About

This report provides cancer statistics and data visualisations to inform understandings of cancer in Australia and how rates have been changing over time. The report includes a range of statistics on cancer survival, incidence, mortality and risk for many different cancers with data spanning back to 1982 for cancer incidence and 1971 for cancer mortality.

Cat. no: CAN 122
- Cancer summary data visualisation
- Cancer data commentaries
- Data

Findings from this report:
- At the end of 2017, 470,000 people were alive who had been diagnosed with cancer in the previous 5 years
- In 2014–2018, 5-year relative survival for all cancers combined was 87% for people under 20 years of age
- 5-year relative survival was 70% for all cancers combined in 2014–2018
- It is estimated that 50,000 people will die from cancer in 2022

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Cancer summary data visualisation

For many different cancers, this data visualisation provides a wide range of cancer-related statistics that, together, present a summary of national cancer data and trends over time. Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page. Please note that cancer mortality data is usually included within this visualisation but is only included within the Cancer mortality by age groups visualisation and Cancer risk data visualisation for this year’s report due to complexities in reporting.

Cancer data in Australia - a summary of incidence, mortality, survival and prevalence of cancer in Australia.

This visualisation contains trend information for around 60 cancers divided across Figures 1 to 4 and Table 1.

Figure 1 is a line graph that contains information on the number of cancer cases or deaths and age-standardised rates of cancer diagnosis or cancer death between 1982 and 2020.

Figure 2 is a line graph that contains information on the crude rate of cancer diagnosis or cancer death for various 5-year age groups from 0-4, 5-9, etc. up to 90+ for a selected year between 1982 and 2020.

Table 1 contains cancer-related summary statistics such as the number of cases or deaths, crude and age-standardised rate of diagnosis or death and mean and median ages at diagnosis or death.

Figure 3 is a line graph that contains information on 5-year relative survival rates for cancer from 1987-1991 to 2012-2016 for a selected cancer.

Figure 4 is a column graph that contains information on cancer prevalence, or, the number of people alive at 31 December 2015 who have been diagnosed with the selected cancer in the last year, last 5 years and 34 years.
Please note that cancer incidence statistics from 2019 to 2022 are projections; all other statistics are derived from actual data.

Data informing the summary dashboard is available as supplementary tables.

References


Vaccarella S, Franceschi S, Bray F, Wild C, Plummer M and Dal Maso L 2016. 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. The New England Journal of Medicine 375: 614-17.
Cancer rankings data visualisation

The cancer rankings data visualisation provides the top 20 cancers diagnosed between 1982 and 2022. The rankings are available by sex and age group (including all ages) and can be presented as counts or rates. Cancer mortality rankings are excluded from this visualisation this year and are excluded until the cancer mortality data investigations are complete. It is expected that this work will be completed in time for the 2023 release of Cancer data in Australia.

Two rankings tables are provided to allow comparisons to be made. Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page.

Data visualisation of Australia’s leading cancers

References


Vaccarella S, Franceschi S, Bray F, Wild C, Plummer M and Dal Maso L 2016. 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. The New England Journal of Medicine 375: 614-17.

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Cancer incidence by age visualisation

For many different cancers, this data visualisation provides cancer incidence data by age for a wide range of age groups. Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page.

Data visualisation of cancer data by age groups

Cancer incidence by age data are available as supplementary tables.

Visualisation not available for printing

Last updated 13/06/2022 v7.0
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Cancer mortality by age visualisation

For many different cancers, this data visualisation provides cancer mortality data by age for a wide range of age groups. For this year and as part of the cancer mortality data investigations, two sources of mortality data are used for cancer mortality reporting (the sources are the National Mortality Database (NMD) and the Australian Cancer Database (ACD)). More information about the cancer mortality investigations is in Cancer data commentary number 8. General assistance of how to choose which source to use for reporting on selected cancers is found within the data visualisation. It is expected that guidelines to better help people select the appropriate data source for the selected cancer will be available some time in the near future. Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page.

Data visualisation of cancer mortality by age groups

Visualisation not available for printing

Cancer mortality by age data are available as supplementary tables.

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Cancer survival data visualisation

For many different cancers, this data visualisation provides a range of cancer survival statistics. Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page.


This visualisation contains survival information for around 60 cancers divided across Figures 1 to 4.

Figure 1 is a line graph that contains information on 1 to 5-year observed or relative survival rates for the selected cancer from 1987–1991 to 2012–2016.

Figure 2 is a column graph that contains information on 1 to 5-year observed or relative survival rates by sex for the selected cancer for the most recent period 2012-2016.

Figure 3 is a line graph that contains information on 1 to 5-year observed or relative survival rates for the selected cancer in order of increasing age group (0-4, 5-9, etc. up to 90+) for the most recent period 2012-2016.

Figure 4 is a line graph that contains 5-year conditional observed or relative survival, given the person has already survived 1 to 15 years after diagnosis, for the selected cancer in the most recent period 2012-2016.

Visualisation not available for printing

Cancer survival data is available as supplementary tables.

References


Vaccarella S, Franceschi S, Bray F, Wild C, Plummer M and Dal Maso L 2016. 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. The New England Journal of Medicine 375: 614-17.
Cancer survival by age visualisation

For many different cancers, this data visualisation provides cancer survival data by age, age adjusted survival rates and changes in the age characteristics of people diagnosed. Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page. Additional guidance about using this data is located in the data commentary 6 'About age adjusted survival'.

Data visualisation of cancer survival by age

Visualisation not available for printing

Cancer survival by age data are available as supplementary tables.

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Cancer by state and territory data visualisation

For many different cancers, this data visualisation provides cancer incidence data for each state and territory. Cancer mortality data are excluded from this visualisation this year but are expected to be included after cancer mortality data investigations are complete. It is expected that this work will be completed in time for the 2023 release of Cancer data in Australia.

Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page.

Cancer data: state and territory. Incidence and mortality, counts and rates, by sex and state and territory, from 1982 to 2016.

This visualisation contains incidence and mortality information for around 60 cancers divided across Figures 1 and 2.

Figure 1 is a column graph that contains information on the number of cases diagnosed or the number of deaths and the age-standardised rates of diagnosis or death from the selected cancer by sex for each state and territory and Australia for a selected year from 1982 to 2016.

Figure 2 is a line graph that contains information the number of cases diagnosed or the number of deaths and the age-standardised rates of diagnosis or death from the selected cancer for a selected sex and state or territory between 1982 and 2016.

State and territory incidence data is available as supplementary tables.

Visualisation not available for printing

References


Vaccarella S, Franceschi S, Bray F, Wild C, Plummer M and Dal Maso L 2016. 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. The New England Journal of Medicine 375: 614–17.
Cancer risk data visualisation

For many different cancers, this data visualisation provides cancer incidence and mortality risk data by age. Help with terms, and information about the data, is available by placing the mouse pointer over the icons found near the top of the page. Additional guidance about the risk adjusted for competing mortality and risk unadjusted for competing mortality is located in cancer data commentary number 1 and the methods section.

For this year and as part of the cancer mortality data investigations, two sources of mortality data are used for cancer mortality reporting (the sources are the National Mortality Database (NMD) and the Australian Cancer Database (ACD)). Please read cancer data commentary number 8 for more information about cancer mortality data investigations. General assistance of how to choose which source to use for reporting on selected cancers is found within the data visualisation. It is expected that guidelines to better help people select the appropriate data source for the selected cancer will be available some time in the near future.

Advice about using the mortality data is also available by hovering the cursor above the “please read here for more information about using mortality data” box.

Cancer data in Australia: Risk. Trends over time from 1982 to 2016 for selected cancers, by sex and age.

This visualisation contains risk of cancer diagnosis or risk or cancer death for around 60 cancers.

Figure 1 is a line graph that contains information on the risk of cancer diagnosis (adjusted or unadjusted for competing mortality) for the selected cancer and age range from 1982 to 2020.

Figure 2 is a line graph that contains information on the risk of death from cancer (adjusted or unadjusted for competing mortality) for the selected cancer and age range from 1971 to 2020.

Visualisation not available for printing

Cancer risk data are available as supplementary tables.

References


Vaccarella S, Franceschi S, Bray F, Wild C, Plummer M and Dal Maso L 2016. 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. The New England Journal of Medicine 375: 614-17.
Cancer incidence and survival by stage data visualisation

Cancer stage at diagnosis refers to the extent of spread of cancer at the time of diagnosis—the higher the number (between I and IV), the further the cancer has spread. The stage at diagnosis and subsequent treatment outcomes are important determinants of cancer survival.

National cancer incidence and survival by stage data were first released in the Cancer data in Australia December 2018 release. While almost all other data are updated annually, more recent cancer incidence and survival by stage data is not available so it was not possible to update it. As it is a unique source of national data, the following cancer incidence and survival by stage data visualisation remains available within this Cancer data in Australia report.

This visualisation contains the latest national data on cancer survival and incidence, by stage of cancer at diagnosis for the 5 most commonly diagnosed cancers (melanoma of the skin, and breast, prostate, lung and colorectal cancers) in 2011.

Visualisation not available for printing

Cancer stage data is available as supplementary tables.

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**Need help locating data?**

Data that informs the data visualisations can be found in the Data section of *Cancer data in Australia* (CdiA). The following table outlines the range of data provided within CdiA and can be used to assist in navigating through the various Excel workbooks of this report.

The table contains links to the various data and the respective visualisations the data informs. The Excel workbooks provide data for the many different cancers presented within each visualisation. Please note that estimates based on projections were made for the following: incidence data from 2019 to 2022, National Mortality Database mortality data from 2021 to 2022 and Australian Cancer Database mortality data from 2018 to 2022.

<table>
<thead>
<tr>
<th>Book no.</th>
<th>Broad category (and period)</th>
<th>Contents</th>
<th>Relevant visualisations</th>
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<tbody>
<tr>
<td>1a</td>
<td>Cancer incidence 1982 to 2022</td>
<td>Cancer incidence age-standardised rates (ASR) Crude cancer incidence rates Segi and WHO cancer incidence ASR Age specific cancer incidence rates by 5-year age groups Cases diagnosed by 5-year age groups</td>
<td>Summary Incidence by age</td>
</tr>
<tr>
<td>1b</td>
<td>Cancer incidence 1982 to 2022</td>
<td>Age-specific cancer incidence rates and counts of cancers diagnosed by 10-year age groups</td>
<td>Incidence by age</td>
</tr>
<tr>
<td>1c</td>
<td>Cancer incidence 1982 to 2022</td>
<td>Age-specific cancer incidence rates and counts of cancers diagnosed by 15-, 20-, 25- and 30-year age groups</td>
<td>Incidence by age</td>
</tr>
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</tr>
<tr>
<td><strong>1d</strong></td>
<td><strong>Cancer incidence 1982 to 2022</strong></td>
<td><strong>Age-specific cancer incidence rates and counts of cancers diagnosed by 35-, 40-, 45- and 50-year age groups</strong></td>
<td></td>
</tr>
</tbody>
</table>
| **2a** | **Cancer mortality 1971 to 2022** | **Cancer mortality data based on the National Mortality Database:**  
**Cancer mortality ASR**  
**Crude cancer mortality rates**  
**Segi and WHO cancer mortality ASR**  
**Age-specific cancer mortality rates by 5-year age groups.**  
**Deaths from cancer by 5-year age groups** |
<p>| <strong>2b</strong> | <strong>Cancer mortality 1971 to 2022</strong> | <strong>Cancer mortality data based on the National Mortality Database: Age-specific cancer mortality rates and deaths from cancer (by 10-year age groups)</strong> |
| <strong>2c</strong> | <strong>Cancer mortality 1971 to 2022</strong> | <strong>Cancer mortality data based on the National Mortality Database: Age-specific cancer mortality rates and deaths from cancer (by 15, 20, 25 and 30-year age groups)</strong> |</p>
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<tr>
<th>2d</th>
<th>Cancer mortality 1971 to 2022</th>
<th>Cancer mortality data based on the National Mortality Database: Age-specific cancer mortality rates and deaths from cancer by 35, 40, 45 and 50-year age groups</th>
<th>Mortality by age</th>
</tr>
</thead>
<tbody>
<tr>
<td>2e</td>
<td>Cancer mortality 2007 to 2022</td>
<td>Cancer mortality data based on the Australian Cancer Database: Cancer mortality ASR; Crude cancer mortality rates; Age-specific cancer mortality rates and deaths by 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50-year age groups.</td>
<td>Mortality by age</td>
</tr>
<tr>
<td>3a</td>
<td>Cancer survival 1989-1993 to 2014-2018 periods</td>
<td>Cancer survival rates; Cancer survival rates by 5-year age groups (2014-2018 only); Conditional cancer survival rates</td>
<td>Summary Survival</td>
</tr>
<tr>
<td>3b</td>
<td>Cancer survival 1989-1993 to 2014-2018 periods</td>
<td>Cancer survival rates; Cancer survival rates by 20-year age groups; Age-adjusted cancer survival rates</td>
<td>Survival by age</td>
</tr>
</tbody>
</table>
| 4a   | Cancer risk
Incidence: 1982 to 2022
Mortality: 1971 for 2022 |
|------|---------------------------------------------------------------------|
|      | Cancer risk adjusted for competing mortality, including:
|      | Risk of death from cancer by age
|      | Risk of cancer diagnosis by age
|      | Note: estimates for risk of death in this book are based on cancer deaths from the National Mortality Database. |

| 4b   | Cancer risk
Incidence: 1982 to 2022
Mortality: 1971 for 2022 |
|------|---------------------------------------------------------------------|
|      | Cancer risk unadjusted for competing mortality, including:
|      | Risk of death from cancer by age
|      | Risk of cancer diagnosis by age
|      | Note: estimates for risk of death in this book are based on cancer deaths from the National Mortality Database. |

| 4c   | Cancer risk
Mortality: 2007 to 2022 |
|------|---------------------------------------------------------------------|
|      | Cancer risk adjusted and unadjusted for competing mortality, including:
|      | Risk of death from cancer by age
<p>|      | Note: estimates for risk of death in this book are based on cancer deaths from the Australian Cancer Database. |</p>
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<th>Page</th>
<th>Description</th>
<th>Details</th>
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</table>
| 5    | Age at diagnosis/death | Incidence: 1982 to 2022  
Mortality: 1971 to 2022  
Median and mean age at cancer diagnosis  
Median and mean age at death from cancer  
Note: estimates for risk of death in this book are based on cancer deaths from the National Mortality Database.  
Incidence by age  
Mortality by age |
| 6    | Cancer prevalence as at 31 December 2017 | Number of people alive and diagnosed with cancer:  
within the last year  
within the last 5 years  
within the last 36 years |
| 7    | State and territory incidence data 1982 to 2018 | State and territory cancer incidence ASR  
State and territory number of cancer cases diagnosed |
| 8    | Cancer incidence and survival by stage 2011 | Proportion of cases diagnosed by stage at diagnosis  
Cancer survival by stage at diagnosis  
Stage data is only available for melanoma of the skin, breast cancer in females, lung cancer, prostate cancer and colorectal cancer.  
Stage |
<table>
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<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACIM</td>
<td>Australian cancer incidence and mortality</td>
<td>The Australian Cancer Incidence and Mortality (ACIM) workbooks are no longer provided.</td>
<td>n.a.</td>
<td></td>
</tr>
</tbody>
</table>
# Cancer data commentaries

The Cancer data commentaries series has been created within Cancer data in Australia to communicate key findings within the data, to help increase cancer awareness and to improve the understanding of cancer trends in Australia.

## The Cancer data commentaries released in 2022

<table>
<thead>
<tr>
<th>Commentary no.</th>
<th>Title and content overview</th>
<th>Release date</th>
</tr>
</thead>
<tbody>
<tr>
<td>C8</td>
<td>Cancer mortality data investigations (preliminary investigations) Using National Mortality Database (NMD) and Australian Cancer Database mortality data comparisons, this commentary explores potential limitations in using the NMD to report on mortality for some cancers. It discusses the complexity of establishing the underlying cause of death and the corresponding issues these may have on mortality reporting for some cancers.</td>
<td>01/07/2022</td>
</tr>
</tbody>
</table>

Cancer data commentaries released prior to 2022 contain data that was up-to-date at the time but may change as CdIA is updated.

## The Cancer data commentaries released prior to 2022

<table>
<thead>
<tr>
<th>Commentary no.</th>
<th>Title and content overview</th>
<th>Release date</th>
</tr>
</thead>
<tbody>
<tr>
<td>C7</td>
<td>Updating sarcoma reporting A commentary introducing the new reporting category 'all sarcomas combined' and outlining changes to soft tissue sarcoma and bone cancer reporting within CdIA.</td>
<td>08/06/2021</td>
</tr>
<tr>
<td>C6</td>
<td>About age-adjusted survival A commentary outlining how to use age-adjusted survival rates and data within the cancer survival by age data visualisation.</td>
<td>08/06/2021</td>
</tr>
<tr>
<td>C5</td>
<td>Improving the understanding of ovarian cancer statistics A commentary discussing issues that are impacting on the reliable interpretation of ovarian cancer rate changes over time.</td>
<td>08/06/2021</td>
</tr>
<tr>
<td>C4</td>
<td>A different view of how brain cancer rates are changing over time A commentary aiming to provide a clearer picture of how brain cancer rates may be changing over time</td>
<td>08/06/2021</td>
</tr>
<tr>
<td>C3</td>
<td>How are pancreatic cancer rates changing? A commentary about how pancreatic cancer incidence, mortality, risk and survival rates have been changing over the last 20 years.</td>
<td>13/11/2020</td>
</tr>
<tr>
<td>C2</td>
<td>Risk of melanoma of the skin by age and over time An overview of the changing risk of being diagnosed with, or dying from, melanoma of the skin; risk is considered by different ages.</td>
<td>30/10/2020</td>
</tr>
<tr>
<td>C1</td>
<td>Changes to the cancer risk data and guidance using the risk methods An overview of the expanded range of cancer risk data, including assistance in understanding risk adjusted for competing mortality.</td>
<td>30/10/2020</td>
</tr>
</tbody>
</table>

The data presented in the Cancer data commentaries are available in the supplementary tables.
At the time of releasing the 2022 Cancer data in Australia (CdiA) report, AIHW remains in the process of investigating cancer mortality reporting. This commentary discusses preliminary investigations undertaken into differences between cancer mortality information according to the National Mortality Database (NMD) and the Australian Cancer Database (ACD) and the commentary also outlines planned work to improve cancer mortality reporting.

Underlying cause of death

The number of deaths from cancer is based on the number of deaths for which cancer is determined to be the underlying cause of death. The underlying cause of death is defined by the World Health Organization as ‘the disease or injury which initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury’.

Cause of death coding in the National Mortality Database

The National Mortality Database (NMD) obtains cause of death information from death registrations; these must be certified by a doctor using the Medical Certificate of Cause of Death or by a coroner. The doctor is asked to provide their best medical opinion on the cause of death and outlines all diseases and conditions that caused and contributed to death.

The cause of death information on the death registration is sent to the Australian Bureau of Statistics (ABS) for coding and analysis. No further information or additional detail is available for doctor-certified deaths. For any coroner-referred cancer-related deaths, the ABS accesses information from the National Coronial Information System which includes the police report, toxicology, forensic pathology and coronial finding. The ABS codes these certificates according to WHO guidelines applying the International Classification of Diseases 10th Revision (ICD-10). There are numerous complex rules related to cancer that must be applied. Data is disseminated for statistical purposes and used to create unit record datasets, such as is used in the NMD.

Cause of death coding in the Australian Cancer Database

Cause of death information is also compiled by the various state and territory cancer registries for people diagnosed with cancer. Medical coders refer to rules and guidelines described in the ICD-10 to assist in determining the cause of death. Cancer registries determine cause of death by considering what is stated on the death certificate as well as any additional information the registry has available to them, potentially including sources such as hospital admissions and pathology information. This additional information can result in a different cause of death being assigned than can be ascertained from the death certificate information alone (which is the only information available to code cause of death information in the NMD). State and territory cancer registries provide this coded cause of death information to the AIHW to include in the Australian Cancer Database (ACD). It should be noted that state and territory registry processes and information available can vary across jurisdictions to some degree.

Cancer mortality reporting

Previously, the National Mortality Database (NMD) has been used by the AIHW as the sole basis for reporting deaths from cancer. However, as AIHW has started analysing and reporting mortality for more detailed cancer types, it has become apparent that the NMD may not be as suitable for reporting on certain cancer types. The AIHW has developed a new cancer mortality series using the ACD, which makes it possible to assess the suitability of NMD data for reporting on different cancers.

At the time of releasing the 2022 update of Cancer data in Australia, these cancer mortality investigations remain a work in progress. More information about cancer mortality data is expected to be released prior to the 2023 release of CdiA. The cancer mortality figures published in the initial release of the CdiA 2022 report are unlikely to be revised as a result of the investigations, with planned work more likely to provide greater depth of understanding of cancer mortality data.

With often finer level cancer information available, the cancer registry-derived cause of death is more likely to be able to be coded to finer level causes of death for cancer. However, as the ACD cause of death is often reliant on probabilistic data linkage, some deaths may not be recorded within the ACD because a link could not be successfully made.

Determining cause of death can be complex and may depend on the information available. While the ACD is likely to be more precise than the NMD (for the reasons mentioned previously), some issues may still exist. For example, there are instances where a person may be diagnosed with a cancer in different states and territories at different points in time. In this case both cancer registries will register the cancer incidence that occurred within their jurisdiction and when deriving a cause of death may have access to different information and therefore could potentially arrive at a different cause of death. For these records, when AIHW receives the data, it uses an algorithm to derive a consistent cause of death for the person in the ACD.
It is expected that the combination of ACD and NMD mortality data will lead to more informed cancer mortality reporting. This paper looks to provide some understanding of how and why the data sources can differ. The 2022 release of the Cancer mortality by age data visualisations illustrates how the two sources compare for many different types of cancer.

Cancer cause of death

When compared with the ACD, the NMD routinely reports more deaths from all cancers combined than the ACD (Table 1). Please note that these comparisons exclude non-melanoma skin cancer (NMSC) deaths because, for NMSC, the ACD only collects mortality information on the rare types of these cancers while the NMD also includes deaths from common NMSCs - basal and squamous cell carcinomas. This difference in scope influences comparisons between ACD and NMD deaths from cancer so deaths from this cancer are accordingly excluded in Table 1.

A death from cancer in the NMD but not the ACD will either be because a death is recorded in the NMD but not in the ACD or because the death is recorded in both databases but the ACD records the death as a non-cancer death. It is also possible for a death to be considered as a cancer-related death within the ACD but not within the NMD. It is unlikely for a death to be recorded in the ACD but not in the NMD because the NMD includes all deaths in Australia whereas the ACD only includes a subset of all deaths (for people who have been diagnosed with cancer since 1982).

The AIHW aims to get a better understanding of the differences between the databases at the unit record level during the remainder of this year. Until this work has been completed, it is not possible to provide certainty regarding the nature of differences. It is possible that the larger difference observed between the ACD and NMD in 2017 may be due to the ACD not yet receiving the notification of deaths for some records.

At this preliminary stage of investigation, there appear to be relatively small differences between the count of deaths from all cancers combined according to the NMD and the ACD, suggesting that NMD data is likely to be suitable to use for reporting on deaths from all cancers combined.

Table 1: Deaths from all cancers combined (excluding non-melanoma of the skin) based on the Australian Cancer Database and National Mortality Database, 2007 to 2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths from the ACD</th>
<th>Deaths from the NMD</th>
<th>Difference</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>39,837</td>
<td>40,079</td>
<td>242</td>
<td>0.6%</td>
</tr>
<tr>
<td>2008</td>
<td>40,295</td>
<td>40,954</td>
<td>659</td>
<td>1.6%</td>
</tr>
<tr>
<td>2009</td>
<td>40,454</td>
<td>41,249</td>
<td>795</td>
<td>2.0%</td>
</tr>
<tr>
<td>2010</td>
<td>41,790</td>
<td>42,214</td>
<td>424</td>
<td>1.0%</td>
</tr>
<tr>
<td>2011</td>
<td>41,937</td>
<td>42,634</td>
<td>697</td>
<td>1.7%</td>
</tr>
<tr>
<td>2012</td>
<td>42,814</td>
<td>43,147</td>
<td>333</td>
<td>0.8%</td>
</tr>
<tr>
<td>2013</td>
<td>43,545</td>
<td>43,610</td>
<td>65</td>
<td>0.1%</td>
</tr>
<tr>
<td>2014</td>
<td>43,480</td>
<td>43,729</td>
<td>249</td>
<td>0.6%</td>
</tr>
<tr>
<td>2015</td>
<td>44,635</td>
<td>44,880</td>
<td>245</td>
<td>0.5%</td>
</tr>
<tr>
<td>2016</td>
<td>44,625</td>
<td>45,228</td>
<td>603</td>
<td>1.4%</td>
</tr>
<tr>
<td>2017</td>
<td>45,173</td>
<td>46,104</td>
<td>931</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

Note: the difference is calculated as the number of deaths from the NMD minus the number of deaths from the ACD and this difference is also presented as a proportion of the ACD.

Source: National Mortality Database and Australian Cancer Database 2018

Cancer cause of death by age group

Tables 2 and 3 highlight that the comparability of the ACD and NMD deaths from cancer reduces as age increases. This is likely because the underlying cause of death by age may be more complex at older ages and the number of possible underlying causes of death for an individual are more likely to be greater. Table 2 shows that there is a relatively high level of agreement between the ACD and NMD for the age groups from 0 to 60 years old. However, there are greater differences for people aged 80 years and over and a large number of deaths occur in this age group.

Table 2: Deaths from all cancers combined (excluding non-
### Table 3: Deaths from all cancers combined (excluding non-melanoma of the skin) based on the Australian Cancer Database and the National Mortality Database, by age group, 2013

<table>
<thead>
<tr>
<th>Age group</th>
<th>Deaths from the ACD</th>
<th>Deaths from the NMD</th>
<th>Difference</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 19 years</td>
<td>145</td>
<td>142</td>
<td>-3</td>
<td>-2.1%</td>
</tr>
<tr>
<td>20 to 39 years</td>
<td>597</td>
<td>599</td>
<td>2</td>
<td>0.3%</td>
</tr>
<tr>
<td>40 to 59 years</td>
<td>5,949</td>
<td>5,914</td>
<td>-35</td>
<td>-0.6%</td>
</tr>
<tr>
<td>60 to 79 years</td>
<td>21,080</td>
<td>20,957</td>
<td>-123</td>
<td>-0.6%</td>
</tr>
<tr>
<td>80 years and over</td>
<td>15,774</td>
<td>15,995</td>
<td>221</td>
<td>1.4%</td>
</tr>
<tr>
<td>All ages combined</td>
<td>43,545</td>
<td>43,610</td>
<td>65</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Note: the difference is calculated as the number of deaths from the NMD minus the number of deaths from the ACD.

Source: National Mortality Database and Australian Cancer Database 2018

The comparison of cancer-related deaths in 2016 examines a year where the overall difference between the ACD and NMD is greater than in 2013. Similar to 2013 data, the 2016 mortality data confirms that the overall difference between the ACD and NMD is likely to be most strongly influenced by differences in the oldest age groups.

### Table 3: Deaths from all cancers combined (excluding non-melanoma of the skin) based on the Australian Cancer Database and the National Mortality Database, by age group, 2016

<table>
<thead>
<tr>
<th>Age group</th>
<th>Deaths from the ACD</th>
<th>Deaths from the NMD</th>
<th>Difference</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 19 years</td>
<td>129</td>
<td>125</td>
<td>-4</td>
<td>-3.1%</td>
</tr>
<tr>
<td>20 to 39 years</td>
<td>610</td>
<td>623</td>
<td>13</td>
<td>2.1%</td>
</tr>
<tr>
<td>40 to 59 years</td>
<td>5,917</td>
<td>5,947</td>
<td>30</td>
<td>0.5%</td>
</tr>
<tr>
<td>60 to 79 years</td>
<td>21,824</td>
<td>21,870</td>
<td>46</td>
<td>0.2%</td>
</tr>
<tr>
<td>80 years and over</td>
<td>16,145</td>
<td>16,662</td>
<td>517</td>
<td>3.2%</td>
</tr>
<tr>
<td>All ages combined</td>
<td>44,625</td>
<td>45,228</td>
<td>603</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

Note: the difference is calculated as the number of deaths from the NMD minus the number of deaths from the ACD and this difference is also presented as a proportion of the ACD.

Source: National Mortality Database and Australian Cancer Database 2018

**Cause of death by cancer site**

In general, cancer mortality reporting from the NMD is likely to be more similar to the ACD for broader cancer sites and for more common cancer types. As cancer site information reaches a greater level of detail, it becomes more likely that the additional information available in the ACD enables the underlying cause of death to be recorded as more specific cancer sites.
Urinary tract cancer mortality provides a useful example to demonstrate this. In 2016, the NMD recorded 2,335 deaths from cancers of the urinary tract while the ACD recorded 2,240. Overall, in 2016 the different sources recorded a 4% difference in the number of deaths from cancer in this area of the body (Table 4).

When finer levels of reporting are considered, the differences between the mortality data according to the ACD and NMD increase. When 2016 deaths from the NMD are compared with the ACD, the number of deaths from bladder cancer, kidney cancer and cancer of other urinary organs were respectively 9% understated, 14% overstated and 29% overstated (Table 4).

The 2021 release of CdiA included cancer of other urinary organs for the first time. The release of this and other general groups was done to provide more complete cancer reporting information within the public domain. With the release, it was noted that these ‘other’ groups highlighted inconsistencies between ACD and NMD reporting (for example, incidence of ‘other urinary organs’ was relatively stable, survival was decreasing marginally but the mortality data indicated rapid increases - the rapidly increasing mortality was not consistent with these incidence and survival trends so the inconsistency between ACD and NMD coding becomes more apparent).

The 2022 release of CdiA provides more detail in reporting such as separating cancer of other urinary organs into its component parts of renal pelvis cancer, ureteral cancer, urethral cancer and cancer of overlapping and unspecified urinary organs (paraurethral cancer is part of the urinary tract but is excluded from CdiA reporting and the following analysis because there are most commonly zero cases and deaths reported). For the reasons outlined above, when compared with the ACD, the NMD respectively under-counts deaths for these more specific cancer types by 96%, 63% and 71%, and overstates deaths by 1,600% for cancer of overlapping and unspecified urinary organs (noting the 1,600% is of a small number) (Table 4).

The NMD likely over-states deaths in cancer in overlapping and unspecified urinary organs because there is only sufficient information to identify this broader cancer site rather than a more-specific cancer site. This is because, most commonly, only the term “transitional cell carcinoma” is provided on the death certificates.

<table>
<thead>
<tr>
<th>Cancer group/site</th>
<th>Deaths from the ACD</th>
<th>Deaths from the NMD</th>
<th>Difference</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal pelvis cancer (C65)</td>
<td>168</td>
<td>7</td>
<td>-161</td>
<td>-96%</td>
</tr>
<tr>
<td>Ureteral cancer (C66)</td>
<td>82</td>
<td>30</td>
<td>-52</td>
<td>-63%</td>
</tr>
<tr>
<td>Urethral cancer (C68.0)</td>
<td>14</td>
<td>4</td>
<td>-10</td>
<td>-71%</td>
</tr>
<tr>
<td>Cancer of overlapping and unspecified urinary organs (C68.8-C68.9)</td>
<td>19</td>
<td>323</td>
<td>304</td>
<td>1,600%</td>
</tr>
<tr>
<td>Other urinary organs (C65-C66, C68)</td>
<td>283</td>
<td>364</td>
<td>81</td>
<td>29%</td>
</tr>
<tr>
<td>Kidney cancer (C64)</td>
<td>843</td>
<td>957</td>
<td>114</td>
<td>14%</td>
</tr>
<tr>
<td>Bladder cancer (C67)</td>
<td>1,114</td>
<td>1,014</td>
<td>-100</td>
<td>-9%</td>
</tr>
</tbody>
</table>

Table 4: Urinary tract cancer deaths based on the Australian Cancer Database and the National Mortality Database, by age group, 2016
In regards to the cancer of overlapping and unspecified sites in the urinary tract, the difference between the ACD and NMD has become greater in more recent years. It should be noted that not all ‘other and unspecified’ cancer sites within the NMD are overstated when compared with the ACD. However, these groups may be more prone to being over-stated in the NMD.

### Colorectal cancer mortality

The reporting of colorectal cancer deaths through the NMD has historically been challenging. Previously, colorectal cancer reporting was under-reported because many deaths were recorded as cancer of the intestinal tract, part unspecified (ICD-10 code of C26.0). To address this, the Australian Bureau of Statistics recommended that colorectal cancer include C26.0 when reporting deaths from colorectal cancer (ABS advice discussing the issue). When C26.0 is included to arrive at an NMD count for colorectal cancer deaths, it is much closer to the count according to ACD data.

When compared with the ACD, the number of colon cancer (C18) and rectal cancer (C20) deaths are lower in the NMD. Cancer of the rectosigmoid junction (C19) is currently not reported on separately within the CdiA but, when compared with the ACD, is considerably greater within the NMD. Within CdiA reporting, C19 and C20 are both included within rectal cancer and when combined, rectal cancer deaths are greater in the NMD compared to the ACD.

Some likely reasons for the differences between colorectal cancer mortality data in the NMD and ACD include:

- The term bowel cancer is commonly used in Australia by doctors as an interchangeable term for colon cancer. The term bowel cancer is coded to C26.0 (Cancer of the intestinal tract, part unspecified) and colon cancer to C18.9 (Colon, unspecified). For statistical analysis it is recommended that these two codes are combined.

- C19 - the term colorectal cancer is often used on death certificates and the term is coded to C19 (Cancer of the rectosigmoid junction).

In future, it is unlikely that AIHW will publish colon or rectal cancer deaths separately using the NMD because of the relatively large differences between the NMD and ACD. As noted above, the information received on death certificates is unlikely to enable finer level reporting such as colon or rectal cancer from the NMD but it is suitable for reporting at the broader level of colorectal cancer. However, rectal and colon cancer mortality from the NMD has continued to be published in this edition as part of the mortality data investigations. Like many of the broader cancer sites and groups, colorectal cancer reporting within the NMD aligns much more closely to the ACD.

Table 5: Colorectal cancer deaths based on the Australian Cancer Database and the National Mortality Database, 2016

<table>
<thead>
<tr>
<th>Cancer group/site</th>
<th>Deaths from the ACD</th>
<th>Deaths from the NMD</th>
<th>Difference</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colon cancer (C18)</td>
<td>3,520</td>
<td>1,758</td>
<td>-1,762</td>
<td>-50%</td>
</tr>
<tr>
<td>Cancer of rectosigmoid junction (C19)</td>
<td>461</td>
<td>1,933</td>
<td>1,472</td>
<td>319%</td>
</tr>
<tr>
<td>Rectal cancer (C20)</td>
<td>1,267</td>
<td>665</td>
<td>-602</td>
<td>-48%</td>
</tr>
<tr>
<td>Cancer of the intestinal tract, part unspecified (C26.0)</td>
<td></td>
<td>1,048</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Colorectal cancer</td>
<td>5,248</td>
<td>5,404</td>
<td>156</td>
<td>3%</td>
</tr>
</tbody>
</table>
Future work and reporting of cancer mortality

Future work
At the time of this CdiA release, AIHW had not completed the full range of mortality data investigations. This is a large body of work, which is likely to be complex and time consuming. The future work and reporting discussed in the following paragraphs are likely directions but may be refined as the project continues.

The next stage of investigations is to compare underlying cause of death information in the ACD with the NMD at the unit record level. The results should enable more definitive advice to be provided and improved understandings of cancer mortality information.

By examining cause of death at the unit record level for cancers such as liver cancer, it may be possible to determine whether the cause of death information on liver cancer within the NMD may include some metastatic cancers. For example, this could occur where liver cancer deaths reported in the NMD have no corresponding record of the person being diagnosed with liver cancer (noting the ACD only includes primary cancers, not secondary (metastatic) cancers).

While the NMD may have access to less information from which to identify underlying causes of death for cancer than the ACD does, it has a longer historical time-series and is more up-to-date. At the time of releasing the CdiA, mortality data in the NMD was sufficiently complete for reporting up to 2020, while the ACD incidence data was sufficiently complete for reporting up to 2018 (with some estimation of late registrations) and ACD mortality data was complete up to 2017. It is possible that, like the 2018 incidence data, there may still be some outstanding mortality information that is yet to be provided to the ACD. Accordingly, the 2017 ACD may under-count mortality to some extent. This will need to be investigated more fully but preliminary work suggests this is likely to be occurring to some extent.

The AIHW is liaising with the ABS in regard to cancer mortality data. Through the investigations and liaison with ABS, it is expected that it may be possible to improve cancer mortality understandings and reporting.

Mortality reporting for Cancer data in Australia (2022 release)
At present, AIHW has included actual ACD mortality data from 2007 to 2017 and projections up to 2022. It has also produced NMD mortality reporting from 1971 to 2020 and projections up to 2022. Within the Cancer mortality by age and Cancer risk data visualisations, there is some general information to help identify which source of data is appropriate for the selected cancer. This general information will soon be accompanied by guidelines to better help people who may wish guidance on how to select the most appropriate source of data. The general information and upcoming guidelines are offered for assistance only, these are not intended to be prescriptive and it is acknowledged that users of the data may wish to undertake their own analysis to select the most appropriate data source for their needs.

The AIHW usually also reports on cancer mortality by state and territory. The preliminary data investigations are focussing on national data. Cancer mortality statistics by state and territory will not be published by AIHW within the CdiA report until further investigations have been completed to a sufficient standard to release mortality statistics for state or sub-state geographic areas.

Mortality data is normally available within the CdiA summary statistics data visualisations. They have not been included this year as the reporting is too complex to include within this general information page. Mortality data is published within the ‘Cancer mortality by age’ and ‘Cancer risk’ data visualisations.

Future reporting
The timeliness of the NMD ensures that, wherever its reporting for a cancer is of a sufficient consistency with the ACD, it is recommended for mortality reporting. However, where the NMD produces cancer mortality statistics that are considered to be particularly distant from the ACD results, they are not expected to be released in the CdiA in future.

The AIHW aims to investigate whether it is possible to use the ACD to derive estimated pre-2007 deaths from cancers. If successful, this information will be published to provide a longer time-series of cancer mortality statistics from the ACD.

It is possible that ACD mortality and NMD mortality will continue to be released in the future in some form. However, it is an aim of the project to provide users with cancer mortality statistics that are as simple to use as possible and meet users needs. As the release of data from multiple data sources to report on one item would not achieve the desired simplicity, this is hoped to be remedied in future CdiA reports.
Cancer data commentaries

Updating sarcoma reporting
Cancer data commentary no. 7

Cancer data in Australia (CdiA) now includes the group ‘all sarcomas combined’. Sarcomas are cancers that originate in bone, cartilage and the soft tissues of the body (for example, the ligaments, tendons, muscles, subcutaneous tissue and blood vessels). CdiA already includes data on soft tissue sarcoma and bone cancer and the combination of these produces ‘all sarcomas combined’.

Note that many kinds of cancer that originate outside bones can spread to the bones. However, CdiA only reports on cancers classified by their primary (original) site, not where they spread to (secondary sites). In the context of primary site, the terms “bone cancer” and “bone sarcoma” are equivalent, i.e. every primary cancer of the bone is a sarcoma.

Prior to the creation of this new cancer reporting category, a review was undertaken of the CdiA definitions of soft tissue sarcoma and bone cancer. This resulted in changes to both definitions. This commentary summarises the impact of these changes on the time series of incidence counts.

About the review process
The definitions of soft tissue sarcoma and bone cancer used in previous versions of CdiA were compared with the RARECAREnet project list of cancers. The RARECAREnet project involves partners all around Europe and aims at building an information network to provide comprehensive information on rare cancers to the community at large. The definitions used within the RARECAREnet project and potential changes to them were discussed with Australia’s cancer registries. It should be noted that the potential changes discussed with Australian cancer registries relate only to the cancer coding and not whether the cancer is rare.

Progress of the review
At the time of releasing CdiA, the review is not fully complete. It is possible that some further small changes will occur as work continues in this area. However, the current new definitions already offer a substantial improvement to existing reporting.

Impact of changes
The following sections highlight the impact of the changes to cancer incidence counts. The definitions themselves can be found in Appendix A.

Bone cancer
The impact of using the new definition is very small. Between 2008 and 2017 the new definition gives an average of 2 more cases per year than the old definition.

Figure 1: Cases of bone cancer, old and new definitions, persons, 1982-2017

Notes:
1. 2017 counts include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
2. 2016 counts include estimates of late registrations for the Northern Territory only.

Source: AIHW Australian Cancer Database 2017

Soft tissue sarcoma
The impact of using the new definition varies from year to year. Between 2008 and 2017 the new definition gives an average of around 58 more cases per year than the old definition.

Figure 2: Cases of soft tissue sarcoma, old and new definitions, persons, 1982-2017
Notes:

1. 2017 counts include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
2. 2016 counts include estimates of late registrations for the Northern Territory only.

Source: AIHW Australian Cancer Database 2017

Appendix A
The definitions are given in terms of ICD-O-3 topography and histology codes. The RARECAREnet list of cancers is available within the supplementary tables of the ‘Incidence and survival of rare cancers in the US and Europe’ research paper.

Bone cancer

Table 1: Old CdiA definition for bone cancer

<table>
<thead>
<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C40, C41</td>
<td>All except 9050-9055, 9140, 9590-9993</td>
</tr>
</tbody>
</table>

Table 2: RARECAREnet definition for bone cancer

<table>
<thead>
<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C40, C41</td>
<td>8004</td>
</tr>
<tr>
<td>C30, C32.3, C33, C34.0, C40, C41</td>
<td>8800-8806, 8810-8812, 8815, 8830, 8840, 8850-8855, 8890, 8891, 8894-8896, 8900-8902, 8910, 8912, 8920, 9040-9044, 9120, 9124, 9130, 9133, 9150, 9170, 9180-9187, 9192-9195, 9220, 9221, 9230, 9231, 9240, 9242, 9243, 9250, 9260, 9364, 9473, 9540, 9560, 9561, 9571, 9580, 9581</td>
</tr>
<tr>
<td>All</td>
<td>9370, 9371, 9372</td>
</tr>
</tbody>
</table>

The new CdiA definition for bone cancer is the same as the RARECAREnet definition but also includes codes shown in Table 3.

Table 3: Additional codes to be used in the CdiA definition of bone cancer

<table>
<thead>
<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C40, C41</td>
<td>8000, 8002, 8003</td>
</tr>
<tr>
<td>C30, C32.3, C33, C34.0, C40, C41</td>
<td>9261</td>
</tr>
</tbody>
</table>

Soft tissue sarcoma

Table 4: Old CdiA definition for soft tissue sarcoma

<table>
<thead>
<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All except C40, C41</td>
<td>8800-8936, 8990-8992, 9040-9045, 9120-9262, 9540-9582</td>
</tr>
</tbody>
</table>

Table 5: RARECAREnet definition for soft tissue sarcoma

<table>
<thead>
<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
</table>
The new CdiA definition for soft tissue sarcoma is the same as the RARECAREnet definition but also includes codes shown in Table 6.

<table>
<thead>
<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>8936, 9140</td>
</tr>
<tr>
<td>All except C30, C32.3, C33, C34.0, C40, C41</td>
<td>9045</td>
</tr>
</tbody>
</table>

The new CdiA definition for soft tissue sarcoma is the same as the RARECAREnet definition but also includes codes shown in Table 6.

Table 6: Additional codes to be used in the CdiA definition of soft tissue sarcoma

<table>
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<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>8936, 9140</td>
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<tr>
<td>All except C30, C32.3, C33, C34.0, C40, C41</td>
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</tr>
</tbody>
</table>

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Table 6: Additional codes to be used in the CdiA definition of soft tissue sarcoma

<table>
<thead>
<tr>
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<th>Histology codes</th>
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</thead>
<tbody>
<tr>
<td>All</td>
<td>8936, 9140</td>
</tr>
<tr>
<td>All except C30, C32.3, C33, C34.0, C40, C41</td>
<td>9045</td>
</tr>
</tbody>
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The new CdiA definition for soft tissue sarcoma is the same as the RARECAREnet definition but also includes codes shown in Table 6.

Table 6: Additional codes to be used in the CdiA definition of soft tissue sarcoma

<table>
<thead>
<tr>
<th>Topography codes</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>8936, 9140</td>
</tr>
<tr>
<td>All except C30, C32.3, C33, C34.0, C40, C41</td>
<td>9045</td>
</tr>
</tbody>
</table>
Cancer data commentaries

About age-adjusted survival

Cancer data commentary no. 6

Changes in cancer survival rates over time are often used to gain insights into how survival outcomes are changing for people diagnosed with cancer. However, for some cancers the insights may be confounded by changes in the age composition of those diagnosed over time. Age-adjusted survival estimates have been added to Cancer data in Australia (CdiA). These rates enable the assessment of which cancers’ survival rates have been impacted by changes over time in relation to age at diagnosis and therefore may not dependably reflect changes in survival outcomes over time.

This commentary discusses age-adjusted survival and the impacts age at diagnosis can have on cancer survival rates. The advice provided within this commentary is general advice to help increase the familiarity with the data now being offered. Recommendations are not meant to be prescriptive nor a recommendation of best practice and may change to some extent depending on the investigation being undertaken.

How changes in age of those diagnosed can impact on the overall survival rate

Brain cancer survival time series are used here to illustrate a time series where changes in the age of those diagnosed impacts substantially on the survival rates over time. Figure 1 provides the 5-year relative survival rates over time for brain cancer. The change from 20% in the earliest period to 22% in the latest period could lead to the conclusion that brain cancer survival outcomes haven’t changed much over time.

![Figure 1: Five-year relative survival, brain cancer, persons, 1988-1992 to 2013-2017](source: AIHW Australian Cancer Database 2017.)

However, while the changes in rates are accurate, this trend may not provide the whole picture. Cancer survival rates often differ considerably by age. On average, older people generally have lower cancer survival rates than younger people. Therefore, if progressively higher proportions of the people diagnosed over time are older then improvements in survival rates may be offset by the greater proportions of older people being diagnosed.

Age adjusted survival rates

Age-adjusted survival rates help to identify the occasions where changes in cancer survival rates over time are impacted by age. CdiA includes “forward looking age-adjusted rates” and “backward looking age-adjusted rates”. They are both age-adjusted rates but the age adjustments have been applied differently. The forward looking and backward looking descriptions are terms used to more simply distinguish between the two.

Age-adjusted survival rates (forward looking)

The forward looking age-adjusted rates detail what the survival rates would be if the age composition of those diagnosed in the base period (that is 1988-1992) remained the same in all future periods. If the age composition of the people diagnosed with brain cancer in 2013-2017 was the same as in 1988-1992, brain cancer survival rates would be 34% in 2013-2017, not 22% as per the unadjusted relative survival rates (Figure 2).

![Figure 2: Five-year relative survival and age-adjusted relative survival, brain cancer, persons, 1988-1992 to 2013-2017](source: AIHW Australian Cancer Database 2017.)
Age–adjusted survival rates (backward looking)

However, the age composition of people diagnosed with brain cancer has changed over time. Noting what the rates would have been only indicates that the time series is strongly impacted by changes in age. The backward looking age-adjusted survival rates offer an alternative perspective of the time series in relation to changes in cancer survival outcomes.

The backward looking age-adjusted rates provide what the survival rates for each period would be if the age composition of those diagnosed in the most recent period (2013–2017 in this example) occurred across all previous periods. Using backward looking age-adjusted survival rates, 5-year relative survival rates for brain cancer have doubled between 1988–1992 and 2013–2017 (increased from 11% to 22%) (Figure 3).

Why produce forward looking and backward looking age-adjusted rates?

In general, we recommend the use of actual (unadjusted) relative survival rates when these are not overly impacted by changes in age composition. Backward looking age-adjusted survival rates are recommended for use when the actual time series does not appear to represent changes in survival outcomes; that is, rate changes over time are influenced substantially by changes in the age at diagnosis. The forward looking age adjusted survival rates are useful to not only identify if changes in age are affecting actual relative survival time series but provide complementary information for the actual relative time series (an example using all cancers combined follows).

The 5-year relative survival rate for all cancers combined has improved from 51% to 70% between 1998–1992 and 2013–2017. The forward looking age-adjusted survival trend suggests that the change in rates would have been more if not for changes in the age composition of people diagnosed with cancer over time (Figure 4).
Note: Ages are adjusted to equal the age composition of those diagnosed with brain cancer for the 1988–1992 survival period.

Source: AIHW Australian Cancer Database 2017.

For all cancers combined, the actual relative survival rate doesn’t appear to be greatly impacted by age so it likely provides a reasonable general reflection of improvement in survival outcomes. When discussing changes in actual relative survival rates, the information gained from the forward looking age-adjusted rates allows a more informative description of survival outcomes to be provided, for example:

The 5-year relative survival rate for cancer has improved from 51% to 70% between 1988-1992 and 2013-2017 (Figure 5). Improvements in survival outcomes are slightly under-stated because some improvements have been offset by increasing proportions of older people diagnosed with cancer as the Australian population ages over time (noting that older people generally have lower cancer survival rates).

Figure 5: Five-year relative survival rates, all cancers combined, persons, 1988-1992 to 2013-2017

Source: AIHW Australian Cancer Database 2017.

Survival by age group and proportion of people diagnosed by age

Up to this point, we’ve talked about older people having lower survival rates and that, for some cancers, there are proportionally more older people being diagnosed. This will not be true for all cancers so where can this information be found? The cancer survival by age data visualisation includes a couple of other sets of data that allow survival rates by age, and changes in age at diagnosis, to be more simply obtained; these are discussed below.

Cancer survival rates by age group

In 2013-2017, brain cancer 5-year relative survival rates were as high as 68% for people aged between 20 and 39 and as low as 1.4% for people aged over 80 (Figure 6). Similar information is available for all cancers reported within the CdiA and can be located within the Cancer survival by age data visualisation.

Figure 6: Five-year relative survival rates, by age group, brain cancer, persons, 1988-1992 to 2013-2017

Source: AIHW Australian Cancer Database 2017.
Proportion of cases diagnosed by age

The proportion of people diagnosed with brain cancer who were aged over 80 has increased from 2.3% in 1982 to 12.9% in 2017 (Figure 7). Similar information by 20-year age groups is available for all cancers reported on within the CdiA and can be located within the Cancer survival by age data visualisation.

Figure 7: Proportion of cases diagnosed by age group, brain cancer, persons, 1982 to 2017

Source: AIHW Australian Cancer Database 2017.

A summary of how the information presented in the cancer survival by age data visualisation can be used together

For brain cancer, we’ve noted that actual relative survival rates are substantially different to the age-adjusted survival rates (Figure 2). The data on the proportion of cases by age indicates that a much greater proportion of people diagnosed with brain cancer are older in more recent periods (Figure 7) and the survival rates are very low for older age groups (Figure 6). In this example, the actual relative survival rates for brain cancer don’t reflect the overall changes in survival outcomes very well because they are impacted by age (Figure 2) and so we present the age-adjusted (backward looking) time series in place of the actual (Figure 3).

For all cancers combined, we’ve noted that actual relative survival rates are reasonably close to the age-adjusted survival rates (Figure 4). This indicates that age hasn’t substantially impacted the survival rates over time so we can simply use the actual relative survival rates to describe the changes over time in survival outcomes (Figure 5). We can also choose to use information from the forward looking age-adjusted rates to provide context that improvements are slightly understated because proportionally more older people are being diagnosed (data not presented here but available within the Cancer survival by age data visualisation).

Concluding points

1. Age-adjusted rates (forward looking) are primarily developed to investigate whether the time series for actual relative survival is substantially impacted by changes in age composition but also offer additional context about actual changes in survival outcomes over time.
2. Age-adjusted rates (backward looking) are primarily developed to provide an alternative reporting option to actual relative survival rates for instances where the actual relative survival rates aren’t considered to adequately represent changes in survival outcomes over time.
3. Age-adjusted rates are intended to provide a more comprehensive understanding of survival outcomes over time for the reported cancer but these rates are not comparable with other cancers (or even the same cancer for a different sex - this is discussed in the next section).
4. Both observed and relative age-adjusted survival rates are available within CdiA.

As the length of the survival time series presented in CdiA increases, changes in the age composition of those diagnosed over time has greater potential to influence survival rates. The cancer survival by age data visualisation aims to provide people with information to help understand changes in survival outcomes (and not simply rates) over time.

Future work - age-standardised survival rates

Age-adjusted rates have been added to CdiA to focus on how to better understand how survival outcomes are changing over time for each individual cancer. These age-adjusted survival rates are not directly comparable with actual, or age-adjusted, rates for different cancers (or by sex) because the age composition for one age-adjusted series will more than likely be different to another.

In our future work program, we plan to also produce age-standardised survival rates. These rates will enable comparisons to be made between cancers because they will use the same standard population (and therefore have the same age composition) across different cancers. The age-standardised rates will allow comparisons to be made between cancers but in moving towards this objective, will not capture actual changes over time in survival outcomes for specific cancers as well as age-adjusted survival rates do.

At present, and within the CdiA, to compare survival rates across cancers, comparisons by age group will be the most directly comparable. Comparisons of actual relative survival rates are commonly performed and are useful for general survival comparisons. More precise comparisons between cancers will become available when work on age-standardised survival rates is complete and included within CdiA (tentatively scheduled for the first release of 2022).
Cancer data commentaries

Improving the understanding of ovarian cancer statistics
Cancer data commentary No. 5

Ovarian cancer incidence rates have been decreasing, with some larger decreases in more recent years. Without additional context, it appears as though the real world risk of being diagnosed with ovarian cancer in Australia is reducing. However, the rate decreases are perhaps more due to research that has led to some cancers previously thought to be ovarian in origin now being considered cancers of the fallopian tube.

This commentary provides information to help understand ovarian cancer trends.

The issue impacting ovarian cancer data

Histology and cancer site

Fundamental to understanding the issue impacting ovarian cancer statistics is a familiarity with the terms ‘cancer histology’ and ‘cancer site’. Histology describes the types of cells in which cancer originates, while cancer site describes the site of the body where the cancer originates. A high grade serous carcinoma is an example of a histology while the ovaries are an example of a site.

Research improves the understanding of primary site of diagnosis

It was first recognised in 2001 that a high percentage of so-called ovarian high grade serous carcinomas (HGSCs) in women with certain genetic mutations actually begin in the fallopian tube rather than the ovary (Colgan et al. 2001; Piek et al. 2001). Further research indicated that the fallopian tube is also the primary site of HGSCs that are not associated with those mutations (Garg 2013). In 2015 the International Collaboration on Cancer Reporting guidelines for assigning the primary site of HGSCs were updated to reflect this new understanding (McCluggage et al. 2015). These influential guidelines have affected practice in pathology laboratories and hence cancer registries.

The impact of the research on ovarian cancer rates

Following the research, we would expect ovarian cancer rates to decrease to some extent. This is not because there is a real world reduced risk but because some cancers that would have previously been recorded as ovarian will be recorded as cancers of the fallopian tube.

The impact of the changes in the data on the ovarian cancer time series

Ovarian cancer time series are likely to be measuring different things at different points in time. Where decreasing rates occur, there may be uncertainty as to whether the apparent decreases are due to fewer real world cases or because more cases historically thought to be ovarian in origin are being recorded as cancers of the fallopian tube.

Defining the terms ‘historical understanding’ and ‘current understanding’

For the rest of this commentary, the term ‘historical understanding of ovarian cancer’ refers to ovarian cancer as well as the serous carcinomas of the fallopian tube that were previously thought to be ovarian cancers.

The term ‘current understanding of ovarian cancer’ is used to refer to ovarian cancer as it is now understood. It includes only cases where the ovaries are the primary site and excludes all cancers of the fallopian tube that were historically recorded as ovarian cancers.

There is no clear single break in time series

Ideally, all pathology reports involving the diagnosis of non-uterine HGSC would be based on a consistent understanding of the site where the cancer originated and these understandings would uniformly change when research dictates. If this were the case, we could clearly suggest the year when ovarian cancer rates changed from the historical understanding of ovarian cancer to the current understanding.

Unfortunately, with the complexity of determining histology, the evolving research and the diverse number of people making diagnoses, it can take some time before research findings are broadly accepted and changes are consistently implemented. Given this, it is not possible to identify a single point in time when ovarian cancer incidence rates changed from measuring the historical understanding of ovarian cancer to measuring the current understanding. Indeed, it is likely that for years following the research that incidence rates will be measuring a hybrid of current and historical understandings of ovarian cancer.

The above paragraphs highlight an issue impacting the data; it is not a comment on data collection practices. We would like to acknowledge the enduring efforts, the quality of work, and considerable expertise, of cancer registries and those in the medical field who provide the foundation from which the Australian Cancer Database (ACD) is produced.

Incidence rates
Measuring incidence rates based on the historical understanding of ovarian cancer

Our investigations into the quality of ovarian cancer data highlighted the need to improve the reliability of ovarian cancer rates. We have introduced the ‘ovarian cancer and serous carcinomas of the fallopian tube’ reporting group as a step towards this. This new reporting group is likely to suit the needs of people who wish to understand how ovarian cancer incidence rates, as ovarian cancer is historically understood, have changed over time.

Figure 1 shows that the incidence rates for serous carcinomas of the fallopian tube have increased as ovarian cancer decreased. A proportion of these changes are likely the result of a shift in the understanding of the site rather than independent increases/decreases; larger offsetting movements are evident from 2012.

The new combined reporting group (ovarian cancer and serous carcinomas of the fallopian tube) is much more stable over time. The speculated movements from ovarian cancer to cancer of the fallopian tube are offset within the new combined reporting group (Figure 1).

Figure 1: Age-standardised incidence rates, females, 1982 to 2017

Notes:
1. 2017 rates include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
2. 2016 rates include estimates of late registrations for the Northern Territory only.

Source: AIHW Australian Cancer Database 2017

We acknowledge that the ovarian cancer and serous carcinomas of the fallopian tube cancer group may include a small number of serous carcinomas of the fallopian tube that may historically always have been diagnosed as such.

Appendix 1 outlines which histologies are included within serous carcinomas of the fallopian tube and mentions why these have been selected.

Measuring incidence rates based on the current understanding of ovarian cancer

The 2017 incidence rate is likely to be the best estimate of ovarian cancer based on the current understanding but may still include some serous carcinomas of the fallopian tube (Figure 2).

Figure 2: Ovarian cancer age-standardised incidence rates, females, 1982 to 2017

Notes:
1. 2017 rates include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
2. 2016 rates include estimates of late registrations for the Northern Territory only.

Source: AIHW Australian Cancer Database 2017

We will continue to publish ovarian cancer incidence rates but will either refer data users to this commentary or provide the following caution:

• Rates for more recent years are unlikely to be comparable with earlier years. Earlier years are more likely to include serous carcinomas of the fallopian tube while the most recent years are less likely to do so.
Ovarian cancer incidence time series based on the current understanding are likely to be of a poor quality. We expect that as time progresses, future years of ovarian cancer incidence rates will better measure the current understanding of ovarian cancer and time series will become more reliable.

Ovarian cancer incidence projections

For the 2021 Cancer data in Australia report (CdIA), actual cancer incidence data is available up to 2017 and projections are available for 2018 to 2021. Projections have been made for ‘ovarian cancer and serous carcinomas of the fallopian tube’ but not for ovarian cancer.

This is because projections are produced based on the premise that trends occurring over the most recent 10 years are a reasonable basis from which to project future cancer rates. Unfortunately, there is too much uncertainty within the ovarian cancer incidence rate time series to provide a reasonable basis to derive projections.

Survival rates

Both incidence and survival rates are derived from the ACD. Ovarian cancer survival rates are provided in Table 1. The recommendations outlined in the incidence section also apply to survival rates and all data derived from the ACD. More precisely:

- the ‘ovarian cancer and serous carcinomas of the fallopian tube’ survival rates better align with the historical understanding of ovarian cancer.
- The most recent ovarian cancer best aligns with the current understanding of ovarian cancer.
- Ovarian cancer survival rates from earlier years are likely to include more serous carcinomas of the fallopian tube and may not be directly comparable with later years.

Table 1: Five-year relative survival rates, ovarian cancer and serous carcinomas of the fallopian tube and ovarian cancer, females, 1988-1992 to 2013-2017

<table>
<thead>
<tr>
<th>Period</th>
<th>Ovarian cancer 5-year relative survival rate</th>
<th>Ovarian cancer Confidence interval (95%)</th>
<th>Ovarian cancer and serous carcinomas of the fallopian tube 5-year relative survival rate</th>
<th>Ovarian cancer and serous carcinomas of the fallopian tube Confidence interval (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988–1992</td>
<td>37.4%</td>
<td>35.9% – 38.9%</td>
<td>37.4%</td>
<td>35.9% – 38.9%</td>
</tr>
<tr>
<td>1993–1997</td>
<td>40.3%</td>
<td>38.9% – 41.7%</td>
<td>40.4%</td>
<td>39.0% – 41.8%</td>
</tr>
<tr>
<td>1998–2002</td>
<td>40.6%</td>
<td>39.2% – 42.0%</td>
<td>40.7%</td>
<td>39.3% – 42.1%</td>
</tr>
<tr>
<td>2003–2007</td>
<td>41.7%</td>
<td>40.4% – 43.1%</td>
<td>42.2%</td>
<td>40.8% – 43.5%</td>
</tr>
<tr>
<td>2008–2012</td>
<td>44.1%</td>
<td>42.8% – 45.4%</td>
<td>44.8%</td>
<td>43.5% – 46.1%</td>
</tr>
<tr>
<td>2013–2017</td>
<td>47.1%</td>
<td>45.8% – 48.4%</td>
<td>48.1%</td>
<td>46.9% – 49.4%</td>
</tr>
</tbody>
</table>

Source: AIHW Australian Cancer Database 2017

Mortality rates

Unlike incidence and survival data, mortality data are sourced from the National Mortality Database (NMD), not the ACD. NMD data are derived from information recorded on death certificates. Therefore, the NMD does not include histology information nor have access to some of the additional information used to derive the ACD data, which enables cancer type to be more accurately assigned in the ACD in some cases.

As the NMD data is based on less information than the ACD, it is likely to generally record the historical understanding of ovarian cancer. The two points discussed below support this possibility.

1. Cancers of the fallopian tube mortality rate trends remain quite constant

Figure 3 compares the serous cancers of the fallopian tube incidence rates with the fallopian tube cancer mortality rates. An exact comparison cannot be made because the NMD does not collect information about cancer histology. It is therefore not possible to isolate deaths from serous carcinomas of the fallopian tube, only deaths from all cancers of the fallopian tube (all histologies, not only serous carcinomas).
We would expect that the increasing incidence of cancers of the fallopian tube should lead to increasing mortality rates to some extent; this does not occur and mortality rates for cancers of the fallopian tube remain quite stable.

Figure 3: Age-standardised incidence rate for serous cancers of the fallopian tube comparison with age-standardised mortality rates for cancer of the fallopian tube

Notes:
1. 2017 incidence rates include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
2. 2016 incidence rates include estimates of late registrations for the Northern Territory only.

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

2. Ovarian cancer mortality rates appear to align better with ‘ovarian cancer and serous carcinomas of the fallopian tube’ incidence rates

Ovarian cancer mortality rates have been decreasing over time (Figure 4). Reducing rates may be explained by improvements in survival (Table 1). Unlike ovarian cancer incidence rates, ovarian cancer mortality rates have not been decreasing sharply. This suggests that mortality data are not being impacted by ovarian cancer deaths (as historically understood) being recorded as cancer of the fallopian tube deaths (Figure 3).

Incidence, survival and mortality rates have the general relationship that, where data is coherent, improvements in survival should generally correspond with increases in the difference between incidence and mortality rates. For ovarian cancer incidence and ovarian cancer mortality comparisons - this is not the case (Figure 4)

Figure 4: Age-standardised incidence and mortality rates, selected cancers, females, 1982 to 2017

Notes:
1. 2017 incidence rates include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
2. 2016 incidence rates include estimates of late registrations for the Northern Territory only.

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

Mortality to incidence ratio tests

We use mortality to incidence ratios to further explore the relationship between mortality and incidence data. Age-standardised mortality rates from the NMD are compared with age-standardised incidence rates from the ACD for each year and annual ratios are formed.

Survival rates have improved for ovarian cancer over time. Given this, the mortality to incidence ratio should be decreasing over time.

Figure 5 contrasts the mortality to incidence ratio for:
• Series 1: Ovarian cancer age-standardised mortality rates / ovarian cancer and serous carcinomas of the fallopian tube age standardised incidence rates

Over time, the mortality to incidence ratio improves for series 1. This is to be expected where survival increases. The ovarian cancer mortality data appears to be measuring the historical understanding of ovarian cancer and these two data sources appear to provide complementary information about ovarian cancer as it is historically understood.

• Series 2: Ovarian cancer age-standardised mortality rates / ovarian cancer age-standardised incidence rates

Over time, the incidence to mortality ratio for series 2 remains quite stable. This is not to be expected where survival is increasing. The stability of the ratio likely occurs because the improvements in survival are resulting in fewer deaths but for the ratio, these are offset by the reduction of cases diagnosed as ovarian cancer (and instead diagnosed as cancer of the fallopian tube).

Figure 5: Age-standardised mortality rate to age-standardised incidence rate, rates ratios, selected cancers, females, 1982 to 2017

Notes:

1. Series 1 = ovarian cancer age-standardised mortality rate divided by the ovarian cancer and serous carcinomas of the fallopian tube age-standardised incidence rate.
2. Series 2 = ovarian cancer age-standardised mortality rate divided by the ovarian cancer age-standardised incidence rate.
3. 2017 incidence rates include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
4. 2016 incidence rates include estimates of late registrations for the Northern Territory only.

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

Recommendations for how to use the data together

Ovarian cancer as it is historically understood

We believe the ovarian cancer and serous carcinomas of the fallopian tube group provides a useful representation of ovarian cancer as it is historically understood. This reporting group is available for cancer incidence, survival, prevalence and conditional survival.

Ovarian cancer mortality data is derived from the NMD and appears to provide a strong representation of ovarian cancer as it is historically understood. Within the CdiA, we will footnote data to note that ovarian cancer mortality rates likely include some cancers originating in the fallopian tube.

Ovarian cancer as it is currently understood

The most recent incidence and survival rates represent the closest estimate of ovarian cancer as it is currently understood but data should be used with a degree of caution, particularly in earlier years.

At present, national mortality rates do not exist for ovarian cancer as it is currently understood but possible approaches to remedy this are being considered for future CdiA releases.

Future work

Our work towards better understanding ovarian cancer incidence and mortality rates will continue into the future. As new data is received, the guidance provided within this paper may need to evolve. We will continue to monitor ovarian cancer rates and update advice within the CdiA data commentary series if necessary.

Appendix 1

ICD-10 and histology codes for the ovarian cancer and serous carcinomas of the fallopian tube group (derived from the ACD)

ICD10: C56 Ovarian cancer (all histologies)
ICD10: C570 Cancer of the fallopian tube (selected histologies)
ICD10: C578 Cancer of overlapping sites of female genital organs (selected histologies)
Selected histologies

8441 - Serous carcinoma not otherwise specified
8460 - Low grade serous carcinoma
8461 - High grade serous carcinoma

About the construction of the ovarian cancer and serous carcinomas of the fallopian tube group

The selected histologies were identified as the histologies that contributed to unusual increases in incidence rates for the C570 and C578 ICD10 codes. The increase was confirmed as likely being due to the change in understanding of ovarian cancer. It is acknowledged that some increase in serous carcinomas of the fallopian tube may not be directly related to changes in ovarian cancer rates. However, given the generally low rates of serous carcinomas of the fallopian tube, it is speculated that increases in serous carcinomas of the fallopian tube are mostly related to changes in the understandings of ovarian cancer.

The group is called ‘ovarian cancer and serous carcinomas of the fallopian tube’ for simplicity and to reflect the general intent of what it aims to measure. However, the code C57.8 also includes cancer of two or more contiguous sites of the female genital organs whose point of origin cannot be determined. Therefore, this code may contain some cancers that are neither ovarian nor of the fallopian tube.

Given that serous carcinoma of the ovary remains a legitimate diagnosis, we cannot speculate on the extent to which current ovarian cancer incidence data may still contain cancers of the fallopian tube. This does not impact on the ovarian cancer and serous carcinomas of the fallopian tube group but may for those interested only in ovarian cancer as currently understood.
Cancer data commentaries

A different view of brain cancer rate changes over time

Cancer data commentary no. 4

Examination of brain cancer rate time series provides us with understandings of how brain cancer has been changing over time. Various brain cancer time series give the appearance that very little is changing over time. However, all may not be as it seems with brain cancer statistics. This commentary provides additional information that may refine conclusions about how brain cancer rates are changing over time.

Brain cancer incidence and mortality rates for people aged 80 or more increased substantially between 1982 and 1996

With the exception of the population aged 80 and over, brain cancer incidence rates by age groups have been relatively constant since 1982. For people aged over 80, the incidence rates have more than tripled between 1982 and 2021 (7.5 cases per 100,000 persons to an estimated 24 cases per 100,000 persons) with most of the change occurring prior to 1996 (Figure 1).

Figure 1: Age-specific incidence rates, brain cancer, by age group, persons, 1982 to 2021

Notes:
1. Actual rates are provided between 1982 and 2017, 2018 and onwards are projections.
2. 2017 rates include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
3. 2016 rates include estimates of late registrations for the Northern Territory only.

Source: AIHW Australian Cancer Database 2017

Brain cancer mortality rates for people aged 80 and over have also increased substantially; these rates are estimated to have more than quadrupled between 1982 and 2021 (5.3 deaths per 100,000 persons to an estimated 23 deaths per 100,000 persons) (Figure 2).

Figure 2: Age-standardised mortality rates, brain cancer, by age group, persons, 1982 to 2021

Note: Actual rates are provided between 1982 and 2019, 2020 and 2021 are projections.

Source: AIHW National Mortality Database

Why have the incidence and mortality rates for the older populations increased?

It has been suggested that the increasing rates of death from brain cancer for people older than 80 may not be genuine, rather brain cancers in the elderly were not diagnosed as often in earlier years. Increasing rates for the elderly began to occur with the availability of more sophisticated, non-invasive diagnostic technology and changes in the attitude toward care for the elderly (Modan et al. 1992).
What do brain cancer incidence and mortality rates look like when adjusted for possible undercount?

The increase in brain cancer incidence in the elderly populations may be related to more aggressive diagnostic testing for this population (Legler et al. 1999) rather than brain cancer becoming more common in this population. Our interpretations of brain cancer rates today and how things have changed is based in part on comparisons with past rates. When we adjust time series for the possible historical under-diagnosis of brain cancer in the elderly, our understandings of brain cancer trends alters accordingly (particularly mortality trends).

Adjusting brain cancer age-standardised incidence and mortality rates for possible under-diagnosis

We have created a time series that aims to remove the potential under-diagnosis of the elderly in earlier years. Pre-1996 brain cancer incidence rates appear to be at most risk of reduced incidence and mortality rates arising from potential under-diagnosis. By using the 1996 incidence rates for the elderly and applying these age-specific rates to earlier years, we are able to derive adjusted age-standardised incidence rates; these rates provide an indication of the age-standardised rates without the possible under-diagnosis of the elderly. This same process has been used for mortality data.

We emphasise that the actual/raw rates represent the accurate rates of diagnosis and death as they were recorded at the time. The adjusted time series may provide a more comparable time series from which brain cancer trends may be better understood.

How do brain cancer incidence rates change over time when adjusted for possible under-diagnosis?

Figure 3 provides the actual and adjusted age-standardised brain cancer incidence rates from 1982 to 2021. Actual age-standardised incidence rates remain quite stable throughout time, as do the adjusted rates. The impact of adjusting incidence rates for possible under-diagnosis on how time series is interpreted is relatively limited. Its main impact for incidence may be to alter the possible interpretation that brain cancer age-standardised incidence rates were historically lower and that the occasional lower rates occurring in some more recent years have occurred in the past.

Figure 3: Age-standardised incidence rates and adjusted age-standardised incidence rates, brain cancer, persons, 1982 to 2021

Notes:
1. Actual rates are provided between 1982 and 2017, 2018 and onwards are projections.
2. 2017 rates include estimates for the Northern Territory and an estimate of late registrations for all other jurisdictions.
3. 2016 rates include estimates of late registrations for the Northern Territory only.
4. For 1982 to 1995, brain cancer rates for the population aged over 80 are adjusted to equal the 1996 rate of this population.

Source: AIHW Australian Cancer Database 2017

How do brain cancer mortality rates change over time when adjusted for possible under-diagnosis?

Actual age-standardised mortality rates for brain cancer suggest there is some volatility but overall little has changed over time. However, adjusted mortality rates more clearly show there has been a decrease in mortality rates. (Figure 4).

For mortality rates to have improved while incidence remained relatively stable, survival rates must have improved to some degree. This has occurred and is discussed in the next section.

Figure 4: Age-standardised mortality rates and adjusted age-standardised mortality rates, brain cancer, persons, 1982 to 2021
Notes:

1. Actual rates are provided between 1982 and 2019, 2020 and 2021 are projections.
2. For 1982 to 1995, brain cancer rates for the population aged over 80 are adjusted to equal the 1996 rate of this population.

Source: AIHW National Mortality Database

Brain cancer survival rates have changed more over time than it appears

Brain cancer 5-year relative survival rates appear to have increased by only 2 percentage points over a span of more than 20 years (20% in 1988-1992 to 22% in 2013-2017) (Figure 5). However, further analysis suggests that this time series is unlikely to satisfactorily capture the extent that brain cancer has really improved (which is discussed in detail in Cancer data commentary number 6 and briefly summarised below).

Figure 5: Five-year relative survival, persons, brain cancer, 1988-1992 to 2013-2017

Source: AIHW Australian Cancer Database 2017

Why aren’t improvements in brain cancer relative survival being adequately captured?

Relative survival time series (all ages) across the different time periods are based on the survival for the entire population diagnosed with brain cancer for each of the relevant periods. The population aged over 80 has much lower survival rates than younger ages. Periods such as 1988-1992 include much smaller proportions of people aged over 80 than later periods. As time goes by, increases in brain cancer survival that have been occurring for most age groups which would normally also be apparent in the relative survival rate for all ages combined are being offset by the growing number of older people being diagnosed with brain cancer in later years.

When adjusting for age, brain cancer 5-year survival rates have doubled

When adjusting for age, the 2013-2017 brain cancer 5-year relative survival rate is effectively double that of 1988-1992 (11% to 22%). The actual 1988-1992 5-year relative survival rate of 20% is derived from a younger population of those diagnosed with brain cancer. If it had the same age characteristics as the population diagnosed in 2013-2017 the 5-year relative survival rate would have been 11% and not 20% (Figure 6). The age adjusted relative survival time series provides a more genuine reflection of changes in brain cancer survival outcomes over time.

Figure 6: Five-year relative survival and age-adjusted relative survival, brain cancer, persons, 1988-1992 to 2013-2017
Improvements in brain cancer survival have occurred for most age groups

Changes in brain cancer survival are better considered by viewing how survival rates have changed for each of the specific age groups. The population aged 20 to 39 has had the largest improvement in brain cancer 5-year survival rates between 1988-1992 and 2013-2017 (54% to 68%). For people aged 40 to 59, 5-year relative survival rates improved from 18% to 27% for the same period. Even though 5-year relative survival rates for people aged 60 to 79 remain low at 6.7%, this rate is double the rate of 3.1% in 1988-1992 (Figure 7).

Figure 7: Five-year relative survival, brain cancer, by age group, persons, 1988-1992 to 2013-2017

Improvements in survival are generally more evident for shorter survival periods (such as 2-year survival rates), particularly for cancers with relatively low survival rates such as brain cancer. These rates are available within the CdiA Survival by age data visualisation.

Concluding points

The incidence and mortality data adjusted for under-diagnosis appears to provide a more reasonable interpretation of brain cancer rates over time than the actual data. Relatively stable age-standardised incidence rates are accompanied by mortality data that is stable before decreasing. Decreases in mortality are likely to be driven by improvements in survival.

While there is some evidence supporting the under-diagnosis of the older populations in earlier years, it cannot be known with certainty. The age-adjusted mortality and incidence age-standardised rates presented are speculative of how rates would look assuming under-diagnosis of the elderly occurred in the past.

Actual age-standardised and crude incidence and mortality rates for brain cancer remain an accurate description of what was recorded in the relevant years and will therefore continue to be published in CdiA without adjustment. This commentary is intended to support interpretations of brain cancer data, but not replace the data recorded.

Brain cancer relative survival time series will continue to be published within CdiA. This data remains an accurate reflection of relative survival rates for the population diagnosed with brain cancer for the respective periods. These survival rates are now accompanied by the age-adjusted tool which is used to identify whether changes in survival rates are being impacted by changes in the age of those diagnosed with cancer across time.

CdiA now includes survival rates by 20 year age groups over time. These data provide further insights into cancer survival over time and provide important information for all cancers.
How are pancreatic cancer rates changing?

Cancer data commentary no. 3

This commentary discusses trends in pancreatic cancer incidence, mortality and survival, in particular, changes that have occurred since around 2000.

The pancreas is located near the stomach; it produces enzymes that aid digestion and hormones that regulate blood sugar levels. Pancreatic cancer occurs when abnormal cells in the pancreas multiply out of control and form a tumour.

Pancreatic cancer has very low survival rates and is becoming more commonly diagnosed. Research indicates that the poorer outcomes associated with pancreatic cancer are primarily due to its presentation at an advanced stage. Early stages of pancreatic cancer do not usually produce symptoms, so it is generally advanced when it is diagnosed (AIHW 2012).

### Terms used

*Incidence rates* refer to the rate of pancreatic cancer cases diagnosed.

*Mortality rates* refer to the rate of death from pancreatic cancer.

*Projections* are estimates for the most recent years (2017-2020 for incidence and 2019-2020 for mortality). Estimates are derived based on trends from the previous 10 years of actual data. Where this commentary discusses rates based on projections, the rates are described as ‘estimated’.

For those less familiar with statistical methods and terms, some assistance in their use is provided within the commentary. Please see the methods section of Cancer data in Australia for more detailed information.

### Pancreatic cancer trends

The estimated number of pancreatic cancer cases diagnosed per year has more than doubled in 20 years

From 1982, the number of pancreatic cancer cases diagnosed each year was steadily increasing; from 2002, the number of cases continued to increase but overall, increases were greater. Between 1982 and 2002, the number of pancreatic cancer cases diagnosed increased by around 60% (from 1,200 cases in 1982 to 1,900 in 2002). It is estimated that the number of pancreatic cancer cases diagnosed in 2020 will be more than double those of 2002 (estimated 3,900 cases in 2020) (Figure 1). This increase in incidence from 2002 is attributable to general population growth, an ageing population and pancreatic cancer becoming more commonly diagnosed across various age groups.

**Figure 1: Pancreatic cancer cases diagnosed, persons, 1982-2020**

![Graph showing pancreatic cancer cases diagnosed, persons, 1982-2020](source: AIHW Australian Cancer Database 2016)

The ageing population places upwards pressure on pancreatic cancer case numbers

The Australian population continues to increase but the growth is not uniform across age groups. With life expectancy increasing, more people are living to older ages than in the past and older populations are growing at a faster pace than younger populations and the overall population growth.

Older populations experience higher rates of pancreatic cancer. The combination of the size of older populations increasing at greater rates and pancreatic cancer being more common at older ages contributes to the number of cases diagnosed increasing at greater rates than general population growth. A clearer understanding of the influence of the ageing population upon the number of pancreatic cancer cases diagnosed over time can be gained through the following crude and age-standardised incidence rate time series.

Pancreatic cancer incidence rates are increasing
About crude rates - interpreting time series

The crude rate of cancer is the rate of cancer within the population. The crude rate of cancer will remain the same where the rate of cancer increases at the same rate as population growth.

Given that pancreatic cancer more commonly occurs in older people and the size of older populations is increasing at a faster rate than general population growth, there is a regular upwards pressure on crude rates.

Crude incidence rates for pancreatic cancer increased from 7.9 cases per 100,000 persons in 1982 to 9.8 cases per 100,000 people in 2002; most of the increase during this time is attributable to impacts of an ageing population. By 2020, crude rates are estimated to reach 15 cases per 100,000; this increase is attributable to both the ageing population and pancreatic cancer becoming more commonly diagnosed across various age groups (Figure 2).

About age-standardised rates - interpreting time series

Like crude rates, age-standardised rate time series focus on changes to cancer rates. Unlike crude rates, they remove the impact of changes to the age composition of the population (such as impacts due to the ageing population).

An increase in age-standardised rates indicates that overall cancer rates are increasing and there are ages for which the cancer is becoming more commonly diagnosed (and vice versa for decreasing age-standardised rates).

Whether an age-standardised rate is increasing, decreasing or remaining stable, it only indicates overall movement. Some rates among individual age groups may not be moving in the same direction as the overall age-standardised cancer rates.

Between 1982 and 2002, age-standardised incidence rates were stable and ranged between 9.6 cases per 100,000 people and 10.3 cases per 100,000 people (Figure 2).

Age-standardised incidence rates began to increase from 2002. It is estimated that age-standardised incidence rates for pancreatic cancer in Australia will be 12.5 cases per 100,000 persons by 2020 (Figure 2).

Figure 2: Pancreatic cancer age-standardised and crude incidence rates, persons, 1982–2020

Source: AIHW Australian Cancer Database 2016

The median age at diagnosis has fallen

The median age at diagnosis had been increasing from 1982. These increases slowed from the late 90’s and began to decrease from 2008 (the median age was 69.6 in 1982, increasing to a peak of 73.9 in 2008 and by 2016 it was 72.8) (Figure 3).

The median age at death from pancreatic cancer has moved in a relatively similar manner in that there has been a general stabilisation from original increases; it differs in that there has not been a drop in median age at death (Figure 3).

Comparability of median age at diagnosis and median age at death

Please note that median age at diagnosis and median age at death are derived from different data sources. The median age at diagnosis time series is more sensitive to change as it is calculated to a month whereas median age at death is only calculated to a year. Comparisons between the two may be impacted by the difference in sensitivity to some extent.

Figure 3: Pancreatic cancer median age at diagnosis and median age at death, persons, 1982–2018
Despite increases in incidence, mortality rate trends remain relatively consistent
Between 1982 and 2020, crude mortality rates ranged between 7.4 cases per 100,000 persons in 1983 and an estimated 12.8 cases per 100,000 persons in 2020. The ageing population is the predominant driver for increasing crude mortality rates (Figure 4).

Between 1982 and 2020, age-standardised mortality rates ranged from 9.2 cases per 100,000 persons in 1982 to 10.4 cases per 100,000 persons in 2017 (Figure 4). While the more recent mortality rates are generally on the higher end of the pancreatic cancer mortality rate range, they have not increased to the same degree as age-standardised incidence rates.

The widening of the gap between incidence and mortality rates indicates improvements in survival rates and the risk data provided later in this commentary help visualise the improvements.

Figure 4: Age-standardised and crude mortality rates, pancreatic cancer, persons, 1982–2020

Survival rates remain low but have improved

About relative survival
An observed cancer survival rate is the rate of survival of those diagnosed with cancer. An observed survival rate considers only whether the person has survived for the period in question. It is limited to the extent that it does not take into account the fact that some deaths may have occurred due to causes other than the relevant cancer.

A relative survival rate adjusts the observed survival rate to account for deaths that may be expected to occur in the general population. A relative cancer survival rate is the survival rate of people diagnosed with cancer relative to the survival rate for the general population. A rate of 100% indicates there is no difference between the survival of those diagnosed with cancer and the survival of the general population.

All survival rates referred to in this commentary are relative survival rates. Confidence intervals are available in the supplementary tables.

Survival rates for pancreatic cancer are amongst the lowest of all cancers. The 5-year survival rate for all cancers combined (that is, the survival rate of people diagnosed with any type of cancer) in 2012–2016 was around 69%; the equivalent 5-year survival rate for pancreatic cancer was 10.7%.

The 5-year survival rate of 10.7% remains low but it has been improving (6.5% in 2007–2011) and is around 3 times the survival in 1987–1991 (3.2%) (Figure 5).

Shorter-term survival rates have improved over time and greater improvement is evident in more recent years. For instance, between 2007–2011 and 2012–16, 1-year survival improved by over 8 percentage points (from 24.6% to 33.1%) (Figure 5).
Survival is improving for younger and older populations

Survival rates for pancreatic cancer decrease as age at diagnosis increases. In 2012-2016 the 5-year survival for people aged 0 to 39 was 52%; the equivalent rate for people aged over 80 was 2.9% (Figure 6).

5-year survival rates have been improving for younger and older age groups. In 1997-2001, the 5-year survival for people aged 0-39 was 32%; by 2012-2016 it had increased to 52%. Across the same time periods, for people aged 40-59 years, survival increased from 11% to 21% and for people aged 60-79, survival has increased from 4.3% to 10.5% (Figure 6).

Of the 16,000 total cases in 2012-2016, around 8,600 (54%) were diagnosed in people aged 60 to 79 years. The 5-year survival rate for pancreatic cancer (all ages) continues to be very close to that of the 60-79 age group. For example, the 5-year survival rate for people aged 60-79 was 10.5% in 2012-2016 and 10.7% for pancreatic cancer overall (all ages combined) (Figure 6).

Pancreatic cancer incidence risk is increasing

Pancreatic cancer risk is either the risk of being diagnosed with (incidence) or dying from (mortality) pancreatic cancer by a specified age.

Risk estimates are adjusted for competing mortality. A fundamental aspect of risk adjusted for competing mortality is that it considers the likelihood of reaching a given age and then considers the likelihood of diagnosis with (or death from) the cancer.

Given that life expectancy in Australia is increasing, more people are reaching the ages at which pancreatic cancer is more commonly diagnosed. Within the risk time series, risk increases to some extent because more people are more likely to survive to older ages.

Where risk is low and estimates are more volatile, analysis of risk is discussed using the average over a period of time rather than single years (for example, the average risk from 2011 to 2020).

Risk by the age of 40

The risk of being diagnosed with pancreatic cancer by the age of 40 has been increasing (average risk of 1 in 14,300 for the 1991-2000 period, to 1 in 11,900 in 2001-2010 and 1 in 7,800 in 2011-2020) (Figure 7).

While the risk of being diagnosed with pancreatic cancer by the age of 40 is reaching its highest levels in 2011-2020, this is not the case for the risk of dying from pancreatic cancer. The average risk of death for the 2011-2020 period is 1 in 25,500. This is an increase on the average risk over 2001-2010 (1 in 29,900) but is lower than the average risk of death for the 1991-2000 period (1 in 20,300) (Figure 7). The increasing gap between the risks of diagnosis and death reflects the improvement in survival for younger people diagnosed with pancreatic cancer.
The risk of being diagnosed with pancreatic cancer is increasing but it remains a relatively low risk for younger populations. To provide some context by comparison with a couple of cancers more commonly associated with ages 40 and under, the average risk of being diagnosed with colorectal cancer by the age of 40 between 2011–2020 is 1 in 550; for melanoma of the skin it is 1 in 301.

**Figure 7: Risk of diagnosis and risk of death, by the age of 40, pancreatic cancer, persons, 1982–2020**

Source: AIHW Australian Cancer Database 2016 and AIHW National Mortality Database

**Risk by age 70**

Since 1982, the median age of diagnosis has generally remained around the age of 70. The risk of being diagnosed with pancreatic cancer by the age of 70 has trended upwards since 2002 (1 in 260 in 2002 to an estimated 1 in 189 in 2020). Over the same time, the risk of death by the age of 70 remained similar (1 in 281 in 2002 to an estimated 1 in 282 in 2020) (Figure 8).

**Figure 8: Risk of diagnosis and risk of death, by the age of 70, pancreatic cancer, persons, 1982–2020**

Source: AIHW Australian Cancer Database 2016 and AIHW National Mortality Database

**Can the data provide insights into the potential reasons behind changing pancreatic cancer rates?**

More information and data is required to better understand the potential drivers affecting pancreatic cancer incidence, mortality and survival trends in Australia. This section discusses the available data trends and highlights some possible reasons for the observed changes.

The possibilities considered in this section include:

- improvements in cancer detection
- changes in risk factors
- improvements in cancer treatment
- changes in the proportion of different histological types of pancreatic cancer (noting that mortality by histology is not currently available).

**Changes in histology type**

Histology describes the type of cells in which cancer originates. Symptom patterns and survival outcomes vary based on histology type. Histology groupings presented in this commentary are based on the histological groups described in *Cancer incidence in five continents* (Bray et al. 2017). See Appendix A for more details.

The histological types for pancreatic cancer include adenocarcinoma, unspecified malignant neoplasms, unspecified carcinomas, neuroendocrine neoplasms, other specified carcinomas, sarcomas and other specified malignant neoplasms. Sarcomas and other specified malignant neoplasms are not discussed further due to the small number of cases diagnosed (4 cases in total in 2016) but are included in totals.

Please note that changes in the proportion of cases diagnosed by histology type may change over time to some degree due to changes in coding practices (for example, some proportion of adenocarcinoma increases over time may be due to reductions in unspecified carcinomas).
While acknowledging changes in coding practices make it difficult to establish the degree to which different histology types may be becoming more commonly diagnosed, neuroendocrine neoplasms increasingly appear to make up a greater portion of the total number of pancreatic cancer’s diagnosed (Figure 9). Neuroendocrine neoplasms also have the highest survival rates of all pancreatic cancer histological types (neuroendocrine neoplasms had a 5-year survival of 69% in 2012–2016) (Figure 10).

Neuroendocrine 5-year survival in 2012–2016 improved by around 10 percentage points from 2007–2011 (from 59% to 69%). Improvements in survival for pancreatic cancer’s most common histology type, adenocarcinomas, are key to improvements in pancreatic cancer survival rates. Adenocarcinoma has very low 5-year survival rates but they have also improved (from 4.7% in 2007–2011 to 6.7% in 2012–2016) (Figure 10).

In 1987–1991, the adenocarcinoma 5-year survival rate was 1.9% and the overall pancreatic cancer survival rate was 3.2%. In 2012–2016, the respective rates were 6.7% and 10.7% (Figures 5 and 10). Improvements in adenocarcinoma survival are key to the improvements in pancreatic cancer survival overall. The increasing difference between the overall pancreatic survival rate and the adenocarcinoma rate is suggestive that histology types with higher survival are contributing more towards overall pancreatic cancer survival rates.

Figure 9: Proportion of pancreatic cancer cases diagnosed by histology type, persons, 1982-2016

![Figure 9](image)

Source: AIHW Australian Cancer Database 2016

Figure 10: 5-year relative survival, pancreatic cancer, by histology type, persons, 1987–1991 to 2012–2016

![Figure 10](image)

Source: AIHW Australian Cancer Database 2016

Focussing on shorter-term survival for the most common histology type, adenocarcinoma 1-year survival improved from 30% in 2007–2011 to 36% in 2012–2016 (Figure 11).

Figure 11: 1-year relative survival, pancreatic cancer, by histology type, persons, 1987–1991 to 2012–2016

![Figure 11](image)

Source: AIHW Australian Cancer Database 2016

As previously discussed, survival rates for pancreatic cancer decrease with increasing age. Higher survival rates for younger ages (Figure 6) are also influenced by histology to some degree. In particular, the higher survival neuroendocrine neoplasms are proportionally more common in younger age groups (Figure 12).
Figure 12: Proportion of pancreatic cancers diagnosed with neuroendocrine neoplasm histology type, by age group, persons, 2000–2016

Source: AIHW Australian Cancer Database 2016

Exploring survival rates by age group can provide insights into whether the higher survival rates observed for neuroendocrine neoplasms are only due to it having a younger age profile. Comparisons of the 2012–2016 5-year survival rates for people diagnosed at age 60–79 show that the survival rate is much higher for those diagnosed with neuroendocrine neoplasms (64%) than adenocarcinomas (7.1%) (AIHW 2020, unpublished). This highlights that the higher survival rates for neuroendocrine neoplasms are not solely due to a younger age profile.

Improvements in cancer detection

Improvements in cancer detection would be expected to generally result in increasing incidence rates (for a period of time), increasing survival rates and potentially younger age at diagnosis (as the cancer is diagnosed earlier than it would have otherwise been). Mortality rates would be expected to either decrease or at least not increase proportional to incidence rates.

There are no early detection tests for pancreatic cancer. Pancreatic cancer trends do however exhibit some similarities to trends arising from improvements in cancer detection. As national data on stage at diagnosis are not currently available for pancreatic cancer, it is not possible to determine whether the cancer is being diagnosed at earlier stages.

Increase in the prevalence of risk factors for pancreatic cancer

Risk factors associated with pancreatic cancer include smoking, overweight/obesity, age, family history, diabetes, chronic pancreatitis, liver cirrhosis and stomach infections (Cancer Australia 2020). An increase in the prevalence of these risk factors may lead to increases in pancreatic cancer incidence.

Each risk factor will be changing to varying degrees within the population, the extent to which these changes impact on pancreatic cancer rates cannot be known with any certainty. Focussing on several key risk factors, smoking rates are declining while overweight/obesity and diabetes are increasing. If the key risk factors for pancreatic cancer are changing over time, it may lead to changes in incidence rates and possibly the age at diagnosis may change over time as a result.

The ageing population’s impact on incidence and mortality counts and crude rates is discussed earlier. The ageing population will also place upwards pressure on median age at diagnosis and downwards pressure on survival rates (because survival rates decrease with increasing age at diagnosis).

More effective treatment

More effective treatments would be expected to result in increases in survival rates, decreases in mortality and increases in median age at death. Increases in rates of survival by stage at diagnosis (which is not available nationally for pancreatic cancer) would indicate that any improvements in survival are likely to be due to improvements in treatment rather than pancreatic cancers being diagnosed at earlier stages on average.

National Pancreatic Cancer Roadmap

Cancer Australia is working with the Department of Health to develop a National Pancreatic Cancer Roadmap to improve outcomes and survival for people with pancreatic cancer. The Roadmap will identify key priority areas for action over the next five years, across the continuum of pancreatic cancer care and pancreatic cancer research. The roadmap is expected to be developed by December 2021. More information about the roadmap is available on the Cancer Australia website.

Where can I find more data on pancreatic cancer?

Data used to inform this commentary are available on the Data page.

A more complete range of pancreatic cancer data is available within the Cancer data in Australia report, including by sex. General incidence, mortality and survival trends discussed in this paper are common across the sexes although males have higher incidence and mortality rates (survival rates are generally similar).

The Cancer data in Australia report is updated annually but note that the data to inform this commentary were obtained from the Australian Cancer Database, National Mortality Database and associated projections as at the time this commentary was released. For this reason, the estimates presented in this commentary may not be consistent with the estimates presented in Cancer data in Australia.
## Pancreatic cancer (ICD-10 C25) histology groupings

<table>
<thead>
<tr>
<th>Histology group</th>
<th>ICD-O-3.1 histology codes</th>
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</thead>
<tbody>
<tr>
<td>Carcinomas</td>
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<tr>
<td>Adenocarcinomas</td>
<td>814, 816, 819-823, 825-842, 848-855, 8570-8574, 8576-8579</td>
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<tr>
<td>Neuroendocrine neoplasms</td>
<td>8013, 8041-8045, 815, 824</td>
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<td>Other specified carcinomas</td>
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<td>Unspecified carcinomas</td>
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<tr>
<td>Sarcomas</td>
<td>880-893, 899, 904, 9120-9139, 9141-9249, 954-958</td>
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<tr>
<td>Other specified malignant neoplasms</td>
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<tr>
<td>Unspecified malignant neoplasms</td>
<td>800</td>
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</table>

Note: Only the first 3 digits are given except when the 4th digit is necessary.
Cancer data commentaries

Risk of melanoma of the skin by age and over time

Cancer data commentary 2

This commentary discusses risk trends for melanoma of the skin at different ages and over time. It supports the introduction of the expanded risk data available in the Cancer data in Australia report.

Some key terms

- For convenience, melanoma of the skin has been abbreviated to ‘melanoma’; please note melanoma may occur in other sites of the body.
- Melanoma incidence risk’ is the risk of being diagnosed with melanoma while ‘melanoma mortality risk’ is the risk of dying from melanoma. This paper uses a risk method that adjusts for competing mortality; Cancer data commentary no.1 provides help in understanding cancer risk methods and concepts.

Melanoma risk

Cancer awareness campaigns such as the ‘Slip-Slop-Slap’ campaign of the 1980s and ensuing advertisements since have increased public awareness of melanoma and its prevention. Through continuing education, today’s population should be better informed about how to identify and prevent melanoma than populations of the past.

Lifetime melanoma incidence risk informs risk of being diagnosed with melanoma for the total population (that is, the risk across all ages of the population). Within the total population, older people have lived most of their lives in a less ‘sun smart’ environment while younger Australians have lived the majority of their life in times when public awareness was greater. The following melanoma incidence risk by age commentary highlights the falling risk for the younger populations of today and increasing risk for older populations.

The risk of being diagnosed with melanoma of the skin by the age of 30 has more than halved in 23 years

In 1982, the risk of being diagnosed with melanoma by the age of 30 was around 1 in 600 people. Incidence risk trended upwards and in 1997 has risen to around 1 in 430 people (Figure 1).

From 1997, the risk of melanoma by the age of 30 began to fall. Based on current projections, in 2020 the risk of being diagnosed with melanoma by the age of 30 (estimated at around 1 in 1,170 people) has fallen to less than half of the risk in 1997 (Figure 1).

Following years of consistent decline, the risk of death from melanoma by the age of 30 in 2020 is estimated to be less than one-sixth of the risk in 1982 (1 in 62,000 persons in 2020 compared with 1 in 9,100 persons in 1982) (Figure 1).

The risk of being diagnosed with melanoma of the skin by the age of 60 peaked in the 1990’s

In 2005, and following years of increasing risk from 1982, melanoma incidence risk by the age of 60 began to fall and then stabilise from around 2012 (1 in 56 people in 2005 to an estimated 1 in 65 people in 2020) (Figure 2).

The large difference between the incidence risk and mortality risk reflects the relatively high survival rates for melanoma when considered in the context of other cancers.

The risk of death from melanoma by the age of 60 decreased consistently from 1982; from 2013 melanoma mortality risk decreased more sharply (from 1 in 650 in 1982 to 1 in 850 in 2013 and an estimated 1 in 1,600 in 2020) (Figure 2).

Note: Incidence risk for 2017-2020 and mortality risk for 2019 - 2020 are based on projections.

Source: AIHW Australian Cancer Database 2016 and National Mortality Database
The risk of death from melanoma of the skin peaked in 2013

The lifetime risk of being diagnosed with melanoma is estimated to have tripled since 1982 (1 in 46 people in 1982 to an estimated 1 in 15 people in 2020) (Figure 3). Considering the younger population’s melanoma of the skin incidence risk has been decreasing and incidence risk by the age of 60 has been stabilising, the continuation of increasing melanoma incidence risk is driven by risks from the older population.

Part of the increase in the total population’s risk of being diagnosed with melanoma is due to increasing life expectancy. Essentially, the ageing population increases the proportion of people living to ages for which melanoma is generally more common (Figure 3).

The lifetime risk of death from melanoma continued to rise up until 2013 (Figure 3). Please note that lifetime risk is not the risk for the ‘average lifetime’, it includes all people within the population and in very broad terms may be considered as risk by age 100 and more.

Figure 3: Lifetime incidence and mortality risk, melanoma of the skin, persons

In 2013, the total population’s risk of death from melanoma was around 1 in 110 people; the lifetime melanoma mortality risk in 2013 had more than doubled from 1982 (1 in 240 people). Since the 2013 peak, lifetime melanoma mortality risk is estimated to have fallen to 1 in 140 people (Figure 4). Sharply decreasing mortality risk in conjunction with increasing incidence risk is indicative of improving survival outcomes for those diagnosed with melanoma (Figure 4).

Figure 4: Lifetime mortality risk, melanoma of the skin, persons

The lifetime risk of death for males from melanoma of the skin has fallen strongly
The decrease in lifetime mortality risk from 2013 is driven largely by reductions in the comparatively high risk for males (1 in 80 in 2013 to an estimated 1 in 104 in 2020). For females, the lifetime risk of death also fell but at a slower rate (1 in 185 in 2013 to an estimated 1 in 197 in 2020 (Figure 5).

Figure 5: Lifetime mortality risk, melanoma of the skin, by sex, 1982-2020

Note: Mortality risk for 2019 - 2020 are based on projections.
Source: National Mortality Database

For both sexes, the lifetime risk of being diagnosed with melanoma continues to increase (figure 6) but the lifetime mortality risk for melanoma is starting to decrease.

Figure 6: Lifetime incidence risk, melanoma of the skin, by sex, 1982-2020

Note: Incidence risk for 2017-2020 are based on projections.
Source: AIHW Australian Cancer Database 2016

While melanoma mortality risk peaked in 2013, impacts of an ageing population (that is, more people living to ages where melanoma incidence rates are higher) will continue to place upwards pressure on the risk of being diagnosed with melanoma and in turn the risk of death from melanoma; this may be particularly true for the ageing populations living in times when ‘Sunsmart’ awareness was less.

Information about the risk data, terms used and where to find melanoma data

About the risk data
- This paper uses a risk method that adjusts for competing mortality; Cancer data commentary no.1 provides help in understanding cancer risk methods and concepts.
- Risk within this paper outlines the risk within the Australian population; an individual’s risk may be different depending on their own risk factors (for example, a daily smoker may have a higher risk of developing types of cancer where smoking is a risk factor).
- Cancer incidence risk in 2017-2020 and cancer mortality risk in 2019-2020 are projections; actual data informs other years.

Terms used
Lifetime risk refers to the risk of (being diagnosed with or dying from) melanoma of the skin for the total population. Lifetime risk is not the risk of the ‘average lifetime’; it is risk by age 100 and greater (to the oldest person/s in the population for the year).

Melanoma incidence risk refers to the risk of being diagnosed with melanoma of the skin.

Melanoma mortality risk refers to the risk of dying from melanoma of the skin.

Where to find melanoma data

Melanoma data used in the commentary

Data used to inform this commentary is available in these Excel workbooks:

Data tables: Cancer data in Australia commentary no. 2 - Risk of melanoma of the skin by age and over time (XLSX 145kB).
Cancer data commentaries

Changes to the cancer risk data and guidance using the risk methods

Cancer data commentary no. 1

The 2020 release of Cancer data in Australia (CDiA) contains a greater range of risk data than previous AIHW releases. This cancer data commentary provides guidance on using the new risk data and summarises key changes.

Changes in the 2020 release of cancer risk data

Changes to CDiA include the following:

- Previously, the only risk data available was not adjusted for competing mortality; now risk adjusted for competing mortality is also available
- Risk by age 5 up to risk by age 90 (in 5-year increments) and lifetime risk are now released -- previously only risk by age 75 and by age 85 were available
- Because of methodological issues associated with its derivation, ‘All cancers combined’ incidence risk time series is not available
- While the previous method of calculating incidence risk (not adjusted for competing mortality) has been revised, the new method is similar to the previous method and produces comparable results (with the exception of ‘All cancers combined’ incidence)

About the two methods for measuring risk

‘Cancer risk’ is generally used to describe the risk of being diagnosed with, or the risk of dying from, cancer.

CDiA includes a ‘risk adjusted for competing mortality’ (AdjCom) method and a ‘risk unadjusted for competing mortality’ (RUCM) method. A more technical overview of the methods is available in the methods section of CDiA.

Risk unadjusted for competing mortality only considers the likelihood of being diagnosed with, or dying from, cancer. ‘Competing mortality’ considers the probability of a certain event occurring for a person (e.g. diagnosis of cancer, death from cancer) while taking into account the fact that the person might die before the event happens. The additional factor of competing mortality results in an estimate that better reflects the ‘real world’ risk but it also produces more complex comparisons. In particular, to what extent are changes in risk over time, or differences between the risk for two populations, influenced by competing mortality and to what extent are they driven by cancer risk?

Why publish two risk methods?

The different methods have their own respective strengths and limitations. Therefore, one method may be better suited to inform a particular investigation than the other. Guidance on using the methods is provided in more detail in the following sections.

What are the practical differences between the risk methods?

AdjCom measures risk by taking into account the mortality that occurs due to other causes whereas RUCM does not. The following hypothetical situation helps highlight the practical differences.

- Suppose that in 1982 and then in 2015, only people aged 10 to 14 were diagnosed with condition X and only people aged 85 to 89 were diagnosed with condition Y.
- Suppose that the number of people who were diagnosed with condition X was equal to 0.5% of the population alive aged 10 to 14, and the number of people who were diagnosed with condition Y was equal to 0.5% of the population alive aged 85 to 89.

Table 1 provides the risk of diagnosis using RUCM and AdjCom for conditions X and Y in 1982 and 2015 and calculates the risk for each condition.

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Condition X</td>
<td>2.4690% (1 in 41)</td>
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<td>2.4635% (1 in 41)</td>
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<td>Condition Y</td>
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<td>2.4690% (1 in 41)</td>
<td>0.4822% (1 in 207)</td>
<td>1.0636% (1 in 94)</td>
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Observations:

- RUCM for conditions X and Y were the same for 1982. RUCM does not distinguish between age groups. A population risk based only on a rate of 0.5% of 10 to 14 year olds will be the same as a population risk based only on 0.5% of all 85 to 89 year olds.
AdjCom for condition Y is less than AdjCom for condition X. When competing mortality is taken into account, people have less chance of being diagnosed with condition Y than condition X because a much smaller proportion of people reach age 85 than reach age 10.

RUCM has remained the same over time. For conditions X and Y, RUCM is the same from 1982 to 2015 because the incidence rates of X and Y have remained unchanged and RUCM does not distinguish between age groups or the likelihood of surviving to a given age.

AdjCom has increased over time. The risk of being diagnosed with condition Y has more than doubled, even though the incidence rates in 1982 and 2015 are the same (0.5% of the population aged 85 to 89). This occurred because a much greater proportion of people are living to the age of 85 in 2015 than in 1982.

Please note that RUCM minus AdjCom does not somehow isolate the effect of competing mortality. In fact, AdjCom can be higher than RUCM, as is the case for condition X in 2015 in the example above. To view RUCM and AdjCom formulas, please go to Cancer data in Australia methods section.

**Which risk method should I use?**
The selection of which risk method to use depends on the purpose of the investigation. The most complete understanding of risk is accomplished when using the two methods together.

By factoring in competing mortality, AdjCom provides a better estimate of ‘real world’ cancer risk (that is, a better approximation of the likelihood of being diagnosed with, or dying from, cancer in Australia). However, when viewing changes over time or between populations, the question when using AdjCom is “are the observed differences or changes due to competing mortality or due to the risk purely attributable to cancer?”.

On the other hand, in not factoring in competing mortality, RUCM is less representative of the ‘real world’ risk, particularly at older ages. However, its strength is that comparisons and time series are solely attributable to cancer risk (i.e. not affected by differences in competing mortality).

Because the methods have opposing strengths and limitations, use of the two methods together can help provide a more complete understanding of risk. In general, when writing about cancer risk, AIHW cite AdjCom but also use RUCM to understand cancer-specific trends that are isolated from competing mortality.

**How the risk methods can be used together**
RUCM and AdjCom measure risk differently and are not directly comparable. However, the information from the respective time series can be used in a complementary manner to provide greater insights into changes over time; the following discussion of changes in lung cancer risk over time helps illustrate this by using AdjCom to estimate the ‘real world’ risk and RUCM to isolate cancer risk.

Between 1982 and 2020, the risk of persons being diagnosed with lung cancer by the age of 90 is estimated to have increased from 1 in 23 to 1 in 18. The increase in risk of being diagnosed with lung cancer by the age of 90 is mostly due to a greater proportion of people surviving to the ages where lung cancer is more commonly diagnosed but increasing lung cancer rates have contributed to some degree (Figure 1).

**Figure 1: Risk of being diagnosed with lung cancer by the age of 90, risk adjusted for competing mortality and risk unadjusted for competing mortality, persons, 1982 to 2020**

![Figure 1: Risk of being diagnosed with lung cancer by the age of 90, risk adjusted for competing mortality and risk unadjusted for competing mortality, persons, 1982 to 2020](Image)

Source: AIHW ACD 2016

The above interpretation of lung cancer risk is undertaken by using AdjCom to provide the ‘real world’ estimate but RUCM to interpret cancer specific risk change over time. Given RUCM focusses only on cancer risk and the RUCM time series is considerably flatter than AdjCom, the sharper increase in AdjCom is likely predominantly due to changes in competing mortality over time.

When using RUCM to assist in the interpretation of AdjCom time series, note that RUCM less AdjCom does not equal competing mortality.

**Difficulties using AdjCom to compare populations with different competing mortality**
AdjCom comparisons between different populations are accurate but can be open to misinterpretation. Where readers are not aware of the competing mortality concept, it is likely that comparisons will be interpreted as only being due to cancer rates. Where readers are aware of the concept, the question often arises as to whether differences are due to competing mortality or cancer rates.
The potential for misinterpretation, and how to address the issue by using the methods together, is demonstrated in the following consideration of the question ‘Are males more likely to be diagnosed with pancreatic cancer?’.

**AdjCom analysis:**
The risk of males being diagnosed with pancreatic cancer by the age of 90 between 1982 and 2020 is generally quite similar to females (Figure 2).

**RUCM analysis:**
Between 1982 and 2020, males consistently have a greater risk of being diagnosed with pancreatic cancer by the age of 90 (Figure 2).

**AdjCom used in conjunction with RUCM analysis:**
Between 1982 and 2020, the risk of males being diagnosed with pancreatic cancer is quite similar to females. More precisely though, males have a greater risk of being diagnosed with pancreatic cancer but females are more likely to live to the ages where pancreatic cancer more commonly occurs (Figure 2).

**Figure 2: Risk of being diagnosed with pancreatic cancer by the age of 90, by sex, RUCM and AdjCom, 1982 to 2020**

Source: AIHW ACD 2016

**International cancer risk comparisons**
When comparing Australian cancer risk data internationally, care should be taken to ensure the comparisons use the same method.

The International Agency for Research on Cancer presents international risk comparisons; these comparisons are unadjusted for competing mortality and the comparisons measure risk of being diagnosed with (based on cases), and risk of death from, specific cancers. The RUCM data AIHW produces is the most comparable method, noting that it measures the risk of being diagnosed for people, not cases (Appendix B provides information on the generally negligible difference between measuring risk of people being diagnosed with cancer and the risk of cancer cases being diagnosed).

**General hints for using risk adjusted for competing mortality**

**Using life expectancy to help interpret change in risk adjusted for competing mortality**
Over time, life expectancy is increasing. Cancer is more common in older ages and more people are surviving to older ages. Cancer specific risk may be increasing or decreasing depending on the cancer but the greater number of people reaching older ages, the greater the upwards pressure on the population’s cancer risk.

**Using life expectancy to help risk adjusted for competing mortality comparisons**
AdjCom comparisons between populations are influenced by cancer rates and competing mortality. RUCM can be used to identify which population has higher rates of cancer. In regards to competing mortality differences, the population with lower life expectancy should have less upwards pressure on risk to some extent because the population is less likely to live to the ages where cancer more commonly occurs.

**Using ‘younger’ age groups to simplify interpreting risk adjusted for competing mortality**
In many circumstances, risk will be used as supportive information or used a simple measure to inform a general audience. In such circumstances, it may be both undesirable and impractical to distinguish between competing mortality impacts and cancer specific impacts. If appropriate, consideration could be given to reporting on risk by age 75 in preference to older ages. Risk by age 75 is less impacted by competing mortality than older ages; this results in:

- RUCM and AdjCom estimates being more similar than at older ages and therefore less likely to provide contradictory comparisons or trends
- Interpretation of risk over time, or between sexes, being more strongly influenced by cancer specific risk (cancer specific risk is assumed to be the focal point for many general audiences).

**Lifetime risk may not be the most appropriate indicator to inform risk for the general population**
Lifetime risk is not the risk for an average lifetime. Lifetime risk may be considered as risk by the age of the oldest person in the population for each year; this will be risk by age over 100 for the cancer data time series. Given most people are not expected to live to beyond 100, lifetime risk may not be the most appropriate indicator where the purpose is to provide the general population with a simple and relevant
indication of cancer risk.

More about the additional risk by age data

For both AdjCom and RUCM, risk is reported in 5-year increments from risk by age 5 to risk by age 90. Lifetime risk is also provided for AdjCom.

The provision of additional risk data by age allows interpretation of cancer risk, and cancer risk trends, for more stages of life.

All cancers combined’ incidence risk time series is not available

The time series for All cancers combined incidence risk are not available because the RUCM and AdjCom methods cannot do so with suitable accuracy; the following paragraphs discuss this in more detail.

What should AdjCom and RUCM measure?

The AdjCom and RUCM methods should ideally calculate incidence risk only including people who have not been diagnosed with cancer before; the population who have previously been diagnosed with cancer realised their cancer incidence risk in the year they were first diagnosed with cancer.

What do AdjCom and RUCM measure?

The AdjCom and RUCM methods used calculate incidence risk based on the number of people diagnosed in the year, irrespective of whether individuals have been diagnosed with cancer in previous years.

Why can’t cancer incidence risk be calculated using only those diagnosed with cancer for the first time?

Over 100 years of cancer incidence data would be required to identify all people diagnosed with cancer for the first time so the data required to calculate the exact risk of diagnosis are not yet available, i.e. based only on those diagnosed with cancer for the first time.

A ‘best estimate’ of cancer incidence risk using the ‘first time diagnosed’ concept is provided in Attachment A. The ‘best estimate’ is provided for 2015 and uses 34 years of cancer data to identify and account for the population who have previously been diagnosed with cancer.

Are the AdjCom and RUCM incidence risk measures reliable?

Comparisons between AdjCom and the ‘best estimate’ of cancer incidence risk are provided in Attachment A. Where the two values are suitably close, AdjCom and RUCM risk are considered acceptable proxies that are accurate enough to approximate cancer incidence risk.

For most cancers, the proxy and the best estimate are usually quite close. However, for the group ‘all cancers combined’, the proxy measure of risk is around 10 percentage points higher than the best estimate. The all cancers combined incidence risk using the proxy is over-stated to the extent that it is not considered suitable.

Is the all cancers combined mortality risk time series available?

All cancers combined mortality risk is available. The complexities surrounding cancer incidence risk do not apply to cancer mortality risk. This is because death occurs only once, so the issue of multiple diagnoses and recognising the first occurrence does not apply to mortality risk.

What information is available to inform all cancers combined risk?

The ‘best estimate’ of all cancers combined incidence risk as presented in Attachment A can be used as the most recent estimate of risk. The ‘best estimate’ is only produced for the most recent year for which all states and territories have provided data. A time-series is not available due to comparability issues across time. For example, 2015 will have over 30 years of data from which to identify if a person has been diagnosed with cancer before, whereas the first year of data, 1982, would have no earlier years to identify if a person has been diagnosed with cancer before.

The previous method of cancer incidence risk is no longer available

Prior to the 2020 release of cancer risk data, AIHW measured risk of diagnosis using the RUCM method. However, the previous method measured this risk using ‘cases diagnosed in the year’ while the replacement method of RUCM measures this risk using ‘people diagnosed in the year’. The change to measuring risk of people being diagnosed is closer to the recommended measure of measuring risk of people who were diagnosed for the first time. Attachment B quantifies the impact of changing measurement from cases to people for 2015.

Note that the RUCM method of measuring the risk of death from cancer has not changed from previous publications.

Attachment A

Lifetime risk of diagnosis and risk of diagnosis before age 85 for persons, 2015

Comparison of risk adjusted for competing mortality estimates based on:

- people diagnosed for the first time ever (Method A)
people diagnosed in a year (Method B)

* the first time ever only factors if a person has been diagnosed previously and since 1982; data on earlier years is not available

<table>
<thead>
<tr>
<th>Cancer site/type</th>
<th>Method A %</th>
<th>Method A 1 in ...</th>
<th>Method B %</th>
<th>Method B 1 in ...</th>
<th>Method A %</th>
<th>Method A 1 in ...</th>
<th>Method B %</th>
<th>Method B 1 in ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute lymphoblastic leukaemia (ALL)</td>
<td>0.1492</td>
<td>670</td>
<td>0.1492</td>
<td>670</td>
<td>0.1414</td>
<td>707</td>
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<td>Acute myeloid leukaemia (AML)</td>
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<td>207</td>
<td>0.4826</td>
<td>207</td>
<td>0.3842</td>
<td>260</td>
<td>0.3842</td>
<td>260</td>
</tr>
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<td>All blood cancers combined</td>
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<td>7.0902</td>
<td>14</td>
<td>5.5780</td>
<td>18</td>
<td>5.6781</td>
<td>18</td>
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<tr>
<td>All cancers combined</td>
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<td>60.4152</td>
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<td>43.2378</td>
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<tr>
<td>Cancer of other and ill-defined digestive organs</td>
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<td>0.1537</td>
<td>650</td>
<td>0.0792</td>
<td>1,262</td>
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<td>0.3402</td>
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<td>Cancer of small intestine</td>
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<td>Cancer of the gallbladder and extrahepatic bile ducts</td>
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<td>0.5128</td>
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<td>Cancer of the salivary glands</td>
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<td>0.1552</td>
<td>644</td>
<td>0.1218</td>
<td>821</td>
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<td>Cancer of unknown primary site</td>
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<td>Chronic myeloid leukaemia (CML)</td>
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<td>Head and neck cancer (excluding lip)</td>
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<td>1.6196</td>
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<td>1.3639</td>
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<td>1.4184</td>
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<td>Head and neck cancer (with lip)</td>
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<td><strong>Kidney cancer</strong></td>
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<td>AIHW 2016 Australian Cancer Database</td>
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<td><strong>Laryngeal cancer</strong></td>
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<td><strong>Lip cancer</strong></td>
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<tr>
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<tr>
<td><strong>Mouth cancer</strong></td>
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<tr>
<td><strong>Nasal cavity, middle ear and</strong></td>
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<tr>
<td><strong>sinuses cancer</strong></td>
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<tr>
<td>(rare types)</td>
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<tr>
<td><strong>Oesophageal cancer</strong></td>
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<tr>
<td><strong>Oropharyngeal cancer</strong></td>
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<tr>
<td><strong>Ovarian cancer</strong></td>
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<tr>
<td><strong>Penile cancer</strong></td>
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<td><strong>Prostate cancer</strong></td>
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<tr>
<td><strong>Rectal cancer</strong></td>
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<td><strong>Soft tissue sarcoma</strong></td>
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<tr>
<td><strong>Stomach cancer</strong></td>
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<tr>
<td><strong>Testicular cancer</strong></td>
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<td><strong>Thyroid cancer</strong></td>
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<td><strong>Tongue cancer</strong></td>
<td>0.3795</td>
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<tr>
<td><strong>Uterine cancer</strong></td>
<td>2.3069</td>
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<td><strong>Vaginal cancer</strong></td>
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<td></td>
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<tr>
<td><strong>Vulvar cancer</strong></td>
<td>0.3492</td>
<td></td>
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</tr>
</tbody>
</table>

Notes:
1. Risk estimates for sex-specific cancers are presented for the relevant sex e.g. the risk of being diagnosed with prostate cancer is presented as the risk of being diagnosed in males.
2. Risk estimates for breast cancer are presented as the risk of diagnosis in females.

Source: AIHW 2016 Australian Cancer Database

Attachment B
## Risk of diagnosis before age 75 and age 85, persons, 2015

Comparison of risk unadjusted for competing mortality estimates based on:

- cases diagnosed in a year (Method A)
- people diagnosed in a year (Method B)

<table>
<thead>
<tr>
<th>Cancer site/type</th>
<th>Method A %</th>
<th>Method A 1 in ...</th>
<th>Method B %</th>
<th>Method B 1 in ...</th>
<th>Method A %</th>
<th>Method A 1 in ...</th>
<th>Method B %</th>
<th>Method B 1 in ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute lymphoblastic leukaemia (ALL)</td>
<td>0.1292</td>
<td>774</td>
<td>0.1292</td>
<td>774</td>
<td>0.1532</td>
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Notes:
1. Risk estimates for sex-specific cancers are presented for the relevant sex e.g. the risk of being diagnosed with prostate cancer is presented as the risk of being diagnosed in males.

2. Risk estimates for breast cancer are presented as the risk of diagnosis in females.

Source: AIHW 2016 Australian Cancer Database

Last updated 5/07/2022 v40.0
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Using the data - FAQs

Which cancers are available in this report?

The list of cancers available within CdIA are provided in the table below. On occasion, some cancers may not be available for some reports, for example, histology information is not available within the National Mortality Database and accordingly the cancer groups that are derived from histology data are not available in the mortality by age data visualisation.

Cancers and cancer groupings reported on within the Cancer data in Australia report

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<th>Cancer group/site</th>
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<td>Mouth cancer</td>
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<td>Submandibular gland cancer</td>
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<td>Sublingual gland cancer</td>
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<td>Cancer overlapping and unspecified sites in major salivary glands</td>
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<td>C01-C14, C30-C32</td>
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<td>C44 (ACD data excludes basal and squamous cell carcinomas of the skin. These are the most common types of non-melanoma skin cancer and accordingly ACD based statistics for this cancer are described within this report as 'Non-melanoma skin cancer (rare types)'). The NMD includes basal and squamous cell carcinomas of the skin and is described within this report as 'Non-melanoma skin cancer (all types)').</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>C45</td>
</tr>
<tr>
<td>Kaposi sarcoma</td>
<td>C46</td>
</tr>
<tr>
<td>Condition</td>
<td>Code</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Cancer of peripheral nerves and autonomic nervous system</td>
<td>C47</td>
</tr>
<tr>
<td>Peritoneal cancer</td>
<td>C48</td>
</tr>
<tr>
<td>Cancer of connective, subcutaneous and other soft tissues</td>
<td>C49</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>C50</td>
</tr>
<tr>
<td>Vulvar cancer</td>
<td>C51</td>
</tr>
<tr>
<td>Vaginal cancer</td>
<td>C52</td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>C53</td>
</tr>
<tr>
<td>Endometrial cancer</td>
<td>C54.1</td>
</tr>
<tr>
<td>Uterine cancer</td>
<td>C54-C55</td>
</tr>
<tr>
<td>Ovarian cancer</td>
<td>C56</td>
</tr>
<tr>
<td>Ovarian cancer and serous carcinomas of the fallopian tube</td>
<td>C56 (all histologies) and C57.0, C57.8 (with histologies 8441, 8460, 8461)</td>
</tr>
<tr>
<td>Cancer of other female genital organs</td>
<td>C57</td>
</tr>
<tr>
<td>Cancer of other female genital organs excluding serous carcinomas of the fallopian tube</td>
<td>C57 excluding C57.0, C57.8 (with histologies 8441, 8460, 8461)</td>
</tr>
<tr>
<td>Placenta cancer</td>
<td>C58</td>
</tr>
<tr>
<td>Gynaecological cancers</td>
<td>C51-C58</td>
</tr>
<tr>
<td>Penile cancer</td>
<td>C60</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>C61</td>
</tr>
<tr>
<td>Testicular cancer</td>
<td>C62</td>
</tr>
<tr>
<td>Cancer of other male genital organs</td>
<td>C63</td>
</tr>
<tr>
<td>Kidney cancer</td>
<td>C64</td>
</tr>
<tr>
<td>Renal pelvis cancer</td>
<td>C65</td>
</tr>
<tr>
<td>Ureteral cancer</td>
<td>C66</td>
</tr>
<tr>
<td>Bladder cancer</td>
<td>C67</td>
</tr>
<tr>
<td>Urethral cancer</td>
<td>C68.0</td>
</tr>
<tr>
<td>Cancer of overlapping and unspecified sites in urinary tract</td>
<td>C68.8-C68.9</td>
</tr>
<tr>
<td>Eye cancer</td>
<td>C69</td>
</tr>
<tr>
<td>Other central nervous system cancers</td>
<td>C70, C72, C75.1–C75.3</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Brain cancer</td>
<td>C71</td>
</tr>
<tr>
<td>Brain and other central nervous system cancers</td>
<td>C70–C72, C75.1–C75.3</td>
</tr>
<tr>
<td>Thyroid cancer</td>
<td>C73</td>
</tr>
<tr>
<td>Cancer of other endocrine glands</td>
<td>C74–C75 (excluding C75.1–C75.3)</td>
</tr>
<tr>
<td>Cancer of other and ill-defined sites</td>
<td>C76</td>
</tr>
<tr>
<td>Cancer of unknown primary site</td>
<td>C80 (NMD mortality data includes C77–C79, C97)</td>
</tr>
<tr>
<td>Hodgkin lymphoma</td>
<td>C81</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>C82–C86</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>C81–C86</td>
</tr>
<tr>
<td>Immunoproliferative cancers</td>
<td>C88</td>
</tr>
<tr>
<td>Multiple myeloma</td>
<td>C90.0</td>
</tr>
<tr>
<td>Other plasma cell cancers</td>
<td>C90.1–C90.9</td>
</tr>
<tr>
<td>Acute lymphoblastic leukaemia</td>
<td>C91.0</td>
</tr>
<tr>
<td>Chronic lymphocytic leukaemia</td>
<td>C91.1</td>
</tr>
<tr>
<td>Other and unspecified lymphoid leukaemia</td>
<td>C91.2–C91.9</td>
</tr>
<tr>
<td>Acute myeloid leukaemia</td>
<td>C92.0, C92.3–C92.6, C92.8, C93.0, C94.0, C94.2, C94.4–C94.5</td>
</tr>
<tr>
<td>Chronic myeloid leukaemia (CML)</td>
<td>C92.1</td>
</tr>
<tr>
<td>Other and unspecified myeloid leukaemia</td>
<td>C92.2, C92.7, C92.9, C93.2, C93.7, C93.9, C94.6–C94.7</td>
</tr>
<tr>
<td>Chronic myelomonocytic leukaemia (including juvenile)</td>
<td>C93.1, C93.3</td>
</tr>
<tr>
<td>Myeloproliferative neoplasms (excluding CML)</td>
<td>C94.1, D45, D47.1, D47.3–D47.5 (NMD mortality data excludes C94.1)</td>
</tr>
<tr>
<td>Other and unspecified leukaemias</td>
<td>C95</td>
</tr>
<tr>
<td>Leukaemia</td>
<td>C91–C95 (NMD mortality data excludes C94.1)</td>
</tr>
</tbody>
</table>
### Other blood cancers
C94.3, C96

### Myelodysplastic syndromes
D46

### All blood cancers combined
C81-C96, D45-D46, D47.1, D47.3-D47.5 (NMD mortality data excludes C94.1)

### All cancers combined
C00-C96, D45-D46, D47.1, D47.3-D47.5 (NMD mortality data includes C97)

Please note there are no deaths reported for C94.1 within the NMD. For simplicity, when ICD-10 coding for myeloproliferative neoplasms (excluding CML), leukaemia and all blood cancers combined is mentioned elsewhere in the report, the ACD ICD-10 coding alone may be cited.

### Histology-based cancer reporting within the Cancer data in Australia report

<table>
<thead>
<tr>
<th>Cancer group</th>
<th>Histology codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroendocrine tumours</td>
<td>Histology including 8013, 8040-8045, 8150-8156, 8158, 8240-8249, 8345-8347, 8680-8683, 8690-8693, 8700, 9091 and also topography C73 with a histology of 8510</td>
</tr>
</tbody>
</table>
| Soft tissue sarcoma          | Histology 8800-8936, 8990-8992, 9040-9045, 9120-9262, 9540-9582 for all topography codes except C40-C41  
Histology 8936, 9140 for all topography codes  
Histology 9045 for all topography codes except C30, C32.3, C33, C34.0, C40-C41 |
| All sarcomas combined        | All sarcomas combined is the aggregate of bone cancer and soft tissue sarcoma |

Note: Please refer to Cancer data commentary no. 7 ‘Updating sarcoma reporting’ for more information on the coding of all sarcomas combined and bone cancer from the Australian Cancer Database.

### How are the cancers grouped?

Cancer groupings have been based on the third edition of the International Classification of Diseases of Oncology (ICD-O-3) classifications.

Where possible, specified cancers have been provided as well as the larger groupings in which they are included - for example, acute myeloid leukaemia and acute lymphoblastic leukaemia have separate filter options in the summary visualisations, as well as their higher grouping leukaemia.

Note that in the rankings visualisation, higher level groupings such as leukaemia and head and neck cancers are generally excluded; instead, individual cancers such as acute myeloid leukaemia, are included in rankings.

### Which cancers are excluded from the cancer data?

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 are collected by each state and territory cancer registry and provided to the Australian Institute of Health and Welfare annually to produce the Australian Cancer Database. Since basal and squamous cell carcinomas of the skin are not notifiable, data on these cancers are not included in statistics from the ACD.

### Why are some survival rates greater than 100%?

Five-year relative survival is the percentage of people diagnosed with a cancer who survived for at least 5 years after diagnosis, relative to people of the same age and sex in the population. Where the survival rate of the population diagnosed with a cancer is greater than the general population and there are little to no deaths in the diagnosed population, the relative survival rate may be greater than 100%. The 5-
year relative survival is used as an example, the same principles apply to all relative survival data.

**Why are some rates missing?**

Suppression rules have been applied to the data. Rates for state and territory incidence and mortality are not calculated where the count of cancers is less than 5. Suppression occurs because population rate trends and comparisons derived from low counts may have a greater likelihood of being misinterpreted. While rates based on low counts are not provided for state and territory incidence and mortality, counts of the data are available in the relevant “Cancer data in Australia source” worksheet.

Survival rates are also suppressed for smaller populations. Count data is not provided for survival, only the rates. Accordingly, suppressed survival rates may appear as missing data.

**Why do some cancers have a shorter time series?**

Time series are only presented for a cancer where the data is considered complete. Data from the Australian Cancer Database (ACD) is reportable from 1982 onwards and the National Mortality Database (NMD) data is reported from 1971 onwards. Unless otherwise indicated, all cancer groups reported within Cancer data in Australia will have complete data reportable from these years onwards. The following table specifies the year from which data were considered sufficiently complete to be reported from the ACD and NMD.

<table>
<thead>
<tr>
<th>Cancer group/site</th>
<th>ACD Incidence</th>
<th>NMD Mortality</th>
<th>ACD Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>All blood cancers combined</td>
<td>2003</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Brain and other central nervous system (cancer of the)</td>
<td>1982</td>
<td>1979</td>
<td>2007</td>
</tr>
<tr>
<td>Chronic myelomonocytic leukaemia (including juvenile)</td>
<td>1997</td>
<td>2013</td>
<td>2007</td>
</tr>
<tr>
<td>Connective, subcutaneous and other soft tissues (cancer of)</td>
<td>1982</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Endometrial cancer</td>
<td>2010</td>
<td>1997</td>
<td>2010</td>
</tr>
<tr>
<td>Kaposi sarcoma</td>
<td>1982</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>1982</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Myelodysplastic syndromes</td>
<td>2003</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Myeloproliferative neoplasms (excluding CML)</td>
<td>2003</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Non-melanoma skin cancer (rare types)</td>
<td>2001</td>
<td>n.a.</td>
<td>2007</td>
</tr>
<tr>
<td>Other and unspecified leukaemia</td>
<td>1997</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Cancer Category</td>
<td>Start Year</td>
<td>End Year</td>
<td>Reporting Year</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------</td>
<td>----------</td>
<td>----------------</td>
</tr>
<tr>
<td>Other and unspecified lymphoid leukaemia</td>
<td>1997</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Other and unspecified myeloid leukaemia</td>
<td>1997</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Other blood cancers</td>
<td>1997</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Other central nervous system cancers</td>
<td>1982</td>
<td>1979</td>
<td>2007</td>
</tr>
<tr>
<td>Other endocrine glands (cancer of)</td>
<td>1982</td>
<td>1979</td>
<td>2007</td>
</tr>
<tr>
<td>Other plasma cell cancers</td>
<td>1997</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Other thoracic and respiratory organs (cancer of)</td>
<td>1982</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Overlapping and unspecified sites in major salivary glands (cancer of)</td>
<td>1982</td>
<td>1979</td>
<td>2007</td>
</tr>
<tr>
<td>Overlapping and unspecified sites in urinary tract (cancer of)</td>
<td>1982</td>
<td>1979</td>
<td>2007</td>
</tr>
<tr>
<td>Peripheral nerves and autonomous nervous system (cancer of)</td>
<td>1982</td>
<td>1997</td>
<td>2007</td>
</tr>
<tr>
<td>Urethral cancer</td>
<td>1982</td>
<td>1979</td>
<td>2007</td>
</tr>
</tbody>
</table>

The years stated above also apply to risk of diagnosis and risk of death estimates. Time series for survival and prevalence data are also shortened where the coverage years required to derive these estimates extends beyond the reportable start year. For example: survival estimates for all blood cancers combined are derived from the ACD and are only reported for the 2009–2013 and 2014–2018 periods. Similarly, only 1-year and 5-year prevalence are reported when considering the 31 December 2017 census date.

Neuroendocrine tumours, all sarcomas combined and soft tissue sarcoma data is available for incidence and survival and now also mortality from the ACD. The method to derive mortality for these cancer groups from the ACD will be refined in the future and may change to some degree in future CdaA reports.

**Why don’t state and territory counts of new cases of cancer equal the Australian total?**

The Australian Capital Territory and Northern Territory incidence counts for each cancer are equal to the average of the most recent 5 years of data. The presentation of rolling averages are used to reduce volatility associated with cancer rates in these smaller populations. The method is used within this report for methodological consistency with data produced by the respective data custodians.

**How do I download data from visualisations?**
All of the data visualisations have been created using a program called Tableau. You can interact with filters on these visualisations to see the specific data you are interested in.

To view the underlying data from the visualisations click on the link at the bottom of the page to download an Excel file containing the data.

**How do I print?**

Pages can be printed by pressing Ctrl and P on the keyboard at the same time, or by clicking on ‘File’ at the top of the browser and selecting print. However, note that the visualisations in Tableau do not print correctly with this method.

To print a Tableau visualisation, select ‘Download’ on the menu below the visualisation and choose to download as an image or PDF. Using this method, the visualisation prints in the same way that it is presented on the screen, with the selected filters.

Another useful tool for selecting only the visualisation(s) you require is the ‘Snipping Tool’, which allows a screenshot to be taken of the relevant area on the screen.

**How do I interact with the graphs and maps?**

The graphs, maps and figures have been developed in a program called Tableau. You can interact with these to see the specific data you are interested in. If the mouse pointer is placed over the graph, map or figure to display the Tooltip it will change to a hand selector. The Tooltip displays the underlying data.

You can also download the underlying data from the Tableau visualisations into an Excel file. Click on the link at the bottom of the page which displays the graph you are interested in.

Some Tableau visualisations have a legend where one element can be selected to highlight it. To do this, place the mouse pointer over the legend and a small selector icon will appear (it looks like a highlighter). Click on this icon and then click on the specific element you are interested in.

Some graphs, maps or figures allow the data to be filtered. Filters are displayed either as a button or a drop down list. In either option, select the data you’re interested in to display it.

If you want to clear your selections and return the graph, map or figure to its original appearance, click on the ‘revert’ button at the bottom.

When you position your mouse pointer over a Tableau map, a toolbar will appear on the left. The + and - buttons provide zoom in and out. Clicking on the arrow pointing to the right allows you to choose to zoom, pan, or select areas of the map. Click on the home button to return to the map’s default view.

Please note that Tableau is not compatible with versions of Internet Explorer below version 11.

**How do I extract data files?**

Data files are available in .xlsx format by clicking the link at the bottom of each page.

**Where does the information come from?**

This report predominantly uses data from the Australian Cancer Database (ACD) and the National Mortality Database (NMD). Please visit the Notes section for more information.

**I want to do my own data analysis, where can I get more data?**

The information in this report is free to download, but must be used in accordance with the AIHW’s data use policy. Most information released by AIHW is made available under a [Creative Commons BY 4.0 licence](http://creativecommons.org/licenses/by/4.0/).

For more information about copyright at AIHW.

Tableau allows you the freedom to view and manipulate a selection of data. If you require data not currently available here, please:

- email cancer@aihw.gov.au for questions regarding cancer or
- email screening@aihw.gov.au for questions regarding cancer screening or
- submit a data request

and we will contact you.

Should you wish to request additional data, the AIHW generally charges for data requests at an hourly rate on a cost-recovery basis.

**Where can I get help?**

If you need help using our interactive visualisations (graphs and figures), or help downloading data, you can contact us at cancer@aihw.gov.au.
Cancer is classified by the International Statistical Classification of Diseases and Related Health Problems Version 10 (ICD-10). This is a statistical classification, published by the World Health Organization, in which each morbid condition is assigned a unique code according to established criteria.

Actual mortality data from the National Mortality Database, up to 2019 are based on the year of occurrence of the death and data for 2020 are based on the year of registration of the death.

With the exception of prostate cancer, the 2019–2022 incidence estimates are projections based on 2009–2018 incidence data; prostate cancer incidence projections use only the most recent available year to inform projections. The 2021–2022 mortality estimates are projections based on 2011-2020 data.

Projection methods rely on the assumption that past trends may be reasonably used to estimate future counts and rates. For prostate cancer incidence, this has generally not been the case in more recent years. Prostate cancer incidence use the most current rates (by age) applied to future years population estimates.

Relative survival was calculated with the period method, using the period 2014-2018 (Brenner & Gefeller 1996). This captured the survival experience of people who were diagnosed with cancer before or during 2014-2018 and were still alive at the beginning of 2014. Note that this period does not contain estimated incidence data. Estimated incidence data includes DCO cases for NSW in 2018 and late-registration cases for Australia in 2018. Data from the National Death Index (NDI) on deaths (from any cause) that occurred up to 31 December 2018 were used to determine which people with cancer had died and when this occurred.

Relative survival for registry-derived (RD) stage tables was calculated using the cohort method, using the period 2011-2016. In this method, a cohort of patients diagnosed with cancer is followed over time to estimate the proportion surviving for a selected timeframe (e.g. 5 years).

Age-specific incidence, mortality and incidence rates are expressed as per 100,000 population.

Age-standardised incidence and mortality rates for the Australian population were age standardised to the 2001 Australian Standard Population and are expressed as per 100,000 population.

Incidence and mortality rates are based on the Australian population as at 30 June. Prevalence counts are based on the Australian population as at 31 December.

Stage data for colorectal cancer excludes cases identified from death certificates only, cancer of the appendix (ICD-10 code C18.1), and colorectal cancers with a histology for which staging rules are not applicable.

Stage data for breast cancer in females includes ICD-10 code C50, lung cancer excludes trachea (C34), melanoma of the skin excludes skin of genitals and melanoma of “unknown primary site” (C43) and prostate cancer includes C61. Certain morphology codes are excluded.
Technical notes

Methods

Age-adjusted survival

Comparisons of cancer survival rates over time may be affected by changes in the age composition of those diagnosed. For example, if more older people are diagnosed with cancer over time and older people have lower survival rates, improvements in survival over time may be offset by the increasingly older age of people diagnosed with cancer.

In order to calculate age-adjusted survival we first choose a fixed period, called the base period, and take note of the age composition of the people who were diagnosed with the cancer of interest during that period. We calculate age-adjusted survival for other periods by assuming that the age composition of patients in the other period is the same as that of the base period. Thus the age-adjusted survival is effectively the survival that would have occurred had there been no change in age composition from the base period.

Age-adjusted survival is different to age-standardised survival. An age-standardised rate uses the same standard population for all cancers and sexes (including persons). Using a standard population allows meaningful comparisons between different cancers, sexes and across time. In contrast, age-adjusted survival rates use a population relevant to the specific cancer (or cancer group) and sex to allow meaningful comparisons across time. Age-adjusted survival rates are only intended to enhance the understanding of how survival has changed over time for the specific cancer and sex and are not directly comparable with other cancers or sexes.

CdiA does not currently report on age-standardised survival but future releases are expected to contain age-standardised survival rates.

Age-standardised rates (ASR)

A crude rate provides information on the number of, for example, new cases of cancer or deaths from cancer by the population at risk in a specified period. No age adjustments are made when calculating a crude rate. Since the risk of cancer heavily depends on age, crude cancer incidence and mortality rates are not as suitable for looking at changes over time or making comparisons between different population groups if there are differences in those populations’ age structures.

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

There are two methods 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 as at 30 June 2001) by the age-specific incidence rates (or death rates) for the population of interest. The next 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 100,000 population in this report.

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.

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 2018 for all states and territories with the exception New South Wales death-certificate only cases for 2018 and late registrations; death-certificate-only cases and late registrations are estimated in the ACD.

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.

For more information on the ACD please see the ACD 2018 Data Quality Statement.

Estimating death-certificate-only cases for NSW for 2018
If a person’s death certificate states that they had cancer, in most cases the cancer registry already has other evidence of the cancer. However, in about 1.5% of cases, despite the registry’s subsequent enquiries with relevant institutions, the registry is unable to find any other evidence of the cancer. Such cases are called death-certificate-only (DCO) cases.

The New South Wales Cancer Registry was unable to submit its DCO cases for 2018 in time to be included in the 2018 ACD. The AIHW estimated the number of DCO cases for NSW for 2018 by assuming they would be the same as they were in NSW in 2017, stratified by sex, diagnosis age group, topography, histology and behaviour.

**Estimating late registrations of cancer for 2018**

Late registrations are cases of cancer that have not been registered by the cancer registry by the time the registry needs to submit its data to the AIHW. Almost all late registrations have a diagnosis year equal to that of the most recent year of the ACD, in this case 2018. Experience has shown that late registrations account for about 1% of cases in that year. For example, it is expected that about 1% of cases for diagnosis year 2018 are not part of the 2018 ACD; they will appear for the first time in the 2019 ACD (with a diagnosis year of 2018). The AIHW has made estimates of these cases based on the late registrations for 2017 that appeared for the first time in the 2018 ACD.

The estimated number of late registrations for 2018 is 2,247 cases overall.

**International Classification of Diseases for Oncology (ICDO)**

Cancers were originally classified solely under the ICD classification system, based on topographic site and behaviour. However, during the creation of the Ninth 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 area 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.

**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 2019. Registration of deaths is the responsibility of each state and territory Registry of Births, Deaths and Marriages. These data are then collated and coded by the ABS and are maintained at the AIHW in the NMD.

In the NMD, both the year in which the death occurred and the year in which it was registered are provided. For the purposes of this report, actual mortality data are shown based on the year the death occurred, except for the most recent year (namely 2020) where the number of people whose death was registered is used. Previous investigation has shown that the year of death and its registration coincide for the most part. However, in some instances, deaths at the end of each calendar year may not be registered until the following year. Thus, year of death information for the latest available year is generally an underestimate of the actual number of deaths that occurred in that year.

In this report, deaths registered in 2017 and earlier are based on the final version of cause of death data; deaths registered in 2018, 2019 and 2020 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)
- ABS quality declaration summary for Causes of death, Australia (ABS cat. no. 3303.0).

For more information on the AIHW NMD see Deaths data at AIHW.

**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 persons 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.

The 2022 population estimates were sourced from the Centre of Population December 2021 update of the National age and sex structure, 2020-21 to 2031-32 (NOM upside scenario).

**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 2017
- 5-year prevalence is the number of living people who were diagnosed in the past 5 years to 31 December 2017. 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 two 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.

**Projections - Estimating the incidence of cancer**

Please note that no adjustments have been made to the projections to account for the potential impact of COVID.

Estimates of national incidence in 2019–2022 was estimated by projecting the sex- and age-specific incidence rates observed in Australia during 2009–2018. The time series were stratified by the following variables:

- sex
- 5-year age group (0-4, ..., 85-89, 90+)
- 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:

- least squares linear regression was used to find the straight line of best fit through the time series
- if the slope was positive, the straight line of best fit was extrapolated to obtain the estimate of the 2019 rate
- if the slope was negative, the time series floor was set to 0
- the estimated incidence rates for 2019 were then multiplied by the Estimated Resident Populations for 2019 to obtain the estimated incidence numbers.

Note the following:

- estimates were made for Australia as a whole, not for individual jurisdictions
- for the majority of cancers, 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 made for late registrations for 2018 were treated as real data for the purposes of estimating Australian incidence for 2019–2022.
- the 10 years of incidence data used as the baseline were 2009-2018
- for populations, the ABS Estimated Resident Populations were used for 2009-2021, and the 2022 population estimates were sourced from the Centre of Population.
- The method for projecting cancer incidence rates relies on the assumption that incidence trends are likely to provide a useful basis to project future cancer incidence rates and counts. For prostate cancer, this has not been the case in more recent years. Prostate cancer incidence trends now use the latest available incidence rates by age, applied to the relevant populations by age, to arrive at projected incidence and counts.

**Projections - Estimating the mortality of cancer**

Please note that no adjustments have been made to the projections to account for the potential impact of COVID.

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

- the 10-year baseline for incidence is 2009-2018 while the baseline for mortality from the NMD is 2011-2020 and the baseline for mortality from the ACD is 2008-2017.

**Relative 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. (Ideally these life tables should be restricted to the population of
Australians who do not have cancer but such life tables are unavailable. It is standard practice around the world to use life tables for the entire population.

A simplified example of how relative survival is interpreted is shown in Figure G1. 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, which is 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 M1: Simplified example of how relative survival is calculated

The survival statistics in this report were produced using a modified version of a SAS program written by Dickman (2004) and employed the period method (Brenner and Gefeller 1996) with 1-year intervals. Observed survival was calculated from data in the ACD. Expected survival was calculated using the Ederer II method whereby matched people in the general population are considered to be at risk of death until the corresponding cancer patient dies or is censored (Ederer and Heise 1959).

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

- \( S(j|i) \) is the probability of surviving at least \( j \) more days given that the person has already survived at least \( i \) days
- \( S(i + j) \) is the probability of surviving at least \( i + j \) days
- \( S(i) \) is 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):

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

where

- \( d_k \) is the number of deaths
- \( r_k \) is the number at risk during the \( k \)th interval.

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

Risk

We use 19 age groups, numbered 1 to 19. Age group \( i \) (\( i = 1 \) to 18) is 5 years wide and comprises all ages in the interval \((5i - 5, 5i)\). Age group 19 comprises all ages 90 and above. The cancer under consideration is referred to as “the cancer”. This could be a specific cancer, a group of related cancers or all cancers combined. There are two different measures of risk, one adjusted for competing mortality and one not adjusted. For brevity, these are called the adjusted risk \((AR)\) and unadjusted risk \((UR)\). The full notation is as follows, where \( D \) is for diagnosis and \( M \) is for mortality.

\[
ARD(5i) = \text{adjusted risk of being diagnosed with the cancer before age } 5i \ (i = 1 \text{ to } 18),
\]
ARD(∞) = adjusted lifetime risk of being diagnosed with the cancer,  
ARM(5i) = adjusted risk of dying from the cancer before age 5\(i\) \(i = 1\) to 18,  
ARM(∞) = adjusted lifetime risk of dying from the cancer, 

and similarly for URD and URM.

For each age group \(i\), the following three rates are used in the risk formulas.  
\(D_i\) = rate of first ever diagnosis of the cancer (the first in one's life, not the first in age group \(i\)),  
\(M_i\) = rate of death from the cancer,  
\(A_i\) = rate of death from all causes (including the cancer),

Note that the denominator of \(D_i\) is the general population, not the population of people who have never been diagnosed with the cancer.

Risk not adjusted for competing mortality
As this measure of risk is not adjusted for competing mortality, the formulas are relatively simple and do not involve \(A_i\). The formulas come from Day (1987).

\[
URD(5i) = \frac{1}{1 - e^{-5D_i + 5M_i + \ldots + 5M_{18}}} \quad , \quad i = 1, 2, \ldots, 18
\]

\[
URD(∞) = 1.
\]

\[
URM(5i) = \frac{1}{1 - e^{-5D_i + 5M_i + \ldots + 5M_{18}}} \quad , \quad i = 1, 2, \ldots, 18
\]

\[
URM(∞) = 1.
\]

Note that the lifetime risks are necessarily 1. Not adjusting for competing mortality is equivalent to the scenario where it is impossible to die of any cause other than the cancer. Hence every person must eventually be diagnosed with the cancer and eventually die from it. This is why it is not informative to report unadjusted lifetime risks.

Risk adjusted for competing mortality
The formulas in this section come from Fay et al. (2003). The risk of diagnosis is as follows.

\[
ARD(5) = \frac{D_1}{A_1} (1 - e^{-5A_1})
\]

\[
ARD(5i) = \text{ARD}(5 - 5) + \frac{D_i}{A_i} (1 - e^{-5A_i}) e^{-5(A_1 + A_2 + \ldots + A_{i-1})}, \quad i = 2, 3, \ldots, 18
\]

\[
ARD(∞) = \text{ARD}(90) + \frac{D_{19}}{A_{19}} e^{-5(A_1 + A_2 + \ldots + A_{18})}.
\]

The formula for risk of death is the same as above except that \(M_i\) replaces \(D_i\) throughout.

\[
ARM(5) = \frac{M_1}{A_1} (1 - e^{-5A_1})
\]

\[
ARM(5i) = \text{ARM}(5 - 5) + \frac{M_i}{A_i} (1 - e^{-5A_i}) e^{-5(A_1 + A_2 + \ldots + A_{i-1})}, \quad i = 2, 3, \ldots, 18
\]

\[
ARM(∞) = \text{ARM}(90) + \frac{M_{19}}{A_{19}} e^{-5(A_1 + A_2 + \ldots + A_{18})}.
\]

Use of a proxy to calculate risk of diagnosis
In order to calculate the risk of diagnosis we need the age-specific rates, \(D_i\), at which people are being diagnosed with the cancer for the first time in their lives. This requires knowledge of each person’s cancer history from birth. As the Australian Cancer Database (ACD) starts from the beginning of 1982, this is impossible for most age groups and will remain impossible for many decades to come. In order to estimate the risk of diagnosis we need a satisfactory proxy for \(D_i\).
The best available estimate of $D_i$ is obtained by using the entire history of the ACD. That is, instead of counting first ever diagnoses (which is impossible) we count “first from 1/1/1982” diagnoses. However, using such an estimate would mean that we couldn’t produce a consistent time series of risks. This is because each estimate in the time series would be based on a different amount of “lookback time” for previous diagnoses. The estimate in 1982 would be based on at most one year of lookback time, the estimate in 1983 would be based on up to two years of lookback time, and so on.

In order to enable the production of a time series of risks, the AIHW has chosen to use a lookback time of up to one calendar year for both the adjusted and unadjusted risks of diagnosis. That is, for the year for which the risks are being calculated, lookback goes back to the 1st of January of that year. Using this method we are in fact counting the number of people (not cancers) diagnosed in the year under consideration, irrespective of whether they have been diagnosed with the same cancer in a previous year. AIHW analysis has shown that this method provides a satisfactory estimate of $D_i$, except for the group “all cancers combined”. No suitable period of lookback time was identified for this group. As such, AIHW does not produce a time series of risk of diagnosis for all cancers combined. However, the best available estimate for the latest year of data available is produced. This estimate is based on lookback to the beginning of 1982. Based on the analysis referred to above, this estimate is likely to be a few percentage points higher than the true value.
Technical notes

Indices of data quality for the 2018 Australian Cancer Database

The following two indices are commonly used to assess the completeness and accuracy of incidence data in cancer registries. A detailed discussion of how they are used can be found in *Cancer Incidence in Five Continents*.

**Percentage of cases that were microscopically verified (MV%)**

Microscopic verification is the gold standard for diagnosing cancer. The MV% is the percentage of registered cases for which the diagnosis was microscopically verified. A high MV% suggests higher quality data. A low MV% suggests (1) incomplete notification of pathology reports and therefore possibly lower accuracy of diagnoses, and (2) incomplete notification of cancers for which histology is often the only source of notification, e.g. melanoma of the skin.

**Percentage of cases that are death certificate only (DCO%)**

The DCO% is the percentage of registered cases for which no evidence of cancer was available other than a statement on the death certificate that the person died from or with cancer. A low DCO% suggests higher quality data. A high DCO% suggests incomplete incidence notification. Also, such diagnoses may be less accurate.

### Indices of data quality for the 2018 Australian Cancer Database, year of diagnosis 2017

<table>
<thead>
<tr>
<th>Cancer site/type (ICD-10 codes)</th>
<th>No. of cases</th>
<th>MV%</th>
<th>DCO%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lip (C00)</td>
<td>654</td>
<td>98.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Tongue (C01-C02)</td>
<td>998</td>
<td>96.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Mouth (C03-C06)</td>
<td>637</td>
<td>96.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Parotid gland (C07)</td>
<td>218</td>
<td>97.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Submandibular gland (C08.0)</td>
<td>44</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sublingual gland (C08.1)</td>
<td>1</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Overlapping and unspecified major salivary glands (C08.8-C08.9)</td>
<td>24</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Tonsil and oropharynx (C09-C10)</td>
<td>780</td>
<td>97.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Nasopharynx (C11)</td>
<td>145</td>
<td>95.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Pyriform sinus and hypopharynx (C12-C13)</td>
<td>176</td>
<td>96.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Other and ill-defined sites in lip, oral cavity and pharynx (C14)</td>
<td>59</td>
<td>93.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Oesophagus (C15)</td>
<td>1,574</td>
<td>94.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Stomach (C16)</td>
<td>2,422</td>
<td>93.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Small intestine (C17)</td>
<td>697</td>
<td>95.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Colon (C18)</td>
<td>10,552</td>
<td>93.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Rectum and rectosigmoid junction (C19-C20)</td>
<td>4,752</td>
<td>96.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Tissue Type</td>
<td>Count</td>
<td>Rate</td>
<td>%</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------</td>
<td>------</td>
<td>---</td>
</tr>
<tr>
<td>Anus and anal canal (C21)</td>
<td>482</td>
<td>96.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Liver (C22)</td>
<td>2,220</td>
<td>52.5</td>
<td>3.5</td>
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<tr>
<td>Gallbladder (C23)</td>
<td>378</td>
<td>81.2</td>
<td>1.3</td>
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<tr>
<td>Extrahepatic bile duct (C24.0)</td>
<td>336</td>
<td>74.7</td>
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<td>Ampulla of Vater (C24.1)</td>
<td>199</td>
<td>90.5</td>
<td>0.5</td>
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<tr>
<td>Overlapping and unspecified sites in biliary tract (C24.8-C24.9)</td>
<td>160</td>
<td>72.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Pancreas (C25)</td>
<td>3,679</td>
<td>73.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Other and ill-defined digestive organs (C26)</td>
<td>290</td>
<td>55.2</td>
<td>31.0</td>
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<tr>
<td>Nasal cavity (C30.0)</td>
<td>122</td>
<td>97.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Middle ear (C30.1)</td>
<td>2</td>
<td>50.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Sinuses (C31)</td>
<td>73</td>
<td>94.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Larynx (C32)</td>
<td>572</td>
<td>93.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Lung, bronchus and trachea (C33-C34)</td>
<td>12,649</td>
<td>85.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Thymus, heart, mediastinum, pleura and ill-defined sites in respiratory and intrathoracic organs (C37-C39)</td>
<td>146</td>
<td>95.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Bones, joints and articular cartilage (C40-C41)</td>
<td>254</td>
<td>94.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Melanoma of the skin (C43)</td>
<td>14,976</td>
<td>99.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Non-melanoma of the skin (C44)</td>
<td>1,116</td>
<td>96.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Mesothelioma (C45)</td>
<td>819</td>
<td>91.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Kaposi sarcoma (C46)</td>
<td>55</td>
<td>96.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Peripheral nerves and autonomic nervous system (C47)</td>
<td>47</td>
<td>95.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Peritoneum and retroperitoneum (C48)</td>
<td>221</td>
<td>93.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Connective, subcutaneous and other soft tissue (C49)</td>
<td>701</td>
<td>95.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Breast (C50)</td>
<td>17,947</td>
<td>98.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Vulva (C51)</td>
<td>373</td>
<td>97.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Vagina (C52)</td>
<td>108</td>
<td>93.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Cases</td>
<td>Survival (%)</td>
<td>Reliability (%)</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------</td>
<td>--------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Cervix (C53)</td>
<td>840</td>
<td>97.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Uterus (C54–C55)</td>
<td>2,795</td>
<td>97.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Ovary (C56)</td>
<td>1,313</td>
<td>91.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Other and unspecified female genital organs (C57)</td>
<td>399</td>
<td>97.7</td>
<td>0.8</td>
</tr>
<tr>
<td>Placenta (C58)</td>
<td>9</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Penis (C60)</td>
<td>134</td>
<td>97.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Prostate (C61)</td>
<td>20,811</td>
<td>96.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Testis (C62)</td>
<td>892</td>
<td>98.8</td>
<td>0.1</td>
</tr>
<tr>
<td>Other and unspecified male genital organs (C63)</td>
<td>33</td>
<td>97.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Kidney (C64)</td>
<td>3,717</td>
<td>91.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Renal pelvis (C65)</td>
<td>291</td>
<td>88.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Ureter (C66)</td>
<td>161</td>
<td>90.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Bladder (C67)</td>
<td>2,816</td>
<td>91.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Urethra (C68.0)</td>
<td>36</td>
<td>88.9</td>
<td>2.8</td>
</tr>
<tr>
<td>Paraurethral gland (C68.1)</td>
<td>0</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Overlapping and unspecified sites in urinary tract (C68.8–C68.9)</td>
<td>57</td>
<td>80.7</td>
<td>14.0</td>
</tr>
<tr>
<td>Eye and adnexa (C69)</td>
<td>318</td>
<td>78.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Brain (C71)</td>
<td>1,805</td>
<td>83.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Other and unspecified parts of central nervous system (C70, C72, C75.1–C75.3)</td>
<td>119</td>
<td>78.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Thyroid (C73)</td>
<td>3,151</td>
<td>98.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Other and unspecified endocrine glands and related structures (C74, C75.0, C75.4–C75.9)</td>
<td>127</td>
<td>85.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Hodgkin lymphoma (C81)</td>
<td>703</td>
<td>98.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma (C82–C86)</td>
<td>5,624</td>
<td>95.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Immunoproliferative cancers (C88)</td>
<td>367</td>
<td>97.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Multiple myeloma (C90.0)</td>
<td>2,018</td>
<td>91.9</td>
<td>2.1</td>
</tr>
<tr>
<td>Other plasma cell cancers (C90.1–C90.9)</td>
<td>62</td>
<td>90.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Acute lymphoblastic leukaemia (C91.0)</td>
<td>361</td>
<td>98.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Count</td>
<td>%</td>
<td>CDU</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Chronic lymphocytic leukaemia (C91.1)</td>
<td>2,065</td>
<td>91.9</td>
<td>1.3</td>
</tr>
<tr>
<td>Other and unspecified lymphoid leukaemias (C91.2-C91.9)</td>
<td>166</td>
<td>91.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Acute myeloid leukaemia (C92.0, C92.3-C92.6, C92.8, C93.0, C94.0, C94.2, C94.4-C94.5)</td>
<td>980</td>
<td>92.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Chronic myeloid leukaemia (C92.1)</td>
<td>366</td>
<td>88.8</td>
<td>2.7</td>
</tr>
<tr>
<td>Chronic myelomonocytic leukaemia (including juvenile) (C93.1, C93.3)</td>
<td>307</td>
<td>88.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Other and unspecified myeloid leukaemias (C92.2, C92.7, C92.9, C93.2, C93.7, C93.9, C94.6-C94.7)</td>
<td>130</td>
<td>92.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Other and unspecified leukaemias (C95)</td>
<td>85</td>
<td>32.9</td>
<td>42.4</td>
</tr>
<tr>
<td>Myeloproliferative neoplasms excluding chronic myeloid leukaemia (C94.1, D45, D47.1, D47.3-D47.5)</td>
<td>1,520</td>
<td>83.1</td>
<td>2.0</td>
</tr>
<tr>
<td>Myelodysplastic syndromes (D46)</td>
<td>1,496</td>
<td>81.1</td>
<td>3.9</td>
</tr>
<tr>
<td>Other blood cancers (C94.3, C96)</td>
<td>94</td>
<td>96.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Other and ill-defined sites (C76)</td>
<td>122</td>
<td>81.1</td>
<td>13.1</td>
</tr>
<tr>
<td>Unknown primary site (C80)</td>
<td>2,525</td>
<td>55.7</td>
<td>14.1</td>
</tr>
<tr>
<td>All cancers combined (C00-C97, D45, D46, D47.1, D47.3-D47.5)</td>
<td>140,473</td>
<td>92.4</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Notes:
1. 2017 has been used as the reference year because the NSW DCO cases for 2018 were not available in time to be included in the 2018 ACD.
2. Estimated data are excluded.
3. The categories “non-melanoma of the skin” and “all cancers combined” exclude basal and squamous cell carcinomas of the skin.

Technical notes

Glossary

**Age-adjusted survival:** a method to remove the influence of changes in the ages of those diagnosed with a specific cancer type (or group) over time when considering changes in relative survival rates over time. As the adjustments are applied to a specific cancer type (or group), age-adjusted survival rates for a cancer (or group) are not directly comparable with other cancers (or groups) or between different sexes for the same cancer (or group).

**Age-specific rate:** the 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.

**Cancer:** refers to 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.

**Cancer incidence:** the number of new cancers diagnosed during a specified time period (usually one year).

**Cancer mortality:** the number of deaths occurring during a specified time period (usually one year) for which the underlying cause of death is cancer.

**Cohort method:** a method for calculating survival. It follows a group (cohort) of patients all diagnosed in a specified era, e.g. 2005–2009, and calculates the proportion of the original cohort that is still alive after a specified period of time after diagnosis, e.g. 5 years. Compare to the period method.

**Crude rate:** the number of events in a given period divided by the size of the population at risk in a specified time period.

**Period method:** a method for calculating survival. It specifies a period of time, e.g. 2010–2014, and calculates survival based on all patients who live part or all of their post-diagnosis life during that period. Compare to the cohort method.

**Prevalence:** the number of people alive with a prior diagnosis of cancer at a given time. The longest period for which it is possible to calculate prevalence using the available national data (from 1982 to 2018) is currently 36 years so this is used to provide an estimate of the ‘total’ prevalence of cancer as at the end of 2017, noting that people diagnosed with cancer before 1982 are not included.

**Relative survival:** the ratio of observed survival of a group of persons with cancer to expected survival of those in the corresponding general population after a specific interval (such as 1, 3 or 5 years) following diagnosis.

**Risk adjusted for competing mortality:** ‘Cancer risk’ describes the risk of being diagnosed with, or dying from, cancer. Risk adjusted for competing mortality considers the probability of a certain event occurring for a person (for example, diagnosis of cancer or death from cancer) while taking into account the fact that the person might die before the event happens.

**Risk not adjusted for competing mortality:** ‘Cancer risk’ describes the risk of being diagnosed with, or dying from, cancer. It does not factor the likelihood of a person dying before being diagnosed or the likelihood of a person dying from another cause.

**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 cancer has spread from the original site to other parts of the body.

**Survival:** a general term indicating the probability of being alive for a given amount of time after a particular event, such as diagnosis of cancer.
Technical notes

References

Main report (excludes cancer data commentaries)


Vaccarella S, Franceschi S, Bray F, Wild C, Plummer M and Dal Maso L 2016. 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. The New England Journal of Medicine 375: 614-17.


Cancer data commentaries


Notes

This report provides a wide range of cancer related statistics including historical data ranging back to 1982 and projections up to 2022; cancer mortality data ranges back to 1971.

Amendments

31 Jan 2019 - Mortality worksheets in the ACIM books for colorectal cancer and cancer of other and ill-defined digestive organs have been revised to correct errors in the counts and rates.

Data quality statement

The data quality statement for the Australian Cancer Database 2018 can be found on the METEOR website.

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)
- ABS quality declaration summary for Causes of death, Australia (ABS cat. no. 3303.0)

For more information on the AIHW NMD visit Deaths data at AIHW, and for the National Death Index Data Quality Statement visit the NDI.
Data

Handy tip: The CdiA Excel workbooks are often very large and it can be difficult to locate exactly what you are looking for. Given the size of these Excel worksheets, we recommend using the Excel filter to more easily locate the specific data you are looking for.

The filter function may be used by highlighting the title row and pressing Shift+Ctrl+L. You may then more simply locate the data you are looking for through the dropdown lists available from each column heading.

The data: The Need help locating data? page provides a brief description of the Excel data and it may be of assistance to more easily navigate through the Excel data. The page also provides information about which Excel data informs various visualisations as well as providing links to the various data visualisations.

Rankings data are only available from the Tableau presentation.

Mortality data: This year’s release of CdiA continues to include mortality data from the National Mortality Database and now also includes mortality data from the Australian Cancer Database. The additional source is being released in conjunction with AIHWs cancer mortality data investigations. These investigations are in a preliminary stage with the overall objective of the project to improve mortality reporting. Please read Cancer data commentary number 8 for more information about the investigations and two sources of mortality data.

ACD pivot table
The 2018 Australian Cancer Database (ACD) pivot table contains incidence counts from the 2018 ACD by cancer type (defined by 3-character ICD-10 code), sex, age group and year of diagnosis.

The ACD pivot table includes a ‘Pivot table’ worksheet and a ‘raw data’ worksheet. The raw data worksheet provides the background data that is used to generate the pivot tables. The raw data worksheet now also includes rates. Rates are not recommended for use in the pivot tables but have been provided in the raw data worksheet (because the pivot table adds data to arrive at totals and rates are not additive).

Data tables: CDIA 2022: Book 1a – Cancer incidence (age-standardised rates and 5-year age groups)
Data
Download Data tables: CDIA 2022: Book 1a – Cancer incidence (age-standardised rates and 5-year age groups). Format: XLSX 10.4Mb

Data tables: CDIA 2022: Book 1b – Cancer incidence by age (10-year age groups)
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Data tables: CDIA 2022: Book 1c – Cancer incidence by age (15, 20, 25 and 30-year age groups)
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Data tables: CDIA 2022: Book 1d – Cancer incidence by age (35, 40, 45 and 50-year age groups)
Data
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Data tables: CDIA 2022: Book 2a – Cancer mortality (age-standardised rates and 5-year age groups)
Data
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Data
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Data tables: CDIA 2022: Book 2c – Cancer mortality by age (15, 20, 25 and 30-year age groups)
Data
Download Data tables: CDIA 2022: Book 2c – Cancer mortality by age (15, 20, 25 and 30-year age groups). Format: XLSX 11.1Mb
Related material

Resources

Cancer in Australia 2021
Resource
View

National Bowel Cancer Screening Program: Monitoring report 2021
Resource
View

National Cervical Screening Program monitoring report 2021
Resource
View

BreastScreen Australia monitoring report 2021
Resource
View

Cancer screening and COVID-19 in Australia
Resource
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Mesothelioma in Australia 2020
Resource
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Health system expenditure on cancer and other neoplasms in Australia, 2015-16
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Cancer statistics for small geographic areas
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Radiotherapy in Australia 2018-19
Resource
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