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Contents

Summary

Cancer is a major cause of illness in Australia, where it is responsible for 18% of the burden of ill health suffered by Australians, and almost 9% of health system expenditure attributable to specific diseases.

There are over 1 million people alive in Australia who are either currently living with or have lived with cancer. This number is expected to grow over time as both cancer incidence and cancer survival continue to increase. In 2021, it is estimated that 151,000 people will be diagnosed with cancer (excluding basal cell carcinomas (BCC) and squamous cell carcinomas (SCC) of the skin), and 49,000 people will die as a result of cancer. Influenced by population growth and older people becoming a larger proportion of the population (Australia's ageing population), the number of new cases of cancer diagnosed is estimated to increase to 185,000 in 2031.

Cancer survival varies from cancer to cancer but overall cancer survival has improved, with 70% of all people diagnosed with cancer (excluding BCC and SCC) surviving at least five years after diagnosis; up from 51% about 30 years ago.

Almost half (42%) of the cancer burden is attributable to personal and behavioural risk factors (for example, smoking and overweight). Understanding and avoiding the risk factors associated with cancer can help to reduce the chance of getting cancer, while participation in cancer screening programs can increase the likelihood of detecting cancer early, enabling better outcomes from treatments. Improvements in cancer treatments and care are also important contributors to improvements in survival.

The age-standardised incidence rate of cancer has decreased from a peak of 508 cases per 100,000 people in 2008, to an estimated 486 cases per 100,000 people in 2021, influenced by strong decreases in prostate cancer incidence, likely linked to previous changes in diagnostic guidelines. If prostate cancer is excluded, the all-cancer incidence rate for males has been relatively stable over the past 20 years. On the other hand, the all-cancer incidence rate for females has increased from 404 to an estimated 441 cases per 100,000 females. Increasing incidence rates for females reflects, amongst other things, an increase in the incidence rate of lung cancer due to the historical increase in the smoking rate amongst females.

Over the past 20 years, incidence rates for most of the common cancers have increased. However, some have remained steady and others have decreased.

Cancer mortality rates continue to fall, with a sharper decline for males than for females. Between 1989 and 2021, age-standardised cancer mortality rates have declined substantially for both males and females from 287 to an estimated 182 deaths per 100,000 males, and from 165 to an estimated 122 deaths per 100,000 females.

Cancer incidence and survival outcomes are not evenly spread across the population. For example:

- On average, Indigenous Australians were 14% more likely to be diagnosed with cancer and 20% less likely to survive at least five years after diagnosis compared with non-Indigenous Australians. Survival for Indigenous Australians was lower in regional and remote areas than in other areas.
- Cancer incidence rates were slightly higher in regional areas, while survival declined with increasing remoteness, at least partially reflecting poorer survival for Indigenous Australians in more remote areas.

- Compared with people living in the least socioeconomically disadvantaged areas, cancer incidence rates for people living in the most disadvantaged areas were 5% higher, but survival rates were almost 20% lower, and cancer mortality rates were over 40% higher.

In this report, rare and less common cancers are defined as those with incidence rates lower than 12 cases per 100,000 people. While 30% of all cancers diagnosed are classified as rare or less common cancers, these are responsible for 42% of all cancer deaths.

The effect of the COVID-19 pandemic on cancer diagnosis and treatment

The COVID-19 pandemic appears to have had at least some effect on the uptake of cancer-related services. In this report, the incidence data presented for 2021 are estimates based on the latest available information and time-series trends to 2017. These estimates do not take into account the potential impact of COVID-19 on cancer diagnoses. Fewer people may have been diagnosed with cancer during COVID-19 restrictions than would otherwise have been the case.

After having increased by an average of 1% per year over the previous 20 years, the rate of cancer-related hospitalisations decreased by 1% between 2018–19 and 2019–20, noting that COVID-19 restrictions were in place only during the last quarter of 2019–20. COVID-19 restrictions also appear to have affected uptake of breast ultrasound, mammography, breast MRI and colonoscopy. For example, the number of people having MBS-subsidised colonoscopies was 11% lower in 2020 compared with 2019, following average growth of around 3% per annum since 2011.

The full impact of the COVID-19 pandemic on cancer diagnosis and treatment will not be known for several years.

Data at a glance

Estimated incidence of cancer in 2021 (by sex)

Table 1: Estimated 20 most commonly diagnosed cancers, by sex, 2021

Males			Females		
Cancer site/type (ICD-10 codes)	**Cases**	**ASR**	**Cancer site/type (ICD-10 codes)**	**Cases**	**ASR**
Prostate cancer (C61)	18,110	116.8	Breast cancer (C50)	19,866	130.4
Melanoma of the skin (C43)	9,869	66.9	Colorectal cancer (C18–C20)	7,293	44.3
Colorectal cancer (C18–C20)	8,247	55.7	Melanoma of the skin (C43)	7,009	45.1
Lung (C33–C34)	7,460	48.8	Lung cancer (C33–C34)	6,350	37.4
Non-Hodgkin lymphoma (C82–C86)	3,694	24.9	Uterine cancer(C54–55)	3,267	20.4
Kidney cancer (C64)	2,936	20.0	Thyroid cancer (C73)	2,760	19.8
Bladder cancer (C67)	2,369	15.5	Non-Hodgkin lymphoma (C82–C86)	2,708	16.5
Pancreatic cancer (C25)	2,213	14.7	Pancreatic cancer (C25)	2,048	11.9
Liver cancer (C22)	2,050	13.6	Ovarian cancer and serous carcinomas of the fallopian tube (C56 and C57.0, C57.8 (with histologies 8441, 8460, 8461))	1,720	10.9
Stomach cancer (C16)	1,558	10.4	Kidney cancer (C64)	1,441	9.1
Chronic lymphocytic leukaemia (C91.1)	1,418	9.4	Cancer of unknown primary site (C77–C80, C97)	1,048	5.5
Multiple myeloma (C90.0)	1,387	9.2	Multiple myeloma (C90.0)	1,036	6.2
Cancer of unknown primary site (C77–C80, C97)	1,305	8.7	Cervical cancer (C53)	913	6.8
Oesophageal cancer (C15)	1,201	7.8	Other cancers of the blood and lymphatic system (C94.1, C96, D45, D47.1, D47.3–D47.5)	878	5.5
Brain cancer (C71)	1,171	8.2	Chronic lymphocytic leukaemia (C91.1)	843	5.0
Thyroid cancer (C73)	1,070	7.7	Stomach cancer (C16)	834	5.0
Other cancers of the blood and lymphatic system (C94.1, C96, D45, D47.1, D47.3–D47.5)	1,045	7.1	Liver cancer (C22)	782	4.7
Testicular cancer (C62)	980	7.7	Brain cancer (C71)	725	4.8
Myelodysplastic syndromes (D46)	979	6.4	Bladder cancer (C67)	697	3.9
Non-melanoma skin cancer (rare types) (C44)	902	6.0	Cancer of the gallbladder and extrahepatic bile ducts (C23–C24)	640	3.7
All cancers combined	**80,371**	**536.7**	**All cancers combined**	**70,411**	**443.7**

Notes

1. ICD-10 is the International Statistical Classification of Diseases and Related Health Problems, 10th Revision.
2. The 2021 estimates are based on 2008–2017 incidence data (see Appendix A). Estimates are rounded to the nearest whole number.
3. ASR refers to age-standardised rate. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
4. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).

Source: AIHW Australian Cancer Database 2017.

Estimated mortality from cancer in 2021 (by sex)

Table 2: Estimated 20 most common causes of death from cancers, by sex, 2021

Males			Females		
Cancer site/type (ICD-10 codes)	**Deaths**	**ASR**	**Cancer site/type (ICD-10 codes)**	**Deaths**	**ASR**
Lung cancer (C33–C34)	4,998	32.7	Lung cancer (C33–C34)	3,695	21.3
Prostate cancer (C61)	3,323	21.7	Breast cancer (C50)	3,102	18.3
Colorectal cancer (C18–C20, C26.0)	2,836	18.9	Colorectal cancer (C18–C20, C26.0)	2,459	13.4
Pancreatic cancer (C25)	1,789	11.8	Pancreatic cancer (C25)	1,602	9.0
Liver cancer (C22)	1,599	10.4	Cancer of unknown primary site (C77–C80, C97)	1,166	6.1
Cancer of unknown primary site (C77–C80, C97)	1,390	9.2	Ovarian cancer (C56)	1,042	6.0
Oesophageal cancer (C15)	1,036	6.8	Liver cancer (C22)	825	4.8
Non-Hodgkin lymphoma (C82–C86)	974	6.4	Non-Hodgkin lymphoma (C82–C86)	706	3.8
Brain cancer (C71)	935	6.4	Uterine cancer (C54–55)	662	3.8
Melanoma of the skin (C43)	843	5.6	Brain cancer (C71)	593	3.7
Acute myeloid leukaemia (C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5)	732	4.8	Melanoma of the skin (C43)	472	2.6
Stomach cancer (C16)	723	4.8	Multiple myeloma (C90.0)	462	2.6
Bladder cancer (C67)	721	4.7	Acute myeloid leukaemia (C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5)	449	2.6
Kidney cancer (C64)	638	4.2	Stomach cancer (C16)	418	2.4
Mesothelioma (C45)	615	4.0	Oesophageal cancer (C15)	364	2.0
Multiple myeloma (C90.0)	612	4.0	Bladder cancer (C67)	299	1.5
Non-melanoma skin cancer (C44)	515	3.4	Kidney cancer (C64)	297	1.6
Cancer of other urinary organs (C65–C66, C68)	409	2.7	Non-melanoma skin cancer (C44)	245	1.2
Myelodysplastic syndromes (D46)	330	2.2	Cervical cancer (C53)	237	1.6
Cancer of other soft tissue (C47, C49)	207	1.4	Myelodysplastic syndromes (D46)	218	1.1
All cancers combined	**27,600**	**182.0**	**All cancers combined**	**21,621**	**122.3**

Notes

1. ICD-10 is the International Statistical Classification of Diseases and Related Health Problems, 10th Revision.
2. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.
3. ASR refers to age-standardised rate. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
4. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: AIHW National Mortality Database.

Estimated cancer incidence and mortality in 2021

Table 3: Estimated 20 most commonly diagnosed cancers and estimated 20 most common causes of death from cancers, persons, 2021

Incidence			Mortality		
Cancer site/type (ICD-10 codes)	**Cases**	**ASR**	**Cancer site/type (ICD-10 codes)**	**Deaths**	**ASR**
Breast cancer (C50)	20,030	67.8	Lung cancer (C33–C34)	8,693	26.5
Prostate cancer (C61)	18,110	55.9	Colorectal cancer (C18–C20, C26.0)	5,295	16.0
Melanoma of the skin (C43)	16,878	55.3	Pancreatic cancer (C25)	3,391	10.3
Colorectal cancer (C18–C20)	15,540	49.7	Prostate cancer (C61)	3,323	9.5
Lung cancer (C33–C34)	13,810	42.6	Breast cancer (C50)	3,138	9.8
Non-Hodgkin lymphoma (C82–C86)	6,402	20.4	Cancer of unknown primary site (C77–C80, C97)	2,556	7.5
Kidney cancer (C64)	4,377	14.4	Liver cancer (C22)	2,424	7.4
Pancreatic cancer (C25)	4,261	13.2	Non-Hodgkin lymphoma (C82–C86)	1,680	5.0
Thyroid cancer (C73)	3,830	13.9	Brain cancer (C71)	1,528	5.0
Uterine cancer (C54–55)	3,267	10.5	Oesophageal cancer (C15)	1,400	4.3
Bladder cancer (C67)	3,066	9.3	Melanoma of the skin (C43)	1,315	4.0
Liver cancer (C22)	2,832	8.9	Acute myeloid leukaemia (C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5)	1,181	3.6
Multiple myeloma (C90.0)	2,423	7.6	Stomach cancer (C16)	1,141	3.5
Stomach cancer (C16)	2,392	7.6	Multiple myeloma (C90.0)	1,074	3.2
Cancer of unknown primary site (C80)	2,353	7.0	Ovarian cancer (C56)	1,042	3.2
Chronic lymphocytic leukaemia (C91.1)	2,261	7.0	Bladder cancer (C67)	1,020	2.9
Other cancers of the blood and lymphatic system (C94.1, C96, D45, D47.1, D47.3–D47.5)	1,923	6.3	Kidney cancer (C64)	935	2.8
Brain cancer (C71)	1,896	6.5	Non-melanoma skin cancer (C44)	760	2.2
Ovarian cancer and serous carcinomas of the fallopian tube (C56 and C57.0, C57.8 (with histologies 8441, 8460, 8461))	1,720	5.7	Mesothelioma (C45)	758	2.3
Oesophageal cancer (C15)	1,649	5.1	Uterine cancer (C54–55)	662	2.0
All cancers combined	**150,782**	**486.1**	**All cancers combined**	**49,221**	**149.1**

Notes

1. ICD-10 is the International Statistical Classification of Diseases and Related Health Problems, 10th Revision.
2. All rates and counts are for persons.
3. The 2021 mortality estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.
4. The 2021 incidence estimates are based on 2008–2017 incidence data (see Appendix A). Estimates are rounded to the nearest whole number.
5. ASR refers to age-standardised rate. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
5. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except incidence excludes basal and squamous cell carcinomas of the skin (part of C44).
6. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex-specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly or solely occurs.

Source: AIHW Australian Cancer Database 2017 and AIHW National Mortality Database.

1 Introduction

1.1 Cancer

Cancer is a term used for diseases in which abnormal cells divide without control and can invade nearby tissues. Cancer cells can also spread to other parts of the body through the blood and lymph systems. In this report, cancer refers to invasive cancer, unless otherwise stated.

Cancer is a major cause of illness in Australia and has a substantial social, economic and personal impact on individuals, families and the community.

Cancer and other neoplasms are major contributors to the burden of disease (for definition see Box 2.1) in Australia, constituting 18% of the burden in 2018—greater than the next 3 leading contributors: cardiovascular disease, musculoskeletal diseases and mental and substance abuse disorders (13% each) (AIHW 2021b).

In Australia, cancer ranked third in terms of estimated total health system expenditure on diseases in 2015–16, and accounted for 8.6% of total disease expenditure. In that financial year, health system expenditure on cancer and other neoplasms was estimated to be $10.1 billion, comprising $9.7 billion on diagnosing and treating cancer and $409 million on the 3 national population cancer screening programs—bowel, breast and cervical (AIHW 2021h).

In 2021, an average of 413 people are estimated to be diagnosed with cancer each day and an average of 135 deaths are estimated to be caused by cancer each day.

Box 1.1: Cancer registration in Australia

Registration of all cancers, excluding basal and squamous cell carcinomas of the skin, is required by law in each state and territory. Information on newly diagnosed cancers is collected by each state and territory population-based cancer registry and provided to the AIHW annually to form the Australian Cancer Database (ACD). Since basal and squamous cell carcinomas of the skin are not notifiable in all jurisdictions, data on these cancers are not included in the ACD. However, past research has shown that basal and squamous cell carcinomas of the skin are the most frequently diagnosed cancers in Australia (AIHW 2016; AIHW & CA 2008).

Box 1.2: All cancers combined

In this report, all cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5. Note that all cancers combined in cancer incidence, survival and prevalence data from the ACD excludes basal and squamous cell carcinomas of the skin (see previous Box) whereas mortality data include these skin cancers. Appendix B provides a list of ICD-10 codes for each type of cancer.

1.2 Report overview

This report is the 20th in a series and provides a comprehensive overview of national statistics on cancer. It includes information and statistics on cancer risk factors, national population screening programs, Medicare-subsided surveillance and treatment, cancer incidence, hospitalisations, survival, prevalence and mortality.

Supplementary online data tables referred to in this report (those with a prefix of S) are available from the report's data page.

Previous editions of *Cancer in Australia* have included summary pages for selected cancers. This information and other related statistics are now available annually through the *Cancer data in Australia* online product (AIHW 2021f).

1.3 Data sources

Data within this report are predominantly sourced from the ACD and the National Mortality Database (NMD). Several other data sources including the National Hospital Morbidity Database (NHMD), the AIHW Medicare Benefits Schedule (MBS) database and the 2020 GLOBOCAN database (for international comparisons) have also been used to present a broad picture of cancer in Australia. Information about each of these data sources is presented in Appendix C.

This report uses the ACD for its counts of new cases of cancer diagnosed in Australia each year. The Australian Mesothelioma Registry (AMR) is an alternative source for mesothelioma data. Please refer to Appendix C for information about the comparability of counts of new cases of mesothelioma between the ACD and the AMR.

1.4 Data presentations

The structure of reporting information in this report may change between sections. The following paragraphs explain why sections may focus on different reference years and different levels of reporting.

Reference years

The latest complete year of data available across data sources may vary. In this report, data are presented up to the latest complete year available from the relevant data source.

Data projections

For the ACD and NMD, data are available up to 2017 for incidence and 2019 for mortality, with estimates for more recent years (including 2021) based on projections (see Appendix A for more details). Estimates for 2021 provide the most up-to-date statistics possible. Projections are provided for all cancers combined and for selected cancer types.

Long-term projections of incidence, up to and including 2031, are also presented in this report (see Appendix A for more details).

Aggregating data

Reference years

For smaller populations, it is sometimes necessary to combine several years of data to obtain a cohort of sufficient size for reliable estimates (for example, cancer incidence for Indigenous populations is reported for 2012–2016). Data are presented for multiple years to increase reporting group size and reduce random variations in rates.

Sex

For smaller populations, it is sometimes not feasible to report by sex. Data are presented only for 'persons' in these instances to increase reporting group size and reduce the amount of random variation in the data.

1.5 Notes about certain cancers

Non-melanoma skin cancer

There is a complexity when reporting statistics for non-melanoma skin cancer (NMSC). The two most common types of NMSC are basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). These are notifiable diseases in Tasmania but not in any other state or territory. Consequently, this report is unable to present incidence, survival or prevalence statistics for NMSC. However, other statistics, such as mortality and hospitalisations can be presented.

There are numerous other kinds of NMSC besides BCC and SCC. They are very rare in comparison to BCC and SCC and are referred to as non-melanoma skin cancer (rare types) in this report. They are notifiable diseases throughout Australia and hence can have their incidence, survival and prevalence reported. Unfortunately, mortality statistics cannot be reported for the rare types of NMSC only. This is because BCC, SCC and the rare types of NMSC are all assigned the same ICD-10 code (C44), which makes them indistinguishable from each other in the AIHW's National Mortality Database.

Breast cancer and sex-specific cancers

Both males and females can develop breast cancer. However, the proportion of females who develop breast cancer is far greater than the proportion of males who do so. Sometimes within this report, breast cancer rates are reported for the total population, and will be expressed as a rate per 100,000 people. Where this occurs, the rate is an accurate reflection of breast cancer within the whole Australian population but it will often be around half of the equivalent rate when reported for females only (which would be expressed as a rate per 100,000 females).

Cancers such as prostate cancer, testicular cancer, uterine cancer and cervical cancer are all sex-specific, and incidence and mortality rates for these cancers will also sometimes be expressed for the total population (per 100,000 people). Similar to breast cancer, the person rate will often be around half of the rate when expressed per 100,000 individuals of the relevant sex.

Breast cancer data for persons, males and females are available in *Cancer data in Australia* (AIHW 2021f).

Ovarian cancer

Some types of cancer that used to be classified as ovarian cancer are now known to be fallopian tube cancers and are classified accordingly. This change means that the incidence rate of ovarian cancer has been dropping for approximately 10 years while that of fallopian tube cancer has been increasing. As fallopian tube cancer is quite rare and not reported in its own category by AIHW, readers who are unaware of the change in coding practice may misunderstand the meaning of the decreasing trend in the incidence rate of ovarian cancer. For this reason a new cancer group called 'ovarian cancer and serous carcinomas of the fallopian tube' has been introduced. This group closely resembles the group 'ovarian cancer' as it was understood in earlier years and allows valid comparisons with older data and the analysis of trends.

Much more detail about this issue is available in Cancer data commentary no. 5 in *Cancer data in Australia* (AIHW 2021f).

Note that statistics for ovarian cancer and serous carcinomas of the fallopian tube can only be presented for measures derived from the Australian Cancer Database, namely incidence, survival and prevalence. It is not possible to create this cancer group for mortality data.

1.6 The impact of COVID-19 on cancer data

The impact of COVID-19 on cancer diagnoses has not been taken into account in the incidence projections, as the estimates for 2021 are based on actual data up to the end of 2017. Research conducted in Victoria found that during the COVID-19 restrictions in 2020 there was a 10% reduction in cancer pathology notifications to the population-based cancer registry, corresponding to an estimated 2,530 undiagnosed cancers, raising concerns about a future spike in numbers (te Marvelde et al. 2021).

Cancer Australia has identified unexpected reductions in MBS-subsidised cancer-related diagnostic and therapeutic procedures in 2020 (Cancer Australia 2021). For the fourteen cancer types considered, there were 163,595 fewer diagnostic procedures and 14,600 fewer therapeutic services provided in Australia in 2020 compared with the numbers that would have been expected (reductions of 8% and 9%, respectively).

This edition of *Cancer in Australia* has also identified a decrease in selected MBS-subsidised cancer-related services in 2020 (Chapter 4), and a slight decrease in the number of cancer-related hospitalisations in 2019–20 (Chapter 6), noting that only the last few months of 2019–20 were affected by the pandemic.

The full effect of the pandemic on cancer diagnosis and outcomes, while expected to become clearer over time, will likely not be fully understood and enumerated for some years.

2 Risk factors for cancer

2.1 Determining associations between risk factors and cancer

A risk factor is any factor associated with an increased likelihood of a person developing a health disorder or health condition, such as cancer. Exposure to a risk factor does not mean that a person will definitely develop cancer. Some people are exposed to at least 1 cancer risk factor but will never get cancer, and some people without any of these risk factors will develop cancer.

Understanding what causes cancer is essential in developing practices and policies to successfully prevent, detect and treat the disease. For most cancers, the causes are not fully understood. However, some factors that place individuals at a greater risk for cancer are well recognised.

The Australian Burden of Disease Study (ABDS) 2018 estimated the contribution of various risk factors to the health loss from cancer in Australia. The risk factors examined by the ABDS are the focus of the discussion in this chapter.

For a risk factor to be included in the ABDS, it needs to be measureable, modifiable and there must be strong evidence of a causal relationship with cancer. This means that the list is not exhaustive. For example, family history and genetic susceptibility are risk factors for cancer but are excluded from the ABDS risk factors as they are not modifiable. Further details about the criteria for ABDS risk factor selection can be found in '*Australian Burden of Disease: methods and supplementary material 2015'* (AIHW 2021c). Further details about cancer risks are available from Cancer Council Australia.

Types of risk factors

Risk factors can be categorised as behavioural risks, biomedical risks and environmental risks (Figure 2.1).

Behavioural risk factors

A risk factor may be linked to the behaviour of an individual. Behavioural risk factors include those that are modifiable by changes in individual behaviour, such as diet, tobacco smoking drinking alcohol and physical inactivity.

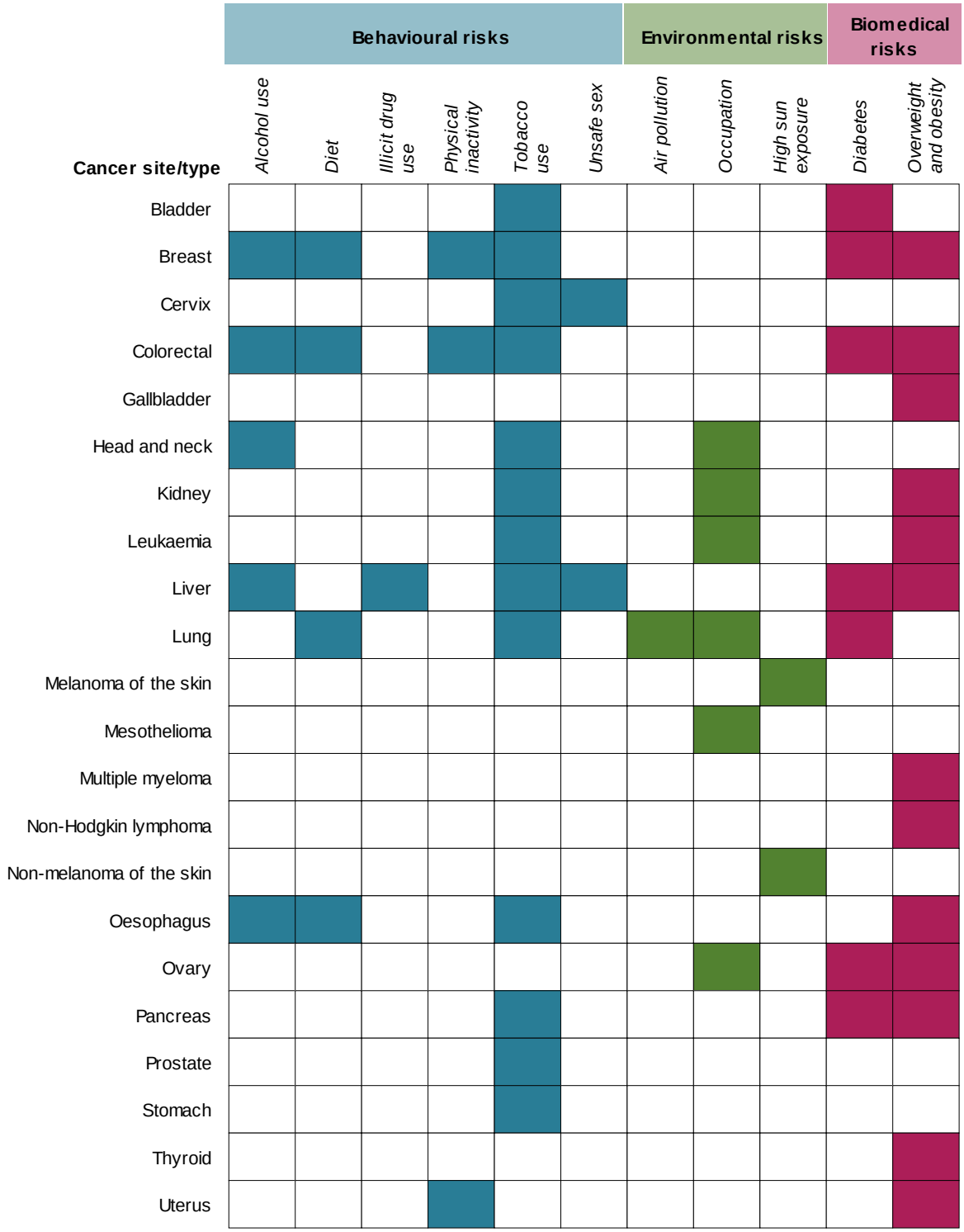
Biomedical risk factors

Biomedical risk factors are bodily states that have an impact on a person's risk of disease. Types of biomedical risk factors include high blood plasma glucose (including diabetes), and overweight and obesity.

Environmental risk factors

The risk of developing some cancers is associated with exposure to certain substances, pollutants or energies. For example, the risk of developing skin cancer increases with increasing exposure to solar ultraviolet radiation (sun exposure).

Figure 2.1 Cancer risk factors and associated cancers



Notes

1. Sun exposure is categorised as an environmental risk factor in this paper but may also be categorised as a behavioural risk where individuals exhibit sun seeking behaviour.
2. Head and neck cancers includes cancers of the lip, tongue, mouth, salivary glands, pharynx, nasal cavity, sinuses and larynx.

Source: AIHW 2021b.

2.2 Cancer risk factors in Australia

This section looks at the impact of cancer risks in Australia and the extent to which cancer risks are occurring in the Australian population. Impacts of cancer on Australians may be measured using burden of disease analysis to quantify the extent that certain risk factors contribute to the cancer burden.

Information about the extent to which cancer risks occur in the Australian population in this section are presented through prevalence data. For example, the rate of daily smokers provides an indication of people who are undertaking a behaviour that is a known cause of cancer.

Box 2.1: What is 'burden of disease'?

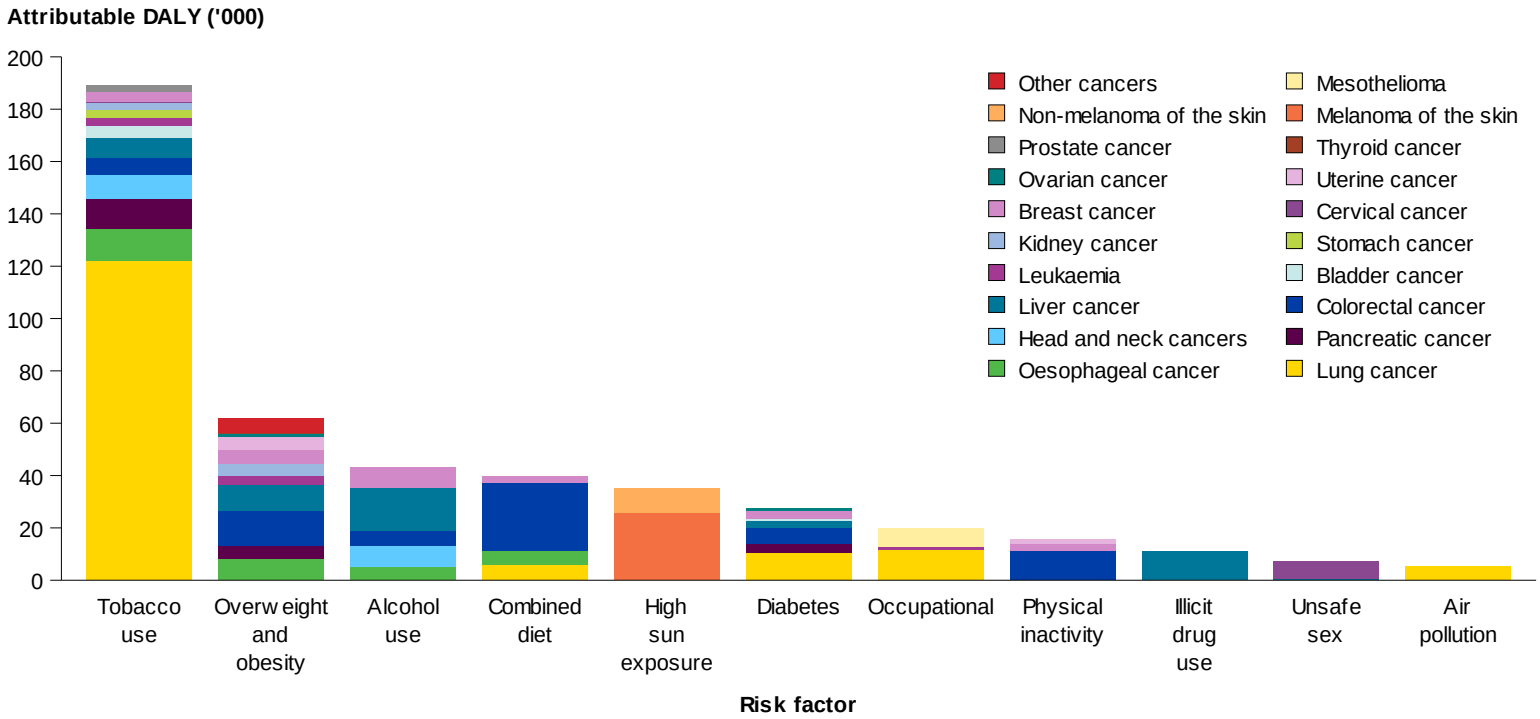
Burden of disease analysis is a technique used to assess and compare the impact of different diseases, conditions or injuries and risk factors on a population. It uses information from a range of sources to quantify the fatal and non-fatal effects of these diseases in a consistent manner so that they can then be combined into a summary measure of health called disability-adjusted life years, or DALY. A DALY combines the estimates of years of life lost due to premature death (YLL) and years lived in ill health or with disability (YLD) to count the total years of healthy life lost from disease and injury.

Cancer burden attributable to specific risk factors

Collectively, cancer and other neoplasms caused the greatest disease burden in Australia in 2018, responsible for an estimated 881,094 DALY. Cancer accounted for 18% of the total burden of disease, compared with 13% each from cardiovascular diseases, mental and substance use disorders and musculoskeletal disorders (AIHW 2021d).

Burden of disease analysis quantifies the impact that cancer risk factors contribute to the cancer burden. A large proportion (42.2%) of the cancer burden is attributable to the joint effect of risk factors (AIHW 2021b), and of these, tobacco use has the greatest impact, being responsible for one-fifth of the cancer burden in Australia in 2018 (Figure 2.2).

Figure 2.2: Cancer burden (DALY) attributable to specific risk factors, 2018



Notes

1. Dietary risk factors are presented as the joint effect 'Combined diet'.
2. In this figure, 'Other cancers' comprises non-Hodgkin lymphoma, myeloma and gallbladder cancer. 'Head and neck cancers' comprises lip and oral cavity cancer, laryngeal cancer, nasopharyngeal cancer and other oral cavity and pharynx cancers.
3. Data for this figure are in online Table S2.1.

Source: AIHW burden of disease database.

Tobacco use

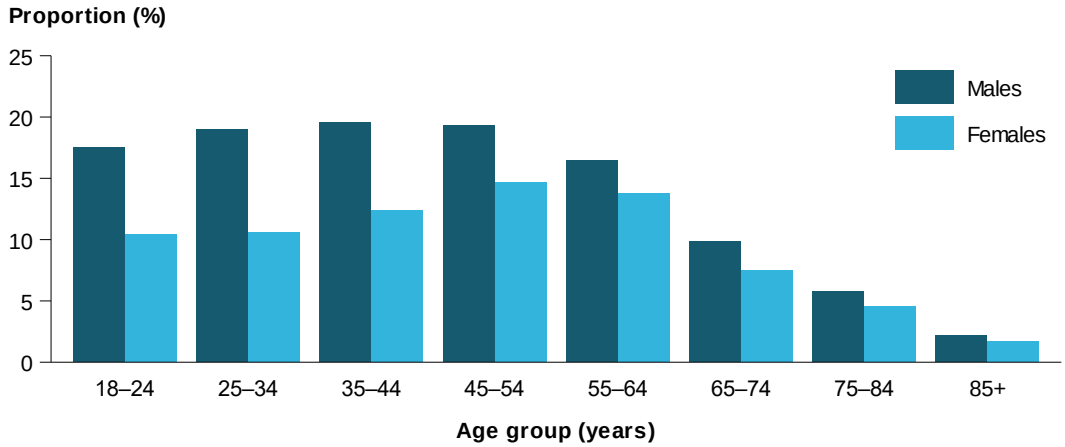
Cancer burden from tobacco use

Tobacco use was the risk factor that contributed the most by far to cancer burden, responsible for 189,200 cancer-related DALY in 2018, which equates to 21% of the total cancer burden (881,100 DALY). Lung cancer accounted for about two-thirds (65%) of the cancer burden from tobacco use. The remaining cancer burden from tobacco use comprised the burden of oesophageal, pancreatic, liver, colorectal, lip and oral cavity, bladder, breast, stomach, kidney, laryngeal, prostate, nasopharyngeal and cervical cancers as well as leukaemia (AIHW 2021b).

Tobacco use in Australia

In 2017–18, 14% of Australians aged over 18 were daily smokers and 1.4% smoked on a less than daily basis (online Table S2.2). For all age groups younger than 75–84, men were more likely to be daily smokers; for the oldest age groups the rate of males who were daily smokers was similar to females (Figure 2.3). Men were more likely to be daily smokers than women (17% compared with 11%) (online Table S2.2). Women were also more likely than men never to have smoked (63% compared with 48%) (online Table S2.2).

Figure 2.3: Prevalence of daily smoking, by age and sex, 2017–18



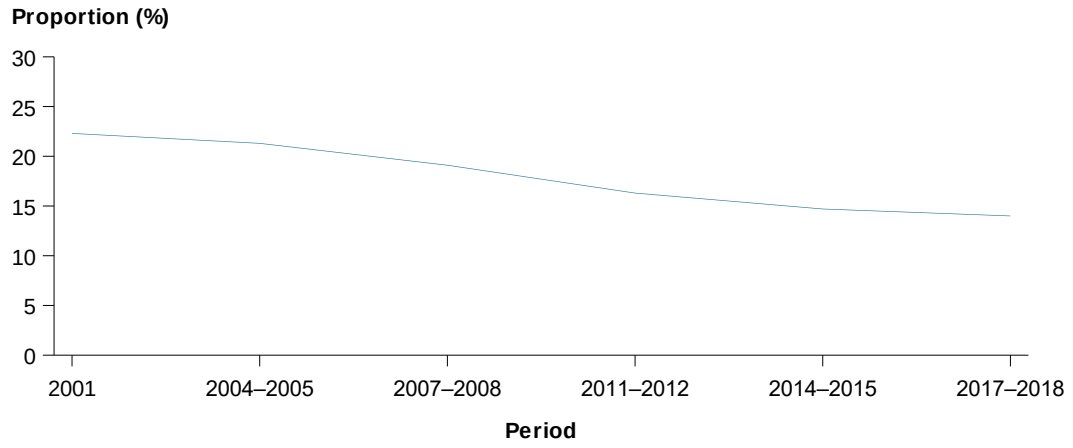
Notes

1. In 2017–18, data from the National Health Survey (NHS) and the Survey of Income and Housing (SIH) have been combined to create a much larger sample which will allow for a more accurate smoker status estimate.
2. Data for this figure are in online Table S2.2.

Source: National Health Survey, Australian Bureau of Statistics (ABS) 2018a.

The rate of daily smokers has been reducing over time. After adjusting for age, 22% of adults were daily smokers in 2001 compared with 14% in 2017–18 (Figure 2.4).

Figure 2.4: Proportion of daily smokers, persons aged 18 and over, 2001 to 2017–18



Notes

1. Proportions have been age-standardised to the 2001 Australian population.
2. In 2017–18, data from the National Health Survey (NHS) and the Survey of Income and Housing (SIH) have been combined to create a much larger sample which will allow for a more accurate smoker status estimate.
3. Trend data are based on when survey data are available.
4. Data for this figure are in online Table S2.3.

Source: National Health Survey, ABS 2018b.

Overweight and obesity

Cancer burden from overweight and obesity

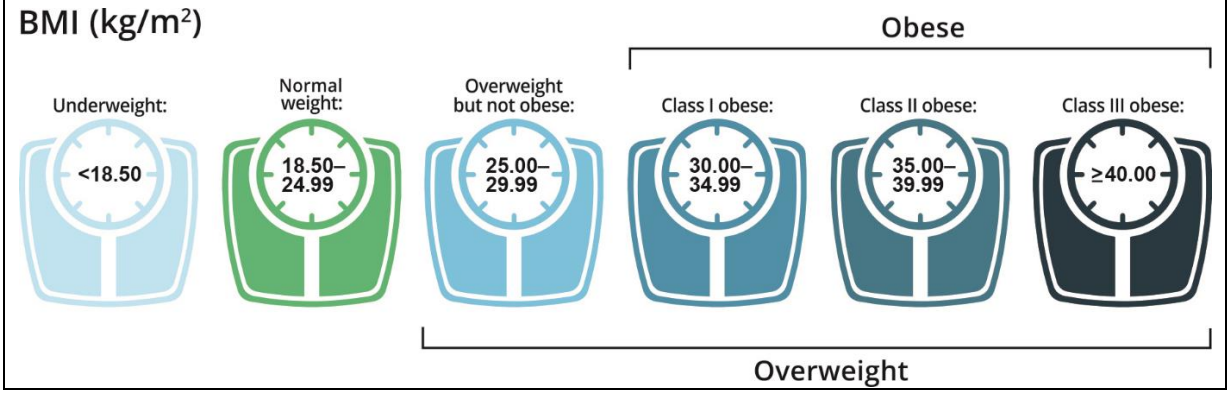
Overweight and obesity contributed around 62,000 DALY (7.0%) to the cancer burden. About one-fifth (21%) of the cancer burden from overweight and obesity was attributed to colorectal cancer, and 17% to liver cancer. Overweight and obesity also contributed to the burden due to oesophageal, breast, uterine, pancreatic, kidney, gallbladder, ovarian and thyroid cancers as well as non-Hodgkin lymphoma, myeloma and leukaemia (AIHW 2021b).

Overweight and obesity in Australia

In 2017–18, 67% of Australians aged 18 and over were overweight or obese (36% overweight but not obese, and 31% obese) (online Table S2.4). Box 2.2 provides detail about measuring overweight and obesity.

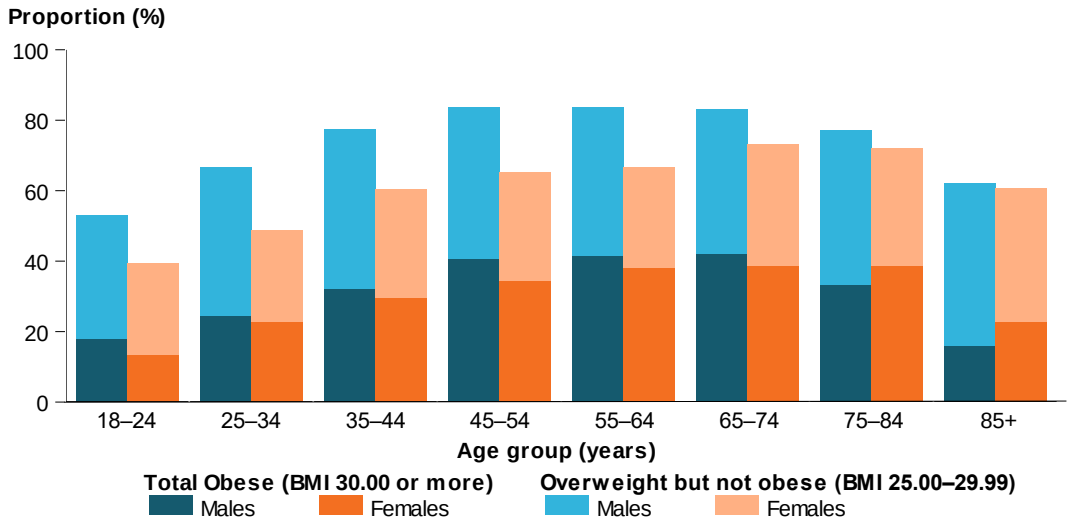
Box 2.2: Measuring Overweight and Obesity

Body Mass Index (BMI) is calculated by dividing a person's weight (in kilograms) by their height (in metres) squared. This report uses the BMI classifications for adults defined by the World Health Organization (WHO). Obesity is split into 3 classes, according to severity, with more severe obesity associated with a higher risk of comorbidities (WHO 2000).



Overall in 2017–18, women were significantly less likely to be overweight and obese than men (60% compared with 75%) (online Table S2.4). This was true for women of all age groups except those over 75, where the rates of overweight and obesity were similar for men and women. Similar proportions of males and females were obese (33% and 30%, respectively), but males were more likely to be overweight but not obese than females (42% compared with 30%) (Figure 2.5).

Figure 2.5: Proportion of overweight and obese, by age and sex, 2017–18

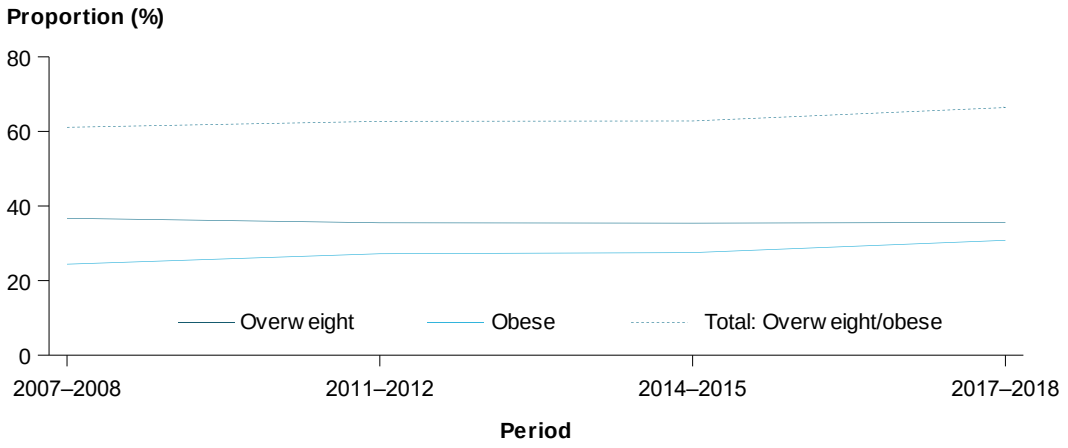


Note: Data for this figure are in online Table S2.4.

Source: National Health Survey, ABS 2018b.

After adjusting for age, the proportion of overweight and obese persons increased from 61% in 2007–08 to 66% in 2017–18. Over this time, the proportion of overweight people remained stable but the proportion of obese people in the Australian population increased from 24% to 31% (Figure 2.6).

Figure 2.6: Proportion of overweight and obese, persons aged 18 and over, 2007–08 to 2017–18



Notes

1. Proportions have been age-standardised to the 2001 Australian population.
2. Trend data are based on when survey data are available.
3. Data for this figure are in online Table S2.3.

Source: National Health Survey, ABS 2018b.

Alcohol use

Cancer burden from alcohol use

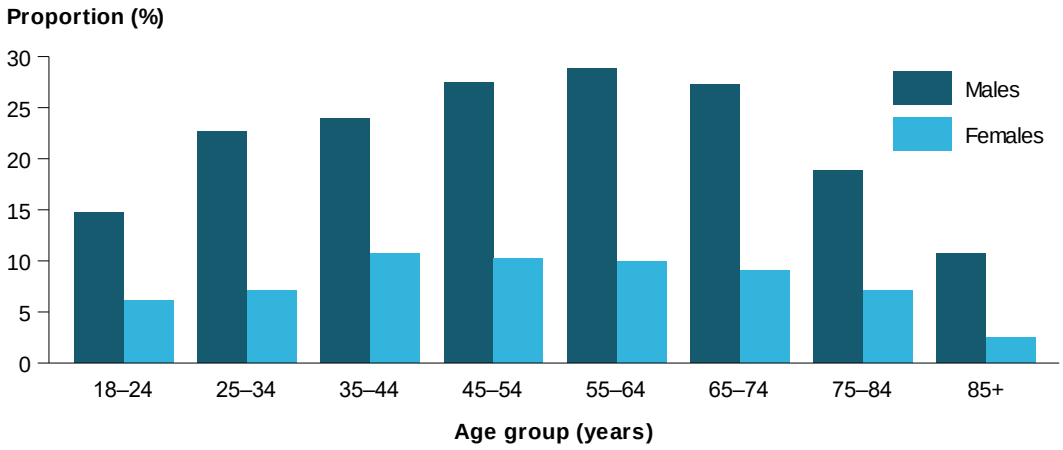
Alcohol use contributed 43,300 DALY (4.9%) to the cancer burden. The cancer burden from alcohol was greatest for liver cancer, followed by breast, colorectal, oesophageal, lip, oral cavity and pharyngeal cancers. Laryngeal and nasopharyngeal cancers were also attributed to long-term alcohol use (AIHW 2021b).

Alcohol in Australia

In 2017–18, around 1 in 6 adults consumed more than 2 standard drinks per day, exceeding the recommended guidelines (online Table S2.5).

In 2017–2018, men were much more likely than women to have consumed more than 2 standard drinks a day on average in the previous week and this was consistent across all reported age groups (Figure 2.7).

Figure 2.7: Proportion of the population exceeding alcohol risk guidelines in the previous week, by age group and sex, 2017–2018



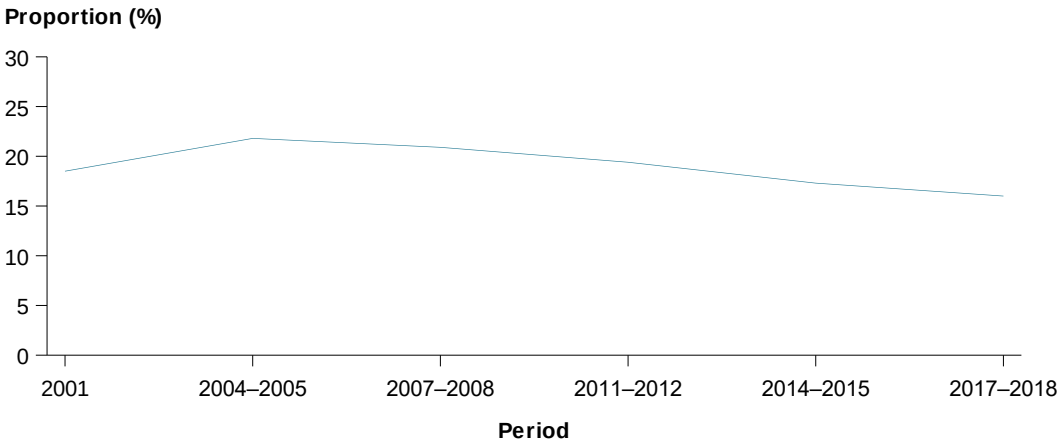
Notes

1. National Health and Medical Research Council (NHMRC) 2009 guideline 1 for the consumption of alcohol which recommends no more than 2 standard drinks per day.
2. The data for this figure are in online Table S2.5.

Source: National Health Survey, ABS 2018b.

After adjusting for age, the proportion of people who had more than 2 standard drinks a day on average in the previous week decreased from 19% in 2001 to 16% in 2017–18 (Figure 2.8).

Figure 2.8: Proportion of the population exceeding alcohol risk guidelines in the previous week, persons aged 18 and over, 2001 to 2017–2018



Notes

1. Proportions have been age-standardised to the 2001 Australian population.
2. Trend data are based on when survey data are available.
3. National Health and Medical Research Council (NHMRC) 2009 guideline 1 for the consumption of alcohol which recommends no more than 2 standard drinks per day.
4. Data for this figure are in online Table S2.3.

Source: National Health Survey, ABS 2018b.

Dietary risks

Cancer burden from dietary risks

The dietary risks included in the ABDS 2018 were a diet low in fruit, vegetables, milk, nuts and seeds, whole grains and high fibre cereals, legumes, polyunsaturated fat and fish and seafood, as well as a diet high in sodium, sugar-sweetened beverages, red meat and processed meat. Dietary risk factors contributed burden to a range of cancer types. These burdens cannot be added together without special analyses because of the high likelihood of inter-relatedness (see Box 2.3). An analysis of the joint effect of diet shows that the various dietary risk factors together accounted for 39,500 DALY (4.5%) of the cancer burden.

Diet low in whole grains and high fibre cereals contributed the highest dietary risk burden (15,600 DALY) for cancer, which was all from colorectal cancer. Diets low in milk (4,600 DALY) or high in red or processed meat (5,700 and 2,200 DALY, respectively) also contributed to the burden of colorectal cancer. Diets high in red meat also contributed to the burden of breast cancer (2,300 DALY). Diets low in fruit contributed to the burden (9,900 DALY) of lung and oesophageal cancers. Diets low in vegetables also contributed to the burden of oesophageal cancer (1,900 DALY) (AIHW 2021b).

Box 2.3: Why risk factor estimates cannot be added together

Most of the risk factors were analysed independently in the ABDS 2018. However, separate estimates for different risk factors cannot be added, due to complex pathways and interactions between them. The risk factors might be in the same causal pathway (for example, sugar-sweetened beverages and high body mass) or, when added, the estimate of attributable burden may be more than the total burden of that disease.

A statistical approach to combine risk factors is referred to as the 'joint effect'. In this report, the joint effect has been estimated for all included dietary risk factors to produce an overall estimate 'All risk factors combined'. The ABDS 2018 did not calculate joint effects for other combinations of risk factors (for example, for all behavioural risk factors) (AIHW 2021b).

Nutrition in Australia

Cancer Council Australia notes 'there is no one "super" fruit or vegetable that protects against cancer. They all contain varying amounts of fibre, vitamins, minerals, antioxidants and phytochemicals, therefore it is important to eat a variety'. Australia has national dietary guidelines to support optimal nutritional and health outcomes for the population, which include recommended serves of vegetables, fruit, grains, meat and alternatives and dairy products and alternatives (NHMRC 2013). Australians of all ages generally:

- do not eat the recommended amounts of the 5 food groups—vegetables, fruit, grains, meat and alternatives, and dairy products and alternatives
- eat too much food that is high in energy and low in nutrients ('discretionary food')
- eat too much sugar, saturated fat, and sodium (salt) (AIHW 2018e).

Fruit and vegetable intake is often used as an indicator of overall diet quality.

In 2017–18, 5.4% of people aged 18 and over in Australia met the National Health and Medical Research Council (NHMRC) guidelines on the recommended minimum serves of fruit and vegetables each day. People over 18 were much more likely to meet the recommended serves of fruit (51%) than vegetables (7.5%) (online Table S2.6).

In 2017–18, more than 90% of men and women failed to meet the recommended minimum serves of fruit and vegetables each day in almost all age groups; the only exceptions were women aged 55–74 where the rates were just under 90% (Table 2.1).

Table 2.1: Proportion who did not meet the recommended minimum serves of fruit and vegetables each day, by sex and age, 2017–18

Age group	Inadequate fruit		Inadequate vegetables		Inadequate fruit and vegetables	
(years)	Males (%)	Females (%)	Males (%)	Females (%)	Males (%)	Females (%)
18–24	54.4	52.9	96.5	94.7	96.8	96.4
25–34	60.5	49.2	97.0	89.9	98.7	93.8
35–44	57.8	48.4	96.8	90.2	97.8	93.4
45–54	54.0	45.7	96.5	89.0	97.3	93.0
55–64	50.4	39.7	97.1	85.7	98.0	88.8
65–74	45.6	32.3	93.4	84.4	95.7	87.8
75–84	39.6	32.4	87.4	89.4	90.2	90.7
85+	#35.6	38.6	#94.2	93.7	#93.5	95.7
Total	**53.4**	**44.2**	**96.0**	**89.1**	**97.1**	**92.3**

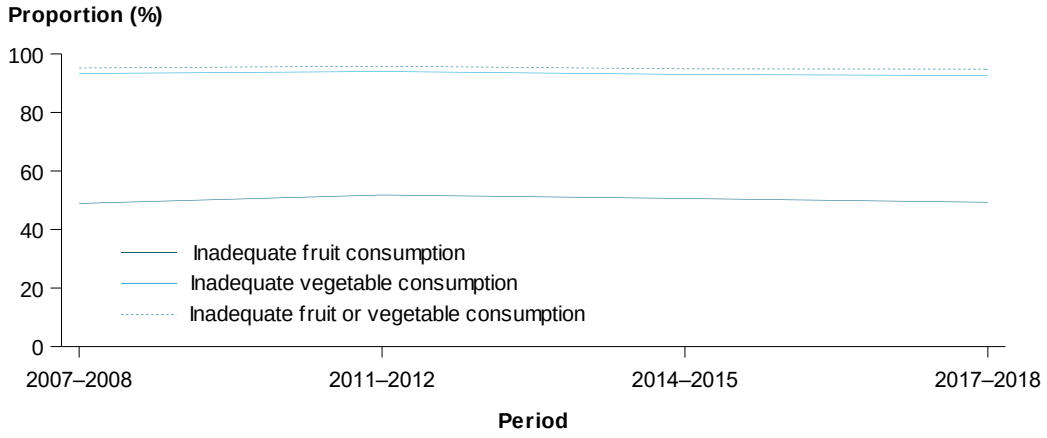
Has a high margin of error and should be used with caution.

Note: National Health and Medical Research Council's (NHMRC) 2013 Australian Dietary Guidelines recommend a minimum number of serves of fruit and vegetables each day, depending on a person's age and sex, to ensure good nutrition and health.

Source: National Health Survey, ABS 2018b.

The proportion of people who did not meet the National fruit and vegetable intake recommendations remained relatively stable between 2007–08 and 2017–18 (Figure 2.9).

Figure 2.9: Proportion of the population who did not consume the recommended minimum serves of fruit and vegetables each day, persons aged 18 and over, 2007–08 to 2017–18



Notes

1. Proportions have been age-standardised to the 2001 Australian population.
2. Trend data are based on when survey data are available. The duration between surveys, and as presented above, may differ.
3. National Health and Medical Research Council's (NHMRC) 2013 Australian Dietary Guidelines recommend a minimum number of serves of fruit and vegetables each day, depending on a person's age and sex, to ensure good nutrition and health.
4. Data for this figure are in online Table S2.3.

Source: National Health Survey, ABS 2018b.

High sun exposure

Cancer burden from high sun exposure

High sun exposure contributed around 35,300 DALY (4.0%) to the cancer burden—this comprised 25,900 DALY from melanoma of the skin and 9,400 DALY from non-melanoma skin cancer (AIHW 2021b).

High sun exposure in Australia

Research from the Cancer Council's National Sun Protection Survey 2016–17 noted that 11% of adults were actively trying to get a tan, while 66% of adults reported having tanned skin—an indication that most ultraviolet (UV) damage is due to incidental sun exposure during Australians' daily activities (Cancer Council Australia 2020).

Data from the Cancer Council Australia's National Sun Protection Surveys indicates considerable opportunity for improvement in UV protective behaviour. In 2016–17, 47% of adults and 33% of adolescents typically employed 2 protective behaviours or more (wearing a hat or sunscreen, plus 1 other factor (hat, sunscreen, staying in shade, clothing covering arms or legs), while 17% of adults and 26% of adolescents surveyed reported being sunburned on summer weekends (Cancer Australia 2019).

The UV index (Bureau of Meteorology 2021) is a simple and informative way of describing the daily danger of solar UV radiation intensity: the higher the rating, the higher the danger. The UV index numbers have corresponding exposure categories ranging from low to extreme; a UV index category is low where it is below 2 and extreme where it is above 11.

All Australian capital cities except Hobart and Melbourne have at least 1 month of the year when the UV rating index is, on average, extreme. For most Australian cities, the average monthly UV rating index is at least very high for one-quarter of the year; for Darwin it is at least very high all year round (Table 2.2).

Cancer Council Australia recommends avoiding unprotected sun exposure when UV levels are 3 or above, by using sun protection (hat, clothing, sunscreen, and so forth) when heading outdoors for more than a few minutes (Cancer Council Australia 2016c).

Table 2.2: Australian capital city average daily maximum UV levels by month

Location	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Darwin	9	10	12	13	12	12	12	13	12	11	9	8
Brisbane	4	5	7	9	11	11	12	11	9	7	5	4
Perth	3	4	6	8	10	11	12	11	9	6	4	3
Sydney	3	4	5	7	9	10	11	10	8	5	3	2
Canberra	2	3	5	7	9	11	11	8	7	5	3	2
Adelaide	2	3	5	7	9	11	11	10	8	5	3	2
Melbourne	2	3	4	6	8	10	10	9	7	4	2	2
Hobart	1	2	3	4	6	7	8	7	4	3	1	1

UV Index number and exposure categories

Category	Low	Moderate	High	Very High	Extreme
UV index	1 and 2	3 to 5	6 and 7	8 to 10	11 and over

Note: UV index values are rounded to the nearest whole number. Rounding may affect the accuracy of the exposure category in the above table.

Source: Cancer Council Australia 2016d.

Diabetes

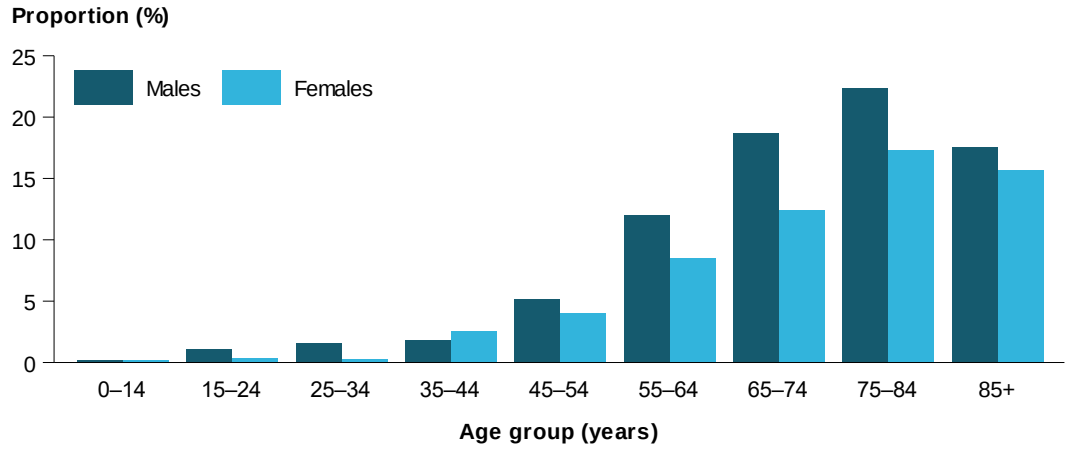
Cancer burden from diabetes

Diabetes contributed 27,600 DALY (3.1%) to the cancer burden—this comprises 10,500 DALY from lung cancer; 6,000 DALY from colorectal cancer; 3,400 DALY from pancreatic cancer; 3,100 DALY from breast cancer; 2,700 DALY from liver cancer; 1,000 DALY from bladder cancer; and 1,000 DALY from ovarian cancer (AIHW 2021b).

Diabetes in Australia

In 2017–18, 4.9% of Australians had diabetes based on self-reported data, which included people with type 1 diabetes, type 2 diabetes, and unknown type diabetes, but excludes gestational diabetes (online Table S2.7). The prevalence of diabetes was higher for males (5.5%) than females (4.3%). The proportion increased quite steadily and peaked at age 75–84 for both sexes (22% and 17%, respectively), then decreased for older age groups (Figure 2.10).

Figure 2.10: Prevalence of self-reported diabetes, by age group and sex, 2017–18



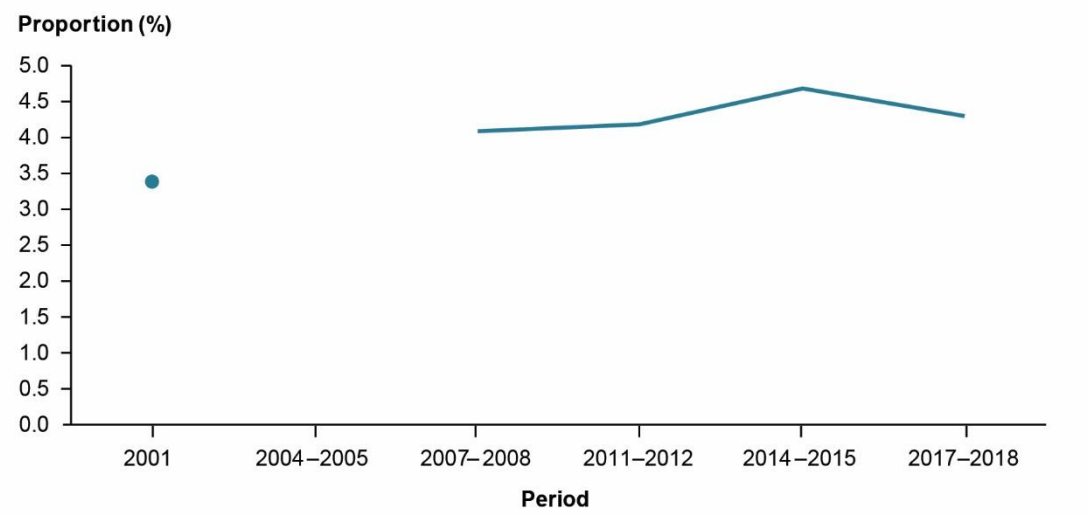
Notes

1. Diabetes mellitus includes type 1 and type 2 diabetes, and type unknown. Estimates also include persons who reported they had diabetes but that it was not current at the time of interview.
2. Data for this figure are in online Table S2.7.

Source: National Health Survey, ABS 2018b.

The age-standardised prevalence rate of self-reported diabetes increased from 3.4% in 2001 to 4.3% in 2017–18 (Figure 2.11).

Figure 2.11: Proportion of self-reported diabetes, persons all ages combined, 2001 to 2017–18



Notes

1. Proportions have been age-standardised to the 2001 Australian population.
2. Trend data are based on when survey data are available. The duration between surveys, and as presented above, may differ.
3. Diabetes mellitus includes type 1 and type 2 diabetes, and type unknown. These estimates also include persons who reported they had diabetes but that it was not current at the time of interview. These persons were excluded from previous estimates of diabetes published in Australian Health Survey: First Results, 2011–12 (cat. no. 4364.0.55.001). Data for 2004–05 are not available using this definition.
4. Data for this figure are in online Table S2.3.

Source: National Health Survey, ABS 2018b.

Occupational exposures and hazards

Cancer burden from occupational exposures and hazards

Occupational exposures and hazards contributed 19,800 DALY (2.2%) to the cancer burden, comprising mainly 11,700 DALY from lung cancer; 7,000 DALY from mesothelioma; and 1,000 DALY from leukaemia (AIHW 2021b). Laryngeal, ovarian, nasopharyngeal and kidney cancers were also attributable to occupational exposures and hazards (AIHW 2021b).

Occupational cancer risk in Australia

Some occupations operate in environments where there is an increased risk of exposure to cancer-causing agents. Steps have been taken to reduce such risks. For example, asbestos is a cancer-causing agent that was historically used in Australia in the construction of homes and buildings. In 2003, Australia banned the use of all forms of asbestos (ASEA 2018). While the ban reduces the risk of exposure to asbestos, its widespread historical use means that it remains in some products and environments.

Legislation banning smoking in public places reduces the risk of exposure to second-hand smoke with benefits to a wide range of people, including patrons and those employed in restaurants and bars.

Occupational exposure contributed mainly to the burden of lung cancer and mesothelioma, both of which are linked with asbestos. Other substances in occupational settings that can cause lung cancer include arsenic, beryllium, cadmium, chromium, diesel engine exhaust, second-hand smoke, nickel, silica and polycyclic hydrocarbons (AIHW 2021b).

Physical inactivity

Cancer burden from physical inactivity

Physical inactivity contributed around 15,400 DALY (1.8%) to the cancer burden—this comprised 11,500 DALY from colorectal cancer; 2,300 DALY from breast cancer; and a further 1,600 from uterine cancer (AIHW 2021b).

Physical activity in Australia

Australia's Physical Activity and Sedentary Behaviour Guidelines outline the minimum levels of physical activity required for health benefits, as well as the maximum time that should be spent on sedentary behaviours to achieve optimal health (Department of Health 2017).

In 2017–18, 55% of adults were rated insufficiently active under the guidelines. The proportion of people considered insufficiently active increased with age, and women were more likely than men to be insufficiently active (Table 2.3).

Table 2.3: Prevalence of insufficient physical activity in persons aged 18 and over, 2017–18

Age group (years)	Males	Females	Persons
	Crude per cent		
18–24	41.4	47.9	44.6
25–34	42.7	53.1	47.9
35–44	43.7	58.4	51.1
45–54	49.2	55.9	52.6
55–64	52.2	58.4	55.4
65+	69.0	74.5	71.9
All persons (18+)	50.1	58.9	54.6

Notes

1. Physical inactivity is defined as not having met physical activity guidelines.
2. For 18–64 year olds, not meeting guidelines is captured here as not completing 150 minutes of physical activity (where vigorous activity is multiplied by 2) on 5 days or more in the last week.
3. For adults aged 65 years and over, not meeting guidelines is captured here as not completing 30 minutes or more of physical activity on at least 5 days in the last week.
4. Physical activity includes exercise at work, walking for fitness, recreation, or sport; walking to get to or from places; moderate exercise; and vigorous exercise recorded in the week prior to interview. Data do not include people for whom this measure was not known or not applicable.

Source: AIHW 2020c (Insufficient physical activity tables S1a).

Noting that there are some small differences in definition in 2007–08, and after adjusting for age, the proportion of people not meeting the physical activity guidelines (excluding exercise at work) has tended to decrease over recent years, from 69% in 2007–08 to 65% in 2017–18 (AIHW 2020c).

3 Cancer projections and Australia's ageing population

The Australian population is ageing, and the risk of being diagnosed with cancer increases with age. With more Australians living to older ages, the number of cancer cases diagnosed each year continues to rise.

This chapter explores the influence of Australia's ageing population on the increasing number of cancer cases, and how cancer counts and rates may look 10 years from now.

3.1 Changes in cancer counts over 20 years

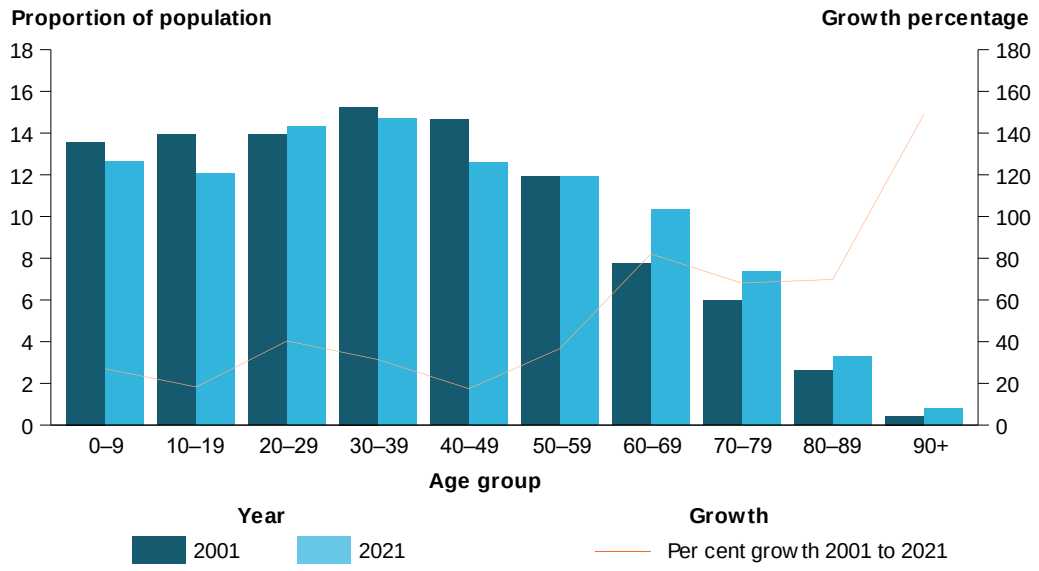
The number of cancers diagnosed is estimated to have increased by 67% over 20 years

In 2021, the Australian population is expected to exceed 26 million, increasing about 36% since 2001. Over the same time, the number of cancer cases diagnosed is estimated to have increased by 67% (90,000 cases in 2001 compared with an estimated 151,000 in 2021). While the rate of increase in cancer diagnosis far outstrips general population growth, ageing of the population drives most of the increase in cancer diagnoses, as discussed below.

Population growth for older age groups is far greater than for younger age groups

Australia's population growth has not been uniform across age groups (Figure 3.1).

Figure 3.1: Australia's population composition and growth, by age group, 2001 and 2021



Notes

1. Populations used are the 30 June 2001 ABS Estimated Resident Population (ABS 2017) and the 30 June 2021 ABS population projections (ABS 2018c).
2. Data for this figure are in online Table S3.1.

Source: ABS 2017 and ABS 2018c.

With life expectancy increasing, more people are living to older ages than in the past; older populations are growing faster than younger populations. As this trend continues, older Australians are making up a larger proportion of the total population (for example, the proportion of the Australian population aged 60 and over has increased from 17% to 22% between 2001 and 2021) (Figure 3.1).

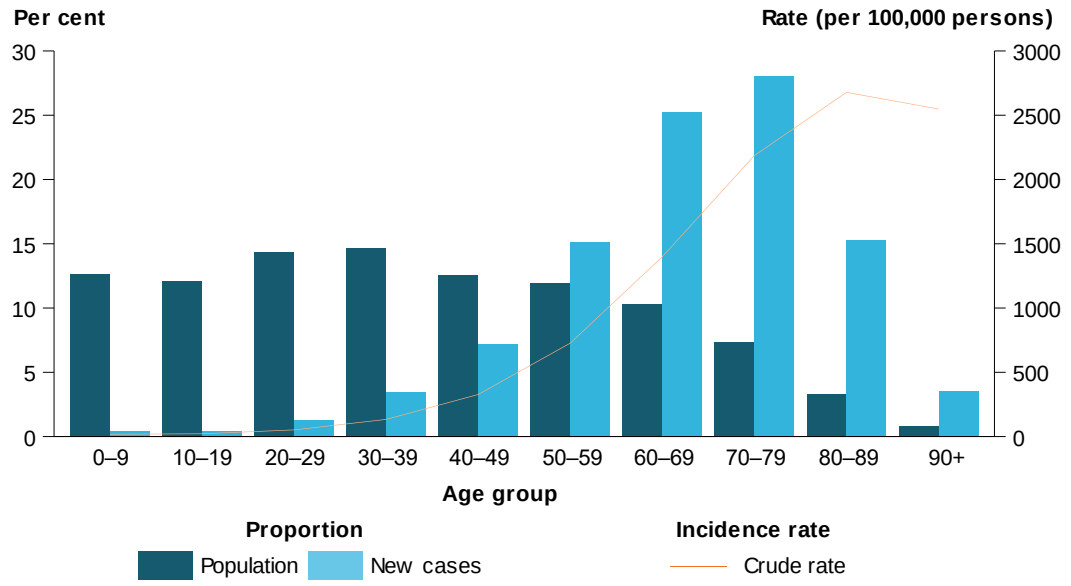
The largest increases in population growth have occurred for people in their 60s (which has increased by 82%—around 1.2 million people) and those aged over 90 (which has increased by 149%—around 125,000 people) (Figure 3.1). These increases, as well as increases in populations aged in their 70s and 80s, are well above the overall population growth of about 36%.

Cancer is more common in older age groups

In 2021, the age-specific cancer incidence rate for people under 10 years of age is estimated to be 18 cases per 100,000 people. Age-specific incidence rates increase with increasing age to reach more than 1,000 cases per 100,000 people for people in their 60s, peaking at around 2,700 cases per 100,000 people for people in their 80s—close to 150 times the rate for the youngest age group (Figure 3.2).

In 2021, more than half of the Australian population is aged 0–39 but this group is estimated to be responsible for only about 6% of new cancer cases. Conversely, those aged 60 and over make up less than a quarter of the population, yet are estimated to be responsible for 72% of new cancer cases (Figure 3.2).

Figure 3.2: Population and cancer cases composition with crude cancer incidence rates, by age group, persons, Australia, 2021



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Population is the 30 June 2021 ABS population projections (ABS 2018c).
3. Data for this figure are in online Table S3.2.

Source: AIHW ACD 2017 and ABS 2018c.

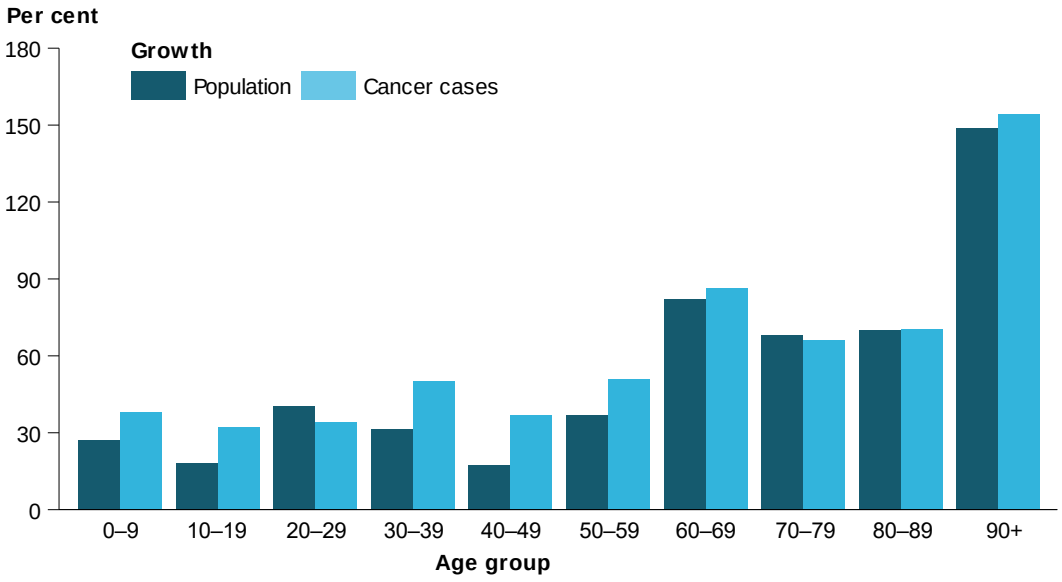
For most older age groups, the cancer incidence rate growth mirrors population growth

As previously noted, the percentage increase in cancer cases is far greater than the percentage increase in the population. However, there is much greater alignment between the growth of cancer incidence and population when changes in population age structures are considered.

Between 2001 and 2021, the population aged 60–69 increased by around 82% and the number of cancers diagnosed in this age group increased by around 86%. For older age groups, the percentage increases in population and cancer incidence tended to be even more similar (Figure 3.3).

For younger age groups, growth in cancer cases tended to be appreciably greater than population growth. Where this occurs, cancer is becoming more commonly diagnosed within these populations. Some increases may be due to improvements in cancer detection, including diagnosis occurring at younger ages, on average, than in the past. Increases may also be due to cancer becoming more common at these ages; the driving factors for change in rates may differ between cancers.

Figure 3.3: Growth in the population and the number of cancer cases from 2001 to 2021, by age group, Australia



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Populations used are the 30 June 2001 ABS Estimated Resident Population (ABS 2017) and the 30 June 2021 ABS population projections (ABS 2018c).
3. Data for this figure are in online Table S3.3.

Source: AIHW ACD 2017, ABS 2017 and ABS 2018c.

3.2 Cancer incidence projections for 2031

Cancer incidence projections to 2031 are based on population growth by age and whether historical trends suggest cancer is becoming more or less common in these age groups.

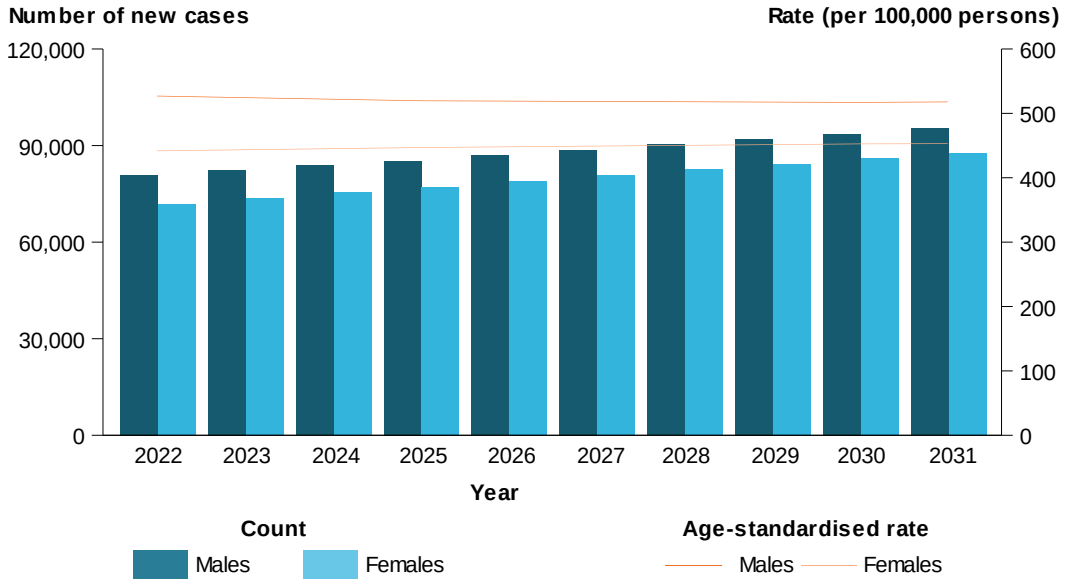
The ageing population is expected to continue to contribute to an increasing number of cancer cases. The Australian population is expected to increase by 15% (about 4 million people) between 2021 and 2031, while cancer cases are estimated to increase by around 22% (online Table S3.4).

Around 1.7 million cases of cancer are estimated to be diagnosed over the next 10 years

It is estimated (projected) that around 185,000 cases of cancer will be diagnosed in 2031, and that between 2022 and 2031, a total of around 1.7 million cases of cancer will be diagnosed.

The number of new cases is estimated to continue to grow for both males and females, though growth is expected to be slightly greater for females than males (22% compared with 18%). Figure 3.4 shows how the number of new cases and the age-standardised rates are projected to change over the 10 years to 2031. Projections suggest that incidence rates for males will decrease a little, while rates for females will increase a little.

Figure 3.4: Number of new cases of cancer and age-standardised rates, by sex, 2022–2031, Australia



Notes

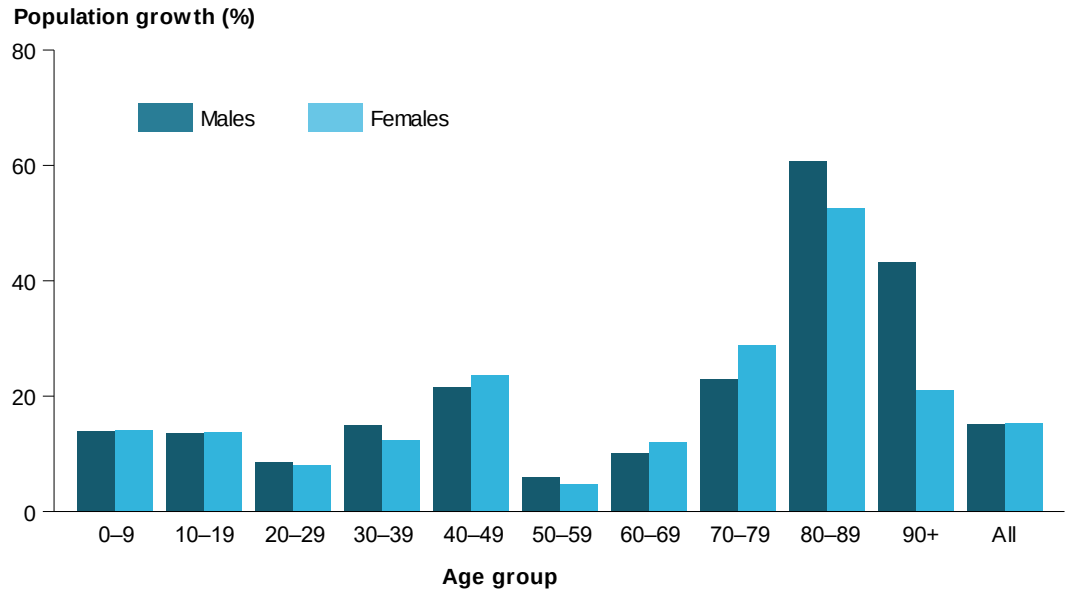
1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Populations used are the 30 June ABS population projections from 2022 to 2031 (ABS 2018c).
3. Data for this figure are in online Table S3.5.

Source: AIHW ACD 2017 and ABS 2018c.

Australia's ageing population is expected to continue to contribute to higher cancer counts

The trend towards the ageing of the population is expected to continue into the future, with growth in the number of older people driving increasing cancer counts. Figure 3.5 shows that the greatest percentage increase in population growth over the 10 years to 2031 is expected to be in the population aged in their 80s (online Table S3.5). As previously discussed, this population has the greatest cancer incidence rate.

Figure 3.5: Population growth, by sex and age group, 2021–2031, Australia



Notes

1. Populations are the 30 June ABS population projections from 2021 to 2031 (ABS 2018c).
2. Data for this figure are in online Table S3.5.

Source: ABS 2018c.

Long-term cancer incidence projections

Cancer incidence projections for a wide range of cancers and cancer groups to 2031 are available in the supplementary tables (online Table S3.4). These projections were carried out using the Nordpred software package (Fekjaer & Møller).

Box 3.1: Limitations of the projections model

The cancer incidence projections from 2022 to 2031 were carried out using the Nordpred software package. The projections are not forecasts and do not attempt to allow for future changes in cancer detection methods, changes in cancer risk factors or for non-demographic factors beyond the base years of the model which may affect future cancer incidence rates.

Projections also do not factor in disruptions to health services or to population growth due to the COVID-19 pandemic. Some early evidence in this report indicates that the numbers of people accessing testing such as MBS-subsidised colonoscopy and mammograms were lower than in previous years, potentially affecting diagnosis. In addition, net overseas migration to Australia fell from 247,601 in 2019, to only 3,226 in 2020 (ABS 2021b), potentially affecting the population estimates used and the number of people in the population who might be diagnosed with cancer.

4 Screening and early detection

Key statistics

Participation in screening programs

In the 2-year period 2018–2019:

- 55% of women aged 50–74 participated in BreastScreen Australia
- 3.1 million women aged 25–74 (46%) participated in the National Cervical Screening Program (NCSP)
- the participation rate for the National Bowel Cancer Screening Program (NBCSP) was 43.5%.

Benefits of screening programs

In 2019, 60% of the 5,781 breast cancers detected through BreastScreen Australia were small in size (compared with around 30% that would be expected in otherwise similar women who had not screened).

Breast cancers detected through BreastScreen Australia have a 54% to 63% lower risk of causing death than breast cancers diagnosed in eligible women who have never screened.

For every 1,000 people screened in the NCSP, 9 had a high-grade abnormality detected and an opportunity to prevent progression to cancer.

Women diagnosed with cervical cancer through the NCSP have a 77% lower risk of dying from cervical cancer than otherwise similar women who have never undergone cervical screening.

In 2019, the NBCSP helped to identify:

- 1,376 people with confirmed or suspected bowel cancer, which, based on the findings of AIHW linkage studies, would be less likely to be at advanced stage than if these people had not screened
- 5,163 people with pre-cancerous adenomas, allowing the opportunity to prevent progression to cancer.

People diagnosed with bowel cancer through the NBCSP have a 40% lower risk of dying from bowel cancer than similar people who have never been invited to screen.

MBS-subsidised services

In 2020:

- 633,127 women had an MBS-subsidised breast cancer imaging procedure, with an average of 1.7 breast cancer imaging procedures per patient
- 1,320,178 men received an MBS-subsidised prostate-specific antigen (PSA) test, with an average of 1.3 PSA tests per patient
- 566,710 Australians received an MBS-subsidised colonoscopy (263,854 men, 302,856 women).

This chapter provides information on population-based cancer screening and other cancer surveillance and detection activities. Population-based screening is an organised, systematic and integrated process of testing for signs of cancer or pre-cancerous conditions in populations without obvious symptoms. Cancer screening programs target specific populations and/or age groups where evidence shows screening to be most effective.

The cancer surveillance and detection section of this chapter aims to provide information on some of the cancer detection activities that occur outside national population-based cancer screening programs. Individuals may undergo cancer detection activities for reasons including that they have a family history of cancer or that they present with suspected symptoms of cancer. Surveillance is also used to find early signs a cancer has come back and may be used for people with increased risk of cancer. Within surveillance, examinations and tests are generally done on a regular schedule. Active surveillance may also be used to monitor prostate cancer that isn't causing any symptoms or problems. Active surveillance may be suggested if the cancer is unlikely to spread or cause symptoms (Cancer Council Australia 2018).

The cancer surveillance and detection statistics presented in this report have been produced by analysing the MBS-subsidised services that are likely to include initial cancer detection tests. However, it was not possible to determine whether some MBS-subsidised services were undertaken for detection or for monitoring purposes (for example, PSA testing in people with a previous diagnosis of prostate cancer). Accordingly, while the intent of this chapter is to provide information on the activities undertaken to detect cancer, these MBS items can also include monitoring activities undertaken by individuals previously diagnosed with that particular cancer.

Screening data presented in this chapter are the latest complete data available at the time of publishing, but pre-date the COVID-19 pandemic. However, a review of preliminary data from January to September 2020 (AIHW 2021g) shows:

- a reduction in the number of screening mammograms between March and May 2020 (the start of the pandemic), but a return to the expected number by July or August 2020.
- no clear change in the number of bowel cancer screening tests.
- fewer cervical screening tests in 2020, with unclear implications because of changes made to the screening program.

The decreases observed in screening program data are reflective of an 8% decrease in cancer-related MBS-subsidised diagnostic services (which excluded screening services reported in this chapter) between 2019 and 2020 reported by others (Cancer Australia 2021).

4.1 Population-based cancer screening

In Australia, there are 3 national population-based screening programs—BreastScreen Australia, the National Cervical Screening Program and the National Bowel Cancer Screening Program. 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. The programs target specific populations and age groups where evidence shows screening is most effective at reducing cancer-related morbidity and mortality.

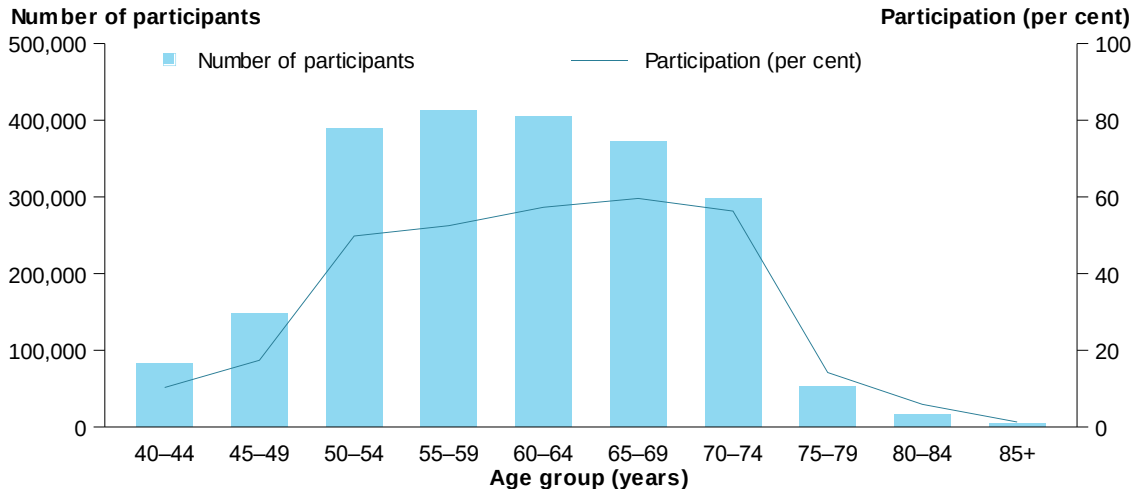
BreastScreen Australia—more than 1.8 million women screened in 2018–2019

The introduction of BreastScreen Australia in 1991 led to an increase in the breast cancer incidence rate as a result of these cancers being diagnosed earlier than they would have been had they continued to grow until symptoms developed. The mortality rate for breast cancer decreased after BreastScreen Australia was introduced as detection of breast cancer at an earlier stage is associated with increased treatment options (NBOCC 2009) and improved survival (AIHW & NBCC 2007). Treatment advances, including new systemic therapies, will also have contributed to mortality reductions.

Through funding from the Australian Government, the program provides free 2-yearly screening mammograms to women aged 50–74 (women aged 40–49 and 75 and over are also eligible to attend, but are not actively targeted). However, as women aged 70–74 have been actively targeted only from 1 July 2013, the trend for participation is presented only for women aged 50–74 for the periods 2014–2015 to 2018–2019.

In the 2-year period 2018–2019, more than 1.8 million women aged 50–74 had a screening mammogram, giving a participation rate of 55% (AIHW 2021e). Participation rates for those in the target age group were highest for women aged 60–64 (57%) and 65–69 (60%) and lowest for those aged 50–54 (50%) (Figure 4.1; AIHW 2021e).

Figure 4.1: Participation number and rate, by age, BreastScreen Australia, 2018–2019



Notes

1. The participation rate is the number of women screened in 2018–2019, as a percentage of the ABS estimated resident population.
2. Data for this figure are in online Table S4.1.

Source: AIHW analysis of BreastScreen Australia data (AIHW 2021e).

The age-standardised participation rate for women aged 50–74 remained steady between 53% and 54% between 2014–2015 and 2018–2019 (online Table S4.2; AIHW 2021e).

In 2019, for women aged 50–74 screening for the first time, 91 invasive breast cancers and 24 ductal carcinomas in situ (DCIS) were detected for every 10,000 women screened. The detection rate was lower among women attending a subsequent screening, at 56 invasive breast cancers and 13 DCIS per 10,000 women screened (AIHW 2021e).

Detection of breast cancers when they are small is beneficial as small breast cancers tend to be at an earlier stage. Earlier detection of asymptomatic cancer through screening, at a less advanced stage of development, increases treatment options that are less aggressive and improves survival outcomes.

A linkage study by AIHW for an earlier period (2002–2012, when the screening target age was 50–69) found that 55.3% of invasive breast cancers detected through BreastScreen Australia were small, compared with 27.6% of those detected outside the program (AIHW 2018b). This finding is reflected in the fact that, in 2019, 60% of the 5,781 invasive breast cancers diagnosed in women aged 50–74, through BreastScreen Australia, were small (≤15mm) (AIHW 2021e).

The same study (AIHW 2018b) found that after allowing for lead time bias and selection bias, breast cancers detected through BreastScreen Australia had a 54% to 63% lower risk of causing death than breast cancers diagnosed in eligible women who had never screened.

National Cervical Screening Program—transition to a renewed screening program

The NCSP has seen cervical cancer incidence and mortality rates halved since its introduction in 1991, due to the program's ability to detect pre-cancerous abnormalities that may, if left, progress to cervical cancer. The NCSP achieved this through 2-yearly Pap tests to detect precancerous changes to cervical cells. With opportunistic cervical screening occurring in Australia since 1960, falls in incidence and mortality rates for cervical cancer were also evident before this national program was introduced.

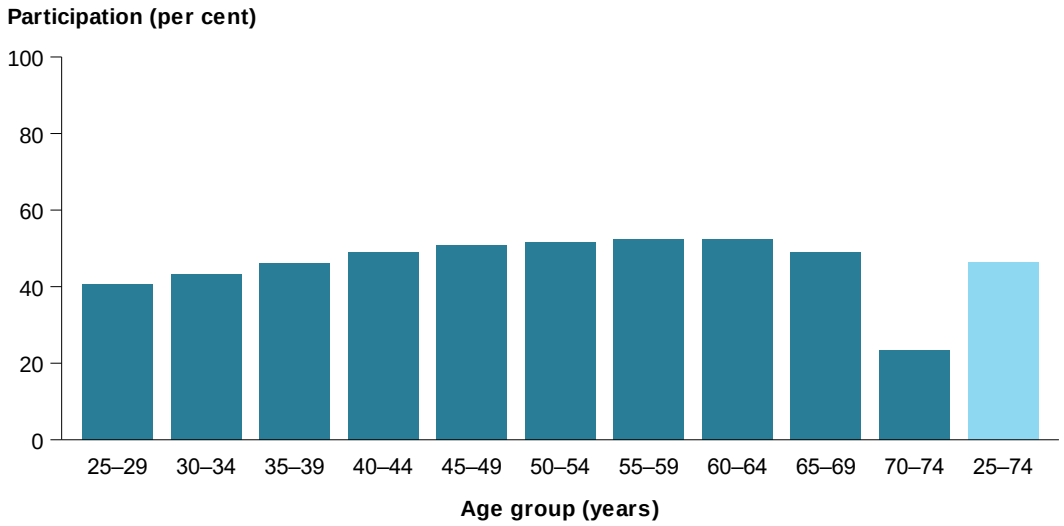
Improvements in technology, a greater understanding of the role of human papillomavirus (HPV) in the development of cervical cancer, and the introduction of an HPV vaccine that is now administered to girls and boys under the National Immunisation Program led to the NCSP being reviewed to ensure that the NCSP continued to provide Australians with safe and effective cervical screening. As a result of this, a 'renewed' NCSP was introduced on 1 December 2017. The renewed NCSP means changes to the way that people are screened. Instead of people aged 20–69 having a Pap test every 2 years, people aged 25–74 now have a Cervical Screening Test (CST) every 5 years. The CST is an HPV test, followed by a liquid based cytology (LBC) test if oncogenic HPV is found.

Note that the term 'people' used in the context of the NCSP is defined as any person with a cervix. This may include women, transgender men, intersex people, and non-binary people.

Currently, there are not enough years of data available to report on the 5-yearly screening interval under the renewed program, thus participation and coverage have been estimated for the available years. Over the 2 years 2018–2019, more than 3.1 million people aged 25–74 had a screening HPV test (primary screening or 12-month repeat HPV test), which equates to a participation rate of 46%. Over the same period, more than 3.5 million people aged 25–74 had an HPV or LBC test for any reason, which equates to a coverage rate of 52% (AIHW 2020b).

Participation was highest in people aged 50–64, with around 52% of this age group having a screening test in 2018 or 2019. Participation was lowest for people aged 70–74, with only 23% screening (Figure 4.2; AIHW 2020b).

Figure 4.2: Participation by age group, National Cervical Screening Program, 2018–2019



Notes

1. The participation rate is the number of women who had a screening HPV test (reason for test of primary screening or repeat HPV test) between 1 January 2018 and 31 December 2019 as a percentage of the average ABS estimated resident population for females aged 25–74 in 2018 and 2019, adjusted to exclude the estimated number of people who have had a hysterectomy (using age-specific hysterectomy fractions derived from the AIHW National Hospital Morbidity Database).
2. Data for this figure are in online Table S4.3.

Source: AIHW analysis of NCSR data.

In 2019, of the 1.5 million primary screening episodes in people aged 25–74, 2% were found to have a higher risk of significant cervical abnormality, while 6% were found to have intermediate risk (AIHW 2020b). Clinical guidelines determine the next disease management steps—colposcopy, and possibly biopsy and histology, or ongoing surveillance.

Detection of high-grade abnormalities is by histology, which is the primary diagnostic tool of the NCSP. In 2019, of all those people who had histology performed, a high-grade abnormality was detected in 16,221 people aged 25–74. From this, it is estimated that for every 1,000 people screened, 9 had a high-grade abnormality detected, providing an opportunity for treatment before possible progression to cervical cancer (AIHW 2020b).

Apart from cervical cancer thus prevented by the NCSP, people whose cervical cancer is diagnosed through screening have a better outcome. An AIHW linkage study (AIHW 2019a) demonstrated that those people who had their cervical cancer diagnosed through screening had a 77% lower risk of dying from cervical cancer than people who had never had a Pap test, with more than 70% of cervical cancers diagnosed in people who had never screened or who had not screened for some time (AIHW 2019a).

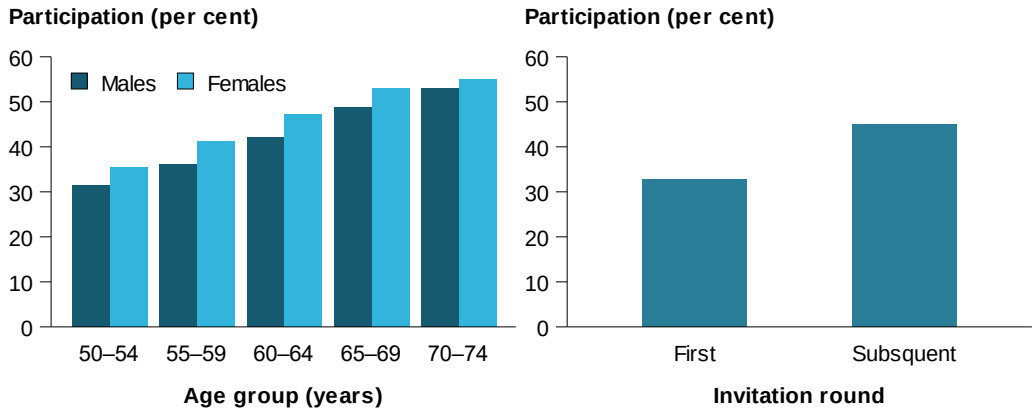
National Bowel Cancer Screening Program—females participating at greater rates than males

The National Bowel Cancer Screening Program (NBCSP) was established in 2006, and offers free screening, using an immunochemical faecal occult blood test (iFOBT), to people aged 50–74. The roll-out of biennial screening for all eligible Australians in the target age group was completed in 2020, and consequently, the results from NBCSP monitoring reports and *Cancer in Australia* reports prior to 2016 are not directly comparable to the results published here.

Of the eligible people invited in 2018–2019, more than 2.5 million participated in the program, a participation rate of 43.5%. Participation was higher among women (46%) than men (41%)

and higher in older age groups (online Table S4.5). The participation rate was higher for people receiving their second or later (subsequent) screening invitation (45% compared with 33%) (Figure 4.3). The re-participation rate for those who had participated previously and were receiving a subsequent invitation was 81% (AIHW 2021i).

Figure 4.3: Participation rate, by sex and age and by invitation round, National Bowel Cancer Screening Program, 2018–2019



Notes

1. Subsequent invitation round includes second, third and subsequent invitation rounds.
2. Data for this figure are in online tables S4.5 and S4.6.

Source: NBCSP Register as at 31 December 2020.

Using the new indicator across all program data to date, the participation rate decreased from 44% in 2007–2008 to 36% in 2012–2013, then gradually rose back to 43.5% in 2018–2019 (online Table S4.7; AIHW 2021i).

In 2019, 89,817 screening participants returned a positive screening test, giving a screening positivity rate of 7%.

Of the 56,890 people who had a NBCSP diagnostic assessment (colonoscopy) in 2019, 204 and 1,172, respectively, were diagnosed with a confirmed or suspected cancer (2.5%), and 5,163 were diagnosed with an adenoma (9%) (AIHW 2021i).

Note that outcome data for the NBCSP—such as follow-up data from primary practitioners, colonoscopy and histopathology following a positive iFOBT result—are under-reported and so are not complete. The Department of Health is working on steps to improve data return from these outcome sources.

The AIHW has also conducted linkage studies for the NBCSP, which demonstrated the program contributes to earlier detection and improved survival (AIHW 2018a, AIHW 2018c). For people whose bowel cancer was diagnosed after a 2006–2010 NBCSP invitation, those diagnosed through the program were significantly less likely to have an advanced-stage cancer compared to people who did not respond to an invitation to participate (non-responders had 2.71 higher odds of having an advanced-stage cancer compared to responders) (AIHW 2018a). In addition, a second linkage study found that after adjusting for lead time bias, people diagnosed through the NBCSP had a 40% lower risk of dying from bowel cancer than people who had never been invited to screen (AIHW 2018c).

Benefits of the National Bowel Cancer Screening Program are projected to include the prevention of 92,200 cancers and 59,000 deaths from 2015 to 2040 with the current

participation rate of 40%, and the prevention of even greater numbers of cancers and deaths predicted with higher levels of participation (Lew et al. 2017).

4.2 MBS-subsidised surveillance, detection and monitoring services

Cancer surveillance, detection and monitoring also occurs outside screening programs and may be provided under Medicare-subsidised services, or privately. The MBS lists services that are subsidised by the Australian Government under Medicare. Data for this section are sourced from the MBS claims database maintained by the Department of Health and sourced from Services Australia (see Appendix C for more information on MBS data included in this chapter).

This section includes information on the number of different MBS cancer surveillance, detection and monitoring procedures and tests and the average number of services received. Throughout this section, where multiple procedures occur (for example, a breast mammogram and an ultrasound), it is likely that a mix of procedures is provided for detection or surveillance and diagnostic purposes.

Between 2019 and 2020, there was a reduction in the number of people receiving most of the MBS-subsidised cancer surveillance, detection and monitoring services described in this section. This is in line with the finding that there were, respectively, 8% and 9% fewer than expected diagnostic and therapeutic services provided during 2020, the first year of the COVID-19 pandemic (Cancer Australia 2021).

Breast imaging (female only)

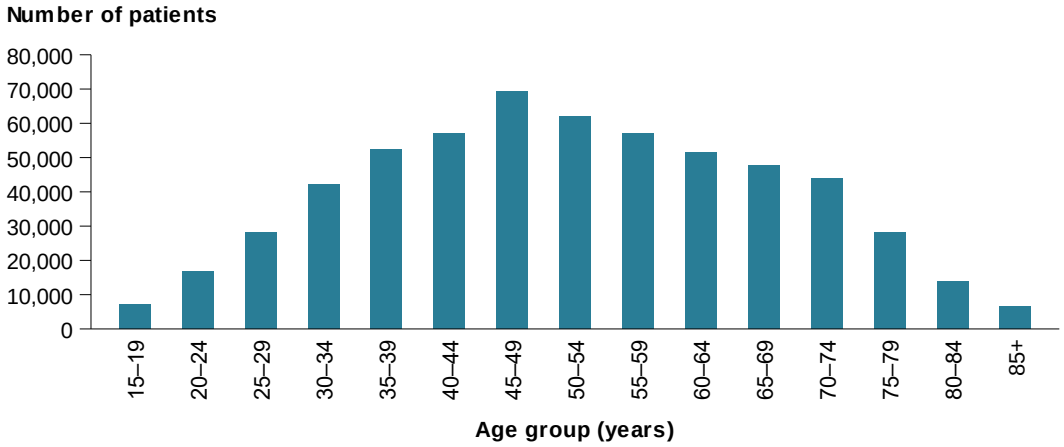
Breast imaging can be used to investigate breast symptoms, for surveillance of women at high risk of developing breast cancer or for surveillance of women who have a personal history of breast cancers. Breast imaging procedures include ultrasound, mammograms and magnetic resonance imaging (MRI).

In 2020, 633,127 women had an MBS-subsidised breast imaging procedure. During that year, women had an average of 1.7 breast imaging procedures per patient (online Table S4.8).

MBS-subsidised breast ultrasound services

In 2020, 588,042 women received an MBS-subsidised breast ultrasound. During that year, women had an average of 1.1 breast ultrasounds per patient and the Australian Government contributed on average $108 per patient (online Table S4.9). The number of women aged 15 and over who had a breast ultrasound increased with age and peaked for those aged 45–49 (69,419), before decreasing in older age groups (Figure 4.4).

Figure 4.4: Number of female patients receiving MBS-subsidised breast ultrasounds, by age group, 2020



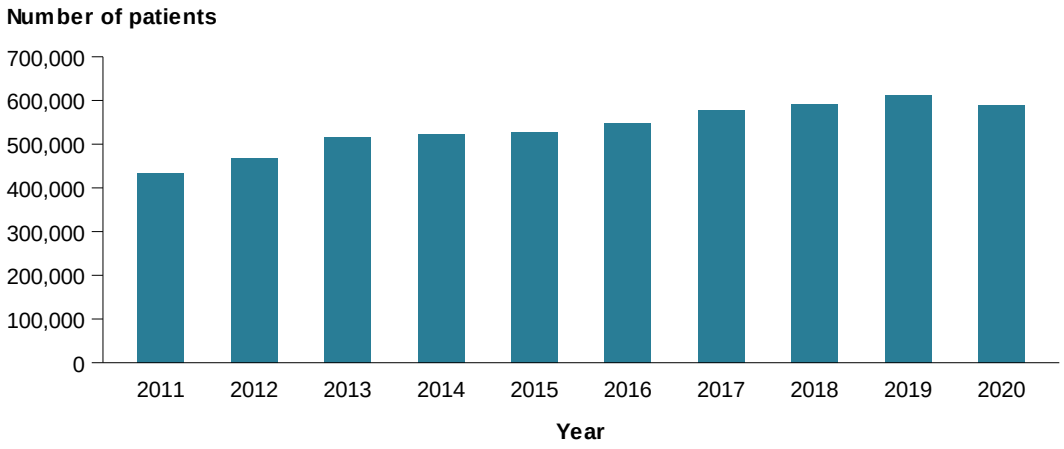
Notes

1. Patient numbers based on a count of unique patients who received at least 1 breast ultrasound service in the calendar year.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Age calculated as age at date of last breast ultrasound service in the calendar year.
4. Patients aged under 15, or whose age is unknown are excluded from this figure.
5. Data for this figure are in online Table S4.9.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

Between 2011 and 2019, the number of women undertaking an MBS-subsidised breast ultrasound increased steadily, by 42% from 432,625 to 613,022, while the number of services increased by 43%. In this period, the female population aged 15 and over increased by 14%—considerably less than the increase in women receiving the service during this period (online Table S4.9). However, between 2019 and 2020, the number of breast ultrasound services decreased slightly by 4.1%, noting that COVID-19 restrictions were in place during this period (Figure 4.5 and online Table S4.10).

Figure 4.5: Number of female patients receiving MBS-subsidised breast ultrasounds, 2011 to 2020



Notes

1. Patient numbers based on a count of unique patients who received at least 1 breast ultrasound service.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Patient numbers based on count of unique patients who received at least 1 breast ultrasound service in a calendar year. Therefore the same patient may be represented in counts for different years.
4. Data for this figure are in online Table S4.10.

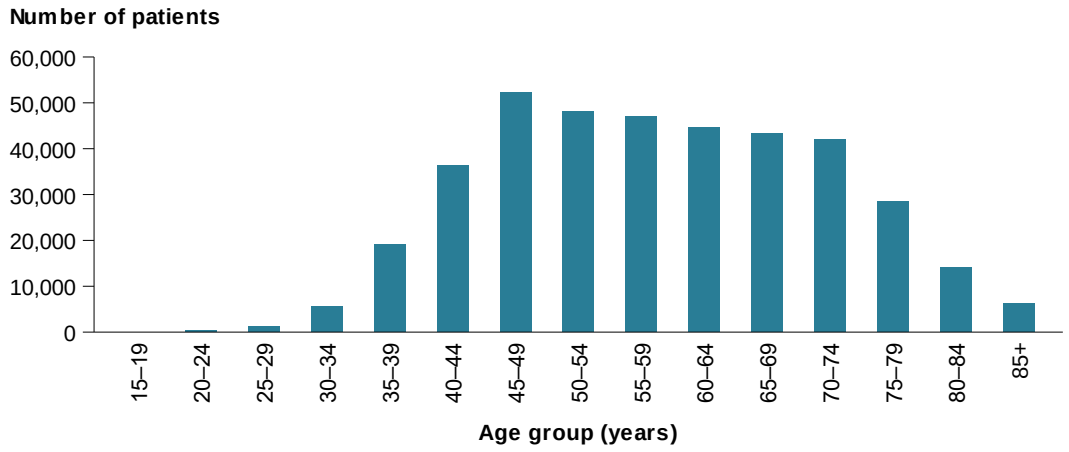
Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

MBS-subsidised mammogram services

In 2020, 388,952 women received a MBS-subsidised mammogram. During that year, women had an average of 1.0 mammogram per patient and the Australian Government contributed on average $170 per patient compared with $77 in 2017 (online Tables S4.11 and S4.12a). The increase in the government contribution is due to the introduction of 2 time-limited MBS items for three-dimensional breast tomosynthesis (3DBT, item numbers 59302 and 59305) from 1 November 2018. 3DBT is a relatively new digital mammography technology that produces a 3D image of the breast by using several X-rays directed at different angles. It costs more than a conventional mammogram and the Australian Government benefit paid for the 3DBT services is higher than that for conventional mammogram services.

MBS-subsidised mammograms were much less common in women aged under 35 and were most common in the female population aged 40–74 (Figure 4.6).

Figure 4.6: Number of female patients receiving MBS-subsidised breast mammograms, by age, 2020



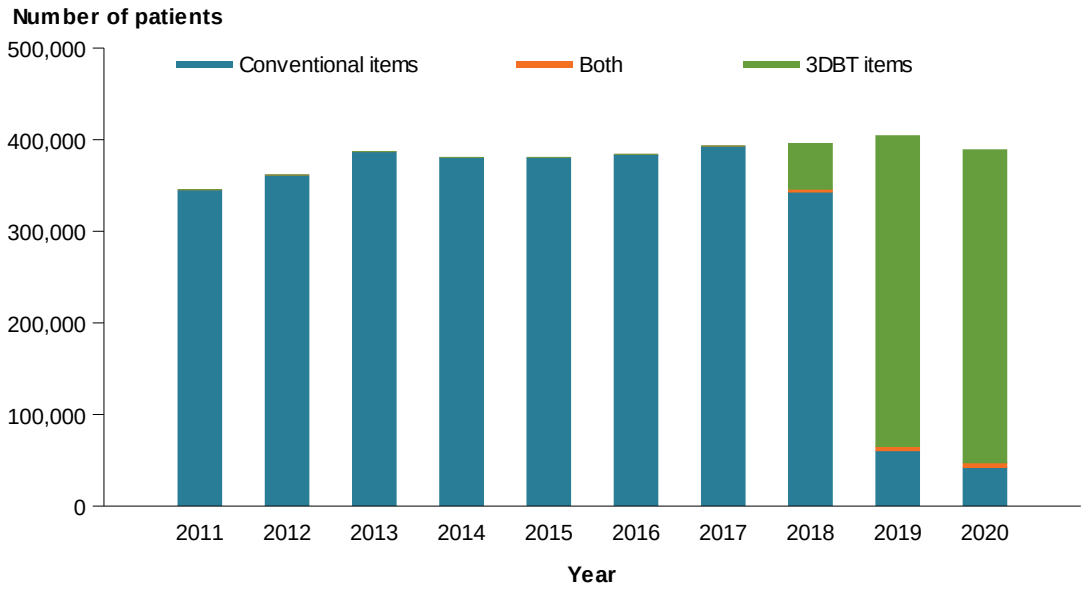
Notes

1. Patient numbers based on a count of unique patients who received at least 1 mammogram service in the calendar year.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Age calculated as age at date of last mammogram in the calendar year.
4. Patients aged under 15, or whose age is unknown are excluded from this figure.
5. Data for this figure are in online Table S4.11.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

Between 2011 and 2019, the number of women undertaking an MBS-subsidised mammogram increased by 17%, from 345,386 to 404,336, but decreased slightly by 3.8% to 388,952 between 2019 and 2020, noting that COVID-19 restrictions were in place in 2020 (Figure 4.7). The number of mammogram tests increased by 18% between 2011 and 2019, and decreased by 3.5% in 2020 (online Table S4.12a). MBS items for 3DBT were introduced from 1 November 2018. In 2020, 89% of patients who undertook an MBS-subsidised mammogram had the 3DBT (Figure 4.7).

Figure 4.7: Number of female patients receiving MBS-subsidised breast mammograms, 2011 to 2020



Notes

1. Patient numbers based on a count of unique patients who received at least 1 mammogram service.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Patient numbers based on count of unique patients who received at least 1 mammogram service in a calendar year. Therefore the same patient may be represented in counts for different years.
4. Data for this figure are in online Table S4.12a and S4.12b.

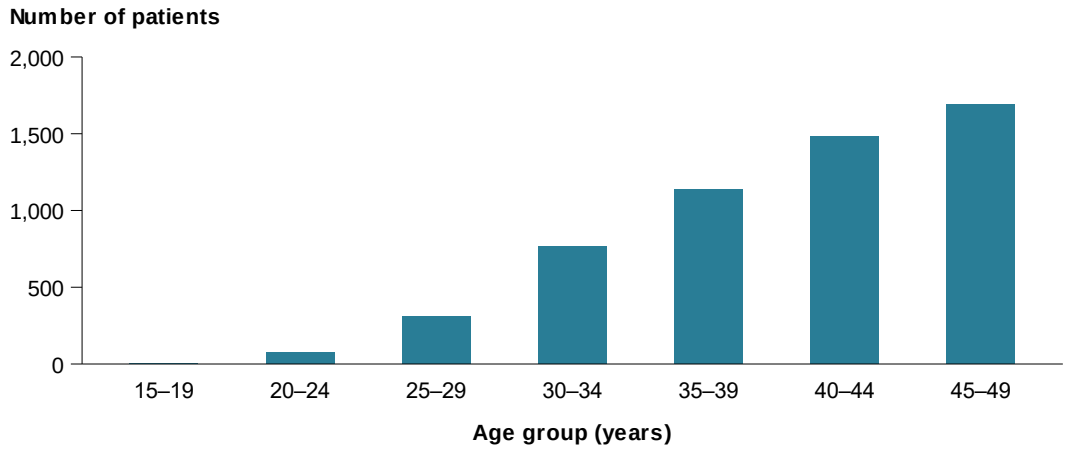
Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

MBS-subsidised breast magnetic resonance imaging

In 2020, 5,468 women received an MBS-subsidised MRI. During that year, these women had an average of 1.0 breast MRI per patient and the Australian Government overall contributed $690 per patient (online Table S4.13). The number of women aged over 15 who had breast MRI increased with increasing age, and peaked at 1,688 for women aged 45–49 (Figure 4.8).

Note that the MBS items for breast MRIs are limited to women aged under 50 who are at increased risk of breast cancer due to family history, genetic risk, or prior detection of an abnormality. These MBS items also do not include women with a personal history of breast cancer, and therefore MRI services conducted for this purpose are not captured in these data.

Figure 4.8: Number of female patients receiving MBS-subsidised breast MRI, by age, 2020



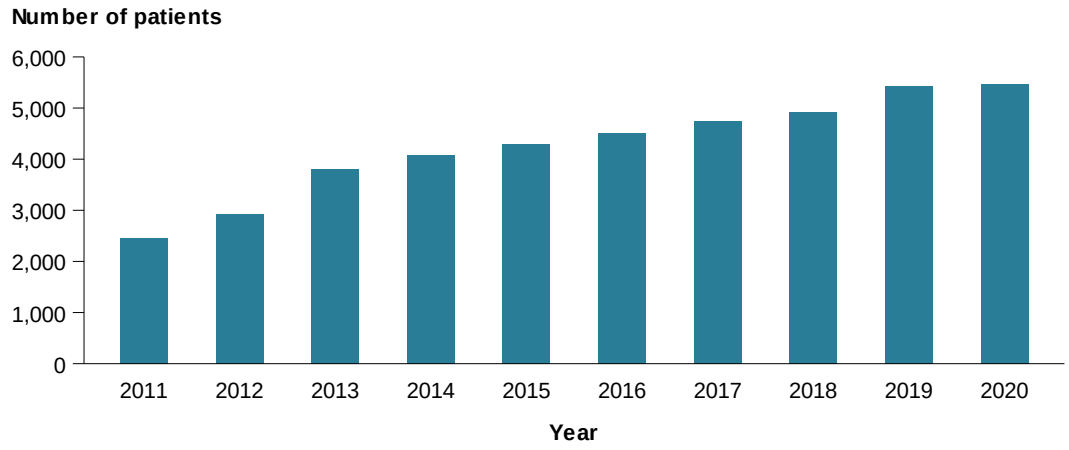
Notes

1. Patient numbers based on a count of unique patients who received at least 1 breast MRI service in the calendar year.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Age calculated as age at date of last breast MRI service in the calendar year.
4. Patients aged under 15, over 50, or whose age is unknown are excluded from this figure.
5. Data for this figure are in online Table S4.13.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

Between 2011 and 2020, the number of women undertaking MBS-subsidised breast MRIs more than doubled from 2,450 to 5,468 (Figure 4.9). The number of breast MRI services increased at a similar rate (119%) during this period (online Table S4.14). The Australian Government introduced these MBS items in 2009 and 2011 and therefore the increase could be related to the progressive uptake of these items since then.

Figure 4.9: Number of female patients receiving MBS-subsidised breast MRI, 2011–2020



Notes

1. Patient numbers based on a count of unique patients who received at least 1 breast MRI service.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Patient numbers based on count of unique patients who received at least 1 breast MRI service in a calendar year. Therefore the same patient may be represented in counts for different years.
4. Data for this figure are in online Table S4.14.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

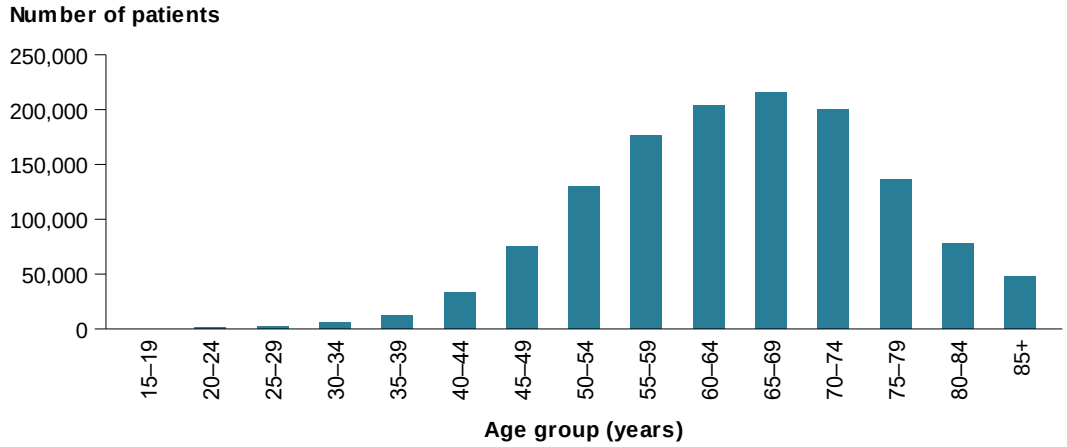
MBS-subsidised prostate-specific antigen tests

Prostate-specific antigen is a protein produced within the prostate and is quantifiable by a blood test (PSA test). PSA levels in the blood naturally increase with increasing age, and a PSA level that is higher than normal for that age can be an indicator of prostate cancer, or of recurrence of prostate cancer. It is important to note that not all males with prostate cancer have abnormal PSA levels and that high PSA levels are not specific to prostate cancer. Inflammation and benign enlargement of the prostate can also result in elevated or high PSA levels (American Urological Association 2013; Andrology Australia 2018).

Note that for GP out-of-hospital pathology requests, only the 3 most expensive items are paid through Medicare. It may be the case that for some patients a PSA test would not appear in the MBS data if more than 3 tests are requested and a PSA test is not among the 3 most expensive items. Services requested for hospital admitted patients and services requested by medical specialists do not have these restrictions.

In 2020, around 1.32 million men received an MBS-subsidised PSA test. During that year, these men had an average of 1.3 PSA tests per patient and the Australian Government contributed, on average, $24 per patient (online Table S4.15). The number of men aged over 15 who had a PSA test increased with increasing age and peaked for men aged 65–69, before decreasing in older age groups (Figure 4.10 and (online Table S4.16).

Figure 4.10: Number of male patients receiving MBS-subsidised PSA testing, by age group, 2020



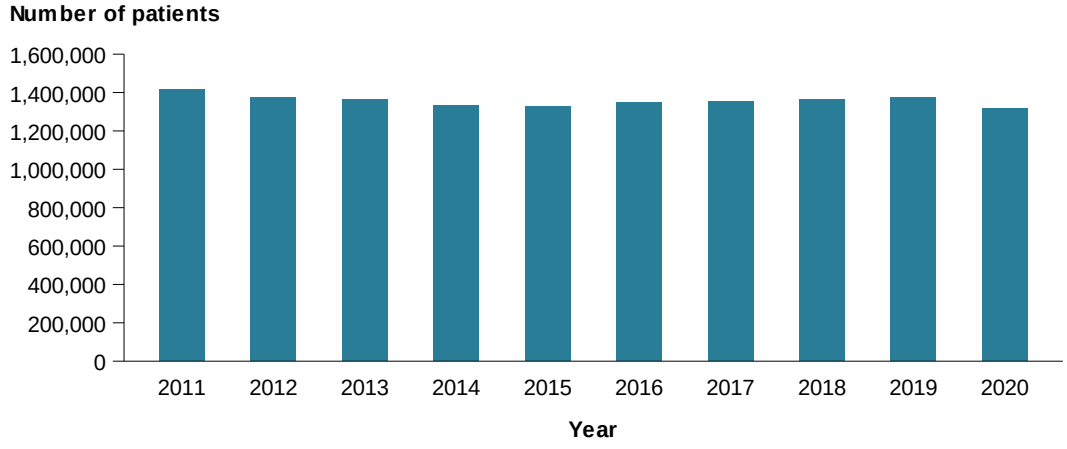
Notes

1. Patient numbers based on a count of unique patients who received at least 1 PSA service in the calendar year.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C for associated MBS item numbers.
3. Age calculated as age at date of last PSA service for the calendar year.
4. Patients aged under 15, or whose age is unknown are excluded from this figure.
5. Data for this figure are in online Table S4.15.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) claims database.

The number of males receiving MBS subsidised PSA testing showed little overall change between 2011 and 2019, but decreased by 4% between 2019 and 2020, noting that COVID-19 restrictions were in place at that time (Figure 4.11).

Figure 4.11: Number of male patients receiving MBS-subsidised PSA testing, 2011–2020



Notes

1. Patient numbers based on a count of unique patients who received at least 1 PSA service.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Patient numbers based on count of unique patients who received at least 1 PSA service in a calendar year. Therefore the same patient may be represented in counts for different years.
4. Data for this figure are in online Table S4.16.

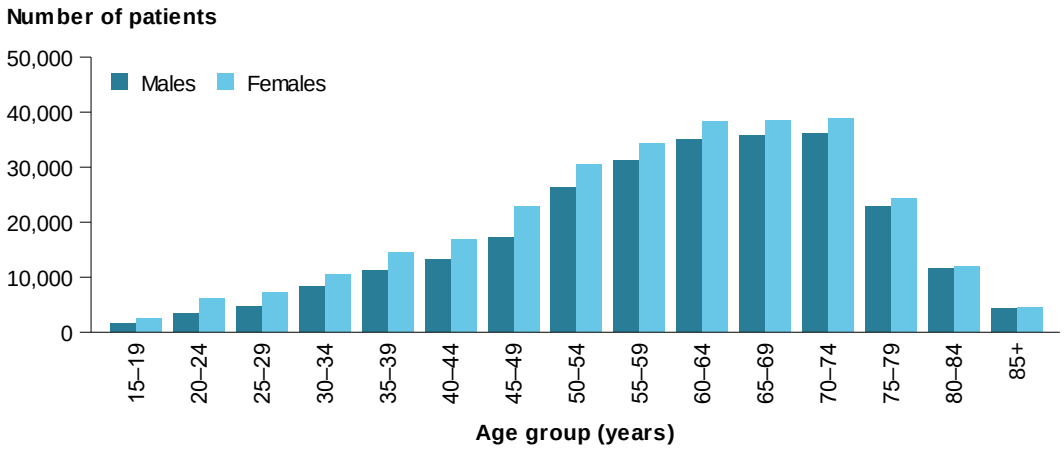
Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

MBS-subsidised colonoscopies

Colonoscopies are used as a diagnostic assessment tool for patients presenting with symptoms of colorectal cancer; as a surveillance tool in those at increased risk for colorectal cancer; and as a follow-up to a positive iFOBT, including for those in the NBCSP. Colonoscopies may be used to diagnose colorectal cancer and other abnormalities, such as benign tumours and polyps (which may also be removed during the procedure).

In 2020, 566,710 Australians received an MBS-subsidised colonoscopy. More women than men had a colonoscopy that year (302,856 and 263,854, respectively) (online Table S4.17). On average, men and women had, respectively, 1.6 and 1.5 colonoscopies per patient, and the Australian Government contributed $316 per patient. The number of men and women aged over 15 who had a colonoscopy increased with age and peaked at 70–74 for both sexes, then decreased for older age groups (Figure 4.12).

Figure 4.12: Number of patients receiving MBS-subsidised colonoscopies, by age group and sex, 2020



Notes

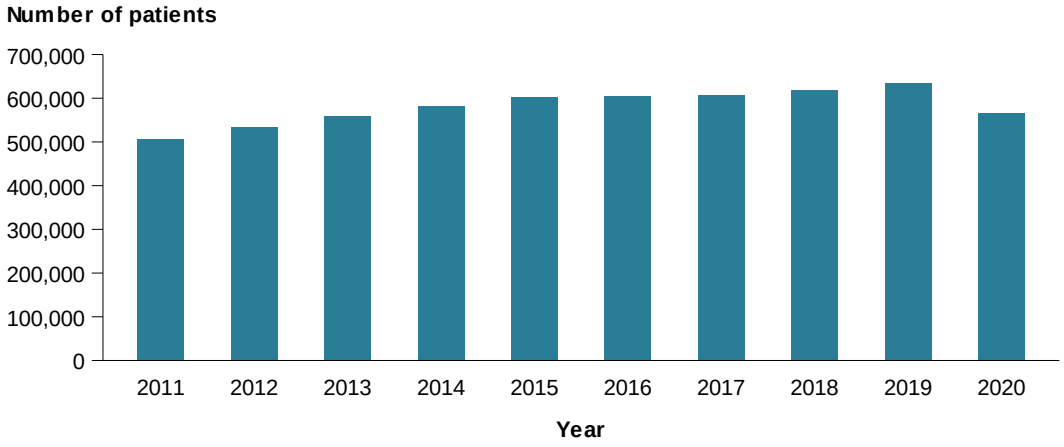
1. Patient numbers based on a count of unique patients who received at least 1 colonoscopy service in the calendar year.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C for associated MBS item numbers.
3. Age calculated as age at date of last colonoscopy service in the calendar year.
4. Patients aged under 15, or whose age is unknown are excluded from this figure.
5. Data for this figure are in online Table S4.17.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

Between 2011 and 2019, the number of people undertaking an MBS-subsidised colonoscopy rose 26%, from 505,589 to 635,424. The proportional increase is around twice that for the population older than 15 in the same period (14%) (online Table S4.18). However, despite a 1.4% increase in the population aged 15 and over between 2019 and 2020 (online Table S4.18), the number of people receiving colonoscopy services decreased by 11%, noting that COVID-19 restrictions were in place during this period (Figure 4.13).

In contrast, the number of MBS-subsidised colonoscopy services increased by 24% between 2019 and 2020, presumably as a consequence of the restructuring of MBS items for colonoscopy services so as to align MBS arrangements with clinical guidelines. Eight new colonoscopy items were added to the MBS and 4 were deleted. In 2020, 97% of patients who undertook an MBS-subsidised colonoscopy had one of the new MBS items (online Table S4.18).

Figure 4.13: Number of patients receiving MBS-subsidised colonoscopies, 2011–2020



Notes

1. Patient numbers based on a count of unique patients who received at least 1 colonoscopy service.
2. Data reported by date of service (i.e. 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C (Table C1) for associated MBS item numbers.
3. Patient numbers based on count of unique patients who received at least 1 colonoscopy service in a calendar year. Therefore the same patient may be represented in counts for different years.
4. Data for this figure are in online Table S4.18.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

5 Number of new cancer cases

Key statistics

In 2021 in Australia, it is estimated that:

- 150,782 new cases of cancer will be diagnosed
- the age-standardised incidence rate will be 486 cases per 100,000 people
- more than half (53%) of all cancers will be diagnosed in males
- 72% of new cancer cases will occur in people aged 60 and over.

About the cancer incidence counts

Data for this section are sourced from the 2017 ACD and focus on the estimated cancer incidence for 2021 and cancer trends from 1982 to 2021 (see Appendix C for details on this data source)

At the time of writing, 2017 was the latest year for which cancer incidence data was available for most jurisdictions. In this report, projections of cancer incidence have been presented for subsequent years, including 2021. These projections are a mathematical extrapolation of past trends, assuming that the same trend will continue into the future, and are intended to illustrate future changes that might reasonably be expected to occur if the past trends were to continue over the projection period. These projections are not forecasts and do not attempt to allow for future changes in cancer detection methods, changes in cancer risk factors or for non-demographic factors beyond the base years of the model which may affect future cancer incidence rates.

Note that the impact of COVID-19 on cancer diagnoses has not been taken into account, as the projections for 2021 are based on actual data up to the end of 2017.

Research conducted in Victoria found that during the COVID-19 restrictions in 2020 there was a 10% reduction in cancer pathology notifications to the Victorian Cancer Registry, corresponding to an estimated 2,530 undiagnosed cancers, and raising concerns of a future spike in numbers (te Marvelde et al. 2021).

This chapter focuses on the *number of new cases* of cancers diagnosed in a year rather than on the *number of people* newly diagnosed (because 1 person can be diagnosed with more than 1 cancer in a year), although the 2 numbers are likely to be similar.

The cancer incidence counts and rates presented in this chapter include only notifiable cancers. Almost all cancers are notifiable, the exception being basal cell carcinomas (BCC) and squamous cell carcinomas (SCC) of the skin. The omission of cases of BCC/SCC of the skin from incidence data effectively means that the complete picture of cancer incidence counts and rates in Australia is not available.

Box 5.1: Estimates of BCC/SCC incidence

While numbers of BCC and SCC are not captured in the ACD, it has been estimated that in 2011–2014 the age-standardised incidence rate for BCC and SCC was respectively, 770 and 271 people diagnosed per 100,000 people (Pandeya et al. 2017). Combined, these 2 cancers amount to around twice the incidence rate for all notifiable cancers for the respective time period.

While the exclusion of BCC/SCC of the skin from cancer counts technically represents a significant undercount of cancers, the prognosis for these cancers is generally much more favourable than for other cancers, and unlike other cancers the treatment is generally undertaken in primary health care.

BCC/SCC of the skin is included among the mortality rates for non-melanoma skin cancer reported in this report. In general, over the last 20 years, mortality rates for non-melanoma skin cancer have been around 2 deaths per 100,000 people. The mortality rate is much less than the BCC/SCC incidence rates and it should be noted that the mortality rates for non-melanoma skin cancer include rare types of non-melanoma skin cancers, which are notifiable. For more details see page 3.

5.1 All cancers combined

More than 150,000 cases of cancer are estimated to be diagnosed in 2021

In 2021, it is estimated that around 151,000 new cases of cancer will be diagnosed in Australia (excluding BCC/SCC of the skin). Age-standardised incidence rates of cancer and counts of cases are higher for males but the difference between male and female rates has reduced in more recent years. More than half (53%) of new cancer cases are estimated to be diagnosed in males (Table 5.1) compared to a peak in 2009 when males accounted for 57% of new cancer cases (online Table S5.1).

Table 5.1: Estimated incidence of all cancers combined, by sex, 2021

	Males	Females	Persons
Number of cases	80,371	70,411	150,782
Age-standardised rate	536.7	443.7	486.1
Percentage of all cancer cases	53.3	46.7	100.0

Note: All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).

Source: AIHW ACD 2017.

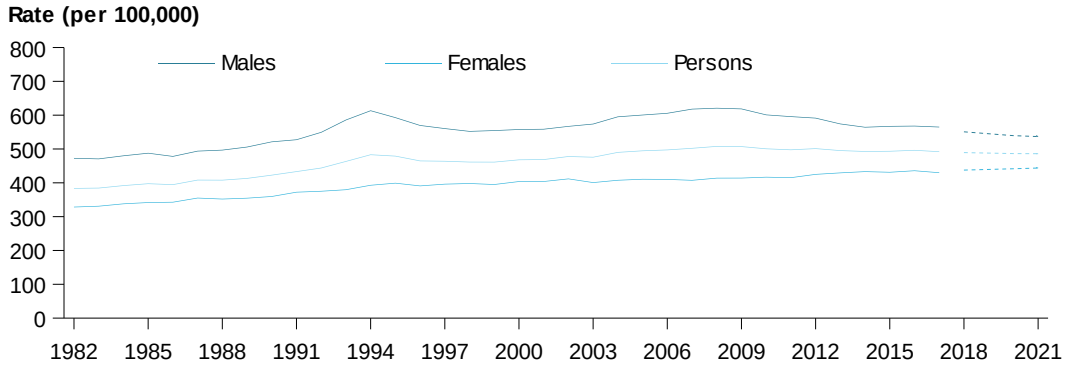
The number of new cancer cases continues to rise

The age-standardised incidence rate has increased from 384 cases per 100,000 people in 1982 to an estimated 486 cases per 100,000 people in 2021. While part of the increase may be due to a genuine increase of cancer within the Australian population, improved cancer detection will also have contributed to increasing rates (Figure 5.1).

Focusing on more recent trends and differences by sex, the age-standardised incidence rate for all cancers combined is estimated to have been decreasing, although trends differ by sex. The rate for males is estimated to have decreased from 559 cases per 100,000 males in 2001 to 537 cases per 100,000 males in 2021. The trend differs for females, where it is

estimated to have increased from 404 cases per 100,000 females in 2001 to 444 cases per 100,000 females in 2021. Incidence rates for females have been increasing relatively consistently each year while male incidence rates peaked in 2008 at 621 cases per 100,000 males before decreasing (Figure 5.1).

Figure 5.1: Trends in incidence of all cancers combined, by sex, 1982–2021



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. Actual incidence data are provided for 1982–2017 and estimated data are provided for 2018–2021.
4. The data for this figure are in online Table S5.1.

Source: AIHW ACD 2017.

Cancer incidence rates for males and persons are more stable when prostate cancer is excluded

All cancers combined incidence trends provide a general indication of broad cancer trends in Australia. Focusing on the impact of prostate cancer trends on the trend for all cancers combined, this section provides additional context so that more recent all cancers combined trends may be better understood.

For much of the beginning of this century, the annual movement of prostate cancer incidence rates was greater than for any other cancer. Prostate cancer incidence rates were 133 cases per 100,000 males in 2001 and increased to 198 cases per 100,000 males in 2009 before decreasing to an estimated 117 cases per 100,000 males in 2021. The corresponding figures for all cancers combined incidence rates in 2001, 2008 and 2012 were, respectively, 559, 621 and an estimated 537 cases per 100,000 males (online table S5.1).

Changes in the incidence rates for all cancers combined largely mirror changes in prostate cancer incidence rates, because prostate cancer is a common (high incidence) cancer and there have been substantial changes in its incidence over the period.

Why have prostate cancer incidence rates changed so much over the last 20 years and what do the rate changes really mean?

The PSA threshold at which males were referred for a prostate biopsy was lowered in 2002 and this might have contributed to the peak incidence during the mid to late 2000s (Smith et al. 2008).

Essentially, the increasing prostate cancer incidence rates in the early 2000s may be a consequence of bringing forward the diagnosis of some prostate cancer cases as well as diagnosing some prostate cancers that may not otherwise have ever been diagnosed. The reduction in rates following the peak in 2009 may be at least partly due to rates re-adjusting after the initial spike.

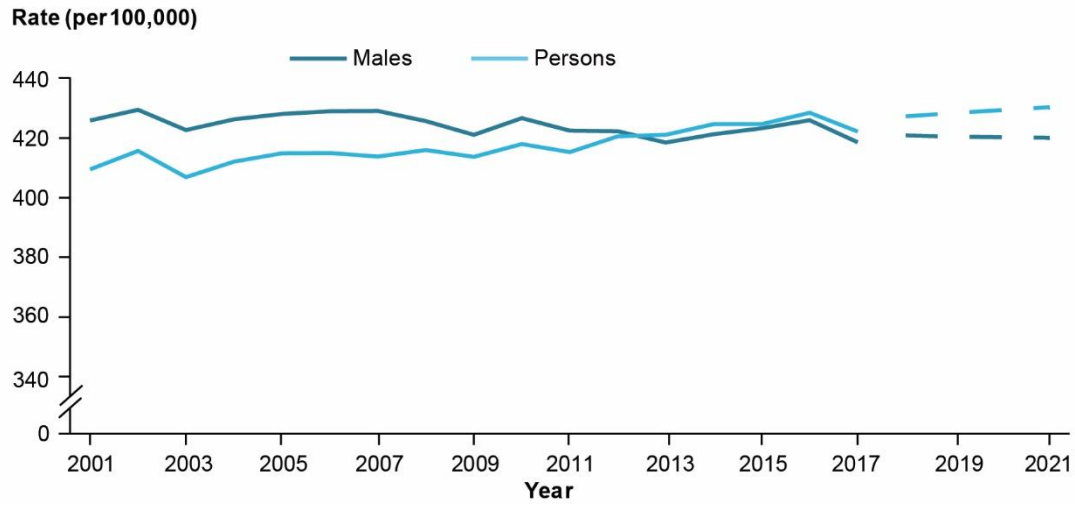
In many countries, changes in prostate cancer diagnosis have been associated with changes in PSA testing (Zhou et al 2015), and in the US, decreasing prostate cancer incidence has been linked, in part, to previous early diagnosis of prostate cancer through widespread use of PSA testing (Downer et al 2017).

The prostate cancer trends may not accurately reflect whether prostate cancer is becoming more or less common in the population. Rather, much of the post-2000 rate trends may suggest only that prostate cancer remains very common in Australia; that many men are having PSA levels monitored; and that incidence rates are strongly influenced by the threshold at which prostate biopsies are recommended.

When prostate cancer incidence is excluded from all cancers combined, age-standardised incidence rates for males have been relatively stable from 2001 to 2021 while the rate for persons continues to increase (Figure 5.2).

The impact of prostate cancer upon all cancers combined should be factored in when considering cancer incidence trends for males and persons.

Figure 5.2: Trends in the incidence of all cancers combined excluding prostate cancer, for males and persons, 2001 to 2021



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44). Data exclude prostate cancer (C61).
2. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. Actual incidence data are provided for 1982–2017 and estimated data are provided for 2018–2021.
4. The data for this figure are in online Table S5.2.

Source: AIHW ACD 2017.

5.2 How incidence of the most commonly diagnosed cancers has changed

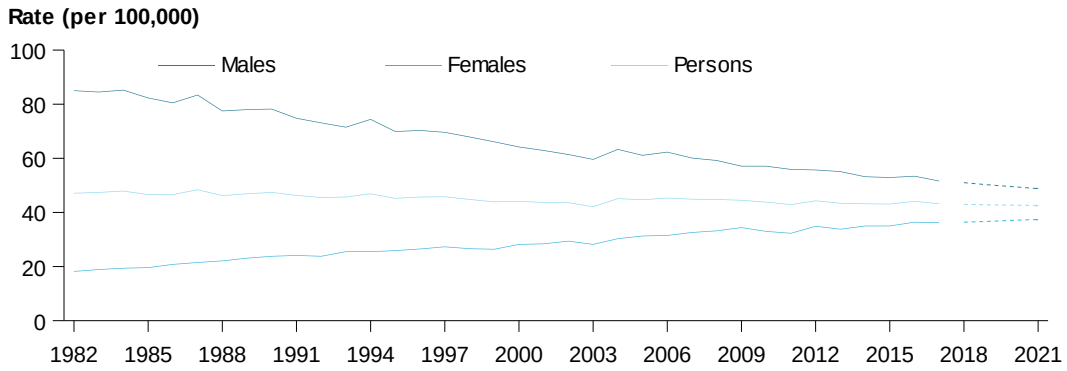
There are many different types of cancer with many differing incidence trends. For many cancers, incidence trends differ by age. This section focuses on changes in the most commonly diagnosed cancers to explore how cancer incidence rates have changed between 2001 and 2021: overall incidence trends and trends by 20-year age groups are discussed.

For practical reasons, changes in incidence described in this chapter are provided for persons (and not for each sex and each age group), but cancer incidence rates by sex and 20-year age group from 2001 to 2021 are available in the supplementary tables.

As lung cancer is a common cancer and trends for males and females differ substantially, Figure 5.3 is provided to illustrate rate differences by sex and their combined influence on overall lung cancer incidence rates. In this example, the relatively stable lung cancer incidence rate for persons obscures the fact that rates for males have been decreasing steadily over time, while those for females have been increasing. These changes will have been at least partially influenced by historic changes in male and female smoking rates reported by others (OECD 2021).

While this section focuses on more recent cancer incidence trends, a longer time series is provided in Figure 5.3 to demonstrate how enduring the respective lung cancer incidence trends by sex have been.

Figure 5.3: Lung cancer age-standardised incidence rates, by sex, 1982 to 2021



Notes

1. Lung cancer is coded in the ICD-10 as C33–C34.
2. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. Actual incidence data are provided for 1982–2017 and estimated data are provided for 2018–2021.
4. The data for this figure are in online Table S5.3.

Source: AIHW ACD 2017.

Please note the following sections use 2001 and 2021 incidence rate differences to provide broad indications of how cancer incidence rates have changed over time. Detailed data for 2001 and 2021 are available in online Table S5.4, and time series data for a range of cancers, by age group, are available in *Cancer data in Australia* (AIHW 2021f).

Changes in cancer incidence rates in all ages combined

In 2001 and 2021, the 10 most commonly diagnosed cancers are estimated to account for around 71% of all cancers diagnosed (Table 5.2).

In 2001, colorectal cancer was the most commonly diagnosed cancer in Australia. However, age-standardised incidence rates have decreased substantially, and in 2021, colorectal cancer is estimated to be the fourth most commonly diagnosed cancer (following breast cancer, prostate cancer and melanoma of the skin (Table 5.2).

In 2001, stomach cancer was the ninth most commonly diagnosed cancer. With decreasing age-standardised incidence rates (9.8 to 7.6 cases per 100,000 people between 2001 and 2021 (Online Table S5.4)), stomach cancer is no longer estimated to be one of the 10 most commonly diagnosed cancers in 2021 (Table 5.2).

Table 5.2: Estimated 10 most commonly diagnosed cancers among persons in 2021, all ages, 2001 and 2021

	2001				2021			
Cancer site/type (ICD-10 codes)	**Cases**	**ASR**	**Risk to age 85**	**Ranking**	**Cases**	**ASR**	**Risk to age 85**	**Ranking**
Breast cancer (C50)	11,941	61.9	1 in 18	2	20,030	67.8	1 in 15	1
Prostate cancer (C61)	11,480	59.5	n.p.	3	18,110	55.9	n.p.	2
Melanoma of the skin (C43)	9,002	46.7	1 in 23	4	16,878	55.3	1 in 18	3
Colorectal cancer (C18–C20)	12,805	66.4	1 in 15	1	15,540	49.7	1 in 19	4
Lung cancer (C33–C34)	8,430	43.7	1 in 21	5	13,810	42.6	1 in 20	5
Non-Hodgkin lymphoma (C82–C86)	3,447	17.9	1 in 57	6	6,402	20.4	1 in 45	6
Kidney cancer (C64)	2,085	10.8	1 in 93	9	4,377	14.4	1 in 67	7
Pancreatic cancer (C25)	1,903	9.9	1 in 102	10	4,261	13.2	1 in 69	8
Thyroid cancer (C73)	1,196	6.2	1 in 202	14	3,830	13.9	1 in 83	9
Uterine cancer (C54–C55)	1,544	8.0	n.p.	12	3,267	10.5	n.p.	10
All cancers combined	**90,403**	**468.8**	**n.p.**	**. .**	**150,782**	**486.1**	**n.p.**	**. .**

Notes

1. ASR refers to age-standardised rate. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. Risk is adjusted for competing mortality.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
4. No risk estimates available for all cancers combined or sex-specific cancers at the persons level but sex-specific rates and risks for sex-specific cancers are available within *Cancer data in Australia* (AIHW 2021f).
5. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'persons' rate strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: breast cancer – 119 cases per 100,000 females in 2001 and 130 cases per 100,000 females in 2021; prostate cancer – 133 cases per 100,000 males in 2001 and 117 cases per 100,000 males in 2021; uterine cancer – 15 cases per 100,000 females in 2001 and 20 cases per 100,000 females in 2021.
6. 2001 data are based on actual data and 2021 data are projections.

Source: AIHW ACD 2017.

With age-standardised rates of 6.2 cases per 100,000 people in 2001 increasing to an estimated 14 cases per 100,000 people in 2021, thyroid cancer is estimated to be among the 10 most commonly diagnosed cancers in Australia in 2021 (Table 5.2). Increasing rates of thyroid cancer are likely to be the result of an increase in medical surveillance and the introduction of new diagnostic techniques, such as neck ultrasonography (Vaccarella et al. 2016). Increases in the prevalence of overweight and obesity are also likely to be contributing to increases in thyroid cancer incidence over time (Kitahara et al. 2020). The incidence rate for thyroid cancer has been increasing across all age groups since 2001.

Age-standardised incidence rates for breast cancer, melanoma of the skin, non-Hodgkin lymphoma, kidney cancer and uterine cancer are also estimated to have increased over the 20 years. Conversely, age-standardised incidence rates for prostate cancer, lung cancer and stomach cancer have decreased (Table 5.2).

Around 20% of cancers estimated to be diagnosed in 2021 were cancers of the digestive organs. The age-standardised incidence rate for this group of cancers has gradually decreased from 103 to an estimated 94 cases per 100,000 people between 2001 and 2021 (Table 5.3). This reduction is primarily attributable to decreasing colorectal cancer incidence rates. However, the age-standardised incidence rates of some cancers in this group are estimated to have increased; for example, the rates for pancreatic and liver cancers increased, respectively, from 9.9 to an estimated 13.2 cases per 100,000 people (Table 5.2) and 4.6 to an estimated 8.9 cases per 100,000 people over this period.

Table 5.3: Age-standardised incidence rates and cases for cancer groups, persons, all ages, 2001 and 2021

	2001		2021		
Cancer site/type (ICD-10 codes)	**Cases**	**ASR**	**Cases**	**ASR**	**Change**
Digestive organs (C15–C26)	19,809	102.7	29,742	94.2	-8.5
Urinary tract cancers (C64–C68)	4,651	24.1	8,046	25.5	1.4
Lymphoma (C81–C86)	3,857	20.0	7,207	23.4	3.4
Gynaecological cancers (C51–C58)	3,802	19.7	6,576	21.8	2.1
Head and neck cancers (C00–C14, C30–C32)	3,364	17.4	5,104	16.7	-0.7
Leukaemia (C91–C95)	2,725	14.1	4,903	15.9	1.8
Brain and other CNS cancers (C70–C72, C75.1–C75.3)	1,419	7.4	2,020	6.9	-0.5

Notes

1. ASR refers to age-standardised rate. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. Change is equal to the 2021 ASR minus the 2001 ASR.
3. Head and neck cancers incorporate cancers of the lip, tongue, mouth, salivary glands, pharynx, nasal cavity, sinuses and larynx.
4. CNS = 'central nervous system'.
5. Data are presented for persons to gauge the cancer group's impact upon the population. For gynaecological cancers, the 'person' rate strongly understates the rate/impact on females. The equivalent female rate for gynaecological cancers: 38 cases per 100,000 females in 2001 and 42 cases per 100,000 females in 2021.
6. 2001 data are based on actual data and 2021 data are projections.
7. The data supporting this table are in online Table S5.5.

Source: AIHW ACD 2017.

Changes in cancer incidence rates by age group

This section describes the key changes in age-specific cancer incidence rates over time for the age groups 0–19, 20–39, 40–59, 60–79 and 80 and over. These age groups were chosen because they provide a general overview of how patterns of incidence change with age. However, it is possible that different age group selections might identify slightly different patterns.

Changes in cancer incidence rates for people aged 0–19

The age-specific cancer incidence rate for people aged 0–19 increased from 18 cases per 100,000 people in 2001 to an estimated 20 cases per 100,000 people in 2021.

Age-specific incidence rates remained relatively stable for many cancers in the 0–19 age group. Colorectal cancer and melanoma of the skin are 2 notable exceptions. In 2001,

melanoma of the skin was the third most commonly diagnosed cancer and accounted for 11% of cancers diagnosed in the age group. With the age-specific rate decreasing from 1.9 cases per 100,000 people in 2001 to an estimated 0.4 cases per 100,000 people in 2021, melanoma of the skin is no longer among the most common cancers for this age group and is estimated to account for only 2% of cancer cases diagnosed in the population aged 0–19.

Conversely, the age-specific colorectal cancer incidence rate in 2021 is estimated to have more than doubled from 0.6 to 1.4 cases per 100,000 people between 2001 and 2021 (Table 5.4).

Table 5.4: Estimated 10 most commonly diagnosed cancers in 2021, persons aged 0–19, 2001 and 2021

Cancer site/type	2001			2021		
(ICD-10 codes)	Cases	Rate	Ranking	Cases	Rate	Ranking
Acute lymphoblastic leukaemia (C91.0)	190	3.6	1	243	3.7	1
Brain cancer (C71)	104	2.0	2	131	2.0	2
Hodgkin lymphoma (C81)	70	1.3	4	98	1.5	3
Colorectal cancer (C18-C20)	30	0.6	11	94	1.4	4
Bone cancer (C40–C41 and selected histologies)	48	0.9	7	81	1.2	5
Cancer of other blood and lymphatic system (C94.1, C96, D45, D47.1, D47.3–D47.5)	n.p.	n.p.	n.p.	71	1.1	6
Thyroid cancer (C73)	27	0.5	12	65	1.0	7
Cancer of other soft tissue (C47, C49)	35	0.7	8	63	1.0	8
Non-Hodgkin lymphoma (C82-C86)	62	1.2	5	61	0.9	9
Kidney cancer (C64)	32	0.6	10	52	0.8	10
All cancers combined	**960**	**18.1**	**. .**	**1,294**	**19.9**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. Cancer of other blood and lymphatic system (C94.1, C96, D45, D47.1, D47.3–D47.5) reporting started in 2003.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
4. 2001 data are based on actual data and 2021 data are projections.

Source: AIHW ACD 2017.

Changes in cancer incidence rates for people aged 20–39

Age-specific cancer incidence rates for the population aged 20–39 increased from 87 cases per 100,000 people in 2001 to an estimated 93 cases per 100,000 people in 2021. While melanoma of the skin is estimated to remain the most commonly diagnosed cancer for this age group, incidence rates for melanoma of the skin have decreased considerably in the 20 years to 2021 (Table 5.5).

In this age group, age-specific incidence rates for a number of cancers increased over the period. The colorectal cancer incidence rate increased from 4.4 in 2001 to an estimated 10.3 cases per 100,000 people in 2021, while the thyroid cancer incidence rate increased from 6.5 to an estimated 10.9 cases per 100,000 people over the same period.

Increasing rates of colorectal cancer are occurring within Australia and internationally. It may take younger people with colorectal cancer more time to be diagnosed with colorectal cancer because the symptoms may be attributed to other causes, particularly given that colorectal cancer is more commonly associated with older age groups. Young-onset patients are also

more likely to be diagnosed with colorectal cancer in stage III or IV, when the disease is more difficult to treat (Bowel Cancer Australia 2020).

Table 5.5: Estimated 10 most commonly diagnosed cancers in 2021, persons aged 20–39, 2001 and 2021

Cancer site/type (ICD-10 codes)	2001			2021		
	Cases	Rate	Ranking	Cases	Rate	Ranking
Melanoma of the skin (C43)	1,311	23.3	1	1,135	14.9	1
Breast cancer (C50)	688	12.2	2	993	13	2
Thyroid cancer (C73)	363	6.5	4	832	10.9	3
Colorectal cancer (C18-C20)	250	4.4	5	783	10.3	4
Testicular cancer (C62)	386	6.9	3	619	8.1	5
Cervical cancer (C53)	195	3.5	7	331	4.3	6
Hodgkin lymphoma (C81)	164	2.9	8	321	4.2	7
Non-Hodgkin lymphoma (C82-C86)	208	3.7	6	244	3.2	8
Brain cancer (C71)	157	2.8	9	223	2.9	9
Kidney cancer (C64)	71	1.3	12	170	2.2	10
All cancers combined	**4,896**	**87.0**	**. .**	**7,118**	**93.3**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
3. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: breast cancer – 24 cases per 100,000 females in 2001 and 26 cases per 100,000 females in 2021; testicular cancer – 14 cases per 100,000 males in 2001 and 16 cases per 100,000 males in 2021; cervical cancer – 7 cases per 100,000 females in 2001 and 9 cases per 100,000 females in 2021.
4. 2001 data are based on actual data and 2021 data are projections.

Source: AIHW ACD 2017.

Box 5.2: HPV vaccination programs and cervical cancer rates in younger females

Human papillomavirus is a leading risk factor for cervical cancer. A national HPV vaccination program commenced in schools in 2007. The vaccination program targets boys and girls aged 12–13 and when implemented also included a catch-up program to vaccinate females up to the age of 26.

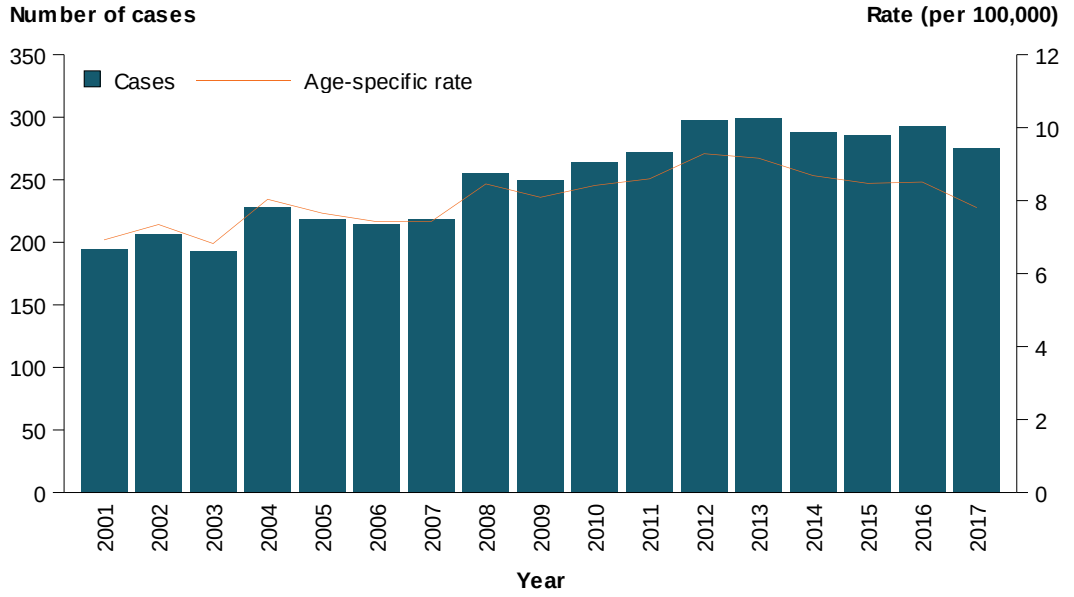
With the vaccination program predominantly covering adolescents and cancer risk being greater at later stages of life, benefits of the program are anticipated to become more apparent as the vaccinated population progress to stages of life where HPV-related cancer incidence risk is higher. The information in this analysis provides additional context in regard to the increasing age-specific incidence rate of cervical cancer for the 20–39 age group.

For the 20–39 age group, the cervical cancer age-specific incidence rate increased from 6.9 cases per 100,000 females in 2001 to a peak of 9.3 cases in 2012 and then declined to 7.8 cases per 100,000 females in 2017 (Figure 5.4; online Table S5.6). The 2021 estimate of 8.7 cases per 100,000 females is based on the overall trend seen in the 10 years of data covering 2008–2017. A limitation of the method is that it may overstate the incidence rate when a new, decreasing trend is emerging, which could be the case for cervical cancer.

Figure 5.5 focuses on cervical cancer age-specific incidence rates for the 15–24 age group. While cervical cancer incidence rates in this age group are relatively low when compared with the 20–39 year olds in Figure 5.4, a large and increasing proportion of this age group have received an HPV vaccination in more recent years (online Table S5.7), and encouragingly, cervical cancer diagnosis in this age group has decreased during this period.

However, additional years of data will be required before the effect of HPV vaccination on the overall population of females will become apparent.

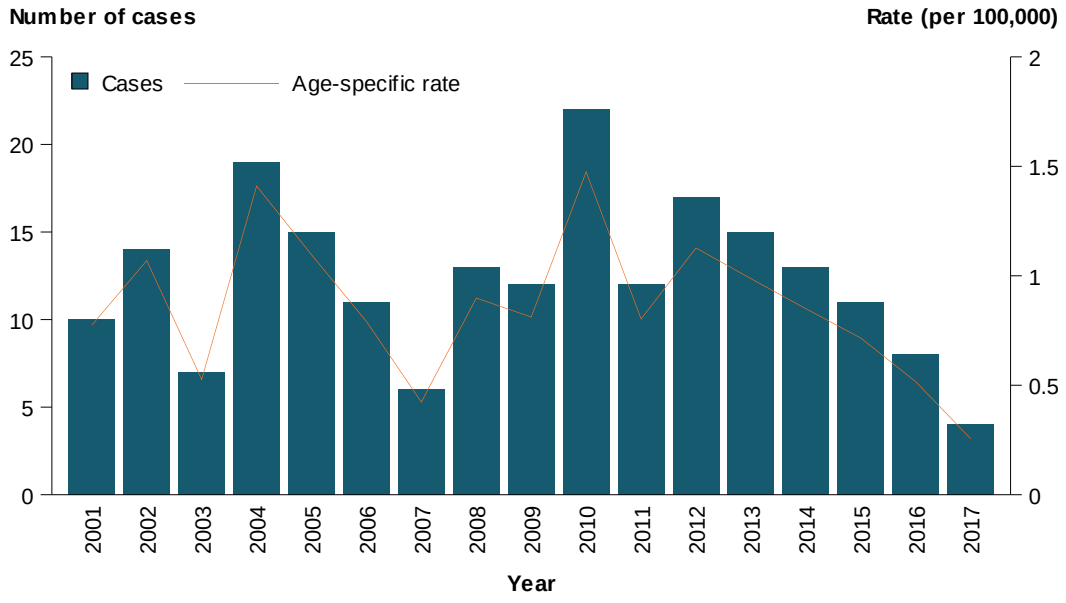
Figure 5.4: Cervical cancer incidence, females aged 20–39, 2001–2017



Note: The data for this figure are in online Table S5.6.

Source: AIHW ACD 2017

Figure 5.5: Cervical cancer incidence, females aged 15–24, 2001–2017



Note: The data for this figure are in online Table S5.7.

Source: AIHW ACD 2017.

Changes in cancer incidence rates for people aged 40–59

The age-specific incidence rate of all cancers combined for the 40–59 age group is estimated to have increased more than for any other age group. For some cancers such as prostate cancer, the increases observed may indicate an increased likelihood of detection of cancers at an earlier age than in the past. As previously mentioned, increasing rates of thyroid cancer are likely to be the result of an increase in medical surveillance and the introduction of new diagnostic techniques, such as neck ultrasonography (Vaccarella et al. 2016).

Increasing age-specific incidence of kidney cancer may be due to increased incidental diagnosis of renal cell carcinoma (the most common kidney cancer found in adults). These kidney cancers are smaller and their diagnosis provides a better prognosis and longer cancer-specific survival (Al-Marhoon et al. 2011) (Table 5.6). For each of these cancers where improved detection may be contributing to rate increases, it is difficult to gauge the extent to which these cancers are becoming more common in the population.

The NBCSP targets people aged 50–74 and the colorectal cancer age-specific incidence trends for the 40–59 age group may be better considered by differentiating between the populations within and outside the program. The NBSCP is discussed in more detail in the ‘Screening and early detection’ chapter. While colorectal cancer age-specific incidence rates for the 40–59 age group are decreasing, the age-specific incidence rate for the 40–49 age group is estimated to have increased from 25 to 30 cases per 100,000 people (AIHW 2021f). Conversely, the age-specific incidence rate for the 50–59 age group is estimated to have decreased from 78 to 57 cases per 100,000 people (AIHW 2021f).

Breast cancer predominantly occurs in females and the BreastScreen Australia program targets females aged 50–74 (although females outside these ages can also participate in the program). The increasing breast cancer age-specific incidence rates for females in the 40–59 age group between 2001 and 2021 are due to increasing incidence rates for females aged 40–49 (152 to 176 cases per females) (AIHW 2021f). In this period, female breast cancer incidence rate for the 50–59 age group decreased from the 2001 rate of 281 cases per

100,000 females to 254 cases per 100,000 females before gradually increasing to an estimated 273 cases per 100,000 females in 2021 (online Table S5.4).

Table 5.6: Estimated 10 most commonly diagnosed cancers in 2021, persons aged 40–59, 2001 and 2021

Cancer site/type (ICD-10 codes)	2001			2021		
	Cases	Rate	Ranking	Cases	Rate	Ranking
Breast cancer (C50)	5,370	105.0	1	7,351	114.0	1
Melanoma of the skin (C43)	3,198	62.5	2	4,314	66.9	2
Prostate cancer (C61)	1,624	31.8	4	3,289	51.0	3
Colorectal cancer (C18-C20)	2,488	48.6	3	2,776	43.1	4
Lung cancer (C33-C34)	1,503	29.4	5	1,821	28.2	5
Thyroid cancer (C73)	495	9.7	9	1,533	23.8	6
Kidney cancer (C64)	634	12.4	7	1,241	19.2	7
Non-Hodgkin lymphoma (C82-C86)	950	18.6	6	1,204	18.7	8
Uterine cancer (C54-C55)	562	11.0	8	902	14.0	9
Liver cancer (C22)	207	4.0	19	735	11.4	10
All cancers combined	**23,024**	**450.2**	**. .**	**33,642**	**521.7**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
3. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: breast cancer – 209 cases per 100,000 females in 2001 and 224 cases per 100,000 females in 2021; prostate cancer – 64 cases per 100,000 males in 2001 and 104 cases per 100,000 males in 2021; uterine cancer – 22 cases per 100,000 females in 2001 and 28 cases per 100,000 females in 2021.
4. 2001 data are based on actual data and 2021 data are projections.

Source: AIHW ACD 2017.

For the 40–59 age group, age-specific incidence rates for cancers of the digestive organs increased from 76 to an estimated 84 cases per 100,000 people between 2001 and 2021 (online Table S5.5). The largest contributors to this increase were liver and pancreatic cancer, which have increased, respectively, from 4.0 to an estimated 11 cases per 100,000 people and from 6.5 to an estimated 9.7 cases per 100,000 people over this period (Table 5.6).

The increase in kidney cancer age-specific rates for the 40–59 age group was greater in males than in females over this period, increasing from 16 to an estimated 27 cases per 100,000 males compared with an increase from 8.9 to an estimated 11.4 cases per 100,000 females (online Table S5.4).

Change in cancer incidence rates for people aged 60–79

Between 2001 and 2021, the cancer age-specific incidence rate for the population aged 60–79 decreased slightly. Within this overall change, colorectal cancer incidence rates decreased substantially while lung cancer and prostate cancer incidence rates decreased to a smaller extent (Table 5.7).

The decrease in lung cancer age-specific incidence rates for persons aged 60–79 was the net effect of decreasing incidence rates for males being greater than the increasing incidence rates for females. The age-specific incidence rate for males decreased from 286 to an estimated 205 cases per 100,000 males between 2001 and 2021, while the equivalent rate for females increased from 124 to an estimated 169 cases per 100,000 females during the same period. This reflects historic changes in the prevalence of smoking daily in the Australian population aged 15 and over. The male daily smokers rate consistently decreased from the 1960s, whereas the female daily smokers rate increased slightly in the 1960s and 1970s, before declining relatively steadily from the 1980s through to more recent times (OECD 2021).

The large decrease in colorectal cancer age-specific incidence rates for the population aged 60–79 between 2001 and 2021 (278 to an estimated 169 cases per 100,000 people) has contributed to the reduction in the incidence rate of cancers of the digestive organs for this age group (online Table S5.4); whereas rates of pancreatic cancer and liver cancer, which are commonly diagnosed digestive organ cancers, increased during this time (Table 5.7).

Age-specific incidence rates for breast cancer, melanoma of the skin, and kidney cancer are estimated to have increased between 2001 and 2021. Breast cancer incidence in this age group increased sharply from 2013, coinciding with BreastScreen Australia's extension of its target population of 50–69 to include women aged 70–74.

The increase in the melanoma of the skin age-specific incidence rate from 131 to an estimated 184 cases per 100,000 people in this age group between 2001 and 2021 is in strong contrast to the decreasing rates for younger age groups. The trend may be due to younger age groups living a greater proportion of their lives in an environment where skin cancer awareness has been greater.

The age-specific incidence rate of uterine cancer increased between 2001 and 2021 from 56 to an estimated 79 cases per 100,000 females (online Table S5.4). The increase in uterine cancer incidence rates has been occurring in many other countries and is hypothesised to be related to increases in risk factors. Risk factors include high and rising rates of obesity and shifts in reproductive trends, including having fewer children and delaying childbirth until later in life (National Cancer Institute 2017).

Table 5.7: Estimated 10 most commonly diagnosed cancers in 2021, persons aged 60–79, 2001 and 2021

Cancer site/type (ICD-10 codes)	2001			2021		
	Cases	Rate	Ranking	Cases	Rate	Ranking
Prostate cancer (C61)	7,686	290.7	1	12,692	272.7	1
Breast cancer (C50)	4,667	176.5	4	9,544	205.1	2
Lung cancer (C33-C34)	5,348	202.2	3	8,681	186.5	3
Melanoma of the skin (C43)	3,452	130.5	5	8,563	184.0	4
Colorectal cancer (C18–C20)	7,354	278.1	2	7,886	169.5	5
Non-Hodgkin lymphoma (C82–C86)	1,636	61.9	6	3,494	75.1	6
Pancreatic cancer (C25)	1,015	38.4	11	2,388	51.3	7
Kidney cancer (C64)	1,043	39.4	9	2,364	50.8	8
Uterine cancer (C54-C55)	770	29.1	12	1,903	40.9	9
Liver cancer (C22)	488	18.5	18	1,581	34.0	10
All cancers combined	**45,892**	**1,735.5**	**. .**	**80,328**	**1,726.1**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
3. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: prostate cancer – 604 cases per 100,000 males in 2001 and 563 cases per 100,000 males in 2021; breast cancer – 337 cases per 100,000 females in 2001 and 393 cases per 100,000 females in 2021; uterine cancer – 56 cases per 100,000 females in 2001 and 79 cases per 100,000 females in 2021.
4. 2001 data are based on actual data and 2021 data are projections.

Source: AIHW ACD 2017.

Changes in cancer incidence rates for people aged 80 and over

The age-specific incidence rate for all cancers combined in people aged 80 and over increased slightly from 2,644 to an estimated 2,652 cases per 100,000 people between 2001 and 2021.

Age-specific incidence rates for people aged 80 and over reduced for prostate cancer. Reductions in incidence rates for prostate cancer may be attributable to surveillance programs increasing the likelihood of detecting this cancer at earlier ages than in the past.

The breast cancer age-specific incidence rates provided in Table 5.8 provide an accurate reflection of change in regard to the impact upon the Australian population aged 80 and over. The table provides person rates to allow better national comparability of cancers. However, for the population aged 80 and over, the proportion of males is increasing, and it is this increasing proportion of males that underlies the observed decreasing breast cancer incidence rates for persons (in 2001, 35% of the population aged 80 and over were male but in 2021 the proportion has increased to 42%). As highlighted in the notes for Table 5.8, breast cancer age-specific incidence rates for females aged 80 and over increased between 2001 and 2021 (312 cases per 100,000 females in 2001 compared with 342 cases per 100,000 females in 2021).

Lung cancer age-specific incidence rates increased from 256 to an estimated 299 cases per 100,000 people between 2001 and 2021, with the increase reflecting growth in the incidence of this cancer in females. The age-specific incidence rate increased from 148 to an estimated 213 cases per 100,000 females aged 80 and over, while the equivalent rate for males

decreased from 455 to an estimated 416 cases per 100,000 males aged 80 and over between 2001 and 2021 (online Table S5.4).

Please note that national incidence rates for myelodysplastic syndromes are available only from 2003 and this cancer is not ranked in the 2001 portion of Table 5.8. The general trend for this cancer for the 80 years and over age group is one of gradually decreasing age-specific incidence rates, with around 77 cases per 100,000 people in 2004 compared with an estimated 67 cases per 100,000 people in 2021.

Table 5.8: Estimated 10 most commonly diagnosed cancers in 2021, persons aged 80+, 2001 and 2021

Cancer site/type	2001			2021		
(ICD-10 codes)	Cases	Rate	Ranking	Cases	Rate	Ranking
Colorectal cancer (C18–C20)	2,683	453.8	1	4,001	373.7	1
Lung cancer (C33–C34)	1,516	256.4	3	3,196	298.5	2
Melanoma of the skin (C43)	938	158.6	5	2,839	265.1	3
Breast cancer (C50)	1,216	205.7	4	2,139	199.8	4
Prostate cancer (C61)	2,167	366.5	2	2,123	198.3	5
Non-Hodgkin lymphoma (C82–C86)	591	100.0	8	1,399	130.7	6
Pancreatic cancer (C25)	527	89.1	9	1,181	110.3	7
Bladder cancer (C67)	632	106.9	7	1,151	107.5	8
Cancer of unknown primary site (C80)	926	156.6	6	1,126	105.2	9
Myelodysplastic syndromes (D46)	n.p.	n.p.	n.p.	715	66.8	10
All cancers combined	**15,631**	**2643.7**	**. .**	**28,400**	**2,652.4**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
3. Myelodysplastic syndromes (D46) reporting started in 2003.
4. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: breast cancer – 312 cases per 100,000 females in 2001 and 342 cases per 100,000 females in 2021; prostate cancer – 1,038 cases per 100,000 males in 2001 and 469 cases per 100,000 males in 2021.
5. 2001 data are based on actual data and 2021 data are projections.

Source: AIHW ACD 2017.

6 Treatment

Key statistics

In the 2019–20 financial year:

- there were 1.3 million cancer-related hospitalisations, accounting for 1 in 9 of all hospitalisations
- same-day care accounted for about three-quarters (74%) of cancer-related hospitalisations
- the average length of stay was 7.5 days for overnight cancer-related hospitalisations
- non-melanoma skin cancer was the most common cancer recorded as a principal diagnosis
- about 825,000 chemotherapy procedures were performed. For these procedures, lymphoma was the most common principal diagnosis and cancer of secondary site was the most common additional diagnosis
- palliative care was provided in 43,446 cancer-related hospitalisations. For these, cancer of a secondary site was the most common principal diagnosis.

From 2001–02 to 2019–20, the age-standardised cancer-related hospitalisation rate increased from 367 per 10,000 to 443 admissions per 10,000 people.

In 2020:

- about 69,000 people received MBS-subsidised chemotherapy services and had on average 11 services per person
- about 20,000 people received MBS-subsidised vascular surgical operations for chemotherapy services and had on average 1 service per person
- 77,200 people received MBS-subsidised radiotherapy sessions and had on average 33 radiotherapy services per person.

Data for the following sections of this chapter refer to the 2019–20 financial year and are mainly sourced from the National Hospital Morbidity Database (NHMD), which is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. For more information on the NHMD, see Appendix C and AIHW *MyHospitals* '*Hospitals info & downloads–about the data*'.

In this report, cancer-related hospitalisations are defined as those where at least 1 of the following applies:

- the principal diagnosis (the diagnosis chiefly responsible for the episode of care) is cancer (ICD-10-AM codes C00–C96, D45, D46, D47.1, D47.3–D47.5)
- the additional diagnosis (a diagnosis that coexists with the principal diagnosis or arises during the episode of care and affects the care) is cancer (ICD-10-AM codes C00–C96, D45, D46, D47.1, D47.3–D47.5)
- the principal diagnosis is a cancer-related treatment (and cancer is not an additional diagnosis) (ICD-10-AM codes Z08, Z40.00, Z40.01, Z51.0, Z51.1, Z54.1, Z54.2).

A time trend has been presented for hospitalisations but not for chemotherapy or radiotherapy. Changes in the rate of cancer-related hospitalisation are apparent over the early stages of the COVID-19 pandemic. While it is not possible here to report changes in

chemotherapy and radiotherapy that might be related to the pandemic, it is worth noting that there was a 9% decrease in cancer-related MBS-subsidised therapeutic services (some of which will include both these services), between 2019 and 2020 (Cancer Australia 2021).

6.1 Hospitalisations for all cancers combined

In 2019–20, there were 1.3 million cancer-related hospitalisations, accounting for about 1 in 9 hospitalisations in Australia. Around 36% of all cancer-related hospitalisations had a principal diagnosis of cancer (Table 6.1) and more than half had an additional diagnosis of cancer (58%). The remainder had a principal diagnosis related to the treatment of cancer (and cancer was not an additional diagnosis) (5.4%).

Table 6.1: Cancer-related hospitalisations, 2019–20

	Number	%	ASR
Principal diagnosis of cancer	482,167	36.3	158.6
Additional diagnosis of cancer	775,180	58.3	260.5
Principal diagnosis of cancer-related service (and cancer is not an additional diagnosis)	71,491	5.4	23.5
All cancer-related hospitalisations	**1,328,838**	**100.0**	**442.5**

Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. Age-standardised rates (ASR) are age-standardised to the 2001 Australian Standard Population and are expressed per 10,000 population.

Source: AIHW National Hospital Morbidity Database.

Average length of stay for overnight cancer-related hospitalisations

In 2019–20, 74% of cancer-related hospitalisations were same-day hospitalisations and 26% were overnight hospitalisations. The average length of stay (ALOS) for overnight cancer-related hospitalisations was 7.5 days. For hospitalisations relating to a principal diagnosis of cancer, 49% were overnight, with an ALOS of 7.1 days (Table 6.2).

Table 6.2: Length of stay for cancer-related hospitalisations, 2019–20

	Same-day		Overnight		
	Number	%	Number	%	ALOS
Principal diagnosis of cancer	248,094	51.5	234,073	48.5	7.1
Additional diagnosis of cancer	662,781	85.5	112,399	14.5	8.7
Principal diagnosis of cancer-related service (and cancer is not an additional diagnosis)	67,344	94.2	4,147	5.8	2.1
All cancer-related hospitalisations	**978,219**	**73.6**	**350,619**	**26.4**	**7.5**

Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. ALOS—average length of stay (days).

Source: AIHW National Hospital Morbidity Database.

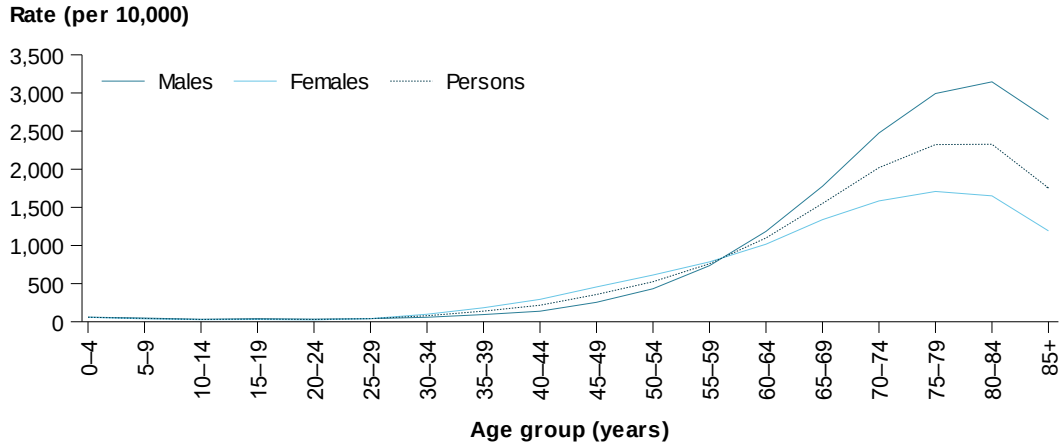
Hospitalisation rates by age group and sex

In 2019–20, a large proportion of all cancer-related hospitalisations were among older age groups (Figure 6.1). The age-specific rates of cancer-related hospitalisations were relatively low in age groups below 50 years of age. The age-specific rate peaked at 2,327 hospitalisations per 10,000 people for those aged 80–84, before decreasing in those aged 85 and over.

The age-specific cancer-related hospitalisation rate for females was less than 100 hospitalisations per 10,000 females for age groups under 35, while for males the rate was less than 100 hospitalisations per 10,000 males for age groups under 40. The age-specific hospitalisation rate was higher for females aged 25–59 than for males (Figure 6.1). Age-specific hospitalisation rates for the female age groups of 35–39 and 40–44 were double those of males for the same age groups (online Table S6.1). Higher hospitalisation rates for females aged 30–59 are partly due to the relatively high number of breast cancer hospitalisations for females in this age group (online Table S6.2).

The age-specific hospitalisation rates were greater among males than females for all age groups over 60. The disparity was about double for those aged 80–84 (1.9 times) and more than double for those aged 85 and over (2.2 times). Higher male age-specific hospitalisation rates for those aged over 60 are partly attributed to the high number of prostate cancer and non-melanoma skin cancer hospitalisations among males (online Table S6.2).

Figure 6.1: Age-specific rates for all cancer-related hospitalisations, by age group and sex, 2019–20



Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. The rates are age-specific rates expressed per 10,000 population.
3. Data for this figure are in online Table S6.1.

Source: AIHW National Hospital Morbidity Database.

Changes in numbers and rates of cancer-related hospitalisations

Trends in hospitalisations are presented from 2001–02 to 2019–20. Changes in hospital admission procedures and coding may affect trends over time.

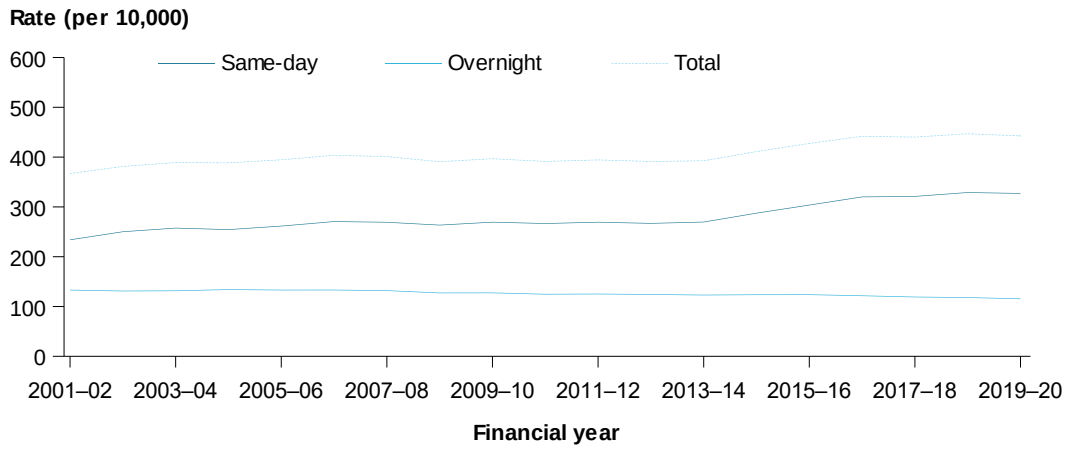
Between 2001–02 and 2019–20, the number of cancer-related hospitalisations consistently increased, by an overall 86%, from 0.7 million to 1.3 million hospitalisations. Same-day cancer-related hospitalisations increased by 115% (from 456,000 to 978,000) during this time

and overnight hospitalisations increased by 35% (from 259,000 to 351,000) (online Table S6.3).

Between 2001–02 and 2018–19, the age-standardised cancer-related hospitalisation rate increased steadily by more than 20%, from 367 per 10,000 people to 447 admissions per 10,000 people. This is largely due to an increasing number of same-day hospitalisations where a pharmacotherapy treatment was recorded (see 'Chemotherapy procedures' in Section 6.3). The overall same-day hospitalisation rate increased from 234 per 10,000 people to 329 admissions per 10,000 and the overnight hospitalisation rate decreased from 133 per 10,000 to 116 admissions per 10,000 people (Figure 6.2).

COVID-19 restrictions were in place during the last few months of 2019–20. While the number of cancer-related hospitalisations increased by 1.7% between 2018–19 and 2019–20, the age-standardised rate of cancer-related hospitalisation decreased slightly by 1.0% (447 to 443 admissions per 10,000 people) (Figure 6.2). During this period, both the age-standardised same-day hospitalisation and overnight hospitalisation rates decreased, by, respectively, 0.5% (329 to 327 admissions per 10,000 people) and 2.1% (118 to 116 admissions per 10,000 people).

Figure 6.2: All cancer-related hospitalisations by same-day and overnight status, 2001–02 to 2019–20



Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 10,000 population.
3. Data for this figure are in online Table S6.3.

Source: AIHW National Hospital Morbidity Database.

Impact of COVID-19 on cancer-related hospitalisations in 2019–20

The COVID-19 pandemic had a profound impact on activity in Australian hospitals. Social, economic, business and travel restrictions, including restrictions on some hospital services, and associated measures in other health-care services to support social distancing, alongside changes in community behaviours, resulted in an overall decrease in hospital activity. The latest *MyHospitals* update shows that the overall number of hospitalisations has consistently increased over the years, but between 2018–19 and 2019–20 the number decreased 2.8% (AIHW 2021a).

The COVID-19 pandemic may have also affected cancer-related hospitalisations. The age-standardised rate of cancer-related hospitalisations decreased slightly (by 1.0%) between

2018–19 and 2019–20. This decrease compares with an average annual increase of just over 1% between 2001–02 and 2018-19. However, even though the age-standardised rate decreased, the number of cancer-related hospitalisations increased by 1.7% (22,597 additional hospitalisations) between 2018–19 and 2019–20, compared with a decrease of 2.8% for all hospitalisations.

6.2 Cancer types most commonly recorded as the principal diagnosis for hospitalisations

In 2019–20, non-melanoma skin cancer was the most common cancer recorded as a principal diagnosis (25%), followed by prostate cancer (9%) and cancer of secondary site (9%). The 10 most common cancers accounted for 76% of all hospitalisations with a principal diagnosis of cancer (Table 6.3).

For overnight hospitalisations, the ALOS was longest for cancer of other central nervous system (13.8 days), followed by leukaemia (12.6), mouth cancer (11.5) and vaginal cancer (11.5) (online Table S6.4).

Table 6.3: Ten most common cancers recorded as a principal diagnosis, 2019–20

Principal diagnosis (ICD-10-AM codes)	Number	%
Non-melanoma skin cancer (C44)	120,724	25.0
Prostate cancer (C61)	44,540	9.2
Cancer of secondary site (C77–C79)	43,639	9.1
Colorectal cancer (C18–C20)	28,537	5.9
Breast cancer (C50)	27,340	5.7
Leukaemia (C91–C95)	25,790	5.3
Lymphoma (C81–C86)	23,292	4.8
Lung cancer (C33–C34)	21,006	4.4
Myelodysplastic syndromes (D46)	17,707	3.7
Melanoma of the skin (C43)	12,916	2.7
Total hospitalisations with a principal diagnosis of cancer	**482,167**	**100**

Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. Breast cancer in the above table includes males and females.

Source: AIHW National Hospital Morbidity Database.

Most common cancers recorded as principal diagnosis by sex

In 2019–20, non-melanoma skin cancer was the most common cancer type recorded as a principal diagnosis for both males and females (accounting for 26% of hospitalisations of males and 24% of hospitalisations of females with a principal diagnosis of cancer). Prostate cancer ranked second for males, accounting for 16% of hospitalisations, while breast cancer ranked second for females (14%) (Table 6.4).

Table 6.4: Ten most common cancers recorded as a principal diagnosis, by sex, 2019–20

Males			Females		
Principal diagnosis (ICD-10-AM codes)	**Number**	**%**	**Principal diagnosis (ICD-10-AM codes)**	**Number**	**%**
Non-melanoma skin cancer (C44)	73,071	25.9	Non-melanoma skin cancer (C44)	47,652	23.8
Prostate cancer (C61)	44,540	15.8	Breast cancer (C50)	27,132	13.5
Secondary site (C77–C79)	22,129	7.9	Secondary site (C77–C79)	21,510	10.7
Colorectal cancer (C18–C20)	15,841	5.6	Colorectal cancer (C18–C20)	12,695	6.3
Leukaemia (C91–C95)	15,767	5.6	Leukaemia (C91–C95)	10,023	5.0
Lymphoma (C81–C86)	13,372	4.7	Lymphoma (C81–C86)	9,920	5.0
Myelodysplastic syndromes (D46)	11,427	4.1	Lung cancer (C33–C34)	9,703	4.8
Lung cancer (C33–C34)	11,303	4.0	Myelodysplastic syndromes (D46)	6,280	3.1
Bladder cancer (C67)	10,030	3.6	Melanoma of the skin (C43)	5,301	2.6
Melanoma of the skin (C43)	7,615	2.7	Multiple myeloma (C90.0)	5,205	2.6
Total hospitalisations with a principal diagnosis of cancer	**281,855**	**100.0**	**Total hospitalisations with a principal diagnosis of cancer**	**200,308**	**100.0**

Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. Hospitalisations in which the principal diagnosis is cancer relates to ICD-10-AM codes C00–C96, D45, D47.1 and D47.3.

Source: AIHW National Hospital Morbidity Database.

6.3 Chemotherapy for cancer

Chemotherapy is the use of drugs to kill or slow the growth of cancer cells, and is an important part of cancer treatment. Chemotherapy is usually given in an outpatient setting or in a hospital or treatment centre. Sometimes a short stay in hospital is necessary if it is a longer or more complex chemotherapy treatment. In some cases, patients can have chemotherapy treatment at home. Cancer-related admitted-patient hospitalisations where a chemotherapy procedure was performed provide only limited information. Therefore, chemotherapy numbers based on the MBS and the NHMD database are both presented in this section. Note that there can be duplication across these different data sources (that is, it is possible for a single chemotherapy service to be counted in more than 1 of these data sources) so the estimates derived from different data sources should not be added together. See Appendix C for more information on MBS and NHMD data.

MBS-subsidised chemotherapy services and vascular surgical operations for chemotherapy services

The MBS database contains information on MBS-subsidised chemotherapy services and vascular surgical operations for chemotherapy services. Information is collected about patients, providers, the type of service provided and the amount of benefit paid for that service. The database includes information on each service received in non-hospital settings and by private patients in hospital settings, which include public and private hospitals. The database does not include information on services to public in-patients or public out-patients of public hospitals or on services that are not listed on the MBS. In addition, the database does not include information on the cancer type and thus it is not possible to undertake analysis for types of cancer using this data source.

In 2020, 68,942 people received approximately 758,000 MBS-subsidised chemotherapy services. During that year, patients had, on average, 11 chemotherapy services and the Australian Government contributed, on average, $722 per patient. Around 46% of MBS-subsidised chemotherapy patients were males and 46% of these services were provided to males. In 2020, males and females both had on average 11 chemotherapy services per patient (Table 6.5).

Chemotherapy is most often administered into a blood vessel (intravascular) and sometimes a vascular operation is required for chemotherapy to be provided. In 2020, around 20,000 patients received over 23,500 MBS-subsidised vascular surgical operations for chemotherapy services. During that year, patients had an average of 1.2 vascular surgical operation for chemotherapy service and the Australian Government contributed, on average, $334 per patient. Around 41% of patients were males and 41% of these types of services were provided to males. In 2020, males and females both had an average of 1.2 services per patient (Table 6.5).

Table 6.5: MBS-subsidised chemotherapy services and vascular surgical operations for chemotherapy, by sex and by service type, 2020

	Patients		Services			Benefit paid ($)	
	Number	Per cent	Number	Per cent	Services per patient	Amount	Benefit per patient
				Chemotherapy			
Sex							
Males	32,014	46.4	351,671	46.4	11.0	23,155,263	723
Females	36,928	53.6	406,324	53.6	11.0	26,654,260	722
Persons	**68,942**	**100.0**	**757,995**	**100.0**	**11.0**	**49,809,523**	**722**
				Vascular surgical operation for chemotherapy			
Sex							
Males	8,201	41.0	9,640	40.8	1.2	2,804,421	342
Females	11,793	59.0	14,016	59.2	1.2	3,872,012	328
Persons	**19,994**	**100.0**	**23,656**	**100.0**	**1.2**	**6,676,434**	**334**

Notes

1. Data reported by date of service (that is, 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed up to and including 31 May 2021.
2. Patient numbers based on a count of unique patients who received at least 1 chemotherapy service or 1 vascular surgical operation for chemotherapy service in each calendar year.
3. Services per patient is the average number of MBS-subsidised chemotherapy services received per patient.
4. Benefit per patient is the average MBS-subsidised chemotherapy or vascular surgical operation for chemotherapy benefit subsidised per patient.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) claims database.

MBS-subsidised chemotherapy services and vascular surgical operations for chemotherapy services by age group and sex

Figure 6.3 shows how MBS-subsidised chemotherapy services and vascular surgical operations for chemotherapy services in 2020 varied by age and sex.

In 2020, around 9 of every 10 patients receiving MBS-subsidised chemotherapy or vascular surgical operations for chemotherapy services were over the age of 45 (online tables S6.5 and S6.6).

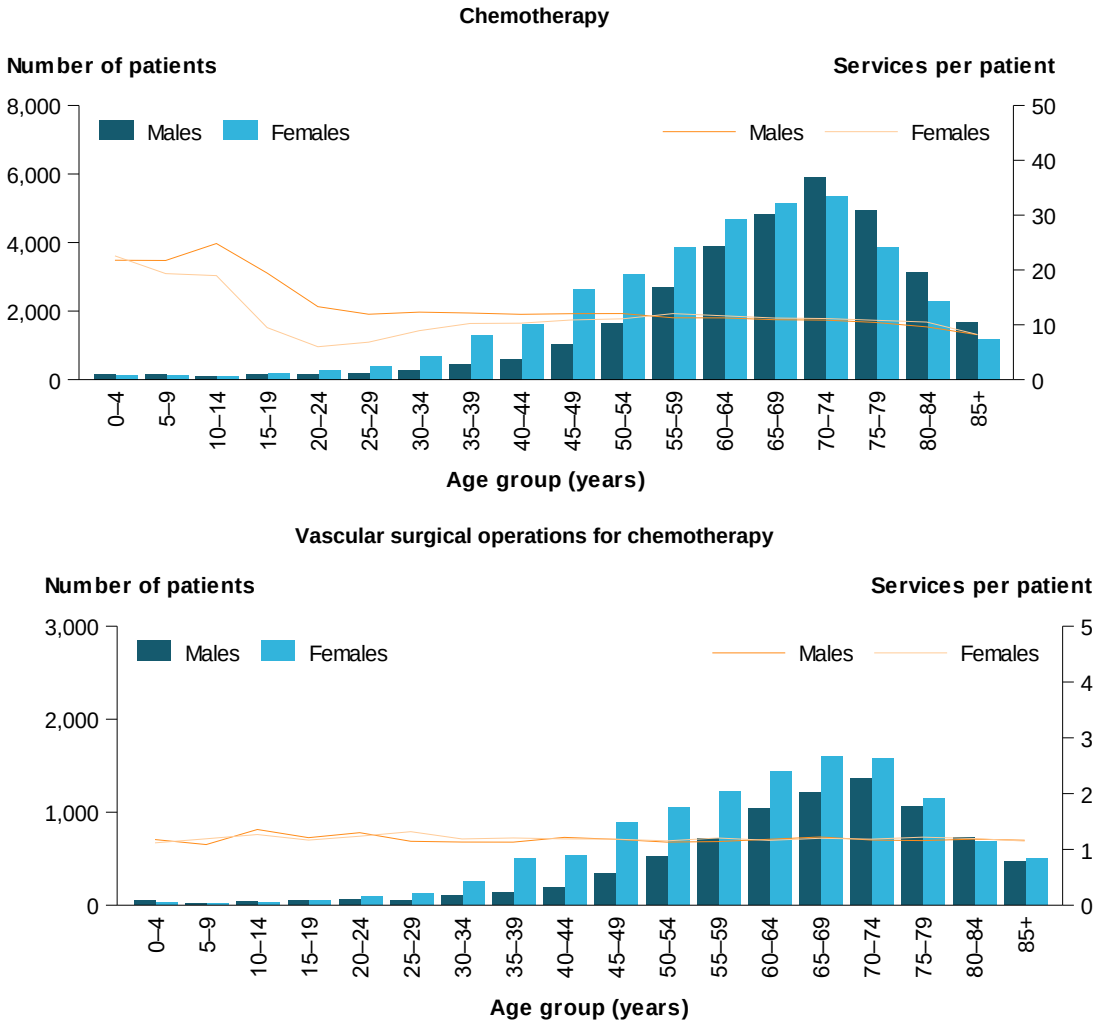
For MBS-subsidised chemotherapy services, on average, each patient received 11 services per year. Patients aged 0–4 and 10–14 had the highest average number of services per patient (22 services), whereas patients aged 85 and over had the lowest average number of services per patient (8 services) (online Table S6.5).

For MBS-subsidised vascular surgical operations for chemotherapy services, on average, each patient received 1.2 services per year, which is similar across all age groups (ranging from 1.1 to 1.3 services per patient per year) (online Table S6.6).

For all age groups from 15–19 to 65–69, more females than males received MBS-subsidised chemotherapy services. For all age groups under 15 and those over 70, more males than females received these types of services. Males aged 10–14 received an average of 25 MBS-subsidised chemotherapy services per year, which was more than for females in this age group and more than for males or females in any other age group (Figure 6.3).

For all age groups 20 and over, except 80–84, more females than males received MBS-subsidised vascular surgical operations for chemotherapy services. In 2020, the average services in all age groups ranged from 1.1 to 1.4 operations per patient for males, and from 1.1 to 1.3 operations per patient for females (Figure 6.3).

Figure 6.3: MBS-subsidised chemotherapy services and vascular surgical operations for chemotherapy, by age group and sex, 2020



Notes

1. Patient numbers based on a count of unique patients who received at least 1 chemotherapy service in the calendar year.
2. Data reported by date of service (that is, 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C for associated MBS item numbers.
3. Age calculated as age at date of last radiotherapy service in the calendar year.
4. Services per patient is the average number of MBS-subsidised chemotherapy services received per patient.
5. Data for this figure are in online tables S6.5 and S6.6.

Source: AIHW analysis of MBS database.

Chemotherapy procedures for cancer-related hospitalisations

This section explores the number of chemotherapy procedures performed in a hospital setting. Note that the number of procedures performed does not necessarily indicate the number of hospitalisations as multiple procedures can be performed during a single hospitalisation. The numbers and rates given here may represent an undercount as the NHMD does not include records for non-admitted patients in public hospitals.

Note that while the method for calculating chemotherapy procedures is the same as in the previous edition of this report, *Cancer in Australia 2019*, it differs from the method used in earlier editions and therefore the results are not directly comparable. See Appendix D for more details.

In 2019–20, there were 847,000 hospitalisations where the additional diagnosis was cancer or the principal diagnosis was a cancer-related treatment (and cancer was not an additional diagnosis) (Table 6.6). For these hospitalisations, pharmacotherapy (chemotherapy) was the most common principal diagnosis, accounting for over 70% (621,600 hospitalisations) of the total cases (Table 6.6 and online Table S6.7), which is around 2.7 times as many hospitalisations with chemotherapy as the principal diagnosis as there were in 2001–02 (online Table S6.7). Note that these numbers relate to hospitalisations so they are not directly comparable with other results presented for chemotherapy procedures due to differences in the scope of the analysis. See Appendix D for more details.

Table 6.6: Cancer-related hospitalisations with chemotherapy as the principal diagnosis, by sex, Australia, 2019–20

	Males		Females		Persons	
	Number	%	Number	%	Number	%
Pharmacotherapy session for neoplasm (Chemotherapy [Z51.1])	297,758	69.3	323,834	77.6	621,603	73.4
Additional diagnosis of cancer or principal diagnosis of cancer-related service (and cancer is not an additional diagnosis)	**429,575**	**100.0**	**417,082**	**100.0**	**846,671**	**100.0**

Note: Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.

Source: AIHW National Hospital Morbidity Database.

In 2019–20, nearly 825,000 chemotherapy procedures were performed. Of these, 51,100 had a principal diagnosis of cancer. In contrast, the majority (90%) of the total procedures had a principal diagnosis of a chemotherapy session (Z51.1) and an additional diagnosis of a cancer (Table 6.7). A small proportion (2%) of chemotherapy procedures were performed for a non-cancer principal diagnosis (but had an additional diagnosis of a cancer). Note that these estimates may not accurately indicate the usage of chemotherapy in the treatment of cancer.

Table 6.7: Chemotherapy procedures for cancer-related hospitalisations, by sex and diagnosis type, Australia, 2019–20

	Males		Females		Persons	
	Number	%	Number	%	Number	%
Principal diagnosis of cancer	29,596	7.3	21,500	5.1	51,096	6.2
Principal diagnosis of chemotherapy with an additional diagnosis of cancer	355,647	88.1	385,307	91.4	740,962	89.8
Additional diagnosis of cancer and principal diagnosis of non-cancer	8,277	2.1	8,160	1.9	16,438	2.0
Total chemotherapy procedures for a cancer-related hospitalisation	**403,487**	**100.0**	**421,437**	**100.0**	**824,936**	**100.0**

Notes

1. Persons includes sex 'not stated/inadequately described' or 'intersex or indeterminate'.
2. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
3. Columns do not sum to totals as there were 16,440 chemotherapy procedures performed for hospitalisations where the principal diagnosis was a cancer-related treatment but the additional diagnosis was non-cancer.

Source: AIHW National Hospital Morbidity Database.

Most common principal diagnoses for hospitalisations where chemotherapy was performed

The scope of the analysis for chemotherapy procedures is for individual cancer types as opposed to all cancers combined. This involves allowing for hospitalisations where the patients may have a principal diagnosis of a cancer (or chemotherapy session) and additional diagnoses of different cancers.

In 2019–20, for hospitalisations where a chemotherapy procedure was performed, lymphoma was the most common principal diagnosis for both males and females, accounting for 22% of the procedures for males and 19% for females. The next most common diagnoses for both sexes were leukaemia (males 19% and females 18%) and colorectal cancer (males 15% and females 16%) (Table 6.8). Note above, that these chemotherapy procedures are for hospitalisations with allowance for multiple and different cancer diagnoses.

Table 6.8: Ten most common principal diagnoses for hospitalisations where a chemotherapy procedure was performed, by sex, 2019–20

Males			Females		
Cancer site/type (ICD-10-AM codes)	**Number**	**%**	**Cancer site/type (ICD-10-AM codes)**	**Number**	**%**
Lymphoma (C81–C86)	6,355	21.5	Lymphoma (C81–C86)	4,054	18.9
Leukaemia (C91–C95)	5,676	19.2	Leukaemia (C91–C95)	3,777	17.6
Colorectal cancer (C18–C20)	4,364	14.7	Colorectal cancer (C18–C20)	3,425	15.9
Multiple myeloma (C90.0)	2,047	6.9	Cancer of secondary site (C77–C79)	1,512	7.0
Cancer of secondary site (C77–C79)	1,497	5.1	Multiple myeloma (C90.0)	1,485	6.9
Stomach cancer (C16)	1,180	4.0	Breast cancer (C50)	1,133	5.3
Lung cancer (C33–C34)	954	3.2	Pancreatic cancer (C25)	771	3.6
Pancreatic cancer (C25)	878	3.0	Lung cancer (C33–C34)	761	3.5
Bone cancer (C40–41)	812	2.7	Bone cancer (C40–41)	527	2.5
Brain cancer (C71)	556	1.9	Ovarian cancer (C56)	447	2.1
Total	**29,596**	**100.0**	**Total**	**21,500**	**100.0**

Notes

1. Hospitalisation for which the care type was reported as Newborn with no qualified days and records for ‘Hospital boarders’ and ‘Posthumous organ procurement’ have been excluded from the analysis.
2. 10% of the procedures were performed in same-day hospitalisations and 90% of procedures were performed in overnight hospitalisations. The principal diagnoses would indicate the most common cancers being treated for overnight hospitalisations.
3. Totals are hospitalisations with principal diagnosis of cancer where radiotherapy procedure was performed.

Source: AIHW National Hospital Morbidity Database.

Most common additional diagnoses for hospitalisations where chemotherapy was performed

In 2019–20, for hospitalisations where chemotherapy procedures were performed, cancer of secondary site was the most common additional diagnosis in both males and females, accounting for 37% of the procedures for males and 41% for females. The next most common additional diagnoses for males where a chemotherapy procedure was performed were colorectal cancer (13%) and lung cancer (11%); for females, the next most common additional diagnoses were breast cancer (36%), and colorectal cancer (8.2%) (Table 6.9). Again, note that these procedures are for hospitalisations with allowance for multiple and different cancer diagnoses.

Table 6.9: Ten most common additional diagnoses for hospitalisations where a chemotherapy procedure was performed, by sex, 2019–20

Males			Females		
Cancer site/type (ICD-10-AM codes)	**Number**	**%**	**Cancer site/type (ICD-10-AM codes)**	**Number**	**%**
Cancer of secondary site (C77–C79)	130,547	36.7	Cancer of secondary site (C77–C79)	158,009	41.0
Colorectal cancer (C18–C20)	45,949	12.9	Breast cancer (C50)	138,366	35.9
Lung cancer (C33–C34)	39,100	11.0	Colorectal cancer (C18–C20)	31,607	8.2
Multiple myeloma (C90.0)	36,217	10.2	Lung cancer (C33–C34)	30,201	7.8
Lymphoma (C81–C86)	27,113	7.6	Multiple myeloma (C90.0)	25,053	6.5
Melanoma of the skin (C43)	22,691	6.4	Lymphoma (C81–C86)	19,598	5.1
Prostate cancer (C61)	22,118	6.2	Ovarian cancer (C56)	18,432	4.8
Leukaemia (C91–C95)	21,933	6.2	Leukaemia (C91–C95)	12,810	3.3
Bladder cancer (C67)	15,932	4.5	Pancreatic cancer (C25)	12,389	3.2
Pancreatic cancer (C25)	15,070	4.2	Melanoma of the skin (C43)	9,935	2.6
Total	**355,647**	**100.0**	**Total**	**385,307**	**100.0**

Notes

1. Hospitalisation for which the care type was reported as Newborn with no qualified days and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. Almost all procedures were performed in same-day hospitalisations with few (less than 1%) performed in overnight hospitalisations.
3. These procedures were performed during hospitalisations where the patient was admitted for a chemotherapy session, i.e. the principal diagnosis of the hospitalisation was a chemotherapy session. The additional diagnoses, therefore, indicate the cancer being treated.
4. Percentages are based on the total numbers of chemotherapy procedures performed for hospitalisations where a principal diagnosis was chemotherapy with an additional diagnosis of cancer. If one chemotherapy procedure was related to multiple and different cancer diagnoses, it was counted only once in the total. Sum of the additional diagnosis of each individual cancer site may exceed 100% as more than 1 additional diagnosis can be reported for each chemotherapy procedure performed.

Source: AIHW National Hospital Morbidity Database.

6.4 Radiotherapy for cancer

Radiotherapy is an important part of cancer treatment. Australian research indicates that 48% of cancer patients receive external beam radiotherapy at least once during their treatment (Barton et al. 2014). Radiotherapy is often provided on a non-admitted basis so admitted-patient hospitalisations where a radiotherapy procedure was performed provides only limited information. Therefore, radiotherapy numbers based on the NHMD, the MBS database and the National Radiotherapy Waiting Times Database (NRWTD) are all presented in this section.

Note that there can be duplication across these different data sources (that is, it is possible for a single radiotherapy service to be counted in more than 1 of these data sources) so the estimates derived from different data sources should not be added together. See Appendix C for more information on MBS, NHMD and NRWTD data.

MBS-subsidised radiotherapy services

The MBS database contains information on MBS-subsidised radiotherapy services. Information is collected about patients, providers, the type of service provided and the amount of benefit paid for that service. The database includes information on each radiotherapy service, rather than a course (for example, 1 person may receive multiple radiotherapy services as part of 1 course). The database does not include information on public patients in public hospitals or on services that are not listed on the MBS. Also, the

database does not include information on the cancer type and thus it is not possible to undertake analysis for types of cancer using this data source.

In 2020, 77,200 people received over 2.5 million MBS-subsidised radiotherapy services. During that year, patients had, on average, 33 radiotherapy services and the Australian Government contributed, on average, $8,016 per patient. Around 52% of MBS-subsidised radiotherapy patients were male and 55% of the MBS-subsidised radiotherapy services were provided to males. Males had a higher average number of services per patient than females (34 radiotherapy services per patient per year compared with 31) (Table 6.10).

Table 6.10: MBS-subsidised radiotherapy services, by sex, 2020

	Patients		Services			Benefit paid ($)	
Sex	Number	Per cent	Number	Per cent	Services per patient	Amount	Benefit per patient
Males	40,282	52.2	1,381,186	54.9	34	341,419,297	8,476
Females	36,918	47.8	1,135,841	45.1	31	277,410,252	7,514
Persons	**77,200**	**100.0**	**2,517,027**	**100.0**	**33**	**618,829,549**	**8,016**

Notes

1. Data reported by date of service (that is, 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed up to 31 May 2021. See Appendix C for associated MBS item numbers.
2. Patient numbers based on a count of unique patients who received at least 1 radiotherapy service in each calendar year.
3. Services per patient is the average number of MBS-subsidised radiotherapy services received per patient.
4. Benefit per patient is the average MBS-subsidised radiotherapy benefit subsidised per patient.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) claims database.

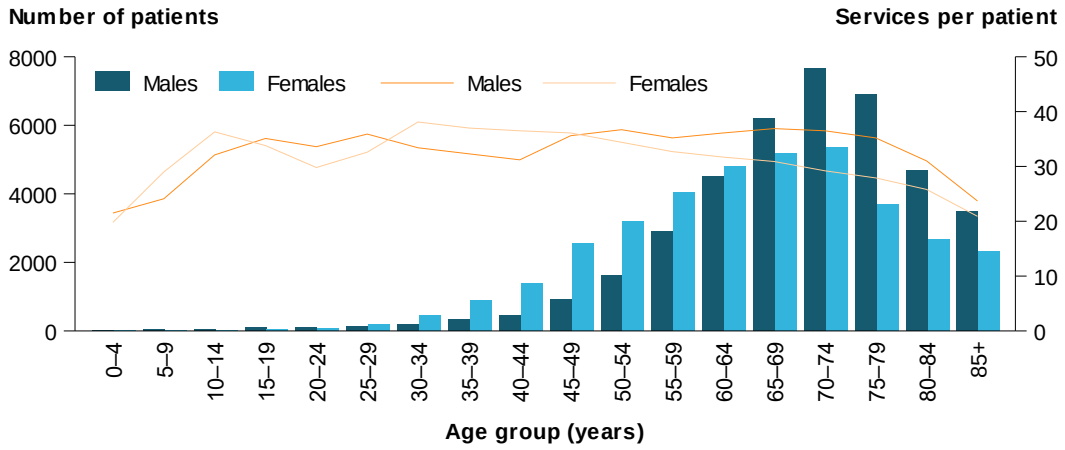
MBS-subsidised radiotherapy services by age group and sex

In 2020, around 9 of every 10 patients receiving MBS-subsidised radiotherapy services were over the age of 50. On average, patients received 33 MBS-subsidised radiotherapy services. The youngest (0–4 years) age group had fewest services per patient (21 services) (online Table S6.8).

For age groups 65 and over, more males received MBS-subsidised radiotherapy services than females (Figure 6.4). This may be partly attributed to the high prostate cancer incidence rate among males in this age group. Between the ages of 25 and 64, more females received radiotherapy services than males (Figure 6.4). This may be partly attributed to the high breast cancer incidence rate among females in this age group. Around 7,700 males aged 70–74 received radiotherapy services, which is more than any other male or female age group.

Females aged 30–34 received, on average, 38 MBS-subsidised radiotherapy services which is more than any other female or male age group.

Figure 6.4: MBS-subsidised radiotherapy services, by age group and sex, 2020



Notes

1. Patient numbers based on a count of unique patients who received at least 1 radiotherapy service in the calendar year.
2. Data reported by date of service (that is, 2020 refers to services rendered between 1 January 2020 and 31 December 2020) for all services processed until 31 May 2021. See Appendix C for associated MBS item numbers.
3. Age calculated as age at date of last radiotherapy service in the calendar year.
4. Services per patient is the average number of MBS-subsidised radiotherapy services received per patient.
5. Data for this figure are in online Table S6.8.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

Radiotherapy procedures for cancer-related hospitalisations

This section explores the number of radiotherapy procedures performed in an admitted-patient setting. However, radiotherapy is often provided on a non-admitted basis. Note that the number of procedures performed does not necessarily indicate the number of hospitalisations as multiple procedures can be performed during a single hospitalisation.

In 2019–20, there were 847,000 hospitalisations where the additional diagnosis was cancer or the principal diagnosis was a cancer-related treatment (and cancer was not an additional diagnosis) (tables 6.1 and 6.11). For these hospitalisations, radiotherapy ranked the 12th most common principal diagnosis, accounting for 0.3% (2,850 hospitalisations) of the total cases (Table 6.11). Note that these numbers are hospitalisations, which are not directly comparable with other results presented for radiotherapy procedures due to differences in the scope of the analysis. See Appendix D for more details.

Table 6.11: Cancer-related hospitalisations with radiotherapy as the principal diagnosis, by sex, Australia, 2019–20

	Males		Females		Persons	
	Number	%	Number	%	Number	%
Radiotherapy session (Z51.0)	1,555	0.4	1,296	0.3	2,851	0.3
Additional diagnosis of cancer or principal diagnosis of cancer-related service (and cancer is not an additional diagnosis)	**429,575**	**100.0**	**417,082**	**100.0**	**846,671**	**100.0**

Note: Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.

Source: AIHW National Hospital Morbidity Database.

In 2019–20, 21,217 radiotherapy procedures were performed for cancer-related hospitalisations. Of these, 14,139 had a principal diagnosis of cancer. Only 14% of the total procedures had a principal diagnosis of a radiotherapy session (Z51.0) and an additional diagnosis of a cancer (Table 6.12). Another 19% of radiotherapy procedures were performed for a non-cancer principal diagnosis (but had an additional diagnosis of a cancer). Note that these estimates may not accurately indicate the usage of radiotherapy in the treatment of cancer.

Table 6.12: Radiotherapy procedures for cancer-related hospitalisations, by sex and diagnosis type, 2019–20

	Males		Females		Persons	
	Number	%	Number	%	Number	%
Principal diagnosis of cancer	9,576	70.3	4,563	60.1	14,139	66.6
Principal diagnosis of radiotherapy with an additional diagnosis of cancer	1,534	11.3	1,475	19.4	3,009	14.2
Additional diagnosis of cancer and principal diagnosis of non-cancer	2,465	18.1	1,545	20.4	4,010	18.9
Total radiotherapy procedures for a cancer-related hospitalisation	**13,626**	**100.0**	**7,591**	**100.0**	**21,217**	**100.0**

Notes

1. Persons includes sex 'not stated/inadequately described' or 'intersex or indeterminate'.
2. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
3. Columns do not sum to totals as there were 59 radiotherapy procedures performed for hospitalisations where the principal diagnosis was a cancer-related treatment but the additional diagnosis was non-cancer.

Source: AIHW National Hospital Morbidity Database.

Again, note that the scope of the analysis for radiotherapy procedures looks at individual cancer types as opposed to all cancers combined. This involves allowing for hospitalisations where the patients may have a principal diagnosis of a cancer (or radiotherapy session) and additional diagnoses of different cancers.

Most common principal diagnoses for hospitalisations where radiotherapy was performed

In 2019–20, for hospitalisations where a radiotherapy procedure was performed, prostate cancer was the most common principal diagnosis for males, accounting for 50% of the procedures for males. The next most common diagnoses for males were cancer of secondary site (17%) and thyroid cancer (5.3%). For females, the most common principal diagnosis was cancer of secondary site (31%), followed by thyroid cancer (20%) and cervical cancer (9.6%) (Table 6.13). Note that these radiotherapy procedures are for hospitalisations with allowance for multiple and different cancer diagnoses.

Table 6.13: Ten most common principal diagnoses for hospitalisations where a radiotherapy procedure was performed, by sex, 2019–20

Males			Females		
Cancer site/type (ICD-10-AM codes)	**Number**	**%**	**Cancer site/type (ICD-10-AM codes)**	**Number**	**%**
Prostate cancer (C61)	4,815	50.3	Cancer of secondary site (C77–C79)	1,391	30.5
Cancer of secondary site (C77–C79)	1,652	17.3	Thyroid cancer (C73)	914	20.0
Thyroid cancer (C73)	508	5.3	Cervical cancer (C53)	437	9.6
Lung cancer (C33–C34)	465	4.9	Lung cancer (C33–C34)	334	7.3
Liver cancer (C22)	215	2.2	Breast cancer (C50)	176	3.9
Lymphoma (C81–C86)	163	1.7	Multiple myeloma (C90.0)	118	2.6
Brain cancer (C71)	161	1.7	Lymphoma (C81–C86)	107	2.3
Oesophageal cancer	144	1.5	Leukaemia (C91–C95)	106	2.3
Multiple myeloma (C90.0)	133	1.4	Brain cancer (C71)	88	1.9
Oropharyngeal cancer (C09–C10)	121	1.3	Oesophageal cancer (C15)	74	1.6
Total	**9,576**	**100.0**	**Total**	**4,563**	**100.0**

Notes:

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. 31% of the procedures were performed in same-day hospitalisations and 69% of procedures were performed in overnight hospitalisations. The principal diagnoses would indicate the most common cancers being treated for overnight hospitalisations.
3. Totals are hospitalisations with principal diagnosis of cancer where radiotherapy procedure was performed.

Source: AIHW National Hospital Morbidity Database.

Most common additional diagnoses for hospitalisations where radiotherapy session was the principal diagnosis

In 2019–20, for hospitalisations where radiotherapy procedures were performed, brain cancer was the most common additional diagnosis for males, accounting for 33% of the procedures. The next most common additional diagnoses for males were cancer of secondary site (19%) and prostate cancer (13%). For females, the most common additional diagnoses were cervical cancer (25%), followed by uterine cancer and brain cancer (Table 6.14). Note that these procedures are for hospitalisations with allowance for multiple and different cancer diagnoses.

Table 6.14: Ten most common additional diagnoses for hospitalisations where a radiotherapy session was the principal diagnosis, by sex, 2019–20

Males			Females		
Cancer site/type (ICD-10-AM codes)	**Number**	**%**	**Cancer site/type (ICD-10-AM codes)**	**Number**	**%**
Brain cancer (C71)	510	33.2	Cervical cancer (C53)	363	24.6
Cancer of secondary site (C77–C79)	298	19.4	Uterine cancer (C54–55)	n.p.	n.p.
Prostate cancer (C61)	196	12.8	Brain cancer (C71)	n.p.	n.p.
Cancer of other endocrine glands (C74–C75 excluding C75.1–C75.3)	n.p.	n.p.	Cancer of secondary site (C77–C79)	171	11.6
Pancreatic cancer (C25)	105	6.8	Cancer of the small intestine (C17)	84	5.7
Cancer of the small intestine (C17)	100	6.5	Cancer of other endocrine glands (C74–C75 excluding C75.1–C75.3)	65	4.4
Lung cancer (C33–C34)	69	4.5	Pancreatic cancer (C25)	64	4.3
Cancer of other soft tissue (C47, C49)	n.p.	n.p.	Kidney cancer (C64)	n.p.	n.p.
Bone cancer (C40–C41)	n.p.	n.p.	Lung cancer (C33–C34)	n.p.	n.p.
Eye cancer (C69)	n.p.	n.p.	Breast cancer (C50)	n.p.	n.p.
Total	**1,534**	**100.0**	**Total**	**1,475**	**100.0**

n.p. not publishable due to confidentiality.

Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. Almost all procedures were performed in same-day hospitalisations with few (less than 1%) performed in overnight hospitalisations.
3. These procedures were performed during hospitalisations where the patient was admitted for a radiotherapy session, i.e. the principal diagnosis of the hospitalisation was a radiotherapy session. The additional diagnoses, therefore, indicate the cancer being treated.
4. Percentages are based on the total numbers of radiotherapy procedures performed for hospitalisations where a principal diagnosis was radiotherapy with an additional diagnosis of cancer. If 1 radiotherapy procedure was related to multiple and different cancer diagnoses, it was counted only once in the total. Sum of the additional diagnosis of each individual cancer site may exceed 100% as more than 1 additional diagnosis can be reported for each radiotherapy procedure performed.
5. Numbers have been suppressed where only a few hospitals are responsible for a large proportion of radiotherapy sessions.

Source: AIHW National Hospital Morbidity Database.

Courses of radiotherapy

The NRWTD provides information on the number of courses of radiotherapy that began in the reporting period, key characteristics of the patients who undertook a course of treatment, and the waiting times associated with these courses. This source contains information on the number of courses, rather than on the number of services, and therefore is not comparable with MBS radiotherapy data.

The NRWTD contains data on the courses of radiotherapy and the associated principal diagnosis. The principal diagnosis is the diagnosis established after study to be chiefly responsible for causing a patient's need for the current course of treatment. In the case of radiotherapy treatment, it is typically a type of cancer.

Data reported for principal diagnosis may not reflect the incidence of certain cancers in the Australian population. The differences in principal diagnosis activity in this report may indicate data quality issues; for example, some providers may be reporting the primary site of the cancer, rather than the diagnosis code associated with the health condition being treated in the specific course of radiotherapy. For this reason, comparisons should be made with caution. See *Radiotherapy in Australia 2018–19* (AIHW 2020d) for further details.

Box 6.1: A course of radiotherapy

In this report, a course of radiotherapy is a series of 1 or more external beam radiotherapy treatments prescribed by a radiation oncologist, and should have an associated ready-for-care date and, when treatment starts, a radiotherapy start date.

A patient can receive more than 1 course of radiotherapy at the same time (courses that are simultaneous or overlap). These courses may have the same or different ready-for-care dates and the same or different radiotherapy start dates.

Only a radiation oncologist can prescribe a course of radiotherapy. A prescription is not necessarily equal to a course of radiotherapy. A prescription may be for 1 or more courses of radiotherapy. A prescription outlines the anatomical region/sites to be treated and is for a prescribed dose at a defined volume (fractionation) over a defined period.

One course of radiotherapy may cover multiple phases and multiple treatment plans.

In 2018–19, around 74,200 courses of radiotherapy were delivered in Australia. Of these, public providers delivered around 64% (47,300 courses). Private providers delivered the remaining 36% of courses reported (26,900 courses). Around one-quarter of the radiotherapy courses for males were for prostate cancer (25%) and 42% of radiotherapy courses for females were for breast cancer. Lung cancer was the second most common reason for a radiotherapy course in both males and females (Table 6.15).

Table 6.15: Five most common cancers for which a radiotherapy course was provided, by sex, 2018–19

Males			Females		
Cancer site/type (ICD-10-AM codes)	**Number**	**%**	**Cancer site/type (ICD-10-AM codes)**	**Number**	**%**
Prostate cancer (C61)	9,626	25.1	Breast cancer (C50)	14,933	41.7
Lung cancer (C33–C34)	5,151	13.4	Lung cancer (C33–C34)	4,427	12.4
Head and neck cancer (including lip)	2,574	6.7	Colorectal cancer (C18–C20)	1,203	3.4
Colorectal cancer (C18–C20)	1,878	4.9	Uterine cancer (C54–C55)	960	2.7
Lymphoma (C81–C86)	1,162	3.0	Lymphoma (C81–C86)	848	2.4
Total radiotherapy courses	**38,414**	**100.0**	**Total radiotherapy courses**	**35,781**	**100.0**

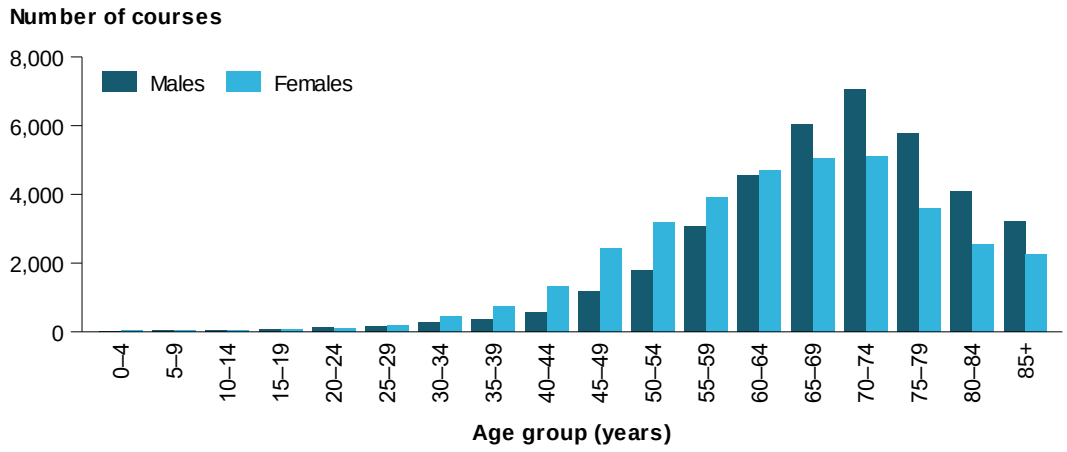
Notes

1. Information is presented based on principal diagnosis. Data reported for principal diagnosis may not reflect the incidence of certain cancers in the Australian population. See *Radiotherapy in Australia 2018–19* (AIHW 2020d) for further details.
2. Head and neck cancer (including lip) includes ICD-10-AM-codes C00–C14, C30–C32.

Source: AIHW 2020d.

Until about 65 years of age, a greater proportion of radiotherapy courses were provided to females, but in older age groups males received the greater proportion (Figure 6.5). Patients in the 70–74 age group had the highest number of radiotherapy courses (7,100 for males and 5,100 for females).

Figure 6.5: Number of radiotherapy courses provided for cancer, by age group and sex, 2018–19



Notes

1. Information is presented based on principal diagnosis. Data reported for principal diagnosis may not reflect the incidence of certain cancers in the Australian population. See *Radiotherapy in Australia 2018–19* (AIHW 2020d) for further details.
2. Data for this figure are in online Table S6.9.

Source: AIHW 2020d.

6.5 Hospitalisations for palliative care for cancer

Admitted hospital care commonly focuses on the treatment and care of disease. Palliative care—sometimes referred to as 'hospice care', 'end-of-life care' and 'specialist palliative care'—'is an approach that aims to improve the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual' (WHO 2002). Research has indicated that cancer is the most frequently recorded principal diagnosis for palliative care-related separations (AIHW 2021j).

This report covers palliative care provided in settings of admitted patient care. While palliative care is provided in other settings (for example, community-based palliative care services), comprehensive national information on palliative care provided in these settings does not currently exist. Available data suggest that just over half of palliative care episodes in Australia occur in admitted patient care settings (Connolly et al. 2016); this indicates that, while not complete, data presented in this report cover a substantial proportion of palliative care provided in Australia.

This section presents a summary of cancer-related hospitalisations where palliative care was provided in an admitted patient setting. Cancer-related hospitalisations where palliative care was provided are defined as those where:

- the care type is palliative care (care type code of 3.0), or
- the additional diagnosis (a diagnosis that coexists with the principal diagnosis or arises during the episode of care) is palliative care (ICD-10-AM code Z51.5).

In 2019–20, around 43,400 cancer-related hospitalisations in Australia involved palliative care, accounting for 50% of all hospitalisations involving palliative care and 0.4% of all hospitalisations. This number decreased slightly from around 43,600 in 2018–19. For most of these cancer-related hospitalisations involving palliative care, the care type was recorded as palliative care (72%). For the remainder, palliative care was recorded as an additional

diagnosis and provided as part of the hospitalisation where the intended care type was acute care or other modes of care.

The most common type of cancer recorded for palliative care hospitalisations was secondary site cancer (20%), followed by lung cancer (13%) and colorectal cancer (6.6%) (Table 6.16).

In 2019–20, 52% of cancer-related hospitalisations involving palliative care ended in death, 13% were transferred to another facility and 30% were discharged to where they usually live, which could be a person's own home or welfare institution.

Table 6.16: Ten most common principal diagnoses for cancer-related hospitalisations where palliative care was provided, 2019–20

Principal diagnosis (ICD-10-AM codes)	Number	%
Cancer of secondary site (C77–C79)	8,781	20.2
Lung cancer (C33–C34)	5,511	12.7
Colorectal cancer (C18–C20)	2,861	6.6
Pancreatic cancer (C25)	2,375	5.5
Prostate cancer (C61)	1,641	3.8
Breast cancer (C50)	1,518	3.5
Liver cancer (C22)	1,423	3.3
Brain cancer (C71)	1,298	3.0
Leukaemia (C91–C95)	1,018	2.3
Stomach cancer (C16)	1,014	2.3
Total cancer-related hospitalisations where palliative care was provided	**43,446**	**100.0**

Notes

1. Hospitalisation for which the care type was reported as *Newborn with no qualified days* and records for 'Hospital boarders' and 'Posthumous organ procurement' have been excluded from the analysis.
2. Breast cancer in the above table includes males and females.

Source: AIHW National Hospital Morbidity Database.

7 Survival and survivorship after a cancer diagnosis

Key statistics

In 2013–2017 in Australia:

- 5-year relative survival for all cancers combined was 70%
- for males, 5-year relative survival was highest for those diagnosed with testicular cancer, prostate cancer and lip cancer, and lowest for those diagnosed with mesothelioma, cancer of other and ill-defined digestive organs and pancreatic cancer
- for females, 5-year relative survival was highest for those diagnosed with thyroid cancer, melanoma of the skin and lip cancer, and lowest for those diagnosed with cancer of other and ill-defined digestive organs, cancer of unknown primary site and mesothelioma.

Between 1988–1992 and 2013–2017, 5-year relative survival for all cancers combined increased from 51% to 70%.

At the end of 2016, 747,392 people were alive who had been diagnosed with cancer at some time in the previous 10 years (10-year prevalence).

7.1 Survival

Data for this section are sourced from the 2017 ACD and focus on 5-year relative survival (see Chapter 1 and Appendix C for details of this data source). Data from the National Death Index (NDI) on deaths (from any cause) that occurred to 31 December 2017 were used to determine which people with cancer had died and when this occurred.

Relative survival refers to the probability of being alive for a given amount of time after diagnosis compared with the general population. A 5-year relative survival figure of 100% means that the cancer has no impact on the person's chance of still being alive 5 years after diagnosis, whereas a figure of 50% means that the cancer has halved that chance. For more information, see Box 7.1 and Appendix F.

Information on cancer survival provides an indication of cancer prognosis and the effectiveness of treatments available. A range of factors influence survival from cancer, including characteristics of the patient (such as age, sex and genetics), the nature of the tumour (such as site, stage at diagnosis and histology type) and the health-care system (such as the availability of health-care services, screening, diagnostic and treatment facilities, and follow-up services) (Black et al. 1998; WCRF & AICR 2007).

Box 7.1: Relative survival calculation method

In this chapter, relative survival was calculated using the period method for all reported time periods (Brenner & Gefeller 1996). This method calculates survival from a given follow-up or at-risk period. Survival estimates are based on the survival experience of people who were diagnosed before or during this period, and who were at risk of dying during this period. See Appendix F for more information about the period method.

Note that the period method is an alternative to the traditional cohort method, which focuses on a group of people diagnosed with cancer in a past time period, and follows these people over time. By its nature, the period method produces more up-to-date estimates of survival than the cohort method. In this chapter, survival for all year-spans presented has been calculated using the period method.

All cancers combined

In 2013–2017, 5-year relative survival was 70% for all cancers combined. This means that, from the time of diagnosis, people diagnosed with cancer had a 70% chance of surviving for at least 5 years compared with their counterparts in the general population. Females had a slightly higher 5-year relative survival rate than males (Table 7.1).

Table 7.1: Five-year relative survival for all cancers combined, 2013–2017

Sex	5-year relative survival (%)
Males	68.5
Females	71.1
Persons	69.7

Note: All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).

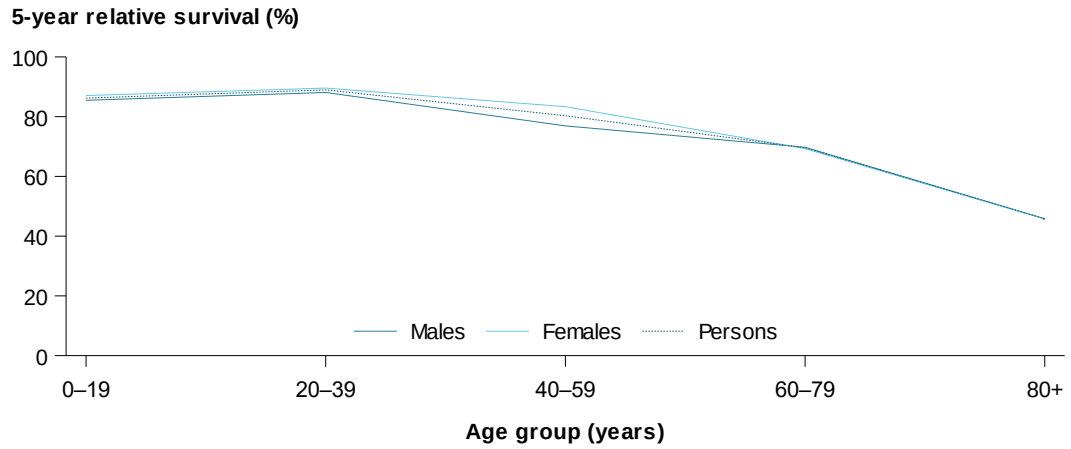
Source: AIHW ACD 2017.

Survival by age group

In 2013–2017, for all cancers combined, 5-year relative survival was highest for those aged 20–39 (where it was 89%); survival then decreased with increasing age and was lowest for those aged 80 and over (46%) (Figure 7.1). The difference in survival by age may be due to a number of reasons, including the stage at diagnosis of tumours, a greater likelihood of comorbidity among those diagnosed at an older age, differences in treatments received, and inclusion in clinical trials (Brenner & Arndt 2004; Ellison & Gibbons 2006; NCRI & WHC 2006).

In the period 2013–2017, up to the age group of 40–59, females had higher 5-year relative survival than males, in particular in females aged 40–59 where the relative survival was 6 percentage points higher (83% compared with 77% in males). In those aged 60 and over, the 5-year relative survival rates for males and females were similar. The 5-year relative survival in those aged 60–79 was 70% in males and 69% in females; for those aged 80 and over, the survival rate was equal at 46% (online Table S7.1). The difference in the age-related pattern of survival for all cancers combined by sex may be at least partly due to differences between the survival outcomes and ages at diagnosis for cancers that are more commonly (or exclusively) diagnosed for each sex, such as prostate cancer and breast cancer.

Figure 7.1: Five-year relative survival for all cancers combined, by age at diagnosis and sex, 2013–2017



Notes

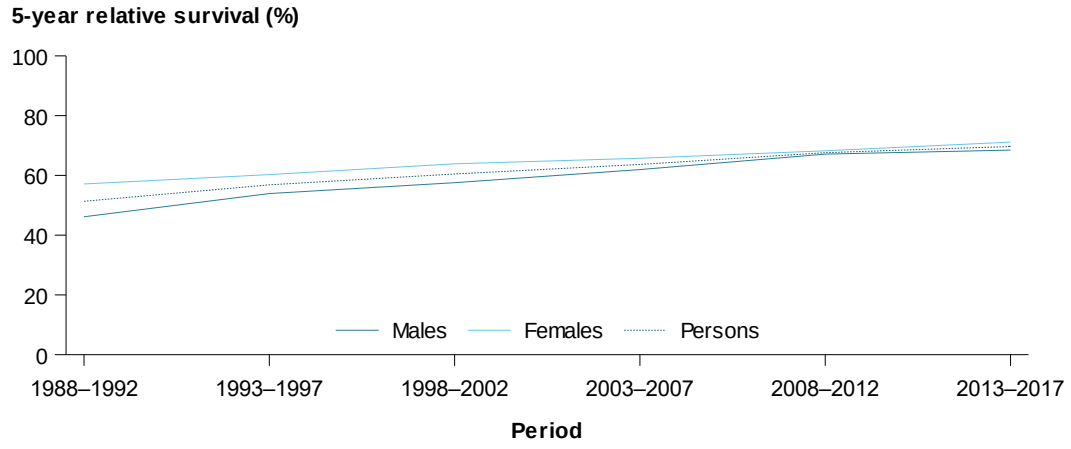
1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Data for this figure are in online Table S7.1.

Source: AIHW ACD 2017.

Five-year relative survival rates for all cancers combined have improved since 1988–1992

Five-year relative survival for people diagnosed with cancer increased over time, from 51% in 1988–1992 to 70% in 2013–2017 (Figure 7.2). The increase in 5-year survival over time is evident in both males and females. For all cancers combined, 5-year survival for males increased from 46% in 1988–1992 to 69% in 2013–2017, and for females, it increased from 57% to 71%. Survival gains may be due to better diagnostic methods, earlier detection and improvements in treatment (Dickman & Adami 2006).

Figure 7.2: Five-year relative survival for all cancers combined, by sex, 1988–1992 to 2013–2017



Notes

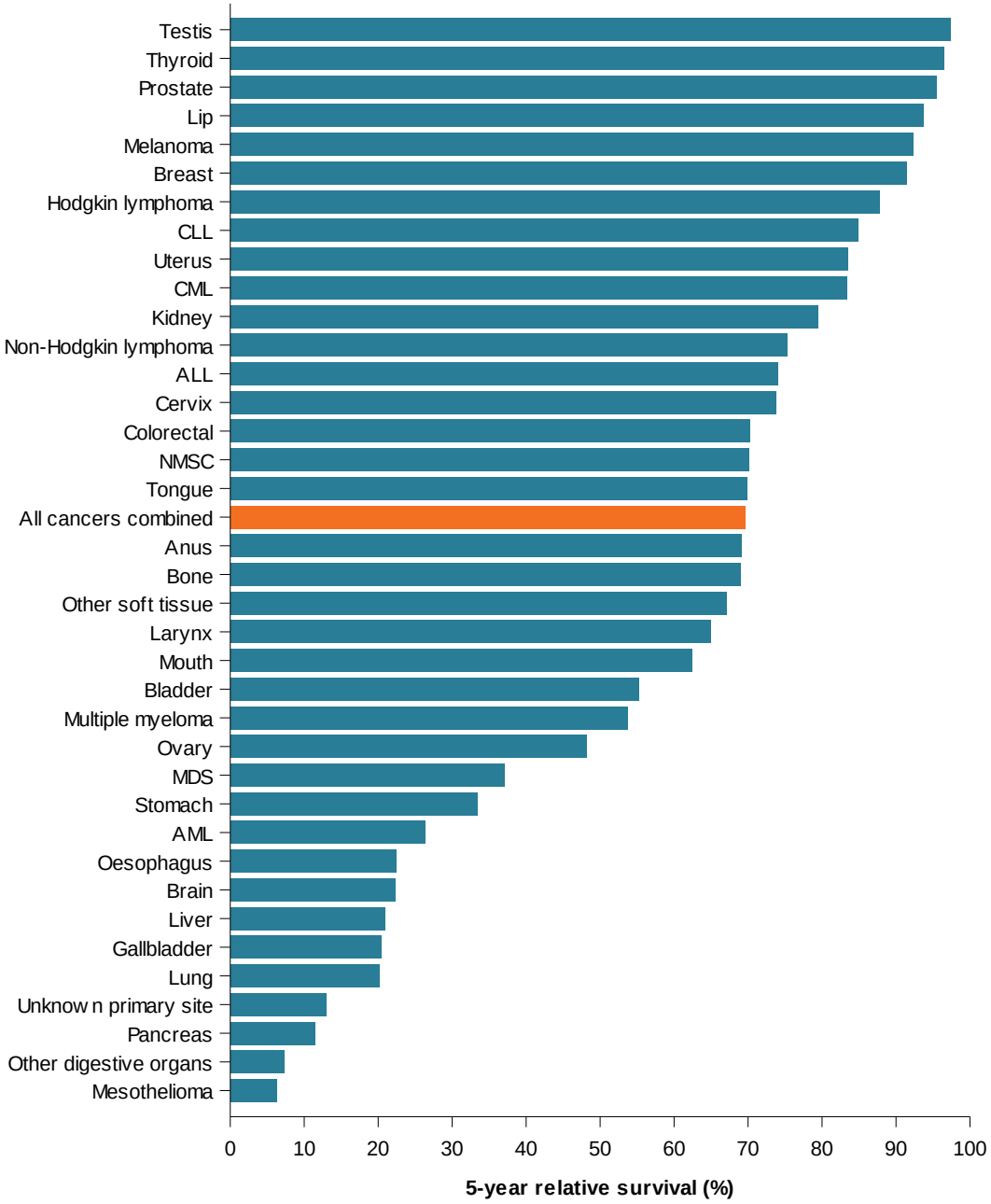
1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Data for this figure are in online Table S7.2.

Source: AIHW ACD 2017.

Cancer types

In the period 2013–2017, 5-year relative survival was over 95% for testicular cancer (97%), thyroid cancer (97%) and prostate cancer (96%) and below 10% for those diagnosed with cancer of other and ill-defined digestive organs (7.3%) and mesothelioma (6.4%) (Figure 7.3; online Table S7.3).

Figure 7.3: Five-year relative survival for selected cancers, 2013–2017



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. CLL = Chronic lymphocytic leukaemia, CML = Chronic myelogenous leukaemia, ALL = Acute lymphoblastic leukaemia, NMSC = Non-melanoma skin cancer (rare types), MDS = Myelodysplastic syndromes, AML = Acute myeloid leukaemia.
3. Survival for ovarian cancer also includes serous carcinomas of the fallopian tube.
4. The data for this figure are in online Table S7.3.

Source: AIHW ACD 2017.

Survival by sex

In 2013–2017, females had higher 5-year relative survival rates than males for several cancers including anal cancer, lung cancer, melanoma of the skin, mouth cancer, non-melanoma skin cancer (rare types), myelodysplastic syndromes and thyroid cancer. Some of the cancers for which females had noticeably higher rates of survival than males included anal cancer (73% compared with 63%), lung cancer (25% compared with 17%), non-melanoma skin cancer (rare types) (74% compared with 68%) and mouth cancer (67% compared with 60%) (online Table S7.3).

In 2013–2017, males had higher 5-year relative survival rates than females for various cancers including bladder cancer (58% compared with 48%), cancer of unknown primary site (16% compared with 9.6%) and acute lymphoblastic leukaemia (76% compared with 72%) (online Table S7.3).

In the same period, 5 of the 10 most commonly diagnosed cancers for males recorded 5-year survival rates at or above 70%, while for females 6 of the 10 most commonly diagnosed cancers recorded 5-year survival rates above 70%. The most commonly diagnosed cancer for males had a 5-year survival rate of 96% (prostate cancer); for females the most commonly diagnosed cancer (breast cancer) had a 5-year survival rate of 92% (Table 7.2).

Table 7.2: Five-year relative survival for the 10 most commonly diagnosed cancers, by sex, 2013–2017

Males		Females	
Cancer site/type (ICD-10 codes)	**Survival (%)**	**Cancer site/type (ICD-10 codes)**	**Survival (%)**
Prostate cancer (C61)	95.5	Breast cancer (C50)	91.5
Melanoma of the skin (C43)	90.8	Colorectal cancer (C18-C20)	71.0
Colorectal cancer (C18-C20)	69.8	Melanoma of the skin (C43)	94.3
Lung cancer (C33-C34)	17.0	Lung cancer (C33-C34)	24.7
Lymphoma (C81-C86)	75.6	Uterine cancer (C54-C55)	83.5
Head and neck cancer (including lip) (C00-C14, C30-C32)	70.8	Lymphoma (C81-C86)	78.5
Leukaemia (C91-C95)	63.6	Thyroid cancer (C73)	97.9
Kidney cancer (C64)	79.1	Pancreatic cancer (C25)	11.8
Bladder cancer (C67)	57.6	Leukaemia (C91-C95)	62.5
Pancreatic cancer (C25)	11.2	Ovarian cancer (C56, C57.0 and C57.8)	47.5

Notes

1. Data are sorted in order of most common cancers by sex.
2. Ovarian cancer is ovarian cancer and serous carcinomas of the fallopian tube (C56, C57.0 and C57.8 with histology 8441, 8460, 8461).

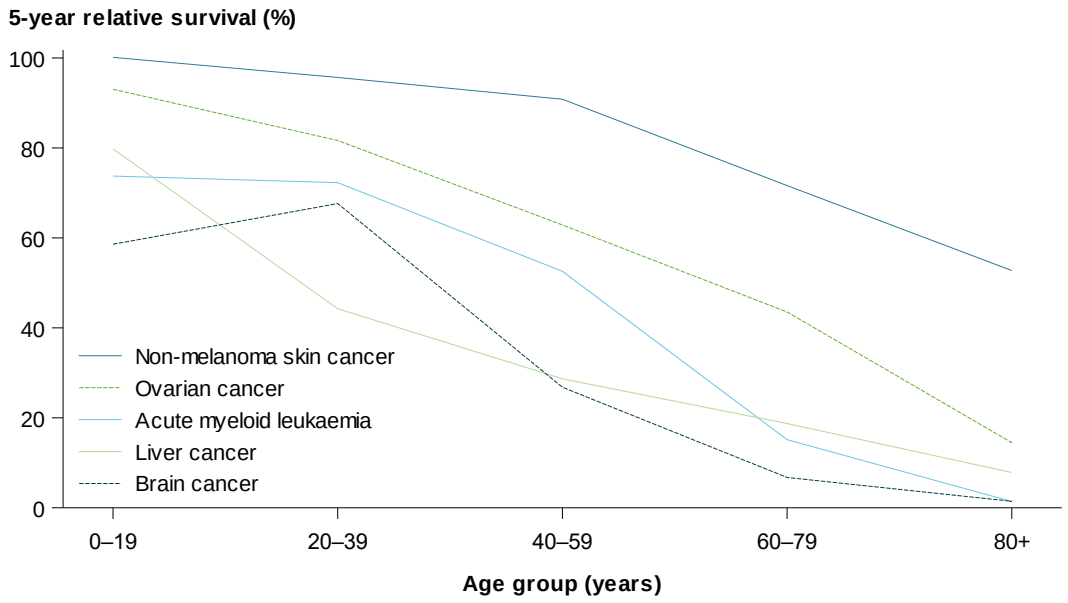
Source: AIHW ACD 2017.

Survival by age group

For many individual cancer types in 2013–2017, 5-year relative survival decreased with increasing age; however, the pattern of decline varied across cancer types (online Table S7.4). The difference in survival by age may be due to a number of reasons, including the stage at diagnosis of tumours, potential comorbidity, and differences in treatments received (Brenner & Arndt 2004; Ellison & Gibbons 2006; NCRI & WHC 2006).

Non-melanoma skin cancer (rare types), ovarian cancer and serious carcinomas of the fallopian tube, acute myeloid leukaemia, liver cancer and brain cancer show some of the largest age-related declines in survival. Of these cancers, the largest difference can be seen in females with ovarian cancer and serious carcinomas of the fallopian tube where the 5-year relative survival for people aged 0–19 is 93%, decreasing to 15% in those aged 80 and over. Non-melanoma skin cancer (rare types), ovarian cancer and serious carcinomas of the fallopian tube, acute myeloid leukaemia and liver cancer all show a decrease in survival across increasing age groups, while brain cancer survival increases from 59% to 68% between age 0–19 and 20–39 before declining in older age groups (Figure 7.4).

Figure 7.4: Five-year relative survival for selected cancers by age at diagnosis, 2013–2017



Notes

1. Ovarian cancer includes serous carcinomas of the fallopian tube and is coded as C56, C57.0, and C57.8 (with histologies 8441, 8460 and 8461).
2. Data for this figure are presented in online Table S7.4.
3. Non-melanoma skin cancer in this figure refers only to the rare types, i.e. it excludes basal and squamous cell carcinomas.

Source: AIHW ACD 2017.

Age-adjusted survival

For some cancers, trends in survival are confounded by changes over time in the age distribution of those diagnosed. For this reason, *Cancer data in Australia* (AIHW 2021f) includes age-adjusted survival for around 70 cancers.

Changes in cancer survival rates over time are used to gauge the extent to which cancer survival outcomes are improving. Over time, it is possible for changes in the age composition of the people diagnosed to confound the understanding of whether survival outcomes are improving.

For example, 5-year relative survival for brain cancer changed from 20% to 22% between 1988–1992 and 2013–2017. At face value, it appears as though survival outcomes have barely improved. However, there were relatively fewer older people diagnosed with brain cancer in 1988–1992 than in 2013–2017 and older people have worse survival than younger and middle-aged people. Therefore, it is possible that improvements in survival outcomes have been offset by greater proportions of older people being diagnosed. Age-adjustment shows that this is indeed the case. When the age distribution of the brain cancer population for 1988–1992 is adjusted to match that of the 2013–2017 population, the 5-year relative

survival figure for 1988–1992 changes from 20% to 11%. From this viewpoint it can be said that age-adjusted 5-year relative survival for brain cancer has improved from 11% to 22% between 1988–1992 and 2013–2017.

More information on age-adjusted survival can be found in Cancer data commentary no. 6 in *Cancer data in Australia* (AIHW 2021f).

5-year relative survival rates have increased significantly for most cancers

Between 1988–1992 and 2013–2017, survival from most cancers improved, but the change was not uniform over time or across cancer types (Figure 7.5). The cancers that had the largest absolute increase in survival were prostate cancer, kidney cancer, multiple myeloma, non-Hodgkin lymphoma and tongue cancer, with the 5-year relative survival of each increasing by 20 percentage points or more.

Some cancers had a decrease in survival over time, including bladder cancer (66% to 55%). However, it is possible that the decrease in bladder cancer survival may be due to changes in the coding and classification of in situ and invasive tumours (Luke et al 2010) as well as increased age at diagnosis.

Survival for some cancers showed no significant change over time; these included laryngeal cancer, lip cancer and mesothelioma.

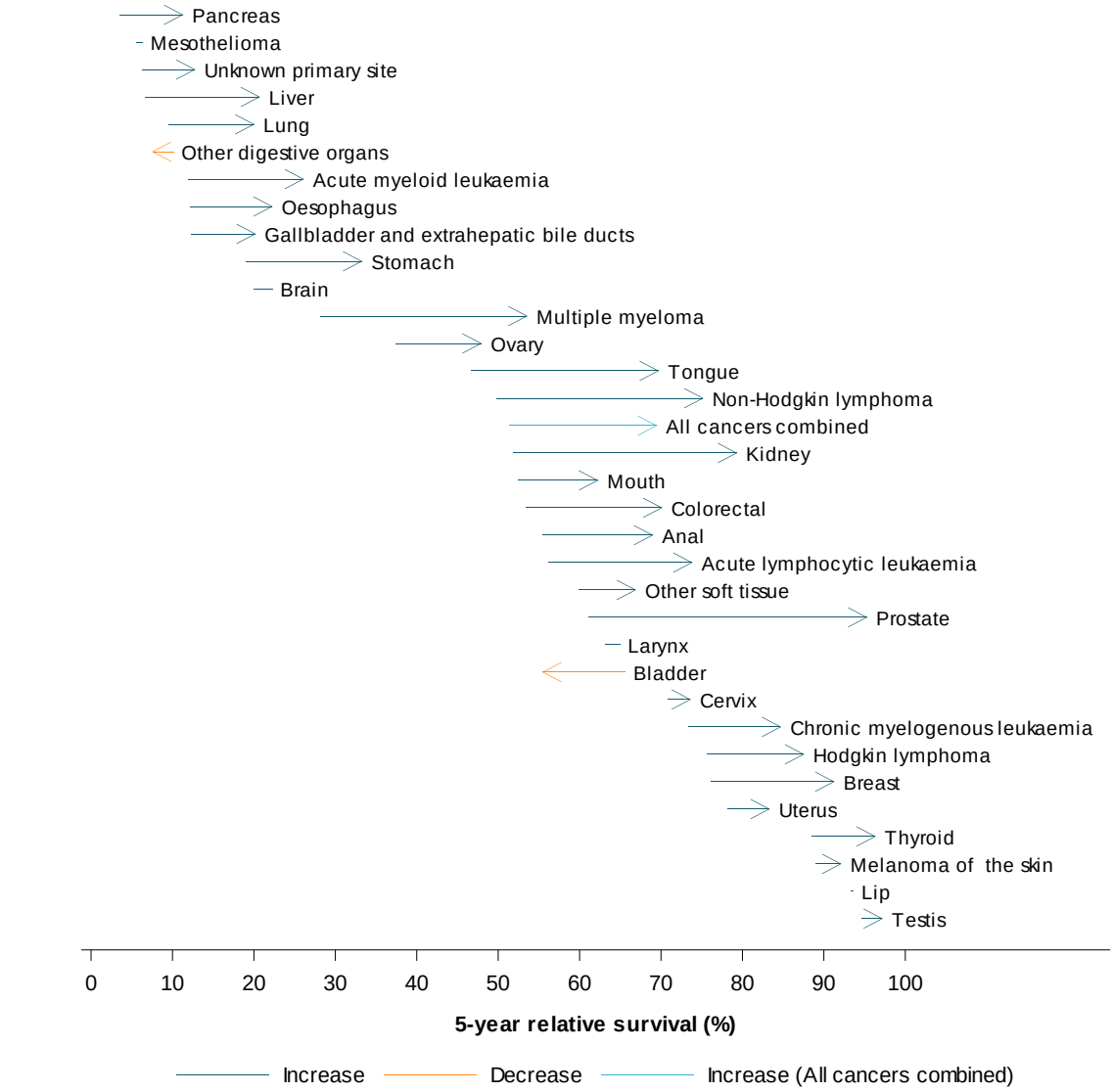
Low survival cancers

In this report, a low survival cancer is defined as a cancer where the 5-year relative survival rate is 30% or less. In the period 1988–1992, pancreatic cancer, mesothelioma, cancer of unknown primary site, liver cancer, lung cancer, cancer of other and ill-defined digestive organs, acute myeloid leukaemia, oesophageal cancer, cancer of the gallbladder and extrahepatic bile ducts, stomach cancer, brain cancer and multiple myeloma were all considered low survival cancers.

In the period 2013–2017, stomach cancer and multiple myeloma were no longer considered low survival cancers; multiple myeloma 5-year relative survival increased from 28% to 54% over this time while stomach cancer 5-year relative survival increased from 19% to 34% (Figure 7.5).

Most of the cancers that were low survival in 1982 recorded improved 5-year relative survival to some extent during this time, although survival for brain cancer and mesothelioma remained relatively unchanged (online Table S7.5). However, note that the 5-year age-adjusted relative survival for both of these cancers did show improvements over time. Age-adjusted survival (see description in the ‘Age-adjusted survival’ section above) shows that brain cancer survival increased from 11% in 1988–1992 to 22% in 2013–2017 and mesothelioma survival increased from 3% to 6.4% over the same period (AIHW 2021f).

Figure 7.5: Survival trends for selected cancers, between 1988–1992 and 2013–2017



Notes

1. Arrow positions indicate survival estimates and arrow lengths indicate the change in survival between the periods 1988–1992 and 2013–2017.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
3. Ovarian cancer includes serous carcinomas of the fallopian tube.
4. Data for this figure are in online Table S7.5.

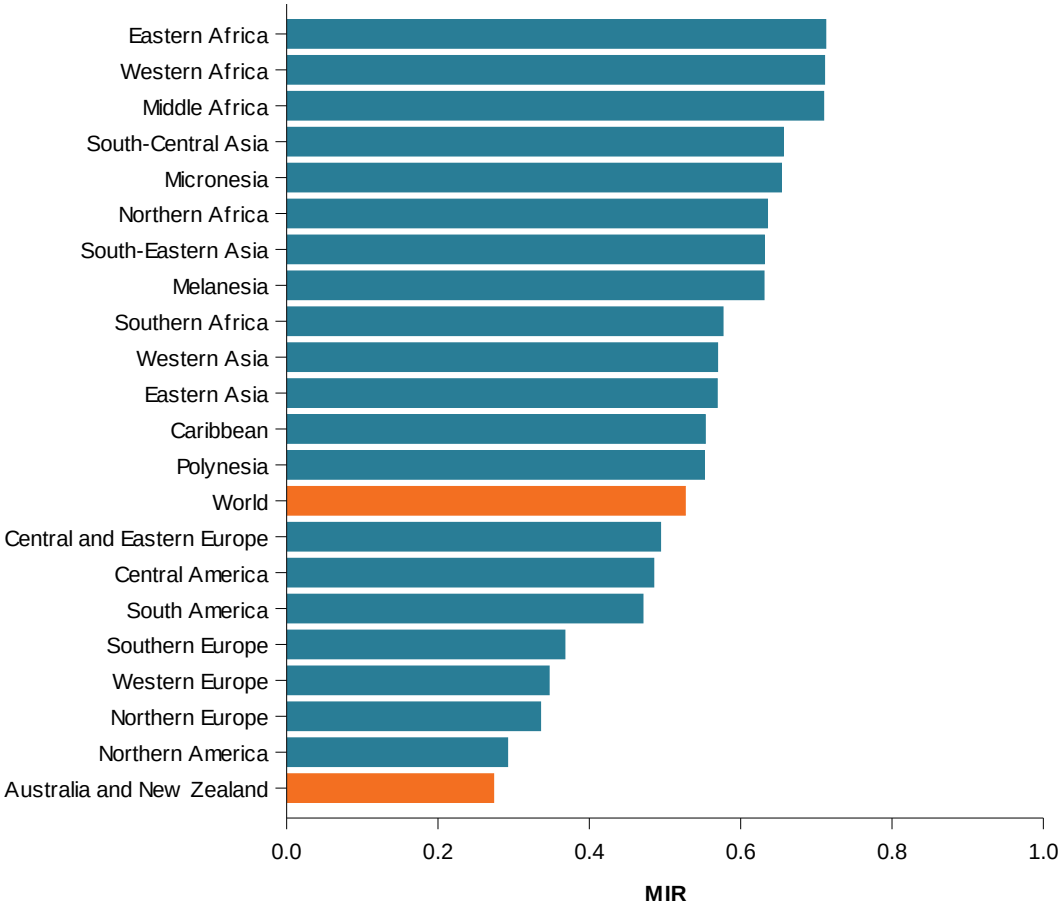
Source: AIHW ACD 2017.

International comparisons

Although more rudimentary than relative survival estimates, the mortality-to-incidence ratio (MIR) is used in this report to measure survival in the international context because it enables comparisons between more countries or regions. This ratio describes how many deaths there were in a particular year due to a particular disease, relative to the number of new cases diagnosed that year (using age-standardised data). An MIR is a number between 0 and 1, with 0 indicating that no-one ever died of the cancer and 1 that everyone died from the cancer. Therefore, low MIR values indicate longer survival, while high MIR values indicate shorter survival.

For this report, data for international comparisons were sourced from the International Agency for Research on Cancer (IARC) 2020 GLOBOCAN database (Global Cancer Observatory (IARC) 2020). The GLOBOCAN estimates are for 2020, and are based on cancer incidence and mortality rates from about 3 to 5 years earlier (see Appendix C). In 2020, the MIR for Australia and New Zealand was 0.3, which was the lowest of all regions compared, suggesting that cancer survival in Australia and New Zealand was higher than in all other regions. By comparison, the MIR for the world was 0.5, indicating that Australia has higher cancer survival than the world average (Figure 7.6), noting that cancer survival will be influenced by the mix of cancers in various countries, which may differ from region to region.

Figure 7.6: International comparison of mortality-to-incidence ratios for all cancers combined, 2020



Notes

1. Cancers coded in the ICD-10 as C00–C97, excluding C44 (non-melanoma skin cancer).
2. The ratios are based on incidence and mortality data which were estimated for 2020 by the IARC and are based on data from about 3 to 5 years earlier. Data are based on the GLOBOCAN 2020 database (Global Cancer Observatory (IARC) 2020).
3. Data for this figure are in online Table S7.6.

Source: Global Cancer Observatory (IARC) 2020.

7.2 Conditional survival

All cancers combined

Conditional survival estimates show the probability of surviving a given number of years provided that an individual has already survived a specified amount of time after diagnosis. Ordinary relative survival shows the probability of survival at diagnosis. Note that conditional survival estimates in this report are conditional *relative* survival estimates and have been derived from relative survival but are referred to simply as 'conditional survival'. For information on relative survival see Appendix F.

For all cancers combined, the prospect of surviving for at least 5 more years after having already survived for 1 or more years increased markedly. At diagnosis, the probability of surviving for at least 5 years was 70%. However, by 1 year after diagnosis, individuals with cancer had an 82% chance of surviving at least 5 more years (Table 7.3).

Table 7.3: Summary of conditional survival from all cancers combined, Australia, 2013–2017

Years already survived	5-year conditional relative survival (%)
At diagnosis	69.7
Already survived 1 year after diagnosis	82.2
Already survived 5 years after diagnosis	92.4

Note: All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).

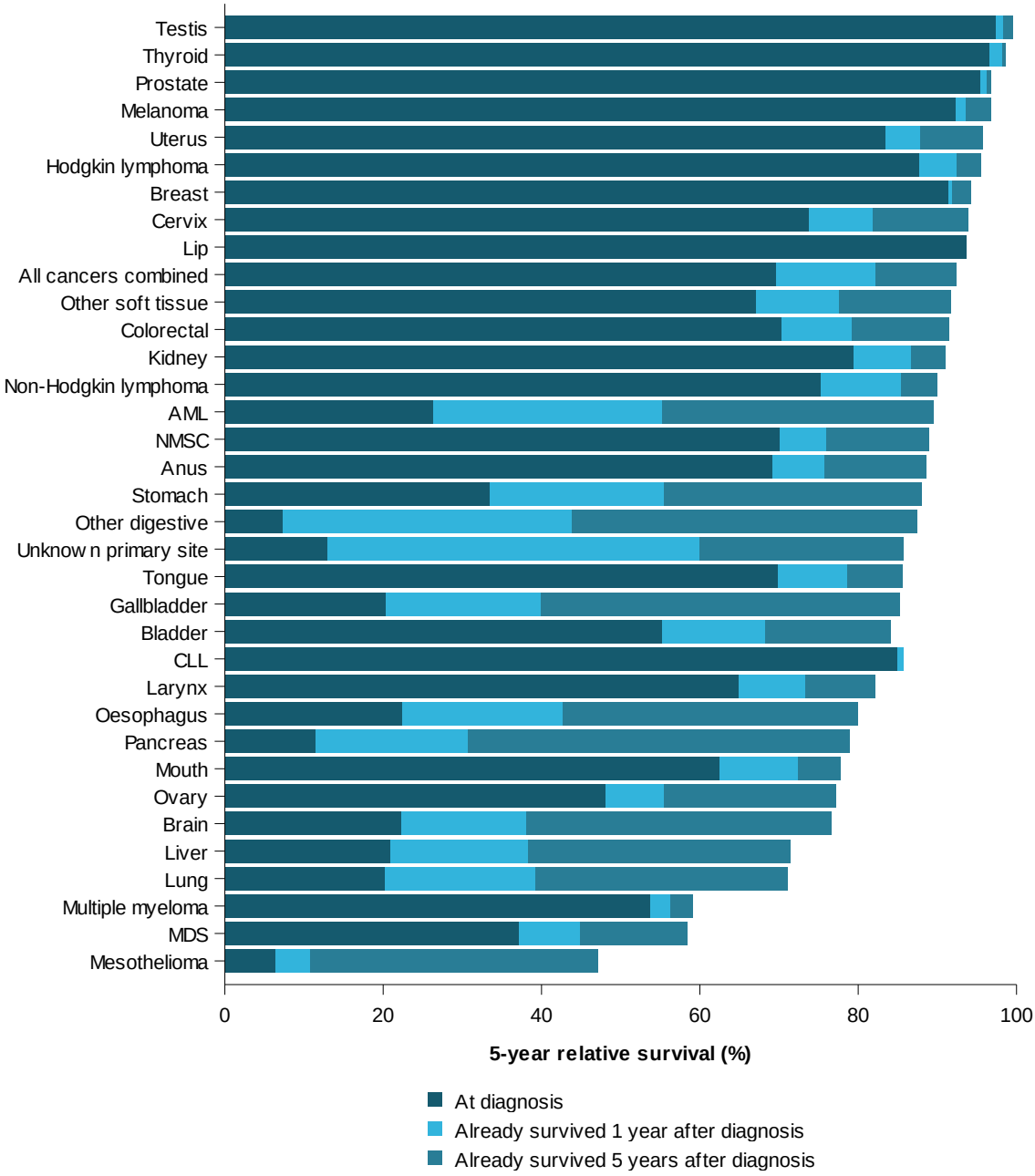
Source: AIHW Australian Cancer Database 2017.

Cancer types

The relationship between conditional survival and survival at diagnosis varied for different cancer types. The following cancers had poor survival prospects at diagnosis and had substantial increases in conditional survival with the number of additional years survived: acute myeloid leukaemia, cancer of the gallbladder and extrahepatic bile ducts, cancer of unknown primary site, and cancer of other and ill-defined digestive organs. All of these had a 5-year relative survival at diagnosis of 30% or less. However, 5 years after diagnosis, survival for an additional 5 years was more than 80%. Brain cancer, liver cancer, lung cancer, oesophageal cancer, and pancreatic cancer also had a 5-year relative survival of 30% or less. The 5-year conditional survival for these cancers, after having survived 5 years, was more than 70%.

The following cancers that had relatively high survival at diagnosis showed little increase in conditional survival at 5 years after diagnosis: testicular cancer, thyroid cancer, prostate cancer, lip cancer, melanoma of the skin and breast cancer in females. All of these had high 5-year relative survival at diagnosis (more than 90%), with only marginal gains in conditional survival after having already survived for 1 or 5 years (Figure 7.7).

Figure 7.7: Five-year survival by number of years already survived, 2013–2017



Notes

1. The 3 columns for each cancer are overlapping, such that the area for 'Already survived 5 years after diagnosis' includes those for 'Already survived 1 year after diagnosis' and 'At diagnosis'.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
3. AML = Acute myeloid leukaemia, NMSC = Non-melanoma skin cancer (rare types), CLL = Chronic lymphocytic leukaemia, MDS = Myelodysplastic syndromes.
4. Data for this figure are in online Table S7.7.

Source: AIHW ACD 2017.

7.3 Survivorship population

The size of the survivorship population is measured using prevalence data. Prevalence refers to the number of people alive who have previously been diagnosed with cancer.

Data for this section are sourced from the 2017 ACD and are presented for limited-duration prevalence with an index date of 31 December 2016. rather than 2017 because 2017 incidence data for NT being unavailable (see Appendix C for details on this data source). Data from the NDI on deaths (from any cause) that occurred to 31 December 2018 were used to determine which people with cancer had died and when this occurred. Note that a person who was diagnosed with 2 separate cancers contributed separately to the prevalence of each cancer. However, this person would contribute only once towards prevalence of all cancers combined. Limited-duration prevalence (1-, 5-, 35-year) for around 70 cancers can be found in *Cancer data in Australia* (AIHW 2021f).

All cancers combined

At the end of 2016, around 747,000 people were alive who had been diagnosed with cancer (excluding basal cell and squamous cell carcinoma of the skin) at some time in the previous 10 years (10-year prevalence). This represented 3.1% of the Australian population. The 35-year prevalence was 1,176,285 people—this suggests that around 5% of the Australian population at the time had been diagnosed with cancer in the previous 35 years and were still alive (Table 7.4). Note that 35-year prevalence has been used because it is the maximum number of years for which prevalence can be calculated using the available data. For 10-year prevalence, males make up about 54% of the prevalence population, but for 35-year prevalence, males and females are both close to 50%.

Table 7.4: Limited-duration prevalence of all cancers combined, by sex, at end of 2016

Sex	Number	% of prevalent cases	% of population
	10-year prevalence		
Males	401,589	53.7	3.3
Females	345,803	46.3	2.8
Persons	**747,392**	**100.0**	**3.1**
	35-year prevalence		
Males	589,951	50.2	4.9
Females	586,334	49.8	4.8
Persons	**1,176,285**	**100.0**	**4.8**

Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Prevalence refers to the number of living people previously diagnosed with cancer, not the number of cancer cases.
3. Based on the Australian population at 31 December 2016.

Source: AIHW Australian Cancer Database 2017.

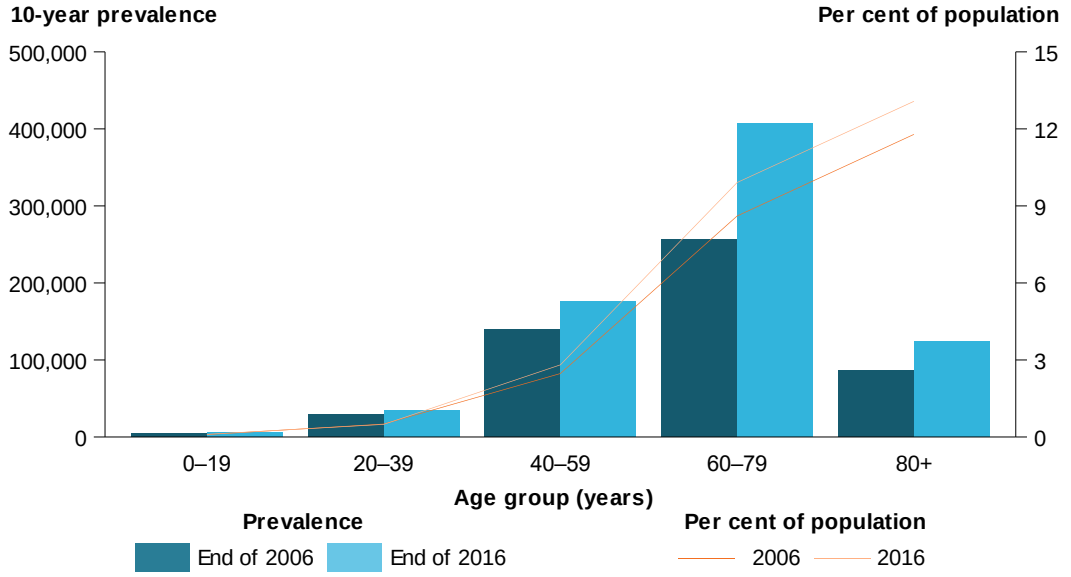
The survivorship population has increased over 10 years

The 10-year prevalence proportion for all cancers combined increased from 2.5% of the population at the end of 2006 to 3.1% at the end of 2016. This increase occurred because a greater proportion of people are being diagnosed with cancer and cancer survival rates have increased. For both males and females aged 40 and over, the 10-year prevalence proportion of the population in 2016 is greater than it was in 2006; for younger age groups there is little difference (online Table S7.8a).

Ten-year prevalence for males has increased from 2.6% of the population at the end of 2006 to 3.3% at the end of 2016; for females the proportion of the population alive and previously diagnosed with cancer increased from 2.4% of the population to 2.8% (online Table S7.8a).

The proportion of the population alive and previously diagnosed with cancer increases with age. For the population aged 80 and over, 13% of people alive at 31 December 2016 had been diagnosed with cancer within the last 10 years whereas the equivalent figure for those under 20 years of age is 0.1% of the population. Compared to 2006, the proportion of people alive and diagnosed with cancer over the previous 10 years increased for all age groups over 40 (Figure 7.8).

Figure 7.8: Comparison of 10-year prevalence of all cancers combined, by age group, at end of 2006 and 2016



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Age refers to the age of a person on the index date of 31 December 2006 and 31 December 2016.
3. Per cent of population is the percentage of people alive and diagnosed with cancer in the previous 10 years as a proportion of the Australian population for the respective age groups.
4. Data for this figure are in online Table S7.8a.

Source: AIHW ACD 2017.

Prostate is the most commonly diagnosed cancer in males while for females it is breast cancer; both cancers have high survival rates that have the potential to strongly influence prevalence change. When these cancers are excluded, 2.1% of males alive at the end of 2016 had been diagnosed with cancer over the last 10 years (for females the equivalent figure was 1.8%). The 10-year prevalence rate of the population for both sexes, and excluding the most commonly diagnosed cancer, increased between 2006 and 2016 (1.7% to 2.1% for males and 1.5% to 1.8% for females) (online Table S7.8b).

Cancer types

The 10-year prevalence rate for most cancers increased between 1997–2006 and 2007–2016 (online Table S7.9). Large increases can be seen for pancreatic cancer (increasing by 87%) and thyroid cancer (increasing by 69%).

For pancreatic cancer, the 10-year prevalence rate has almost doubled from 11 people alive and diagnosed with cancer in the previous 10 years per 100,000 people at the end of 2006, to 20 people alive and diagnosed with cancer in the previous 10 years per 100,000 people at the end of 2016. Over a similar period, the 5-year relative survival rate has more than doubled from 5.3% in 2003–2007 to 12% in 2013–2017. Increasing pancreatic cancer incidence rates and survival rates have led to the increase in pancreatic cancer prevalence rates.

While the 5-year relative survival for thyroid cancer has not changed much since 2003–2007, increasing thyroid cancer diagnosis rates have contributed to the increasing prevalence rate.

Life after cancer

There are more than 1 million people alive in Australia who have had, or are living with cancer. The population who have been diagnosed with cancer continues to increase due to higher incidence, earlier detection, and advancements in treatment and technology, leading to greater survival. People who have survived cancer often face physical, psychological and financial changes as a result of the disease. Some specific changes that people may experience after surviving cancer include:

- trouble chewing and swallowing
- changes in weight and eating habits
- bladder or bowel control issues
- lymphoedema, or swelling
- pain
- menopausal symptoms
- fatigue
- sleep problems
- memory and concentration changes
- anxiety and depression.

(Cancer Australia 2018; Cancer Council Australia 2016a, Cancer Council Australia 2016b; Espie et al. 2008; Ganz et al. 2000; Gielissen et al. 2006; Kroenke et al. 2010; National Cancer Institute 2018).

For some people, these changes can be interrelated, or occur simultaneously, increasing the complexity of the management required.

Experiences after cancer

There is no standard experience of cancer as illustrated by the following quote. ‘It’s interesting that everyone has a different story to tell. I've spoken with women from regional and outback areas who are isolated from the health-care access we take for granted. I've also spoken with women who are still pregnant when they're faced with a cancer diagnosis. Every person is different’— observations of a previous cancer patient now involved with cancer peer support (Cancer Council Australia 2017).

While cancer usually affects older people, younger cancer survivors may experience specific challenges relating to career goals, intimate relationships, depressive symptoms, managing sexual and fertility anxieties and consequences of premature menopause (Zebrack 2011).

A cancer diagnosis can have financial implications, from which psychosocial challenges may arise. This may be through stress directly related to money, and/or indirectly by deprivation of the confidence being employed provides and meaningful connections cultivated in workplaces (Wakefield et al. 2014). However, when looking for work post treatment, some seek roles meaningful to their life overall, instead of financial reward (McGrath et al. 2012).

These factors, and the associated stressors and reduced quality of life for cancer survivors and their family, friends and caregivers, highlight the importance of follow-up health care and of survivorship as part of the cancer control continuum (National Cancer Institute 2015).

8 Number of deaths

Key statistics

In 2021, in Australia, it is estimated that:

- 49,221 people will die from cancer
- more than half (56%) of all cancer-related deaths will be male
- the age-standardised cancer mortality rate will be 149 deaths per 100,000 people, a decrease from 209 per 100,000 people in 1982
- 88% of cancer deaths in males and 86% of cancer deaths in females will occur among those aged 60 and over
- after adjusting for competing mortality, the risk of dying from cancer before the age of 85 will be 1 in 6 for males and 1 in 7 for females
- lung cancer will be the leading cause of death from cancer, followed by colorectal cancer, pancreatic cancer, prostate cancer and breast cancer.

Data for this section are sourced from the NMD (see Appendix A for further information on mortality projection methodology and Appendix C for information on the NMD data source). In this chapter, the number of cancer deaths relates to deaths where the underlying cause was a primary cancer, and includes basal cell and squamous cell carcinoma of the skin.

At the time of writing, 2019 was the latest year for which mortality data was available for all jurisdictions. In this report, projections of cancer deaths and death rates have been presented for subsequent years, including 2021. These projections of cancer incidence are a mathematical extrapolation of past trends, assuming that the same trend will continue into the future, and are intended to illustrate future changes that might reasonably be expected to occur if the past trends were to continue over the projection period. These projections are not forecasts and do not attempt to allow for future changes in cancer detection methods, changes in cancer risk factors or for non-demographic factors beyond the base years of the model which may affect future cancer death rates.

8.1 All cancers combined

Cancer is a leading cause of death within Australia. In 2020, it accounted for 30% of all deaths (ABS 2021a).

In 2021, it is estimated that 49,200 people will die from cancer in Australia, an average of 135 deaths each day.

The age-standardised mortality rate for all cancers combined is estimated to be 149 deaths per 100,000 people in 2021. The mortality rate for males (182 deaths per 100,000 males) is estimated to be 1.5 times that for females (122 deaths per 100,000 females) (Table 8.1).

In 2021, it is estimated that the risk of dying from cancer before the age of 75 will be 1 in 12 for males and 1 in 15 for females, after adjusting for competing mortality (see Appendix E for further information). By the age of 85, the risk is estimated to be 1 in 6 for males and 1 in 7 for females (Table 8.1).

Table 8.1: Estimated mortality for all cancers combined, by sex, 2021

	Males	Females	Persons
Number of deaths	27,600	21,621	49,221
ASR	182.0	122.3	149.1
Percentage of all cancer deaths (%)	56.1	43.9	100.0
Risk to age 75	1 in 12	1 in 15	1 in 13
Risk to age 85	1 in 6	1 in 7	1 in 6

Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
2. ASR refers to the age-standardised rate. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. The percentage of all deaths is based on the number of cancer deaths for each sex divided by the total number of deaths for each sex. Percentages do not sum across the row.
4. The percentage of all cancer deaths is the number of cancer deaths for each sex divided by the total number of cancer deaths. Percentages sum across the row.
5. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.
6. The risk to age 75 and risk to age 85 are adjusted for competing mortality, i.e. they take into account the fact that a person could die before being diagnosed with cancer. See Appendix E for more information.

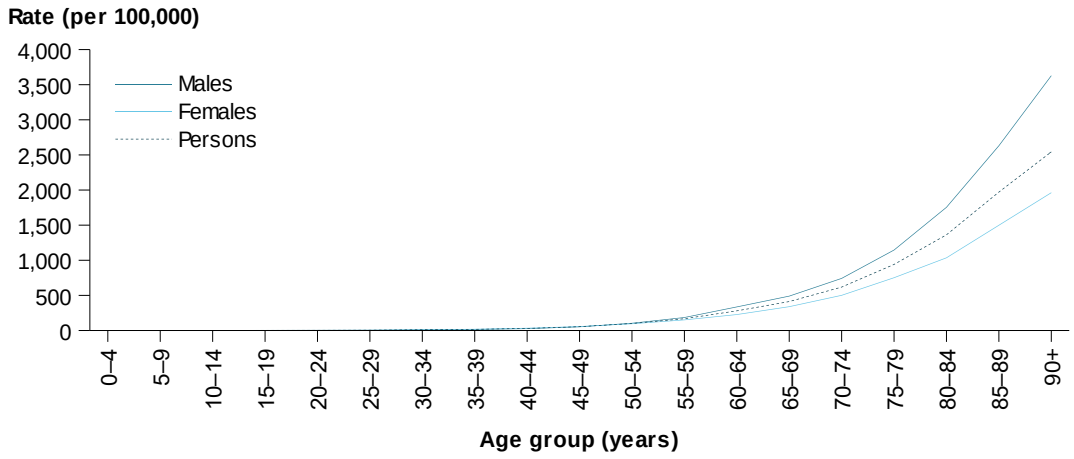
Source: AIHW National Mortality Database.

Mortality by age group and sex

The age-specific mortality rate of all cancers combined generally increases with increasing age (Figure 8.1). In 2021, it is estimated that 88% of all cancer deaths in males and 86% of all cancer deaths in females will occur in people aged 60 and over. Fewer deaths from cancer occur in younger populations; the estimated mortality rate is less than 10 deaths per 100,000 people in all age groups up to and including 25-29 years (online Table S8.1).

From age group 55–59, the mortality rate is estimated to rise more steeply with increasing age for males, to 3,628 deaths per 100,000 males for those aged 90 and over.

Figure 8.1: Estimated mortality for all cancers combined, by age at death and sex, 2021



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
2. Rates refer to the age-specific rate and are expressed per 100,000 population.
3. 2001 data are based on actual data and 2021 data are projections.
4. Data for this figure are in online Table S8.1.

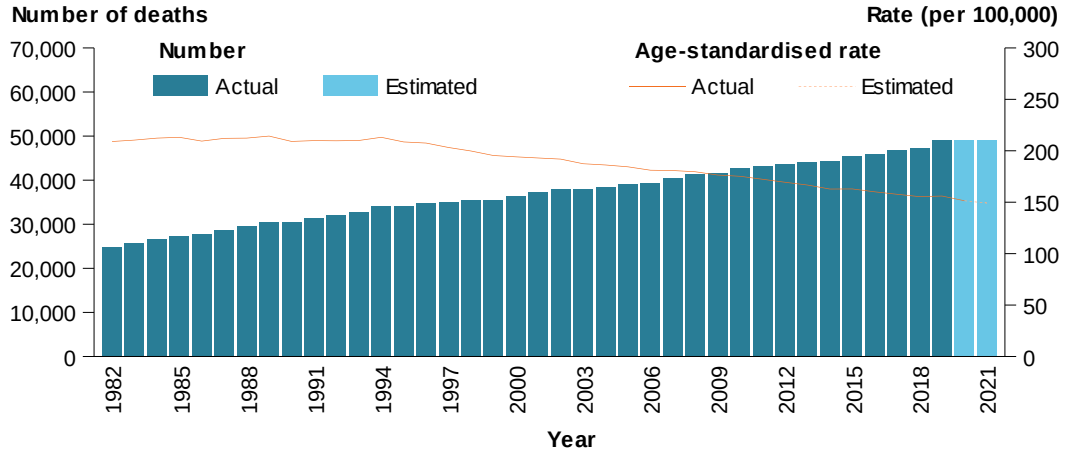
Source: Source: AIHW National Mortality Database.

Numbers of deaths and mortality rates for selected cancers, for 5-year age groups in 2021, are available in online Table 8.2.

Trends

The number of deaths from all cancers combined has risen steadily from 24,900 in 1982 to an estimated 49,200 in 2021 (Figure 8.2). The number of deaths estimated for 2021 will be the largest number reported in any year to date but much of this increase is due to population growth and to the ageing of the population. In contrast, it is estimated that the age-standardised mortality rate for all cancers combined has decreased by 29%, from 209 per 100,000 people in 1982 to 149 deaths per 100,000 people in 2021. A decrease in the mortality rate may be due to various factors, such as earlier detection and improvements in treatment.

Figure 8.2: Trends in mortality for all cancers combined, persons, 1982 to 2021



Notes

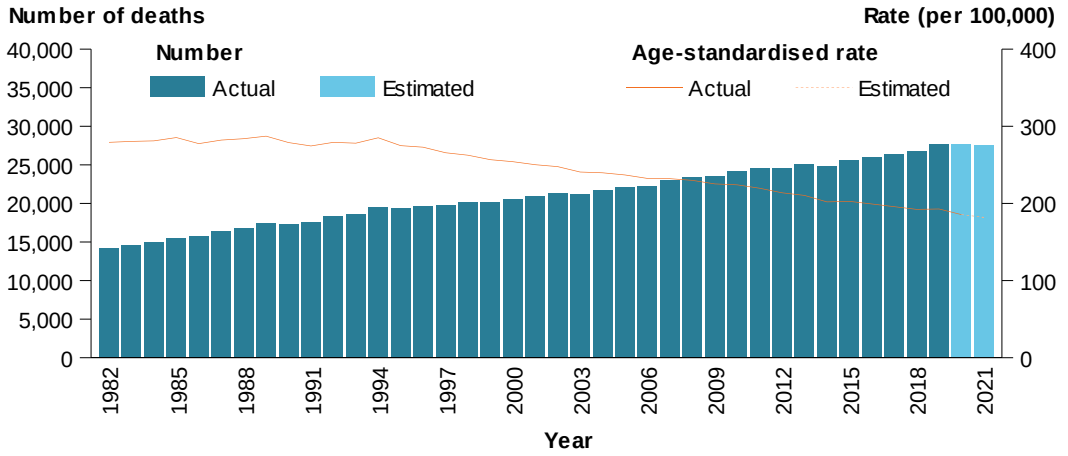
1. Deaths registered in 2017 and earlier are based on the final version of cause of death data; deaths registered in 2018 and 2019 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Actual mortality data from 1982 to 2018 are based on the year of *occurrence* of the death, and data for 2019 are based on the year of *registration* of the death (see Appendix C).
3. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
4. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: Data for this figure are in online Table S8.3.

Cancer mortality rate for males continues to fall

For males, the age-standardised mortality rate reached a peak of 287 deaths per 100,000 males in 1989 and the rate is estimated to have decreased by 37% to 182 deaths per 100,000 males in 2021 (Figure 8.3). The decrease over time for males can be largely attributed to declines in mortality rates for lung cancer, colorectal cancer, stomach cancer and prostate cancer, but many cancers contribute to the overall rate reduction to some extent.

Figure 8.3: Trends in mortality for all cancers combined, males, 1982–2021



Notes

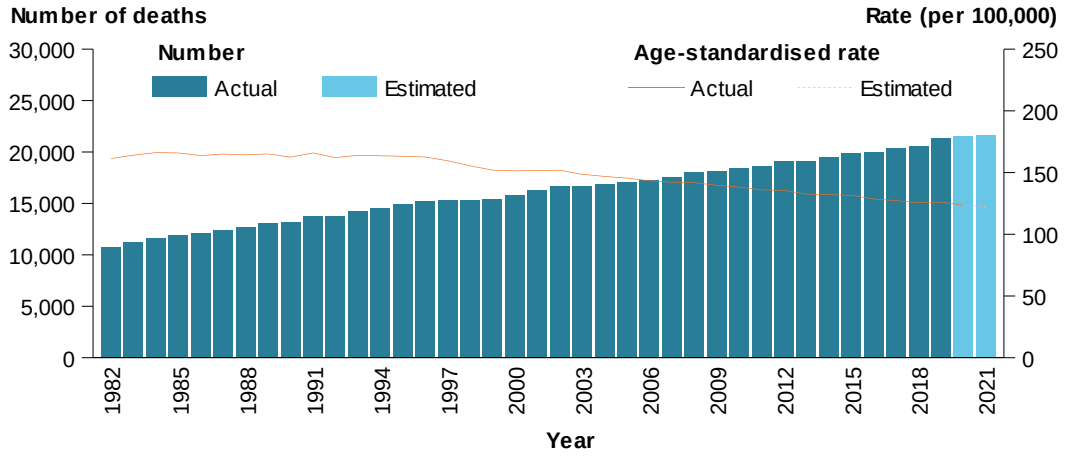
1. Deaths registered in 2017 and earlier are based on the final version of cause of death data; deaths registered in 2018 and 2019 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Actual mortality data from 1982 to 2018 are based on the year of occurrence of the death, and data for 2019 are based on the year of registration of the death (see Appendix C).
3. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
4. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: Data for this figure are in online Table S8.3.

Colorectal and breast cancers contribute to decreases in female mortality rates for all cancers combined

The cancer age-standardised mortality rate was consistently lower for females than males between 1982 and 2019, and is estimated to be lower in 2020 and 2021. The age-standardised mortality rate for females remained fairly steady from 1982 to 1996, before falling by 25% from 163 deaths per 100,000 females in 1996 to an estimated 122 per 100,000 females in 2021 (Figure 8.4). This decrease can be largely attributed to the decline in the mortality rates of colorectal cancer, breast cancer and stomach cancer but, similar to male trends, many different cancers contributed to the reduction of age-standardised mortality rates.

Figure 8.4: Trends in mortality for all cancers combined, females, 1982–2021



Notes

1. Deaths registered in 2017 and earlier are based on the final version of cause of death data; deaths registered in 2018 and 2019 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Actual mortality data from 1982 to 2018 are based on the year of *occurrence* of the death, and data for 2019 are based on the year of *registration* of the death (see Appendix C).
3. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
4. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: Data for this figure are in online Table S8.3.

8.2 How the most common causes of death from cancer have changed over 20 years

This section focuses on changes in the most common cause of death from cancer to explore how cancer mortality rates have changed over 20 years; mortality trends by 20-year age groups are discussed.

The focal point of data presented is limited to persons for practical reasons. Cancer mortality rates for the 20 most common causes of death from cancer by sex and 20-year age groups from 2001 to 2021 are available in the supplementary tables.

Data for all selected cancers and all years from 2001 to 2021 is available by sex and 20 year age group in online table S8.4.

Changes in cancer mortality rates in all ages combined

Lung cancer is estimated to be the leading cause of cancer death in 2021 (8,693 deaths), as it was in 2001 (7,049 deaths). The age-standardised mortality rate for lung cancer is estimated to be 27 deaths per 100,000 people in 2021, compared with 37 deaths per 100,000 people in 2001. After adjusting for competing mortality, the estimated risk of death from lung cancer before the age of 85 is 1 in 33 in 2021, compared with 1 in 25 in 2001 (Table 8.2). See Appendix E for information about risk adjusted for competing mortality.

For most of the cancer types ranked in the top 10 in 2021 the age-standardised rates are estimated to have decreased since 2001, except for liver cancer and pancreatic cancer. Between 2001 and 2021, the age-standardised mortality rates for liver cancer have almost doubled from 4.0 to an estimated 7.4 deaths per 100,000 people, whereas rates for pancreatic cancer increased slightly from 9.4 to an estimated 10.3 deaths per 100,000 people.

Table 8.2: Estimated 10 most common causes of death from cancer in 2021, all persons, 2001 and 2021

	2001				2021			
Cancer site/type (ICD-10 codes)	**Deaths**	**ASR**	**Risk to age 85**	**Ranking**	**Deaths**	**ASR**	**Risk to age 85**	**Ranking**
Lung cancer (C33–C34)	7,049	36.5	1 in 25	1	8,693	26.5	1 in 33	1
Colorectal cancer (C18–C20, C26.0)	4,965	25.7	1 in 39	2	5,295	16.0	1 in 64	2
Pancreatic cancer (C25)	1,811	9.4	1 in 105	6	3,391	10.3	1 in 88	3
Prostate cancer (C61)	2,718	14.1	. .	3	3,323	9.5	. .	4
Breast cancer(C50)	2,620	13.6	1 in 80	4	3,138	9.8	1 in 104	5
Cancer of unknown primary site (C77–C80, C97)	2,194	11.4	1 in 93	5	2,556	7.5	1 in 138	6
Liver cancer (C22)	778	4.0	1 in 245	15	2,424	7.4	1 in 120	7
Non-Hodgkin lymphoma (C82–C86)	1,497	7.8	1 in 130	7	1,680	5.0	1 in 189	8
Brain cancer (C71)	1,064	5.5	1 in 187	10	1,528	5.0	1 in 191	9
Oesophageal cancer (C15)	1,040	5.4	1 in 188	11	1,400	4.3	1 in 210	10
All cancers combined	**37,222**	**193.0**	**1 in 5**	**. .**	**49,221**	**149.1**	**1 in 6**	**. .**

Notes

1. ASR refers to the age-standardised rate. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. The risk to age 85 is adjusted for competing mortality; that is, it takes into account the fact that a person could die before being diagnosed with cancer. See Appendix E for more information.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
4. Data are presented for persons to gauge the cancer's impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: prostate cancer – 36 deaths per 100,000 males in 2001 and 22 deaths per 100,000 males in 2021; breast cancer – 25 deaths per 100,000 females in 2001 and 18 deaths per 100,000 females in 2021.
5. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.

Source: AIHW National Mortality Database.

Changes in cancer mortality rates for people aged 0–19

Overall, age-specific mortality rates for the 0 to 19 age group decreased from 3.1 deaths per 100,000 people in 2001 to 2.1 deaths per 100,000 people in 2021. The 10 most common causes of death from cancer are estimated to account for 90% of all deaths from cancer for people aged 0–19 in 2021.

Brain cancer has been estimated to cause more deaths in people aged 0–19 than any other cancer in both 2001 and 2021. This disease is estimated to account for around 1 in 3 of the 134 cancer-related deaths for these ages in 2021. The age-specific mortality rate for brain cancer is estimated to be 0.6 deaths per 100,000 people in this age group in 2021, compared with 0.9 per 100,000 people in 2001 (Table 8.3).

Brain cancer remains the leading cause of cancer death for this age group. Cancer mortality rates for this age group are very low and rankings between years can be volatile. The decrease in brain cancer age-specific mortality rates for 0 to 19 year olds reflects a trend for rates to decline, as does the decrease in acute lymphoblastic leukaemia (ALL) age-specific mortality rates from 0.5 to an estimated 0.2 per 100,000 people, and non-Hodgkin lymphoma age-specific mortality rates from 0.2 to an estimated 0.1 deaths per 100,000 people (Table 8.3).

Table 8.3: Estimated 10 most common causes of death for cancer in 2021, persons aged 0–19, 2001 and 2021

Cancer site/type (ICD-10 codes)	2001			2021		
	Deaths	Rate	Ranking	Deaths	Rate	Ranking
Brain cancer (C71)	49	0.9	1	42	0.6	1
Cancer of other soft tissue (C47, C49)	13	0.2	4	17	0.3	2
Bone cancer (C40–C41)	8	0.2	7	16	0.2	3
Acute myeloid leukaemia (AML) (C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5)	14	0.3	3	12	0.2	4
Acute lymphoblastic leukaemia (ALL) (C91.0)	28	0.5	2	11	0.2	5
Cancer of other endocrine glands (C74–C75 excluding C75.1–C75.3)	9	0.2	6	8	0.1	6
Other and unspecified leukaemia (C94.3, C95)	3	0.1	9	5	0.1	7
Other central nervous system cancers (C70, C72, C75.1–C75.3)	3	0.1	9	4	0.1	8
Non-Hodgkin lymphoma (C82–C86)	12	0.2	5	4	0.1	9
Liver cancer (C22)	2	0.0	13	2	0.0	10
All cancers combined	**166**	**3.1**	**. .**	**134**	**2.1**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
3. 2021 rates and counts are based on projections.
4. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.

Source: AIHW National Mortality Database.

Changes in cancer mortality rates for people aged 20–39

Overall, age-specific mortality rates for the 20 to 39 age group decreased from 12.5 deaths per 100,000 people in 2001 to an estimated 8.9 deaths per 100,000 people in 2021. The 10 most common causes of death from cancer are estimated to account for 70% of all cancer deaths in people aged 20–39 in 2021.

Colorectal cancer is estimated to be the leading cause of cancer death in people aged 20–39 in 2021. Of those leading cancers considered in Table 8.4, colorectal cancer is the only cancer for which age-specific mortality rates are estimated to have increased (an estimated 1.6 deaths per 100,000 people in this age group in 2021, compared with 1.2 per 100,000 people in 2001) (Table 8.4).

The age-specific cancer mortality rate for people aged 20–39 decreased. Melanoma of the skin and breast cancer contributed substantially to the overall reduction (Table 8.4).

ALL and non-Hodgkin lymphoma age-specific mortality rates for people aged 20–39 also decreased between 2001 and 2021. Both were amongst the 10 leading causes of death from cancer for this age group in 2001, but with lower age-specific mortality rates in 2021 they no longer appear amongst the 10 leading causes of death from cancer for this age group (both ALL and non-Hodgkin lymphoma age-specific mortality rates for people aged 20–39 decreased from 0.6 deaths per 100,000 people in 2001 to 0.2 estimated deaths per 100,000 people in 2021) (online Table S8.4).

Table 8.4: Estimated 10 most common causes of death for cancer in 2021, persons aged 20–39, 2001 and 2021

Cancer site/type	2001			2021		
(ICD-10 codes)	Deaths	Rate	Ranking	Deaths	Rate	Ranking
Colorectal cancer (C18–C20, C26.0)	66	1.2	4	120	1.6	1
Brain cancer(C71)	77	1.4	2	96	1.3	2
Breast cancer (C50)	89	1.6	1	80	1.0	3
Lung cancer (C33–C34)	34	0.6	5	29	0.4	4
Stomach cancer (C16)	28	0.5	9	28	0.4	5
Cancer of other soft tissue (C47, C49)	24	0.4	10	28	0.4	6
Cervical cancer (C53)	23	0.4	11	28	0.4	7
Cancer of unknown primary site (C77–C80, C97)	32	0.6	7	25	0.3	8
Bone cancer (C40–C41)	15	0.3	15	22	0.3	9
Melanoma of the skin (C43)	71	1.3	3	22	0.3	10
All cancers combined	**705**	**12.5**	**. .**	**680**	**8.9**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. 2021 counts and rates are projections.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
4. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent females rates for these cancers: breast cancer – 3 deaths per 100,000 females in 2001 and 2 deaths per 100,000 females in 2021; cervical cancer – 1 death per 100,000 females in 2001 and 1 death per 100,000 females in 2021.
5. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.

Source: AIHW National Mortality Database.

Changes in cancer mortality rates for people aged 40–59

Overall, age-specific mortality rates for the 40 to 59 age group decreased from 118 deaths per 100,000 people in 2001 to an estimated 86 deaths per 100,000 people in 2021. In 2021, the 10 most common causes of death from cancer are estimated to account for 74% of all cancer deaths for people aged 40–59.

Even though lung cancer mortality rates are reducing, lung cancer is estimated to remain the leading cause of cancer death in people aged 40–59 in 2021 (944 deaths). The age-specific mortality rate for lung cancer is estimated to be 15 deaths per 100,000 people in this age group in 2021, a decrease of 31% from 2001 (21 deaths per 100,000 people) (Table 8.5).

Except for liver cancer and pancreatic cancer, age-specific mortality rates for the leading 10 causes of death from cancer for people aged 40–59 are estimated to have decreased since 2001. The age-specific mortality rate for liver cancer is estimated to be 5.6 deaths per 100,000 people in 2021, an increase of 75% from 2001 (3.2 deaths per 100,000 people). The age-specific mortality rate for pancreatic cancer is estimated to have increased slightly from 5.2 to an estimated 5.7 deaths per 100,000 people between 2001 and 2021.

The three leading causes of death from cancer for people age 40–59 remain lung, breast and colorectal cancer, but mortality rates have decreased strongly for each between 2001 and 2021 (Table 8.5).

Table 8.5: Estimated 10 most common causes of death for cancer in 2021, persons aged 40–59, 2001 and 2021

	2001			2021		
Cancer site/type (ICD-10 codes)	**Deaths**	**Rate**	**Ranking**	**Deaths**	**Rate**	**Ranking**
Lung cancer (C33–C34)	1,090	21.3	1	944	14.6	1
Breast cancer (C50)	836	16.3	2	670	10.4	2
Colorectal cancer (C18–C20, C26.0)	730	14.3	3	636	9.9	3
Brain cancer (C71)	331	6.5	4	380	5.9	4
Pancreatic cancer (C25)	264	5.2	6	370	5.7	5
Liver cancer (C22)	162	3.2	12	364	5.6	6
Cancer of unknown primary site (C77–C80, C97)	259	5.1	7	242	3.8	7
Oesophageal cancer (C15)	184	3.6	10	171	2.7	8
Stomach cancer (C16)	199	3.9	9	163	2.5	9
Melanoma of the skin (C43)	266	5.2	5	158	2.5	10
All cancers combined	**6,046**	**118.2**	**. .**	**5,559**	**86.2**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. 2021 counts and rates are projections.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
4. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer, the 'person' rates strongly understate the rate/impact for females where the cancer more commonly occurs. The equivalent females rates for breast cancer are 33 deaths per 100,000 females in 2001 and 20 deaths per 100,000 females in 2021.
5. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.

Source: AIHW National Mortality Database.

Changes in cancer mortality rates for people aged 60–79

Overall, age-specific mortality rates for the 60 to 79 age group decreased considerably from 747 deaths per 100,000 people in 2001 to an estimated 512 deaths per 100,000 people in 2021. The 10 most common causes of death from cancer are estimated to account for 70% of all cancer deaths in people aged 60–79 in 2021.

Lung cancer is estimated to be the leading cause of cancer death in people aged 60–79 in 2021 (5,122 deaths). The age-specific mortality rate for lung cancer is estimated to be 110 deaths per 100,000 people in this age group in 2021, a decrease of 35% from 2001 (169 deaths per 100,000 people) (Table 8.6).

Except for liver cancer and pancreatic cancer, the age-specific mortality rates for the top 10 cancer types in 2021 for people aged 60–79, are estimated to have decreased from 2001. The age-specific mortality rate for liver cancer is estimated to be 30 deaths per 100,000 people in 2021, an increase of 77% from 2001 (17 deaths per 100,000). The age-specific mortality rate for pancreatic cancer is estimated to have increased slightly from 37 in 2001 to 40 deaths per 100,000 people in 2021 (Table 8.6).

The age-specific mortality rate for colorectal cancer is estimated to have more than halved from 100 deaths per 100,000 people in 2001 to an estimated 47 deaths per 100,000 people in 2021. Age-specific mortality rates for prostate cancer and non-Hodgkin lymphoma are estimated to have almost halved in 2021 compared with 2001 (Table 8.6).

Table 8.6: Estimated 10 most common causes of death for cancer in 2021, persons aged 60–79, 2001 and 2021

Cancer site/type	2001			2021		
(ICD-10 codes)	Deaths	Rate	Ranking	Deaths	Rate	Ranking
Lung cancer (C33–C34)	4,459	168.6	1	5,122	110.1	1
Colorectal cancer (C18–C20, C26.0)	2,639	99.8	2	2,192	47.1	2
Pancreatic cancer (C25)	983	37.2	6	1,856	39.9	3
Liver cancer (C22)	445	16.8	14	1,380	29.7	4
Breast cancer (C50)	1,084	41.0	5	1,374	29.5	5
Prostate cancer (C61)	1,352	51.1	3	1,270	27.3	6
Cancer of unknown primary site (C77–C80, C97)	1,126	42.6	4	1,055	22.7	7
Oesophageal cancer (C15)	561	21.2	9	812	17.4	8
Brain cancer (C71)	505	19.1	11	768	16.5	9
Non-Hodgkin lymphoma (C82–C86)	787	29.8	7	761	16.4	10
All cancers combined	**19,742**	**746.6**	**. .**	**23,838**	**512.2**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. 2021 rates and counts are projections.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
4. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: breast cancer – 78 deaths per 100,000 females in 2001 and 57 deaths per 100,000 females in 2021; prostate cancer – 106 deaths per 100,000 males in 2001 and 56 deaths per 100,000 males in 2021.
5. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.

Source: AIHW National Mortality Database.

Changes in cancer mortality rates for people aged 80 and over

Overall, age-specific mortality rates for people aged 80 and over decreased slightly from 1,786 deaths per 100,000 people in 2001 to an estimated 1,775 deaths per 100,000 people in 2021. The 10 most common causes of death from cancer are estimated to account for 68% of all cancer deaths in people aged 80 and over in 2021.

Decreasing age-specific rates for colorectal cancer (259 to an estimated 219 deaths per 100,000 people) and prostate cancer (216 to an estimated 185 deaths per 100,000 people) contributed greatly to the overall decrease. However, increasing age-specific mortality rates for pancreatic cancer (94 to an estimated 108 deaths per 100,000 people), melanoma of the skin (36 to an estimated 51 deaths per 100,000 people) and liver cancer (26 to an estimated 62 deaths per 100,000 people) offset the overall decrease in cancer mortality rates. In this age group, liver cancer age-specific mortality rates more than doubled (26 deaths per 100,000 people to an estimated 62 deaths per 100,000 people) (Table 8.7).

Lung cancer is estimated to be the leading cause of cancer death in people aged 80 and over in 2021 (2,597 deaths). In this age group, the age-specific mortality rate for lung cancer is estimated to be 243 deaths per 100,000 people in 2021, which is similar to the rate in 2001 (247 deaths per 100,000 people) (Table 8.7).

The breast cancer mortality rates provided in Table 8.7 provide an accurate reflection of change in regard to the impact upon the Australian population aged 80 and over. The table provides person rates to allow better national comparability of cancers.

However, while a greater proportion of this age group have been female, this is changing over time as the proportion who are male increases. It is this increasing proportion of males that is playing a large part in driving the decrease in breast cancer mortality rates for persons (in 2001, 35% of the population aged 80 and over were male, but by 2021 the proportion had increased to 42%). As highlighted in the notes for Table 8.7, breast cancer age-specific mortality rates for females aged 80 and over increased slightly between 2001 and 2021 (158 deaths per 100,000 females in 2001 compared with 162 deaths per 100,000 females in 2021).

Except for liver cancer, pancreatic cancer and melanoma of the skin, the mortality rates for the top 10 cancer types in 2021 are estimated to have decreased since 2001.

Table 8.7: Estimated 10 most common causes of death for cancer in 2021, persons aged 80 and over, 2021 and 2001

Cancer site/type	2001			2021		
(ICD-10 codes)	Deaths	Rate	Ranking	Deaths	Rate	Ranking
Lung cancer (C33–C34)	1,462	247.3	2	2,597	242.5	1
Colorectal cancer (C18–C20, C26.0)	1,529	258.6	1	2,347	219.2	2
Prostate cancer (C61)	1,279	216.3	3	1,976	184.5	3
Cancer of unknown primary site (C77–C80, C97)	773	130.7	4	1,233	115.2	4
Pancreatic cancer (C25)	555	93.9	6	1,152	107.6	5
Breast cancer (C50)	611	103.3	5	1,014	94.7	6
Non-Hodgkin lymphoma (C82–C86)	444	75.1	7	792	74.0	7
Liver cancer (C22)	152	25.7	18	660	61.6	8
Bladder cancer (C67)	402	68.0	8	653	61.0	9
Melanoma of the skin (C43)	214	36.2	12	542	50.6	10
All cancers combined	**10,560**	**1,786.0**	**. .**	**19,010**	**1,775.4**	**. .**

Notes

1. Rates refer to the age-specific rate and are expressed per 100,000 population.
2. 2021 rates and counts are projections.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5.
4. Data are presented for persons to gauge the cancers impact upon the population. For breast cancer and sex specific cancers, the 'person' rates strongly understate the rate/impact for the sex where the cancer more commonly (or solely) occurs. The following rates provide the equivalent male/female rates for these cancers: prostate cancer – 613 deaths per 100,000 males in 2001 and 436 deaths per 100,000 males in 2021; breast cancer – 158 deaths per 100,000 females in 2001 and 162 deaths per 100,000 females in 2021.
5. The 2021 estimates are based on 2010–2019 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.

Source: AIHW National Mortality Database.

9 Rare and less common cancers

Key statistics

- In 2017, of the cases diagnosed, 17% (1 in 6) were rare cancers, 13% were less common cancers and 70% were common cancers.
- In the period 2013–2017, the 5-year relative survival rate for the rare cancer group was 59%, for the less common cancer group it was 47% and for common cancer group it was 77%.
- Rare and less common cancers accounted for close to 42% of deaths from cancer.

Box 9.1: What is a rare or less common cancer?

Rare Cancers Australia defines a cancer to be 'rare' if it has an incidence rate of less than 6 cases per 100,000 people per year. If the incidence rate is greater than or equal to 6 cases per 100,000 people per year but less than 12 cases per 100,000 people per year, the cancer is called 'less common'. 'Common' cancers are defined as those with an incidence rate of 12 or more cases per 100,000 people per year.

In this chapter, a cancer's rarity is measured by using its age-standardised incidence rate for 2017. For example, in 2017 liver cancer has an age-standardised incidence rate of 7.6 cases per 100,000 people and is therefore a less common cancer. Classification of rarity may change over time; for example, until 2007 liver cancer had age-standardised incidence rates below 6 cases per 100,000 people and would have been categorised as a rare cancer in the years before 2007.

The rarity group classification used in this report generally relies on cancer sites or types and groups using ICD-10 codes. However, the rates cited in this report would change if histology coding was used to define rarity. For example, for this report, breast cancer is considered a common cancer. However, if histology were considered, each different type of breast cancer (for example, invasive ductal carcinoma, invasive lobular carcinoma or inflammatory carcinoma) would be classified for rarity based on the incidence rates.

Incidence and survival data in this chapter are sourced from the 2017 ACD and mortality data are sourced from the NMD.

Rare Cancer Europe notes several of the specific challenges presented by rare cancers. These include:

- late or incorrect diagnosis
- lack of access to appropriate therapies and clinical expertise
- very limited number of clinical studies due to the small number of patients
- lack of interest in developing new therapies due to limitations in the market (RCE 2021).

Personal impacts that cancer has on individuals are discussed in Chapter 7, but the following excerpt provides a small insight relevant to rare cancers:

'Participating in support groups, including Rare Cancers Australia's Sarcoma Support Group, has been great. It was through one online session that I met a person with the same diagnosis as me, an amazing feeling when you have such a rare condition. Support groups

are a fantastic way to connect with people and I've found it valuable to listen to other people's experiences, the difference in care that they receive, and it's always interesting to hear the carer's point of view.' (RCA 2021).

9.1 Incidence by cancer rarity

Some types of rare cancers may be diagnosed in only a handful of people each year, while there may be close to 500 cases for other types (for example, anal cancer).

Individually, less common cancers are more numerous than rare cancers. For example, in 2017, around 1,800 cases of brain cancer and around 2,800 cases of bladder cancer were diagnosed.

Individually, common cancers are more numerous than less common cancers. For example, in 2017, there were 3,700 cases of pancreatic cancer and 20,700 cases of prostate cancer.

Table 9.1 summarises incidence for each of these cancer groupings. Online Table S9.1 contains a full list of cancers in each rarity grouping, as well as incidence and mortality rates.

Rare cancers are individually rare, but collectively account for around 1 in 6, or 17% of cases diagnosed in 2017. Less common cancers accounted for around 13% of cancer cases in 2017 while common cancers accounted for around 70% of cases.

Table 9.1: Incidence of rare, less common and common cancers, and all cancers combined, persons, Australia, 2017

	Rare cancers	Less common cancers	Common cancers	All cancers combined
Number of cases	23,816	18,443	97,158	139,413
Age-standardised rate	85.3	63.9	342.9	492.1
Percentage of all cancer cases	17.1	13.2	69.7	100.0

Notes

1. Rare cancers are those with age-standardised rates of less than 6 cases per 100,000 people. Less common cancers are those with age-standardised rates of at least 6 and less than 12 cases per 100,000 people. Common cancers are those with age-standardised rates of 12 or more cases per 100,000 people.
2. Individual cancers were grouped based on rarity and the numbers of new cases were summed accordingly. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 people.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
4. The sum of rarity groups may not equal the total for all cancers combined as a result of coding changes for bone cancer. Bone cancer coding relies on histology and this may create overlap.

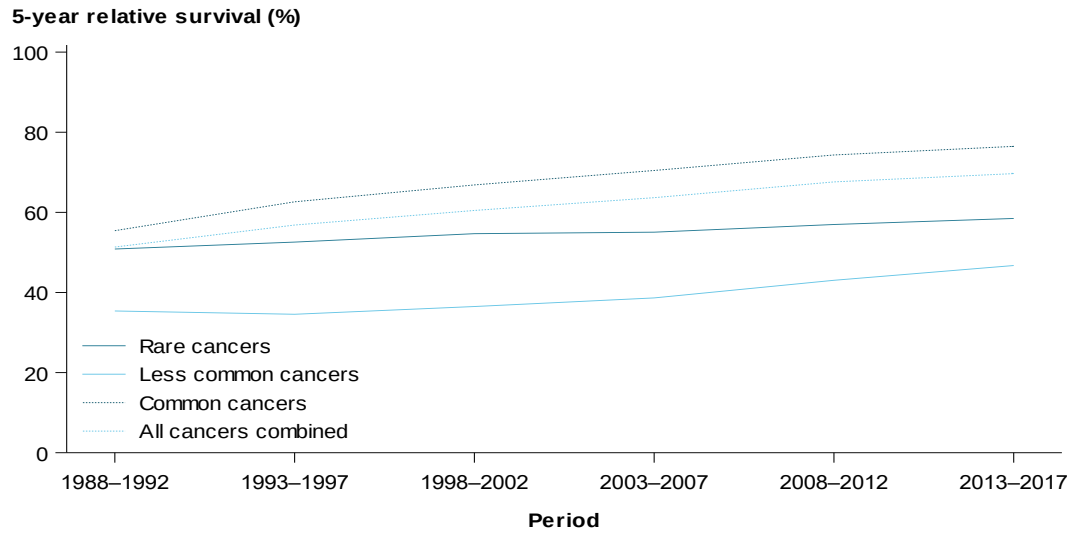
Source: AIHW ACD 2017.

9.2 Survival by cancer rarity

In the period 2013–2017, the 5-year relative survival rate for the rare cancer group was 59%; for the less common cancer group it was 47%; and for common cancer group it was 77% (Figure 9.1). These survival rates provide only a general indication that rare and less common cancers tend to be lower survival cancers, while common cancers include a greater proportion of higher survival cancers.

Between the periods 1988–1992 and 2013–2017, survival improved by 8 percentage points for the rare cancer group, 11 percentage points for the less common cancer group, and by 21 percentage points for the common cancer group (Figure 9.1). These changes provide a general indication that drivers for survival improvement, such as advancements in diagnosis and treatment, have been greatest for the common cancers and lowest for rare cancers.

Figure 9.1: 5-year relative survival by cancer rarity group, 1988–1992 to 2013–2017



Notes

1. Rare cancers are those with age-standardised rates of less than 6 cases per 100,000 people. Less common cancers are those with age-standardised rates of at least 6 and less than 12 cases per 100,000 people. Common cancers are those with age-standardised rates of 12 or more cases per 100,000 people.
2. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44). Rare cancers are found in online Table S9.1.
3. Data for this figure are in online Table S9.2.

Source: AIHW ACD 2017.

Box 9.2: Limitations of the survival by cancer rarity group time series

The cancer rarity survival rate time series compares how cancer survival by rarity groupings changes over time, with rarity of cancer based on whether it is rare, less common or common in 2017. It does not compare the survival rates of rare cancers as classified in each period with the survival rates of those classified as such in other periods as the time series can be greatly affected by the shift of cancers between rarity classifications.

Improvements in survival rates over time for any group of cancers are influenced by improvements in survival for the various cancer types within the group but also by the relative proportions of the cancer types in the group. For example, the proportion of prostate cancers within the common cancers group has increased since the 1980s while that of lung cancers has decreased. As prostate cancer has high survival and lung cancer has low survival, this change in proportions would have some impact on the survival for the group as a whole.

9.3 Mortality by cancer rarity

Thirty per cent of cancers diagnosed in 2017 are considered rare or less common cancers, but these accounted for close to 42% of deaths from cancer in that year (Table 9.2).

Table 9.2: Mortality of rare, less common and common cancers and all cancers combined, persons, Australia, 2017

	Rare cancers	Less common cancers	Common cancers	All cancers combined
Number of deaths	9,497	9,998	27,244	46,739
Age-standardised rate	32.2	33.7	91.7	157.7
Percentage of all cancer deaths	20.3	21.4	58.3	100.0

Notes

1. Individual cancers were grouped based on rarity and the numbers of deaths were summed accordingly. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 people.
2. Rare cancers are those with age-standardised rates of less than 6 cases per 100,000 people. Less common cancers are those with age-standardised rates of at least 6 and less than 12 cases per 100,000 people. Common cancers are those with age-standardised rates of 12 or more cases per 100,000 people.
3. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).

Source: AIHW ACD 2017.

9.4 Different ways to consider cancer by rarity (technical note)

This section describes some of the limitations of the rarity data reported in this chapter and some complexities of cancer rarity reporting.

Age-standardised rates have been used in this report so far in preference to crude rates. For consistency, age-standardised rates have also been used to classify the rarity of cancers. However, this is only one possible metric for considering cancer rarity and, for different reports or purposes, a different metric might be used. Further, more sophisticated cancer reporting would allow a more thorough consideration of cancer rarity.

Rather than using age-standardised rates, crude rates could be used to define cancer rarity. Generally, crude rates and age-standardised rates provide a consistent rarity classification for each cancer. However, if crude rates had been used in this chapter then myelodysplastic syndromes, oesophageal cancer and other cancers of the blood and lymphatic system would be classified as less common rather than rare cancers.

As previously mentioned, cancer rarity may change over time. Since 2003, myelodysplastic syndromes has been classified sometimes as rare and sometimes as a less common cancer when using crude rates as the metric. The age-standardised rates over the same period almost always consider the cancer to be rare. When using a year or period to derive cancer rarity, in situations where cancer incidence rates lie at the boundaries between rarity categories, the actual categorisation for that period may be a subjective question of whether the classification for the year/period used is representative of the rarity classification.

Other cancers of the blood and lymphatic system is a cancer grouping comprising several different cancers. For this group, the 2017 age-standardised rate of 5.7 cases per 100,000 people suggests the cancer to be rare while the crude rate of 6.5 cases per 100,000 people suggests the group to be less common. Irrespective of whether crude or age-standardised rates are used, the rarity would change had each of the individual cancers been individually categorised.

Oesophageal cancer crude rates in 2017 suggest the cancer is less common while age-standardised rates suggest the cancer is rare. It is the only cancer among the 3 considered where the choice of age-standardised or crude rates offers a consistently different rarity categorisation for a single cancer site (considering a single site on the basis of ICD-10 classification).

The decision of whether to use age-standardised rates or crude rates should create only minor differences in reporting and should not change the messages contained in this chapter.

As noted above, the use of general cancer groups (for example, other cancers of the blood and lymphatic system) can affect cancer rarity classification and rates. Similarly, cancer rarity can be considered by cancer site and histology. For example, in 2017, pancreatic cancer is a common cancer (age-standardised rate of 12.5 cases per 100,000 people and crude rate of 14.8 cases per 100,000 people). However, when the different histologies for the pancreas are considered, types of pancreatic cancer include adenocarcinomas, squamous cell carcinomas, acinar cell carcinomas and neuroendocrine carcinomas. If cancer rarity is considered by histologies such as these, cancer rarity classifications in pancreatic cancer reporting will change again.

AIHW is developing and testing cancer site by histology national incidence reporting but this expansive reporting framework is not available at the time of publishing this report. While the framework remains under development, it is clear that if used to report cancer rarity in the future, it would identify a greater number of rare cancers.

Statistics reported in this chapter consider cancer rarity using incidence rates at the person level rather than by sex. It is not unusual for a cancer to have a cancer rarity classification that is not the same for males as it is for females. Breast cancer is the most notable example as the cancer is rare in males but common in females. It may be more appropriate to consider cancer rarity by sex not only for breast cancer but also for sex-specific cancers. For example, in 2017, uterine cancer is a less common cancer at the person level but would be a common cancer if the incidence rate was measured per 100,000 females.

10 Key population groups

Key statistics

Aboriginal and Torres Strait Islander people

Cancer incidence and survival are reported for New South Wales, Victoria, Queensland, Western Australia and the Northern Territory. Cancer mortality is reported for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory.

In the period 2012–2016, the all cancer combined age-standardised incidence rate for Indigenous Australians was 14% higher than for non-Indigenous Australians. Age-standardised cancer incidence rates were highest for Indigenous Australians in *Major cities* (538 cases per 100,000 people) and lowest in *Very remote* areas (424 cases per 100,000 people).

In 2015–2019, the all cancer combined age-standardised mortality rate for Indigenous Australians was 45% higher than the rate for non-Indigenous Australians.

In 2012–2016, 5-year approximate relative survival for all cancers combined was 54% for Indigenous Australians and 68% for non-Indigenous Australians, but this differed across remoteness areas. Five-year observed survival (which is not comparable with 5-year relative survival) for Indigenous Australians in 2007–16 was 53% in *Major cities*, 47% in regional areas and 38% in remote areas; the respective observed survival rates for non-Indigenous Australians in these areas were 60%, 58% and 61%.

Remoteness area

- In 2012–2016, the age-standardised incidence rate of all cancers combined was highest in regional areas and lowest in *Very remote* areas.
- In 2015–2019, age-standardised mortality rates for all cancers combined were highest in *Very remote* areas and lowest in *Major cities*.
- In 2012–2016, 5-year observed survival for all cancers combined generally decreased with increasing remoteness from 63% in *Major cities* to 55% in *Very remote* areas.

Socioeconomic disadvantage

Compared with those living in the least disadvantaged areas, those living in the most disadvantaged areas of Australia had the:

- highest incidence rates for all cancers combined (2012–2016).
- highest mortality rates for all cancers combined (2015–2019).
- lowest 5-year observed survival for all cancers combined (56% in the most disadvantaged areas compared with 68% in the least disadvantaged areas).

Incidence and survival data in this section are from the 2017 ACD and mortality data are from the NMD.

At the time of writing, the ACD contained data on all cases of cancer diagnosed from 1982 to 2017 for all states and territories with the exception of 2017 Northern Territory data. As a consequence, the most recent actual data available for all states and territories (including the Northern Territory) are for 2016, so the latest data presented in this chapter relate to 2016 rather than 2017.

Observed differences by the characteristics examined in this section may result from a number of factors, including variations in:

- population characteristics (for example, a relatively greater proportion of the population living in remote areas)
- the prevalence of risk factors and/or protective factors (for example, tobacco consumption, physical activity)
- the availability and usage of diagnostic services.

Box 10.1: Cancer data for states and territories

Previous editions of Cancer in Australia have reported on state and territory cancer rates. Detailed cancer data for states and territories are now published in the *Cancer data in Australia* (AIHW 2021f). This web report provides cancer incidence and mortality data for each state and territory, for a wide range of cancers. Data can be viewed on the visualisation page and downloaded as supplementary tables.

10.1 Aboriginal and Torres Strait Islander people

This section presents data on cancer incidence, survival and deaths among Aboriginal and Torres Strait Islander people. Indigenous Australians' cancer outcomes, particularly cancer survival, are generally poorer than non-Indigenous Australians'. Many factors may contribute to this, such as higher smoking rates and poorer or late access to health services (AIHW & NIAA 2020). Around 19% of Aboriginal and Torres Strait Islander people live in *Remote* and *Very remote* areas of Australia, where access to health services is more difficult, despite the high health needs (AIHW 2014).

Box 10.2: Quality of Indigenous status data

For new cases of cancer, data from New South Wales, Victoria, Queensland, Western Australia and the Northern Territory in the 2017 ACD are considered of sufficient quality of information on Indigenous identification for inclusion in this report (Table 10.1). Incidence and survival data by Indigenous status presented in this chapter are for these 5 jurisdictions combined. Around 90% of Indigenous Australians live in these 5 jurisdictions (ABS 2018a). For these jurisdictions, less than 8% of the records in the ACD had a missing Indigenous status (Table 10.1).

Information on Indigenous identification in the mortality data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory in the NMD is considered of sufficient quality for inclusion in this report (Table 10.1). Mortality data by Indigenous status presented in this chapter are for these 5 jurisdictions combined (which is different from the combination of 5 jurisdictions for incidence and survival data). Almost 9 in 10 (88%) Indigenous Australians live in these jurisdictions (ABS 2018a). For these 5 jurisdictions, less than 1% of the records in the NMD had a missing Indigenous status (Table 10.1).

Table 10.1 Availability of cancer data by Indigenous status

Data source	Reporting period	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Missing Indigenous status
2017 ACD	2012–2016	Yes	Yes	Yes	Yes	No	No	No	Yes	7.8%
NMD	2015–2019	Yes	No	Yes	Yes	Yes	No	No	Yes	0.5%

Source: AIHW ACD 2017; AIHW National Mortality Database.

Cancer incidence rates for Indigenous Australians

In the period 2012–2016 in the 5 jurisdictions pooled for analysis (New South Wales, Victoria, Queensland, Western Australia and the Northern Territory), an average of 1,665 cases of cancer were diagnosed among Indigenous Australians each year—this is 1.6% of all cancer cases diagnosed in that period and for which Indigenous status was known (online Table S10.1 and Table S10.2). For these jurisdictions, Indigenous Australians represent 3.3% of the total population (ABS 2018a) yet only 1.6% of cancer cases. This discrepancy in proportions is likely due in part to the younger age structure of the Indigenous population: the median age of the Indigenous population is 20 whereas the median age of the non-Indigenous population is 38 (ABS 2018a). Because cancer is more likely to occur in older people and the Indigenous population is in general much younger, the Indigenous population is likely to have lower crude incidence rates than the non-Indigenous population. However, when age-standardised rates are used, more meaningful comparisons can be made.

In 2012–2016 in the 5 reporting jurisdictions, the age-standardised incidence rate for all cancers combined was 14% higher for Indigenous Australians (523 cases per 100,000 people) than for non-Indigenous Australians (459 cases per 100,000 people) (online Table S10.1).

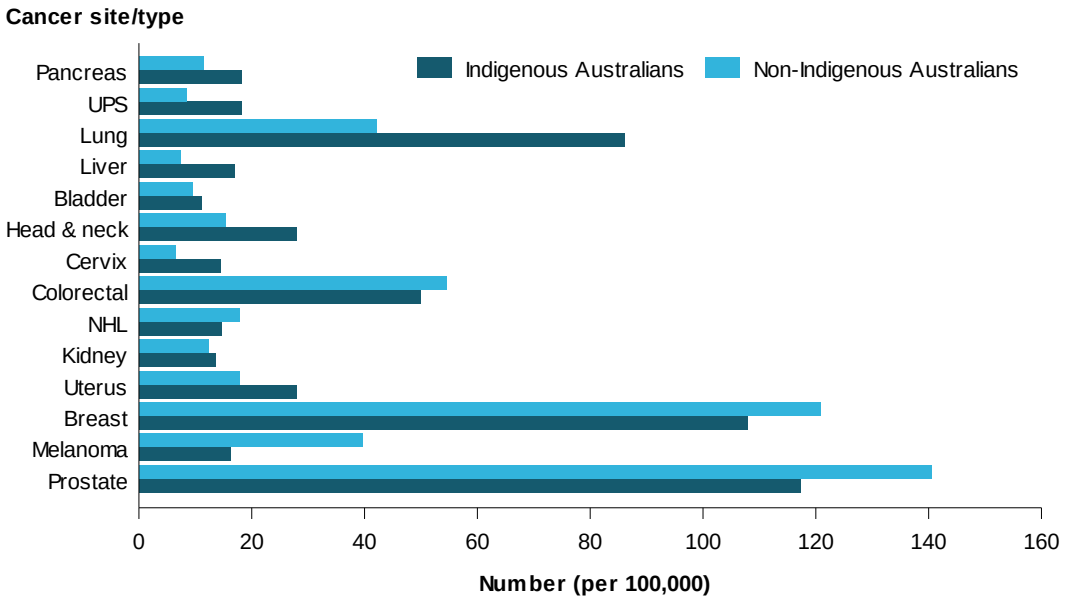
In the same period and jurisdictions, of the selected cancers prostate cancer was the most commonly diagnosed for Indigenous males (141 cases per year) and breast cancer was the most common for Indigenous females (205 cases per year). Lung cancer was the second most commonly diagnosed cancer for both sexes (125 cases per year for males and 119 cases per year for females), but the most commonly diagnosed cancer for Indigenous Australians overall (online Table S10.1).

In the same period and jurisdictions, and after adjusting for age, Indigenous Australians were more than twice as likely to be diagnosed with cancers of the lung, liver and unknown primary site as non-Indigenous Australians (Figure 10.1, online Table S10.1). People diagnosed with these cancers had relatively low survival rates (for details see the next section on cancer survival). Adjusting for age, Indigenous Australians were 1.8 times as likely to be diagnosed with head and neck cancer (including lip) compared with non-Indigenous Australians (28 and 15 cases per 100,000 people, respectively).

Tobacco smoking is a known risk factor for lung cancer. Tobacco smoking and alcohol consumption are known risk factors for liver cancer and some head and neck cancers, such as cancers of the oral cavity, pharynx and larynx (Wild et al. 2020). Data from the 2018–19 National Aboriginal and Torres Strait Islander Health Survey show that Indigenous Australians aged 15 and over are almost 3 times as likely to be a current smoker as non-Indigenous Australians, and 1.2 times as likely to exceed the National Health and Medical Research Council (NHMRC) lifetime alcohol risk guidelines of no more than 2 standard drinks per day on average (AIHW & NIAA 2020). Because many cancers develop later in life and may be caused by cumulative exposure to risk factors, these findings suggest that disparities in incidence rates in cancers for which smoking or excessive alcohol consumption is a risk factor may continue into the future.

For melanoma of the skin, the age-standardised incidence rate for Indigenous Australians was less than half that for non-Indigenous Australians (16 and 40 cases per 100,000 people, respectively) (Figure 10.1). Rates of colorectal cancer, breast cancer in females and prostate cancer in males were also lower for Indigenous Australians than for non-Indigenous Australians (Figure 10.1).

Figure 10.1: Age-standardised incidence rates, selected cancers, by Indigenous status, NSW, Vic, Qld, WA and the NT combined, 2012–2016



Notes

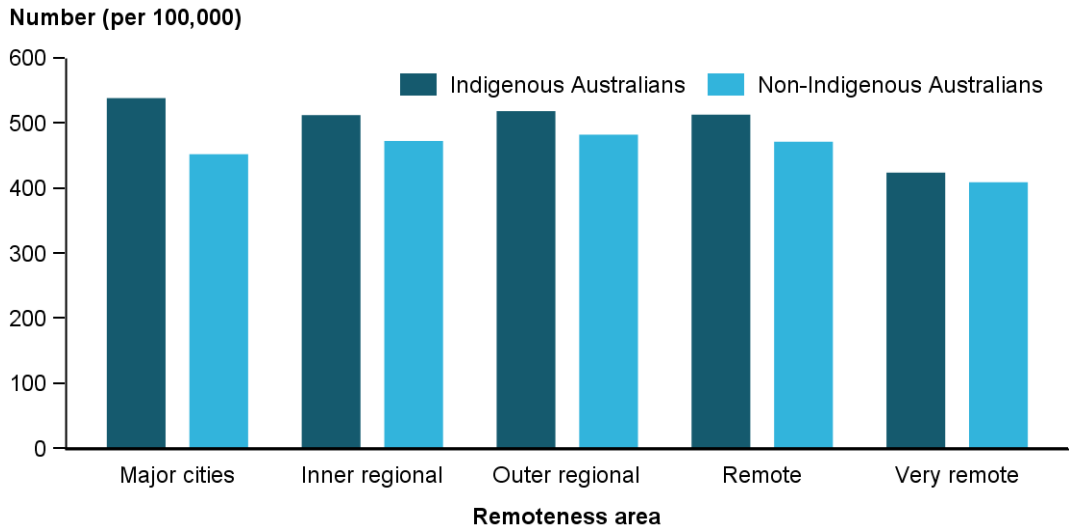
1. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. Breast, cervical and uterine cancer rates are per 100,000 females. Prostate cancer rates are per 100,000 males. Other cancers are per 100,000 people. The rates for these cancers should not be compared with those for cancers that have different denominators.
3. Head and neck cancers includes cancers of the lip, tongue, mouth, salivary glands, pharynx, nasal cavity, sinuses and larynx.
4. NHL = Non-Hodgkin lymphoma, UPS = Cancer of unknown primary site.
5. The cancer types are listed in increasing order of 5-year approximate relative survival in Indigenous Australians. See Figure 10.3.
6. Data for this figure are in online Table S10.1.

Source: AIHW ACD 2017.

Incidence across remoteness areas for all cancers combined

In the period 2012–2016 in the 5 reporting jurisdictions, Indigenous Australians living in *Major cities* were 1.2 times as likely to be diagnosed with cancer as non-Indigenous Australians living in *Major cities* (538 and 452 cases per 100,000 people, respectively). Indigenous Australians living in *Inner regional*, *Outer regional* and *Remote* areas had slightly higher cancer incidence rates for all cancers combined compared with non-Indigenous Australians living in the same areas (all rate ratios 1.1). In *Very remote* areas, age-standardised incidence rates for Indigenous Australians were around 4% higher than for non-Indigenous Australians (424 and 409 cases per 100,000 people, respectively) (Figure 10.2).

Figure 10.2: Age-standardised incidence rates, all cancers combined, by Indigenous status and remoteness area, NSW, Vic, Qld, WA and the NT combined, 2012–2016



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Geography is based on area of usual residence (Statistical Local Area, Level 2) at time of diagnosis/death. The area of usual residence was then classified according to Remoteness Area 2016 (see Appendix H).
3. The rates are calculated using population denominators modelled by the AIHW based on available ABS population estimates and projections (series B).
4. The rates were age-standardised to the 2001 Australian Standard Population by 5-year age group to 75+, and are expressed per 100,000 population.
5. Data for this figure are in online Table S10.2.

Source: AIHW ACD 2017.

Incidence across remoteness areas for selected cancers

In the 5 reporting jurisdictions in 2012–2016, cancer incidence rates for Indigenous Australians varied across remoteness areas. Bearing in mind that there were relatively small numbers of cancers reported in some areas and the general data quality issues, apparent geographic trends should be interpreted cautiously and with reference to data presented in online Table S10.2.

Incidence rate trends for Indigenous Australians vary depending on the cancer.

Age-standardised incidence rates for 3 of the more common cancers in Indigenous Australians differ greatly when comparing *Major cities* with *Very remote* areas:

- breast cancer in females (123 cases per 100,000 females in *Major cities* compared to 80 cases per 100,000 females in *Very remote* areas)
- colorectal cancer (55 cases per 100,000 people in *Major cities* compared to 28 cases per 100,000 people in *Very remote* areas)
- prostate cancer (127 cases per 100,000 males in *Major cities* compared to 79 cases per 100,000 males in *Very remote* areas).

Bladder, pancreatic and kidney cancers, as well as melanoma of the skin and non-Hodgkin lymphoma also all recorded much higher age-standardised incidence rates in *Major cities* than *Very remote* areas (online Table S10.2).

The age-standardised incidence rate for lung cancer increased with increasing remoteness, with one exception, from 80 cases per 100,000 people in *Major cities* to 98 cases per 100,000 people in *Remote* areas. The exception was that lower incidence rates (62 cases per 100,000 people) occurred in *Very remote* areas (Online Table S10.2).

Remote and *Very remote* areas had the highest age-standardised incidence rates for head and neck cancer (including lip), liver cancer and uterine cancer, as well as cancer of unknown primary site. Adjusting for age, Indigenous Australians living in *Very remote* areas were more than twice as likely to be diagnosed with cancer of unknown primary site as those living in *Major cities* (28 and 13 cases per 100,000 people, respectively). Age-standardised rates for cervical cancer tended to be similar in *Major cities*, *Inner regional* and *Outer regional* areas (around 13 cases per 100,000 females), but higher in *Remote* and *Very remote* areas (18 and 19 cases per 100,000 females respectively) (online Table S10.2).

Note that while Indigenous status was missing for some records, this was particularly the case for melanoma of the skin, with 26% of records in *Major cities* having missing Indigenous status, declining with remoteness to 7.5% in *Very remote* areas. The greater the proportion of records with missing Indigenous status, the greater the understatement of age-standardised rates and the potential for comparisons by Indigenous status to be imprecise. Cancer incidence rates and associated proportions of missing Indigenous status by remoteness are available in online Table S10.2.

Cancer survival rates for Indigenous Australians

All cancers combined

For the same states and territories included in incidence reporting, the 5-year approximate relative survival rate (see Box 10.3) for all cancers combined was 54% for Indigenous Australians and 68% for non-Indigenous Australians (online Table S10.3).

Box 10.3: Approximate relative survival rates by Indigenous status

The calculation of relative survival by Indigenous status would require life tables for the 5 relevant states and territories combined, stratified by Indigenous status, for each year of the analysis. These life tables are not currently available. The approximate relative survival figures presented in this section were calculated using a life table for all of Australia stratified by Indigenous status, repeated for each year of the analysis—see Appendix E for more information.

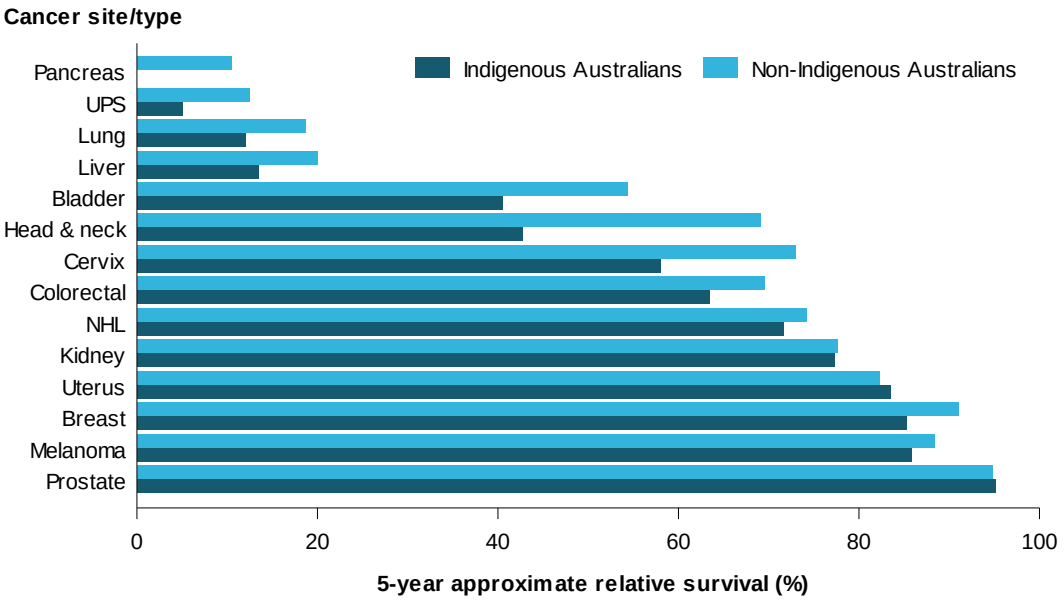
Please note that apart from reporting 5-year approximate relative survival rates by Indigenous status, 5-year observed survival is used in this chapter to describe cancer survival by remoteness area, cancer survival by socioeconomic area and Indigenous cancer survival by remoteness area (see Appendix E for details on relative survival and observed survival). The comparative limitation of using observed survival is that it makes no adjustments for deaths that may ordinarily occur within the population. While relative survival is preferred, Australian life tables by remoteness area, Australian life tables by socioeconomic area and the Indigenous life tables by remoteness area were unavailable at the time of drafting this report.

Selected cancers

In the period 2012–2016 in the 5 reporting jurisdictions, Indigenous Australians generally had lower 5-year approximate relative survival rates for the majority of the selected cancers compared with non-Indigenous Australians, having notably lower survival rates than non-Indigenous Australians for the following cancers (Figure 10.3):

- breast cancer (85% compared with 91%)
- colorectal cancer (63% compared with 70%)
- cervical cancer (58% compared with 73%)
- head and neck cancer (including lip) (43% compared with 69%)
- bladder cancer (41% compared with 54%)
- lung cancer (12% compared with 19%)
- liver cancer (14% compared with 20%)
- cancer of unknown primary site (5% compared with 13%).

Figure 10.3: Five-year approximate relative survival, selected cancers, by Indigenous status, Australia, 2012–2016



Notes

1. 5-year approximate relative survival for pancreatic cancer for Indigenous Australians is not presented because it could not be calculated due to the small number of cases.
2. UPS = Cancer of unknown primary site. NHL = non-Hodgkin lymphoma.
3. Breast relates to breast cancer in females.
4. Head and neck cancer includes cancers of the lip, tongue, mouth, salivary glands, pharynx, nasal cavity, sinuses and larynx.
5. Data for this figure are in online Table S10.3.

Source: AIHW ACD 2017.

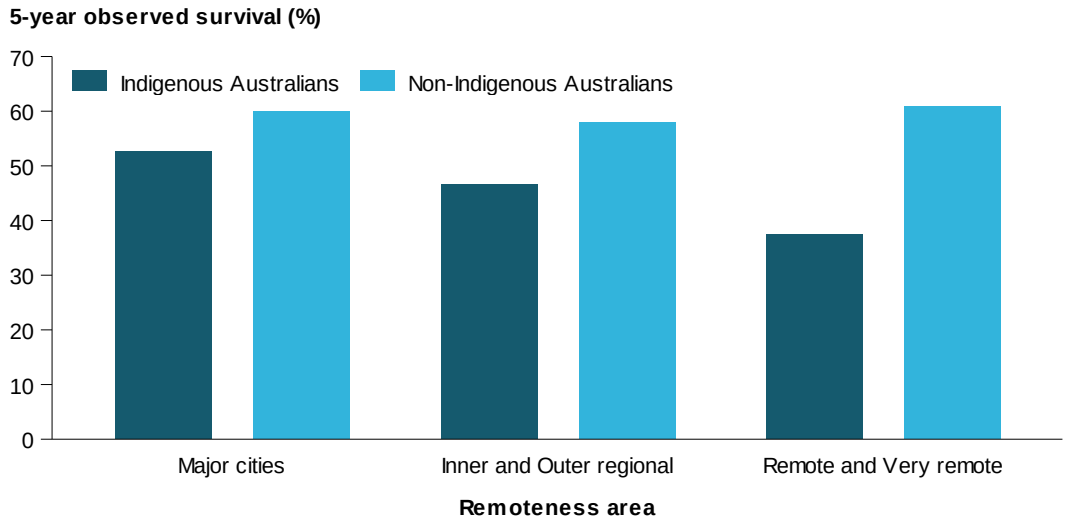
Survival rates across remoteness areas for all cancers combined

Five-year observed survival for the longer period 2007–2016 has been used to describe cancer survival for Indigenous Australians in remoteness areas of the 5 reporting jurisdictions.

The 5-year observed survival rate for all cancers combined for Indigenous Australians living in *Major cities* was 53%, which was significantly higher than that for Indigenous Australians living in *Inner regional and Outer regional* areas (47%), and for Indigenous Australians living in *Remote and Very remote* areas (38%).

The 5-year observed survival rates for all cancers combined for Indigenous Australians in all remoteness areas were lower than those for non-Indigenous Australians with the greatest difference recorded in *Remote and Very remote* areas (38% compared with 61%) (Figure 10.4).

Figure 10.4: Five-year observed survival, all cancers combined, by Indigenous status and remoteness area, NSW, Vic, Qld, WA and the NT combined, 2007–2016



Notes

1. All cancers combined comprises ICD-10 codes C00–C97, D45, D46, D47.1 and D47.3–D47.5, except basal and squamous cell carcinomas of the skin (part of C44).
2. Observed survival was calculated with the period method, using the period 2007–2016. There are differences between observed survival and relative survival which should be taken into account when interpreting these data. For more information, see Appendix F.
3. Data for this figure are in online Table S10.4.

Source: AIHW ACD 2017.

Survival rates across remoteness areas for selected cancers

In the 5 reporting jurisdictions in 2007–2016, significant differences in 5-year observed survival rates (online Table S10.4) were evident for Indigenous Australians living in *Major cities* compared with those living in remote areas of Australia, most notably for:

- lung cancer (12% compared with 6.0%)
- breast cancer in females (79% compared with 70%)
- head and neck cancer (including lip) (47% compared with 31%).

Cancer mortality rates for Indigenous Australians

All cancers combined

In the period 2015–2019 in the 5 jurisdictions pooled for analysis (New South Wales, Queensland, Western Australia, South Australia and the Northern Territory), there were 715 cancer-related deaths for Indigenous Australians on average each year (2.1% of all deaths due to cancer) (online Table S10.1). When adjusted for age, the cancer mortality rate for Indigenous Australians in these jurisdictions was 1.4 times the rate for non-Indigenous Australians in these areas (230 and 159 deaths per 100,000 people, respectively).

Selected cancers

In 2015–2019 in the 5 reporting jurisdictions, of the selected cancers, lung cancer accounted for the highest average number of cancer-related deaths for Indigenous males (105 deaths per year), followed by liver cancer (34 per year), head and neck cancer (including lip) (32 per year), colorectal cancer (30 per year), cancer of unknown primary site (25 per year) and prostate cancer (24 per year). For Indigenous females, lung cancer accounted for the highest average number of cancer-related deaths (83 per year) followed by breast cancer (37 per year), colorectal cancer (26 per year), pancreatic cancer (25 per year), cancer of unknown primary site (21 per year) and liver cancer (19 per year) (online Table S10.1).

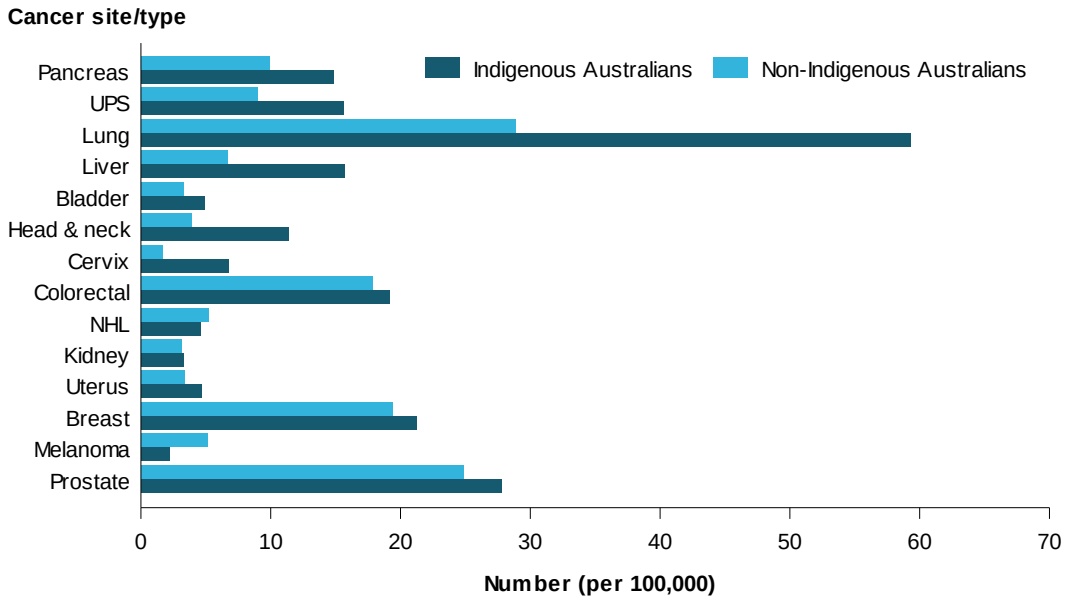
In 2015–19, age-standardised mortality rates for Indigenous Australians were higher than for non-Indigenous Australians for many cancers, including the following (Figure 10.5):

- head and neck cancer (including lip) (11 compared with 3.9 deaths per 100,000 people)
- liver cancer (16 compared with 6.7 deaths per 100,000 people)
- lung cancer (59 compared with 29 deaths per 100,000 people)
- cancer of unknown primary site (16 compared with 9.0 deaths per 100,000 people)
- pancreatic cancer (15 compared with 9.9 deaths per 100,000 people)
- bladder cancer (4.9 compared with 3.3 deaths per 100,000 people)
- uterine cancer (4.7 compared with 3.4 deaths per 100,000 females)
- prostate cancer (28 compared with 25 deaths per 100,000 males)
- kidney cancer (3.3 compared with 3.1 deaths per 100,000 people)
- breast cancer in females (21 compared with 19 deaths per 100,000 females).

Cervical cancer mortality rates for Indigenous females were 4 times those of non-Indigenous females (6.8 and 1.7 deaths per 100,000 females, respectively).

Mortality rates for a minority of cancers were lower for Indigenous Australians than for non-Indigenous Australians. In particular, for melanoma of the skin, the age-standardised mortality rate for Indigenous Australians was less than half that for non-Indigenous Australians (2.2 deaths per 100,000 people and 5.1 deaths per 100,000 people, respectively). Indigenous Australians also had lower age-standardised mortality rates for non-Hodgkin lymphoma (4.6 compared with 5.2 deaths per 100,000 people) (Figure 10.5).

Figure 10.5: Age-standardised mortality rates, selected cancers, by Indigenous status, NSW, Qld, WA, SA and the NT combined, 2015–2019



Notes

1. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. Breast, cervical and uterine cancer rates are per 100,000 females. Prostate cancer rates are per 100,000 males. Other cancers are per 100,000 people. These cancers should not be compared with cancers that have different denominators.
3. Head and neck cancers includes cancers of the lip, tongue, mouth, salivary glands, pharynx, nasal cavity, sinuses and larynx.
4. NHL = Non-Hodgkin lymphoma, UPS = Cancer of unknown primary site.
5. The cancer types are listed in increasing order of 5-year approximate relative survival in Indigenous Australians. See Figure 10.3.
6. Data are stratified by the year of occurrence of death for years up to and including 2018, and year of registration of death for 2019.
7. Deaths registered in 2017 and earlier are based on the final version of cause of death data. Deaths registered in 2018 are based on the revised version and deaths registered in 2019 are based on the preliminary version. Revised and preliminary versions are subject to further revision by the Australian Bureau of Statistics (ABS).
8. Data for this figure are in online Table S10.1.

Source: AIHW ACD 2017.

10.2 Remoteness areas

People living in remote areas of Australia are often disadvantaged in relation to access to primary health-care services, educational and employment opportunities, and income. Further, they are more likely to have higher rates of risky health behaviours, such as smoking and heavy alcohol use (AIHW 2020a). Incidence and mortality rates were calculated according to the remoteness area of residence at diagnosis or death. The remoteness areas divide Australia into broad geographic regions that share characteristics of remoteness for statistical purposes (see Appendix G).

Cancer incidence rates across remoteness areas

In the period 2012–2016, the age-standardised incidence rate of all cancers combined was highest in *Inner regional* and *Outer regional* areas (respectively 513 and 512 cases per 100,000 people), and lowest in *Very remote* areas (422 cases per 100,000 people) (Figure 10.7). Incidence rates in *Major cities* and *Remote* areas for the period were the same (487 cases per 100,000 people).

Age-standardised incidence by remoteness for selected cancers for 2012–2016 are provided in online Table S10.5; rates and trends for some of the more commonly diagnosed cancers (and cancer groups) were as follows.

- Prostate cancer age-standardised incidence rates were all around 150 cases per 100,000 males for non-remote areas, the *Remote* areas incidence rate was 133 cases per 100,000 males and the *Very remote* areas incidence rate was 105 cases per 100,000 males.
- Breast cancer age-standardised incidence rates decreased marginally with increasing remoteness, with the exception of *Very remote* areas where there was a large decrease (*Major cities* 127 cases per 100,000 females to *Remote* 116 cases per 100,000 females to a low of 89 cases per 100,000 females for *Very remote* areas).
- The lung cancer incidence rate was highest in *Remote* and *Very remote* areas (52 and 49 cases per 100,000 people, respectively) and lowest in *Major Cities* (42 cases per 100,000 people).
- Incidence rates for head and neck cancer (including lip) increased with increasing remoteness from 16 cases per 100,000 people in *Major cities* to 27 cases per 100,000 people in *Very remote* areas.

In 2012–2016, excluding *Very remote* areas, age-standardised melanoma of the skin rates ranged between 62 cases per 100,000 people (*Inner regional*) and 48 cases per 100,000 people (*Major cities*); equivalent rates were much lower for *Very remote* Australia (35 cases per 100,000 people) (online Table S10.5). Around 47% of people living in *Very remote* Australia are Indigenous Australians (ABS 2018a). In 2012-2016, Indigenous Australians living in *Very remote areas* had very low age-standardised incidence rates of melanoma of the skin (3.2 cases per 100,000 people for selected jurisdictions) (online Table S10.2). The low melanoma of the skin incidence rate for Indigenous Australians living in *Very remote* areas likely contributes to the lower overall melanoma of the skin incidence rates for *Very remote* areas.

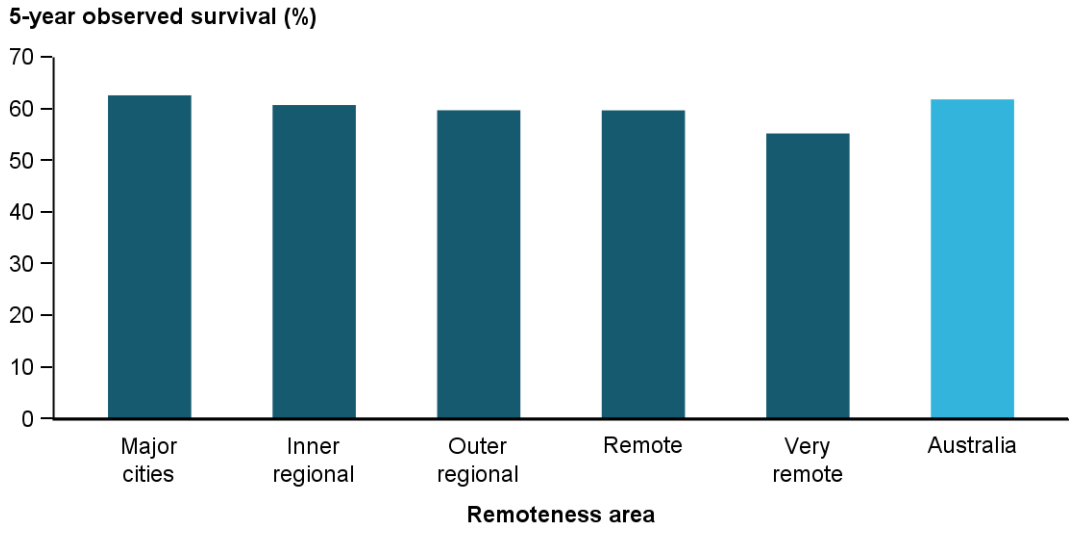
While age-standardised incidence rates for 2012–2016 for all cancers combined is lowest in *Very remote* areas, these areas had the highest incidence rate for cervical cancer, liver cancer, cancer of unknown primary site, uterine cancer and head and neck cancers (including lip) (online Table S10.5).

Cancer incidence data for remoteness areas are available in online Table S10.5.

Cancer survival rates by remoteness area

In the period 2012–2016, people living in *Major cities* had the highest 5-year observed survival for all cancers combined (63%) while *Very remote* areas had the lowest (55%) (Figure 10.6).

Figure 10.6: Five-year observed survival, all cancers combined, 2012–2016, by remoteness area



Notes

1. Geography is based on area of usual residence (Statistical Local Area, Level 1, SA1) at time of diagnosis/death where available, and area of usual residence (Statistical Local Area, Level 2, SA2) where SA1 was not available. The area of usual residence was then classified according to Remoteness Area 2016 (see Appendix H).
2. Data for this figure are in online Table S10.6.

Source: AIHW ACD 2017.

The 5-year observed survival rate for lung cancer in 2012–2016 in Australia was 16%. At 18%, the 5-year observed survival rate for *Major cities* is significantly higher than the Australian rate and all other remoteness areas (online Table S10.6).

The 5-year observed survival rate for head and neck cancers (including lip) in 2012–2016 in Australia was 64%. At 48%, the 5-year observed survival rate for *Very remote* areas was significantly lower than the Australian rate and all non-remote areas (online Table S10.6).

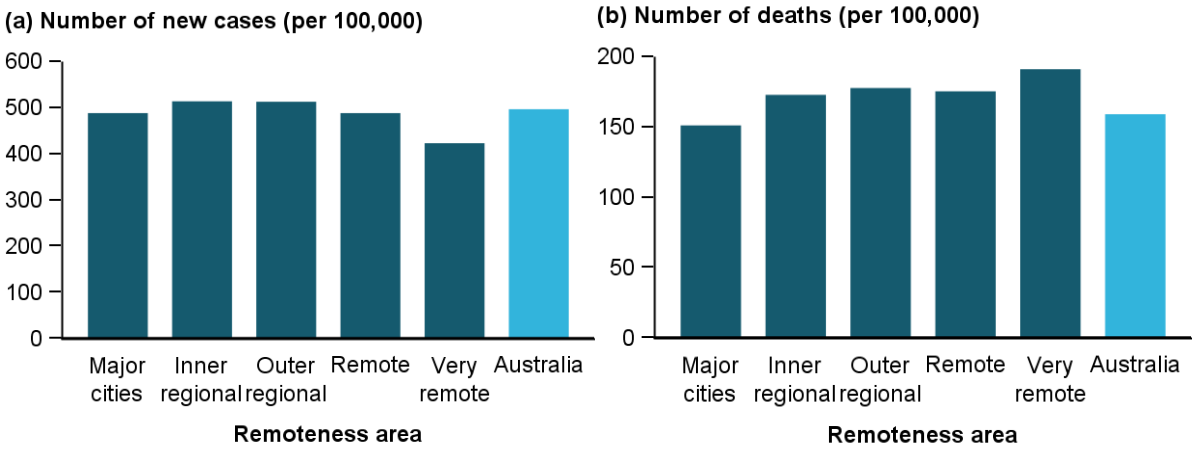
The 5-year observed survival rate for melanoma of the skin in 2012–2016 in Australia was 82%. At 88%, the 5-year observed survival rate for *Very remote* areas is significantly higher than the Australian rate and all non-remote areas (online Table S10.6).

The 5-year observed survival rate for liver cancer in 2012–2016 in Australia was 18%. At 20%, the 5-year observed survival rate for *Major cities* is significantly higher than the Australian rate and all regional areas. While remote survival rates form part of the Australian total, the rates are not available for comparison due to insufficient numbers of people diagnosed to produce these results (online Table S10.6).

Cancer mortality rates by remoteness area

In 2015–2019, the age-standardised mortality rate for all cancers combined was highest in *Very remote* areas (191 deaths per 100,000 people) and lowest in *Major cities* (151 per 100,000 people) (Figure 10.7).

Figure 10.7: Incidence of all cancers combined, 2012–2016(a) and mortality for all cancers combined, 2015–2019, by remoteness area(b)



Notes

1. Geography is based on area of usual residence (Statistical Local Area, Level 2) at time of diagnosis/death. The area of usual residence was then classified according to Remoteness Area 2016 (see Appendix H).
2. The rates were age-standardised to the 2001 Australian Standard Population 5-year age group to 85+, and are expressed per 100,000 population.
3. Data for this figure are in online Table S10.5.

Sources: AIHW ACD 2017; AIHW National Mortality Database.

In 2015–2019, mortality rates:

- *Major cities* had the lowest age-standardised mortality rate for prostate cancer (23 deaths per 100,000 males), while all other remoteness areas had rates of over 27 deaths per 100,000 males.
- Lung cancer age-standardised mortality rates increased with increasing remoteness (27 deaths per 100,000 people in *Major cities* up to 41 deaths per 100,000 people in *Very remote* areas).
- Head and neck cancers (including lip) age-standardised mortality rates increased with increasing remoteness (3.4 deaths per 100,000 people in *Major cities* up to 11 deaths per 100,000 people in *Very remote* areas).
- Pancreatic cancer age-standardised mortality rates were lowest in *Very remote* areas (8.5 deaths per 100,000 people) and highest in non-remote areas where mortality rates were between 10 and 11 deaths per 100,000 people.
- Liver cancer age-standardised mortality rates were highest in *Very remote* areas (13 deaths per 100,000 people), followed by *Remote* areas (7.8 deaths per 100,000 people) while all non-remote areas had age-standardised mortality rates of between 6.4 and 6.8 deaths per 100,000 people.

- Uterine cancer age-standardised mortality rates were highest in *Very remote* areas at 5.4 deaths per 100,000 females; all other remoteness areas had mortality rates between 3.3 and 3.6 deaths per 100,000 females.
- Cervical cancer age-standardised mortality rates were highest in *Very remote* areas (5.6 deaths per 100,000 females) and were more than double that of any other remoteness area.

Detailed data on cancer mortality across remoteness areas is provided in online Table S10.5.

10.3 Socioeconomic area

The Index of Relative Socio-economic Disadvantage (IRSD) is a general socioeconomic index that summarises information about the economic and social conditions of people and households within an area. The index scores each geographic area by summarising attributes of the population, such as income, educational attainment, unemployment and jobs in relatively unskilled occupations. Note that the IRSD used in this report is an area-based measure of socioeconomic group rather than a person-based measure (see Appendix G).

In the following paragraphs, socioeconomic group 1 represents people living in the lowest socioeconomic areas (that is, areas that are most disadvantaged) and socioeconomic group 5 represents people living in the highest socioeconomic areas (that is, areas that are least disadvantaged).

Cancer incidence rates by socioeconomic area

In the period 2012–2016, the age-standardised incidence rate for all cancers combined was highest for those living in the 2 lowest socioeconomic areas and lowest for those living in the 2 highest socioeconomic areas (Figure 10.9).

The age-standardised incidence rates tended to increase with increasing disadvantage for the following cancers (online Table S10.7):

- colorectal cancer (from 52 in the least disadvantaged areas to 61 cases per 100,000 people in the most disadvantaged areas)
- lung cancer (from 31 to 55 cases per 100,000 people)
- head and neck cancer (including lip) (from 14 to 21 cases per 100,000 people)
- kidney cancer (from 11 to 15 cases per 100,000 people)
- pancreatic cancer (from 11 to 13 cases per 100,000 people)
- cancer of unknown primary site (from 7.2 to 11 cases per 100,000 people)
- liver cancer (from 5.9 to 9.4 cases per 100,000 people)
- cervical cancer (from 5.9 to 8.8 cases per 100,000 females)
- uterine cancer (from 17 cases to 20 per 100,000 females).

In contrast the age-standardised incidence rates tended to decrease with increasing disadvantage for the following cancers (online Table S10.7):

- breast cancer (from 138 in the least disadvantaged areas to 117 cases per 100,000 females in the most disadvantaged areas)
- prostate cancer (from 169 to 137 cases per 100,000 males).

Cancer survival rates by socioeconomic area

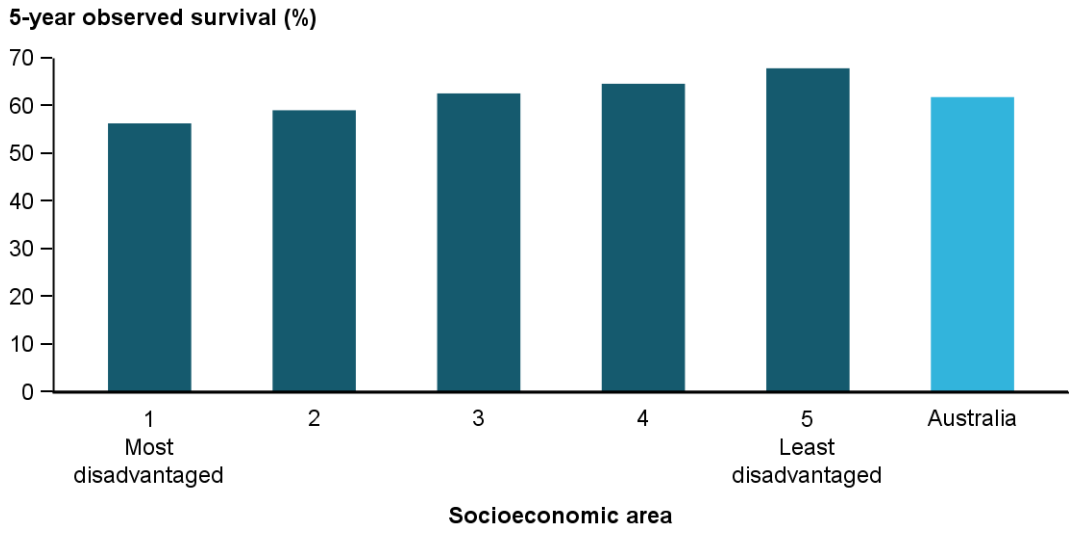
In the period 2012–2016, the 5-year observed cancer survival rate for all cancers combined increased from 56% in areas of the most socioeconomic disadvantage, to 68% in areas of the least disadvantage (Figure 10.8).

Notable differences between 5-year observed survival rates in the least and most socioeconomically disadvantaged areas were evident for the following cancers (online Table S10.8):

- cervical cancer (79% in the least disadvantaged areas compared with 65% in the most disadvantaged areas)
- head and neck cancer (including lip) (69% compared with 60%)
- non-Hodgkin lymphoma (72% compared with 64%)
- kidney cancer (75% compared with 68%)
- colorectal cancer (63% compared with 57%)
- prostate cancer (88% compared with 80%)
- cancer of unknown primary site (14% compared with 7.7%).

The 5-year observed survival rates for the above and other selected cancers by socioeconomic disadvantage are available in online Table S10.8.

Figure 10.8: Five-year observed survival for all cancers combined, 2012–2016, by area of relative socioeconomic disadvantage



Notes

1. Socioeconomic area was classified using the ABS IRSD (see Appendix H).
2. Data for this figure are in online Table S10.8.

Source: AIHW ACD 2017.

Cancer mortality rates by socioeconomic area

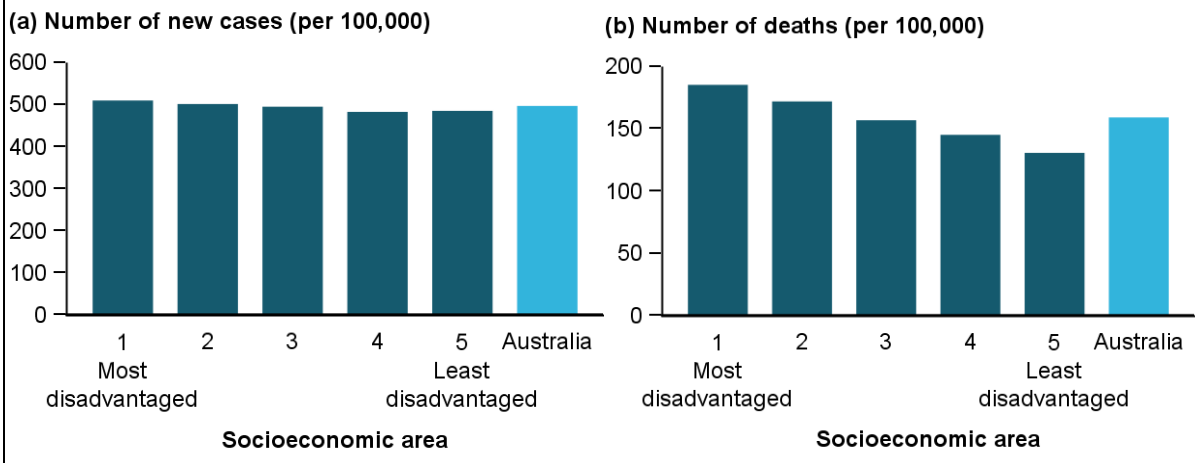
In the period 2015–2019, the age-standardised mortality rate for all cancers combined was highest among those living in the most socioeconomically disadvantaged areas (185 deaths per 100,000 people) and lowest among those living in the least disadvantaged areas (130 per 100,000 people) (Figure 10.9).

In the same period, age-standardised mortality rates for different types of cancer generally increased with increasing disadvantage, with some of the larger differences for the following cancers (online Table S10.7):

- lung cancer (19 compared with 38 deaths per 100,000 people, respectively, in the least and most disadvantaged areas)
- prostate cancer (22 compared with 27 deaths per 100,000 males)
- colorectal cancer (15 compared with 21 deaths per 100,000 people)
- head and neck cancer (including lip) (2.4 compared with 5.5 deaths per 100,000 people)
- kidney cancer (2.3 compared with 3.9 deaths per 100,000 people)
- liver cancer (5.4 compared with 8.5 deaths per 100,000 people)
- cancer of unknown primary site (6.6 compared with 11 deaths per 100,000 people).

Age-standardised mortality rates for the above and other selected cancers by socioeconomic disadvantage are available in online Table S10.8.

Figure 10.9: Incidence of all cancers combined, 2012–2016(a) and mortality for all cancers combined, 2015–2019, by area of relative socioeconomic disadvantage(b)



Notes

1. Socioeconomic group was classified using the ABS IRSD (see Appendix H).
2. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. Data for this figure are in online Table S10.7.

Sources: AIHW ACD 2017; AIHW National Mortality Database.

Age-standardised mortality rates for the above and other selected cancers by socioeconomic disadvantage are available in online Table S10.8.

11 Non-malignant tumours

The previous chapters presented data about cancers, also known as malignant or invasive tumours. This chapter presents data about selected non-malignant tumours. For information on the coding of non-malignant tumours, refer to table B2 in Appendix B.

The first group of tumours presented below are called in situ tumours. It is difficult to determine which in situ tumours will become invasive. However, it is estimated that females diagnosed with ductal carcinoma in situ of the breast have an 11% chance of being diagnosed with invasive breast cancer in the 10 years following diagnosis (AIHW 2010). Because of this, people diagnosed with in situ and other non-malignant tumours are still subject to the psychological and societal impacts of a cancer diagnosis as well as conventional cancer treatment and management programs. These can include but are not limited to tumour excision, mastectomy or breast-conserving surgery (for those with carcinoma in situ of the breast), hysterectomy (for those with carcinoma in situ of the cervix), radiotherapy, and increased screening participation compared with the general population (van Seijen 2019; Tan et al 2019).

In situ data are sourced from the 2017 ACD. Actual in situ data are available to 2017 except for the Northern Territory, where data are available to 2016 (see Appendix A). Projections to 2021 are reported for carcinoma in situ of the breast and melanoma in situ of the skin as data for these tumours are available for every state and territory. Table 11.1 summarises non-malignant tumour data availability and where data are suitable for reporting.

Table 11.1: Summary of non-malignant tumour data available in the 2017 ACD

		Data availability	
Tumour site/type	**State and territory**	**Actual data***	**Projected data**
Carcinoma in situ of the breast	All, except NT for 2017	2002–2017	2018–2021
Carcinoma in situ of the cervix	Vic and Qld	2001–2017	Not available
Melanoma in situ of the skin	All, except NT for 2017	2004–2017	2018–2021
Non-malignant neoplasms of the brain and other central nervous system	Vic, Qld and WA	2003–2017	Not available

* Note that 'Actual data' outlines the period where data becomes available for all mentioned jurisdictions. Some jurisdictions may have data suitable for reporting before the beginning of the 'Actual data' period.

Source: AIHW ACD 2017.

11.1 Carcinoma in situ of the breast (female only)

In 2021, it is estimated that around 3,000 new cases of carcinoma in situ of the breast will be diagnosed (online Table S11.1). The age-standardised incidence rate for females is estimated to be 21 cases per 100,000 females.

Carcinoma in situ of the breast rates are highest for women aged 70–74

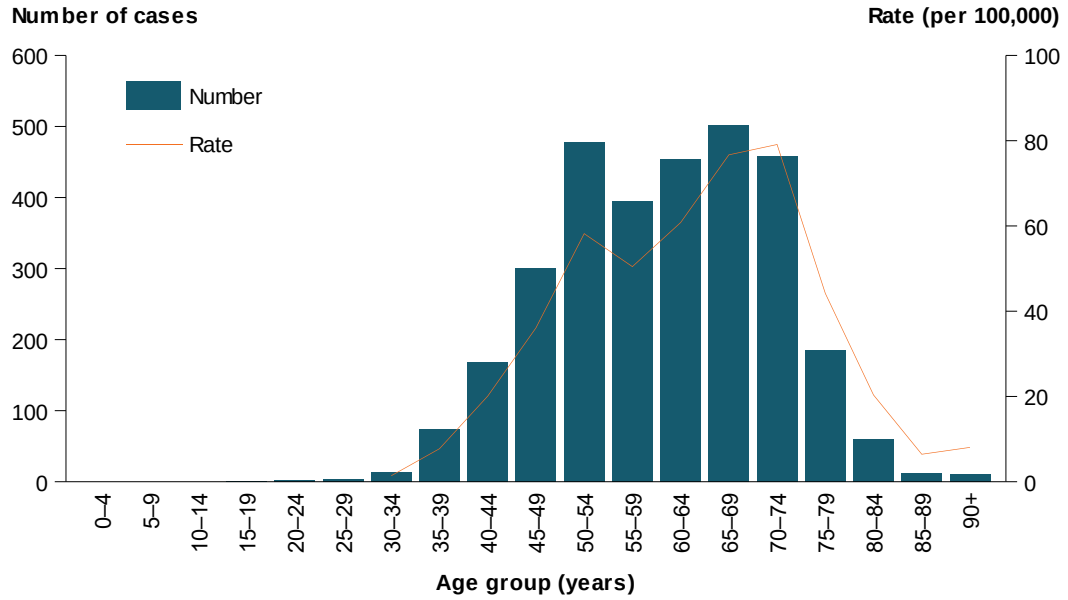
In 2021, the number of new cases of carcinoma in situ of the breast is estimated to increase with increasing age, peaking at around 500 cases for women aged 65–69 before decreasing. The age-specific incidence rate of carcinoma in situ of the breast is estimated to be much lower for those younger than 40. The rate is estimated to increase from 20 cases per 100,000 females aged 40–44 to 79 cases per 100,000 females aged 70–74 and then decrease to 8 cases per 100,000 females aged 90 or over (Figure 11.1). The relatively high

incidence to age 75 may be related to BreastScreen Australia targeting women aged 50–74 for breast cancer screening (AIHW 2018b).

Carcinoma in situ of the breast incidence rates are increasing

The age-standardised incidence rate of carcinoma in situ of the breast increased from 15 cases per 100,000 females in 2002 to an estimated 21 cases per 100,000 females in 2021 (Figure 11.2). Incidence rates may be partially attributable to national population-based breast cancer screening. Carcinoma in situ of the breast was rarely detected before breast screening was introduced. Its incidence has increased since the introduction of screening mammography, including that performed through BreastScreen Australia (AIHW 2018b).

Figure 11.1: Estimated incidence rates of carcinoma in situ of the breast, by age at diagnosis, females, 2021

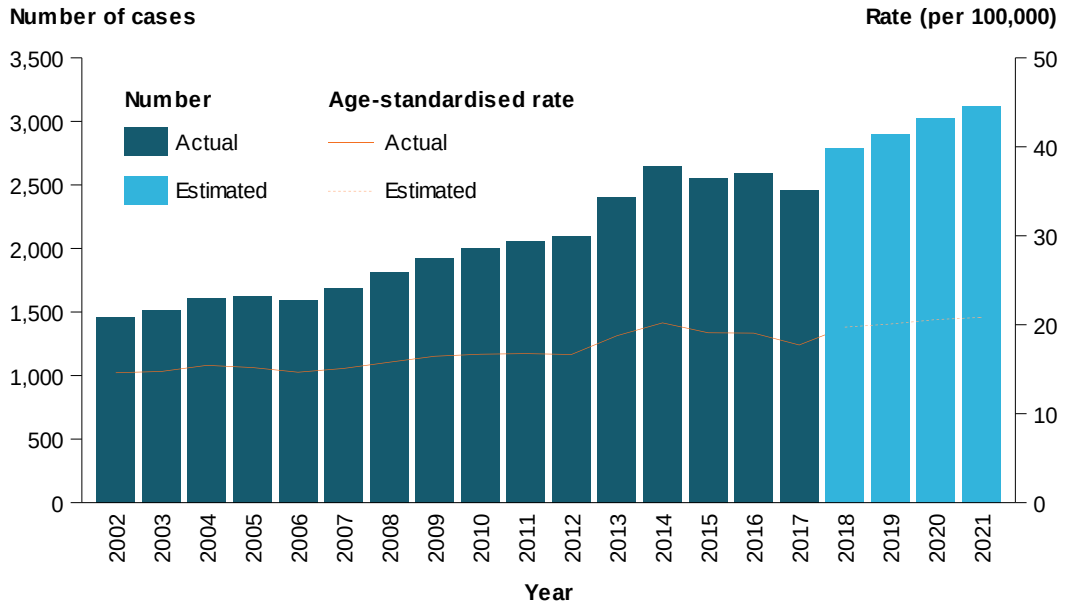


Notes

1. The rates are age-specific rates expressed per 100,000 population.
2. The data for this figure are in online Table S11.1.

Source: AIHW ACD 2017.

Figure 11.2: Trends in incidence of carcinoma in situ of the breast, females, 2002–2021



Notes

1. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. The data for this figure are in online Table S11.2.

Source: AIHW ACD 2017.

11.2 Carcinoma in situ of the cervix

In 2017, there were 4,721 new cases of carcinoma in situ of the cervix in Victoria and Queensland combined (online Table S11.3). The age-standardised incidence rate was 85 cases per 100,000 females.

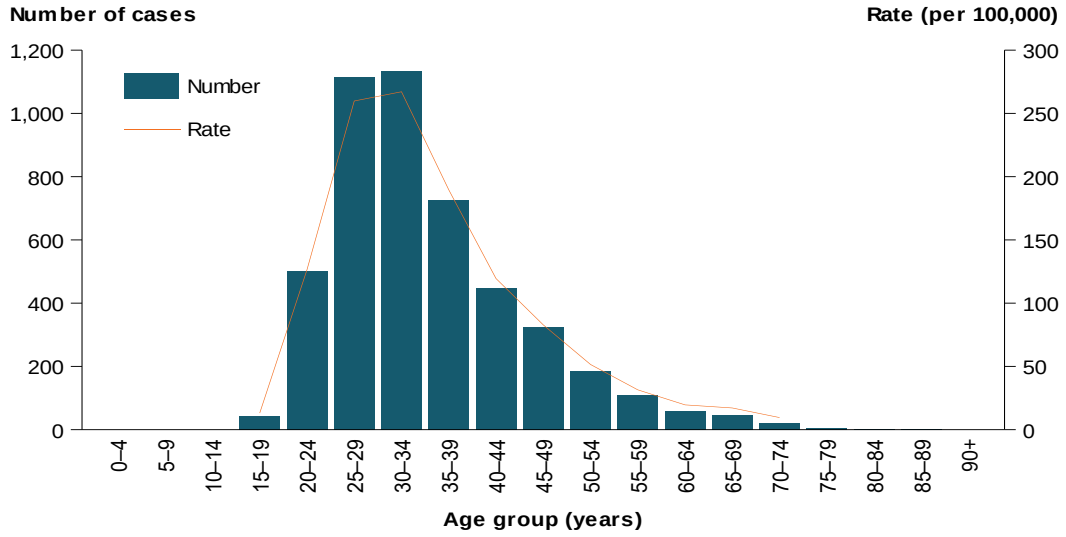
Carcinoma in situ of the cervix incidence rates highest in women aged 30–34

In 2017, the number of new cases of carcinoma in situ of the cervix increased sharply with age to a peak of 1,135 cases for women aged 30–34 and then decreased gradually with each subsequent age group before decreasing to fewer than 10 cases in each age group beyond 70–74 (Figure 11.3). The age-specific incidence rate of carcinoma in situ of the cervix was highest for women aged 25–34, at more than 260 cases per 100,000 females.

Carcinoma in situ of the cervix incidence rates have been stable

The age-standardised incidence rate of carcinoma in situ of the cervix remained relatively stable at around 90 cases per 100,000 females between 2001 and 2013 and reached a peak of 97 cases per 100,000 females in 2012 (Figure 11.4). Since 2013, the age-standardised incidence rate has gradually decreased to 85 cases per 100,000 females in 2017. The incidence of carcinoma in situ of the cervix may be influenced by the consistent participation rates of females from 2001 onwards in the National Cervical Screening Program and the resulting early detection of cervical abnormalities that could otherwise develop into cervical cancer (AIHW 2018d).

Figure 11.3: Incidence rates of carcinoma in situ of the cervix, by age at diagnosis, females, Victoria and Queensland, 2017

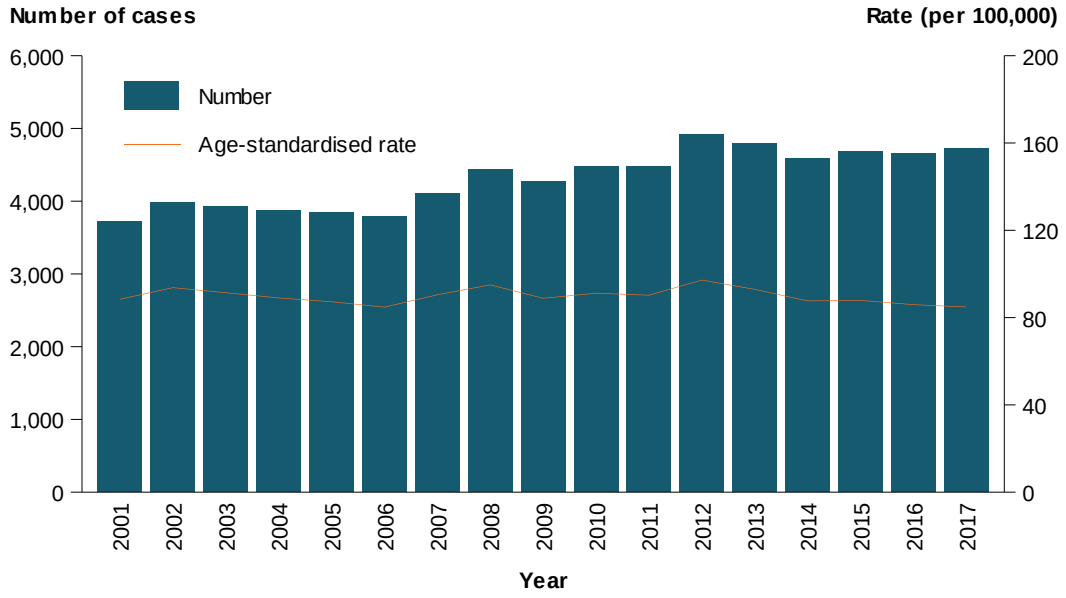


Notes

1. The rates are age-specific rates expressed per 100,000 population.
2. The rates for age groups 75–79 to 90+ have been omitted due to the small number of cases.
3. The data for this figure are in online Table S11.3.

Source: AIHW ACD 2017.

Figure 11.4: Trends in incidence of carcinoma in situ of the cervix, females, Victoria and Queensland, 2001–2017



Notes

1. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. The data for this figure are in online Table S11.4.

Source: AIHW ACD 2017.

11.3 Melanoma in situ of the skin

It is estimated that in 2021, there will be around 28,000 new cases of melanoma in situ of the skin (Table 11.2). Approximately 56% of these cases will be diagnosed in males. In 2021, the age-standardised incidence rate is estimated to reach 105 cases per 100,000 males and 80 cases per 100,000 females.

Table 11.2: Estimated Incidence rate for melanoma in situ of the skin, by sex, Australia, 2021

	Males	Females	Persons
Number of cases	15,378	12,207	27,585
Age-standardised rate	104.6	80.0	91.5
Percentage of all cancer cases	55.7	44.3	100
Risk to age 75	1 in 12	1 in 15	1 in 14
Risk to age 85	1 in 8	1 in 11	1 in 9

Note: The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.

Source: AIHW ACD 2017.

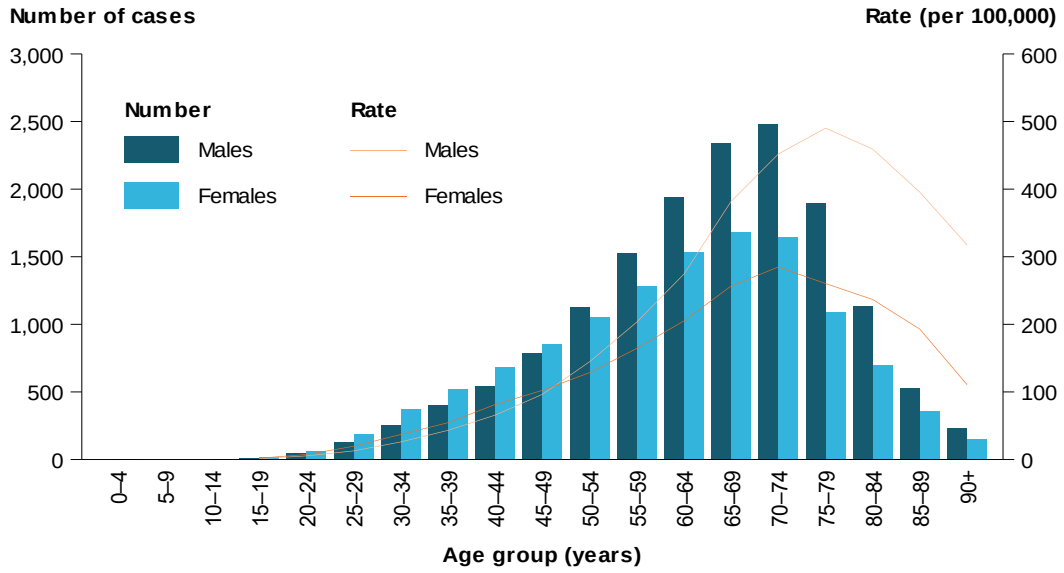
Melanoma in situ of the skin incidence rates peak after 70

It is estimated that in 2021, the age-specific incidence rate of melanoma in situ of the skin for males will increase with increasing age, peaking at around 500 cases per 100,000 males aged 75–79, and decrease to around 300 cases per 100,000 males aged 90 and over. The age-specific incidence rate for females is also estimated to increase with age, peaking at 285 cases per 100,000 females aged 70–74, before decreasing to 111 cases per 100,000 females aged 90 and over (Figure 11.5). Males aged 50 and over have consistently higher rates of melanoma in situ of the skin than females.

Incidence rates for melanoma in situ of the skin projected to more than triple between 2004 and 2021

Between 2004 and 2021, the age-standardised incidence rate of melanoma in situ of the skin increased from 29 cases per 100,000 people in 2004 to an estimated 92 cases per 100,000 people in 2021. Large increases were apparent for both males and females (Figure 11.6) with rates in males higher than in females across all years. The increase may be related to an increase in ultraviolet radiation exposure, improvements in detection tools, an increased awareness of skin cancer, an increase in specialist skin clinics, and the reclassification of tumours over time (Leest et al. 2015; Toender et al. 2014).

Figure 11.5: Estimated incidence rates of melanoma in situ of the skin, by age at diagnosis and sex, Australia, 2021

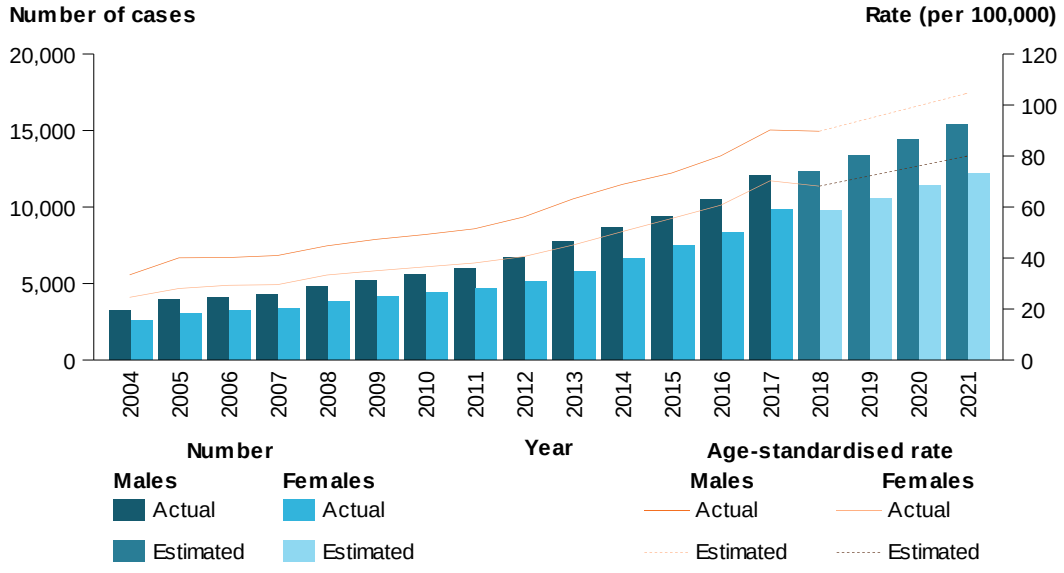


Notes

1. The rates are age-specific rates expressed per 100,000 population.
2. The rates for age groups 0–4 to 10–14 have been omitted due to the small number of cases.
3. The data for this figure are in online Table S11.5.

Source: AIHW ACD 2017.

Figure 11.6: Trends in incidence of melanoma in situ of the skin, by sex, Australia, 2004–2021



Notes

1. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. The data for this figure are in online Table S11.6.

Source: AIHW ACD 2017.

11.4 Non-malignant neoplasms of the brain and other central nervous system

In 2017, there were 1,210 new cases of non-malignant neoplasms of the brain and other central nervous system (CNS) in Victoria, Queensland and Western Australia combined (Table 11.3). About 65% of these cases were diagnosed in females. The age-standardised incidence rate for females was 10 cases per 100,000 females. This compares with 6 new cases per 100,000 males and 8 new cases per 100,000 people.

Table 11.3: Incidence rate for non-malignant neoplasms of the brain and other central nervous system, by sex, Vic, Qld and WA combined, 2017

	Males	Females	Persons
Number of cases	419	791	1,210
Age-standardised rate	5.9	10.2	8.1
Percentage of all cases	34.6	65.4	100
Risk to age 75	1 in 216	1 in 125	1 in 157
Risk to age 85	1 in 164	1 in 93	1 in 117

Note: The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.

Source: AIHW ACD 2017.

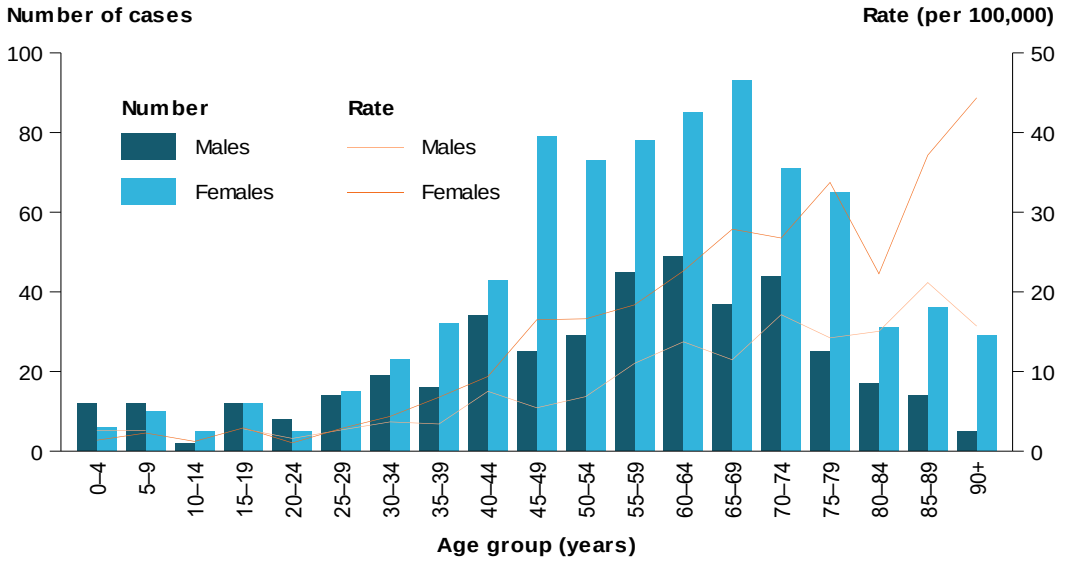
In 2017, for Victoria, Queensland and Western Australia combined, the number of new cases of non-malignant neoplasms of the brain and other CNS for males generally increased with increasing age until 60–64, where it peaked at 49 new cases; for females the number of new cases peaked at 93 for those aged 65–69 (Figure 11.7).

The age-specific incidence rate of non-malignant neoplasms of the brain and other CNS also generally increased with increasing age. For males, the highest incidence rate occurred for those aged 85–89 at 21 cases per 100,000 males. For females, the incidence rate increased with each increasing age group up to those aged 75–79. There was a sudden decrease for females aged 80–84 and it then continued to increase, reaching a high of 44 cases per 100,000 females aged 90 and over (Figure 11.7).

Incidence rates for non-malignant neoplasms of the brain remain relatively stable over time

Between 2003 and 2017, for Victoria, Queensland and Western Australia combined, the number of new cases of non-malignant neoplasms of the brain and other CNS increased from 845 cases in 2003 to 1,210 cases in 2017, exceeding 1,000 cases per year since 2010. The age-standardised incidence rate remained relatively stable between 4.9 and 6.6 cases per 100,000 males and between 9.3 and 10.4 cases per 100,000 females for this period (Figure 11.8).

Figure 11.7: Incidence rates of non-malignant neoplasms of the brain and other CNS, by age at diagnosis and sex, Vic, Qld and WA combined, 2017

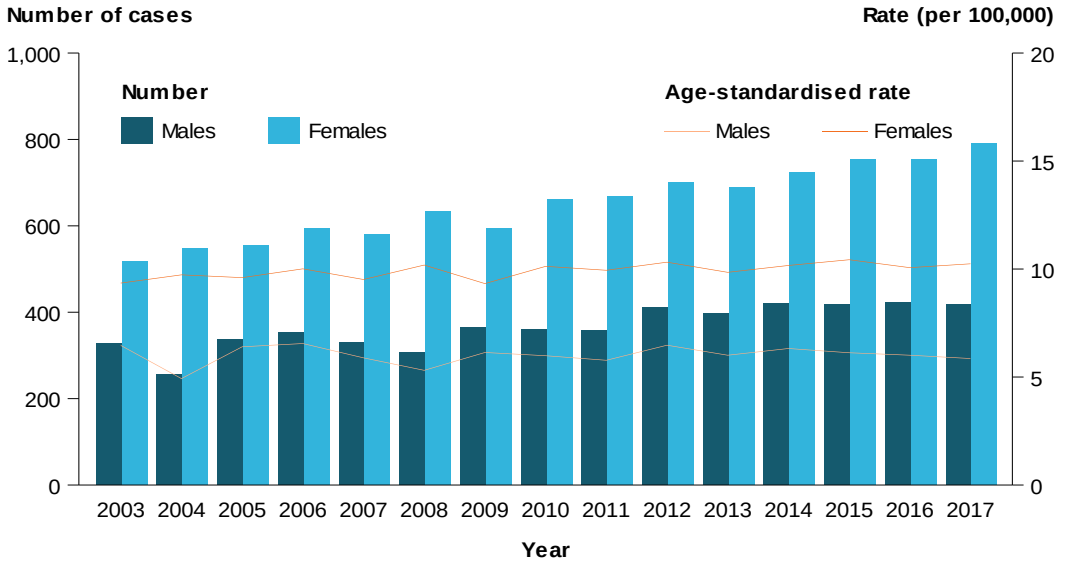


Notes

1. The rates are age-specific rates expressed per 100,000 population.
2. The rates for age group 10–14 in males have been omitted due to the small number of cases.
3. The data for this figure are in online Table S11.7.

Source: AIHW ACD 2017.

Figure 11.8: Trends in incidence of non-malignant neoplasms of the brain and other CNS, by sex, Victoria, Queensland and Western Australia combined, 2003–2017



Notes

1. The rates were age-standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. The data for this figure are in online Table S11.8.

Source: AIHW ACD 2017.

Appendix A: Methodology for estimating missing records in the 2017 ACD and cancer projections

Estimating the number of missing records in the 2017 ACD

The 2017 ACD contains data that have been estimated by the AIHW to account for the following three types of missing records.

- The NT Cancer Registry was unable to submit its incidence data for 2017 in time to be included in the 2017 ACD.
- The NSW Cancer Registry was unable to submit its death-certificate-only cases for 2017 in time to be included in the 2017 ACD.
- There are expected to be some late registrations. These are cases of cancer that were diagnosed in 2017 but had not been coded by the relevant cancer registry in time to be included in the 2017 ACD. This occurs when the registry has not received enough (or any) information about the cancer by the time they need to submit their data to the AIHW.

Estimating the number of new cases in NT in 2017

The NT Cancer Registry was unable to submit its incidence data for 2017 in time to be included in the 2017 ACD. The AIHW estimated these data by projecting the incidence counts observed in the preceding 10 years (2007–2016). There was a separate time series for each combination of sex and cancer type. There were 65 cancer types which were non-overlapping and collectively covered all cancers. For each time series, the straight line of best fit was determined by ordinary linear regression. This line was extrapolated one year ahead to obtain the estimated count for 2017. Estimated counts that were negative were changed to zero. There were only four such counts and their sum was only about –0.5 cases. The estimated count for each stratum was then distributed pro-rata by age group, topography, histology and behaviour using the proportions observed in the preceding 5 years of data combined (2012–2016).

Estimating the number of death-certificate-only cases in NSW in 2017

If a person's death certificate states that they had cancer, in most cases the cancer registry already has other evidence of the cancer. However, in about 1.5% of cases, despite the registry's subsequent enquiries with relevant institutions, the registry is unable to find any other evidence of the cancer. Such cases are called death-certificate-only (DCO) cases.

The NSW Cancer Registry was unable to submit its DCO cases for 2017 in time to be included in the 2017 ACD. The AIHW estimated the number of such cases by assuming they would be the same as they were in NSW in 2016, stratified by sex, diagnosis age group, topography, histology and behaviour.

Estimating the number of late registrations for 2017

Almost all late registrations have a diagnosis year equal to that of the most recent year of the ACD, in this case 2017. Comparisons between successive versions of the ACD have shown that late registrations account for about 1% of cases in that year. For example, it is expected that about 1% of cases diagnosed in 2017 are not part of the 2017 ACD; they will appear for the first time in the 2018 ACD (with a diagnosis year of 2017). The AIHW has made estimates of these cases by assuming they would be the same as the late registrations for 2016, that is, cases diagnosed in 2016 that appeared for the first time in the 2017 ACD. Note that in the case of NT the most recent year of data is 2016, not 2017, so estimates of late registrations for NT were made for 2016.

Incidence and mortality projections

Incidence projections for 2018–2021

Estimates of national incidence for 2018–2021 were calculated using a very similar method to that used to estimate incidence for 2017 for NT (see preceding section). The two main differences were that the time series were stratified by age group in addition to sex and cancer type and that the dependent variable was the age-sex-specific incidence rate rather than the incidence count. Projected rates were converted to counts by multiplying by the relevant estimated or projected resident populations. Note the following:

- The incidence estimates already made for 2017 for NT were treated as real data for the purposes of estimating national incidence for 2018–2021.
- The 10 years of incidence data used for the baseline time series were 2008–2017.
- The ABS Estimated Resident Populations were used for 2008–2019, and the ABS population projection series B for 2020–2021 (ABS 2018c).

Incidence projections for 2022–2031

Longer term incidence projections covering 2022–2031 were calculated using the Nordpred software package (Fekjaer & Møller). Nordpred uses 5-year age groups up to age 80–84 and a final age group of 85 and above. For some younger age groups and cancer types the number of cases was insufficient to produce stable projections. In these situations Nordpred projected the average of the rates of the last two five-year periods.

Mortality projections for 2020–2021

The mortality projections for 2020–2021 were carried out using almost the same method that was used for the short-term incidence projections. The only difference was that the projections were for the years 2020–2021 (compared to 2018–2021) with a baseline of 2010–2019 (compared to 2008–2017) because two more years of actual mortality data were available for use.

Appendix B: Cancer codes

Table B1: ICD-10 codes for cancer

Cancer site/type	ICD-10 codes
Lip, oral cavity and pharynx	
Lip	C00
Tongue	C01–C02
Mouth	C03–C06
Major salivary glands	C07–C08
Oropharynx	C09–C10
Nasopharynx	C11
Hypopharynx	C12–C13
Other and ill-defined sites in the lip, oral cavity and pharynx	C14
Digestive organs	
Oesophagus	C15
Stomach	C16
Small intestine	C17
Colorectal	C18–C20
Anus	C21
Liver	C22
Gallbladder and extrahepatic bile ducts	C23–C24
Pancreas	C25
Other and ill-defined digestive organs	C26
Respiratory system and intrathoracic organs	
Nasal cavity, middle ear and sinuses	C30–C31
Larynx	C32
Lung	C33–C34
Other thoracic and respiratory organs	C37–C39
Bone	C40–C41
Skin	
Melanoma of the skin	C43
Non-melanoma skin cancer	C44
Mesothelial and soft tissue	
Mesothelioma	C45
Kaposi sarcoma	C46
Peritoneum	C48
Other soft tissue	C47, C49
Breast	C50

(continued)

Table B1 (continued): ICD-10 codes for cancer

Cancer site/type	ICD-10 codes
Female genital organs	
Vulva	C51
Vagina	C52
Cervix	C53
Uterus	C54–C55
Ovary	C56
Other female genital organs	C57
Placenta	C58
Male genital organs	
Penis	C60
Prostate	C61
Testis	C62
Other male genital organs	C63
Urinary tract	
Kidney	C64
Bladder	C67
Other urinary organs	C65–C66, C68
Eye, brain and other parts of the central nervous system	
Eye	C69
Brain	C71
Other central nervous system	C70, C72, C75.1–C75.3
Thyroid and other endocrine glands	
Thyroid	C73
Other endocrine glands	C74–C75 excluding C75.1–C75.3
Blood and lymphatic system	
Hodgkin lymphoma	C81
Non-Hodgkin lymphoma	C82–C86
Immunoproliferative cancers	C88
Multiple myeloma	C90.0
Other plasma cell	C90.1–C90.9
Acute lymphoblastic leukaemia	C91.0
Chronic lymphocytic leukaemia	C91.1
Other and unspecified lymphoid leukaemia	C91.2–C91.9
Acute myeloid leukaemia	C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5
Chronic myeloid leukaemia	C92.1
Other and unspecified myeloid leukaemia	C92.2, C92.7, C92.9, C93.1–C93.9, C94.6–C94.7
Other and unspecified leukaemia	C94.3, C95
Myelodysplastic syndromes	D46
Other cancers of the blood and lymphatic system	C94.1, C96, D45, D47.1, D47.3–D47.5

(continued)

Table B1 (continued): ICD-10 codes for cancer

Cancer site/type	ICD-10 codes
Other	
Other and ill-defined sites	C76
Unknown primary site	C80
All cancers combined	**C00–C97, D45, D46, D47.1, D47.3–D47.5**

Notes

1. For mortality data, colorectal cancer comprises codes C18–C20 and C26.0.
2. For incidence data, bone cancer is coded using the RARECAREnet definition which includes additional histology codes at particular sites. For details see Cancer data commentary no. 7 in *Cancer data in Australia* (AIHW 2021f). For mortality data, bone cancer comprises codes C40–C41.
3. For incidence, survival and prevalence data, non-melanoma of skin (C44) excludes basal and squamous cell carcinomas because they are not notifiable diseases and aren't collected by cancer registries except in Tasmania. However, for mortality data, basal and squamous cell carcinomas are included in the statistics for code C44.
4. For incidence data, ovarian cancer and serous carcinomas of the fallopian tube are coded as ICD10 codes C56 and C57.0, C57.8 (with histologies 8441, 8460, 8461). For details see Cancer data commentary no. 5 in *Cancer data in Australia* (AIHW 2021f). For mortality data, ovarian cancer is coded as C56.
5. For incidence data, cancer of other female genital organs excluding serous carcinomas of the fallopian tube are coded as ICD10 code C57 excluding C57.0, C57.8 (with histologies 8441, 8460, 8461). See also note 4. For mortality data, cancer of other female genital organs is coded as C57.
6. For incidence data, C94.1 is included in other and unspecified leukaemia and is excluded from other cancers of the blood and lymphatic system. For mortality data, C94.1 is excluded from other and unspecified leukaemia and is included in other cancers of the blood and lymphatic system.
7. For mortality data, unknown primary site comprises codes C77–C80 and C97. However, C77–C79 have not been used since 2007 and C97 has not been used since 2012.

Table B2: ICD-10 codes for non-malignant tumours in the 2017 ACD

Non-malignant tumour site/type	ICD-10 codes
Melanoma in situ	D03
Carcinoma in situ of breast	D05
Carcinoma in situ of cervix	D06
Benign neoplasm of central nervous system	D32–D33
Neoplasm of uncertain behaviour of central nervous system	D42–D43

Note: Melanoma in situ of the skin is ICD-10 code D03 in conjunction with ICD-O-3.1 topography code C44.

Appendix C: Data sources

Australian Burden of Disease Study

Data to develop the ABDS estimates for cancer were obtained from many sources. Deaths data for the fatal burden were sourced from the NMD. Data for the non-fatal burden came from a variety of administrative sources including the ACD, the NHMD and MBS claims data, as well as a number of epidemiological studies. Data for risk factor exposure were sourced from the National Health Survey 2017–18 and the National Drug Strategy Household Survey 2019.

Other inputs for the ABDS were obtained from a number of Global Burden of Disease (GBD) studies, including the GBD 2010, GBD 2013, GBD 2015, GBD 2017 and GBD 2019. These included the standard life table for fatal burden, health states and disability weights for the non-fatal burden and relative risks, and Theoretical Minimum Risk Exposure Distributions for the risk factor attribution.

Population estimates underpinning all estimates were sourced from the Australian Demographic Statistics from the ABS.

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

Australian Cancer Database

All forms of cancer, except basal and squamous cell carcinomas of the skin, are notifiable diseases in each Australian state and territory. This means there is legislation in each jurisdiction that requires hospitals, pathology laboratories and various other institutions to report all cases of cancer to their central cancer registry. An agreed subset of the data collected by these cancer registries is supplied annually to the AIHW, where it is compiled into the Australian Cancer Database (ACD). The ACD currently contains data on all cases of cancer diagnosed from 1982 to 2017 for all states and territories with the exception of 2017 Northern Territory data.

Cancer reporting and registration is a dynamic process, and records in the state and territory cancer registries may be modified if new information is received. As a result, the number of cancer cases reported by the AIHW for any particular year may change slightly over time and may not always align with state and territory reporting for that same year. Further details about the 2017 ACD can be found in the Data Quality Statement.

Australian Mesothelioma Registry

The Australian Mesothelioma Registry (AMR) is a stand-alone database that contains information about people with mesothelioma. The AMR includes data on new cases of mesothelioma diagnosed in Australia from 1 July 2010. This report uses the ACD as its source of information for all cancers, including mesothelioma. Where complete mesothelioma data are available for both sources, the ACD and AMR provide identical or very similar counts of new cases.

BreastScreen Australia

Data for the number of women who had a screening mammogram and the number of women with invasive breast cancer and DCIS (detected through BreastScreen Australia) are sourced from the BreastScreen register in each state and territory, according to definitions and data specifications in the *BreastScreen Australia data dictionary version 1.2* (AIHW 2019b). These data are compiled into national figures by the AIHW to allow national monitoring of the program. Further details about BreastScreen Australia data can be found in the Data Quality Statement.

Census and population data

Throughout this report, population data were used to derive rates of, for example, cancer incidence and mortality. The population data were sourced from the ABS using the most up-to-date estimates available at the time of analysis.

To derive its estimates of the resident populations, the ABS uses the 5-yearly Census of Population and Housing data and adjusts it as described here:

- All respondents in the Census are placed in their state or territory, Statistical Local Area and postcode of usual residence; overseas visitors are excluded.
- An adjustment is made for people missed in the Census.
- Australians temporarily overseas on Census night are added to the usual residence Census count.

Estimated resident populations are then updated each year from the Census data, using indicators of population change, such as births, deaths and net migration. More information is available from the ABS website.

GLOBOCAN

The GLOBOCAN database, prepared by the IARC, contains cancer incidence and mortality data from cancer registries around the world (Global Cancer Observatory (IARC) 2020). The IARC uses these data to produce estimates for a 'common year'. The most recent GLOBOCAN estimates are for 2020 and are based on incidence data from 3 to 5 years earlier. The GLOBOCAN data for all cancers combined pertain to cancers coded in the ICD-10 as C00–C97, excluding those for C44 (non-melanoma skin cancer). They thus encompass a narrower range of cancers than is generally considered in this report. Australian estimates used in the international context are age-standardised to the World Standard Population and are therefore not comparable with national data presented elsewhere.

Medicare Benefits Schedule database

Medicare provides free or subsidised access to a range of medical services. The Medicare Benefits Schedule (MBS) database is maintained by the Australian Government Department of Health, and is compiled from data supplied by the Department of Health for services. The database includes services that qualify for a Medicare Benefit under the *Health Insurance Act 1973*, and for which a claim has been processed by Services Australia (and its predecessors) from February 1984 onwards. These data are generated as an administrative by-product of the processing of MBS claims and payments. Information is collected about patients, providers, the type of service provided (MBS item number) and the amount of

benefit paid for that service (based on the schedule fee). The database does not include information on public patients in public hospitals or services that are not listed on the MBS. Services rendered free of charge in recognised hospitals, services that qualified for a benefit under the Department of Veterans' Affairs National Treatment Account and services rendered under other publicly funded programs such as breast screening services are also excluded.

The MBS lists services that are subsidised by the Australian Government under Medicare. Each professional service (consultation, procedure, test) contained in the schedule has a unique item number and a set schedule fee. Services listed in the MBS must be rendered according to the provisions of the relevant Commonwealth, state and territory laws. The MBS claims database is maintained by the Department of Health and sourced from Services Australia. For more information on the specific MBS item numbers used in this report, see Table C1. More information on MBS item numbers in general can be found on the MBS Online website.

Table C1: MBS item numbers

Procedure	MBS item numbers
Breast MRI	63457, 63464, 63467. Note: The item number 63457 has been deleted from 1 May 2020.
Breast ultrasound	55059, 55060, 55070, 55073, 55061, 55062, 55076, 55079.
Colonoscopies	32084, 32087, 32090, 32093, 32222, 32223, 32224, 32225, 32226, 32227 32228, 32229. Note: From 1 November 2019, item 32090 was replaced by 7 new items (32222 to 32228), and item 32093 was replaced by new item 32229.
Mammogram	59300, 59301, 59303, 59304, 59302, 59305. Note: 59302 and 59305 are new time-limited MBS items for 3DBT from 1 November 2018.
PSA testing	66655, 66656, 66659, 66660.
Radiotherapy	15000, 15003, 15006, 15009, 15012, 15100, 15103, 15106, 15109, 15112, 15115, 15211, 15214, 15215, 15218, 15221, 15224, 15227, 15230, 15233, 15236, 15239, 15242, 15245, 15248, 15251, 15254, 15257, 15260, 15263, 15266, 15269, 15272, 15275, 15303, 15304, 15307, 15308, 15311, 15312, 15315, 15316, 15319, 15320, 15323, 15324, 15327, 15328, 15331, 15332, 15335, 15336, 15338, 15339, 15342, 15345, 15348, 15351, 15354, 15357, 15500, 15503, 15506, 15509, 15512, 15513, 15515, 15518, 15521, 15524, 15527, 15530, 15533, 15536, 15539, 15550, 15553, 15555, 15556, 15559, 15562, 15565, 15600, 15700, 15705, 15710, 15715, 15800, 15850, 15900.
Chemotherapy	Prior to 1 November 2020: 13915, 13918, 13921, 13924, 13927, 13930, 13933, 13936, 13939, 13942, 13945, 13948. On and after 1 November 2020: 13950.
Vascular surgical operations for chemotherapy	34521, 34524, 34527, 34528, 34529, 34530, 34534, or 34533 with which chemotherapy services were rendered in combination.

National Bowel Cancer Screening Program

Data from the National Bowel Cancer Screening Register were used to report both the number of people who participated in the National Bowel Cancer Screening Program (NBCSP) and the number of bowel cancers detected through the program. These data are supplied twice a year to the AIHW by the Department of Human Services (formerly Medicare Australia) for monitoring purposes. They are compiled by the AIHW and reports are produced annually (AIHW 2018a). Further details about NBCSP screening data can found in the Data Quality Statement.

National Cervical Screening Program

Data on the participation in the National Cervical Screening Program (NCSP) and the number of people with a high-grade cervical abnormality detected through the program are provided by the cervical screening register in each state and territory according to definitions and data specifications in the *National Cervical Screening Program data dictionary* (AIHW 2017a) except for participation. The revised definition of participation will be in the next version of the NCSP data dictionary. These data are compiled into national figures by the AIHW to allow national monitoring of the NCSP. Further details about NCSP screening data can be found in the Data Quality Statement.

National Death Index

The National Death Index (NDI) is a database housed at the AIHW that contains records of all deaths occurring in Australia since 1980. The data are obtained from the registrars of births, deaths and marriages in each state and territory. The NDI is designed to facilitate the conduct of epidemiological studies and its use is strictly confined to medical research. Cancer incidence records from the ACD were linked to the NDI and used to calculate the survival and prevalence data presented in this report. Further details about the NDI can be found in the Data Quality Statement.

National Health Survey

In the 2017–18 National Health Survey, about 16,400 private dwellings across Australia were surveyed, with a total of approximately 21,300 people. All urban and rural areas in all states and territories were included but non-private dwellings, *Very remote* areas and discrete Aboriginal and Torres Strait Islander communities were excluded. Within each randomly selected dwelling 1 adult (18 or over) and 1 child (0–17) were interviewed. Adults were personally interviewed by an ABS interviewer. An adult, nominated by the household, was interviewed about 1 child in the household; some children aged 15–17 may have been personally interviewed with parental consent.

The survey collected a wide variety of data on areas such as Body Mass Index, physical measurements (for example, measured waist circumference, weight, height), blood pressure, breastfeeding, smoking, fruit and vegetable intakes, dietary behaviours, alcohol consumption, exercise and sedentary behaviour. The key results provide information on the prevalence of long-term health conditions, health risk factors and demographic and socioeconomic characteristics.

National Hospital Morbidity Database

The National Hospital Morbidity Database (NHMD) is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. The data supplied are based on the National Minimum Data Set (NMDS) for admitted-patient care; they 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. The purpose of the NMDS for admitted-patient care is to collect information about care provided to admitted patients in Australian hospitals. The scope of the NMDS is episodes of care for admitted patients in all public and private acute and psychiatric hospitals, free-standing day hospital facilities, and alcohol and drug treatment centres in Australia. Hospitals operated by the Australian Defence Force, corrections authorities and in Australia's off-shore territories are not in scope, but some are included.

For more information on the specific use of the NHMD in cancer reporting, see Appendix D. Further details about the NHMD can be found in the Data Quality Statement.

National Mortality Database

The National Mortality Database (NMD) contains information provided by the registries of births, deaths and marriages and the National Coronial Information System—and coded by the ABS—for deaths from 1964 to 2019. Registration of deaths is the responsibility of each state and territory Registry of Births, Deaths and Marriages. These data are then collated and coded by the ABS and are maintained at the AIHW in the NMD.

In the NMD, both the year in which the death occurred and the year in which it was registered are provided. For the purposes of this report, actual mortality data are shown based on the year the death occurred, except for the most recent year (namely 2019) where the number of people whose death was registered is used. Previous investigation has shown that the year of death and its registration coincide for the most part. However, in some instances, deaths at the end of each calendar year may not be registered until the following year. Thus, year of death information for the latest available year is generally an underestimate of the actual number of deaths that occurred in that year.

In this report, deaths registered in 2017 and earlier are based on the final version of cause of death data; deaths registered in 2018 and 2019 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.

The data quality statements underpinning the NMD can be found on the following ABS web pages.

- ABS quality declaration summary for Deaths, Australia.
- ABS quality declaration summary for Causes of death, Australia.

For more information on the NMD see *Deaths data at AIHW*.

National Radiotherapy Waiting Times Database

The National Radiotherapy Waiting Times Database (NRWTD) is a compilation of data supplied to the AIHW based on the Radiotherapy Waiting Times NMDS. Each data record contains information relating to a course of radiotherapy that began in the reference period (that is, where the waiting period associated with the course of radiotherapy ended in the reference period). The data collected includes administrative details, patient demographic characteristics and some clinical information, including principal diagnosis (8th edition of ICD-10-AM). Further details about the NRWTD can be found in the Data Quality Statement.

Appendix D: Definition of cancer-related hospitalisations

Hospitalisations related to cancer

A ‘separation’ is the term used to refer to the episode of admitted-patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay, starting or ending in a change of type of care (for example, from acute care to rehabilitation). In this report, a separation is also referred to as a hospitalisation.

Due to coding methods, it is insufficient to simply select hospitalisations for which cancer was recorded as the principal diagnosis—hospitalisations must also include those hospitalisations where a treatment relating to cancer was recorded as the principal diagnosis. These treatments are usually coded using Z-codes defined in the ICD-10-AM, Chapter 21 ‘Factors influencing health status and contact with health services’ (NCCH 2010).

Note that, based on the definition of cancer-related hospitalisations, data presented in this report may have included a small number of some treatments and services provided to non-cancer patients. For example, Z51.0 *Radiotherapy session* services are not entirely cancer specific; that is, they may be provided to a small number of non-cancer patients, although the majority of these interventions are cancer-related.

Table D1: Definition of cancer-related hospitalisations

	ICD-10-AM codes	
Definition	**Principal diagnosis**	**Additional diagnosis**
Principal diagnosis of cancer	C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5	
Additional diagnosis of cancer		C00–C96, D45, D46, D47.1, D47.3, D47.4, D47.5
Principal diagnosis is a cancer-related treatment (and cancer is not an additional diagnosis)	Z08 (Follow-up examination after treatment for malignant neoplasms) Z40.00 (Breast prophylactic surgery for risk-factors related to malignant neoplasms) Z40.01 (Ovary prophylactic surgery for risk-factors related to malignant neoplasms) Z51.0 (Radiotherapy session) Z51.1 (Pharmacotherapy session for neoplasm) Z54.1 (Convalescence following radiotherapy) Z54.2 (Convalescence following chemotherapy)	Cancer codes excluding (C00–C96, D45, D46, D47.1, D47.3, D47.4, D47.5)

Note: Codes were sourced from the 11th edition of the International statistical classification of diseases and related health problems, 10th revision, Australian modification (ICD-10-AM) (ACCD 2019).

Definition of chemotherapy procedures

For earlier editions of this report, cancer-related hospitalisations for which a chemotherapy session was performed included only chemotherapy sessions with a principal diagnosis of Z51.1 and an additional diagnosis of cancer. From the previous edition of this report, *Cancer in Australia 2019*, the scope has been expanded to include hospitalisations where a procedure block code related to pharmacotherapy was assigned and cancer was a principal and/or additional diagnosis. Consequently, the results presented in this report are only directly comparable to results presented in *Cancer in Australia 2019*.

Table D2: Definition of chemotherapy procedures for cancer-related hospitalisations

Block codes	Block Name
1920	Administration of pharmacotherapy
1922	Other procedures related to pharmacotherapy

Note: Codes were sourced from the 11th edition of the Australian Classification of Health Interventions (ACHI) (ACCD 2019).

Table D3: Definition of cancer-related hospitalisations where a chemotherapy procedure was performed

	ICD-10 AM codes		
Definition	**Principal diagnosis**	**Additional diagnosis**	**Block Code**
Principal diagnosis of a cancer	C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5		1920, 1922
Additional diagnosis of a cancer	Z51.1 (Pharmacotherapy session for neoplasm)	C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5	1920, 1922
	Codes excluding C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5	C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5	1920, 1922

Note: Codes were sourced from the 8th edition of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), and the Australian Classification of Health Interventions (ACHI) (ACCD 2019).

Definition of radiotherapy procedures

This is the first time that the admitted-patient data on radiotherapy procedures were included in the *Cancer in Australia* report. Radiotherapy data in this report include hospitalisations where a procedure block code related to radiotherapy was assigned and cancer was a principal and/or additional diagnosis. Radiation oncology procedures were assigned as one of the block codes 1786–1800 in the NHMD.

Table D4: Definition of cancer-related hospitalisations where a radiotherapy procedure was performed

	ICD-10 AM codes		
Definition	**Principal diagnosis**	**Additional diagnosis**	**Block Code**
Principal diagnosis of a cancer	C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5		1786–1800
Additional diagnosis of a cancer	Z51.0 (Radiotherapy session)	C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5	1786–1800
	Codes excluding C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5	C00–C97, D45, D46, D47.1, D47.3, D47.4, D47.5	1786–1800

Note: Codes were sourced from the 11th edition of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM), and the Australian Classification of Health Interventions (ACHI) (ACCD 2019).

Palliative care separations

For the purpose of this report, a palliative care separation is defined as a separation for which palliation was a substantial component of the care provided, and those in which the principal clinical intent of the care was palliation during part and/or all of the separation, as evidenced by a code of *Palliative care* for the 'Care type' and/or diagnosis data items in the NHMD. See the AIHW report *Palliative care services in Australia* (AIHW 2021j).

Table D5: Definition of palliative care separations

	ICD-10 AM codes	
Definition	**Care type**	**Diagnoses**
Care type is palliative care	3.0	
Additional diagnosis is palliative care		Z51.5

Note: Codes were sourced from the 11th edition of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) (ACCD 2019).

Terms and classifications relating to admitted-patient care

Statistics on admitted patients are compiled when an **admitted patient** (a patient who undergoes a hospital's formal admission process) completes an episode of admitted-patient care and 'separates' from the hospital. This is because most of the data on the use of hospitals by admitted patients are based on information provided at the end of the patients' episodes of care, rather than at the start. The length of stay and the procedures carried out are then known and the diagnostic information is more accurate.

Separation is the term used to refer to the episode of admitted-patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay, starting or ending in a change of type of care (for example, from acute care to rehabilitation). 'Separation' means the process by which an admitted patient completes an episode of care by being discharged, dying, transferring to another hospital or changing type of care.

Patient day (or day of patient care) means the occupancy of a hospital bed (or chair in the case of some same-day patients) by an admitted patient for all or part of a day. The length of stay for an overnight patient is calculated by subtracting the date the patient is admitted from the date of separation and deducting days the patient was on leave. A same-day patient is allocated a length of stay of 1 day.

A **same-day separation** occurs when a patient is admitted to and separated from the hospital on the same date. It should be noted that a separation may be generated by a transfer between hospitals, or by a change in the type of care provided. Therefore, same-day separations may include records for patients whose stay in hospital was longer than 1 day but involved more than 1 separation.

An **overnight separation** occurs when a patient is admitted to and separated from the hospital on different dates.

The **principal diagnosis** is the diagnosis established after study to be chiefly responsible for occasioning the patient's episode of admitted-patient care. An **additional diagnosis** is a condition or complaint that either coexists with the principal diagnosis or arises during the episode of care. An additional diagnosis is reported if the condition affects patient management.

In 2014–15, diagnoses and external causes of injury were recorded using the 8th edition of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM) (NCCC 2012).

A **procedure** is a clinical intervention that is surgical in nature, carries an anaesthetic risk, requires specialised training and/or requires special facilities or services available only in an acute care setting. Procedures therefore encompass surgical procedures and non-surgical investigative and therapeutic procedures, such as X-rays. Patient support interventions that are neither investigative nor therapeutic (such as anaesthesia) are also included. In 2014–15, procedures were recorded using the 8th edition of the Australian Classification of Health Interventions (ACHI) (NCCC 2012).

See the Glossary for more information, and for more terms relating to admitted-patient care.

Appendix E: Statistical methods and technical notes

Rates: crude, age-specific and age-standardised

The *crude* incidence (or mortality) rate in a given year is defined to be the number of diagnoses of (or deaths from) cancer in that year divided by the total population on 30 June of that year (it is standard to use the mid-year population as a best guess at the average daily population across the whole year). For cancer, these rates are typically quite small and difficult to conceptualise. To simplify communication, the convention is to express cancer incidence and mortality rates per 100,000 males, females or people, as the case may be. For example, instead of saying that the incidence rate was 0.000456 cases per person we say that it was 45.6 cases per 100,000 people.

The *age-specific* rate in a given age group in a given year is the crude rate restricted to that age group. It is defined to be the number of diagnoses of (or deaths from) cancer in that age group in that year divided by the total population of that age group on 30 June of that year.

For most types of cancer, age-specific incidence rates vary a great deal by age, typically being very low in children and young people and increasing dramatically in older age groups. As the incidence rate of cancer depends heavily on age, crude rates are not suitable for looking at trends or making comparisons between different populations. This is because a population whose average age is relatively young will have a lower crude rate than a population whose average age is relatively old simply by virtue of the age difference. More meaningful comparisons can be made by using the *age-standardised rate*. Age-standardisation is a mathematical process that effectively removes the influence that a population's age structure has on the crude rate, thus producing rates that can be compared fairly.

In order to carry out age-standardisation, a so-called *standard population* must be chosen and adhered to. The population used in this report is the 2001 Australian Standard Population. Then the age-specific rates that were calculated from the study population are applied to the analogous age groups in the standard population. This yields the number of cases (or deaths) in each age group that would have occurred in the standard population if it was subject to the same rates as those experienced by the study population. Then all those cases (or deaths) are added up across the age groups to arrive at the total number of cases (or deaths) that would have occurred in the standard population. Finally, that number is divided by the total size of the standard population. This final figure is the age-standardised incidence (or mortality) rate of cancer in the study population.

Note that the above age-standardised rate is more properly called the *directly* age-standardised rate. There is another method, which yields the *indirectly* age-standardised rate. However, that method is not used in this report.

Risk of cancer

The risk of being diagnosed with cancer before the age of 75 (or 85), calculated for a given year, say 2021, is the probability that a baby born during 2021 will be diagnosed with cancer at some time before reaching the age of 75 (or 85). The calculations assume that as the person ages they will experience the same age-specific cancer incidence rates and all-cause mortality rates that were observed in 2021. Note that the calculations are carried out within a

competing risks framework, which means that they take into account the probability of the person dying (of any cause) before being diagnosed.

Similarly, the risk of dying from cancer before the age of 75 (or 85), calculated for a given year, say 2021, is the probability that a baby born during 2021 will die from cancer at some time before reaching the age of 75 (or 85).

It is important to understand that the risks referred to above are not any individual person's risks; they are averages across the whole population. Some people will have higher-than-average risk and some will have lower-than-average risk. The factors that determine individual risk are discussed in Chapter 2 of this report.

There is a substantial amount of cancer risk data in *Cancer data in Australia* (AIHW 2021f), which also presents the formulas used to calculate risk and provides guidance in interpreting and using risk data (see Cancer data commentary no. 1).

Survival: observed, expected and relative

Observed survival is defined to be the proportion of patients who are still alive a specified time after diagnosis. For example, a 5-year observed survival figure of 60% means that 60% of patients are still alive 5 years after their diagnosis. Observed survival measures the combined impact of two different factors: mortality that is due to the cancer and mortality that would have occurred anyway, that is, whether the person had cancer or not. The second factor is called *background mortality*. The presence of background mortality makes observed survival unsuitable for comparing cancer survival between different populations because different populations may have different background mortality. To make fair comparisons, a method for quantifying the mortality due only to the cancer is needed. The most commonly used method is called relative survival.

Relative survival is defined to be observed survival divided by expected survival. *Expected survival* is the proportion of the group of cancer patients who would be expected to survive for the specified time period if they didn't have cancer. Expected survival is calculated by referring to life tables produced by the Australian Bureau of Statistics. Life tables give the probability that an average person of a given sex and age will survive for at least one more year. Each person in the cancer group is matched with a hypothetical 'control', who is an 'average' person of the same sex and age as the cancer patient. The set of all controls is called the control group. The expected survival for the control group can be calculated by reference to the survival probabilities in the life tables.

A simplified example of how relative survival is calculated is shown in Figure E1. Five-year observed survival is 60% (0.6) and 5-year expected survival is 90% (0.9), so 5-year relative survival is 0.6 divided by 0.9, or 67% (0.67). One way to interpret this result is that the chance of a cancer patient surviving at least 5 years after diagnosis is 67% of the chance that a sex- and age-matched peer in the general population has of surviving at least 5 more years. An alternate way is that the cancer diagnosis has reduced the person's chance of surviving for at least 5 more years by 33% (100%–67%) compared to if they hadn't been diagnosed with cancer.

It is important to understand that the survival percentages referred to above are not any individual person's chances of survival; they are averages across the whole population. Some people will have higher-than-average chance and some will have lower-than-average chance. An individual person's chance of survival will be determined by the details of their particular cancer, their other health conditions and other factors.

Figure E1: Simplified example of how relative survival is calculated

There are several different methods of calculating expected survival. The Ederer II method was used in this report (Ederer & Heise 1959). There are two overarching conceptual approaches to calculating survival: the cohort method and the period method. The period method was used in this report (Brenner & Gefeller 1996). The survival calculations were carried out using a SAS program originally written by Dickman (2004).

Approximate relative survival rates by Indigenous status

The calculation of exact relative survival by Indigenous status would require life tables for the combined jurisdictions of NSW, Vic, Qld, WA and NT, stratified by Indigenous status, for each year of the analysis. Such life tables are not available. The approximate relative survival figures presented in Chapter 10 were calculated by using a life table for all of Australia stratified by Indigenous status, repeated for each year of the analysis.

The life tables were based on enhanced Indigenous deaths which were estimated by applying Indigenous status adjustment factors to the recorded Indigenous deaths in the NMD for the period 2008–2014. Although all deaths are likely reported, not all Indigenous deaths are identified as Indigenous during the death registration process. This could lead to under-identification of Indigenous deaths and over-estimation of Indigenous life expectancy. This problem was dealt with by linking the NDI with independent and comparative data sets that contained information on Indigenous identification. Indigenous status was compared across the linked data sets and the result of the comparison was then used in preparing Indigenous status adjustment factors. The adjustment factors were calculated separately for males and females and for each age group. The enhanced Indigenous deaths were then used in preparing Indigenous life tables using standard statistical and demographic techniques. For further details of this work see AIHW (2012 & 2017b).

Prevalence

Total prevalence on a given day, called the index day, is defined to be the number of people alive at the end of that day who had been diagnosed with cancer at any time in the past. In order to be able to compute the total prevalence of cancer it is necessary to have a

population-wide database that extends back into the past longer than any human lifetime. As the ACD started in 1982, it won't be possible to compute total prevalence of cancer in Australia for many more decades.

Another prevalence concept is known as *limited-duration prevalence*. Specifically, *N-year prevalence* on a given day, where *N* is any number 1, 2, 3, …, is defined to be the number of people alive at the end of that day who had been diagnosed with cancer at any time in the previous *N* years. For example, 5-year prevalence on 31 December 2016 is the number of people who were alive at the end of 2016 who had been diagnosed with cancer at any time in the previous 5 years, that is, 2012 to 2016. As the ACD started in 1982 and the 2017 ACD is nationally complete to the end of 2016, the maximum duration prevalence that can be reported from the 2017 ACD is 35-year prevalence.

Note that prevalence is measured by the number of people diagnosed with cancer, not the number of cancer cases. A person who was diagnosed with 2 separate cancers will contribute separately to the prevalence of each cancer. However, this person will contribute only once to the prevalence of all cancers combined. For this reason, the prevalence added up over all individual cancers can be greater than the prevalence of the group 'all cancers combined'.

Prevalence can be expressed as a rate by dividing the prevalence by the size of the total population on the index day. Like incidence and mortality rates, prevalence rates can be crude, age-specific or age-standardised. Note that when prevalence is presented by age, the age refers to the age of the person on the index day. This is in contrast to how statistics by age are presented for incidence and survival. For those measures the age refers to the age at diagnosis.

Mortality-to-incidence ratio

The mortality-to-incidence ratio (MIR) for a given period (almost always one year) is defined to be the number of deaths from cancer in that period divided by the number of diagnoses of cancer in that period. In some situations the age-standardised rates are used instead of the raw numbers but the latter are preferable when available.

The value of the MIR will lie between 0 (if there were no deaths from the cancer) and, generally speaking, 1 (if there were just as many deaths as new diagnoses). The value can exceed 1 from time to time (if there were more deaths than new diagnoses), but this is not sustainable because there cannot be consistently more deaths than diagnoses year after year.

A cancer's MIR is a measure of survival. Low values of the MIR indicate longer survival while high values indicate shorter survival. Relative survival is a better measure than the MIR but has drawbacks: it is complicated to calculate, can be done in a number of different ways and depends on the existence of good-quality life tables for the population concerned. This means there can be comparability and interpretation problems when comparing relative survival between different countries. On the other hand, the MIR is easy to calculate, can only be done in two ways (raw numbers or age-standardised rates) and does not depend on any auxiliary information such as life tables. Therefore the MIR is often used to compare survival between countries. Note, though, that the MIR only gives a valid measure of the survival experience in a population if:

- cancer registration and death registration are complete or nearly so, and
- the incidence rate, mortality rate and survival proportion are not undergoing rapid change.

Appendix F: Enhancements and other events affecting data

The *Cancer in Australia* series utilises a range of data from various sources. On occasion, data sources may be subject to processes intended to improve the reliability of statistical information. This appendix notes such enhancements and their impacts upon the statistics presented in this report.

Australian Cancer Database—Indigenous status

Improvements in the recording of Indigenous status in the 2017 ACD resulted in a reduction in the number of people with unknown Indigenous status and consequently an increase in cancer incidence counts for the Indigenous and non-Indigenous populations.

National Mortality Database—colorectal cancer

The AIHW uses the NMD for reporting cancer mortality. The NMD is coded and compiled by the ABS, and ABS advice notes that where 'bowel cancer' or 'colorectal cancer' is recorded on the death certificate, internationally agreed rules state that the cancer should be coded to C26.0, which is not a code used for colorectal cancer within incidence data (C18–C20). The ABS advises that using C18–C20 as the definition of colorectal cancer within the NMD leads to a substantial undercount of deaths due to colorectal cancer. For this reason, in *Cancer in Australia 2021* the AIHW uses C18–C20 and C26.0 as the definition of colorectal cancer in the NMD. This is different from previous versions of this report and results in a greater number of deaths being attributed to colorectal cancer than previously.

Appendix G: Classifications

Remoteness areas

The remoteness areas divide Australia for statistical purposes into broad geographic regions that share characteristics of remoteness. The Remoteness Structure, which divides each state and territory into several regions on the basis of their relative access to services, has 6 classes of remoteness: *Major cities*, *Inner regional*, *Outer regional*, *Remote*, *Very remote* and *Migratory*. The category *Major cities* includes Australia's capital cities, except for Hobart and Darwin, which are classified as *Inner regional*. Remoteness areas are based on the Accessibility and Remoteness Index of Australia, produced by the Australian Population and Migration Research Centre at the University of Adelaide.

The 2017 ACD contains the 2016 Statistical Area Level 1 (SA1) of usual residence at time of diagnosis for most records and the 2016 Statistical Area Level 2 (SA2) for all records. A correspondence was used to map the SA1 (when available) or SA2 (when not) to the 2016 Remoteness Area (RA).

The NMD contains the 2011 SA2 of usual residence at time of death for deaths registered in 2015, and the 2016 SA2 for deaths registered in 2016–2019. A correspondence was used to map the 2011 SA2 or 2016 SA2 to the 2016 RA.

Index of Relative Socio-economic Disadvantage

The IRSD is one of 4 Socio-Economic Indexes for Areas developed by the ABS. This index is based on factors such as average household income, education levels and unemployment rates. The IRSD is not a person-based measure; rather, it is an area-based measure of socioeconomic disadvantage in which small areas of Australia are classified on a continuum from disadvantaged to affluent. This information is used as a proxy for the socioeconomic disadvantage of people living in those areas and may not be correct for each person in that area.

In this report, the first socioeconomic area (quintile 1) corresponds to geographical areas containing the 20% of the population with the greatest socioeconomic disadvantage according to the IRSD, and the fifth group (quintile 5) corresponds to the 20% of the population with the least socioeconomic disadvantage.

Socioeconomic disadvantage quintiles were assigned to cancer cases according to the IRSD of the SA2 of usual residence at the time of diagnosis, and to deaths according to the SA2 of usual residence at the time of death.

International Classification of Diseases for Oncology

Australia's cancer registries code neoplasms using the first revision of the third edition of the International Classification of Diseases for Oncology (ICD-O-3.1). The coding system uses three components: one for the part of the body in which the neoplasm originated (called the topography code), one for the type of cell that is neoplastic (the histology code) and one that indicates whether the neoplasm is benign, in situ, malignant or of uncertain malignancy (the behaviour code). The histology together with the behaviour is called the morphology. The ICD-O-3.1 code is translated to an ICD-10 code for high-level reporting such as is found in *Cancer in Australia.* For lower-level reporting, such as breaking down lung cancer into different types, it is necessary to use the histology code.

International Statistical Classification of Diseases and Related Health Problems

The International Statistical Classification of Diseases and Related Health Problems (ICD) is used to classify diseases and other health problems (including symptoms and injuries) in clinical and administrative records. The use of a standard classification system enables the storage and retrieval of diagnostic information for clinical and epidemiological purposes that is comparable between different service providers, across countries and over time.

In 1903, Australia adopted the ICD to classify causes of death and it was fully phased in by 1906. Since 1906, the ICD has been revised 9 times to recognise new diseases (for example, Acquired Immunodeficiency Syndrome, or AIDS), increased knowledge of diseases, and changing terminology in the description of diseases. The version currently in use, the ICD-10 (WHO 1992), was endorsed by the 43rd World Health Assembly in May 1990 and officially came into use in World Health Organization member states from 1994.

International Statistical Classification of Diseases and Related Health Problems, Australian Modification

The Australian modification of the ICD-10, referred to as the ICD-10-AM (NCCH 2010), is based on the ICD-10. The ICD-10 was modified for the Australian setting by the National Centre for Classification in Health, with assistance from clinicians and clinical coders. Despite the modifications, compatibility with the ICD-10 at the higher levels of the classification (that is, up to 4 character codes) has been maintained. The ICD-10-AM has been used to classify diagnoses in hospital records in all states and territories since 1999–00 (AIHW 2000).

Australian Classification of Health Interventions

The current version of the ICD does not incorporate a classification system for coding health interventions (that is, procedures). In Australia, a health intervention classification system was designed to be implemented at the same time as the ICD-10-AM in July 1998. The system was based on the MBS coding system and originally called MBS-Extended. The name was changed to the Australian Classification of Health Interventions (ACHI) with the release of the third revision of the ICD-10-AM in July 2002 (NCCH 2010). The ACHI and the ICD-10-AM are used together in Australian hospital records to classify morbidity, surgical procedures and other health interventions.

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Abbreviations

ABDS	Australian Burden of Disease Study
ABS	Australian Bureau of Statistics
ACCD	Australian Consortium for Classification Development
ACD	Australian Cancer Database
ACHI	Australian Classification of Health Interventions
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
ALL	Acute lymphoblastic leukaemia
ALOS	average length of stay
AML	acute myeloid leukaemia
AMR	Australian Mesothelioma Registry
ASR	age-standardised rate
BCC	basal cell carcinoma
BMI	Body Mass Index
CLL	chronic lymphocytic leukaemia
CNS	central nervous system
CST	Cervical Screening Test
DALY	disability-adjusted life year
DCIS	ductal carcinoma in situ
HPV	human papilloma virus
IARC	International Agency for Research on Cancer
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th Revision
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification
ICD-O-3.1	International Classification of Diseases for Oncology, 3rd Edition, 1st Revision
iFOBT	immunochemical faecal occult blood test
IRSD	Index of Relative Socio-economic Disadvantage
LBC	liquid based cytology
MBS	Medicare Benefits Schedule
MDS	Myelodysplastic syndromes
MIR	mortality-to-incidence ratio
MRI	magnetic resonance imaging
NBCSP	National Bowel Cancer Screening Program
NCSP	National Cervical Screening Program
NDI	National Death Index

NHMD	National Hospital Morbidity Database
NHMRC	National Health and Medical Research Council
NMD	National Mortality Database
NMDS	National Minimum Data Set
NRWTD	National Radiotherapy Waiting Times Database
NSW	New South Wales
NT	Northern Territory
Pap test	Papanicolaou smear (cervical smear test)
PSA	prostate-specific antigen
Qld	Queensland
RD stage	Registry-derived stage
SA	South Australia
SA2	Statistical Areas Level 2
SCC	squamous cell carcinoma
Tas	Tasmania
UV	Ultraviolet radiation
Vic	Victoria
WA	Western Australia
WHO	World Health Organization
YLD	years lived with disability
YLL	years of life lost

Symbols

. .	not applicable
≤	less than or equal to
≥	greater than or equal to
n.p.	not publishable because of small numbers, confidentiality or other concerns about the quality of the data

Glossary

Aboriginal or Torres Strait Islander: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Indigenous**.

additional diagnosis: A condition or complaint either coexisting with the principal diagnosis or arising during the episode of care.

administrative databases: Observations about events that are routinely recorded or required by law to be recorded. Such events include births, deaths, hospital separations and cancer incidence. Administrative databases include the Australian Cancer Database, the National Mortality Database and the National Hospital Morbidity Database.

admitted patient: A person who undergoes a hospital's formal admission process to receive treatment and/or care. Such treatment or care can occur in hospital and/or in the person's home (as a 'hospital-in-home' patient).

age-specific rate: A rate for a specific age group. The numerator and denominator relate to the same age group.

age-standardisation: A method of removing 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; then the disease rates that would have occurred with that structure are calculated and compared.

asymptomatic: Without symptoms.

average length of stay (ALOS): The average (mean) number of patient days for **admitted patient** episodes. Patients who are admitted and have a **separation** on the same date are allocated a length of stay of 1 day.

benign: Term that describes non-cancerous tumours that may grow larger but do not spread to other parts of the body.

burden of disease: Term referring to the quantified impact of a disease or injury on an individual or population, using the disability-adjusted life year measure.

cancer (malignant neoplasm): A large range of diseases in which some of the body's cells become defective, begin to multiply out of control, can invade and damage the area around them, and can also spread to other parts of the body to cause further damage.

carcinoma: A cancer that begins in the lining layer (epithelial cells) of organs such as the lungs.

causal relationship: a relationship between 2 things, where 1 thing is responsible for causing the other thing; for example, a causal relationship between tobacco smoking (an exposure) and lung cancer (a disease) has been established through multiple epidemiological studies.

chemotherapy: The use of drugs (chemicals) to prevent or treat disease, with the term being applied for treatment of cancer rather than for other uses.

cohort method: A method of calculating **survival** that is based on a cohort of people diagnosed with cancer in a previous time period and followed over time.

common cancer: A cancer with an age-standardised incidence rate of 12 per 100,000 people or more.

colonoscopy: A procedure to examine the bowel using a special scope, usually carried out in a hospital or day clinic.

crude rate: The number of events in a given period divided by the size of the population at risk in a specified time period.

death due to cancer: A death where the underlying cause is indicated as cancer.

ductal carcinoma in situ (DCIS): A non-invasive tumour of the mammary gland (breast) arising from cells lining the ducts.

expected survival: A measure of **survival** that reflects the proportion of people in the general population alive for a given amount of time. Expected survival estimates are crude estimates calculated from **life tables** of the general population by age, sex and calendar year.

iFOBT (immunochemical faecal occult blood test): A test used to detect tiny traces of blood in a person's faeces that may be a sign of bowel cancer. The iFOBT is a central part of Australia's National Bowel Cancer Screening Program.

histology: The microscopic characteristics of cellular structure and composition of tissue.

hospitalisation: See **separation**.

incidence: The number of new cases (of an illness or event, and so on) in a given period.

Indigenous: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Aboriginal or Torres Strait Islander**.

International Statistical Classification of Diseases and Related Health Problems: The World Health Organization's internationally accepted classification of death and disease. The 10th 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 (see Appendix G).

invasive: See **malignant**.

length of stay: Duration of hospital stay, calculated by subtracting the date the patient was admitted from the day of **separation**. All leave days, including the day the patient went on leave, are excluded. A **same-day patient** is allocated a length of stay of 1 day.

less common cancer: A cancer with an age-standardised incidence rate of 6 per 100,000 people or more but less than 12 per 100,000 people.

life tables: Tables of annual probabilities of death in the general population.

limited-duration prevalence: The number of people alive at a specific time who have been diagnosed with cancer over a specified period (such as the previous 5 or 25 years).

malignant: A tumour with the capacity to spread to surrounding tissue or to other sites in the body. See also **invasive**.

mammogram: A radiographic depiction of the breast.

mortality due to cancer: The number of deaths that occurred during a specified period (usually a year) for which the underlying cause of death was recorded as cancer.

mortality-to-incidence ratio: The ratio of the age-standardised mortality rate for cancer to the age-standardised incidence rate for cancer (see also **age-standardisation** and **incidence**).

neoplasm: An abnormal ('neo' = new) growth of tissue. Can be **benign** (not a cancer) or **malignant** (a cancer) (see also **invasive**). Also known as a **tumour**.

new cancer case: See **incidence**.

non-Indigenous: People who have declared that they are not of **Aboriginal or Torres Strait Islander** descent.

observed survival: A measure of **survival** that reflects the proportion of people alive for a given amount of time after a diagnosis of cancer. Observed survival estimates are crude estimates calculated from population-based cancer data.

overnight patient: An **admitted patient** who receives hospital treatment for a minimum of one night (that is, is admitted to, and has a **separation** from, hospital on different dates).

palliative care hospitalisations: For the purposes of this report, those **hospitalisations** for which palliative care was a substantial component of the care provided. Such separations were identified as those for which the principal clinical intent of the care was palliation during part or all of the separation, as evidenced by a code of **palliative care** for the 'Care type' and/or 'Diagnosis' data items in the National Hospital Morbidity Database.

pap smear (Pap test): Papanicolaou smear, a procedure to detect cancer and pre-cancerous conditions of the female genital tract.

patient days: The number of full or partial days of stay for patients who were admitted for an episode of care and who underwent **separation** during the reporting period. A patient who is admitted and separated on the same day is allocated 1 patient day.

period method: A method of calculating **survival** that is based on the survival experience during a recent at-risk or follow-up time period.

population estimates: Official population numbers compiled by the Australian Bureau of Statistics at both state and territory and Statistical Local Area levels by age and sex at 30 June each year. These estimates allow comparisons to be made between geographical areas of differing population sizes and age structures.

prevalence: The total number of people alive at a specific date who have ever been diagnosed with a particular disease, such as cancer.

primary cancer: A **tumour** that is at the site where it first formed (see also **secondary cancer**).

principal diagnosis: The diagnosis listed in hospital records to describe the problem that was chiefly responsible for the patient's episode of care in hospital.

procedure: A clinical intervention that is surgical in nature, carries a procedural risk, carries an anaesthetic risk, requires specialised training and/or requires special facilities or equipment available only in the acute care setting.

projection: Longer-term extrapolation of recent trend data using unknown parameters such as expected future populations.

rare cancer: A cancer with an age-standardised incidence rate of less than 6 per 100,000 people.

relative survival: The ratio of **observed survival** of a group of persons diagnosed with cancer to **expected survival** of those in the corresponding general population after a specified interval following diagnosis (such as 5 or 10 years).

risk factor: Any factor that represents 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, namely protective factors, risk factors are known as 'determinants'.

same-day patient: A patient who is admitted to, and has a **separation** from, hospital on the same date.

secondary site cancer: A **tumour** that originated from a cancer elsewhere in the body. Also referred to as a **metastasis**.

separation: An episode of care for an **admitted patient** which may include a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay that begins or ends in a change of type of care (for example, from acute to rehabilitation). In this report, separations are also referred to as **hospitalisations**.

stage: The extent of a cancer in the body. Staging is usually based on the size of the **tumour**, whether lymph nodes contain cancer, and whether the cancer has spread from the original site to other parts of the body.

statistical significance: An indication from a statistical test that an observed difference or association may be significant or 'real' because it is unlikely to be due only to chance. A statistical result is usually said to be 'significant' if it would occur by chance only once in 20 times or less often.

survival: A general term indicating the probability of being alive for a given amount time after a particular event, such as a diagnosis of cancer.

symptom: Any indication of a disorder that is apparent to the person affected.

tumour: An abnormal growth of tissue. Can be **benign** (not a cancer) or **malignant** (a cancer).

underlying cause of death: The disease or injury that initiated the sequence of events leading directly to death.

valid iFOBT test result: Immunochemical faecal occult blood test (iFOBT) result that is either positive or negative. Inconclusive results are excluded from analysis.

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Related publications

Cancer in Australia is a biennial series. The 19 earlier editions and any published subsequently can be downloaded free from the AIHW website. The website also includes information on how to order printed copies.

The following AIHW web reports might be of interest.

- Cancer data in Australia (AIHW 2021f).
- Cancer statistics for small geographic areas.

The following AIHW reports might also be of interest.

- AIHW 2021. BreastScreen Australia monitoring report 2021. Cat. no. CAN 140. Canberra: AIHW.
- AIHW 2021. National Bowel Cancer Screening Program: monitoring report 2021. Cancer series no.132. Cat. no. CAN 139. Canberra: AIHW.
- AIHW 2020. National Cervical Screening Program monitoring report 2020. Cancer series 130. Cat. no. CAN 138. Canberra: AIHW.
- AIHW 2020. Radiotherapy in Australia 2018–19. Cat. no. HSE 248. Canberra: AIHW.
- AIHW 2018. Analysis of bowel cancer outcomes for the National Bowel Cancer Screening Program 2018. Cat. no. CAN 113. Canberra: AIHW.
- AIHW 2018. Analysis of breast cancer outcomes and screening behaviour for BreastScreen Australia. Cancer series no.113. Cat. no. CAN 118. Canberra: AIHW.
- AIHW 2018. Analysis of cancer outcomes and screening behaviour for national cancer screening programs in Australia. Cancer series no. 111. Cat. no. CAN 115. Canberra: AIHW.
- AIHW 2016. Skin cancer in Australia. Cat. no. CAN 96. Canberra: AIHW.
- AIHW 2015. Breast cancer in young women: key facts about breast cancer in women in their 20s and 30s. Cancer series no. 96. Cat. no. CAN 94. Canberra: AIHW.
- AIHW 2014. Head and neck cancers in Australia. Cancer series no. 83. Cat. no. CAN 80. Canberra: AIHW.

Cancer is a major cause of illness and death in Australia. In 2021 it is estimated that about 151,000 Australians will be diagnosed with cancer (413 per day) and 49,000 will die (135 per day). This report, the latest in a biennial series, presents a comprehensive overview of cancer statistics, including risk factors, screening and other early detection, incidence, treatment, survival, prevalence, mortality, rare cancers, and cancer in Aboriginal and Torres Strait Islander people.

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