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Cancer in Australia

2019

AACR
Australasian Association of Cancer Registries

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2019

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Contents

Summary

Cancer is a major cause of illness in Australia—there are over 1 million people alive in Australia who are either living with or have lived with cancer. Around 30 years ago, about 5 in 10 people survived for at least 5 years after their cancer diagnosis; more recent figures are closer to 7 in 10 people surviving at least 5 years. Understanding and avoiding the risk factors associated with cancer can help to reduce the chance of getting cancer, while cancer screening programs increase the likelihood of detecting cancer early, enabling better outcomes from treatments. Improvements in treatments and care are also important contributors to improvements in survival.

Even though cancer survival rates have increased and cancer mortality rates continue to drop, cancer accounts for around 3 of every 10 deaths in Australia. Aboriginal and Torres Strait Islander people and people in lower socioeconomic groups both have lower cancer survival rates than other Australians. And while cancer survival rates have improved overall, people diagnosed with cancers such as pancreatic cancer, lung cancer and mesothelioma have a less than 1 in 5 chance, on average, of surviving at least 5 years after being diagnosed.

Cancer incidence rate on a downward trend since 2008

In 2008, cancer incidence (new diagnoses) rates peaked at an age-standardised rate of 508 cases per 100,000 persons. In 2019, it is estimated that almost 145,000 new cases of cancer (excluding basal and squamous cell carcinoma of the skin) will be diagnosed in Australia. The 2019 estimate equates to an age-standardised rate of 483 cases per 100,000 persons in 2019—close to 5% less than the rate in 2008.

Death rates continue to fall, with a sharper decline for males

In 2019, the estimated age-standardised cancer mortality rate for the Australian population is expected to reach a new low of 159 deaths per 100,000 persons. It is estimated that just under 50,000 people will die from cancer in 2019 and over half of them will be male (56%).

The highest age-standardised mortality rate due to cancer recorded in Australia occurred in 1989. It is estimated that in 2019, male mortality rates will have dropped by 92 deaths per 100,000 males since 1989 (195 per 100,000 males in 2019 compared with 287 in 1989), while the female rate will have dropped by 35 deaths per 100,000 females over the same period (130 per 100,000 in 2019, 165 per 100,000 in 1989).

Early detection of cancer improves survival rates

While stage at diagnosis information enables a better understanding of cancer survival, stage data are not routinely collected nationally and only recently became available for the 5 most commonly diagnosed cancers—breast cancer, prostate cancer, colorectal cancer, lung cancer and melanoma of the skin—for 2011. The relative rate for a female to survive at least 5 years after a diagnosis of breast cancer in its earliest stage in 2011 was effectively 100%. Where females were diagnosed with breast cancer at the latest stage, the survival rate reduced to 32%. The importance of detecting cancer at an earlier stage to improve the chance of survival was evident in all of the different cancer types where stage data were collected.

Around half of cancer deaths are due to rare and less common cancers

In this report, a rare cancer has been defined as having an incidence rate of fewer than 6 cases per 100,000 persons and a less common cancer as having an incidence rate between 6 and 12 cases per 100,000 persons. Rare cancers include bone cancer, mesothelioma, eye cancer and cancer of the nose and sinuses. Stomach cancer, liver cancer, bladder cancer, pancreatic cancer and brain cancer are among the group of less common cancers.

In 2015, around 1 in 3 people diagnosed with cancer were diagnosed with a rare or less common cancer; for the same year these cancers accounted for just under 1 in 2 cancer-related deaths.

Cancers with an incidence rate greater than 12 cases per 100,000 persons have been defined as common cancers and include breast cancer, prostate cancer, colorectal cancer, melanoma of the skin and lung cancer.

Data at a glance

Estimated incidence of cancer in 2019 (by sex)

Table 1: Estimated 20 most commonly diagnosed cancers, by sex, 2019

Males			Females		
Cancer site/type (ICD-10 codes)	**Cases**	**ASR**	**Cancer site/type (ICD-10 codes)**	**Cases**	**ASR**
Prostate (C61)	19,508	130.2	Breast (C50)	19,371	130.8
Colorectal (C18–C20)	9,069	63.4	Colorectal (C18–C20)	7,329	45.8
Melanoma of the skin (C43)	8,899	62.5	Melanoma of the skin (C43)	6,330	42.3
Lung (C33–C34)	7,184	49.2	Lung (C33–C34)	5,633	34.6
Head and neck (with lip) (C00–C14, C30–C32)	3,807	26.7	Uterus (C54–C55)	3,115	19.9
Lymphoma (C81–C86)	3,647	25.9	Lymphoma (C81–C86)	2,776	18.1
Leukaemia (C91–C95)	2,609	18.5	Thyroid (C73)	2,645	19.6
Kidney (C64)	2,539	17.9	Pancreas (C25)	1,710	10.2
Bladder (C67)	2,447	16.9	Leukaemia (C91–C95)	1,642	10.7
Liver (C22)	1,907	13.2	Ovary (C56)	1,510	9.8
Pancreas (C25)	1,889	13.0	Head and neck (with lip) (C00–C14, C30–C32)	1,405	9.1
Stomach (C16)	1,613	11.2	Kidney (C64)	1,275	8.3
Cancer of unknown primary site (C80)	1,403	9.8	Cancer of unknown primary site (C80)	1,210	6.8
Oesophagus (C15)	1,179	8.0	Cervix (C53)	951	7.2
Brain (C71)	1,160	8.3	Multiple myeloma (C90.0)	868	5.3
Multiple myeloma (C90.0)	1,139	7.9	Stomach (C16)	849	5.2
Myelodysplastic syndromes (D46)	986	6.9	Brain (C71)	809	5.5
Thyroid (C73)	971	7.1	Bladder (C67)	721	4.2
Testis (C62)	852	6.9	Liver (C22)	692	4.3
Mesothelioma (C45)	700	4.8	Myelodysplastic syndromes (D46)	631	3.6
All cancers combined	**78,081**	**540.5**	**All cancers combined**	**66,632**	**434.2**

Notes

1. ICD-10 is the International Statistical Classification of Diseases and Related Health Problems, 10th Revision.
2. The 2019 estimates are based on 2006–2015 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 includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma of the skin.

Source: AIHW Australian Cancer Database 2015.

Estimated mortality from cancer in 2019 (by sex)

Table 2: Estimated 20 most common causes of death from cancers, by sex, 2019

Males			Females		
Cancer site/type (ICD-10 codes)	**Deaths**	**ASR**	**Cancer site/type (ICD-10 codes)**	**Deaths**	**ASR**
Lung (C33–C34)	5,179	35.6	Lung (C33–C34)	3,855	23.3
Prostate (C61)	3,306	23.0	Breast (C50)	3,058	18.8
Colorectal (C18–C20, C26.0)	3,009	21.1	Colorectal (C18–C20, C26.0)	2,588	15.0
Pancreas (C25)	1,590	11.0	Pancreas (C25)	1,460	8.6
Liver (C22)	1,436	9.8	Cancer of unknown primary site (C77–C80, C97)	1,173	6.4
Cancer of unknown primary site (C77–C80, C97)	1,258	8.8	Ovary (C56)	1,046	6.4
Melanoma of the skin (C43)	1,190	8.3	Leukaemia (C91–C95)	850	5.0
Leukaemia (C91–C95)	1,189	8.3	Liver (C22)	725	4.4
Oesophagus (C15)	1,087	7.4	Lymphoma (C81–C86)	676	3.9
Lymphoma (C81–C86)	956	6.7	Brain (C71)	617	4.1
Brain (C71)	932	6.6	Uterus (C54–C55)	562	3.4
Head and neck (with lip) (C00–C14, C30–C32)	887	6.1	Melanoma of the skin (C43)	536	3.3
Bladder (C67)	852	5.9	Stomach (C16)	507	3.0
Stomach (C16)	780	5.4	Multiple myeloma (C90.0)	446	2.6
Kidney (C64)	682	4.7	Oesophagus (C15)	383	2.2
Mesothelioma (C45)	648	4.5	Bladder (C67)	357	2.0
Multiple myeloma (C90.0)	615	4.3	Kidney (C64)	351	2.0
Non-melanoma of the skin (C44)	494	3.4	Head and neck (with lip) (C00–C14, C30–C32)	315	1.9
Other urinary organs (C65–C66, C68)	331	2.3	Cervix (C53)	256	1.8
Myelodysplastic syndromes (D46)	324	2.3	Non-melanoma of the skin (C44)	220	1.2
All cancers combined	**28,070**	**194.8**	**All cancers combined**	**21,826**	**129.9**

Notes

1. ICD-10 is the International Statistical Classification of Diseases and Related Health Problems, 10th Revision.
2. The 2019 estimates are based on 2007–2016 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 includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: AIHW National Mortality Database.

Estimated cancer incidence and mortality in 2019

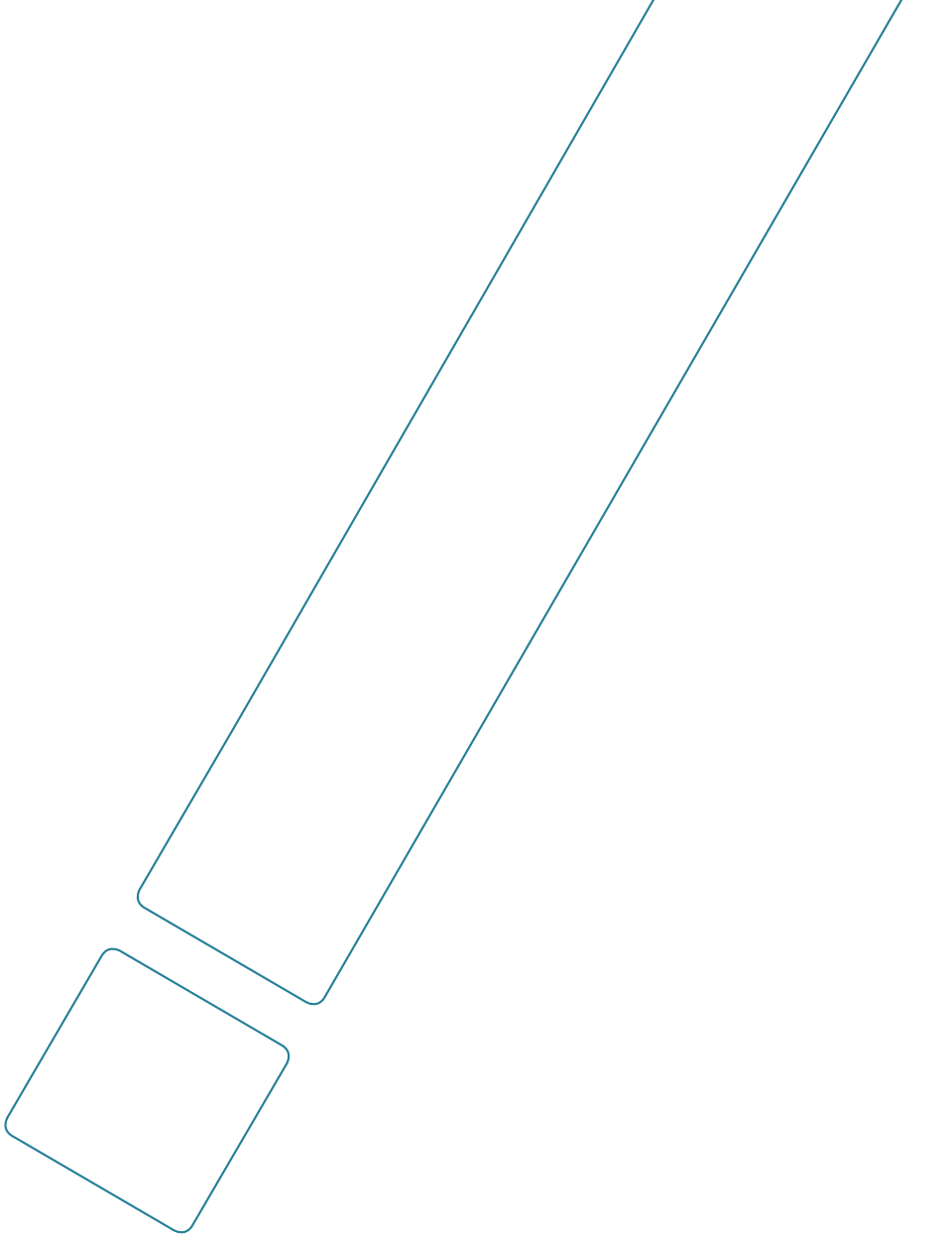
Table 3: Estimated 20 most commonly diagnosed cancers and estimated 20 most common causes of death from cancers, persons, 2019

Incidence			Mortality		
Cancer site/type (ICD-10 codes)	**Cases**	**ASR**	**Cancer site/type (ICD-10 codes)**	**Deaths**	**ASR**
Breast (C50)	19,535	67.7	Lung (C33–C34)	9,034	28.8
Prostate (C61)	19,508	62.6	Colorectal (C18–C20, C26.0)	5,597	17.8
Colorectal (C18–C20)	16,398	54.1	Prostate (C61)	3,306	10.0
Melanoma of the skin (C43)	15,229	51.7	Breast (C50)	3,090	10.1
Lung (C33–C34)	12,817	41.2	Pancreas (C25)	3,051	9.7
Lymphoma (C81–C86)	6,423	21.8	Unknown primary site (C77–C80, C97)	2,431	7.6
Head and neck (with lip) (C00–C14, C30–C32)	5,212	17.6	Liver (C22)	2,161	7.0
Leukaemia (C91–C95)	4,251	14.4	Leukaemia (C91–C95)	2,039	6.5
Kidney (C64)	3,814	12.9	Melanoma of the skin (C43)	1,725	5.6
Thyroid (C73)	3,615	13.4	Lymphoma (C81–C86)	1,632	5.2
Pancreas (C25)	3,599	11.6	Brain (C71)	1,549	5.3
Bladder (C67)	3,168	10.1	Oesophagus (C15)	1,470	4.7
Uterus (C54–C55)	3,115	10.3	Stomach (C16)	1,287	4.2
Unknown primary site (C80)	2,613	8.2	Bladder (C67)	1,209	3.7
Liver (C22)	2,599	8.6	Head and neck (with lip) (C00–C14, C30–C32)	1,202	3.9
Stomach (C16)	2,462	8.1	Multiple myeloma (C90.0)	1,062	3.3
Multiple myeloma (C90.0)	2,007	6.5	Ovary (C56)	1,046	3.4
Brain (C71)	1,968	6.9	Kidney (C64)	1,034	3.3
Oesophagus (C15)	1,687	5.4	Mesothelioma (C45)	776	2.4
Myelodysplastic syndromes (D46)	1,618	5.1	Non-melanoma of the skin (C44)	714	2.2
All cancers combined	**144,713**	**482.7**	**All cancers combined**	**49,896**	**159.0**

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 2019 mortality estimates are based on 2007–2016 mortality data (see Appendix A). Estimates are rounded to the nearest whole number.
4. The 2019 incidence estimates are based on 2006–2015 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.
6. All cancers combined mortality includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, the coding is the same for incidence except it excludes C44 that indicate basal or squamous cell carcinoma of the skin.

Source: AIHW Australian Cancer Database 2015 and AIHW National Mortality Database.



Introduction

1

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 and economic impact on individuals, families and the community. An average of 396 people are expected to be diagnosed with cancer each day in 2019 and an average of 137 deaths are expected to be caused by cancer each day for the same period.

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 and therefore not in this report. However, past research has shown that basal and squamous cell carcinomas of the skin are the most frequently diagnosed cancers in Australia (AIHW 2016a; AIHW & CA 2008).

Box 1.2: All cancers combined

Within this report, all cancers combined incorporates ICD-10 cancer codes C00–C97 (malignant neoplasms of specific sites), D45 (polycythaemia), D46 (myelodysplastic syndromes) and D47.1, D47.3–D47.5 (myeloproliferative diseases); but excludes basal cell carcinoma and squamous cell carcinoma of the skin. Appendix B provides a list of cancer codes.

1.2 Report overview

This report is the 19th in a series and provides a comprehensive overview of national statistics on cancer.

It presents information and statistics on cancer risk factors, national population screening programs, Medicare-subsided surveillance and treatment, cancer incidence, hospitalisations, survival, prevalence and mortality. Information is generally structured according to the general chronological 'journey through the health system' of people diagnosed with cancer. It is acknowledged, however, that this chronological order can vary widely for individuals diagnosed with cancer.

There is a 'spotlight' on cancer stage at diagnosis. Cancer stage at diagnosis data provide a quantitative view of how survival outcomes are better when cancer is detected at an earlier stage.

Supplementary data tables referred to in this report (those with a prefix of S) are available from www.aihw.gov.au.

The Cancer in Australia report previously included summary pages for selected cancers. This information and other related statistics will now be available annually through the AIHW annual Cancer Data in Australia online product at www.aihw.gov.au.

1.3 Data sources

Data within this report is predominantly sourced from the Australian Cancer Database (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 2018 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 Australian 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 AMR.

1.4 Data presentations

The structure of reporting information within 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, estimates for 2019 have been presented based on projections of data available up to 2015 for incidence and 2016 for mortality (see Appendix A for more details). Estimates for 2019 provide the most up-to-date statistics possible. Projections are provided for all cancers combined and by selected cancer types (see Box 1.3 for breast cancer classification information).

Box 1.3: Breast cancer in females

Both males and females can develop breast cancer. However, the proportion of females who develop breast cancer is much greater than the proportion of males who do so. To present the proportion across the entire population (males and females) would not accurately reflect the burden of breast cancer in females. For this reason, breast cancer data in this report refer to invasive breast cancer in females, unless otherwise stated. Breast cancer data for persons, males and females is available in the Cancer Data in Australia online product www.aiwh.gov.au.

Aggregating data

Reference years

For smaller reporting populations, it is sometimes necessary to combine several years of data in order to obtain a cohort of sufficient size to reliably report on (for example, 2010–2014). Data are presented for multiple years to increase reporting group size and reduce random variations in rates.

Sex

For smaller reporting 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.

Risk factors for cancer

2

2.1 Determining links 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) 2011 estimated the contribution of various risk factors to the health loss from cancer in Australia. The risk factors contained within the ABDS are the focus of the discussion within 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 2011: methods and supplementary material'. Further details about cancer risks are available from the Cancer Council Australia at www.cancer.org.au.

Types of risk factors

Risk factors may be categorised into 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 and drinking alcohol.

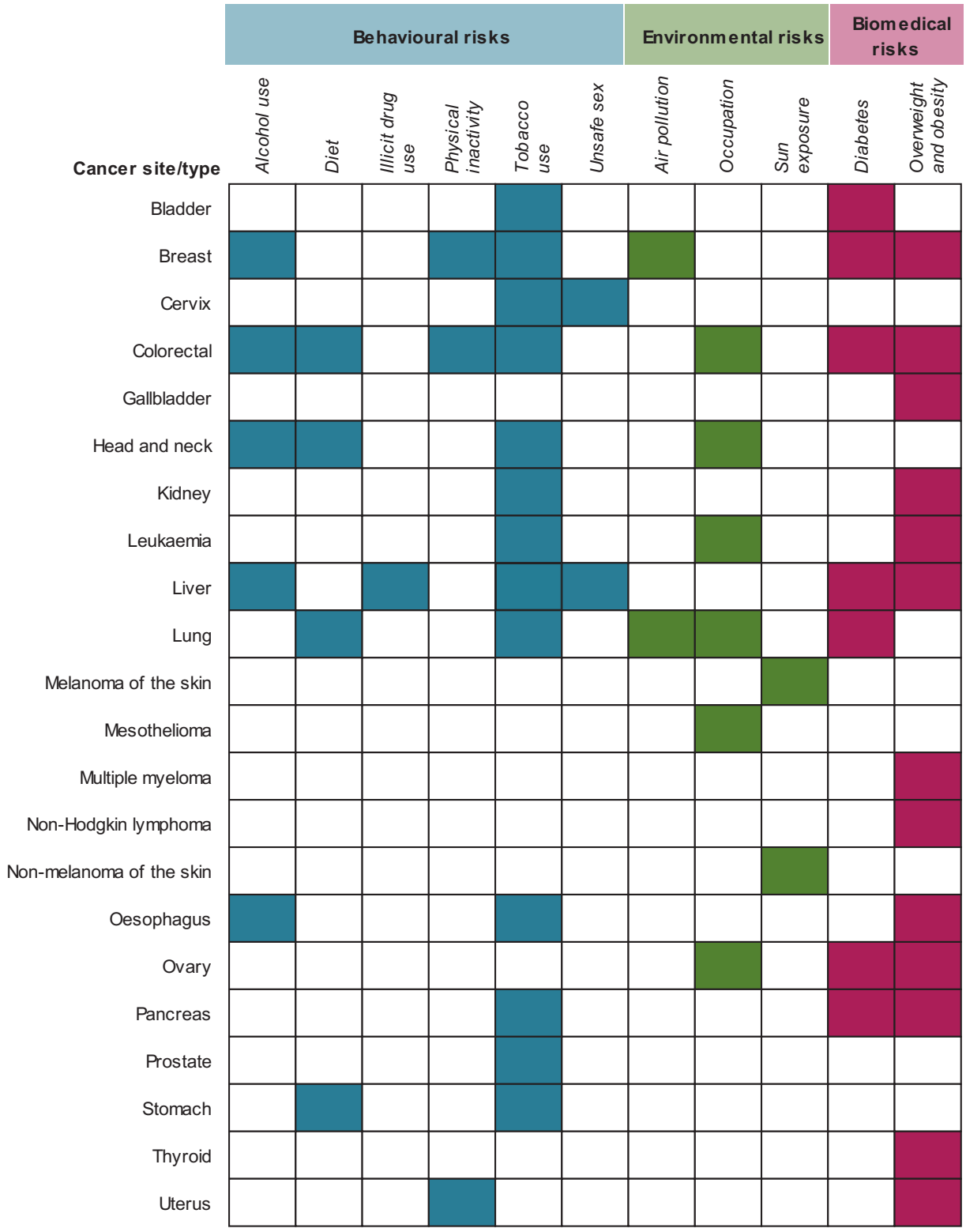
Biomedical risk factors

Biomedical risk factors are bodily states that have an impact on a person's risk of disease. Types of biomedical risk factors include diabetes and excess body fat.

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 ultraviolet radiation.

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.
3. Air pollution in the above table includes second hand smoke.

Source: AIHW Burden of Disease 2015 (forthcoming).

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 outline 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 cancer risk. Prevalence data are an indication only of cancer risk. For example, the rate of people who met physical activity guidelines is an indication of physical activity in Australia; it is not suggesting that meeting the guidelines is the benchmark from which cancers with a risk factor of physical inactivity are best managed.

Box 2.1: What is 'burden of disease'?

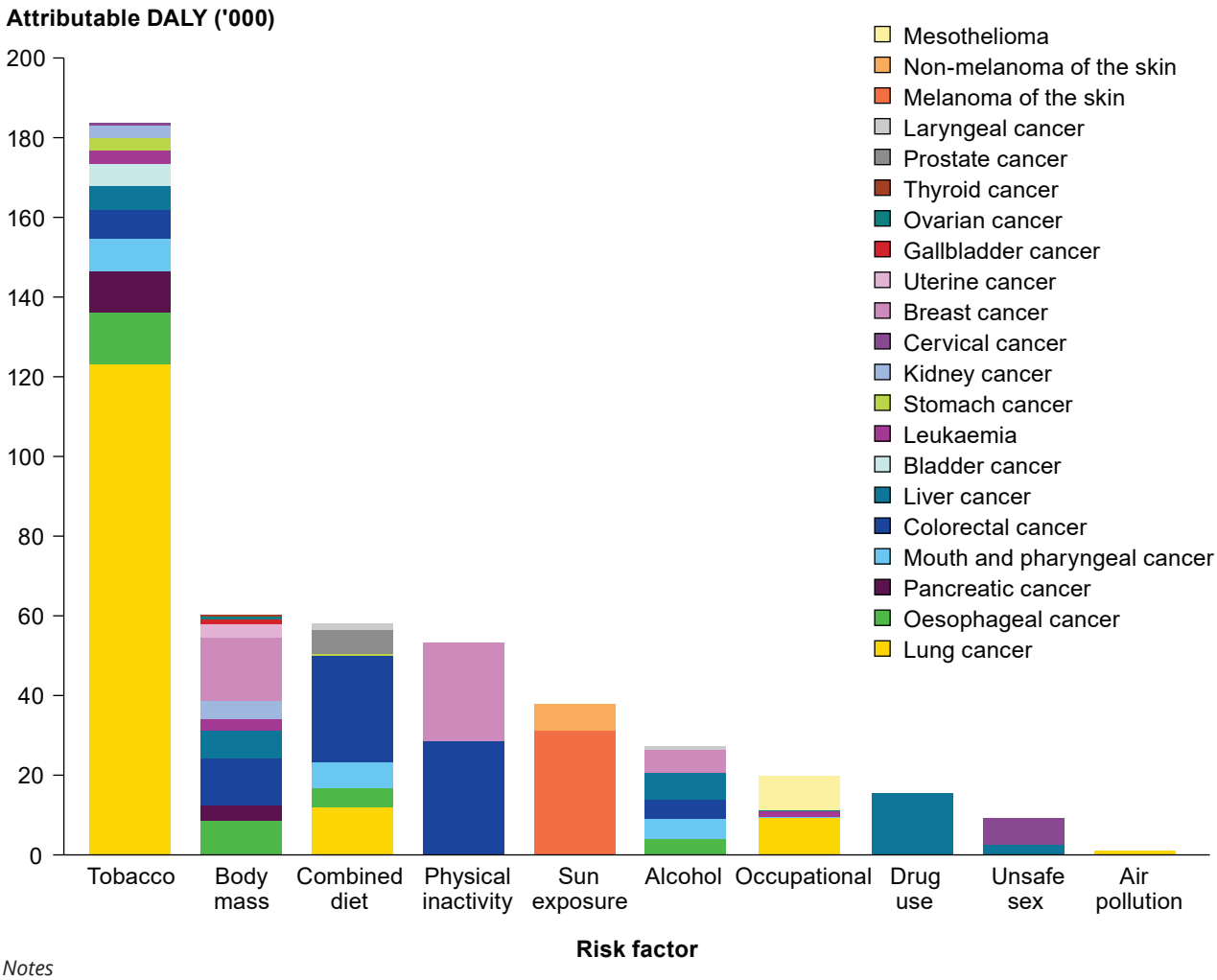
Burden of disease analysis is a technique used to assess and compare the impact of different diseases, conditions or injuries and risk factors on a population. It uses information from a range of sources to quantify the fatal (dying from cancer) and non-fatal (living with cancer) effects of these diseases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

Cancer burden attributable to specific risk factors

Collectively, cancer and other neoplasms caused the greatest disease burden in Australia in 2011, responsible for an estimated 833,250 DALY. Cancer accounted for 19% of the total burden of disease, compared with 15% from cardiovascular diseases, and 12% each from mental and substance use disorders and musculoskeletal disorders (AIHW 2017a).

Burden of disease analysis examines and quantifies the impact that cancer risk factors contribute to the cancer burden in Australia. Of the risk factors, tobacco use has the greatest impact, contributing 183,729 DALY to the cancer burden in Australia in 2011 (Figure 2.2).

Figure 2.2: Cancer burden (DALY) attributable to specific risk factors, 2011



Notes

1. Dietary risk factors are presented as the joint effect 'Combined diet'.
2. Data for this figure are in online Table S2.1.

Source: AIHW burden of disease database; AIHW 2017a.

Tobacco

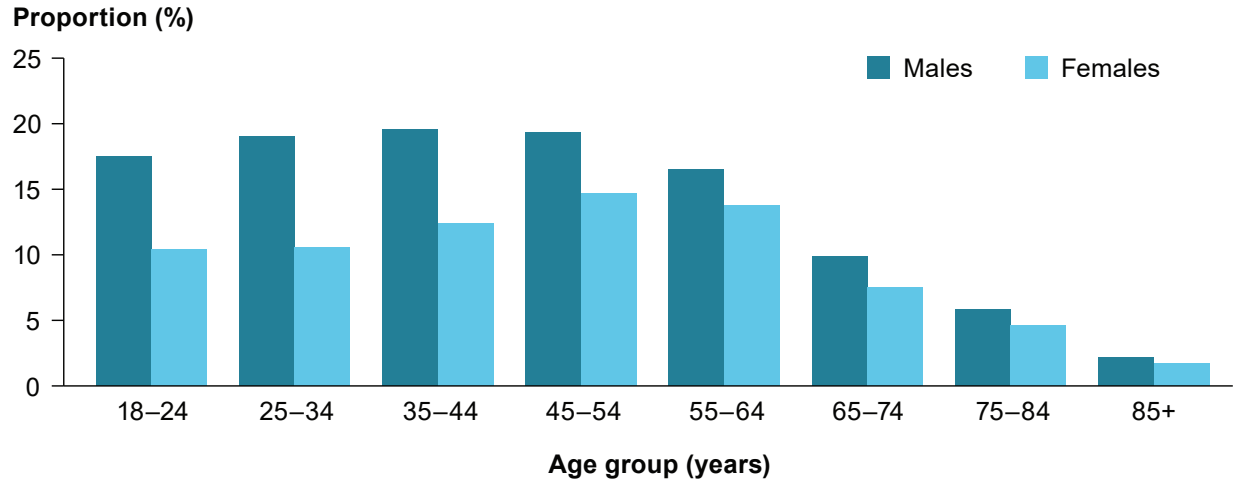
Cancer burden from tobacco

Tobacco was by far the largest risk factor contributing to cancer burden, responsible for 183,700 cancer-related DALY in 2011; this equates to 22% of the total cancer burden (833,250 DALY). Two-thirds (67%) of the cancer burden from tobacco was from lung cancer, but tobacco also contributed to the burden of oesophageal, pancreatic, mouth and pharyngeal, liver, stomach, kidney, cervical, colorectal and bladder cancers as well as leukaemia (AIHW 2017a).

Tobacco use in Australia

In 2017–18, 14% of Australians aged over 18 were daily smokers and 1.4% smoked but not on a daily basis (online Table S2.2). Men were more likely to be daily smokers than women (17% compared with 11%) (Figure 2.3). Women were also more likely than men to have never smoked (63% compared with 48%) (online Table S2.2).

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



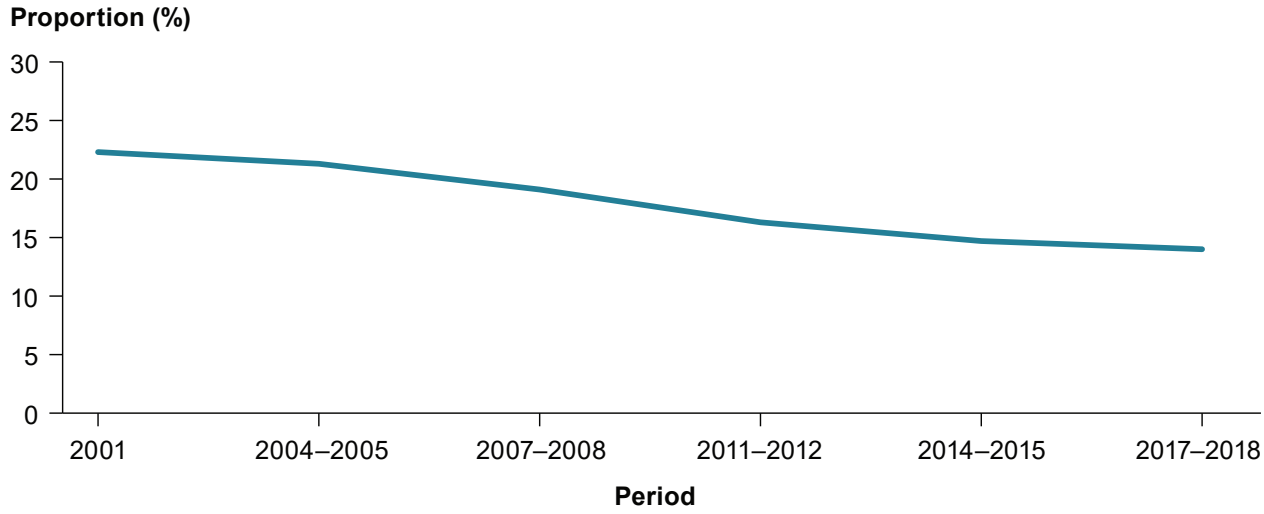
Notes

1. In 2017–18, data from National Health Survey (NHS) and 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, ABS 2018a.

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

Figure 2.4: Proportion of daily smokers, 2001 to 2017–18



Notes

1. Proportions have been age standardised to the 2001 Australian population.
2. Trend data is based on when survey data is available. The duration between surveys, and as presented above, may differ.
3. Data for this figure are in online Table S2.3.

Source: National Health Survey, ABS 2018a.

High body mass

Cancer burden from high body mass

High body mass contributed around 60,000 DALY (7.2%) to the cancer burden. High body mass was found to be causally related to several cancer types in the ABDS 2011, including colorectal, breast, gallbladder, kidney, oesophageal, pancreatic and uterine cancers. Evidence suggests high body mass is also causally related to leukaemia, and liver, ovarian and thyroid cancers (AIHW 2017a).

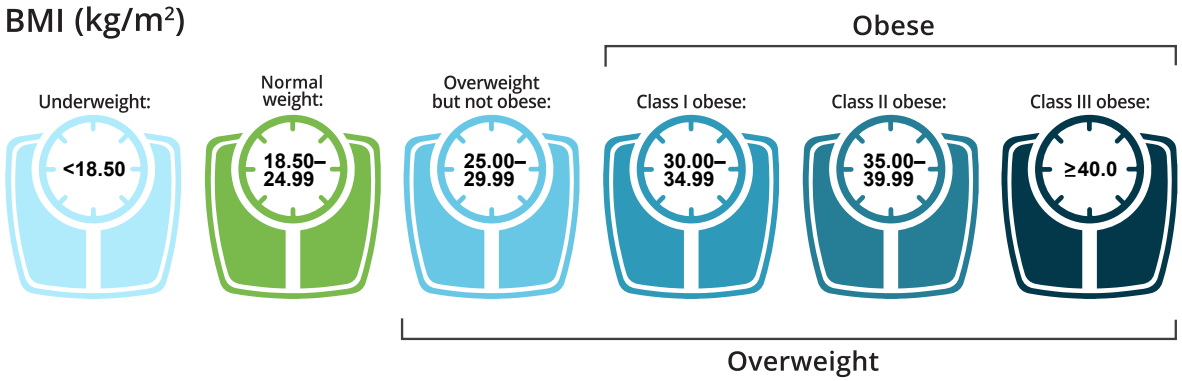
Overweight and obesity in Australia

In 2017–18, 67% of Australians aged 18 years and over were overweight or obese (36% overweight but not obese and 31% obese) (online Table S2.4). Box 2.1 provides detail about measuring overweight and obesity.

Box 2.2: Measuring Overweight and Obesity

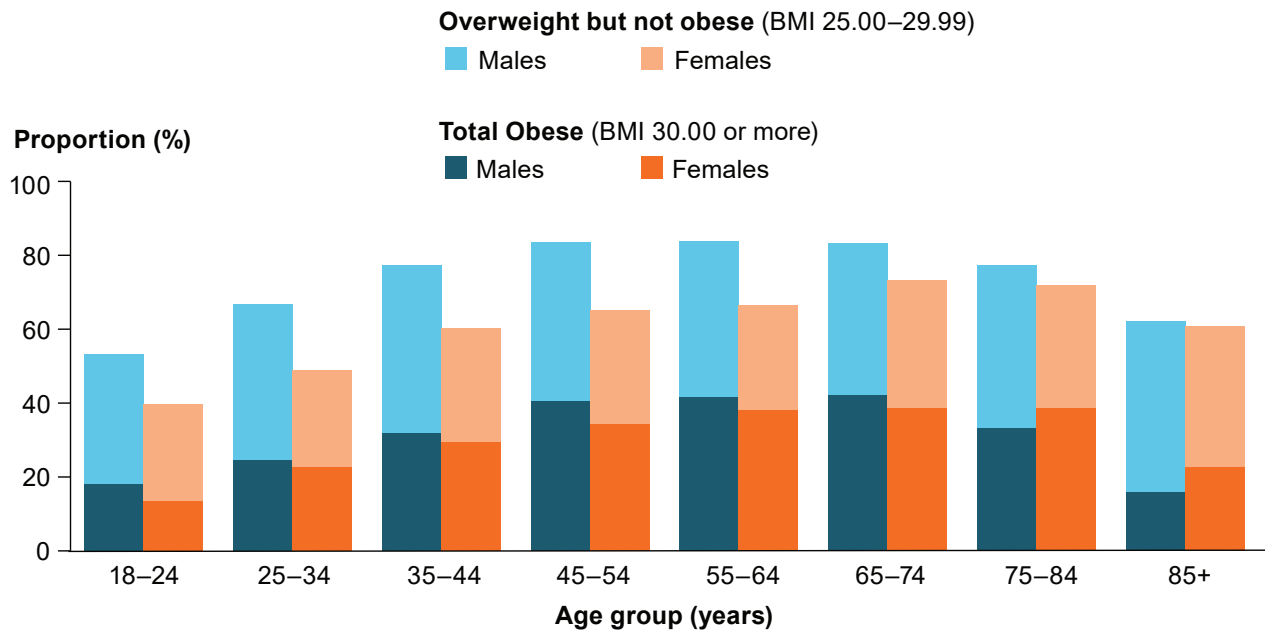
Body Mass Index (BMI) is calculated by dividing a person's weight (in kilograms) by their height (in metres) squared. This report uses the BMI classifications for adults defined by the World Health Organization (WHO). Obesity is split into 3 classes, according to severity, with more severe obesity associated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

$$BMI = \frac{\text{weight in } \mathbf{kg}}{(\text{height in } \mathbf{m})^2}$$



Overall, 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 (Figure 2.5). Similar proportions of males and females were obese (33% and 30%, respectively), however, males were more likely to be overweight but not obese than females (42% compared with 30%) (online Table S2.4).

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

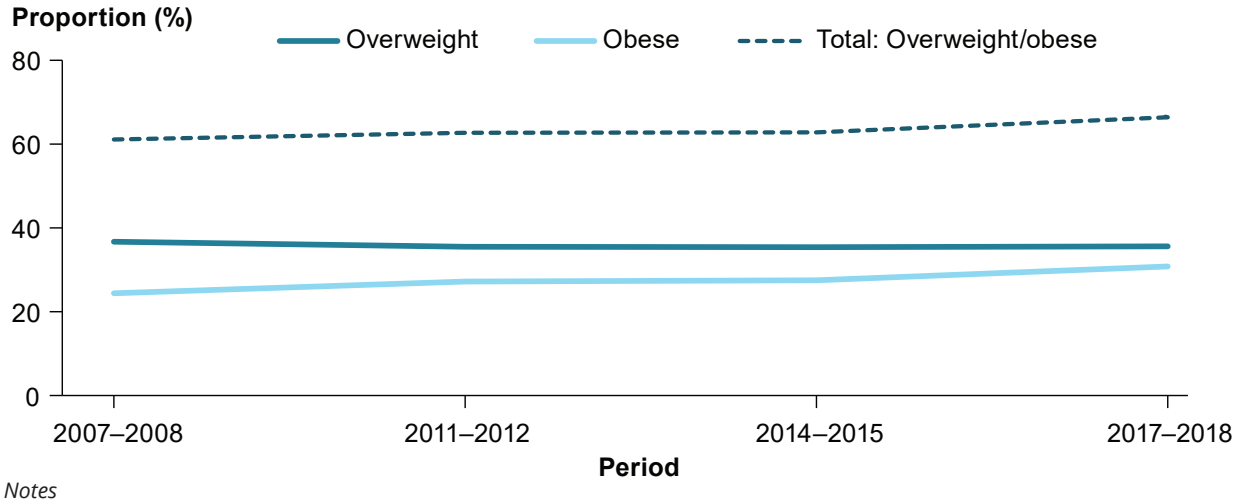


Note: Data for this figure are in online Table S2.4.

Source: National Health Survey, ABS 2018a.

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 quite 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, 2007–08 to 2017–18



Notes

1. Proportions have been age standardised to the 2011 Australian population.
2. Trend data is based on when survey data is available. The duration between surveys, and as presented above, may differ.
3. Data for this figure are in online Table S2.3.

Source: National Health Survey, ABS 2018a.

Dietary risks

Cancer burden from high body mass

Dietary risk factors contributed various amounts of burden to different cancer types. These 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 58,000 DALY (7%) of the cancer burden. Diets low in fruit contributed the highest burden (21,000 DALY) across lung, oesophageal, mouth and pharyngeal, and laryngeal cancers. Diets low in milk or fibre (10,000 and 9,000 DALY, respectively) or high in processed or red meat (7,000 and 3,600 DALY, respectively) contributed to the burden of colorectal cancer (2017a).

Box 2.3: Why risk factor estimates cannot be added together

Most of the risk factors were analysed independently in the ABDS 2011. It is important to note that the separate estimates for different risk factors cannot be added or combined without further analysis, due to complex pathways and interactions between them. For example, the risk factors (sugar-sweetened beverages and high body mass) might be in the same causal pathway or, when combined, the estimate of attributable burden may be more than the total burden of that disease.

Further analysis is needed to combine risk factors. This is referred to as the 'joint effect'. In this report, the joint effect has been estimated for all the included risk factors to produce an overall estimate 'All risk factors combined' and for the dietary risk factors. The ABDS 2011 did not calculate joint effects for other combinations of these risk factors (for example, for all behavioural risk factors) (AIHW 2017a).

Nutrition in Australia

The 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 enough 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 2018a).

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's 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 S2.5).

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 (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 (years)	Inadequate fruit		Inadequate vegetables		Inadequate fruit and vegetables	
	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**

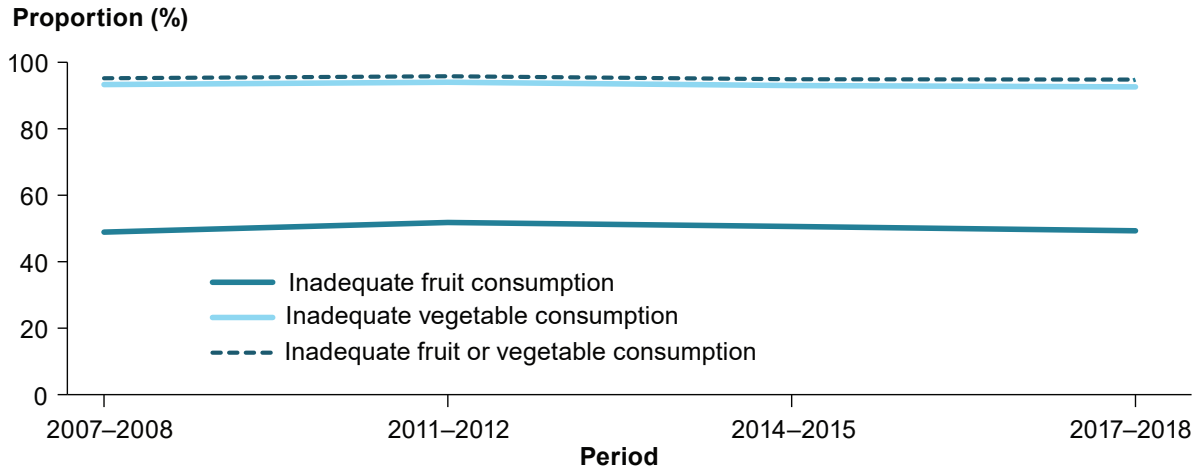
Has a high margin of error and should be used with caution.

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 2018a.

The proportion of people who did not meet recommended fruit and vegetable intake has remained relatively stable from 2007–08 to 2017–18 (Figure 2.7).

Figure 2.7: Proportion of the population who did not consume the recommended minimum serves of fruit and vegetables each day, 2007–08 to 2017–18



Notes

1. Proportions have been age standardised to the 2001 Australian population.
2. Trend data is based on when survey data is 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 2018a.

Physical inactivity

Cancer burden from physical inactivity

Physical inactivity contributed around 53,000 DALY (6.4%) to the cancer burden—this comprised 28,600 DALY from colorectal cancer and a further 24,600 DALY from breast cancer (AIHW 2017a).

Physical activity in Australia

Australia's Physical Activity and Sedentary Behaviour Guidelines are a set of recommendations outlining the minimum levels of physical activity required for health benefits, as well as the maximum time one should spend on sedentary behaviours to achieve optimal health (Department of Health 2017).

In 2014–15, people aged 35 and over were more likely to be insufficiently active than younger people. Women were more likely than men to be insufficiently active (Table 2.2).

Table 2.2: Prevalence of insufficient physical activity in persons aged 18 and over, 2014–15

Age group (years)	Males	Females	Persons
18–24	45.4	50.7	48.0
25–34	43.9	49.0	46.5
35–44	53.3	53.6	53.4
45–54	56.8	56.2	56.6
55–64	54.0	59.7	56.5
65+	73.5	76.9	75.0
All persons (18+)	n.p.	n.p.	56.4

Notes

1. For 18–64 year olds, insufficient physical activity is defined as those who completed less than 150 minutes of physical activity or more than 150 minutes of physical activity but in less than 5 sessions in the 7 days prior to interview.
2. For adults aged 65 and over, insufficient physical activity is captured here as completing less than 30 minutes of moderate intensity exercise on at least 5 of the 7 days prior to interview.
3. Physical Activity includes 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.
4. Rates are age standardised to the 2001 Australia standard population.

Source: Risk factors to health, AIHW 2017b.

In 2007–08, after adjusting for age, the proportion of people aged 18–64 who completed less than 150 minutes moderate intensity exercise per week was 49%; the equivalent age adjusted rate in 2014–15 was 44% (AIHW 2017b).

Sun exposure

Cancer burden from sun exposure

Sun exposure contributed around 37,700 DALY (4.5%) to the cancer burden—this comprised 31,200 DALY from melanoma and 6,600 DALY from non-melanoma skin cancer (AIHW 2017a).

Sun exposure in Australia

Research from the Cancer Council's National Sun Survey suggested that 50 per cent of sunburn in adults surveyed occurred during everyday activities. The survey also noted that 11% of adults were actively trying to get a tan, while 64% of adults reported having tanned skin—an indication that most ultraviolet (UV) damage is unintentional (Cancer Council Australia 2017a).

The UV index is a simple and informative way of describing the daily danger of solar UV radiation intensity (Bureau of Meteorology); 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 2.3).

Table 2.3: 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 impact upon the accuracy of the exposure category in the above table.

Source: Cancer Council Australia 2016.

While there are no national data regarding rates of sunburn, amount of time spent in the sun or the proportion of people who are 'SunSmart', there is a considerable risk of over-exposure to the sun in Australia. This needs to be managed through the use of sunscreen and appropriate hats and clothing.

Alcohol use

Cancer burden from alcohol use

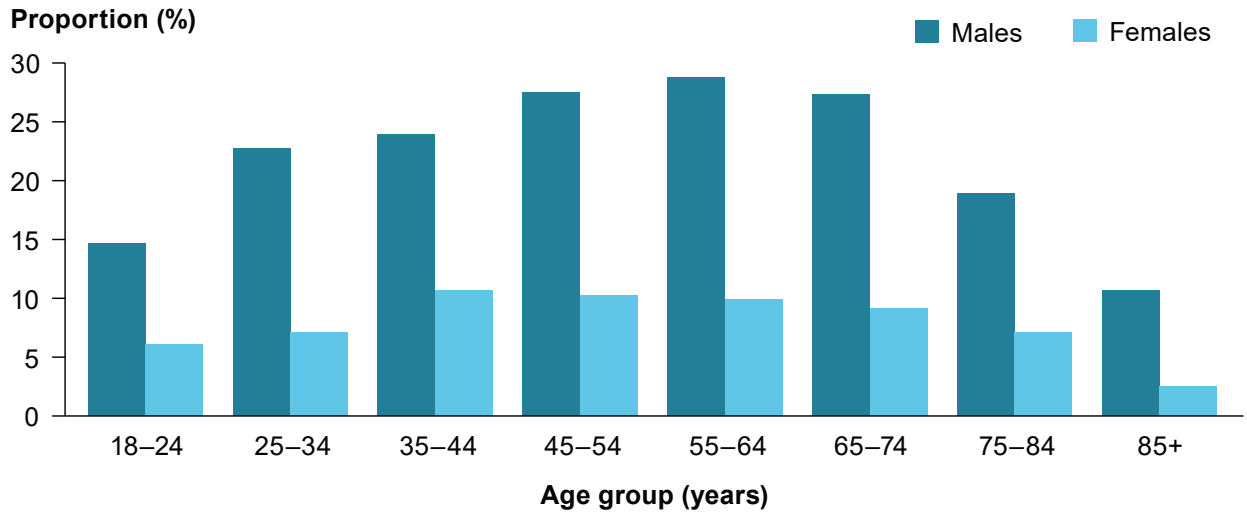
Alcohol use contributed 27,200 DALY (3.3%) to the cancer burden. Liver cancer caused the greatest cancer burden from alcohol use, followed by breast, mouth and pharyngeal cancers. Burden from colorectal, laryngeal and oesophageal cancers was also attributed to long-term alcohol use (AIHW 2017a).

Alcohol in Australia

In 2017–18, around 1 in 6 people aged over 18 had, on average, consumed more than 2 standard drinks per day, exceeding the lifetime alcohol risk guidleines (online Table S2.6).

In 2017–18, men were much more likely than women to consume, on average, more than 2 standard drinks a day in the previous week and this was consistent across all age groups (Figure 2.8).

Figure 2.8: Proportion of the population exceeding lifetime alcohol risk guidelines in the last week, by age group and sex, 2017–2018



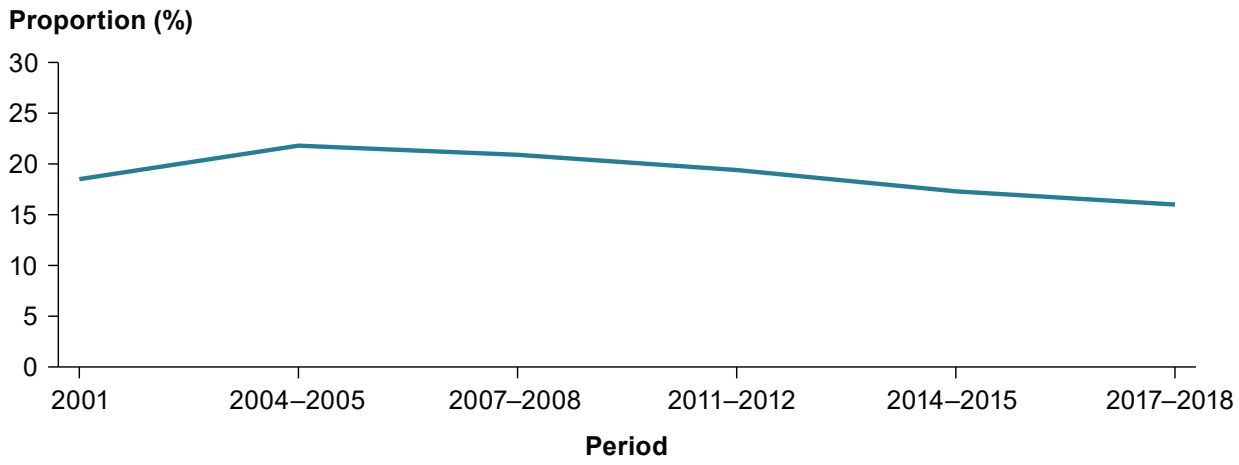
Notes

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 S2.6.

Source: National Health Survey, ABS 2018a.

After adjusting for age, the proportion of people who had, on average, more than 2 standard drinks a day in the previous week has decreased from 19% in 2001 to 16% in 2017–18 (Figure 2.9).

Figure 2.9: Proportion of the population exceeding lifetime alcohol risk guidelines in the last week, 2001 to 2017–2018



Notes

1. Proportions have been age standardised to the 2001 Australian population.
2. Trend data is based on when survey data is available. The duration between surveys, and as presented above, may differ.
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 2018a.

Occupational exposures

Cancer burden from occupational exposures

Occupational exposures (19,800 DALY) also contributed to the cancer burden—this mainly comprises 9,412 DALY from lung cancer, 8,452 DALY from mesothelioma and 1,621 DALY from leukaemia (2017a). Laryngeal, ovarian, mouth and pharyngeal cancers were also attributable to occupational exposures (AIHW 2017a).

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. Asbestos is linked with both lung cancer and mesothelioma. 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 (ABDS 2015 forthcoming).

Spotlight:

Cancer stage at diagnosis

Cancer stage at diagnosis refers to the extent or spread of cancer at the time of diagnosis. The stage at diagnosis and subsequent treatment options are important determinants of cancer survival; information within this chapter highlights the importance of detecting cancer at an early stage.

3.1 Stage at diagnosis

Cancer Australia undertook a pilot initiative in collaboration with all state and territory population-based cancer registries and the AIHW to produce national information on cancer stage at the time of diagnosis. The initiative enabled the collection of cancer stage at diagnosis for 5 common cancers (melanoma of the skin, and breast, prostate, lung and colorectal cancers) diagnosed in 2011. The invaluable data collected show the proportion of these cancers that were diagnosed at each stage and quantify how survival rates are better for cancers diagnosed at earlier stages.

Registry-derived stage (RD stage) data are used to report on cancer stage at diagnosis. The higher the number (between I and IV), the further the cancer has spread.

Melanoma of the skin, breast cancer and prostate cancer all record higher rates of early-stage diagnosis

The average RD stage at diagnosis is a calculation used to determine, on average, at what stage cancers are diagnosed. The average RD stage at diagnosis differed between cancer types. Melanoma of the skin had the highest rate of early detection with over 90% of the cases diagnosed as Stage I or II (Table 3.1). Earlier detection may be partly attributable to community awareness campaigns over time that encourage and teach effective identification of the warning signs of melanoma of the skin.

On average, breast cancer in females and prostate cancer in males were diagnosed before Stage II (average RD stage 1.8). The higher proportion of cases diagnosed as Stage I and II for breast cancer may be partly attributable to the national breast cancer screening program, while for prostate cancer in males it may be attributed to prostate-specific antigen (PSA) testing.

Colorectal cancer had an average RD stage at diagnosis of 2.4. The distribution of the cases was largely similar across stages I, II and III, each accounting for just over 20% of total cases.

Of the 5 cancers for which cancer stage at diagnosis was derived, lung cancer had the highest average RD stage at diagnosis (3.2). Over 40% of lung cancer cases were Stage IV at diagnosis and this may be an under-representation, as stage at diagnosis was not able to be derived for over a quarter of cases.

Table 3.1: Incidence of select cancers, by RD stage, Australia, 2011

	RD stage at diagnosis					
Cancer site/type	**I**	**II**	**III**	**IV**	**Unknown**	**Total**
Breast cancer (females)						
Number of cases	6,110	4,936	1,721	660	788	14,215
% of total cases	43.0	34.7	12.1	4.6	5.5	100.0
Average RD stage						1.8
Colorectal cancer						
Number of cases	3,098	3,399	3,299	2,474	1,723	13,993
% of total cases	22.1	24.3	23.6	17.7	12.3	100.0
Average RD stage						2.4
Prostate cancer						
Number of cases	7,186	9,245	2,246	836	528	20,041
% of total cases	35.9	46.1	11.2	4.2	2.6	100.0
Average RD stage						1.8
Lung cancer						
Number of cases	1,183	662	1,131	4,273	2,885	10,134
% of total cases	11.7	6.5	11.2	42.2	28.5	100.0
Average RD stage						3.2
Melanoma of the skin						
Number of cases	8,730	1,577	331	233	328	11,199
% of total cases	78.0	14.1	3.0	2.1	2.9	100.0
Average RD stage						1.3
Total						
Number of cases	26,307	19,819	8,728	8,476	6,252	69,582
% of total cases	37.8	28.5	12.5	12.2	9.0	100.0
Average RD stage						2.0

Note: Refer to Appendix F for information about the average RD stage calculation.

Source: AIHW ACD 2014.

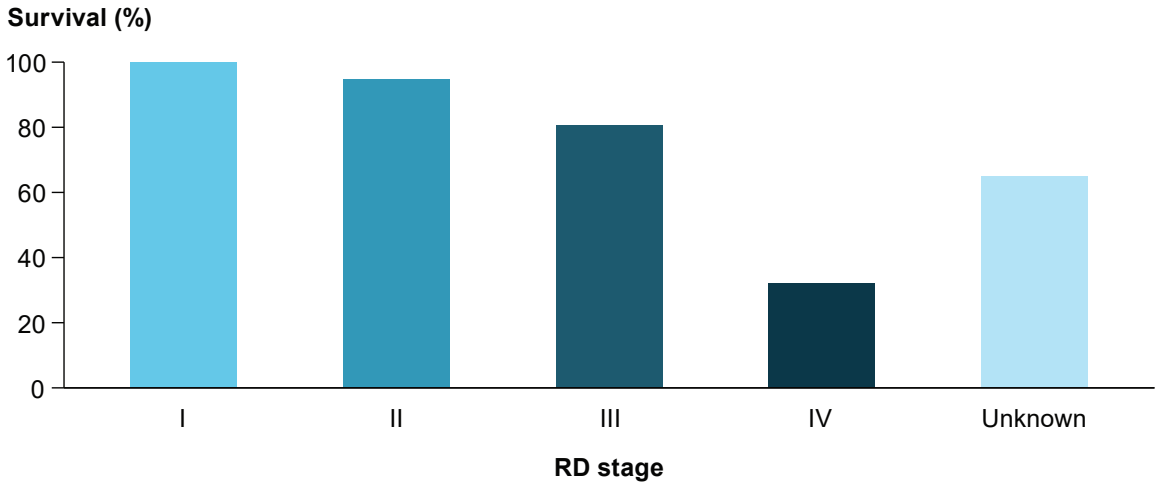
Survival rates increase with early detection

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.

The stage at diagnosis and subsequent treatment outcomes are important determinants of cancer survival. Five-year relative survival rates were higher for cancers diagnosed at earlier stages (such as stages I and II) (online Table S3.1).

In 2011, colorectal cancer, breast cancer in females, melanoma of the skin, and prostate cancer all had close to 100% 5-year relative survival when diagnosed at Stage I. At Stage IV, the 5-year relative survival rate fell to 36% for prostate cancer, 32% for breast cancer in females, 26% for melanoma of the skin and 13% for colorectal cancer (figures 3.1 to 3.4). While lung cancer has a comparatively low 5-year relative survival at Stage I (68%), the Stage I rate is significantly higher than the 3.2% 5-year relative survival rate calculated for lung cancer at Stage IV (Figure 3.5).

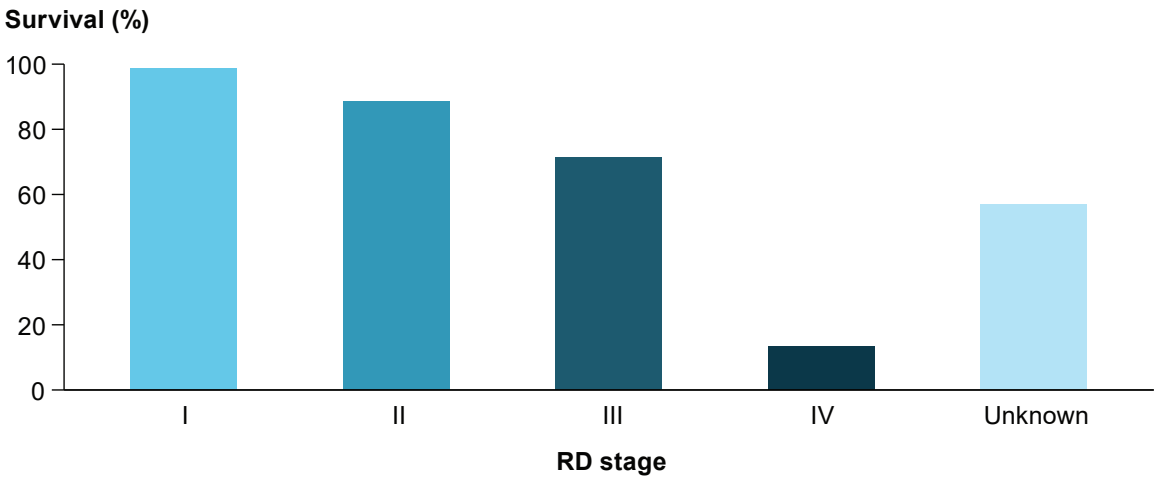
Figure 3.1: 5-year relative survival for breast cancer, by stage at diagnosis, 2011



Note: Data for this figure are in online Table S3.1.

Source: AIHW ACD 2014.

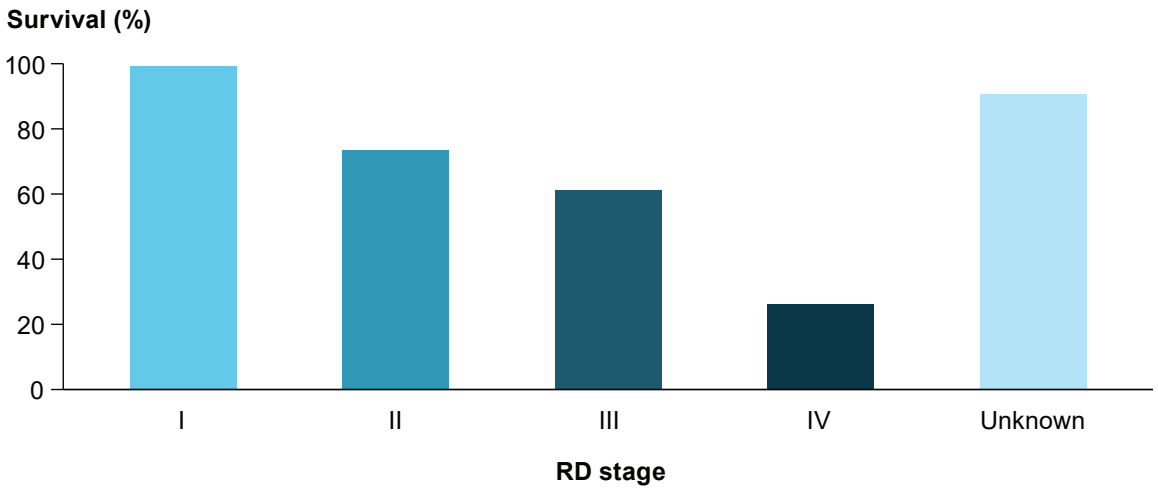
Figure 3.2: 5-year relative survival for colorectal cancer, by stage at diagnosis, 2011



Note: Data for this figure are in online Table S3.1.

Source: AIHW ACD 2014.

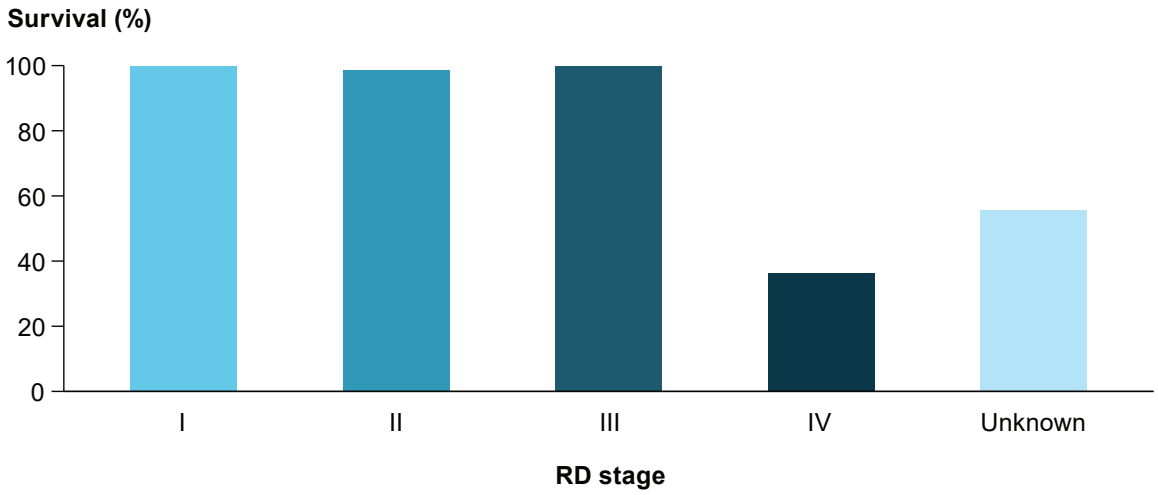
Figure 3.3: 5-year relative survival for melanoma of the skin, by stage at diagnosis, 2011



Note: Data for this figure are in online Table S3.1.

Source: AIHW ACD 2014.

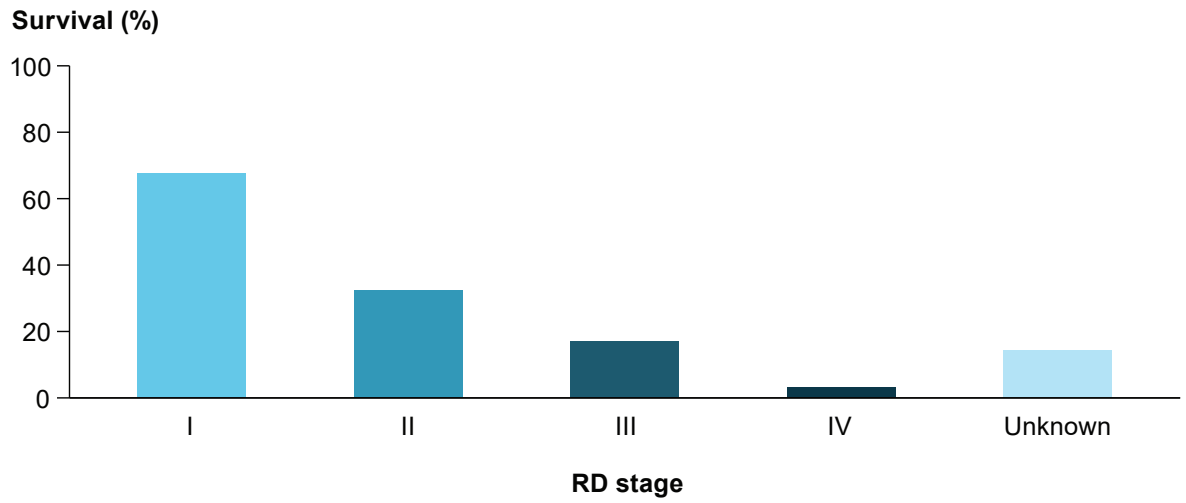
Figure 3.4: 5-year relative survival for prostate cancer, by stage at diagnosis, 2011



Note: Data for this figure are in online Table S3.1.

Source: AIHW ACD 2014.

Figure 3.5: 5-year relative survival for lung cancer, by stage at diagnosis, 2011



Note: Data for this figure are in online Table S3.1.

Source: AIHW ACD 2014.

Screening and early detection

4

Key findings

In the 2-year period 2015–2016:

- 55% of women aged 50–74 participated in BreastScreen Australia
- 55% of women aged 20–69 participated in the National Cervical Screening Program
- the participation rate for the National Bowel Cancer Screening Program was 41%.

In 2017:

- 629,234 women had a Medicare-subsidised breast cancer imaging test, with an average of 1.7 breast cancer imaging tests per patient
- 1,355,803 men received a Medicare-subsidised prostate-specific antigen (PSA) test, with an average of 1.2 PSA tests per patient
- 604,366 Australians received a Medicare-subsidised colonoscopy (282,453 men, 321,913 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 population 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 of 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, exams 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 New South Wales 2018).

The cancer surveillance and detection statistics presented in this report were 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 monitoring purposes (for example, PSA testing in people with 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.

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 1.7 million women screened in 2015–2016

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.

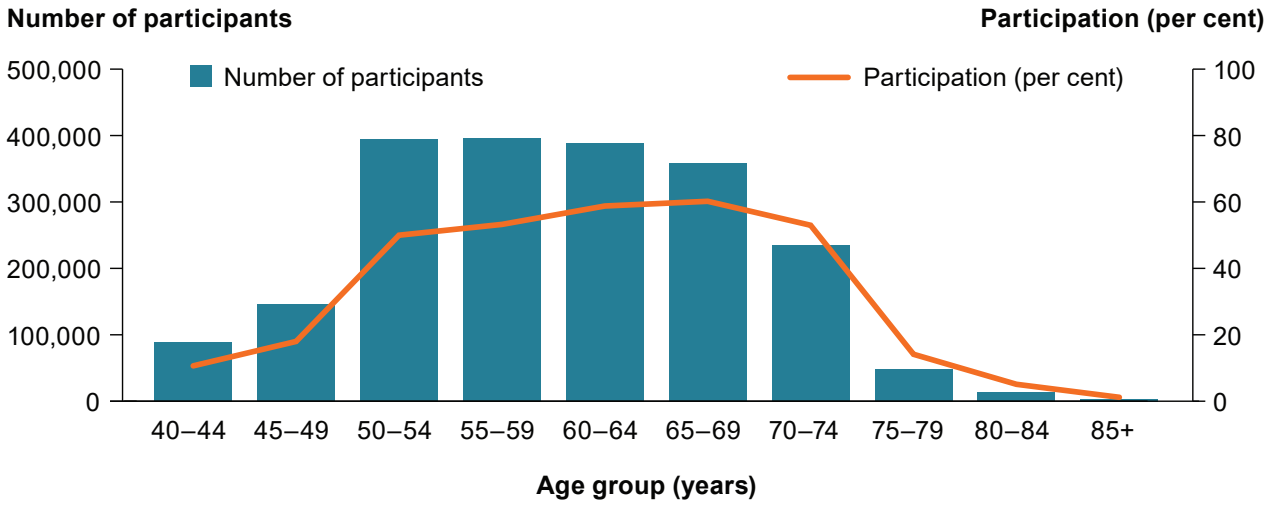
Through funding from the federal government, the program provides free 2-yearly screening mammograms to women aged 50–74 (women aged 40–49 and 75 and over are also eligible to attend, but are not actively targeted). However, as women aged 70–74 have been actively targeted only from 1 July 2013, the trend for participation is presented only for women aged 50–69.

In the 2-year period 2015–2016, more than 1.7 million women aged 50–74 had a screening mammogram, giving a participation rate of 55% (AIHW 2018b). Participation rates for those in the target age group were highest for women aged 60–64 (59%) and 65–69 (60%) and lowest for those aged 50–54 (50%) (Figure 4.1).

The age-standardised participation rate for women aged 50–69 increased from 52% in 1996–1997 to peaks of 58% in 2001–2002 and 2005–2006. Since then, it has remained steady between 53% and 57%. Over the same period the total number of women participating in screening steadily increased (online Table S4.2).

In 2016, for women aged 50–74, 84 invasive breast cancers and 24 ductal carcinomas in situ (DCIS) were detected for every 10,000 women screened for the first time. The detection rate was lower among women attending a subsequent screening, at 55 invasive breast cancers and 13 DCISs per 10,000 (AIHW 2018b).

Figure 4.1: Participation number and rate, by age, BreastScreen Australia, 2015–2016



Notes

1. Participation rates are the number of women screened as a percentage of the eligible female population, calculated as the average of the 2015 and 2016 ABS estimated resident population.
2. Data for this figure are in online Table S4.1.

Source: AIHW analysis of BreastScreen Australia data (AIHW 2018b).

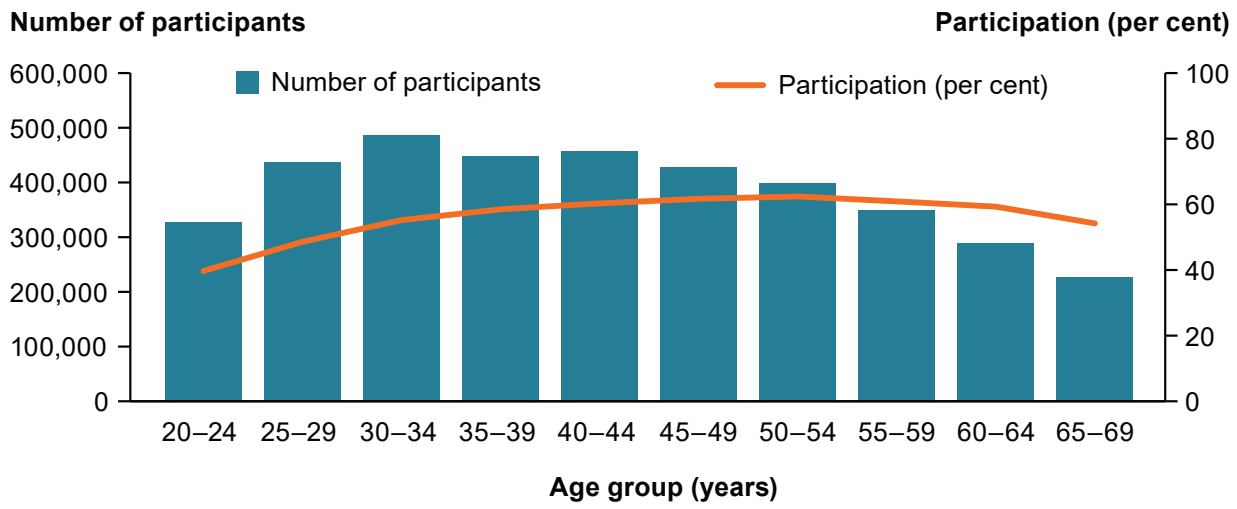
National Cervical Screening Program—participation rate continues to be greater than 50%

The introduction of the National Cervical Screening Program (NCSP) in 1991 led to falls in both cervical cancer incidence and mortality due to the program's ability to detect pre-cancerous abnormalities that may, if left, progress to cancer. With opportunistic cervical screening occurring in Australia since 1960, falls in incidence and mortality of cervical cancer were also evident before this national program was introduced (in 1991).

The NCSP program originally targeted women aged 20–69 for a 2-yearly Papanicolaou (Pap) smear, or 'Pap test'. However, since human papillomavirus (HPV) infection has been identified as playing a key role in the development of cervical cancer, focus has shifted to developing tests to detect the presence of HPV, as well as the introduction of a national HPV vaccination program in 2007. From 1 December 2017, the NCSP changed to 5-yearly cervical screening for women aged 25–74 using a primary HPV test with partial HPV genotyping, supported by reflex liquid-based cytology, to triage clinical management using a risk-based approach (MSAC 2014).

The latest data available are for women screened in the 2-year period 2015–2016 and are based on the previous NCSP, so the target age group of 20–69 has been used. In 2015–2016, more than 3.8 million women aged 20–69 had a screening Pap test, giving a participation rate of 55% (AIHW 2018c). Participation was highest for women aged 45–49 and 50–54 (62%) and lowest for those aged 20–24 (40%) (Figure 4.2).The participation rate has remained relatively stable over time, with the highest rate over the last 10 years occurring in 2006–2007 (60%), and the lowest in 2015–16 (56%) (online Table S4.4). In 2016, for every 1,000 women screened, a high-grade abnormality was detected in 7 (AIHW 2018c).

Figure 4.2: Participation number and rate, by age, National Cervical Screening Program, 2015–2016



Notes

1. Participation rates are the number of women screened as a proportion of the eligible female population. The eligible female population is the average of the ABS estimated resident population, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW NHMD.
2. These data exclude women who have opted off the cervical cytology register.
3. Data for this figure are in online Table S4.3.

Source: AIHW analysis of state and territory cervical screening register data (AIHW 2018c).

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

The National Bowel Cancer Screening Program (NBCSP) was established in 2006. A data linkage study published by the AIHW in 2018 found that NBCSP invitees (particularly those who participated) who were diagnosed with bowel cancer had a lower risk of dying from the disease, and were more likely to have less-advanced cancers when diagnosed than non-invitees. These findings demonstrate that the NBCSP is contributing to reducing morbidity and mortality from bowel cancer in Australia (AIHW 2018d).

The NBCSP offers free screening, using an immunochemical faecal occult blood test (iFOBT), to people aged 50–74. Currently, the Australian Government is rolling out biennial screening for those in this target age group, which will be completed by 2020. Information presented here is reported against the NBCSP key performance indicators. The results from the NBCSP monitoring report or *Cancer in Australia* reports prior to 2016 are not directly comparable to the results published here.

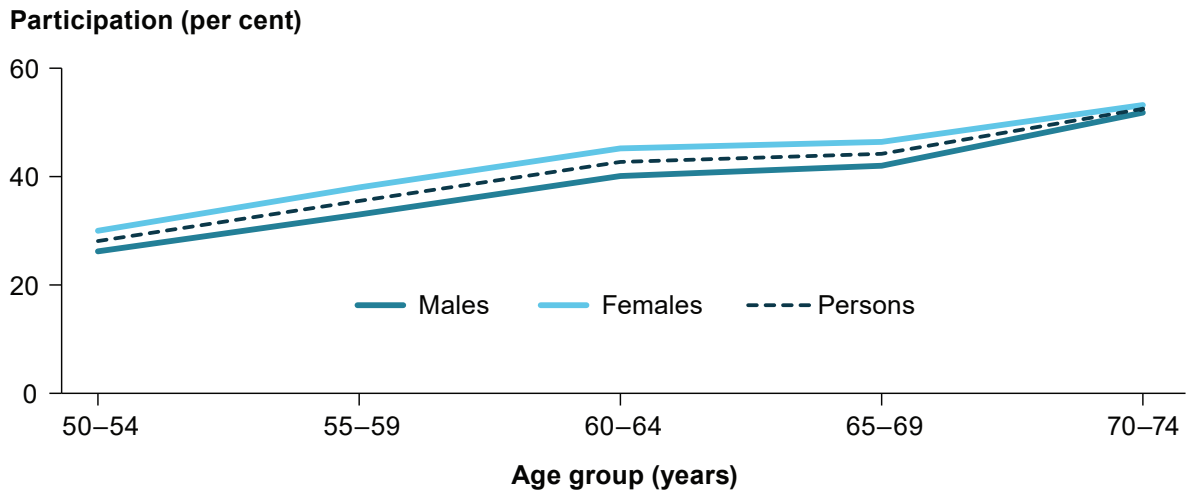
- Of the eligible people invited in 2015–2016, almost 1.3 million participated in the program, a participation rate of 41% (AIHW 2018d). Participation was higher among women (43%) than men (39%) and higher in older age groups (Figure 4.3). The participation rate was higher for people receiving their second or later (subsequent) screening invitation (45% compared with 34%). The re-participation rate for those who had participated previously and were receiving a subsequent invitation was 77%.
- 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 rose to 41% in 2015–2016 (online Table S4.6).

In 2016:

- about 58,700 participants returned a positive screening test, giving a screening positivity rate of 8.1%
- of the 36,855 participants who had a diagnostic assessment (colonoscopy), 1,410 were diagnosed with a confirmed or suspected cancer and 4,439 were diagnosed with an adenoma (AIHW 2018d).

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

Figure 4.3: Participation rate, by age and sex, National Bowel Cancer Screening Program, 2015–2016



Notes

1. The participation rate is the percentage of people invited to screen through the NBCSP in a 24-month period who returned a completed screening test within that period or in the following 6 months.
2. Data for this figure are in online Table S4.5.

Source: National Bowel Cancer Screening Program Register as at 30 June 2017.

4.2 Medicare-subsidised surveillance, detection and monitoring tests

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 the Department of Human Services (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 tests and the average number of tests received. Throughout this section, where multiple tests occur (for example, a breast mammogram and an ultrasound), tests are likely to include a mix of tests for detection or surveillance and diagnostic purposes.

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 tests include ultrasound, mammograms and magnetic resonance imaging (MRI).

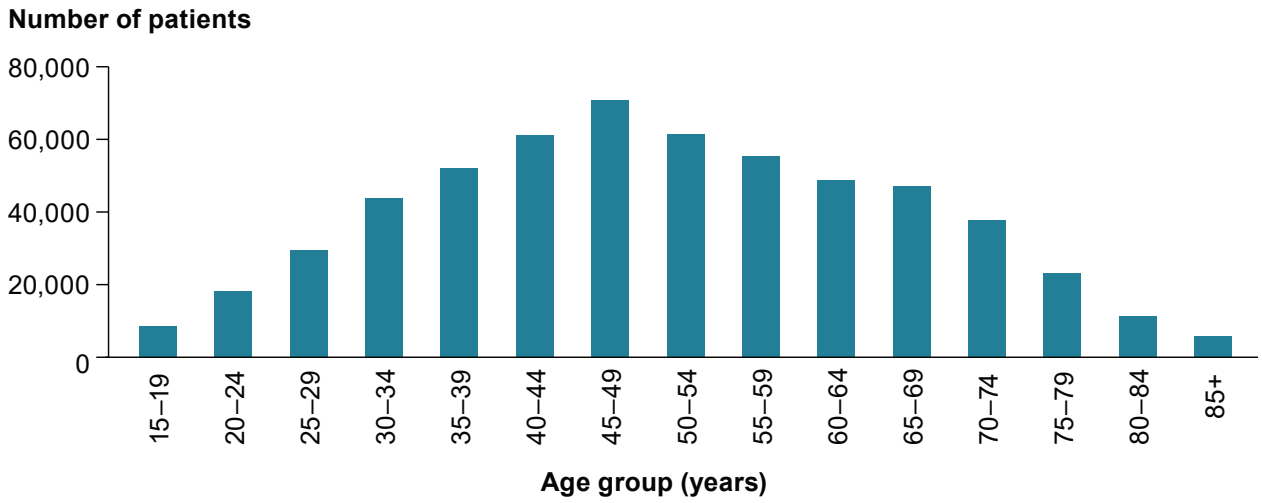
In 2017, 629,234 women had a Medicare-subsidised breast imaging test. During that year, women had an average of 1.7 breast imaging tests per patient (online Table S4.7).

MBS-subsidised breast ultrasound services continue to increase

In 2017, 577,958 women received a Medicare-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 S4.8). The number of women 15 and over who had a breast ultrasound increased with age and peaked for those aged 45–49 (70,668), before decreasing in older age groups (Figure 4.4).

Between 2011 and 2017, the number of women undertaking a Medicare-subsidised breast ultrasound increased by 34% from 432,615 to 577,958. The number of breast ultrasound services increased at the same rate (34%) during this period (Table S4.9). The increase in the female population aged 15 and over between 2011 and 2017 was 11%—considerably less than the increase in women undertaking the service.

Figure 4.4: Medicare-subsidised breast ultrasounds, by age group, females, 2017



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. 2017 refers to services rendered between 1 January 2017 and 31 December 2017) for all services processed until 31 August 2018. 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 S4.8.

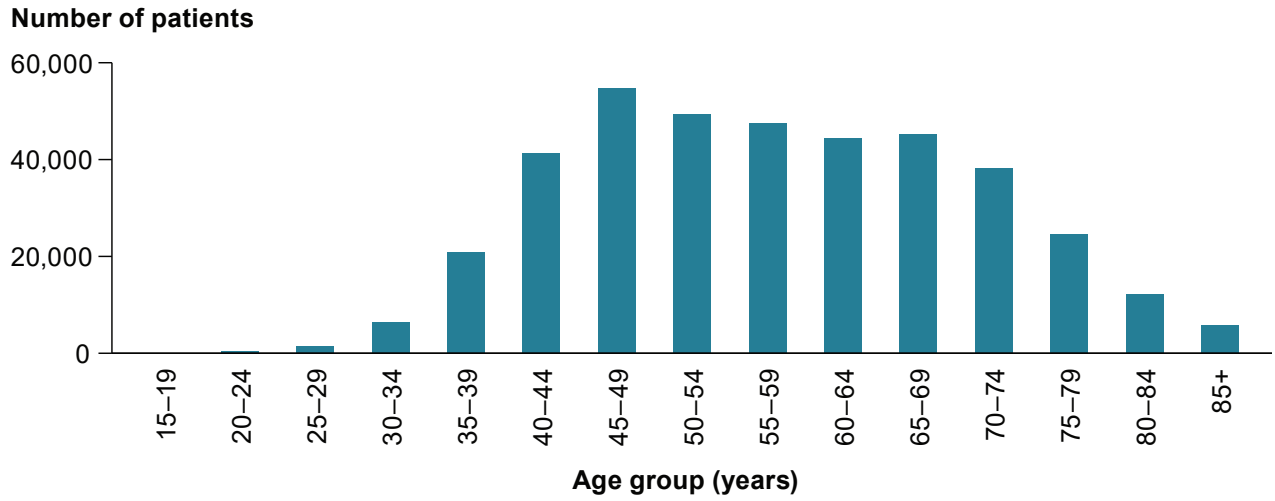
Source: AIHW analysis of Medicare Benefits Schedule (MBS) database.

Almost 400,000 MBS-subsidised mammogram services provided in 2017

In 2017, 392,648 women received a Medicare-subsidised mammogram. During that year, women had an average of 1.0 mammogram per patient and the Australian Government contributed on average $77 per patient (online Table S4.10). Mammograms were much less common in women aged under 35 and were most common in women aged between 40 and 74 (Figure 4.5).

Between 2011 and 2017, the number of women undertaking a Medicare-subsidised mammogram increased by 14%, from 345,384 to 392,648. The number of mammogram tests increased at a similar rate (14%) during this period (online Table S4.11). The 14% increases are a little above the 11% increase that occurred in the female population aged over 15 over the same time.

Figure 4.5: Medicare-subsidised breast mammograms, by age, females, 2017



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. 2017 refers to services rendered between 1 January 2017 and 31 December 2017) for all services processed until 31 August 2018. 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 S4.10.

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

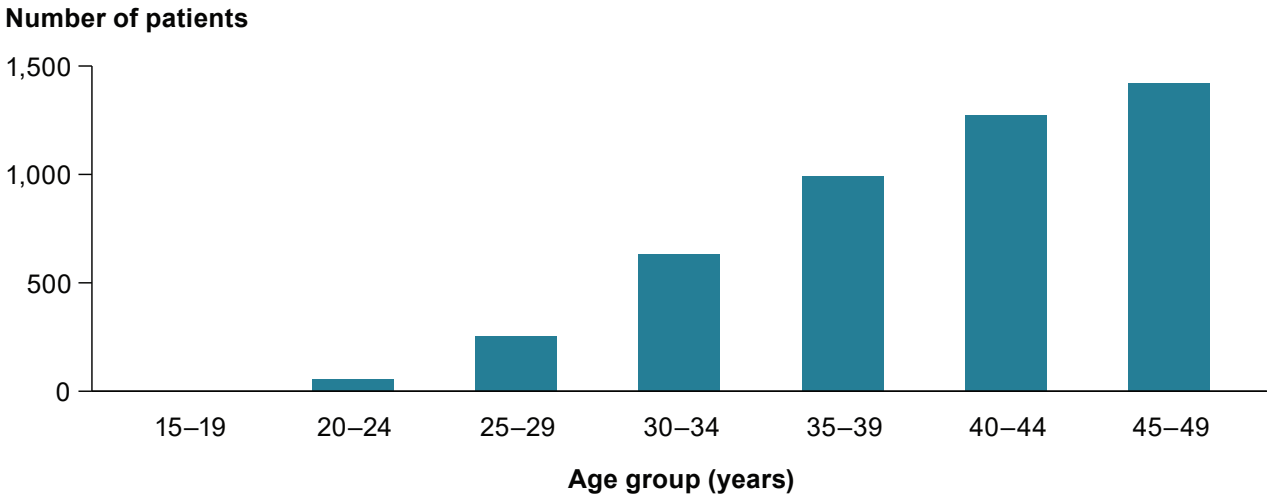
Government contributions for breast magnetic resonance imaging (for women under 50) were $687 per patient

In 2017, 4,640 women received a Medicare-subsidised breast MRI. During that year, these women had an average of 1.0 breast MRI per patient and the Australian Government overall contributed $687 per patient (Table S4.12). The number of women over 15 who had breast MRI increased with age, and peaked at 1,420 for women aged 45–49 (Figure 4.6).

Note that the MBS items for breast MRI 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. The 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.

Between 2011 and 2017, the number of women undertaking Medicare-subsidised breast MRI increased 89%, from 2,450 to 4,640. The number of breast MRI services increased at a similar rate (86%) during this period (Table S4.13). The Australian Government introduced these MBS items in 2009 and 2011 and therefore the increase could be related to the uptake of these items.

Figure 4.6: Medicare-subsidised breast MRI, by age, females, 2017



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. 2017 refers to services rendered between 1 January 2017 and 31 December 2017) for all services processed until 31 August 2018. 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 S4.12.

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

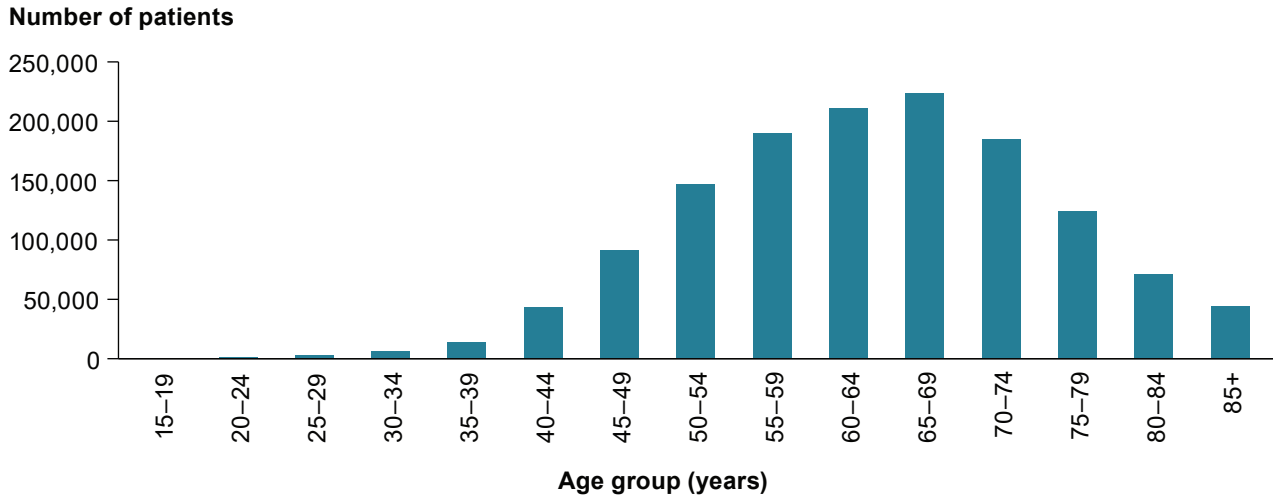
Over 1.3 million men receive prostate-specific antigen tests each year

Prostate-specific antigen (PSA) is a protein produced within the prostate and is quantifiable by a blood test (PSA test). PSA levels in the blood naturally increase with age, and a PSA level that is higher than normal for that age can be an indicator of risk 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).

In 2017, around 1.36 million men received a Medicare-subsidised PSA test. During that year, these men had an average of 1.2 PSA tests per patient and the Australian Government contributed, on average, $23 per patient (Table S4.14). The number of men aged over 15 who had a PSA test increased with age and peaked for men aged 65–69, before decreasing in older age groups (Figure 4.7).

On average, between 2011 and 2017 over 1.3 million men undertook Medicare-subsidised PSA testing. In the same period, the number of Medicare-subsidised PSA testing services remained stable at 1.2 services per patient (Table S4.15).

Figure 4.7: Medicare-subsidised PSA testing, by age group, males, 2017



Notes

1. Services per patient is the average number of Medicare-subsidised PSA services received per patient.
2. Data reported by date of service (i.e. 2017 refers to services rendered between 1 January 2017 and 31 December 2017) for all services processed until 31 August 2018. 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 S4.14.

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

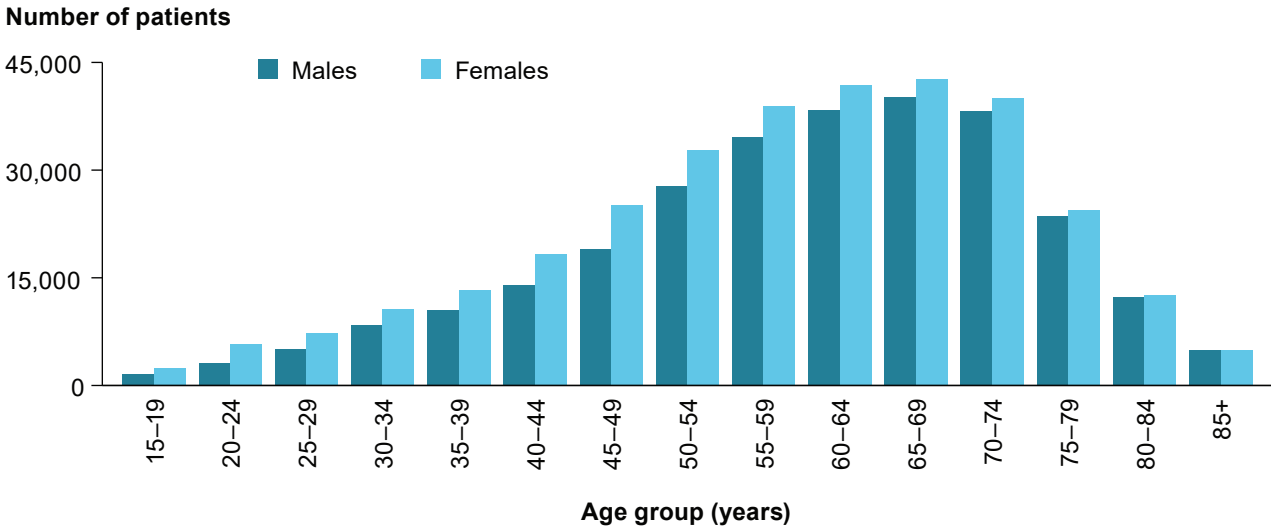
MBS colonoscopies increase 20% since 2011

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). Data within this section include colonoscopy procedures that represent an initial cancer detection process but exclude iFOBT follow ups and procedures of a diagnostic nature.

In 2017, 604,366 Australians received a Medicare-subsidised colonoscopy. More women than men had a colonoscopy that year (321,913, and 282,453, respectively) (online Table S4.16). Both men and women had an average of 1.0 colonoscopy per patient and the Australian Government contributed, on average, $304 per patient ($311 and $298 per patient for men and women, respectively). The number of men and women aged over 15 who had a colonoscopy increased with age and peaked at 65–69 for both sexes, then decreased for older age groups (Figure 4.8).

Between 2011 and 2017, the number of people undertaking a Medicare-subsidised colonoscopy rose 20%, from 505,589 to 604,366. The number of colonoscopy services rose at the same rate (20%) during this period (Table S4.17). The increase in the rate of people undertaking, and services for, Medicare-subsidised colonoscopies is around twice that of the increase in the population aged over 15 for the same period (10%).

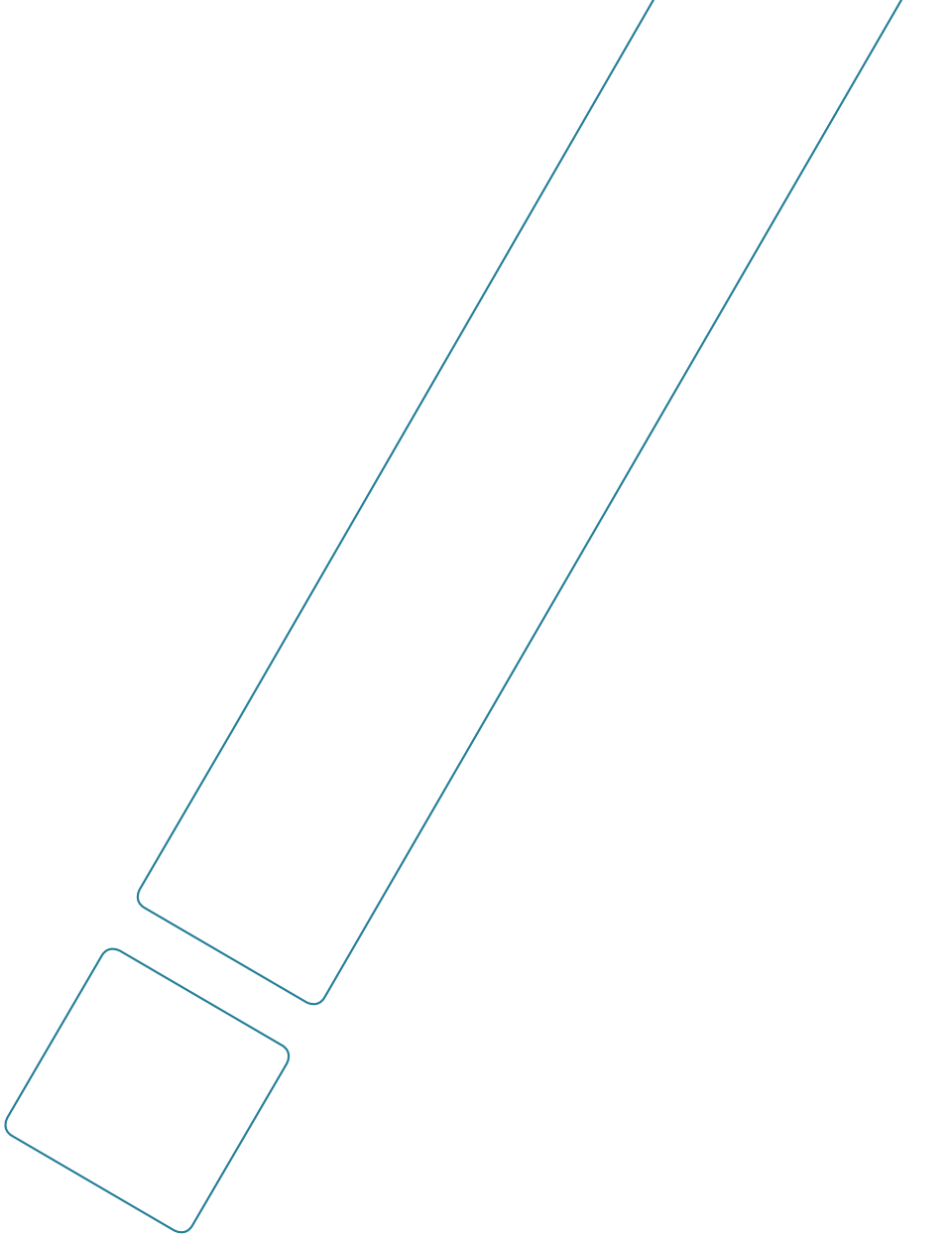
Figure 4.8: Medicare-subsidised colonoscopies, by age group and sex, 2017



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. 2017 refers to services rendered between 1 January 2017 and 31 December 2017) for all services processed until 31 August 2018. See Appendix E 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 S4.16.

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



Number of new cases

5

Key findings

In 2019 in Australia, it is estimated that:

- 144,713 new cases of cancer will be diagnosed
- the age-standardised cancer incidence rate will be 483 cases per 100,000 persons
- more than half (54%) of all cancers will be diagnosed in males
- around 9 of every 10 new cancer cases will be diagnosed in those aged 50 and over
- the risk of being diagnosed with cancer before the age of 85 will be 1 in 2
- prostate cancer will be the most commonly diagnosed cancer in males, followed by colorectal cancer, melanoma of the skin, lung cancer and head and neck cancer
- breast cancer will be the most commonly diagnosed cancer in females, followed by colorectal cancer, melanoma of the skin, lung cancer and uterine cancer.

Data for this section are sourced from the 2015 ACD and focus on the estimated cancer incidence for 2019 and cancer trends from 1982 to 2019 (see Appendix C for details on this data source). 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.

5.1 All cancers combined

In 2019, it is estimated that 144,713 new cases of cancer will be diagnosed in Australia (excluding basal and squamous cell carcinoma of the skin, as these cancers are not notifiable diseases and hence are not reported to cancer registries). More than half (54%) of these cases are expected to be diagnosed in males (Table 5.1). In 2019, it is estimated that 1 in 3 males and 1 in 4 females will be diagnosed with cancer by the age of 75. By the age of 85, the risk is estimated to increase to 1 in 2 for both males and females.

Table 5.1: Estimated incidence of all cancers combined, by sex, 2019

	Males	Females	Persons
Number of cases	78,081	66,632	144,713
Age-standardised rate	540.5	434.2	482.7
Percentage of all cancer cases	54.0	46.0	100.0
Risk to age 75	1 in 3	1 in 4	1 in 3
Risk to age 85	1 in 2	1 in 2	1 in 2

Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal cell carcinoma or a squamous cell carcinoma.
2. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.

Source: AIHW ACD 2015.

People over 50 will account for around 90% of the estimated cancers diagnosed in 2019

The incidence of cancer generally increases with age. In 2019, it is estimated that the age-specific rate of diagnosis of new cases of cancer will range from a low of around 12 cases per 100,000 persons for those aged 5 to 9 to a peak of 2,690 cases per 100,000 persons for those over 85 years of age (Figure 5.1). In 2019, it is estimated that people over 50 years of age will account for just under 9 of every 10 new cases of cancer (online Table S5.1).

Female cancer incidence rates are higher than male for those in their 30s and 40s

In 2019, for those aged between 25 and 54, the age-specific incidence rate is higher for females than males. The high incidence of all cancers combined in this age group may in part be attributable to the high incidence rate of breast cancer in this age group. After the age of 55, the age-specific incidence rate is higher for males than females (Figure 5.1). The high incidence of all cancers combined for males aged 55 or older may in part be due to the high incidence rate of prostate cancer in males in these older age groups.

Figure 5.1: Estimated incidence rates of all cancers combined, by age at diagnosis and sex, 2019

Notes

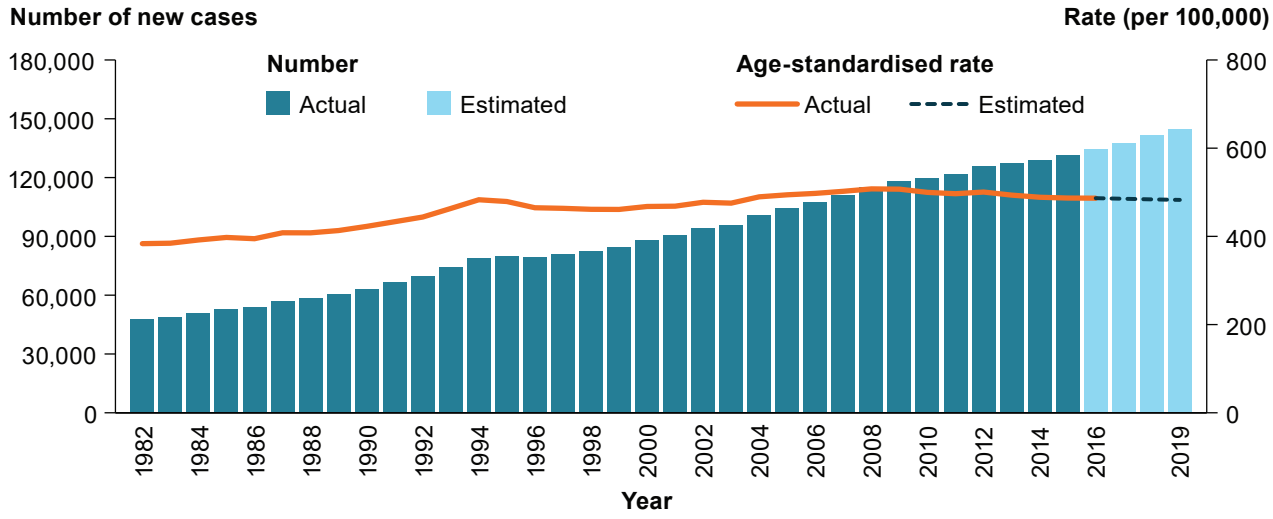
1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal cell or squamous cell carcinoma.
2. Data for this figure are in online Table S5.1.

Source: AIHW ACD 2015.

Cancer incidence—more cases than ever but declining rates of cancer

While the number of new cases of cancer diagnosed in 2019 is expected to be 3 times that of 1982, the incidence rates of cancer have fluctuated over time, with some noticeable decreases. The age-standardised incidence rate of all cancers combined increased from 383 per 100,000 persons in 1982 to a peak of 507 per 100,000 in 2008, before a predicted decrease to 483 per 100,000 in 2019 (Figure 5.2). The increase in trend in the early years leading up to 1994 can be attributed to the rise in the number of prostate cancers and breast cancers in females diagnosed, and may be due to screening and surveillance activities and improvements in technologies and techniques used to identify and diagnose cancer. The decrease in the last few years from 2008 onwards has mainly been observed in males and is mostly due to changes in the incidence rate of prostate cancer.

Figure 5.2: Trends in incidence of all cancers combined, persons, 1982 to 2019



Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
2. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. The data for this figure are in online Table S5.2.

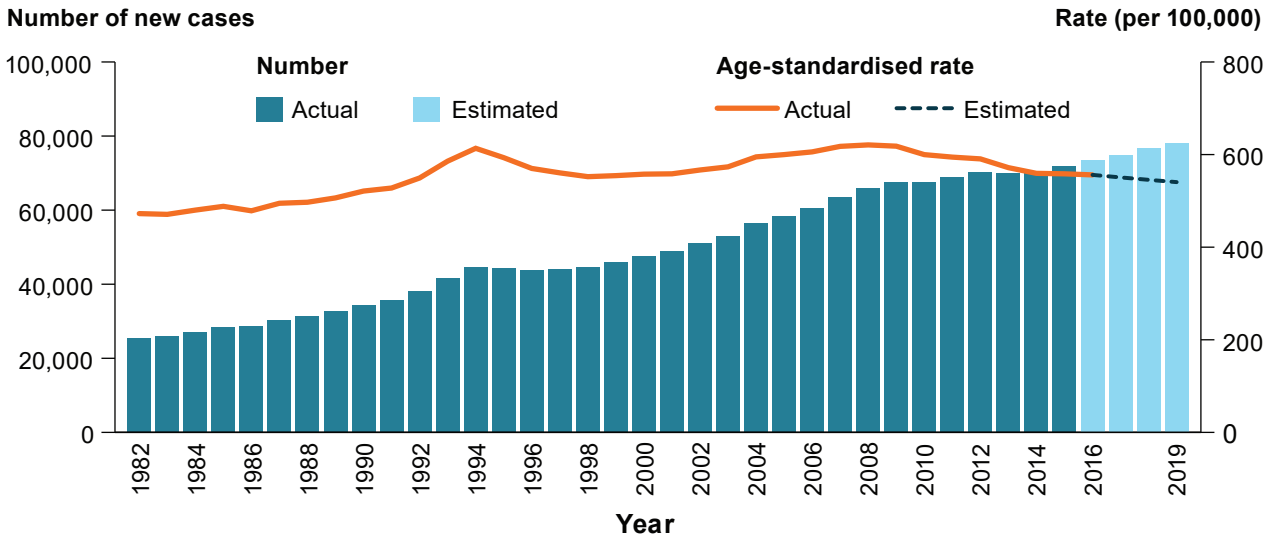
Source: AIHW ACD 2015.

Male cancer incidence rates are decreasing

For males, the age-standardised incidence rate increased steadily until 1994, when it peaked at 614 cases per 100,000. This was followed by a decline until the late 1990s when it began to increase again, reaching a rate of 621 cases per 100,000 males in 2008. It then fell steadily to a rate of 558 cases per 100,000 in 2015. It is expected to continue to fall to 541 per 100,000 in 2019 (Figure 5.3).

The trend in the rate for males is strongly influenced by changes in the incidence rate of prostate cancer—the most common cancer in males. PSA testing and associated changes in guidelines can affect the number of new cases of prostate cancer. PSA testing was introduced in 1987 and is thought to have contributed to the peak in incidence during the 1990s. The PSA threshold at which males were referred for a prostate biopsy was lowered in 2002 and might have contributed to the peak incidence during the mid to late 2000s (Smith et al. 2008). More recently, the clinical practice guidelines for PSA and the early management of testdetected prostate cancer (Prostate Cancer Foundation of Australia and Cancer Council Australia 2016) were endorsed by the National Health and Medical Research Council in November 2015.

Figure 5.3: Trends in incidence of all cancers combined, males, 1982 to 2019



Notes

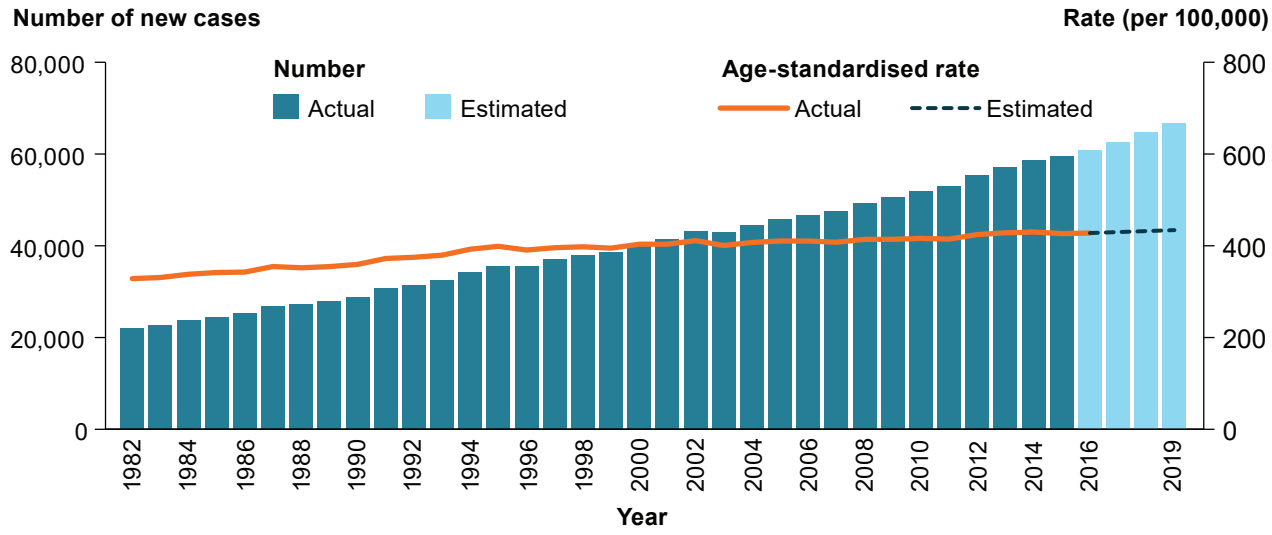
1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
2. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. The data for this figure are in online Table S5.2.

Source: AIHW ACD 2015.

Female cancer incidence rate estimated to reach a new high in 2019

For females, between 1982 and 2015 the age-standardised incidence rate of all cancers combined has increased to some degree in all but 8 of the 33 years. It is predicted that the rate of new cancer cases for females will reach 434 per 100,000 females in 2019 (Figure 5.4). The rate for females has been strongly influenced by the trend in the incidence rate of breast cancer. The development of new technologies such as MRI, the introduction of the BreastScreen Australia screening program and increased breast awareness may have contributed to the increased diagnosis of breast cancer (Youlden et al. 2012).

Figure 5.4: Trends in incidence of all cancers combined, females, 1982 to 2019



Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
2. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. The data for this figure are in online Table S5.2.

Source: AIHW ACD 2015.

5.2 Most commonly diagnosed cancers

In 2019, breast cancer (males and females) is estimated to be the most commonly diagnosed cancer in Australia, followed by prostate cancer, colorectal cancer, melanoma of the skin and lung cancer. The 10 most commonly diagnosed cancers are estimated to account for 74% of all cancers diagnosed (Table 3).

Prostate cancer for males and breast cancer for females are estimated to continue to be the leading cancers by sex in 2019

In 2019, prostate cancer is estimated to be the most commonly diagnosed cancer in males (19,508 cases), with an estimated 1 in 6 risk of diagnosis before the age of 85. For females, breast cancer is estimated to be the most commonly diagnosed cancer (19,371 cases, risk before age 85 of 1 in 7). For both sexes, the respective most commonly diagnosed cancer is expected to occur at more than twice the rate of the second most common cancer by sex. For both sexes in 2019, colorectal cancer is expected to be the second most common cancer, followed by melanoma of the skin and lung cancer. It is, however, expected that males will have higher rates of new cancer cases for each of these cancer types (Table 5.2).

Table 5.2: Estimated 10 most commonly diagnosed cancers, by sex, 2019

Males				Females			
Cancer site/type (ICD-10 codes)	**Cases**	**ASR**	**Risk to age 85**	**Cancer site/type (ICD-10 codes)**	**Cases**	**ASR**	**Risk to age 85**
Prostate (C61)	19,508	130.2	1 in 6	Breast (C50)	19,371	130.8	1 in 7
Colorectal (C18–C20)	9,069	63.4	1 in 12	Colorectal (C18–C20)	7,329	45.8	1 in 17
Melanoma of the skin (C43)	8,899	62.5	1 in 13	Melanoma of the skin (C43)	6,330	42.3	1 in 21
Lung (C33–C34)	7,184	49.2	1 in 15	Lung (C33–C34)	5,633	34.6	1 in 21
Head and neck (with lip) (C00–C14, C30–C32)	3,807	26.7	1 in 32	Uterus (C54–C55)	3,115	19.9	1 in 40
Lymphoma (C81–C86)	3,647	25.9	1 in 31	Lymphoma (C81–C86)	2,776	18.1	1 in 45
Leukaemia (C91–C95)	2,609	18.5	1 in 43	Thyroid (C73)	2,645	19.6	1 in 56
Kidney (C64)	2,539	17.9	1 in 46	Pancreas (C25)	1,710	10.2	1 in 71
Bladder (C67)	2,447	16.9	1 in 42	Leukaemia (C91–C95)	1,642	10.7	1 in 75
Liver (C22)	1,907	13.2	1 in 61	Ovary (C56)	1,510	9.8	1 in 84
All cancers combined	**78,081**	**540.5**	**1 in 2**	**All cancers combined**	**66,632**	**434.2**	**1 in 2**

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. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
3. Head and neck cancers incorporate cancers of the lip, tongue, mouth, salivary glands, pharynx, nasal cavity, sinuses and larynx.

Source: AIHW ACD 2015.

Lymphoma is estimated to be the most commonly diagnosed cancer for 15–24 year olds in 2019

In 2019, an estimated 804 new cases of cancer will be diagnosed in people aged 0–14. For this age group, leukaemia (274 cases) is estimated to be the most commonly diagnosed cancer, followed by brain cancer (100) and lymphoma (75) (online Table S5.3).

In 2019, an estimated 1,002 new cases of cancer will be diagnosed in people aged 15–24. For this age group, lymphoma (195 cases) is estimated to be the most commonly diagnosed cancer, followed by testicular cancer (121) and thyroid cancer (118) (online Table S5.3).

In 2019, an estimated 16,715 new cases of cancer will be diagnosed in people aged 25–49. For this age group, breast cancer (3,890 cases) is estimated to be the most commonly diagnosed cancer, followed by melanoma of the skin (2,603) and colorectal cancer (1,447) (online Table S5.3).

In 2019, an estimated 39,908 new cases of cancer will be diagnosed in people aged 50–64. Breast cancer (6,764 cases) is estimated to be the most commonly diagnosed cancer, followed by prostate cancer (6,389) and melanoma of the skin (4,251) for this age group. The number of cancers diagnosed in this age group may, in part, be attributable to the national breast and bowel screening programs which target people aged 50 to 74 (online Table S5.3).

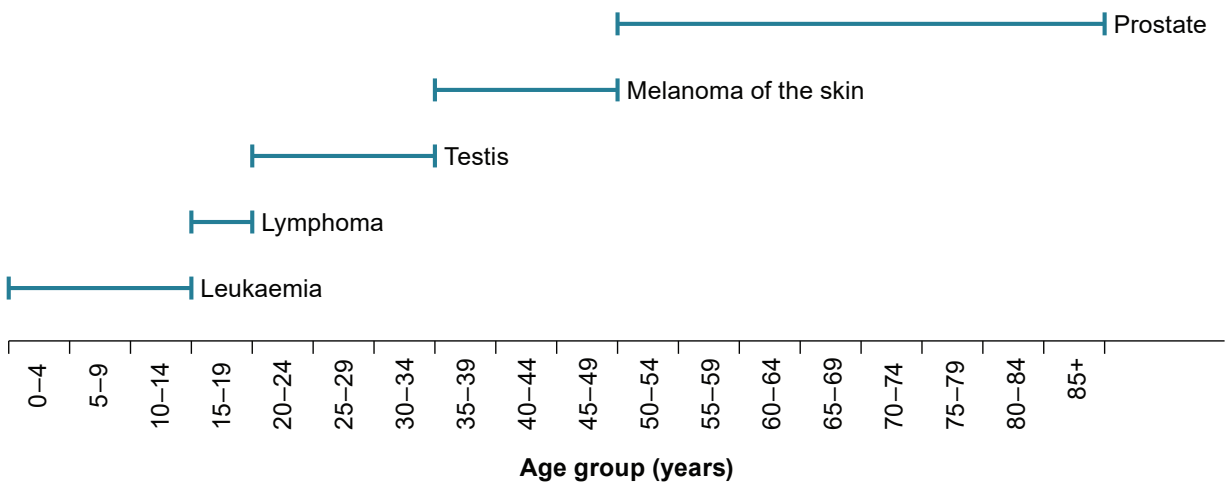
In 2019, an estimated 86,283 new cases of cancer will be diagnosed in people aged 65 and over.

Prostate cancer (12,582 cases) is estimated to be the most commonly diagnosed cancer, followed by colorectal cancer (11,051) and lung cancer (9,517). Population-based screening programs target people in this age group, which could contribute to the number of cancers diagnosed (online Table S5.3).

Leukaemia is estimated to be the most commonly diagnosed cancer for those under 10 years of age in 2019

Figures 5.5 and 5.6 outline the estimated most commonly diagnosed cancers in 2019 by sex and age group. Leukaemia is estimated to be the most common cancer diagnosed for males aged 0–15; leading cancers for these age groups in females are the same with the exception that colorectal cancer is the leading cancer diagnosed for females aged 10–15. For both sexes, lymphoma is estimated to be the most common cancer for age group 15 to 19. Prostate cancer is estimated to be the most commonly diagnosed cancer for males aged 50 and over. Breast cancer is estimated to be the most common cancer for females in the age groups between 30 and 80.

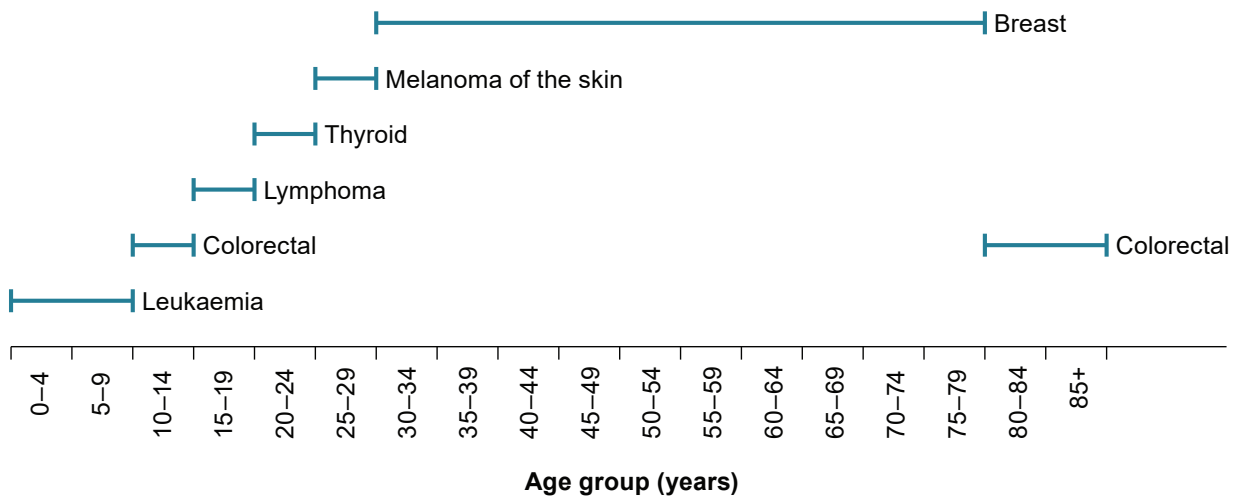
Figure 5.5: Estimated most commonly diagnosed cancer, by age group, males, 2019



Note: Data for this figure are in online Table S5.4.

Source: AIHW ACD 2015.

Figure 5.6: Estimated most commonly diagnosed cancer, by age group, females, 2019



Note: Data for this figure are in online Table S5.4.

Source: AIHW ACD 2015.

Thyroid cancer incidence rates are increasing faster than those for any other cancer

This sub-section examines the change in cancer incidence rates between 1982 and 2019. The investigations focus on cancers with an age-standardised incidence rate of 3 per 100,000 or more in either 1982 or 2019. Note the incidence may be less than 3 in 1 of the reference years. Cancers with these rates are primarily selected for statistical reasons as this section focuses largely on percentage change over time and cancers with low rates over time will be very sensitive to change.

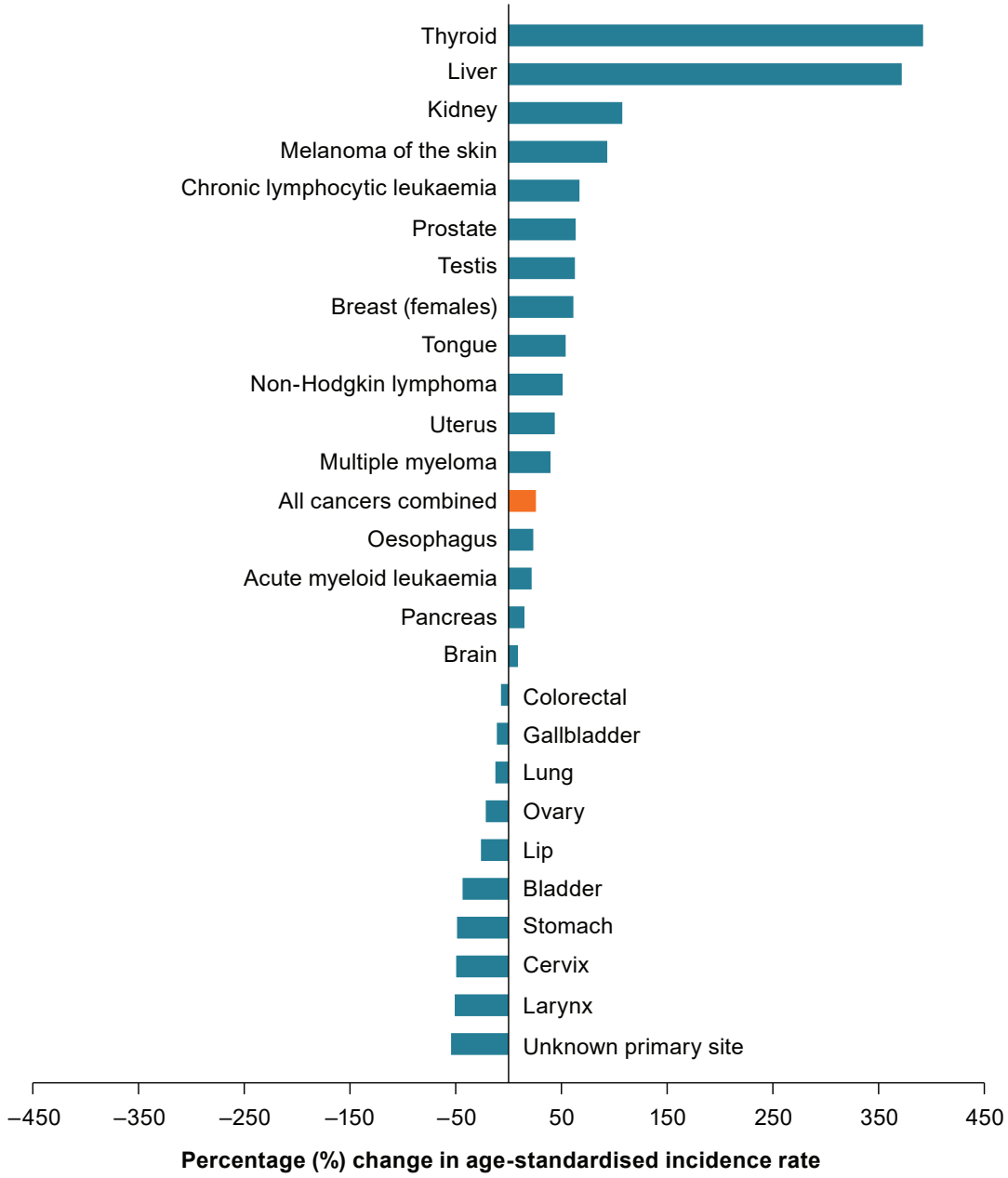
Between 1982 and 2019, thyroid cancer had the greatest percentage increase in the age-standardised incidence rate, of 392% (from 2.7 to 13 per 100,000 persons) (Figure 5.7). The increase in thyroid cancer may be due to an increase in medical surveillance and the introduction of new diagnostic techniques, such as neck ultrasonography (Vaccarella et al. 2016). Other substantial increases in the age-standardised incidence rates occurred for:

- liver cancer (378% increase from 1.8 to 8.6 per 100,000 persons)
- kidney cancer (108% increase from 6.2 to 12.9 per 100,000 persons)
- melanoma of the skin (93% increase from 27 to 52 per 100,000 persons) (online Table S5.5).

Between 1982 and 2019, the cancers that show the greatest estimated percentage decrease in age-standardised incidence rates are:

- cancer of unknown primary site (54% decrease from 18 to 8.2 per 100,000 persons)
- laryngeal cancer (51% decrease from 4.3 to 2.1 per 100,000 persons)
- cervical cancer (50% decrease from 14 to 7.2 per 100,000 females)
- stomach cancer (48% decrease from 16 to 8.1 per 100,000 persons) (Figure 5.7).

Figure 5.7: Estimated percentage change in age-standardised incidence rates for selected cancers between 1982 and 2019



Notes

1. The bars indicate the estimated percentage change in incidence rates between 1982 and 2019. The percentage change between 1982 and 2019 is a summary measure that allows the use of a single number to describe the change over a period of multiple years. However, it is not always reasonable to expect that a single measure can accurately describe the trend over the entire period.
2. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. Includes cancers with an age-standardised rate of 3 per 100,000 persons or more in either 1982 or 2019.
4. The data for this figure are in online Table S5.5.

Source: AIHW ACD 2015.

5.3 Rare and less common cancers, 2015

In 2015, over 43,000 people were diagnosed with a rare or less common cancer. Rare Cancers Australia defines rare cancer as cancers with an incidence rate of fewer than 6 cases diagnosed per 100,000 persons per year and less common cancers as those with an incidence rate between 6 and 12 cases per 100,000 persons per year. Common cancers are defined as those with an incidence rate greater than 12 new cases diagnosed per 100,000 Australians per year. Refer to online Table S5.6 for the full list of cancers, and the corresponding rarity grouping, incidence and mortality rates.

In 2015, there were 23,799 new cases of a rare cancer and 22,271 cases of a less common cancer diagnosed in Australia. When combined, this represented just over a third of all cancer cases diagnosed in that year (Table 5.3).

Table 5.3: Incidence of rare, less common and common cancers and all cancers combined, persons, Australia, 2015

	Rare cancers	Less common cancers	Common cancers	All cancers combined
Number of cases	23,799	22,271	85,382	131,452
Age-standardised rate	89.4	82.2	315.3	486.9
Percentage of all cancer cases	18.1	16.9	65.0	100.0
Risk to age 75	1 in 16	1 in 18	1 in 4	1 in 3
Risk to age 85	1 in 10	1 in 10	1 in 3	1 in 2

Notes

1. Rare cancers are those with age-standardised rates less than 6 cases diagnosed per 100,000 Australians. Less common cancers are those with age-standardised rates between 6 and 12 cases per 100,000 Australians. Common cancers are those with age-standardised rates greater than 12 cases per 100,000 Australians.
2. Individual cancers were grouped based on rarity and the number of new cases were summed accordingly. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal cell carcinoma or a squamous cell carcinoma.

Source: AIHW ACD 2015.

Bladder cancer incidence rate for males is almost 4 times that of females

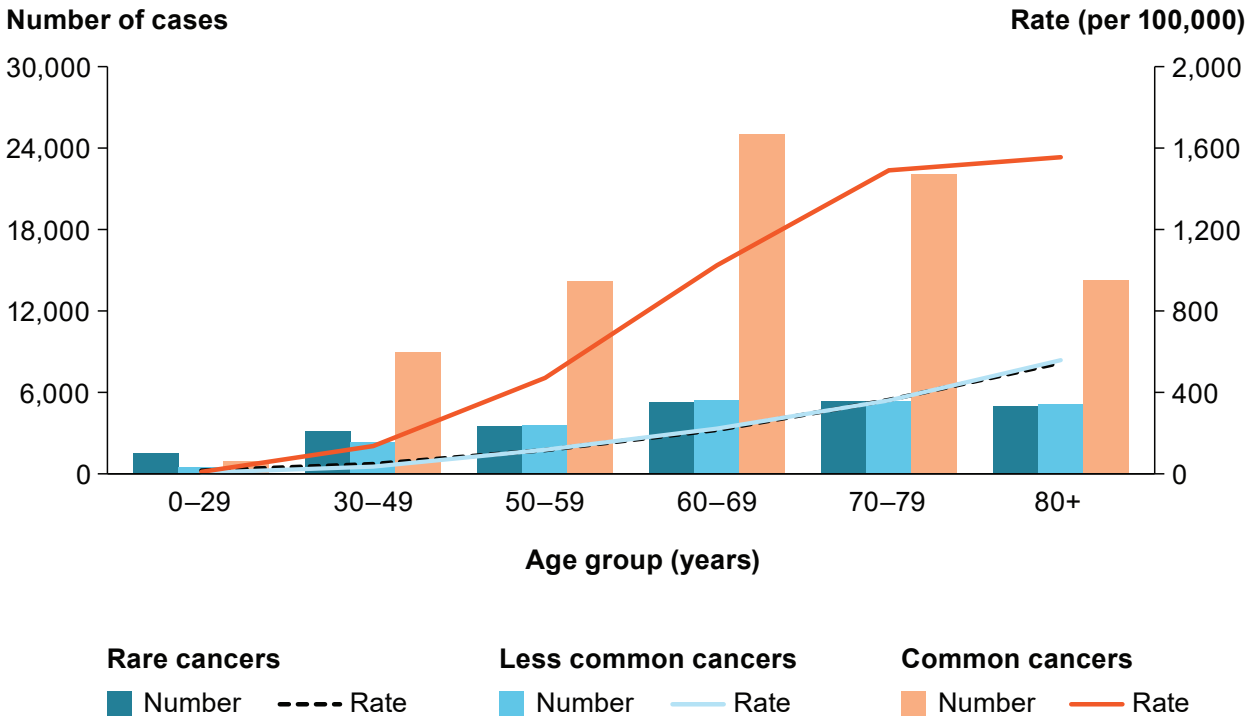
The majority of cancers have higher incidence rates in males than females (online Table S5.6). Cancer rarity is classified by the age-standardised incidence rate per persons; however, excluding sex-specific cancers, there are cancers that are predominantly diagnosed in females. Where disparity between sexes occurs, a cancer may be 'rare' within one sex but may be defined as 'less common' or 'common' within the other.

In 2015, for the cancers that differed in rarity between males and females (that is, if rarity were defined by age-standardised rates by sex and not persons the cancer rarity for males would differ from that for females), bladder cancer had the greatest male-to-female incidence rate ratio: incidence for males was almost 4 times higher than for females. This is followed by liver cancer (3.0), oesophageal cancer (2.8) and kidney cancer (2.1). Similarly, looking at the female-to-male incidence rate ratio for cancers predominantly in females, breast cancer showed the greatest disparity, of 104 cases in females for every case in males. This is followed by thyroid cancer, with an incidence age-standardised rate almost 3 times as high as that of males (online Table S5.6).

Rare cancers are more commonly diagnosed in people under 30 than common and less common cancers combined

In 2015, the incidence of rare, less common and common cancers all increased with increasing age. Rare cancers were more commonly diagnosed in those under 30 than either common or less common cancers. Common cancers were by far the most commonly diagnosed cancers for those over 30 (Figure 5.8).

Figure 5.8: Incidence of rare, less common and common cancers, by age at diagnosis, 2015



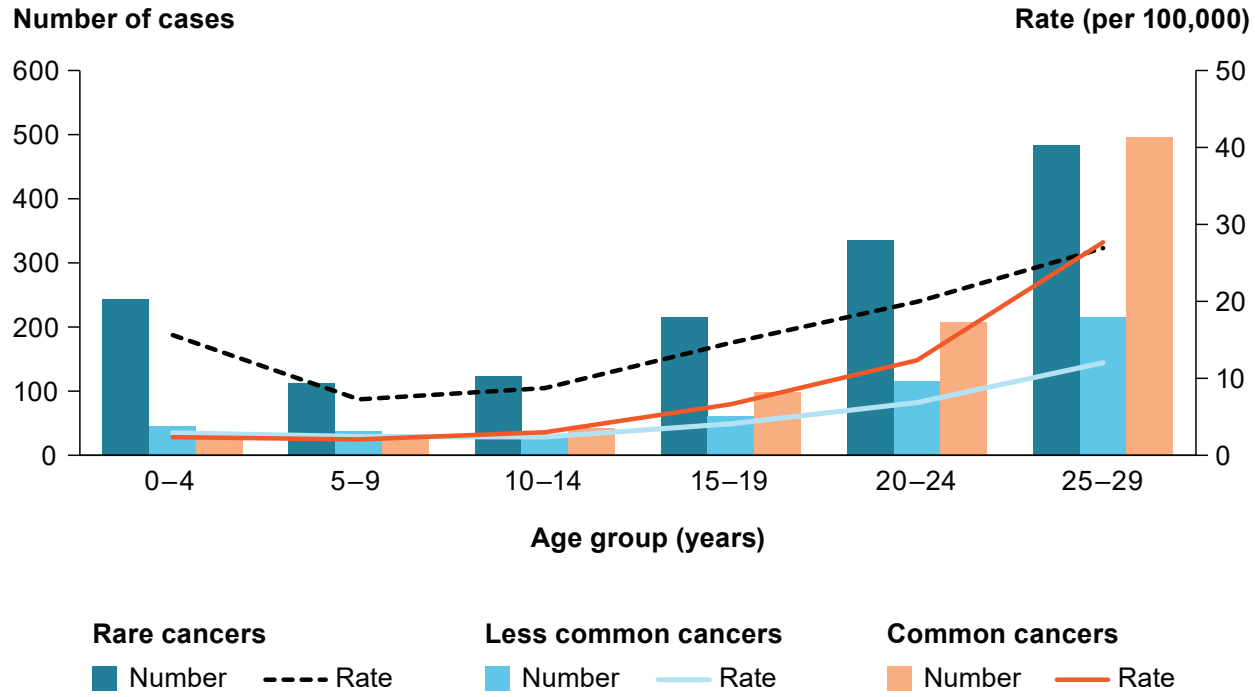
Notes

1. The rates are age-specific rates expressed per 100,000 population.
2. The data for this figure are in online Table S5.7.

Source: AIHW ACD 2015.

In 2015, and focussing on cancers diagnosed in the under 30 age groups, rare cancers were diagnosed at least twice as often as either common or less common cancers in age groups under 20. Of the under 30 age groups, the 25–29 age group was the only group where rare cancers were not the most commonly diagnosed; for this age group, common cancers were the most commonly diagnosed cancer rarity group (Figure 5.9).

Figure 5.9: Incidence of rare, less common and common cancers for those aged 0–29, by age at diagnosis, 2015



Notes

1. The rates are age-specific rates expressed per 100,000 population.
2. The data for this figure are in online Table S5.8.

Source: AIHW ACD 2015.

5.4 Non-malignant tumours

This section presents information on some non-malignant tumours and in situ tumours. In situ tumours are tumours that are 'in the original place' but are not invasive or malignant. This group is coded differently from invasive cancer and is in addition to the numbers presented in the previous section (which are invasive or malignant neoplasms). For more information on the coding of non-malignant tumours, refer to Appendix B2 and B3.

In situ data are sourced from the ACD 2015. Actual in situ data are available to 2015—except for New South Wales, where data were available to 2014 (see Appendix A). Projections to 2019 are reported for carcinoma in situ of the breast and melanoma in situ of the skin as the data for these tumours are nationally complete. Table 5.4 summarises the non-malignant tumour data availability and where data is suitable for reporting.

Table 5.4: Summary of non-malignant tumour data available for reporting

Tumour site/type	State and territory	Data availability	
		Actual data*	Projected data
Carcinoma in situ of the breast	All, except NSW	2002–2015	2016–2019
	NSW	2002–2014	2015–2019
Carcinoma in situ of the cervix	Vic and Qld	2001–2015	Not available
Melanoma in situ of the skin	All, except NSW	2004–2015	2016–2019
	NSW	2002–2014	2015–2019
Non-malignant neoplasms of the brain and other central nervous system	Vic, Qld and WA	2003–2015	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 'Actual data' period.

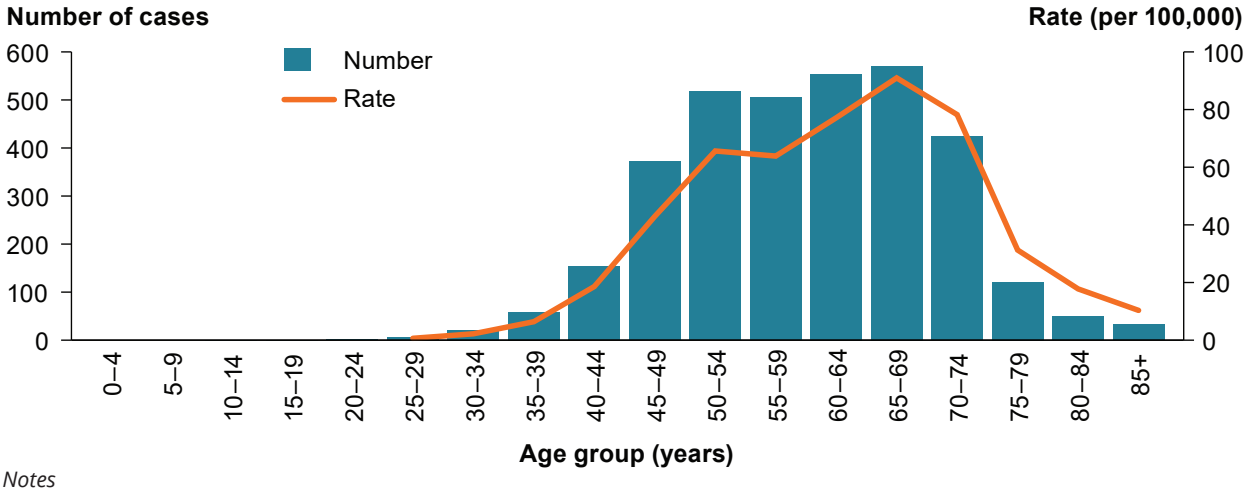
Carcinoma in situ of the breast (female only)

In 2019, it is estimated that 3,389 new cases of carcinoma in situ of the breast will be diagnosed (online Table S5.9). The age-standardised incidence rate for females is estimated to be around 23 cases per 100,000 females.

Carcinoma in situ of the breast rates are highest for women aged 65–69

In 2019, the number of new cases of carcinoma in situ of the breast is estimated to increase with age, peaking at 571 cases for women aged 65–69 (Figure 5.10). The age-specific incidence rate of carcinoma in situ of the breast is expected to be much lower for those aged under 40. The rate is expected to increase from 19 cases per 100,000 for females aged 40–44 to 91 cases per 100,000 for females aged 65–69 (Figure 5.10). The rate is then expected to decrease to 10 cases per 100,000 for females aged 85 and over. This may be related to BreastScreen Australia targeting women aged 50–69 for breast cancer screening (AIHW 2018b).

Figure 5.10: Estimated incidence rates of carcinoma in situ of the breast, by age at diagnosis, females, 2019



Notes

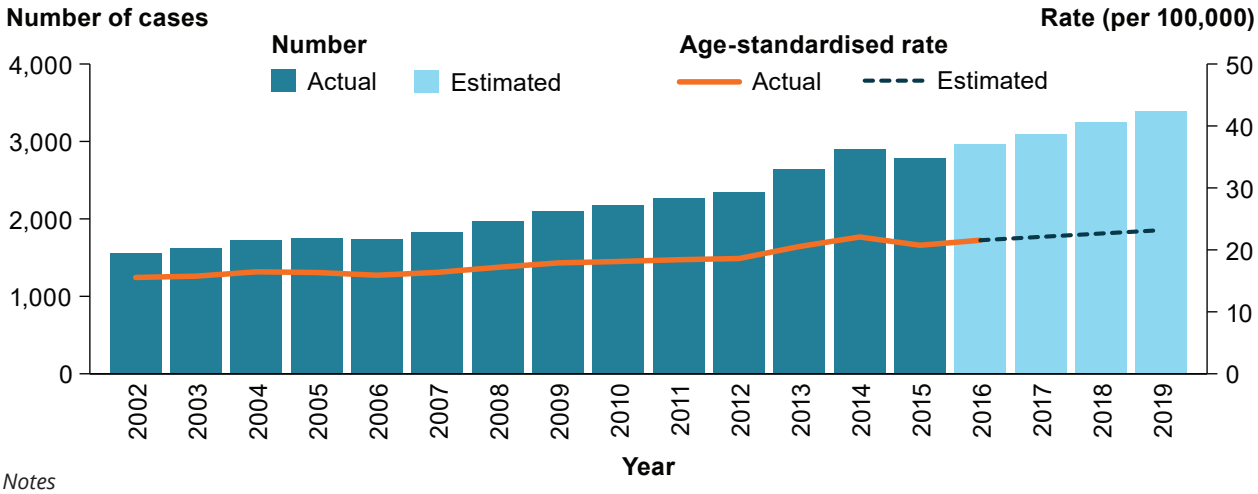
1. The rates are age-specific rates expressed per 100,000 population.
2. The rates for age groups 10–14 to 20–24 have been omitted due to the small number of cases.
3. The data for this figure are in online Table S5.9.

Source: AIHW ACD 2015.

Carcinoma in situ of the breast incidence rates are increasing

The age-standardised incidence rate of carcinoma in situ of the breast is estimated to increase from 16 cases per 100,000 in 2002 to 23 cases per 100,000 in 2019 (Figure 5.11). 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 5.11: Trends in incidence of carcinoma in situ of the breast, females, 2002 to 2019



Notes

1. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. Data is for Victoria and Queensland.
3. The data for this figure are in online Table S5.10.

Source: AIHW ACD 2015.

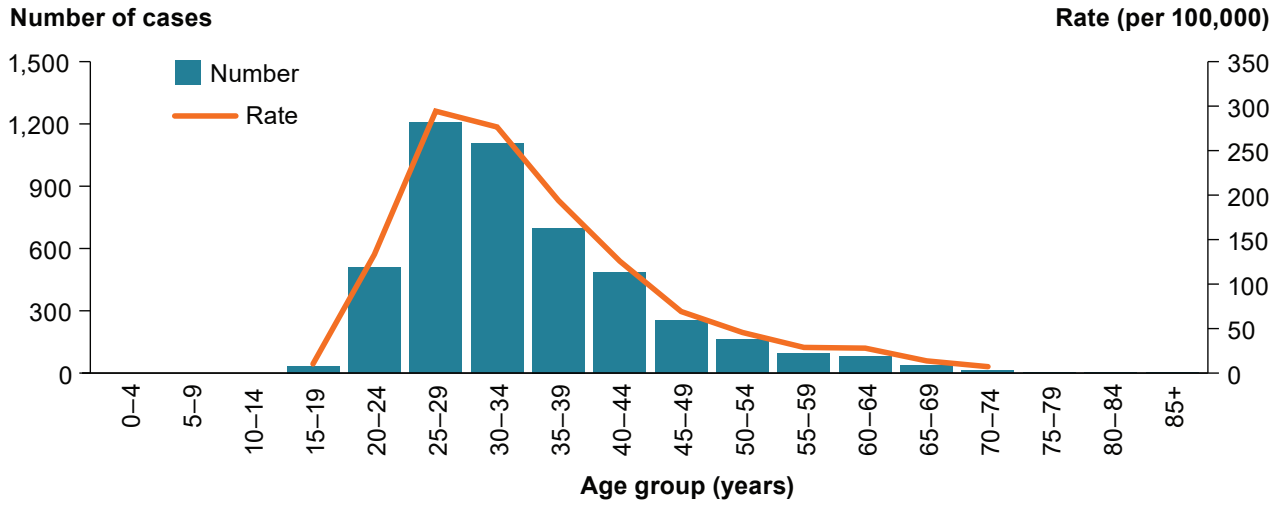
Carcinoma in situ of the cervix

In 2015, there were 4,691 new cases of carcinoma in situ of the cervix in Victoria and Queensland combined (online Table S5.11). The age-standardised incidence rate was 88 cases per 100,000 females.

Carcinoma in situ of the cervix rates are highest in females aged 25–29

In 2015, the number of new cases of carcinoma in situ of the cervix increased rapidly to a peak of 1,206 cases for women aged 25–29 and decreased gradually with each subsequent age group before decreasing to fewer than 10 cases for each age group over 75 (Figure 5.12). The age-specific incidence rate of carcinoma in situ of the cervix was high for women aged 25–34, at over 275 cases per 100,000, compared to other age groups.

Figure 5.12: Incidence rates of carcinoma in situ of the cervix, by age at diagnosis, females, Victoria and Queensland, 2015



Notes

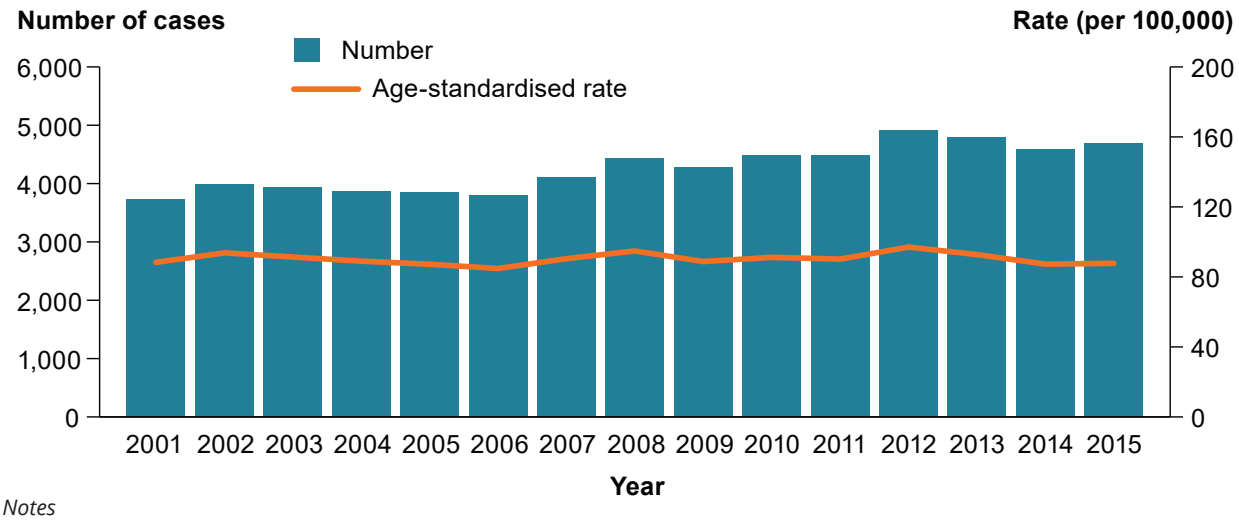
1. The rates are age-specific rates expressed per 100,000 population.
2. The rates for age groups 75–79 to 85+ have been omitted due to the small number of cases.
3. The data for this figure are in online Table S5.11.

Source: AIHW ACD 2015.

Carcinoma in situ of the cervix 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 2015 and reached a peak of 97 cases per 100,000 in 2012 (Figure 5.13). The incidence of carcinoma in situ of the cervix may be influenced by the consistent participation rates of females from 2001 onwards within the National Cervical Screening Program and the resulting early detection of cervical abnormalities that could otherwise develop into cervical cancer (AIHW 2018c).

Figure 5.13: Trends in incidence of carcinoma in situ of the cervix, females, Victoria and Queensland, 2001 to 2015



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 S5.12.

Source: AIHW ACD 2015.

Melanoma in situ of the skin

It is estimated that in 2019, there will be 23,741 new cases of melanoma in situ of the skin (Table 5.5). Approximately 58% of these cases will be diagnosed in males. The age-standardised incidence rate for males is estimated to reach 96 cases per 100,000 compared with 67 cases per 100,000 for females.

Table 5.5: Estimated Incidence rate for melanoma in situ of the skin, by sex, Australia, 2019

	Males	Females	Persons
Number of cases	13,740	10,002	23,741
Age-standardised rate	95.8	67.1	80.5
Percentage of all cancer cases	57.9	42.1	100.0
Risk to age 75	1 in 13	1 in 18	1 in 16
Risk to age 85	1 in 9	1 in 13	1 in 10

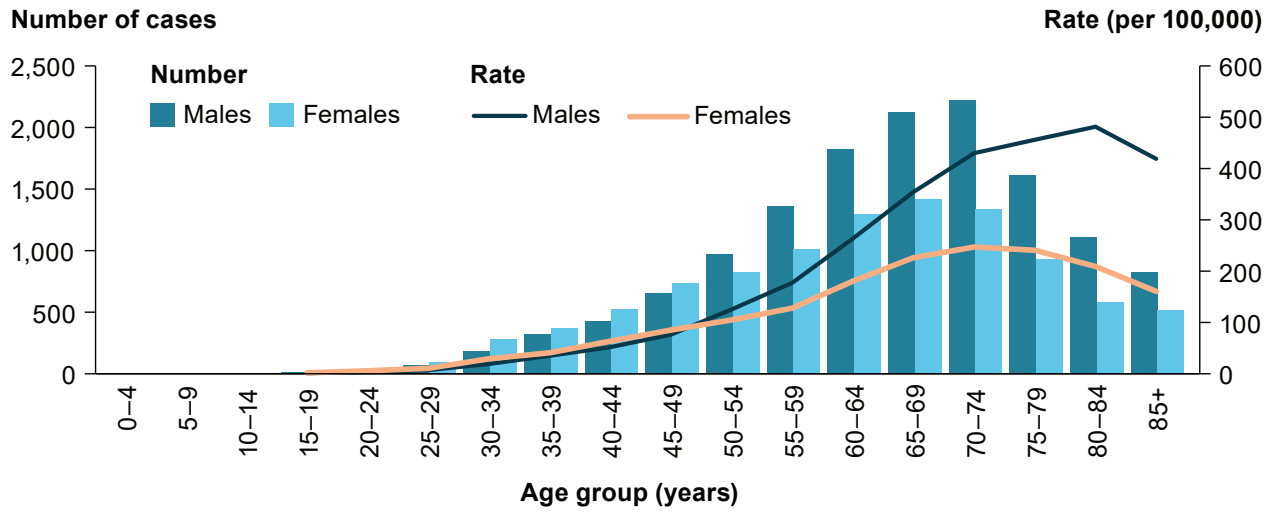
Note: The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.

Source: AIHW ACD 2015.

Melanoma in situ of the skin incidence rates for males peak in the 80–84 age group

It is estimated that in 2019, the age-specific incidence rate of melanoma in situ of the skin for males will increase with increasing age, peaking at 482 cases per 100,000 for males aged 80–84 and decreasing to 419 cases per 100,000 for males aged 85 and over. The age-specific incidence rate for females is also expected to increase with age, peaking at 247 cases per 100,000 females aged 70–74, before decreasing to 161 cases per 100,000 females aged 85 and over (Figure 5.14). Males aged 50 and over have consistently higher rates of melanoma in situ of the skin than females.

Figure 5.14: Estimated incidence rates of melanoma in situ of the skin, by age at diagnosis and sex, Australia, 2019



Notes

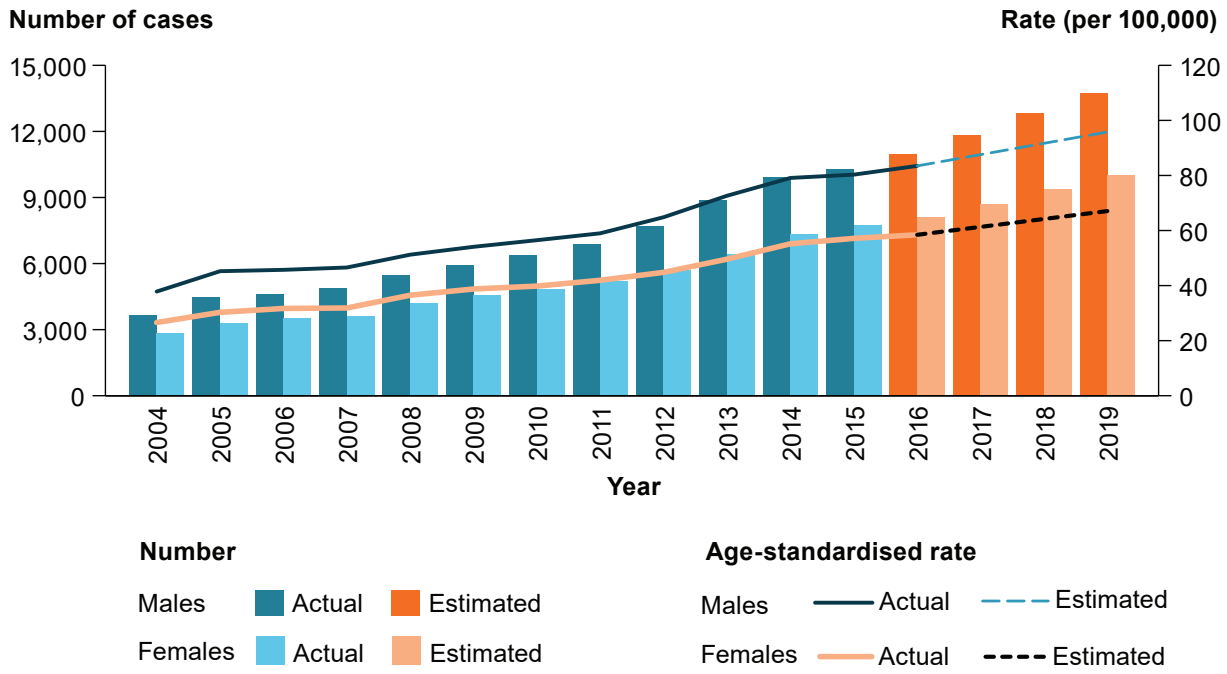
1. The rates are age-specific rates expressed per 100,000 population.
2. The rates for age group 10–14 have been omitted due to the small number of cases.
3. The data for this figure are in online Table S5.13.

Source: AIHW ACD 2015.

Incidence rates for melanoma of the skin in situ projected to more than double between 2004 and 2019

Between 2004 and 2015, the number of new cases of melanoma in situ of the skin increased by 115%, from 32 per 100,000 persons in 2004 to 68 per 100,000 persons in 2015; the rate is estimated to reach 81 per 100,000 persons in 2019. Large increases were observed for males and females (Figure 5.15). 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 5.15: Trends in incidence of melanoma in situ of the skin, by sex, Australia, 2004 to 2019



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 S5.14.

Source: AIHW ACD 2015.

Non-malignant neoplasms of the brain and other central nervous system

In 2015, there were 1,124 new cases of non-malignant neoplasms of the brain and other central nervous system (CNS) in Victoria, Queensland and Western Australia combined (Table 5.6). About 65% of these cases were diagnosed in females. The age-standardised incidence rate for females was 10 cases per 100,000. This compares with 5.8 new cases per 100,000 males and 8.0 new cases per 100,000 persons.

Table 5.6: Incidence rate for non-malignant neoplasms of the brain and other central nervous system, by sex, Vic, Qld and WA combined, 2015

	Males	Females	Persons
Number of cases	398	726	1,124
Age-standardised rate	5.8	10.0	8.0
Percentage of all cases	35.4	64.6	100.0
Risk to age 75	1 in 228	1 in 129	1 in 164
Risk to age 85	1 in 154	1 in 91	1 in 113

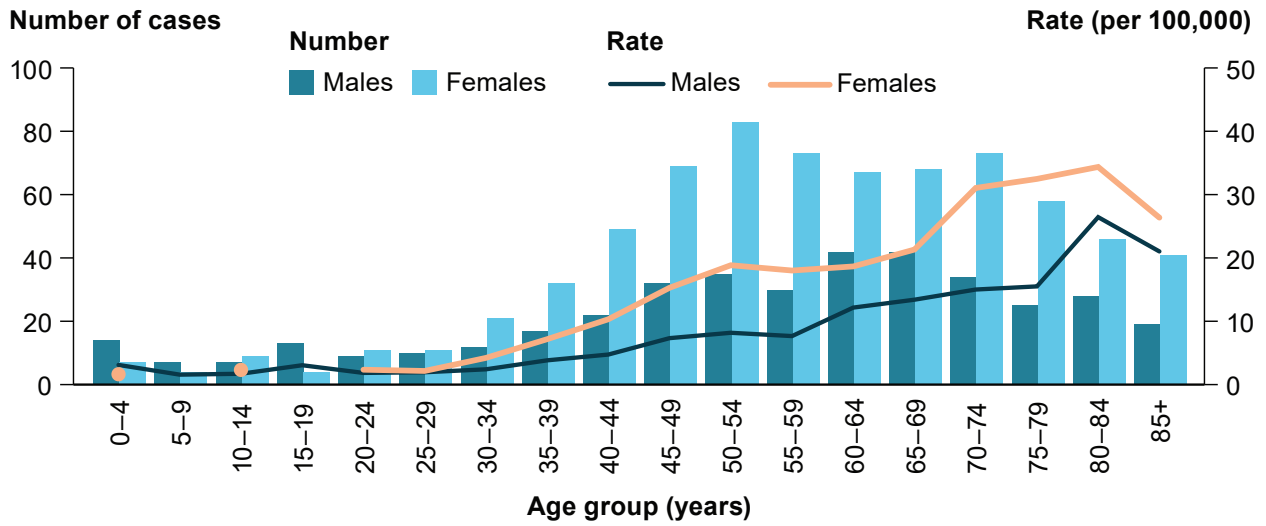
Note: The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.

Source: AIHW ACD 2015.

In 2015, 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 for those aged 60–64, where it peaked at 42 new cases; for females the number of new cases peaked at 83 for those aged 50–54 (Figure 5.16).

The age-specific incidence rate of non-malignant neoplasms of the brain and other CNS also generally increased with increasing age. For both sexes, the highest incidence rate of non-malignant neoplasms of the brain and other CNS occurred for those aged 80–84; the male rate for this age was 26 cases per 100,000 males while the female rate was 35 cases per 100,000 females (Figure 5.16).

Figure 5.16: Incidence rates of non-malignant neoplasms of the brain and other CNS, by age at diagnosis and sex, Vic, Qld and WA combined, 2015



Notes

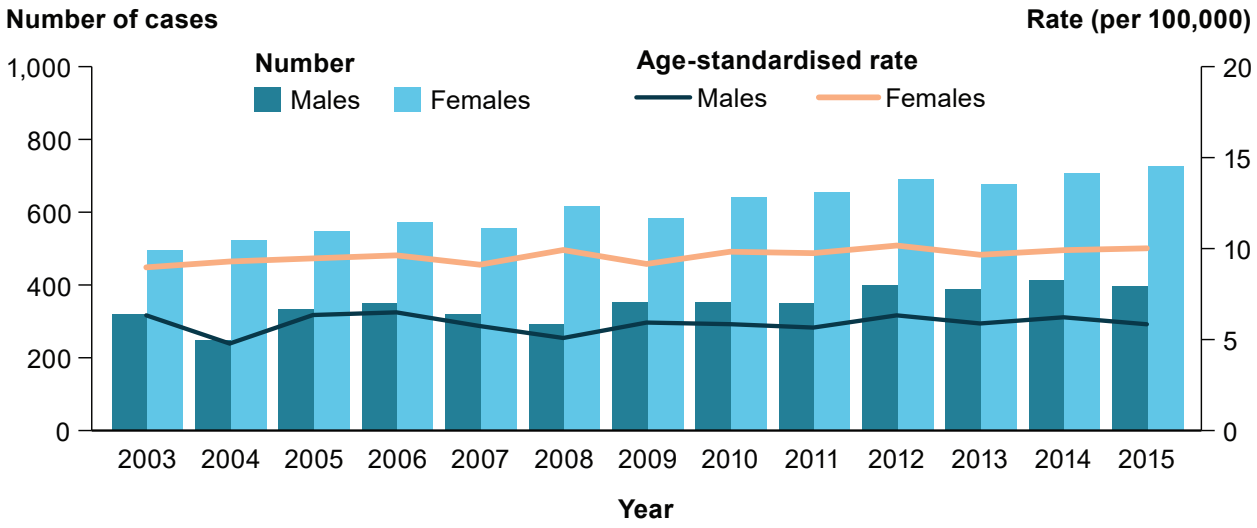
1. The rates are age-specific rates expressed per 100,000 population.
2. The isolated value for the 0–4 and 10–14 age groups relates to the rates for females. The rates for age groups 5–9 and 15–19 for females have been omitted due to the small number of cases.
3. The data for this figure are in online Table S5.15.

Source: AIHW ACD 2015.

Incidence rates for non-malignant neoplasms of the brain remain relatively stable over time

Between 2003 and 2015, for Victoria, Queensland and Western Australia combined, the number of new cases of non-malignant neoplasms of the brain and other CNS increased from 816 cases in 2003 to 1,124 cases in 2015, exceeding 1,100 cases in 2014 and 2015. The age-standardised incidence rate remained relatively stable between 4.8 and 6.5 cases per 100,000 for males and between 9.0 and 10 cases per 100,000 for females for this period (Figure 5.17).

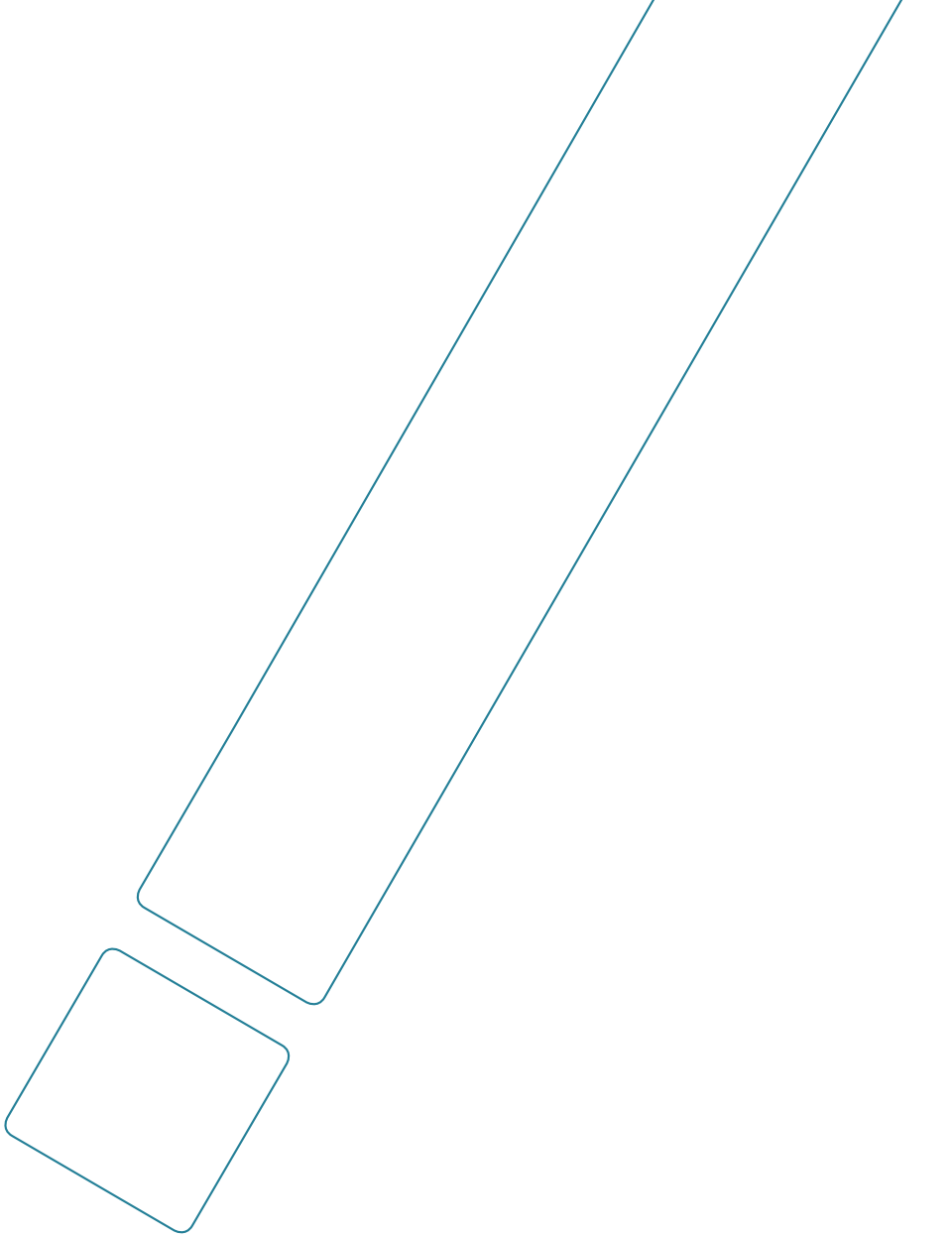
Figure 5.17: Trends in incidence of non-malignant neoplasms of the brain and other CNS, by sex, Victoria, Queensland and Western Australia combined, 2003 to 2015



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 S5.16.

Source: AIHW ACD 2015.



Treatment

6

Key findings

In the 2016–17 financial year:

- there were 1,228,905 cancer-related hospitalisations, accounting for 1 in 9 of all hospitalisations
- about three-quarters (72%) of cancer-related hospitalisations were for same-day care
- the average length of stay for overnight cancer-related hospitalisation was 7.8 days
- non-melanoma skin cancer was the most common cancer recorded as a principal diagnosis
- over 680,000 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 41,467 cancer-related hospitalisations. For these, cancer of a secondary site was the most common principal diagnosis.

From 2001–02 to 2016–17, the age-standardised cancer-related hospitalisation rate increased by over 20% from 367 per 10,000 to 443 per 10,000.

In 2017, 67,941 people received a Medicare-subsidised radiotherapy session and had, on average, 32 radiotherapy services.

Data for this chapter refer to the 2016–17 financial year and are mainly sourced from the National Hospital Morbidity Database (NHMD) which is a compilation of episodelevel records from admitted patient morbidity data collection systems in Australian hospitals. For more information on the NHMD, see Appendix C and *Admitted patient care 2016–17: Australian hospital statistics* (AIHW 2018e). In this report, cancer-related hospitalisations are defined as those where at least 1 of the following apply:

- 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, Z400.01, Z51.0, Z51.1, Z54.1, Z54.2).

6.1 Hospitalisations for all cancers combined

In 2016–17, there were 1,228,905 cancer-related hospitalisations, accounting for about 1 in 9 hospitalisations in Australia. Around 38% of all cancer-related hospitalisations had a principal diagnosis of cancer (Table 6.1) and more than half had an additional diagnosis of cancer (56%). The remainder had a principal diagnosis related to treatment of cancer (and cancer was not an additional diagnosis) (6.3%).

Table 6.1: Cancer-related hospitalisations, 2016–17

	Number	%	ASR
Principal diagnosis of cancer	466,157	37.9	166.3
Additional diagnosis of cancer	685,107	55.7	248.4
Principal diagnosis of cancer-related service (and cancer is not an additional diagnosis)	77,641	6.3	27.8
All cancer-related hospitalisations	**1,228,905**	**100.0**	**442.6**

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 2016–17 was a little over 1 week

In 2016–17, 72% of cancer-related hospitalisations were same-day hospitalisations and 28% were overnight hospitalisations. The average length of stay (ALOS) for overnight cancer-related hospitalisations was 7.8 days. For hospitalisations relating to a principal diagnosis of cancer, 50% were overnight, with an ALOS of 7.2 days (Table 6.2).

Table 6.2: Length of stay for cancer-related hospitalisations, 2016–17

	Same-day		Overnight		
	Number	%	Number	%	ALOS
Principal diagnosis of cancer	235,392	50.5	230,765	49.5	7.2
Additional diagnosis of cancer	579,578	84.6	105,529	15.4	9.4
Principal diagnosis of cancer-related service (and cancer is not an additional diagnosis)	72,839	93.8	4,802	6.2	2.2
All cancer-related hospitalisations	**887,809**	**72.2**	**341,096**	**27.8**	**7.8**

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 for patients with cancer was highest for those aged 75–79

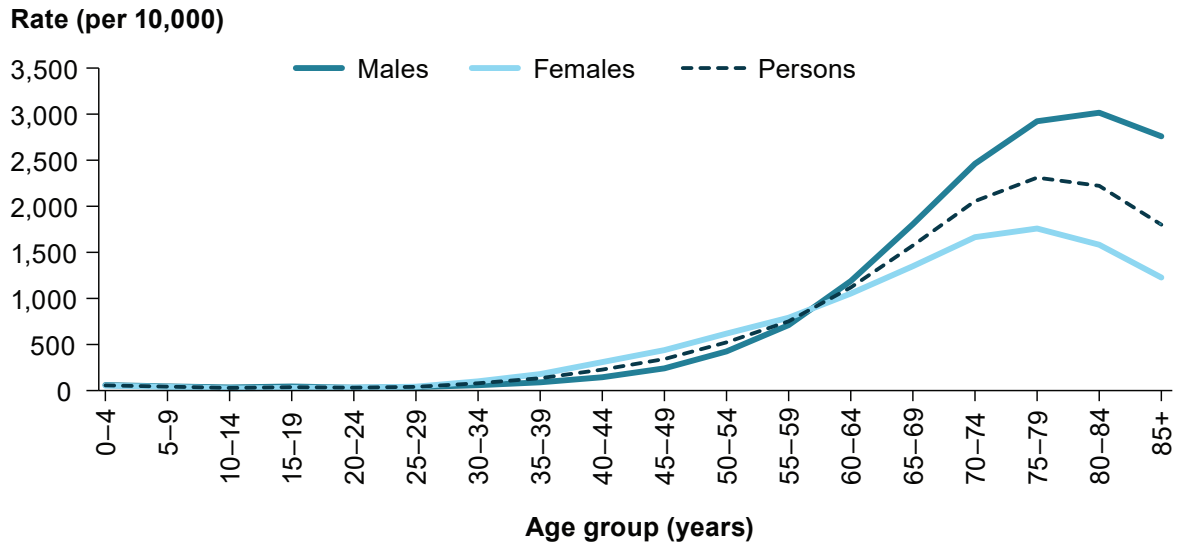
In 2016–17, those among older age groups represented a greater proportion of all cancer-related hospitalisations (Figure 6.1). The hospitalisation rate for patients with cancer was relatively low in younger age groups and began increasing for those aged 30 or older. The rate peaked at 2,311 hospitalisations per 10,000 people for those aged 75–79, before decreasing in subsequent age groups.

Cancer-related hospitalisation rate is highest for older males

The cancer-related hospitalisation rate for females was less than 100 per 10,000 for age groups under 30, while for males the rate was less than 100 per 10,000 for age groups under 40. The hospitalisation rate was higher for females aged between 30 and 60 than for males (Figure 6.1). Hospitalisation rates for the female age groups of 35–39 and 40–44 were double those of males for the same age groups (2.0 times and 2.1 times, respectively) (online Table S6.1). Higher hospitalisation rates for females aged 30 to 60 are partly due to the relatively high number of breast cancer hospitalisations for females in this age group (online Table S6.3).

The hospitalisation rate was greater among males than females for all age groups over 60. The disparity was more than double for those aged over 85 (2.2 times). Higher male 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 S6.3).

Figure 6.1: Age-specific rates for all cancer-related hospitalisations, by age group and sex, 2016–17



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.

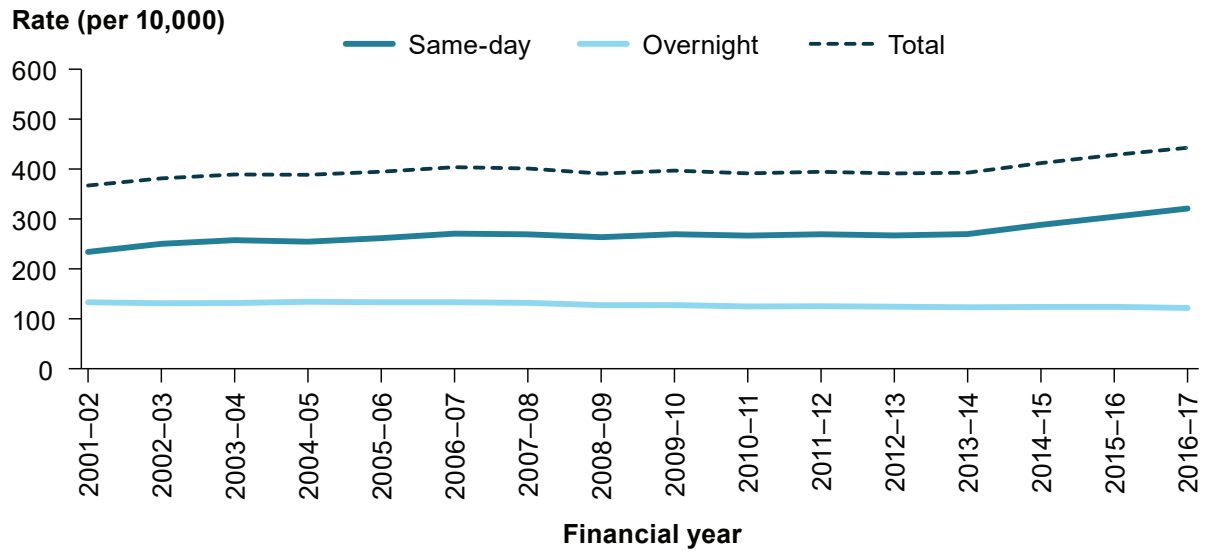
Increasing frequency of chemotherapy treatments driving the increase in cancer-related same-day hospitalisation rate

Trends in hospitalisations are presented from 2001–02 to 2016–17. Changes in hospital admission procedures and coding may affect trends over time.

Between 2001–02 and 2016–17, the number of cancer-related hospitalisations increased over 70%, from 715,245 to 1,228,905 hospitalisations. Same-day cancer-related hospitalisations increased by 95% during this time and overnight hospitalisations increased by 32% (online Table S6.2).

For the same period, the age-standardised cancer-related hospitalisation rate increased by over 20%, from 367 per 10,000 people to 443 per 10,000. This is largely due to an increasing number of same-day hospitalisations where a pharmacotherapy treatment was recorded (see 'Section 6.3 Chemotherapy procedures'). The overall same-day hospitalisation rate increased from 234 per 10,000 people to 321 per 10,000 and the overnight hospitalisation rate decreased from 133 per 10,000 to 122 per 10,000 (Figure 6.2).

Figure 6.2: All cancer-related hospitalisations by same-day and overnight status, 2001–02 to 2016–17



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 S6.2.

Source: AIHW National Hospital Morbidity Database.

6.2 Hospitalisations for principal diagnosis of cancer

Non-melanoma skin cancer was the most common cancer recorded as a principal diagnosis (25%), followed by cancer of secondary site (9.5%) and prostate cancer (8.4%). The 10 most common cancers accounted for 76% of all hospitalisations with a principal diagnosis of cancer (Table 6.3). For overnight hospitalisations, cancer of other central nervous system had the longest ALOS (14.4 days), followed by cancer of other plasma cell (12.7) and leukaemia (12.5) (online Table S6.4).

Table 6.3: Ten most common cancers recorded as a principal diagnosis, 2016–17

Principal diagnosis (ICD-10-AM codes)	Number	%
Non-melanoma skin cancer (C44)	115,237	24.7
Secondary site (C77–C79)	44,436	9.5
Prostate cancer (C61)	39,100	8.4
Colorectal cancer (C18–C20)	29,846	6.4
Breast cancer (C50)	27,119	5.8
Leukaemia (C91–C95)	23,405	5.0
Lymphoma (C81–C86)	23,250	5.0
Lung cancer (C33–C34)	20,181	4.3
Myelodysplastic syndromes (D46)	15,918	3.4
Bladder cancer (C67)	14,659	3.1
Total hospitalisations with a principal diagnosis of cancer	**466,157**	**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.

Non-melanoma skin cancer was the most common cancer recorded as principal diagnosis

Non-melanoma skin cancer was the most common cancer type recorded as a principal diagnosis for males (accounting for 26% of hospitalisations of males with a principal diagnosis of cancer); respectively, non-melanoma skin cancer was also the most common cancer recorded as principal diagnosis for females, representing 23% of hospitalisations of females with a principal diagnosis of cancer. Prostate cancer ranked second for males, accounting for 15% of hospitalisations while for females breast cancer was second (14%) (Table 6.4).

Table 6.4: Ten most common cancers recorded as a principal diagnosis, by sex, 2016–17

Males			Females		
Principal diagnosis (ICD-10-AM codes)	**Number**	**%**	**Principal diagnosis (ICD-10-AM codes)**	**Number**	**%**
Non-melanoma skin cancer (C44)	69,367	25.7	Non-melanoma skin cancer (C44)	45,870	23.4
Prostate cancer (C61)	39,099	14.5	Breast cancer (C50)	26,953	13.7
Secondary site (C77–C79)	22,551	8.4	Secondary site (C77–C79)	21,885	11.2
Colorectal cancer (C18–C20)	16,249	6.0	Colorectal cancer (C18–C20)	13,597	6.9
Leukaemia (C91–C95)	13,956	5.2	Lymphoma (C81–C86)	9,632	4.9
Lymphoma (C81–C86)	13,618	5.0	Leukaemia (C91–C95)	9,449	4.8
Lung cancer (C33–C34)	11,397	4.2	Lung cancer (C33–C34)	8,783	4.5
Bladder cancer (C67)	11,382	4.2	Myelodysplastic syndromes (D46)	5,902	3.0
Myelodysplastic syndromes (D46)	10,016	3.7	Melanoma of the skin (C43)	5,121	2.6
Melanoma of the skin (C43)	7,363	2.7	Uterine cancer (C54–C55)	4,709	2.4
Total hospitalisations with a principal diagnosis of cancer	**269,993**	**100.0**	**Total hospitalisations with a principal diagnosis of cancer**	**196,163**	**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, D46, D47.1 and D47.3–D47.5.

Source: AIHW National Hospital Morbidity Database.

6.3 Chemotherapy procedures

This section explores the number of chemotherapy procedures performed within 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 the method for calculating chemotherapy procedures differed from that in previous *Cancer in Australia* reports and therefore the results are not directly comparable. See Appendix E for more details.

In 2016–17, there were 762,748 hospitalisations where the additional diagnosis was cancer or the principal diagnosis was a cancer-related treatment (and cancer was not an additional diagnosis). For these hospitalisations, pharmacotherapy (chemotherapy) was the most common principal diagnosis, accounting for over 70% (540,517 hospitalisations) of the total cases. Hospitalisations with chemotherapy as the principal diagnosis increased by 132% from 2001–02 when 232,806 hospitalisations were recorded (online Table S6.5). Note that these numbers are not directly comparable with other results presented for chemotherapy henceforth due to differences in the scope of the analysis. See Appendix E for more details.

In 2016–17, there were 684,498 chemotherapy procedures performed for cancer-related hospitalisations. Of these, 43,756 had a principal diagnosis of cancer. The majority (over 89%) of the total procedures had a principal diagnosis of a chemotherapy session (Z51.1) and an additional diagnosis of a cancer. A small proportion (3%) of chemotherapy procedures were performed for a non-cancer principal diagnosis (but had an additional diagnosis of a cancer). These cases may not truly indicate the usage of chemotherapy in the treatment of cancer.

Table 6.5: Chemotherapy procedures for cancer-related hospitalisations, by sex and diagnosis type, Australia, 2016–17

	Males		Females		Persons	
	Number	%	Number	%	Number	%
Principal diagnosis of cancer	24,142	55.2	19,614	44.8	43,756	100.0
Principal diagnosis of chemotherapy with an additional diagnosis of cancer	280,016	46.6	321,388	53.4	601,412	100.0
Additional diagnosis of cancer and principal diagnosis of non-cancer	9,542	45.9	11,230	54.1	20,772	100.0
Total chemotherapy procedures for a cancer-related hospitalisation	**323,274**	**47.2**	**361,216**	**52.8**	**684,498**	**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 18,558 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.

Note that the scope of the analysis for chemotherapy procedures henceforth looks at individual cancer types as opposed to all cancers combined. This involves allowing for hospitalisations where the patient may have a principal diagnosis of a cancer (or chemotherapy session) and additional diagnoses of different cancers. For example, a patient may be admitted for ovarian cancer with metastases to the peritoneum and undergoes chemotherapy treatment over 6 months. The chemotherapy procedures will be counted for the principal diagnosis of ovarian cancer as well as the additional diagnosis of cancer of the peritoneum.

Lymphoma was the most common principal diagnosis for hospitalisations where chemotherapy was performed

In 2016–17, for hospitalisations where chemotherapy procedures were performed, lymphoma was the most common principal diagnosis for both males and females, accounting for 21% of the procedures for males and 17% for females. The next most common diagnoses were leukaemia (males 16% and females 14%) and colorectal cancer (males 11% and females 12%) for both sexes (Table 6.6). Note that these procedures are for hospitalisations with allowance for multiple and different cancer diagnoses.

Table 6.6: Ten most common principal diagnoses for hospitalisations where a chemotherapy procedure was performed, by sex, Australia, 2016–17

Males			Females		
Cancer type	**Number**	**%**	**Cancer type**	**Number**	**%**
Lymphoma	5,474	21.1	Lymphoma	3,614	16.9
Leukaemia	4,227	16.3	Leukaemia	3,041	14.2
Colorectal cancer	2,941	11.4	Colorectal cancer	2,515	11.7
Secondary site	2,472	9.5	Breast cancer	2,469	11.5
Multiple myeloma	1,439	5.6	Secondary site	2,299	10.7
Lung cancer	1,094	4.2	Multiple myeloma	1,000	4.7
Prostate cancer	921	3.6	Lung cancer	859	4.0
Bladder cancer	666	2.6	Ovarian cancer	857	4.0
Bone cancer	579	2.2	Bone cancer	562	2.6
Stomach cancer	536	2.1	Pancreatic cancer	470	2.2
Total	**25,906**	**100.0**	**Total**	**21,433**	**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. 15% of procedures were performed in same-day hospitalisations and 85% of procedures were performed in overnight hospitalisations. The principal diagnoses would indicate the most common cancers being treated for overnight hospitalisations.
3. Percentages are based on the total chemotherapy procedures performed for hospitalisations with allowance for multiple and different cancer diagnoses. These totals will be greater than those presented in Table 6.5.

Source: AIHW National Hospital Morbidity Database.

In 2016–17, for hospitalisations where chemotherapy procedures were performed, cancer of secondary site was the most common additional diagnosis in both males and females, accounting for 31% of the procedures for males and 34% for females. The next most common additional diagnoses for were colorectal cancer (13%) and lung cancer (7.6%); for females the next most common additional diagnoses were breast cancer (27%) and colorectal cancer (7.4%) (Table 6.7). Note that these procedures are for hospitalisations with allowance for multiple and different cancer diagnoses.

Table 6.7: Ten most common additional diagnoses for hospitalisations where a chemotherapy procedure was performed, by sex, Australia, 2016–17

Males			Females		
Cancer type	**Number**	**%**	**Cancer type**	**Number**	**%**
Secondary site	113,632	30.8	Secondary site	152,344	33.9
Colorectal cancer	47,021	12.8	Breast cancer	122,927	27.4
Lung cancer	27,935	7.6	Colorectal cancer	33,139	7.4
Multiple myeloma	26,032	7.1	Lung cancer	20,786	4.6
Lymphoma	22,635	6.1	Ovarian cancer	19,018	4.2
Prostate cancer	21,504	5.8	Multiple myeloma	18,047	4.0
Leukaemia	19,378	5.3	Lymphoma	16,176	3.6
Melanoma of the skin	14,256	3.9	Leukaemia	10,603	2.4
Pancreatic cancer	12,147	3.3	Pancreatic cancer	9,888	2.2
Bladder cancer	11,960	3.2	Melanoma of the skin	5,915	1.3
Total	**368,635**	**100.0**	**Total**	**449,026**	**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. The majority of 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 chemotherapy procedures performed for hospitalisations with allowance for multiple and different cancer diagnoses. These totals will be greater than those presented in Table 6.5.

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 should receive external beam radiotherapy at least once during their treatment (Barton et al. 2014). Radiotherapy is often provided on a non-admitted basis so limited information is available in the NHMD. Therefore, radiotherapy numbers based on the NHMD are not presented and the MBS database and the National Radiotherapy Waiting Times Database (NRWTD) have been used instead. See Appendix C for more information on MBS data.

Medicare-subsidised radiotherapy services

The MBS database contains information on Medicare-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 2017, 67,941 people received over 2.2 million Medicare-subsidised radiotherapy services. During that year, patients had, on average, 32 radiotherapy services and the Australian Government contributed, on average, $6,684 per patient. Around 51% of Medicare-subsidised radiotherapy patients were males and 54% of the Medicare-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 30) (Table 6.8).

Table 6.8: Medicare-subsidised radiotherapy services, by sex, 2017

	Patients	Services		Benefit paid ($)	
Sex	**Number**	**Number**	**Services per patient**	**Amount**	**Benefit per patient**
Males	34,319	1,197,152	34	240,631,536	7,011
Females	33,622	1,037,157	30	213,500,390	6,350
Persons	**67,941**	**2,234,309**	**32**	**454,131,927**	**6,684**

Notes

1. Data reported by date of service (that is, 2017 refers to services rendered between 1 January 2017 and 31 December 2017) for all services processed up to 31 August 2018. See Appendix E 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 Medicare-subsidised radiotherapy services received per patient.
4. Benefit per patient is the average Medicare-subsidised radiotherapy benefit subsidised per patient.

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

Around 90% of radiotherapy patients are over 50

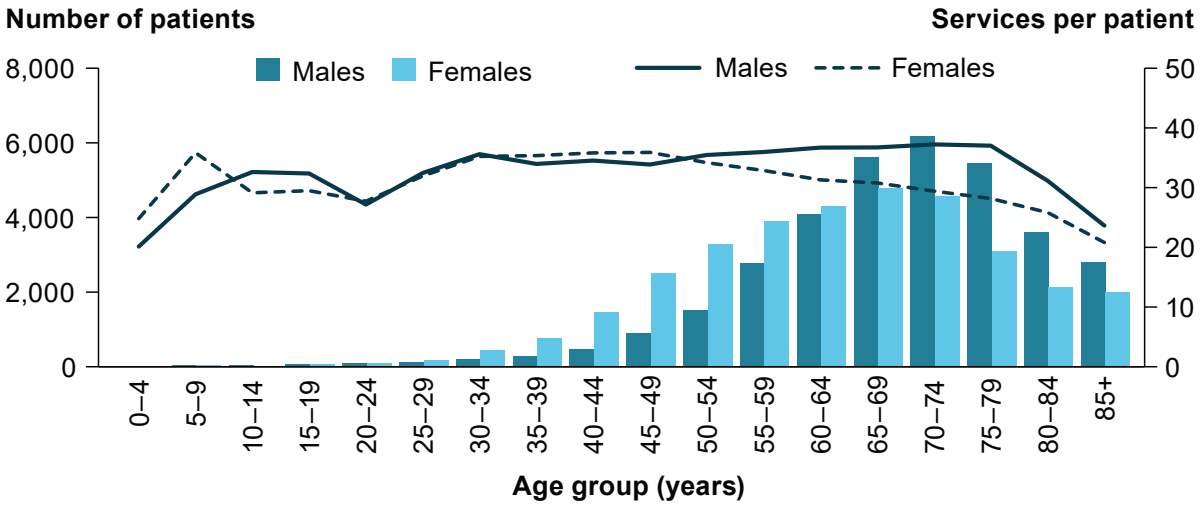
In 2017, around 9 of every 10 patients receiving Medicare-subsidised radiotherapy services were over the age of 50. On average, patients received 32 Medicare-subsidised radiotherapy services. The youngest (0–4 years) and oldest (85 years and older) age groups had the fewest services per patient (22 services) (online Table S6.6).

Males aged 70 to 79 receive the greatest number of radiotherapy services per patient

For age groups 65 and older, more males received Medicare-subsidised radiotherapy services than females (Figure 6.3). This may be partly attributed to the high prostate cancer incidence rate among males within this age group. Between the ages of 25 and 64, more females received radiotherapy services than males (Figure 6.3). This may be partly attributed to the high breast cancer incidence rate among females within this age group.

Women aged between 30 and 49 received, on average, 35 Medicare-subsidised radiotherapy services and this is more than any other female age group. Men aged between 70 and 79, on average, received more Medicare-subsidised radiotherapy services than any other female or male age group.

Figure 6.3: Medicare-subsidised radiotherapy services, by age group and sex, 2017



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, 2017 refers to services rendered between 1 January 2017 and 31 December 2017) for all services processed until 31 August 2019. See Appendix E 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 Medicare-subsidised radiotherapy services received per patient.
5. Data for this figure are in online Table S6.6.

Source: AIHW analysis of Medicare Benefits Schedule (MBS) 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, where 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 2015–16* (AIHW 2017c) for further details.

In 2016–17, over 63,500 courses of radiotherapy were delivered in Australia. Of these, around one-quarter of the radiotherapy courses for males were for prostate cancer (26%) and 44% 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 6.9).

Table 6.9: Five most common cancers for which a radiotherapy course was provided, by sex, 2016–17

Males			Females		
Cancer site/type (ICD-10-AM codes)	**Number**	**%**	**Cancer site/type (ICD-10-AM codes)**	**Number**	**%**
Prostate cancer (C61)	7,993	25.8	Breast cancer (C50)	14,376	44.2
Lung cancer (C33–C34)	4,254	13.7	Lung cancer (C33–C34)	3,782	11.6
Head and neck (with lip) cancer	2,475	8.0	Colorectal cancer (C18–C20)	1,124	3.5
Colorectal cancer (C18–C20)	1,805	5.8	Uterine cancer (C54–C55)	907	2.8
Lymphoma (C81–C86)	1,041	3.4	Head and neck (with lip) cancer	823	2.5
Total radiotherapy courses	**30,978**	**100.0**	**Total radiotherapy courses**	**32,538**	**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 2015–16* (AIHW 2017e) for further details.
2. Head and neck (with lip) cancer includes ICD-10-AM-codes C00–C14, C30–C32.
3. Total includes non-cancer-related and not stated diagnosis.

Source: NRWTD.

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 hospitalisations (AIHW 2018g).

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 within 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 2016–17, 77,369 cancer-related hospitalisations in Australia involved palliative care (0.6% of all hospitalisations). Of these, 54% were cancer-related. For most of these hospitalisations, 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 hospitalisation was secondary site cancer (21%), followed by lung cancer (13%) and colorectal cancer (7%) (Table 6.10).

In 2016–17, 51% of cancer-related hospitalisations involving palliative care ended in death, 12% were transferred to another facility and 32% were discharged to where they usually live, which could be a person's own home or welfare institution.

Table 6.10: Ten most common principal diagnoses for cancer-related hospitalisations where palliative care was provided, 2016–17

Principal diagnosis (ICD-10-AM codes)	Number	%
Secondary site (C77–C79)	8,508	20.5
Lung cancer (C33–C34)	5,539	13.4
Colorectal cancer (C18–C20)	2,834	6.8
Pancreatic cancer (C25)	2,275	5.5
Brain cancer (C71)	1,502	3.6
Prostate cancer (C61)	1,485	3.6
Breast cancer (C50)	1,444	3.5
Liver cancer (C22)	1,165	2.8
Lymphoma (C81–C86)	1,017	2.5
Leukaemia (C91–C95)	1,005	2.4
Total cancer-related hospitalisations where palliative care was provided	**41,467**	**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.

Survival and survivorship after a cancer diagnosis

7

Key findings

In 2011–2015 in Australia:

- 5-year relative survival for all cancers combined was 69%
- the 5-year relative survival was highest for those diagnosed with testicular cancer, thyroid cancer and prostate cancer
- the 5-year relative survival was lowest for those diagnosed with mesothelioma, cancer of other digestive organs and pancreatic cancer.

Between 1986–1990 and 2011–2015, 5-year relative survival for all cancers combined increased from 50% to 69%.

At the end of 2014:

- 431,704 people were alive who had been diagnosed with cancer in the previous 5 years
- for males, 5-year prevalence was highest for prostate cancer, followed by melanoma of the skin and colorectal cancer
- for females, 5-year prevalence was highest for breast cancer, followed by colorectal cancer and melanoma of the skin.

7.1 Survival

Data for this section are sourced from the 2015 ACD and focus on 5-year relative survival (see Chapter 1 and Appendix C for details on this data source). Data from the National Death Index (NDI) on deaths (from any cause) that occurred up to 31 December 2015 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 survival from cancer 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, all year spans presented were calculated using the period method.

All cancers combined

In 2011–2015, 5-year relative survival was 69% for all cancers combined. This means that people diagnosed with cancer had a 69% 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, 2011–2015

Sex	5-year relative survival (%)
Males	68.1
Females	69.9
Persons	**68.9**

Note: All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.

Source: AIHW ACD 2015.

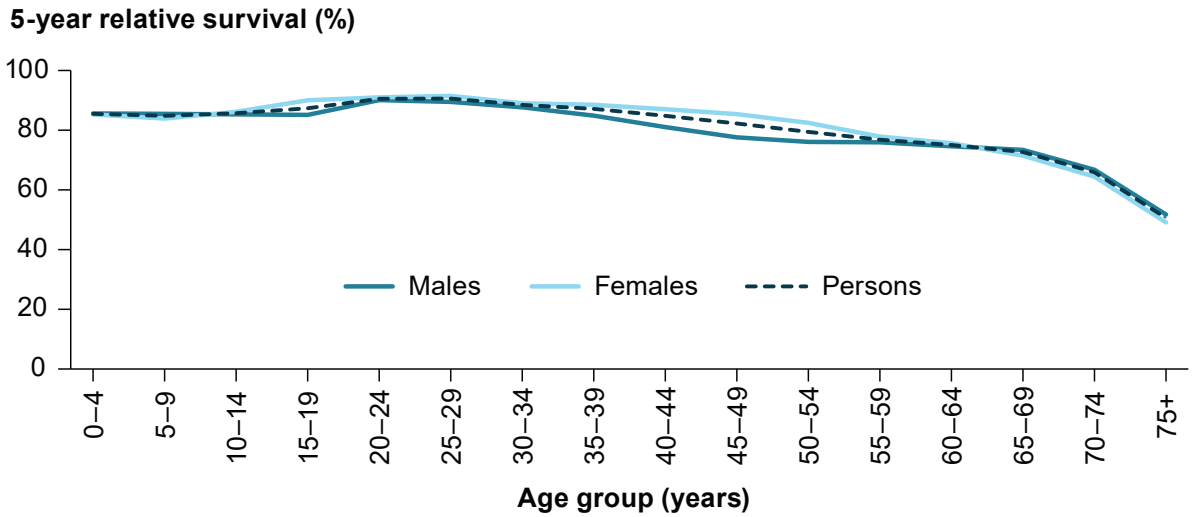
People aged in their twenties have the highest 5-year survival rates

In 2011–2015, for all cancers combined, 5-year relative survival was highest for those aged in their twenties, where it was around 90%; survival then decreased with age and was lowest for those aged 75 and over (51%) (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).

Cancer survival rates are similar for males and females in younger age groups but differ for ages over 35

Up to the age of 34, males and females had similar 5-year relative survival with the exception of the 15–19 age group, where female rates were higher (90% compared with 85%). Between the ages of 35 and 64, female survival rates were higher than for males. Males had higher 5-year relative survival than females for ages 65 and up (online Table S7.1). The difference in the age-related pattern of survival by sex may be partly due to the age distributions and survival outcomes for prostate cancer and breast cancer.

Figure 7.1: Five-year relative survival for all cancers combined, by age at diagnosis and sex, 2011–2015



Notes

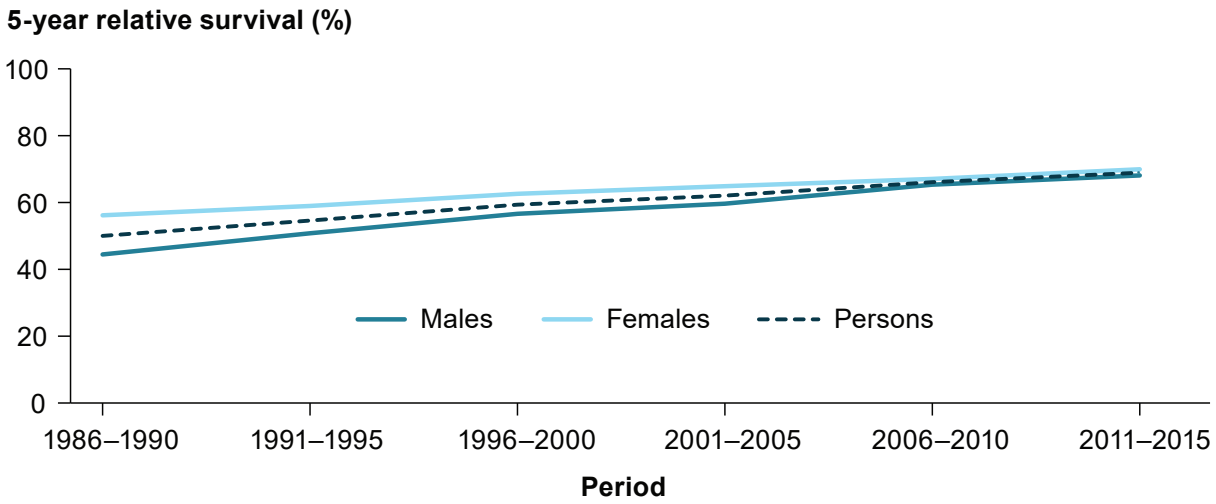
1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
2. Data for this figure are in online Table S7.1.

Source: AIHW ACD 2015.

Five-year relative survival rates for all cancers combined have been improving over the last 30 years

Five-year relative survival for people diagnosed with cancer increased over time, from 50% in 1986–1990 to 69% in 2011–2015 (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 45% in 1986–1990 to 68% in 2011–2015, and for females it increased from 56% to 70%. These 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, 1986–1990 to 2011–2015



Notes

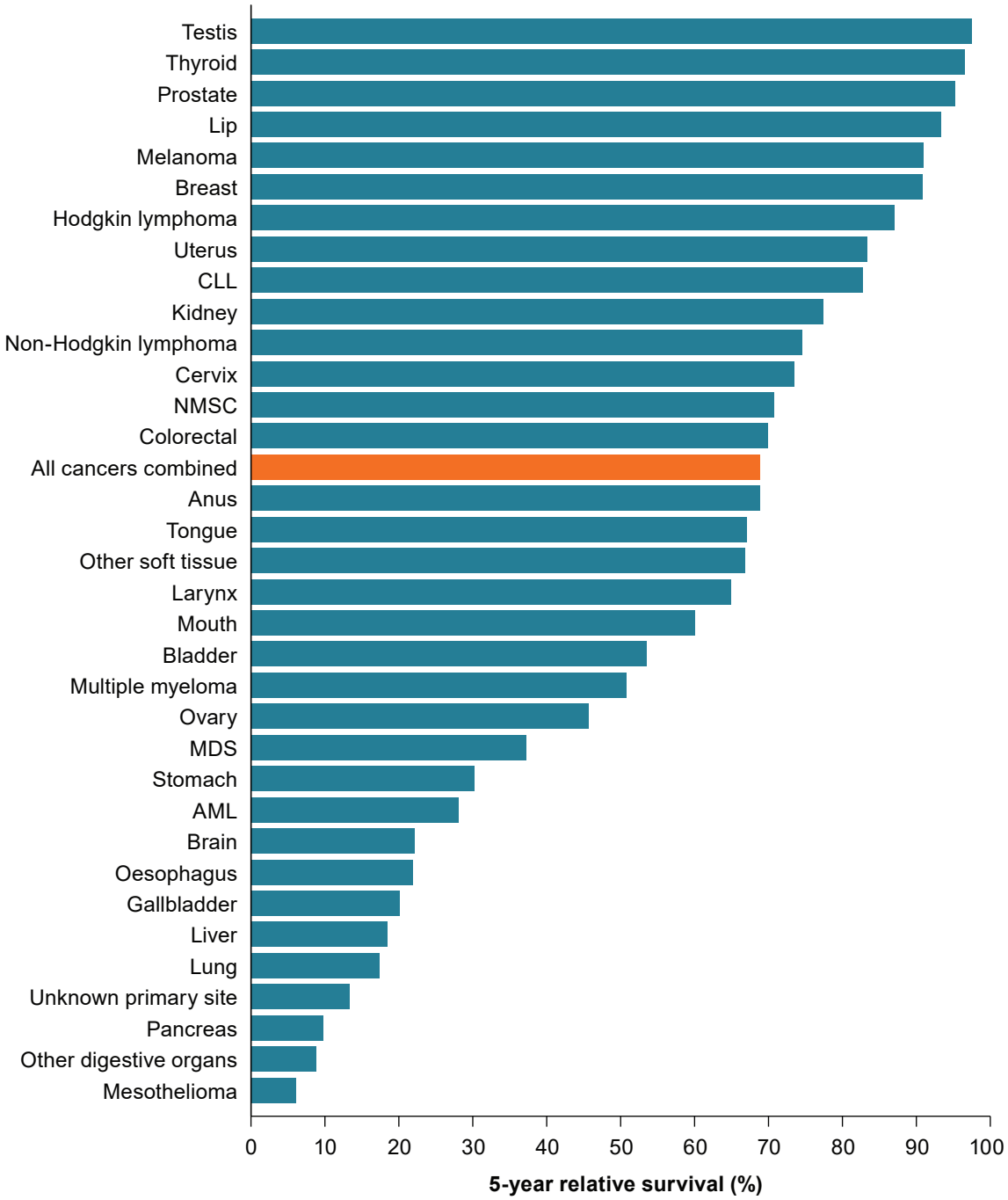
1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
2. Data for this figure are in online Table S7.2.

Source: AIHW ACD 2015.

Cancer sites

In 2011–2015, 5-year relative survival was over 95% for testicular cancer (98%), thyroid cancer (97%) and prostate cancer (95%) and below 10% for those diagnosed with pancreatic cancer (9.8%), cancer of other digestive organs (8.8%) and mesothelioma (6.1%) (Figure 7.3; online Table S7.3).

Figure 7.3: Five-year relative survival for selected cancers, 2011–2015



Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
2. CLL = Chronic lymphocytic leukaemia, AML = Acute myeloid leukaemia, NMSC = Non-melanoma of the skin.
3. Data for this figure are in online Table S7.3.

Source: AIHW ACD 2015.

Female survival rates for several cancers, including melanoma of the skin and lung cancer, are greater than male rates

In 2011–2015, females had higher 5-year relative survival rates for several cancers including anal cancer, lung cancer, melanoma of the skin, mouth cancer, non-melanoma skin cancer, myelodysplastic syndromes and thyroid cancer. The cancers where females had higher rates of survival and the differences between males and females were greatest were anal cancer (73% compared with 62%), non-melanoma of the skin (77% compared with 67%) and mouth cancer (65% compared with 57%).

In 2011–2015, males had higher 5-year relative survival rates than females for bladder cancer (56% compared with 46%), cancer of unknown primary site (17% compared with 9.6%) and cancer of the gallbladder and extrahepatic bile ducts (23% compared with 18%) (online Table S7.3).

In the same period, 4 of the 10 most commonly diagnosed cancers for males recorded 5-year survival rates above 70%; 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 95% (prostate cancer); for females the most commonly diagnosed cancer (breast cancer) also had a 5-year survival rate above 90% (91%) (Table 7.2).

Table 7.2: Five-year relative survival for the 10 most commonly diagnosed cancers, by sex, 2011–2015

Males		Females	
Cancer site/type (ICD-10 codes)	**Survival (%)**	**Cancer site/type (ICD-10 codes)**	**Survival (%)**
Prostate (C61)	95.2	Breast (C50)	90.8
Colorectal (C18–C20)	69.5	Colorectal (C18–C20)	70.4
Melanoma of the skin (C43)	89.1	Melanoma of the skin (C43)	93.7
Lung (C33–C34)	15.0	Lung (C33–C34)	20.8
Head and neck (with lip) (C00–C14, C30–C32)	69.5	Uterus (C54–C55)	83.3
Lymphoma (C81–C86)	75.3	Lymphoma (C81–C86)	77.2
Leukaemia (C91–C95)	63.0	Thyroid (C73)	97.8
Kidney (C64)	77.1	Pancreas (C25)	9.9
Bladder (C67)	56.0	Leukaemia (C91–C95)	60.7
Liver (C22)	19.2	Ovary (C56)	45.7

Note: Data are sorted in order of most common cancers by sex (see Table 1).

Source: AIHW ACD 2015.

For most cancers, survival rates are generally lower in the older age groups

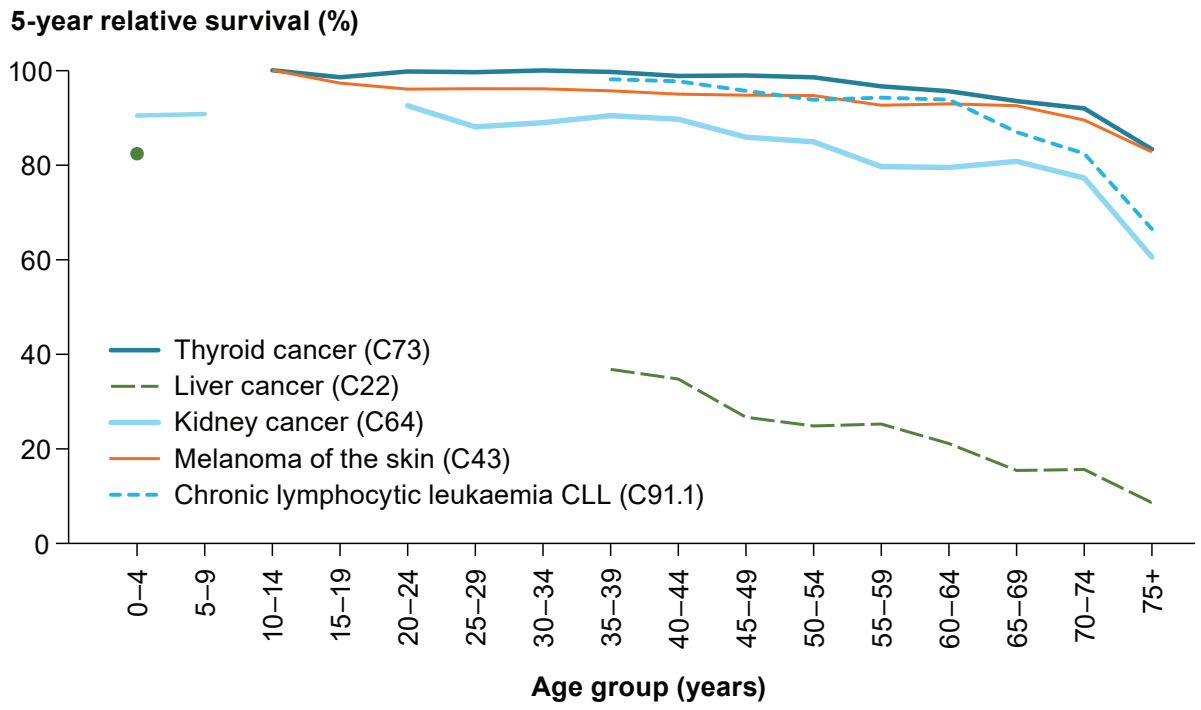
In 2011–2015, the 5-year relative survival rates for colorectal cancer, melanoma of the skin and prostate cancer did not vary considerably for those aged between 25 and 69, but rates dropped to varying extents for those aged 70 and over. For many individual cancer types, 5-year relative survival decreased 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).

Spotlight on 5-year relative survival by age for cancers increasing at the greatest rate (incidence)

Online Table S7.4 provides detail of 5-year relative survival by age for a wide range of cancers. This sub-section focuses on survival by age for the 5 cancers (with an age standardised rate of at least 3 per 100,000 persons) where diagnosis of cancer has been increasing at the greatest rates since 1982 (thyroid cancer, liver cancer, kidney cancer, melanoma of the skin and chronic lymphocytic leukaemia (CLL)). Only 1 of these cancers is a low-survival cancer (liver cancer) and 2 of the cancers have survival rates over 90% (thyroid cancer and melanoma of the skin) (online Table S7.4).

Each of the selected cancers follows a similar general trend of higher survival rates for younger ages. The cancers with higher overall survival rates maintain higher survival rates for more ages before a decrease in the later age groups. Conversely, liver cancer 5-year survival rates decrease by age from the first age group, while CLL and kidney cancer survival decreases quite gradually before large decreases in the oldest age groups (Figure 7.4).

Figure 7.4: Five-year relative survival for selected cancers by age at diagnosis, 2011–2015



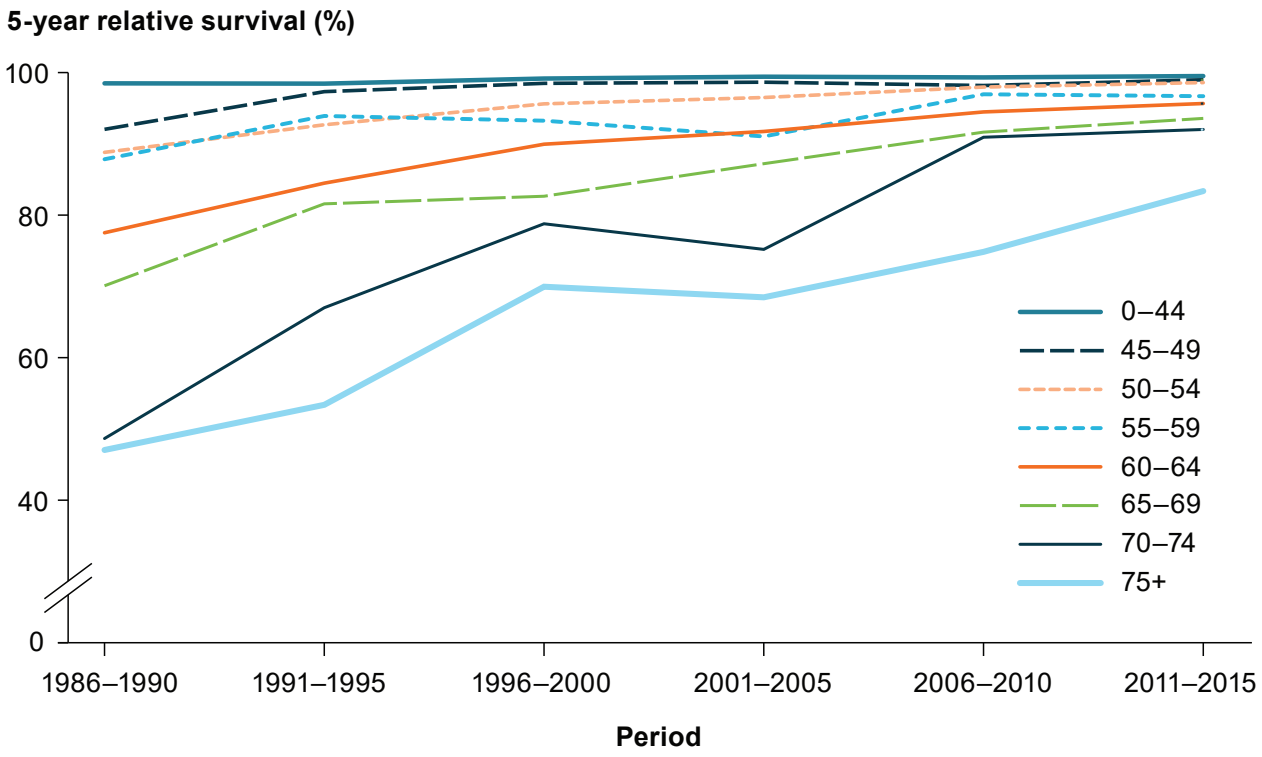
Notes

1. Where 5-year relative survival rates are not presented by age, the rates cannot be released due to the small number of cases.
2. The isolated value in the 0-4 age group relates to liver cancer, survival rates for liver cancer between the ages of 5 to 34 cannot be released due to the small number of cases.
3. Data for this figure are presented in online Table S7.4.

Source: AIHW ACD 2015.

Thyroid cancer had high survival rates for most age groups up to 70–74 before a moderate decrease for those aged 75 and over. (Figure 7.4). Figure 7.5 shows that this trend was not always present for all age groups over time, with more older age groups experiencing much lower 5-year relative survival than younger age groups and the survival of many older age groups being much lower in previous years. Over time, age is becoming a smaller risk factor for survival for thyroid cancer.

Figure 7.5: Five-year relative survival by age at diagnosis for thyroid cancer, by period



Note: Data for this figure are presented in online Table S7.5.

Source: AIHW ACD 2015

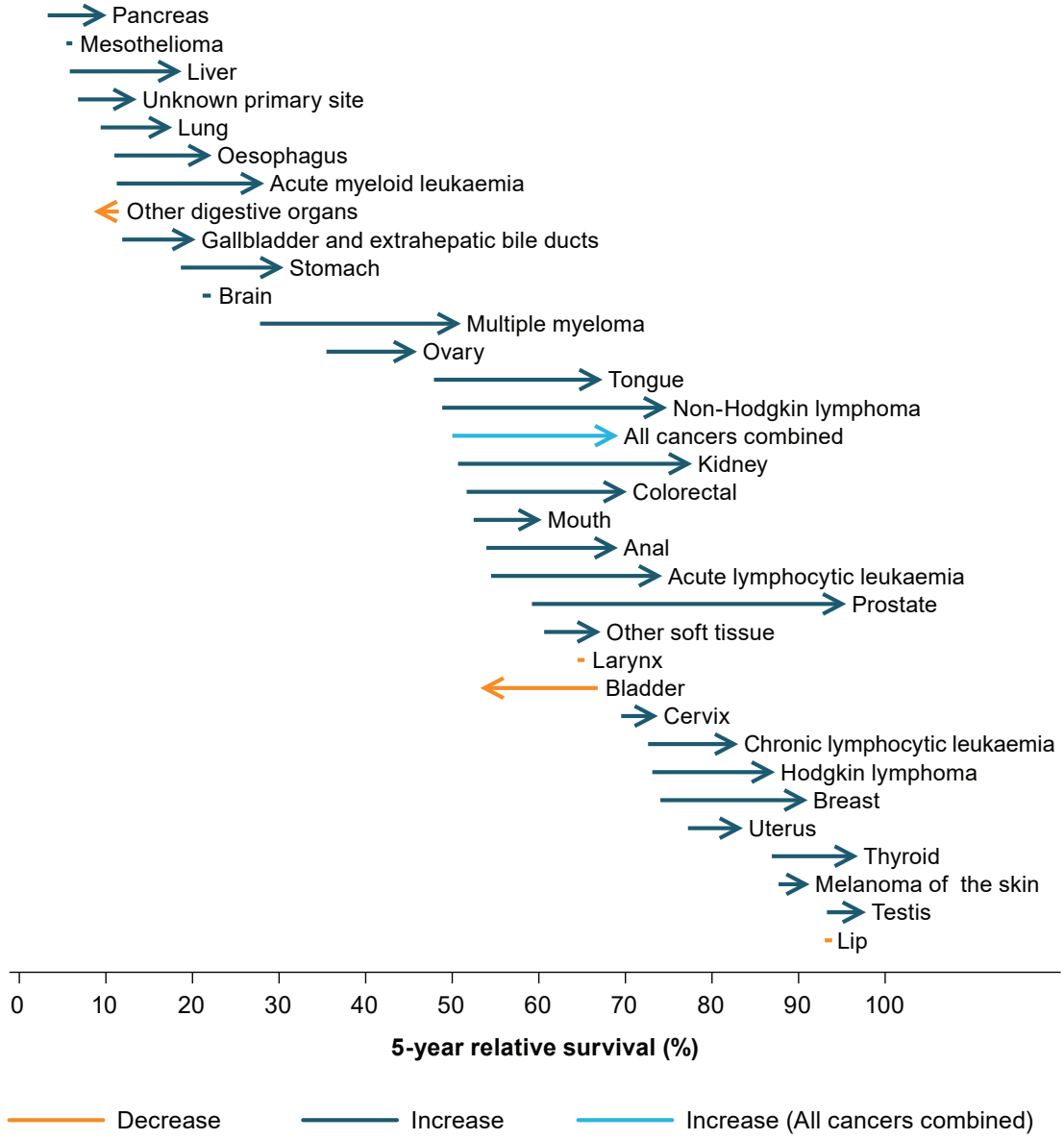
Prostate cancer 5-year survival rates have increased significantly in the last 25 years

Between 1986–1990 and 2011–2015, survival from most cancers improved, but the change was not uniform over time or across cancer types (Figure 7.6). The cancers that had the largest absolute increase in survival were prostate cancer, kidney cancer, non-Hodgkin lymphoma, and multiple myeloma, with the 5-year relative survival of each increasing by 20 percentage points or more. Bladder cancer decreased in survival over time (67% to 54%). Survival for some cancers showed no significant change over time; these included cancer of the larynx, lip cancer, cancer of other digestive organs, mesothelioma and brain cancer.

Low survival cancers

Within this report, a low survival cancer is defined as a cancer where the 5-year relative survival rate is 30% or less. In 1986–1990, pancreatic cancer, mesothelioma, liver cancer, lung cancer, oesophageal cancer, cancer of other digestive organs, gallbladder and extrahepatic bile ducts, stomach cancer, brain cancer and multiple myeloma were all low survival cancers. In 2011–2015, stomach cancer and multiple myeloma were no longer low survival cancers; multiple myeloma 5-year relative survival increased from 28% to 51% over this time while stomach cancer moved to just over 30% from 19% (Figure 7.6). Most of the cancers that were low survival in 1982 recorded improved 5-year relative survival to some extent during this time, although brain cancer, cancer of other digestive organs and mesothelioma remained around the same survival in 2011–2015 as in 1986–1990 (online Table S7.6).

Figure 7.6: Survival trends for selected cancers, between 1986–1990 and 2011–2015



Notes

1. Arrow positions indicate survival estimates and arrow lengths indicate the change in survival between the periods 1986–1990 and 2011–2015.
2. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
3. Data for this figure are in online Table S7.6.

Source: AIHW ACD 2015.

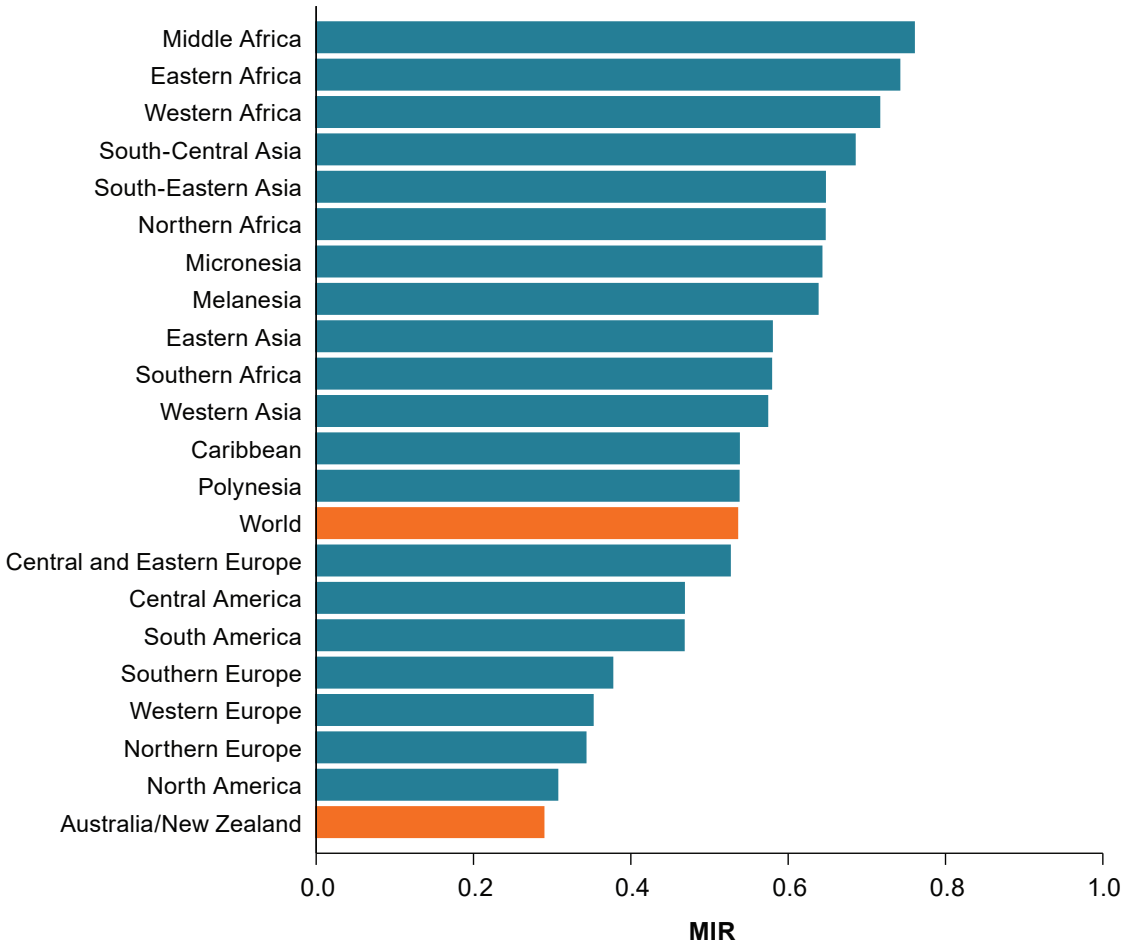
International comparisons

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. 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—0 means 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) 2018 GLOBOCAN database (Global Cancer Observatory (IARC) 2018). The GLOBOCAN estimates are for 2018, and are based on cancer incidence and mortality rates from about 3 to 5 years earlier (see Appendix C). In 2018, the MIR for Australia and New Zealand was 0.3, which was the lowest of all regions compared, suggesting that cancer survival in Australia 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 7.7).

Figure 7.7: International comparison of mortality-to-incidence ratios for all cancers combined, 2018



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 2018 by the IARC and are based on data from about 3 to 5 years earlier. Data is based on the GLOBOCAN 2018 database (Global Cancer Observatory (IARC) 2018).
3. Data for this figure are in online Table S7.7.

Source: Global Cancer Observatory (IARC) 2018.

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, 5, 10 or 15 years increased markedly. At diagnosis, the probability of surviving for at least 5 years was 69%. However, by 1 year after diagnosis, individuals with cancer had an 82% chance of surviving at least 5 more years (Table 7.3). This increased further to 95% by 15 years after diagnosis, at which time survival prospects were almost the same as for the general population.

Table 7.3: Summary of conditional survival from all cancers combined, Australia, 2011–2015

Years already survived	5-year conditional relative survival (%)
At diagnosis	68.9
Already survived 1 year after diagnosis	81.8
Already survived 5 years after diagnosis	92.0
Already survived 10 years after diagnosis	94.3
Already survived 15 years after diagnosis	95.4

Note: All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.

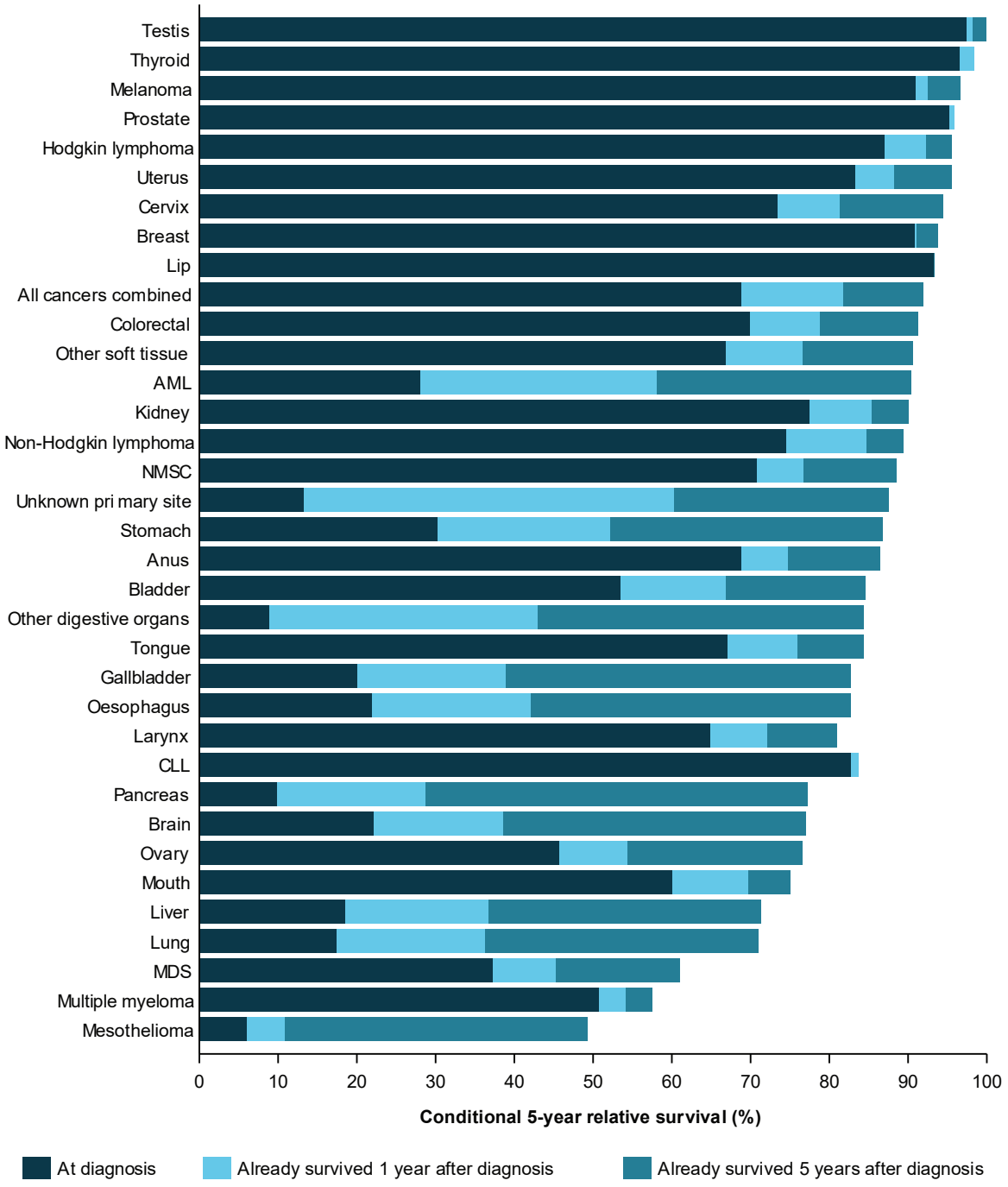
Source: AIHW Australian Cancer Database 2015.

Cancer sites

The relationship between conditional survival and survival at diagnosis varied for different cancer sites. 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, oesophageal cancer, cancer of the gallbladder and extrahepatic bile ducts, cancer of unknown primary site, and other digestive cancers. 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%.

The following cancers that had relatively high survival at diagnosis were observed to have little increase in conditional survival at 5 years after diagnosis: testicular cancer, thyroid cancer, prostate 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 7.8).

Figure 7.8: Five-year survival by number of years already survived, 2011–2015



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 includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
3. AML = Acute myeloid leukaemia, CLL = Chronic lymphocytic leukaemia, NMSC = Non-melanoma of the skin.
4. Data for this figure are in online Table S7.8.

Source: AIHW ACD 2015.

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 2015 ACD and are presented for limited-duration prevalence with an index date of 31 December 2014 (due to availability of actual cancer incidence data from states and territories) (see Appendix C for details on this data source). Data from the NDI on deaths (from any cause) that occurred to 31 December 2016 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.

All cancers combined

At the end of 2014, 431,704 people were alive who had been diagnosed with cancer (excluding basal cell and squamous cell carcinoma of the skin) in the previous 5 years. This represented 1.8% of the Australian population. Males made up 54% of the 5-year prevalent cases. At the end of 2014, the 10-year prevalence of cancer was 701,247 (3.0% of the Australian population) and the 33-year prevalence was 1,082,511 (4.6% of the Australian population) (Table 7.4). Note that 33-year prevalence has been used because it is the maximum number of years for which prevalence can be calculated using the available data.

Table 7.4: Limited-duration prevalence of all cancers combined, by sex, at end of 2014

Sex	Number	% of prevalent cases	% of population
5-year prevalence			
Males	234,556	54.3	2.0
Females	197,148	45.7	1.7
Persons	**431,704**	**100.0**	**1.8**
10-year prevalence			
Males	379,647	54.1	3.2
Females	321,600	45.9	2.7
Persons	**701,247**	**100.0**	**3.0**
33-year prevalence			
Males	543,656	50.2	4.6
Females	538,855	49.8	4.5
Persons	**1,082,511**	**100.0**	**4.6**

Notes

1. Includes cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma of the skin.
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 2014.

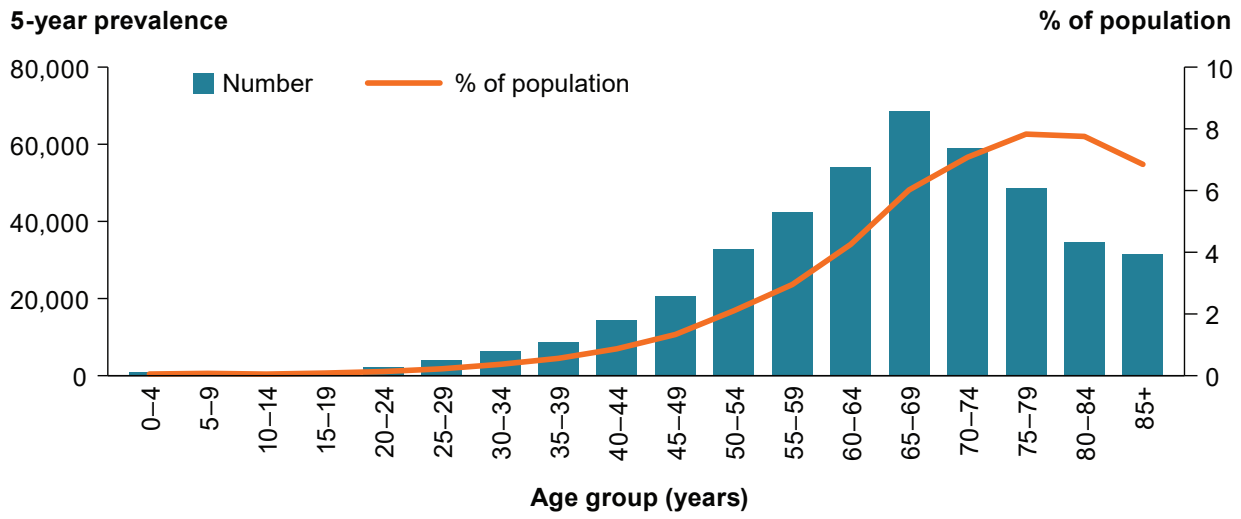
Source: AIHW Australian Cancer Database 2015.

Around a quarter of people aged over 85 have been diagnosed with cancer some time in their life

Five-year prevalence for all cancers combined generally increased with age, with counts peaking at the 65–69 age group. At the end of 2014, 7.8% of all Australians aged 75–84 and over had had a diagnosis of cancer within the previous 5 years. The 5-year prevalence rates were highest for those aged 75–79 and 80–84 and lowest for those under 14 (Figure 7.9).

At the end of 2014, the 65–69 age group was the only group with more than 100,000 people who had been diagnosed with cancer in the previous 10 years. For 10-year prevalence, the 80–84 age group recorded the highest rate of people who had been diagnosed with cancer in the previous 10 years (13% of Australians aged 80–84). At the same time, the 33-year prevalence for all cancers combined was over 110,000 for those aged over 85; this is just under a quarter of all Australians aged over 85 (online Table S7.9).

Figure 7.9: Five-year prevalence of all cancers combined, by age group, at end of 2014



Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma.
2. Age refers to the age of a person on the index date of 31 December 2014.
3. Percent of population is the percentage of people alive and diagnosed with cancer in the last 5 years as a proportion of the Australian population for the respective age groups.
4. Data for this figure are in online Table S7.9.

Source: AIHW ACD 2015.

The 5-year prevalence of prostate cancer was higher than for any other cancer

At the end of 2014, prostate cancer had the highest 5-year prevalence of all cancers. Among males, prostate cancer had the highest 5-year prevalence (90,354), followed by melanoma of the skin (31,598) and colorectal cancer (29,593). Among females, breast cancer had the highest 5-year prevalence (71,394), followed by colorectal cancer (24,453) and melanoma of the skin (23,530) (Table 7.5).

Table 7.5: Five-year prevalence for the 10 most commonly diagnosed cancers, by sex, at end of 2014

Cancer type/site (ICD-10 codes)	Males		Females		Persons	
	Number	% of prevalent cases	Number	% of prevalent cases	Number	% of prevalent cases
Prostate (C61)	90,354	100.0	. .	. .	90,354	100.0
Breast (C50)	549	0.8	71,394	99.2	71,943	100.0
Melanoma of the skin (C43)	31,598	57.3	23,530	42.7	55,128	100.0
Colorectal (C18–C20)	29,593	54.8	24,453	45.2	54,046	100.0
Non-Hodgkin lymphoma (C82–C86)	10,405	56.6	7,989	43.4	18,394	100.0
Lung (C33–C34)	9,411	53.5	8,192	46.5	17,603	100.0
Kidney (C64)	8,020	64.9	4,344	35.1	12,364	100.0
Thyroid (C73)	3,076	25.3	9,092	74.7	12,168	100.0
Uterus (C54–C55)	. .	. .	10,454	100.0	10,454	100.0
Bladder (C67)	6,063	79.0	1,608	21.0	7,671	100.0
All cancers combined	**234,556**	**54.3**	**197,148**	**45.7**	**431,704**	**100.0**

Notes

1. Online Table S7.10 contains prevalence information for a wider range of cancers and where prevalence is calculated at 5, 10 and 33 years.
2. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma of the skin.

Source: AIHW ACD 2015.

Life after cancer

There are over one million people alive in Australia who have had, or are living with, cancer. The population who have ever 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

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

For some people, these changes can be interrelated, or occur simultaneously, compounding the management required. The management of these changes occurs in addition to the daily requirements those with cancer would have to meet were they not being treated for cancer.

Experiences after cancer

There is no standard experience

'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,' highlights Suzy, a previous cancer patient now involved with cancer peer support (Cancer Council Australia 2017b).

Cancer survivors may be young

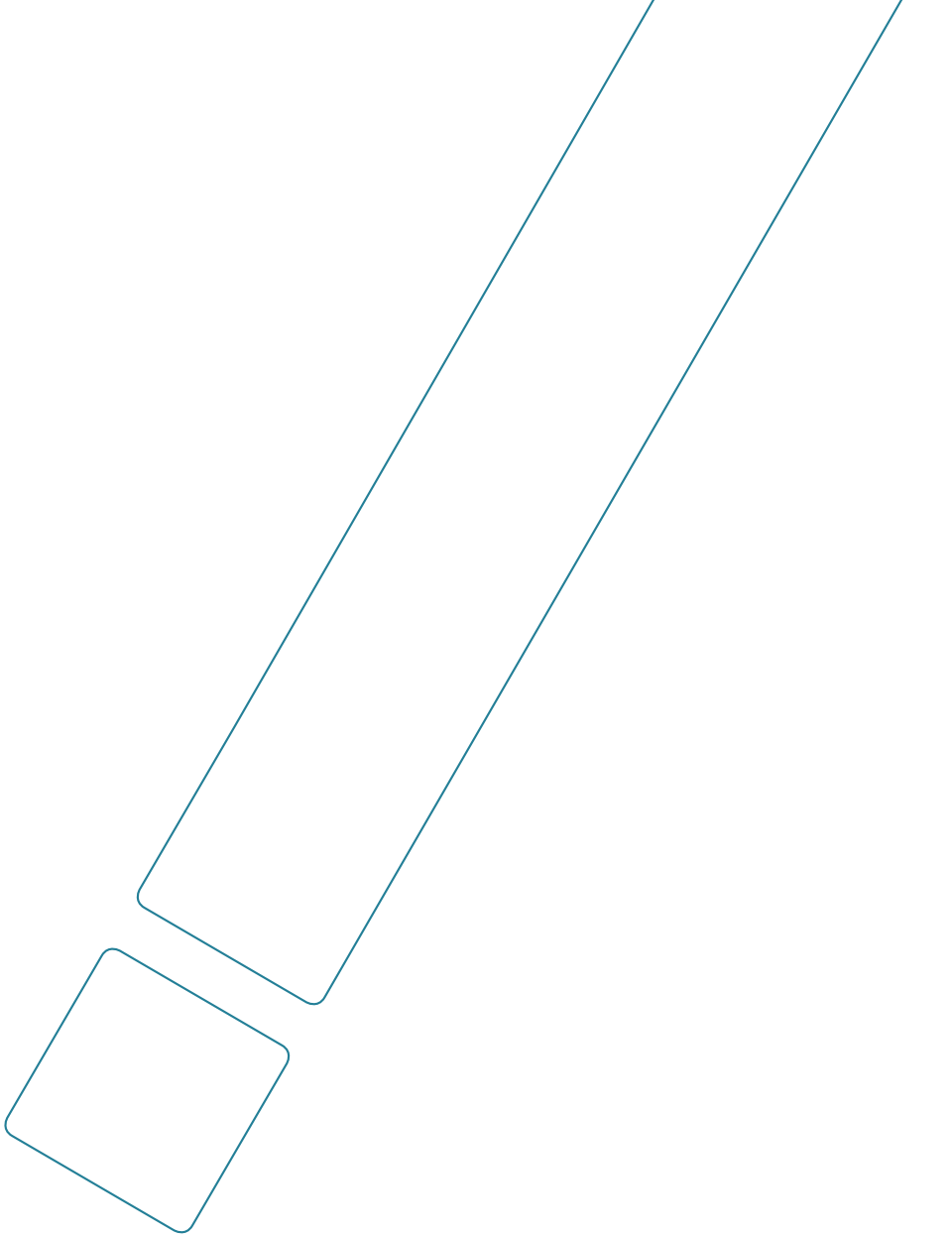
Younger cancer survivors may experience specific challenges relating to career goals, intimate relationships, depressive symptoms, managing sexual and fertility anxieties and consequences of premature menopause (Zebrack 2011).

Financial changes involve more than numbers

As a result of financial changes, 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).

Support

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).



Number of deaths

8

Key findings

In 2019, in Australia, it is estimated that:

- 49,896 people will die from cancer
- more than half (56%) of all cancer-related deaths will be for males
- the age-standardised cancer mortality rate will be 159 deaths per 100,000 persons, a decrease of 24% from 1982 (209 per 100,000)
- 87% of cancer deaths in males and 85% of cancer deaths in females will occur among those aged 60 and over
- the risk of dying from cancer before the age of 85 will be 1 in 4 for males and 1 in 6 for females
- lung cancer will be the leading cause of death from cancer, followed by colorectal cancer, prostate cancer, breast cancer and pancreatic 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.

8.1 All cancers combined

In 2016, cancer was the leading cause of death in Australia, accounting for approximately 3 of every 10 deaths (29%) (AIHW 2018h). In 2019, it is estimated that 49,896 people will die from cancer in Australia, an average of 137 deaths every day.

The age-standardised mortality rate for all cancers combined is estimated to be 159 deaths per 100,000 people in 2019. The mortality rate for males (195 deaths per 100,000) is estimated to be 1.5 times that for females (130 per 100,000) (Table 8.1).

In 2019, it is estimated that the risk of dying from cancer before the age of 75 will be 1 in 10 for males and 1 in 13 for females. By the age of 85, the risk is estimated to increase to 1 in 4 for males and 1 in 6 for females (Table 8.1).

Table 8.1: Estimated mortality for all cancers combined, by sex, 2019

	Males	Females	Persons
Number of deaths	28,070	21,826	49,896
ASR	194.8	129.9	159.0
Per cent of all cancer deaths (%)	56.3	43.7	100.0
Per cent of all deaths (%)	32.7	27.1	30.0
Risk to age 75	1 in 10	1 in 13	1 in 11
Risk to age 85	1 in 4	1 in 6	1 in 5

Notes

1. All cancers combined includes cancers coded in the ICD-10 as 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 per cent of all deaths is based on the number of cancer deaths for each sex divided by the total number of deaths for each sex. Per cents do not sum across the row.
4. The per cent of all cancer deaths is the number of cancer deaths for each sex divided by the total number of cancer deaths. Per cents sum across the row.

Source: AIHW National Mortality Database.

More than 4 in 5 deaths from cancer will occur in people over 60 years of age

The age-specific mortality rate of all cancers combined generally increases with increasing age (Figure 8.1). In 2019, it is estimated that 87% of all cancer deaths in males and 85% of all cancer deaths in females will occur in people aged 60 and over. Fewer deaths from cancer occur in the younger populations: the estimated mortality rate is less than 10 deaths per 100,000 males aged under 35, while females aged under 30 have mortality rates less than 10 deaths per 100,000 females (online Table S8.1).

After 55, the mortality rate rose more steeply for males, to 3,025 deaths per 100,000 for those aged 85 and over. Mortality from prostate cancer contributed to the high cancer mortality rate in older males (Figure 8.1).

Figure 8.1: Estimated mortality for all cancers combined, by age at death and sex, 2019

Notes

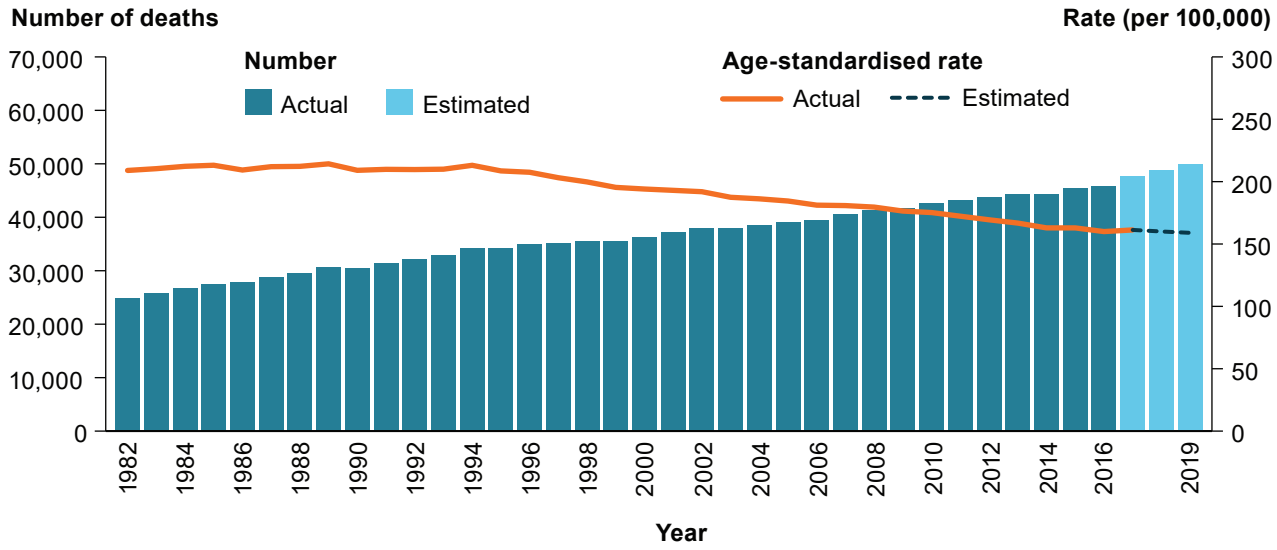
1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.
2. Data for this figure are in online Table S8.1.

Source: Source: AIHW National Mortality Database.

Cancer mortality rates continue to decline

The number of deaths from all cancers combined has risen steadily from 24,915 in 1982 to an estimated 49,896 in 2019 (Figure 8.2). The number of deaths estimated for 2019 will be the largest number reported in any year to date but some of the increase is due to population growth. In contrast, it is estimated that the age-standardised mortality rate for all cancers combined has decreased by 24%, from 209 per 100,000 in 1982 to 159 per 100,000 in 2019. 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 2019



Notes

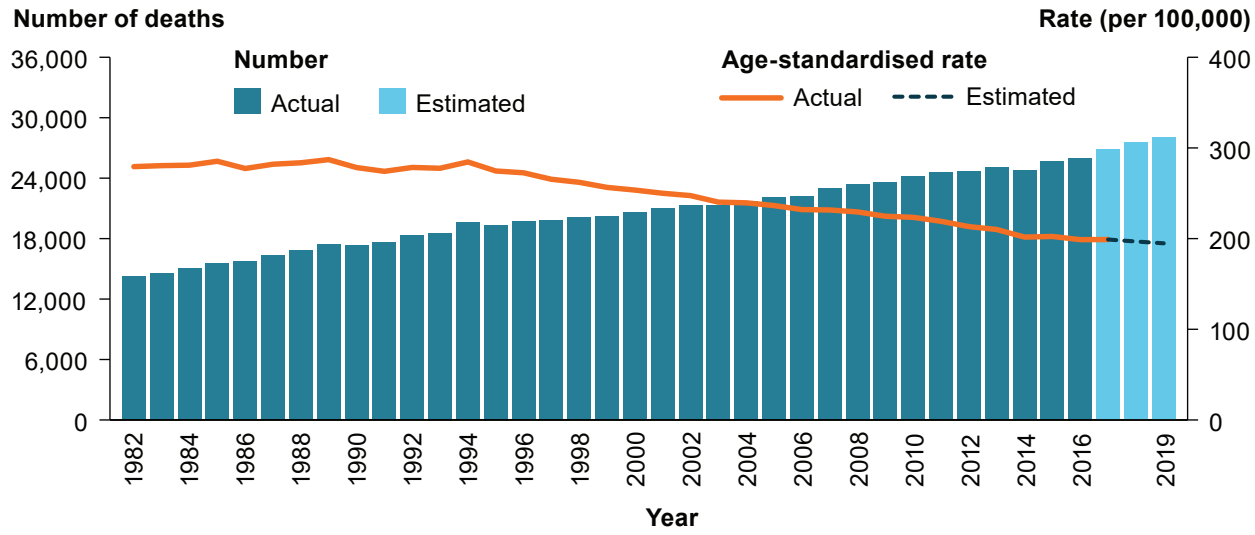
1. Deaths registered in 2014 and earlier are based on the final version of cause of death data; deaths registered in 2015 and 2016 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Actual mortality data from 1982 to 2015 are based on the year of occurrence of the death, and data for 2016 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 includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: Data for this figure are in online Table S8.2.

Cancer mortality rate for males continues to fall

For males, the mortality rate reached a peak of 287 deaths per 100,000 in 1989 and the rate is estimated to decrease by 32% to 195 per 100,000 in 2019 (Figure 8.3). The decrease over time can be largely attributed to declines in mortality rates for lung cancer, colorectal cancer and stomach cancer.

Figure 8.3: Trends in mortality for all cancers combined, males, 1982 to 2019



Notes

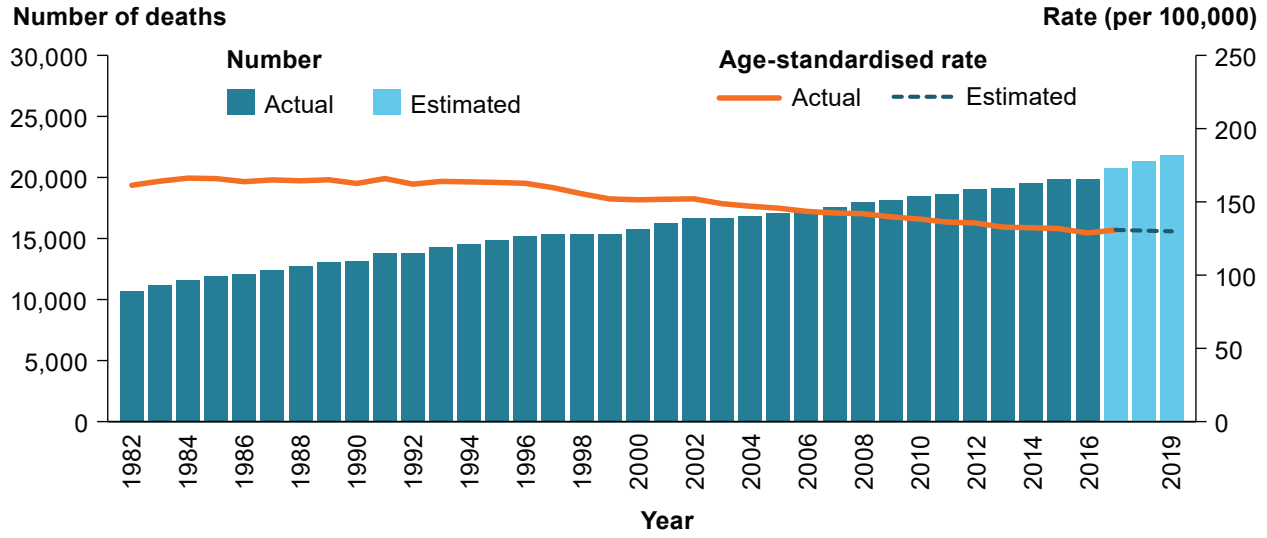
1. Deaths registered in 2014 and earlier are based on the final version of cause of death data; deaths registered in 2015 and 2016 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Actual mortality data from 1982 to 2015 are based on the year of occurrence of the death, and data for 2016 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 includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: Data for this figure are in online Table S8.2.

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

The cancer mortality rate was consistently lower for females than males. The mortality rate remained fairly steady until 1996, before falling by 20% from 163 deaths per 100,000 females in 1996 to 130 per 100,000 females in 2019 (Figure 8.4). This decrease can be largely attributed to the decline in the mortality rates of colorectal cancer, breast cancer and cancer of unknown primary site.

Figure 8.4: Trends in mortality for all cancers combined, females, 1982 to 2019



Notes

1. Deaths registered in 2014 and earlier are based on the final version of cause of death data; deaths registered in 2015 and 2016 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Actual mortality data from 1982 to 2015 are based on the year of occurrence of the death, and data for 2016 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 includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: Data for this figure are in online Table S8.2.

8.2 Most common causes of death from cancer

In 2019, lung cancer is estimated to be the leading cause of death from cancer in Australia (9,034 deaths), followed by colorectal cancer (5,597), prostate cancer (3,306), breast cancer (3,090) and pancreatic cancer (3,051). These 5 cancers are expected to account for around half (48%) of all deaths from cancer in 2019, with lung cancer alone expected to account for nearly 1 in 5 (18%) cancer deaths (Table 3).

Lung cancer is estimated to be the leading cause of cancer-related death for both sexes

Lung cancer is estimated to be the leading cause of cancer death in both males and females (5,179 deaths and 3,855 deaths, respectively). The estimated risk of death from the disease before the age of 85 is 1 in 20 for males and 1 in 30 for females. The 5 cancers with the highest mortality rates for males are expected to account for around 52% of all estimated cancer deaths in males in 2019; the 5 cancers with the highest mortality rate for females are expected to account for around 56% of estimated cancer deaths in females in 2019 (Table 8.2).

Table 8.2: Estimated 10 most common causes of death for cancer, by sex, 2019

Males				Females			
Cancer site/type (ICD-10 codes)	**Deaths**	**ASR**	**Risk to age 85**	**Cancer site/type (ICD-10 codes)**	**Deaths**	**ASR**	**Risk to age 85**
Lung (C33–C34)	5,179	35.6	1 in 20	Lung (C33–C34)	3,855	23.3	1 in 30
Prostate (C61)	3,306	23.0	1 in 35	Breast (C50)	3,058	18.8	1 in 43
Colorectal (C18–C20, C26.0)	3,009	21.1	1 in 37	Colorectal (C18–C20, C26.0)	2,588	15.0	1 in 51
Pancreas (C25)	1,590	11.0	1 in 65	Pancreas (C25)	1,460	8.6	1 in 82
Liver (C22)	1,436	9.8	1 in 76	Cancer of unknown primary site (C77–C80, C97)	1,173	6.4	1 in 135
Cancer of unknown primary site (C77–C80, C97)	1,258	8.8	1 in 88	Ovary (C56)	1,046	6.4	1 in 114
Melanoma of the skin (C43)	1,190	8.3	1 in 89	Leukaemia (C91–C95)	850	5.0	1 in 147
Leukaemia (C91–C95)	1,189	8.3	1 in 86	Liver (C22)	725	4.4	1 in 158
Oesophagus (C15)	1,087	7.4	1 in 96	Lymphoma (C81–C86)	676	3.9	1 in 189
Lymphoma (C81–C86)	956	6.7	1 in 109	Brain (C71)	617	4.1	1 in 197
All cancers combined	**28,070**	**194.8**	**1 in 4**	**All cancers combined**	**21,826**	**129.9**	**1 in 6**

Notes

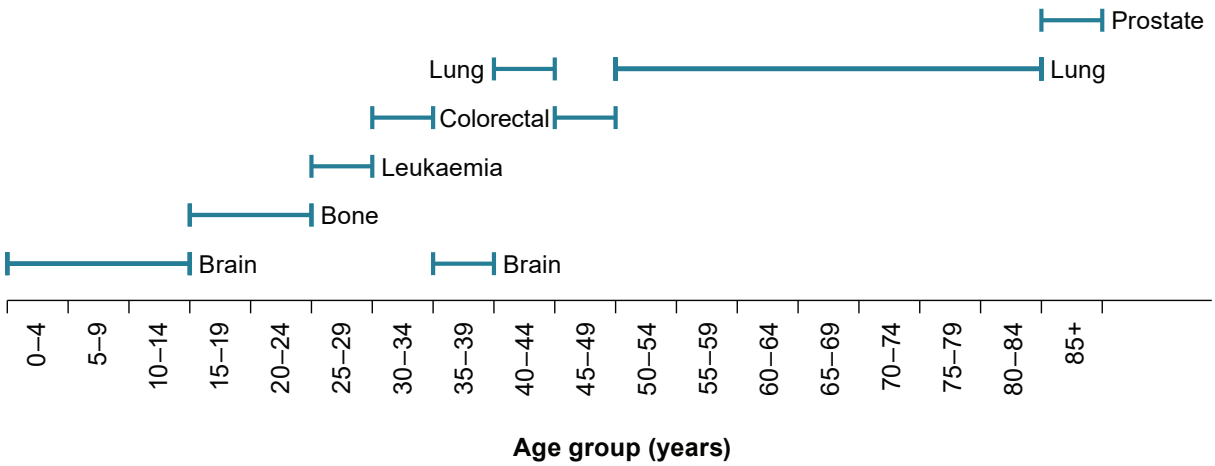
1. ASR refers to the age-standardised rate. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
2. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.

Source: AIHW National Mortality Database.

Brain cancer is the leading cause of cancer-related death for males aged under 15

Brain cancer causes more deaths in males aged 0 to 14 than any other cancer (Figure 8.5) and accounted for over 1 in 3 of the 56 cancer-related male deaths for these ages (online Table S8.4). Bone cancer is the leading cause of cancer-related deaths for males in age groups between 15 and 24. For each of the age groups over 40, common cancers were the leading cause of death from cancer for males (Figure 8.5).

Figure 8.5: Estimated leading cause of death for cancer at each age group, males, 2019



Notes

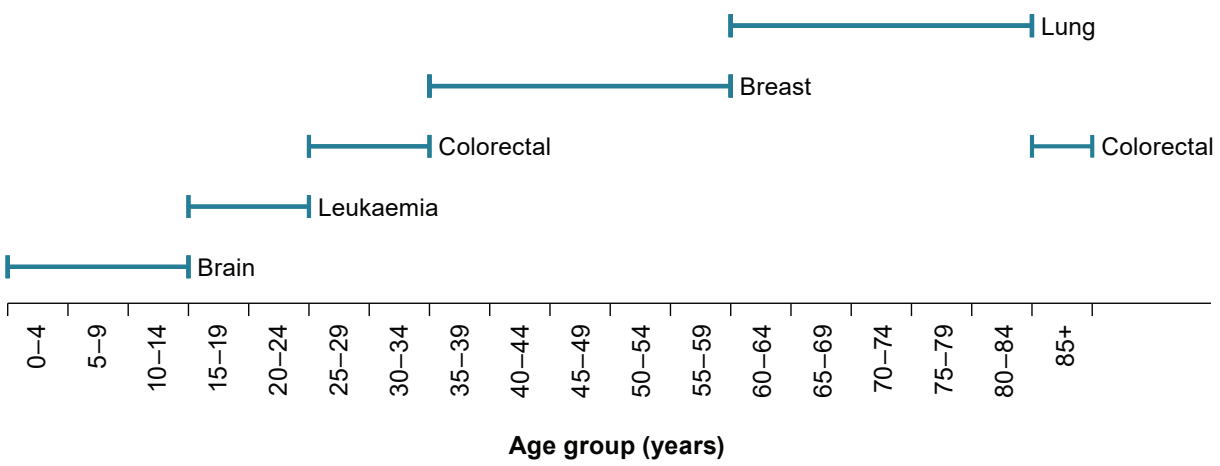
1. For age group 25–29 years, leukaemia and colorectal cancer were both leading cause of death due to cancer.
2. Data for this figure are in online Table S8.3.

Source: AIHW National Mortality Database.

Leukaemia is estimated to be the leading cause of cancer-related death for females aged 15 to 24

Leukaemia is estimated to account for more deaths in females aged 15 to 24 than any other cancer (Figure 8.6). The cancers estimated to cause the most deaths for females by age group are similar to those for males, including that brain cancer is the leading cause of cancer-related deaths for those aged 0 to 14 and, in older age groups, the leading causes of cancer-related deaths are a selection of common cancers.

Figure 8.6: Estimated leading cause of death for cancer at each age group, females, 2019



Notes

1. For age group 0–4 years, leukaemia and brain cancer were both leading cause of death due to cancer.
2. Data for this figure are in online Table S8.3.

Source: AIHW National Mortality Database.

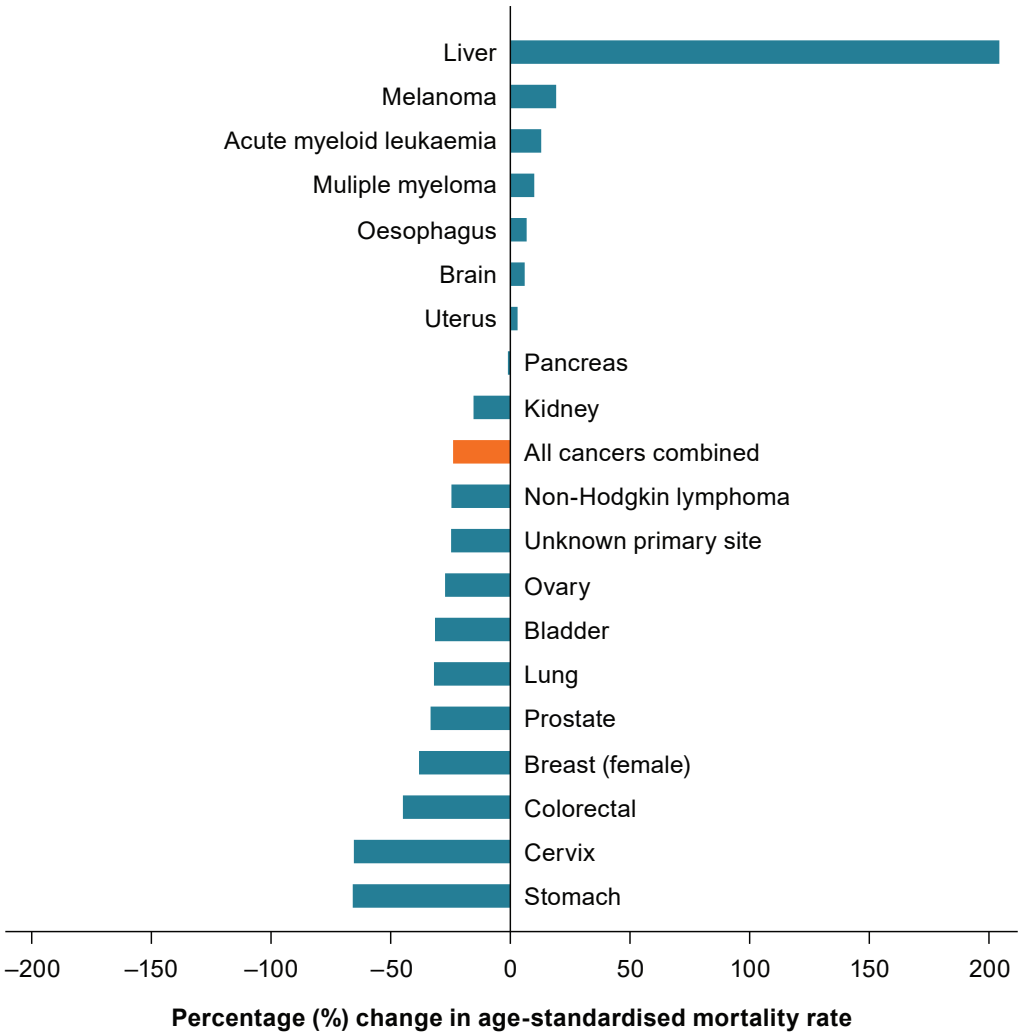
Liver cancer estimated mortality rates in 2019 are around 3 times the 1982 rates

Analysis of change over time within this section focuses only on cancers with an age-standardised mortality rate of 3 per 100,000 persons or more in 1982 or 2019. Note the mortality rate may be less than 3 in 1 of the reference years. Cancers with these rates are primarily selected for statistical reasons as this section focuses largely on percentage change over time and cancers with low rates over time will be very sensitive to change.

The age-standardised mortality rates for 7 of the selected cancers increased between 1982 and 2019. Liver cancer had by far the largest increase (204%), from 2.3 deaths per 100,000 persons to 7.0 per 100,000 persons (Figure 8.7). Of the selected cancers, all except brain cancer had improvements in 5-year relative survival rates since 1982 (online Table S7.6).

Stomach cancer and cervical cancer age-standardised mortality rates are estimated to decrease by 66% in 2019 from the respective rates recorded in 1982 (Figure 8.7). Stomach cancer rates fell from 12 to 4.2 deaths per 100,000 persons, while cervical cancer rates fell from 5.2 deaths per 100,000 females to 1.8 deaths per 100,000 females. Lung cancer had the greatest decrease in terms of age-standardised number of deaths per 100,000. In 2019, the estimated rate for lung cancer is 29 deaths per 100,000 persons—around 13 deaths per 100,000 less than the rate recorded in 1982 (online Table S8.5).

Figure 8.7: Estimated percentage change in age-standardised mortality rates for selected cancers between 1982 and 2019



Notes

1. The bars indicate the percentage change in mortality rates between 1982 and 2019. The percentage change between 1982 and 2019 is a summary measure that allows the use of a single number to describe the change over a period of multiple years. However, it is not always reasonable to expect that a single measure can accurately describe the trend over the entire period.
2. The rates were age standardised to the 2001 Australian Standard Population and are expressed per 100,000 population.
3. Data only includes cancers with a mortality rate of 3 or more in 1982 or 2019.
4. Data for this figure are in online Table S8.5.

Source: AIHW National Mortality Database.

8.3 Deaths from rare and less common cancers

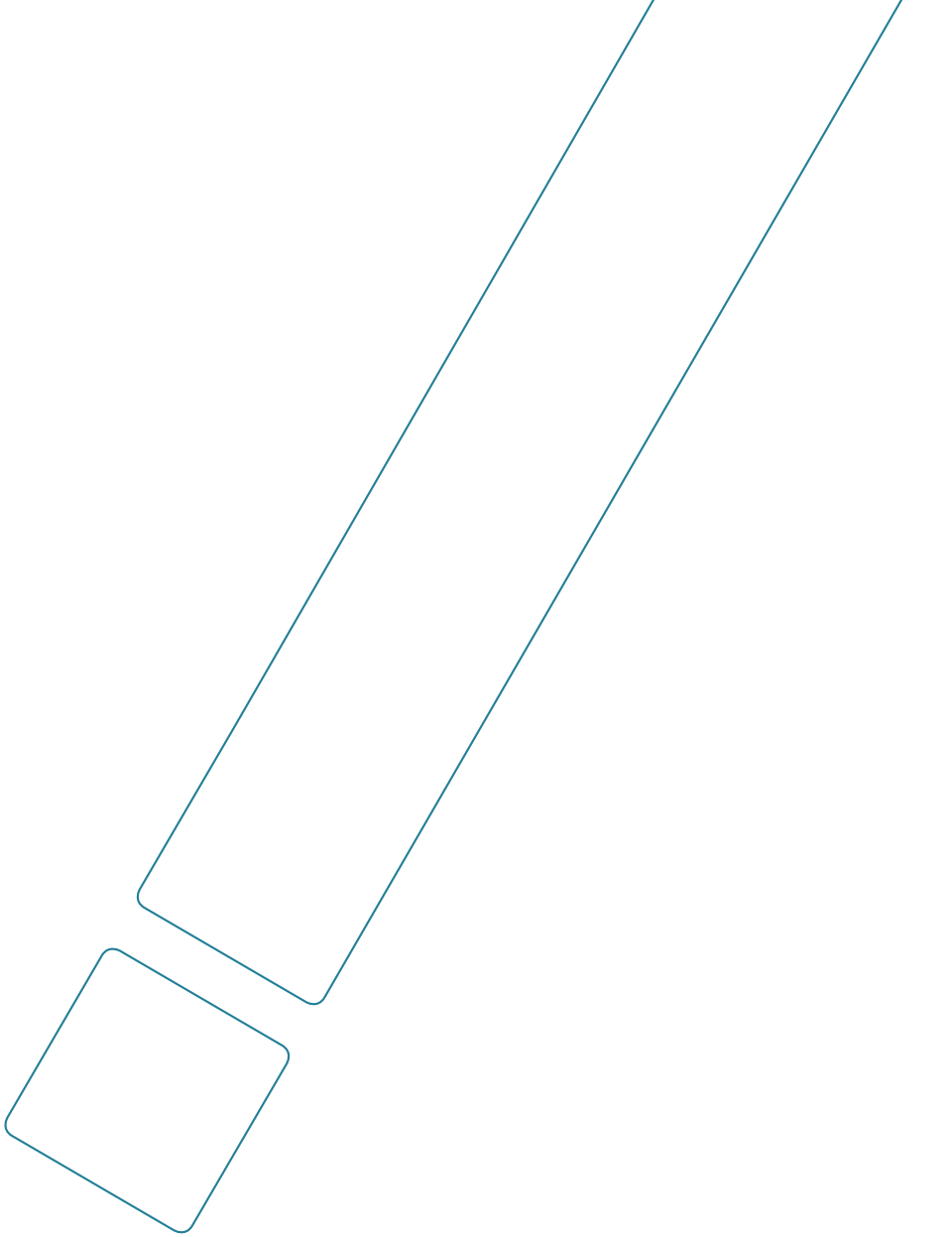
The definitions of 'rare' and 'less common' cancers are based on incidence rates per year (see Section 5.3).

Rare and less common cancers account for around half of cancer deaths

In 2015, just under 22,000 people died from rare or less common cancers (9,391, and 12,278 deaths, respectively), and 23,811 died from common cancers (online Table 5.6). While rare and less common cancers together accounted for a little over a third of cancers diagnosed in 2015, they accounted for close to half of cancer deaths (48%).

Males were more likely to die from rare and less common cancers, such as oesophageal cancer, liver cancer, pancreatic cancer and cancer of unknown primary site, than from kidney cancer (online Table 5.6).

Similarly, females were more likely to die from oesophageal cancer (rare) than kidney cancer (common), and much more likely to die from pancreatic cancer (less common) than melanoma (online Table 5.6).



Key population groups

9

Key findings

Aboriginal and Torres Strait Islander people

In the 5 years from 2010 to 2014 in New South Wales, Victoria, Queensland, Western Australia and the Northern Territory, lung cancer was the most common cancer diagnosed for Aboriginal and Torres Strait Islander people.

In the 5 years from 2012 to 2016 in New South Wales, Queensland, Western Australia, South Australia and the Northern Territory, lung cancer was the most common cancer causing mortality for Aboriginal and Torres Strait Islander people.

State and territory

- In the 5 years from 2010 to 2014, the age-standardised incidence rate of all cancers combined was highest in Queensland and lowest in the Australian Capital Territory.
- In the 5 years from 2012 to 2016, the age-standardised mortality rate was highest in the Northern Territory and lowest in the Australian Capital Territory.

Remoteness area

- During the period 2010–2014, those living in *Inner regional* areas of Australia had higher age-standardised incidence rates for melanoma of the skin, prostate cancer and kidney cancer than people living in *Very remote* areas.
- During the period 2012–2016, those living in *Very remote* areas had higher age-standardised mortality rates for liver cancer, cancer of unknown primary site and lung cancer than people living in *Major cities*.

Socioeconomic disadvantage

Those living in the most disadvantaged areas of Australia during the period:

- in 2010–2014 had the highest age-standardised incidence rates of cancers including cervical cancer, cancer of unknown primary site, colorectal cancer, uterine cancer and head and neck cancer
- in 2012–2016 had the highest age-standardised mortality rates of cancers including lung cancer, cancer of unknown primary site, colorectal cancer and prostate cancer.

Incidence data in this section are sourced from the ACD and mortality data is sourced from the NMD.

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 and/or protective factors (for example, tobacco consumption, physical activity)
- the availability and usage of diagnostic services.

9.1 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 lower education and employment rates, higher smoking rates and poor access to health services (AIHW 2018i). Around 19% of Aboriginal and Torres Strait Islander people live in *Remote* and *Very remote* areas of Australia, where access to services is more difficult, compared to around 1% of the non-Indigenous population (ABS 2018b).

Box 9.1: Data quality challenges

Cancer-related age-standardised rates for Aboriginal and Torres Strait Islander people are generally updated in the *Cancer in Australia* series but are not presented in this edition. See Item 1 in Appendix G for more information.

Improvements to the quality of Indigenous status information within the 2015 ACD have reduced the number of records with unknown Indigenous status and led to an increase in the cancer incidence for the Indigenous and non-Indigenous populations. See Item 2 in Appendix G for more information.

Lung cancer is the most commonly diagnosed cancer for Indigenous Australians

For new cases of cancer, data from New South Wales, Victoria, Queensland, Western Australia and the Northern Territory are considered of sufficient quality for inclusion in this report. Just over 90% of Indigenous Australians live in these 5 jurisdictions (ABS 2018b). Around 10% of the new cancer case records in the reporting jurisdictions had unknown Indigenous status.

Between 2010 and 2014, an average of 1,696 cases of cancer were diagnosed among Indigenous Australians each year—this is around 1.5% of all cancer cases diagnosed in that period (online Table S9.1).

Of the selected cancers, prostate cancer was the most commonly diagnosed cancer for male Indigenous Australians (154 cases per year) while breast cancer was the most common for female Indigenous Australians (197 per year). Lung cancer was the second most commonly diagnosed cancer for both sexes (128 per year for males and 114 per year for females). Overall, lung cancer was the most commonly diagnosed cancer for Indigenous Australians (Table 9.1).

Table 9.1: Incidence of all cancers combined and selected cancers for Aboriginal and Torres Strait Islander people, by sex, 2010–2014

Cancer site/type (ICD-10 codes)	Males		Females	
	Number of new cases	Average number of new cases	Number of new cases	Average number of new cases
Lung cancer (C33–C34)	640	128	571	114
Breast cancer (C50)	5	1	984	197
Colorectal cancer (C18–C20)	451	90	389	78
Prostate cancer (C61)	771	154	..	..
Head and neck cancer (with lip) (C00–C14, C30–C32)	402	80	134	27
Melanoma of the skin (C43)	190	38	139	28
Liver cancer (C22)	190	38	73	15
Non-Hodgkin lymphoma (C82–C86)	148	30	111	22
Uterine cancer (C54–C55)	..	..	259	52
Cancer of unknown primary site (C80)	130	26	122	24
Pancreatic cancer (C25)	119	24	124	25
Cervical cancer (C53)	..	..	177	35
Kidney cancer (C64)	100	20	75	15
Bladder cancer (C67)	95	19	44	9
All cancers combined	**4,262**	**852**	**4,219**	**844**

Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma of the skin.
2. Data is for New South Wales, Victoria, Queensland, Western Australia and the Northern Territory.

Source: AIHW ACD 2015.

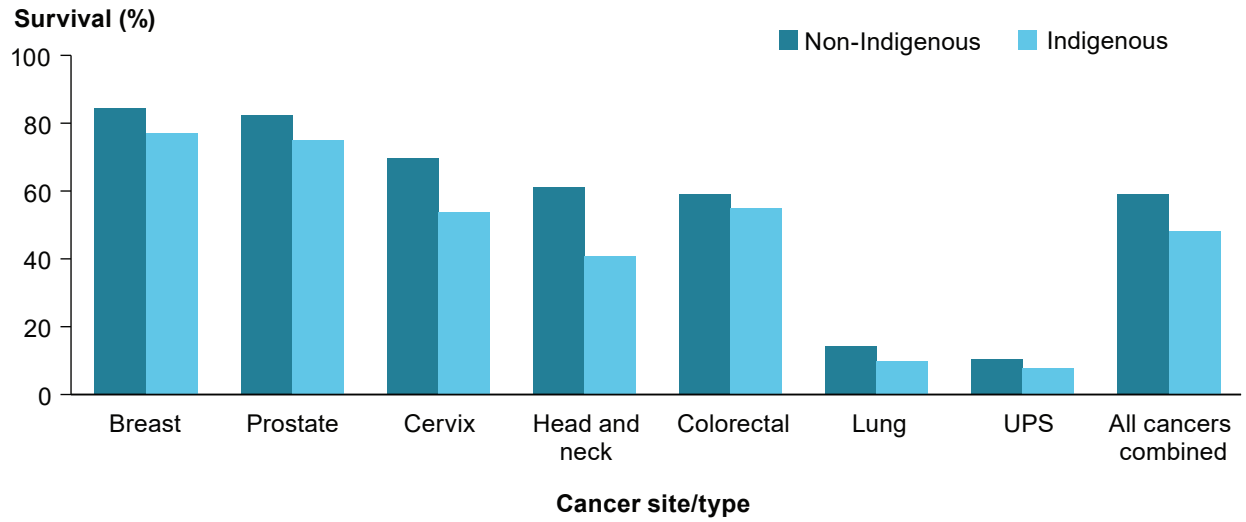
Aboriginal and Torres Strait Islander people have lower cancer survival rates than non-Indigenous Australians

In 2010–2014, for the same states and territories included in incidence reporting, the 5-year observed survival rate for all cancers combined was 48% for Indigenous Australians and 59% for non-Indigenous Australians.

For the majority of cancers, Aboriginal and Torres Strait Islander people generally record lower observed survival rates when compared to non-Indigenous Australians. Notably lower survival rates for Indigenous Australians are observed for breast cancer in females (77% compared with 84%), prostate cancer (75% compared with 83%), cervical cancer (54% compared with 70%), head and neck (with lip) cancer (41% compared with 61%) and lung cancer (10% compared with 14%) (Figure 9.1).

Please note that this chapter uses observed survival rather than relative 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 by Indigenous status can usually be generated and is preferred, these data are unavailable at the time of writing—see Item 1 in Appendix G for more information.

Figure 9.1: 5-year observed survival of all cancers combined and selected cancers, by Indigenous status, 2010–2014



Notes

1. UPS = Cancer of unknown primary site).
2. Breast relates to breast cancer in females.
3. Head and neck cancer includes cancers of the lip, tongue, mouth, salivary glands, pharynx, nasal cavity, sinuses and larynx.
4. Data for this figure are in online Table S9.2

Source: AIHW ACD 2015.

Lung cancer is the leading cause of cancer-related deaths for Aboriginal and Torres Strait Islander people

For mortality data, data from New South Wales, Queensland, Western Australia, South Australia and the Northern Territory are considered of sufficient quality for inclusion in this report. Almost 9 in 10 (88%) Indigenous Australians live in these jurisdictions (ABS 2018b). For these 5 jurisdictions, less than 1% of the NMD had records with 'unknown' Indigenous status.

Between 2012 and 2016, there was an average of 583 cancer-related deaths for Indigenous Australians each year (1.8% of all deaths due to cancer) (online Table S9.1). Of the selected cancers, lung cancer accounted for the highest average number of cancer-related deaths for male Indigenous Australians (83 deaths per year), followed by head and neck cancer (31 per year), liver cancer (24 per year) and colorectal cancer (22 per year). For female Indigenous Australians, lung cancer had the highest average number of cancer-related deaths (73 per year) followed by breast cancer (35 per year), colorectal cancer (20 per year) and cancer of unknown primary site (19 per year) (Table 9.2).

Table 9.2: Mortality of all cancers combined and selected cancers for Aboriginal and Torres Strait Islander people, by sex, 2012–2016

	Males		Females	
Cancer site/type (ICD-10 codes)	Number of deaths	Average number of deaths	Number of deaths	Average number of deaths
Lung cancer (C33–C34)	417	83	363	73
Breast cancer (C50)	3	1	176	35
Colorectal cancer (C18–C20)	112	22	101	20
Prostate cancer (C61)	81	16	..	..
Head and neck cancer (with lip) (C00–C14, C30–C32)	155	31	49	10
Melanoma of the skin (C43)	16	3	8	2
Liver cancer (C22)	119	24	83	17
Non-Hodgkin lymphoma (C82–C86)	32	6	20	4
Uterine cancer (C54–C55)	..	..	34	7
Cancer of unknown primary site (C80)	98	20	97	19
Pancreatic cancer (C25)	81	16	77	15
Cervical cancer (C53)	..	..	61	12
Kidney cancer (C64)	26	5	14	3
Bladder cancer (C67)	32	6	15	3
All cancers combined	**1,518**	**304**	**1,399**	**280**

Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.
2. Data is for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory.

Source: AIHW National Mortality Database.

9.2 Remoteness area

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 2018i). Incidence and mortality rates were calculated according to the level of 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 H).

Inner regional areas record the highest rate of all cancers combined, prostate cancer and melanoma of the skin

Between 2010 and 2014, the age-standardised incidence rate of all cancers combined was highest in *Inner regional* areas (513 cases per 100,000 persons) and lowest in *Very remote* areas (445 per 100,000) (Figure 9.3).

Between 2010 and 2014, the age-standardised incidence rates decreased as remoteness increased for the following cancers:

- breast cancer
  (*Very remote* areas, 95 per 100,000 females–*Major cities*, 124 per 100,000 females)
- non-Hodgkin lymphoma
  (*Very remote* areas, 13 per 100,000 persons–*Major cities*, 20 per 100,000 persons)
- pancreatic cancer
  (*Very remote* areas, 10 per 100,000 persons–*Major cities*, 12 per 100,000 persons).

Between 2010 and 2014, the age-standardised incidence rates increased as remoteness increased for the following cancers:

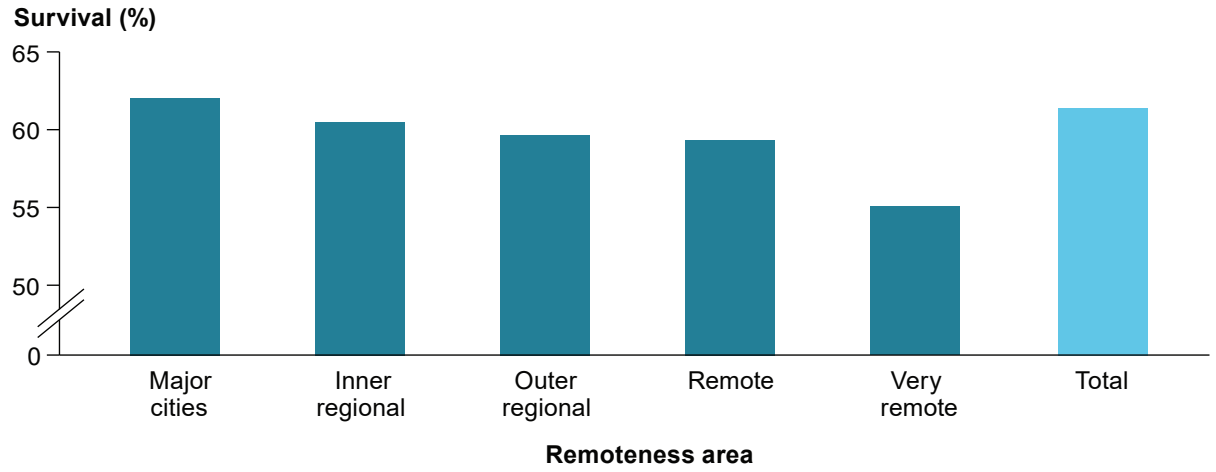
- head and neck
  (*Major cities*, 16 per 100,000 persons–*Very remote* areas, 30 per 100,000 persons)
- lung cancer
  (*Major cities*, 42 per 100,000 persons–*Very remote* areas, 59 per 100,000 persons)
- Cancer of unknown primary site
  (*Major cities*, 9.3 per 100,000 persons–*Very remote* areas, 15 per 100,000 persons).

Inner regional areas had the highest age-standardised incidence rates for prostate cancer (165 per 100,000 males), melanoma of the skin (60 per 100,000 persons) and kidney cancer (13 per 100,000 persons). For each of these cancers, *Very remote* areas had the lowest rates (116 per 100,000 males, 33 per 100,000 persons and 11 per 100,000 persons, respectively) (online Table S9.3).

Cancer survival rates generally decrease as remoteness increases

In 2010–2014, *Major cities* had the highest 5-year observed survival for all cancers combined (62%) while *Very remote* areas recorded the lowest rate (55%) (Figure 9.2).

Figure 9.2: 5-year observed survival for all cancers combined, 2010–2014, by remoteness area



Notes

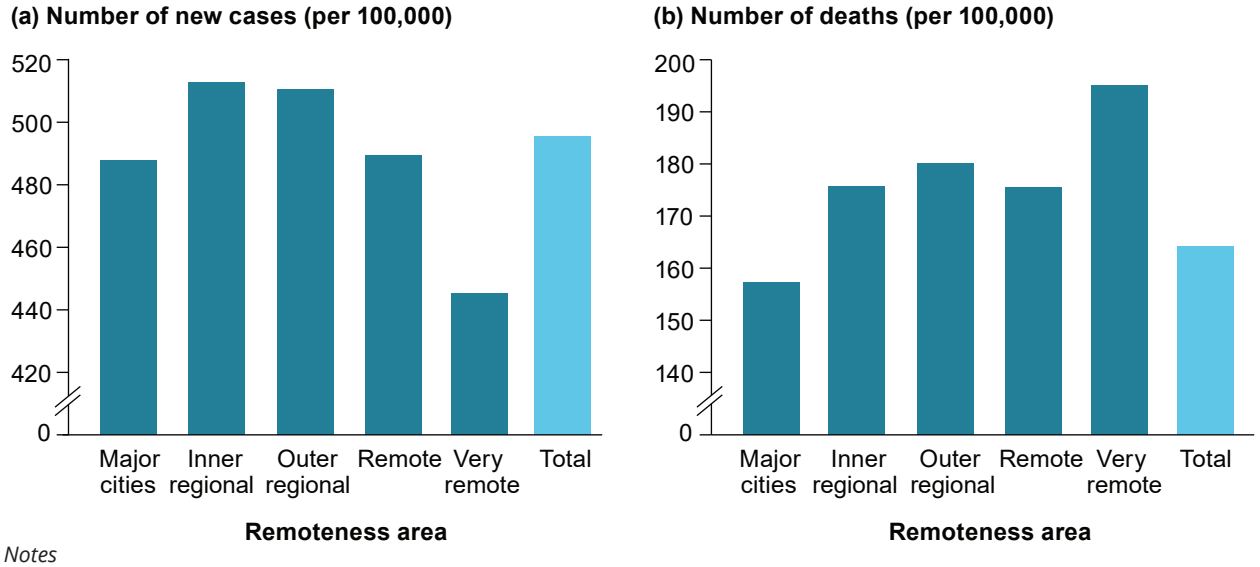
1. Geography is based on area of usual residence (Statistical Local Area, Level 2) at time of diagnosis/death. The area of usual residence was then classified according to Remoteness Area 2011 (see Appendix H).
2. Data for this figure are in online Table S9.4.

Source: AIHW ACD 2015.

Very remote areas have the highest rate of cancer-related deaths

Between 2012 and 2016, the age-standardised mortality rate for all cancers combined was highest in *Very remote* areas (195 deaths per 100,000 persons) and lowest in *Major cities* (157 per 100,000 persons) (Figure 9.3).

Figure 9.3: Incidence of all cancers combined, 2010–2014[(a)] and mortality for all cancers combined, 2012–2016, 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 2011 (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 S9.3.

Sources: AIHW ACD 2015; AIHW National Mortality Database.

Between 2012 and 2016, *Very remote* areas had the highest age-standardised mortality rate for breast cancer (23 per 100,000 females); *Remote* areas had the lowest rate for breast cancer (18 per 100,000 females) (online Table S9.3).

Very remote areas also had the highest age-standardised mortality rate for cancer of unknown primary site (13 per 100,000 persons), head and neck cancers (13 per 100,000 persons) liver cancer (11 per 100,000 persons) and lung cancer (42 per 100,000 persons) (online Table S9.3).

Major cities had the lowest age-standardised mortality rate for cancer of unknown primary site (8.7 per 100,000 persons), head and neck cancer (3.5 per 100,000 persons), lung cancer (29 per 100,000 persons) and prostate cancer (24 per 100,000 males) (online Table S9.3).

Inner regional areas had the highest age-standardised mortality rates for melanoma of the skin (6.7 per 100,000 persons), non-Hodgkin lymphoma (5.7 per 100,000 persons) and prostate cancer (30 per 100,000 males). *Outer regional* areas recorded the highest age-standardised mortality rates for colorectal cancer (23 per 100,000 persons), pancreatic cancer (10 per 100,000 persons) and kidney cancer (4 per 100,000 persons) (online Table S9.3).

9.3 Socioeconomic area

The Index of Relative Socio-economic Disadvantage (IRSD) is used to indicate socioeconomic groups. 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 is an area-based measure of socioeconomic group rather than a personbased measure (see Appendix H).

In the following paragraphs, a rising scale is used where socioeconomic group 1 represents people living in the lowest socioeconomic areas (that is, highest socioeconomic disadvantage) and socioeconomic group 5 represents people living in the highest socioeconomic areas (that is, most socioeconomic advantage).

People living in disadvantaged areas had higher rates of cancer

Between 2010 and 2014, 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 9.5).

Between 2010 and 2014, the age-standardised incidence rates increased as disadvantage increased for the following cancers:

- cervical (6 cases per 100,000 females to 9.1 per 100,000 females)
- colorectal (53 per 100,000 persons to 63 per 100,000 persons)
- head and neck (14 per 100,000 persons to 22 per 100,000 persons)
- kidney (11 per 100,000 persons to 14 per 100,000 persons)
- unknown primary site (8 per 100,000 persons to 12 per 100,000 persons)
- uterus (17 per 100,000 females to 20 per 100,000 females).

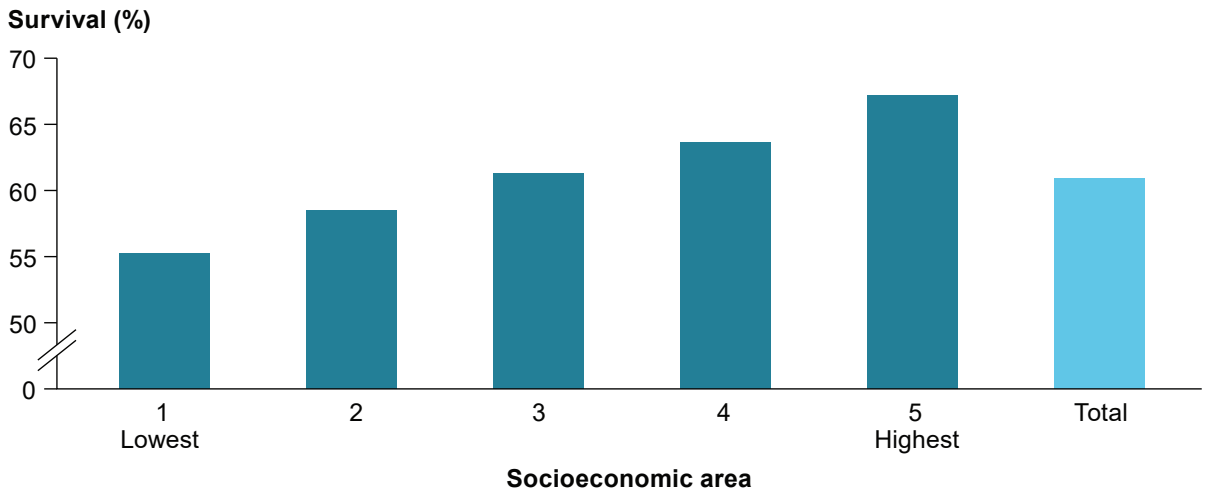
Between 2010 and 2014, the age-standardised incidence rates increased as advantage increased for breast cancer (113 per 100,000 females to 135 per 100,000 females) and prostate cancer (149 per 100,000 males to 180 per 100,000 males) (online Table S9.5).

Cancer survival rates decreased as socioeconomic disadvantage increased

Between 2010 and 2014, the 5-year observed cancer survival rate for all cancers combined was 67% for those living in the areas with the most socioeconomic advantage. Five-year observed survival decreased as socioeconomic disadvantage increased, with those in the lowest socioeconomic area recording 5-year observed survival rates of 55% (Figure 9.4).

Between 2010 and 2014, some of the larger 5-year observed survival rate differences occurred between the most and least socioeconomic disadvantaged for cervical cancer (79% compared with 61%), head and neck cancer (with lip) (69% compared with 59%), non-Hodgkin lymphoma (71% compared with 61%), kidney cancer (74% compared with 66%), colorectal cancer (63% compared with 56%) and prostate cancer (87% and 80%); for each of these cancers the people living in the most socioeconomically disadvantaged areas had the lowest 5-year observed survival rate.

Figure 9.4: 5-year observed survival for all cancers combined, 2010–2014, by quintile 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 S9.6.

Source: AIHW ACD 2015.

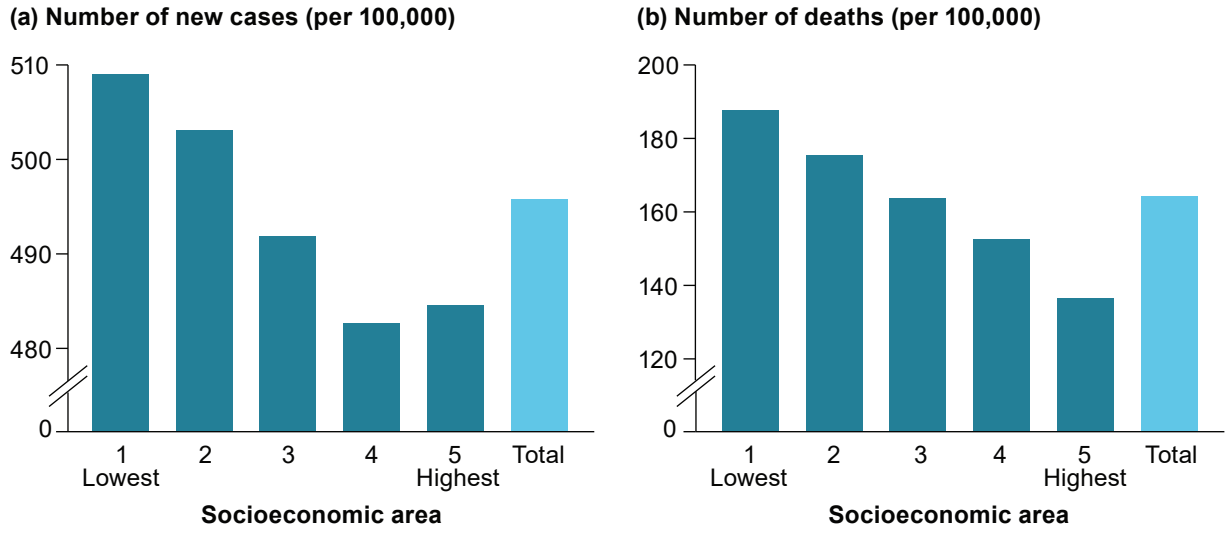
Cancer mortality rates were highest for those living in disadvantaged areas

Between 2012 and 2016, the age-standardised mortality rate for all cancers combined was highest among those living in the lowest socioeconomic areas (187 deaths per 100,000 persons) and lowest among those living in the highest socioeconomic areas (136 per 100,000) (Figure 9.5).

In the same period, age-standardised mortality rates for different types of cancer generally increased as disadvantage increased. There were larger differences between age-standardised rates for the following cancers:

- lung cancer (21 per 100,000 persons in the most advantaged areas compared with 39 in the most disadvantaged areas)
- prostate cancer (23 per 100,000 males in the most advantaged areas compared with 29 in the most disadvantaged areas)
- colorectal cancer (16 per 100,000 persons in the most advantaged areas compared with 22 in the most disadvantaged areas)
- cancer of unknown primary site (6.9 per 100,000 persons in the most advantaged areas compared with 11 in the most disadvantaged areas) (online Table S9.5).

Figure 9.5: Incidence of all cancers combined, 2010–2014[(a)] and mortality for all cancers combined, 2012–2016, by quintile 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 S9.5.

Sources: AIHW ACD 2015; AIHW National Mortality Database.

9.4 State and territory

Queensland records the highest rate for all cancers combined and melanoma of the skin

Between 2010 and 2014, the average annual number of cancer cases diagnosed ranged from 744 in the Northern Territory to 41,677 in New South Wales. When the size and age structure of the population in each state and territory were considered, the highest incidence rates of all cancers combined were in Queensland (534 per 100,000) and Tasmania (502 per 100,000). The incidence rates were lowest in the Australian Capital Territory (455 per 100,000) and the Northern Territory (466 per 100,000) (Table 9.3).

Table 9.3: Incidence of all cancers combined, by state and territory, 2010–2014

State or territory	Number of new cases	Average number of new cases	ASR (per 100,000)
New South Wales	208,385	41,677	500.2
Victoria	149,137	29,827	473.0
Queensland	129,238	25,848	534.2
Western Australia	60,009	12,002	486.3
South Australia	48,465	9,693	475.8
Tasmania	16,126	3,225	501.6
Australian Capital Territory	8,047	1,609	455.3
Northern Territory	3,721	744	466.2
Australia	**623,128**	**124,626**	**495.7**

Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5, except those C44 codes that indicate a basal or squamous cell carcinoma of the skin.
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.

Source: AIHW ACD 2015.

The incidence of different types of cancer varies across states and territories. While the Northern Territory records the second lowest incidence of all cancers combined, it had the highest incidence of head and neck cancer (31 per 100,000 persons), liver cancer (13 per 100,000 persons), pancreatic cancer (14 per 100,000 persons), lung cancer (56 per 100,000 persons), and cancer of unknown primary site (18 per 100,000 persons). Queensland had the highest age-standardised rate for all cancers combined but of the selected cancers records the highest age-standardised rate only for melanoma of the skin (72 per 100,000 persons) (online Table S9.7).

Northern Territory records the highest cancer mortality rate

Between 2012 and 2016, the average annual number of deaths from all cancers combined ranged from 291 in the Northern Territory to 15,010 in New South Wales. After taking the size and age structure of the population in each state and territory into consideration, the mortality rate for all cancers combined was highest in the Northern Territory (212 per 100,000) followed by Tasmania (189 per 100,000). The mortality rates were lowest in the Australian Capital Territory (148 per 100,000) and Victoria (158 per 100,000) (Table 9.4).

Due to the differences in data sources and analysis approaches, mortality data in this chapter are not directly comparable with those published by individual state and territory cancer registries. Mortality data in this chapter were derived using the place of a person's residence at the time of *death*. In contrast, some state and territory cancer registries present mortality information based on a person's place of residence at the time of *diagnosis*. In the latter data, the deaths may or may not have occurred in the state or territory indicated (see Appendix C for more details).

Table 9.4: Mortality for all cancers combined, by state and territory, 2012–2016

State or territory	Number of deaths	Average number of deaths per year	ASR (per 100,000)
New South Wales	75,050	15,010	165.2
Victoria	54,604	10,921	157.7
Queensland	44,151	8,830	171.4
Western Australia	20,510	4,102	158.7
South Australia	18,461	3,692	163.5
Tasmania	6,544	1,309	188.5
Australian Capital Territory	2,687	537	147.6
Northern Territory	1,455	291	212.3
Australia	**223,474**	**44,695**	**164.3**

Notes

1. All cancers combined includes cancers coded in the ICD-10 as C00–C97, D45, D46, D47.1 and D47.3–D47.5.
2. Mortality data may not be comparable with mortality data published in state and territory cancer reports since the data shown in this report relate to the place of residence at the time of *death*, not the place of residence at the time of *diagnosis*, as shown in some state and territory reports. Further, the state and territory cancer registries may use a different methodology from that used by the ABS to determine the cause of death.
3. Total includes records with 'unknown' jurisdictions.
4. 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.

Source: AIHW National Mortality Database.

The Northern Territory records the highest age-standardised mortality rate overall and for a range of specific cancers including:

- lung cancer (43 per 100,000 persons)
- breast cancer (25 per 100,000 females)
- head and neck cancers (14 per 100,000 persons)
- liver cancer (13 per 100,000 persons).

The age-standardised mortality rates were lowest in the Australian Capital Territory for lung cancer (22 per 100,000 persons), head and neck cancers (2 per 100,000 persons) and liver cancer (5 per 100,000 persons) while Western Australia had the lowest rate for breast cancer (20 per 100,000 females).

Tasmania had the highest age-standardised mortality rates for colorectal cancer (24 per 100,000 persons) and pancreatic cancer (11 per 100,000 persons) (online Table S9.7).

Appendix A: Methodology for 2015 cancer incidence for NSW and cancer projections

Estimating 2015 cancer incidence for NSW (excluding prostate cancer)

With the exception of prostate cancer (which is explained in the following subsection), cancer incidence for NSW in 2015 was estimated by projecting the sex- and age-specific incidence rates observed in NSW during 2005–2014. The time series were stratified by the following variables:

- sex
- 5-year age group (0–4, ..., 80–84, 85+)
- 4-character ICD-O-3 topography code (C00.0, ..., C80.9)
- 4-digit ICD-O-3.1 histology code (8000, ..., 9992).

For each time series, the process was as described below:

- If any of the rates in the series was zero, the mean of the 10 rates was used as the estimate of the 2015 rate.
- If none of the rates was zero, least squares linear regression was used to find the straight line of best fit through the time series.
- A 5% level of significance was used to test the hypothesis that the slope of the line was different from zero.
- If the slope was not statistically significantly different from zero, the mean of the 10 rates was used as the estimate of the 2015 rate.
- If the slope was positive, the straight line of best fit was extrapolated to obtain the estimate of the 2015 rate.
- If the slope was negative, the time series was fitted with a log-linear model (that is, the logs of the rates were fitted with a straight line), the line was extrapolated 1 year ahead to give an estimate of log(rate) for 2015 and this was converted to an estimate of the rate for 2015.
- The estimated incidence rates for 2015 were then multiplied by the Estimated Resident Populations for 2015 to obtain the estimated incidence numbers.

Estimating 2015 prostate cancer incidence for NSW

Due to the effect of PSA testing, prostate cancer incidence rates have fluctuated considerably over time, making the methodology described in the previous subsection unreliable for estimating the incidence of prostate cancer. Instead, the estimates of 2015 prostate cancer incidence for NSW were based on the relationship between the age-specific incidence rates in NSW and those in the other 7 states and territories combined. These combined jurisdictions will be referred to as the single jurisdiction OTH in what follows (OTH for 'other'). The general procedure is as follows.

For a given age group, for each year between 2005 and 2014 divide the age-specific incidence rate in NSW by the age-specific incidence rate in OTH. Use the average of these 10 ratios as the estimated ratio for 2015. Multiply the estimated ratio for 2015 by the actual age-specific incidence rate in OTH for 2015. This gives the estimated age-specific incidence rate for 2015 for NSW, which can then be converted to a count by multiplying by the relevant population.

The procedure described in the previous paragraph breaks down if any of the 10 incidence rates in OTH is zero. This happens to occur for each age group 0–4 to 30–34. In these cases, calculate the age-specific incidence rates in NSW and OTH for the 10 years 2005–2014 combined instead of separately. Divide the NSW rate by the OTH rate to obtain the estimate of the 2015 ratio and then proceed as above.

The procedure described in the previous paragraph breaks down if all of the 10 incidence rates in OTH are zero. This happens to occur for age group 5–9. In this case, calculate the age-specific incidence rate in NSW for the 10 years 2005–2014 combined and use it as the estimate for the age-specific incidence rate for 2015. Then proceed as above.

Projections—estimating the incidence of cancer, excluding prostate cancer

Estimates of national incidence in 2016–2021 were calculated using the same approach as discussed in the above section 'Estimating 2015 cancer incidence for NSW'. Note the following:

- Estimates were made for Australia as a whole, not for individual jurisdictions.
- Instead of using the topography and histology codes to define the cancer groups, ICD-10 codes were used (for example, breast or melanoma of the skin as well as groupings such as head and neck cancers which is a consolidation of cancers of the lip, tongue, mouth, salivary glands, oropharynx, nasopharynx, hypopharynx and other sites in the pharynx).
- The incidence estimates already made for 2015 for NSW were treated as real data for the purposes of estimating Australian incidence for 2016–2021.
- The 10 years of incidence data used as the baseline were 2006–2015.
- For populations, the ABS Estimated Resident Populations were used for 2006–2017, and the ABS population projection series 29(B) for 2018–2021 (ABS 2013).

Projections—estimating the incidence of prostate cancer

MBS item 66655 (PSA test) enables testing activity for prostate cancer to be quantified. At the time this analysis was undertaken, the number of services of item 66655 was available up to the end of 2017. It has been noted previously that there is a positive correlation between the number of services of item 66655 in a given year and the incidence of prostate cancer in the following year (AIHW & AACR 2012). This relationship is employed in the following explanation of how the estimates of prostate cancer incidence for 2016–2018 were derived. The data used were as follows:

- year: 2002, ..., 2017
- MBS age group: 0–4, then 10-year age groups 5–14, ..., 75–84, and 85+
- prostate cancer incidence: number of cases of prostate cancer, 2003–2015
- PSA tests: number of services of item 66655 in 2002–2017 (Medicare Australia). By hypothesis, these data are correlated with incidence in 2003–2018.

The number of cases and number of tests were converted to case rates and claim rates by dividing by the relevant populations. A combination of visual data exploration and linear or log-linear regression was used to model the case rate as a function of the claim rate and/or year. Estimated case rates for 2016–2018 were obtained by applying the model to the PSA data for 2015–2017. Estimated incidence counts for 2016–2018 were obtained by multiplying the case rates by the relevant populations.

The final step was to convert the estimated incidence counts for the 10-year MBS age groups (5–14, ..., 75–84) to 5-year age groups, consistent with incidence data. For a given 10-year age group the 'younger age group' is defined to be the 5-year age group consisting of the first 5 years of the range and the 'older age group' is defined as the other 5 years. The data used in this step were as follows:

- year: 2003, ..., 2018
- 10-year age group: 5–14, 15–19, ..., 75–84
- number of cases in each 10-year age group, including estimates for 2016–2018
- number of cases in each younger age group, 5–9, 15–19, ..., 75–79 for 2003–2015.

Linear regression was used to model the number of cases in the younger age group as a function of year and number of cases in the 10-year age group. The estimated number of cases in the younger age group for 2016–2018 was obtained by applying the model to those years. The estimated number of cases in the older age group was obtained by subtracting the estimate for the younger age group from the estimate for the 10-year age group.

At this point, there were incidence estimates available for each 5-year age group for each year from 2016 to 2018. Estimates for 2019 could not be obtained by the same method as there were no PSA data for 2018 available at the time of the analysis. Projections for 2019–2021 were carried out using the methodology that was used for all other cancers except that 2009–2018 was used as the baseline instead of 2006–2015.

Projections—estimating the mortality of cancer

This method is the same as the incidence projections with the exceptions that:

- the 10-year baseline for incidence is 2006–2015 while the baseline for mortality is 2007–2016
- NSW 2015 data are obtained from the NMD and are not estimated.

Appendix B: Cancer codes

Table B1: Cancer codes

Cancer site/type	ICD-10 codes
Lip, oral cavity and pharynx	
Lip	C00
Tongue	C01–C02
Mouth	C03–C06
Salivary glands	C07–C08
Oropharynx	C09–C10
Nasopharynx	C11
Hypopharynx	C12–C13
Other sites in pharynx, etc.	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 digestive organs	C26
Respiratory system and intrathoracic organs	
Nose, sinuses, etc.	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 of the skin	C44
Mesothelial and soft tissue	
Mesothelioma	C45
Kaposi sarcoma	C46
Peritoneum	C48
Other soft tissue	C47, C49
Breast	C50

continued

Cancer site/type	ICD-10 codes
Female genital organs	
Vulva	C51
Vagina	C52
Cervix	C53
Uterus	C54–C55
Ovary	C56
Other female genital organs and placenta	C57–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
Thyroid and other endocrine glands	
Thyroid	C73
Other endocrine glands	C74–C75
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 (ALL)	C91.0
Chronic lymphocytic leukaemia (CLL)	C91.1
Other and unspecified lymphoid leukaemia	C91.2–C91.9
Acute myeloid leukaemia (AML)	C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5
Chronic myelogenous leukaemia (CML)	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	C94.1, C94.3, C95
Myelodysplastic syndromes	D46
Other cancers of the blood and lymphatic system	C96, D45, D47.1, D47.3–D47.5

continued

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 incidence and survival data, those C44 codes that indicate basal or squamous cell carcinoma of the skin are not included.
2. For mortality data before 2008, unknown primary site is coded as C77–C80. For mortality data before 2013, C97 was an applicable code.
3. For mortality data, colorectal cancer includes (C18–C20) C26.0.

Table B2: ICD-10 codes for non-malignant tumours

Non-malignant tumour site/type	ICD-10 codes
Melanoma in situ of the skin	D03
Carcinoma in situ of the breast	D05
Carcinoma in situ of the cervix	D06

Notes

1. Melanoma in situ of the skin is coded as D03 where the topography code is C44.
2. Carcinoma in situ of the breast includes only those cases where a malignant breast cancer case was not recorded within the 4 months leading up to and after the date of diagnosis of the in situ tumour.
3. Carcinoma in situ of the cervix includes only those cases where a malignant cervical cancer case was not recorded within the 4 months leading up to and after the date of diagnosis of the in situ tumour.

Table B3: Central Brain Tumour Registry of the United States (CBTRUS) histology groupings for benign (/0) and uncertainbehaviour neoplasms (/1) of the brain and other CNS, modified for Australian context

Histology group	ICDO3 histology codes and behaviours
Neuroepithelial Tissue	
Pilocytic astrocytoma	9421/1
Unique astrocytoma variants	9384/1
Ependymal tumours	9383/1, 9394/1
Glioma malignant, NOS	9431/1, 9432/1
Choroid plexus tumours	9390/0,1
Other neuroepithelial tumours	9363/0, 9444/1
Neuronal and mixed neuronalglial tumours	8680/0,1, 8681/1, 8690/1, 8693/1, 9412/1, 9413/0, 9442/1, 9492/0 (excluding site C75.1), 9493/0, 9505/1, 9506/1, 9509/1
Tumours of the pineal region	9360/1, 9361/1
Embryonal tumours	9490/0
Cranial and Spinal Nerves	9540/0,1, 9541/0, 9550/0, 9560/0,1, 9570/0, 9571/0, 9562/0
Meninges	9530/0,1, 9531/0, 9532/0, 9533/0, 9534/0, 9537/0, 9538/1, 9539/1, 8324/0, 8800/0, 8810/0, 8815/0, 8824/0,1, 8830/0,1, 8831/0, 8835/1, 8836/1, 8850/0,1, 8851/0, 8852/0, 8854/0, 8857/0, 8861/0, 8870/0, 8880/0, 8890/0,1, 8897/1, 8900/0, 8920/1, 8935/0,1, 8990/0,1, 9040/0, 9136/1, 9150/0,1, 9170/0, 9180/0, 9210/0, 9241/0, 9373/0, 8728/0,1, 8770/0, 8771/0, 9161/1, 9220/0,1, 9535/0
Germ Cell Tumours and Cysts	8440/0, 9080/0,1, 9084/0
Sellar Region	8040/0,1, 8140/0,1, 8146/0, 8260/0, 8270/0, 8271/0, 8272/0, 8280/0, 8281/0, 8290/0, 8300/0, 8310/0, 8323/0, 9492/0 (site C75.1 only), 9582/0, 9350/1, 9351/1, 9352/1
Unclassified	9120/0, 9121/0, 9122/0, 9123/0, 9125/0, 9130/0,1, 9131/0, 9133/1, 8000/0,1, 8001/0,1, 8005/0, 8010/0, 8452/1, 8711/0, 8713/0, 8811/0, 8840/0, 9173/0, 9580/0

Note: The original CBTRUS classification includes the codes 9421/1, 9431/1 and 9432/1 (groups 1.01 and 1.04 in this table) with malignant neoplasms (see previous table). For the Australian context these codes have been classfied as nonmalignant (see next table) because they are not notifiable in all jurisdictions.

Source: Ostrom et al. 2016.

Appendix C: Data sources

2014–15 National Health Survey

In the 2014–15 National Health Survey, about 14,700 private dwellings across Australia were surveyed, with a total of 19,259 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 one 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, use of health services and demographic and socioeconomic characteristics.

2017–18 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 one 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.

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 nonfatal 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 Australian Health Survey 2011–12 and the National Drug Strategy Household Survey 2007 and 2010.

Other inputs for the ABDS were obtained from the 2010 or 2013 Global Burden of Disease. 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 2011: methods and supplementary material* (AIHW 2016c).

ABS 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 at www.abs.gov.au.

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 ACD. The ACD currently contains data on all cases of cancer diagnosed from 1982 to 2015 for all states and territories with the exception of 2015 New South Wales 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.

The Data Quality Statement for the ACD 2014 can be found at https://meteor.aihw.gov.au/content/index.phtml/itemId/687104.

Australian Mesothelioma Registry (AMR)

The 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 very similar counts of new cases. Between 2010 and 2014, the AMR and ACD counts of new cases were no more than 2 apart (in 2014 the AMR recorded 770 new cases while the ACD recorded 768).

In 2015 the number of new cases in the AMR is 734, while the 2015 ACD count is 727. Differences between the ACD and AMR in 2015 may be due to NSW data within the 2015 ACD being based on projections (see Appendix A) while the AMR data include only actual cases.

BreastScreen Australia Program

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 1.1* (AIHW 2015). These data are compiled into national figures by the AIHW to allow national monitoring of BreastScreen Australia.

GLOBOCAN

The GLOBOCAN database, prepared by the IARC, contains cancer incidence and mortality data from cancer registries around the world (Global Cancer Observatory (IARC) 2018). The IARC uses these data to produce estimates for a 'common year'. The most recent GLOBOCAN estimates are for 2018 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 (that is, 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.

National Bowel Cancer Screening Program data

Data from the National Bowel Cancer Screening Register were used to indicate both the number of people who participated in the National Bowel Cancer Screening Program 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 2018d).

The Data Quality Statement for the National Bowel Cancer Screening Program can be found at http://meteor.aihw.gov.au/content/index.phtml/itemId/668817.

National Cervical Screening Program data

Data on the number of women who participated in the National Cervical Screening Program and the number of women with a highgrade 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 cancer prevention data dictionary version 1: working paper* (AIHW 2014). These data are compiled into national figures by the AIHW to allow national monitoring of the NCSP.

The Data Quality Statement for cervical screening data can be found on the AIHW website at http://meteor.aihw.gov.au/content/index.phtml/itemId/668824.

National Death Index

The 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.

The Data Quality Statement for the NDI can be found at http://meteor.aihw.gov.au/content/index.phtml/itemId/480010.

The Data Quality Statement for BreastScreen Australia data can be found at http://meteor.aihw.gov.au/content/index.phtml/itemId/ 668821.

National Hospital Morbidity Database

The AIHW 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 E.
The Data Quality Statement for the AIHW NHMD 2014–15 can be found at http://meteor.aihw.gov.au/content/index.phtml/itemId/638202.

National Mortality Database

The AIHW 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 2016. 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 2016) 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 2014 and earlier are based on the final version of cause of death data; deaths registered in 2015 and 2016 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.

The data quality statements underpinning the AIHW NMD can be found on the following ABS internet pages:

- ABS quality declaration summary for Deaths, Australia (ABS cat. no. 3302.0) http://www.abs.gov.au/ausstats/abs%40.nsf/mf/3302.0/
- ABS quality declaration summary for Causes of death, Australia (ABS cat. no. 3303.0) http://www.abs.gov.au/ausstats/abs%40.nsf/mf/3303.0/.

For more information on the AIHW NMD see *Deaths data at AIHW* http://www.aihw.gov.au/deaths/aihw-deaths-data/.

National Radiotherapy Waiting Times Database

The National Radiotherapy Waiting Times Database (NRWTD) (METeOR identifier: 598445) is a compilation of data supplied to the AIHW based on the Radiotherapy Waiting Times NMDS (METeOR identifier: 579304).

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).

The Data Quality Statement for the National Radiotherapy Waiting Times Database can be found at http://meteor.aihw.gov.au/content/index.phtml/itemId/696042.

Medicare Benefits Schedule database

Medicare provides free or subsidised access to a range of medical services. The MBS database is maintained by the 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 the Department of Human Services 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 the Department of Human Services. For more information on the specific MBS item numbers used in this report, see Table C1.

Table C1: MBS items

Procedure	MBS items
Breast MRI	63457, 63464, 63467
Breast ultrasound:	55059, 55060, 55070, 55073, 55061, 55062, 55076, 55079
Colonoscopies	32084, 32087, 32090, 32093
Mammogram	59300, 59301, 59303, 59304
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

See the website http://www.mbsonline.gov.au/ for more information on MBS item numbers.

Appendix D: Cancer incidence, mortality and survival for all cancer groupings

Table D1: Incidence (2015), mortality (2016) and 5-year relative survival (2011–2015) by cancer site/type, persons, Australia

	Incidence		Mortality		Survival
Cancer site/type (ICD-10 codes)	**Number**	**ASR**	**Number**	**ASR**	**Relative survival (%)**
Lip cancer (C00)	935	3.6	7	0.0	93.3
Tongue cancer (C01–C02)	865	3.2	212	0.7	67.1
Mouth cancer (C03–C06)	598	2.2	135	0.5	60.1
Cancer of salivary glands (C07–C08)	331	1.2	109	0.4	76.4
Oropharyngeal cancer (C09–C10)	678	2.6	180	0.6	68.6
Nasopharyngeal cancer (C11)	131	0.5	67	0.2	69.5
Hypopharyngeal cancer (C12–C13)	177	0.6	51	0.2	35.3
Cancer of other sites in pharynx, etc. (C14)	69	0.2	85	0.3	36.5
Oesophageal cancer (C15)	1,469	5.3	1,338	4.7	22.0
Stomach cancer (C16)	2,222	8.1	1,087	3.8	30.3
Cancer of the small intestines (C17)	532	2.0	120	0.4	66.0
Colorectal cancer (C18–C20)	15,604	57.4	5,375	18.7	69.9
Anal cancer (C21)	421	1.6	87	0.3	68.9
Liver cancer (C22)	2,079	7.6	1,864	6.6	18.5
Cancer of the gallbladder and extrahepatic bile ducts (C23–C24)	891	3.2	269	0.9	20.1
Pancreatic cancer (C25)	3,307	11.9	2,911	10.2	9.8
Cancer of other digestive organs (C26)	273	0.9	122	0.4	8.8
Cancer of nose, sinuses, etc. (C30–C31)	211	0.8	40	0.1	57.8
Laryngeal cancer (C32)	638	2.3	194	0.7	65.0
Lung cancer (C33–C34)	11,788	42.8	8,410	29.5	17.4
Cancer of other thoracic and respiratory organs (C37–C39)	118	0.5	48	0.2	58.8
Bone cancer (C40–C41)	255	1.0	100	0.4	69.6
Melanoma of the skin (C43)	13,694	51.8	1,281	4.5	91.0
Non-melanoma of the skin (C44)	953	3.5	679	2.3	70.8
Mesothelioma (C45)	727	2.6	672	2.3	6.1
Kaposi sarcoma (C46)	60	0.2	3	0.0	84.8
Peritoneum cancer (C48)	201	0.8	76	0.3	41.2
Other soft tissue cancer(C47, C49)	744	2.9	336	1.2	66.9

continued

Cancer site/type (ICD-10 codes)	Incidence		Mortality		Survival
	Number	ASR	Number	ASR	Relative survival (%)
Breast cancer (C50)	17,004	64.7	3,004	10.7	90.8
Vulva cancer (C51)	349	2.4	88	0.5	73.0
Vaginal cancer (C52)	91	0.6	35	0.2	47.7
Cervical cancer (C53)	857	6.9	259	1.9	73.5
Uterine cancer (C54–C55)	2,723	19.3	527	3.5	83.3
Ovarian cancer (C56)	1,365	9.8	938	6.2	45.7
Cancer of other female genital organs and placenta (C57–C58)	276	2.0	37	0.3	54.8
Cancer of the penis (C60)	103	0.8	19	0.1	72.4
Prostate cancer (C61)	18,878	140.9	3,248	25.2	95.2
Cancer of other male genitals (C63)	40	0.3	4	0.0	79.3
Kidney cancer (C64)	3,382	12.7	953	3.3	77.4
Bladder cancer (C67)	2,770	10.0	1,019	3.4	53.5
Cancer of other urinary organs (C65–C66, C68)	503	1.8	355	1.2	40.9
Eye cancer (C69)	354	1.3	49	0.2	78.8
Brain cancer (C71)	1,787	6.9	1,439	5.3	22.1
Cancer of other central nervous system (C70, C72)	81	0.3	19	0.1	73.7
Thyroid cancer (C73)	2,878	11.6	140	0.5	96.6
Cancer of other endocrine glands (C74–C75)	119	0.5	47	0.2	62.0
Hodgkin lymphoma (C81)	647	2.7	82	0.3	87.0
Non-Hodgkin lymphoma (C82–C86)	5,031	18.7	1,471	5.1	74.6
Immunoproliferative cancers (C88)	288	1.1	42	0.1	88.0
Multiple myeloma (C90.0)	1,885	6.9	905	3.2	50.7
Other plasma cell cancers (C90.1–C90.9)	87	0.3	21	0.1	62.0
Acute lymphoblastic leukaemia (ALL) (C91.0)	389	1.6	97	0.4	74.0
Chronic lymphocytic leukaemia (CLL) (C91.1)	1,597	5.8	339	1.1	82.8
Other and unspecified lymphoid leukaemia (C91.2–C91.9)	162	0.6	42	0.1	81.3
Acute myeloid leukaemia (AML) (C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5)	1,042	3.9	971	3.5	28.0
Chronic myelogenous leukaemia (CML) (C92.1)	317	1.2	110	0.4	83.5
Other and unspecified myeloid leukaemia (C92.2, C92.7, C92.9, C93.1–C93.9, C94.6–C94.7)	336	1.2	137	0.5	36.0
Other and unspecified leukaemia (C94.1, C94.3, C95)	62	0.2	127	0.4	16.1
Myelodysplastic syndromes (D46)	1,312	4.7	443	1.5	37.3

continued

Cancer site/type (ICD-10 codes)	Incidence		Mortality		Survival
	Number	ASR	Number	ASR	Relative survival (%)
Other cancers of blood and lymphatic system (C96, D45, D47.1, D47.3–D47.5)	1,205	4.5	223	0.8	78.1
Cancer of other and ill-defined sites (C76)	85	0.3	156	0.5	56.2
Cancer of unknown primary site (C80)	2,621	9.2	2,554	8.8	13.3
All cancers combined (C00–C97, D45, D46, D47.1, D47.3–D47.5)	**131,452**	**486.9**	**45,782**	**160.0**	**68.9**

Notes

1. The 2014 incidence data include estimates for NSW. See Appendix A for more details.
2. Deaths registered in 2014 and earlier are based on the final version of cause of death data; deaths registered in 2015 and 2016 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
3. Relative survival was calculated with the period method, using the period 2011–2015 (Brenner & Gefeller 1996). Note that this period does not contain incidence data for 2015 for NSW (see Appendix A).
4. ASR refers to the age-standardised rate. The rates were age standardised to the Australian population as at 30 June 2001 and expressed per 100,000 population.
5. For incidence and survival data, those C44 codes that indicate basal or squamous cell carcinoma of the skin are not included.
6. For mortality data before 2008, unknown primary site is coded as C77–C80.
7. For incidence and survival data, colorectal cancer is coded as C18–C20. For mortality data, colorectal cancer is coded as C18–C20 and C26.0.
8. For incidence and survival data, cancer of other digestive organs is coded as C26. For mortality data, cancer of other digestive organs is coded as C26.1, C26.8 and C26.9.

Sources: AIHW ACD 2015; AIHW National Mortality Database.

Appendix E: 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 noncancer 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 E1: Definition of cancer-related hospitalisations

	ICD-10-AM codes	
Definition	**Principal diagnosis**	**Additional diagnosis**
Principal diagnosis of cancer	C00–C96, 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)	Not a cancer code (C00–C96, D45, D46, D47.1, D47.3, D47.4, D47.5)

Note: Codes were sourced from the 8th edition of the (NCCC 2012).

Definition of chemotherapy procedures

For previous 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. For this report, the scope is 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 not directly comparable to results presented in previous editions of this report.

Table E2: 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 9th edition of the ACHI (ACCD 2015).

Table E3: 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–C96, D45, D46, D47.1, D47.3, D47.4, D47.5		1920, 1922
Additional diagnosis of a cancer	Z51.1 (Pharmacotherapy session for neoplasm)	C00–C96, D45, D46, D47.1, D47.3, D47.4, D47.5	1920, 1922
	Not a cancer code (C00–C96, D45, D46, D47.1, D47.3, D47.4, D47.5)	C00–C96, D45, D46, D47.1, D47.3, D47.4, D47.5	1920, 1922

Note: Codes were sourced from the 8th edition of the (NCCC 2012).

Palliative care-related hospitalisations

For the purpose of this report, a palliative care-related hospitalisation is defined as a hospitalisation 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 an additional diagnosis. See the AIHW report *Palliative care services in Australia* (AIHW 2018g).

Table E4: Definition of palliative care-related hospitalisations

	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 8th edition of the ACHI (NCCC 2012).

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 eighth 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 F: Statistical methods and technical notes

Age-specific rates

Age-specific rates provide information on the incidence of a particular event in an age group relative to the total number of people at risk of that event in the same age group. It is calculated by dividing the number of events occurring in each specified age group by the corresponding 'at-risk' population in the same age group and then multiplying the result by a constant (for example, 100,000) to derive the rate. Age-specific rates are often expressed per 100,000 population.

Age-standardised rates

A crude rate provides information on the number of, for example, new cases of cancer or deaths from cancer in the population at risk in a specified period. No age adjustments are made when calculating a crude rate. Since the risk of cancer depends heavily on age, crude rates are not suitable for looking at trends or making comparisons across groups in cancer incidence and mortality.

More meaningful comparisons can be made by using age-standardised rates (ASRs), with such rates adjusted for age in order to facilitate comparisons between populations that have different age structures—for example, between Indigenous people and other Australians. This standardisation process effectively removes the influence of age structure on the summary rate.

Two methods are commonly used to adjust for age: direct and indirect standardisation. In this report, the direct standardisation approach presented by Jensen and colleagues (1991) is used. To age-standardise using the direct method, the first step is to obtain population numbers and numbers of cases (or deaths) in age ranges—typically 5-year age ranges. The next step is to multiply the age-specific population numbers for the standard population (in this case, the Australian population at 30 June 2001) by the age-specific incidence rates (or death rates) for the population of interest (such as those in a certain socioeconomic group or those who live in *Major cities*). The third step is to sum across the age groups and divide this sum by the total of the standard population to give an ASR for the population of interest. Finally, this is expressed per 10,000 or 100,000 population, as appropriate.

Risk to age 75 or 85

The calculations of risk shown in this report are measures that approximate the risk of developing (or dying from) cancer before the age of 75 or 85, assuming that the risks at the time of estimation remained throughout life. Risk calculations are based on a mathematical relationship with the cumulative rate.

The cumulative rate is calculated by summing the age-specific rates for all specific age groups:

$$\text{Cumulative rate} = \frac{5 \times (\text{sum of the age-specific rates}) \times 100}{100{,}000}$$

The factor of 5 is used to indicate the 5 years of life in each age group and the factor of 100 is used to present the result as a percentage. As age-specific rates are presented per 100,000 population, the result is divided by 100,000 to return the age-specific rates to a division of cases by population.

Cumulative risk is related to cumulative rate by the expression:

$$\text{Cumulative risk} = 1 - e^{-rate/100}$$

where the rate is expressed as a percentage.

The risk is expressed as a '1 in *n*' proportion by taking the inverse of the above formula:

$$n = \frac{1}{\left(1 - e^{-rate/100}\right)}$$

For example, if *n* equals 3, the risk of a person in the general population being diagnosed with cancer before the age of 75 (or 85) is 1 in 3. Note that these figures are average risks for the total Australian population. An individual person's risk may be higher or lower than the estimated figures, depending on their particular risk factors.

Relative survival and observed survival

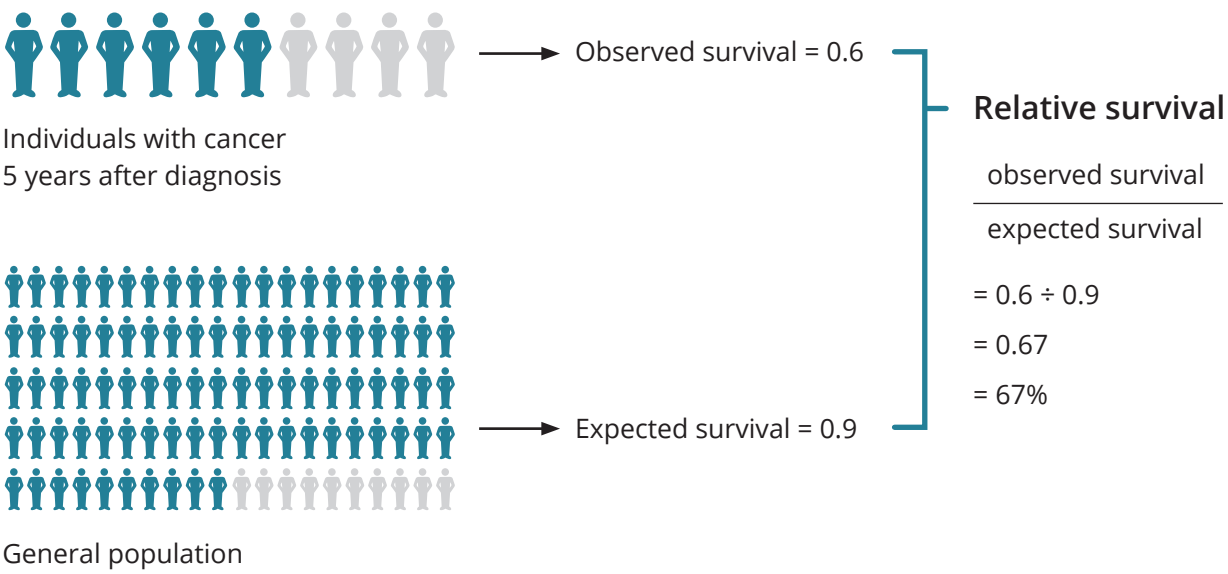
Relative survival is a measure of the survival of people with cancer compared with that of the general population. It is the standard approach used by cancer registries to produce population-level survival statistics and is commonly used as it does not require information on cause of death. Relative survival reflects the net survival (or excess mortality) associated with cancer by adjusting the survival experience of those with cancer for the underlying mortality that they would have experienced in the general population.

Relative survival is calculated by dividing observed survival by expected survival, where the numerator and denominator have been matched for age, sex and calendar year.

Observed survival refers to the proportion of people alive for a given amount of time after a diagnosis of cancer; it is calculated from population-based cancer data. Expected survival refers to the proportion of people in the general population alive for a given amount of time and is calculated from life tables of the entire Australian population, assumed to be cancer free.

A simplified example of how relative survival is interpreted is shown in Figure F1. Given that 6 in 10 people with cancer are alive 5 years after their diagnosis (observed survival of 0.6) and that 9 in 10 people from the general population are alive after the same 5 years (expected survival of 0.9), the relative survival of people with cancer would be calculated as 0.6 divided by 0.9, or 0.67. This means that individuals with cancer are 67% as likely to be alive for at least 5 years after their diagnosis as are their counterparts in the general population.

Figure F1: Simplified example of how relative survival is calculated



All observed survival was calculated from data in the ACD. Expected survival was calculated from the life tables of the entire Australian population, as well as the Australian population stratified by remoteness area and socioeconomic area. The Ederer II method was used to determine how long people in the general population are considered 'at risk'. It is the default approach, whereby matched people in the general population are considered to be at risk until the corresponding cancer patient dies or is censored (Ederer & Heise 1959).

The period method was used to calculate the survival estimates in this report (Brenner & Gefeller 1996), in which estimates are based on the survival experience during a given at-risk or follow-up period. Time at risk is left truncated at the start of the period and right censored at the end so that anyone who is diagnosed before this period and whose survival experience overlaps with this period would be included in the analysis.

All survival statistics in this report were produced using SAS statistical software and calculated using software written by Dickman (2004).

Calculation of conditional relative survival

Conditional survival is the probability of surviving *j* more days, given that an individual has already survived *i* days. It was calculated using the formula:

$$S(j|i) = \frac{S(i+j)}{S\,(i)}$$

where

$S(j|i)$ indicates the probability of surviving at least *j* more days given survival of at least *i* days

$S(i+j)$ indicates the probability of surviving at least *i*+*j* days

$S\,(i)$ indicates the probability of surviving at least *i* days.

Confidence intervals for conditional survival were calculated using a variation of Greenwood's (1926) formula for variance (Skuladottir & Olsen 2003):

$$\mathrm{Var}[S(j|i)] = \sum_{k=i+1}^{i+j} \frac{d_k}{r_k(r_k - d_k)}$$

where

d_k is the number of deaths

r_k is the number at risk during the kth interval.

The 95% confidence intervals were constructed assuming that conditional survival estimates follow a normal distribution.

Prevalence

Limited-duration prevalence is expressed as *N-year prevalence* throughout this report. *N-year prevalence* on a given index date—where *N* is any number 1, 2, 3 and so on—is defined as the number of people alive at the end of that day who had been diagnosed with cancer in the past *N* years.
For example:

- 1-year prevalence is the number of living people who were diagnosed in the past year to 31 December 2012
- 5-year prevalence is the number of living people who were diagnosed in the past 5 years to 31 December 2012. This includes the people defined by 1-year prevalence.

Note that prevalence is measured by the number of people diagnosed with cancer, not the number of cancer cases. An individual who was diagnosed with 2 separate cancers will contribute separately to the prevalence of each cancer. However, this individual will contribute only once to prevalence of all cancers combined. For this reason, the sum of prevalence for individual cancers will not equal the prevalence of all cancers combined.

Prevalence can be expressed as a proportion of the total population at the index date. In this report, the prevalence proportion is expressed per 10,000 population due to the relative size of the numerator and denominator. These are crude rates and have not been standardised.

Differences in limited-duration prevalence are presented according to age in the report. Note that while age for survival and incidence statistics refers to the age at diagnosis, prevalence age refers to the age at the point in time from which prevalence was calculated, or 31 December 2012 in this report. Therefore, a person diagnosed with cancer in 1982 who turned 50 that year would be counted as age 80 in the prevalence statistics (as at the end of 2012).

Mortality-to-incidence ratio

Both MIRs and relative survival ratios can be used to estimate survival from a particular disease (such as cancer) for a population. Although MIRs are the cruder of the two ratios, they do not have the same comparability and interpretation problems associated with them when trying to make international comparisons. Thus, the MIR is considered to be a better measure when comparing survival between countries.

The MIR is the number of deaths in a given year divided by the number of new cases in the same year. It is a number between 0 and 1 although it can exceed 1 in certain circumstances. The MIR is a measure of the fatality of the cancer in question: if no-one ever died of the cancer, the MIR would be 0; if everyone died on the same day they were diagnosed, the MIR would be 1. Low values of the MIR indicate longer survival while high values indicate shorter survival. In general, if the MIR is decreasing over time, we can conclude that survival is improving over time.

The MIR gives a valid measure of the survival experience in a population only if:

- cancer registration and death registration are complete or nearly so
- the incidence rate, mortality rate and survival proportion are not undergoing rapid change.

Average RD stage at diagnosis

The average RD stage at diagnosis is used to represent the average stage at which cancers are diagnosed. There are four RD stages of diagnosis (I, II, III and IV) and the lower the RD stage, the earlier the cancer has been detected. The average RD stage calculation is explained through the following example:

	RD stage at diagnosis					
Cancer type	**I**	**II**	**III**	**IV**	**Unknown**	**Total**
Breast cancer (females)						
Number of cases	6,110	4,936	1,721	660	788	14,215

Step 1: Calculate the total number of records where the RD stage is known:

Stage I records 6,110 + Stage II records 4,936 + Stage III records 1,721 +

Stage IV records 660 = Total records where RD stage is known 13,427.

Step 2: Calculate the proportion of records that occur at each stage of diagnosis:

Stage I (6,110 ÷ 13,427) = 0.45505

Stage II (4,936 ÷ 13,427) = 0.36762

Stage III (1,721 ÷ 13,427) = 0.12817

Stage IV (660 ÷ 13,427) = 0.04915

Step 3: Multiply the proportion for each RD stage at diagnosis by the number of the RD stage and then aggregate the results to arrive at the average RD stage at diagnosis.

Stage I 0. 45505 * 1 = 0.45505

Stage II 0. 36762 * 2 = 0.73523

Stage III 0. 12817 * 3 = 0.38452

Stage IV 0. 04915 * 4 = 0.19662

Average RD stage = 1.77143

Appendix G: 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. Appendix G notes the enhancements and impacts upon the data in the Cancer in Australia series.

Item 1 Aboriginal and Torres Strait Islander population projections

At the time of writing this report, Aboriginal and Torres Strait Islander population projections and estimates were available only where derived from the Aboriginal and Torres Strait Islander population estimate at 30 June 2011. The Aboriginal and Torres Strait Islander population at 30 June 2016 is 19% larger than the 2011 estimate. The ABS notes that the population increase is greater than demographic factors alone can explain.

Rather than publish age-standardised rates based on 2011 population projections which are likely to substantially overstate Indigenous incidence and mortality rates when compared with the anticipated rates using population projections derived from 2016 data, only counts are provided. Age-standardised rates of cancer for Indigenous Australians will be published in the future after Aboriginal and Torres Strait Islander population projections derived from 2016 data are available.

For this report, observed survival statistics for Indigenous Australians are presented in the 'Key population groups' chapter, but relative survival statistics are not. Relative survival statistics were not included because the available life tables are based on Aboriginal and Torres Strait Islander population data which, as discussed above, are outdated.

Item 2 Australian Cancer Database—Indigenous status

Improvements to the recording of Indigenous status in the most recent ACD resulted in the reduction of unknown Indigenous status and increasing cancer incidence counts for the Indigenous and non-Indigenous populations.

The average annual count of Indigenous Australians diagnosed with cancer in the 2017 edition of this publication was 1,189 (between 2008 and 2012). The revised number of Indigenous Australians diagnosed with cancer for the same period and based on more complete Indigenous data is 1,549.

Item 3 National Mortality Database—Colorectal cancer

The AIHW uses the National Mortality Database (NMD) for reporting cancer mortality. The NMD is coded and compiled by the ABS, and ABS advice notes that where 'bowel cancer' is recorded on the death certificate, internationally agreed rules state that the cancer should be coded to a less specific code (C26.0) as the specific site of the cancer is not known. The ABS advises that the use of code C26.0 for 'bowel cancer' deaths leads to an undercount of deaths due to colorectal cancer (C18–C20). For this reason, in *Cancer in Australia 2019* the AIHW uses C18–C20, and C26.0 when reporting deaths from colorectal cancer using the NMD. This is different to previous versions of this report and will result in a greater number of deaths being attributed to colorectal cancer.

Appendix H: 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.

Each unit record in the ACD contains the 2011 Statistical Areas Level 2 (SA2), but not the remoteness area. To calculate the cancer incidence rates by remoteness area, a correspondence was used to map the 2011 SA2 to the 2011 remoteness areas. Similarly, the cancer mortality rates by remoteness area were calculated by applying a correspondence from the 2011 SA2 to the 2011 remoteness areas. For 2016 mortality data, the NMD contains 2016 SA2s. A correspondence file is used to map these SA2s to 2011 SA2s which are then mapped to 2011 remoteness areas by a 2011 SA2—remoteness correspondence.

Index of Relative Socio-economic Disadvantage

The IRSD is one of four 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 personbased 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

Cancers were originally classified solely under the ICD classification system, based on topographic site and behaviour. However, during the creation of the 9th Revision of the ICD in the late 1960s, working parties suggested creating a separate classification for cancers that included improved morphological information. The first edition of the ICD-O was subsequently released in 1976 and, in this classification, cancers were coded by both morphology (histology type and behaviour) and topography (site).

Since the first edition of the ICD-O, a number of revisions have been made, mainly in the areas of lymphoma and leukaemia. The current edition, the third edition (ICD-O-3), was released in 2000 and is used by most state and territory cancer registries in Australia, as well as by the AIHW in regard to the ACD.

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 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.

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.

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 persons 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 E).

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 persons or more but less than 12 per 100,000 persons.

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 1 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, as 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 persons.

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.

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 just 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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Abbreviations

ABS	Australian Bureau of Statistics
ABDS	Australian Burden of Disease Study
ACD	Australian Cancer Database
ACT	Australian Capital Territory
ACHI	Australian Classification of Health Interventions
AIHW	Australian Institute of Health and Welfare
ALOS	average length of stay
AML	acute myeloid leukaemia
AMR	Australian Mesothelioma Registry
ASR	age-standardised rate
BMI	Body mass index
CBTRUS	Central Brain Tumour Registry of the United States
CLL	chronic lymphocytic leukaemia
CNS	central nervous system
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	International Classification of Diseases for Oncology
ICD-O-3	International Classification of Diseases for Oncology, 3rd Edition
iFOBT	immunochemical faecal occult blood test
IRSD	Index of Relative Socio-economic Disadvantage
MBS	Medicare Benefits Schedule
MDS	Myelodysplastic syndromes
METeOR	AIHW Metadata Online Registry
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

NMD	National Mortality Database
NMDS	National Minimum Data Set
NOS	Not otherwise specified
NRWTD	National Radiotherapy Waiting Times Database
NSW	New South Wales
OTH	Other
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
TAS	Tasmania
UV	Ultraviolet radiation
VIC	Victoria
WA	Western Australia
WHO	World Health Organisation
YLD	years lived with disability
YLL	years of life lost

Symbols

. .	not applicable
n.p.	not published

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Related publications

This report, *Cancer in Australia 2019*, is now a biennial series. The 18 earlier editions and any published subsequently can be downloaded free from the AIHW website <http://www.aihw.gov.au/cancer-publications/>. The website also includes information on ordering printed copies.

The following AIHW publications relating to cancer might also be of interest:

- AIHW 2018. Cancer Data in Australia. Cat.no CAN 122. Canberra: AIHW.
- AIHW 2018. BreastScreen Australia monitoring report 2018. Cancer series no. 112. Cat. no. CAN 116. Canberra: AIHW.
- AIHW 2018. Cervical screening in Australia 2018. Cat. no. CAN 111. Canberra: AIHW.
- AIHW 2018. National Bowel Cancer Screening Program: monitoring report 2016. Cat. no. CAN 112. Canberra: AIHW.
- AIHW 2018. Radiotherapy in Australia 2016–17. Cat. no. HSE 209. 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.

The following online AIHW products relating to cancer might also be of interest:

- Cancer incidence and mortality by small geographic areas <http://www.aihw.gov.au/cancer-data/cancer-incidence/>.

In 2019, the rate of new cancer cases in Australia is expected to reach 483 new cases per 100,000 people, while cancer-related deaths are expected to decrease to 159 per 100,000 people. From 1982 to 2019, thyroid cancer and liver cancer incidence rates increased more than for any other cancer. Although liver cancer survival has improved since 1982, with the increasing liver cancer incidence rate, liver cancer mortality rates also increased more than for any other cancer.

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