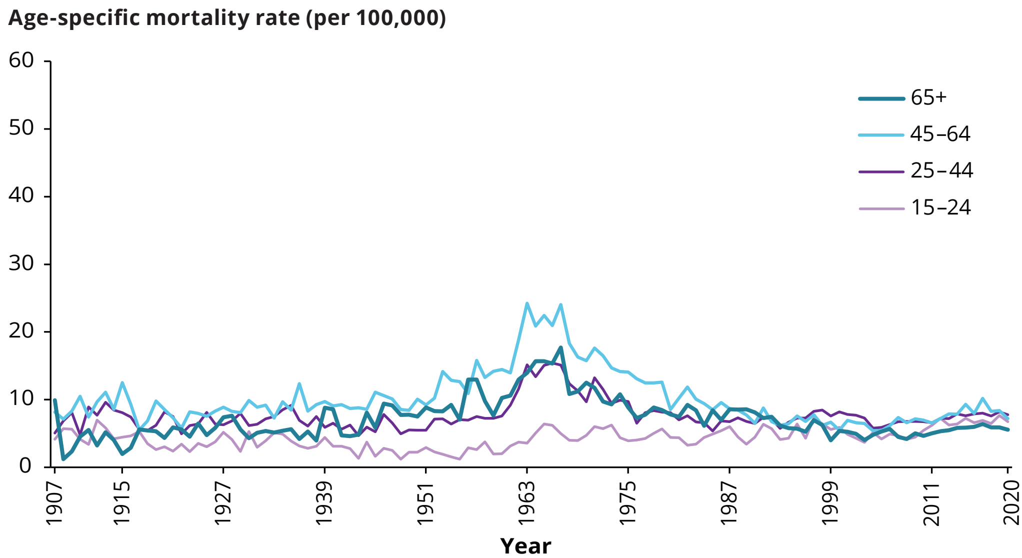
Today, suicide is a continuing public health challenge and it is one of the top 20 causes of death in Australia.

Figure 4.14: Age-specific mortality rate (per 100,000 population) from suicide, by broad age groups, males (a) and females (b), 1907–2020

(a) Males



(b) Females



Notes

1. Deaths of children attributed to suicide can be influenced by coronial reporting practices, and reporting practices may lead to differences in counts across jurisdictions. For more information on issues associated with the compilation of suicide data, see ABS report 3303.0 – Causes of death, Australia, 2018, Explanatory notes 91 to 100.
2. Age-specific mortality rates are the total number of deaths of a specified age group divided by the population of the same age group for the time period, multiplied by 100,000. They are used to provide a crude comparison between age groups.

Source: AIHW National Mortality Database.

High mortality rates in younger males are an ongoing public health concern. In 2000, suicide deaths made up 24% of all deaths for men aged 20–39; in 2019, this increased to 30%. Suicide is complex and thought to result from various biological, environmental and social factors. It could be associated with trauma and stress, potentially from early childhood. It can include wider socioeconomic factors, such as unemployment and low socioeconomic status.

In 2010, the Senate Community Affairs References Committee raised concerns about the accuracy of suicide reporting and about factors that may impede accurate identification and recording of possible suicides. The quality of suicide data has improved with quality assurance activities undertaken (Australian Senate Community Affairs Reference Committee 2010). For detailed and up-to-date data on suicide in Australia, see the AIHW's Suicide and Self-harm Monitoring website, https://www.aihw.gov.au/suicide-self-harm-monitoring/data.

Increase in accidental poisoning deaths from the late 20th century

The age-standardised mortality rate from accidental poisoning increased in the late 20th century – from 1.3 deaths per 100,000 population in 1979 to a peak of 5.7 in 1999. This notable increase in deaths in 1999 coincided with an epidemic of drug poisoning, mainly by opioids (mostly heroin) (AIHW 2015). In the following year (2000), the rate fell by 25% to 4.3 deaths per 100,000 before dropping further – to 2.9 deaths per 100,000 – in 2002 (Figure 4.15).

Between 2002 and 2020, the mortality rate due to accidental poisoning increased by 60% for females (from 2.0 to 3.1 deaths per 100,000 population) and 103% for males (from 3.9 to 7.9 per 100,000) (Figure 4.15). The age-standardised mortality rate for people in 2020 was 5.5 deaths per 100,000 – 7.3 per 100,000 in adults aged 25 and over, and 1.1 in children and young adults aged under 25.

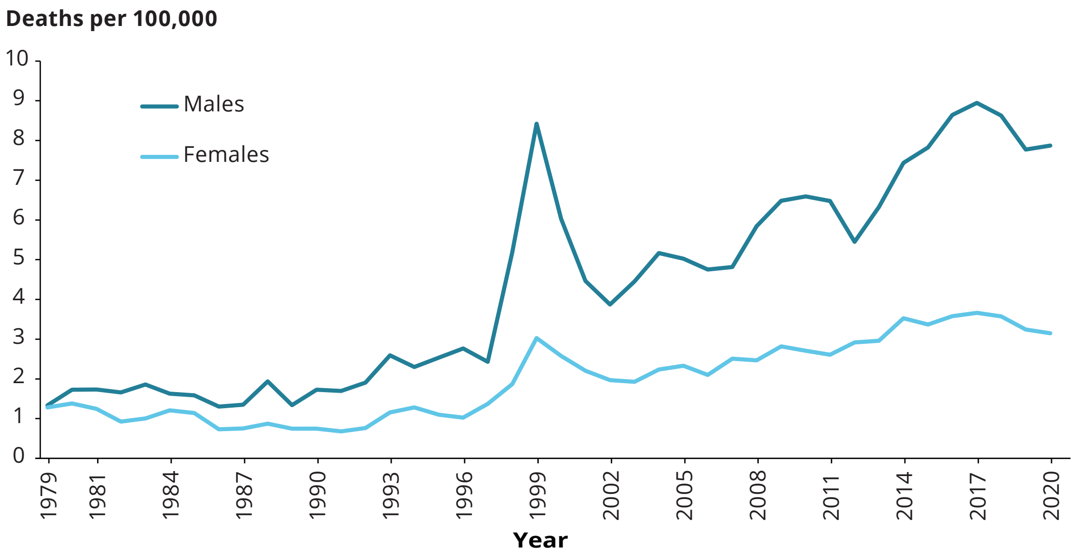
Drug-induced deaths have increased since the start of the 21st century (Figure 12.16). They are defined as those deaths that can be directly attributable to drug use. This includes deaths due to acute toxicity (for example, drug overdose) and chronic use (for example, drug-induced cardiac conditions) (ABS 2021b).

Between 2006 and 2020, the median age at death for drug-induced deaths increased from 41.1 to 44.4 for males and from 46.6 to 48.1 for females. Over the same period, the age-standardised mortality rate increased by 71% for males (from 5.6 to 9.5 deaths per 100,000 population) and by 36% for females, from 3.6 to 4.9 deaths per 100,000 (Figure 4.16).

Drug-induced deaths are more likely to be due to pharmaceutical drugs than illegal drugs, with benzodiazepines being the most commonly involved single drug type in drug-induced deaths (817 deaths in 2020). The rate of deaths where benzodiazepines were present rose from 1.2 deaths per 100,000 population in 2006 to 3.2 per 100,000 in 2020. For synthetic opioids (including fentanyl and tramadol), the mortality rate increased from 0.3 per 100,000 (57 deaths) in 2010 to 0.9 per 100,000 (218 deaths) in 2020.

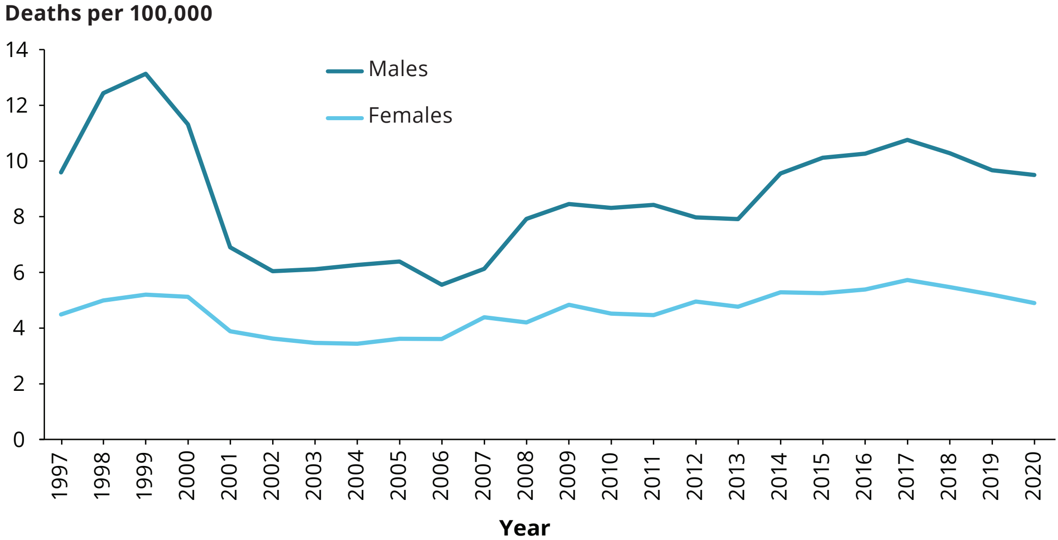
While pharmaceutical drugs caused a higher number of drug-induced deaths than illegal drugs, the number of methamphetamine deaths (including from using the illicit drug ice) has increased rapidly, with the death rate in 2020 being 5 times that in 2006 (increase from 0.4 to 2.1 per 100,000).

Figure 4.15: Age-standardised mortality rates (per 100,000 population) from accidental poisoning, by sex, 1979–2020



Source: AIHW National Mortality Database.

Figure 4.16: Age-standardised mortality rates (per 100,000 population) from drug-induced deaths, by sex, 1997–2020



Source: AIHW National Mortality Database.

While the total number of drug-related (excluding alcohol) hospitalisations remained relatively steady between 2015–16 (63,799 hospitalisations) and 2019–20 (62,757), when population growth and ageing are taken into account, the rate decreased over this period (from 271.5 to 252.8 hospitalisations per 100,000 population) (Chrzanowska et al. 2021; Man et al. 2021).

Individual drugs have contributed differently to this trend in drug-related hospitalisations. In recent years, the number of hospitalisations related to some drug types has increased (AIHW 2021a):

- Cannabinoids-related hospitalisations increased from 6,020 (25.1 per 100,00 population) in 2015–16 to 6,640 (26.0 per 100,000) in 2019–20.
- Methamphetamine-related hospitalisations increased from 9,317 (38.8 per 100,000) in 2015–16 to 14,053 (55.0 per 100,000) in 2019–20.
- Cocaine-related hospitalisations also increased, rising from 776 (3.2 per 100,000) hospitalisations in 2015–16 to 1,275 (5.0 per 100,000) in 2019–20.

Reductions in work-related fatalities

Work-related fatalities made up a substantial proportion of accidental deaths over the 20th century. Working conditions in the earlier part of the century were often dangerous, involving substantial exposure to a range of toxic substances or immediate physical risks.

Modern occupational health and safety legislation was developed in the 1970s. Since then, there have been major reductions in fatalities as a result of changes in industrial, occupational and work-related practices and safety measures. These have included:

- reforms in the mining and related industries to reduce workers' exposure to hazardous substances
- establishment of registries to record information about workers who suffered from certain hazardous exposures and injuries; for example, the Australian Mesothelioma Register, which began in 1980 and was redeveloped into the Australian Mesothelioma Registry in 2010
- National Coronial Information System
- campaigns on a range of issues, such as sun protection on construction sites, or the use of seat belts on forklifts (Gruszin et al. 2012).

Data on workplace fatalities are available from 2003 onwards from Safe Work Australia. The data indicate a slight increase in fatalities between 2003 and 2007, after which there was a 50% decrease in the mortality rate to 1.5 per 100,000 workers in 2020 (2.8 per 100,000 for men and 0.1 for women) (SWA 2021b). Both the number and rate of workers' compensation claims for serious illness and injury have fallen since 2000–01, from 16.3 to 9.9 serious claims per 1,000 employees in 2019–20 (SWA 2021a). In other words, the number of serious claims fell 9.5%, from 133,041 claims in 2000–01 to 120,355 claims in 2019–20 (SWA 2021a).

Today, industry-level standards, acts and regulations govern workplace health and safety. Each state and territory has its principal Occupational Health and Safety Acts. Australia's no-fault compensation schemes support injured workers and promote rehabilitation and a safe return to work.

Exposure to asbestos and mesothelioma

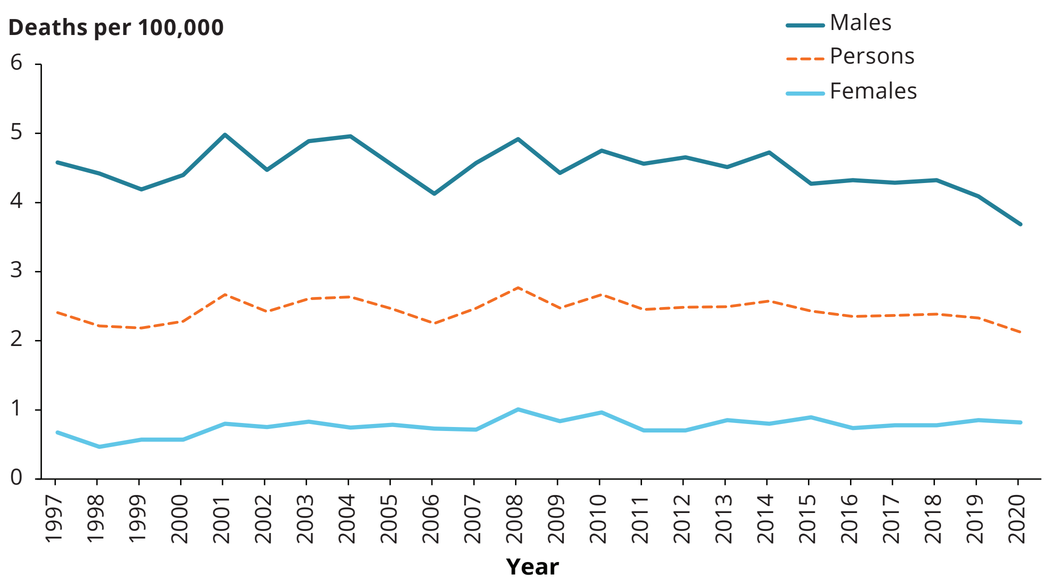
Occupational exposures, including exposure to asbestos, are estimated to be responsible for 15% of lung cancers in males, and air pollution is estimated to be responsible for about 5% of all cases of lung cancer (Giles et al. 1988). Asbestos was used widely throughout Australia by the 1950s and could be found in most homes, cars and workplaces. A substantial asbestos mining industry also existed, exposing workers to large doses of asbestos dust.

In the 1960s, there were growing concerns about the health risks associated with asbestos. Asbestos mining ended in 1983, and asbestos has not been used for new homes since 1990. A complete ban on its importation and use has been in place since 2003; however, asbestos exposure continues in both occupational and non-occupational settings (Soeberg et al. 2018).

Exposure to asbestos is the main cause of mesothelioma. A large amount of asbestos remains in older structures and products, potentially exposing workers and/or the public to asbestos (AIHW 2021h). Australia has one of the highest measured incidence rates of mesothelioma in the world (Bray et al. 2017). Each year in Australia, between 700 and 800 people are diagnosed with this rare and aggressive cancer. Between 1982 and 2019, the number of new cases of mesothelioma reported annually steadily increased (from 135 to 588 for males and from 22 to 138 for females; AIHW 2021h); however, there was little change in the age-standardised rates over this period, suggesting this increase is mainly due to population increase and ageing.

Deaths from mesothelioma followed a similar pattern, with the number of deaths increasing since 1997 to 735 in 2019 and 701 in 2020. While there has been little change in the age-standardised mortality rates over this period (Figure 4.17), there have been some improvements, most notably in the age-adjusted 1-year survival (AIHW 2021h).

Figure 4.17: Age-standardised mortality rates (per 100,000 population) from mesothelioma, by sex, 1997–2020



Source: AIHW National Mortality Database.

Recent rise of dementia as a leading cause of death

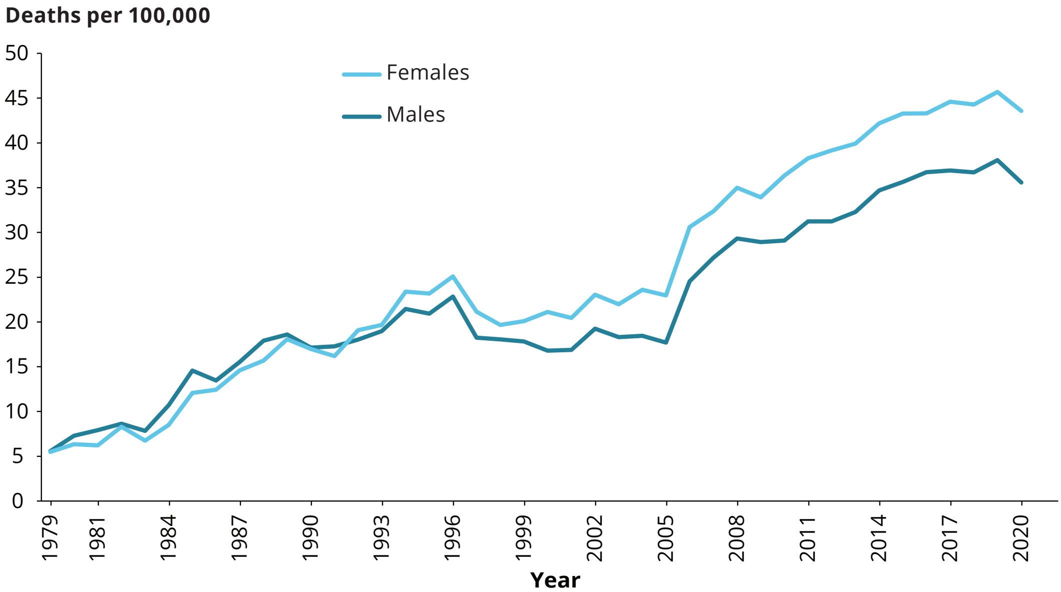
Dementia is a term used to describe a group of similar conditions characterised by gradual impairment of brain function. Changes due to these conditions may affect memory, speech, cognition (thought), behaviour, mobility and an individual's personality. A person's health and functional ability decline as the disease progresses. Alzheimer's disease is a common type of dementia (AIHW 2021f).

The age-standardised rate of deaths due to dementia (including Alzheimer's disease) rose steadily from the early 1980s to 1996 (25 deaths per 100,000 population). Changes to coding practices for dementia in 1997 and 2005 created breaks in the time series. Dementia age-standardised mortality rates then continued to increase by a further 41%, from 29 deaths per 100,000 in 2006 to 40 in 2020 (Figure 4.18), when looking at the underlying cause of death.

Ageing is the biggest risk factor for dementia. In 2020, 14,575 people died due to dementia as the underlying cause of death, and an additional 11,515 people died with dementia listed as an associated cause of death. Today, dementia is the second leading cause of death for men and the leading cause for women. The number of Australians living with dementia - and consequent mortality - is projected to continue to increase, with more Australians living to older ages (ABS 2015).

The number of deaths due to dementia has increased markedly since 1979 for people aged over 85 compared with people aged 60–64 (Figure 4.19). Among people aged 85 and over, the number of deaths from dementia in 2020 was 2.5 times more than that in 2006 (compared with 1.2 and 1.8 times more for people aged 60–64 and 65–69, respectively). This suggests that the increased mortality rate due to dementia is at least partly due to people living longer.

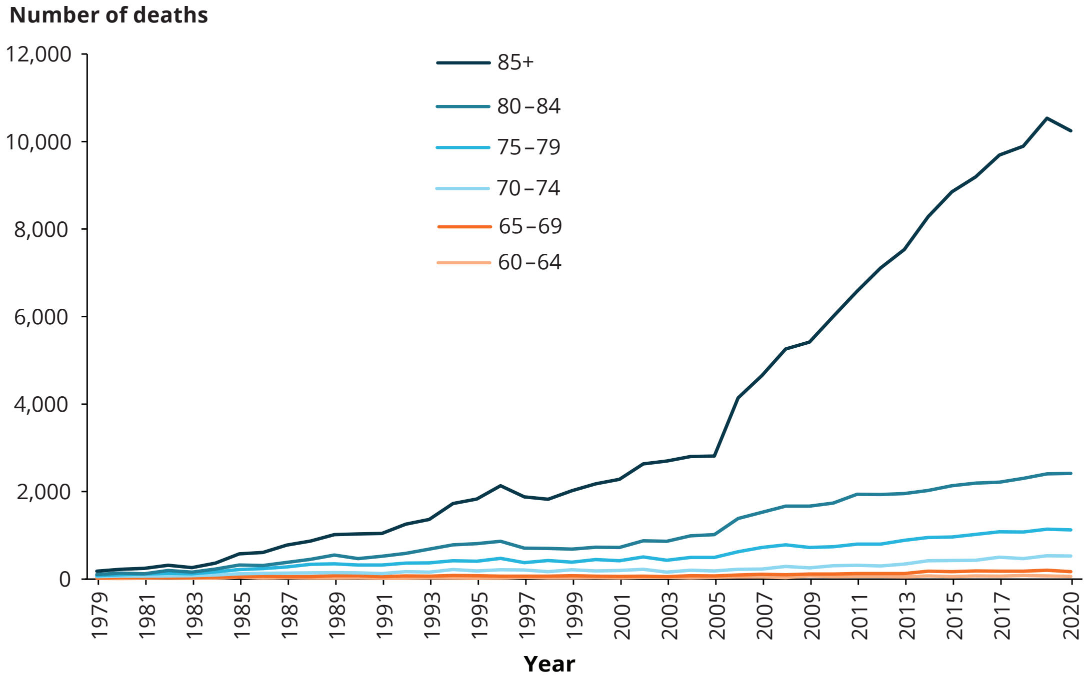
Figure 4.18: Age-standardised mortality rates (per 100,000 population) from dementia (including Alzheimer's disease), by sex, 1979–2020



Note: 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 (I60–I69), and (2) legal changes allowing veterans and members of the defence forces to relate death from vascular dementia to relevant service, with an accompanying promotional campaign targeted at health professionals thought to have increased the number of dementia deaths among this group (ABS 2015).

Source: AIHW National Mortality Database.

Figure 4.19: Deaths from dementia (including Alzheimer's disease), by age groups 60–64 to 85 and over, 1979–2020



Source: AIHW National Mortality Database.

Further information and data on dementia can be found at https://www.aihw.gov.au/reports/australias-health/dementia and in the web report *Dementia in Australia* (AIHW 2021f) (see https://www.aihw.gov.au/reports/dementia/dementia-in-aus/contents/about).

Ongoing challenges

As societies evolve, so do the patterns of disease and appropriate strategies for intervention. Improved infectious disease control, and environmental and social conditions all contributed to longevity and reduced burden of disease in the 20th century.

Today, more people are living longer with chronic conditions. Just under half (47%) of Australians had one or more chronic conditions in 2017–18, an increase from 42% of people in 2007–08 (ABS 2018b). This increase is associated with a number of factors, including:

- improvements in the treatment and management of chronic conditions, which extends life expectancy
- social and behavioural risk factors, such as poor diet and physical inactivity (ABS 2018b).

As the prevalence of chronic conditions increases, it is expected that multimorbidity – the presence of 2 or more chronic conditions in a person at the same time – will also become more common (AIHW 2021e). Multimorbidity makes treatment more complex; it can require ongoing management and specialised care across the health system, leading to higher demand for health services and greater economic investment.

A key focus in recent years, therefore, is the prevention and better management of chronic conditions to improve health outcomes; this is reflected in national guidelines and the National Preventive Health Strategy (Department of Health 2019, 2021a, 2021b).

Although there have been many achievements in improving public health in Australia over the last century, inequalities in health across the population are still a challenge in the 21st century. Premature mortality and the prevalence of illness remain higher among lower socioeconomic groups, people living in remote areas and Indigenous Australians.

The COVID-19 pandemic has affected many aspects of life in Australia, including health behaviours, income and work – and how the health system operates (AIHW 2021i; see chapters 1, 2 and 3 of this report for more information). Other challenges will arise for future mortality trends related to modern lifestyle factors, such as obesity, physical inactivity and mental health. Furthermore, emerging global pressures, such as pandemics (UNEP and ILRI 2020), the rise of antibiotic and antimicrobial resistance (WHO 2020, 2021), and climate change (Haines and Ebi 2019; McMichael et al. 2012) may have an impact on the health of Australians into the future.

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Australia's health care system: its evolution from the Spanish influenza to COVID-19

5

Australia's health care system: its evolution from the Spanish influenza to COVID-19

Key messages

The Coronavirus disease 2019 (COVID-19) pandemic has been one of the biggest public health challenges Australia has faced since the Spanish influenza around 100 years ago.

Some strategies adopted during the pandemic to prevent the spread of the disease – such as controlling population movement, quarantining and mask wearing – were also used during the Spanish influenza.

Despite these similarities, over the last 100 years, Australia's health system has changed in many ways in terms of its characteristics and how it is managed; it has also been changed by technical and pharmaceutical advances.

Key events in the health system between the Spanish influenza and COVID-19

January 1919	first cases of the Spanish influenza began to appear in Australia
1921	Federal Government, with the agreement of the state governments, created the Department of Health
1920s to 1930s	first mass vaccination programs began
1948	Pharmaceutical Benefits Scheme began as a limited scheme
1960	Pharmaceutical Benefits Scheme, as we know it today, was introduced
1975	Medibank commenced
1984	the Medicare system commenced, establishing basic health care for all Australians
1997	National Immunisation Program established
January 2020	first COVID-19 case reported in Australia
February 2021	COVID-19 vaccinations commenced in Australia

Until the COVID-19 crisis, the Spanish influenza pandemic of around 1919 was one of the worst public health crises Australia had faced (Bongiorno 2020). An estimated 40% of the Australian population of 5 million people became ill and around 15,000 died during the Spanish influenza (Department of Health 2011; Gruszin et al. 2012; NMA 2021).

These 2 pandemics, roughly 100 years apart, bookend substantial change in Australia's health system and in some ways, have helped to shape it. While the full impact of the COVID-19 pandemic is yet to be known or seen, this article summarises the major developments in the health system since the Spanish influenza. It covers changes in responsibilities for administering and funding the health system, public health measures, medicine policy and vaccinations, and the development of medical care and technologies such as critical care and intensive care units.

Federated responsibilities

After Federation, the delivery of health care was, at first, largely a state government or private responsibility. The Australian Constitution (1901) granted powers to the Federal Parliament only on quarantine matters (as far as public health matters were concerned) related to preventing diseases entering Australia (Biggs 2016; Hilless and Healy 2001; Sheehan 2020).

When the Spanish influenza first appeared in Australia, effective health treatments beyond basic nursing care were limited. Despite attempts to control movement across and within states, the disease spread across the country.

At that time, while some free treatments were provided in public and charitable hospitals, most health care was privately funded on a fee-for-service basis paid 'out of pocket' or by taking out insurance in funds known as friendly societies (Box 5.1) (Hilless and Healy 2001). In many cases, the hospitals treating the poor were staffed by honorary doctors working for no pay but who charged the wealthy for medical services provided in private rooms (RACGP 2008).

Given the local and fragmented nature of health care in Australia at the time, coordinating a response to the Spanish influenza pandemic was difficult. In 1921, this was recognised when the Federal Government, with the agreement of the states, created the Department of Health (Department of Health 2021a; Hilless and Healy 2001). Initially the department looked only after quarantine and 'reporting infectious diseases, public health research laboratories and occupational health' (Department of Health 2021a). Today, the Department of Health has been the primary funder of health care during the COVID-19 pandemic and the national coordinating and advisory body for the health response, including through the Office of Health Protection and the Chief Health Officer.

The roles of Australian governments have evolved through the pandemic. In the early stages, the National Cabinet, which was set up to consider such matters, reviewed restrictions on business and other measures to reduce infection, which were then largely implemented nationally. Later, state and territory governments played a stronger role in determining the restrictions that would apply in their jurisdiction. This development reflected the differing circumstances of jurisdictions in terms of their population characteristics and the timing and nature of COVID-19 outbreaks.

Throughout the pandemic, state and territory governments have been mainly responsible for setting up testing and vaccination services, enforcing public health directions and managing the capacity of hospital services to care for critically ill patients.

The Australian Government has been responsible for procuring and approving vaccination supplies and, in large part, making payments to individuals and businesses as part of an economic response to the pandemic.

Health insurance and funding

Private health insurance (PHI) schemes began in Australia with the friendly society movement (Box 5.1); many of today's health funds have their origins in these organisations (ABS 2012; Gale and Watson 2007). Voluntary PHI was the dominant form of health insurance until the public health insurance scheme was established (Duckett and Nemet 2019).

Box 5.1: Friendly societies

Friendly societies were mutual self-help organisations that covered the gap between people who qualified for free medical treatment and people who could afford to pay medical fees. Local groups banded together to form these societies. Members contributed fees on a regular basis; in turn, the society provided members and their families with general practitioner services and paid for their treatment and/or funeral benefits when required (Gale and Watson 2007; Hilless and Healy 2001; RACGP 2008).

In the decades following the Spanish influenza pandemic (during which World War II occurred), new health technologies and treatments, such as vaccines, emerged and debate continued on the role of the Australian Government in the health sector. The 1946 referendum on Social Services amended the Constitution to give the Australian Parliament new health responsibilities; specifically, to give it the power to make laws for the provision of pharmaceutical, sickness and hospital benefits, and to deliver and fund medical and dental services (AEC 2012; Goddard 2014; Senate Select Committee on Health 2016).

A few years later, the *1953 National Health Act* (Cth) came into effect. Among other functions, this act gave certain roles to the Australian Government in relation to the provision of health benefits and vaccines. This act, and the Medical Benefits Scheme (also set up in 1953), implemented arrangements whereby people who met a means test received free treatment in public wards by honorary specialists, while others paid for medical and hospital services (Gale and Watson 2007).

At this time, the Australian Government also introduced a subsidy – administered by non-profit voluntary health funds – for health services (Gale and Watson 2007). To keep premiums affordable, funds did not have to insure against pre-existing conditions, chronic illnesses or hospitalisations longer than a specific period (Gale and Watson 2007). In 1953, 83% of the population belonged to a private fund (Gale and Watson 2007). Of the remainder, many received benefits via pensions or as war veterans (RACGP 2008).

In 1975, Medibank was established, which provided Australians with access to hospital and certain medical services free of charge and without means tests; however, by 1978 it had been dismantled (Gale and Watson 2007). It was replaced in 1984 by the Medicare system. Today, Medicare supports the right to universal access for all Australians to a wide range of health and hospital services at low or no cost, as well as subsidising a large number of prescription medicines. These arrangements are administered through the Medicare Benefits Schedule (MBS) and the Pharmaceutical Benefits Scheme (PBS).

The establishment of a universal public health insurance scheme tended to draw people away from private funds, which lost a considerable number of members (Gale and Watson 2007); by the late 1990s, membership had fallen to around 31% (APRA 2021). As a result, various rebates and incentives were introduced to grow and maintain membership rates. Between 2000 to 2019, around 45% of the population, on average, in Australia had PHI (APRA 2021).

At this stage, it is not possible to determine what real impact the COVID-19 pandemic has had on PHI. Membership slightly increased in 2021, possibly attributable to COVID-19, even though access to medical services funded through PHI were curtailed due to pandemic restrictions. After falling steadily from 2015 through to 2020 (from 47% to 44%), PHI coverage was 45% in the December 2021 quarter (APRA 2021).

There are now around 34 PHI providers, although 80% of consumers are covered by the 5 largest PHIs (Commonwealth Ombudsman 2020).

Currently, the ratio of total health spending in Australia in the public and private sectors is around 70% to 30%, respectively. As well as managing the MBS and PBS programs, the Australian Government is responsible for system management, policy and funding for general practitioners (GPs) and primary health care services, and for establishing Primary Health Networks. It contributes the most to overall health spending (around 43% of total spending in 2019–20).

The state and territory governments have primary responsibility for managing public hospitals as well as a variety of additional service delivery and regulatory roles; in 2019–20, they contributed 28% of total health spending in Australia (AIHW 2021c). Each state and territory also receives Australian Government payments that are tied to specific hospital activity levels and funding arrangements.

This complex sharing of roles and responsibilities influenced how Australia has responded to the COVID-19 pandemic, with a variety of measures requiring coordination across governments and sectors within the health system. For example, the COVID-19 vaccine program has largely been managed through cooperative arrangements; vaccines have been delivered through a range of channels, including dedicated clinics managed by state and territory governments, many general practices and selected pharmacies.

Public hospitals

Since Medicare was established, Australian and state and territory governments have funded and provided public hospital services under a series of agreements. The basic principles of these agreements have not changed, with the latest National Health Reform Agreement (NHRA) 2020–2025 (CFFR 2020) reaffirming the commitment of all governments to the Medicare principles, which underpin public hospital services (Box 5.2). The NHRA outlines the shared responsibility of the governments to work in partnership to improve health outcomes and to ensure the sustainability of the health care system. It has a particular focus on public hospital funding.

Box 5.2: Principles established by early funding arrangements

The first iteration of agreements, Medicare Agreements, were signed under the *Medicare Agreements Act 1992* (Cth) which contained the key principles of:

- choices of services, whereby people were to be given the choice to receive public hospital services free of charge as public patients
- universality of services, whereby access to public hospital service was based on clinical need
- equity in service provision, whereby states would ensure that the provision of public hospital services is equitable, regardless of geographic location (Senate Select Committee on Health 2016).

The NHRA recognises the states and territories as the managers of the public hospital system and public health services as well as of relationships with local hospital networks. Local hospital networks are independent authorities set up by the states and territories to manage public hospital services and funding (CFFR 2020).

The NHRA has formed an important part of the COVID-19 response, with its framework used to implement specific pandemic arrangements. In particular, the Australian Government provided additional funding and guarantees to state and territory governments to help ensure that their hospital systems had adequate capacity to manage the impact of COVID-19 (Morrison 2020). A range of other initiatives and further additional funding arrangements were also put in place, together with broader measures, such as restricting the volumes of elective surgery (AIHW 2021b).

Private hospitals

Private hospitals are largely owned and operated by private (non-government) organisations – either for-profit companies or not-for-profit organisations (AIHW 2016). Private for-profit and religious/charitable hospitals provide around 80% of available beds in private acute care and psychiatric hospitals (Senate Standing Committee on Community Affairs 2000).

From the time of the Spanish influenza until the late 1970s, many private for-profit hospitals were small institutions, often owned and operated directly by medical practitioners. From the 1990s, the private hospital sector grew considerably, with corporations entering the for-profit market (PC 1999; Senate Standing Committee on Community Affairs 2000). For instance, from 2006–07 to 2016–17, the number of private hospitals increased from 557 to 657, with their income increasing from around $7.5 billion to $15 billion (ABS 2018b).

The Australian Government now regulates private hospitals through various provisions of the *National Health Act 1953* (Cth) and the *Private Health Insurance Act 2007* (Cth). Private hospitals also need to be licensed by each state and territory government. The licensing requirements vary across jurisdictions (Department of Health 2012), but most jurisdictions incorporate controls on the number and geographical location of private hospital beds (PC 1999).

Private hospitals undertake most elective surgeries in Australia. In 2018–19, two-thirds (66%) of all elective admissions to hospital involving surgery were to private hospitals, with the number of hospitalisations of this type having grown at an average of 1.2% each year since 2014–15. The COVID-19 pandemic response has, at times, restricted health care activity, including the volume of elective surgery. This has reduced the activity of private hospital facilities and related medical specialist and allied health services. For example, the number of hospitalisations in private hospitals for an elective admission for surgery fell by 5.7% between 2018–19 and 2019–20 after national restrictions on elective surgery were introduced in March 2020 (AIHW 2021a).

Recognising resources that might be available to help respond to the COVID-19 pandemic (including essential equipment and staff), the Australian and state and territory governments initiated a range of agreements with private hospitals to ensure a cooperative approach. These agreements, such as the National Partnership on COVID-19 Response (see https://federalfinancialrelations.gov.au/agreements/covid-19-response), enabled sharing of resources and continuing care to vulnerable populations who might have ordinarily received care in a public hospital. They also preserved the viability of private hospitals during this critical time, enabling them to continue their operations when the pandemic response ended.

Health protection and other public health measures

The health protection and other public health measures introduced to manage the Spanish influenza and COVID-19 were similar in many respects. Before it was known that the Spanish influenza had reached Australia, strict quarantine measures were introduced in an attempt to keep it out of the country; these were removed when the first case was confirmed in Melbourne in January 1919 (NMA 2021). States made their own arrangements to handle and contain disease outbreaks, including organising border controls. In Sydney strict measures were implemented to limit the spread of the disease, including closing schools and places of entertainment and mandating the use of masks (NMA 2021). Such measures did not prevent the spread of the disease but they did slow its movement (NMA 2021).

How health messages and communication are delivered has changed considerably since 1919. During the Spanish influenza, efforts were made to slow transmission through public health education initiatives, such as distributing information flyers (Stephens 2020). This contrasts with the way the COVID-19 pandemic has been managed: social media and daily briefings by politicians and health officials covering key announcements and presenting latest case numbers.

While the way in which health information is delivered has changed since the Spanish influenza outbreak, some public health measures and restrictions adopted for the COVID-19 pandemic were similar. For instance, the strict border controls; quarantine and contact tracing measures; and the closure of schools, non-essential retailers, places of entertainment and workplaces. During COVID-19, travel has been restricted and, where possible, people have worked or studied from home. At various stages, wearing of masks has been mandated in specific contexts, and social distancing and hand hygiene have been encouraged throughout (see 'Health promotion and health protection' at https://www.aihw.gov.au/reports/australias-health/health-promotion).

Telehealth

One way that these measures were supported was through the expansion of telehealth arrangements. Telehealth is the umbrella term for the electronic and telecommunication based expansion of health care services, which include telemedicine (telehealth clinical services) and electronic health record systems (Bursell et al. 2013). In the early 1990s, telemedicine was described as:

> *'the linking of doctors, nurses, patients and specialists using telecommunications with additional facilities such as slow scan television and voice conferences. Computer-based systems can also provide access to diagnostic images and pathology reports as well as computer-based information retrieval systems'* (AIHW 1993:1).

The Australian Government funds telehealth services – real-time telephone and video consultations – through the MBS, while state and territory governments administer teleconsultations within the public hospital system (Taylor et al. 2021).

During COVID-19, an important measure to prevent disease transmission was the introduction of government subsidies for a wide range of medical professionals that expanded access to telehealth under Medicare for consultations that had not previously been eligible. In 2020, 23% of all Medicare services were telehealth service – primarily delivered by telephone (AIHW 2021b). Of Medicare subsidised services, consultations with GPs were most likely to be conducted via telehealth (25% of consultations in 2020) compared with specialist (17%) and allied health attendances (16%).

Medicine policy and vaccines

Contrasting with the rapid development of vaccines for COVID-19, little was known about viruses at the time of the Spanish influenza (Sheehan 2020). Despite this, multiple groups around the world, including some in Australia, worked to develop a vaccine. Millions of doses of vaccine were made and then distributed, without the clinical trials required today. The vaccines were what would now be called broad-spectrum vaccines; primarily, they reduced the number of secondary infections in people who already had influenza by 'collecting gunk out of the lungs of people who had confirmed cases of pneumonic influenza' (Lyons and Taylor 2020). The demand for vaccination was strong, with a quarter of the population of New South Wales lining up to get it voluntarily (Lyons and Taylor 2020).

One group working on the Spanish influenza vaccine was Commonwealth Serum Laboratories (CSL), set up by the Australian Government in 1916 to reduce Australia's dependence on overseas vaccines (NMA 2021; NSW Health Department 1997). As well as a vaccine for the Spanish influenza, CSL developed vaccines for typhoid, cholera, plague, smallpox and diphtheria antitoxin (Burgess 2003).

During the 1920s and 1930s, the first mass vaccination programs began, including school-based vaccination programs immunising against diphtheria (Burgess 2003; NCIRS 2021). The outbreak of World War II (in 1939), again stimulated vaccine development, as it was feared that a recurrence of an influenza pandemic might decimate the armed services (NSW Health Department 1997). The availability of these and other vaccinations (including against polio and tuberculosis), along with improvements in social conditions and the availability of treatment options, markedly reduced deaths from infectious diseases over the course of the 20th century. For more information, see Chapter 4 'Changing patterns of mortality in Australia since 1900'.

The successful Social Services referendum in 1946 (with consequential change in constitutional powers) led to the passing of the *Pharmaceutical Benefits Act 1947* (Cth) (Biggs 2003), with the first round of medicines to be subsidised directed towards antibiotics and vaccines for conditions such as diphtheria. The PBS, as it is known today, came into effect in 1960; it was established under the *National Health Act 1953* (Cth) (Department of Health 2021b; Goddard 2014; Grove 2016).

Although the PBS has historically been used to subsidise vaccines, few now remain on it. In recent years, new vaccines have been listed predominantly on the National Immunisation Program (NIP) Schedule. Under legislation, the Pharmaceutical Benefits Advisory Committee must consider both PBS and NIP listings.

The Australian Government retained responsibility for vaccination programs until 1988, when it was transferred to state and territory governments (NCIRS 2021). This resulted in variation across Australia in implementing the NIP. Each jurisdiction used different vaccine schedules, pricing varied, and some diseases (such as measles) were not well controlled (Ruff et al. 2012).

In 1993, the first national strategy for immunisation (1993 to 2001) was produced by a panel of experts on behalf of the National Health and Medical Research Council, which set out a common vaccination schedule and fixed pricing for all states and territories (NCIRS 2021). The strategy outlined clear responsibilities for immunisation through a childhood immunisation agreement between the Australian and state and territory governments. It also specified:

- better mechanisms for recording and reporting data
- better coordination between public and private sector providers
- recommendations for immunisation coverage (Department of Health 2019).

Australian and state and territory governments established the NIP in 1997 to reduce the number of cases of diseases preventable by vaccination by increasing immunisation coverage (Department of Health 2021d). The NIP is delivered and coordinated across these levels of government. It is underpinned by the National Immunisation Strategy (currently for 2019–2024) (Department of Health 2019), which outlines strategic priorities and regulation policy. A range of committees and other bodies play key roles in advising on and directing the strategy. Today, the NIP is viewed as a key success in Australia's immunisation coverage. For more information, see Chapter 4 'Changing patterns of mortality in Australia since 1900'.

In the mid-2000s, Australian immunisation agreements enhanced coordination between the Australian Government and state and territory governments. This led to consistent funding for all vaccines of the NIP in return for agreed outcomes for immunisation coverage and vaccine wastage (Ruff et al. 2012).

As with all medicines today, several phases of clinical trials of COVID-19 vaccines were conducted before they were approved for use (Box 5.3). Their rapid development was made possible by:

- considerable international efforts and coordination
- the ability to undertake trials concurrently (rather than sequentially)
- the availability of newer technologies (Department of Health 2021c). One such technology was the availability of mRNA (Messenger RNA) vaccines that had been researched in recent decades for use in protecting against other diseases and can now be produced more efficiently than traditional methods of production (CDC 2022).

Box 5.3: Current process for authorising new medicines and medical services

The Medical Services Advisory Committee (MSAC) and the Pharmaceutical Benefits Advisory Committee (PBAC) are the bodies responsible for assessing and recommending new medicines and medical services for public funding in Australia. Both committees analyse the comparative safety, clinical effectiveness and cost-effectiveness of proposed medicines and medical services and technologies throughout their evaluation.

The committees have defined assessment procedures and use several subcommittees to assist them with their evaluation. The PBAC, for example, uses an Economics Subcommittee to assess clinical and economic evaluations of medicines submitted to it for listing; the subcommittee advises the PBAC on technical aspects of these evaluations.

Both committees analyse cost-effectiveness as part of their scope. For example, the MSAC uses a 5-year time horizon to evaluate cost-effectiveness, using metrics such as:

- the number of people likely to use the proposed medical service
- the number of times the proposed medical service is delivered
- the costs for each form of the proposed medical service, multiplied by the relevant unit costs.

Transformation of medical care and specialisation

In 1919, although hospitals may have had separate clinical departments, 'there was little evidence of any organised specialisation' (Storey 2014). This changed after World War I. The experiences and needs of patients after the war drove greater specialisation of medical practice and the development of postgraduate training opportunities. The first medical college, the Royal Australasian College of Surgeons, was established in 1927 (Storey 2014).

Critical and intensive care medicine have been particularly important areas of medical care in combating the COVID-19 pandemic:

- Critical care medicine (CCM) is a highly specialised medical field. It has developed rapidly over recent decades and plays an increasingly crucial role in providing hospital care (Thompson et al. 2017). CCM has the capability to reverse near-fatal states and to temporarily support failing vital functions, systems and organs, while the patient recovers from the underlying disease process (Villar et al. 2001).
- Intensive care is a separately recognised specialty in Australia, with specific postgraduate training and qualifications. ICUs are dedicated wards, usually staffed by specifically trained intensive care specialists (Hillman 2007), where patients can be continually observed and monitored, with life support (including ventilation) provided if needed.

The first respiratory unit using tank ventilators in Australia was established in the late 1950s, and the first unit using positive pressure mechanical ventilators (which 'deliver' breaths to the patient to make breathing easier) in 1961 (Blyth 1987). Use of positive pressure ventilators had became widespread after a polio epidemic in Denmark in 1952 when it was used to treat patients with acute respiratory failure – a milestone usually regarded as the 'birth' of intensive medicine. Before this, ventilation support relied on the 'iron lung', which was based on negative pressure ventilation – breathing was stimulated by applying negative air pressure to expand the chest, thereby expanding the lungs and allowing air to flow in.

During the 1970s, the scope of intensive care increased, and today ICUs now care for 'critically ill patients with a wide range of life-threatening respiratory, circulatory, neural and metabolic disorders caused by trauma, sepsis and meeting medical, surgical and paediatric diseases' (Blyth 1987). Intensive care physicians have, since the 1970s, been transforming medicine by integrating knowledge derived over generations with modern medical research and information technology (Villar et al. 2001).

CCM, particularly ventilation, is a vital aspect of the care of people suffering from advanced states of COVID-19 infection. Because of the specialised nature of both the staff and the facilities that constitute CCM, however, they are not widely available throughout Australia. At the start of the COVID-19 pandemic, there were around 200 ICUs with approximately 2,200 beds across the public and private hospitals, with most based in the major capital cities.

Australia's hospital system plays an important role in managing and treating COVID-19 patients, and in many ways the focus of Australia's response to the COVID-19 pandemic has been to ensure these facilities are not overwhelmed. This has entailed planning for surge responses and purchasing more ventilators. The focus of this strategy, however, has largely been on public health and social measures to limit the spread of the disease, and the temporary cancellation of many elective surgeries – some of which rely on ICUs as part of post-operative care arrangements.

From data submitted annually to the AIHW's National Hospital Morbidity Database it is possible to determine the number of people who were hospitalised with COVID-19 for the first part of 2020. Between January and June 2020:

- over 2,600 hospitalisations involved a COVID-19 diagnosis
- 8.6% of these hospitalisations involved a stay in an ICU
- the average length of stay for hospitalisations was 9 days, ranging from 1 day to 87 days (AIHW 2021a).

The number of hospitalisations and ICU stays since mid-2020 will have increased substantially. For updated information presented as daily counts, see Chapter 1 'The impact of a new disease: COVID-19 from 2020, 2021 and into 2022'.

Conclusion

Australia's health care system has evolved substantially from the time of the Spanish influenza pandemic of a century ago, to the system in place today. The response to the COVID-19 pandemic has, so far, been more effective than the response to the Spanish influenza epidemic in curtailing the spread of the disease, and in treating people infected by it. It is the hard work of a century that has created a health system that can cope with a major health crisis like COVID-19.

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Health service costs in the last year of life

6

Health service costs in the last year of life

Key findings

This article presents findings from a forthcoming AIHW study (AIHW forthcoming 2022b) that used linked administrative data to examine health service use and costs in the last year of a person's life for 4 main types of health services: hospital admissions, emergency department (ED) presentations, Medicare Benefits Schedule (MBS) services, and prescriptions supplied under the Pharmaceutical Benefits Scheme (PBS) and Repatriation Pharmaceutical Benefits Scheme (RPBS).

Key findings are:

- although only around 0.7% of the Australian population die each year, 8.0% of the health expenditure in scope was for people in their final year of life. This outlay was 17 times as high as costs for people not in the last year of their life (when adjusted for the different age profiles of these 2 population groups)
- for each of the 4 health service types analysed, costs were higher for people in their last year of life than for people who were not. This cost ranged from 4.8 times as high for MBS services to 39 times as high for hospital admissions
- average annual health service costs per person were much higher for young people in their last year of life compared with equivalent costs for people of the same age not in their last year of life, but this differential decreased with age. For example, costs for young people aged 10–19 in their last year of life were 43 times as high as costs for people of the same age who were not in their last year of life, but only 3.1 times as high for people aged 80 and over
- among the leading causes of death, average health service costs in the last year of life were highest for people who died from cancer (in particular, colorectal, breast and prostate cancer), and lowest for people who died from dementia (including Alzheimer's disease) and suicide
- people who died aged 85 and over and used residential aged care in their last year of life:
  - used fewer hospital and MBS services, but had more prescriptions supplied under the PBS (on average) than people of the same age who died and did not use residential aged care in their last year of life.
  - had 27% lower average health service costs (excluding the costs of aged care and health care provided by residential aged care services) than people of the same age who died and did not use residential aged care in their last year of life.

Although these findings are largely consistent with previous research, the study reported on in this article has provided new insights on this topic.

In 2020, 161,300 deaths were registered in Australia (AIHW 2022a). Understanding how people interact with Australia's health system in the period leading up to death provides vital information on health care provision in the last year of life. This information is essential to assess and evaluate health service planning and policy.

Australians experience a wide variety of health service pathways in their final year of life, which vary according to demographic and clinical factors. Healthy young people and people who die due to causes such as injury often have no contact with the health system in the 12 months before their death. In contrast, people aged 65 and over who have multiple comorbidities (Legler et al. 2011; Luta et al. 2020) and die from specific causes such as cancer have very high levels of health service use.

Knowing the cost of services in the last year of life allows us to understand and compare the intensity of health care service needs in the lead up to death across different types of services. Past research suggests that there are large variations in health service costs by age and that these costs vary by cause of death (being higher for causes such as cancer and lower for those such as dementia (including Alzheimer's disease)).

While there has been some international and Australian-based research exploring patterns of health service use and costs in the period leading up to death, the findings presented in this article are from a study that looked at a range of health care services and causes of death in Australia on a large-scale for the first time. The study (AIHW forthcoming 2022b) delivers new insights on the topic, including:

- estimates of the total cost of the health services examined that were spent in the last year of life
- detailed cost estimates for people who used and did not use residential aged care in their last year of life
- characteristics of people who use, and do not use, health services in their last year of life.

The study uses linked administrative data available from the AIHW's National Integrated Health Services Information Analysis Asset (NIHSI AA), to estimate health service costs for 4 main types of health services:

- public hospital ED presentations
- public (and some private) hospital admitted patient hospitalisations
- Medicare services covered by the MBS, such as general practitioner (GP), specialist, pathology and diagnostic imaging services
- prescriptions supplied under the PBS and RPBS (referred to collectively as PBS in this article).

The total estimated cost of these 4 health services over the period of analysis (1 July 2010 to 31 December 2016) was $296.1 billion (average of $45.6 billion per year). Of this total, 8.0% ($23.6 billion; average of $3.6 billion per year) was spent on these health services in the last year of life. Note the health expenditure estimates in this article differ from those published in the AIHW's Health Expenditure Australia reports (AIHW 2021) because of differences in the scope of the health services and costs included in NIHSI AA (version 0.5). For further information, see the section 'Health services and costs in and out of scope of this analysis' below.

Key findings from this study will help to fill a major evidence gap in an area with growing policy relevance in Australia – particularly in the context of population growth, ageing, increased longevity, a growing economy and increased spending on health. This article and its findings will be useful for health care professionals (including those people working in palliative care settings), policy makers and researchers for current and future planning and health service delivery.

Findings from previous research

Limited research has been undertaken previously on this topic in Australia. Studies based on one-off linkage projects have been undertaken in New South Wales (Chróinín et al. 2018; Reeve et al. 2018) and Western Australia (Spilsbury and Rosenwax 2017). Studies were also published using survey and linkage data from the Australian Longitudinal Study on Women's Health (Dobson et al. 2020; Harris et al. 2016). Internationally, larger studies were undertaken in countries such as New Zealand (Blakely et al. 2015; Hamblin et al. 2018), England (Luta et al. 2020) and Scotland (Diernberger et al. 2021).

These previous studies showed that, in general, health service use was higher for people in their last year of life than for people of similar age who were not. However, health service use and costs among people in their last year of life have also been found to vary according to the type of service, age of the person, proximity to death (for example, 6 months or 12 months before death), cause of death, and place of death (such as a residential aged care facility or a hospital).

For example, studies looking at proximity to death and age at death have found the following:

- healthcare use and costs in the last year of life increase with proximity to death (Diernberger et al. 2021; Langton et al. 2016; Luta et al. 2020)
- health service use is higher for people in their last year of life than for people of the same age who are not. However, as people age (particularly after age 90), this difference diminishes for most health service types (Hamblin et al. 2018)
- overall health service costs are higher for young people in the last year of life than equivalent costs for people of the same age who are not. However, by the time people reach age 95, there is little difference in costs between the people in their last year of life and those who are not (Blakely et al. 2015)
- older age at death, particularly of people aged 95 and over, is associated with lower hospital admission rates and costs (Chróinín et al. 2018; Diernberger et al. 2021; Hamblin et al. 2018; Langton et al. 2016; Reeve et al. 2018).

Cancer and cardiovascular diseases are leading causes of death in Australia. Dementia (including Alzheimer's disease) is the leading cause of death for older Australians (aged 85 and over). Studies looking at health service use and costs in the last year of life by cause of death have found that:

- dying of cancer is associated with higher rates of hospitalisations, primary care service use and prescription medicine use but lower rates of ED use than deaths from other causes (Diernberger et al. 2021; Langton et al. 2016; Reeve et al. 2018)
- dying from dementia is associated with lower average hospital admissions than dying from other leading causes such as cardiovascular diseases and respiratory diseases (Diernberger et al. 2021; Dobson et al. 2020)
- hospital use in the last year of life is associated with other factors that may be independent of the cause of death, such as the number and type of comorbidities and common principal diagnoses in hospital (Bardsley et al. 2019; Dobson et al. 2020; Luta et al. 2020). For example, a person may die from cancer but may be hospitalised for a pre-existing condition, such as cardiovascular disease.

Studies looking at place of death have found that people who die in residential aged care incur lower health service costs than people who die in hospital (Langton et al. 2016).

How did this study examine health services and costs in the last year of life?

De-identified data from the NIHSI AA were used to retrospectively examine health service records of people who had died. Four health service types were examined: ED visits, hospital admissions, MBS services and prescriptions supplied under the PBS. See Box 6.1 for more information on the NIHSI AA.

Box 6.1: What is the National Integrated Health Services Information Analysis Asset?

The NIHSI AA is an enduring linked data asset managed under the custodianship of the AIHW. It is available for analysis by the AIHW and participating jurisdictions for approved projects. Creating this data asset has enabled, for the first time ever, a wide range of complex issues to be analysed. For example, the AIHW has reported on data currently available on the use of primary and community-based secondary healthcare services by people with dementia through services provided under the MBS (AIHW 2021a); it has also examined the feasibility of predicting early dementia using Medicare claims (AIHW 2021e).

Using NIHSI AA has enabled a richer understanding of the patterns of health service use and costs in the year before death than was previously possible by using a single data source. NIHSI AA datasets are also longitudinal, so that trends, patient pathways, disease prevalence and severity can be better understood and analysed over time.

The version of NIHSI AA (version 0.5) used in this study contains linked data from 2010–11 to 2016–17, which was the most recent available at the time of analysis. It presents data on:

- admitted patient care services (in all public and, where available, private hospitals), ED services and outpatient services in public hospitals for all participating states and territories (New South Wales, Victoria, South Australia and Tasmania)
- PBS and RPBS national data (hereafter, for ease of reference, collectively referred to as PBS data in this article)
- MBS national data
- residential aged care national data (includes permanent residential aged care and respite care)
- National Death Index data (deaths from 1 July 2010 to 31 December 2017).

The NIHSI AA is currently updated annually, with the latest version including data up to June 2019, with data for 2019–20 expected to be added by September 2022.

This article uses the 12 months before death to analyse and present patterns of health service use and costs that align with the time period before death used in some other key research on this topic. Deaths from 1 July 2010 to 31 December 2017 were included in the analysis. Note that service use and costs for people who died at the start or end of the study period will not cover a full 12 months before death. Methods used in this study are detailed in the Technical notes of the detailed report (AIHW forthcoming 2022b).

Residential aged care data in the NIHSI AA were used only to indicate whether people had used residential aged care or not in their last year of life. The costs of residential aged care were not included in this study. However, it is acknowledged that aged care services provide essential care and support to many people in their last year of life.

Similar analyses using data in the NIHSI AA could be undertaken for different proximities to death (for example, last 2 years, 6 months or 3 months before death).

Note that findings in this article indicate patterns of health service use and costs in the last year of life before the outbreak of the coronavirus disease (COVID-19) in Australia. Some of these patterns are likely to differ in 2020, 2021 and 2022, when lockdowns and restrictions affecting access to health services due to the pandemic were in place for some of the year.

Health services and costs in and out of scope of this analysis

Health service costs for MBS services and for prescriptions supplied under the PBS include both Australian Government benefits paid, and patient out-of-pocket costs. Hospital admitted patient and ED attendance costs include government (Australian Government and state/territory government) costs only. Non-government hospital and ED costs such as out-of-pocket and private health insurance costs (estimated to represent around 21% of total health expenditure (AIHW 2021b: Table 29)) are not captured.

Other health system costs not captured in the NIHSI AA v0.5 and thus not included in estimates presented in this article include those for:

- admitted patient care services, ED services and outpatient services in all public hospitals in Queensland, Western Australia, the Australian Capital Territory and the Northern Territory
- admitted patient care services in private hospitals in any state or territory except Victoria
- ambulance services
- community health, allied health and dental services
- over the counter pharmaceuticals

- Department of Veterans' Affairs (DVA) primary care services (MBS equivalent and allied health) and residential care services
- community-based aged care, such as in-home palliative care and community nursing
- community and residential mental health services
- mental health programs such as headspace.

Government costs for hospital admitted patient hospitalisations and ED presentations were estimated using the Independent Hospital Pricing Authority's activity based funding formula applied to each service. Methods and calculations used to estimate costs and service utilisation are in the Technical notes of the detailed report (AIHW forthcoming 2022b).

Aged care costs are not included in the estimates for health system costs. However, it is acknowledged that aged care services can provide health-related services for residents in their final year that are not provided through MBS, PBS or hospital care.

Health service use and costs in the last year of life

Nearly all Australians use health services in their last year of life

Slightly more than 1.1 million people died between July 2010 and December 2017. Of these people, 97% (1.1 million) used at least one health service (as captured by the NIHSI AA) in their last year of life. This proportion was similar for males (97%) and females (98%) but was slightly less for people aged 0–64 (91%).

Under half (48%, 550,000 people) of Australians who died between July 2010 and December 2017 visited an ED at least once in their last year of life, and 48% (549,000) had at least one acute hospital admission. Around 94% (1.1 million people) were supplied at least one prescription under the PBS (such as anti-dementia drugs, opioids and immuno-suppressants) and 91% (1.0 million) used at least one MBS service (such as a GP attendance, specialist service, pathology service and diagnostic imaging).

Considering the 20 leading underlying causes of death, people least likely to use any of the 4 health service types in their last year of life were people who died by suicide (10%) and from coronary heart disease (3.1%). Furthermore, 63% of people who died by suicide did not visit an ED, 98% did not have a mental health hospital admission and 78% did not have an acute hospital admission in their last year of life. Eleven per cent of people aged 0–64 who died from accidental falls did not use a health service in their last year.

In their last year of life, people visited an ED an average of 1.4 times per person and were admitted to hospital 2.6 times, on average. There was little difference in the age-standardised average annual numbers of hospital admissions and ED visits per person between people in their last year of life and people who were not.

After adjusting for age, average annual MBS service use among people in their last year of life was 4.5 times as high as that for people who were not (48 and 11 services per person, respectively), while the average annual number of prescriptions supplied to people in their last year of life was 4 times as high as that for people not in the last year of life (30 and 7.4 prescriptions per person, respectively). The number of reported MBS services are very high as every pathology test generates a separate MBS claim.

Estimated lifetime health costs for people who died

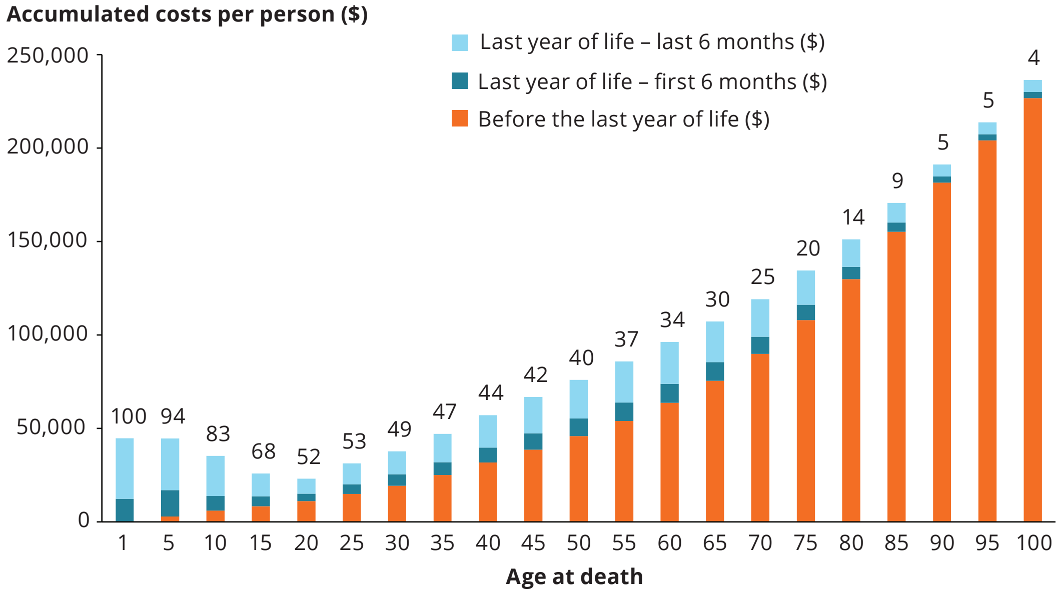
Total estimated lifetime costs for the 4 services analysed ranged from:

- $44,800 for infants
- to $23,200 for people aged 20 when they died
- to $236,000 for people aged 100 or over when they died.

An estimated 8.0% of all health expenditure for the 4 health services was incurred for people in their last year of life. However, this varied depending on the age at death. When looking at the accumulated lifetime costs per person for the health services examined, costs spent in the last year of life generally fell with increasing age (Figure 6.1).

Due to data limitations, estimating lifetime health system costs of Australians using linked data is challenging. Importantly, for this analysis, it was assumed that health care costs for people in the years before their last year of life, are equivalent to the annualised age-specific costs estimated from the data. Methods used to estimate lifetime costs are in the Technical notes of the detailed report (AIHW forthcoming 2022b).

Figure 6.1: Estimated lifetime health costs, by age at death



Note: The numbers above each bar are percentages, representing, the proportion of costs attributable to the last year of life at each age at death.

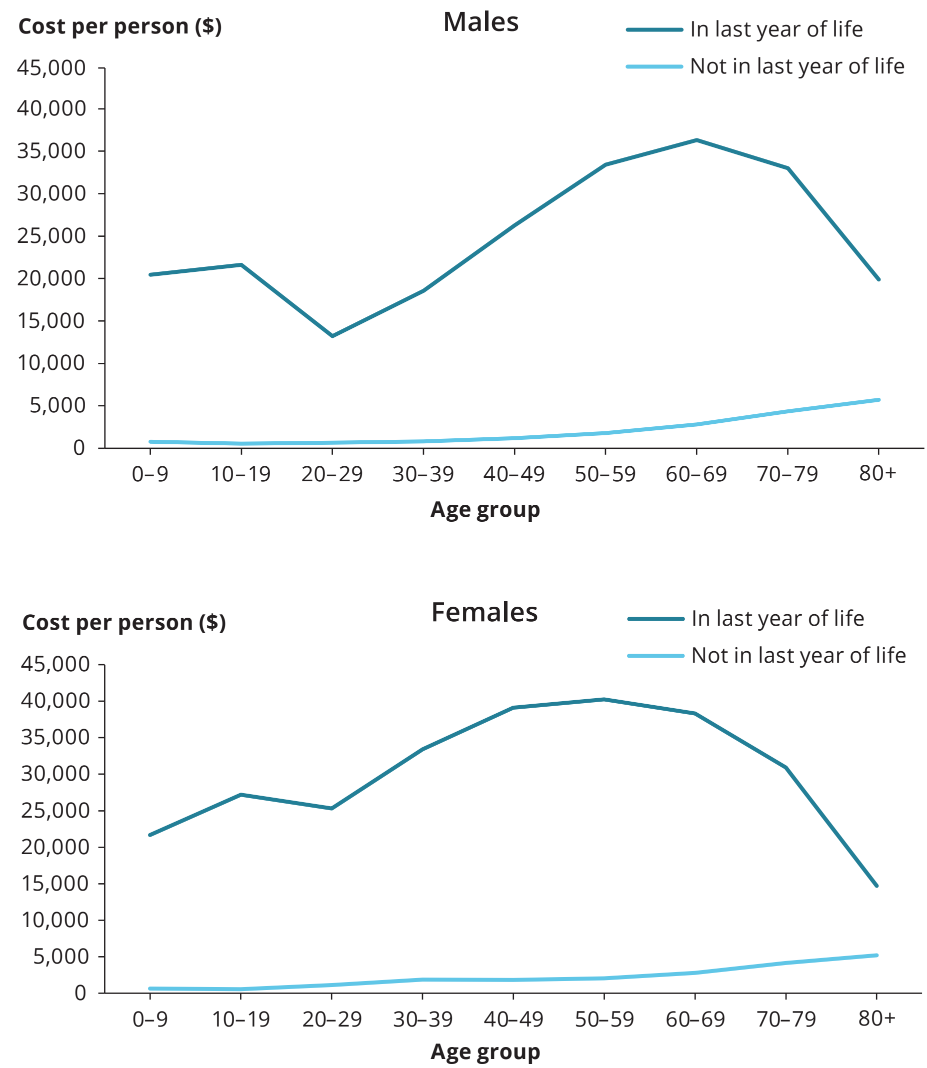
Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Average healthcare costs in the last year of life vary by age group and sex

Slightly more than half (51%, 582,300 deaths) of all deaths during the study period occurred in males and they accounted for 56% of total health service costs in the last year of life. Overall, the annual average cost of the 4 health services was higher for males than females ($26,300 and $21,600 per person, respectively). However, after age-standardising to the 2001 Australian Standard Population, the overall annual average cost was higher for females ($31,100 per female) than males ($23,700 per male).

Almost 90% (989,000 deaths) of deaths occurred in people aged 60 and over, with this age group accounting for 83% of total health service costs in the last year of life. Average annual costs of health services per person in the last year of life were lowest among people aged 20–29 ($16,600); they then increased with age to the 60–69 age group ($37,100) before declining to around $17,000 for people aged 80 and over. Average annual health service costs among people not in their last year of life generally increased steadily with age. The lower costs for young adults in both population groups are likely to be largely driven by males dying from sudden causes of death such as traffic accidents which are not associated with prior direct health service use. These patterns for people in and not in their last year of life were similar for females and males (Figure 6.2).

Figure 6.2: Average annual health service cost per person, by sex, age group and whether in last year of life



Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Among young people, those in their last year of life had higher average annual health service costs than those not in their last year of life

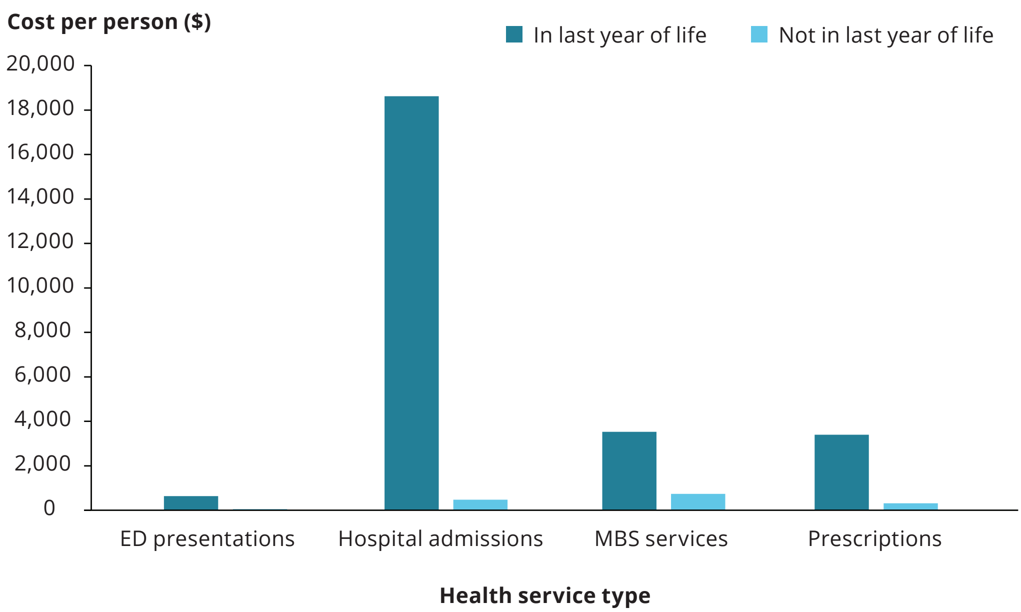
Overall, the crude average annual health costs per person were $24,000 for people in the last year of life and $1,700 for people who were not. After adjusting for age, the average annual health cost per person in the last year of life was 17 times as high as that for people not in their last year of life ($26,200 compared with $1,600 per person).

Health care spending for people in their last year of life differs significantly from that for people of similar age who are not in their last year of life. Average annual health service costs were much higher for young people in their last year of life (up to 43 times as high for people aged 10–19 compared with people of the same age who did not die); however, the differential decreased with age (for example, by age 80, annual average health service costs were only 3 times as high). A similar pattern was evident when looking at costs for each of the health service types individually.

The age-standardised average annual costs for each type of health service were higher for people in their last year of life than for the rest of the population (Figure 6.3). They were:

- 39 times as high for hospital admissions ($18,600 per person in last year of life compared with $475 per person not in the last year of life)
- 12 times as high for ED visits ($640 compared with $53)
- 11 times as high for prescriptions supplied under the PBS ($3,400 compared with $320)
- almost 5 times as high for MBS services ($3,500 compared with $740).

Figure 6.3: Age-standardised average annual health service cost per person, by whether in last year of life and health service type



Note: Average annual costs per person are age-standardised to the 2001 Australian Standard Population.

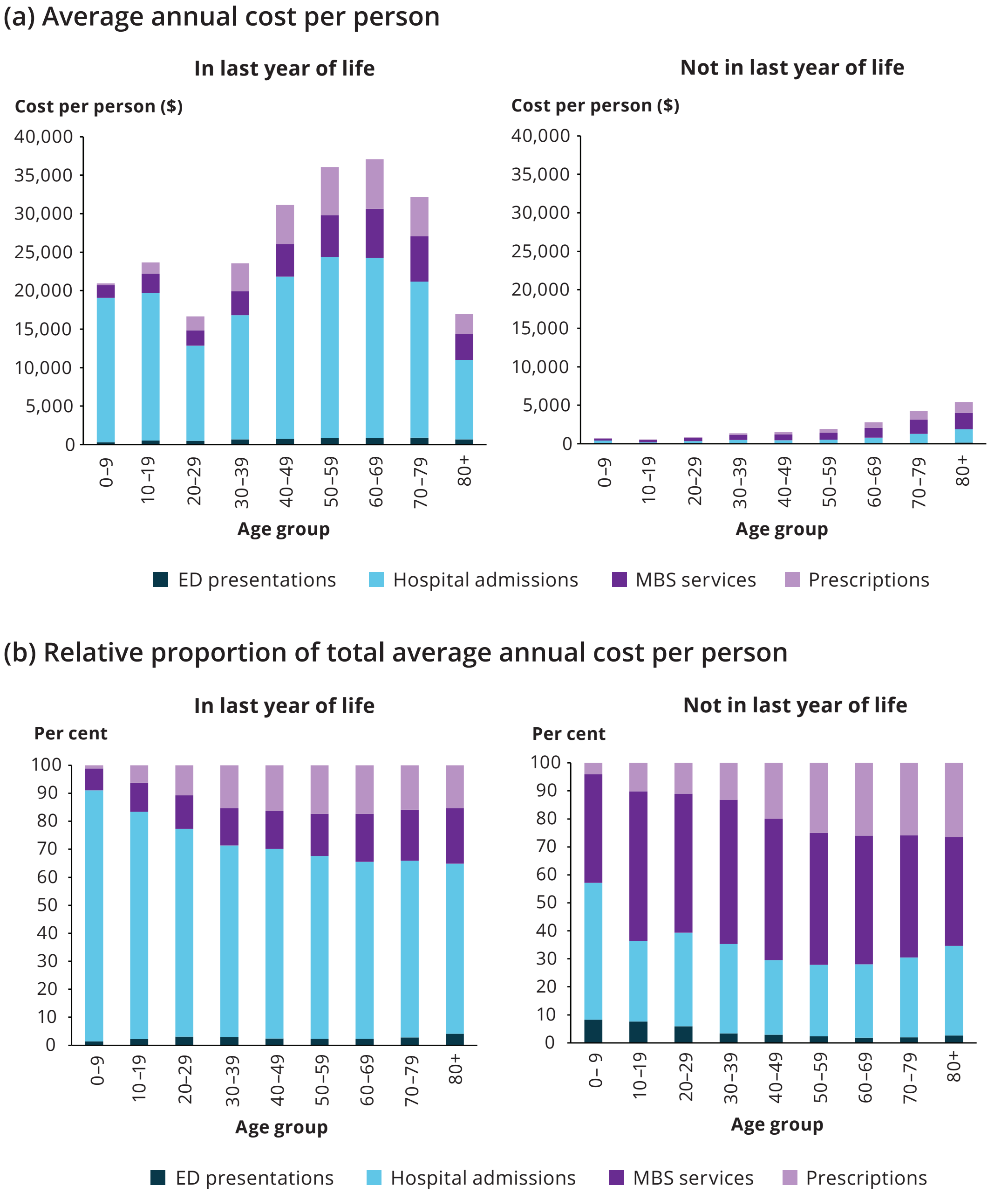
Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Of the health services included, hospital admissions accounted for the largest average costs per person in the last year of life in each age group, being highest in people aged 50–59 and 60–69. For both MBS services and for prescriptions supplied under the PBS, average costs in the last year of life were highest in the 60–69 age group. The average cost of ED attendances per person in the last year of life increased between the ages of 20 and 79 (by 78%) (Figure 6.4a).

For the rest of the population (people not in their last year of life), from the age of 10, average annual costs per person for hospital admissions, MBS services and prescriptions supplied under the PBS, increased with age (Figure 6.4a). Of these health services, the highest average annual costs per person in each age group were for MBS services.

Patterns in the relative proportion of total average annual health service costs per person for the 4 health services differed between people who were in their last year of life and people who were not (Figure 6.4b). In each age group, hospital admissions accounted for the largest proportions of total average annual costs per person among people in their last year of life, while the relative costs of MBS services dominated for people not in their last year of life. As age increased, prescriptions supplied under the PBS generally accounted for an increasing proportion of the total average annual costs per person, irrespective of whether or not the person was in their last year of life.

Figure 6.4: Average annual health service cost (a) and relative proportion of total average annual health service cost (b) per person, by age group, health service type, and whether in the last year of life



Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Health service costs in the last year of life were highest for people dying from cancer

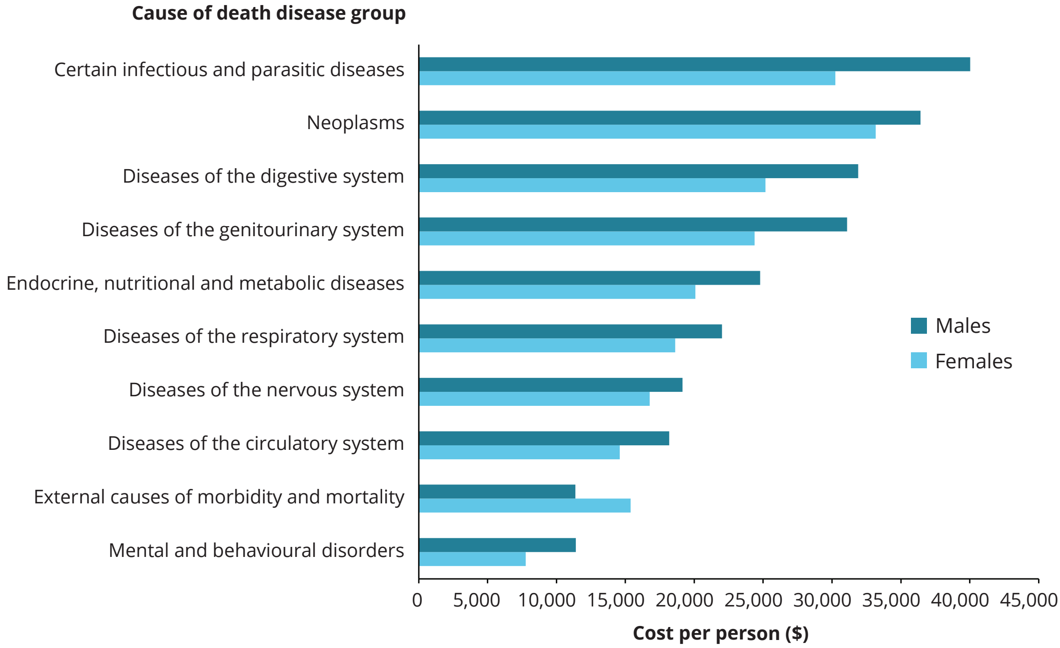
This section examines how health service costs in the last year of life differ by underlying cause of death. It should be noted that the cost data included in this section have not been adjusted for age. However, it is acknowledged that health care costs vary greatly by age for many causes of death, and more detailed analysis by age and cause of death (as well as age-adjustment) is planned as part of future work on this topic.

The total health service costs over the study period were highest among people who died from cancer, followed by cardiovascular diseases. These disease groups had the highest number of deaths over the period (335,000 and 331,000, respectively).

The average annual cost per person of health services in the last year of life was highest among people who died from infectious diseases ($35,200 per person) followed by cancer ($35,000). Deaths among women from pregnancy and childbirth had an average cost of $35,400 per female. Average health service costs were lowest for people who died from mental and behavioural disorders ($9,100 per person) and external causes (injury and poisoning) ($12,800).

By sex, average costs of health services in the last year of life were highest for females who died from cancer and males who died from infectious diseases (Figure 6.5).

Figure 6.5: Average annual health service cost per person in the last year of life, by sex and selected cause of death disease groups



Notes:

1. Disease groups are based on the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) chapter level groupings.
2. Only disease groups with a total of more than 15,000 deaths among people who died during the study period and used at least one health service in their last year of life are shown.
3. Average health service costs per person have not been adjusted for age.
4. Costs for women who died from Pregnancy and childbirth related conditions are not shown in this figure due to the small number of deaths in the period of analyses (75 deaths). However, this group incurred high health service costs.

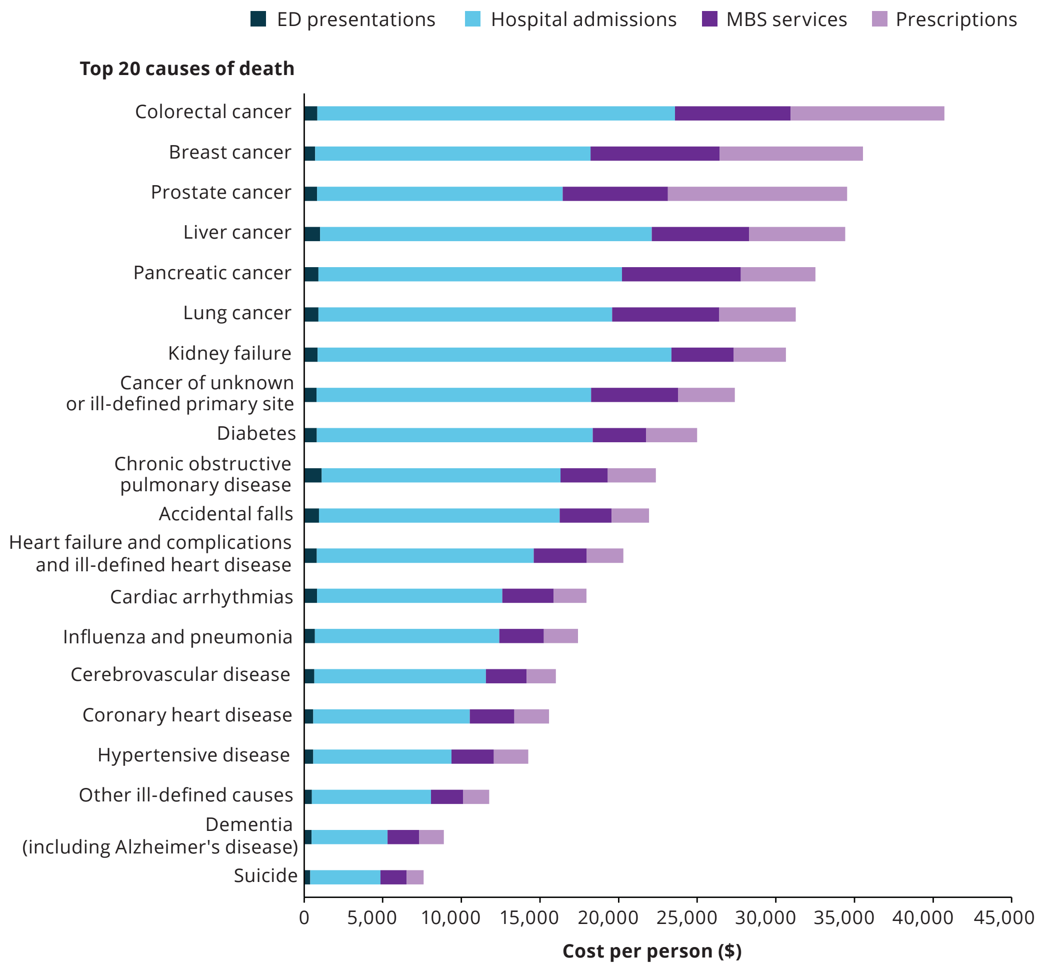
Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Considering the leading 20 specific causes of death, the average annual cost of health services in the last year of life was highest among people who died from colorectal (bowel) cancer ($40,700 per person), followed by breast cancer ($35,500 per person), and prostate cancer ($34,500 per person). Average costs were lowest for suicide ($7,600 per person) and dementia (including Alzheimer's disease) ($8,900). It should be noted that many of these conditions are associated with longer term health service costs (not just in the last year of life).

The low costs for suicide should also be interpreted with caution as it is likely that other services not included in the NIHSI AA may have been used (for example, ambulance, DVA-funded services, community and residential mental health services, homeless services and local drop-in health services), and some costs borne privately and/or through programs like headspace. However, these results are still informative as they provide policy makers with a sense of how people who die by suicide use health services and interact with the health system (or not) in their last year of life.

Looking at service type, deaths from cancers tended to have the highest average annual costs per person for hospital admissions, MBS services and prescriptions supplied under the PBS, while deaths from chronic obstructive pulmonary disease (COPD) had the highest average ED costs (Figure 6.6). Deaths by suicide had the lowest average costs per person in the last year of life for all 4 service types examined.

Figure 6.6: Average annual health service cost per person in the last year of life, by health service type and the top 20 causes of death



Notes:
1. Average health service costs per person have not been adjusted for age.
2. Data have been sorted by average total cost of the 4 health services.

Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Health service use and costs for people who used residential aged care

Previous research suggests that people's use of health services can change after entering permanent residential aged care (AIHW 2020a). This analysis uses a flag to identify people who used residential aged care (permanent residential and/or respite care) in their final year, not all of whom would have spent the entire 12 months in aged care or would necessarily have died in a residential aged care facility. Some people residing in aged care could have died elsewhere, such as in hospital (AIHW 2021c). Furthermore, the analysis was restricted to people aged 85 and over, as most deaths in aged care occur in this age group.

High proportion of deaths among people aged 85 and over who used residential aged care in their last year of life

Over the study period, there were 432,000 people who died and used residential aged care in their last year of life (38% of all deaths in this study). More than two-thirds (68%) of these deaths occurred in people aged 85 and over (291,300 people). In comparison, there were 706,000 deaths among people who did not use residential aged care in their last year of life, and 25% of these deaths occurred in people aged 85 and over (176,200 people).

The remainder of this section describing services and costs by use of residential aged care focuses on people aged 85 and over only.

Women accounted for a greater proportion of deaths among people who used residential aged care in their last year of life (66%, or 192,000 women) than men (34%, 99,400 men). This is consistent with the fact that around two-thirds of people living in permanent residential aged care are women (AIHW 2021d). Women are also more likely to live longer than men and are less likely to have a living spouse/carer.

In contrast, among people who died and did not use residential aged care in their last year of life, the proportion of women (51%, 89,600 women) was only slightly higher than that for men (49%, 86,600 men).

The leading underlying causes of death among people aged 85 and over who used residential aged care in their last year of life were dementia (including Alzheimer's disease) (19%, 54,600 deaths) and coronary heart disease (16%, 47,000). For people of the same age who did not use residential aged care in their last year, the leading causes of death were coronary heart disease (17%, 29,400 deaths) and cerebrovascular disease (8.0%, 14,000).

Among all people aged 85 and over who died from dementia (including Alzheimer's disease), 88% used residential aged care in their last year of life.

More prescriptions were supplied on average for people who used residential aged care in their last year of life

Among people aged 85 and over who died and used residential aged care in their last year of life:

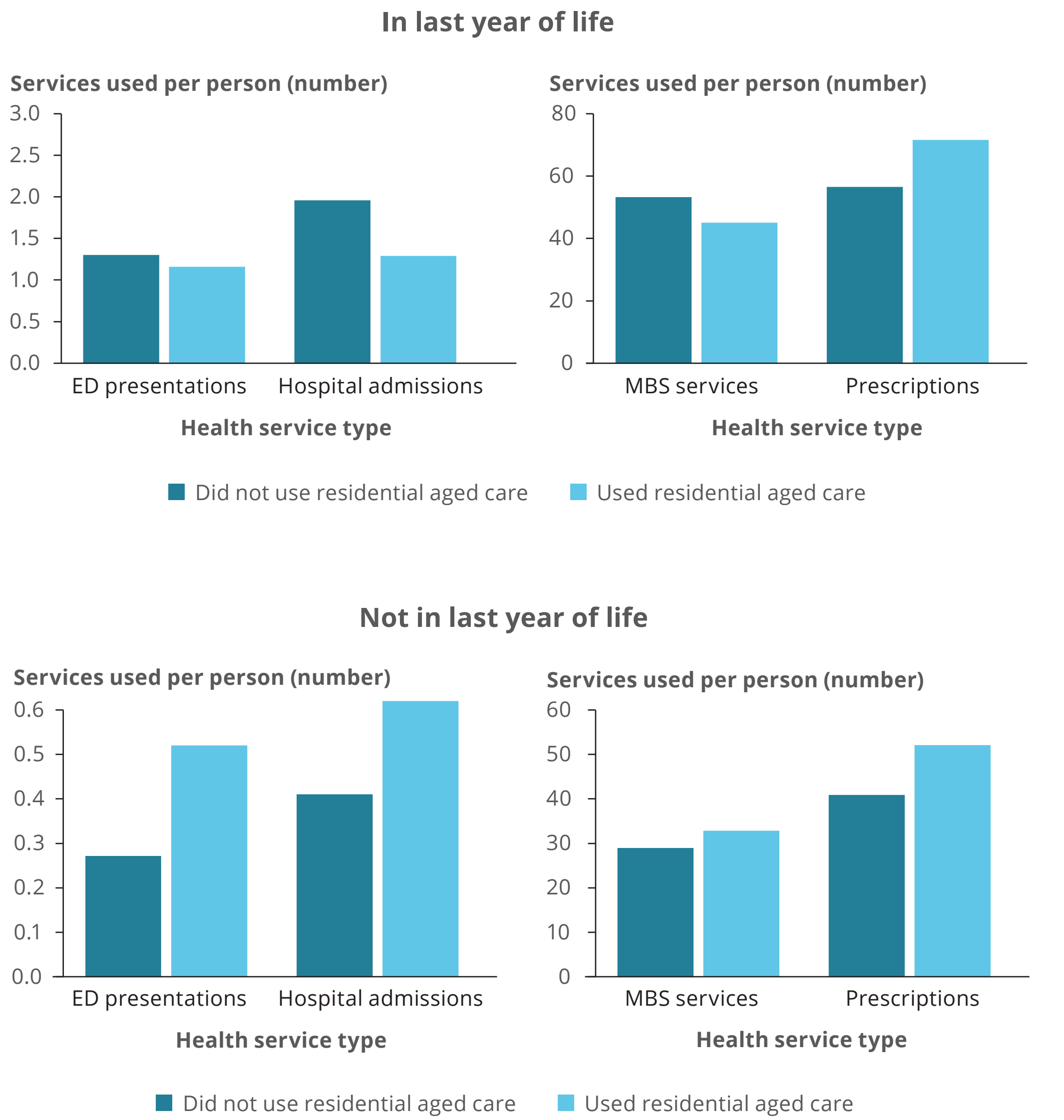
- 45% visited an ED at least once in that last year
- 43% had at least one acute hospital admission
- 90% used at least one MBS service
- almost 100% were supplied at least one prescription under the PBS.

In comparison, among people aged 85 and over who died and did not use residential aged care in their last year of life:

- the proportions with at least one ED visit or at least one acute hospital admission in that last year were higher (50% and 51%, respectively)
- the proportions using at least one MBS service or being supplied with at least one prescription under the PBS were slightly lower (85% and 96%, respectively).

On average, people aged 85 and over who died and used residential aged care in their last year of life used fewer hospital and MBS services (34% and 16% lower respectively), but had more prescriptions supplied under the PBS (27% higher), than people of the same age who did not use residential aged care in their last year of life (Figure 6.7). There was very little difference in the average number of ED visits for people who used residential aged care in their last year of life (1.2 per person) and people who did not (1.3 per person).

Figure 6.7: Average annual number of health services used per person aged 85 and over, by whether in last year of life, use of residential aged care and health service type



Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

One explanation for the lower use of MBS services among people who used residential aged care is that some of these people may access GPs by other channels – such as through DVA health care services which are not included in MBS claims.

In each year from 2012–13 to 2016–17, around 10% of people living in residential aged care had no MBS claims for GP visits while in care but most of these people probably received GP care through other means, such as DVA arrangements (AIHW 2020b). In addition, some health care services would be provided within the residential aged care facilities and are not captured in NIHSI AA. Furthermore, people who use residential aged care may not always be able to receive the care they need for reasons such as:

- increasing health care needs
- care needs not being identified or identified late
- not being able to access relevant health care services, particularly among people who are older, frail or living with disability (Royal Commission into Aged Care Quality and Safety 2021).

Thus, health service costs for people who used residential aged care are likely to be much higher than reported here.

In contrast, among people aged 85 and over who were not in the last year of life, people who used residential aged care had higher average annual service use than people who did not use residential aged care for each of the health service types examined (Figure 6.7).

Health service costs were lower for people who used residential aged care services

Around one-quarter (26%, or $6.1 billion) of the total health care costs (for the health service types examined) spent on people in their last year of life were for people who used residential aged care in their last year. For people who died aged 85 and over, 55% of health care costs or $3.2 billion were for people who used residential aged care in their last year. Note that costs of aged care or any healthcare (and associated costs) delivered as part of community aged care and the residential aged care service (and not through the MBS, PBS or hospital care) as well as outpatient care are not included in the estimates presented.

Average annual health service costs for people aged 85 and over who used residential aged care in their last year of life were:

- 27% lower than costs for people of the same age who did not use residential aged care in their last year ($12,500 and $17,000 per person, respectively) (Table 6.1)

- lower for each of the 4 health service types:
  - 32% lower for hospital admissions ($7,100 per person for people who used residential aged care compared with $10,400 for people who did not)
  - 16% lower for ED visits ($580 per person compared with $700)
  - 23% lower for MBS services ($2,600 per person compared with $3,400)
  - 14% lower for prescriptions supplied under the PBS ($2,200 per person compared with $2,500)
- higher for men than women ($14,600 compared with $11,400 per person)
- higher than costs for people who used residential aged care and were not in their last year of life (Table 6.1).

Table 6.1: Average annual health service costs per person aged 85 and over, by whether in last year of life and use of residential aged care

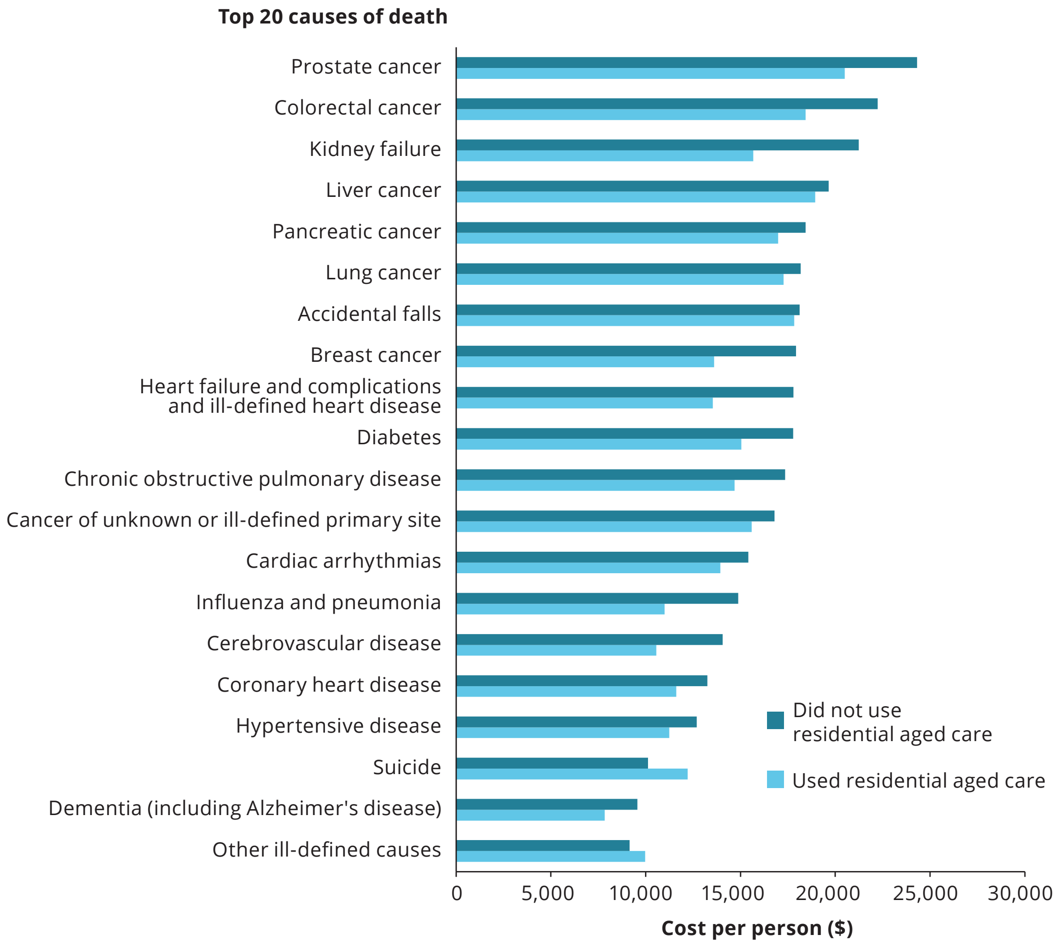
	In last year of life	Not in last year of life	Ratio
Used residential aged care	$12,488	$6,852	1.8
Did not use residential aged care	$17,023	$5,126	3.3
Ratio	**0.7**	**1.3**	..

Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Health service costs were lower for people who used residential aged care for most leading causes of death

Average annual health service costs per person among people aged 85 and over who died and used residential aged care in their last year of life were lower than costs for people of the same age who died and did not use these services for most of the 10 disease groups (with more than 15,000 deaths in total over the study period) and the leading causes of death except for suicide and other ill-defined causes (such as senility and unspecified cardiac arrest) (Figure 6.8).

Figure 6.8: Average annual health service cost per person aged 85 and over in the last year of life for the top 20 causes of death, by use of residential aged care



Note: Data have been sorted by average total cost for people who did not use residential aged care in their last year of life.

Source: AIHW analysis of the National Integrated Health Services Information Analysis Asset (version 0.5).

Future directions

This study demonstrates the value of using linked administrative health data, such as the NIHSI AA, to analyse health care service use and costs. The findings in this article provide new insights on this topic, filling information gaps not examined in previous research to date.

Future work planned to update and extend the analysis presented in this article includes:

- more detailed disaggregation by age group and adjusting all estimates (including those by cause of death) by age
- updating the health service use and cost information to include later years of data
- examining several additional factors, such as multi-morbidity, which may help to explain the drivers of high service use and costs in the last year of life (and in the Australian population more generally). For example, the following could be examined:
  - differences by socioeconomic group and remoteness area to provide information on equitable access to health services
  - different time intervals for proximity to death (for example, last 6 months, 3 months, 1 month before death).

More detailed disaggregations within each health service type for different causes of death would provide additional insights (for example, mental health services for deaths from suicide, and chemotherapy and radiation therapy services for deaths from cancer). A closer analysis of the diagnoses for hospitalisation and ED admissions in the last year of life could also be undertaken to identify costs directly associated with the cause of death.

More detailed analyses of the characteristics of people who have little interaction with the health system before death would also be of value in providing additional insights into unmet or no need for health services. It may also be possible to explore the costs of residential aged care in the last year of life using methods that have been applied in estimating expenditure for dementia.

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Reporting on the health of culturally and linguistically diverse populations in Australia

7

Reporting on the health of culturally and linguistically diverse populations in Australia

Key findings

Australia is one of the most culturally and linguistically diverse countries in the world (ABS 2017). Measuring how the health care system responds to the needs of culturally and linguistically diverse (CALD) Australians is challenging, as information to identify CALD people in health data is limited, is not collected consistently, and is not routinely reported on.

Linked data can provide a solution to some of these challenges as data are linked at the level of the individual. Information from one data set – such as CALD information from the Census of Population and Housing (Census) – can be used to supplement information in datasets that do not collect this information – such as the Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS).

This article explores variations in the use of 2 common and important health services in Australia – non-referred visits to general practitioners (GPs) and practice nurses and blood pressure lowering medicines – using country of birth and proficiency in spoken English as indicators of cultural and linguistic diversity. The analyses in these case studies are only possible with the use of linked data, as no CALD information is collected in the MBS and PBS.

Results from these 2 case studies indicate that there are:

- variations in non-referred attendances in Australia by country of birth, and by country of birth *and* English proficiency.
- differences by country of birth in the use of blood pressure lowering medicines; only 2 countries had differences by English proficiency.

These case studies demonstrate the value of linked data in providing richer information on CALD groups and their use of health services in Australia. Measuring these variations is an important first step to identify possible issues and prompt further investigation.

Combining aspects of cultural and linguistic diversity, such as country of birth and proficiency in spoken English, highlighted the diversity that exists within CALD groups. There are many dimensions of cultural and linguistic diversity that affect health status and the ability to navigate the health system; hence a range of variables may be required depending on the issue being explored.

Future analyses will explore in more detail the interaction of other sociodemographic factors with health service use and outcomes for CALD groups, including how these differ for males and females. The 2021 Census, which included a question on long-term health conditions for the first time, will provide valuable information on the health needs of CALD groups which will help to explain variations in health care use.

Australia is one of the most culturally and linguistically diverse countries in the world (ABS 2017). As at 30 June 2020, 3 in 10 people living in Australia were born overseas, with Australia's population including people born in nearly every country of the world (ABS 2021a).

Patterns of migration to Australia are driven by historical and political contexts. Currently there are 2 distinct programs to settling permanently in Australia:

- the Migration Program which includes the skilled and family streams
- the Humanitarian Program for refugees and people in humanitarian need.

Over the past 20 years nearly 3.4 million people have migrated to Australia, the majority of whom have done so via the skilled (61%) and family (30%) streams, with 9% via the Humanitarian Program (Department of Home Affairs 2020).

Table 7.1 shows the 10 countries with the largest number of migrants to Australia as at 30 June 2020, and the median age of migrants from each country. Older migrants are most likely to have been born in European countries, while younger migrants are more likely to have come from Asian countries or New Zealand.

Table 7.1: Australia's estimated resident population, by country of birth, 30 June 2020

Country of birth	Persons	Per cent	Median age (years)
England	980,360	3.8	58
India	721,050	2.8	35
China	650,640	2.5	38
New Zealand	564,840	2.2	44
Philippines	310,050	1.2	40
Vietnam	270,340	1.1	47
South Africa	200,240	0.8	44
Italy	177,840	0.7	72
Malaysia	177,460	0.7	41
Sri Lanka	146,950	0.6	41
All overseas born	*7,653,990*	*29.8*	*44*
Australian born	18,043,310	*70.2*	*34*
Total population	**25,697,300**	**100.0**	**38**

Note: China excludes Special Administrative Regions and Taiwan.

Source: ABS 2021a.

A 'healthy migrant effect' has been observed in some migrants due to the combination of health screening checks and strict eligibility requirements under the skilled migration stream, as well as immigrant self-selection (Kennedy et al. 2014). However humanitarian migrants may experience worse health due to pre- and post-arrival factors such as a lack of high-quality care and public health programs in their country of origin, trauma, possibly prolonged detention, and barriers to appropriate care on arrival (Au et al. 2019). These barriers include language difficulties, the perceived or actual cost of care, unemployment, cultural difficulties, and a workforce unfamiliar with the health needs of refugees (Murray and Skull 2005). For people living in Australia temporarily, their visa type influences their access to free or Medicare-subsidised public health care (Services Australia 2021).

A key role of the Australian health system is to respond to individual health care needs by providing safe, effective, accessible and appropriate treatment and other services; see 'Health system overview' at https://www.aihw.gov.au/reports/australias-health/health-system-overview. It is therefore important to understand the health status and service needs of all Australians and whether that differs for different groups. However, measuring how the health care system responds to the needs of CALD Australians has traditionally been challenging. This is because information to identify CALD people in health data is limited, is not collected consistently, and is not routinely reported on.

Cultural and linguistic diversity can encompass a range of aspects including a person's country of birth, their ancestry, where their parents were born, what language/s they speak, and their religious affiliation. Defining the 'CALD' population is complex, and often a range of information is required to identify the unique characteristics of a person that may affect their health care needs.

Using linked data can provide a solution to some of these challenges. By combining different sources of information, it is possible to tell a rich story of a person's demographic profile and interactions with various services. For example, the Multi-Agency Data Integration Project (MADIP) combines information from data sets such as the Census, the Australian Bureau of Statistics' (ABS) National Health Surveys, MBS, PBS and Deaths Registrations (ABS 2021b). Because the data are linked at the level of the individual, information from one data set (for example, CALD information from the Census) can be used to supplement information in data sets that do not collect this information (such as the MBS and PBS).

While some CALD groups (such as those with limited proficiency in English) might experience difficulties when accessing health care, measuring access to health care is inherently complex. For instance:

- the concept of access incorporates physical aspects (availability and accessibility), financial aspects (affordability) and cultural aspects (acceptability) and is strongly related to the needs of the individual
- the concept of need incorporates both an individual's perceived need, and/or their needs as defined by experts, carers or family (AIHW 2014).

Ideally, any measure of access to health care would incorporate all aspects of access and need. However, there is a lack of robust data to enable this, and much of the research in this area is limited to small, qualitative studies and focus groups.

For this reason, measuring variations in the use of health care is sometimes done to identify groups that may be missing out on necessary care or, conversely, receiving unnecessary care. While some variation is to be expected due to differences in health needs or personal preferences, variation may also be due to differences in access to care and warrant further investigation (AIHW 2020).

This article explores variations in the use of 2 common and important health services in Australia between CALD groups, using country of birth and English proficiency as indicators of cultural and linguistic diversity.

- The first case study explores variations in non-referred visits to GPs and practice nurses, as general practice is central to primary care in Australia as well as being the gateway to specialist health services.
- The second case study investigates variations in prescriptions dispensed for blood pressure lowering medicines, which are among the most dispensed medicines in Australia (NPS Medicinewise 2021).

These analyses are made possible only with the use of linked data, as no CALD information is collected in the MBS and PBS.

The forthcoming AIHW report *Reporting on the health of culturally and linguistically diverse populations in Australia: an exploratory paper* will provide a detailed discussion of many of the issues and technical considerations for using linked data that are summarised in this short article. See https://www.aihw.gov.au/reports-data/population-groups for more information.

Variations in health service use

The case studies presented in this article use claims data from the MBS and PBS linked with demographic data from the 2016 Census to provide information on health service use for CALD groups. The studies explore whether a person's country of birth and/or proficiency in spoken English is associated with differences in their use of the health care system in Australia.

There is no ideal rate of health care use. This article draws no conclusions about whether a higher or lower rate of service use is desirable for a particular group, nor does it try to assess the degree to which patient needs are being met.

The MBS contains information on all Medicare services subsidised by the Australian Government to people in Australia who are eligible for and registered with Medicare. This includes Australian and New Zealand citizens and holders of permanent residence visas. Some applicants for permanent residency and people from countries with which Australia has reciprocal health care agreements may also be entitled to benefits under MBS arrangements (AIHW 2021c). The MBS data were used to identify people who claimed an MBS rebate for a non-referred attendance between 1 January and 31 December 2016. This included any one of the following services:

- non-referred attendances by a GP or a Vocationally Registered General Practitioner (VRGP). These are Medicare-subsidised patient-doctor encounters, such as visits and consultations, for which the patient has not been referred by another doctor
- non-referred attendances – enhanced primary care. These refer to a range of services – such as health assessments, medication management reviews, the creation and review of treatment plans, and the coordination of care for people living with complex health conditions who require multidisciplinary, team-based care from a GP and at least 2 other providers
- non-referred attendances – other. These include professional attendance at consulting rooms, nursing homes or hospitals, family group therapy, and examination by a specialist in preparation for the administration of anaesthetic
- non-referred attendances – practice nurse items. These include services provided by a practice nurse or Aboriginal and Torres Strait Islander Health Practitioner on behalf of a medical practitioner.

The PBS contains information on medicines listed on the PBS that are dispensed to people in Australia with an active Medicare card. The PBS data were used to identify people who were dispensed one of the following blood pressure lowering medicines between 1 January and 31 December 2016:

- antihypertensives: these suppress signals that make the heart beat harder, or open and relax peripheral arteries
- diuretics: these increase urination, helping rid the body of water and salt and thus reducing blood volume
- beta-blockers: these suppress signals that cause the heart to beat fast and hard
- calcium channel blockers: these block a conduction pathway in the heart, reducing the force of contraction and widening blood vessels
- renin-angiotensin system agents: these block effects of the renin-angiotensin system, a hormone system that regulates blood pressure and the volume of fluids in the body. The group includes ACE inhibitors (plain and in combinations), angiotensin II receptor blockers (plain and in combinations), and other agents acting on the renin-angiotensin system (AIHW 2021b).

Relevant MBS and PBS records were identified and then linked to the Census data set in MADIP, using the Spine ID to provide demographic information, including age, country of birth and proficiency in spoken English (Table 7.2). These records formed the numerator for the analyses, with Census data used to create corresponding denominator populations.

The crude and age-standardised proportions (Box 7.1) of adults aged 18 and over who had a non-referred attendance, or a prescription dispensed for blood pressure lowering medicine in 2016 were calculated by:

- country of birth
- proficiency in spoken English and
- country of birth *and* proficiency in spoken English.

As Australia is home to migrants from more than 200 countries of birth, results have been presented for the 10 countries of birth with the largest number of migrants to Australia, as well as for those with the 5 highest and 5 lowest age-standardised proportions for non-referred attendances or prescriptions dispensed for blood pressure lowering medicines (noting that these categories are not mutually exclusive).

Table 7.2: Overview of data analysed in the case studies

Variables	Measurement
BTOS	Broad type of service (BTOS) is a broad classification of the MBS used for reporting. The following BTOS groups were included: 0101 Non referred attendances - General Practitioner/Vocationally Registered General Practitioner (VRGP), 0102 Non referred attendances - enhanced primary care, 0103 Non referred attendances – other, 0110 Non referred attendances - practice nurse items.
ATC4	The Anatomical Therapeutic Chemical (ATC) Classification allocated to the PBS medicine at the item code level, is listed in the PBS Schedule and reflects the therapeutic use of the medicine on the PBS. The following ATC2 groups were included: C02 Antihypertensives, C03 Diuretics, C07 Beta-blocking agents, C08 Calcium channel blockers and C09 Agents acting on the Renin-angiotensin system.
Country of birth	The country in which the respondent was born, coded to the Standard Australian Classification of Countries (SACC), 2016 (ABS 2016) as reported in the Census.
Proficiency in spoken English	Obtained from the Census. People who nominate speaking a language other than English at home are asked 'How well does the person speak English?'. Possible responses are 'Very well', 'Well', 'Not well' and 'Not at all'. For these analyses, the following groupings are used: 'Very well/well', 'Not well/not at all', 'Speaks English only'. Self-assessed proficiency in spoken English can be useful for identifying people who may experience barriers in accessing services (ABS 1999).
Age	Obtained from the Census, which reports the age (in years) of the respondent. Limited to people aged 18 and over at the time of the Census.
Spine ID	This variable is the Person Linkage Spine identification key used to enable linkage between datasets in the MADIP. The spine is based on the combined population from the Medicare Consumer Directory, Centrelink Administrative Data (the Department of Social Services Data Over Multiple Individual Occurrences [DOMINO] dataset), and Personal Income Tax. Only records with a Spine ID were used to create the denominator populations from the Census.

Limitations of the data

The information presented in the 2 case studies described in this article includes data only for people who were an Australian resident on the night of the Census in August 2016 and who had a relevant MBS or PBS claim in 2016.

This is particularly relevant for some CALD populations, who may not be eligible for Medicare through their current visa, or who may not have a record on the other datasets used to create the Person Linkage Spine (Centrelink and Australian Tax Office).

There were large differences in linkage rates between the Census and the Person Linkage Spine by country of birth (range 70–98%) and proficiency in spoken English (range 82% for low proficiency to 95% for people who spoke English only), which may have affected the results presented in these case studies. To limit the inclusion of people in the denominator who were not eligible for Medicare (and therefore PBS medicines), only Census records with a Spine ID were included.

Due to the nature of the development of the Person Linkage Spine, all relevant records from the MBS and PBS had a Spine ID. However around 85% of the records for non-referred services in the MBS and 88% of the records for blood pressure lowering medicines identified in the PBS then linked to a record in the Census.

Box 7.1: Age standardisation

Health service use is associated with age. This means that comparisons between population groups can be confounded by differences in their age distributions. This is particularly important when comparing CALD groups in Australia, as migration patterns have varied over time including both the number of migrants, and the types of visas and countries from which people have arrived. These variations have influenced the age structure and the socioeconomic composition of Australia's CALD population (Wilson et al. 2020). See Table 7.1 for the median age of migrants from the 10 countries with the largest number of migrants to Australia as at 30 June 2020.

Age-standardised rates are often used to compare outcomes for populations with different age structures. As the purpose of this article is solely to compare health service use for different populations, age-standardised results have been used throughout. Unadjusted (crude) rates reflect the true rate of service use, and these are available in the supplementary tables which accompany *Australia's health 2022* online. See https://www.aihw.gov.au/reports/australias-health/australias-health-2022-data-insights/data.

For the analyses in this article, rates were directly age standardised using the 2001 Australian population. Age-adjusted rates that are based on a small number of events are unreliable and can exhibit a large amount of random variation. The results presented in this article have been limited to those with a sufficiently sized numerator and denominator.

Case study 1: Non-referred attendances

Primary health care is the front line of Australia's health care system, and general practice is often the first point of contact a person has with the system. The types of services delivered under primary health care are broad ranging and include health promotion, prevention and screening, early intervention, treatment and management. Effective primary health care is associated with improved population health outcomes for all-cause mortality, all-cause premature mortality, and cause-specific premature mortality from major respiratory and cardiovascular diseases (AMA 2021).

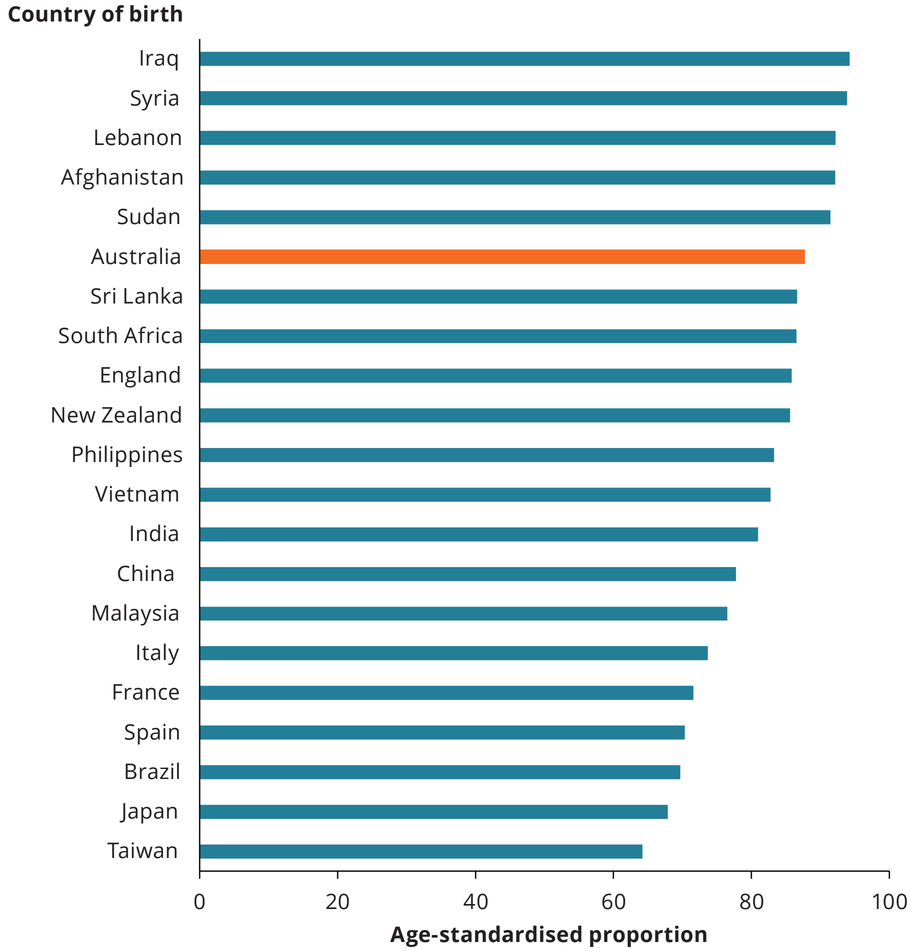
In 2016, almost 9 in 10 (88%) Australians aged 18 and over had a non-referred Medicare-subsidised patient-doctor or patient-practice nurse encounter (non-referred attendance), according to linked Census and MBS data.

Country of birth

Figure 7.1 shows the proportion of Australians with a non-referred attendance for the 10 countries of birth with the largest numbers of migrants to Australia in 2016 and the top 5 and bottom 5 countries (after adjusting for age). The proportion for people born in Australia is also shown for comparison.

After adjusting for age, people born in Taiwan had the lowest proportion of people who had a non-referred attendance (64%), and people born in Syria and Iraq the highest (both 94%).

Figure 7.1: Proportion of Australians aged 18 and over with a non-referred attendance, by country of birth, 2016



Note*:* Directly age-standardised to the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020; Table S7.1.

Country of birth and proficiency in spoken English

Some differences were observed in the proportion of people who had a Medicare-subsidised non-referred attendance in 2016 by proficiency in spoken English, after adjusting for age:

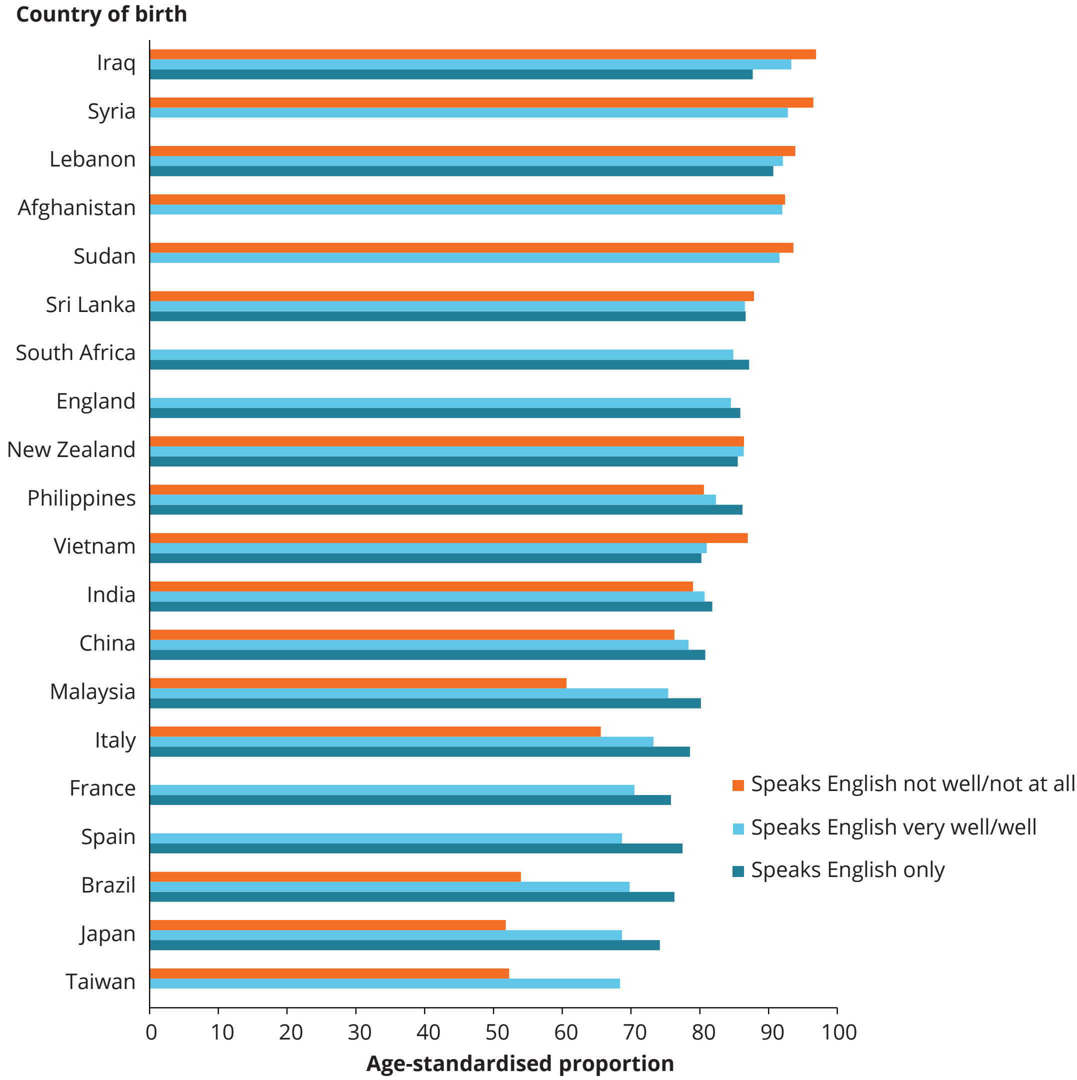
- speaks only English at home (87%)
- speaks a language other than English at home but speaks English well or very well (83%)
- speaks a language other than English at home and does not speak English well or at all (81%).

However, greater differences were apparent for some countries when the data were analysed by both country of birth and English proficiency combined. Figure 7.2 shows the same countries of birth as in Figure 7.1, further disaggregated by proficiency in spoken English.

For the countries of birth with the highest age-standardised proportions of people with a non-referred attendance overall, only small differences were observed by English proficiency. For these countries, people who did not speak English well or at all had a slightly higher proportion of people with a non-referred attendance than people who spoke another language at home but spoke English well or very well, or who spoke only English at home.

However, the opposite pattern was observed for countries with the lowest proportions of non-referred attendances. For these countries, people who did not speak English well or at all had the lowest proportion of non-referred attendances – up to 22 percentage points lower for Brazil and Japan – than those who spoke only English at home.

Figure 7.2: Proportion of Australians aged 18 and over with a non-referred attendance, by country of birth and proficiency in spoken English, 2016



Notes:

1. Directly age-standardised to the 2001 Australian Standard Population.

2. Some categories of proficiency in spoken English are not presented due to small sample sizes.

Source: AIHW analysis of ABS 2020; Table S7.2.

Discussion

This case study shows that there are variations in non-referred attendances in Australia by country of birth, and by country of birth and English proficiency.

Interestingly, 4 of the countries of birth with the highest proportion of people with a non-referred attendance (Iraq, Syria, Afghanistan and Sudan) also have some of the highest proportions of humanitarian entrants (based on results from the linked Census and Migrants Integrated Dataset 2016 (ABS 2018)). For these countries, only small differences were seen in the use of non-referred attendances by proficiency in spoken English. This was also largely the case for the countries of birth with the largest number of migrants to Australia, the exceptions being Malaysia and Italy.

In comparison, the countries of birth with the lowest proportions of non-referred attendances had very few or no humanitarian entrants. However, people born in these countries who did not speak English well or at all were the least likely to have a non-referred attendance, in the main driven by people aged under 55.

There is no ideal rate of health care use, nor robust national data on the health needs of CALD Australians. It is therefore not possible to draw any conclusions about whether a higher or lower rate of service rate is desirable for a particular CALD group, or whether their particular health needs are being met.

Variation in the use of health services presented in this article may reflect factors such as differences in need, availability and use of services not covered by the MBS, or accessibility and availability of appropriate health care providers. For example, lower rates of non-referred attendances for people born in Japan and Taiwan may reflect a lower rate of need (for example the 'healthy migrant effect') and/or barriers to access. Conversely, the higher rates of non-referred attendances for people born in Iraq and Syria may reflect a higher rate of need, and/or more accessible services (for example through services tailored specifically to refugees and humanitarian entrants).

Case study 2: Use of blood pressure lowering medicines

High blood pressure is a common risk factor to health, and it is important to ensure medicines that help to reduce it are available and accessible for all Australians

Based on measured and self-reported data from the 2017–18 ABS National Health Survey, about 1 in 3 people aged 18 and over (34%) have high blood pressure (hypertension) (AIHW 2019). High blood pressure can increase the risk of several chronic conditions including stroke, coronary heart disease, heart failure and chronic kidney disease (AIHW 2019). In 2018, 5.1% of the total burden of disease in Australia, and 35% of the burden of cardiovascular disease, was due to high blood pressure (AIHW 2021a).

Some medicines can help to reduce high blood pressure through a range of mechanisms such as regulating the heartbeat, dilating blood vessels and altering fluid volume in the body (AIHW 2021b). In 2019–20, more than 61 million prescriptions for blood pressure lowering medicines were dispensed to the Australian population under the PBS, more than half (57%) of all cardiovascular medicines (AIHW 2021b). Blood pressure lowering medicines are also used to prevent cardiovascular disease in at-risk patients.

However, it is important to note that the PBS data provides information only on prescriptions filled (dispensed). Unfilled prescriptions (where a person received a prescription but did not fill it) are not included in the PBS data. There may be a range of financial, practical, cultural or other reasons why people do not get their prescriptions filled, which may be particularly relevant for some CALD populations.

Burden of disease

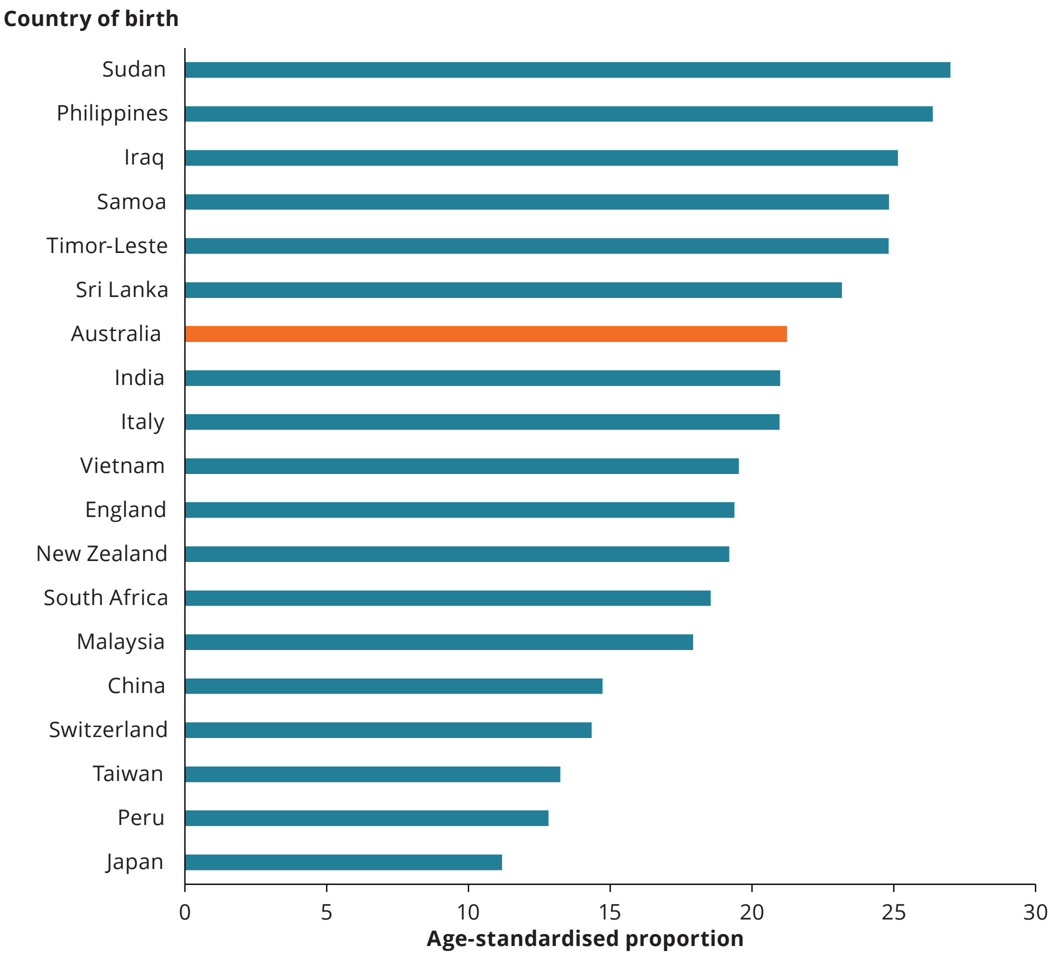
The burden of disease is the quantifiable impact of a disease, injury or risk factor on a population, using the disability-adjusted life year (DALY) measure. A DALY is a year of healthy life lost, either through premature death or, equivalently, through living with ill health due to illness or injury.

Country of birth

Figure 7.3 shows the 10 countries of birth with the largest number of migrants to Australia, and those with the 5 lowest and 5 highest age-standardised proportions of people who were dispensed a prescription for blood pressure lowering medicines in 2016 (with some overlap between the two). The proportion for people born in Australia is also shown for comparison.

After adjusting for age, people born in Japan had the lowest proportion of people who were dispensed a prescription (11%), and people born in Sudan the highest (27%).

Figure 7.3: Proportion of Australians aged 18 and over with a prescription dispensed for blood pressure lowering medicine, by country of birth, 2016



Note: Directly age-standardised to the 2001 Australian Standard Population.

Source: AIHW analysis of ABS 2020; Table S7.3.

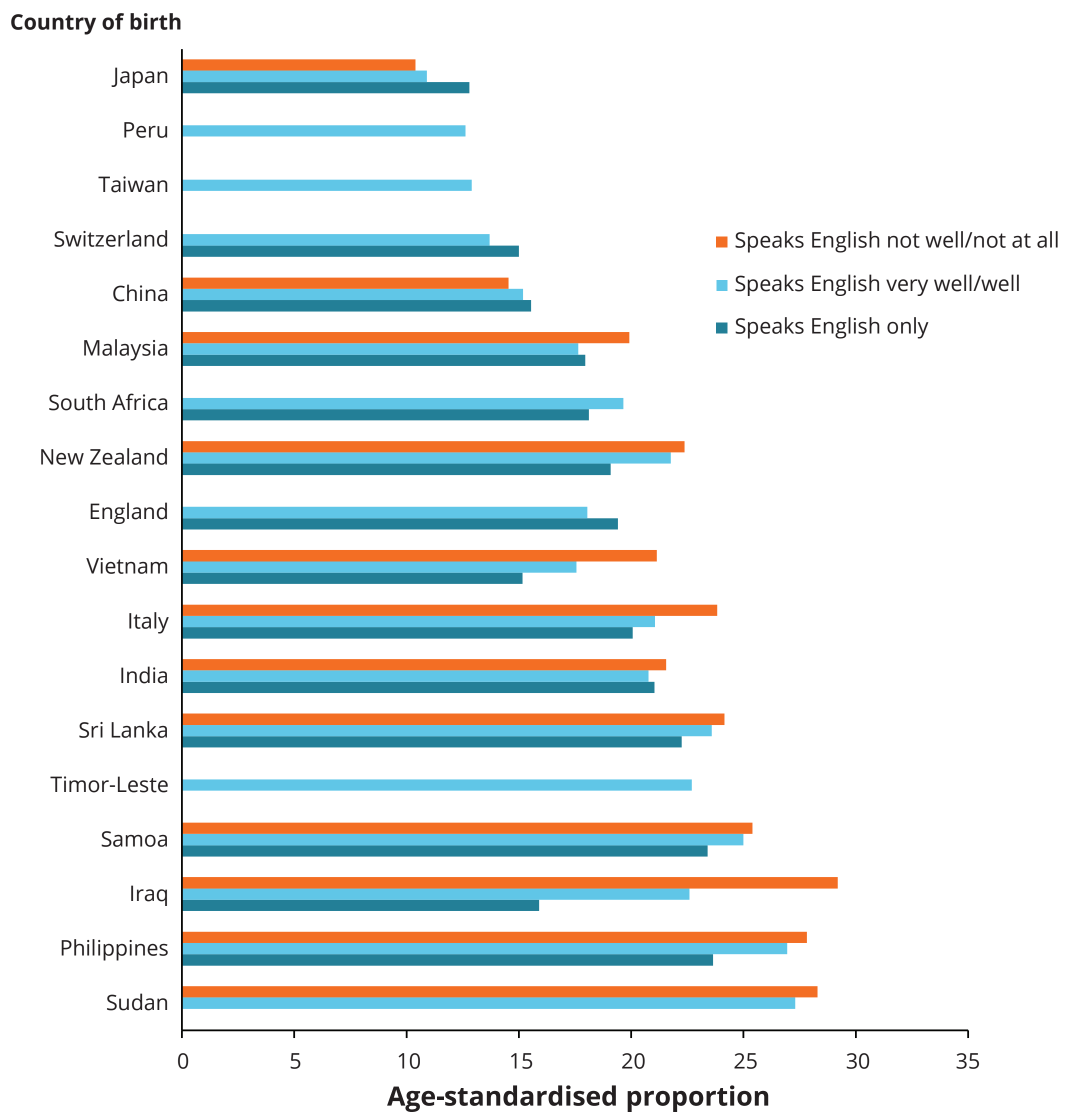
Country of birth and proficiency in spoken English

When analysing the PBS prescription data by proficiency in spoken English, and after adjusting for age, there was little difference in the proportion of people who had a blood pressure lowering medicine dispensed in 2016:

- speaks English only (20.9%)
- speaks English well or very well (20.5%)
- does not speak English well or at all (20.8%).

Figure 7.4 shows the countries of birth as in Figure 7.3 further disaggregated by English proficiency. For most of the countries, only small differences were seen in the age-standardised proportions of people who had a blood pressure lowering medicine dispensed in 2016 by English proficiency, though the proportion for people who did not speak English well or at all tended to be slightly higher. The greatest differences were for Iraq – where the proportion dispensed a blood pressure lowering medicine was nearly twice as high for people who do not speak English well or at all (29%) as for people who spoke only English at home (16%) – and for Vietnam (21% and 15% respectively).

Figure 7.4: Proportion of Australians aged 18 and over with a prescription dispensed for blood pressure lowering medicine, by country of birth and proficiency in spoken English, 2016



Notes:

1 Directly age-standardised to the 2001 Australian Standard Population.

2. Some categories of proficiency in spoken English are not presented due to small sample sizes.

Source: AIHW analysis of ABS 2020; Table S7.4.

Discussion

Large differences were seen by country of birth in the use of blood pressure lowering medicines. However, only 2 of the countries presented (Iraq and Vietnam) had differences in the proportion of people dispensed a blood pressure lowering medicine by spoken English proficiency.

As with non-referred attendances, interpreting these variations is complex. There is no information on the number of people who require blood pressure lowering medicines for CALD groups. This situation is further compounded by potential variations in access to health care services, and whether people receive and fill a prescription. A low rate of use could indicate a low need for blood pressure lowering medicines, or that people need them but are not using them. For example, a relatively low proportion of people who were born in Japan and Taiwan had a non-referred attendance or prescription dispensed for blood pressure lowering medicines. However, it is not possible to tell from these analyses whether this is due to their being in better health than people born in other countries, or that they are not accessing the services they need.

Conclusion

These 2 case studies demonstrate the value of linked data in providing richer information on CALD groups and their use of health services in Australia. Linking information from the Census to large data sets such as the MBS and PBS provides an opportunity to explore differences in health service use by the many dimensions of cultural and linguistic diversity, both separately and in combination. Measuring these variations is an important first step to identify possible issues and prompt further investigation.

It is also possible to report in much greater detail using large data sets such as the MBS and PBS than smaller data collections. For example, the ABS National Health Survey collects a range of information on CALD people, together with their health status and outcomes. However, the survey includes a relatively small sample of the Australian population only, which limits its usefulness for reporting on smaller populations.

Combining aspects of cultural and linguistic diversity, such as country of birth and proficiency in spoken English highlights the diversity that exists within CALD groups. There are multiple aspects to cultural and linguistic diversity: even where people have one aspect in common, such as their country of birth, there may be considerable differences in other dimensions such as language spoken, their ancestry, or how long they have spent in Australia. These aspects can affect their health status and their ability to navigate the health system. For this reason, it is not possible to have one definition of cultural and linguistic diversity that suits every purpose; a range of variables may be required depending on the issue being explored.

Information on migration pathways and socioeconomic factors (such as income and education) was not included in the analyses in this article. It is hoped that future analyses will explore the interaction of these factors with health service use and outcomes for CALD groups in more detail, including how these differ for males and females.

The 2021 Census included a question on long-term health conditions for the first time, which will provide valuable information on the health needs of CALD groups. This information will help to explain variations in health care use, as well as providing an opportunity to explore differences in health status by aspects of cultural and linguistic diversity in greater detail than has previously been possible.

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Mental health of young Australians

8

Mental health of young Australians

Key messages

More young Australians are experiencing higher levels of psychological distress than people in older age groups. This pre-dates the COVID-19 pandemic.

More young females experience higher levels of psychological distress than young males.

Young Australians tend to make use of mental health services at a higher rate than people in older age groups, although many do not, cannot or choose not to access support.

The importance of young peoples' mental health is universally recognised. Youth is a key transition period in a person's life, and also the period when mental illness is most likely to emerge (Kessler et al. 2005). A 2020 survey of Australians aged 15–19 found that around two-thirds of respondents consider mental health to be very or extremely important (Brennan et al. 2021).

This article presents mental health-related statistics and information on Australians aged 12–24 years. It focuses on available national data sources and selected research findings and considers aspects such as the prevalence of mental illness, changes in mental health over time, the use of mental health services, and spending on these services. The impact of the COVID-19 pandemic on the mental health of young Australians is also considered.

Box 8.1: Who are Australia's young people?

Young people are often defined as people aged 12–24. According to the Australian Bureau of Statistics (ABS), more than 4.1 million Australians, or 16% of the total population, were aged 12–24 as at June 2020 (ABS 2021). However, definitions of who constitutes young people vary between data sources according to different frameworks, policies and legislation, which can make comparisons difficult. Where a source in this article uses a different age range, this is noted.

As of 2020, more than half of the people aged 15–19 in Australia are happy (59%) and feel positive about the future (56%) (AIHW 2021a). However, many young people do experience psychological distress and mental illness.

Box 8.2: Mental health and mental illness

'Mental health is a state of well-being in which an individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and can contribute to their community' (WHO 2018). Mental ill health can affect the potential of young people to live fulfilling and productive lives.

Mental illnesses (also referred to as mental disorders) are diagnosable health conditions. They are conditions that affect how a person feels, thinks, behaves and interacts with others. Someone may experience poor mental health or symptoms of mental illness without meeting the diagnostic criteria for a mental illness.

In recent years, the number of young people, especially young females, experiencing psychological distress (see Box 8.4) has been increasing at a greater rate than for other age groups. This has coincided with rising mental health-related hospital admissions and community health care engagement. Although this trend pre-dates the COVID-19 pandemic, concern about the impacts of the pandemic on young people has generated greater interest in the challenges facing young Australians, and what may be done to assist.

Box 8.3: The state of mental health data

Although a new nationwide mental health prevalence survey was conducted in 2021 – with results expected to be released mid-2022 – major data sources currently available are several years old. The most comprehensive source of data on the prevalence of mental illness in Australia is the 2007 National Survey of Mental Health and Wellbeing (NSMHWB). This survey asked participants about their history of mental illness and included symptom measures that could be used to suggest a diagnosis (ABS 2008).

The Child and Adolescent Survey of Mental Health and Wellbeing (also known as Young Minds Matter), specifically aimed at Australians aged 4–17, was last conducted in 2013–14 (Goodsell et al. 2017).

The Household, Income and Labour Dynamics in Australia Survey (HILDA) has followed the wellbeing of around 17,000 Australians each year since 2001. However, many longitudinal surveys, including HILDA, have recorded declining participation rates over time, particularly among the young and among people experiencing poor health (Butterworth et al. 2020). Thus, many of these surveys may underestimate the extent and prevalence of mental illness among young Australians.

Box 8.3 (continued): The state of mental health data

Very few surveys report data on Aboriginal and Torres Strait Islander people; culturally and linguistically diverse groups; young Australians with disability; or lesbian, gay, bisexual, transgender, intersex, queer, asexual and other sexually or gender diverse (LGBTIQA+) young Australians. This is often due to concerns about the small number of participants. A notable exception is the Writing Themselves in 4 Survey of LGBTIQA+ young people (Hill et al. 2021).

Although substantial gaps remain, the mental health data landscape has been improving its scope, scale and quality since the first National Mental Health Plan in 1993. In addition to the 2021 NSMHWB, the 2021 Census of Population and Housing (Census) included a question on whether a long-term health condition, including a 'mental health condition', had ever being diagnosed by a health practitioner (ABS 2020). This is the first time this question has been included in an Australian Census. Data from the 2021 Census are expected to be available from June 2022.

How many young Australians are affected by mental illness?

The 2007 NSMHWB found that more than one-quarter (26%) of Australians aged 16–24 (males 23%, females 30%) had experienced any mental illness in the previous 12 months, with anxiety disorders being the most common overall (males – substance use disorders, females – anxiety disorders), compared with 1 in 6 (16%) Australians aged 25–85 (males – 14%, females – 18.3%) (ABS 2008). If this rate for Australians aged 16–24 was applied to the population in 2020, it would suggest that more than one million young Australians (males 486,000, females 607,000) experienced mental illness in the previous 12 months.

Based on the Young Minds Matter Survey, in 2013–14, 1 in 7 (14%) young people aged 12–17 met the clinical criteria for a mental illness in the previous 12 months (males 16%, females 13%). The most common disorder overall, and in males, was Attention Deficit Hyperactivity Disorder (ADHD), while anxiety disorders were the most common disorder in females (Lawrence et al. 2015). It should be noted that the NSMHWB did not report on ADHD or on Conduct Disorder, the third most common disorder in the Young Minds Matter Survey.

According to the ABS 2017–18 National Health Survey, more than one-quarter (26%) of Australians aged 15–24 (males 21%, females 30%) were experiencing a mental or behavioural condition at that time (ABS 2018).

Box 8.4: Psychological distress

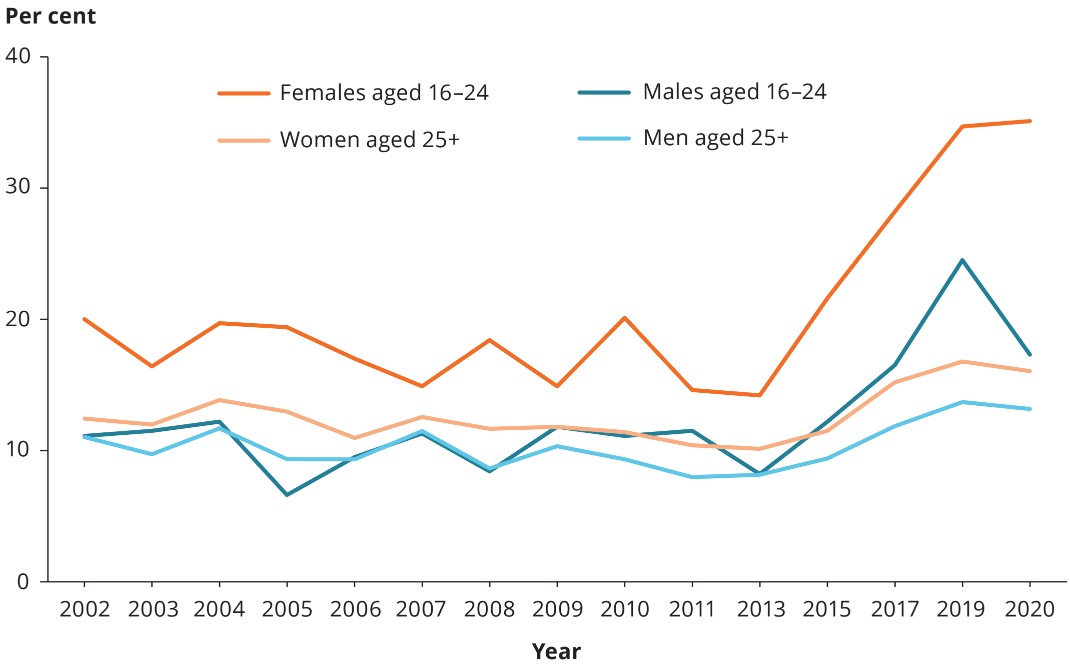
Psychological distress is an individual's overall level of psychological strain or pain. Someone experiencing psychological distress will not necessarily be experiencing mental illness, although high scores on the Kessler 10 Psychological Distress Scale (K10) are strongly correlated with the presence of depressive or anxiety disorders (Andrews and Slade 2001). As psychological distress is relatively straightforward to measure, high and very high levels are often used as a 'proxy' for mental illness.

Young Australians are more likely to experience psychological distress – and to experience higher levels of it – than people in older age groups. This trend, which pre-dates the COVID-19 pandemic, is consistent across multiple surveys (ABS 2018, 2021; Biddle 2021; Brennan et al. 2021; Butterworth et al. 2020; CEE 2020; Dib et al. 2021; Wilkins et al. 2021). For example, the New South Wales Population Health Survey, an annual survey of 8,000 to 16,000 New South Wales residents aged 16 and over, showed that psychological distress in people aged 16–24 increased between 2013 and 2019 at a higher rate than for other age groups (CEE 2020) (Figure 8.1).

This phenomenon is not unique to Australia, with young people in this age group in Iceland and the United States also experiencing increases in psychological distress compared with other age groups (Nature Editorial Board 2021).

Some groups of young Australians experience more distress than others. For instance, more young females experience higher levels of psychological distress than males (Brennan et al. 2021). Further, the annual Mission Australia Youth Survey suggests that a higher proportion of young Australians with disability experience psychological distress than do young people who do not have disability (Brennan et al. 2021), while a 2019 survey of more than 6,000 young LGBTQIA+ Australians found that four-fifths (81%) of participants aged 14–21 reported high or very high levels of psychological distress (Hill et al. 2021).

Figure 8.1: Persons aged 16 and over reporting high or very high psychological distress, by age group and sex, 2002 to 2020



Notes

1. K10 is a 10-item questionnaire that measures anxiety, depression, agitation, and psychological fatigue in the most recent 4-week period.
2. People whose responses had a K10 score of 22 or above were indicated to have high or very high distress.
3. The K10 questions were included in the NSW Population Health Survey every year between 2002 and 2011. After 2011 and until 2019, they were included every second year. The questions were also included in the 2020 survey.
4. The indicator shows self-reported data collected through Computer Assisted Telephone Interviewing. To counter diminishing coverage of the population by landline telephone numbers (<85% since 2010), a mobile phone number sampling frame was introduced in the 2012 survey.
5. The inclusion of mobile phone numbers has substantially increased the Aboriginal sample and this change in design means that the 2012 NSW Population Health Survey estimates reflect both changes that have occurred in the population over time and changes due to the improved design of the survey.
6. Estimates were weighted to adjust for differences in the probability of selection among respondents and were benchmarked to the estimated residential population using the latest available ABS mid-year population estimates.

Source: CEE 2020.

Box 8.5: Suicide and self-harm

Mental ill health can be associated with suicidal behaviours (thinking about or planning taking one's own life [suicidal ideation] or attempting suicide). However, while suicidal behaviours occur in people with mental illness, it is not confined to this group (AIHW 2021j). Intentional self-harm is often defined as deliberately injuring or hurting oneself, with or without the intention of dying. The majority of self-harm is not done with suicidal intent. The reasons for self-harm are different for each person and are often complex (AIHW 2021j).

Suicide was the leading cause of death for Australians aged 15–24 from 2017 to 2019, although males aged 25–64 experienced higher rates of suicide than males aged 15–24 (AIHW 2021d). In 2020, 480 Australians aged 24 and younger took their own lives (AIHW 2021c). COVID-19 has not been associated with an overall rise of suspected deaths by suicide (AIHW 2021c).

The Young Minds Matter Survey found that, between 2013 and 2014, around 1 in 10 surveyed 12–17-year-olds (11%, or an estimated 186,000 survey participants) reported having ever self-harmed, and about three-quarters of these (an estimated 137,000) had harmed themselves in the previous 12 months. Around 1 in 13 (7.5%, or an estimated 128,000 participants) had seriously considered attempting suicide in the previous 12 months and, of these, one-third (2.4% of all 12–17-year-olds) reported having attempted suicide in the previous 12 months (AIHW 2020). For more information, including ambulance attendances, refer to the AIHW Suicide and self-harm monitoring site at at https://www.aihw.gov.au/suicide-self-harm-monitoring.

Mental health of young Australians in recent years

The reasons for the trend of increasing psychological distress among Australia's young people are unclear but likely to be complex and vary between individuals. With an existing trend of rising psychological distress, the mental health impacts of the COVID-19 pandemic have been felt more severely by young people across the world (UNICEF 2021).

A survey of Australians aged 15–19 conducted between April and August 2020 found that more than 2 in 5 (43%) reported that they felt stressed either all of the time or most of the time (Tiller et al. 2020), while a repeat study in 2021 found that 45% rated their mental health as poor (Tiller et al. 2021). Another survey of around 500 Australians aged 15–25 in June 2020 and January 2021 similarly found that around half of the participants were experiencing moderate to severe symptoms of anxiety and/or depression (Dimov et al. 2021).

Yet another study of 760 Australians aged 12–18 found that three-quarters (75%) felt that the COVID-19 pandemic had negatively affected their mental health (Li et al. 2021). Females aged 12–24 continue to experience higher rates of psychological distress than males of any age group (headspace 2020).

The COVID-19 pandemic has been associated with a worsening of subjective mental health (Dib et al. 2021; Li et al. 2021) and increases in psychological distress, although both have fluctuated throughout the pandemic's course. As at April 2021, psychological distress continued to be higher for young Australians, despite the average level of psychological distress across all age groups returning to pre-pandemic levels (AIHW 2021k).

As at October 2021, psychological distress among young people remained higher than in 2017, while psychological distress among older age groups had reduced to a level comparable with pre-pandemic levels (Biddle and Gray 2021).

Mental health service use by young Australians

Although many young Australians experience mental illness, many do not, cannot or do not wish to engage with mental health treatment or support services for a multitude of reasons (Islam et al. 2020; Brennan et al. 2021). Even so, young Australians tend to use mental health services at a higher rate than people in older age groups.

Medicare-subsidised services

In 2020–21, around one-third (32%) of Australians aged 12–24 received a Medicare-subsidised mental health-specific service, an increase from more than one-quarter (28%) in 2019–20. By way of comparison, around 1 in 10 (11%) of the total population received such a service in 2020–21. Females receive services at a higher rate than males. For example, in 2020–21 females aged 18–24 received 1,258 services per 1,000 population (an individual may receive multiple services in a year) compared with 531 for males of the same age. The rate at which females receive services has also increased over time at a much greater pace than for males (AIHW 2021f).

These figures are likely to be an underestimate as not all mental health-related consultations take place under a mental health-specific Medicare item number. For example, the Bettering the Evaluation and Care of Health Survey of General Practitioners (BEACH), last conducted in 2014–15, suggested that the number of mental health-related consultations was several times higher than the number captured in Medicare data (AIHW 2015).

Services commissioned by Primary Health Networks

The Australian Government funds Primary Health Networks (PHNs) to commission mental health services. Service organisations commissioned by PHNs delivered 378,275 mental health services to 50,147 people aged 12–24 in 2020–21 (PMHC MDS 2022). This included 126,159 child and youth specific mental health services provided to 12,330 young people (PMHC MDS 2022).

headspace is the primary youth-focused mental health service commissioned by PHNs to provide services to young people aged 12–25 experiencing, or at risk of, mild to moderate mental illness. During 2020–21, headspace services provided 441,914 occasions of service to 106,574 young people (headspace 2021). headspace services are supported by grant funding from the Australian Government (via PHNs) in addition to the engagement of private practitioners funded through the Medicare Benefits Schedule (MBS).

Prescriptions dispensed

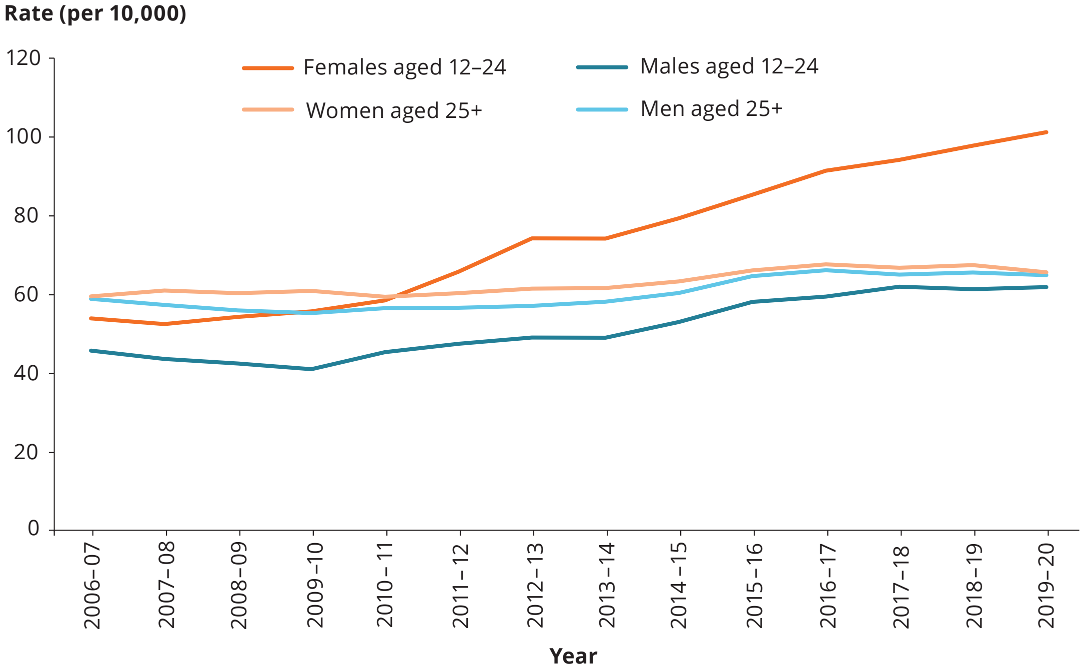
Young Australians tend to receive fewer prescriptions related to mental health than older age groups, with about 1 in 12 (8.2%) of people aged 12–17 and 1 in 8 (12.6%) of people aged 18–24 dispensed a medication in 2019–20. The exception is agents used to treat ADHD, which are dispensed at a far higher rate to young Australians than to people in older age groups (AIHW 2021g). This is consistent with data indicating that ADHD is the most prevalent mental disorder diagnosed in Australians aged 4–17 as of 2013–14 (AIHW 2021i; Lawrence et al. 2015). Although Australians aged 12–24 have received few prescriptions overall, their mental health prescriptions have increased over time, from 514 per 1,000 population in 2013–14 to 791 in 2019–20.

Hospital presentations

In 2019–20, Australians aged 18–24 had the highest rate of mental health-related presentations to hospital emergency departments (EDs) of any age group, at 209.3 per 10,000 population, compared with 121.6 per 10,000 for all ages. Females aged 18–24 had the highest rate of mental health-related ED presentations (226.8 per 10,000 population) of any age and gender group, compared with 115.4 per 10,000 for females of all ages. The rate at which females aged 12–24 are presenting to EDs has also been increasing more rapidly than for males since 2014–15 (AIHW 2021e).

People with mental health care needs may be admitted to hospital for more than 1 day (known as overnight admitted patient care). Although rates of admission, including specialised psychiatric care, have increased somewhat across all age groups since 2006–07, the increase is most prominent in females aged 12–24, with the rate of admission almost doubling, from 54.0 per 10,000 population in 2006–07 to 101.2 in 2019–20 (Figure 8.2) (AIHW 2021h).

Figure 8.2: Overnight admitted mental health hospitalisation rate (per 10,000 population) with specialised care, by age group and sex, 2006–07 to 2019–20



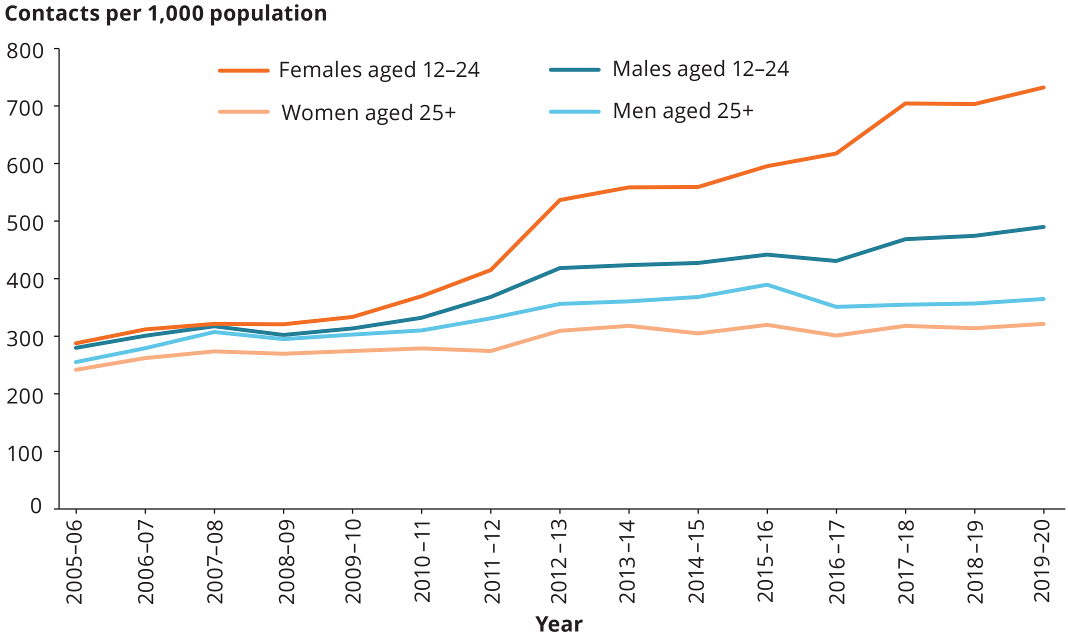
Notes

1. Hospitalisations with a care type of Newborn (without qualified days), and records for Hospital boarders and Posthumous organ procurement have been excluded.
2. The details of the process for categorising a hospitalisation as being related (or not) to mental health can be found in the online Classification codes section of the Mental health services in Australia report (AIHW 2021i).'
3. The data do not include records for which demographic information was missing or not reported.

Source: AIHW 2021h.

A similar pattern to hospital presentations is seen for engagement with community mental health care. Care contacts (per 1,000 population) have risen at a greater rate for Australians aged 12–24 than for other age groups, with females in this age group recording the largest rise (AIHW 2021b) (Figure 8.3).

Figure 8.3: Community mental health care service contacts per 1,000 population, by age group and sex, 2005–06 to 2019–20



Notes

1. Rates for specific age groups, sex and jurisdictions are crude rates based on the 2011 Census estimated resident populations as at 31 December of the reference year.
2. Queensland transitioned to new clinical information systems in 2008–09, which affected activity data reporting.
3. Changes to South Australian legislation and data collection methods for involuntary care resulted in an increase in the number of contacts with involuntary legal status in 2010–11. Time series comparisons should therefore be made with caution. South Australia transitioned to a new hospital-based system during 2013–14 which had an impact on activity data reporting for a small number of hospital-based services.
4. In 2011–12 and 2012–13, protected industrial action in Victoria caused service level collection gaps. Victoria required that data for 2011–12 and 2012–13 be excluded from all totals, with no proxy data included for Victoria when calculating national totals. Therefore, any calculations involving national totals during these reporting years are not valid. Rates for 2011–12 and 2012–13 were calculated using adjusted population data, which accounts for missing data as detailed in the classifications and technical notes section of the Mental health services in Australia report (AIHW 2021i). Comparisons over time should be made with caution.
5. Industrial action in Tasmania in 2011–12, 2012–13 and 2018–19 affected the quality and quantity of Tasmania's data. For more details, see the Data source and key concepts section within the Community mental health care services section of Mental health services in Australia report (AIHW 2021i). Industrial action for 2018–19 lasted from September 2018 to September 2019, partially affecting 2019–20 reported data.
6. Tasmania transitioned to a new clinical information system in 2013–14; this had an impact on activity data reporting.
7. Victorian data were affected by industrial activity in 2015–16 and 2016–17, but there was no reduction in actual services. The collection of non-clinical and administrative data was affected, with impacts on community mental health service activity and client outcome measures (see the data quality statement for the 2019-20 Community mental health care National Minimum Data Set at https://meteor.aihw.gov.au/content/index.phtml/itemId/699975).
8. New South Wales data were affected by the introduction of a new system in the Justice Health Network from 2016–17 to 2018–19. This resulted in reduced data coverage (see the data quality statement for the Community mental health care National Minimum Data Set at https://meteor.aihw.gov.au/content/index.phtml/itemId/742292).

Source: AIHW 2021b.

Kids helpline, a crisis phone line aimed at people aged 5–25, recorded an overall upward trend in demand from March 2020. As at 19 September 2021, kids helpline responded to 20% more contacts during the preceding week than for the same period in 2019 (AIHW 2022a).

Expenditure on mental health services for young Australians

It is difficult to estimate the total expenditure on youth mental health in Australia. Funding arrangements for youth mental health services (and mental health services in general) are complex, with sources including the Australian and state and territory governments, insurance providers, education providers and out-of-pocket expenses (Productivity Commission 2020). As well, many young people access mental health services provided through schools or universities, and data on this mental health-related activity and expenditure are not routinely reported. Nonetheless, it is clear that increasing concern about youth mental health has been accompanied by increasing funding for mental health services targeting young people.

Expenditure on specialised mental health care services (primarily inpatient treatment by a psychiatrist) for Youth (persons aged 16–24) by states and territories increased from $10.1 million (or $3.64 per capita) in 2010–11 to $124.1 million ($42.36 per capita) in 2019–20. This represents an average annual increase of 32.2% (31.4% per capita) over this time, by far the highest increase for any target population. For comparison, the average annual increase in expenditure for all populations combined over this time was 2.6% (1.0% per capita) (AIHW 2022b).

Further reading

Australian Institute of Health and Welfare – *Australia's youth* at
https://www.aihw.gov.au/reports/children-youth/australias-youth/contents/about

Australian Institute of Health and Welfare – *Mental health services in Australia* at
https://www.aihw.gov.au/reports/mental-health-services/mental-health-services-in-australia/report-contents/summary-of-mental-health-services-in-australia

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Mothers who live in remote areas and their babies

9

Mothers who live in remote areas and their babies

Key findings

In 2019, 2.3% (6,661) of women who gave birth in that calendar year lived in remote areas of Australia (see Box 9.2: Article definitions, scope and methods). Women who live remotely have less access to health care, including maternity care, which can be detrimental to their health and the health of their babies. Compared with women who lived in regional areas and *Major cities,* mothers who lived in remote areas in 2019 were more likely to:

- be aged under 20 (7.2%, compared with 3.3% in regional areas and 1.3% in *Major cities*)
- identify as Aboriginal and/or Torres Strait Islander (respectfully referred to hereafter as Indigenous mothers) (39%, compared with 9.2% in regional areas and 2.3% in *Major cities*)
- live in the lowest socioeconomic areas (36%, compared with 28% in regional areas and 17% in *Major cities*).

Women who lived in remote areas in 2019 had higher rates of behavioural risk factors, with 26% smoking at any time during pregnancy (compared with 16% in regional areas and 6.8% in *Major cities*) and 7.8% drinking alcohol at any time during pregnancy (compared with 3.0% and 2.0%, respectively).

Access to maternity care was identified as a potential issue as women who lived in remote areas were more likely to have their first antenatal visit after 20 weeks' gestation (16%, compared with 8.4% for non-remote areas).

Women who lived in remote areas had slightly fewer interventions, such as induced labour (32%), instrumental vaginal birth (8.7%) and caesarean section birth (33%) than women who lived in regional areas (34%, 10% and 34%, respectively) and *Major cities* (35%, 14% and 37%, respectively). They were also more likely to have an intact perineum (35 per 100 women giving birth vaginally, compared with 27 and 20 per 100 in regional areas and *Major cities*, respectively).

Similar patterns in access to the first antenatal visit and in time to the nearest birthing facility were seen for Indigenous mothers who lived in remote areas and Indigenous mothers who lived in regional areas and *Major cities*.

The majority of women who live in remote areas of Australia have uncomplicated pregnancies and healthy babies; however, when differences between mothers are explored based on the remoteness area in which they live, it is clear that women who live in remote areas face additional challenges to mothers who live in non-remote areas.

The health of mothers and their babies is affected by a range of complex and interrelated factors. These include the social determinants of health (see Box 9.1: Social determinants of health), behavioural risk factors, a woman's underlying health status, and access to health services (AIHW 2020b).

Box 9.1: Social determinants of health

The concept of 'social determinants of health' recognises the potent and complex effects of the social environment on health outcomes.

The World Health Organization (WHO) considers the circumstances in which people are born, live and work as being the most important determinants of health. These include income, power, education and social support.

The social determinants of health shape the immediate determinants of health, including biomedical factors and health behaviours. This means that a person's health advantage or disadvantage is determined by broader social and economic conditions under which they live (for more information, see 'Social determinants of health' https://www.aihw.gov.au/reports/australias-health/social-determinants-of-health).

One of the key social determinants of health are the circumstances – including the geographical location – in which a person lives, with women who live in remote areas often experiencing compounding disadvantage in relation to education, employment, housing and income (AIHW 2019a, 2020b).

Additionally, women who live in remote areas have higher rates of behavioural risk factors, such as smoking, and are more likely to be living with a chronic disease (AIHW 2019a; Rolfe et al. 2017).

While robust health systems play a vital role in ameliorating the factors that lead to poorer health, multiple challenges affect the delivery of health care in remote areas of Australia. These include lack of transport; closure of maternity services; and the distribution of services, staff and resources across large distances (AIHW 2020a; Barclay et al. 2016).

Previous research on maternal and perinatal health indicates that, besides having higher rates of behavioural risk factors, mothers who live in remote areas have higher rates of chronic health conditions and may also experience difficulty in accessing appropriate maternity care (AIHW 2017, 2021b).

This article examines the outcomes of pregnancy and birth, and birth outcomes, for mothers who lived in remote areas of Australia, and their babies. It also outlines the differences in outcomes compared with mothers who lived in non-remote areas, and their babies.

As almost half of all people living in remote areas identify as being Aboriginal and/or Torres Strait Islander people, this article includes a section that concentrates on Indigenous mothers and their babies.

Specifically, this article focuses on women who gave birth in 2019 in regard to:

- demographics, behavioural risk factors and health conditions
- access to antenatal care and public birthing facilities
- labour and birth outcomes for mothers and babies
- outcomes for Indigenous mothers and Indigenous babies.

In acknowledgement of the unique challenges faced by women who live in rural and remote areas and Indigenous women, these groups of women have been identified as a priority population in the *National Women's Health Strategy 2020–2023* (Department of Health 2019).

Box 9.2: Article definitions, scope and methods

The data in this article are based on the National Perinatal Data Collection (NPDC), which is a national population-based cross-sectional collection of data on pregnancy and childbirth. Analysis of NPDC data can show associations only – they are not suitable for determining causation. Consideration of the potential drivers of differences in health status between mothers who live in remote areas and mothers who live in regional areas and *Major cities* – such as policy, clinical guidelines and health service performance – is an area for future research.

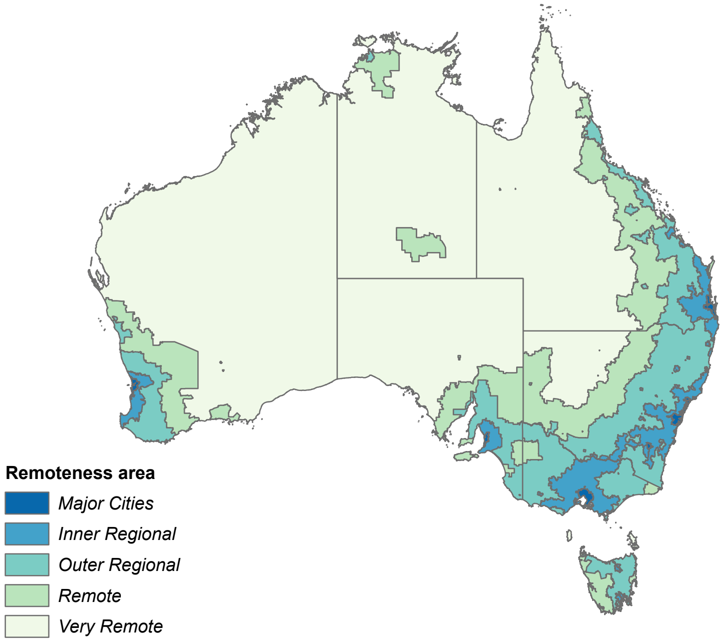
In this article, mothers are defined as women who gave birth in the 2019 calendar year, and mothers in remote areas as women whose usual residence was in a *Remote* or *Very Remote* area. Remoteness is determined according to the Australian Bureau of Statistics (ABS) Accessibility/Remoteness Index of Australia, which is a measure of relative access to services based upon population and distance to services (ABS 2018). The Australian Statistical Geography Standard (ASGS) Remoteness Structure, 2016 divides Australia into 5 classes of remoteness: *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote* (ABS 2018). Remoteness data used in this article are derived by applying this classification to the mother's usual area of residence in the NPDC. Remoteness area was calculated where geographic area of usual residence was provided.

The comparison groups used in this article are mothers whose usual residence was in a regional area (*Inner regional* and *Outer regional* areas combined) or *Major cities*. Where applicable, these are collectively referred to as non-remote areas (regional areas and *Major cities*) or all remoteness areas (remote areas, regional areas and *Major cities*) (see Figure 9.1).

(continued)

Box 9.2 (continued): Article definitions, scope and methods

Figure 9.1: Remoteness areas of Australia



Source: AIHW.

Time trend analysis in this article compares trends for women who gave birth by remoteness area in 2019 and 2012; 2012 is used as the comparison year as this is the earliest reference period that can be analysed, due to differences in reporting practices in earlier years.

To better understand the context for Indigenous Australians, this article reports within-group comparative analysis of Indigenous mothers who lived in remote and non-remote areas. While comparing the outcomes of Indigenous and non-Indigenous populations is important in determining national priorities and informing research, exclusively focusing on differences can contribute to a narrative of deficit about the health of Indigenous Australians and act as a barrier to improvements (Fogarty et al. 2018).

The measures of socioeconomic disadvantage used in this article are based on the 2016 Socio-Economic Indexes for Areas Index of Relative Socioeconomic Disadvantage (SEIFA IRSD) developed by the ABS for use at Statistical Area Level 2 (SA2). SEIFA IRSD is a measure of average disadvantage of all people living in a geographic area and cannot be presumed to apply to all individuals living in the area.

This article reports crude proportions. Although age is a known confounding variable across a number of reported data items, and mothers who lived in remote areas were younger than mothers living in non-remote areas, patterns remained consistent even after the effect of age was removed (age-standardised).

For more information on data sources and methods, see the report on 'Australia's mothers and babies' http://www.aihw.gov.au/reports/mothers-babies/australias-mothers-babies/contents/technical-notes/data-sources.

Maternal demographics

Most of the Australian landmass is classified as remote (Figure 9.1), and 1.9% of the 2019 ERP lived in *Remote* or *Very remote* areas (ABS 2021). In 2019, however, only 2.3% (6,661) of women who gave birth lived in these areas. Of these, 32% lived in Western Australia, 28% in Queensland and 21% in the Northern Territory.

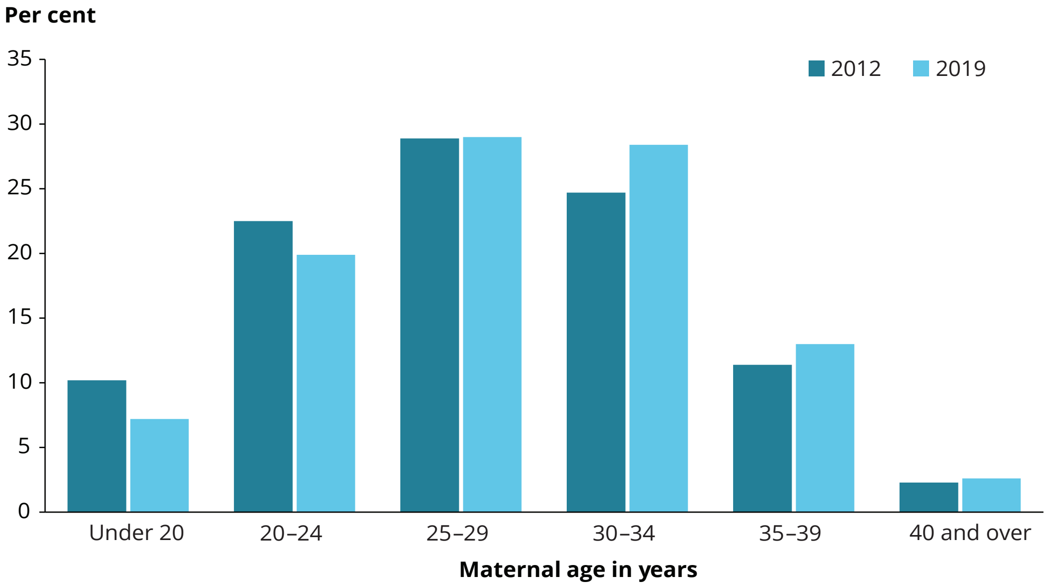
The characteristics of mothers have important implications for their experience of pregnancy and birth. For example, younger mothers (aged under 20), older mothers (aged over 40) and women who gave birth and identified as Indigenous have an increased risk of complications and adverse pregnancy outcomes (for more information, see the section in this chapter on 'Indigenous mothers who live in remote areas and their babies') (AIHW 2021b).

In 2019, mothers who lived in remote areas were more likely to be:

- Indigenous (39%, compared with 9.2% in regional areas and 2.3% in *Major cities*)
- born in Australia (86%, compared with 85.6% in regional areas and 57% in *Major cities*)
- younger, with higher proportions of mothers aged under 20 and 20–24 (7.2% and 20%, respectively, compared with 3.3% and 17% in regional areas and 1.3% and 8.7% in *Major cities*).

Over time, the age of mothers who lived in remote areas has increased (Figure 9.2) in line with overall national increases in maternal age (AIHW 2021b).

Figure 9.2: Proportion of women who gave birth and lived in remote areas, by maternal age, 2012 and 2019



Source: AIHW National Perinatal Data Collection.

Socioeconomic position is viewed as a key social determinant of health and more than one-third (36%) of mothers from remote areas lived in the lowest socioeconomic areas (first quintile). This is compared with 28% of mothers who lived in regional areas and 17% of mothers in *Major cities*. The proportion of mothers from remote areas who lived in the lowest socioeconomic areas has, however, fallen over time – down from 43% in 2012.

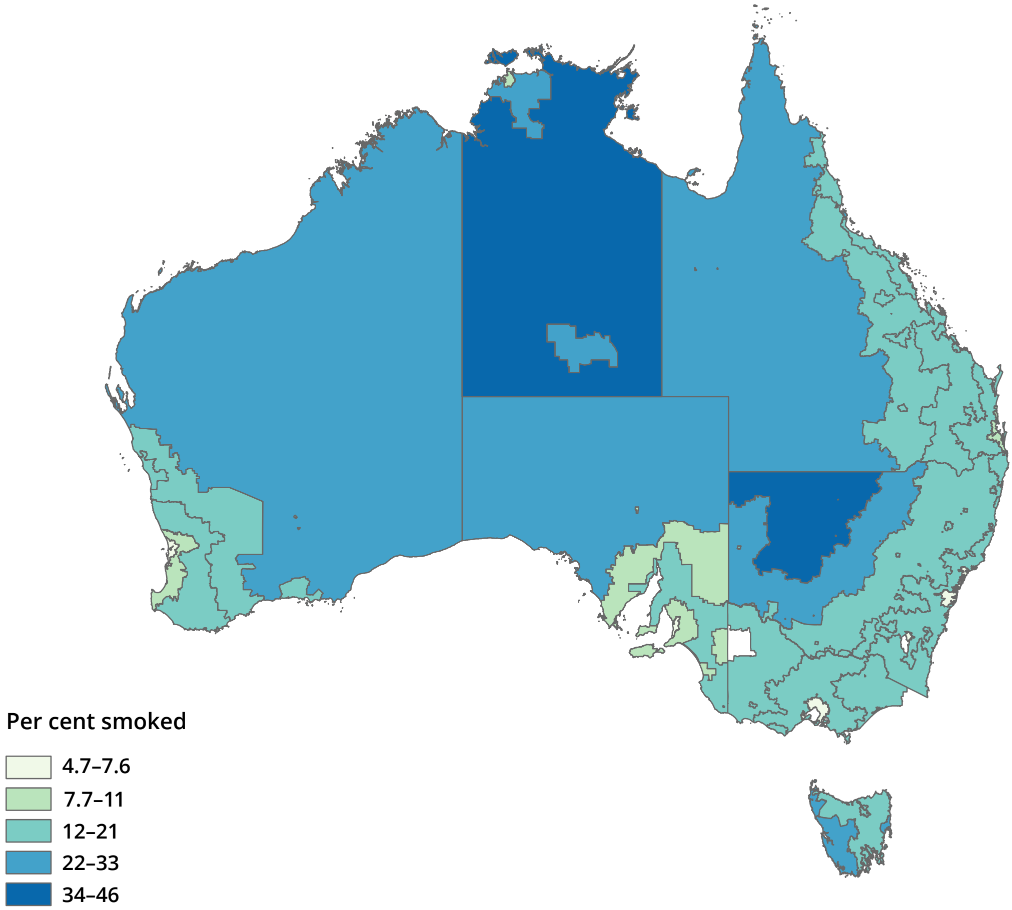
Smoking and alcohol consumption

Smoking during pregnancy is a common behavioural risk factor and is associated with low birthweight, being small for gestational age, pre-term birth and perinatal death (AIHW 2021b). Alcohol consumption is another important behavioural risk factor which, in some instances, can have considerable effects on fetal development, including fetal alcohol spectrum disorder (AIHW 2021b).

Support to stop smoking, and drinking alcohol, is widely available through antenatal care clinics (AIHW 2021b). However, this support may be less accessible for mothers who live in remote areas due to the challenges involved in accessing care, including antenatal care clinics (Barclay et al. 2016).

In 2019, mothers who lived in remote areas were more likely to smoke at any time during pregnancy (26%) than mothers living in regional areas (16%) and *Major cities* (6.8%) (Figure 9.4). Rates of smoking during pregnancy have been consistently higher in remote areas than in non-remote areas over time; however, the proportion of mothers who live in remote areas and smoked during pregnancy has declined (down from 29% in 2012). Figure 9.3 shows the proportion of women who smoked at any time in pregnancy within each remoteness area (see Figure 9.1), overlaid on a map of Australia.

Figure 9.3: Proportion of women who gave birth and smoked at any time during pregnancy, by remoteness area, 2019

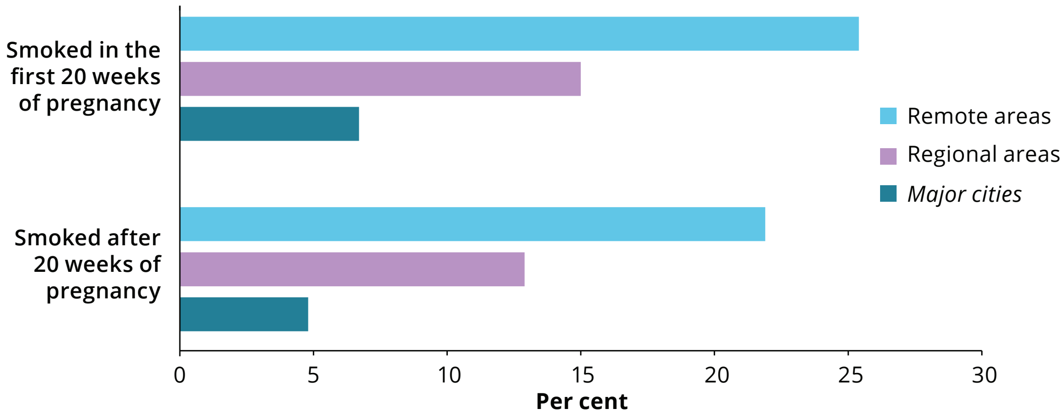


Notes

1. Mother's tobacco smoking status during pregnancy is self-reported.
2. Percentage was calculated after excluding records with smoking status of 'Not stated'. Care must be taken when interpreting percentages.
3. Data are by state/territory of mother's usual residence.
4. For WA, 'Smoked' includes occasional smoking. 'Did not smoke' includes 'Not determined' average number of tobacco cigarettes smoked per day in first 20 weeks of pregnancy and after 20 weeks of pregnancy. For WA, smoking status was determined at multiple locations and times and is therefore difficult to report accurately at time of birth.
5. White areas on the map represent areas where analysis by remoteness area resulted in nil records.

Source: AIHW National Perinatal Data Collection.

Figure 9.4: Proportion of women who gave birth, by smoking status and remoteness area, 2019



Notes

1. Mother's tobacco smoking status during pregnancy is self-reported.
2. Percentage calculated after excluding records with 'Not stated' values. Care must be taken when interpreting percentages.

Source: AIHW National Perinatal Data Collection.

Mothers who lived in remote areas were also more likely to drink alcohol during pregnancy (7.8%) than mothers living in regional areas (3.0%) and *Major cities* (2.0%). The proportion of mothers who lived in remote areas who reported drinking alcohol during the first 20 weeks of pregnancy was 7.3%, compared with 3.0% in the last 20 weeks of pregnancy.

Data on maternal consumption of alcohol during pregnancy were available for the first time in 2019. The analysis in this article excludes data for New South Wales and South Australia.

Healthy body weight

Obesity (a body mass index, or BMI, greater than 30) in pregnancy puts women at increased risk of conditions such as pre-eclampsia, and their babies have higher rates of congenital anomaly, stillbirth and neonatal death (AMB 2021b).

In 2019, mothers who lived in remote areas and regional areas had similar proportions of obesity (28% and 27%, respectively) and being overweight (BMI between 25 and 29.9) (both 27%) compared with 19% obese and 26% overweight for mothers who lived in *Major cities*.

Mothers who lived in remote areas were more likely to be underweight (BMI under 18.5) (4.5%) than mothers in regional areas (3.5%) and *Major cities* (3.7%).

Box 9.3: Body mass index

BMI is calculated by dividing a person's weight in kilograms by the square of their height in metres.

BMI does not necessarily reflect body fat distribution or describe the same degree of fatness in different individuals. At a population level, however, it is a practical and useful measure to identify overweight and obesity (AIHW 2020c).

In the NPDC, BMI refers to pre-pregnancy BMI. However, source data and methods used for data collection are not uniform nationally. For example, BMI can be calculated based on self-reported height and weight or on those measured at the first antenatal visit.

Maternal health conditions

The maternal health conditions of diabetes and hypertension are associated with increased risk of maternal illness and death, and of babies being born pre-term, small for gestational age, being admitted to a special care nursery, and perinatal death (AIHW 2019b; Queensland Clinical Guidelines 2021).

In 2019, mothers who lived in remote areas had higher rates of pre-existing diabetes (2.5%) than mothers living in regional areas (1.3%) and *Major cities* (0.7%). The rate of pre-existing hypertension for mothers who lived in remote areas was also higher (1.0%, compared with 0.8% for regional areas and 0.6% for *Major cities)*. This reflects previous findings that people who live in remote areas have higher rates of chronic health conditions (AIHW 2019a).

The rate of gestational diabetes was similar or the same across all remoteness areas (11% for remote and regional areas and 12% for *Major cities*), while the proportion of women who developed gestational hypertension was slightly lower in remote areas (2.2%) than in regional areas (2.9%) and *Major cities* (2.3%).

Previous pregnancies

Parity is the number of previous pregnancies resulting in live births or stillbirths, excluding the current pregnancy. First-time mothers and mothers with a higher parity – particularly a parity of 4 or greater than 5 – may be at increased risk of adverse birth outcomes, including pre-term birth (ACM 2021; Koullali et al. 2020).

In 2019, mothers who lived in remote areas were less likely to be a first-time mother (37%, compared with 39% in regional areas and 44% in *Major cities*); however, a higher proportion of mothers who lived in remote areas had a parity of 4 or more (6.0%), than mothers who lived in non-remote areas (4.7% in regional areas and 2.8% in *Major cities*) (Table 9.1).

Table 9.1: Proportion of women who gave birth, by parity and remoteness area, 2019

	Remoteness area			
Parity	Remote areas	Regional areas	*Major cities*	Total
		Per cent		
None	37.3	38.8	43.9	42.5
1	31.3	33.4	35.9	35.2
2	17.6	16.6	13.2	14.1
3	7.7	6.5	4.2	4.8
4 or more	6.0	4.7	2.8	3.3
Not stated	0.0	0.0	0.0	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**

Note: The percentages may not sum to 100% due to rounding.

Source: AIHW National Perinatal Data Collection.

Antenatal care visits

The time from conception to birth is known as the antenatal period. Antenatal care visits are designed to assess and improve the health of mothers and their babies during pregnancy. Antenatal care visits include assessing and monitoring maternal and fetal health, identifying and managing risk factors, providing advice, and encouraging health behaviours (Department of Health 2020).

The availability and accessibility of services impact the use of antenatal care services (AIHW 2017). Mothers living in remote areas of Australia may face challenges in accessing appropriate antenatal care due to geographic isolation and limitations in workforce availability (Department of Health 2020).

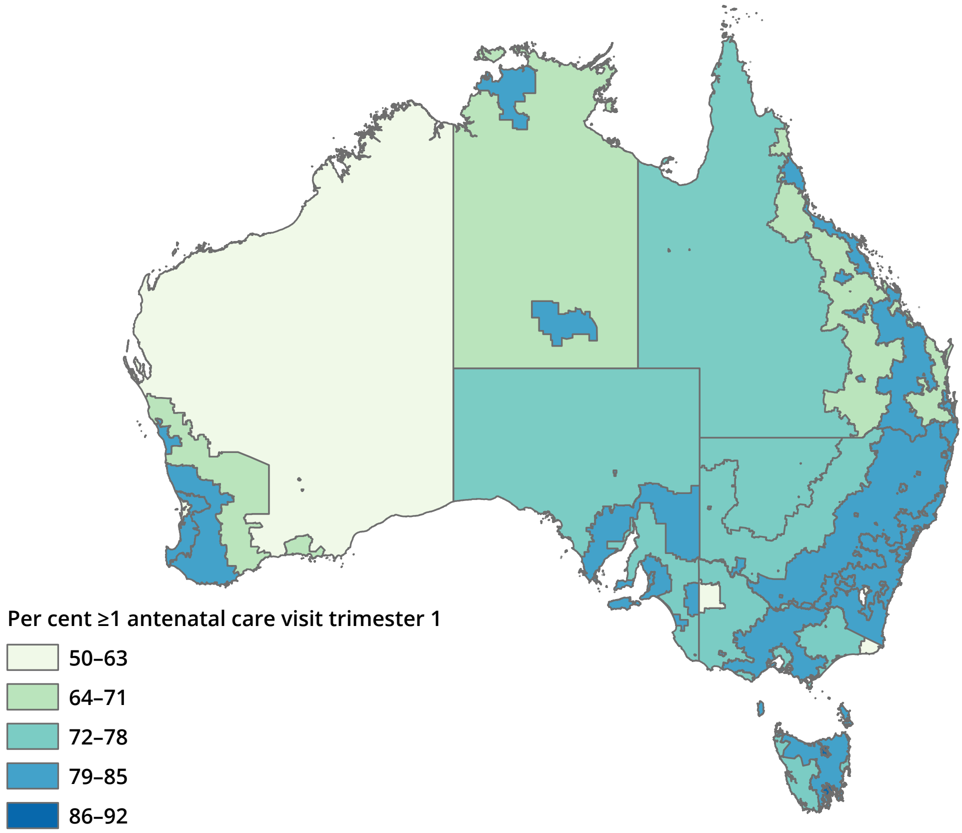
As well as these challenges, the Council of Australian Governments (COAG) Health Council publication *Women-centred care: strategic directions for Australian maternity services* acknowledges that restricted options for maternity care can cause family and work life disruptions – and safety issues – for women who live in rural and remote communities (COAG Health Council 2019).

In 2019, mothers living in remote areas were less likely to attend their first antenatal care visit in the first trimester (less than 14 weeks' gestation) (72%, compared with 78% for regional areas and 76% for *Major cities*). Importantly, these women were also nearly twice as likely to attend their first antenatal visit at a gestation greater than 20 weeks (15%, compared with 8.4% for non-remote areas).

Over time, however, the proportion of mothers who lived in remote areas attending their first antenatal care visit within the first trimester has improved, up from 63% in 2012.

Figure 9.5 shows the proportion of women who had at least one antenatal visit in the first trimester within each remoteness area (see Figure 9.1), overlaid on a map of Australia.

Figure 9.5: Proportion of women who gave birth and had at least one antenatal care visit in the first trimester, by remoteness area, 2019



Notes

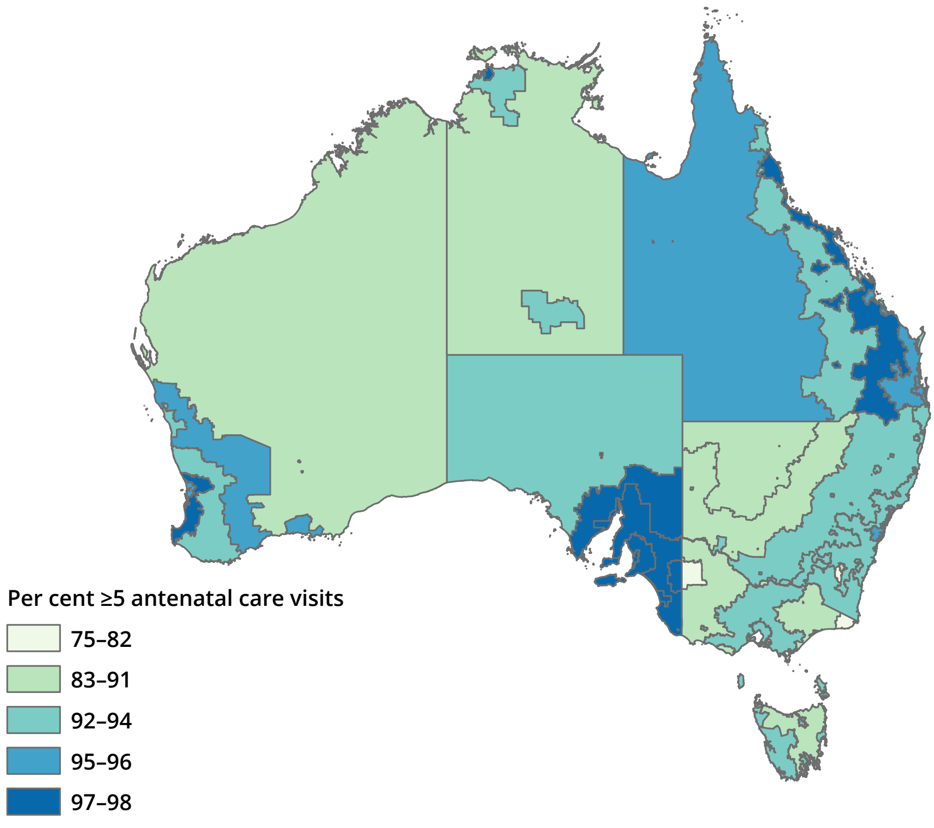
1. Percentage calculated after excluding records with duration of pregnancy at first antenatal visit of 'Not stated'. Care must be taken when interpreting percentages.
2. Data are by state/territory of mother's usual residence.
3. For Western Australia, gestational age at first antenatal visit is reported by birth hospital; therefore, data may not be available for women who attend their first antenatal visit outside the birth hospital. This particularly affects hospitals without antenatal care services onsite.
4. For the Australian Capital Territory, the first antenatal visit is often the first hospital antenatal clinic visit. In many cases, earlier antenatal care provided by the woman's general practitioner is not reported.
5. White areas on the map represent areas where analysis by remoteness area resulted in nil records.

Source: AIHW National Perinatal Data Collection.

In 2019, 94% of mothers who lived in remote and regional areas had 5 or more antenatal care visits, compared with 95% for *Major cities*. However, mothers who lived in remote areas were more likely to have no antenatal care during pregnancy (0.4%, compared with 0.1% for non-remote areas).

Figure 9.6 shows the proportion of women who had 5 or more antenatal care visits in the first trimester within each remoteness area (see Figure 9.1), overlaid on a map of Australia.

Figure 9.6: Proportion of women who gave birth and had 5 or more antenatal care visits, by remoteness area, 2019



Notes

1. Number of antenatal visits are based on women who gave birth at 32 weeks or more gestation (excluding unknown gestation).
2. Percentage calculated after excluding records with number of antenatal visits of 'Not stated'. Care must be taken when interpreting percentages.
3. Data are by state/territory of mother's usual residence.
4. For the Australian Capital Territory, in many cases, early antenatal care provided by the woman's general practitioner is not reported.
5. For the Northern Territory, 'Not stated' includes antenatal care where attendance is evident by the availability of antenatal screening results, but the total number of antenatal visits is unknown.

Source: AIHW National Perinatal Data Collection.

Drive time to public birthing facilities

This section uses drive time as a measure to explore access to birthing services for women across Australia. This analysis calculates the drive time in minutes from residential addresses to a public birthing facility, weighted for the population of females aged 15–44 (women of reproductive age) living within a statistical area. Public birthing facilities were selected as these are accessible to all women. The facilities included in this analysis were based on those in scope for the AIHW's Maternity Models of Care data collection and limited to public hospitals that provided intrapartum care.

Research indicates that increased travel time to birthing services may be associated with increased risk of post-partum haemorrhage, being born before arrival and perinatal mortality (Malouf et al 2020).

In this section, access is measured in terms of physical or spatial access, although it is acknowledged that other factors – such as cost, workforce availability and cultural appropriateness – affect the accessibility of care (AIHW 2017). The measure of interest in this section is weighted average drive time – a measure of drive time for women aged 15–44 which is modified to reflect the population distribution in an area. This is an average measure, so women within an SA2 are likely to have a drive time higher or lower than the area value, but the weighting ensures that the measure best reflects the experience of most women of reproductive age.

In 2016, an estimated 91,684 women of reproductive age (between ages of 15 and 44) lived in remote areas, representing 1.8% of the total ERP. Of these, 40% had a drive time of less than 30 minutes to a public birthing facility and 38% had a drive time of more than 2 hours (Table 9.2).

Table 9.2: Women of reproductive age, by drive time to access a public birthing facility and remoteness area, 2016

	Drive time				
Remoteness area	**Less than 30 minutes**	**Between 30 and 60 minutes**	**More than 1 hour to 2 hours**	**More than 2 hours**	**Total**
			Number		
Major cities	3,761,803	15,391	0	0	**3,777,194**
Regional areas	930,577	157,092	27,329	2,166	**1,117,164**
Remote areas	36,384	5,990	14,465	34,845	**91,684**
Total	**4,728,764**	**178,473**	**41,794**	**37,011**	**4,986,042**
			Per cent		
Major cities	99.6	0.4	0.0	0.0	**100.0**
Regional areas	83.3	14.1	2.4	0.2	**100.0**
Remote areas	39.7	6.5	15.8	38.0	**100.0**
Total	**94.8**	**3.6**	**0.8**	**0.7**	**100.0**

Notes

1. Weighted average drive time was calculated based on population data for the 2016 Statistical Area Level 1 (SA1) and SA2 ERP for females aged 15–44.
2. Where an SA2 spanned more than one remoteness area, the ERP with a remoteness area having a ratio of greater than or equal to 0.5 was counted.

Analysis based on statistical area, rather than population size, presents a different picture (Figure 9.7). In 2016, SA2s in remote areas made up only 4.2% of SA2s overall. Of these, 25% had a drive time of less than 30 minutes to access a public birthing facility, and nearly half (48%) had a drive time of more than 2 hours. In contrast, most SA2s in regional areas had a drive time of an hour or less (76% had a drive time of less than 30 minutes and 19% had a drive time between 30 and 60 minutes). The vast majority (99%) of SA2s in *Major cities* had a drive time of less than 30 minutes (Table 9.3).

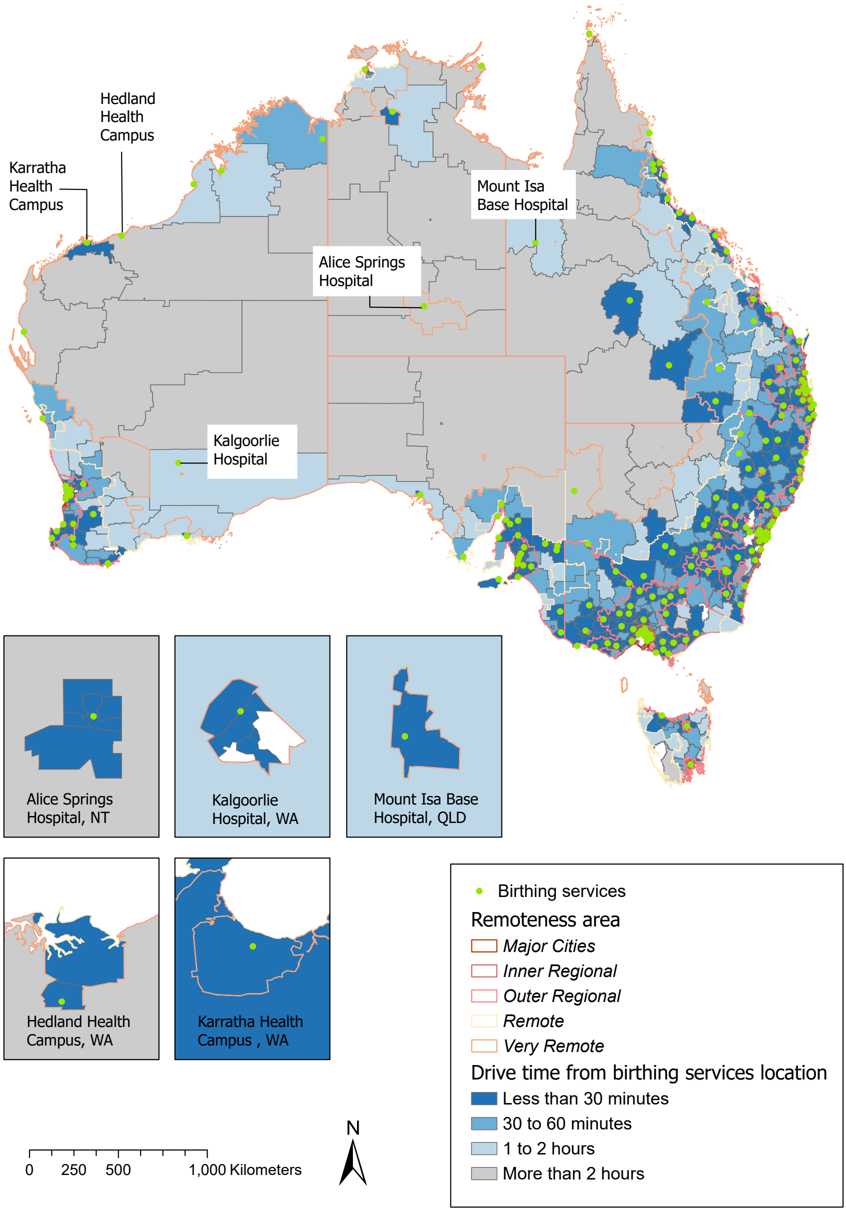
Table 9.3: SA2s, by population drive time to access a public birthing facility and remoteness area, 2016

	Drive time				
Remoteness area	**Less than 30 minutes**	**Between 30 and 60 minutes**	**More than 1 hour to 2 hours**	**More than 2 hours**	**Total**
			Number		
Major cities	1,308	10	0	0	**1,318**
Regional areas	610	155	37	2	**804**
Remote areas	23	5	21	45	**94**
Total	**1,941**	**170**	**58**	**47**	**2,216**
			Per cent		
Major cities	99.2	0.8	0.0	0.0	**100.0**
Regional areas	75.9	19.3	4.6	0.2	**100.0**
Remote areas	24.5	5.3	22.3	47.9	**100.0**
Total	**87.6**	**7.7**	**2.6**	**2.1**	**100.0**

Notes

1. Weighted average drive time was calculated based on population data for the 2016 SA1 and SA2 ERP for females aged 15-44.
2. Where an SA2 spanned more than one remoteness area, the ERP with a remoteness area having a ratio of greater than or equal to 0.5 was counted.
3. Percentages may not sum to 100% due to rounding.

Figure 9.7: Drive time of women of reproductive age to a public birthing facility, and public birthing facility location, by SA2, 2016



Notes

1. Public birthing facility data are based on facilities in scope for the AIHW's Maternity Models of Care data collection in 2021.
2. Weighted average drive time was calculated based on population data for the 2016 SA1 and SA2 ERP for females aged 15–44.
3. Hospital locations chosen for pop-out windows in this figure were selected based on a remoteness area of *Remote* or *Very remote* and ERP density, with preference given to populations with a higher density. Due to spacing limitations, not all hospitals in remote population centres could be shown.
4. White areas on the map represent areas where there were no population data.

Source: AIHW.

Onset of labour

Labour can occur spontaneously or it may be induced through surgical or medical intervention. If there is no labour, a caesarean section is performed (AIHW 2021b).

Labour may be induced if there is concern for the health of the mother or her baby. Compared with spontaneous labour, induction increases the risks of adverse pregnancy outcomes, such as an increased risk of emergency caesarean section, infection and bleeding, and a less positive experience of birth for women (Coates et al. 2020; Grivell et al. 2012).

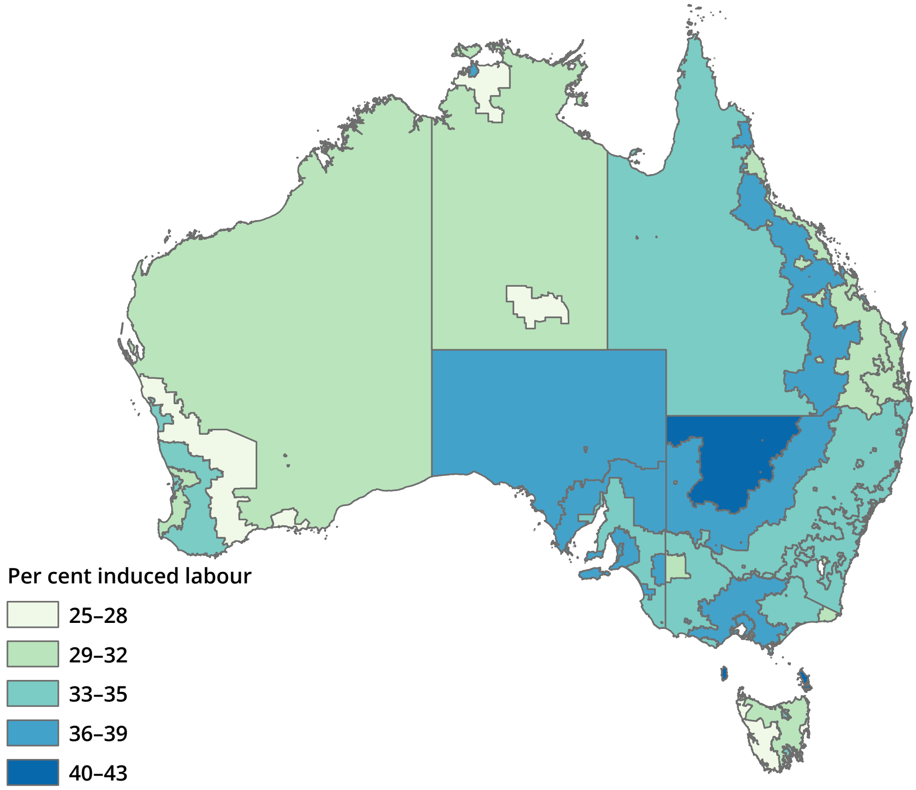
In 2019, mothers who lived in remote areas had slightly higher rates of spontaneous labour (48%) than in regional areas (45%) and *Major cities* (42%). They also had slightly lower rates of:

- induced labour (32%) than for mothers who lived in regional areas (34%) and *Major cities* (35%)
- no labour (20%) than for mothers who lived in regional areas (21%) and *Major cities* (24%).

Since 2012, the proportion of mothers living in remote areas who had spontaneous labour has decreased (down from 56%) and the proportion having induced or no labour has increased (up from 27% and 17%, respectively).

Figure 9.8 shows the proportion of women who had an induced labour within each remoteness area (see Figure 9.1), overlaid on a map of Australia.

Figure 9.8: Proportion of women who gave birth and had an induced labour, by remoteness area, 2019



Notes

1. 'Induced' may include cases where induction of labour was attempted but labour did not result.
2. Data are by state/territory of mother's usual residence.
3. White areas on the map represent areas where analysis by remoteness area resulted in nil records.

Source: AIHW National Perinatal Data Collection.

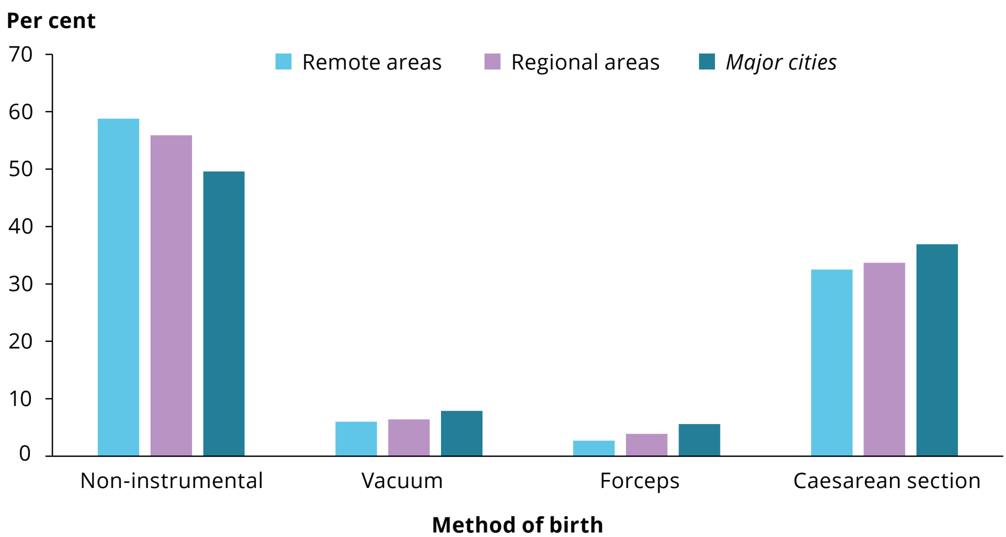
Method of birth

Method of birth refers to how the baby was born, which may be vaginally or by caesarean section. Compared with non-instrumental vaginal births, instrumental vaginal births (assisted by vacuum or forceps) and caesarean section births can carry additional risks for mothers and babies, such as infection and physical trauma. Although each method carries risks, women and their health care providers choose them to avoid complications and increase the likelihood of positive pregnancy outcomes (Victorian Department of Health 2017).

In 2019, 59% of mothers who lived in remote areas had a non-instrumental vaginal birth (compared with 56% for regional areas and 50% for *Major cities*) and 8.7% had an instrumental vaginal birth (compared with 10% for regional areas and 14% for *Major cities*).

The proportion of mothers who had a caesarean section birth was similar for remote areas (33%) and regional areas (34%); these proportions compare with 37% for *Major cities* (Figure 9.9).

Figure 9.9: Proportion of women who gave birth, by method of birth and remoteness area, 2019



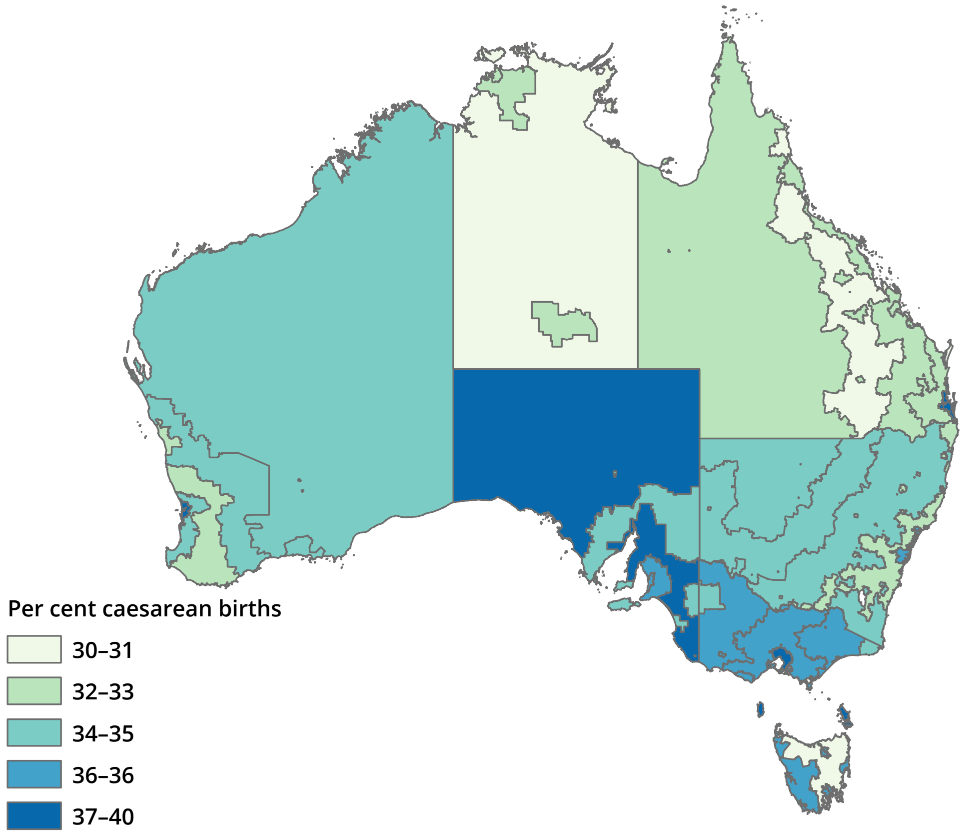
Note: For multiple births, the method of birth of the first-born baby is used.

Source: AIHW National Perinatal Data Collection.

Since 2012, rates of non-instrumental vaginal birth have fallen (down from 62%) for mothers who lived in remote areas, while rates of instrumental vaginal and caesarean section births have increased (up from 8.0% and 30%, respectively).

Figure 9.10 shows the proportion of women who had a caesarean section birth within each remoteness area (see Figure 9.1), overlaid on a map of Australia.

Figure 9.10: Proportion of women who had a caesarean section birth, by remoteness area, 2019



Notes

1. For multiple births, the method of birth of the first-born baby is used.
2. Data are by state/territory of mother's usual residence.
3. White areas on the map represent areas where analysis by remoteness area resulted in nil records.

Source: AIHW National Perinatal Data Collection.

Perineal status

Perineal status refers to the state of the perineum following a vaginal birth. An episiotomy is an incision of the perineum and vagina to enlarge the vulval orifice (AIHW 2021b). Data are specific to women who gave birth vaginally. Note that women can be recorded as having both an episiotomy and some degree of laceration.

Many women who give birth vaginally experience perineal tears, which are classified from first- to fourth-degree tears depending on their severity. Third and fourth-degree tears are considered to be severe and can have lifelong impacts if not repaired immediately after the birth (Homer and Wilson 2018). Episiotomies are usually performed when there is a medical indication and can vary in severity (NCT 2018).

In 2019, mothers who lived in remote areas were more likely to have an intact perineum (35 per 100 women giving birth vaginally, compared with 27 and 20 in regional areas and *Major cities*, respectively) and were less likely to have an episiotomy (14 per 100, compared with 18 and 27 per 100 in regional areas and *Major cities*, respectively). Rates of episiotomy for mothers who lived in remote areas has increased over time (from 11 per 100 in 2014 to 14 in 2019).

Rates of third- or fourth-degree lacerations were similar or the same across all remoteness areas (2.7 per 100 for both remote and regional areas, and 2.9 for *Major cities*).

Maternal length of stay in hospital

Women who live in remote areas of Australia often relocate before giving birth. Practices vary across jurisdictions; generally, however, women who relocate and have low-risk pregnancies travel a few weeks before their due date and stay close to a birthing facility. Women who have higher risk pregnancies may be asked to travel much earlier in the pregnancy, and stay in hospital, spending many weeks away from their home and family (AIHW 2017; Barclay 2016). This means that mothers who live in remote areas may face a lack of practical and emotional support as well as isolation and increased financial costs (Department of Health 2020).

Overall, the antenatal length of stay was similar across all remoteness areas. The median length of stay was 0 days for all remoteness areas, with the average length of stay being 0.7 days for women who lived in remote areas and 0.6 days for both regional areas and *Major cities*. More than half of the women who lived in remote areas had an antenatal hospital stay of less than 1 day (57%, compared with 61% for women who lived in regional areas and 65% for *Major cities*) (Table 9.4).

The postnatal length of stay was also similar across remoteness areas, with a median length of stay of 2 days for women who lived in remote and regional areas and 3 days for *Major cities*. The average length of stay was 2.6 days for women who lived in remote areas and regional areas, and 2.8 days for *Major cities*. Three-quarters of women who lived in remote areas had a postnatal hospital stay of 3 days or less (75%, compared with 77% of mothers who lived in regional areas and 69% in *Major cities*) (Table 9.4).

Table 9.4: Proportion of women who gave birth, by length of stay in hospital and remoteness area, 2019

	Remoteness area			
Length of stay	Remote areas	Regional areas	*Major cities*	Total
Antenatal[(a)]		Per cent		
Less than 1 day	57.3	61.0	64.5	63.5
1 day	33.2	30.8	28.3	29.0
2 days	5.4	5.1	4.7	4.8
3 days	1.5	1.3	1.1	1.1
4 days	0.6	0.5	0.4	0.4
5 days	0.4	0.3	0.2	0.2
6 days	0.3	0.2	0.2	0.2
7–13 days	0.9	0.5	0.4	0.4
14 or more days	0.4	0.3	0.3	0.3
Total	**100.0**	**100.0**	**100.0**	**100.0**
Postnatal[(a)(b)]		Per cent		
Less than 1 day	4.7	4.9	3.7	4.0
1 day	20.0	20.2	16.9	17.8
2 days	26.7	28.3	27.1	27.4
3 days	23.9	24.0	20.9	21.7
4 days	13.4	13.3	17.6	16.4
5 days	6.2	6.3	10.6	9.4
6 days	2.3	1.7	2.0	1.9
7–13 days	2.6	1.2	1.2	1.2
14 days or more	0.2	0.1	0.1	0.1
Total	**100.0**	**100.0**	**100.0**	**100.0**

(a) Excludes women who gave birth in birth centres attached to hospitals.

(b) Includes women who were discharged home. For multiple births, the length of stay after the birth of the first-born baby was used.

Note: Percentages may not sum to 100% due to rounding.

Source: AIHW National Perinatal Data Collection.

Over time, the postnatal length of stay for women who lived in remote areas has become shorter, with an increase in the proportion of stays of 3 days or less (for example, stays of less than 1 day increased from 2.8% in 2012 to 4.7% in 2019) with a corresponding drop in the proportion of stays of 4 days or more (for example, stays of 4 days fell from 18% in 2012 to 13% in 2019).

This trend towards shorter postnatal lengths of stay was also seen in non-remote areas (where stays of less than 1 day increased from 4.0% in 2012 to 4.9% in 2019 for regional areas and from 3.3% in 2012 to 3.7% in 2019 for *Major cities*). The antenatal length of stay for mothers across all remoteness areas remained relatively consistent during this period.

Gestational age

Gestational age is the duration of pregnancy in completed weeks and is reported in 3 categories: pre-term (less than 37 weeks' gestation), term (37 to 41 weeks) and post-term (42 weeks and over).

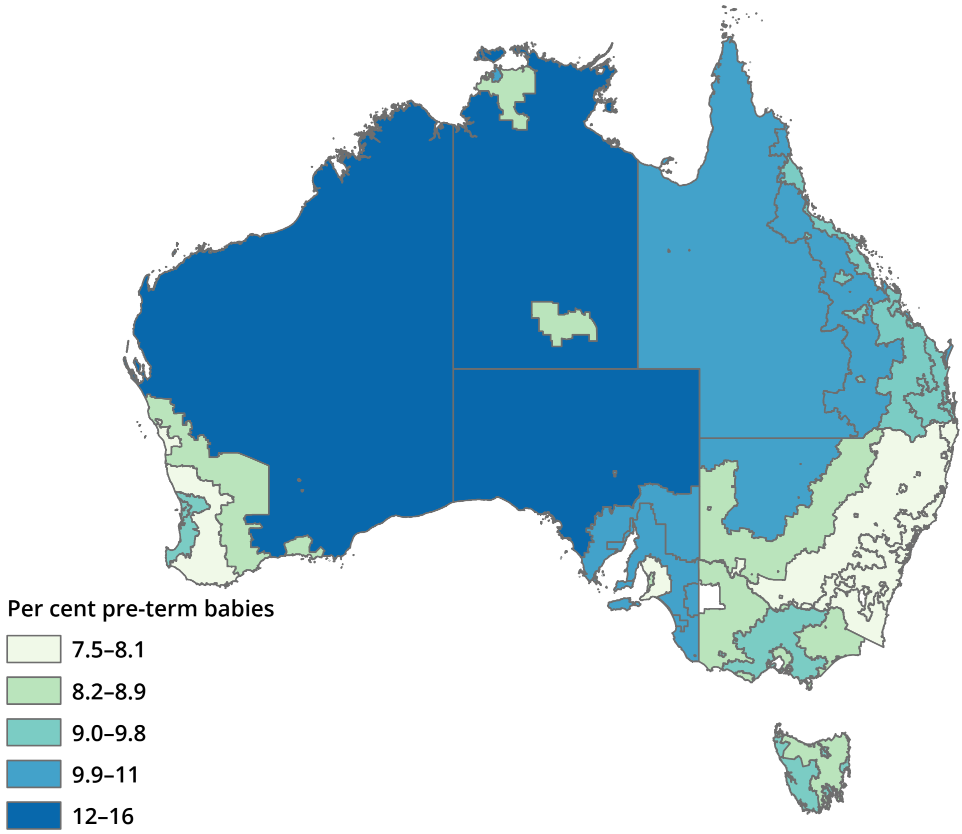
The gestational age of a baby has important implications for their health, as babies born pre-term may have breathing problems, feeding difficulties, and physical and developmental delay (CDC 2020).

In 2019, babies born to mothers who lived in remote areas were slightly more likely to be born pre-term (11%) than babies in regional areas (8.9%) and *Major cities* (8.4%) Babies born to mothers who lived in remote areas were slightly less likely to be born at term (81%) or post-term (7.9%) than babies born in regional areas (82% and 9.5%, respectively) or *Major cities* (83% and 8.6%, respectively).

Over time, the proportion of pre-term babies born to mothers who lived in remote areas has remained relatively unchanged (10% in 2012).

Figure 9.11 shows the proportion of babies born pre-term within each remoteness area (see Figure 9.1), overlaid on a map of Australia.

Figure 9.11: Proportion of babies born pre-term, by remoteness area, 2019



Notes

1. Pre-term births may include a small number of births of less than 20 weeks' gestation.
2. Data are by state/territory of mother's usual residence.
3. White areas on the map represent areas where analysis by remoteness area resulted in nil records.

Source: AIHW National Perinatal Data Collection.

Birthweight

Birthweight is an important indicator of a baby's health. Birthweight is grouped into 3 categories: low birthweight (less than 2,500 grams), normal birthweight (2,500 to 4,499 grams) and high birthweight (4,500 grams or more).

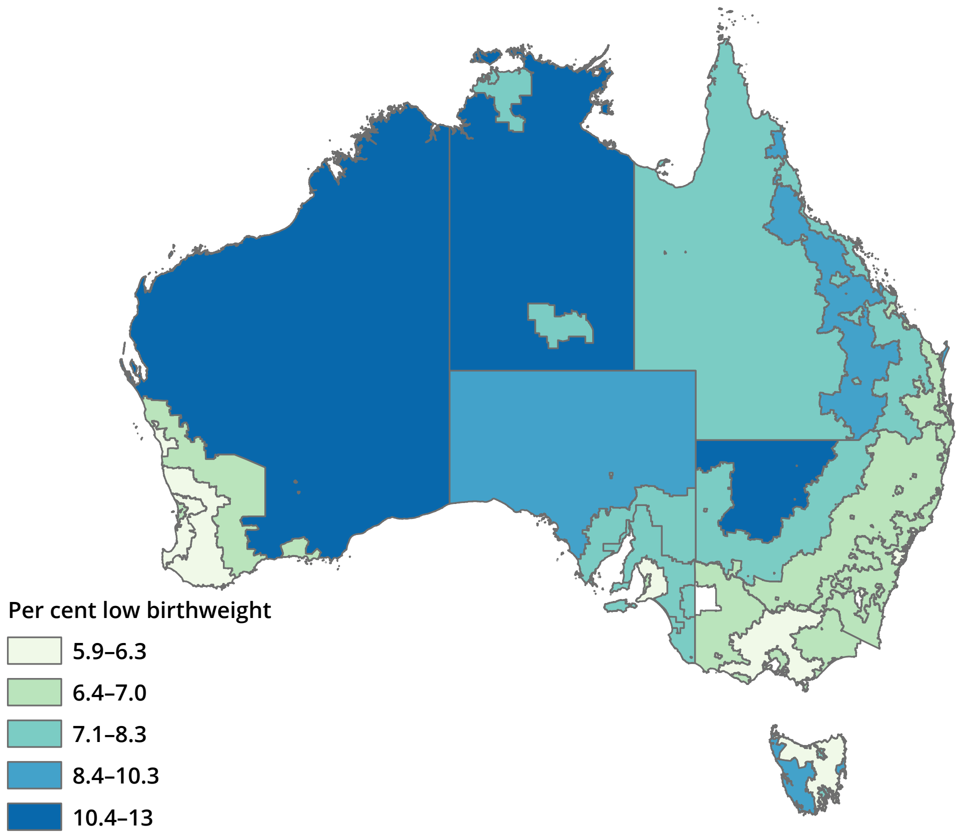
Low-birthweight babies are at a higher risk of disability and death during infancy, with long term health effects including poor cognitive development and increased risk of chronic diseases (AIHW 2020a). Low birthweight is closely associated with pre-term birth. Data on birthweight are limited to liveborn babies.

In 2019, babies born to mothers who lived in remote areas were slightly more likely to be born with a low birthweight (8.9%) than babies born in regional areas (6.7%) and in *Major cities* (6.5%). Babies born to mothers who lived in remote areas were slightly less likely to be born with a normal birthweight (90%) than babies in regional areas and *Major cities* (both 92%).

Over time, the proportion of babies of low birthweight born to mothers living in remote areas has increased (up from 8.0% in 2012).

Figure 9.12 shows the proportion of liveborn babies of low birthweight within each remoteness area (see Figure 9.1), overlaid on a map of Australia.

Figure 9.12: Proportion of liveborn low birthweight babies, by remoteness area, 2019



Notes

1. Includes liveborn babies only.
2. Data are by state/territory of mother's usual residence.
3. White areas on the map represent areas where analysis by remoteness area resulted in nil records.

Source: AIHW National Perinatal Data Collection.

Admission to special care nursery or neonatal intensive care unit

Babies are admitted to a special care nursery (SCN) or neonatal intensive care unit (NICU) if they require more specialised care and treatment than is available on the postnatal ward. Pre-term babies and low birthweight babies are more likely to be admitted to an SCN or NICU (AIHW 2021b). Data on admission to an SCN/NICU are limited to liveborn babies and exclude data for New South Wales and Western Australia.

In 2019, 22% of babies born to mothers who lived in remote areas were admitted to an SCN/NICU compared with 20% of babies born to mothers in regional areas and 17% in *Major cities*.

Stillbirths and neonatal deaths

Perinatal deaths are those occurring before or during labour and/or birth (stillbirth) or up to 28 days after birth (neonatal death), where the baby is of 20 or more completed weeks of gestation or with a birthweight of at least 400 grams.

Multiple maternal and baby factors have been associated with increased risk of perinatal death; for example, medical and obstetric conditions and pre-term birth. Some groups have also been identified as having higher rates of perinatal death, including women living in *Remote* and *Very remote* areas (AIHW 2021c).

In 2019, the perinatal mortality rate for babies born to mothers in remote areas was 13 per 1,000 births (compared with 9.6 per 1,000 births in regional areas and 9.2 in *Major cities*):

- The stillbirth rate was 9.6 per 1,000 births (compared with 7.2 per 1,000 births in both regional areas and *Major cities*).
- The neonatal mortality rate was 3.6 per 1,000 live births (compared with 2.6 per 1,000 live births in regional areas and 2.2 in *Major cities*).

Due to an update in methods, perinatal deaths data by remoteness area may not match previously reported data. Methods will be standardised in future reporting.

Indigenous mothers who live in remote areas and their babies

Accessing appropriate and culturally safe care poses a considerable challenge to Indigenous mothers in remote areas; stressors they may face include separation from country and family, language barriers, culturally inappropriate or unsafe birthing conditions, and navigating an unfamiliar health system (AIHW 2017, 2021a).

Providing appropriate and culturally safe antenatal care and birthing services – while working in partnership with Indigenous women – will improve the likelihood of their having a positive pregnancy experience and a healthy baby (AIHW 2017).

'Birthing on Country' was recognised in the Australian National Maternity Services Plan as a key approach to improve maternity services for Indigenous women and their babies. Birthing on Country is best practice maternity care for Indigenous women and may include the following elements:

- is community-based and governed
- incorporates traditional practice
- involves connection with land and country
- values both Indigenous and non-Indigenous knowledge and learning
- is culturally competent
- is developed by or with Indigenous people (Kildea et al. 2016).

To improve access to Birthing on Country programs for Indigenous women living in remote areas, wider barriers to delivering maternity care in geographically isolated areas need to be resolved, including limited workforce availability and resources, and access to facilities providing intrapartum care (Department of Health 2020; Kildea et al. 2016).

It is important to note that, despite improvements over time, Indigenous mothers and babies experience poorer health outcomes than non-Indigenous mothers and babies in some areas, and that there are complex interactions between maternal and perinatal health outcomes and the determinants of health, including both social determinants and health risk factors (AIHW 2021a).

Indigenous mothers

In 2019, 39% of women who gave birth and lived in remote areas identified as Indigenous. Although Indigenous women account for a higher proportion of the population of mothers in remote areas, overall, the proportion of Indigenous mothers who live in *Major cities* (36%) and regional areas (46%) is higher than that in remote areas (18%).

Indigenous mothers who lived in remote areas in 2019 were more likely to:

- be aged under 20 (15%, compared with 11% of Indigenous mothers in regional areas and 10% in *Major cities*)
- live in the lowest socioeconomic areas (66%, compared with 47% of Indigenous mothers in regional areas and 31% of Indigenous mothers in *Major cities*)
- have lower rates of first antenatal care visit in the first trimester (64%, compared with 70% of Indigenous mothers in regional areas and 68% in *Major cities*)
- smoke at any time during pregnancy (52%, compared with 46% of Indigenous mothers in regional areas and 37% of Indigenous mothers in *Major cities*)
- consume alcohol at any time during pregnancy (13%, compared with 5.6% of Indigenous mothers in regional areas and 5.5% of Indigenous mothers in *Major cities*).

The majority of Indigenous mothers who lived in remote areas had 5 or more antenatal visits (89%, compared with 90% of Indigenous mothers in regional areas and 88% in *Major cities*) and were:

- more likely to have an intact perineum after a vaginal birth (43 per 100 women who gave birth vaginally, compared with 36 Indigenous women in both regional areas and *Major cities*)
- less likely to have an episiotomy (10 per 100 women, compared with 11 in regional areas and 15 in *Major cities*).

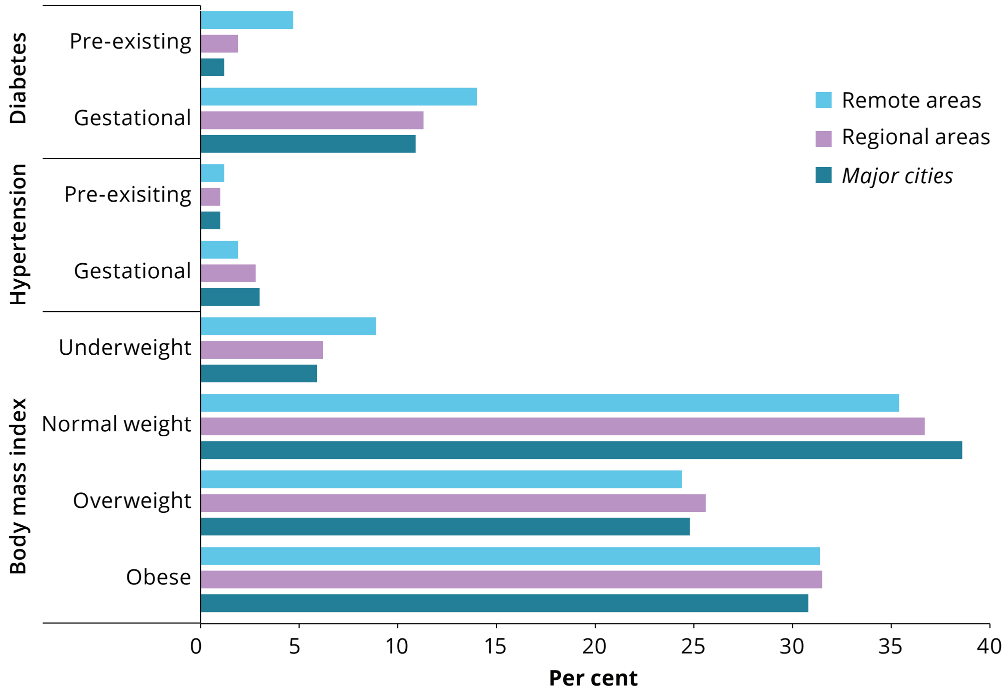
As well, since 2012, the proportion of Indigenous mothers aged under 20 declined (21% down to 15%) as did their living in the lowest socioeconomic areas (75% down to 66%), while first antenatal visit attendance in the first trimester increased (53% up to 64%).

Indigenous mothers who lived in remote areas had higher rates of pre-existing diabetes (4.7%) or gestational diabetes (14%) than Indigenous mothers who lived in regional areas (1.9% and 11%, respectively) or in *Major cities* (1.2% and 11%, respectively).

Indigenous mothers who lived in remote areas had similar rates of pre-existing hypertension (1.2%, compared with 1.0% for Indigenous mothers in non-remote areas) and were less likely to have gestational hypertension (1.9%, compared with 2.8% for Indigenous mothers in regional areas and 3.0% in *Major cities*).

Indigenous mothers who lived in remote areas were more likely to be underweight (8.9%) than Indigenous mothers in regional areas (6.2%) and *Major cities* (5.9%). Rates of obesity were the same across all remoteness areas (31%) (Figure 9.13).

Figure 9.13: Proportion of Indigenous women who gave birth, by BMI, maternal health conditions and remoteness area, 2019

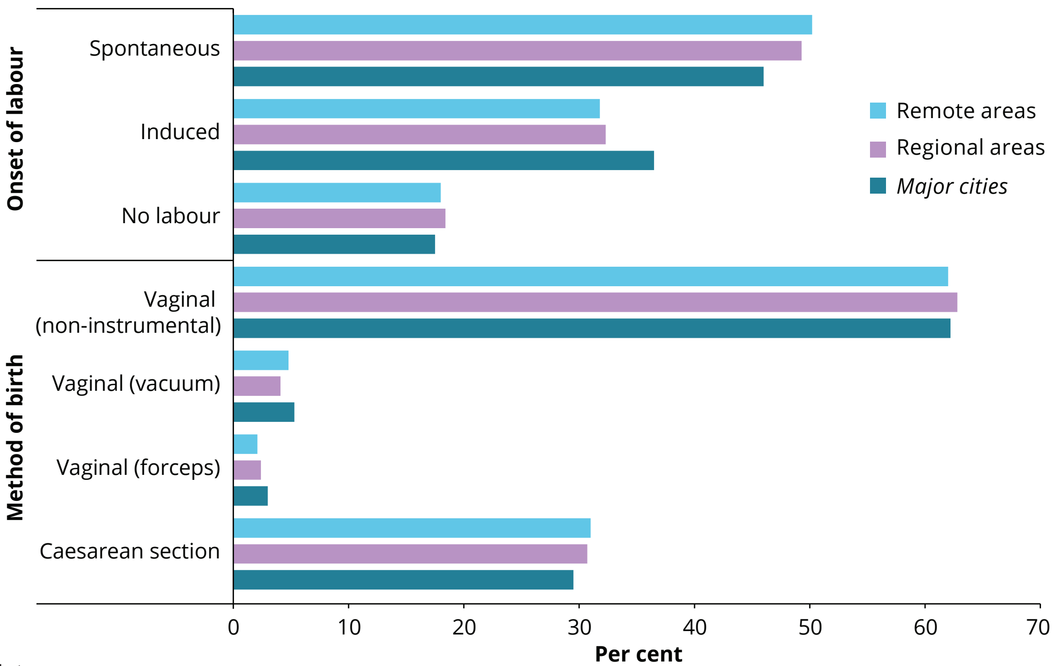


Note: BMI data exclude records where BMI was 'Not stated'.

Source: AIHW National Perinatal Data Collection.

Indigenous mothers who lived in remote areas had a slightly higher rate of spontaneous labour (50%) than Indigenous mothers who lived in regional areas (49%) or *Major cities* (46%). Indigenous mothers who lived in remote areas and regional areas were less likely to have an induced labour (both 32%) than Indigenous mothers in *Major cities* (37%) (Figure 9.14).

Figure 9.14: Proportion of Indigenous women who gave birth, by onset of labour and method of birth and remoteness area, 2019



Notes

1. 'Induced' may include cases where induction of labour was attempted but labour did not result.

2. For multiple births, the method of birth of the first-born baby is used.

Source: AIHW National Perinatal Data Collection.

Over time, the proportion of Indigenous mothers who lived in remote areas who had spontaneous labour fell (down from 63% in 2012) and induced labour rose (up from 22% in 2012).

Non-instrumental vaginal birth has decreased for Indigenous mothers who live in remote areas (from 67% in 2012 to 62% in 2019) and the rate of caesarean section births has increased (from 28% in 2012 to 31% in 2019).

Indigenous babies

In 2019, 2,594 babies were born to Indigenous mothers who lived in remote areas, accounting for 18% of all *babies born to Indigenous mothers* (based on the Indigenous status of the mother).

There were also 2,809 *Indigenous babies* born to mothers who lived in remote areas and who identified as either Indigenous or non-Indigenous, accounting for 16% of all *Indigenous babies* (based on the Indigenous status of the baby). Note that these 2 groups (*babies born to Indigenous mothers* and *Indigenous babies*) are not mutually exclusive.

As more than one-quarter (26%) of *Indigenous babies* were born to non-Indigenous mothers in 2019, it is important to consider the outcomes for babies based on the Indigenous status of both the mother and the baby, otherwise the birth outcomes of a substantial proportion of the Indigenous birth cohort would not be considered (AIHW 2021b). As previously acknowledged, Indigenous mothers may face poorer health outcomes and unique challenges in their experience of pregnancy, and whether the mother identifies as Indigenous or non-Indigenous may have important implications for the health of their baby.

While the outcomes for *Indigenous babies* whose mothers lived in remote areas, and *babies born to Indigenous mothers* who lived in remote areas are very similar, there were some differences. For example, *babies born to Indigenous mothers* who lived in remote areas were slightly more likely to be born pre-term, of low birthweight, admitted to an SCN/NICU and to stay in hospital for 4 days or more than *Indigenous babies* born to mothers who lived in remote areas.

Compared with both *Indigenous babies* and *babies born to Indigenous mothers* who lived in regional areas or *Major cities*, both *Indigenous babies* and *babies born to Indigenous mothers* who lived in remote areas were more likely to:

- be born pre-term
- be of low birthweight
- be admitted to an SCN/NICU
- have a longer length of stay in hospital.

More detail on the differences between these groups is provided in Table 9.5.

In 2019, the perinatal mortality rate for *Indigenous babies* whose mothers lived in remote areas was 20 per 1,000 births (compared with 12 per 1,000 births in regional areas and 10 in *Major cities*). The stillbirth rate was 14 per 1,000 births (compared with 8.4 per births in regional areas and 8.6 in *Major cities*) and the neonatal mortality rate was 6.0 per 1,000 live births (compared with 4.0 per 1,000 live births in regional areas and 2.2 in *Major cities*).

Mortality rates were also higher for *babies born to Indigenous mothers* who lived in remote areas than for *babies born to Indigenous mothers* who lived in other remoteness areas:

- The perinatal mortality rate was 20 per 1,000 births (compared with 14 per 1,000 births in regional areas and 13 in *Major cities*).
- The stillbirth rate was 14 per 1,000 births (compared with 9.6 per 1,000 births in regional areas and 9.8 in *Major cities*).
- The neonatal mortality rate was 6.0 per 1,000 live births (compared with 4.8 per 1,000 live births in regional areas and 3.2 in *Major cities*).

Table 9.5: Baby outcomes, by Indigenous status of the mother and Indigenous status of the baby and remoteness area, 2019

	Proportion of babies of Indigenous mothers[a] (%)				Proportion of Indigenous babies[b] (%)			
	Remoteness area				Remoteness area			
	Remote areas	Regional areas	*Major cities*	Total	Remote areas	Regional areas	*Major cities*	Total
Gestational age								
Pre-term[c]	15.5	12.4	13.0	13.2	14.8	11.6	11.8	12.2
Term	79.5	80.1	78.9	79.5	79.9	80.4	79.4	80.0
Birthweight[d]								
Low birthweight	13.9	11.5	10.5	11.6	13.1	10.6	9.5	10.6
Normal birthweight	84.9	87.4	88.2	87.2	85.7	88.2	89.3	88.2
Apgar score[d]								
Less than 7	3.1	2.5	2.5	2.6	3.1	2.6	2.2	2.5
7 or more	96.3	97.0	97.1	96.9	96.3	97.0	97.4	97.1
Admission to SCN/ NICU[d][e]								
Admitted	28.9	26.1	23.8	26.0	28.1	25.3	22.1	24.7
Not admitted	71.1	73.9	76.2	74.0	71.9	74.7	77.9	75.3
Length of stay[d][f]								
3 days or less	65.8	78.3	76.6	75.8	66.7	78.9	77.1	76.6
4 days or more	34.2	21.7	23.2	24.2	33.3	21.0	22.8	23.3

(a) Based on Indigenous status of the mother; excludes records where Indigenous status was 'Not stated'.
(b) Based on Indigenous status of the baby; excludes records where Indigenous status was 'Not stated'.
(c) Pre-term births may include a small number of births of less than 20 weeks' gestation.
(d) Includes liveborn babies only.
(e) Excludes data for New South Wales and Western Australia.
(f) Babies born in hospital and discharged home. Excludes data for Western Australia.

Conclusion

The majority of mothers who lived in remote areas in 2019 had uncomplicated pregnancies and healthy babies. However, exploring the differences in maternal and perinatal outcomes across remoteness areas makes it clear that mothers who live in remote areas face additional challenges compared with mothers who live in non-remote areas.

These challenges are reflected in the dimensions that affect the health of mothers and their babies: the social determinants of health, behavioural risk factors, health status of the individual, and access to health services.

Despite improvements over time – such as lower rates of smoking during pregnancy – this article found that mothers in remote areas were more likely to face socioeconomic disadvantage, have higher rates of behavioural risk factors and pre-existing maternal health conditions, and have babies who experienced poorer outcomes.

The findings also suggest that mothers who lived in remote areas faced considerable issues in accessing health services, as evidenced by lower rates of antenatal care attendance, antenatal care at a later stage of pregnancy, and increased drive time to a public birthing facility. Access to care is particularly important when considering the pivotal role maternity care plays in managing risk factors, encouraging healthy behaviours and improving maternal and perinatal health.

Many of the trends described in this article for mothers who lived in remote areas and their babies were also seen when comparing Indigenous mothers who lived in remote areas with Indigenous mothers living in non-remote areas. This suggests that the patterns seen are indeed a function of geographic location, as well as complex societal and cultural factors.

Upcoming work by the AIHW will explore the topic of access to maternity care in greater depth, based on analysis of the NPDC and the Maternity Care Classification System.

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Health information in Australia: an evolving landscape with an integrated future

10

Health information in Australia: an evolving landscape with an integrated future

The profile – and value – of health data and information in Australia was brought into the spotlight during the response to COVID-19. This emergency action enabled innovative approaches to be taken in respect to both timeliness and the use of novel data sources.

Maintaining these approaches and the benefits they provided to the health information landscape outside of the emergency context may be a challenge. Emulating that innovation in the longer term is an exciting opportunity for the health information and health service sectors to meet the needs of the Australian population into the future.

This article describes the health information landscape in Australia. It explores ways that data on the health of Australians and the Australian health system are currently generated, collected, transformed, transmitted and translated into actionable information. It comments on inconsistencies in and barriers to collecting and using that information, and on opportunities to innovate and enhance the landscape.

The article takes a system-wide perspective on data and information gaps, and on advances to fill those gaps.

Key messages

The Australian health information landscape is changing in response to internal and external pressures. This article:

- focuses on the totality of that landscape as it currently stands: how and where health data and information are generated and used, where there are systemic gaps or barriers, and where opportunities exist to resolve those gaps at a system level
- presents a vision for an interoperable future: one where health data form part of a connected health system in which digital information is well managed, accessible, shareable and translatable between systems within the health sector and across portfolios
- draws on lessons and innovations from the ongoing COVID-19 pandemic under 3 broad themes: governance and infrastructure, insights and expertise, and timeliness and utility.

Health information landscape

The health information landscape comprises health-related data generated through:

- interactions between patients, clinicians and the health system, collected as clinical, administrative and payment records
- cross-sectional, longitudinal, local and national surveys
- clinical trials and other research
- cross-sectoral data from, for example, disability, education and aged care services
- consumer transactional sources, such as banking and supermarket data
- user-generated data, such as from apps and wearables
- emerging data sets, including genomic data and surveillance monitoring systems.

Collection entities

Multiple entities are involved in collecting health-related data. Primary collection entities include:

- health services, individual consumers, health professionals, private health insurers and governments who are predominantly involved in the collection of clinical, administrative and payment records, for clinical care and resource planning
- statistical agencies, universities and non-government organisations who are predominantly involved in the collection of data through surveys, clinical trials and other research for population health insights, clinical care and policy development.

Australian, state and territory health departments, primary health networks, medical software vendors, statistical agencies, universities and non-government organisations may draw on information sourced from primary collection entities, combined with other health-related data (cross-sectoral, user-generated, consumer transactional), to undertake analytics for population health insights, resource planning and policy development.

The complex interaction between collection entities, data sources and data uses are described further in the following sections.

Data sources

Clinical, administrative and payment records

Clinical information, such as that generated during health care encounters or through clinical trials, is primarily used in individual patient management. It may also be collated and stored in condition-specific clinical registries that support research on the effectiveness of existing and emerging treatments. Data collection and reporting mechanisms – such as those for many services provided by hospitals, and the administrative data generated by the Medicare Benefits Schedule (MBS), the Pharmaceutical Benefits Scheme (PBS) and private health insurance (PHI) – provide some understanding of health service function and usage.

- For example, information on demographics, diagnoses and procedures are collected during a hospital stay, while data on service provider and intervention or medication data are collected as part of the MBS, PBS or PHI billing process. The information these sources provide helps in understanding population health status, disease prevalence, the need for and access to health services, and the operation and resourcing (including funding) of the health system.

There are multiple points of interpretation and transformation as clinical data move, firstly, from a patient to a health professional or health service; then to a record in a clinical information or patient management system; and, finally, to extraction for a range of uses. Each of these points is shaped by data sharing agreements, legislation and technical requirements.

Surveys

Some information on the health of Australians cannot be derived from the administrative systems of health services. Both cross-sectional and longitudinal surveys are used to gain population-level insights on health status, and service use and experiences – including changes over time.

Cross-sectional surveys run by the Australian Bureau of Statistics – including the National Health Survey and Patient Experience Survey (from the Multipurpose Household Survey) – collect targeted information from participants about their diagnosed conditions, and their preferences, experiences, and barriers encountered in using health services. Some outcome information such as self-reported health status is also collected.

Longitudinal surveys such as the Sax Institute's 45 and Up Study and the Australian Longitudinal Study on Women's Health provide information that enables a better understanding of how lifestyle, actions and events can affect health and wellbeing over time.

Surveillance systems

National health monitoring and surveillance systems offer a very specific set of health-related data on population health in Australia. For example, the Communicable Disease Network Australia, which operates under the Australian Health Protection Principal Committee, facilitates the delivery of data on notifiable diseases to the National Notifiable Diseases Surveillance System. This data delivery mechanism has been and remains essential to the Australian Government's response to COVID-19; it also helps in developing a series of national guidelines for the prevention, control and public health management of COVID-19.

The National Ambulance Surveillance System (NASS) is another example, and an emerging source of population health data. This novel system recently contributed to data collection for intentional self-harm (including suicidal behaviours with self-injurious intent), mental health, and alcohol and other drug-related ambulance attendance services. For more information, see Box 10.7.

Other data sources

Cross-sectoral data (for example, on mental health, disability, and aged care services), new consumer sources (such as banking and supermarket data) and emerging data sets (including genomic data, electronic health records and enduring multi-source linked data sets) also contribute to an understanding of the health and wellbeing of the Australian population. The collection, sharing and use of these data as part of the health information landscape is developing.

How is information on the health system and the health of Australians used?

The health information landscape in Australia comprises data collected from and about health care practice, health status and the health system. The data are used to:

- provide clinical care
- generate population health insights
- undertake resource planning
- develop policy.

Providing clinical care

Information from Australia's health system influences the provision of clinical care. For example, data generated at the point of clinical care and through clinical research support quality improvement in clinical care standards, such as those developed by the Australian Commission for Safety and Quality in Health Care. The measures for each standard define the data required to report on quality of care and adherence to the recommended approach, and as such are an important component of the health information landscape (ACSQHC 2022).

Another example is the use of population-level data and associated research in developing the clinical decision support systems (CDSSs) used in a wide range of clinical contexts. CDSSs include tools used by clinicians as well as tools that assist shared decision-making between clinicians and patients. Use of data in this context enables a consistent and evidence-based approach to clinical decision support (AHHA 2014). Many CDSSs are regulated by the Therapeutic Goods Administration; this regulation includes requirements for assurance of quality and consistency of data that they use (TGA 2021).

Population health insights

The collection and processing of population-level data (monitoring) provide a strong evidence base for the health system and the health status of people who use it. Information used for statistical analysis can be collected from surveys, administrative data sets, extracts from clinical information systems and clinical registries. Population health insights can be used at the point of clinical care, providing the basis for real-time risk assessments and benchmarking information to guide treatment decisions.

Measuring health status at a population level involves analysing trends and patterns in risk factors, disease frequency and impact, and condition- or population-specific health service use. When used to its full potential and linked to cross-sectoral data, information from and about Australia's health system contributes to a better understanding of:

- the determinants of health: the links between a person's behaviours and circumstances and their lifetime risks and health outcomes
- the health status of a person: their health conditions, functioning ability and general wellbeing
- the health system (including health service provision, funding and planning): the system's effectiveness, efficiency and appropriateness; its safety and accessibility; and the sustainability of health care
- the broader area of societal impacts (contextual information): the changing demographics of the Australian population, the advancements in research, the economic circumstances affecting workforce and infrastructure, and the expansion and improvements in the collection of data (AIHW 2020).

Resource planning and policy development

Outputs from statistical analysis allow people with oversight of the health system:

- to develop evidence-based policy
- to plan effective resourcing of the health system, resolving gaps in adequate care.

This process relies on interpreting data extracted and compiled from disparate systems to produce meaningful insights. Generating actionable information from health data in this way ultimately contributes to better health and wellbeing outcomes for the Australian population.

Role of COVID-19 in shaping the current health information landscape

Health data have been critical in managing the response to the COVID-19 pandemic, by:

- reporting on case numbers, and on admissions to hospitals and intensive care units
- epidemiological modelling of outbreaks, and the effectiveness of COVID-safe measures
- recording the use of, and anticipating the need for, personal protective equipment (PPE), vaccines and testing kits.

The pandemic propelled health and health information (as a whole-of-population and cross-sectoral issue) into the spotlight, exposing it to greater public scrutiny. The higher visibility of data informing the emergency response to the pandemic – their timeliness, accessibility, utility and governance – exposed gaps in:

- health system information: the number of hospital beds, the supply and stockpile of medical equipment and PPE, the size of the health workforce, protocols and plans for outbreak management in residential facilities
- communication: between governments, service providers, sectors and with the Australian public
- supports for populations at risk: people experiencing disability, frailty, family violence, economic disadvantage, social isolation and marginalisation.

The pandemic response highlighted inequalities in access to services and in health outcomes. But it also created an environment in which standard data governance processes and resourcing restrictions had to be suspended to rectify immediate data and information deficits. This 'opened the door' to innovation and to transformation of the health information landscape.

Current challenges and emerging opportunities in the evolving health information landscape

Beyond the pandemic emergency, drawing value from the growing volume of information generated by the whole health system and technological advancements in how that information is managed is an ongoing challenge. But the situation also presents many opportunities for the evolving health information landscape.

Health providers, consumers and funders expect health information to be accessible, timely, relevant, accurate and actionable; such information could enable evidence-based decisions to be made in 'near real time' at clinical, service and policy planning levels. The benefits of (and requirements for) health data and information in evidence-based decision-making are documented at the national level:

- in frameworks and strategies specific to health conditions, population groups, population sectors and health services (such as the Aboriginal and Torres Strait Islander Health Performance Framework and the National Preventive Health Strategy 2021–2030)
- in clinical guidelines (such as the Australian Commission for Safety and Quality in Health Care's Clinical Care Standards).

These expectations of health data place increasing pressure on data administrators and data systems and, in many cases, are outpacing developments in the technical capacity and governance of systems that support data sharing and analysis. All these factors, in combination, underscore:

- the importance of accessibility and timeliness of data
- the value of technical expertise and data integration to produce meaningful insights
- the critical nature of enabling governance and infrastructure.

These are all areas of recent and ongoing development in the Australian health information landscape.

Gaps in health information: we cannot understand what we cannot see

The health sector is rich with data. Every clinical encounter, every service transaction and every purchase of goods or therapeutics is captured to record the event for clinical, administrative and billing purposes.

These data sources are comprehensive in terms of their primary administrative purpose. However, their uses beyond those purposes are limited. For example, MBS and PBS data do not capture diagnosis or outcome information. So, while the types of services and medications Australians are receiving are well documented, the reason for them and their efficacy are not always known.

Funding and administrative arrangements for these services often prioritise data sharing for these established collections. This means that some parts of Australia's health system are reported on more and have greater visibility than others. Service activity and potential demand are less visible in parts of the system that have greater variation in administration and funding arrangements – for instance, private primary care providers, ambulance services, mental health care services and community outreach services provided by non-government organisations, charities and not-for-profit organisations.

For example, the capacity for detailed reporting on activity for hospital admitted patient care results in more focus on the performance of the hospital system, with the role and functioning of emergency departments being less visible, while the collection of detailed MBS data acts as a partial proxy for primary care.

Similarly, routine collection of demographic information (such as age, sex, geographic location and country of birth) are often used as the default descriptors of diversity. This approach limits the potential value of demographic analysis in understanding the spectrum of the population's health status and service use. It often leads to deficit-based reporting.

For example, where sex becomes a proxy for gender, and country of birth the proxy for cultural and linguistic diversity, the experience of health and the health system among those populations is lost and potentially misrepresented. Binary comparisons between people living in urban and regional areas or between Aboriginal and Torres Strait Islander people and non-Indigenous Australians emphasise the measuring of difference, rather than describing experience and diversity within these populations.

Gaps in information in crucial areas of the health system can limit the capacity for population health monitoring, research, planning and policy development. They can also create an imbalance in understanding the health system as a whole. Gaps can occur due to circumstances at multiple stages in the data life-cycle. For example:

- data can be missing because they are not recorded at the point of care, during a service interaction or included in a survey
- collected data could be unavailable because they are never extracted, transferred or shared in a meaningful or consistent way, or because governance arrangements preclude extraction and sharing

- collected data that are subsequently extracted may not be used, as they are not in a suitable format (with appropriate quality, granularity and completeness) for statistical analysis or for translation to actionable information.

Data gaps vary in their breadth and depth. Some are whole-of-sector gaps and some relate to specific data items. Gaps can be resolved by developing new data collections or by adding new items to existing collections (data development). Sometimes a gap exists because it is not appropriate or practical to collect some data in certain settings. For example, it may not be appropriate to collect comprehensive demographic information in an emergency care setting. Data integration (linkage) can help to enhance existing collections without needing to collect more data.

Data development

The aim of data development is to improve the coverage, quality, relevance and consistency of information. Developing new collections or improving the quality of data already collected means that data can be collected and interpreted more efficiently and accurately, helping to resolve data gaps. Data development includes:

- identifying what data are required
- establishing what data are already collected
- deciding how feasible it is to obtain the data
- determining the mechanisms for using those data appropriately.

Developing or adopting data standards in consultation with stakeholders to enable uniform data collection and reporting is a crucial component of data development.

Box 10.1 describes a holistic data development approach to resolve information gaps in primary health care.

Box 10.1: Developing a primary health care information system

Primary health care is a vital component of Australia's health care system and is often the first point of contact individuals have with the health system. It encompasses a broad range of professions and services. Despite this, there are limited data available to understand how people use primary health care, the conditions managed, the health and wellbeing outcomes, and links between primary and tertiary (hospital) health care and other sectors such as disability and aged care. This makes it difficult to assess the positive impact of the primary health care sector on the health of Australians or to identify where improvements are needed.

continued

Box 10.1 (continued): Developing a primary health care information system

Projects that collect and analyse data from primary care settings show the usefulness of data from the primary health care sector. Examples of projects that have made important gains in overcoming the challenges in extraction, compilation and analysis of general practice data include:

- the Australian Centre for Health Innovation's collaborative project which reported on the impact of COVID-19 on general practice through a suite of impact measures (Thomas et al. 2022)
- the NSW Ministry of Health's Lumos program which links de-identified data from general practice to other NSW health service data to better understand patient experiences of the health system as a whole (NSW Health 2021)
- NPS MedicineWise's MedicineInsight which uses insights gleaned from de-identified general practice data to support quality improvement in primary care and the post-market surveillance of medicines (NPS MedicineWise 2022).

Building on the myriad of efforts to resolve the known gaps in primary health care information, the AIHW is leading the development of a Primary Health Care Information System. This system will encompass the governance, standards, infrastructure, collection, analysis and reporting of primary health care data within Australia. One component of this system is a Primary Health Care Data Collection. This work will complement existing systems and data collections such as the MBS and the My Health Record.

To achieve this, the AIHW's 2022 work program for the development of primary health care includes:

- a Primary Health Care Data Governance Roadmap and Framework, inclusive of Indigenous Data Governance, privacy and consent
- a core data model and standards to support the quality, consistency, interoperability and validation of primary health care data for research and population health
- protocols for the secure transfer and linkage of general practice data and methods to assess their quality, variability and use
- data capacity and capability building in the allied health sector, including a set of common core data items for analytics and reporting, aligned with the overall approach to standardisation of primary health care data
- appropriate infrastructure and governance protocols for the primary health care data collection: how data are collected, stored, analysed and reported and who has access to the collection.

Insights from integrated data

Data integration (also known as data linkage) is increasingly being used to resolve knowledge gaps across the health information system. Data integration helps to reduce the need for resource-intensive comprehensive data collection in all settings, by enabling data from one collection to supplement data in another. It is also used to derive system-level insights on the patient journey, such as:

- before, during and after hospitalisations
- intersection issues, such as the coordination of care between general practice and hospitals and between the health, aged care and disability sectors.

Demand for accessible and large-scale linked data assets to answer complex cross-sector, and cross-jurisdiction health questions is growing. To meet this demand, several enduring linked data assets have emerged in Australia, including the National Integrated Health Services Information Analysis Asset (NIHSI AA) and the Multi-Agency Data Integration Project (MADIP). Enduring linkages have proven more efficient than project-specific linkages as they can be reused for multiple analyses and reporting outputs and added to (both new years of data and new data sources) over time. Box 10.2 provides an example of how meaningful insights from linked data are informing the COVID-19 vaccination roll-out.

Box 10.2: Insights into COVID-19 vaccinations: linking the Australian Immunisation Register to the Multi-Agency Data Integration Project

Linking the Australian Immunisation Register (AIR) to the MADIP is an example of how timely linkage can increase the usefulness of data by forming new insights.

Australia's COVID-19 vaccination roll-out is a national priority that aims to ensure all Australians who want to be vaccinated can be. Enhanced de-identified information from weekly integration of AIR data with the MADIP supports detailed and targeted analysis to understand and foster progress of the roll-out. The integrated data will offer further insights, including identifying priority cohorts (such as people with disability or chronic health conditions), without additional data collection. Individuals need to provide their information once only and it can be used for multiple purposes.

The integrated data set allows for deeper analysis of vaccination trends by occupation and industry, and by different groups, such as young adults or people from culturally and linguistically diverse backgrounds.

Early analysis identified languages and geographic areas that could be used for more focused communications to support vaccine uptake. The use of existing data is carefully managed to protect people's privacy while supporting important policy and real-life outcomes. The integrated MADIP and AIR data, and the associated work to connect the MADIP to the Business Longitudinal Analysis Data Environment and other integrated data assets, continues to support more comprehensive social and economic analyses for the COVID-19 response, as well as longer term research requirements.

Enduring linked data collections benefit from validation, analysis and reporting tools that support the automation of otherwise cumbersome and time-consuming processes and allow for a broader range of analysis techniques and outputs. Machine learning and associated artificial intelligence tools, including natural language processing (NLP) and robotic process automation offer large efficiency gains. Take-up of these tools across the health care sector has been slow, however. This is due to sensitivities around using person-centred data, and a wish to derive insights that are certain and not contestable – not easy to demonstrate with complex computing algorithms. Nonetheless, the AIHW is exploring the use of machine learning and NLP tools for a range of projects to fill information gaps and improve timeliness and efficiency of analysis.

Box 10.3 summarises recent findings for the AIHW's use of the NIHSI AA, demonstrating both the reuse of an enduring linked data asset, and the use of machine learning tools to support analytics and insights.

Box 10.3: Population health insights

Treatment patterns and condition incidence using linked data: incidence of cardiovascular diseases

Acute coronary syndrome (ACS), a subset of coronary heart disease (CHD), refers to acute myocardial infarction (commonly known as a heart attack) and unstable angina.

Counting new cases (incidence) of ACS events is important to understand disease patterns and trends, treatment outcomes and the effectiveness of public health interventions. The current method for estimating the incidence of ACS uses unlinked hospitalisation and deaths data. This method cannot, however, differentiate between initial ACS hospitalisations on the one hand and transfers or readmissions for subsequent treatment of the same ACS event in the same person.

Using this method, hospitalisations where the patient was transferred to another hospital are excluded to minimise the potential for double-counting.

Using linked hospitalisation and deaths data from the NIHSI AA from 2011 to 2018, the AIHW examined all hospitalisations (including transfers and readmissions) and deaths associated with an ACS event. It then used this information to assess the impact of hospital transfers, readmissions and clinical coding on estimating ACS incidence.

It is expected that the results of this study will be published in September 2022. They will help to improve the accuracy of the method used to estimate the incidence of ACS events from unlinked data for national CHD surveillance.

continued

Box 10.3 (continued): Population health insights

Machine learning to predict disease cases: predicting early dementia using Medicare claims

People living with dementia in Australia can be identified from information recorded in data for hospitalisations, prescription medications, residential aged care and death certificates. These sources better capture people at later stages of the disease, however. This means that people with early dementia are under-represented in population health analyses. The majority of health care interactions in the early stages of dementia occur in primary and secondary care settings where diagnosis and other dementia-specific information is lacking.

To better identify people with early dementia, the AIHW used 2 simple machine-learning techniques on linked Medicare data, and linked data for other health services and aged care services from the NIHSI AA, to train algorithms to recognise cases of early dementia in Medicare claims data.

This study explored Medicare claims data for the period 2009–2017. It found that both machine-learning techniques identified around 30,000 possible cases of early dementia in the data that were not identifiable in other health data sets. Around 25,000 of these were true cases (85% precision), representing 80% of all known early dementia cases, based on prescription data. The best predictor of early dementia was geriatrician-specific Medicare item claims, followed by claims for magnetic resonance imaging (MRI), computerised tomography (CT) scans and chemical pathology tests.

These findings suggest that, while it is feasible to use Medicare claims data to identify most people with early dementia, some information on primary and secondary care service use is potentially missing from the algorithm that could help to identify the remaining 20% of known early dementia cases.

In the future, statistical approaches such as these – which help to identify likely cases of dementia in data sources without dementia diagnosis information – may help to improve the accuracy of national dementia prevalence estimates and substantially improve knowledge and understanding of people living with early-stage dementia.

For more information, see the 2021 AIHW study *Predicting early dementia using Medicare claims: a feasibility study using the National Integrated Health Services Information Analysis Asset,* at https://www.aihw.gov.au/reports/dementia/predicting-early-dementia-using-medicare-claims/contents/summary.

Factors that contribute to data gaps are many and complex. Data integration, analysis and development projects, such as those described earlier, have improved the enumeration of health conditions, and the understanding of both health service use and barriers to its use. They have also identified risk factors for poor outcomes and contributed to the development of targeted interventions. These studies offer important (often groundbreaking) means to resolve gaps in data and information for a particular disease, population group or service area. However, many are discrete pieces of work; they could be scalable or their methods and approaches adapted more broadly, but generally their immediate application is limited.

In contrast, a focus on the following 3 areas could resolve multiple important and longstanding issues, and have a broad and sustained effect across the health system:

- data governance: implementing improvements that ensure a balance between privacy and accessibility, founded on principles of community trust, accountability and consent
- interoperability: harnessing technical developments to enable information sharing and use between different parts of the health system, and at the interface with other sectors, to improve clinical care and health outcomes
- workforce: developing digital literacy and capacity among health professionals and building a capable and well-utilised workforce of health information managers, information system developers and data scientists.

Data governance

Information about an individual's health problems and treatments is highly personal and many Australians are justifiably sensitive about who has access to that information. The legislative and regulatory environment around health information is vast, with slight variations between the states and territories. All health organisations must comply with the *Privacy Act 1988* (Cwlth) and the Australian Privacy Principles where any person can be identified; there are also specific provisions for health information to protect people's privacy throughout the data life-cycle.

Legally binding guidelines included in public health acts and in those issued by the National Health and Medical Research Council and approved by Australia's Privacy Commissioner guide appropriate use of health information. Some population health monitoring uses, including research and data linkage activities not authorised by specific legislation, must undergo a rigorous assessment and approvals process by a fully constituted Human Research Ethics Committee.

The Five Safes framework (see https://www.aihw.gov.au/about-our-data/data-governance/the-five-safes-framework) reinforces principles for managing the privacy and confidentiality of data:

- Safe projects – Is the use of the data appropriate?
- Safe people – Can the users be trusted to use it in an appropriate manner?
- Safe data – Is there a disclosure risk in the data itself?
- Safe settings – Does the access facility prevent unauthorised use?
- Safe output – Are the statistical results non-disclosive?

Public trust is also a major factor in the acceptability of using health information to guide research on the health of the population (Aitken et al. 2016). Consumers are engaged by developing a culture of 'digital citizenry' – one that provides opportunities for consumers to experience the collective and individual benefits of understandings gained from analysing population-level health data. As individuals realise the potential for their health information to help meet their own immediate and ongoing health care needs, they may increasingly support the use of their heath information to make evidence-based decisions that also support the wellbeing of the population.

The Attorney-General's Department is currently reviewing the *Privacy Act 1988* to ensure consumers are empowered and protected, while ensuring that data retain usefulness for informed decision-making. Proposed reforms focus on the safe use of data in a digital environment with close reference to the Australian Competition and Consumer Commission's *Digital Platforms Inquiry* (see: https://www.accc.gov.au/focus-areas/inquiries-finalised/digital-platforms-inquiry-0).

Streamlining data governance

Developments in timeliness and data integration have prompted decision-makers to think about the best approaches to data governance. The longevity and efficacy of the Australian health information system requires an approach that supports safe and secure sharing of data to meet legislative requirements and to bolster community trust. Emphasising the safe and timely sharing of data to benefit the community while offering assurance of privacy protection and security has become more important than ever.

While legislated privacy protections and rigorous government frameworks remain firmly in place, there has been a shift toward streamlining release and approval processes to reduce duplication of effort; this has increased the timeliness and usefulness of data. These efforts may also bolster community trust by making it possible to not only use – but also show the worth of – health data where it was not previously permissible to do so – such as happened during the emergency response to COVID-19.

A notable example of this shift is the progress made toward creating a national linkage system, transforming the way enduring data linkages are handled. This approach aims to coordinate and streamline governance processes to increase the usefulness of linked data by de-duplicating approval and linkage activities while protecting privacy. The National Disability Data Asset (NDDA) is a project that is driving a national, streamlined approach to governance. (See Box 10.4 for more details on this project.)

Box 10.4: National Disability Data Asset – governance aspects

Through the NDDA pilot, governments have examined how to best link data to understand outcomes of people with disability – while protecting people's privacy (NDDA 2022).

The pilot phase of the project was completed at the end of 2021. Lessons learnt are informing the design principles for the technical, operational and governance aspects of an enduring NDDA. In December 2021, the Australian Government announced plans to invest a further $36.9 million in the next phase of the NDDA, with its design, governance and costs shared with states and territories. The Australian Bureau of Statistics and the AIHW are jointly responsible for working with Australian and state and territory governments on the next phase of technical implementation.

The pilot highlighted a great willingness by Australian and state and territory governments to share data. However, limitations of existing data governance arrangements and technical infrastructure pose substantial challenges.

Box 10.4 (continued): National Disability Data Asset – governance aspects

A key design principle for the NDDA is to build and govern a national 'multi-purpose data system' as the basis for any people-centred national data asset. The intent is to establish 'context specific' governance for the effective and trust-building use of portfolio-specific data (disability in the case of the NDDA).

To support this objective, the NDDA design is based on 7 building blocks. The first 3 constitute the foundations of a national approach to people-centred data for use, and re-use, across population groups and across human services:

1. **data linkage and integration infrastructure:** to establish a national hub-and-spoke network, building on and evolving existing capabilities for people-centred data sharing across jurisdictions, while allowing jurisdictions to maintain and enhance their own person-centred data assets
2. **National data system governance:** to institutionalise collaboration and joint governance between jurisdictions by establishing a National Data Integration and Infrastructure Board
3. **Streamlined data sharing arrangements:** to facilitate more efficient sharing of data within existing legislation and within each jurisdiction's obligations to data custodians.

The remaining 4 building blocks are to ensure that the enduring NDDA is adapted to deliver scaled insights:

1. **Co-governance of the use of data by governments and the relevant community:** to build and maintain trust – in the NDDA case, people with experience of disability
2. **Data development and a knowledge sharing platform:** to focus on improving data quality practices, and on sharing knowledge of how to use the data effectively – both across governments and with community organisations and researchers – while resolving priority data gaps to enrich insights
3. **Centrally coordinated analysis:** to deliver this through a distributed team that is centrally coordinated, with members chosen from across Australia for their expertise in the given policy context
4. **Sharing of insights with specific decision-makers and communities:** to share insights, via a range of useful formats, with governments, communities and researchers.

Further changes in governance relate specifically to community expectations of and response to the Australian Government's COVID-19 monitoring and reporting – for example, streamlined approval processes, and encouraging release of key or preliminary findings before detailed reports are finalised.

Improving accessibility and timeliness

COVID-19 and the 2019–20 bushfire season in Australia showed that in times of crisis and uncertainty, accessible and well-timed information is key. The information needs of multiple levels of government, service providers and the public pressured the health information system to provide information that was timely and targeted. This required new mechanisms for sourcing data, and new ways to present information.

Examples of these innovations include:

- compiling summary statistics on mental health, suicide and crisis support based on novel data drawn from mental health telehealth services and crisis lines
- working with the Australian National University to undertake COVID-19-focused surveys on mental health, loneliness, alcohol and illicit drug consumption, and housing
- adding short focused reports and dashboards to the AIHW's core suite of products to highlight the COVID-19 period
- developing the Critical Health Resource Information System early in the pandemic (developed by the Australian and New Zealand Intensive Care Society [ANZICS], Ambulance Victoria and Telstra Purple) to capture and report on intensive care unit capacity and activity.

Examples of timely use of data are described in Box 10.5.

Box 10.5: Support for policy and planning: timely monitoring of system and service activity and capacity

Florence

At the start of the COVID-19 pandemic, it was clear there would be a need for active monitoring of health system capacity and activity as the virus progressed through the community. To help meet this need, the AIHW worked with the states and territories, the Australian Government and the ANZICS to set up new data sharing arrangements. The states and territories dedicated resources to provide daily data feeds from every public hospital as part of the data sharing system for hospital capacity and activity. It also involved working with a group set up by the ANZICS to obtain data from public and private intensive care units and using the AIHW's access to MBS and PBS data to include activity not related to hospitals.

These data sources are brought together in a set of digital dashboards known as Florence (in honour of Florence Nightingale).

Box 10.5 (continued): Support for policy and planning: timely monitoring of system and service activity and capacity

Florence represents an unprecedented collation and rapid sharing of data from across the health system. Data are uploaded each day and made instantly available to all levels of government in Australia, to assist with health system resourcing and the planning of public health measures in response to the crisis.

Mental health dashboards

Since April 2020, the AIHW has been assisting the Department of Health to curate, analyse and report on activity related to mental health during the COVID-19 pandemic. Data are reported via 2 dashboards. They include information obtained from the MBS, PBS, and crisis and support organisations (Lifeline, Kids Helpline, Beyond Blue), and through analysis of emerging research findings.

The AIHW has facilitated the sharing of detailed data on the use of mental health services with the New South Wales, Victorian and Queensland governments. Importantly, this involves a 2-way sharing of data with the Australian Government. There is a national version of the mental health COVID-19 reporting dashboard as well as a jurisdictional version that focuses on service activity in each of New South Wales, Victoria and Queensland (AIHW 2022).

The AIHW was able to accelerate planned work to design data requests from new sources, compile them and then provide these data to Australian, state and territory governments. These data supported decision-making for the potential mental health impact of COVID-19 and for the public health measures put in place to slow the pandemic's transmission, such as physical distancing and limitations on gathering.

These monitoring dashboards were provided to governments weekly in 2020, fortnightly in 2021 and now monthly in 2022.

Timely use of data does not mean that all data should be received and reported on with increasing rapidity. 'Timely' does not always mean 'immediately'. Each use of data has a specific purpose in bolstering the health system and the optimal timing for reporting on that data depends on its purpose. An example of varying frequency that affects reporting is the use of deaths data to inform rapid COVID-19 reporting. Preliminary cause of death data are used to show how the pandemic is developing day to day. This provisional reporting is necessarily revised once cause of death is finalised and reported on.

Highly cleansed, curated and slower cadence data sets such as the National Hospital Morbidity database play an important role in complex epidemiological modelling to anticipate population health outcomes based on historical information about the population.

Improved timeliness in the release of data and information in a range of formats that are accessible and relevant to a variety of audiences and for a variety of uses has been and should remain a focus of the Australian health information system.

Engaging with the community

Consumers are becoming more aware of the usefulness of data to monitor and improve the capacity of the health system, sparking an increase in data literacy. This increase coincides with increasing technical capacity for data sharing and evolving consumer expectations about access to and control over data – generating a new form of digital citizenry.

This appetite for data-driven information offers a great opportunity to learn about ways to effectively use data to support community wellbeing.

For example, community-led data visualisations have emerged that integrate publicly available Australian, state and territory government data and present them in a way that is meaningful to the broader community. Projects such as *bushfire.io* at https://bushfire.io/ and *Covid-19 Near Me* at https://covid19nearme.com.au/ are examples.

The interactive tools on websites such as these recognise that there is a heightened level of public engagement in the usefulness of timely, accessible data. These sites make government data accessible to the community in a way that not only resonates with users but also has (at times) been more responsive than government representation of that information.

Robust, transparent and increasingly dynamic privacy protection measures support developments in digital health and empower consumers by offering more access to and control over their own health information. Examples of these developments include the range of mHealth applications (mobile applications used to support health care) being developed by the Australian Digital Health Agency. Direct engagement with consumers is a positive force in ongoing work to improve the quality, quantity and availability of health information on a national level.

Looking to the future, the increasing diversity of data sources, the integration of big data sets and the use of artificial intelligence and machine learning to process those data sets emphasise the need for a more coordinated and streamlined approach to governance that will reduce barriers to data sharing while assuring the privacy of individuals and maintaining community trust.

Interoperability

For health data to be most useful it needs to be shared safely within and between clinical, statistical and policy and planning settings and use cases.

From a clinical perspective, transfer of clinical information between service providers and between different parts of the health system (for example, between primary care and hospitals) determines the accuracy and timeliness of communication between care providers and influences the quality of care, especially in shared care settings. It does this, for example, by:

- streamlining and improving the timeliness of access to health care users' data and information
- providing real-time support for improved clinical decision-making and decisions on patient safety
- providing digitally enabled patient screening and medication alerts.

Building on this, accurate transfer of information from clinical settings to analysis environments is fundamental to the compilation and development of insights for population health analysis and system resourcing.

Successful transfer of information relies on both technical and semantic interoperability:

- Technical interoperability is enabled through use of agreed data exchange specifications to encourage consistency in data structure and format to simplify system interactions and integrations.
- Semantic interoperability can be described as 'the capability of 2 or more systems to communicate and exchange information, and for each system to be able to interpret the meaning of received information and to use it seamlessly with other data held by that system' (Rowland 2020:29).

Technical and semantic interoperability each support the transfer of data between systems and the capacity to access that data beyond their original setting.

Traditionally, service providers, clinicians and academics in both public and private sectors collect data for specific purposes, with limited integration with other health data systems or across different sectors. Data sharing for multiple purposes is a major shift from paper-based clinical and administrative notes generated for use within one health care environment (for example, a hospital department or a general practice). Improving the portability of that data increases its availability for a wider range of uses, including transitions between care providers and any activity that involves extraction and use of data outside of its original environment.

Momentum generated by the COVID-19 pandemic allowed data to flow more easily between entities to meet an acute need for a more complete picture of the Australian health system. However, the national response to solving a shared problem has also highlighted the need for better communication across the health system in non-emergency situations – essentially a need for better interoperability to increase capacity for data sharing.

A coordinated, whole-of-system approach to managing health information that is complete and comparable requires communication between information systems and a common understanding about the meaning of that information as it moves between systems.

As well as appropriate governance arrangements, a key driver in resolving data gaps is the technical capacity to share information between systems. Inconsistencies in data definitions, coding, classifications and standards – as well as inconsistent quality across input data sources – create a challenge at each stage of the data life-cycle. This affects the safe and accurate transfer, storage, meaningful use and appropriate sharing of the data.

Effective interoperable systems resolve this challenge by standardising input, output or the automation of processes for consistent transformation from one format to another. Interoperable systems lead to improved:

- quality of care – facilitating access not only to timely and accurate information but also information sharing between clinicians and clinical decision support
- quality of data generated about that care – implementing the use of standard forms, definitions and meanings
- capacity for that data to traverse the health system – following the care pathway from one setting to another through compatible system interfaces.

The need for interoperability of health information is emphasised in the *National Health Reform Agreement – Addendum 2020–25*, the *Australian Digital Health Strategy* and the *National Healthcare Interoperability Plan* (in development).

The AIHW's Metadata Online Registry (METeOR) is Australia's repository for national metadata standards for health, housing and community services statistics and is one example of infrastructure that supports semantic interoperability. Metadata endorsed for use within an organisation or across Australia are referred to as data standards and describe the expected meaning and acceptable representation of data for use in a defined context. These consistent definitions facilitate a shared understanding of terminology in data collections – a major enabler of interoperability.

Workforce

An appropriately skilled and diverse workforce is crucial to realising the full value of emerging developments in Australia's health information landscape, and to meeting increasing needs for 'useful' health data.

This workforce – comprising clinical, administrative, information management and data science professionals – must keep pace with technological developments and be situated within and reflect the complex political economy of the health system. This is inherently a multi-sectoral collaboration, involving engagement by public and private sectors and many different disciplines, including:

- 'up-skilled' clinicians and other professions involved in collecting clinical information in digital environments
- a health information management workforce skilled in the development of standards to convert that clinical information to meaningful data for use by analysts
- analysts skilled in the quantitative analysis of large, complex data sets, as well as people with the right 'soft' skills and emotional intelligence to understand the narrative behind the data.

Accurate and accessible communication of health information for easy consumption by individuals, their advocates, program managers and policy-makers is an essential component in transforming health data to health information and knowledge.

Digital literacy

Digital health is an umbrella term referring to a range of technologies that can be used to treat patients and collect and share a person's health information. These include mobile health and applications, electronic health records, telehealth and telemedicine, wearable devices, robotics and artificial intelligence (see 'Digital health' at https://www.aihw.gov.au/reports/australias-health/digital-health).
Digital health is transforming health information in terms of the environments it is collected in, the format it is stored in and the capacity to share and integrate information from a range of sources.

The clinical workforce plays an important role in the health information landscape, by undertaking primary data entry in the form of clinical notes, diagnostic reports, screening tests, prescriptions and referrals. Digital literacy and capacity among this workforce are therefore important to encourage the use of digital health systems, and the quality of the data and information they contain.

The National Digital Health Workforce and Education Roadmap, developed by the Australian Digital Health Agency, identified the use of digital platforms by the health workforce as an area for development. It does acknowledge, though, that the technical capacity for implementing digital tools is developing faster than the capacity to use them.

This roadmap focuses on key activities needed to build a digitally capable health workforce, including:

- embedding safe, ethical and effective use of systems of records
- integrating new technologies and ways of working
- transforming digital health data (ADHA 2020).

Digital technologies are intended to improve health care and the experience of clinicians and patients by:

- making health information more readily available at the point of care and more easily transferred between care settings
- reducing the duplication or loss of information across settings and care teams.

It is important to understand the need for well-developed digital literacy among clinicians and other health professionals, and the effect that digital technologies have had on clinical practice. Access to information about the health workforce represents a substantial health information gap (Box 10.6).

Box 10.6: Data on Australia's health workforce

The size, utilisation and capacity of the health information workforce are important elements of the health information landscape.

A substantial gap in the health sector, more broadly, is the limited data on its clinical workforce. This information is critical for service planning and delivery, recruitment and retention and, as highlighted during the Australian response to the COVID-19 pandemic, for resolving potential capacity issues in times of crisis and health emergencies.

Agencies that register health professionals, such as the Australian Health Practitioner Regulation Agency or self-regulated bodies, are sources of information on the number of health professionals permitted to work in the Australian health sector as well as on some of their demographic and employment characteristics.

What these registers do not provide, however, is complete information on aspects such as the setting (or the number of settings) in which an individual health professional works or their scope of practice. Some of this information is collected in survey form by professional bodies, such as the Workforce Survey run by the Australian Primary Health Care Nurses Association or the Commonwealth Fund International Survey of Primary Care Physicians. These surveys provide information on the qualifications and scope of practice of health professionals, their digital literacy and their experience of the health system; they also highlight settings and circumstances in which there may be opportunities to improve workforce utilisation, recruitment and retention (APNA 2022; Doty et al. 2019).

Collating comprehensive national health workforce information within professions, settings or sectors is an area of emerging work.

Health information management

Work to convert clinical data into meaningful information for analysis is managed differently across the health sector. In hospitals, this work relies on the highly skilled Health Information Management workforce, which:

- develops and implements classifications and coding standards
- codifies clinical notes for statistical analysis based on those standards
- ensures, in conjunction with data scientists, the quality of codified data (Henderson 2015; Shepheard 2019).

This work is a key foundation of the national health information landscape, particularly for data that flow from the clinical information systems through to the national collections. While this hospital workforce is well established to collect data on admitted patient care, there is generally no equivalent workforce overseeing data from other sectors, such as those for primary health care, ambulance and emergency departments (Box 10.7).

In general practice, clinical information is transformed into statistical outputs for analysis via complex mapping algorithms built into a range of independent extraction tools. Patient interactions with allied health are rarely codified or used for routine analysis. Variability in the mapping of clinical terms for use in statistical analysis is a potential barrier to the quality, consistency and comparability of data both within and beyond the primary care sector, as data are increasingly brought together through data integration (Youens et al. 2020).

The importance of health sector data – and the mismatch in collection, transformation and reporting and in the subsequent quality and utility of the data – highlight the value obtained by investing in the data workforce and in systems to support standardisation. A highly skilled whole-of-sector health information workforce could secure the future of the health information landscape in Australia. It would guide the implementation of data standards to support interoperability and influence the effective use of emerging data interpretation techniques, such as natural language processing. Health information management processes at the clinical interface would feed through to data transformation and coding to improve analysis of structured coded data and to translate that analysis into information and knowledge that can be acted upon.

Box 10.7: Coding ambulance data

The suicide and self-harm monitoring component of the NASS (a public health monitoring system) was established in 2020. It provides timely and comprehensive data on intentional self-harm (including suicidal behaviours) in the community and builds upon previous work in ambulance surveillance (alcohol and other drugs). Data for the NASS are compiled by Turning Point, in partnership with the Monash University, and are sourced from paramedic electronic patient care records provided by Australian, state and territory ambulance services. As part of the National Suicide and Self-harm Monitoring Project, the AIHW contracted Turning Point, through the Monash University, to develop the NASS for attendances related to self-harm.

continued

Box 10.7 (continued): Coding ambulance data

Information is obtained and coded through manual scrutiny of de-identified electronic patient care records (ePCRs), including paramedic clinical assessment; patient self-report; information from third parties; and other evidence at the scene, such as written statements of intent (including social media, text messages and written notes) recorded by paramedics. Intent of self-harm behaviours derived from the ePCR may be from either stated or physical evidence, or where there is evidence but the patient may have denied the behavioural intent (Lubman et al. 2020).

Ambulance attendances related to self-harm are included if the self-harm occurred in the preceding 24 hours or during the ambulance attendance. There are 4 categories of ambulance attendances for self-harm, defined and coded as:

1. self-injury (non-fatal intentional injury without suicidal intent)
2. suicidal ideation (thinking about killing oneself without acting on the thoughts)
3. suicide attempt (non-fatal intentional injury with suicidal intent, regardless of likelihood of lethality)
4. suicide (fatal intentional injury with suicidal intent).

It is important to note that suicide, suicide attempt and suicidal ideation are considered to be mutually exclusive; however, self-injury could be simultaneously coded with any other self-harm category.

The number of attendances related to suicide is under-represented as ambulances do not attend all deaths. Furthermore, when they do attend, there may be insufficient information to determine suicidal intent at the scene.

Methods of suicide, suicide attempt or suicidal ideation are coded – as are methods of self-injury and categories of suicidal ideation preparation (planned, unplanned and unknown if planned) – using a modified International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) coding framework.

For data on ambulance attendance for suicide and self-harm, see https://www.aihw.gov.au/suicide-self-harm-monitoring/data/ambulance-attendances/ambulance-attendances-for-suicidal-behaviours.

For more information on the topic, see https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0236344.

Data science

Machine learning and associated artificial intelligence tools, including NLP and robotic process automation offer large efficiency gains in analytics and insights generation (AIHW 2021a). Take-up of these tools in the health care and health information sector has been slower than in other areas due to sensitivities in using person-centred data and a desire for certainty and transparency that favours more traditional and established methods of analysis and interpretation.

Data scientists with the skills to perform safe and accurate analysis of big data sets using artificial intelligence and machine learning techniques are becoming increasingly essential. Directing effort and resources towards growing capabilities in this area will support expanded use of large linked data sets for predictive modelling, forecasts, projections and/or the formulation of preliminary estimates.

Shaping the future of health information in Australia

The COVID-19 pandemic created momentum and fostered innovation to resolve immediate and critical gaps in the health information landscape during a period of national emergency. Great opportunities and equivalent challenges for the governance and use of health information in Australia also emerged through that emergency, in the:

- increased realisation of the importance and value of health data and information
- need for timely (including real time), granular, local and linked data
- connection between digital and statistical information within the sector
- increased recognition of the important intersections between segments of the health sector, and between the health sector and others (aged care, disability, for example) (AIHW 2021a).

The COVID-19 emergency also highlighted the benefit of a coordinated national approach to meet these challenges and opportunities. This will be increasingly important to ensure:

- further development in governance and in building community trust
- completeness of information from the whole health system
- sufficient workforce capacity
- technical infrastructure for the future.

Australian governments and health information agencies such as AIHW have a role to play in working collaboratively to meet these challenges and opportunities – harnessing the momentum and innovation generated by the COVID-19 pandemic to secure a more sustainable and effective health information system as a foundation for a healthier Australia.

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Abbreviations

ABS	Australian Bureau of Statistics
ACCHO	Aboriginal Community Controlled Health Organisation
ADHD	Attention Deficit/Hyperactivity Disorder
AIR	Australian Immunisation Register
AIHW	Australian Institute of Health and Welfare
ANZICS	Australian and New Zealand Intensive Care Society
ASGS	Australian Statistical Geography Standard
ASR	age-standardised rate
ATCC	Anatomical Therapeutic Chemical Classification
BEACH	Bettering the Evaluation and Care of Health Survey
BMI	Body Mass Index
BTOS	broad type of service
CALD	culturally and linguistically diverse
CCM	critical care medicine
CDSS	clinical decision support systems
CFR	case fatality rate
CI	confidence interval
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus disease 2019
CSL	Commonwealth Serum Laboratories
CT	computerised tomography
DALY	disability-adjusted life year
DVA	Department of Veterans' Affairs
ED	emergency department
ePCR	electronic patient care record
ERP	Estimated Resident Population
FDV	family and domestic violence

GP	general practitioner
HILDA	Household, Income and Labour Dynamics in Australia Survey
HIV/AIDS	human immunodeficiency virus/acquired immunodeficiency syndrome
HPV	human papilloma virus
ICD-10	International Classification of Diseases, 10th revision
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
ICU	intensive care unit
IRSD	Index of Relative Socioeconomic Disadvantage
ISPHCO	Indigenous-specific primary health care organisation
K10	Kessler-10 Psychological Distress Scale
LGBTIQA+	lesbian, gay, bisexual, transgender, intersex, queer/questioning, asexual plus
MADIP	Multi-Agency Data Integration Project
MBS	Medicare Benefits Schedule
METeOR	Metadata Online Registry
MRI	magnetic resonance imaging
MSAC	Medical Services Advisory Committee
NAAT	nucleic acid amplification tests
NACCHO	National Aboriginal Community Controlled Health Organisation
NASS	National Ambulance Surveillance System
NDDA	National Disability Data Asset
NDIS	National Disability Insurance Scheme
NHRA	National Health Reform Agreement
NIP	National Immunisation Program
NICU	Neonatal Intensive Care Unit
NIHSI AA	National Integrated Health Services Information Analysis Asset
NINDSS	National Interoperable Notifiable Diseases Surveillance System
NLP	natural language processing

NNDSS	National Notifiable Diseases Surveillance System
NPDC	National Perinatal Data Collection
NSMHWB	National Study of Mental Health and Wellbeing
OECD	Organisation for Economic Co-operation and Development
OSR	Online Services Report
PBAC	Pharmaceutical Benefits Advisory Committee
PBS	Pharmaceutical Benefits Scheme
PCR test	polymerase chain reaction test
PHI	private health insurance
PHN	Primary Health Network
PPE	personal protective equipment
RAT	rapid antigen test
RPBS	Repatriation Pharmaceutical Benefits Scheme
SA	South Australia
SA1	Statistical Area Level 1
SA2	Statistical Area Level 2
SACC	Standard Australian Classification of Countries
SARS	severe acute respiratory syndrome
SARS 2	severe acute respiratory syndrome coronavirus 2
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
SCN	Special Care Nursery
SEIFA	Socio-Economic Indexes for Areas
SIDS	sudden infant death syndrome
TGA	Therapeutic Goods Administration
VII	Voluntary Indigenous Identifier
VRGP	vocationally registered general practitioner
YLD	years lived with disability
YLL	years of life lost

Symbols

%	per cent
$	Australian dollars, unless otherwise specified
<	less than
>	more than
≤	less than or equal to
≥	more than or equal to
..	no data/insufficient data
‘000	thousands
mL	millilitre
n.a.	not available

Glossary

Aboriginal Community Controlled Health Organisation (ACCHO): An organisation operated by the local **Indigenous** community, and controlled through a locally elected board, to deliver comprehensive, holistic and culturally appropriate health care to the community. ACCHOS vary in size and composition, from large organisations with multiple medical and other practitioners who provide a range of services, through to small organisations that rely on nurses and/or Aboriginal health workers to provide most services.

Aboriginal or Torres Strait Islander: A person who identifies themselves as being of Aboriginal or Torres Strait Islander origin. See also **Indigenous**.

administrative data: Information collected, processed and stored in automated information systems – includes enrolment or eligibility information, claims information and information on managed care encounters.

administrative data collection: A data set compiled from the information collected to deliver a service or to pay the provider of a service. This type of collection is usually complete (that is, all in-scope events are collected), but it may not be fully suitable for population-level analysis because the data are collected primarily for an administrative purpose.

admission: An admission to hospital (in the context of this report) (see **hospitalisation**).

age-standardisation: A way to remove the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure, and then the rates that would have occurred with that structure are calculated and compared.

Alzheimer's disease: A degenerative brain disease caused by nerve cell death, which results in shrinkage of the brain. It is a common form of **dementia**.

antenatal: The period from conception up to the time of birth. It is synonymous with prenatal.

antibiotic: A medicine that prevents or treats bacterial infections.

antimicrobial: An agent that prevents or treats the growth of microorganisms.

Apgar score: The numerical score used to indicate the baby's condition at 1 minute and at 5 minutes after birth. Between 0 and 2 points are given for each of 5 characteristics: heart rate, breathing, colour, muscle tone and reflex irritability. The total score is between 0 and 10.

asbestos: A naturally occurring, heat-resistant silicate mineral made up of small fibres.

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**.

baby's length of stay: The number of days between date of birth and the date of separation from the hospital of birth (calculated by subtracting the date of birth from the date of separation).

birth: An event in which a baby comes out of the uterus after a pregnancy of at least 20 weeks gestation or weighing 400 grams or more.

birthweight: The first weight of the baby (stillborn or liveborn) obtained after birth (usually measured to the nearest 5 grams and obtained within 1 hour of birth).

body mass index (BMI): The most commonly used method to assess whether a person is normal weight, underweight, overweight or obese. It is calculated by dividing the person's weight (in kilograms) by their height (in metres) squared; that is, $kg \div m^2$. For both men and women, underweight is a BMI below 18.5, acceptable weight is from 18.5 to less than 25, overweight is from 25 to less than 30, and obese is 30 and over. Sometimes overweight and obese are combined, defined as a BMI of 25 and over.

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

caesarean section: A method of birth in which a surgical incision is made in the mother's uterus via the abdomen to directly remove the baby.

cancer (malignant neoplasm): A large range of diseases where some of the body's cells become defective, begin to multiply out of control, invade and damage the area around them, and can then spread to other parts of the body to cause further damage.

cardiovascular disease/condition: Any disease of the circulatory system, namely the heart (cardio) or blood vessels (vascular). Includes angina, heart attack, stroke and peripheral vascular disease. Also known as circulatory disease.

case fatality rate: The number of deaths from a disease divided by the number of cases of that disease.

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**.

cerebrovascular disease: Any disorder of the blood vessels supplying the brain or its covering membranes. A notable and major form of cerebrovascular disease is stroke.

chronic diseases/conditions: Diseases or conditions, such as heart disease, cancer and arthritis, that tend to be long lasting and persistent in their symptoms or development. Although these features also apply to some communicable diseases, the term is usually confined to non-communicable diseases.

chronic obstructive pulmonary disease (COPD): A serious, progressive and disabling long-term lung disease where damage to the lungs (usually because of both emphysema and chronic bronchitis) obstructs oxygen intake and causes increasing shortness of breath. By far the greatest cause of COPD is cigarette smoking.

client contacts: In the Online Services Report collection, this refers to a count of the contacts between clients and each type of health worker in an **organisation (**both employed and visiting health staff), including those made by drivers and field officers (transport contacts). Client contacts do not include administrative contacts or those relating to groups and residential care.

client numbers: The number of individuals who receive health care from an organisation during a set period. Each individual is counted once only within an organisation, regardless of how many times they are seen.

clinical guidelines: Systematically developed statements to inform practitioner and patient decisions on appropriate health care for specific clinical circumstances.

comorbidity: A situation where a person has 2 or more health problems at the same time.

condition (health condition): A broad term that can be applied to any health problem, including symptoms, diseases and certain risk factors such as high blood cholesterol and obesity. Often used synonymously with 'disorder' or 'problem'.

confirmed case of COVID-19: A COVID-19 infection confirmed by a laboratory.

congenital abnormality: A defect in a baby that is present at birth.

coronary heart disease: A disease due to blockages in the heart's own (coronary) arteries, expressed as angina or a heart attack. Also known as ischaemic heart disease.

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

COVID-19 related death: Any death that is linked to **COVID-19**. Includes deaths caused by **COVID-19** as well as deaths of people who died with **COVID-19** but where **COVID-19** was not necessarily the cause of death.

confidence range: a range that indicates the uncertainty of an estimate from data analysis. A 95% confidence interval is a range of values that contain the true value with 95% confidence.

credible range: a range that indicates the uncertainty of an estimate from data analysis. A 95% credible interval has a 95% chance of containing the true value.

crude rate: A rate derived from the number of events recorded in a population during a specified time period, without adjustments for other factors such as age (see **age-standardisation**).

cumulative cases and deaths: The total number of cases or deaths since the first case or death was recorded.

DALY: See **disability-adjusted life year**.

data linkage: A bringing together (linking) of information from 2 or more different data sources believed to relate to the same entity (for example, to the same individual or the same institution). This linkage can yield more information about the entity and, in certain cases, provide a time sequence. The term is synonymous with 'record linkage' and 'data integration'.

de-identified: A process that involves the removal or alteration of personal identifiers, followed by the application of additional techniques or controls to remove, obscure, aggregate, alter and/or protect data so that they are no longer about an identifiable (or reasonably identifiable) individual.

dementia: A term used to describe a group of similar conditions characterised by the gradual impairment of brain function. Common types of dementia are **Alzheimer's disease** and vascular dementia but it is also possible to have multiple types of dementia, which is known as mixed dementia. Dementia is often associated with memory loss, but it can affect speech, cognition (thought), behaviour and mobility. People with dementia experience declining health and ability to live independently as their condition progresses, eventually requiring care and assistance in all aspects of daily living.

demographics: Statistical data relating to population groups, such as for age, sex, economic status, education level and employment status, among others.

determinant: Any factor that can increase the chances of ill health (risk factors) or good health (protective factors) in a population or individual.

diabetes (diabetes mellitus): A chronic condition where the body cannot properly use its main energy source – the sugar glucose. This is due to a relative or absolute deficiency in insulin, a hormone produced by the pancreas, which helps glucose enter the body's cells from the bloodstream and be processed by them. Diabetes is marked by an abnormal build-up of glucose in the blood; it can have serious short- and long-term effects. The 3 main types of diabetes are type 1 diabetes, type 2 diabetes and **gestational diabetes**.

digital health: The electronic management of health information. This includes using technology to collect and share a person's health information. It can be as simple as a person wearing a device to record how much exercise they do each day, through to health care providers sharing clinical notes about an individual.

diphtheria: A highly contagious – and potentially life-threatening – bacterial disease.

disease: A physical or mental disturbance involving symptoms (such as pain or feeling unwell), dysfunction or tissue damage, especially if these symptoms and signs form a recognisable clinical pattern.

disability-adjusted life year (DALY): A year of healthy life lost, either through premature death or equivalently through living with ill health due to illness or injury. It is the basic unit used in **burden of disease and injury** estimates.

epidemic: The rapid spread of a disease within a community or area.

episiotomy: An incision of the **perineum** and vagina to enlarge the vulval orifice.

episodes of care: In the Online Services Report collection, this refers to a count of contacts between an individual client and one or more staff of the organisation within one calendar day during the reporting period. All contacts with the same client on the same day are treated holistically as one episode of care.

excess deaths: The difference between the observed number of deaths from all causes during a period and the number expected based on recent trends. This measure is of particular interest when comparing the situation during a health challenge with the preceding 'normal' period. **fetal alcohol spectrum disorder (FASD):** A range of adverse physical, learning and behavioural effects on a child due to their being exposed to alcohol in the womb during their mother's pregnancy.

fetal death (stillbirth): Death, before the complete expulsion or extraction from its mother, of a product of conception of 20 or more completed weeks of gestation or of 400 grams or more **birthweight**. Death is indicated by the fact that, after such separation, the fetus does not breathe or show any other evidence of life.

first degree laceration: A graze, laceration, rupture or tear of the perineal skin (the skin between the vaginal opening and the anus) during delivery that may be regarded as slight or that involves the fourchette (the small flap of skin at the bottom of the inner folds of the vulva), labia, vagina or vulva.

forceps: Handheld, hinged obstetric instrument applied to the fetal head to assist birth.

fourth degree laceration: A perineal laceration, rupture or tear, as in a **third degree laceration**, occurring during delivery of a baby that also involves the mucosa (inner lining) of the anus or rectum.

general practitioner (GP): A medical practitioner who provides primary, comprehensive and continuing care to patients and their families in the community.

gestational age: The duration of pregnancy in completed weeks, calculated from either the date of the first day of a woman's last menstrual period and her baby's date of birth, or via ultrasound, or derived from a clinical assessment during pregnancy or from examination of the baby after birth.

gestational diabetes: A form of diabetes first diagnosed during pregnancy (gestation). It may disappear after pregnancy but signals a high risk of **diabetes** occurring later.

gestational hypertension: A form of blood pressure/hypertension first diagnosed during pregnancy (gestation).

health: A state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity (a World Health Organization definition).

health literacy: The ability of people to access, understand and apply information about health and the health care system to make decisions related to their health.

health outcome: A change in the health of an individual or population due wholly or partly to a preventive or clinical intervention.

health status: The overall level of health of an individual or population, taking into account aspects such as life expectancy, level of disability, levels of disease risk factors and so on.

high blood pressure/hypertension: The definitions vary but a well-accepted one is from the World Health Organization: a systolic blood pressure of 140 mmHg or more or a diastolic blood pressure of 90 mmHg or more, or [the person is] receiving medication for high blood pressure.

hospital admission: An acute or mental health admission to hospital (see **hospitalisation**).

hospitalisation: An episode of hospital care that starts with the formal **admission** process and ends with the formal separation process (synonymous with admission and separation). An episode of care can be completed by the patient's being discharged, being transferred to another hospital or care facility, or dying – or by a portion of a hospital stay starting or ending in a change of type of care (for example, from acute care to rehabilitation).

ICD-10-AM: The Australian Modification of the **International Statistical Classification of Diseases and Related Health Problems, Tenth Revision**. It is used for diagnoses and procedures recorded for patients admitted to hospitals.

immunisation: The process of receiving a **vaccine** and becoming immune to a disease as a result of being vaccinated.

Indigenous: A person who identifies themselves as being of **Aboriginal and/or Torres Strait Islander** origin.

Indigenous-specific primary health care organisation: An organisation that receives funding from the Australian Government through the Indigenous Australians' Health Programme to provide comprehensive and culturally safe care to Indigenous clients. **Aboriginal Community Controlled Health Organisations (ACCHOs)** manage the majority of the funded organisations, which are located throughout Australia.

Indigenous status: A term used to describe whether or not a person identifies as being of **Aboriginal and/or Torres Strait Islander** origin.

induction of labour: A medical intervention to stimulate the onset of labour.

infectious disease: A disease or illness caused by infectious organisms or their toxic products. The disease may be passed directly or indirectly to humans through contact with other humans, animals or environments where the organism is found. Also referred to as a communicable disease.

influenza (flu): An acute contagious viral respiratory infection marked by fever, fatigue, muscle aches, headache, cough and sore throat.

instrumental delivery: A vaginal delivery using **forceps** or **vacuum extraction**.

intentional self-harm: Attempted **suicide**, as well as cases where people have intentionally hurt themselves, but not necessarily with the intention of suicide (for example, acts of self-mutilation).

International Statistical Classification of Diseases and Related Health Problems (ICD): The World Health Organization's internationally accepted classification of death and disease. The Tenth Revision (ICD-10) is currently in use. The **ICD-10-AM** is the Australian Modification of the ICD-10; it is used for diagnoses and procedures recorded for patients admitted to hospitals.

interoperability: The ability of different information systems, devices and applications ('systems') to access, exchange, integrate and cooperatively use data in a coordinated manner.

intrapartum: A period during childbirth from the start of **labour** through to delivery of the placenta.

labour: The physiological process by which a vaginal birth occurs, starting with the onset of regular uterine contractions, which cause the cervix to progressively dilate; it is distinct from spurious labour or pre-labour rupture of the membranes.

life expectancy: An indication of how long a person can expect to live, depending on the age they have already reached. Technically, it is the number of years of life left to a person at a particular age if death rates do not change. The most commonly used measure is life expectancy at birth.

logarithmic (log) scales: Scales that increase by a set factor (that is,10) and emphasise the rate of change, which is not evident on a linear scale. Linear scales are additive, meaning that the rate of growth in cases continues upwards and can give the impression that public health measures are not working. Log scales are more useful for understanding the changes to infectious disease rates in response to public health measures.

machine learning: The use of algorithms that learn from statistical models to analyse and draw inferences from patterns in data without explicit instructions.

maternal age: The mother's age in completed years at the **birth** of her baby.

Medicare: A national, government-funded scheme that subsidises the cost of personal medical services for all Australians and aims to help them afford medical care. The Medicare Benefits Schedule (MBS) is the listing of Medicare services subsidised by the Australian Government. The schedule is part of the wider Medicare Benefits Scheme (Medicare).

Medicare-subsidised mental health-specific services: Services provided by psychiatrists, general practitioners, psychologists and other allied health professionals. These services are provided in a range of settings – for example, in hospitals, consulting rooms, home visits, telephone and videoconferencing – as defined in the Medicare Benefits Schedule.

mental health: A state of wellbeing in which the person realises their own abilities, can cope with normal stresses of life, can work productively and can contribute to the community. Mental health is the capacity of individuals and groups to interact with one another and their environment in ways that promote subjective wellbeing, optimal development and the use of cognitive, affective and relational abilities.

mental illness/mental health disorder: A range of cognitive, emotional and behavioural disorders, including depression, anxiety, substance use disorders, personality disorders and psychoses, that interfere with the lives and productivity of people. Mental health disorders are diagnosed using certain criteria.

mortality: The number or rate of deaths in a population during a given time period.

mother's length of stay: The number of days between an **admission** date (during the admission resulting in a **birth**) and a separation date (from the hospital where birth occurred). The interval is calculated by subtracting the date of admission from the date of separation.

My Health Record: An online platform for storing the health information of individuals, including their **Medicare** claims history, hospital discharge information, diagnostic imaging reports and details of allergies and medications.

natural language processing: A type of artificial intelligence that enables computers to recognise, understand and use written and/or spoken language in a similar way to how people use language to communicate with each other.

non-admitted patient: A patient who receives care from a recognised non-admitted patient service/clinic of a hospital, including emergency departments and outpatient clinics.

non-Indigenous: A term used to describe people who have indicated that they are not of **Aboriginal or Torres Strait Islander** origin.

outcome (health outcome): A health-related change due to a preventive or clinical intervention or service. (The intervention may be single or multiple, and the outcome may relate to a person, group or population, or be partly or wholly due to the intervention.)

out-of-pocket costs: The total costs incurred by individuals for health care services, over and above any refunds from the MBS, the **Pharmaceutical Benefits Scheme (PBS)** or private health insurance funds.

pandemic: A new infectious disease (**epidemic**), such as a new influenza virus or **COVID-19**, that spreads rapidly across a large region, or worldwide, and affects large numbers of people.

parity: The number of previous pregnancies resulting in live births or stillbirths, excluding the current pregnancy.

perineal status: The state of the **perineum** after birth. Perineal status is categorised as intact; a **first**, **second, third** or **fourth degree laceration**; **episiotomy**; or as another type of perineal laceration, rupture or tear.

perineum: The area of skin between the vagina and the anus, and the underlying fibro-muscular perineal body which is an important part of the support structures of the uterus and vagina.

pertussis: A highly infectious bacterial disease of the air passages marked by explosive fits of coughing and often a whooping sound on breathing in. It is preventable by vaccination. Also known as **whooping cough**.

Pharmaceutical Benefits Scheme (PBS): A national, government-funded scheme that subsidises the cost of a wide variety of pharmaceutical drugs, covering all Australians, to help them afford standard medications. The PBS lists all medicinal products available under the PBS and explains the uses for which subsidies can apply (also see **Repatriation Pharmaceutical Benefits Scheme**).

pneumonia: Inflammation of the lungs as a response to infection by bacteria or viruses. The air sacs become flooded with fluid, and inflammatory cells and affected areas of the lung become solid. Pneumonia is often quite rapid in onset and marked by a high fever, headache, cough, chest pain and shortness of breath.

population health: Typically, the organised response by society to protect and promote health and to prevent illness, injury and disability. Population health activities generally focus on:

- populations rather than individuals
- prevention, promotion and protection rather than on treatment
- the factors and behaviours that cause illness.

It can also refer to the health of particular sub-populations, and comparisons of the health of different populations.

pre-eclampsia: A multi-system disorder unique to human pregnancy characterised by **blood pressure/hypertension** and involvement of one or more other organ systems and/or the fetus.

prevention (of ill health or injury): Action to reduce or eliminate the onset, causes, complications or recurrence of ill health or injury.

primary health care: Services delivered in general practices, community health centres, Aboriginal health services and allied health practices (for example, physiotherapy, dietetic and chiropractic practices) under numerous funding arrangements.

Primary Health Network: An administrative not-for-profit organisation set up under the Australian Government Primary Health Networks Program to commission primary care health services:

- to meet the identified and prioritised needs of people in their administrative health region
- to provide practice support to **general practitioners (GPs)**
- to integrate health services, including coordinating with local hospitals, to improve operational efficiency and provide a better experience for patients.

principal diagnosis: The diagnosis established, after study, to be chiefly responsible for an episode of patient care (**hospitalisation**), residential care or attendance at a health care establishment. Diagnoses are recorded using the relevant edition of the International statistical classification of diseases and related health problems, 10th Revision, Australian modification (**ICD-10-AM**).

private patient: A person admitted to a private hospital, or a person admitted to a public hospital who decides to choose the doctor(s) who will treat them or to have private ward accommodation – which means they will be charged for medical services, food and accommodation.

probable case of COVID-19: a **COVID-19** infection not confirmed by a laboratory (detected by a Rapid Antigen Test).

psychological distress: Unpleasant feelings or emotions that affect a person's level of functioning and interfere with the activities of daily living. It is commonly measured using the Kessler Psychological Distress Scale – consisting of 10 items (K10). The K10 measures a person's level of nervousness, agitation, psychological fatigue and depression during the past 4 weeks. The Kessler 6 Scale is an abbreviated version of K10.

public health: Activities aimed at benefiting the health of a population that emphasise prevention, protection and health promotion (as distinct from treatment tailored to individuals with symptoms). Examples include:

- providing a clean water supply and good sewerage
- conducting anti-smoking education campaigns
- screening for diseases such as cancer of the breast and cervix.

public patient: A person admitted to hospital who has agreed to be treated by doctors of the hospital's choice and to accept shared ward accommodation. Such patients are admitted and treated at no charge and are mostly funded through public sector health or hospital service budgets.

rate: One number (the numerator) divided by another number (the denominator). The numerator is commonly the number of events in a specified time. The denominator is the population 'at risk' of the event. Rates (**crude rates**, age-specific rates and **age-standardised rates**) are generally multiplied by a number such as 100,000 to create whole numbers.

Repatriation Pharmaceutical Benefits Scheme (RPBS): An Australian Government scheme that provides a range of pharmaceuticals and wound dressings at a concessional rate for the treatment of eligible veterans, war widows/widowers and their dependants.

residential aged care: The care provided to a person in an aged care facility approved by the Australian Government (often called 'nursing homes'). The services provided include:

- accommodation in private or shared rooms (bedding and other furnishings, meals and laundry)
- personal care (assistance with activities of daily living, such as bathing, showering, toileting, dressing, eating and moving about)
- social activities
- nursing and allied health care services.

Residential aged care can be provided on a permanent basis (meaning that people live in the facility) or on a short-term basis for respite or emergency support.

respiratory condition: A condition affecting the airways and characterised by symptoms such as wheezing, shortness of breath, chest tightness and cough. Conditions include asthma and **chronic obstructive pulmonary disease (COPD)** – which includes emphysema and chronic bronchitis.

risk factor: A factor representing a greater risk of a health disorder or other unwanted condition or event. Some risk factors are regarded as causes of disease; others are not necessarily so. Along with their opposites, protective factors, risk factors are known as **determinants**.

second degree laceration: Perineal laceration, rupture or tear, as in **first degree laceration**, occurring during delivery that also involves the pelvic floor, perineal muscles or vaginal muscles.

smoker: Someone who reports smoking tobacco daily, weekly or less than weekly.

social determinants of health: The circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces, including economics, social policies and politics.

specialist services: The services that support people with specific or complex health conditions and issues, who are generally referred by **primary health care** providers. These services are often described as 'secondary' health care services. In many cases, a formal referral is required for an individual to access the recommended specialist service.

spontaneous labour: The onset of labour without intervention.

spontaneous vaginal birth: A birth without intervention in which the baby's head is the presenting part.

stillbirth: See **fetal death (stillbirth)**.

stroke: An event that occurs when an artery supplying blood to the brain suddenly becomes blocked or bleeds. A stroke often causes paralysis of parts of the body normally controlled by that area of the brain, or speech problems and other ymptoms. It is a major form of **cerebrovascular disease**.

suicidal behaviours: The collective term for **suicidal ideation**, suicide plans and **suicide** attempts.

suicidal ideation: Serious thoughts about ending one's own life.

suicide: An action to deliberately end one's own life.

surveillance: Systematic ongoing collection, collation and analysis of data and the timely dissemination of information to people who need to know so that they can act on that information.

telehealth: The remote delivery of health care services, such as health assessments or consultations, over the telecommunications infrastructure.

third degree laceration: A perineal laceration, rupture or tear, as in **second degree laceration**, occurring during delivery that also involves the anal floor, rectovaginal septum (the tissue structure separating the vagina and the rectum) or sphincter not otherwise specified.

toxicity: Adverse effects on the body caused by a drug, including overdose.

tuberculosis: An infectious bacterial disease that most often affects the lungs.

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**.

vaccination: Treatment with a **vaccine** to produce immunity against a disease.

vaccine: A substance used to stimulate the production of antibodies and provide immunity against one or several diseases. It is prepared from the causative agent of a disease, its products, or a synthetic substitute, and treated to act as an antigen without inducing the disease.

vacuum extraction: An assisted birth using traction or rotation on a suction cap applied to the baby's head.

virus: An infective agent that typically consists of a nucleic acid molecule in a protein coat, is too small to be seen by light microscopy, and can multiply only within the living cells of a host.

wellbeing: A state of health, happiness and contentment. It can also be described as judging life positively and feeling good. For public health purposes, physical wellbeing (for example, feeling very healthy and full of energy) is also viewed as being critical to overall wellbeing. Because wellbeing is subjective, it is typically measured with self-reports, but objective indicators (such as household income, unemployment levels and neighbourhood crime) can also be used.

whooping cough: See **pertussis**.

workforce: People who are employed or unemployed (not employed but actively looking for work). Also known as the labour force.

Australia's health 2022: data insights is a collection of 10 in-depth articles on selected health topics, including a focus on the health impacts of the COVID-19 pandemic, the evolution of the health system over the last 100 years, and the importance of a strong evidence base for supporting the health of Australians.

Australia's health 2022 is the 18th biennial health report of the Australian Institute of Health and Welfare. This edition's full product suite comprises:

- *Australia's health 2022: data insights*
- Australia's health: topic summaries
- *Australia's health 2022: in brief*.

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