

# CANCER IN VICTORIA 2022

## VICTORIAN CANCER REGISTRY



**VICTORIA**  
State  
Government

 **Cancer  
Council  
Victoria**



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For more detailed data, including access to the VCR Data Explorer  
and downloadable data, please visit our website:  
[www.cancervic.org.au/research/vcr](http://www.cancervic.org.au/research/vcr)

#### Acknowledgment of Country

We acknowledge the Traditional Custodians of the land and water ways on which we work and live,  
and pay our respects to the Elders past and present and those emerging.

The Victorian Cancer Registry expresses appreciation to the Victorian Aboriginal Community Controlled Health Organisation Inc (VACCHO) for their valuable contributions to the sections pertaining to Aboriginal and Torres Strait Islander peoples in this report, including the supply of images.

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# FOREWORD

Welcome to *Cancer in Victoria 2022*, an annual report produced by the Victorian Cancer Registry. This report provides a snapshot of cancer activity in 2022 and examines trends in cancer diagnoses, deaths, survival, and prevalence since 1982.

The impact of the COVID-19 pandemic remains an important issue, as again this year we see fewer diagnoses than we would have expected to see. This expectation is based on historical trends in cancer diagnoses and deaths and considers changes in our Victorian population. It is difficult to determine the true impact, but based on historical trends between 1982-2019, we estimate that there were about 6,660 fewer diagnoses than expected for the period 2020-2022. This excludes prostate cancer, for which historical trends make it difficult to accurately assess missed diagnoses. These statistics serve as a salient reminder for Victorians to attend their general practitioner if they have health concerns and for routine health checks. Our statistics demonstrate that early diagnosis of cancer has a survival benefit.

The extended impact of COVID-19 makes it increasingly difficult to project cancer incidence to 2035. For this reason, we have included two models in our estimates. One model is based on historical data, excluding 2020-2022 in anticipation of these diagnoses being made in the future. The other model includes the recent declines and projects fewer diagnoses in 2037. Based on these two models, it is expected that there will be between 51,366 and 56,523 new diagnoses reported in the 2033-2037 period.



**Professor Sue Evans**  
Director, Victorian Cancer Registry

This year, we report blood cancer statistics for the first time in detail. Blood cancers constitute 13% of all cancers in Victoria, and while there are more than 200 sub-categories classified by the World Health Organization, our focus is on the predominant categories. For those interested in examining individual blood cancers not included in this report, along with other cancers, trends in diagnoses, deaths, and five-year survival spanning four decades, as well as disparities according to location of residence and its associated socioeconomic index, country of birth, Aboriginal and Torres Strait Islander heritage, and cancer services, we invite you to visit our website at <https://www.cancervic.org.au/research/vcr> and delve into our interactive Data Explorer.

The statistics presented in this report are sourced from a comprehensive network, including 262 hospitals, 10 radiation therapy centres, BreastScreen Victoria, each of the 26 Victorian pathology providers, and the 7 interstate cancer registries. Together, 217,946 documents were processed by the Victorian Cancer Registry medical coder team to identify the 36,299 new diagnoses in 2022, and update data from previous years. The Registry is proud to be among the first in the world to deliver the 2022 cancer statistics and we're eager to see whether other cancer registries observe an ongoing impact of COVID-19 on cancer statistics.

The Victorian Cancer Registry, supported by the Victorian Government's funding, is dedicated to maintaining Victoria's leading position in comprehensively describing the epidemiology of cancer. For further information, please contact us directly via [vcr@cancervic.org.au](mailto:vcr@cancervic.org.au).



**Associate Professor Luc te Marvelde**  
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# VICTORIAN CANCER REGISTRY STAFF



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Visit the VCR Data Explorer and Cancer Fact Sheets at  
[www.cancervic.org.au/research/vcr](https://www.cancervic.org.au/research/vcr) 

# GLOSSARY

<b>Age-specific rate</b>	Provides 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 expressed per 100,000 population in this report.
<b>Age-standardised rate (ASR)</b>	Provides the capacity to compare different populations and time periods where different age structures exist. It is calculated by applying a weighted average (based on a standard population) of the number of new cases or deaths per 100,000, with the weights being equal to the proportion of people in each age group in a chosen standard population.
<b>Cancer incidence</b>	Refers to the number of new cancer cases diagnosed during a specific period in a population. Incidence reflects the number of cancer cases and not the number of individuals with cancer; one person may have multiple cancers and each one might be included when calculating cancer incidence, based on internationally agreed rules.
<b>Cancer mortality</b>	The number of deaths attributed to cancer during a specific period in a defined population, regardless of when the diagnosis was made.
<b>Cancer of Unknown Primary site (CUP)</b>	A group of metastatic tumours for which no primary tumour has been identified despite a screen of investigations, with specialist review. The diagnosis usually requires pathology evaluation, including immunohistochemistry markers to define the tumour cell lineage. This group also includes patients who present with advanced disease but for whom further tests are not done because a definitive diagnosis is not likely to affect treatment choices or prognosis. Represents less than 1.5% of all cancers reported by the Victorian Cancer Registry.
<b>Crude rate (CR)</b>	The number of new cancer cases (or deaths) divided by the population at risk in the specific period, expressed as an annual rate per 100,000 population. No age adjustments are made when calculating a crude rate.
<b>Cumulative risk</b>	An estimate of the total risk that a certain event will happen during a given period. This report refers to the cumulative risk of a person being diagnosed with cancer by the age of 75.
<b>Death certificate only (DCO%)</b>	The proportion of cases registered from a death certificate.
<b>Five-year survival</b>	Survival in this report refers to ‘relative survival’; the likelihood of a person diagnosed with cancer surviving for a certain amount of time compared with similar people in the general population. ‘Similar’ in this case is defined by a person of the same sex, age and year (ie. Survival of a 74 year-old male diagnosed in 2016 is compared with the life expectancy of all males who turned 74 in 2016). A relative five-year survival rate of 100% means that as many people with cancer will die as those in a similar population without cancer over a five-year period.
<b>Histology</b>	The study of tissues and cells under a microscope.

<b>In situ</b>	A group of abnormal cells that are found only in the place where they first formed in the body. These abnormal cells may become cancer and spread to nearby normal tissue.
<b>International Classification of Diseases for Oncology (ICD-O)</b>	An international standard for classifying a cancer using a topographical code, which describes the anatomical site of origin (or organ system) of the tumour, and a morphological code, which describes the cell type (or histology) of the tumour, together with the behaviour (malignant or benign). Medical coders classify cancers according to the 3rd edition (ICD-O-3). <sup>32</sup>
<b>International Classification of Diseases and Related Health Problems (ICD-10)</b>	An international standard developed to promote international comparability in the collection, processing, classification, and presentation of health statistics. <sup>31</sup>
<b>Invasive cancer</b>	Cancer that has spread beyond the layer of tissue in which it developed and is growing into surrounding, healthy tissues.
<b>Microscopic verification (MV%)</b>	The proportion of cases verified with morphology.
<b>Morphology</b>	The histological classification of the cancer tissue and a description of the course of development that a tumour is likely to take (benign or malignant).
<b>Projection</b>	An estimate or forecast of future cancer incidence or mortality based on trends extracted from historical data applied to estimates of future population. Cancer projection uses an age-period-cohort (APC) model which considers age effects (i.e. biological and social processes linked to ageing), period effects (i.e. external effects impacting all groups) and cohort effects (i.e. the unique exposure/experience of a group as they move across time). In this report we project cancer incidence and mortality by sex for the next 15 years.
<b>Remoteness</b>	Remoteness classification is applied to the patients’ residence at the time of cancer diagnosis. Geographical areas are grouped to major cities, inner-regional, outer-regional and remote Victoria according to the Australian Bureau of Statistics remoteness structure.
<b>Registry-derived Stage (RD-Stage)</b>	The stage of disease at diagnosis, which is derived by registry staff applying rules to data available to a population-based cancer registry. Registry-derived stage has been developed in consultation with clinicians and is intended to be used for population reporting purposes and not at a patient-level to guide clinical practice.
<b>Standardised Incidence Ratio (SIR)/ Standardised mortality ratio (SMR)</b>	Used to gain an understanding of whether the number of observed cancer cases in a particular population is higher or lower than expected, given the population and age distribution for that population. It is calculated by dividing the observed number of cases by the “expected” number of cases. If more cases are observed than expected, the SIR is greater than 1. If fewer cases are observed than expected, the SIR is less than 1.
<b>Years of Potential Life Lost (YPLL)</b>	The total number of years of life lost due to a premature death from cancer. In this report, a premature death is one which occurs before a person reaches 75 years. For example, someone who died from cancer at the age of 68 equates to 7 years of potential life lost.

# 2022 IN NUMBERS



Cancer is the leading cause of death and a leading cause of disease burden in Victoria.

**In 2022, 35,656 Victorians were diagnosed with cancer. That's an average of 98 people diagnosed every day.**



Melanoma, prostate, breast, bowel, and lung cancer account for **56%** of all cancer diagnoses in Victoria.



There were over **6,600 fewer cancer diagnoses** than expected between 2020 – 2022.



Between the ages of 15 and 54 years, **females are more likely to be diagnosed with cancer than males**, but **more males are diagnosed with cancer overall**.



Melanoma diagnoses in **regional Victoria** are **47% higher** than in major cities while head and neck cancer diagnoses are 33% higher.



Aboriginal Victorians have a **12% lower five-year survival rate** at 60% compared to non-Aboriginal Victorians at 72%.



**32 people** die from cancer every day.



Over **350,000 Victorians** alive today **have been diagnosed with cancer** within the past four decades.



Across all cancers, the **5-year survival rate** is **73%** for **females** and, for the first time, **survival for males has reached 70%**.



**Five-year survival** after a diagnosis of **leukaemia** in children aged less than 15 years has **improved by 45%** over the last 35 years.



**Blood cancer diagnoses increased** by 1% annually until 2020, with a consistent **2% annual decline in blood cancer deaths** over the past 15 years.

# DEMOGRAPHY



Janaya Dwyer, Clinical Nurse Specialist

# VICTORIA'S POPULATION IN 2022

## Snapshot

- Victoria's population is growing and ageing.
- Aboriginal Victorians represent 1% of the state's population.
- About one in three Victorians are born overseas.
- Cancer is the cause of death for nearly one in three Victorians.

### Victoria's population is growing

Victoria is the second most populous state in Australia after New South Wales<sup>1</sup>, and accounts for one quarter of Australia's population, but less than 3% of the country's land area.

As at 30 June 2022, there were approximately 6,630,258 people living in Victoria, of whom 3,277,603 (49.4%) were males and 3,352,655 (50.6%)

were females. This is an increase of about 82,436 people or 1.3% compared to 30 June 2021.<sup>2</sup> In 1982, the Victorian Cancer Registry reached the milestone of capturing cancer statistics for all Victorians. At that time, there were approximately four million people residing in Victoria. Since then, there has been a 66% increase in the population the registry serves.<sup>3</sup>

The year 2022 saw a return to positive population growth in Victoria. There was a decline in population from the second quarter of 2020 until the first quarter, 2022. The removal of border restrictions from February 2022 enabled overseas travel and saw a recovery in the net overseas migration throughout 2022.<sup>2</sup>

In total, 77% of Victorians live in major cities, 19% live in inner regional areas, 4% live in outer regional areas and less than 1% live in remote regions (Figure 1).<sup>4</sup>

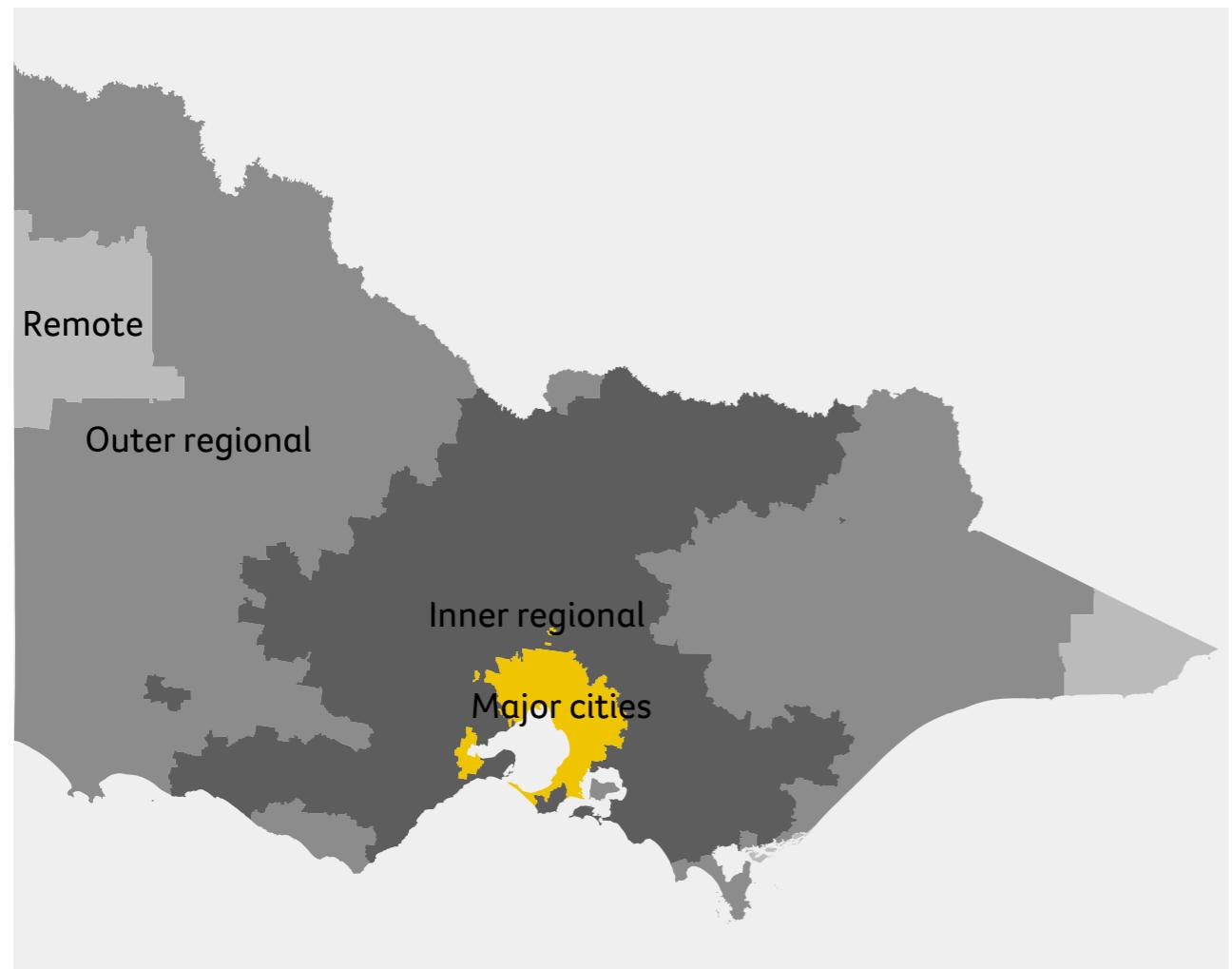


Figure 1: Map of Victoria by Australian Statistical Geography Standard (ASGS) Remoteness Structure<sup>1</sup>

<sup>1</sup>Remoteness areas have been defined by the Australian Statistical Geography Standard using the Accessibility and Remoteness Index of Australia (ARIA+), which considers road distance from a point to the nearest urban centres and localities.

### Aboriginal Victorians represent 1.0% of all Victorians

According to the 2021 Census of Population and Housing, 65,646 Victorians identified as Aboriginal representing 1.0% of Victoria's population and 8.1% of the Aboriginal and/or Torres Strait Islander population in Australia.<sup>5</sup> The median age for Aboriginal and/or Torres Strait Islander people in Victoria in 2021 was 24 years, up from 23 years in 2016 and 22 years in 2011. Half (50.2%) of the Aboriginal people in Victoria live in Greater Melbourne. The Victorian Cancer Registry is working with the Victorian Aboriginal Community Controlled Health Organisation (VACCHO), to support the Aboriginal community to develop and implement culturally safe services and programs to improve cancer outcomes for Aboriginal Victorians.

### About one in three households use a language other than English

Country of birth data is available at the state level only in the census years. Based on the 2021 Census, 2,072,570 (31.7%) Victorians are born overseas, an increase of just 1% from the previous census in 2016. Of those born overseas, the highest proportion come from India (272,250 or 13.1%), followed by China (182,140 or 8.8%) and England (181,440 or 8.8%).<sup>6</sup> The most common ancestries reported by Victorians are English (29%), Australian (27%), Irish (9.4%), Scottish (8.2%) and Chinese (6.6%).<sup>7</sup> A language other than English is used in 30% of Victorian households, with the most common languages spoken at home, other than English, being Mandarin (3.4%), Vietnamese (1.8%), Greek (1.6%), Punjabi (1.6%), Italian (1.4%), and Arabic (1.4%).

### Victorians are living longer

Australia has one of the highest life expectancies in the world, with only Japan and Monaco ranking higher.<sup>8</sup> In Victoria, life expectancy at birth is 85.5 years for females and 81.6 years for males. This is an increase of 1 year for females and 1.1 years for males over the past decade.<sup>9</sup>

However, life expectancy is not equally distributed. The median age of Aboriginal and Torres Strait Islander people in Australia is 24.0 years,<sup>10</sup> while the median age of Victorians living in Melbourne is 36.9 years and in the rest of Victoria is 43.2 years.<sup>11</sup> People aged 65 years and over comprise 5.4% of the Aboriginal and Torres Strait Islander population compared with 17.2% of the non-Aboriginal population.<sup>10</sup>

**"Part of my role is taking the time to ask how distressed somebody is and what's causing that distress and then really being able to knuckle down how to help them with that."**



Janaya Dwyer, Clinical Nurse Specialist

Having grown up in a rural town, Janaya Dwyer is passionate about increasing access to supportive care in regional and rural areas where people are ten per cent more likely to be diagnosed with cancer than those in major cities.

Based at Bendigo Regional Cancer Centre, Janaya divides her time between providing information and support on the Cancer Council Victoria 13 11 20 line and travelling to regional health services presenting cancer information as a Regional Rural Liaison in the Loddon Mallee region.

"Our service covers prevention and screening all the way up to treatment, diagnosis, survivorship issues and end of life care. So, anyone impacted by cancer, who wants information or support," said Janaya.

With years of oncology nursing experience behind her, she jumped at the chance to have a direct impact in and around her hometown. Where clinical nurses may have limited time to chat, Janaya is able to take the time to have these important conversations and give emotional support, which is vital to the delivery of quality cancer care throughout a person's cancer journey.

"Survival rates are changing, we are seeing advancements in early detection, better treatments and clinical trials, and also in disease prevention," she said.

"But what I notice most is the consideration of a person's individual needs as they change over time. It's helping to ensure a good quality of life. Because once they are diagnosed, everything changes. It's helping them figure out their new normal."

## VICTORIA'S POPULATION IN 2022

From 1982 to 2021, the percentage of Victorian men aged 60 years or older increased from 12.4% to 20.9% and the percentage of men aged 70 years or older more than doubled from 5.1% to 10.8% (Figure 2A). For the same period, the percentage of Victorian women aged 60 years or older increased from 16.1% to 23.3% and the percentage of Victorian women aged 70 years or older increased from 7.9% to 12.7% (Figure 2B).<sup>12</sup>

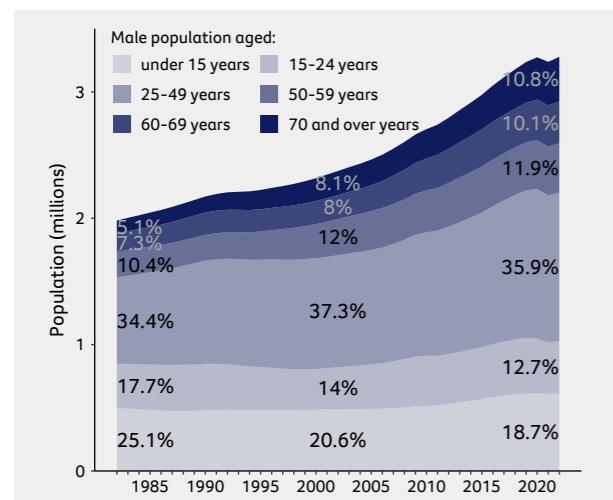


Figure 2A: Victorian population trend for males by age groups, 1982-2022

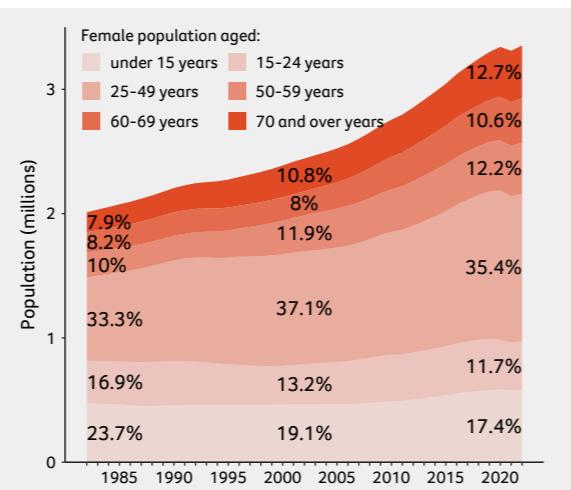


Figure 2B: Victorian population trend for females by age group, 1982-2022

### The median age of Victorians continues to rise for both males and females

The median age of Victorians is 37.9 years, up from 36.9 years in 2016<sup>1</sup> and 34 years in 1995.<sup>13</sup> The median age for Victorians living in Melbourne is 36.8 years, and for those living outside of Melbourne it is 43 years.<sup>14</sup> The age distribution of Victorian males and females is shown in Figure 3.

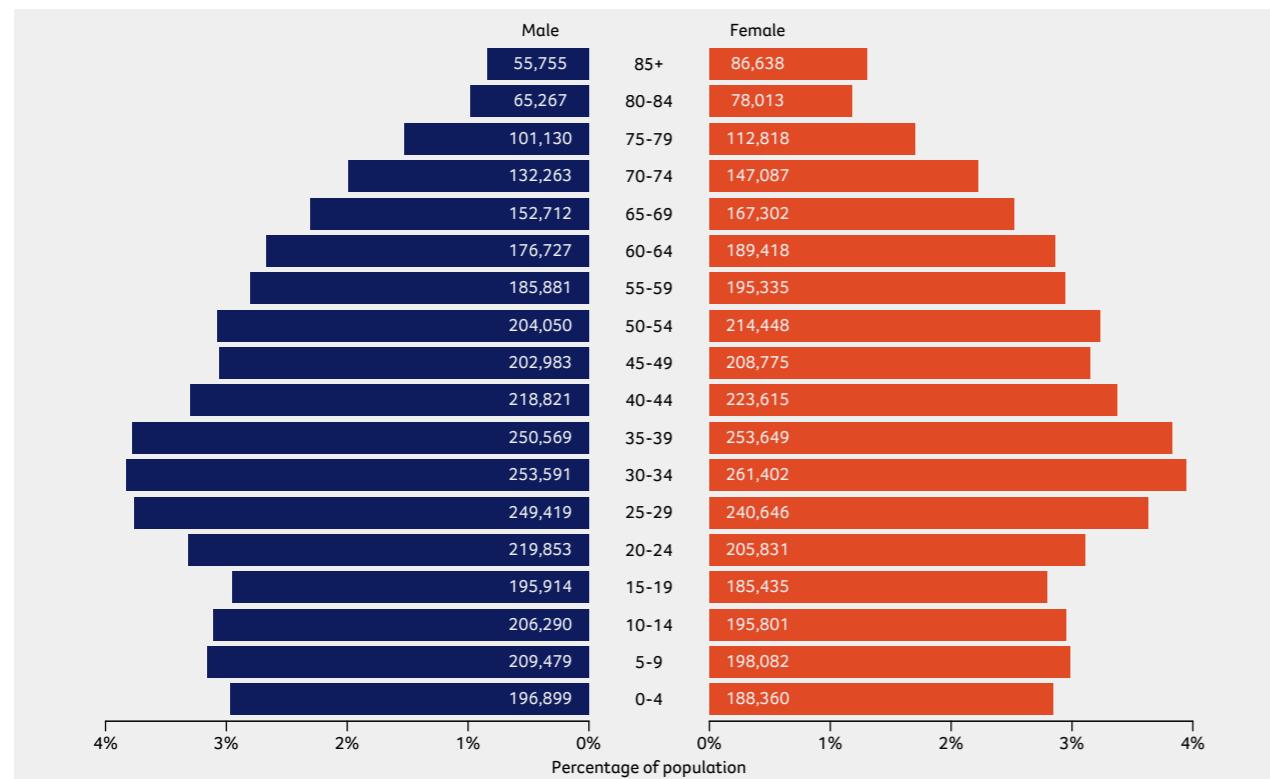


Figure 3: Age distribution as a percentage of the Victorian population by sex, Victoria 2022

If you think about someone living in a rural area who needs to travel to a bigger treatment centre for their treatment, doctors, or specialist appointments, it all adds up.

Janaya Dwyer, Clinical Nurse Specialist



# INCIDENCE



Isla Moore

# NEW CANCER DIAGNOSES AMONG VICTORIANS

## A snapshot of new cancer diagnoses in Victoria in 2022

- **98 Victorians are diagnosed with cancer every day.**
- **For every 100 females diagnosed with cancer, there are 120 males diagnosed.**
- **Cancer diagnoses in Victoria in 2022 are lower than in 2021, but higher than reported in 2020.**
- **About 6,660 fewer cancer diagnoses than expected were estimated by the end of 2022.**
- **The most common cancers in Victoria are cancers of the prostate, breast, bowel, lung, and melanoma. These cancers account for 56% of all diagnoses in Victoria.**
- **Aboriginal Victorians are twice as likely to be diagnosed with cancer than non-Aboriginal Victorians.**
- **Melanoma diagnoses in regional Victoria are 47% higher than in major cities.**

### On average, 98 Victorians are diagnosed with cancer every day.

There were 35,656 Victorians diagnosed with cancer in 2022, of whom 19,419 (54.5%) were males and 16,237 (45.5%) were females. In total 36,299 new cancers were registered in 2022, as 643 Victorians had more than one primary tumour diagnosed.

### Cancer diagnoses declined in 2022 compared to 2021

Traditionally, the annual number of new cancer diagnoses has risen in tandem with our expanding and growing population (Figure 4). Between 1990-1994, the age-standardised incidence rate of cancer increased by 3.5% per annum. This was followed by a period of stability between 1994-2000 before another period of significant increase between 2000-2007 (+1.5% per annum, 95%CI: 0.5%, 2.5%). The past few years has seen a decline in new diagnoses. Notably, in 2020 there was a 3.4% decline in the number of new cancer diagnoses compared to 2019, while in 2021, cancer diagnoses increased by 6.1% compared to 2020 but remained below expected levels based on population growth and ageing. The age-standardised cancer incidence rate was 322 cases per 100,000 in 2019, 303 cases per 100,000 in 2020, and 317 cases per 100,000 in 2021. In 2022, there was a 3.6% decline in the number of new cancer diagnoses compared to 2021, with an age-standardised rate of 302 cases per

100,000. Using cancer diagnosis from 1982 to 2019 and considering population trends, it is estimated that the number of diagnoses for the period 2020-2022 was 6,660 (95% CI: -6,175, -7,145) lower than expected. However, the calculations of missed diagnoses exclude estimates related to prostate cancer incidence, given the considerable variability in its historical trends.

As of 20 November 2023, no other population-based cancer registries have released 2022 cancer incidence data. While it is common for population-based cancer registries to project and estimate incidence rates, uncertainties in certain periods such as the COVID-19 period, make accurate projections challenging. Therefore, the significance of the data presented in this report lies in its representation of actual new diagnoses in 2022. Given that Victoria experienced no restrictions on population movement in 2022, it potentially serves as a valuable benchmark for other jurisdictions and countries to use in comparison, offering a reliable reference point in the absence of finalised data from other registries.

The decline in new cancer diagnoses seen in 2022 may indicate that there are Victorians living in the community with an undiagnosed cancer which in previous years would have been reported to the Victorian Cancer Registry by now. The impact of this will require longer term analyses because many cancers progress slowly and delay may be unlikely to impact survival for many years and perhaps not at all. Yet, for other aggressive tumours, delay will require more extensive treatment and may result in higher mortality. An early indication of impact will be seen in monitoring the stage of cancer with which Victorians present and compare this with historical data. The decline in diagnoses may also, in part, reflect deaths among people who would otherwise have been diagnosed with cancer. In 2021, 0.8% of deaths in Australia were from COVID-19, rising to 9.6% of deaths during January and February 2022.

Compared to 2021, the age-standardised incidence rate in 2022 declined by 4.7%. The age-standardised rate declined in males, from 352 cases per 100,000 in 2021 to 335 cases per 100,000 in 2022. The age-standardised rate declined in females from 287 cases per 100,000 in 2021 to 275 cases per 100,000 in 2022 (Figure 4).

Compared to 2020, there were 809 more diagnoses (+2.3%) in 2022 but considering population growth and the ageing population, there was no significant difference in the age-standardised rate between 2020 and 2022.

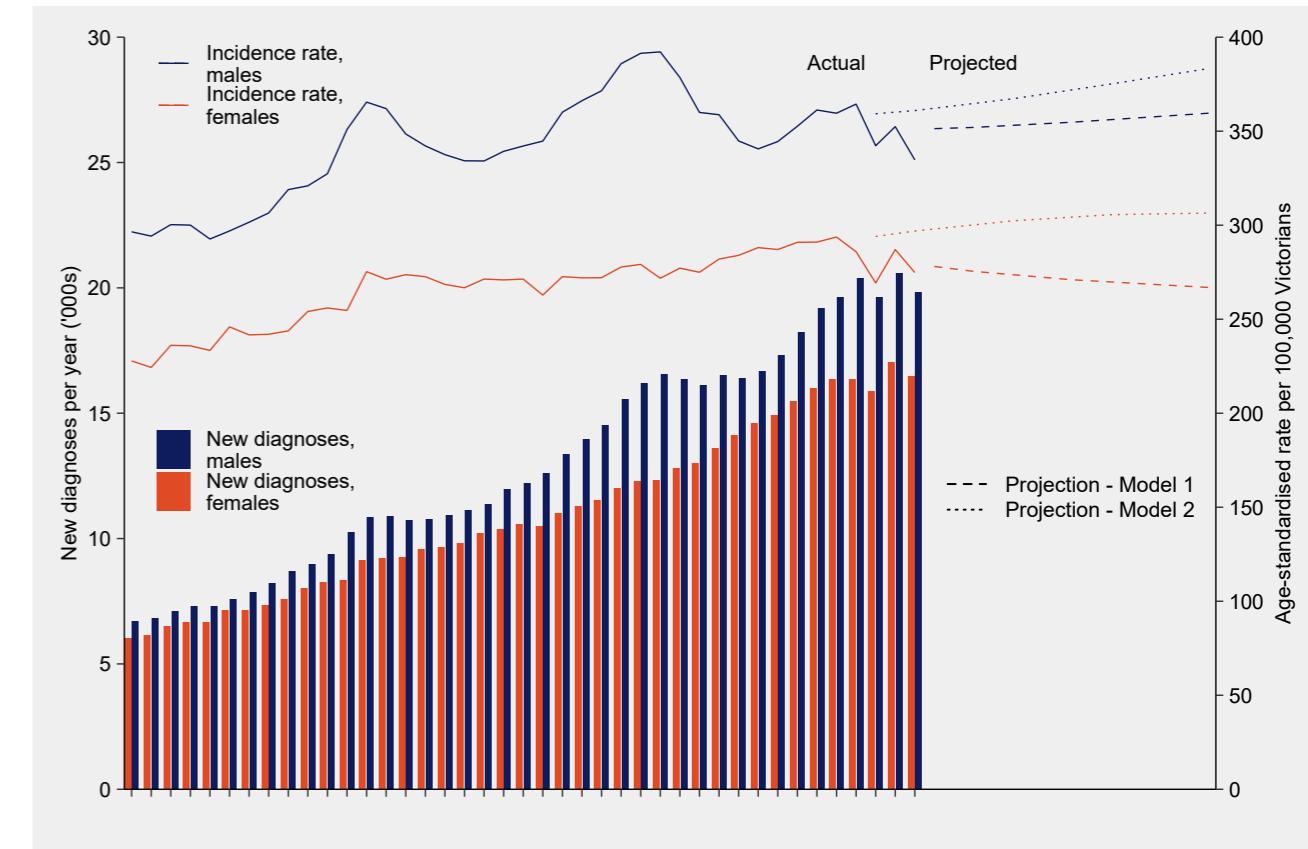


Figure 4: Cancer incidence by sex, 1982–2022, with projected incidence to 2037 based on two models described in Appendix 2 Statistical Methodology, Victoria

### More males are diagnosed with cancer than females.

Cancer is diagnosed in men at a ratio of 120 cases per 100 cases in females. Higher rates of cancer are reported for males in all cancers present in both males and females, except for cancer of the anus and anal canal (0.7 vs 1.2 cases per 100,000), breast (0.6 vs 89 cases per 100,000), and thyroid (5 vs 13 cases per 100,000). The largest difference in age-standardised incidence rates between males and females is seen in cancer of the larynx (2.1 vs 0.3 cases per 100,000) and mesothelioma (1.7 vs 0.4 cases per 100,000). This pattern of higher age-standardised incidence rates among males is seen later in life. Between the ages of 15 and 54 years, females are more likely to be diagnosed with cancer than males (Figure 5).

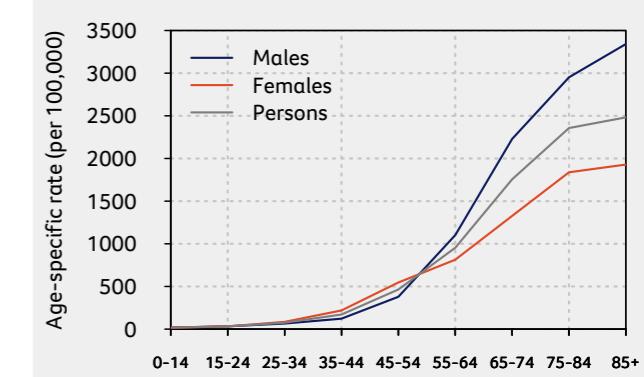


Figure 5: Age-specific incidence rates for all cancers, by sex in Victoria, 2022

# NEW CANCER DIAGNOSES AMONG VICTORIANS

## One in three males and one in four females will develop cancer by the age of 75.

The cumulative risk of developing cancer by the age of 75 is 39.8% for males and 30.6% for females. The risk of developing common cancers by the age of 75 is outlined in Figure 6.

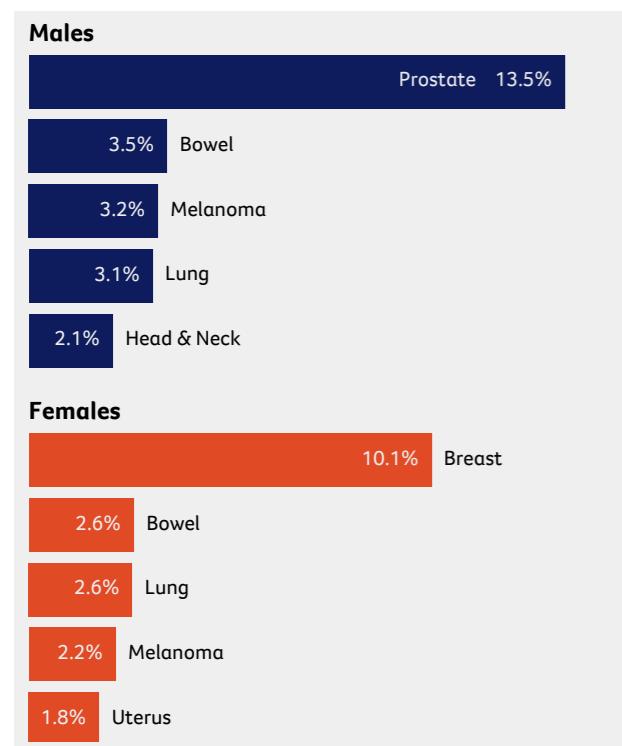


Figure 6: Cumulative risk of developing cancer (%) by the age of 75 years, for selected cancers

In 2022, males accounted for 59% of cancer diagnoses in cancer affecting both men and women, excluding breast cancer.

## Cancer diagnoses increase with age and at a different rate between males and females.

The median age for a cancer diagnosis is 70 years (interquartile range (IQR): 61, 77) for Victorian males and 67 years (IQR: 55, 77) for Victorian females. The cancer rate for males aged 55 years and over are 17 times higher than for males aged less than 55 years. The age-specific cancer rate for females aged 55 years is seven times higher than for females aged less than 55 years.

Figure 5 shows age-specific incidence rates of Victorians diagnosed in 2022. After childhood, incidence increases steadily until age 45, after which a steep increase in cancer diagnoses is seen among males. The incline in females begins earlier

and is more gradual than for males. This is in part accounted for by the earlier diagnoses of breast cancer (median age at diagnosis is 62 years [IQR: 51–73]) and melanoma (median age at diagnosis is 68 years [IQR: 55–77]) among females, and a later peak among males in incidence of prostate cancer (median age at diagnosis is 69 years [IQR: 63–75]) and bowel cancer (median age at diagnosis is 69 years [IQR: 58–78]).

## The five most common cancers account for 56% of all new cancers.

The most commonly occurring cancers in Victoria are those of the prostate, breast, bowel, lung, and melanoma. The percent distribution of cancers for males and females is shown in Figure 7.

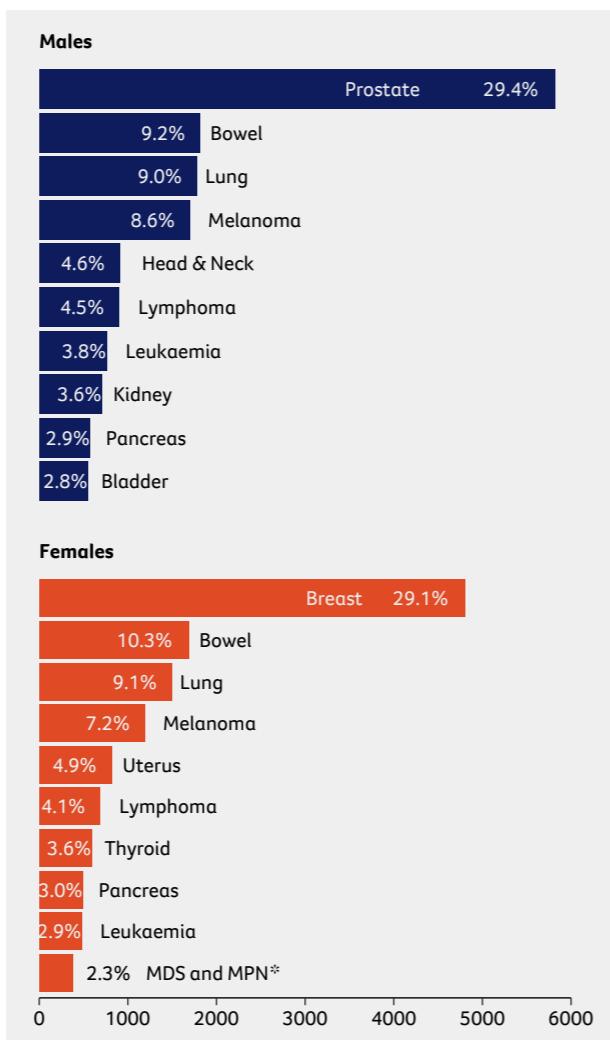


Figure 7: Cancer incidence (numbers and percent of all cancers) for leading cancer types by sex in Victoria 2022 \*Myelodysplastic syndromes and myeloproliferative neoplasms (blood cancers).

“

I didn't realise how much Isla changed during that time until afterwards when she started to get some of her spunk back again.

Isla's mum, Pam



# NEW CANCER DIAGNOSES AMONG VICTORIANS

## The most common cancers in people under 25 years are blood cancers.

The distribution of cancer differs according to age. Figure 8 shows the percent distribution of new diagnoses according to age groups in males and Figure 9 displays cancer incidence for females. For more detailed information on the categorisation of blood cancers according to age groups, please consult the detailed Focus section in this report. It demonstrates the proportionately high rates of blood cancers in young children.

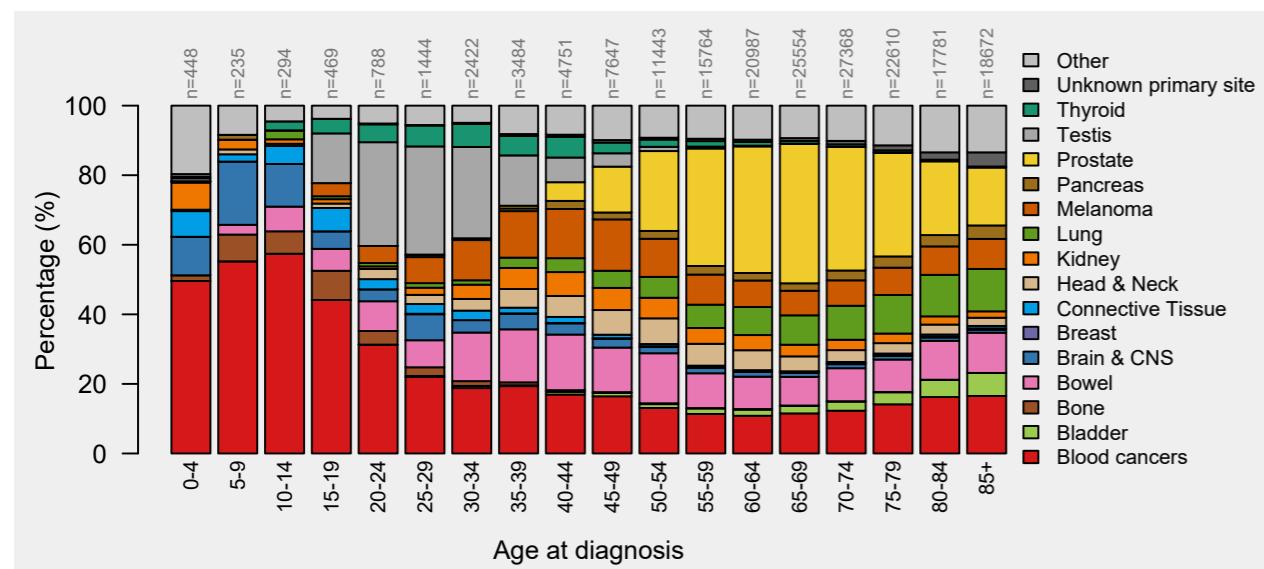


Figure 8: Distribution (%) of new diagnoses of the selected major tumours by age group in males, Victoria 2013-2022 (n: Absolute number).

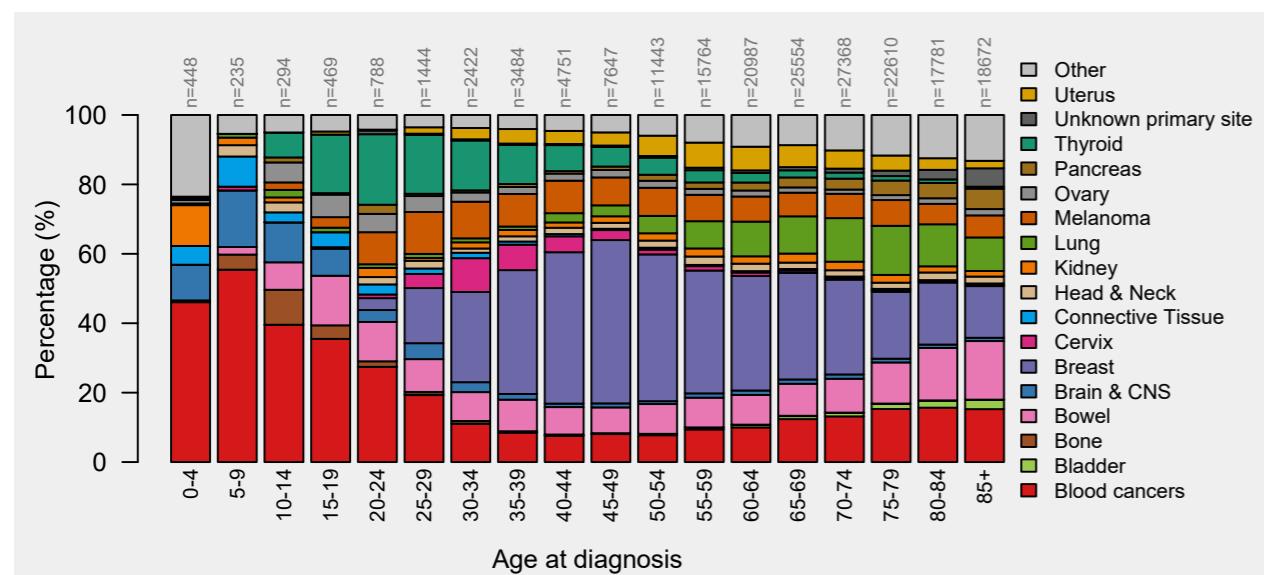


Figure 9: Distribution (%) of new diagnoses of the selected major solid tumours by age group in females, Victoria 2013-2022 (n: Absolute number).

In 2022, there were 206 cancer cases diagnosed in children aged under 15 years (0.5% of total cancers), 263 cancers in those aged 15-24 years (0.7% of total), 755 among 25-34 year olds (2.1% of total), 1,620 among 35-44 year olds (4.5% of total), 3,856 cases among 45-54 year olds (10.6% of total), 7,124 cases among those aged 55-64 years (19.6% of total), 10,522 cases in those aged 65-74 years (29.0% of total), 8,419 cases among 75-84 year olds (23.2% of total) and 3,534 among those aged 85 years and above (9.7% of total).

## Prostate cancer among males and breast cancer among females are the most common cancers reported in those aged between 25 and 59 years.

Cancer diagnoses increase 20 times between the ages 0-24 and 25-59 years, from 469 to 9,220 new diagnoses, with breast and prostate cancer being the most commonly diagnosed cancers in those aged between 25-59 years.

Among females, breast cancer is more common than the next five cancers combined and accounts for 40% of all new cancer diagnoses among females in the 25-59 year age group.

## The most common cancers in people aged 60 and over are prostate, lung and breast cancer.

In males diagnosed with cancer and aged 60 to 74 years, prostate cancer constitutes 39%, followed by lung cancer at 9%, bowel cancer at 8%, and melanoma at 8%.

Among males diagnosed with prostate cancer, 58% are in males aged 60-74 years. For bowel cancer diagnoses in males, 19% occur in those aged 60-74 years, and for melanoma in males, 39% of cases are in 60-74 age group. The age-specific incidence rate of lung cancer almost doubled in males aged 60-64, compared to those aged 55-59 years, from 62.4 to 106.9 cases per 100,000 (or from 116 to 189 cases in 2022). Lung cancer rates continue to rise to a rate of 216.2 cases per 100,000 in males aged 70-74 years and to 376.9 cases per 100,000 in males aged 80-84 years.

In females diagnosed with cancer and aged 60-74 years, breast cancer constitutes 29%, followed by lung cancer at 11%, bowel cancer at 9%, and melanoma at 7%.

Among females diagnosed with breast cancer, 36% are in females aged 60 to 74 years. For lung cancer diagnoses in females, 21% occur in those aged between 60-74 years. For bowel cancer diagnoses in females, 15% occur in those aged 60-74 years, and for melanoma in females, 14% of cases are in 60-74 age group. Lung cancer rates are lower in females than for males, but this gap is narrowing (Figure 19).

## Projecting cancer diagnoses is more difficult as a result of the COVID-19 years.

Cancers are projected to increase, because Victorians are living longer, and cancer is generally a disease of older people. Projections are also influenced by previous improvement in early detection, treatment, and survivorship, which has resulted from scientific discovery. Finally, projections are influenced by population growth, or the movement of people into and out of Victoria. An unknown variable in determining projections is the impact of COVID-19, which has had an immediate and acute impact on cancer diagnoses. It will take some time to understand the impact of the rapid decline in cancer diagnoses, and population-based cancer registries will monitor this through incidence data, including stage of disease at diagnosis, and mortality data. Two models have been used to project new diagnoses in this report:

- Model 1 considers that trends will change as a result of the previous three years (COVID-19 period), and
- Model 2 has removed this period from analyses.

Details are provided in Table 2 for both Model 1 and 2, with the estimated number of new diagnoses in the period 2033-2037 ranging from 51,366 (95%CI: 49,889-53,023) to 56,523 (95%CI: 54,013-59,420). Details of how projections are calculated are outlined in Appendix 2.

## The number of new cancer diagnoses are projected to increase for almost all cancers over the next 15 years.

The increase in the absolute numbers of new diagnoses in the next 15 years depends on whether the 2020-2022 years, for which the number of new diagnoses is down compared to predicted cases using pre-COVID data, are included. Including 2020-2022 (model 1), diagnoses are estimated to increase by 48% in males and by 38% among females. These numbers assume that the downward trends in 2020-2022 will continue into the future. Excluding 2020-2022 (model 2), diagnoses are estimated to increase by 55% in males and by 57% among females. These numbers assume the missed diagnoses will present in the future (Table 2).

# NEW CANCER DIAGNOSES AMONG VICTORIANS

## Aboriginal and Torres Strait Islander People\*

Cancer disproportionately affects Aboriginal Victorians. In an effort to tackle this inequality, the Victorian Aboriginal Community Controlled Health Organisation (VACCHO) has collaborated with various entities, including the Victorian Integrated Cancer Services, the Victorian Comprehensive Cancer Centre Alliance, health services, and Regional Cancer Centres. Together, they have formulated the Victorian Aboriginal Cancer Journey Strategy, aiming to enhance cancer outcomes<sup>(15)</sup>. The strategy is centered on self-determination, ensuring the delivery of high quality care in a manner that aligns with the cultural needs of Aboriginal Victorians. The Optimal Care Pathway for Aboriginal and Torres Strait Islander

People with cancer,<sup>(16)</sup> provides a guiding framework to assess the quality of care delivered to Aboriginal Victorians diagnosed with cancer.

### Aboriginal Victorians are twice as likely to be diagnosed with cancer than non-Aboriginal Victorians.

In the period 2017-2021, on average 328 cancers were diagnosed in Aboriginal Victorians each year, 172 in males and 156 in females. The age-standardised incidence rate of cancer among Aboriginal males was 736 cases per 100,000 and among Aboriginal females was 581 cases per 100,000. By comparison, the age-standardised incidence rate of cancer among non-Aboriginal Victorian males was 354 cases per 100,000 and among non-Aboriginal females was 284 cases per 100,000 (Figure 10).

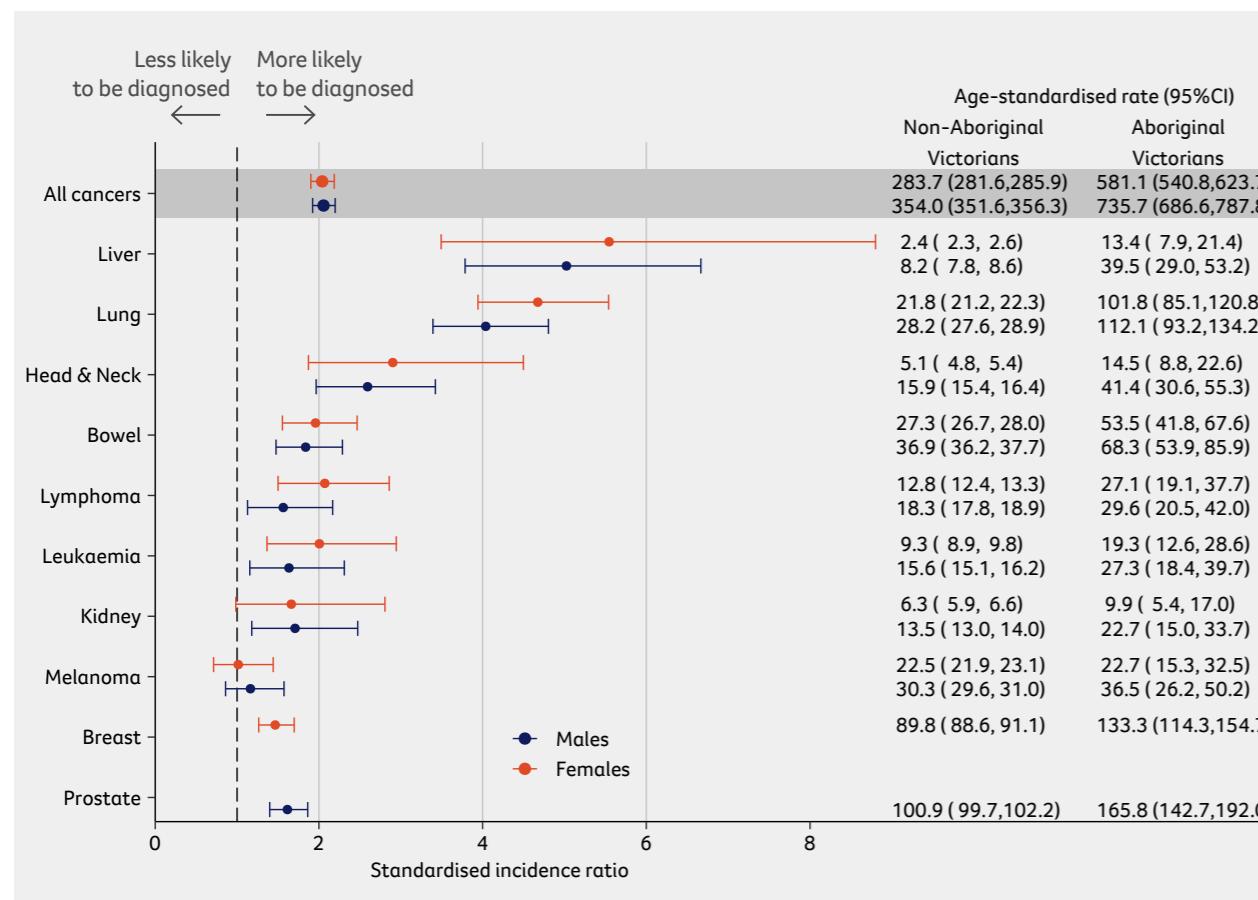


Figure 10: Age-standardised incidence ratio (with 95% confidence interval) for the ten most common cancers diagnosed in Aboriginal Victorians by sex, comparing Aboriginal and non-Aboriginal Victorians, 2017-2021

\*Aboriginal Victorians in this report refers to Aboriginal and/or Torres Strait Islander peoples in Victoria



Artwork by Melinda Cain, Kamaroai, Gamilaraay and Bigambul. Title: Bells Bloodlines.

Aboriginal Victorian males are more than twice as likely to be diagnosed with cancers of the liver, lung, and head and neck. Aboriginal Victorian females are more than twice as likely to be diagnosed with cancers of the liver, lung, head and neck, lymphoma and leukaemia.

The most common cancers for Aboriginal Victorians to be diagnosed with are lung, prostate, breast and bowel cancers. These cancers account for 47.3% of cancers among Aboriginal Victorians.

Most cancers with diagnoses of at least 20 Aboriginal Victorians in the 2017-2021 period had significantly higher mean age-standardised incidence rates for both Aboriginal males and females. Of the most common cancers, differences in the mean age-standardised incidence rates were significantly higher for both Aboriginal males and females for cancers of the head and neck (2.7 times higher), bowel (1.9 times higher), liver (5.1 times higher), lung (4.3 times higher), lymphoma (1.8 times higher), and leukaemia (1.8 times higher).

Aboriginal Victorian females also had significantly higher mean age-standardised incidence rates for cancers of the breast (1.5 times higher), vulva, vagina and other unspecified female genital organs (2.9 times higher), cervix (3.4 times higher) and uterus (2.0 times higher).

For Aboriginal Victorian males, rates were also significantly higher for cancers of the kidney (2.0 times higher), prostate (1.6 times higher) and lymphoma (2.0 times higher).

### Aboriginal Victorians over 70 years of age are 1.9 times as likely to be diagnosed with cancer than non-Aboriginal Victorians.

Differences in cancer incidence rates are evident from the third decade in females and the fourth decade in males and become more pronounced with increasing age for both males and females (Figure 11).

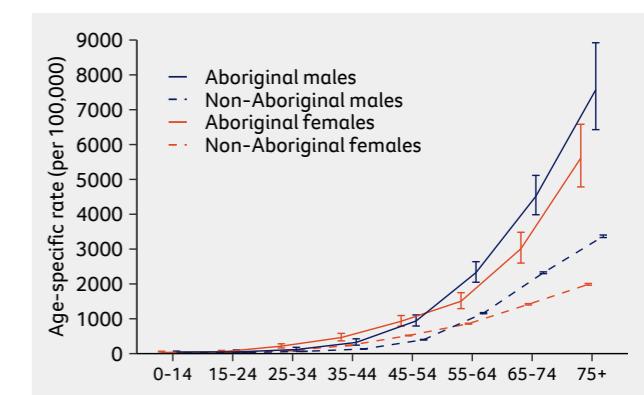


Figure 11: Age-specific cancer incidence rates (with 95% confidence intervals) by sex for Aboriginal and non-Aboriginal Victorians, 2017-2021

# NEW CANCER DIAGNOSES AMONG VICTORIANS

## Regional Victorians\*

### Regional Victorians are 10% more likely to be diagnosed with cancer than those living in major cities.

In 2022, 10,837 regional Victorians were diagnosed with cancer. Between 2020-2022, there were approximately 6,212 males and 4,657 females living in regional Victoria diagnosed with cancer each year. Age-standardised rates of those living in regional Victoria are higher among males than females (371

versus 295 cases per 100,000) (Figure 12). Both males and females living in regional Victoria have higher age-standardised rates of cancer than those residing in major Victorian cities.

The most common cancers among regional Victorians are the same as urban Victorians: prostate, breast, bowel, lung and melanoma. Yet, age-standardised rates were significantly higher for both males and females residing in regional Victoria diagnosed with melanoma, leukaemia, bowel and lung cancer.

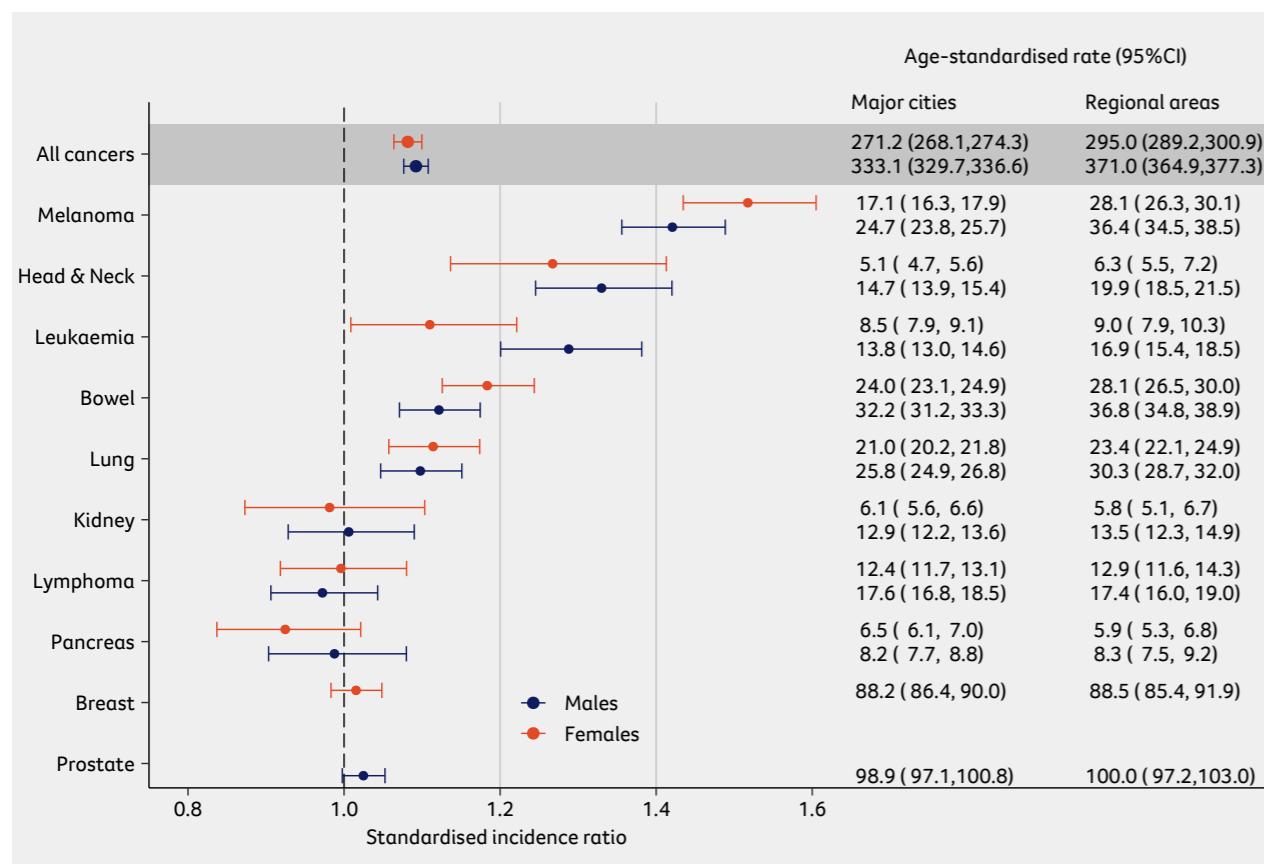


Figure 12: Age-standardised incidence rate (with 95% confidence intervals) for the ten most common cancers, comparing Victorians diagnosed in major cities and regional Victoria, 2020-2022

### Regional Victorians are 47% more likely to be diagnosed with melanoma than those living in major cities.

There were 1,050 regional Victorians diagnosed with melanoma in 2022. Regional Victorians have a significantly higher rate of diagnosis of melanoma than those living in major cities (36.4 versus 24.7 cases per 100,000 among males and 28.1 versus 17.1 cases per 100,000 among females) (Figure 12). Melanoma diagnoses were 63% higher among regional Victorians compared to Victorians who live in major cities. Melanomas account for about 10% of cancers among regional Victorians. Differences in age-standardised rates among males and females over time are shown in Figure 13.

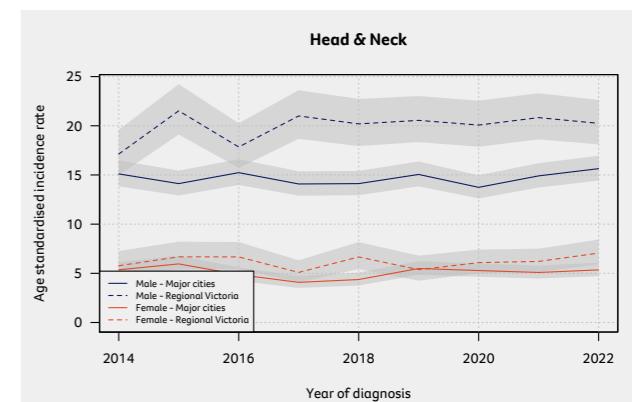


Figure 14: Trend in head and neck cancer age-standardised incidence rates (with 95% confidence intervals) by sex and region, Victoria 2014-2022.

### Lung cancer is more commonly diagnosed in regional Victorians.

There were 595 regional males and 477 regional females diagnosed with lung cancer in 2022. Regional Victorians have a significantly higher rate of diagnosis of lung tumours than major city-dwelling Victorians (30.3 versus 25.8 cases per 100,000 among males and 23.4 versus 21.0 cases per 100,000 among females) (Figure 12). Lung cancer diagnoses were 11% higher among regional Victorians compared to Victorians who live in major cities in 2022. Differences in age-standardised rates among males and females over time are shown in Figure 15.

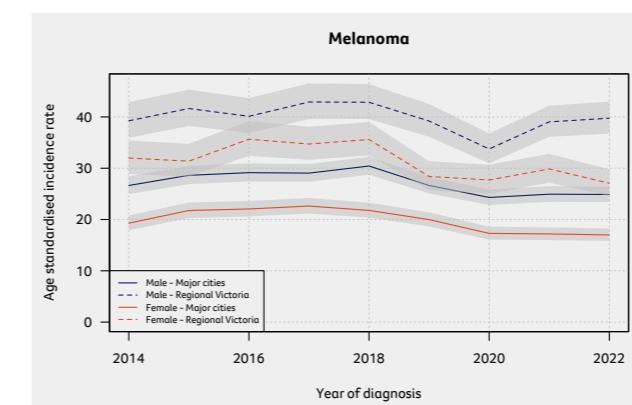


Figure 13: Trend in melanoma age-standardised incidence rates (with 95% confidence intervals) by sex and region, Victoria 2014-2022

### Head and neck cancer diagnoses are 33% higher in regional males than urban males.

There were 311 regional males and 121 regional females diagnosed with head and neck cancer in 2022. Regional Victorians have a significantly higher rate of diagnosis of head and neck tumours than urban Victorians (19.9 versus 14.7 cases per 100,000 among males and 6.3 versus 5.1 cases per 100,000 among females) (Figure 12). Head and neck cancer diagnoses were 33% higher among Victorians residing in regional Victoria compared to those in major cities in 2022. Differences in age-standardised rates of head and neck cancer between males living in major cities and in regional areas of Victoria have persisted over the past six years (Figure 14).

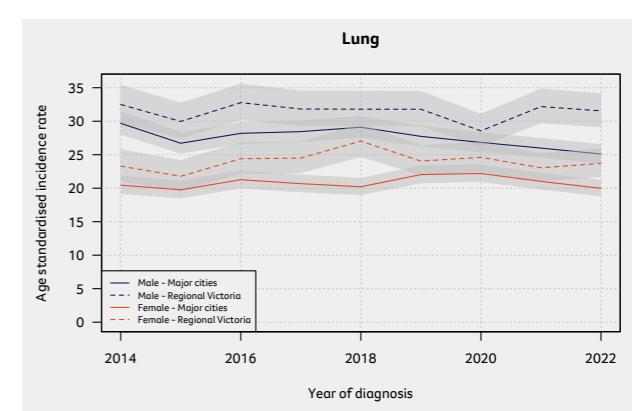


Figure 15: Trend in lung cancer age-standardised incidence rates (with 95% confidence intervals) by sex and region, Victoria 2014-2022.

\* Regional Victoria is defined by the Australian Bureau of Statistics as an area outside of major cities in Victoria as shown in Figure 1 of this report.

# NEW CANCER DIAGNOSES AMONG VICTORIANS

## Commonly Diagnosed Cancers

Details of trends in cancer incidence can be seen for all cancers on the VCR website using the Data Explorer interactive portal (<https://www.cancervic.org.au/research/vcr>). Some details of commonly diagnosed cancers are described in this section.

### Prostate cancer

**Incidence and trend:** Prostate cancer is the most common cancer in Victoria, accounting for 16% of all cancers diagnosed in Victoria in 2022 and 29% of all cancers diagnosed in males. In 2022, there were 5,823 males diagnosed with prostate cancer, providing an age-standardised incidence rate of 98 new cases per 100,000 population. The median age at diagnosis is 69 years (IQR: 63–75) with a range from 33 to 102 years. Prostate cancer rates have fluctuated more than any other cancer in Victoria over the past three decades, with incidence rates mirroring trends in prostate-specific antigen (PSA) screening test rates and shown in Figure 16A.

**Impact of COVID-19:** In 2022, the observed new diagnoses exhibited a relative difference of -22% (95%CI: -18%, -26%) compared to the expected number of cases based on data from 2014–2019, translating to 1,622 fewer cases than anticipated. The decline was most pronounced in males aged 65–69 years (-21%, 95%CI: -13%, -29%) and 75–79 years (-25% [95%CI: -15%, -34%]).

**Projections:** Fluctuations in historical incidence rates make it very difficult to predict future rates (Table 2). Considering these uncertainties, it is projected that annual incidence in 2033–2037 will range from 8,002 to 9,866 or an age-standardised rate range from 102 to 118 cases per 100,000 males (Table 2).

**Stage at diagnosis:** The International Society of Urological Pathology (ISUP) grade group is used to indicate the histological patterns of prostate cancer based on the Gleason score, providing a standardised approach to assessing the aggressiveness of the cancer. A lower ISUP grade confers a survival advantage over higher ISUP grade groups. In Victoria in 2022, 26% of prostate cancer is diagnosed at ISUP grade group 1, 28% at ISUP grade group 2, 13% at ISUP grade group 3, 5% at ISUP grade group 4 and 13% at ISUP grade group 5. In 2022, 350 males (6%) were diagnosed with metastatic disease and for 464 males (8%) the grade group was unknown. Trend in ISUP grade group classification since 2010 is shown in Figure 16B.

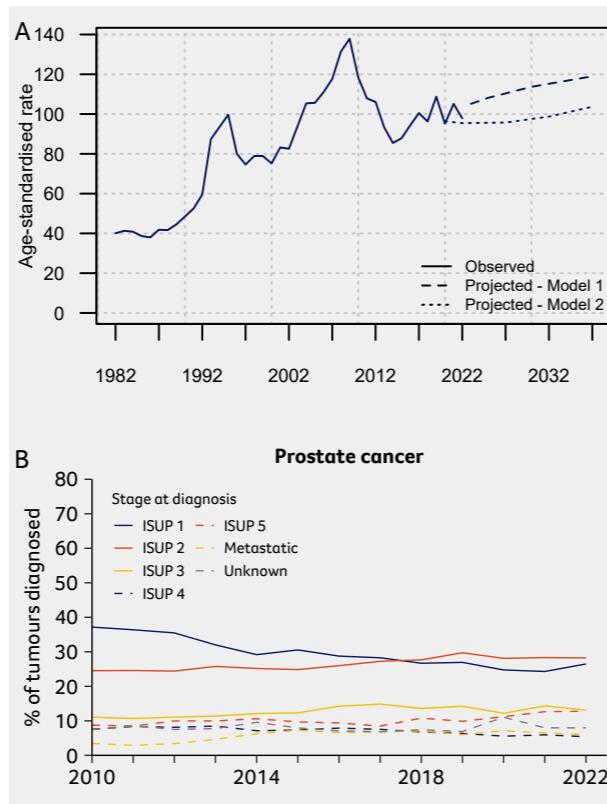


Figure 16: Prostate cancer trend in (A) incidence, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology and B) ISUP grade group at diagnosis, 2010–2022, Victoria.

### Breast cancer

**Incidence and trend:** Breast cancer is the second most common cancer in Victoria, accounting for 13% of all new cases diagnosed in 2022, 29% of all cancers diagnosed in females and 0.2% of cancers among males. There were 4,805 females and 45 males diagnosed in 2022, providing an age-standardised incidence rate of 89 new cases per 100,000 among females and 0.6 cases per 100,000 among males. The median age at diagnosis for females is 62 years (IQR: 51–73) and for males is 78 years (IQR: 67–83). Trends in age-standardised rates of breast cancer among females between 1982–2022 is shown in Figure 17A.

**Impact of COVID-19:** In 2022, there were 472 (95%CI: -358, -585) fewer than anticipated new diagnoses of breast cancer. The decline in new diagnoses relative to expected in 2022 of 9% (95%CI: -6.8%, -11.1%) is more pronounced than in 2021 (-3.8%, 95%CI: -1.9%, -5.8%) but less than experienced in 2020 (-12.4%, 95%CI: -10.7%, -14.2%), when compared

to the number of expected cases based on trends in the 2006–2019 period. The decline was most pronounced in females aged 70–74 years (-19.5%, 95%CI: -12.9%, -26%). The cumulative deficit in breast cancer diagnoses for the period 2020–2022 is estimated to be 1,206 cases, reflecting a 7.9% decline.

**Projections:** In the next decade to 2033–2037, breast cancer age-standardised rates are anticipated to remain steady if COVID-impacted years are removed from the projection model (Model 2) or decline slightly if COVID-19 years are included in the model (Model 1) (Figure 17A). The actual number of breast cancer diagnoses in females is likely to increase to between 6,206–7,297 cases annually over the next 15 years (Table 2).

**Stage at diagnosis:** Trend in registry-derived stage of disease at diagnosis for the period 2010–2022 is shown in Figure 17B. Stage is calculated using registry-derived stage, with the methodology discussed in Appendix 2. Early-stage breast cancer is stage 1 or 2 and indicates that the cancer is contained in the breast or that growth has only extended to the nearby lymph nodes. Stage 3 breast cancer indicates that the tumour is locally advanced, it is larger than 5cm and has spread to tissues around the breast such as the skin, muscles or ribs, or has spread to the lymph nodes. Stage 4 breast cancer has spread to other parts of the body and is called advanced or metastatic disease. In 2022, 38% of breast cancer is diagnosed at stage 1, 37% at stage 2, 7% at Stage 3, 4% at stage 4, and for 14% of cases, stage could not be calculated.

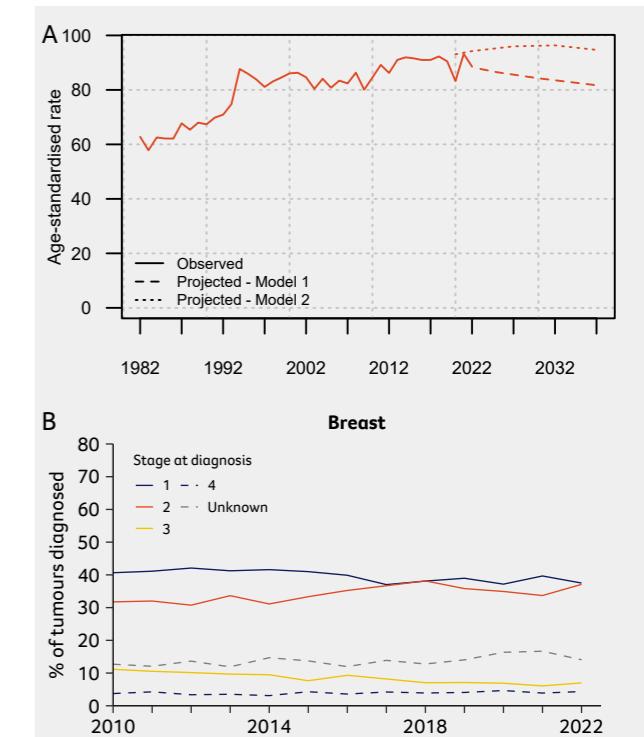


Figure 17: Trend in breast cancer (females only) (A) incidence, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology and B) registry-derived stage at diagnosis, 2010–2022, Victoria.

### Bowel cancer

**Incidence and trend:** Bowel, or colorectal cancer, is the third most common cancer in Victoria, accounting for 10% of all new cases diagnosed in both males and females in 2022. There were 3,504 new bowel cancer diagnoses in 2022: 1,814 (52%) in males and 1,690 (48%) in females, providing an age-standardised incidence rate of 31.0 new cases per 100,000 among males and 24.9 cases per 100,000 among females. The median age at diagnosis is 70 years (IQR: 58–80), with a slightly younger median age at diagnosis for males compared to females (69 [IQR: 58–78] vs 72 [IQR: 59–81] years respectively). Between 2012–2022, the age-standardised incidence rate for all ages decreased from 34.7 to 27.8 cases per 100,000 people (Figure 18A). For the period 2001–2019 the annual percent change in bowel cancer diagnoses was -1.6% (95%CI: -1.8%, -1.3%) in males. Among females, there has been a modest annual percent decline between 1992–2017 of 0.7% (95%CI: -0.9%, -0.5%).

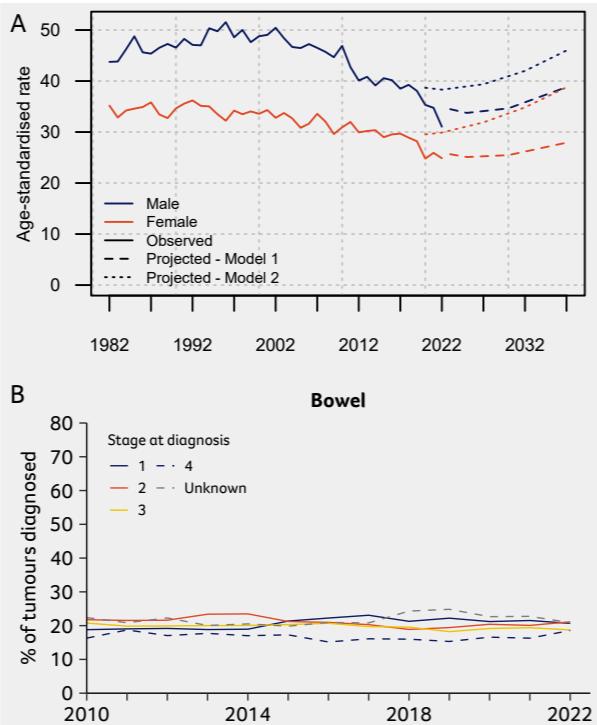
**Impact of COVID-19:** In 2022, there were 614 (95%CI: -537, -691) fewer than anticipated new diagnoses of bowel cancer. The decline in new diagnoses relative to

# NEW CANCER DIAGNOSES AMONG VICTORIANS

expected in 2022 of 15.1% (95%CI: -13.2%, -17.0%) is more pronounced than in both 2021 (-8.5%, 95%CI: -13.2%, -17.0%) and 2020 (-11.0%, 95%CI: -9.4%, -12.6%) when compared to the 2001–2019 period. The decline was seen equally among males and females. In total, in the period 2020–2022 there was an 11.9% (95%CI: -9.6%, -14.3%) decline in new bowel cancer diagnoses among males and an 11.1% (95%CI: -8.5%, -13.7%) decline in new diagnoses in females compared to the number of expected cases based on trends in the 2001–2019 period. The overall deficit of 1,399 fewer cases than expected, reflects an 11.5% decline across both males and females in the period 2020–2022 compared with historical trends between 2001–2019.

**Projections:** Bowel cancer rates are anticipated to increase over the next decade (Table 2 and Figure 18A). Cases are projected to increase to 32.3 cases per 100,000 (Model 1) or 38.9 cases per 100,000 (Model 2). The number of bowel cancer diagnoses is projected to be between 4,567 – 5,757 cases annually over the next 15 years.

**Stage at diagnosis:** Bowel cancer stage at registry-derived diagnosis is reasonably evenly distributed across the four groups, as seen in Figure 18B. In 2022, 21% of bowel cancer cases were diagnosed with stage 1 disease, 21% with stage 2 disease, 19% with stage 3 disease, 19% with stage 4 disease and for 21% of cases stage could not be derived. Comparing the distribution of bowel cancer diagnoses in 2022 and 2010, there is a 10% increase in the proportion of cases diagnosed with stage 1 disease, a 3% decline in cases diagnosed with stage 2 disease, a 14% increase in the cases diagnosed with stage 4 disease, and a 7% decline in cases with no stage available over the last 12 years.



**Figure 18: Trend in bowel cancer (A) incidence, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology and (B) registry-derived stage at diagnosis, 2010–2022, Victoria .**

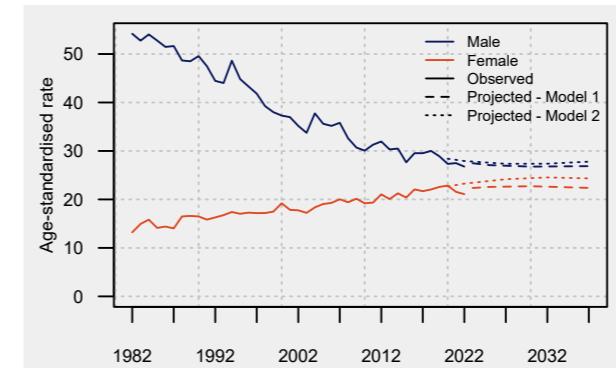
## Lung cancer

**Incidence and trend:** Lung cancer is the fourth most common cancer in Victoria, accounting for 9% of all new cases diagnosed in 2022 among both males and females. There were 1,776 (54%) males and 1,493 (45%) females diagnosed, providing an age-standardised incidence rate of 26.8 cases per 100,000 among males and 21.1 cases per 100,000 among females. The median age at diagnosis is 72 years (IQR: 64–79). Between 2010–2022, the age-standardised incidence rate of lung cancer has been declining at an average rate of 1.2% (95%CI: -1.8%, 0.6%) in males. For females between 1982–2020, the age-standardised incidence rate increased at an average of 1.2% (95%CI: 1.1%, 1.3%) annually and then, between 2020–2022 declined at an average annual percent change of 3.4% (95%CI: -10.4%, 4.1%) (Figure 19).

**Impact of COVID-19:** In 2022, there were 468 (95%CI: -254, -681) fewer than anticipated new diagnoses of lung cancer. The decline in new diagnoses relative to expected in 2022 of 12.8% (95%CI: -6.9%, -18.6%) is more pronounced than

in both 2021 (-7.7%, 95%CI: -3.0%, -12.4%) and 2020 (-4.4%, 95%CI: -0.8%, -8.1%) when compared to the number of expected cases based on trends in the 2015–2019 period. The decline was seen equally among males and females. In total, in the period 2020–2022 there was a 9.0% (95%CI: -2.8%, -15.2%) decline in new lung cancer diagnoses among males and a 7.8% (95%CI: -0.5%, -15%) decline in new diagnoses in females compared to the number of expected cases based on trends in the 2015–2019 period. The overall deficit of 890 fewer cases than expected, reflects an 8.4% decline across both males and females in the period 2020–2022 compared with historical trends between 2015–2019.

**Projections:** Long-term trends show a plateauing of lung cancer incidence among both males and females (Figure 19). In the period 2033–2037, lung cancer cases are projected to remain steady at 24.9 cases per 100,000 (Model 1) or increase to 26.1 cases per 100,000 (Model 2) (Table 2).



**Figure 19: Trend in lung cancer incidence, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology.**

## Melanoma

**Incidence and trend:** Melanoma is the fifth most common cancer in Victoria. In 2022, 2,885 Victorians were diagnosed with melanoma (1,697 males and 1,188 females), accounting for 8% of all new cases diagnosed in 2022 (8.6% of all cancers diagnosed in males and 7.2% in females). The age-standardised incidence rate was 29 cases per 100,000 among males and 19 cases per 100,000 among females. The median age at diagnosis is 69 years (IQR: 58–77). Between 1996–2018, there has been no annual percent change in new melanoma diagnoses. An annual percent decline of 4.2% was seen between 2018–2022, incorporating the COVID-19 years. The trend in melanoma incidence is outlined in Figure 20A.

**"If this was 20 years ago, Isla would've died. The research that's been done in that time means that we could go through without those thoughts."**



**Pam Moore, Isla Moore's mum**

Isla was diagnosed with leukaemia when she was three years old. The first visible sign that something was wrong was the appearance of a small lump on her head that progressively grew.

"After about three months of going around in circles, we decided to go straight to emergency to see if we could get some answers," says, Pam. "Within about an hour or so we found out that she had leukaemia. So, from there we were straight up to the ward and that's when the journey started for us."

Isla was diagnosed with acute lymphoblastic leukaemia (ALL), which affects around 121 Victorians each year, including 65 children under 15 years.

After months of uncertainty, Pam was relieved to finally have a diagnosis. "I just remember that feeling of 'now it starts, now we do what we need to do to get through it,'" she said.

Isla was placed on a course of steroids, chemotherapy, and antibiotics, taking as many as 20 pills a day. She would also go to hospital for intravenous chemotherapy and lumbar punctures and stay for lengthy periods.

Two-and-a-half years after her diagnosis, including nine months of intensive treatment, the medical staff rang the bell at the conclusion of Isla's final dose of chemotherapy. But for Pam and Gareth, there is still an anxious two-year window where relapse is possible.

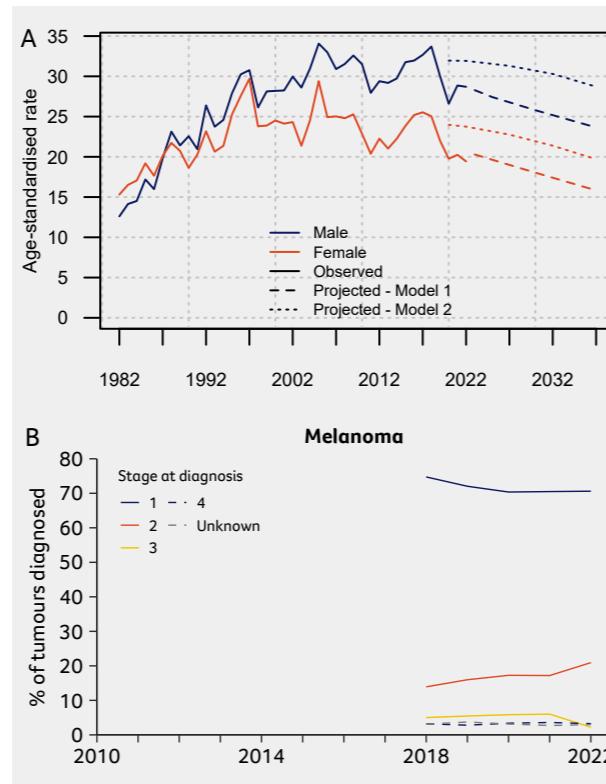
"It's not done, not in my brain. I've still got another 18 months before it's done. So, it's always sitting back there," said Pam.

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**Impact of COVID-19.** In 2022, there were 413 (95%CI: -347, -478) fewer than anticipated new diagnoses of melanoma. The decline in new diagnoses relative to expected in 2022 of 12.5% (95%CI: -10.5%, -14.5%) is similar to 2021 (-11.4%, 95%CI: -9.5%, -13.3%) but less pronounced than reported in 2020 (-17.0%, 95%CI: -15.3%, -18.8%). There was a similar decline among males and females. In total, in the period 2020–2022 there was a 13.2% (95%CI: -10.7%, -15.7%) decline in new melanoma diagnoses among males and a 14.2% (95%CI: 11.4%, -17.0%) decline in new diagnoses in females compared to expected numbers based on trends in the 1996–2019 period. The overall deficit of 1,311 fewer cases than expected, reflects an 13.6% decline across both males and females in the period 2020–2022 compared with historical trends between 1996–2019.

**Projections:** Melanoma age-standardised incidence rates are projected to continue to decline for both males and females over the next 15 years (Figure 20A). Melanoma age-standardised rates are estimated to range from between 20.9 to 30.6 cases per 100,000 in 2033–2037 while new diagnoses are expected to increase by between 24–69% over the next decade, depending on whether or not COVID-19 period is included in projection models (Table 2).

**Stage of disease at diagnosis:** In 2022, 71% of melanomas were diagnosed as stage 1 cancers, 21% with stage 2 disease, 2% with stage 3 disease and 3% were diagnosed with stage 4 disease. For 3% of cases, the stage at diagnosis was unable to be derived or captured from hospital notifications. Over the past five years, there has been a slight decline in the percent of cases diagnosed annually with stage 1 disease (75% to 71%) while the number of cases diagnosed with stage 2 disease has increased from 14% to 21% (Figure 20B).



**Figure 20:** Trend in melanoma (A) incidence, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology and B) registry-derived stage group at diagnosis, 2018–2022, Victoria.

## Uterine (endometrial) cancer

**Incidence and trend:** Uterine cancer is the most common gynaecological cancer among Victorian females and the 5th most commonly diagnosed tumour in females in 2022. The endometrium refers to the lining of the uterus and accounts for 95% of all uterine tumours. In 2022, 813 Victorian females were diagnosed with uterine cancer, providing an age-standardised rate of 14.4 cases per 100,000. The median age at diagnosis is 65 years (IQR: 56–73). Incidence of uterine cancer has been increasing at an average rate of 0.9% (95%CI: 0.8%, 1.1%) annually since 1982 (Figure 21A).

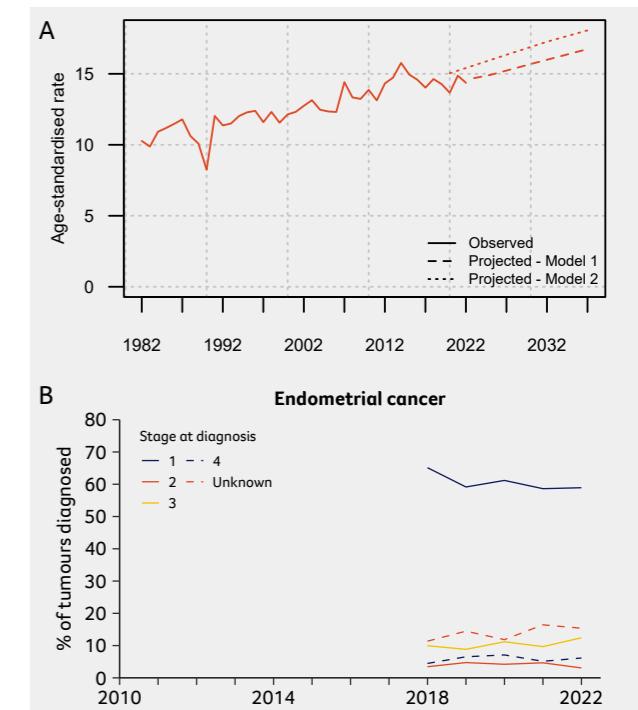
**Impact of COVID-19.** In 2022, there were 77 (95%CI: -55, -102) fewer than anticipated new diagnoses of uterine cancer. The decline in new diagnoses relative to expected in 2022 of 8.6% (95%CI: -5.8%, -11.5%) was more pronounced than in 2021 (-0.9%, 95%CI: 1.8%, -3.6%) but less than reported in 2020 (-10.6%, 95%CI: -8.0%, -13.2%) when compared to the number of expected cases based on trends in the 1982–2019 period.



Isla Moore with dad, Gareth, mum, Pam and brother, Connor

**Projections:** Uterine cancer age-standardised incidence rates are projected to continue to decline over the next 15 years (Figure 21A). Uterine age-standardised rates are estimated to range from between 16.4 to 17.7 cases per 100,000 in 2033–2037, while new diagnoses are expected to increase by between 36–46% over the next decade, depending on whether or not COVID-19 period is included in projection models.

**Stage of disease at diagnosis:** Registry-derived stage was developed for endometrial cancer, excluding other sub-categories of uterine cancers because of differing definitions and survival rates between endometrial and non-endometrial malignancies of the uterus. For endometrial cases diagnosed in 2022, 4% were unstageable. Therefore, of those with stage reported, 77% were diagnosed with stage 1 or 2 disease, 15% with stage 3 disease and 8% with stage 4 disease (Figure 21B).



**Figure 21:** Trend in (A) uterine incidence, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology and B) endometrial cancer registry-derived stage group at diagnosis, Victoria 2018–2022

# NEW CANCER DIAGNOSES AMONG VICTORIANS

Table 1: Detailed tables of new cancer diagnoses by age, sex and cancer type, 2022 Victoria.

ICD-10 group	Site	Males				Females			
		Cases	CR*	CR%**	ASR***	Cases	CR*	CR%**	ASR***
<b>C00-C96,D45-D47</b>	<b>All malignant tumours</b>	<b>19,813</b>	<b>604.5</b>	<b>39.8</b>	<b>334.7</b>	<b>16,486</b>	<b>491.7</b>	<b>30.6</b>	<b>274.8</b>
C00	Lip	137	4.2	0.3	2.4	57	1.7	0.1	0.8
<b>C01-C06</b>	<b>Oral cavity</b>	<b>296</b>	<b>9.0</b>	<b>0.7</b>	<b>5.6</b>	<b>145</b>	<b>4.3</b>	<b>0.2</b>	<b>2.2</b>
C01,C02	__Tongue	178	5.4	0.4	3.6	75	2.2	0.1	1.2
C03	__Gum	22	0.7	0.1	0.4	26	0.8	0.0	0.3
C04	__Floor of mouth	31	0.9	0.1	0.6	11	0.3	0.0	0.2
C05,C06	__Other mouth	65	2.0	0.1	1.1	33	1.0	0.1	0.5
C07,C08	Salivary glands	52	1.6	0.1	0.9	42	1.3	0.1	0.8
<b>C09-C13</b>	<b>Pharynx</b>	<b>252</b>	<b>7.7</b>	<b>0.6</b>	<b>5.0</b>	<b>72</b>	<b>2.1</b>	<b>0.2</b>	<b>1.4</b>
C09,C10	__Oropharynx	174	5.3	0.5	3.5	49	1.5	0.1	0.9
C11	__Nasopharynx	44	1.3	0.1	1.0	16	0.5	0.0	0.3
C12,C13	__Hypopharynx	34	1.0	0.1	0.6	7	0.2	0.0	0.1
C14	Other oral	9	0.3	0.0	0.1	5	0.1	0.0	0.1
C15	Oesophagus	260	7.9	0.5	4.2	117	3.5	0.1	1.4
C16	Stomach	413	12.6	0.8	6.8	258	7.7	0.4	3.8
C17	Small Intestine	112	3.4	0.3	2.1	101	3.0	0.2	1.6
<b>C18-C20</b>	<b>Bowel</b>	<b>1,814</b>	<b>55.3</b>	<b>3.5</b>	<b>31.0</b>	<b>1,690</b>	<b>50.4</b>	<b>2.6</b>	<b>24.9</b>
C18	__Colon	1,198	36.6	2.1	19.6	1,288	38.4	1.9	18.1
C19-20	__Rectum	616	18.8	1.4	11.5	402	12.0	0.7	6.7
C21	Anus & anal canal	44	1.3	0.1	0.7	73	2.2	0.1	1.2
C22	Liver	419	12.8	0.9	7.3	198	5.9	0.3	2.8
C23,C24	Gallbladder	154	4.7	0.3	2.3	152	4.5	0.2	1.8
C25	Pancreas	572	17.5	1.0	8.5	489	14.6	0.7	6.2
C26,C39,C76-C79	Ill-defined sites	76	2.3	0.1	1.1	60	1.8	0.1	0.9
<b>C00-14,C30-32</b>	<b>Head &amp; Neck</b>	<b>906</b>	<b>27.6</b>	<b>2.1</b>	<b>16.8</b>	<b>360</b>	<b>10.7</b>	<b>0.7</b>	<b>5.9</b>
C00-14	[See C00-14 categories above]								
C30,C31	__Nasal Cavities	39	1.2	0.1	0.6	18	0.5	0.0	0.3
C32	__Larynx	121	3.7	0.3	2.1	21	0.6	0.0	0.3
C33,C34	Lung	1,776	54.2	3.1	26.8	1,493	44.5	2.6	21.1
C37,C38	Thymus etc	36	1.1	0.1	0.9	28	0.8	0.1	0.6
C40,C41	Bone	43	1.3	0.1	1.2	27	0.8	0.1	0.8
C43	Melanoma	1,697	51.8	3.2	28.7	1,188	35.4	2.2	19.4
C44	Other Skin	200	6.1	0.3	2.6	88	2.6	0.1	1.0
C45	Mesothelioma	140	4.3	0.2	1.7	34	1.0	0.1	0.4
C46	Kaposi sarcoma	19	0.6	0.0	0.3	4	0.1	0.0	0.0
C47,C49	Connective Tissue	111	3.4	0.2	2.2	81	2.4	0.2	1.7
C48	Peritoneum	18	0.5	0.0	0.4	27	0.8	0.1	0.5
C50	Breast	45	1.4	0.1	0.6	4,805	143.3	10.1	88.5
<b>C51-C58</b>	<b>Female specific organs</b>					<b>1,610</b>	<b>48.0</b>	<b>3.3</b>	<b>28.7</b>
C51,C52,C57	__Vulva etc					310	9.2	0.6	4.7
C53	__Cervix					206	6.1	0.4	4.5
C54,C55	__Uterus					813	24.2	1.8	14.4
C56	__Ovary					280	8.4	0.5	5.2
C58	__Placenta					1	0.0	0.0	0.0

Table 1: Incidence continues

ICD-10 group	Site	Males				Females			
		Cases	CR*	CR%**	ASR***	Cases	CR*	CR%**	ASR***
<b>C60-C63</b>	<b>Male specific organs</b>	<b>6,108</b>	<b>186.4</b>	<b>14.1</b>	<b>105.1</b>				
C60,C63	__Penis etc	56	1.7	0.1	0.9				
C61	__Prostate	5,823	177.7	13.5	97.9				
C62	__Testis	229	7.0	0.5	6.4				
C64	Kidney	705	21.5	1.6	13.1	352	10.5	0.7	5.9
C65,C66,C68	Renal pelvis etc	93	2.8	0.1	1.3	54	1.6	0.1	0.7
C67	Bladder	548	16.7	0.7	7.1	175	5.2	0.2	2.1
C69	Eye	25	0.8	0.1	0.6	28	0.8	0.0	0.5
<b>C70-C72</b>	<b>Brain &amp; CNS</b>	<b>305</b>	<b>9.3</b>	<b>0.6</b>	<b>6.1</b>	<b>196</b>	<b>5.8</b>	<b>0.4</b>	<b>4.0</b>
C70	__Meninges	4	0.1	0.0	0.1	5	0.1	0.0	0.1
C71	__Brain	299	9.1	0.6	5.9	182	5.4	0.4	3.7
C72	__Other CNS	2	0.1	0.0	0.1	9	0.3	0.0	0.2
C73	Thyroid	239	7.3	0.5	5.2	588	17.5	1.3	13.3
C74,C75	Other endocrine	48	1.5	0.1	1.2	48	1.4	0.1	1.2
C80	Unknown primary site	253	7.7	0.3	3.3	233	6.9	0.2	2.6
C81	Hodgkin lymphoma	130	4.0	0.3	3.6	88	2.6	0.2	2.6
<b>C82-C85</b>	<b>Non-Hodgkin lymphoma</b>	<b>740</b>	<b>22.6</b>	<b>1.4</b>	<b>12.8</b>	<b>582</b>	<b>17.4</b>	<b>1.0</b>	<b>9.0</b>
C82	__Nodular NHL	178	5.4	0.4	3.4	157	4.7	0.3	2.7
C83	__Diffuse NHL	385	11.7	0.8	6.6	290	8.6	0.5	4.3
C84	__Mature T/NK-cell lymphomas	63	1.9	0.1	1.1	36	1.1	0.1	0.7
C85	__Other NHL	114	3.5	0.2	1.6	99	3.0	0.1	1.4
C86	Other specified types of T/NK-cell lymphoma	28	0.9	0.1	0.4	14	0.4	0.0	0.2
C88	Immunoproliferative	128	3.9	0.2	2.1	128	3.8	0.2	1.9
C90	Multiple myeloma	380	11.6	0.7	5.6	261	7.8	0.4	3.6
<b>C91-C95</b>	<b>Leukaemia</b>	<b>758</b>	<b>23.1</b>	<b>1.4</b>	<b>14.1</b>	<b>474</b>	<b>14.1</b>	<b>0.9</b>	<b>8.9</b>
C91	__Lymphoid leukaemia	449	13.7	0.9	9.0	257	7.7	0.5	5.1
C92	__Myeloid leukaemia	224	6.8	0.4	4.0	171	5.1	0.3	3.2
C93	__Monocytic leukaemia	77	2.3	0.1	1.0	39	1.2	0.0	0.5
C94	__Other leukaemia	2	0.1	0.0	0.0	1	0.0	0.0	0.1
C95	__Unspecified Leukaemia	6	0.2	0.0	0.1	6	0.2	0.0	0.1
C96	Other haematopoietic	5	0.2	0.0	0.1</				

# NEW CANCER DIAGNOSES AMONG VICTORIANS

**Table 2: Actual and projected new diagnoses and incidence rate (age-standardised rate (ASR) per 100,000 persons with 95% confidence intervals (CI)) for selected common cancers to 2033–2037 by sex, Victoria.**  
Projected estimates were obtained from two different models; model 1 included data from 1982–2022, whereas the data included in model 2 is 1982–2019.

Period	Projections - Model 1				Projections - Model 2			
	Cases	95% CI	ASR*	95% CI	Cases	95% CI	ASR*	95% CI
<b>All malignant cancers</b>								
2018-2022	36,430	[36,137-36,723]	313.5	[310.8-316.0]	43,437	[42,114-44,961]	331.7	[320.9-343.9]
2023-2027	40,764	[40,130-41,433]	310.3	[304.4-316.1]	50,003	[48,041-52,241]	337.9	[323.6-354.2]
2028-2032	46,149	[45,097-47,315]	308.8	[300.7-317.7]	56,523	[54,013-59,420]	343.0	[326.2-361.8]
2033-2037	51,366	[49,889-53,023]	308.6	[298.1-319.8]				
<b>Bladder</b>								
2018-2022	742	[721-766]	4.8	[4.6-5.0]	921	[817-993]	5.0	[4.4-5.4]
2023-2027	774	[725-828]	4.2	[3.9-4.6]	1,084	[925-1,189]	4.9	[4.1-5.5]
2028-2032	846	[765-930]	3.9	[3.4-4.3]	1,264	[1,056-1,398]	4.8	[3.9-5.4]
2033-2037	942	[837-1,052]	3.6	[3.2-4.2]				
<b>Head &amp; Neck</b>								
2018-2022	1,161	[1,132-1,191]	10.6	[10.3-10.9]	1,217	[1,162-1,307]	10.0	[9.5-10.9]
2023-2027	1,288	[1,221-1,361]	10.5	[9.9-11.2]	1,336	[1,262-1,470]	9.8	[9.2-10.9]
2028-2032	1,438	[1,326-1,563]	10.4	[9.5-11.3]	1,462	[1,367-1,639]	9.7	[9.0-11.0]
2033-2037	1,581	[1,438-1,749]	10.2	[9.2-11.4]				
<b>Oesophagus</b>								
2018-2022	400	[384-416]	3	[2.9-3.1]	452	[414-487]	2.9	[2.7-3.2]
2023-2027	444	[418-468]	2.9	[2.7-3.1]	510	[456-556]	2.9	[2.5-3.2]
2028-2032	506	[468-540]	2.8	[2.6-3.1]	567	[500-625]	2.8	[2.4-3.2]
2033-2037	569	[519-616]	2.8	[2.5-3.1]				
<b>Stomach</b>								
2018-2022	676	[653-698]	5.3	[5.1-5.5]	724	[689-804]	5.0	[4.7-5.6]
2023-2027	746	[706-818]	5.2	[4.9-5.8]	818	[770-937]	5.0	[4.6-5.8]
2028-2032	846	[788-973]	5.3	[4.8-6.1]	933	[870-1,084]	5.1	[4.7-6.1]
2033-2037	957	[879-1,136]	5.4	[4.9-6.5]				
<b>Liver</b>								
2018-2022	633	[611-656]	5.2	[5.0-5.4]	915	[880-950]	6.6	[6.3-6.9]
2023-2027	695	[637-779]	5	[4.5-5.6]	1,114	[1,066-1,164]	6.8	[6.5-7.1]
2028-2032	774	[681-910]	4.6	[4.0-5.6]	1,280	[1,217-1,345]	6.5	[6.2-7.0]
2033-2037	855	[731-1,043]	4.3	[3.6-5.5]				
<b>Pancreas</b>								
2018-2022	1,016	[987-1,044]	7.4	[7.2-7.6]	1,335	[1,255-1,434]	8.6	[8.0-9.3]
2023-2027	1,226	[1,147-1,278]	7.8	[7.3-8.2]	1,608	[1,485-1,763]	9.1	[8.3-10.1]
2028-2032	1,483	[1,335-1,563]	8.2	[7.3-8.8]	1,872	[1,711-2,080]	9.5	[8.5-10.7]
2033-2037	1,744	[1,536-1,855]	8.6	[7.4-9.2]				
<b>Cervix</b>								
2018-2022	220	[207-233]	5	[4.7-5.3]	248	[206-302]	5.2	[4.2-6.2]
2023-2027	244	[214-276]	5.1	[4.5-5.8]	266	[206-345]	5.0	[3.9-6.5]
2028-2032	270	[219-327]	5.1	[4.1-6.2]	281	[207-380]	4.8	[3.5-6.6]
2033-2037	291	[221-370]	5	[3.7-6.3]				
<b>Uterus</b>								
2018-2022	799	[776-821]	14.4	[13.9-14.8]	997	[893-1,041]	16.0	[14.3-16.7]
2023-2027	933	[833-986]	14.9	[13.2-15.8]	1,171	[1,013-1,234]	16.9	[14.6-17.9]
2028-2032	1,089	[910-1,174]	15.7	[13.0-17.0]	1,347	[1,141-1,432]	17.7	[15.0-19.0]
2033-2037	1,249	[999-1,362]	16.4	[13.1-18.1]				

**Table 2: Actual and projected new diagnoses and incidence rate- continued.**

Period	Projections - Model 1				Projections - Model 2			
	Cases	95% CI	ASR*	95% CI	Cases	95% CI	ASR*	95% CI
<b>Ovary</b>								
2018-2022	286	[273-299]	5.3	[5.0-5.5]	255	[231-285]	4.3	[3.8-4.8]
2023-2027	241	[206-283]	3.7	[3.2-4.4]	241	[198-292]	3.5	[2.9-4.4]
2028-2032	241	[198-292]	3.5	[2.9-4.4]	247	[187-367]	3.3	[2.4-5.1]
<b>Kidney</b>								
2018-2022	1,046	[1,021-1,067]	9.7	[9.5-9.9]	1,222	[1,153-1,297]	10.1	[9.5-10.7]
2023-2027	1,431	[1,315-1,566]	10.4	[9.5-11.4]	1,597	[1,453-1,683]	11.6	[10.5-12.3]
2028-2032	1,627	[1,466-1,818]	10.6	[9.4-11.9]	1,831	[1,647-1,945]	12.0	[10.7-12.8]
<b>Thyroid</b>								
2018-2022	763	[738-790]	8.7	[8.4-9.0]	930	[851-1,006]	9.4	[8.5-10.2]
2023-2027	1,115	[972-1,251]	9.9	[8.5-11.2]	1,047	[983-1,104]	10.5	[9.8-11.0]
2028-2032	1,289	[1,086-1,483]	10.1	[8.3-11.7]	1,268	[1,165-1,353]	11.2	[10.2-12.0]
2033-2037					1,449	[1,309-1,559]	11.5	[10.3-12.4]
<b>Melanoma</b>								
2018-2022	2,859	[2,808-2,903]	25.1	[24.6-25.5]	3,162	[2,996-3,258]	23.6	[22.3-24.4]
2023-2027	3,551	[3,274-3,697]	22.3	[20.4-23.4]	4,053	[3,671-4,267]	30.7	[27.6-32.6]
2028-2032	3,915	[3,552-4,101]	20.9	[18.8-22.1]	4,837	[4,234-5,157]	31.2	[26.9-33.6]
2033-2037					5,526	[4,762-5,929]	30.6	[25.8-33.2]
<b>Breast (female)</b>								
2018-2022	4,705	[4,577-4,821]	89.5	[87.1-91.7]	5,153	[4,858-5,483]	86.5	[81.3-92.0]
2023-2027	5,702	[5,206-6,263]	84.3	[76.7-92.5]	6,574	[5,939-7,130]</		

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# MORTALITY



# CANCER MORTALITY AMONG VICTORIANS

## A snapshot of cancer mortality in Victoria in 2022

- In Victoria, 32 people die from cancer every day, and more males die from cancer than females.
- The cancer mortality rate has decreased 2.2% per year since 1995 in men and 1.6% per year since 1993 in women.
- Aboriginal Victorians are more than 3 times more likely to die from cancer than non-Aboriginal Victorians.
- The leading causes of cancer death are cancers of the lung, bowel, pancreas, prostate and breast which together account for just over half of all deaths.

### Cancer is the leading cause of death in Victoria.

In 2022, cancer was the cause of about 27% of deaths in Victoria. There were 47,978 registered deaths in Victoria, providing an age-standardised rate of 541 deaths per 100,000 Victorians.<sup>17</sup> Cancer was the leading cause of death, followed by diseases of the circulatory system (e.g. ischemic heart disease,

heart, stroke, other cardiac conditions) and the respiratory system. In 2022, COVID-19 accounted for 2,955 deaths among Victorians.<sup>17</sup>

Years of potential life lost – a measurement of premature death – is calculated by subtracting the age at a person's death from that of a 'standard life', which is calculated as being 75 years by the Australian Bureau of Statistics.<sup>18</sup> Victorian Cancer Registry data estimates that cancer will account for 63,628 years of life lost prematurely in 2022.

### 32 people die from cancer every day.

In 2022, 11,829 Victorians died from cancer, including 6,576 males and 5,253 females.

### More males die from cancer than females.

Males account for 56% of cancer-related deaths. For cancers common in both males and females (and excluding breast cancer), males account for 59% of deaths. In 2022, the median age at death following a diagnosis of cancer was 76 years (IQR: 67-84).

The number of cancer-related deaths is increasing in Victoria due to a growing and ageing population. However, as an age-standardised rate, cancer-related deaths are declining (Figure 22).

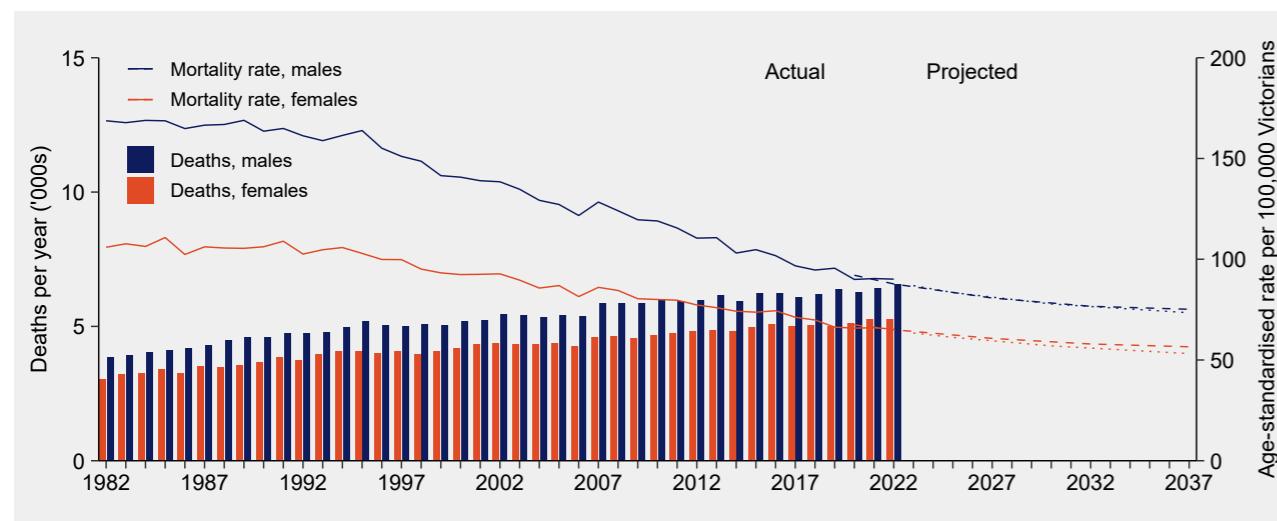


Figure 22: Number of cancer deaths and age-standardised mortality rates for males and females, Victoria 1982–2022, with projections based on two models, described in Appendix 2.

For males, the age-standardised mortality rate has declined at a steady annual rate of 0.5% between 1982–1995 and at a more rapid annual rate of 2.2% between 1995–2022. The age-standardised mortality rate has declined from 169 deaths per 100,000 in 1982, to 138 deaths per 100,000 in 2002, to 110 deaths per 100,000 in 2012 to 90 deaths per 100,000 reported in 2022.

For females, the age-standardised mortality rate has also declined over the past four decades but at a more modest rate and from a lower baseline. Between 1982–1993, an average annual percent change of -0.1% was reported. Between 1993–2022, the average annual decline increased to 1.6%. The age-standardised mortality rate has declined from 106 deaths per 100,000 in 1982, to 93 deaths per 100,000 in 2002, to 77 deaths per 100,000 in 2012 and to 65 deaths per 100,000 in 2022.

The declining mortality rate is the result of improvements in cancer prevention, diagnosis, and treatment. This includes improved recognition of symptoms prompting diagnosis, increasing availability and uptake of screening and case-finding, improvement in delivery of health services, and discoveries such as targeted drug therapies. The mortality rate of most cancers is projected to decline over the next 15 years.

Over the next 15 years, it is projected that male cancer mortality rates will continue to decline, with the two projection models demonstrating little impact of deaths in 2033–2037 (Table 4). Uterine cancers age-standardised deaths are predicted to increase from 2.2 to between 2.4 and 3.2 deaths per 100,000 population by 2033–2037. Prostate cancer age-standardised rates may increase, but this is difficult to predict given the volatility in prostate cancer incidence and mortality data over the previous decades (Table 4).

### The highest cancer mortality rates are in people aged 75 and over.

The highest percentage of deaths is seen in Victorians aged 75–84 years (32%), with deaths distributed evenly among those aged 85 years or older (24%) and between 65–74 years (24%). Distribution of the 11,829 deaths across age groups is displayed in Figure 23. In 2022, there were 305 cancer-related deaths in Victorians under 45, accounting for just 2.6% of all cancer deaths.

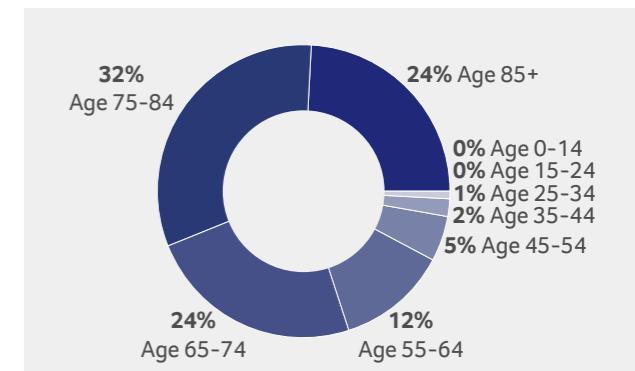


Figure 23: Cancer mortality by age groups, Victoria 2022

The leading causes of cancer death are cancers of the lung, bowel, pancreas, prostate and breast. These cancers account for 51% of all deaths (Figure 24).

For both males and females, lung cancer is the leading cause of cancer death in 2022. Mortality from blood cancers is discussed in more detail in the Focus chapter of this report.

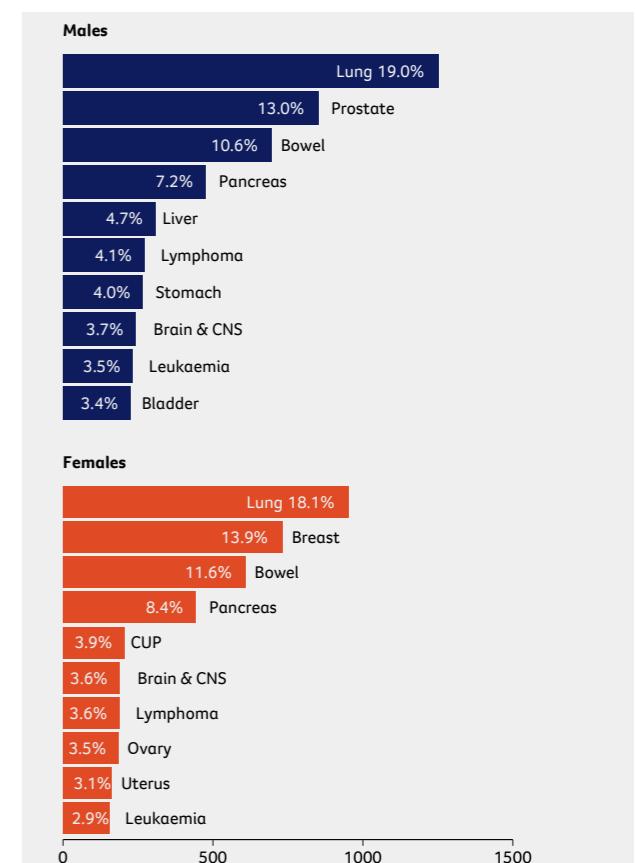


Figure 24: Cancer deaths (numbers and percent of all cancer deaths) for leading cancer types by sex, Victoria 2022

# CANCER MORTALITY AMONG VICTORIANS

## In 2022, over 63,000 years of potential life was lost to cancer in Victoria.

Years of potential life lost – a measurement of premature death – is calculated by subtracting the age at a person's death from that of a 'standard life,' which is calculated as being 75 years by the Australian Bureau of Statistics.<sup>18</sup>

The cancers responsible for the highest number of potential years lost among males are those of the lung, bowel, brain and central nervous system, pancreas, and liver (Figure 25). Together they account for 17,170 years lost or 53% of the 32,451 years lost because of all cancer among males in 2022.

Among females, the cancers responsible for the highest number of potential years lost are those of the breast, lung, bowel, brain and central nervous system, and pancreas. Together they accounted for 18,487 years lost, or 59% of the 31,177 years lost because of all cancer among females.

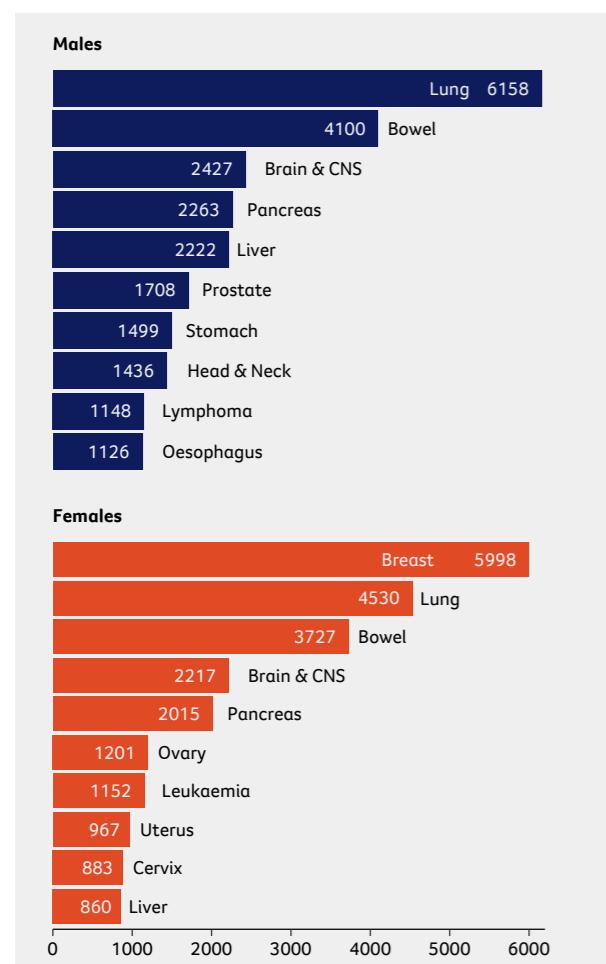


Figure 25: Years of potential life lost due to the leading cancer types in Victoria by sex, 2022

## Cancers of the blood, brain and central nervous system are responsible for most deaths among children

In Victoria in 2022, there were 28 deaths in children aged 0–14 years. Because of the low rate of cancer diagnoses and deaths among children, cancer data among Victorians aged under 15 years contributes to the Australian Childhood Cancer Registry where data is used to produce and publish statistical information about childhood cancer in Australia.<sup>19</sup> This information is used to facilitate research to better understand the causes of childhood cancers and improve outcomes for children with cancer.

Data from the Australian Childhood Cancer Registry indicates that cancer mortality in children aged less than 15 years is rare and is declining. Overall childhood cancer mortality rates in Australia decreased by an average of 2.9% per year between 1998 and 2019, a total decrease of 46% based on the modelled estimates. Mortality rates from childhood leukaemia declined by 58% in the period 1998–2007 and have since remained stable. The percent distribution of cancer deaths by age group, with associated number of deaths is shown in Figure 26 for males and Figure 27 for females.

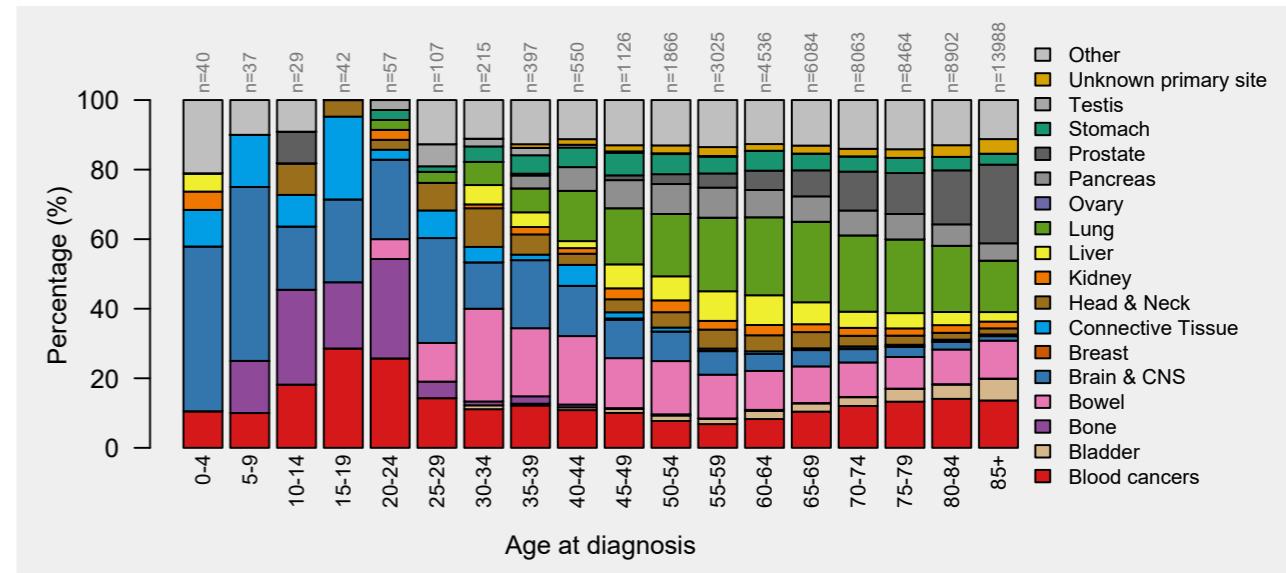


Figure 26: Distribution (%) of cancer deaths for selected major tumours by age group in males, Victoria 2013–2022 (n: Absolute number).

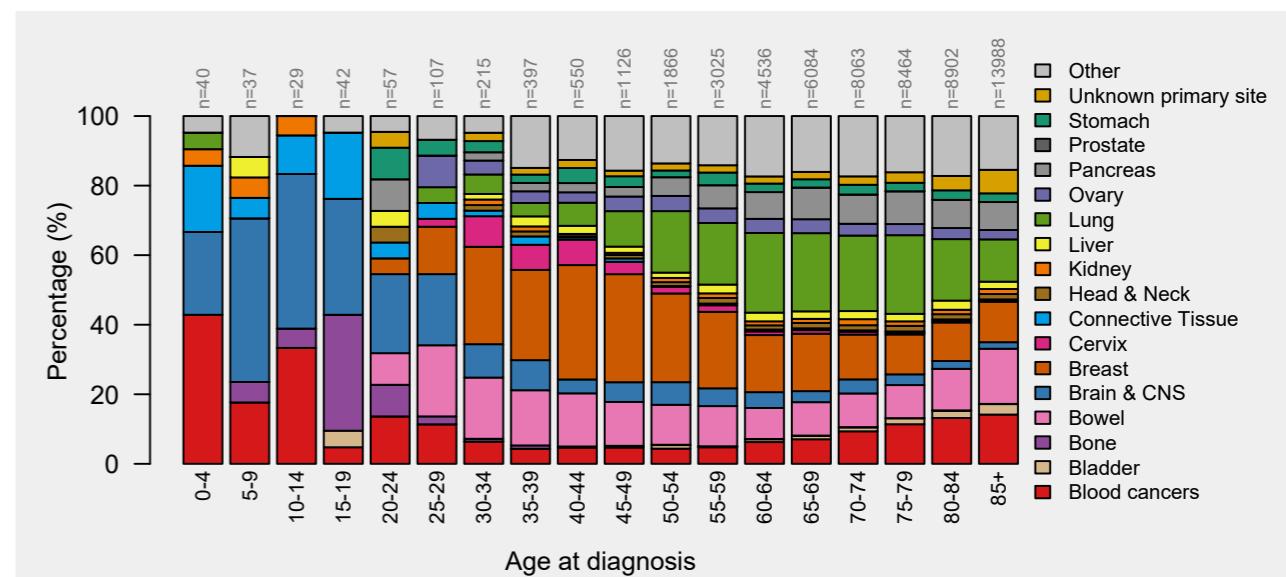


Figure 27: Distribution (%) of cancer deaths for selected major tumours by age group in females, Victoria 2013–2022 (n: Absolute number).

## Bowel, breast, brain and central nervous system and lung cancer were responsible for most deaths among those aged 15–49 years

Among Victorians aged less than 50 years, breast cancer was responsible for most deaths among females and bowel cancer among males. There were 70 deaths from breast cancer and 78 deaths from bowel cancer in this age group. These are discussed further in the *Cancers with higher mortality rates* section of this report.

## Lung, bowel, pancreatic, prostate and breast cancer took more lives than any others in Victorians aged over 50 years.

In 2022, there were 2,155 deaths for lung cancer, 1,229 deaths from bowel cancer, 896 deaths from pancreatic cancer, 848 deaths from prostate cancer and 669 deaths from breast cancer among Victorians aged over 50 years. Together these five cancers accounted for 30% of deaths in Victorians aged over 50 years.

# CANCER MORTALITY AMONG VICTORIANS

## Aboriginal and Torres Strait Islander People\*

### Aboriginal Victorians are more than three times more likely to die from cancer than non-Aboriginal Victorians.

For the period 2017–2021, Aboriginal males were 3.3 times more likely to die from cancer than non-Aboriginal males. Aboriginal females were 3.1 times more likely to die from cancer than non-Aboriginal females (Figure 28). From 2017 to 2021, there were 321 cancer deaths in Aboriginal Victorian males and 264 in Aboriginal Victorian females.

The age-standardised mortality rate among Aboriginal males was 289 deaths per 100,000 compared with 89 deaths per 100,000 in non-Aboriginal males, and in Aboriginal females was 203 deaths per 100,000 compared with 63 deaths per 100,000 in non-Aboriginal females. A fully implemented Victorian Aboriginal Cancer Journey Strategy<sup>15</sup> with culture embedded in care and consideration of the political, social and historical determinants of health, will lead to increased access and participation in cancer screening and

early detection initiatives as well as increased engagement in care that will meet the needs of each Aboriginal family.

Among the most frequently diagnosed cancers in Aboriginal Victorians, both males and females are more than twice as likely to die from cancers of the oesophagus, lung, and liver, than other Victorians (Figure 28).

Aboriginal Victorian males are more likely to die from cancer of the liver (5.2 times), lung (4.5 times), and oesophagus (4.7 times) than non-Aboriginal Victorian males.

Aboriginal Victorian females are more likely than non-Aboriginal Victorian females to die from cancer of the liver (5.4 times), lung (4.6 times), and leukaemia (4.6 times). Mortality from cervical cancer, one of the few highly preventable cancers, is 7.3 times higher among Aboriginal Victorian females than non-Aboriginal females (SIR: 733, ASR 6.4 [95%CI: 2.6, 13.7] vs 0.9 [95%CI: 0.8, 1.0]). With the introduction of universal self-collection for cervical screening, Aboriginal women and people with a cervix have increasingly participated in cervical screening, including those that are underscreened.

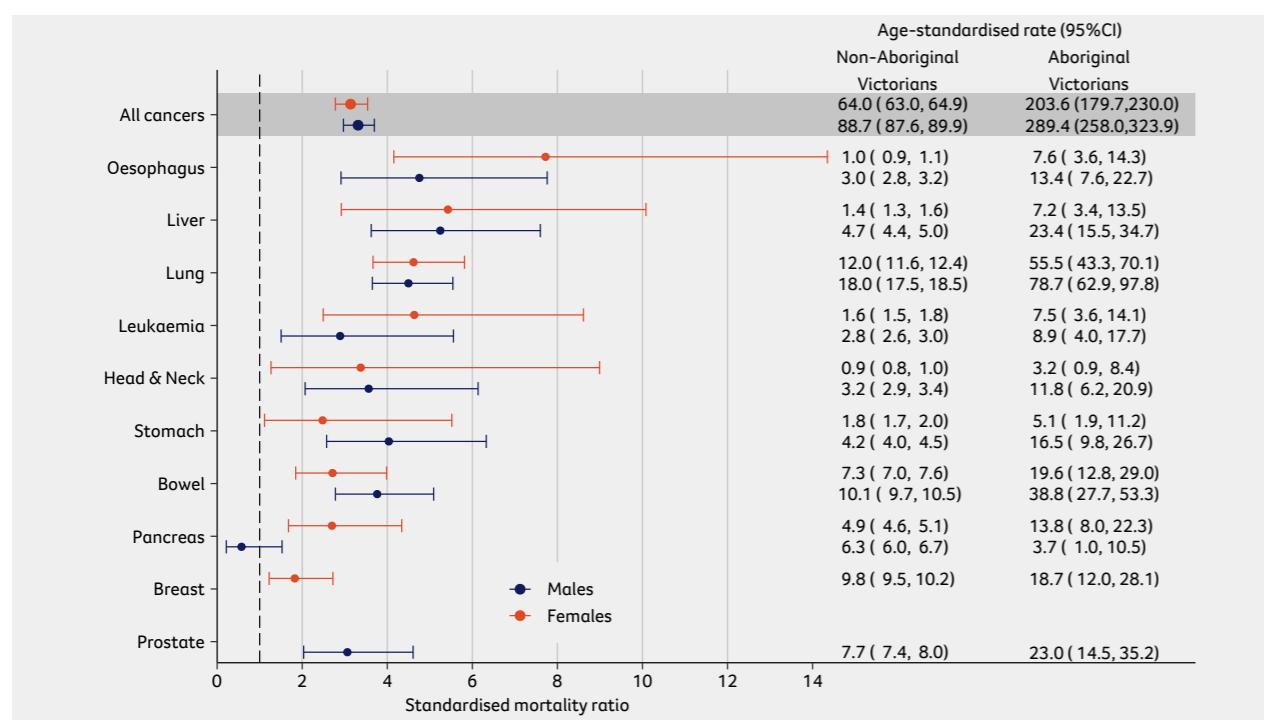


Figure 28: Age-standardised mortality ratio (with 95% confidence interval) for the ten most common cancers diagnosed in Aboriginal Victorians by sex, comparing Aboriginal and non-Aboriginal Victorians, 2017–2021

\*Aboriginal Victorians in this report refers to Aboriginal and/or Torres Strait Islander peoples in Victoria



Image of Aunty Shirley and Temara Blackwood.  
Artist: Aunty Lynette Briggs Wiradjuri, Yorta Yorta



Image of Aunty Eileen Harrison. Artist: Aunty Eileen Harrison, Kurnai. Title: Mother & Child

The Beautiful Shawl Project is a joint effort led by the Community, aiming to offer secure and empowering breast screening encounters for Aboriginal and Torres Strait Islander women. It presents a culturally sensitive and responsive alternative for conventional screening. The initiative involves supplying personalised screening shawls to Aboriginal and Torres Strait Islander women, designed to be culturally fitting, recognisable, and aesthetically pleasing to wear during their breast screening. These shawls, crafted by talented local Aboriginal and Torres Strait Islander women and artists, are given as gifts to take home following the screening process. See <https://www.vaccho.org.au/beautiful-shawl-project/> for more details.

### The median age at death for an Aboriginal Victorian diagnosed with cancer is 67 years compared to 76 years among non-Aboriginal Victorians.

There is a nine-year difference in median age at death between Aboriginal Victorians and non-Aboriginal Victorians. Figure 29 shows age-specific mortality curves for Victorian Aboriginal and non-Aboriginal males and females for the five-year period 2017 to 2021. Differences in cancer mortality progressively become more pronounced with increasing age for both males and females.

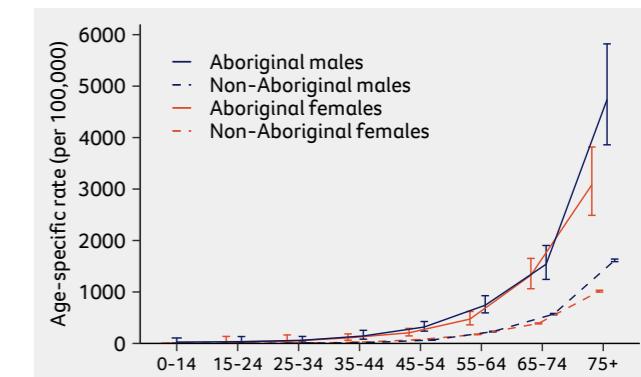


Figure 29: Age-specific cancer mortality rates (with 95% confidence intervals) by sex for Aboriginal and non-Aboriginal Victorians, 2017–2021

# CANCER MORTALITY AMONG VICTORIANS

## Regional Victorians

### Regional Victorians are 16% more likely to die from cancer than those who reside in major cities.

For the period 2020-2022, regional dwelling males were 16% more likely and regional dwelling females were 13% more likely than their major city counterparts to die from cancer (Figure 30). Among cancers commonly diagnosed in males, this

difference was seen in ill-defined tumours (98% higher), melanoma (65% higher) and cancer of the oesophagus (55% higher), prostate (35% higher), bowel (16% higher), head and neck (21% higher), lung (12% higher), and leukaemia (23% higher) (Figure 30). Among commonly diagnosed cancers in females, those residing in regional areas were more likely to die from cancer of the bowel (37% higher), lung (31% higher), ovary (37% higher), melanoma (42% higher), and from cancer of unknown primary site (45% higher).

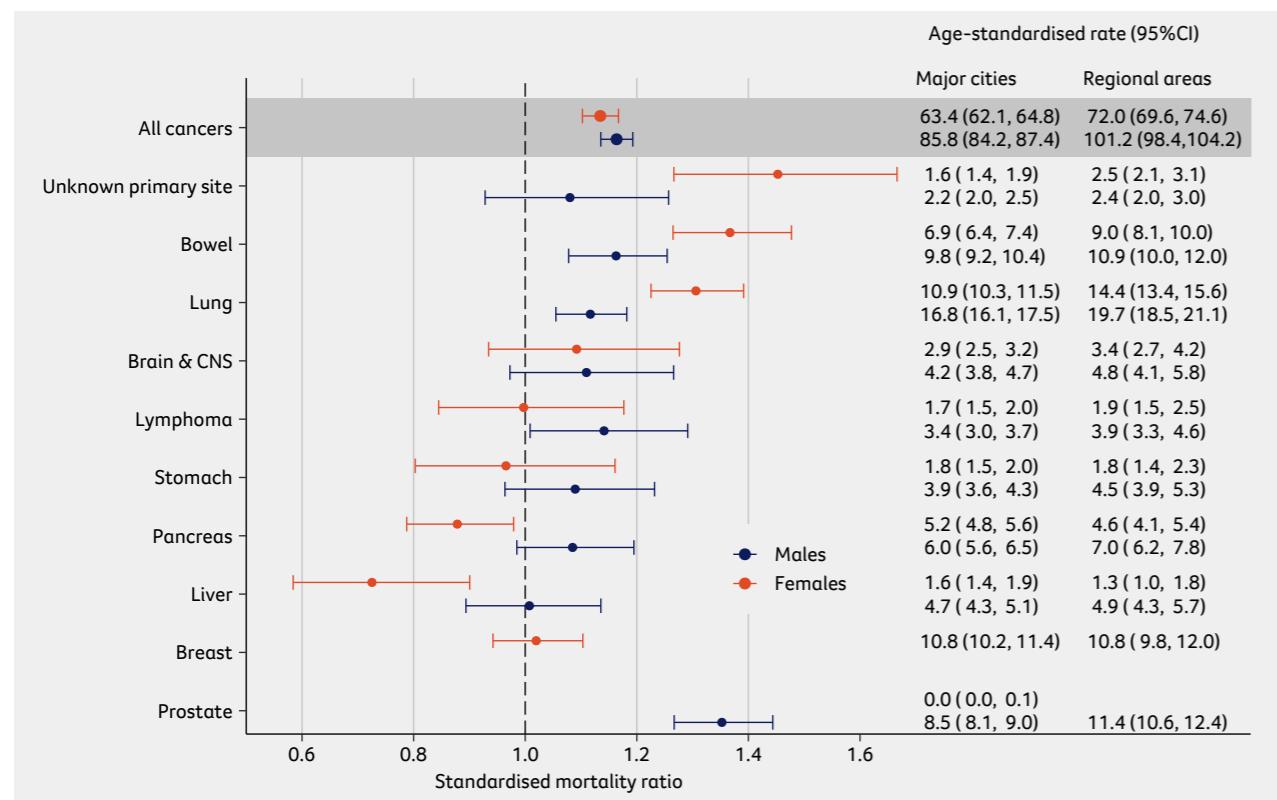


Figure 30: Age-standardised mortality ratio (with 95% confidence interval) for the ten most common cancers comparing Victorians diagnosed in regional and non-regional areas by sex, Victoria 2020-2022

### The median age at death for a Victorian living in regional Victoria with cancer is similar to those living in major cities.

Age-specific mortality rates are comparable for Victorian males and females, regardless of whether they reside in regional areas or in major cities (Figure 31).

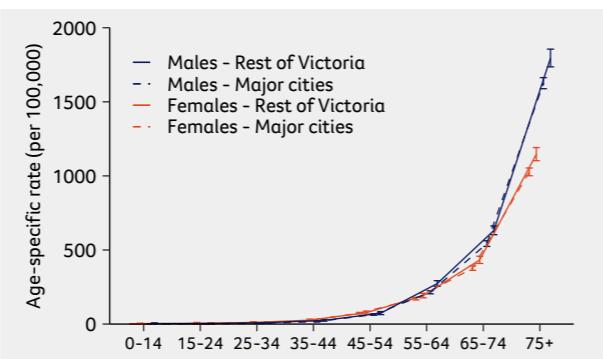


Figure 31: Age-specific cancer mortality rates (with 95% confidence intervals) by sex for regional and non-regional Victorians, 2020-2022



## Cancers with higher mortality rates

Details of trends in cancer mortality can be seen for all cancers on the website using the Data Explorer interactive portal (<https://www.cancervic.org.au/research/vcr>). Some details of commonly diagnosed cancers are described in this section.

### Lung cancer

**Mortality and trend:** Lung cancer is the leading cause of cancer-related deaths in Victoria, being responsible for causing the deaths of 2,205 Victorians in 2022. In 2022, 1,252 males and 953 females died from lung cancer, accounting for 19% of all cancer-related deaths. The median age at death was 75 years (IQR: 67-82). In 2022, the age-standardised mortality rate was 17.6 deaths per 100,000 males and 11.6 deaths per 100,000 females (Figure 32). Among males, lung cancer age-standardised mortality rates declined at an annual percent change of 0.7% during the period 1982-1989 and then a more rapid annual decline of 2.9% was seen between 1989-2022. Among females there was a steady annual increase in mortality of 1.9% between 1982-1994, after which a modest annual decline in age-standardised mortality was seen of 0.2% between 1994-2015. Over the past eight years (2015-2023), the annual percent decline in mortality rates among females has accelerated to 2.3%. This variation is likely the result of historical differences in smoking behavior, with smoking rates in men decreasing since the 1960s but rates in females not decreasing until the 1970s.<sup>20</sup>

**Projections:** Data released by the Australian Institute of Health and Welfare indicates that 11.2%

of Australians aged 15 years and over reported daily smoking in 2019.<sup>21</sup> The proportion of Australians who self-report never smoking has increased by 14% between 1991 and 2019 from 49% to 63% and is currently at its highest level seen over this 25-year period. The proportion of people who were ex-smokers has also increased from 42% in 1991 to 62% in 2019. These statistics support modelling, which indicates that lung cancer mortality will continue to decline over the next 15 years (Figure 32). Age-standardised mortality rates are expected to decline to a rate of between 12.2 and 13 deaths per 100,000 in 2033-2037. The lower rate of 12.2 considers the trend of all years up to and including 2022 while Model 2 excludes years 2020-2022 from the projection model (Table 4).

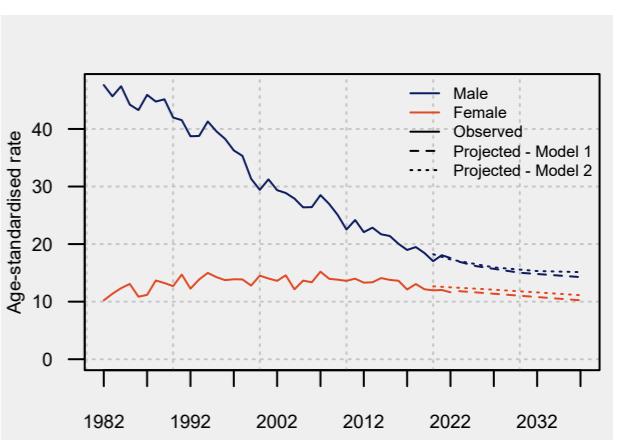


Figure 32: Lung cancer trend in age standardised mortality rate, 1982-2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology.

# CANCER MORTALITY AMONG VICTORIANS

## Bowel cancer

**Mortality and trend:** Bowel cancer is the second leading cause of cancer-related deaths in Victoria, responsible for causing the deaths of 1,307 Victorians in 2022. In 2022, 697 males and 610 females died from bowel cancer, accounting for 11% of all cancer-related deaths. The median age at death in males was 75 years (IQR: 66–84) and females was 78 years (IQR: 66–87). In 2022, the age-standardised mortality rate was 10.0 deaths per 100,000 males and 7.3 deaths per 100,000 females (Figure 33).

Among males, bowel cancer age-standardised mortality rates between 2009–2022 declined at an annual rate of 3.9%. Among females, the decline in bowel cancer mortality has been occurring at a steady rate of 2.3% annually since 1982. The overall decline in bowel cancer age-standardised mortality rates seen in Victoria is likely the result of changing patterns in bowel cancer risk factors, improvements in cancer treatment, and opportunistic colorectal cancer screening since the 1990s, as well as a phased rollout of the National Bowel Cancer Screening Program from 2006.<sup>22</sup>

**Projections:** The number of Victorians dying from bowel cancer is expected to increase over the next 15 years, yet age-standardised mortality rates are expected to decline or remain constant over this period (Table 4). The uncertainty in projecting bowel cancer mortality rates indicates the impact of the 2020–2022 years on bowel cancer incidence and mortality for males.

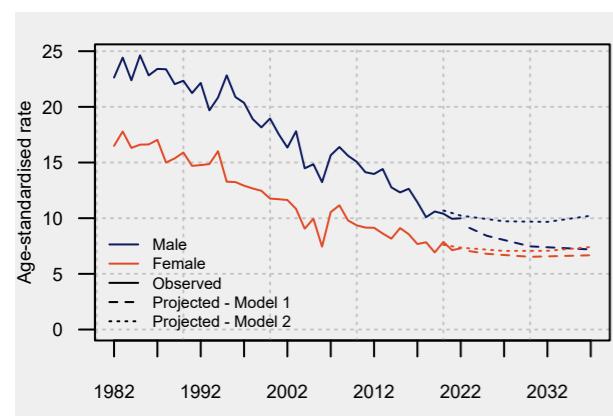


Figure 33: Bowel cancer trend in age standardised mortality rate, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology.

## Pancreatic cancer

**Mortality and trend:** Pancreatic cancer is the third leading cause of cancer-related death in Victoria. In 2022, 917 Victorians died from pancreatic cancer—475 males and 442 females, accounting for 8% of all cancer-related deaths. In 2022, the age-standardised mortality rate was 6.6 deaths per 100,000 males and 5.2 deaths per 100,000 females (Figure 34). Despite the relatively low number of cases diagnosed each year, it is the fifth leading cause of potential years of life lost, after lung, bowel, breast, brain and central nervous system cancer. Because of its poor prognosis, nearly the same number of people die from pancreatic cancer as are diagnosed with the disease. The high mortality rate of pancreatic cancer is the result of the disease only manifesting in its late stage. Currently, no screening test exists to detect the cancer before symptoms develop. For the period 1982–2022, age-standardised mortality rates have been declining steadily at an average annual percent of 0.3% among males and increasing steadily at an average annual rate of 0.2% in females.

**Projections:** Pancreatic cancer deaths are expected to remain constant at an age-standardised rate of between 5.3 and 5.6 deaths per 100,000 in the next 15 years (Table 4).

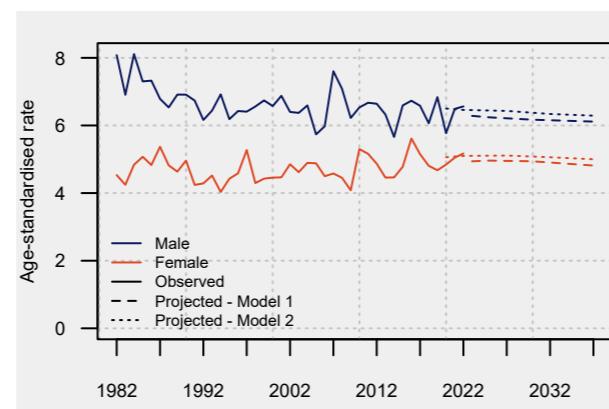


Figure 34: Pancreatic cancer trend in age-standardised mortality rate, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology.

## Breast cancer

**Mortality and trend:** Breast cancer is the second leading cause of cancer deaths in females. It is responsible for 14% of deaths in females. In 2022, 731 females and 8 males died from breast cancer. The median age at death in females was 72 years (IQR: 60–83). In 2022, the age-standardised mortality rate was 10.3 deaths per 100,000 females (Figure 35). Breast cancer mortality declined at an annual rate of 0.2% between 1982–1991. Between 1991–2022, the age-standardised mortality rate from breast cancer declined steadily at an average annual rate of 2.4%. The reduction in breast cancer mortality over the past three decades reflects a reduction in breast cancer risk (such as breastfeeding for longer duration), earlier detection of palpable tumours, and use of adjuvant systemic therapy, such as Tamoxifen and polychemotherapy, which have been widely used after surgery since the late 1980s.<sup>23</sup>

**Projections:** Breast cancer deaths are expected to increase over the next 15 years as a result of the growing and ageing population, despite the age-standardised mortality rate projected to decline to a rate of between 8.4 and 9.6 deaths per 100,000 in 2033–2037 (Table 4).

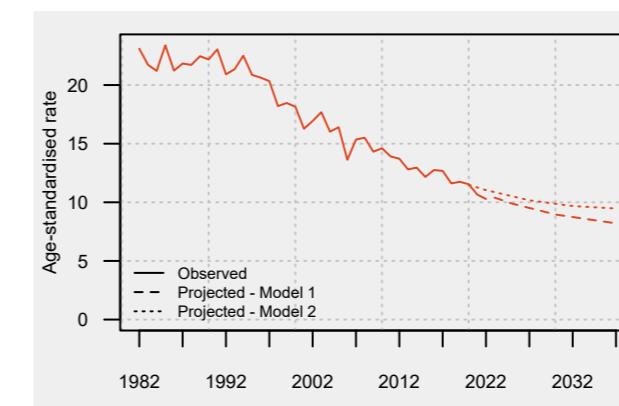


Figure 35: Breast cancer trend in age standardised mortality rate, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology.

## Prostate cancer

**Mortality and trend:** Prostate cancer is the third leading cause of cancer-related deaths in Victoria, being responsible for causing the deaths of 852 Victorian males in 2022. It accounted for 13% of all cancer-related deaths in males. The median age at death was 83 years (IQR: 75–88). In 2022, the age-standardised mortality rate was 9.6 deaths per 100,000 males (Figure 36). Among males, prostate cancer age-standardised mortality rates have fluctuated over the past four decades. Prostate cancer age-standardised mortality rates increased between 1982–1994 at an average percent change of 1.9%. This was followed by a period of decline in deaths, from 1994–2010 at an average rate of 2.1% and then more rapidly between 2010–2014 at 7.2%. Over the past 8 years (2014–2022), prostate cancer deaths have declined at a steady annual rate of 1.1%. This fluctuation reflects change in case finding of prostate cancer by prostate specific antigen (PSA) testing and subsequent prostate biopsies for elevated levels.

**Projections:** Prostate cancer mortality is difficult to project given the long-term fluctuation in incidence and the recent changes seen during the COVID-19 period. Estimates indicate that the age-standardised mortality rate will be between 6.9 and 9.7 deaths per 100,000 in 2033–2037 (Table 4).

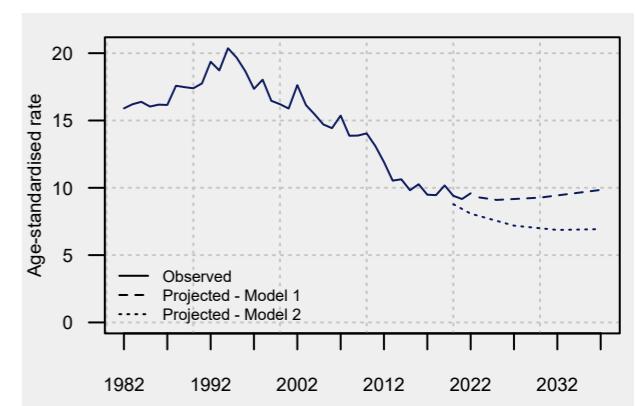


Figure 36: Prostate cancer trend in age-standardised mortality rate, 1982–2022 with projections to 2037 based on two models described in Appendix 2 Statistical Methodology.

# CANCER MORTALITY AMONG VICTORIANS

**Table 3: Number of deaths, crude rate (CR), years of potential life lost to age 75 years (YPLL) and mortality age-standardised rate (ASR) per 100,000 (standardised to World Standard population) by sex and cancer type.**

ICD-10 group	Site	Males				Females			
		Deaths	CR*	YPLL**	ASR***	Deaths	CR*	YPLL**	ASR***
<b>C00-C96,D45-D47</b>	<b>All malignant tumours</b>	<b>6,576</b>	<b>200.6</b>	<b>32,451</b>	<b>90.1</b>	<b>5,253</b>	<b>156.7</b>	<b>31,177</b>	<b>65.3</b>
C00	Lip	5	0.2	35	0.1	1	0.0	9	0.0
<b>C01-C06</b>	<b>Oral cavity</b>	<b>56</b>	<b>1.7</b>	<b>372</b>	<b>0.9</b>	<b>44</b>	<b>1.3</b>	<b>146</b>	<b>0.5</b>
C01,C02	__Tongue	32	1.0	206	0.5	22	0.7	81	0.2
C03	__Gum	8	0.2	61	0.1	11	0.3	42	0.1
C04	__Floor of mouth	5	0.2	33	0.1	2	0.1	2	0.0
C05,C06	__Other mouth	11	0.3	72	0.2	9	0.3	21	0.1
C07,C08	Salivary glands	9	0.3	96	0.1	5	0.1	2	0.0
<b>C09-C13</b>	<b>Pharynx</b>	<b>59</b>	<b>1.8</b>	<b>634</b>	<b>1.1</b>	<b>16</b>	<b>0.5</b>	<b>159</b>	<b>0.3</b>
C09,C10	__Oropharynx	28	0.9	304	0.6	12	0.4	126	0.2
C11	__Nasopharynx	11	0.3	206	0.2	2	0.1	23	0.0
C12,C13	__Hypopharynx	20	0.6	124	0.3	2	0.1	10	0.0
C14	Other oral	9	0.3	83	0.2	2	0.1	9	0.0
C15	Oesophagus	202	6.2	1,126	2.9	87	2.6	411	1.0
C16	Stomach	266	8.1	1,499	3.8	124	3.7	852	1.7
C17	Small Intestine	31	0.9	174	0.5	31	0.9	147	0.4
<b>C18-C20</b>	<b>Bowel</b>	<b>697</b>	<b>21.3</b>	<b>4,100</b>	<b>10.0</b>	<b>610</b>	<b>18.2</b>	<b>3,727</b>	<b>7.3</b>
C18	__Colon	470	14.3	2,627	6.6	469	14.0	2,718	5.4
C19-20	__Rectum	227	6.9	1,473	3.4	141	4.2	1,009	1.8
C21	Anus & anal canal	12	0.4	36	0.2	27	0.8	127	0.3
C22	Liver	308	9.4	2,222	4.9	142	4.2	860	1.8
C23,C24	Gallbladder	119	3.6	420	1.5	109	3.3	486	1.2
C25	Pancreas	475	14.5	2,263	6.6	442	13.2	2,015	5.2
C26,C39,C76-C79	Ill-defined sites	34	1.0	188	0.5	33	1.0	124	0.3
<b>C00-14,C30-32</b>	<b>Head &amp; Neck</b>	<b>184</b>	<b>5.6</b>	<b>1,436</b>	<b>2.9</b>	<b>75</b>	<b>2.2</b>	<b>391</b>	<b>0.9</b>
C00-14	[See C00-14 categories above]								
C30,C31	__Nasal Cavities	15	0.5	132	0.2	6	0.2	60	0.1
C32	__Larynx	31	0.9	84	0.4	1	0.0	6	0.0
C33,C34	Lung	1,252	38.2	6,158	17.6	953	28.4	4,530	11.6
C37,C38	Thymus etc	5	0.2	61	0.1	3	0.1	60	0.1
C40,C41	Bone	18	0.5	538	0.5	3	0.1	78	0.1
C43	Melanoma	178	5.4	730	2.3	84	2.5	540	1.0
C44	Other Skin	22	0.7	68	0.3	15	0.4	81	0.2
C45	Mesothelioma	114	3.5	222	1.3	37	1.1	198	0.5
C46	Kaposi sarcoma	2	0.1	0	0.0	0	0.0	0	0.0
C47,C49	Connective Tissue	45	1.4	743	0.9	18	0.5	307	0.4
C48	Peritoneum	13	0.4	128	0.2	16	0.5	84	0.2
C50	Breast	8	0.2	15	0.1	731	21.8	5,998	10.3
<b>C51-C58</b>	<b>Female specific organs</b>					<b>540</b>	<b>16.1</b>	<b>3,777</b>	<b>7.3</b>
C51,C52,C57	__Vulva etc					139	4.1	726	1.7
C53	__Cervix					55	1.6	883	1.0
C54,C55	__Uterus					161	4.8	967	2.1
C56	__Ovary					185	5.5	1,201	2.4
C58	__Placenta					0	0.0	0	0.0

**Table 3: Number of deaths- continued**

ICD-10 group	Site	Males				Females			
		Deaths	CR*	YPLL**	ASR***	Deaths	CR*	YPLL**	ASR***
<b>C60-C63</b>	<b>Male specific organs</b>	<b>867</b>	<b>26.5</b>	<b>2,013</b>	<b>9.9</b>				
C60,C63	__Penis etc	7	0.2	50	0.1				
C61	__Prostate	852	26.0	1,708	9.6				
C62	__Testis	8	0.2	255	0.2				
C64	Kidney	157	4.8	1,054	2.3				
C65,C66,C68	Renal pelvis etc	54	1.6	226	0.7				
C67	Bladder	225	6.9	524	2.6				
C69	Eye	13	0.4	111	0.2				
<b>C70-C72</b>	<b>Brain &amp; CNS</b>	<b>243</b>	<b>7.4</b>	<b>2,427</b>	<b>4.2</b>	<b>190</b>	<b>5.7</b>	<b>2,217</b>	<b>3.1</b>
C70	__Meninges	4	0.1	19	0.1	19	0.6	73	0.2
C71	__Brain	239	7.3	2,408	4.1	170	5.1	2,144	2.9
C72	__Other CNS	0	0.0	0	0.0	1	0.0	0	0.0
C73	Thyroid	13	0.4	75	0.2				
C74,C75	Other endocrine	8	0.2	232	0.2				
C80	Unknown primary site	184	5.6	614	2.3				
C81	Hodgkin lymphoma	9	0.3	44	0.1				
<b>C82-C85</b>	<b>Non-Hodgkin lymphoma</b>	<b>249</b>	<b>7.6</b>	<b>1,009</b>	<b>3.2</b>	<b>167</b>	<b>5.0</b>	<b>538</b>	<b>1.7</b>
C82	__Nodular NHL	34	1.0	187	0.5				
C83	__Diffuse NHL	177	5.4	747	2.3				
C84	__Mature T/NK-cell lymphomas	18	0.5	44	0.2				
C85	__Other NHL	20	0.6	31	0.2				
C86	Other specified types of T/NK-cell lymphoma	13	0.4	95	0.2				
C88	Immunoproliferative	12	0.4	15	0.1				
C90	Multiple myeloma	142	4.3	398	1.8				
<b>C91-C95</b>	<b>Leukaemia</b>	<b>233</b>	<b>7.1</b>	<b>1,109</b>	<b>3.0</b>	<b>154</b>	<b>4.6</b>	<b>1,152</b>	<b>2.0</b>
C91	__Lymphoid leukaemia	79	2.4	552	1.1				
C92	__Myeloid leukaemia	95	2.9	486	1.3				
C93	__Monocytic leukaemia	52	1.6	45	0.5				
C94	__Other leukaemia	3	0.1	6	0.0				
C95	__Unspecified Leukaemia	4	0.1	20	0.0				
C96	Other haematopoietic	11	0.3	65	0.2				
<b>D45-D47</b>	<b>Myeloproliferative &amp; myelodysplastic</b>	<b>158</b>	<b>4.8</b>	<b>313</b>	<b>1.9</b>	<b>92</b>	<b>2.7</b>	<b>193</b>	<b>0.8</b>
D45	__Polycythaemia Vera	15	0.5	29	0.2				
D46	__Myelodysplastic Syndromes	99	3.0	169	1.1				
D47	__Other Uncertain Behaviour Haematopoietic	44	1.3	115	0.6				

# CANCER MORTALITY AMONG VICTORIANS

**Table 4: Actual and projected mortality rate (age-standardised rate) per 100,000 for selected common cancers to 2033-2037 using two Models described in Appendix 2 “Statistical Methodology” section.**

Period	Projections - Model 1				Projections - Model 2			
	Deaths	95% CI	ASR*	95% CI	Deaths	95% CI	ASR*	95% CI
<b>All malignant cancers</b>								
2018-2022	11,505	[11,380-11,659]	78.1	[77.2-79.3]				
2023-2027	11,915	[11,624-12,296]	70.3	[68.3-72.9]	12,225	[12,040-12,459]	72.8	[71.5-74.3]
2028-2032	12,849	[12,377-13,462]	64.9	[62.2-68.5]	13,446	[13,195-13,758]	68.7	[67.3-70.5]
2033-2037	14,025	[13,379-14,907]	61.9	[58.6-66.1]	14,929	[14,605-15,339]	66.5	[64.9-68.6]
<b>Bladder</b>								
2018-2022	320	[305-337]	1.7	[1.6-1.8]				
2023-2027	334	[308-360]	1.6	[1.5-1.8]	380	[326-460]	1.9	[1.6-2.3]
2028-2032	376	[344-411]	1.5	[1.4-1.7]	442	[363-560]	1.9	[1.5-2.4]
2033-2037	428	[383-476]	1.5	[1.3-1.7]	516	[411-672]	1.8	[1.4-2.5]
<b>Head &amp; Neck</b>								
2018-2022	268	[256-280]	2	[1.9-2.1]				
2023-2027	279	[255-305]	1.8	[1.6-2.0]	292	[256-335]	2.0	[1.7-2.3]
2028-2032	296	[255-338]	1.7	[1.4-2.0]	315	[265-375]	1.9	[1.5-2.3]
2033-2037	318	[267-374]	1.6	[1.3-2.0]	344	[280-420]	1.9	[1.5-2.3]
<b>Oesophagus</b>								
2018-2022	286	[270-299]	2	[1.9-2.1]				
2023-2027	298	[277-334]	1.8	[1.7-2.1]	301	[270-345]	1.8	[1.6-2.1]
2028-2032	328	[300-394]	1.7	[1.6-2.1]	336	[292-401]	1.7	[1.5-2.1]
2033-2037	361	[326-456]	1.7	[1.5-2.2]	374	[318-458]	1.7	[1.4-2.1]
<b>Stomach</b>								
2018-2022	405	[386-423]	2.9	[2.8-3.0]				
2023-2027	429	[384-453]	2.7	[2.4-2.9]	443	[417-468]	2.8	[2.6-3.0]
2028-2032	479	[405-513]	2.6	[2.2-2.9]	504	[471-537]	2.8	[2.5-3.0]
2033-2037	537	[440-584]	2.6	[2.1-2.9]	590	[546-633]	2.8	[2.5-3.1]
<b>Liver</b>								
2018-2022	419	[402-435]	3.1	[3.0-3.3]				
2023-2027	497	[453-525]	3.3	[3.0-3.5]	518	[473-554]	3.4	[3.1-3.7]
2028-2032	597	[522-640]	3.3	[2.9-3.6]	614	[547-664]	3.4	[3.0-3.8]
2033-2037	692	[588-751]	3.2	[2.7-3.5]	703	[617-772]	3.3	[2.8-3.7]
<b>Pancreas</b>								
2018-2022	828	[798-860]	5.6	[5.3-5.8]				
2023-2027	947	[893-1,036]	5.5	[5.2-6.1]	970	[897-1,075]	5.7	[5.2-6.4]
2028-2032	1,098	[1,017-1,255]	5.5	[5.0-6.4]	1,129	[1,021-1,282]	5.7	[5.1-6.6]
2033-2037	1,241	[1,134-1,464]	5.3	[4.7-6.4]	1,295	[1,157-1,486]	5.6	[4.9-6.6]
<b>Cervix</b>								
2018-2022	49	[44-55]	0.9	[0.8-1.0]				
2023-2027	51	[39-62]	0.9	[0.7-1.1]	55	[39-74]	0.9	[0.7-1.3]
2028-2032	53	[37-72]	0.8	[0.5-1.1]	60	[39-89]	0.9	[0.6-1.4]
2033-2037	57	[37-84]	0.8	[0.5-1.2]	67	[40-103]	0.9	[0.5-1.4]
<b>Uterus</b>								
2018-2022	160	[151-169]	2.2	[2.1-2.4]				
2023-2027	192	[175-211]	2.3	[2.0-2.5]	228	[189-282]	2.7	[2.2-3.5]
2028-2032	230	[200-261]	2.3	[2.0-2.7]	288	[225-376]	3.0	[2.3-4.1]
2033-2037	271	[225-318]	2.4	[2.0-2.9]	346	[262-467]	3.2	[2.4-4.5]
<b>Ovary</b>								
2018-2022	173	[163-182]	2.4	[2.2-2.5]				
2023-2027	134	[118-150]	1.6	[1.4-1.8]	166	[142-210]	2.0	[1.7-2.6]
2028-2032	116	[95-136]	1.2	[1.0-1.4]	159	[127-220]	1.7	[1.3-2.4]
2033-2037	112	[89-136]	1	[0.8-1.3]	160	[124-235]	1.5	[1.1-2.3]

**Table 4: Projections (continued)**

Period	Projections - Model 1				Projections - Model 2			
	Deaths	95% CI	ASR*	95% CI	Deaths	95% CI	ASR*	95% CI
<b>Kidney</b>								
2018-2022	213	[204-222]	1.5	[1.4-1.6]	219	[205-232]	1.3	[1.2-1.4]
2023-2027	217	[189-232]	1.3	[1.1-1.4]	240	[222-256]	1.2	[1.1-1.3]
2028-2032	231	[187-253]	1.2	[1.0-1.4]	270	[248-290]	1.2	[1.1-1.3]
2033-2037	245	[188-273]	1.1	[0.8-1.3]				
<b>Thyroid</b>								
2018-2022	34	[30-38]	0.2	[0.2-0.2]	45	[37-56]	0.3	[0.2-0.3]
2023-2027	36	[28-42]	0.2	[0.2-0.2]	52	[41-69]	0.2	[0.2-0.4]
2028-2032	41	[28-49]	0.2	[0.1-0.2]	57	[44-79]	0.2	[0.2-0.4]
2033-2037	46	[28-55]	0.2	[0.1-0.2]				
<b>Melanoma</b>								
2018-2022	277	[263-292]	1.8	[1.7-2.0]	235	[200-308]	1.4	[1.1-1.8]
2023-2027	244	[216-275]	1.4	[1.2-1.6]	223	[179-325]	1.1	[0.8-1.6]
2028-2032	233	[194-278]	1.1	[0.9-1.3]	221	[172-344]	0.9	[0.6-1.4]
2033-2037	236	[188-293]	0.9	[0.7-1.1]				
<b>Breast (female)</b>								
2018-2022	748	[719-771]	11.2	[10.7-11.5]	793	[733-871]	10.5	[9.6-11.7]
2023-2027	766	[726-802]	9.9	[9.4-10.4]	854	[772-967]	9.9	[8.8-11.4]
2028-2032	805	[752-851]	9	[8.3-9.6]	930	[827-1,074]	9.6	[8.3-11.3]
2033-2037	862	[795-919]	8.4	[7.6-9.3]				
<b>Bowel</b>								
2018-2022	1,292	[1,262-1,322]	8.7	[8.5-9.0]	1,382	[1,227-1,481]	8.3	[7.3-9.1]
2023-2027	1,236	[1,164-1,334]	7.5	[7.0-8.2]	1,498	[1,276-1,638]	8.1	[6.8-9.0]
2028-2032	1,253	[1,147-1,413]	6.8	[6.2-7.8]	1,684	[1,399-1,866]	8.3	[6.7-9.4]
2033-2037	1,358	[1,220-1,581]	6.7	[5.9-8.0]				
<b>Lung</b>								
2018-2022	2,145	[2,101-2,185]	14.9	[14.6-15.2]	2,269	[2,158-2,393]	14.1	[13.4-15.0]
2023-2027	2,245	[2,146-2,307]	13.7	[13.0-14.1]	2,457	[2,300-2,633]	13.4	[12.5-14.5]
2028-2032	2,430	[2,268-2,514]	12.8	[11.9-13.3]	2,661	[2,467-2,881]	13.0	[11.9-14.2]
2033-2037	2,607	[2,393-2,720]	12.2	[11.2-12.9]				
<b>Prostate</b>								
2018-2022	816	[785-847]	9.6	[9.2-9.9]	774	[698-857]	7.5	[6.7-8.4]
2023-2027	910	[855-991]	9.1	[8.5-10.0]	866	[754-985]	7.0	[6.0-8.1]
2028-2032	1,108	[1,015-1,253]	9.3	[8.3-10.7]	1,005	[854-1,154]	6.9	[5.7-8.1]
2033-2037	1,348	[1,210-1,571]	9.7	[8.4-11.5]				
<b>Lymphoma</b>								
2018-2022	416	[403-429]	2.6	[2.5-2.7]	383	[359-404]	2.0	[1.9-2.2]
2023-2027	431	[400-460]	2.3	[2.1-2.5]	397	[366-425]	1.7	[1.6-1.9]
2028-2032	459	[412-506]	2	[1.8-2.3]	415	[379-451]	1.5	[1.4-1.7]
2033-2037	489	[430-553]	1.8	[1.6-2.1]				
<b>Leukaemia</b>								
2018-2022	351	[335-370]	2.3	[2.1-2.4]	321	[280-369]	1.6	[1.4-1.9]
2023-2027	325	[290-368]	1.7	[1.5-2.0]	320	[268-381]	1.3	[1.1-1.6]
2028-2032	320	[268-382]	1.4	[1.1-1.7]	335	[274-408]	1.2	[0.9-1.5]
2033-2037	323	[260-403]	1.2	[0.9-1.5]				

# LIVING WITH AND BEYOND CANCER

George Kiossoglou, living beyond leukaemia



# CANCER SURVIVAL AMONG VICTORIANS

## A snapshot of cancer survival in Victoria in 2022

- The 5-year survival rate for Victorians diagnosed with cancer has increased 49% over the past 30 years.
- Across all cancers, the 5-year survival rate is 73% for females and 70% for males.
- Survival rates vary significantly across cancer types and are also impacted by factors such as age, socioeconomic position, Aboriginal or Torres Strait Islander identity, geographic location of residence, and the cancer stage at time of diagnosis.

Throughout this chapter we refer to 'relative survival', which refers to the survival of a person with cancer compared with the expected survival for a person of the same age and sex living in Victoria during the same period. This is further explained in Appendix 2: Statistical Methodology. When referring to five-year survival the reader should assume five-year relative survival.

### Five-year survival after a cancer diagnosis has, for the first time, reached 70% in men.

In Victoria, the five-year survival rate across all cancers is 71% (73% for females and 70% for males). (Figure 37).

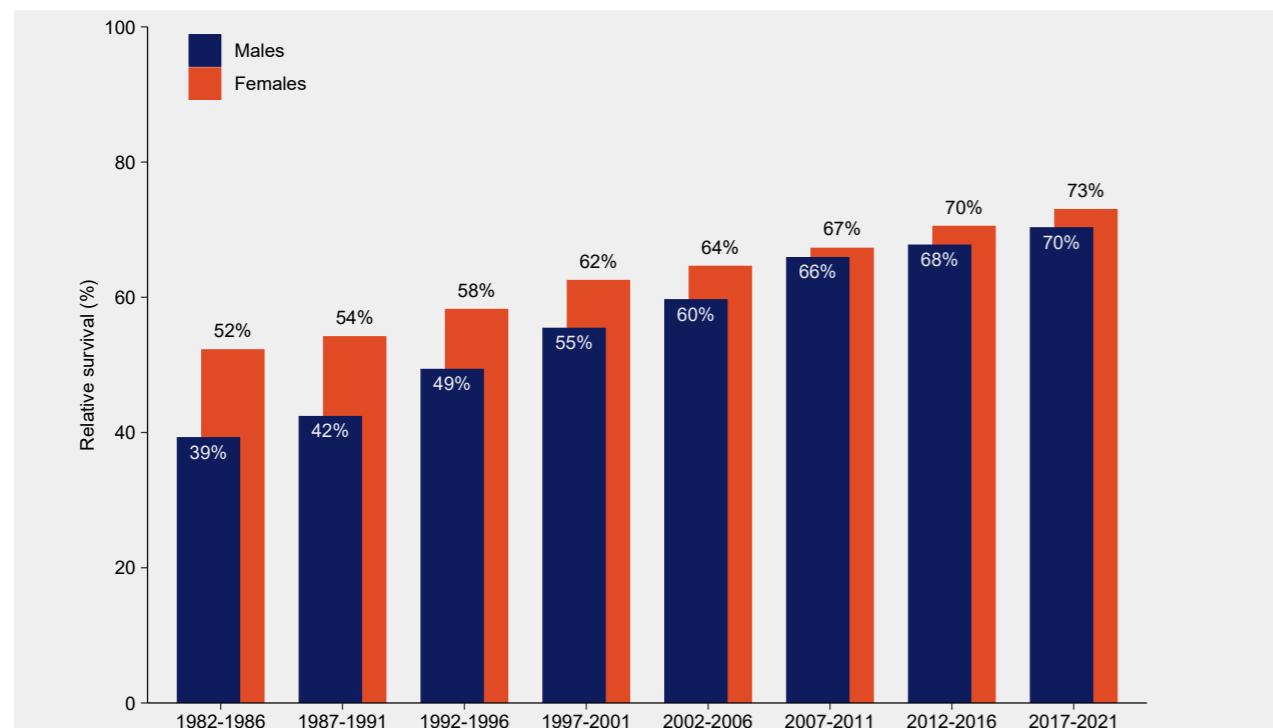


Figure 37: Trend in five-year relative survival for all cancers by year of diagnosis, Victoria 1982–2021

Figure 38 provides a summary of change in five-year survival across three time periods for solid tumours: 1982–1986, then 1997–2001, and the most recent period from 2017–2021. Figure 54 in this year's report dedicated to blood cancers illustrates the change in five-year survival for this group of cancers over the same period.

Figure 38 shows that five-year relative survival rates for cancer in the most recent period vary from 10% for mesothelioma to 98% for testicular cancer and that survival rates continue to improve for most solid tumours.

For solid cancers that occur in females and males, the five-year survival rate is highest for thyroid cancer (95%), melanoma (94%), and lowest for mesothelioma (10%), pancreatic cancer (14%) and cancer of unknown primary site (17%). For males, the five-year survival rate is highest for testicular cancer (98%), prostate cancer (95%) and melanoma (92%), and lowest for mesothelioma (9%), pancreatic cancer (14%) and cancers of unknown primary site (18%). For females, the five-year survival is highest for thyroid (97%), melanoma (96%), and breast cancer (92%) and lowest for mesothelioma (13%), pancreatic cancer (15%) and cancers of unknown primary site (16%).

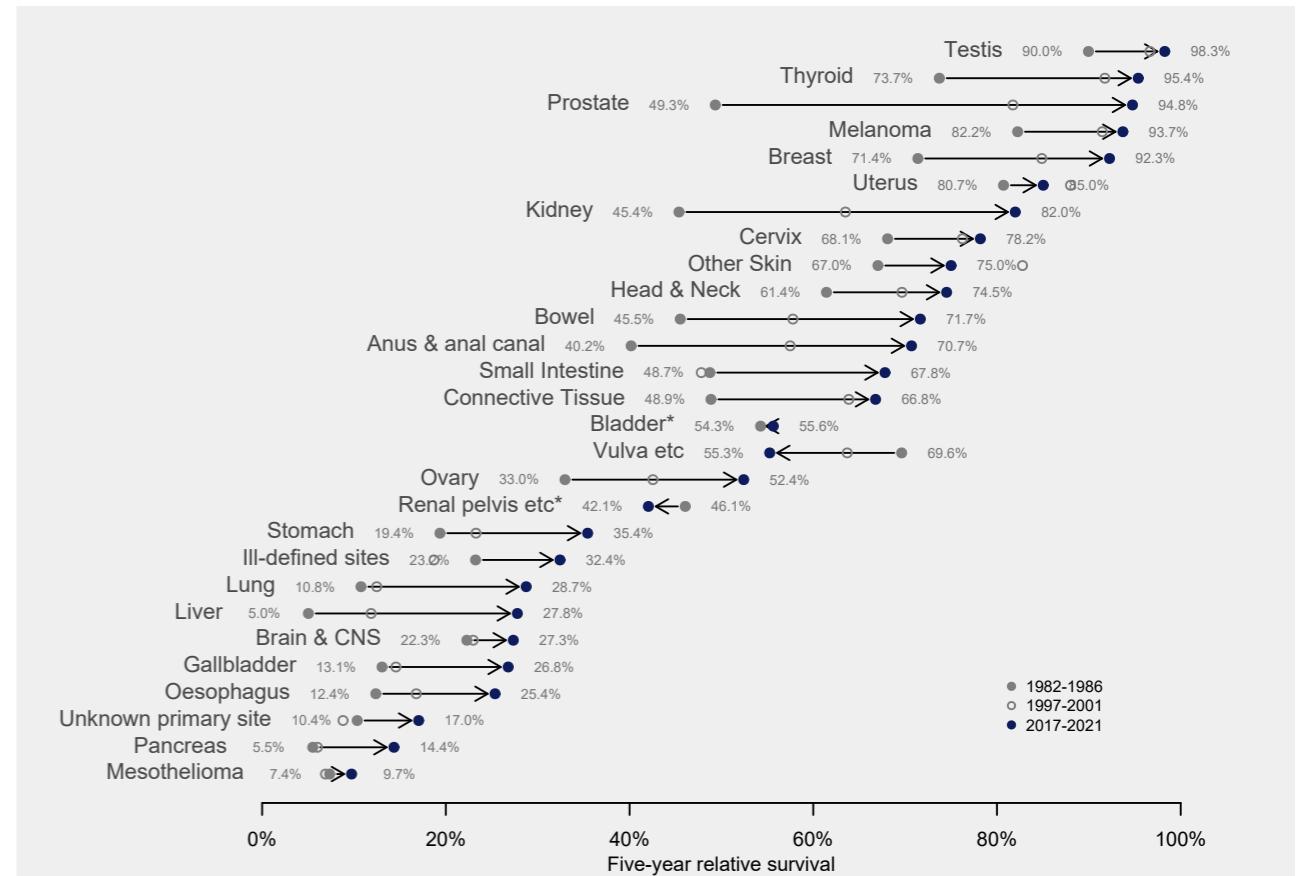


Figure 38: Five-year relative survival rates for common solid tumours in Victoria, showing change between 1982–1986, 1997–2001 and 2017–2021. Cancers marked with an \* show change between the period 1997–2001 to 2017–2021

### The five-year survival rate for Victorians diagnosed with cancer has increased 22% over the past 20 years and 49% over the past 30 years.

Between 1997–2001 and 2017–2021, the five-year survival rate has increased from 59% to 71%. Among females it has increased from 62% to 73%, and for males it has increased from 55% to 70% (Figure 37). When compared to five-year survival rates three decades ago (1987–1991 to 2017–2021), it has increased from 48% to 71%. Survival improvements reflect earlier detection, driven in part by screening programs, and advances in treatment. It is expected that the percentage of people living beyond five years after a diagnosis will continue to increase.

### Change in survival over the past 20 years has varied across the tumour types.

For most blood and solid cancers, there has been significant improvement in five-year survival over the past two decades. The most pronounced

improvement in survival is seen in subgroups of blood cancers, described in detail in the 'Focus' section of this report.

Among solid tumours over the past 20 years (comparing periods 1997–2001 and 2017–2021), improvement in five-year survival is seen across all solid tumours other than bladder, mesothelioma, cancers of connective tissue, other skin, cervix, uterus, and testis. The most significant improvement in absolute five-year cancer survival has been in cancer of the small intestine (20%, 48% to 68%), lung (16%, 13% to 29%), kidney (18%, 63% to 82%) and liver (16%, 12% to 29%). In terms of relative change in five-year survival over this same period, we have seen greatest improvement in relative five-year survival in cancers of the pancreas (138%), liver (134%) and lung (130%).

Over the past 35 years (comparing period 1982–1986 and 2017–2021), improvement is seen in all tumour streams other than mesothelioma, and tumours of the brain and central nervous system,

# CANCER SURVIVAL AMONG VICTORIANS

ill-defined sites, other skin, and uterus. Improvement in absolute change in five-year survival among solid tumours was most notable in cancer of the prostate (45%, 49% to 95%), multiple myeloma (38%, 26% to 64%), kidney (37%, 45% to 82%) and anus and anal canal (31%, 40% to 71%). Yet, the greatest improvement in relative change in five-year survival was in cancer of the liver (451%), lung (167%), and pancreas (160%).

Among females, there has been a decline in absolute five-year survival over the past 20 years (comparing periods 1997-2001 and 2017-2021) for those diagnosed with vulval cancers (-6%, from 59% [95%CI: 53-65%] to 53% [95%CI: 50-56%]) although this has not reached a statistical level of significance. Human papillomavirus (HPV) has been identified in approximately 34% of people diagnosed with vulval

cancer.<sup>24</sup> Primary prevention through HPV vaccination is showing promising results in reducing HPV-associated vulvar cancers.<sup>25</sup> Early detection will have the greatest impact on survival and, in the absence of a specific screening test, relies upon self-examination and early evaluation of patients with signs and symptoms of vulvar disease.

## Five-year survival is increasing across all age groups.

Five-year survival is impacted by age at diagnosis (Figure 39). Nearly all cancer types showed decreasing five-year survival with increasing age. However, the magnitude of the decline varies between cancer types. For example, for females aged 75 years and over, ovarian cancer survival is 23%, compared to 60% for females under 75, and breast cancer survival is 84%, compared to 94% for females under 75.

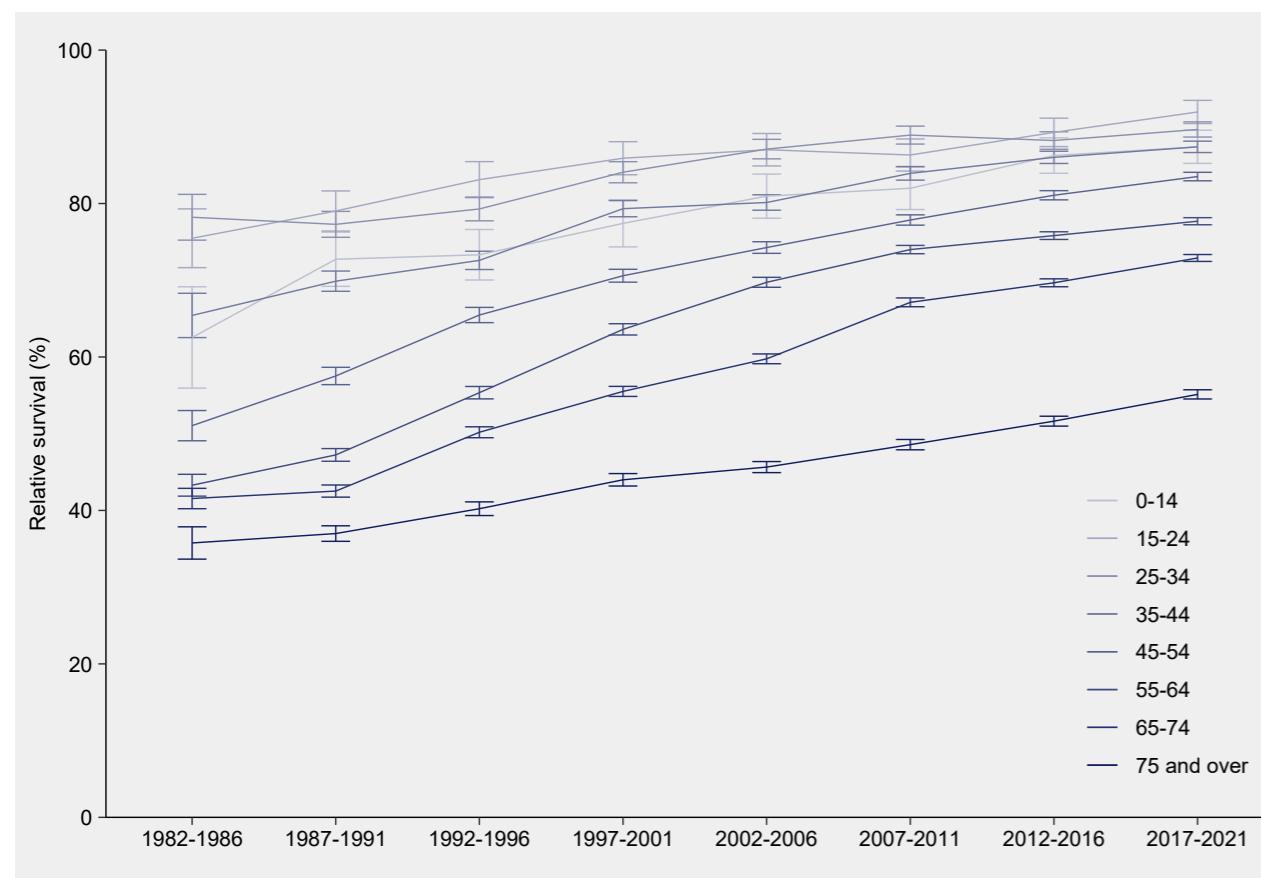


Figure 39: Five-year relative survival (with 95% confidence intervals) by age groups for the periods 1982-1986 to 2017-2021



## Aboriginal and Torres Strait Islander People

### Five-year survival among Aboriginal Victorians is 12% lower than among non-Aboriginal Victorians

In 2017-2021, five-year survival among Aboriginal Victorians was 60% and among non-Aboriginal

Victorians was 72%. (Figure 40). This 12% gap may be driven by a larger proportion of low survival cancers in Aboriginal Victorians (such as lung, liver, and pancreatic cancers), differences in stage of disease at diagnosis, and/or non-cancer related differences impacting life expectancy.

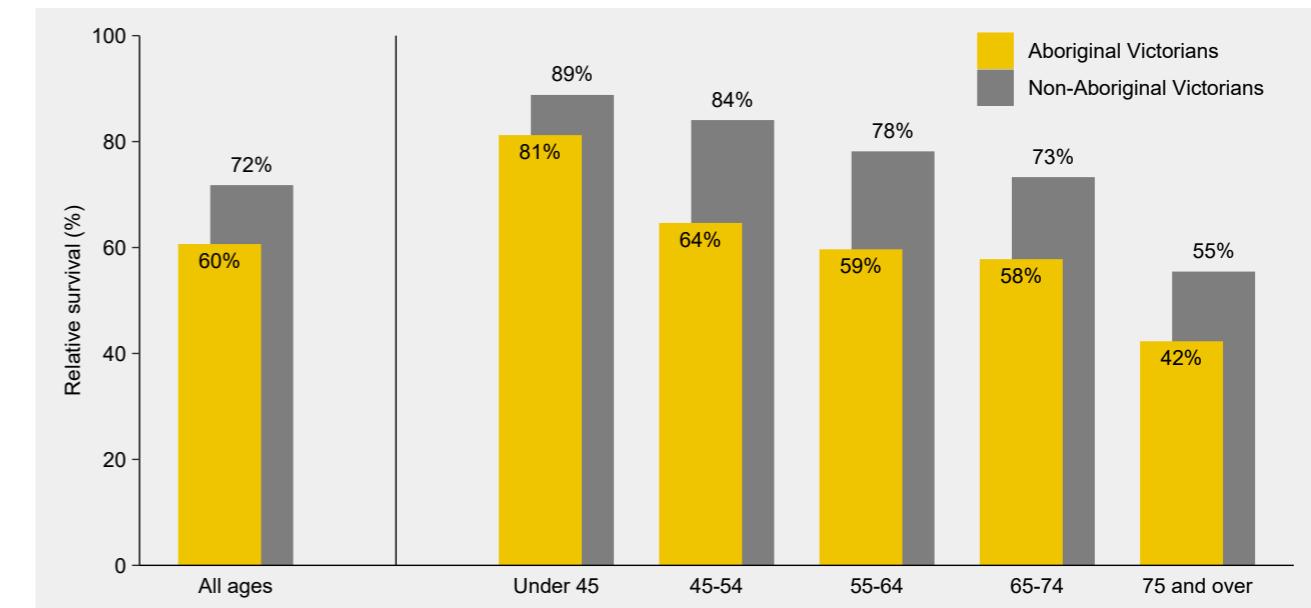


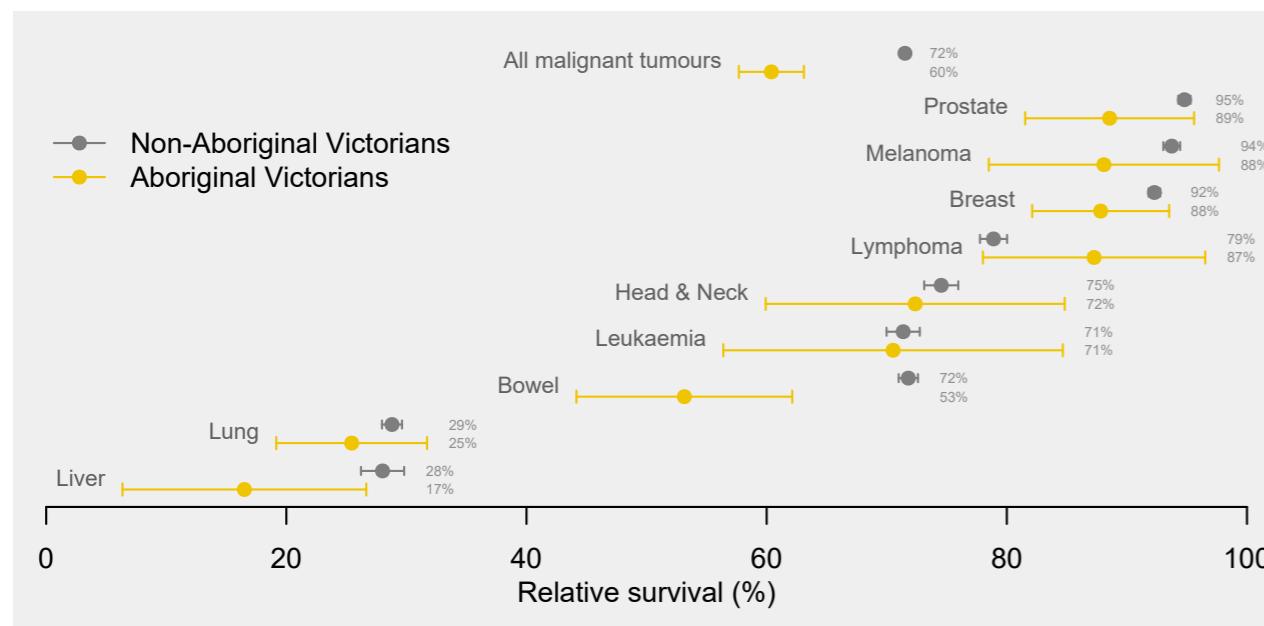
Figure 40: Five-year relative survival by age groups, comparing Aboriginal and non-Aboriginal Victorians 2017-2021

# CANCER SURVIVAL AMONG VICTORIANS

Differences are seen across age groups but are most marked in those aged between 45 and 64 years (Figure 40). In 2022, the Victorian Aboriginal Community Controlled Health Organisation released the Victorian Aboriginal Health and Wellbeing Workforce Strategy 2022–2026<sup>26</sup> to fortify a capable workforce, crucial for the successful implementation of a cancer strategy aimed at addressing existing disparities. This strategy emphasises the development of the Aboriginal and Torres Strait Islander workforce while enhancing the capacity of the non-Aboriginal workforce to deliver culturally safe and effective services. Prioritising cultural strength, the strategy values Indigenous knowledge and ways of knowing, being, and doing, recognising the significance of holistic care that embeds Aboriginal cultures in

health and wellbeing services. Furthermore, the workforce strategy champions the principles of self-determination, empowering Aboriginal people to own their health and wellbeing and devise targeted, localised solutions to workforce planning. By fostering a sense of safety and support within health services, these principles are anticipated to enhance cancer outcomes for Aboriginal individuals.

Figure 41 demonstrates that five-year survival following a diagnosis of bowel cancer is significantly worse for Aboriginal Victorians compared with non-Aboriginal Victorians. Implementing targeted strategies to enhance bowel cancer screening and diagnosis within the Aboriginal Community aims to secure earlier disease detection, thereby positively influencing survival rates.



**Figure 41:** Five-year relative survival rates (and 95% confidence intervals) for the most common cancers comparing Aboriginal and non-Aboriginal Victorians, 2017–2021

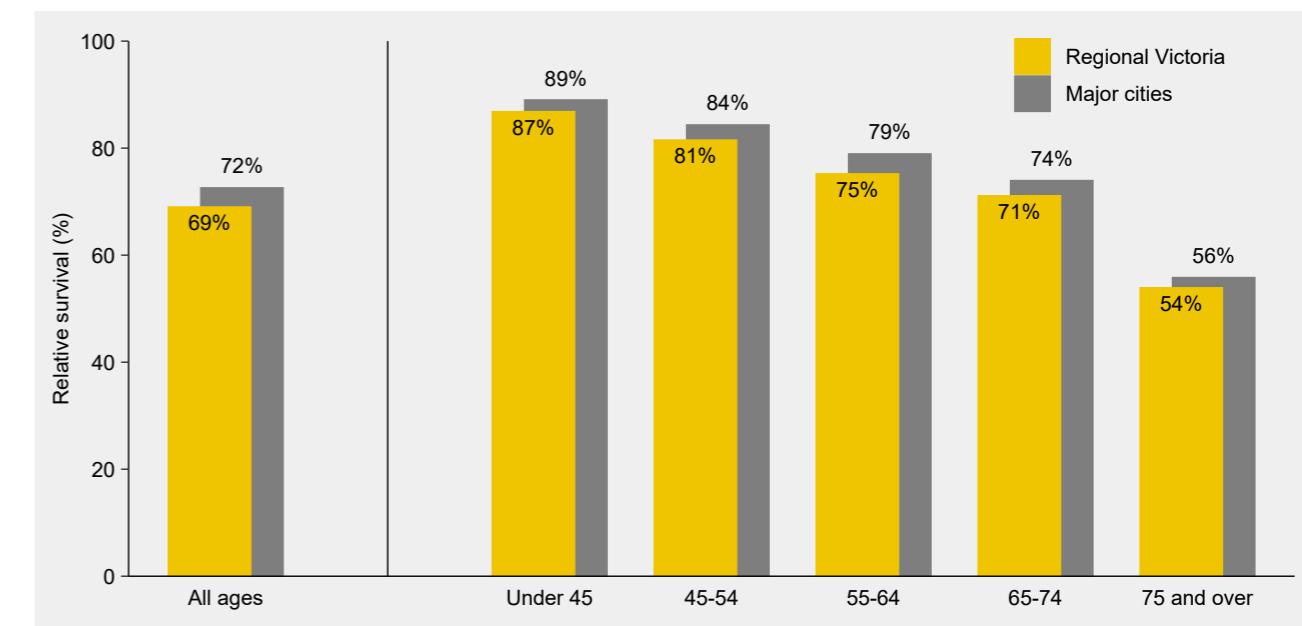
## Regional Victorians

### The five-year survival rate is impacted by where someone lives.

Five-year survival is higher in residents of major Victorian cities (72%) compared to those in regional Victoria (69%), incorporating inner regional, outer regional and remote Victoria as shown in Figure 42. A map detailing geographical areas of Victoria is shown in Figure 1 of this report. Potential explanations for variation in relative survival include the types of cancers distributed in regions, the stage at which the cancers are detected, and the burden of risk factors among the population. Socio-economic differences have been associated with lower survival.<sup>27</sup> Others have

postulated that it may be driven, in part, by diagnostic delays, due to difficulty in accessing medical practitioners and fewer diagnostic facilities.<sup>28</sup> Regional cancer centres and integrated cancer services continue to invest in strategies to lead local implementation of cancer reforms and provide world class cancer services as close to home as is safe and practicable.

The most notable contrast in survival is observed within the age group of 55–64 years, coinciding with the population eligible for bowel and breast cancer screening, as well as case finding for prostate cancer.



**Figure 42:** Five-year relative survival by age groups, comparing Victorians living in regional areas of Victoria and major cities of Victoria, 2017–2021.

# CANCER SURVIVAL AMONG VICTORIANS

Five-year survival rates among regional Victorians do not surpass those of Victorians living in major cities for any cancers. Yet, five-year survival rates for solid tumours are significantly lower for regional Victorians in cancers of the brain and central nervous system (21% vs 29%), breast (91% vs 93%), liver (21% vs 30%), lung (25% vs 30%), pancreas (12% vs 15%),

prostate (93% vs 96%), stomach (30% vs 37%), and thyroid (92% vs 96%). Differences in five-year survival between regional and urban Victorians for select cancers are shown in Figure 43. Variation in five-year survival between regional and major city dwelling Victorians for blood cancers is shown in the Focus section of this report.

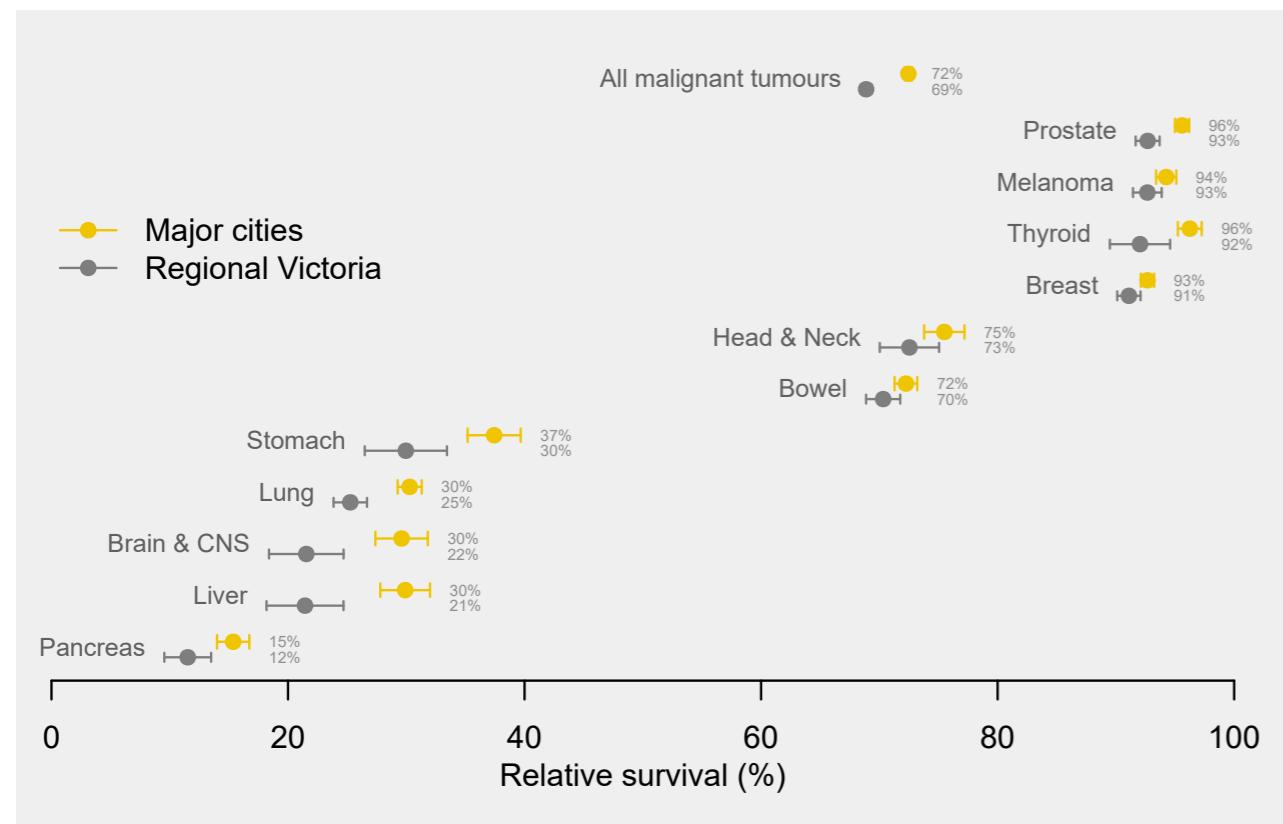


Figure 43: Five-year relative survival for the most common cancers, comparing regional and major city dwelling Victorians, 2017-2021

## Cancer stage at diagnosis

### **There is a strong correlation between stage of disease at diagnosis and survival.**

The Victorian Cancer Registry is undertaking to improve the capture of cancer stage at diagnosis through a number of projects. This includes expanding the registry-derived cancer stage project to other cancer streams and working with Health Information Managers and clinicians to improve documentation of stage at diagnosis in multidisciplinary team meeting software and discharge summaries. For each of the five cancers for which stage is collected by the Victorian Cancer Registry, survival decreased with increasing stage of disease at diagnosis (Figure 44). Diagnosis

of early-stage disease for each of these cancers carries an excellent prognosis. A relative survival rate exceeding 100% in Stage 1 breast, prostate, and melanoma cases implies a superior five-year survival rate for this group compared to the broader Victorian population of equivalent age and sex. This suggests that detection of early-stage cancer may be associated with other factors which increase survival, such as higher socioeconomic status, improved access to medical care and screening tests, or improvement in lifestyle after detection of cancer.<sup>29</sup>

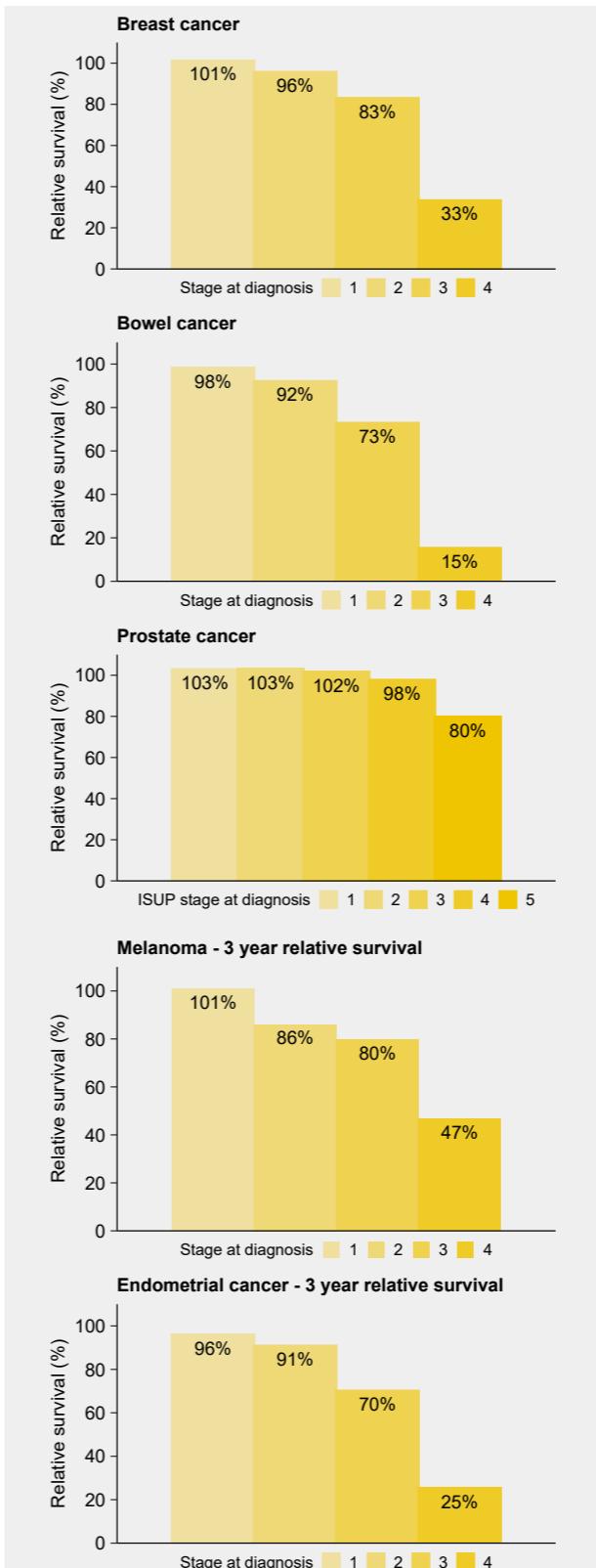


Figure 44 : Five-year relative survival for breast, bowel and prostate cancer, and three-year relative survival for melanoma and endometrial cancer, by stage of disease at diagnosis, Victoria 2021

**"The five-year survival rate for the particular sub-type I had – which was AML with recurrent cytogenetic abnormalities – was five to 10 per cent. So, I consider myself really fortunate."**



George Kiossoglou, living beyond leukaemia

At 66, George's volunteer work has become like a 'second career' for him, which was driven by his experience with acute myeloid leukaemia (AML).

"I'm around because of research. I'm around because of people who identified the BCL2 gene, who developed the machine that did the stem cell transplants, and I thought 'I need to give back' and this felt right," he said.

10 years after surviving aggressive AML, George volunteers with various hospitals, research institutions and organisations as a consumer advisor, committee member, and more, including at Walter and Eliza Hall institute (WEHI), VCCC Alliance, and Royal Melbourne Hospital.

It was an allogeneic stem cell transplant, with stem cells donated by his brother Nick, that ultimately saved George's life. 70 per cent of his original stem cells were replaced with those produced by his brother.

Post-transplant, George experienced five cases of 'graft versus host disease' (GVHD), where his original stem cells were attacked by those of his brother's, viewing them as a threat.

"All have been reasonably mild," said George. "They've been either the skin, the liver, twice on the kidney, and the gut. The kidney was the most life threatening, the gut was the worst."

Now, 10 years on, George still lives with the effects of his illness – from constant tests to a plethora of medications to manage ongoing side effects and symptoms. But through volunteering for the very health centres responsible for saving his life, George is managing his 'new normal' with a renewed sense of purpose by devoting himself to their important work.

## CANCER SURVIVAL AMONG VICTORIANS

**The likelihood of a person surviving five years increases once they have survived a year after their diagnosis.**

Victorians are more likely to die in the first year following their cancer diagnosis than in subsequent years. Among all cancers, survival declines from 100% at diagnosis to 85% at year one, and then slows to 79% at year two, 76% at year three, 73% at year four and 71% at year five. This is shown for selected cancers in Figure 45.

Conditional survival rates among Victorians following a cancer diagnosis indicate that after surviving the initial year post-diagnosis, individuals

exhibit a 93% probability of survival through the subsequent year (Year 2). This trend persists, as those surviving to the conclusion of Year 2 demonstrate a 96% likelihood of reaching the end of Year 3. Individuals surviving through Year 3 exhibit a 97% probability of survival to the end of Year 4. Notably, for those Victorians who survive until the conclusion of Year 4, there is a 98% probability of survival to the end of Year 5. This sequential analysis underscores the improving prospects of survival as individuals surpass successive post-diagnosis milestones.

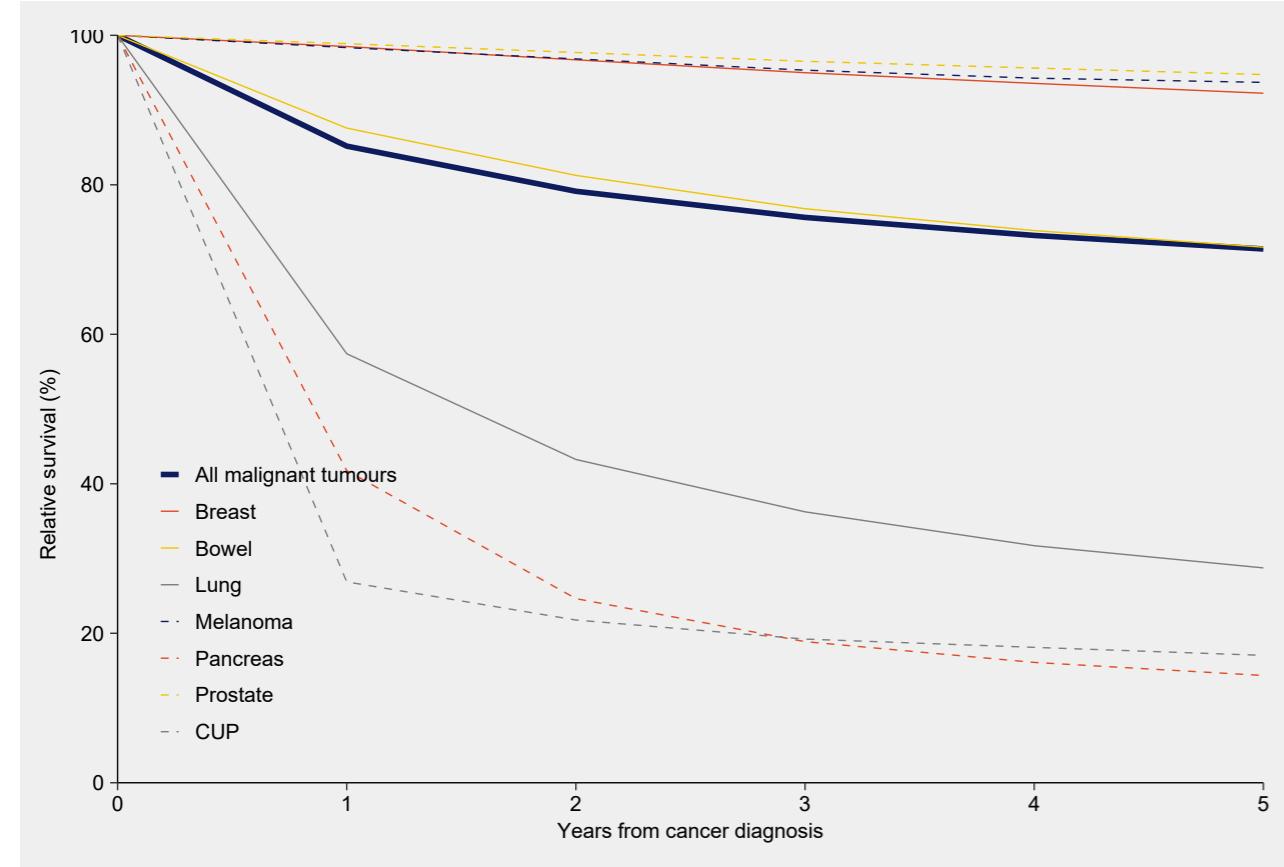


Figure 45: Relative survival in the five years following diagnosis for all cancers and selected common cancers, 2017-2021

“  
I still think about recurrence but my haematologist said, ‘we’ll know before you do’, which is really very assuring.

George Kiossoglou, living beyond leukaemia



# PREVALENCE

## A snapshot of cancer prevalence in Victoria in 2022

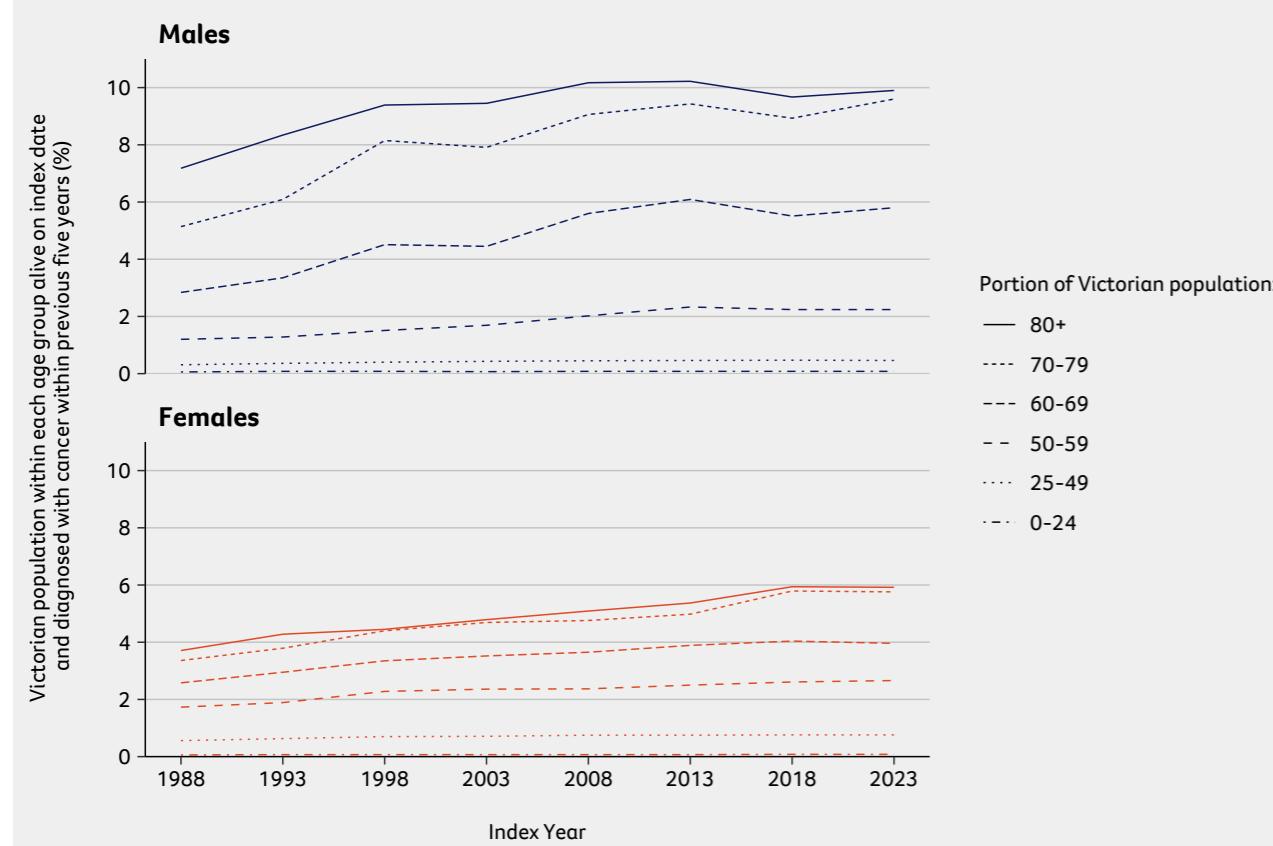
- An estimated 129,454 Victorians are alive after a cancer diagnosis in the past five years, and 211,930 Victorians are alive after a cancer diagnosis in the past 10 years.
- Over 350,000 Victorians who are alive today, have been diagnosed with cancer in the last four decades.
- The proportion of Victorians alive after a cancer diagnosis in the previous 5 years has more than doubled in the last 35 years.
- The most prevalent cancer for Victorian men aged 50 and over is prostate cancer.
- The most prevalent cancer for Victorian women aged 50 and over is breast cancer.

Cancer prevalence measures the number of people living with cancer (including in remission). It is calculated by assessing the number of people alive

on a certain date (index date) and diagnosed with cancer within a specified previous number of years.

Cancer prevalence reflects the relationship between cancer incidence and survival and is impacted by the stage of cancer at the time of diagnosis and the effectiveness of available treatments.

The impact of cancer extends well beyond the diagnostic and treatment period. Sequelae of a cancer diagnosis include physical consequences of treatments (e.g. pain, loss of function peripheral neuropathy, lymphoedema, metabolic syndrome), psychosocial impact (e.g. anxiety and depression, cancer-related fatigue, fear of recurrence, altered sleep and cognition, effects on sex and intimacy) and may include financial issues – all of which are likely to impact on quality of life in the medium and longer term.<sup>30</sup> Trends in prevalence therefore enables forecasting of healthcare costs and services to ensure that the complex needs of Victorian cancer survivors are met. In this report, we examine the prevalence of Victorians diagnosed with cancer after the registry achieved population coverage in 1982.



**Figure 46: Trend in percentage of males and females alive and diagnosed with cancer in the past five years, from 1 January 1988 to 1 January 2023, Victoria**

On 1 January 2023, 1.9% of the Victorian population was living with cancer which was diagnosed in the previous five years. The prevalence of cancer is higher in the older age groups, with 6.3% of Victorians aged 60 years and over, 7.6% of Victorians aged 70 years and over, and 7.6% of Victorians aged 80 years and over having a cancer diagnosed in the past five years.

The percent of the Victorian community living with cancer after a diagnosis in the previous five years has increased in all age groups over the last 40 years but is most pronounced in older Victorians (Figure 46). It has increased from 4.8% to 7.6% in those aged 80 years and over, from 4.1% to 7.6% in those aged between 70-79 years, from 2.7% to 4.8% in those aged 60-69 years, and from 0.5% to 0.7% in those aged under 50 years respectively from the index dates of 1 January 1988 to 1 January 2023.

### The number of Victorians 50 years and over living with or beyond cancer who were diagnosed in the past five years, has almost quadrupled in the last 40 years.

Approximately 351,756 Victorians who are alive today have been diagnosed with cancer within the 40-year period since 1983.

When examining prevalence of Victorians aged 50 years and over with a history of cancer diagnosed in the previous five years, on 1 January 1988 there were 13,945 Victorian males (2.9% of Victorian males aged 50 years and over) and 14,548 Victorian females (2.6% of Victorian females aged 50 years and over) (Figure 47). On 1 January 2023, this number had increased to 62,911 Victorian males aged 50 years and over (5.8% of Victorian males aged 50 years and over) and 50,244 Victorian females aged 50 years and over (4.2% of Victorian females aged 50 years and over) living with a cancer diagnosed in the previous five years.

When examining prevalence of Victorians aged 60 years and over with a history of cancer diagnosed in the previous five years, on 1 January 1988, there were 11,529 Victorian males (4.0% of Victorian males aged 60 years and over) and 11,161 Victorian females (3.0% of Victorian females aged 60 years and over) (Figure 47). On 1 January 2023, this number had increased to 54,169 Victorian males aged 60 years and over (7.8%) and 39,309 Victorian females aged 60 years and over (5.0%) living with a cancer diagnosed in the previous five years.

**"Some [blood cancers] by nature of their rarity and/or paucity of treatments, means improvement has not been universal – changes have occurred at different rates."**



**Dr Nora Lee, Haematologist at Bendigo Hospital and Peter MacCallum Cancer Centre**

As a haematologist involved in clinical trials, Dr Nora Lee is seeing cutting-edge treatments for blood cancers.

Working with the skilled Bendigo Hospital trials unit team, she says patient recruitment to haematology clinical trials is challenging for many patients.

"Teletrials are an increasingly important concept to at least partially overcome the tyranny of distance," said Dr Lee. "We have served as a successful satellite teletrial site for Peter Mac, with published results. Our primary objective is to expand our local haematology trial portfolio.

"[We had] another teletrial for myelofibrosis, but recruitment was slow, potentially related to a combination of a regional setting and an uncommon disease."

Promising results have been seen through clinical trials Dr Lee is involved in, including a young man with mantle cell lymphoma who had a suboptimal response to chemotherapy. With clinical trial treatment, disease remission was achieved, enabling him to undergo an allogeneic stem cell transplant – his ultimate therapeutic goal.

Dr Lee has also seen significant improvement in treating myeloma. "There are numerous clinical trials in this space which continues to expand," she said.

"Patients who would otherwise not have had any further options are still alive because they have access to trials. Eventually some of these cutting-edge treatments could become standard of care."

# PREVALENCE

The increasing prevalence of cancer is the result of Victoria's growing population, the increase in cancer incidence, and the increase in survival following cancer diagnosis. Improvement in survival is impacted by an increase in early-stage disease and improvements in treatment.

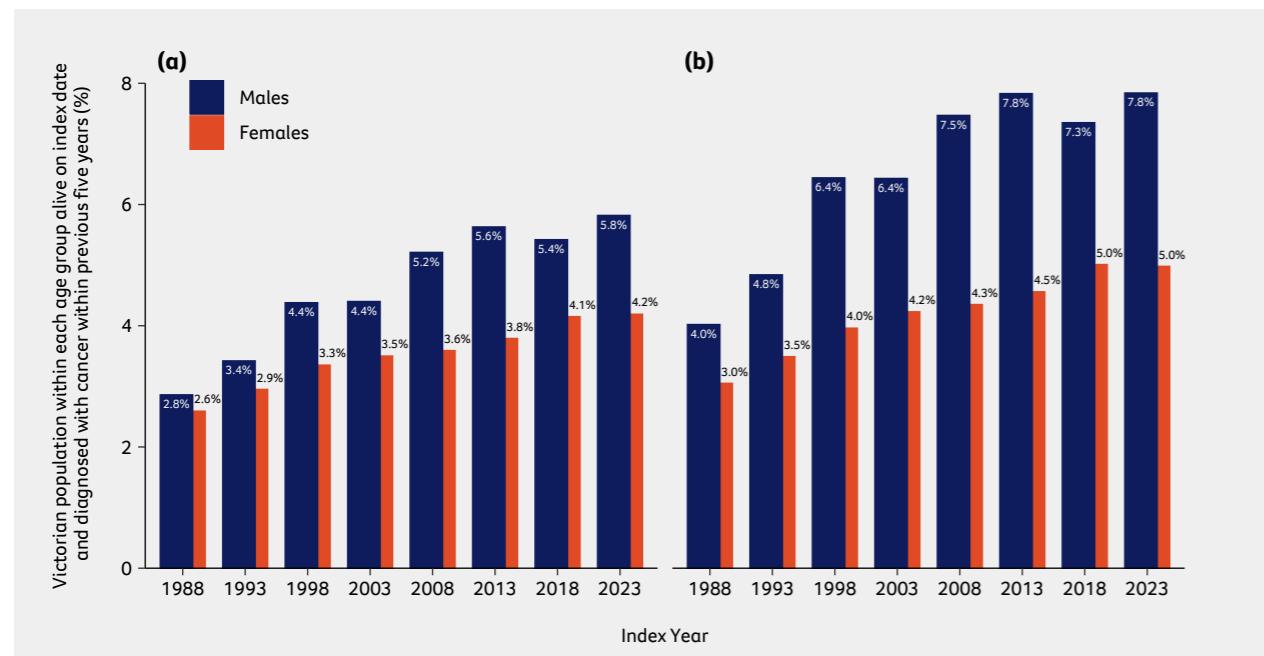


Figure 47: Trend in the percentage of males and females (A) aged 50 years and over and (B) aged 60 years and over alive and diagnosed with cancer in the past five years from each index date.

## Prostate cancer is the most prevalent cancer in men aged 50 and over.

As of 1 January 2023, there were 26,096 Victorian males who had been diagnosed with prostate cancer in the previous five years. This equates to approximately 2% of Victorian males aged 50 years and over having a prostate cancer diagnosis in the previous five years. The high incidence rates and excellent longer-term survival rates among men with early-stage prostate cancer mean that it is by far the most prevalent cancer in Victorian men aged 50 years and over. Prostate cancer is nearly four times as prevalent in males aged 50 years and over than bowel cancer ( $n=6,663$ ), which is the next most prevalent cancer (Figure 48). Prostate cancer remains the most prevalent cancer in males aged over 70 and over 80 years.

## Breast cancer is the most prevalent cancer in women aged 50 and over.

A history of breast cancer diagnosed in the previous five years is three times more prevalent in females

aged 50 years and over than any other cancer. As of 1 January 2023, there were 18,146 females aged 50 years and over who had been diagnosed with breast cancer in the previous five years (Figure 48). Bowel cancer is the next most prevalent cancer impacting women aged 50 years and over. Breast cancer remains the most prevalent cancer in those aged over 70 and over 80 years.

## Lung cancer prevalence reflects a poor prognosis.

Even though lung cancer is one of the most commonly diagnosed cancers for males and females, because of its poor median survival rate (1-year relative survival of 50% in males and 59% in females), it has a low prevalence compared to other common cancers with higher relative survival rates (Figure 48). Lung cancer screening and new therapies such as immunotherapies are both strategies aimed at improving survival and therefore increasing prevalence of lung cancer five years after a diagnosis.

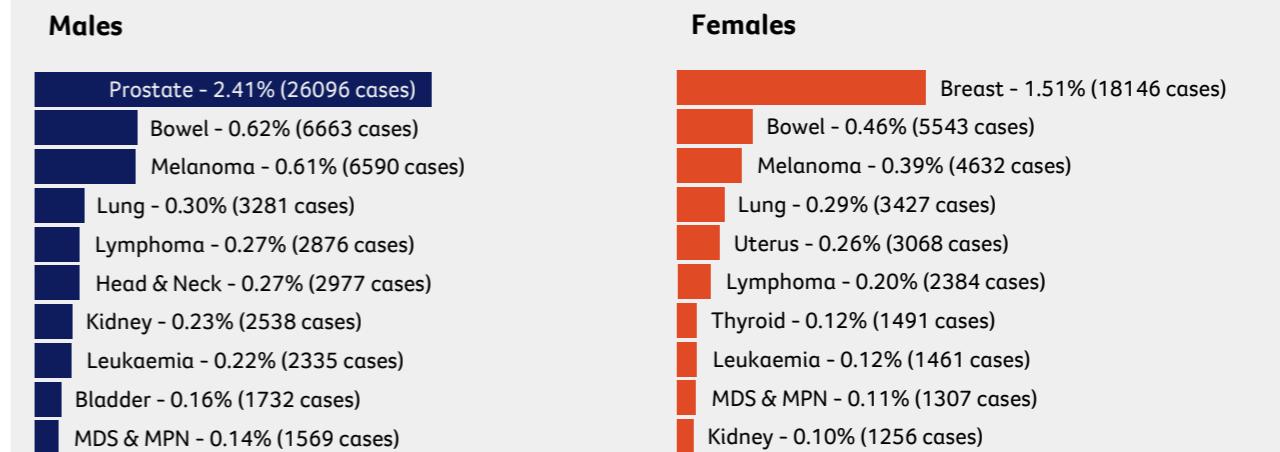


Figure 48: Prevalence of males and females aged 50 years and over with a history of cancer diagnosed in the past five years (index date 1/1/2023)

## About 1 in 3 males and 1 in 4 females aged 80 years and over have been diagnosed with cancer at some time in the last 40 years.

Cancer becomes increasingly prevalent as Victorians age, with rates among those aged 60-69 years more than twice as high as those aged 50-59 years (Figure 49). In Victoria, approximately 27% of Victorians aged 80 years and over (33% of males aged 80 years and over and 23% of females aged 80 years and over) have been diagnosed with cancer in the last 40 years and are still alive today. About 90% of all cancer survivors are aged 50 years and above, 76% are aged 60 years and above, 53% are aged 70 years and above, and 22% are aged 80 years and above.

## Over 5000 Victorians have a history of cancer diagnosed when they were aged less than 15 years.

Although cancer in children and adolescents is relatively uncommon, survival rates following a diagnosis of many cancers is high. In Victoria, there were 2,810 males and 2,335 females alive today, who were diagnosed with cancer when they were aged less than 15 years since 1 January 1982. Extending the age at diagnosis to include adolescents and young adults, there are 6,197 males and 5,523 females alive today who were diagnosed with cancer when they were aged less than 25 years since 1 January 1982.

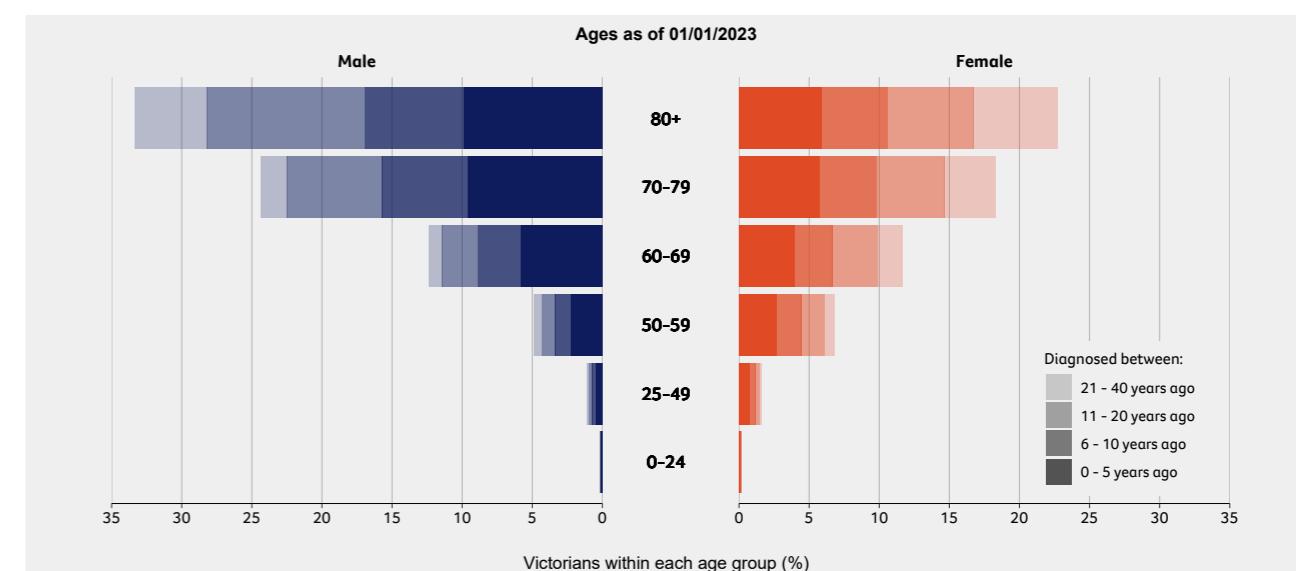


Figure 49: Percent of Victorians who have been diagnosed with cancer in the last 40 years and are still alive today, by age groups (index date 1/1/2023)

# BLOOD CANCERS IN VICTORIA

Dr Omer Gilan, Laboratory Head at Monash University  
and researcher at The Australian Centre for Blood Diseases



# BLOOD CANCERS IN VICTORIA

## A snapshot of blood cancers in Victoria in 2022

- **1 in 8 cancers diagnosed in Victorians is a blood cancer.**
- **Rates of blood cancers were increasing by about 1% annually between 2005 and 2020 and have been stable over the past three years.**
- **Rates of blood cancer deaths are declining by more than 2% annually.**
- **Five-year survival for Victorians continues to improve for all blood cancers.**
- **ALL and HL account for 66% of blood cancers diagnosed in Victorians aged under 30 years.**
- **Plasma cell myeloma, diffuse large B-cell lymphoma, MDS and CLL account for 50% of blood cancers in Victorians aged 30 years and above.**
- **Despite being the blood cancer with the lowest survival rate, recent years have seen significant advances in improving outcomes for AML.**
- **Approximately 17,928 Victorians are living with a blood cancer diagnosed in the past five years.**

## Classifying Blood Cancers

Blood cancers, also known as haematological cancers, refer to a diverse group of disorders which originate in blood cell forming organs of the body.

Blood cancers are classified according to their appearance under the microscope (morphology), the organs they usually affect, their cell of origin (phenotype), genetic and molecular characteristics,

and history of prior cancer or cytotoxic therapy. There are more than 200 sub-categories of blood cancers classified by the World Health Organization, the vast majority of which are defined as rare cancers, because there are an average six or fewer new cases occurring per 100,000 persons each year or 100,000 person-years.

Broadly, there are (1) lymphoid blood cancers, which can be either immature (acute lymphoblastic leukaemia) or mature (lymphoma); (2) myeloid blood cancers, which can be either immature (acute myeloid leukaemia) or mature (myeloproliferative disorder); and (3) other blood cancers, spanning a diverse and broad spectrum of diseases beyond those encompassed by the broad terms lymphoid and myeloid cancer.

In this Focus report, we provide summary statistics on some of the more commonly diagnosed blood cancers, categorising them according to whether they originate from myeloid or lymphoid lineage cells. The International Statistical Classification of Diseases and Related Problems-10th edition Australian modified edition (ICD-10AM)<sup>31</sup> classifies blood cancers in such a way that diverse morphologies are amalgamated within the classification, leading to the grouping of heterogeneous blood cancers under a single category. This section applies morphology codes from the International Classification of Diseases for Oncology-3rd edition,<sup>32</sup> to the ICD-10AM codes to allow a more nuanced understanding and reporting of blood cancers. This approach has recently been used in the reporting of blood cancer incidence and survival by the Australian Institute of Health and Welfare (AIHW).<sup>34</sup> A summary of acronyms used in this report is shown in Table 5.

Table 5: Acronyms for blood cancers used in this report.

Acronym	Description	Acronym	Description
ALL	Acute lymphoblastic leukaemia	AML	Acute myeloid leukaemia
CLL	Chronic lymphoblastic leukaemia	CML	Chronic myeloid leukaemia
DLBCL	Diffuse Large B-cell lymphoma	FL	Follicular lymphoma
HL	Hodgkin lymphoma	MDS	Myelodysplastic syndromes
MPN	Myeloproliferative neoplasms	MM	Multiple myeloma
NHL	Non-Hodgkin lymphoma	PCM	Plasma cell myeloma

## About 1 in 8 cancers are blood cancers

In 2022, 4,566 Victorians were diagnosed with blood cancers, at an age-standardised incidence rate of 38 cases per 100,000. Blood cancers accounted for 13% of the estimated 36,299 new cancer diagnoses in Victoria in 2022.

The most commonly diagnosed blood cancers diagnosed between 2018 and 2022 were lymphoid (B, T, NK) blood cancers (57%), followed by myeloid blood cancers (28%) and plasma cell myeloma (13%). Those included in the Other (2%) category include histiocytic and dendritic cell neoplasms (Figure 50).

Further information on blood cancers classified within the 'Other' sub-categories of lymphoid cell and myeloid cell blood cancers, and plasma cell myeloma, can be explored using national data, available on the AIHW website: <https://www.aihw.gov.au/reports/cancer/cancer-data-in-australia/contents/blood-cancer-incidence-and-survival-by-histology-e>

This interactive portal includes blood cancer data from all Australian jurisdictions for the period 2003-2019.

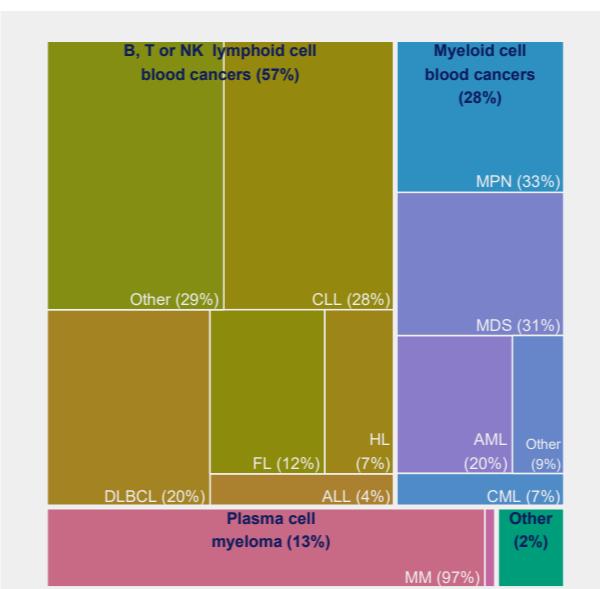


Figure 50: New diagnoses of blood cancers in Victoria, 2018-2022.

**"Research is very challenging, with many failures. So, when you do find something really exciting, it can be really rewarding to see that."**



**Dr Omer Gilan, Laboratory Head at Monash University and researcher at The Australian Centre for Blood Diseases**

Dr Omer Gilan and his team are "looking under the hood" of leukaemia cells by exploring the epigenetic landscape to develop new targeted therapy options for leukaemia patients.

Studying why cancer cells are able to "hijack the epigenome to drive the formation of cancer", he and his team are looking at ways to exploit this knowledge to target cancer cells more effectively and predict how cells become resistant to therapy.

"Only recently we discovered there's this protein, called 'menin', that is needed by a very aggressive type of leukaemia. It was just by tinkering with the cells and understanding how they are kept alive that this therapy, called a 'menin inhibitor', was able to be developed" says Dr Gilan.

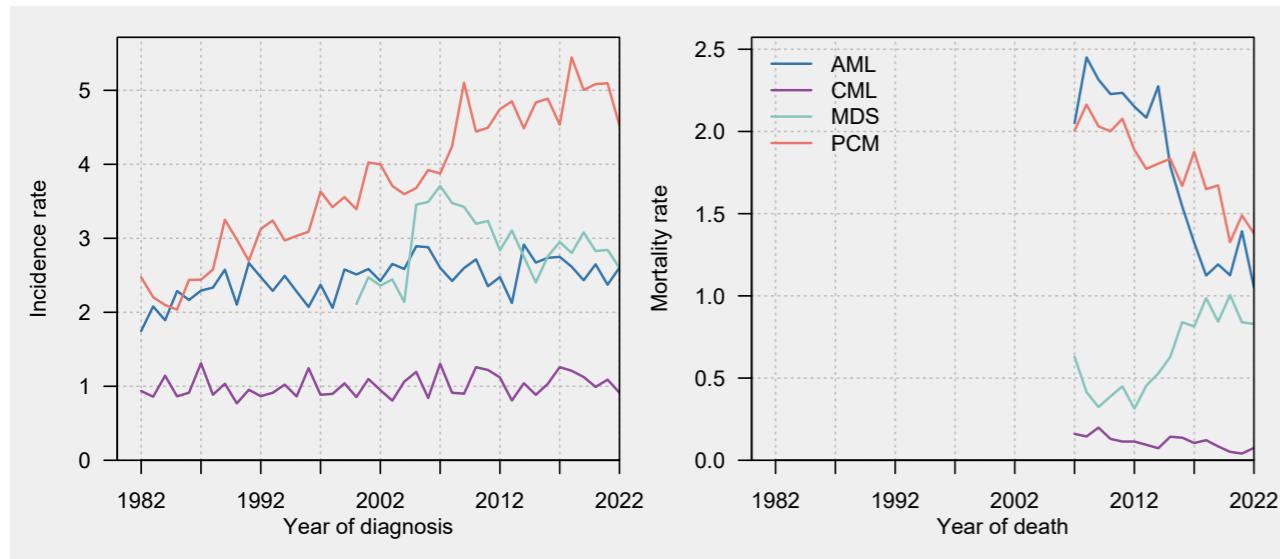
By temporarily switching off menin, the team has found that the leukaemia cells stop proliferating. Early tests have indicated that not only does this therapy take the "foot of the accelerator", "it's also hitting the brakes on the [cancer] cells and from which they cannot recover".

"This therapy restores the normal trajectory of the cells. By restoring that normal trajectory you're basically eliminating the leukaemia cells by sending them back to what they were supposed to be doing," says Dr Gilan.

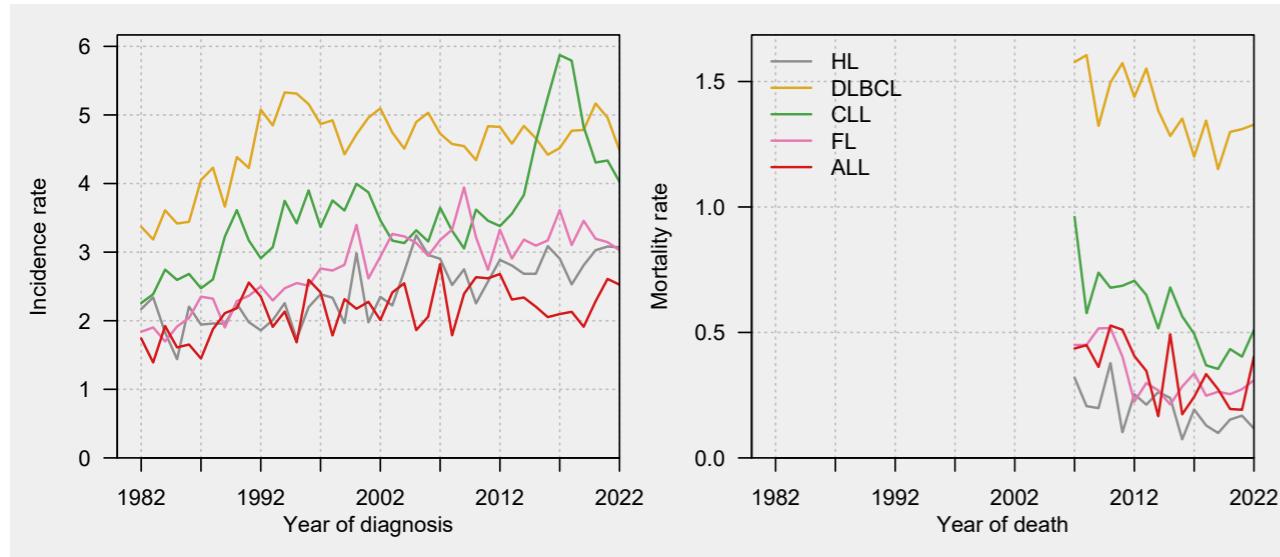
Targeting menin effectively kills aggressive leukaemia cells, prompting therapies that are currently in clinical trials. By interrogating epigenetic proteins that may cooperate with menin to prevent drug resistance, Dr Gilan is discovering new ways of treating patients with aggressive leukaemia.

# BLOOD CANCERS IN VICTORIA

Trends in incidence and mortality rates for myeloid blood cancers and plasma cell myeloma are shown in Figure 51. Trends in incidence and mortality rates for lymphoid cancers are outlined in Figure 52.



**Figure 51:** Age-standardised A) incidence rates (1982–2022) and B) mortality rates (2007–2022) for myeloid blood cancers and plasma cell myeloma in Victoria.



**Figure 52:** Age-standardised A) incidence rates (1982–2022) and B) mortality rates (2007–2022) for B, T, or NK lymphoid blood cancers in Victoria.

## More males are diagnosed with blood cancers than females.

In 2022, of those Victorians diagnosed with blood cancers, there were 2,636 (58%) males and 1,930 (42%) females. This equates to an age-standardised rate of 46 cases per 100,000 in males and 31 cases per 100,000 in females. There are notable differences in blood cancer incidence by sex according to the different sub-categories, as discussed in the various sections of this Focus.

## Blood cancer age-standardised incidence rates have been increasing at 1% annually until 2020 as age-standardised mortality declines by more than 2% annually.

Blood cancer age-standardised incidence rates showed a steady increase from 2005 to 2020, with an average annual change of +1% (95% CI: 0.6%, 1.4%). Between 2020 and 2022, a decline of -4.8% (95% CI: -11.4%, 2.2%) occurred, although this change is not statistically significant.

Over the past 15 years (2007–2022), mortality from blood cancers has declined steadily, at an average annual percent change in age-standardised

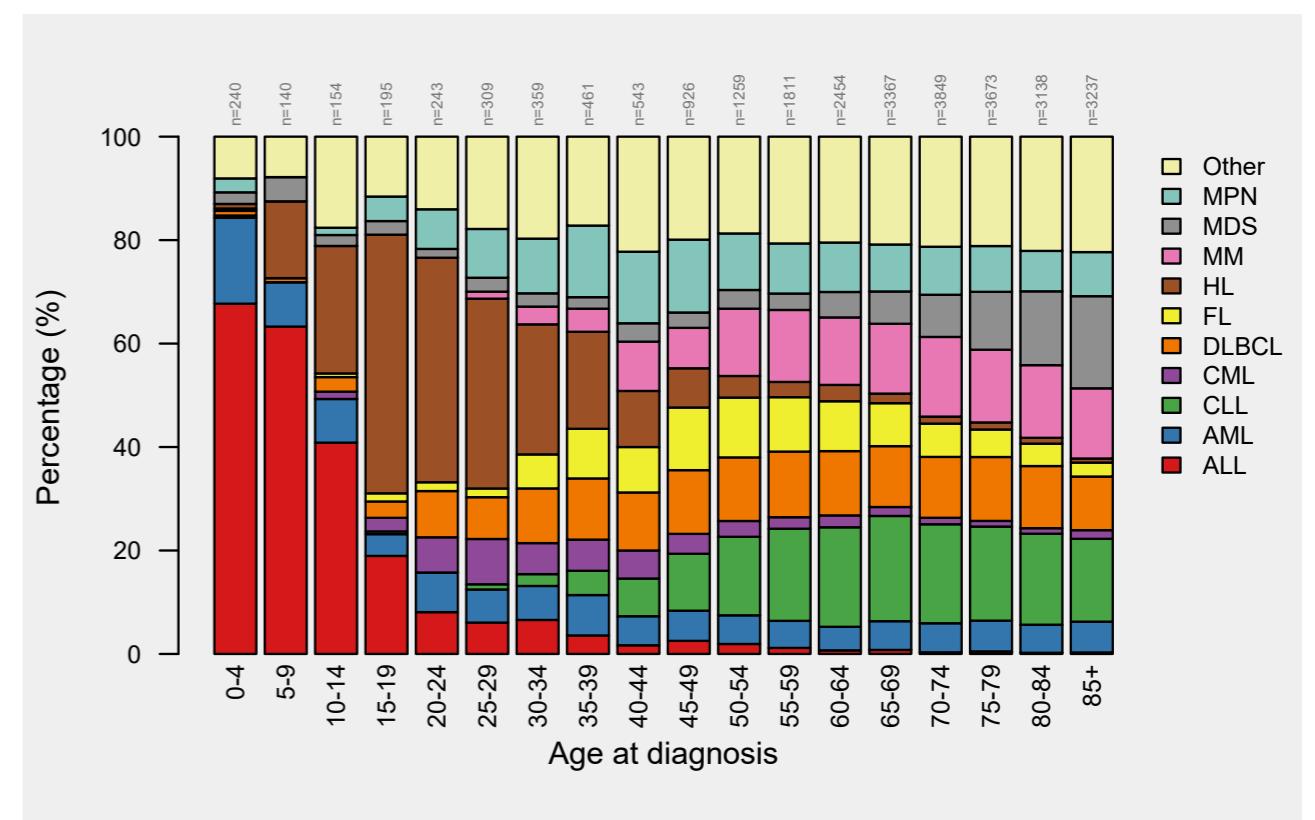
mortality rate of -2.2% (95% CI: -2.5%, -1.8%). The decline is seen more among females than males with an annual percent change of -2.4% (95% CI -3, -1.8%) in females and -2% (95% CI -2.3%, -1.6%) in males.

## Distribution of the blood cancer subtypes varies according to age.

Blood cancers show distinct patterns across age groups (Figure 53). Some blood cancers are more commonly diagnosed in young people, while others are more common in older age groups.

## The most common blood cancers among Victorians aged below 30 years is ALL and HL.

Together ALL and HL account for 66% of blood cancers diagnosed in Victorians aged under 30 years in 2022. Figure 53 indicates that between 2013 and 2022 among infants and young children under the age of five, ALL was the most frequently diagnosed type among the total 423 cancers in that age category. Among Victorians aged 15–34 years, HL was the most commonly diagnosed blood cancer. Among Victorians over 75, the most common blood cancers were plasma cell neoplasia, MDS and CLL.



**Figure 53:** Distribution (%) of new diagnoses of the selected major blood cancer types (and other) by age group, Victoria 2013–2022 (n: Absolute number).

# BLOOD CANCERS IN VICTORIA

## The most common blood cancers among Victorians aged over 30 years are PCM, DLBCL, MDS, and CLL.

Together PCM (15%), DLBCL (13%), MDS (10%) and CLL (13%) account for half of all blood cancers diagnosed in Victorians aged over 30 years in 2022.

## Five-year survival for Victorians continues to improve for all blood cancers.

The prognosis after a diagnosis of blood cancer varies according to its subtype, with five-year survival ranging from 30% to 93%. Figure 54 describes the trend in five-year survival over three time periods: 1982-1986, 1997-2001, and 2017-2021. It shows that for all blood cancers, five-year survival over this 35-year period has improved. Between time period 1 and 2, the most remarkable improvement in survival was seen for CML, demonstrating the impact of

targeted therapies such as tyrosine kinase inhibitors. During the most recent time period, significant improvement is seen in five-year survival for Victorians diagnosed with PCM. FL has the highest five-year relative survival, reaching 93.5%. Despite a 97% increase in five-year survival over the past 30 years, AML has the lowest five-year survival of all blood cancers at 29.9% (Figure 54).

## Nearly 18,000 Victorians are living with a blood cancer diagnosed in the past five years.

As of 1 January 2023, there were 17,928 Victorians living with or beyond a blood cancer diagnosed in the last five years. This includes 10,103 males (56%) and 7,825 (44%) females. In total, 0.7% of the Victorian population have been diagnosed with a blood cancer in the last 40 years (from 1 January 1983) and were alive on 1 January 2023.

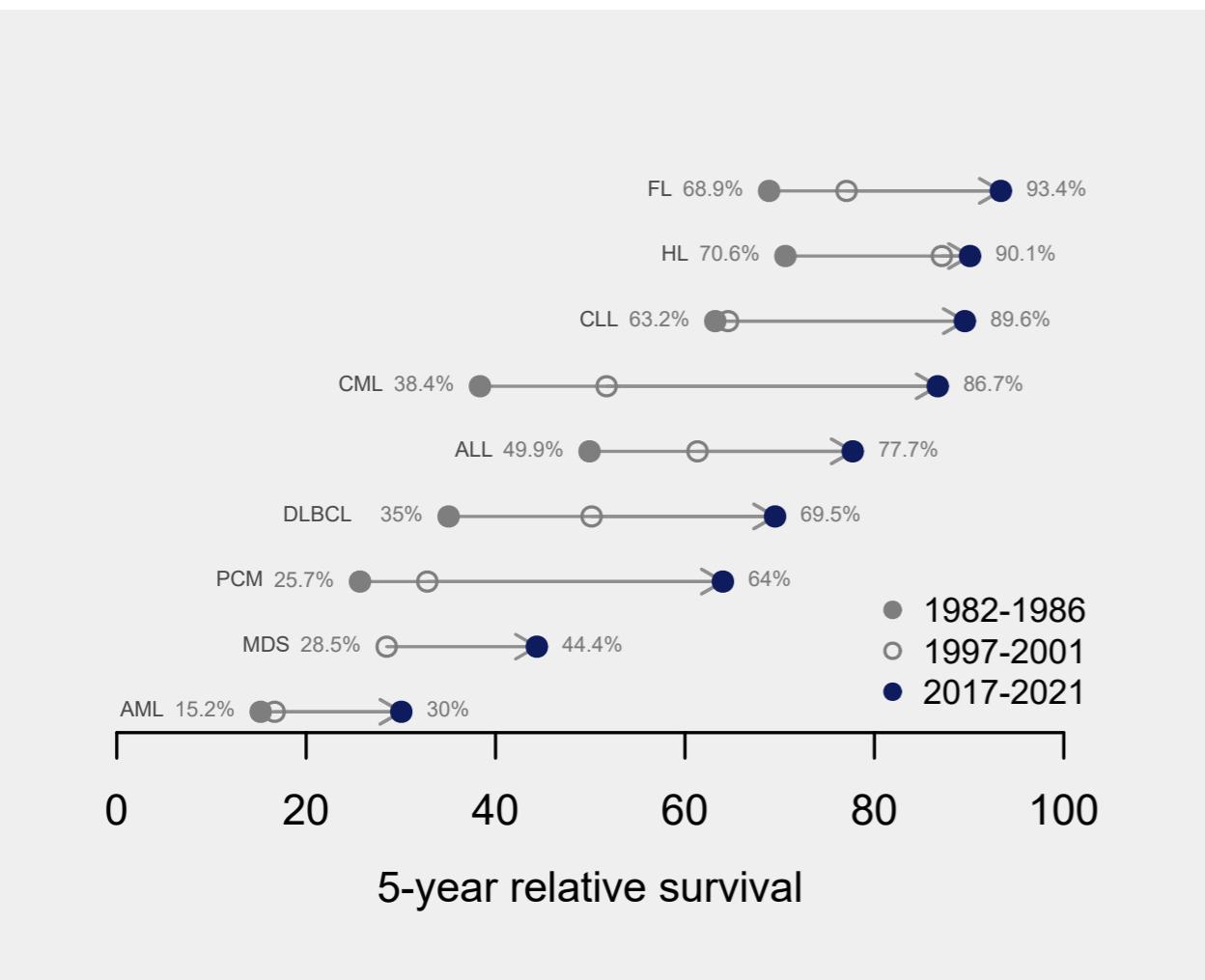


Figure 54: Five-year relative survival for selected blood cancers in the period 1982-1986, 1997-2001 and 2017-2021.

## Commonly Diagnosed Blood Cancers

### 1. Myeloid Blood Cancers

Myeloid blood cancers affect cells in the bone marrow and blood. They originate in the myeloid cells, which are responsible for producing granulocytic and related cells. The main myeloid blood cancers include AML, MDS, and MPNs, including CML. Myeloid cancers account for 28% of all blood cancers.

#### Acute Myeloid leukaemia (AML)

AML is an aggressive cancer that resemble immature myeloid cells in the bone marrow, disrupting the production of normal bone marrow, which normally generates red blood cells, platelets, and normal white blood cells that circulate in the peripheral blood. Patients affected with AML have severely suppressed red blood cells, platelets, and white blood cells (neutrophils) in the peripheral blood. The last few years have seen major breakthroughs in how the disease is understood and managed. There are multiple distinct subtypes of AML categorised according to their morphology, immunophenotype and genetic profile.<sup>32</sup>

Treatment of AML may include intensive chemotherapy, newer targeted therapies, as well as stem cell transplantation. New therapies included on the Pharmaceutical Benefits Scheme (PBS) in the last five years include midostaurin and gilteritinib (FLT3 inhibitors), gemtuzumab ozogomycin (CD33 targeting antibody conjugate), venetoclax (BCL2 inhibitor) and oral azacitidine (hypomethylating agent).

AML can arise without a prior blood cancer history (de novo) or may result from transformation of a prior myeloid blood cancer (secondary) or may also develop as a result of prior radiotherapy or chemotherapy for another cancer (therapy-related AML or "AML post cytotoxic therapy"). A summary of the blood cancers which have transformed to AML is shown in Figure 55.

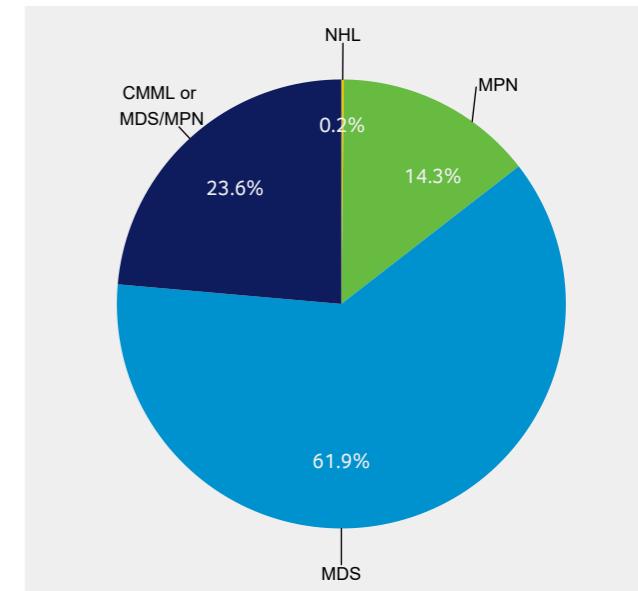


Figure 55: Distribution of blood cancers which have transformed to AML, 2015-2022.

**Incidence and mortality:** AML is a blood cancer associated with increasing age. Between 1982 and 2022, 7,873 Victorians have been diagnosed with AML. In 2022, the median age at diagnosis of AML was 71 years (IQR: 59-79 years). The age-standardised incidence rate of AML in 2022 was 2.6 cases per 100,000. In Victoria in 2022, 178 males and 131 females were diagnosed with AML, with an age-standardised incidence rate of 2.9 and 2.4 cases per 100,000 respectively. The trend in AML crude incidence since 1982 is shown in Figure 56A. Since 1982, the annual percent change in AML age-standardised incidence rate is +0.5% (95% CI: 0.2, 0.7).

In 2022, 166 Victorians died from AML (100 males, 66 females) at an age-standardised mortality rate of 1 death per 100,000. Since 2008, the crude mortality rate has fallen (Figure 56B). Between 2007-2014 mortality declined at an average annual rate of 0.7% (95% CI: -4.1%, 2.9%), although this change is not statistically significant. A significant reduction in annual mortality has been seen between 2014-2018 (-14.7% [95% CI: -26.1%, -1.6%]), with a stabilising in mortality over the last four years.

**Survival and prevalence:** Trends in five-year survival by age groups is shown in Figure 56C. Relative survival in the period 2017-2021 varies from 10% (95% CI: 8%, 13%) in those aged over 70 years to 62% (95% CI: 57%, 66%) in those aged under 60 years. One-year relative survival for AML cases transformed from MDS

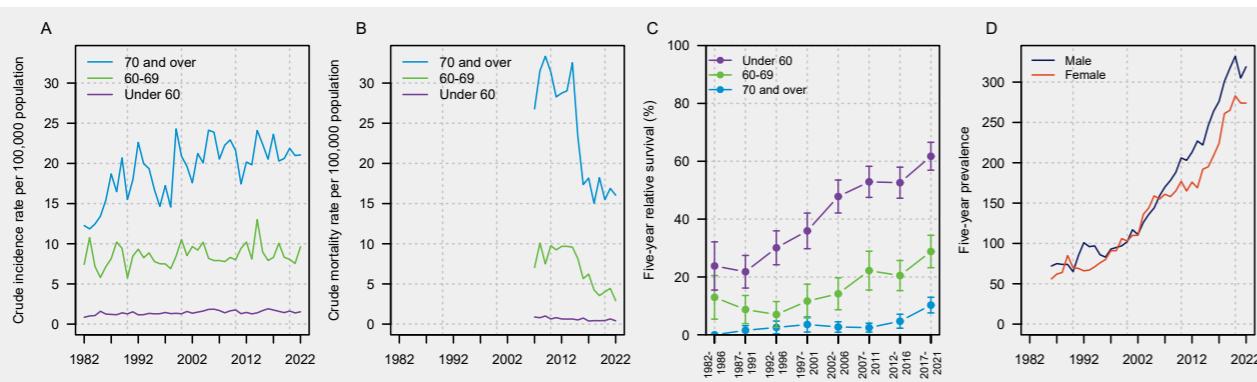


is 20.6% (95% CI: 15.1%, 26.2%), and from CMML or MDS/MPN is 30.5% (95% CI: 20.0%, 40.1%). Three-year relative survival for AML cases transformed from MDS is 7.5% (95% CI: 3.5%, 11.5%), and from CMML or MDS/MPN is 18.6% (95% CI: 9.1%, 28.1%). Survival estimates for those transforming from MPN and NHL to AML cannot be reliably calculated due to low numbers involved.

Improved survival likely reflects advances in supportive care, earlier diagnosis, improvements in therapeutic options and improvements in haemopoietic stem cell transplantation. Significant advances have also been

made in the genetic understanding of the disease, enabling patient access to more targeted treatment approaches (e.g. FLT3 inhibitors). Increased availability of clinical trial options and improved monitoring of residual disease are other notable advances in the last decade for patients with AML.

Five-year prevalence of AML has increased by 68% over the past two decades, from 221 people to 593 people alive five years after a diagnosis of AML. There are 274 females and 319 males currently living with, or in remission from, AML diagnosed five years prior to 31 December 2022 (Figure 56D).



**Figure 56:** Acute Myeloid Leukemia (AML) trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

## BLOOD CANCERS IN VICTORIA

### Myelodysplastic Syndromes (MDS)

MDS, also referred to as myelodysplasia, are blood cancers that affect the production and function of normal blood cells that are usually produced in the bone marrow. This can lead to a decreased number of red blood cells (causing anaemia), white blood cells (causing leukopenia with increased risk of infection) and platelets (causing thrombocytopenia with increased risk of bleeding). There are several subtypes of MDS that can be classified depending on the morphology, genetics, blood count deficiency and proportion of immature “blast” cells in the bone marrow. Because of changes to the classification of MDS, incidence data is only reported for the period 2000–2022 and mortality data from 2008.

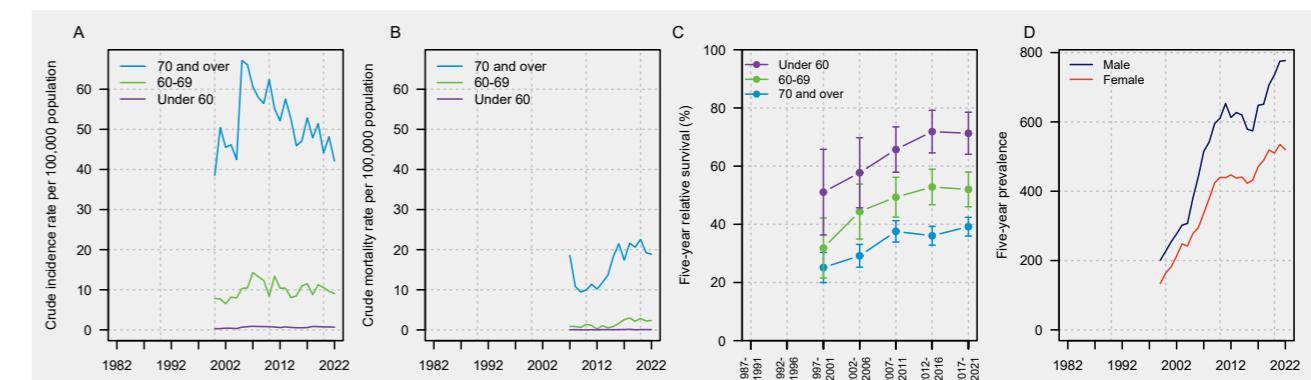
**Incidence and mortality:** MDS, like AML, is a blood cancer associated with increasing age. Between 2000 and 2022, 8,167 Victorians have been diagnosed with MDS. In 2022, 425 Victorians were diagnosed with MDS at an age-standardised incidence rate of 2.6 cases per 100,000. The median age at diagnosis of MDS is 77 years (range 5–101 years, IQR: 70–84 years). MDS disproportionately affects males. In Victoria in 2022, 259 males and 166 females were diagnosed with MDS, with an age-standardised incidence rate of 3.3 and 2.0 cases per 100,000 respectively. Trend in MDS crude incidence since 2000 is shown in Figure 57A. Between 2007–2014, there has been a decline in the age-standardised rate, with an annual percentage change of -4.5% (95% CI: -7.1%, -1.9%),

following which incidence rates have remained steady at an annual percent change of +0.4% (95% CI: -2.2%, -1.3%), although this change is not statistically significant.

In 2022, 166 Victorians (103 males and 63 females) died from MDS at an age-standardised mortality rate of 0.8 deaths per 100,000. Since 2008, the MDS crude mortality rate has increased among those aged over 60 years (Figure 57B). The age-standardised mortality rate has increased steadily over the period 2009–2018, with an annual percent change of +13.8% (95% CI: 7.7%, 20.3%). Between 2018–2022 mortality has stabilised.

**Survival and prevalence:** Five-year survival after a diagnosis of MDS has improved by 33% over the past 15 years, from 33% (95% CI: 30–37%) in the period 2002–2006 to 44% (95% CI: 42%, 47%) in 2017–2021. Five-year survival for those aged under 60 years is now at 71% (95% CI: 64%, 78%) (Figure 57C). Survival decreases for patients with MDS transformed to AML. As with AML, improving survival likely reflects earlier diagnosis, and improved management of cytopenia and supportive care.

Five-year prevalence of MDS has increased by 22% over the past decade, from 1,060 to 1,297 Victorians alive five years after a diagnosis of MDS. There are 777 males and 520 females currently living with, or in remission from, MDS diagnosed five years prior to 31 December 2022 (Figure 57D).



**Figure 57:** Myelodysplastic syndromes (MDS) trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

# BLOOD CANCERS IN VICTORIA

## Myeloproliferative Neoplasms (MPNs)

MPNs are a heterogeneous group of myeloid blood cancers characterised by the abnormal proliferation of one or more types of blood cells, including red blood cells, white blood cells, platelets or bone marrow stroma. This overproduction of cells can lead to various complications and symptoms. CML, polycythaemia vera (PV), essential thrombocythaemia (ET), and primary myelofibrosis (PMF) are the four classic types of myeloproliferative neoplasms. From 1982 to 2022, there have been 3,078 diagnoses of CML, 2,797 diagnoses of PV, 2,298 diagnoses of ET and 1,558 diagnoses of PMF among Victorians. While our primary emphasis in this Focus is on CML, comprehensive details regarding other MPNs can be requested from the Victorian Cancer Registry.

## Chronic Myeloid Leukaemia (CML)

CML is classified as a myeloproliferative neoplasm and is a slow-progressing form of blood cancer that affects myeloid cells. CML is characterised by the Philadelphia chromosome, that juxtaposes the *BCR* and *ABL1* genes to form *BCR:ABL1* gene fusion. This fusion, in turn, triggers an overproduction of mature white blood cells originating from the bone marrow. It is considered a rare blood cancer.

**Incidence and mortality:** Between 1982 and 2022, there were 3,078 Victorians diagnosed with CML. The median age at diagnosis of CML is 60 years (range 21–97, IQR: 44–72 years). The age-standardised incidence rate of CML in 2022 was 0.9 cases per 100,000. In 2022, 92 Victorians were diagnosed with CML (48 males and 44 females), with an age-

standardised incidence rate of 1.0 and 0.9 cases per 100,000 respectively. Trend in CML crude incidence since 1982 is shown in Figure 58A. Since 1982, there has been an annual percent change of +0.3% (95% CI: -0.1%, 0.7%) in the age-standardised rate of CML.

In 2022, 13 Victorians died from CML (5 males, 8 females) at an age-standardised mortality rate of 0.08 case per 100,000. Since 2008, mortality rates have declined at an annual rate of 5.7% (95% CI: -8.8%, -2.5%) with crude mortality rates indicating that the decline was most evident in Victorians aged 70 years and over (Figure 58B).

**Survival and prevalence:** Over the past 35 years, there has been a 126% increase in five-year survival, from 38% (95% CI: 25%, 52%) in 1982–1986 to 87% (95% CI: 83%, 91%) in 2017–2021. Five-year survival in the period 2017–2021 ranges from 63% in those aged 70 and above, to 95% in those aged under 60 years at diagnosis (Figure 58C). This significant improvement is in large part the result of tyrosine kinase inhibitors (TKIs), such as Imatinib (Glivec), that were developed to specifically target the abnormal protein produced by the *BCR-ABL1* gene fusion that drives CML, which revolutionised therapy for this condition. TKIs continue to show remarkable efficacy in controlling CML.

Five-year prevalence of CML has doubled over the past two decades, from 225 to 454 Victorians alive five years after a diagnosis of CML. There are currently 254 males and 200 females currently living with, or in remission from, CML diagnosed five years prior to 31 December 2022 (Figure 58D).

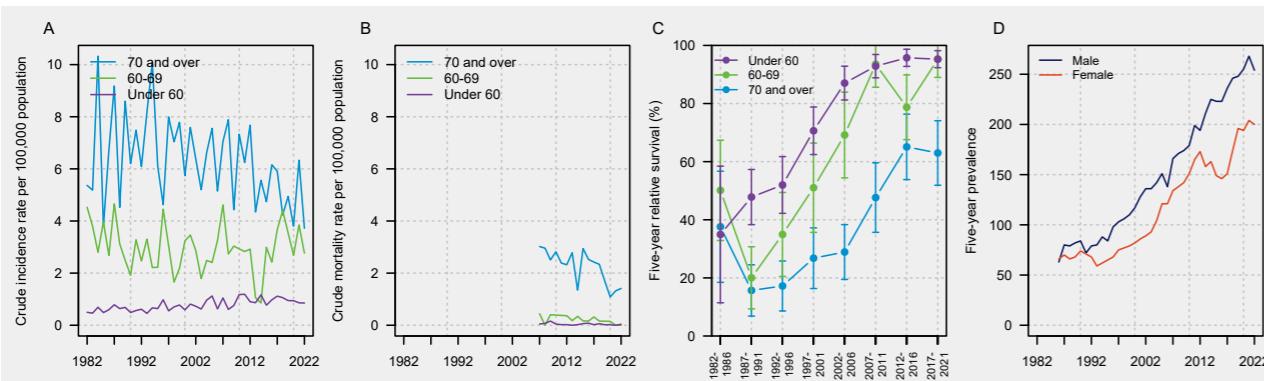


Figure 58: Chronic myeloid leukaemia (CML) trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

## 2. Plasma Cell Myelomas (PCMs) including Multiple Myeloma (MM)

Plasma cell myelomas (PCMs) are forms of blood cancer that arise from the antibody-producing plasma cells in the body. The most common form of PCM is multiple myeloma, a chronic blood cancer caused by abnormal plasma cells in the bone marrow, that can weaken bones, affect production of red cells, elevate calcium levels and cause problems in other body organs such as the kidney. In Victoria, multiple myeloma accounts for 97% of plasma cell myelomas diagnosed between 2018 and 2022 (Figure 50).

**Incidence and mortality:** Between 1982 and 2022 there were 14,229 Victorians diagnosed with PCM. PCM is considered one of the more common blood cancers, with a crude incidence rate of 9.7 cases per 100,000 persons. The age-standardised incidence rate of PCM in 2022 was 4.5 cases per 100,000. The median age at diagnosis of PCM is 73 years (range: 35–99 years, IQR: 65–81 years). In Victoria in 2022, 641 people (380 males and 261 females) were diagnosed with PCM, with an age-standardised incidence rate of 5.6 and 3.6 cases per 100,000 respectively. Figure 59A demonstrates the extent to which new diagnoses of PCM have increased over the past four decades, particularly among older Victorians. The age-standardised incidence rate has increased from 2.5 cases per 100,000 persons in 1982 to 4.5 cases per 100,000 in 2022, or an average annual percent change between 1982–2018 of +2.2% (95% CI: 2%, 2.5%), with a plateau between 2018–2022.

In 2022, 238 Victorians died from PCM (142 males, 96 females) at an age-standardised mortality rate of 1.4 deaths per 100,000. Mortality rates continue to decline at a constant rate of 2.7% (95% CI: -3.4%, -1.0%) per year over the past 15 years (2007–2022) with the greatest decline seen in Victorians aged 60 to 69 years, which may reflect the development of newer and more effective therapies for treatment of this disease (Figure 59B).

**Survival and prevalence:** Over the past 35 years, there has been a 149% increase in five-year survival following a diagnosis of PCM, from 26% (95% CI: 18%, 33%) in 1982–1986 to 64% (95% CI: 62%, 66%) in 2017–2021. Five-year relative survival ranges from 52% in those aged 70 years and above to 82% in those aged under 60 years at diagnosis (Figure 59C). This has been attributed to more effective use of chemotherapy, targeted therapies, and immunotherapies. Drugs such as proteasome inhibitors and monoclonal antibodies have improved response rates and overall survival.

Five-year prevalence of PCM has increased by 211% over the past two decades, from 795 to 2,474 Victorians alive five years after a diagnosis of PCM. There are currently 1,453 males and 1,021 females living with, or in remission from, PCM diagnosed five years prior to 31 December 2022 (Figure 59D).

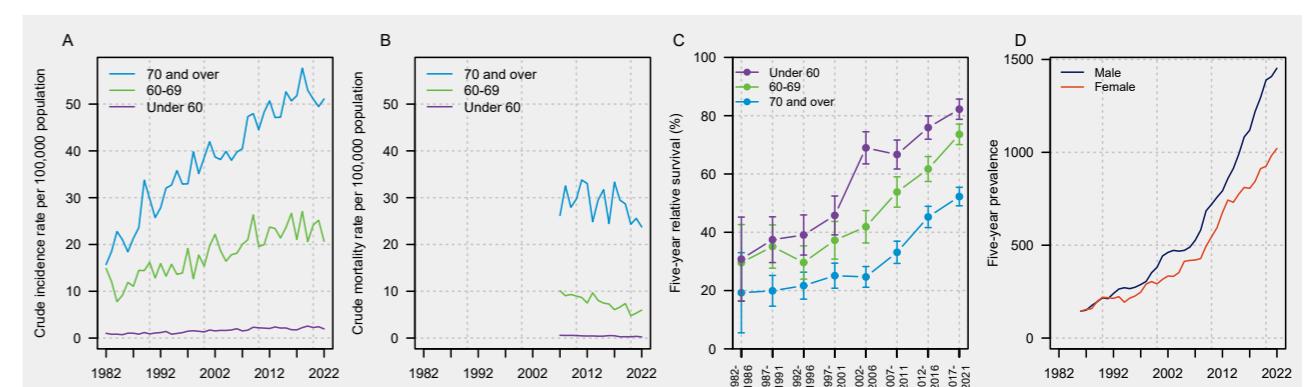


Figure 59: Plasma cell myeloma trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

# BLOOD CANCERS IN VICTORIA

## 3. B, T or NK Lymphoid Cell Blood Cancers

Lymphoid cell blood cancers are cancers that originate from the lymphoid cells that are specific types of white blood cells. These cancers can arise from the bone marrow or other lymphoid tissues in the body and can be broadly categorised into leukaemias and lymphomas.

### Acute Lymphoblastic Leukaemia (ALL)

ALL is a blood cancer that affects the bone marrow and lymphoid tissues. Historically, subtypes of ALL were originally categorised according to their morphology, but further sub-categorisation is now performed based on the proteins expressed on the leukaemia cells (immunophenotype) and genetics. ALL can manifest as leukaemia when immature leukaemia cells rapidly accumulate in the bone marrow that disrupts normal blood cell production, or as lymphoma when ALL cells accumulate in lymph nodes or other lymphoid tissues, causing swelling and potential organ involvement.

**Incidence and mortality:** Between 1982 and 2022 there were 3,516 Victorians diagnosed with ALL. In 2022, there were 69 males and 52 females diagnosed with ALL at a crude incidence rate of 1.8 cases per 100,000 (Figure 60A). The age-standardised incidence rate of ALL in 2022 was 2.5 cases per 100,000. The median age at diagnosis of ALL is 14 years (range: 0-86 years, IQR: 4-41). There are proportionately more males diagnosed with ALL than females (2.9 vs 2.1 cases per 100,000 respectively). Over the past four decades, the age-standardised rate of ALL has shown an average annual percentage change of +0.6% (95% CI: 0.2%, 1.0%). ALL is the most common blood cancer seen among Victorians aged less than 15 years (Figure 53).

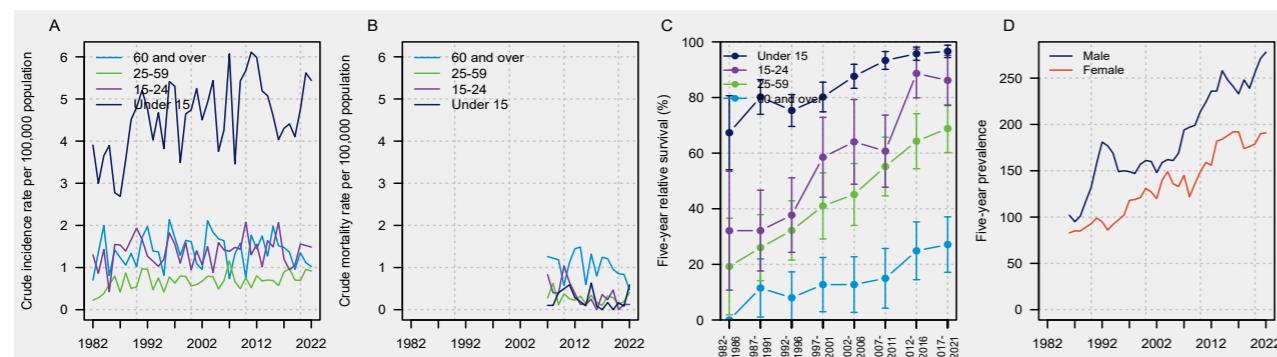


Figure 60: Acute lymphoblastic leukaemia trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

In 2022, 28 Victorians died from ALL (10 males, 18 females) at an age-standardised rate of 0.4 deaths per 100,000. Since 2008, the crude mortality rate has declined across all age groups (Figure 60B). The age-standardised mortality rate has declined at a constant rate, with the annual percent change of 4.2% (95% CI: -7.6%, -0.6%) over the period 2007-2022. The decline in mortality was seen mainly in males compared to females (-7.6% vs +1% annual percent change) over this period, but this was not statistically significant for females.

**Survival and prevalence:** Over the past 35 years, there has been a 56% increase in five-year survival after diagnosis of ALL, from 50% (95% CI: 40%, 60%) in 1982-1986 to 78% (95% CI: 74%, 81%) in 2017-2021. Notably, five-year relative survival ranges from only 23% in those aged 60-69 years to 97% for those aged under 15 years at diagnosis (Figure 60C). During this period, five-year survival among those aged under 15 years has improved from 67% (95% CI: 54%, 81%) to 97% (95% CI: 94%, 99%).

The prevalence of people who have had an ALL diagnosis continues to increase as a result of high remission rates achieved through advances in treatment protocols, including the development of more effective chemotherapy regimens and development of targeted therapies. Improvements in the supportive care for patients undergoing treatment, as well as improvements in access and outcomes of haematopoietic stem cell transplantation, and the advent of newer immunotherapies are also likely to have contributed to improvement in overall survival. There has been a 75% increase in five-year prevalence of ALL over the past two decades, from 268 to 469 Victorians alive five years after a diagnosis of ALL. There are currently 278 males and 191 females living with, or in remission from, ALL diagnosed five years prior to 31 December 2022 (Figure 60D).

### Hodgkin Lymphoma (HL)

HL, previously known as Hodgkin's disease, is a type of lymphoma that originates from abnormal B-cells and is morphologically characterised by the unique appearance of "Reed-Sternberg cells" in lymphoid tissue such as lymph nodes that are affected by disease. HL generally displays a more predictable behaviour and response to treatment than some other forms of non-Hodgkin lymphoma (NHL). HL accounts for approximately 7% of all lymphomas and has a bi-modal age distribution. While absolute number of cases diagnosed in young people each year is low, it is the second most commonly diagnosed blood cancer among Victorians aged 0-14 years and the most commonly diagnosed blood cancer in those aged 15-30 years (Figure 53).

**Incidence and mortality:** Between 1982 and 2022 there were 5,746 Victorians diagnosed with HL. The crude incidence rate in 2022 was 3.3 cases per 100,000 with rates slightly higher among older Victorians (Figure 61A). The age-standardised incidence rate of HL in 2022 was 3.1 cases per 100,000. The median age at diagnosis of HL is 36 years (range: 6-93 years, IQR: 23-61). There are proportionately more males diagnosed with HL than females. In 2022, 130 males and 88 females were diagnosed at an age-standardised rate of 3.6 and 2.6 cases per 100,000 respectively. Since 1982, the age-standardised rate has shown an average annual percentage change of +1.2% (95% CI: 0.9%, 1.5%).

In 2022, 19 Victorians died from HL (9 males, 10 females) at an age-standardised mortality rate of 0.1 deaths per 100,000. Mortality rates continue to decline at a constant rate, with an annual percent change of -5.4% (95% CI: -9.1%, -1.5%) over the

period 2007-2022. Change in the crude mortality rate by age group is shown in Figure 61B.

**Survival:** Five-year survival after a diagnosis of HL reached 90% (95% CI: 88%, 92%) for the first time in the period 2017-2021. This is an increase of 28% from the period 1982-1986, when five-year survival was 71% (95% CI: 64%, 77%). As demonstrated in Figure 61C, patients can live following a diagnosis of HL for an extended period, particularly if diagnosed at or under 70 years of age. For Victorians aged between 15-24 years, five-year survival after a diagnosis of HL has reached 99% (95% CI: 98%, 101%). Treatment of HL, that often includes chemotherapy and radiation therapy, has been highly effective, with many patients achieving complete remission and cure after treatment. The development of combination therapy regimens has significantly improved outcomes over time. While haemopoietic stem cell transplant has been used for patients with poor prognosis diseases, more recently, targeted therapies such as Brentuximab and immune checkpoint inhibitors have also been approved for the treatment of relapsed or refractory HL, further improving survival.

Over the past two decades, there has been an 87% increase in five-year prevalence for people that have received a HL diagnosis, from 526 to 986 Victorians alive five years after a HL diagnosis. There are currently 556 males and 430 females living with, or in remission from, HL diagnosed five years prior to 31 December 2022 (Figure 61D).

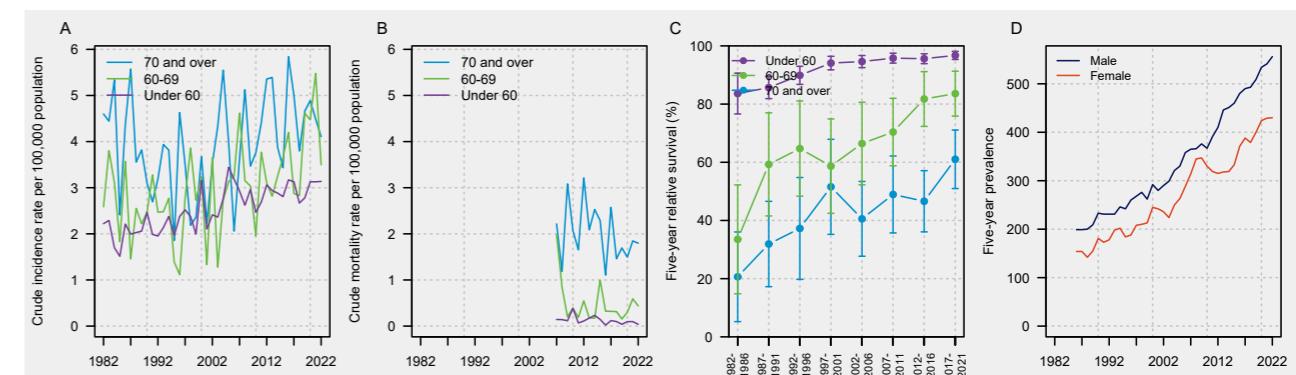


Figure 61: Hodgkin lymphoma trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

# BLOOD CANCERS IN VICTORIA

## Non-Hodgkin Lymphoma (NHL)

NHL encompasses a diverse group of lymphoid cancers with numerous sub-categories of disease. This section focuses on two common NHL subtypes but, since 1982, Victorians have also been diagnosed with other important subtypes of disease: Lymphoplasmacytic lymphoma (1,894 cases), Mantle Cell lymphoma (1,715 cases), and Burkitt lymphoma (485 cases). These subtypes contribute to the overall diversity of B-cell lymphomas, each presenting with distinct characteristics requiring specific clinical considerations.

### - Diffuse Large B-Cell Lymphoma (DLBCL)

DLBCL is the most prevalent type of NHL. DLBCL accounts for 20% of all lymphomas diagnosed between 2018 and 2022. It is a more aggressive form of blood cancer characterised by the rapid growth of abnormal large B-cells that leads to the formation of tumours in lymph nodes and other tissues. While it is an aggressive type of NHL, advances in treatments, including targeted therapies and in particular immunotherapy, have improved the outlook for many patients diagnosed with DLBCL.

As with AML, since 2015, a number of DLBCL cases have developed or transformed from other preceding blood cancers, with most cases being previously diagnosed with another form of NHL (n=497, 99.5%).

**Incidence and mortality:** Between 1982 and 2022 there were 15,313 Victorians diagnosed with DLBCL. The median age at diagnosis of DLBCL is 71 years (range 14-94, IQR: 60-78 years). The age-standardised incidence rate of DLBCL in 2022 was 4.5 cases per 100,000. In 2022, 560 Victorians were diagnosed with DLBCL (309 males and 251 females),

with an age-standardised incidence rate of 5.3 and 3.8 cases per 100,000 respectively. Trend in DLBCL crude incidence since 1982 is shown in Figure 62A. Between 1982-1993, the age-standardised incidence rate of DLBCL increased with an average annual percent change of 4.1% (95% CI: 2.6%, 5.6%). Since then, DLBCL incidence has remained stable.

In 2022, 232 Victorians (129 males and 103 females) died from DLBCL, at an age-standardised mortality rate of 1.3 deaths per 100,000. Since 2008, there has been a modest decline in crude mortality rates following a diagnosis of DLBCL with higher rates recorded in those aged over 70 years (Figure 62B). An annual percent change in age-standardised mortality rate of -1.5% (95% CI: -2.2%, -0.7%) has been recorded over the period 2007-2022, with similar rates of decline among both males and females.

**Survival and prevalence:** Five-year survival after a diagnosis of DLBCL has doubled over the last 35 years, from 35% (95% CI: 29%, 42%) in the period 1982-1985 to 70% (95% CI: 67%, 72%) in the most recent period, from 2017-2021. Figure 62C shows trend in five-year survival, demonstrating a plateauing over the past decade. Of those cases diagnosed with DLBCL from a transformed NHL, 77% (95% CI: 71%, 82%) were alive one-year and 64% (95% CI: 57%, 71%) were alive three-years after this diagnosis. There has been a doubling of five-year prevalence for DLBCL over the past two decades, with 1,049 to 2,104 Victorians alive five years after a diagnosis of DLBCL. There are currently 1,181 males and 923 females living with, or in remission from, DLBCL diagnosed five years prior to 31 December 2022 (Figure 62D).

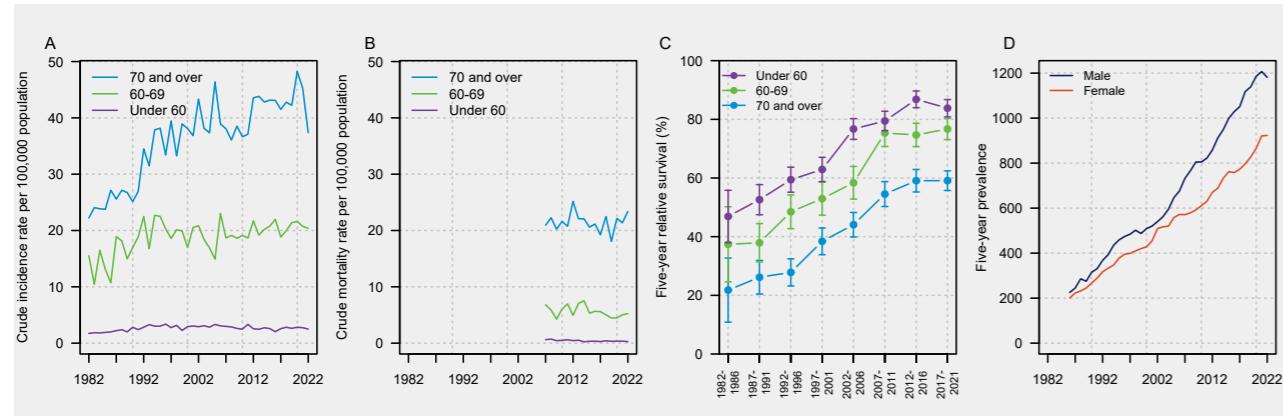


Figure 62: Diffuse large B-Cell lymphoma trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

“

“Probably one of the biggest success stories in cancer is the ability to cure children with leukaemia.

Dr Omer Gilan



# BLOOD CANCERS IN VICTORIA

## - Follicular Lymphoma (FL)

FL is a slow-growing and less aggressive form of NHL compared to DLBCL, that arises from B-cells in the lymphoid system. It is generally first identified by abnormal lymph node enlargement and, occasionally, involvement of the bone marrow.

**Incidence and mortality:** Increasingly, FL is one of the more commonly diagnosed blood cancers. Between 1982 and 2022 there have been 8,708 Victorians diagnosed with FL. The median age at diagnosis of FL is 66 years (range 32-94 years, IQR: 55-74 years). The age-standardised incidence rate of FL in 2022 was 3.0 cases per 100,000. The crude incidence rate of FL is increasing across all age groups shown in Figure 63A, and in 2022 was 5.4 cases per 100,000 in males and 4.7 cases per 100,000 females. The age-standardised incidence rate is marginally higher in males compared to females (3.4 vs 2.7 cases per 100,000 respectively). Age-standardised incidence rates have shown an average annual percentage change of 2.6% between 1982-2004 and has, since then, remained stable.

In 2022, 54 Victorians (34 males, 20 females) died from FL at an age-standardised mortality rate of 0.3

deaths per 100,000. Mortality rates over the past 14 years declined rapidly between 2007-2015 (annual percent change of -8.8% [95% CI: -14.2%, -3%]) and have stabilised in the most recent period from 2015-2022 (annual percent change of +1.7% [95% CI: -5.2%, 9.2%]) (Figure 63B).

**Survival and prevalence:** Five-year survival after a diagnosis of FL has increased 36% over the past 35 years, from 69% (95% CI: 59%, 79%) in the period 1982-1986 to 93% (95% CI: 91%, 95%) in the most recent period of 2017-2021. Survival improvement has been seen across all age groups (Figure 63C). While this may reflect identification of patients with earlier stage disease with improved diagnosis, the development of newer immunotherapy and therapeutic approaches will have contributed to the increase in overall survival.

Five-year prevalence of patients with a FL diagnosis has almost doubled over the past two decades, from 809 to 1,582 Victorians alive five years after a diagnosis of FL. There are currently 806 males and 776 females living with, or in remission from, FL diagnosed five years prior to 31 December 2022 (Figure 63D).

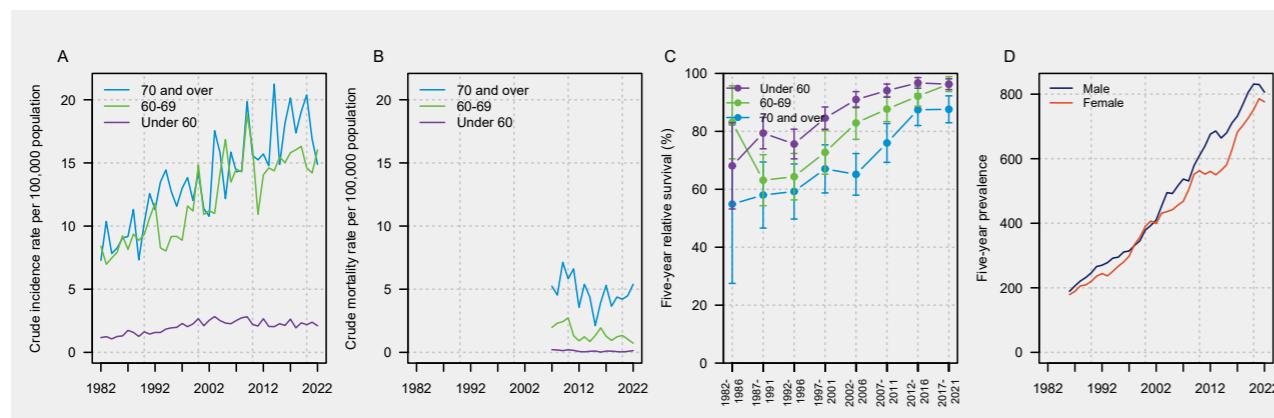


Figure 63: Follicular Lymphoma (FL) trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

## - Chronic Lymphocytic Leukaemia (CLL) / Small Lymphocytic Lymphoma (SLL)

CLL and SLL are related forms of indolent NHL that are characterised by an accumulation of mature but abnormal B-lymphocytes (B cells). CLL affects bone marrow and blood, while SLL primarily affects lymph nodes and lymphoid tissues. They are considered different expressions of the same disease, and management is often based on the predominant location of disease. In this section they have been combined and referred to as CLL. CLL is considered a disease of ageing.

**Incidence and mortality:** Between 1982 and 2022 there were 13,342 Victorians diagnosed with CLL. The median age at diagnosis of CLL is 71 years (range 32-98 years, IQR: 63-69 years). The age-standardised incidence rate of CLL in 2022 was 4.0 cases per 100,000. The sharp increase in crude incidence of CLL between 2014 and 2018 is artificial, reflecting increased detection of CLL by the Victorian Cancer Registry following introduction of E-Path, a system which automated notification of cancers from pathology laboratories (Figure 64A). The crude incidence rate in 2022 was 8.2 cases per 100,000. There are proportionately more males diagnosed with CLL than females. Of those diagnosed with CLL in 2022, there were 355 (66%) males and 186 (35%) females, at an age-standardised rate of 5.6 and 2.7 cases per 100,000 respectively. After an initial annual increase of 3.3% in age-standardised incidence between 1982-1996, incidence rates have stabilised. An annual percent change of +12.6% (95% CI: 6.7%,

18.9%) between 2012-2017 was followed by an annual percent change of -7.8% (95% CI: -10.8%, -4.5%) between 2017-2022.

In 2022, 102 Victorians (62 males, 40 females) died from CLL at an age-standardised mortality rate of 0.5 deaths per 100,000. The age-standardised mortality rate following a diagnosis of CLL has declined from 1.0 deaths per 100,000 in 2007, equating to an average percent change of -4.6% (95% CI: -6.3%, -2.8%) between 2007-2022. This decline is seen mainly in Victorians aged over 70 years (Figure 64B). However, the results should be interpreted with caution, given the large increase in notifications in 2014 of cases which, in previous years were likely not reported to the Victorian Cancer Registry.

**Survival and prevalence:** Over the past 35 years, five-year survival has improved across all age groups (Figure 64C). It has increased 42%, from 63% (95% CI: 54%, 72%) in 1982-1986 to 90% (95% CI: 88%, 91%) in 2017-2021. The steep incline in prevalence seen between 2012-2017 reflects the dramatic increase in CLL incidence in cases which are likely to have had a delayed notification to the VCR.

Five-year prevalence of CLL has increased by 144% over the past 20 years, from 1,046 to 2,548 Victorians alive five years after a diagnosis of CLL. For every three males living with CLL, there are two females currently living with the disease. There were 1,615 males and 933 females living with, or in remission from, CLL who were diagnosed five years prior to 31 December 2022 (Figure 64D).

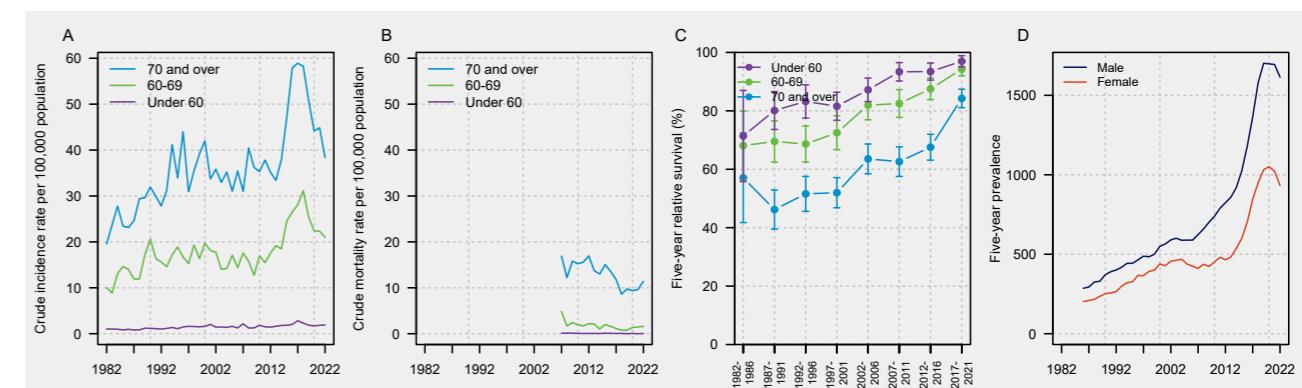


Figure 64 Chronic lymphocytic leukaemia/small lymphocytic lymphoma trend in (A) age-standardised incidence and (B) mortality rates (C) five-year survival by age groups; and (D) five-year prevalence among males and females.

We acknowledge the assistance provided in the writing of this Special Issue by Professor Andrew Wei, Consultant Haematologist, Peter MacCallum Cancer Centre (PMCC) and Royal Melbourne Hospital (RMH) and Dr Ashley Ng, Clinical Haematologist, PMCC and RMH

# APPENDICES



Dr Nora Lee, Haematologist at Bendigo Hospital  
and Peter MacCallum Cancer Centre

# APPENDIX 1: ABOUT THE VICTORIAN CANCER REGISTRY

The goal of the Victorian Cancer Registry is to collect complete and accurate data on all Victorians diagnosed with cancer. This data is used to describe trends in cancer incidence, mortality, stage of disease at diagnosis, and survival. It also provides a tool to identify changes and variation in patterns of cancer among subgroups defined by geography, demography, and social characteristics. Made available to government, researchers and the wider community, our data is continually being used to guide cancer prevention and control interventions to improve cancer outcomes for Victorians.

Data collection began from six public hospitals in Melbourne on 1 January 1940. The registry grew rapidly following introduction of the Cancer (Cancer Reporting) Act 1980, which mandated all hospitals and pathology laboratories to report any patient with cancer.<sup>34</sup> By 1982, the Victorian Cancer Registry became a population-based cancer registry recording all Victorians diagnosed and living with cancer.

The Improving Cancer Outcomes Act 2014 (the Act) established a modern, flexible, and principle-based legislative framework that provides for the collection, use and disclosure of cancer and cancer screening information.<sup>35</sup>

The Improving Cancer Outcomes (Diagnosis Reporting) Regulations 2015 accompany the Act and prescribe the types of cancer – or precursors to cancer – to be reported, services that must notify, and the timeframe in which a report must be made.<sup>36</sup>

## Cancer registration

The data collected by the Victorian Cancer Registry is specified in *User Guide: Cancer Registration Submission to the Victorian Cancer Registry*. The User Guide states that all melanoma skin cancers must be reported to the Victorian Cancer Registry. In terms of non-melanoma skin cancers, all in situ and malignant other skin cancers (e.g. Merkel cell carcinoma, Kaposi sarcoma) of any site must be registered with the Victorian Cancer Registry, but only certain squamous cell carcinomas (SCC) must be registered. Less common non-melanoma skin cancers are registered as “other skin cancers.” The registry also registers some selected uncertain behaviour tumours of the central nervous system (CNS) and brain, ovary, urinary tract and haemopoietic system, and benign CNS tumours. These are not routinely reported in our publications.

The cancer registration process is described in Figure 65. In 2022, the Victorian Cancer Registry implemented the Rapid Case Ascertainment (RCA) module of the E-Path plus software to flag cancer pathology registrations meeting particular parameters set by three designated clinical trials. The aim of the project was to improve the timeliness of identifying Victorians eligible for clinical trials based on their cancer type and genetic markers. The study was finalised in October 2023, and results will be published in 2024.

## Cancer notifiers

The Victorian Cancer Registry is notified of patients with cancer by day procedure centres, hospitals (denominational, privately-owned, and public), public health services, radiation therapy centres, pathology services and prescribed registries.

The Victorian Cancer Registry receives notifications of cancer from 262 hospitals, 11 radiation therapy centres, BreastScreen Victoria and 26 pathology laboratories. The Improving Cancer Outcomes (Diagnosis Reporting) Regulations 2015<sup>36</sup> state that a cancer must be reported by hospitals within 60 days of diagnosis and by pathology services within 30 days of identifying the cancer, or cancer precursor.

Our staff work cooperatively with the other seven population-based cancer registries across Australia to ensure that the registry captures Victorian residents who are diagnosed out-of-state.

Data supplied by the Victorian Registry of Births Deaths and Marriages and the National Death Index also identifies Victorians who have cancer as a cause of death on their death certificate.

As a quality control measure, BreastScreen data is linked with the Victorian Cancer Registry to identify cancers diagnosed within screening intervals.

## Capturing cancer incidence

Cancer notifications are transmitted to the Victorian Cancer Registry where they are imported into the E-Path Plus software. Most cancer notifications (>98%) are received electronically. Pathology reports are automatically imported into the software. Once imported, notifications are consolidated into a medical record and artificial intelligence is used to extract data fields from pathology reports. Medical coders are responsible for auditing data extracted by artificial intelligence software, manually recording

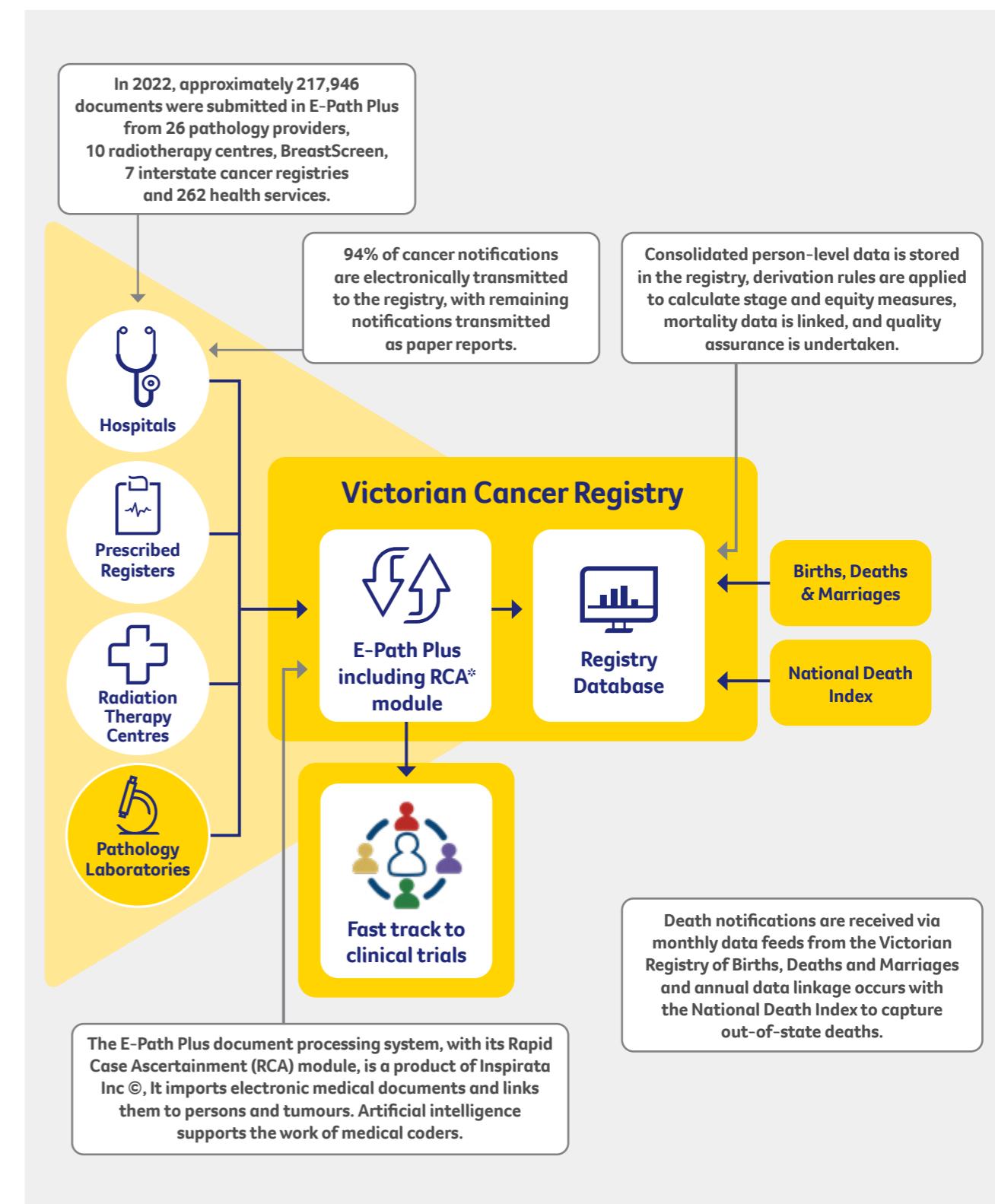


Figure 65: Cancer processing flow diagram, including data sources supplying the Victorian Cancer Registry

\*Rapid Case Ascertainment module

# APPENDIX 1: ABOUT THE VICTORIAN CANCER REGISTRY

additional data from pathology reports, retrieving incomplete data, and ensuring that E-Path Plus has correctly consolidated notifications into the correct tumour type and person record.

Tumours are classified by topography and morphology according to the International Classification of Diseases for Oncology (ICD-O), approved by the International Agency for Research on Cancer (IARC)/ World Health Organization (WHO) ICD-O Committee in April 2019.<sup>32</sup> The ICD-O has been used for nearly 35 years to code the site (topography) and the histology (morphology) of neoplasms, or cancers, usually obtained from a pathology report. The morphology code has five digits; the first four digits identify the histological type and the fifth identifies the behaviour of the neoplasm (malignant, in situ, benign, etc.).

For reporting purposes, the Victorian Cancer Registry uses the International Statistical Classification of Diseases and Related Health Problems, 10th revision Australian Modified (ICD-10AM),<sup>31</sup> which is mapped and derived from ICD-O3 topography and morphology codes. Cancers are grouped by ICD-10AM as shown in Table 6.

The Victorian Cancer Registry is a dynamic database. Despite efforts to ensure that all cancer notifications up to 31 December 2022 are received by the reports censorship date (14 October 2022), the registry will receive a small number of notifications after this date. Historically, there may be up to 300 new diagnoses identified from late notifications, as well as amendments to existing cases because of new notifications and updates to tumour morphology or date of diagnosis.

## Capturing multiple primary tumours

Cancer incidence reflects the number of primary tumours, rather than the number of people, diagnosed with cancer. A person may be diagnosed with multiple tumours over their lifetime.

The Victorian Cancer Registry captures multiple primary cancers in the same person according to rules developed by the International Agency for Research on Cancer (IARC) and the International Association of Cancer Registries (IACR).<sup>38</sup>

## Capturing cancer mortality

The Victorian Cancer Registry routinely links with the National Death Index and the state-based death registry to determine whether people who have been diagnosed with cancer have died. Medical coders refer to rules and guidelines described in the International Classification of Diseases and Related Health Problems<sup>31</sup> to assist in determining cause of death. Data from death certificates is augmented with data in the registry to determine the cancer site and which tumour was responsible for the person's death.

Deaths are coded to the 4-digit ICD-10 code if cancer is determined by coders to be the underlying cause of death, otherwise deaths are coded as non-cancer deaths and no further details are collected.

Prior to 2007, the Victorian Cancer Registry relied upon cause of death data from the Australian Bureau of Statistics (ABS). In 2007, the Victorian Cancer Registry medical coders began determining cause of death data for a number of reasons: (1) they had more comprehensive data available to them, including hospital admission data for recurrent or metastatic disease; (2) death certificates available to the ABS were often insufficient to precisely code haematological malignancies; and (3) delay in release of the ABS cause of death data meant that it was not available for the previous year at the time the Victorian Cancer Registry released its report.

## Data captured by the Victorian Cancer Registry

The registry collects a minimum dataset for each tumour (Table 6). Additional prognostic data is captured for breast cancer (size, hormone-receptor status), prostate (Gleason score), and malignant melanoma (Clark's level and Breslow thickness).

E-Path Plus software automatically abstracts more than 200 data fields from pathology reports (Figure 65). This software was implemented in September 2020, with most of these fields still to be validated.

**Table 6: Information collected by the Victorian Cancer Registry**

### PERSONAL DETAILS

Name(s)	
Residential address at time of diagnosis and death	
Date of birth	
Indigenous status	
Country of birth	
Sex	
Vital status	
Date of last contact, including date of death	
Person identification number/s	
Name of General Practitioner and treating doctor	
Eastern Cooperative Oncology Group (ECOG) performance status at time of diagnosis (if known) (38)	

### TUMOUR DETAILS\*

Date of diagnosis	
Tumour site (topography) - captured using the International Classification of Diseases for Oncology, Third Edition (version ICD-O-3.2) and grouped by the ICD-10AM coding system (Table 6).	
Tumour histology (morphology) - captured using ICD-O-3.2 which uses nomenclature appearing in the World Health Organization's International Histological Classification of Tumours series (WHO "Blue Books") <sup>32</sup>	
Tumour grade/differentiation - a measure of the aggressiveness of the tumour and an important prognostic factor. The classification of tumour grade varies by tumour site and/or histology. Histological examination of tumour tissue determines the tumour grade	
Tumour behaviour - a description of the course of development that a tumour is likely to take. This data element forms part of the microscopic description of tumour morphology on a pathology report. Behaviour is the 5th digit of ICDO-3 morphology	
Stage of cancer at diagnosis- presence of distant metastases at diagnosis is routinely captured for all solid tumours. Stage is derived for breast, bowel, prostate and endometrial cancers and melanomas.	
Best basis of diagnosis - the microscopic or non-microscopic or death certificate source of the diagnosis. The most valid basis of diagnosis is that accepted by the cancer registry as the most reliable diagnostic source of the death certificate, non-microscopic, and microscopic sources available	
Tumour identification number/s	
Laterality - The side of a paired organ that is the origin of the primary cancer e.g. breast, kidney, lung	
Prognostic markers - these biological markers assist in determining risk of disease progression e.g. HER2, ER/PR status for breast cancer	

\*Usually obtained from the pathology report. Multiple primary tumours may be reported for each person.

# APPENDIX 1: ABOUT THE VICTORIAN CANCER REGISTRY

## Cancer types and groups used in this report

Cancer data captured by medical coders using the ICD-O-3.2 coding system<sup>32</sup> is converted to ICD-10 groups for malignant neoplasms

(categories C00-C96).<sup>31</sup> Chronic myeloproliferative and myelodysplastic syndromes, which are classified as malignant tumours in ICD-O-3, are coded as tumours of uncertain behaviour in ICD-10 (category D45-47) (Table 7).

**Table 7: Cancer types and groups used in this report according to the International Statistical Classification of Diseases and Related Health Problems. Tenth Revision, Australian Modification (ICD-10-AM). Eighth edition<sup>31</sup>**

ICD-10 code	Label in tables	Further description (if different from label)
<b>C00-C96, D45-D47 ALL MALIGNANT TUMOURS</b>		
<b>C00-14 LIP, ORAL CAVITY &amp; PHARYNX</b>		
C00	Lip	
C01, C02	Tongue	
C03	Gum	
C04	Floor of mouth	
C05-C06	Other mouth	Other and unspecified parts of the mouth
C01-06	Oral cavity	
C07, C08	Salivary glands	Major salivary glands
C09, C10	Oropharynx	
C11	Nasopharynx	
C12, C13	Hypopharynx	Hypopharynx including pyriform sinus
C09-C13	Pharynx	
C14	Other oral	Other and specified sites of lip, oral cavity, and pharynx
<b>C15-25 DIGESTIVE ORGANS</b>		
C15	Oesophagus	
C16	Stomach	
C17	Small intestine	Small intestine including duodenum
C18	Colon	
C19-C20	Rectum	Rectum including rectosigmoid
C18-C20	Bowel	
C21	Anus	Anus and anal canal
C22	Liver	Liver and intrahepatic bile ducts
C23, C24	Gallbladder	Gallbladder and other biliary tract
C25	Pancreas	
<b>C30-38 RESPIRATORY SYSTEM &amp; INTRATHORACIC ORGANS</b>		
C30, C31	Nasal cavities	Nose, nasal cavities, middle ear and accessory sinuses
C32	Larynx	
C33, C34	Lung	Trachea, bronchus, and lung
C37, C38	Thymus	Thymus, heart, mediastinum, and pleura
<b>C40, C41 BONE, JOINTS &amp; ARTICULAR CARTILAGE</b>		
C40, C41	Bone	Bone and articular cartilage
<b>C43 MELANOMA</b>		
C43	Melanoma	Melanoma of skin
<b>C44 OTHER MALIGNANT NEOPLASMS OF SKIN</b>		
C44	Other skin	Other skin cancer, including less common non-melanoma skin cancers such as Merkel cell tumours, dermatofibrosarcoma protuberans, malignant fibrous histiocytoma and skin appendage tumours, but not the common squamous cell and basal cell carcinomas of skin

**Table 7: Cancer types and groups used in this report- continued**

ICD-10 code	Label in tables	Further description (if different from label)
<b>C45- C49 MESOTHELIAL &amp; SOFT TISSUE</b>		
C45	Mesothelioma	
C46	Kaposi sarcoma	
C48	Peritoneum	Retroperitoneum and peritoneum
C47, C49	Connective tissue	Other connective tissue (including peripheral nerves etc)
<b>C50- C58 BREAST &amp; FEMALE GENITAL ORGANS</b>		
C50	Breast	
C53	Cervix	
C54, C55	Uterus	Body of uterus
C56	Ovary	
C58	Placenta	
C51, C52, C57	Vulva etc.	Vulva and other/unspecified female genital organs
<b>C60- C63 MALE GENITAL ORGANS</b>		
C61	Prostate	
C62	Testis	
C60, C63	Penis etc	Penis and other male genital organs
<b>C64-C68 URINARY TRACT</b>		
C64	Kidney	Kidney, except renal pelvis
C67	Bladder	
C65, C66, C68	Renal pelvis, etc	Renal pelvis and other/unspecified urinary organs
<b>C69-C72 EYES, BRAIN AND OTHER PARTS OF THE CENTRAL NERVOUS SYSTEM</b>		
C69	Eye	
C70	Meninges	
C71	Brain	
C72	Other CNS	Cranial nerves, spinal cord and unspecified CNS
C70-72	Brain and CNS	
<b>C73-C75 THYROID &amp; OTHER ENDOCRINE GLANDS</b>		
C73	Thyroid	
C74, C75	Other endocrine	Other endocrine glands and related structures
<b>C26, C39, C76-80 UNKNOWN PRIMARY SITE</b>		
C26, C39, C76-79	Ill-defined sites	Other and ill-defined sites
C80	Unspecified site	
<b>C81-96, D45-47 MALIGNANT NEOPLASMS OF LYMPHOID, HAEMATOPOIETIC &amp; RELATED TISSUE</b>		
C81	Hodgkin Lymphoma	
C82	Follicular lymphoma	Nodular non-Hodgkin lymphoma
C83	Diffuse NHL	Diffuse non-Hodgkin lymphoma
C84	T-cell lymphoma	Peripheral and cutaneous T-cell lymphoma
C85	Other NHL	Other/unspecified non-Hodgkin lymphoma
C82-86	All NHL	Non-Hodgkin lymphoma
C81-86	All lymphoma	
C88	Immunoproliferative	Malignant immunoproliferative disease
C90	Multiple myeloma	Multiple myeloma and malignant plasma cell neoplasms
C91	Lymphoid leukaemia	
C92	Myeloid leukaemia	
C93	Monocytic leukaemia	
C94	Other leukaemia	Other specified leukaemia
C95	Unspecified leukaemia	Unspecified cell leukaemia
C91-95	All leukaemia	
C96	Other haematopoietic	Other and unspecified haematopoietic neoplasms
D45-D47	Myeloproliferative	Chronic myeloproliferative and myelodysplastic syndromes

# APPENDIX 1: ABOUT THE VICTORIAN CANCER REGISTRY

## Data Quality Assurance

Quality assurance is undertaken throughout the year and an extensive audit and review occurs at the end of the year. Demographic and tumour data is checked for completeness and consistencies.

Medical coders follow up with notifiers to obtain suspected missing or incomplete data.

The following three indices, defined in Cancer Incidence in Five Continents<sup>39</sup> are used to assess the completeness of cancer data captured by population-based cancer registries:

- 1. Proportion of cases registered from a death certificate only (DCO%):** A high DCO% suggests incomplete incidence notification, and such diagnoses may be less accurate. For DCO cases, the date of diagnosis is taken as the date of death if it is not mentioned on the certificate.

### 2. Proportion of cases verified with morphology (MV%):

A low MV% suggests incomplete registration of pathology reports, poorer verification of diagnoses and incomplete registration of cancers for which this is often the only source of notification, such as melanoma. The higher the MV% for cancers of less accessible sites, like brain and pancreas, the greater the confidence that the neoplasm existed and was primary rather than metastatic.

### 3. Mortality to incidence ratio (M/I%):

When the quality of the mortality data is good (especially in terms of the accuracy of cause of death) and incidence and survival are in steady state, the M:I ratio is approximated by 1 minus the five-year survival probability.

**Table 8 Data quality indices by tumour type for tumours diagnosed in 2022.**

Site	DCO (%)	MV (%)	M/I (%)
All malignant tumours	1.3	93.2	33
Head & Neck	0.2	97.9	20
Oesophagus	1.1	92.3	77
Stomach	1.2	94.2	58
Bowel	1.2	94.7	37
Liver	3.2	58.7	73
Gallbladder	4.9	78.4	75
Pancreas	3.5	74.8	86
Lung	2.1	85.9	67
Melanoma	0.1	99.8	9
Breast	0.4	99.1	15
Vulva etc	1.0	97.4	45
Uterus	0.4	98.9	20
Prostate	0.9	96.4	15
Kidney	1.4	90.1	22
Bladder	1.5	94.1	43
Brain & CNS	1.0	87.2	86
Thyroid	0.2	99.0	4
Unknown primary site	12.1	52.1	80
Lymphoma	0.5	97.3	29
Multiple myeloma	1.9	95.6	37
Leukaemia	1.9	93.9	31
Myeloproliferative & myelodysplastic	2.3	88.4	30



## APPENDIX 2: STATISTICAL METHODOLOGY

### Age-standardised rates

The Victorian age-standardised rates (ASR) in this publication are based on the World Standard Population (Cancer Incidence in Five Continents Volume 10, 2014, IARC).<sup>39</sup> These rates are calculated using the direct method<sup>40</sup> by summation of the weighted age-specific rates. The standard error (SE) of each ASR is given in the tables; a 95% confidence interval for the rate can be estimated by (rate  $\pm$  1.96 SE).

### Annual percent change

Annual percent change (APC) provides a means of describing trends in age-standardised incidence and mortality rates over time. APCs in this report are calculated using the *joinpoint* software (version 4.9.0.0; <https://surveillance.cancer.gov/joinpoint/>), where a “joinpoint” refers to a specific point in a time trend where a significant change in the direction or rate of the trend occurs. Joinpoint analysis is a statistical method used to identify these joinpoints and assess whether there are significant changes in trends over time.<sup>41</sup> Calculated using a log transformation approach, it provides a means of characterising trends using a consistent scale. The reported annual percentage change reflects the ACP of the latest period, unless otherwise stated.

### Cancer projections

Cancer projections are intended as a guide to assist in understanding from observed data what future rates of cancer are expected to look like in Victoria. Importantly, projection estimates should be used with caution, as they are influenced by past fluctuations in specific cancer rates. This is notable when assessing prostate cancer which has shown large fluctuation over the past three decades (see Incidence chapter). Projection estimates also do not consider any uncertainty around the future population estimates. Estimates of future population size by age and sex were obtained from the Australian Bureau of Statistics (catalogue #3222.0, series B, 2022-2071, released on 23/11/2023).<sup>42</sup>

Cancer projection uses an age-period-cohort model with a power link function to project cancer incidence and mortality by sex for the next 15 years. Statistical analysis was performed using Nordpred software package in R version 3.6.3.<sup>43</sup> For incidence and mortality projections, incidence, mortality, and population data were aggregated into 5-year age groups and 5-year periods from 1982-2022 for all cancers. Projection was based on the last 15, 20, 25 or

30 years depending on a goodness of fit test.

Cases and deaths for all cancers were projected for three 5-year periods (see Tables 2 and 4). For each 5-year period, projected incidence and mortality presented are the annual average for that period. Only age groups with at least 10 cases or deaths in total were used in the model for projections. Age groups with less than 10 cases or deaths were projected as the average from the last 10 years.

Two different models were run to obtain projections; Model 1 used all available data (1982 to 2022), whereas Model 2 included only pre-COVID data (1982-2019). Since we have seen fewer diagnoses than expected, we wanted to create a projection that took into account that the ‘missed diagnoses’ will present in the future.

### Registry-derived stage (RD-Stage)

RD Stage was introduced for select cancers in 2014 to address a deficit in the reporting of cancer stage by hospitals. The Victorian Cancer Registry has for some years derived stage for selected cancers using data available from pathology reports and from hospital notifications reporting coded metastatic disease sites at diagnosis, augmented by reported stage from hospitals and radiotherapy services where this is available. The derivation rules were the starting point for the national Business Rules developed and evaluated in 2015 by the Victorian Cancer Registry as a national project under the Cancer Australia Staging, Treatment and Recurrence (STaR) initiative.<sup>44</sup>

It is recognised that stage derived using these business rules may differ from stage obtained through multidisciplinary meetings and by clinicians for use in patient management but is the best available measure of stage for use at a population level. To clearly distinguish this registry-derived stage from that from multi-disciplinary team meetings (MDT) or clinicians, the name “Registry-Derived Stage” (or RD-Stage in short) has been adopted.

RD-Stage provides a useful tool to examine variation in practice across geographic regions, age groups and cancer types, and to explore the impact of cancer screening on disease presentation.

Details of the definitions and business rules for RD-Stage are available on request. These are based on TNM 7th Edition for breast and bowel cancers<sup>45</sup> and TNM 8th Edition for melanoma and endometrial cancer.<sup>46</sup> Because of significant changes made to the staging system for prostate cancer between the



7th and the 8th edition, the International Society of Urological Pathology (ISUP) grading system<sup>47</sup> has been used to describe prostate cancer stage in this report. As with lower stage, a lower ISUP group indicates less invasive disease. Small numbers of tumours with morphology not eligible for TNM staging have been excluded from RD-Stage calculation.

### Relative survival

The survival results in this report are relative survival estimates. Relative survival is the survival of a person with cancer compared with the expected survival for a person of the same age and sex in the general population, extracted from Victorian specific life tables obtained from the Australian Bureau of Statistics (ABS; catalogue #3302055001).<sup>9</sup>

Survival figures presented in this report are outcomes from a “period” survival analysis. Only the most recent interval survival estimates for cases diagnosed in different calendar years (cross-sectional estimate of survival) are used. The estimate of period 5-year survival for persons in 2017-2021 uses the 1-year interval survival for patients diagnosed in 2020, the

2-year interval survival for patients diagnosed in 2019, and so on. Because the “period” method uses only the most recent survival experience it provides the most up-to-date measure of recent survival. Period survival was calculated using the Ederer II relative survival method,<sup>48</sup> calculated using the ‘periodR’ package.<sup>49</sup> Using this approach, 56% five-year survival does not mean that 56/100 cancer patients are alive five years later but 56% (about half) as many of this group would survive compared with a group the same age and sex from the general population. Thus, the actual proportion surviving would differ between age groups even if relative survival were the same.

We show here an example of relative survival for two fictional groups of 100 cancer patients aged <30 and >85 years - based on life tables for the whole Victorian population, we would expect to have 95 and 35 persons of the general population surviving after five years. If the relative survival was 56% for each group, the number of cancer patients who survived would be 56% of 95 =53 persons for the younger group and 56% of 35=20 persons for the older group. So, the same relative survival proportion

## APPENDIX 2: STATISTICAL METHODOLOGY

does not mean the same proportion of deaths in the cancer group, but the same excess proportion of deaths.

To present accurate survival statistics, it is necessary to identify deaths occurring in all Australian States and Territories for persons included in the incidence data. Many persons resident in Victoria at time of diagnosis subsequently move interstate. Notification of deaths occurring within Victoria are received monthly from the Victorian Registrar of Births, Deaths and Marriages, but for deaths in other states, it is necessary to link the annual incidence file to the National Death Index (NDI); at the Australian Institute of Health and Welfare (AIHW). The latest linkage to the NDI allows us to include interstate deaths that occurred in 2021 for people who were residents of Victoria at the time of cancer diagnosis but died outside of Victoria.

Relative survival can be above 100% which indicates that survival is better in the group of interest compared with the age/sex-matched Victorian population. We see this for example in early-stage breast and prostate cancer.

### Prevalence

This report provides person-based limited-duration prevalence; that is, the number of people diagnosed with cancer within a specific period (e.g., 2 years, 5 years or 10 years) who were still alive on the index date. Eligible cases included in the prevalence counts were defined as having:

- a diagnosis date in between the index date and the diagnosis cut-off date, with the diagnosis cut-off date calculated as the index date minus the specific period of interest,
- no death date, or a death date greater than or equal to the index date.

Ages of eligible cases were calculated from the index date and cases with an age greater than 105 years were excluded from the dataset as they may have migrated overseas and therefore been lost to follow-up. All age specific calculations were based on the age calculated from the index date.

Population data used to calculate the percentage of different portions of the Victorian population living with a history of cancer were based on the Victorian Estimated Residential Population from ABS as at 1 year prior to the index date year.

### Statistical modelling to estimate the effect of COVID in new diagnoses

Poisson regression was used to estimate the direction and magnitude of trends in incidence for each cancer type by age group and sex using pre-COVID data up to 2019, using the following model with monthly data:

$$[\text{Equation}] + \text{interactions}(\text{sex} \times \text{age} + \text{year} \times \text{sex} + \text{year} \times \text{age} + \text{year} \times \text{sex} \times \text{age}) + \text{residual}$$

where month, sex and age group were categorical variables while year was included as a continuous variable. The expected number of new diagnoses in 2020, 2021 and 2022 were estimated by applying this model on 2020–2022 population data. The observed number of new diagnoses was compared with the expected number (and 95% CI) in absolute and relative sense.

For each tumour type, the start of the pre-COVID period was defined as the start of the latest period during which incidence rates, for males and females, did not change. This period was obtained using the joinpoint software (version 4.9.0.0; <https://surveillance.cancer.gov/joinpoint/>) using all default settings.<sup>41</sup> When the period differed for males and females, the longest common period was used as pre-COVID period, up to 2019.

## APPENDIX 3: RESEARCH AND PUBLICATIONS USING VCR DATA

### How we support cancer care in Victoria

The Victorian Government has developed a Victorian Cancer Plan 2020–24, which sets an agenda for activity aimed at preventing cancer, increasing survival, improving cancer treatments and care, and achieving equitable outcomes for all Victorians with cancer.<sup>50</sup> Data from the Victorian Cancer Registry is used to assess the progress of the plan in realising its goals. It is also used to help plan the delivery of cancer care in Victoria. Local hospitals and cancer services use our data to help them manage cancer service delivery, plan for future cancer needs in their community, undertake audit, and deliver quality improvement activities.

### How we contribute to cancer research in Australia

We provide cancer data to the Australian Cancer Database (ACD), which is hosted by the Australian Institute of Health and Welfare (AIHW). The ACD collects data from each state and territory in Australia, and is a central repository of information about primary, malignant cancers. The AIHW uses this data to report national cancer incidence, trends, projections, survival, and prevalence. These statistics help to inform cancer prevention and treatment strategies and monitor the impact of policies at a national level.

The AIHW makes the data from the ACD public via its website at <https://www.aihw.gov.au/about-our-data/our-data-collections/australian-cancer-database/about-australian-cancer-database>.

### How we contribute to global research

We provide de-identified data to the International Agency for Research on Cancer (IARC) to contribute to global statistics on cancer incidence, prevalence, and mortality. This year, we continue to contribute de-identified data to IARC's global effort to better understand the impact of COVID-19 on cancer incidence, treatments, and outcomes. We also contribute to the International Cancer Benchmarking Partnership (ICBP), a partnership which brings together clinicians, policymakers, researchers and data experts from Australia, Canada, Denmark, Ireland, New Zealand, Norway, Sweden, and the United Kingdom to measure variation in cancer incidence, mortality, survival, stage at diagnosis and survival by stage, and factors which might be driving variation.<sup>51</sup>

### Research supported by our data

We respond to requests for data from government agencies, integrated cancer services, community services and researchers. Requests are made for data to explore disparities in cancer incidence and treatment, identify cancer clusters, and support quality improvement activities.

In addition to formal requests lodged for our data, it is possible to obtain comprehensive cancer data through the publicly available Data Explorer (Figure 66). The Data Explorer allows people to delve into the Victorian cancer data and explore trends in incidence, prevalence, and survival over time and by sub-groups, such as Integrated Cancer Service, Aboriginal and/or Torres Strait Islander status, and socio-economic quintile.



Figure 66: VCR Data Explorer, available to use on website at <https://www.cancervic.org.au/research/vcr>

In 2022, we serviced 116 data requests and undertook 59 data linkages. This is a 19% decline on previous years, likely due to our data being made more accessible and available via the website. Most data access requests were submitted by health care organisations (51%), followed by researchers (25%), Cancer Council requests (13%), state government (7%), and community and federal agencies (4%).

## APPENDIX 3: RESEARCH AND PUBLICATIONS USING VCR DATA

### 2022 Publications arising from VCR Data

Research project requests for registry data through the Victorian Cancer Registry, the Australian Institute of Health and Welfare, and the Centre for Victorian Data Linkage resulted in the following 96 peer-reviewed publications in 2022.

- 1 Ahearn TU, Zhang H, Michailidou K, et al. Common variants in breast cancer risk loci predispose to distinct tumor subtypes. *Breast Cancer Res* 2022;24:2.
- 2 Azad AA, Tran B, Davis ID, et al. Predictors of real-world utilisation of docetaxel combined with androgen deprivation therapy in metastatic hormone-sensitive prostate cancer. *Intern Med J* 2022;52:1339-46.
- 3 Basiri Z, Yang Y, Bruinsma FJ, et al. Physical activity and glioma: a case-control study with follow-up for survival. *Cancer Causes Control* 2022;33:749-57.
- 4 Bassett JK, MacInnis RJ, Yang Y, et al. Alcohol intake trajectories during the life course and risk of alcohol-related cancer: A prospective cohort study. *Int J Cancer* 2022;151:56-66.
- 5 Bensley JG, Dhillon HM, Evans SM, et al. Self-reported lack of energy or feeling depressed 12 months after treatment in men diagnosed with prostate cancer within a population-based registry. *Psychooncology* 2022;31:496-503.
- 6 Berndt SI, Vijai J, Benavente Y, et al. Distinct germline genetic susceptibility profiles identified for common non-Hodgkin lymphoma subtypes. *Leukemia* 2022;36:2835-44.
- 7 Boot IWA, Wesselius A, Yu EYW, et al. Dietary B group vitamin intake and the bladder cancer risk: a pooled analysis of prospective cohort studies. *Eur J Nutr* 2022;61:2397-416.
- 8 Cabasag CJ, Arnold M, Rutherford M, et al. Pancreatic cancer survival by stage and age in seven high-income countries (ICBP SURVMARK-2): a population-based study. *Br J Cancer* 2022;126:1774-82.
- 9 Cameron JK, Aitken J, Reid A, et al. Geographic distribution of malignant mesothelioma incidence and survival in Australia. *Lung Cancer* 2022;167:17-24.
- 10 Cameron JK, Fritsch L, Ross DM, Anderson LA, Baade P. Spatial disparities in the reported incidence and survival of myeloproliferative neoplasms in Australia. *Pathology* 2022;54:328-35.
- 11 Cheah S, Bassett JK, Bruinsma FJ, et al. Alcohol and tobacco use and risk of multiple myeloma: A case-control study. *EJ Haem* 2022;3:109-20.
- 12 Chee LYS, Sia J, Milne RL, Foroudi F, Millar JL, Ong WL. Variations in whole brain radiation therapy fractionation for brain metastases in Victoria. *J Med Imaging Radiat Oncol* 2022;66:1106-14.
- 13 Chen H, Fan S, Stone J, et al. Genome-wide and transcriptome-wide association studies of mammographic density phenotypes reveal novel loci. *Breast Cancer Res* 2022;24:27.
- 14 Cribb L, Hodge AM, Yu C, et al. Inflammation and Epigenetic Aging Are Largely Independent Markers of Biological Aging and Mortality. *J Gerontol A Biol Sci Med Sci* 2022;77:2378-86.
- 15 Dareng EO, Tyrer JP, Barnes DR, et al. Polygenic risk modelling for prediction of epithelial ovarian cancer risk. *Eur J Hum Genet* 2022;30:349-62.
- 16 Dasgupta P, Garvey G, Baade PD. Quantifying the number of deaths among Aboriginal and Torres Strait Islander cancer patients that could be avoided by removing survival inequalities, Australia 2005-2016. *PLoS One* 2022;17:e0273244.
- 17 Dennis J, Tyrer JP, Walker LC, et al. Rare germline copy number variants (CNVs) and breast cancer risk. *Commun Biol* 2022;5:65.
- 18 DeVries AA, Dennis J, Tyrer JP, et al. Copy Number Variants Are Ovarian Cancer Risk Alleles at Known and Novel Risk Loci. *J Natl Cancer Inst* 2022;114:1533-44.
- 19 di Martino E, Smith L, Bradley SH, et al. Incidence trends for twelve cancers in younger adults-a rapid review. *Br J Cancer* 2022;126:1374-86.
- 20 Dianatinasab M, Wesselius A, Salehi-Abargouei A, et al. Dietary fats and their sources in association with the risk of bladder cancer: A pooled analysis of 11 prospective cohort studies. *Int J Cancer* 2022;151:44-55.
- 21 Dillon HT, Saner NJ, Ilsley T, et al. Preventing the adverse cardiovascular consequences of allogeneic stem cell transplantation with a multi-faceted exercise intervention: the ALLO-Active trial protocol. *BMC Cancer* 2022;22:898.
- 22 Dixon-Suen SC, Lewis SJ, Martin RM, et al. Physical activity, sedentary time and breast cancer risk: a Mendelian randomisation study. *Br J Sports Med* 2022;56:1157-70.
- 23 Dorling L, Carvalho S, Allen J, et al. Breast cancer risks associated with missense variants in breast cancer susceptibility genes. *Genome Med* 2022;14:51.
- 24 Dugué PA, Bodelon C, Chung FF, et al. Methylation-based markers of aging and lifestyle-related factors and risk of breast cancer: a pooled analysis of four prospective studies. *Breast Cancer Res* 2022;24:59.
- 25 Dugué PA, Hodge AM, Ulvik A, et al. Association of Markers of Inflammation, the Kynurenone Pathway and B Vitamins with Age and Mortality, and a Signature of Inflammaging. *J Gerontol A Biol Sci Med Sci* 2022;77:826-36.
- 26 Feletto E, Kohar A, Mizrahi D, et al. An ecological study of obesity-related cancer incidence trends in Australia from 1983 to 2017. *Lancet Reg Health West Pac* 2022;29:100575.
- 27 Fiorito G, Pedron S, Ochoa-Rosales C, et al. The Role of Epigenetic Clocks in Explaining Educational Inequalities in Mortality: A Multicohort Study and Meta-analysis. *J Gerontol A Biol Sci Med Sci* 2022;77:1750-9.
- 28 Fogarty T, Tacey M, McCormick G, et al. Patterns of the use of advanced radiation therapy techniques for the management of bone metastases and the associated factors in Victoria. *J Med Imaging Radiat Oncol* 2022;66:678-87.
- 29 Geczik AM, Ferris JS, Terry MB, et al. Adherence to the 2020 American Cancer Society Guideline for Cancer Prevention and risk of breast cancer for women at increased familial and genetic risk in the Breast Cancer Family Registry: an evaluation of the weight, physical activity, and alcohol consumption recommendations. *Breast Cancer Res Treat* 2022;194:673-82.
- 30 Georgeson P, Harrison TA, Pope BJ, et al. Identifying colorectal cancer caused by biallelic MUTYH pathogenic variants using tumor mutational signatures. *Nat Commun* 2022;13:3254.
- 31 Giardiello D, Hooning MJ, Hauptmann M, et al. PredictCBC-2.0: a contralateral breast cancer risk prediction model developed and validated in ~ 200,000 patients. *Breast Cancer Res* 2022;24:69.
- 32 Gough K, Bergin RJ, Drosdowsky A, et al. Women with gynaecological cancer awaiting radiotherapy: Self-reported wellbeing, general psychological distress, symptom distress, sexual function, and supportive care needs. *Gynecol Oncol* 2022;167:42-50.
- 33 Gough K, Pascoe MC, Bergin R, Drosdowsky A, Schofield P. Differential adherence to peer and nurse components of a supportive care package-The appeal of peer support may be related to women's health and psychological status. *Patient Educ Couns* 2022;105:762-8.
- 34 Grootes I, Keeman R, Blows FM, et al. Incorporating progesterone receptor expression into the PREDICT breast prognostic model. *Eur J Cancer* 2022;173:178-93.
- 35 Haas CB, Su YR, Petersen P, et al. Interactions between folate intake and genetic predictors of gene expression levels associated with colorectal cancer risk. *Sci Rep* 2022;12:18852.
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## APPENDIX 3: RESEARCH AND PUBLICATIONS USING VCR DATA

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## APPENDIX 4: IN SITU CANCERS AND DYSPLASIA

The Victorian Cancer Registry receives notifications of pre-cancers as well as cancers. While pre-cancers are not included in the body of this report, they are listed here as they may provide insight into the impact of screening, immunisation and public health messaging on early detection.

Table 9 summarises the distribution of in situ melanoma and breast cancers and cervical pre-cancerous abnormalities captured by the Victorian Cancer Registry.

In Victoria, women have access to regular screening for breast and cervix cancers through BreastScreen Victoria and the National Cervical Screening Program. As a result, we expect to see in situ incidence increasing as cancers are detected earlier. This early detection is expected to be accompanied by decreasing numbers of invasive cancers over time.

### Definition of in situ cancers

**In situ melanomas** are abnormal cells that have not extended beyond the epidermis into the dermis.

**In situ breast cancers** are abnormal cells that have not spread outside the ducts or lobules into breast tissue. They include ductal carcinoma in situ (DCIS), lobular carcinoma in situ (LCIS) and other unspecified carcinoma of the breast.

**Cervical pre-cancerous abnormalities** can develop from squamous or glandular cells. Abnormal squamous cells are known as low-grade (LSIL) or high-grade squamous intraepithelial lesions (HSIL). The registry only receives notification of HSIL or more advanced pre-cancerous cells. Abnormal glandular cells are known as adenocarcinomas in situ (AIS). HSIL and AIS are both caused by the human papillomavirus infection and may become invasive tumours if left untreated.

**Table 9: In situ melanoma, in situ breast and cervical pre-cancer abnormalities reported in 2022: Number of new cases and age-specific rate per 100,000**

Age group	Cervix		Breast		Melanoma			
	Female		Female		Male		Female	
	Cases	Age-specific rate	Cases	Age-specific rate	Cases	Age-specific rate	Cases	Age-specific rate
0-4	0	0.0	0	0.0	0	0.0	0	0.0
5-9	0	0.0	0	0.0	0	0.0	0	0.0
10-14	0	0.0	0	0.0	0	0.0	0	0.0
15-19	3	1.6	0	0.0	3	1.5	1	0.5
20-24	57	27.7	0	0.0	2	0.9	6	2.9
25-29	523	217.3	2	0.8	13	5.2	18	7.5
30-34	528	202.0	6	2.3	34	13.4	39	14.9
35-39	363	143.1	19	7.5	36	14.4	53	20.9
40-44	246	110.0	41	18.3	68	31.1	78	34.9
45-49	166	79.5	79	37.8	91	44.8	120	57.5
50-54	104	48.5	145	67.6	193	94.6	173	80.7
55-59	71	36.3	96	49.1	228	122.7	201	102.9
60-64	56	29.6	104	54.9	287	162.4	247	130.4
65-69	37	22.1	95	56.8	317	207.6	274	163.8
70-74	32	21.8	86	58.5	397	300.2	278	189.0
75-79	7	6.2	42	37.2	332	328.3	249	220.7
80-84	0	0.0	31	39.7	217	332.5	131	167.9
85+	0	0.0	12	13.9	134	240.3	100	115.4
<b>Total</b>	<b>2,193</b>		<b>758</b>		<b>2,352</b>		<b>1,968</b>	
Cumulative rate (%)		4.7		1.8		5.0		4
Lifetime risk (to age 75)		1 in 21		1 in 56		1 in 20		1 in 258
Age-standardised rate		58.0		14.4		35.2		30.6

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