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# cancer

IN AUSTRALIA *an overview* **2012**



Australasian Association  
of Cancer Registries



**Australian Government**

**Australian Institute of  
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*Authoritative information and statistics  
to promote better health and wellbeing*

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# **Cancer in Australia**

## **An overview 2012**

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**The Australian Institute of Health and Welfare is a major national agency which provides reliable, regular and relevant information and statistics on Australia's health and welfare. The Institute's mission is authoritative information and statistics to promote better health and wellbeing.**

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# Abbreviations

AACR	Australasian Association of Cancer Registries
ABCR	Australian Blood Cancer Registry
ABS	Australian Bureau of Statistics
ACD	Australian Cancer Database
ACHI	Australian Classification of Health Interventions
ACIM	Australian Cancer Incidence and Mortality
ACT	Australian Capital Territory
AIDS	Acquired Immunodeficiency Syndrome
AIHW	Australian Institute of Health and Welfare
ALOS	average length of stay
ASGC	Australian Standard Geographical Classification
ASR	age-standardised rate
CA	Cancer Australia
CI	confidence interval
COAG	Council of Australian Governments
CS	crude survival
DALY	disability-adjusted life year
DCIS	ductal carcinoma in situ
DoHA	Australian Government Department of Health and Ageing
FOBT	faecal occult blood test
HPV	human papilloma virus
IARC	International Agency for Research on Cancer
ICD-10	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification
ICD-O	International Classification of Diseases for Oncology
ICD-O-3	International Classification of Diseases for Oncology, 3rd edition
IRSD	Index of Relative Socio-economic Disadvantage
MBS	Medicare Benefits Schedule

MIR	mortality-to-incidence ratio
NBCSP	National Bowel Cancer Screening Program
NCCH	National Centre for Classification in Health
NCSP	National Cervical Screening Program
NDI	National Death Index
NHPA	National Health Priority Area
NHMD	National Hospital Morbidity Database
NHVP	National HPV Vaccination Program
NMD	National Mortality Database
NMSC	non-melanoma skin cancer
NOCD	National Outpatient Care Database
NOS	not otherwise specified
No.	number
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
Pap	Papanicolaou (cervical smear test)
POA	postal area
PSA	prostate-specific antigen
RS	relative survival
SA	South Australia
SACC	Standard Australian Classification of Countries
SEIFA	Socio-Economic Indexes for Areas
SLA	Statistical Local Area
Tas	Tasmania
Vic	Victoria
WA	Western Australia
WHO	World Health Organization
YLD	years lost due to disability
YLL	years of life lost (due to premature mortality)



# Symbols

\$	Australian dollars, unless otherwise specified
%	per cent
<	less than
>	greater than
+	and over
..	not applicable
n.a.	not available
n.p.	not published (data cannot be released due to quality issues)

# Summary

*Cancer in Australia: an overview, 2012* is a joint report by the Australian Institute of Health and Welfare and the state and territory members of the Australasian Association of Cancer Registries, and is a product of the National Cancer Statistics Clearing House. It provides a comprehensive picture of national statistics on cancer, presenting the latest available data and trends over time. Differences by Aboriginal and Torres Strait Islander status, state and territory, remoteness area and socioeconomic status are also discussed.

## **Cancer is the major cause of illness in Australia**

In 2012, it is estimated that more than 120,700 Australians will be diagnosed with cancer, excluding basal and squamous cell carcinoma of the skin. More than half (56%) of these cases are expected to be diagnosed in males. The most commonly reported cancers in 2012 are expected to be prostate cancer, followed by bowel cancer, breast cancer, melanoma of the skin and lung cancer.

Between 1991 and 2009, the number of new cancer cases diagnosed almost doubled – from 66,393 to 114,137. This increasing trend is primarily due to the rise in the number of prostate cancer, breast cancer in females, bowel cancer and lung cancer, and is partly explained by the ageing and increasing size of the population.

## **Mortality rate due to cancer has fallen**

In 2010, more than 42,800 Australians died from cancer. Cancer accounted for about 3 in 10 deaths in Australia, making it the second most common cause of death, exceeded only by cardiovascular diseases. For all cancers combined, the age-standardised mortality rate decreased by 17% from 210 per 100,000 in 1991 to 174 per 100,000 in 2010.

## **Survival improved over time, but not consistent across all cancers**

Five-year survival from all cancers combined increased from 47% in 1982–1987 to 66% in 2006–2010. The cancers that had the largest survival gains over this time were prostate cancer, kidney cancer and non-Hodgkin lymphoma.

Gains in survival have not been consistent across all cancers. Some cancers that already had low survival in 1982–1987 showed only small gains, such as mesothelioma (from 5.5% to 6.2%), brain cancer (from 20% to 22%), pancreatic cancer (from 3% to 5%) and lung cancer (from 9% to 14%).

Australians diagnosed with cancer generally had better survival prospects compared with people living in other countries and regions.

## **Cancer outcomes differ across population groups**

Cancer outcomes differ by Aboriginal and Torres Strait Islander status, remoteness area and socioeconomic status. For all cancers combined, Indigenous Australians experienced higher incidence and mortality rates than non-Indigenous Australians. Incidence rates and survival were lower for people living in remote areas compared with those in major cities, while mortality rates rose with increasing remoteness. Incidence and mortality rates rose and survival from all cancers fell as a person's socioeconomic status decreased.

# Data at a glance

## Estimated incidence of cancer in 2012

Table 1: Estimated 20 most commonly diagnosed cancers, Australia, 2012<sup>(a)</sup>

Males			Females		
Site/type (ICD-10 codes)	Cases	ASR <sup>(c)</sup>	Site/type (ICD-10 codes)	Cases	ASR <sup>(c)</sup>
Prostate (C61)	18,560	147.9	Breast (C50)	14,560	113.2
Bowel (C18–C20)	8,760	72.8	Bowel (C18–C20)	7,080	51.5
Melanoma of skin (C43)	7,440	62.7	Melanoma of skin (C43)	5,070	39.9
Lung (C33–C34)	6,620	55.8	Lung (C33–C34)	4,650	34.1
Non-Hodgkin lymphoma (C82–C85)	2,620	22.0	Uterus (C54–C55)	2,270	17.1
Kidney (C64)	2,000	16.6	Non-Hodgkin lymphoma (C82–C85)	2,070	15.6
Bladder (C67)	1,800	15.3	Thyroid (C73)	1,830	15.4
Unknown primary site (C80)	1,490	12.7	Ovary (C56)	1,410	10.7
Pancreas (C25)	1,450	12.1	Unknown primary site (C80)	1,360	9.2
Stomach (C16)	1,420	11.9	Pancreas (C25)	1,290	9.1
Liver (C22)	1,080	9.0	Kidney (C64)	995	7.6
Oesophagus (C15)	1,000	8.4	Cervix (C53)	785	6.6
Brain (C71)	960	8.1	Stomach (C16)	770	5.5
Myeloma (C90)	895	7.5	Brain (C71)	680	5.4
Myelodysplastic syndrome (D46)	810	7.0	Myeloma (C90)	650	4.7
Chronic lymphocytic leukaemia (C91.1)	765	6.4	Bladder (C67)	625	4.3
Testis (C62)	740	6.7	Myelodysplastic syndrome (D46)	520	3.5
Lip (C00)	660	5.6	Chronic lymphocytic leukaemia (C91.1)	465	3.3
Thyroid (C73)	595	5.1	Oesophagus (C15)	445	3.1
Larynx (C32)	580	4.8	Gallbladder & bile ducts (C23–C24)	415	2.9
<b>All cancers combined<sup>(b)</sup></b>	<b>67,260</b>	<b>557.9</b>	<b>All cancers combined<sup>(b)</sup></b>	<b>53,460</b>	<b>404.5</b>

(a) 2012 estimates are based on 2000–2009 incidence data (see Appendix G). The estimates are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5.

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

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

Source: AIHW Australian Cancer Database 2009.

# Mortality from cancer in 2010

Table 2: The 20 most common causes of death from cancer, Australia, 2010<sup>(a)</sup>

Males			Females		
Site/type (ICD-10 codes)	Deaths	ASR <sup>(c)</sup>	Site/type (ICD-10 codes)	Deaths	ASR <sup>(c)</sup>
Lung (C33–C34)	4,934	44.6	Lung (C33–C34)	3,165	24.2
Prostate (C61)	3,235	30.6	Breast (C50)	2,840	21.6
Bowel (C18–C20)	2,205	20.1	Bowel (C18–C20)	1,777	13.0
Pancreas (C25)	1,233	11.1	Pancreas (C25)	1,201	8.9
Unknown primary site (C80)	1,167	10.7	Unknown primary site (C80)	1,113	7.8
Melanoma of skin (C43)	993	8.9	Ovary (C56)	912	7.0
Liver (C22)	890	7.9	Other digestive organs (C26)	641	4.4
Oesophagus (C15)	879	7.8	Non-Hodgkin lymphoma (C82–C85)	557	4.0
Non-Hodgkin lymphoma (C82–C85)	781	7.1	Brain (C71)	512	4.1
Bladder (C67)	736	6.9	Melanoma of skin (C43)	459	3.5
Brain (C71)	735	6.4	Liver (C22)	449	3.4
Stomach (C16)	719	6.6	Stomach (C16)	375	2.8
Other digestive organs (C26)	713	6.5	Uterus (C54–C55)	364	2.7
Kidney (C64)	575	5.1	Kidney (C64)	352	2.6
Mesothelioma (C45)	516	4.7	Myeloma (C90)	351	2.6
Myeloma (C90)	473	4.3	Acute myeloid leukaemia (C92.0, C92.3–C92.5, C93.0, C94.0, C94.2, C94.4, C94.5)	350	2.6
Acute myeloid leukaemia (C92.0, C92.3–C92.5, C93.0, C94.0, C94.2, C94.4, C94.5)	450	4.1	Oesophagus (C15)	344	2.5
Multiple primary cancers (C97)	325	3.1	Bladder (C67)	295	2.0
Non-melanoma of the skin (C44)	304	2.8	Cervix (C53)	232	1.9
Larynx (C32)	223	2.0	Multiple primary cancers (C97)	178	1.3
<b>All cancers combined<sup>(b)</sup></b>	<b>24,328</b>	<b>221.7</b>	<b>All cancers combined<sup>(b)</sup></b>	<b>18,516</b>	<b>137.6</b>

(a) Mortality data for 2010 are preliminary and are subject to further revision.

(b) Includes cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3.

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

Source: AIHW National Mortality Database.



# 1 Introduction

Cancer is a major cause of illness in Australia and has a significant impact on individuals, families and the health-care system. Despite a decline in cancer mortality and an increase in survival over time, 1 in 2 Australians will develop cancer and 1 in 5 will die from it before the age of 85. Since cancer affects many people – either directly through personally developing the disease or indirectly through family and community members – it is a topic of interest to many and has had a prominent policy focus for decades.

In 1996, cancer was declared a National Health Priority Area by Australian health ministers (AIHW & DHFS 1997). Over the years, a number of national efforts have targeted cancer, focusing on prevention, detection, treatment and research. Some of the major initiatives include the National Health Priority Area cancer control report (DHFS & AIHW 1998) and the *National chronic disease strategy* (NHPAC 2006a) and *National service improvement framework for cancer* (NHPAC 2006b). In 2008, five cancers (bowel, breast, cervical, lung and melanoma of the skin) were included in the health performance indicator 'Incidence of selected cancers' as part of the Council of Australian Governments (COAG) National Healthcare Agreement, and are reported annually. The agreement aims to report on the goals of the health system, and reflect the roles and responsibilities of governments in managing and providing health services (COAG Reform Council 2011).

## What is cancer?

Cancer is a diverse group of diseases in which some of the body's cells become defective and multiply out of control. These abnormal cells invade and damage the tissues around them, and sooner or later spread (metastasise) to other parts of the body and can cause further damage. If the spread of these tumours is not controlled, they can result in death. Not all tumours are invasive. Some are benign, which means they do not spread to other parts of the body and are rarely life-threatening.

Cancers are distinguished from one another by the location in the body in which the disease began (known as the site) and/or by the type of cell involved (known as histology). Cancer that begins in the lung is called lung cancer and cancer that begins in the breast is called breast cancer, regardless of whether or not it has metastasised to other sites. Examples of different cell types of cancer are carcinomas (cancers that begin in the skin or in tissues that line or cover internal organs), sarcomas (which develop in connective and supportive tissues, such as bone, cartilage and muscle), and hematopoietic cancers (cancers that begin in blood-forming tissues, such as the bone marrow). Note that, unlike most other forms of cancer, cancers of the blood, such as leukaemia, do not form a tumour but instead invade other areas of the body through the bloodstream.


The original site in which a cancerous tumour is formed is referred to as the primary cancer. The spread of cancerous cells from the primary tumour to another (that is, secondary) site is referred to as metastasis.


## What are the known risk factors for cancer?

A risk factor is any factor associated with an increased likelihood of a person developing a health disorder or health condition, such as cancer. Understanding what causes cancer is

essential in order to successfully prevent, detect and treat the disease. For most cancers the causes are not fully understood. However, some factors that place individuals at a greater risk for cancer are well-recognised and are outlined below. These risk factors were sourced from the *World cancer report 2008* (IARC 2008) and *Food, nutrition, physical activity and the prevention of cancer* (WCRF & AICR 2007).

It should be noted that having a risk factor does not mean that a person will develop cancer. Many people have at least one cancer risk factor but will never get cancer, while others with this disease may have had no known risk factors.

	<b>Smoking</b>
	Smoking is the major cause of cancer in humans, accounting for about 20–30% of cancer cases. Evidence suggests that both active and passive smoking can cause cancer of the:
	<ul style="list-style-type: none"><li>• bladder</li><li>• cervical</li><li>• kidney</li><li>• larynx</li><li>• liver</li><li>• lung</li><li>• myeloid leukaemia</li><li>• nasal cavity and nasal sinuses</li><li>• oral cavity (lip, mouth, tongue)</li><li>• oesophagus</li><li>• pancreas</li><li>• pharynx</li><li>• stomach.</li></ul>

	<b>Alcohol consumption</b>
	Alcohol consumption is an important risk factor for cancer. The risk of cancer increases with the amount of alcohol consumed. Cancers associated with alcohol consumption include:
	<ul style="list-style-type: none"><li>• bowel</li><li>• breast (females)</li><li>• colon</li><li>• larynx</li><li>• liver</li><li>• oesophageal</li><li>• oral cavity (lip, mouth, tongue)</li><li>• pharynx</li><li>• rectum.</li></ul>



### Diet

Evidence suggests that high intake of particular foods (such as processed meat and foods that are high in fat) is associated with an increased risk of the following cancers:

- bowel
- breast
- kidney
- oesophageal
- pancreas
- prostate
- stomach
- uterine.



### Obesity and physical inactivity

Obesity is defined as abnormal or excessive fat accumulations that may impair health and a body mass index of 30 and over.

Physical activity is an important part of a healthy lifestyle. Doing little or no physical activity increases an individual's risk of being overweight or obese, and is associated with a higher risk of developing cancer. Obesity and no physical activity increases the risk of the following cancers:

- bowel
- breast (females)
- colon (males)
- endometrial cancer
- gallbladder
- kidney
- oesophageal
- ovarian
- pancreas.



### Chronic infections

Chronic infections (such as viruses, bacteria and parasites) are estimated to cause about 8% of cancer cases. Cancers associated with chronic infections include:

- bladder
- cervical
- gallbladder
- leukaemia
- liver
- lung
- lymphoma
- oral cavity (lip, month, tongue)
- oropharynx
- stomach.





### Family history and genetic susceptibility

Some gene mutations increase the risk of cancer being passed from parent to child. Generally for most cancers, inherited susceptibility is rare (5–10% of cancer cases). Genetic inheritance increases risk of the following cancers:

- bladder
- bowel
- breast
- colon
- gallbladder
- leukaemia
- ovarian
- pancreas
- prostate
- testicular
- thyroid.



### Occupational exposures

Occupational exposures account for an estimated 2–5% of cancer cases. Occupational exposures include chemicals, dusts, radiation and industrial processes. Cancers that have been found to be caused by occupational exposures include:

- bladder
- kidney
- leukaemia
- liver
- lung
- lymphoma
- mesothelioma
- nasal cavity
- nasopharynx
- non-melanoma skin cancer
- oesophagus
- oral cavity (lip, mouth, tongue)
- pharynx
- stomach.



### Sunlight

Excessive exposure to the ultraviolet rays of the sun is a risk factor for some cancers. The risk of sunlight is highest for people who have fair skin, blond or red hair, freckles, and/or a tendency to burn easily. Sunlight is a risk factor for:

- melanoma of the skin
- non-melanoma skin cancer.



### **Radiation**

Ionising radiation from natural sources, from nuclear accidents and explosions, and from diagnostic X-rays can be risk factors for cancer. The most common source of radiation for the average person is diagnostic X-rays, however the risk of developing a cancer after an X-ray is minimal and the benefits nearly always outweigh the risk. Ionising radiation can increase the risk of the following cancers:

- breast
- leukaemia
- lung
- thyroid.



### **Medical and iatrogenic factors**

Medical and iatrogenic factors relate to the inadvertent adverse effect or complication resulting from medical treatment or advice. For example, drugs or treatment used for one disease can potentially lead to the development of a secondary condition. Cancers relating to medical and iatrogenic factors include:

- bladder
- bowel
- kidney
- liver
- lung
- mesothelioma
- oesophageal
- pancreas.



### **Reproductive and hormonal factors**

Reproductive hormones are thought to influence the risk of developing some cancers. For women, the risk can be related to reproductive history, endogenous and exogenous hormone exposures and child-bearing. Cancers that are associated with reproductive and hormonal factors include:

- breast
- ovarian
- endometrial.



### **Environmental pollution**

There are many pollutants in the environment that may cause cancer. People are exposed to these pollutants through the air, drinking water, food, soil, sediment, surface waters and groundwater. Pollution can contribute to the following cancers:

- bladder
- kidney
- liver
- lung
- skin
- stomach

## Purpose and structure of this report

*Cancer in Australia: an overview, 2012* provides a comprehensive overview of national statistics on cancer (see Box 1.1 for list of terminology in this report). The report presents the latest available statistics on cancer as a whole, as well as on many individual types of cancer. It includes information on incidence, mortality, survival, prevalence, burden of disease due to cancer, hospitalisations, and the national cancer screening programs. The report is aimed at a wide audience, including health professionals, policy makers, health planners, educators, researchers, consumers and the general public.

The Australian Institute of Health and Welfare (AIHW) has produced an overview report on cancer, either annually or biennially since 1987, and this report is the sixteenth in the series.

Information is in eight thematic chapters. This introductory chapter provides some background information, describes what cancer is and what are the known risk factors, and provides details on data interpretation and data sources. The remaining chapters cover the following topics:

- the number of new cancers diagnosed each year (Chapter 2)
- the number of people who die from cancer each year (Chapter 3)
- survival prospects for those diagnosed with cancer (Chapter 4)
- the number of people alive who have been diagnosed with cancer (Chapter 5)
- differences in incidence, mortality and survival across selected population groups (Chapter 6)
- the burden of disease due to cancer (Chapter 7)
- the number of hospitalisations for cancer (Chapter 8)
- the number of people participated in the national cancer screening programs (Chapter 9).

Data are presented for individual or grouped cancer sites, with the sites defined according to the tenth revision of the International Classification of Diseases and Related Health Problems (ICD-10). Appendix A lists the cancer groupings used in this report.

Compared with the 2010 edition of this report (AIHW & AACR 2010), data for two broader cancer groupings – total lymphoid cancers and total myeloid cancers – are not included, instead, data for individual subgroups of these cancers are presented and compared. Also, ‘Chapter 2 Incidence of cancer’ focuses on the estimated cancer incidence for 2012.

For incidence and mortality statistics, a summary page has been devoted to selected cancers that were commonly diagnosed or were common causes of cancer deaths (Appendix B). These pages present the latest available data, as well as estimates for 2012. Also, an overview of incidence and mortality statistics for all cancer groupings is in Appendix C.

In addition, supplementary data for each chapter are available as online Excel tables at <[www.aihw.gov.au](http://www.aihw.gov.au)>. Throughout the report, these online tables are referred to with a ‘D’, for example, ‘See online Table D2.1’. Appendix D provides more information on accessing these tables online.

### **Box 1.1: Terminology used in this report**

**Incidence rate:** the number of new cancers diagnosed per 100,000 population during a specific period, usually 1 year.

**Mortality rate:** the number of deaths per 100,000 people for which the underlying cause was cancer.

**Relative survival:** the average survival experience. It compares the survival of people diagnosed with cancer (that is, observed survival) with that experienced by people in the general population of equivalent age and sex in the same calendar year (that is, expected survival).

**Prevalence:** the number of people alive who were diagnosed with cancer within a specified time period, such as the previous 5 years.

**Burden of disease:** the quantified impact of prostate cancer on an individual or population.

**Hospitalisation rate:** the number of hospital admissions per 10,000 people due to cancer.

**Year-to-date estimates:** simple extrapolation of recent trend data to the current year. This uses known parameters, such as current populations and knowledge of current practices in cancer detection.

**Projections:** longer-term extrapolation of recent trend data using unknown parameters, such as expected future populations.

## **Data interpretation**

In this report, the term 'cancer' is used to refer to primary tumours that are invasive (that is, malignant). It does not encompass secondary cancers, nor does it include benign or non-invasive tumours.

A number of different classifications are referred to in this report, such as ICD (that is, International Statistical Classification of Disease and Related Health Problems) and ICD-O (that is, International Classification of Disease for Oncology). Information about these classifications is in Appendix E.

This report includes information on the number of cancer cases and deaths, as well as age-standardised rates. The use of age-standardised rates is important when making comparisons between groups and within groups over time, to take into account differences in the age structure and size of the population. This is especially important for cancer, since the risk of many cancers increases with age. Rates have been standardised to the Australian population at 30 June 2001 and are generally expressed per 100,000 population. Further information on age-standardisation and other technical matters is in Appendix H.

Confidence intervals (at the 95% level) are shown in graphs (as error bars) and tables in this report. As explained more fully in Appendix H, confidence intervals can be used as a guide when considering whether differences in rates may be a result of chance variation. Where confidence intervals do not overlap, the difference between rates may be regarded as greater than would readily be attributable to chance. While such differences may be regarded as 'significant' in statistical terms, they may or may not be 'significant' from a practical or clinical perspective.

International comparisons are provided for cancer incidence, mortality and survival. Caution should be taken when comparing cancer data from different countries since observed

differences may be influenced not only by the underlying number of cancer cases (or number of cancer deaths when considering mortality data), but by differences in:

- age distribution and composition of populations
- cancer detection and screening
- types of treatment provided and access to treatment services
- characteristics of the cancer, such as stage at diagnosis and histology type
- coding practices and cancer registration methods, as well as accuracy and completeness of recording of cancer cases.

## Data sources

A key data source for this report was the 2009 Australian Cancer Database (ACD). This database contains information on all new cases of primary, invasive cancer (excluding basal cell and squamous cell carcinoma of the skin) diagnosed in Australia since 1982. Data are collected by state and territory cancer registries from a number of sources and are supplied annually to the AIHW. The AIHW is responsible for the compilation of the ACD through the National Cancer Statistics Clearing House – a collaboration with the Australasian Association of Cancer Registries (AACR).

The 1982–2009 data files for New South Wales and the Australian Capital Territory were not available for inclusion in the 2009 version of the ACD. An extended delay of the receipt of mortality data has meant that New South Wales and the Australian Capital Territory have not been able to close off their 2009 data sets. As a consequence, 2009 cancer data for these jurisdictions are not available for reporting purposes. The 2009 incidence data for New South Wales and the Australian Capital Territory were estimated by the AIHW in consultation with New South Wales and the Australian Capital Territory cancer registries. The estimates were combined with the actual data supplied by other state and territory cancer registries to form a 1982–2009 national cancer data set. Appendix F provides further information.

Another key data source was the National Mortality Database (NMD). This database is a national collection of information for all deaths in Australia from 1968 to 2010 and is maintained by the AIHW. Information on the characteristics and causes of death of the deceased is provided by the Registrars of Births, Deaths and Marriages and coded nationally by the Australian Bureau of Statistics (ABS). Unless stated otherwise, death information in this report relates to the year of death, except for the most recent year (namely, 2010) where year of registration is used. Previous investigation has shown that, due to a lag in processing of deaths, year of death information for the latest available year generally underestimates the true number of deaths, whereas the number of deaths registered in that year is closer to the true value.

Several other data sources – including the National Death Index, the National Hospital Morbidity Database, Medicare Australia data, the Disease Expenditure Database and the 2008 GLOBOCAN database – have also been used to present a broad picture of cancer statistics in Australia.

Additional information about each of the data sources used in this report is in Appendix I.

**Box 1.2: Throughout this report:**

- The term 'cancer' is used to refer to primary tumours which are invasive.
- Differences that are described as 'significant' refer to a statistically significant difference. Such differences may or may not be significant from a practical or clinical perspective.

## What is missing from the picture?

Reliable national data on the incidence of cancer and on the mortality from cancer for Aboriginal and Torres Strait Islander people are not available. While all cancer registries collect information on Aboriginal and Torres Strait Islander status, in some jurisdictions, the quality of the data is insufficient for analyses. In this report incidence data by Aboriginal and Torres Strait Islander status is presented for four jurisdictions and mortality data is presented for five jurisdictions.

Currently, there are no registered national data on the stage (severity) of cancer at diagnosis. Further, no information is available on the treatments applied to cancers, complications with cancer treatment, or the frequency of recurrence of cancer after treatment. However, there are comprehensive national data on treatments provided through admitted patient hospitalisations, for example, surgery and non-surgical care.

Collecting data on stage, treatment and recurrence of cancer is difficult and expensive. Some pilot projects are under ways to collect these data with the aim of expanding the methodology to national data (Cancer Australia 2010).

## 2 Incidence of cancer

### Key findings

In 2012 in Australia, it is estimated that:

- 120,710 new cases of cancer will be diagnosed.
- More than half (56%) of all cancers will be diagnosed in males.
- Seventy-five per cent of new cancer cases in males and 65% in females will occur among those aged 60 and over.
- The most commonly diagnosed cancers in males will be prostate cancer (18,560 cases), bowel cancer (8,760), melanoma of the skin (7,440), lung cancer (6,620) and non-Hodgkin lymphoma (2,620).
- The most commonly diagnosed cancers in females will be breast cancer (14,560 cases), bowel cancer (7,080), melanoma of the skin (5,070), lung cancer (4,650) and uterine cancer (2,270).
- The age-standardised incidence rate will be 474 per 100,000.
- The risk of being diagnosed with cancer before the age of 85 will be 1 in 2 for males and 1 in 3 for females.

## About incidence

Incidence data indicate the number of new cancers diagnosed during a specific period, usually 1 year. Only those cases where cancer was a primary invasive cancer are considered. The case must also be a 'new' primary cancer and not a reoccurrence of a previous primary cancer in the same site (IARC 2004).

Data on the incidence of cancer refers to the number of *cases* newly diagnosed and not to the number of *people* newly diagnosed with cancer. However, since it is rare that a person would be diagnosed with more than one primary cancer during a 1-year period, the annual number of new cancers is practically the same as the annual number of people newly diagnosed with cancer.

The main data source for this chapter was the 2009 ACD. A description of how this database is compiled is in Appendix F. Box 2.1 below describes the registration of cancers in Australia. The information provided in this chapter includes both actual and estimated incidence data. Actual incidence data cover the period 1991–2009 – except for New South Wales and the Australian Capital Territory; for these jurisdictions, data were available to 2008 and estimated for 2009 (see Appendix F). Incidence data for 2010–2012 were estimated based on 2000–2009 national cancer incidence data. Appendix G provides detailed information on the methodology for estimating 2010–2012 incidence data.

This chapter focuses on the estimated cancer incidence for 2012 and cancer trends from 1991 to 2009. It should be noted that the 2010–2012 estimates are only indicative of the future trends and the actual incidence may be different to these estimates. They are not forecasts and do not attempt to allow for future changes in cancer detection methods, changes in cancer risk factors or for non-demographic factors (such as major government policy changes and economic differences) that may affect future cancer incidence rates.

Summary pages for selected cancers are in Appendix B. These pages present the latest available incidence data (2009) and estimates for 2012. An overview of incidence statistics for all cancers is in Appendix C.

### **Box 2.1: Cancer registration in Australia**

Registration of all cancers, excluding basal and squamous cell carcinomas of the skin, is required by law in each state and territory. Information on newly diagnosed cancers is collected by each state and territory cancer registry. Each cancer registry provides data to the AIHW annually, encompassing all cancer cases notified to the registry between 1982 and the most recent completed year of data. The data are compiled to form the ACD.

Since basal and squamous cell carcinomas of the skin are not notifiable, data on these cancers are not included in the ACD and therefore not in this report. However, past research has shown that basal and squamous cell carcinomas of the skin are by far the most frequently diagnosed cancers in Australia (AIHW & CA 2008).



## How many people will be diagnosed with cancer in 2012?

It is estimated that 120,710 new cases of cancer will be diagnosed in Australia in 2012, excluding basal and squamous cell carcinoma of the skin (Table 2.1). More than half (56%) of these cases are expected to be diagnosed in males.

**Table 2.1: Estimated incidence of all cancers combined<sup>(a)</sup>, Australia, 2012<sup>(b)</sup>**

	<b>Males</b>	<b>Females</b>	<b>Persons</b>
Number of cases	67,260	53,460	120,710
Age-standardised rate <sup>(c)</sup>	557.9	404.5	474.4
95% confidence interval	553.6–562.1	401.0–408.0	473.0–477.1
Per cent of all cancer cases	55.7	44.3	100.0

(a) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3 with the exception of those C44 codes that indicate a basal or squamous cell carcinoma of the skin.

(b) 2012 estimates are based on 2000–2009 incidence data (see Appendix G). The estimates are rounded to the nearest 10. The estimates for males and females may not add to the estimates for persons due to rounding.

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

Source: AIHW Australian Cancer Database 2009.

## Which cancers are estimated to be the most common?

Prostate cancer is estimated to be the most common cancer in 2012 (18,560 cases), followed by bowel cancer (15,840), breast cancer (14,680), melanoma of the skin (12,510) and lung cancer (11,280). These cancers are expected to account for more than 60% of all cancers estimated to be diagnosed in 2012.

For males, prostate cancer is estimated to be the most commonly diagnosed (18,560 cases), followed by bowel cancer (8,760), melanoma of the skin (7,440), lung cancer (6,620) and non-Hodgkin lymphoma (2,620).

For females, breast cancer is estimated to be the most commonly diagnosed (14,560 cases). This is followed by bowel cancer (7,080), melanoma of the skin (5,070), lung cancer (4,650) and uterine cancer (2,270) (Table 2.2).

**Table 2.2: Estimated 10 most commonly diagnosed cancers<sup>(a)</sup>, Australia, 2012**

Cancer site/type (ICD-10 codes)	Males			Females			
	Cases	ASR <sup>(b)</sup>	95% CI	Cancer site/type (ICD-10 codes)	Cases	ASR <sup>(b)</sup>	95% CI
Prostate (C61)	18,560	147.9	145.8–150.1	Breast (C50)	14,560	113.2	111.4–115.1
Bowel (C18–C20)	8,760	72.8	71.3–74.4	Bowel (C18–C20)	7,080	51.5	50.3–52.7
Melanoma of the skin (C43)	7,440	62.7	61.3–64.2	Melanoma of the skin (C43)	5,070	39.9	38.8–41.1
Lung (C33–C34)	6,620	55.8	54.4–57.1	Lung (C33–C34)	4,650	34.1	33.1–35.1
Non-Hodgkin lymphoma (C82–C85)	2,620	22.0	21.1–22.8	Uterus (C54–C55)	2,270	17.1	16.4–17.8
Kidney (C64)	2,000	16.6	15.9–17.3	Non-Hodgkin lymphoma (C82–C85)	2,070	15.6	14.9–16.2
Bladder (C67)	1,800	15.3	14.6–16.0	Thyroid (C73)	1,830	15.4	14.7–16.1
Unknown primary site (C80)	1,490	12.7	12.1–13.4	Ovary (C56)	1,410	10.7	10.2–11.3
Pancreas (C25)	1,450	12.1	11.5–12.8	Unknown primary site (C80)	1,360	9.2	8.7–9.7
Stomach (C16)	1,420	11.9	11.3–12.6	Pancreas (C25)	1,290	9.1	8.6–9.6
<b>All cancers<sup>(c)</sup></b>	<b>67,260</b>	<b>557.9</b>	<b>553.6–562.1</b>	<b>All cancers<sup>(c)</sup></b>	<b>53,460</b>	<b>404.5</b>	<b>401.0–408.0</b>

(a) 2012 estimates are based on 2000–2009 incidence data (see Appendix G). The estimates are rounded to the nearest 10.

(b) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

(c) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3 with the exception of those C44 codes which indicate a basal or squamous cell carcinoma of the skin.

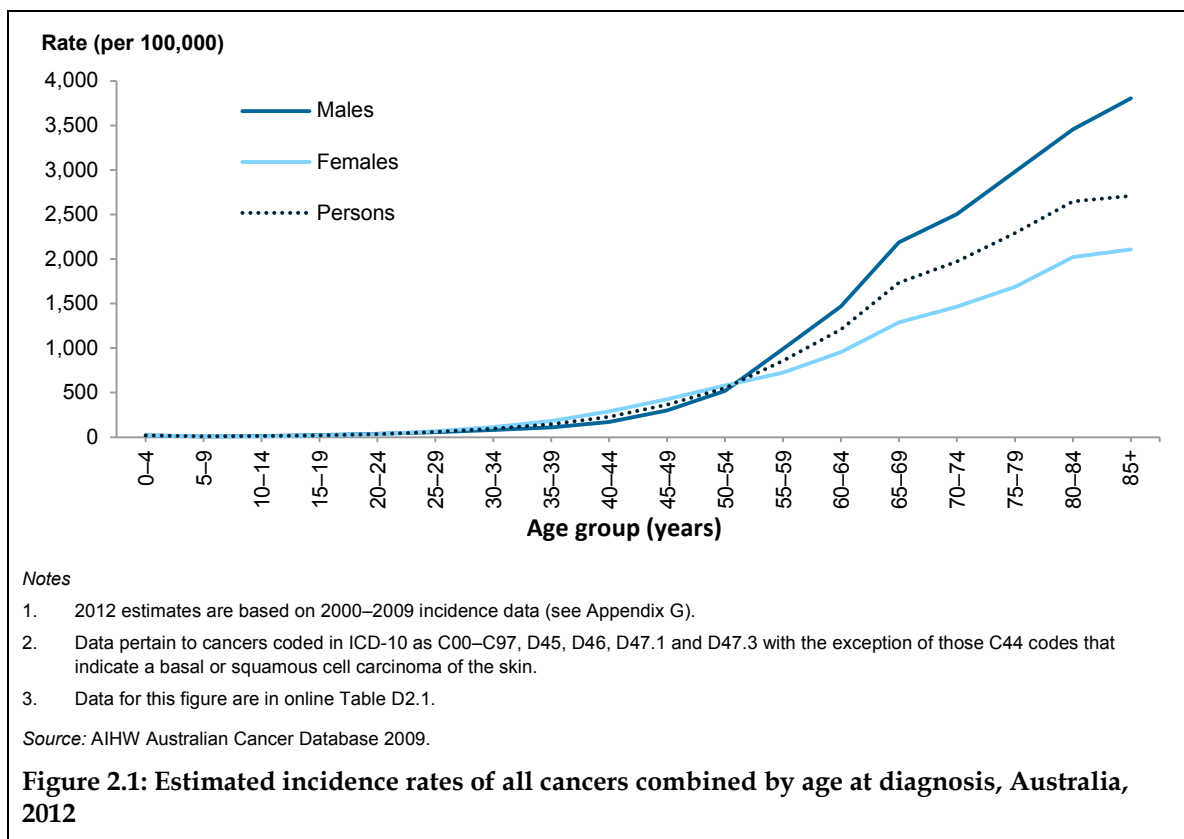
Source: AIHW Australian Cancer Database 2009.

## Does incidence differ by age?

The incidence of cancer is expected to increase with age (Figure 2.1). In 2012, it is estimated that 75% of new cancer cases will be diagnosed in males and 65% in females aged 60 and over.

For those aged under 30, the incidence rates are expected to be similar in males and females. For those aged 30–54, the estimated age-standardised incidence rate is higher for females than males, while a higher incidence rate is expected for males after the age 55.

The expected high incidence of cancer in females aged 30–54 could be due to the estimated high incidence of breast cancer in this age group. Incidence of prostate cancer, bowel cancer, melanoma of the skin and lung cancer will contribute to the estimated high incidence rate in males aged over 55.



## What is the risk of being diagnosed with cancer?

In 2012, it is estimated that 1 in 3 males and 1 in 4 females will be diagnosed with cancer by the age of 75. By the age of 85, the risk is estimated to increase to 1 in 2 for males and 1 in 3 for females (see Appendix H for an explanation of how these risks were calculated).

**Table 2.3: Estimated risk of being diagnosed with cancer<sup>(a)</sup>, Australia, 2012**

	<b>Risk to age 75</b>	<b>Risk to age 85</b>
Males	1 in 3	1 in 2
Females	1 in 4	1 in 3
<b>Persons</b>	<b>1 in 3</b>	<b>1 in 2</b>

(a) 2012 estimates are based on 2000–2009 incidence data (see Appendix G).

Source: AIHW Australian Cancer Database 2009.

For males, the risk of being diagnosed with cancer is estimated to be highest for prostate cancer, at 1 in 8 before the age of 75 and 1 in 6 before the age of 85. The risk is also expected to be high for bowel cancer, at 1 in 19 before the age of 75 and 1 in 10 before the age of 85.

For females, the risk of being diagnosed with cancer is estimated to be highest for breast cancer, with a risk of 1 in 11 before the age of 75 and 1 in 8 before the age of 85. In comparison, the risk of a woman being diagnosed with bowel cancer is estimated to be 1 in 27 before the age of 75, and 1 in 14 before the age of 85.

## What has changed over time?

In this section, trends in incidence for all cancers combined and selected cancer sites are presented for 1991–2009. Estimated incidence data for 2010–2012 are shown in figures and online tables, and were derived from 2000–2009 national cancer incidence data (see Appendix G).

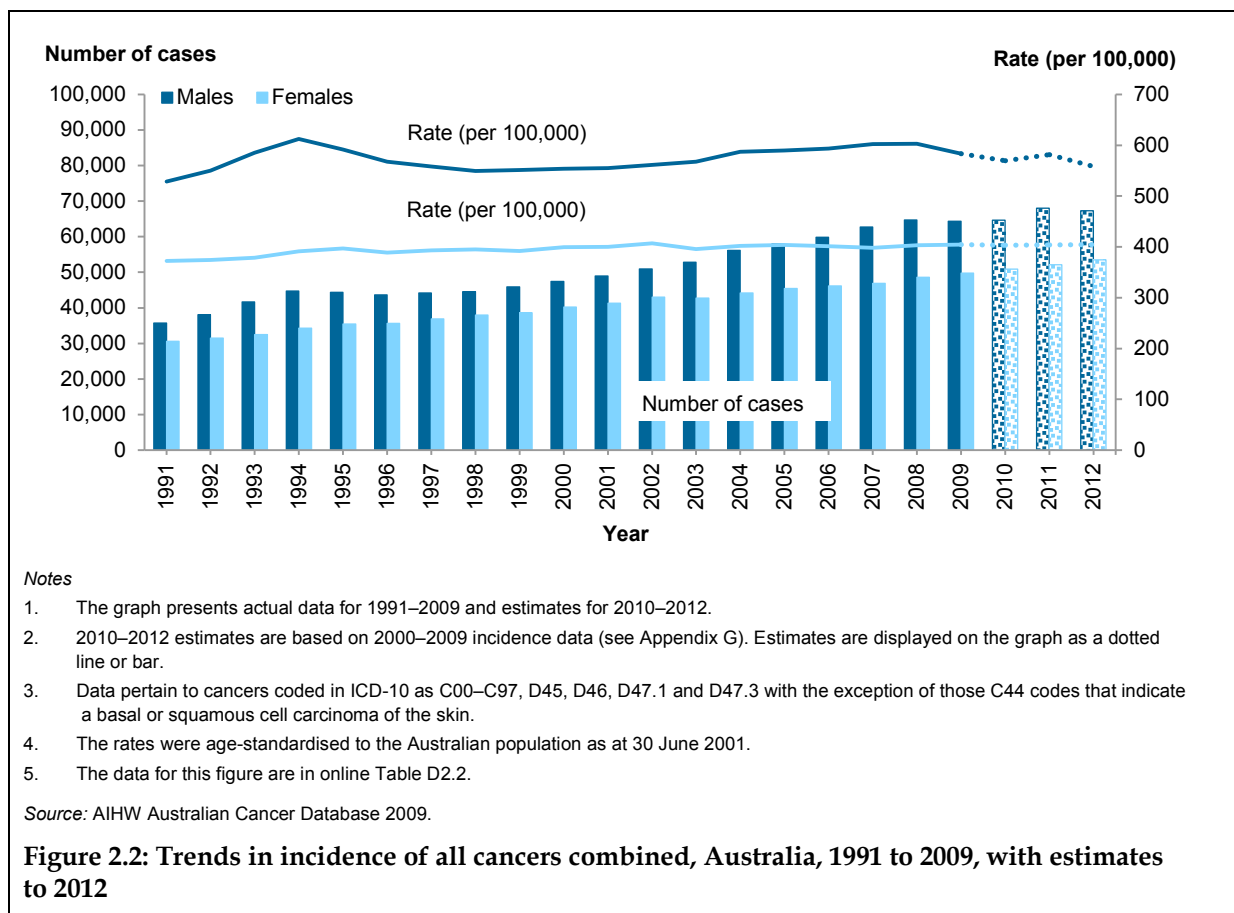
### Trends for all cancers combined

Between 1991 and 2009, the number of new cancer cases diagnosed almost doubled – from 66,393 in 1991 to 114,137 in 2009. This increasing trend is primarily due to the rise in the number of prostate cancer, breast cancer in females, bowel cancer and lung cancer.

The age-standardised incidence rate of all cancers combined increased by 12% from 433 per 100,000 in 1991 to 486 per 100,000 in 2009. This suggests that the increase in the absolute number of cancer cases over the years can only be partly explained by the ageing and increasing size of the population.

The trend in the incidence rate of all cancers combined was markedly different for males and females (Figure 2.2). For males, it increased steadily until 1994, where it peaked at 612 per 100,000. This was followed by a decline until the late 1990s when it began to increase again, reaching a rate of 603 per 100,000 in 2008. The rate fell slightly in 2009 to 584 per 100,000. The trend in the rate for males is strongly influenced by changes in the incidence rate of prostate cancer – the most common cancer in males.

For females, the incidence rate of all cancers combined rose steadily during the early 1990s, reaching 397 per 100,000 in 1995. Since then, it was fairly stable, ranging from 389 to 407 per 100,000. The rate for females has been strongly influenced by the trend in the incidence rate of breast cancer.



## Trends for specific cancers

Figure 2.3 presents a summary of the percentage change in age-standardised incidence rates between 1991 and 2009 for selected cancers.

In general, the incidence rate of some cancers decreased over time. Of the selected cancers, those that showed the greatest percentage-point decrease were:

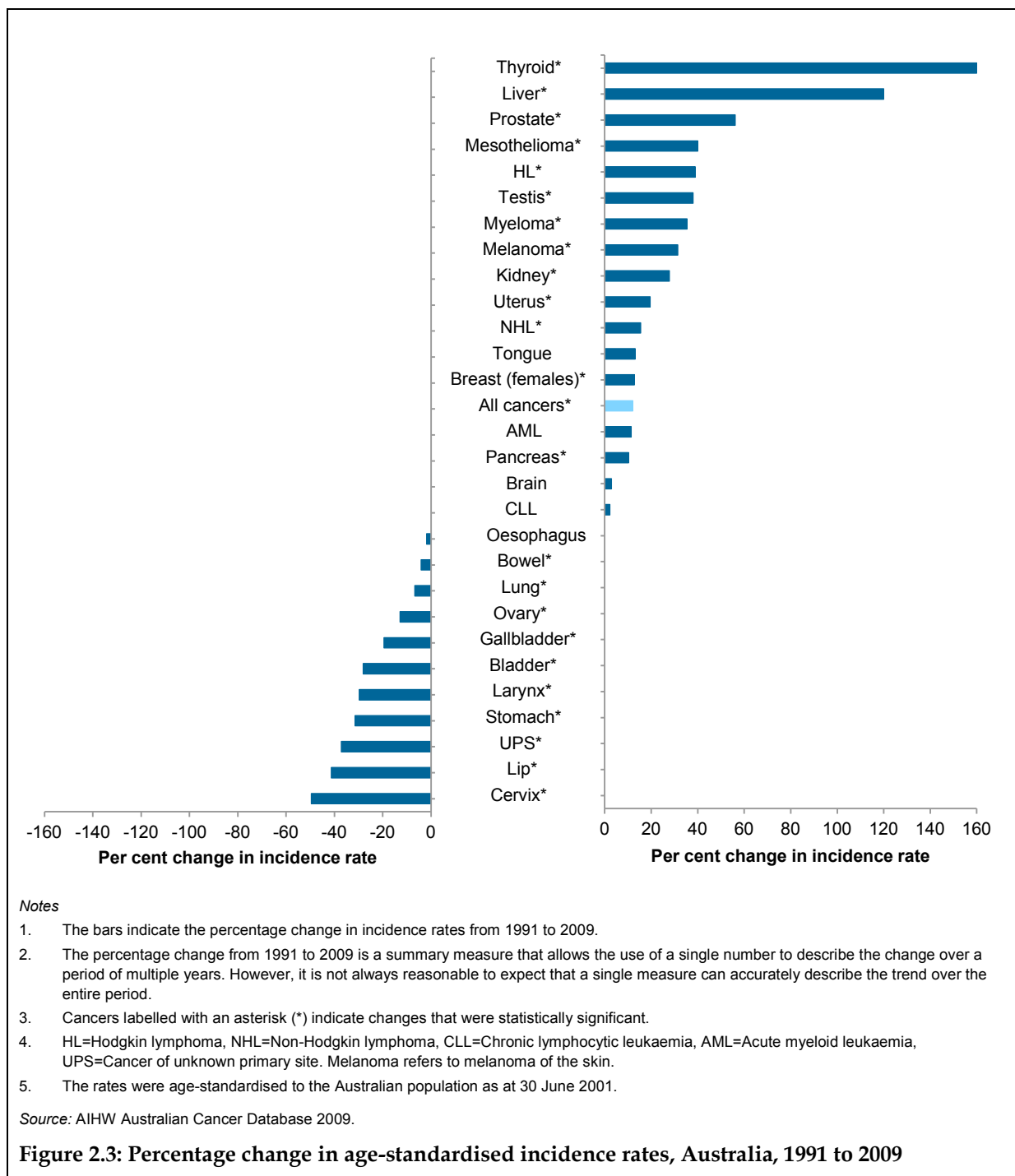
- cervical cancer (from 13 to 6.7 per 100,000)
- lip cancer (from 6.3 to 3.7 per 100,000)
- cancer of unknown primary site (from 19 to 12 per 100,000)
- stomach cancer (from 12 to 8.5 per 100,000).

The incidence rate of these cancers decreased by more than 30 per cent.

However, some cancers showed an increase in incidence rate between 1991 and 2009. They included:

- thyroid cancer (from 3.5 to 9.1 per 100,000)
- liver cancer (from 2.5 to 5.5 per 100,000)
- prostate cancer (from 110 to 172 per 100,000).

More information about the trends in incidence rates of prostate cancer, breast cancer in females, bowel cancer, melanoma of the skin and lung cancer is provided in the following section.



### Prostate cancer

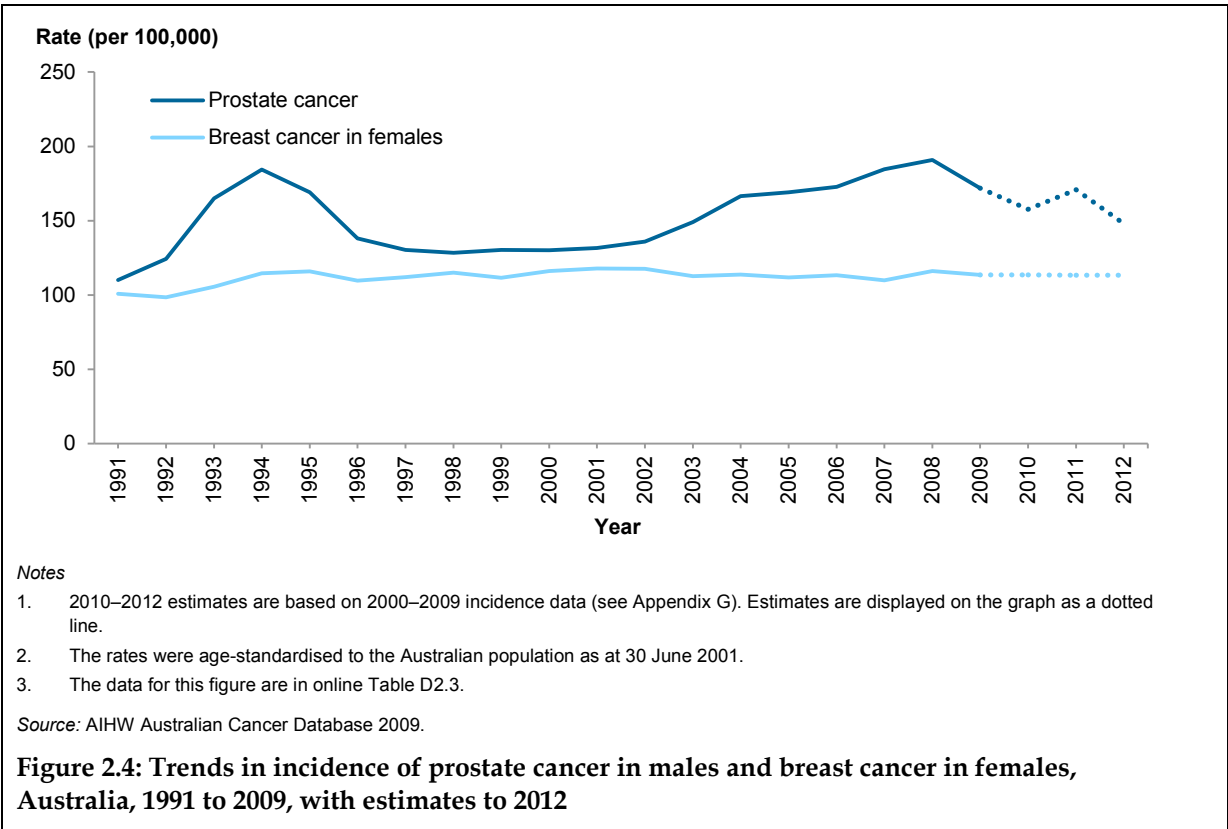
Sharp increases in the age-standardised incidence rate of prostate cancer began to appear in the early 1990s, with a peak of 184 per 100,000 in 1994. The rate then declined rapidly to 130 per 100,000 in 1997, before stabilising for several years. From 2002, it began to increase again, reaching 191 per 100,000 in 2008. The incidence rate declined in 2009 and is estimated to fluctuate between 2010 and 2012 (Figure 2.4).

The peaks in prostate cancers are thought to be due to changes in how prostate cancers are detected, rather than an elevated risk. Prostate-specific antigen (PSA) testing first became available in 1987 and was listed in the Medicare Benefits Schedule in 1989. Therefore, the peak in the early 1990s reflects the large pool of undiagnosed cases that were identified using the PSA test (and subsequent biopsy and confirmation by a specialist). As prostate cancer can be diagnosed in men without symptoms, some of these cancers may have remained undiagnosed until symptoms emerged, or never diagnosed because of mortality from another condition (AIHW & AACR 2010). The second rise in incidence numbers in more recent years is probably a result of changes in diagnostic procedures, including lowering the investigation threshold, which may have led to more men being sent for biopsy and increasing the number of core biopsies taken (Smith et al. 2008).

**Breast cancer in females**

The age-standardised incidence rate of breast cancer in females was 101 per 100,000 in 1991. It increased in the following years and reached 116 per 100,000 in 1995. After this, the rates were fairly stable, ranging from 110 to 118 to 100,000, with the 2009 rate at 114 per 100,000. It is estimated to remain stable between 2010 and 2012 (Figure 2.4).

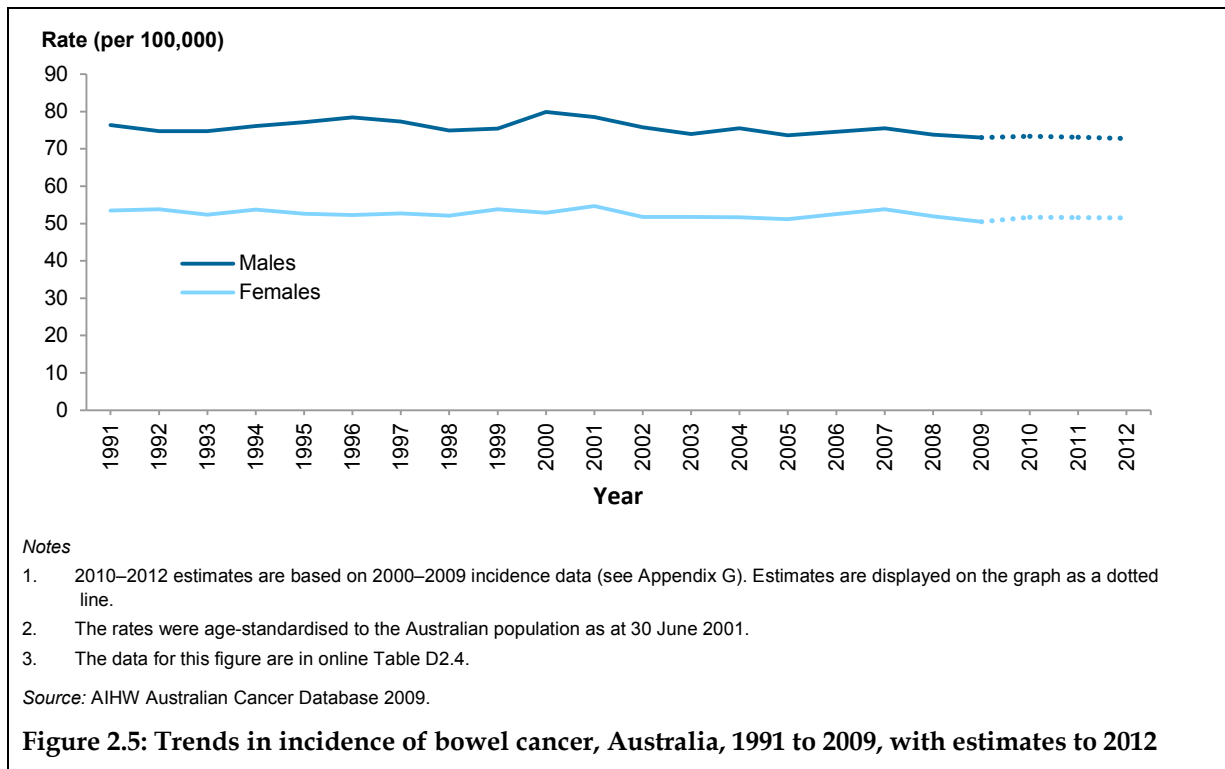
The pronounced increase in the incidence of breast cancer between 1991 and 1995 is most likely due to the introduction of the national breast cancer screening program (known today as BreastScreen Australia), which aims to detect cases of unsuspected breast cancer in women aged 40 and over using screening mammography. The target age range for screening is women aged 50–69 (see Chapter 9 for more information).



## Bowel cancer

The age-standardised incidence rate of bowel cancer for males was 76 per 100,000 in 1991. It increased to 80 per 100,000 in 2000 and declined in the following years. It is expected to fall to 73 per 100,000 in 2012 – a 4.7% decrease from the rate in 1991 (Figure 2.5).

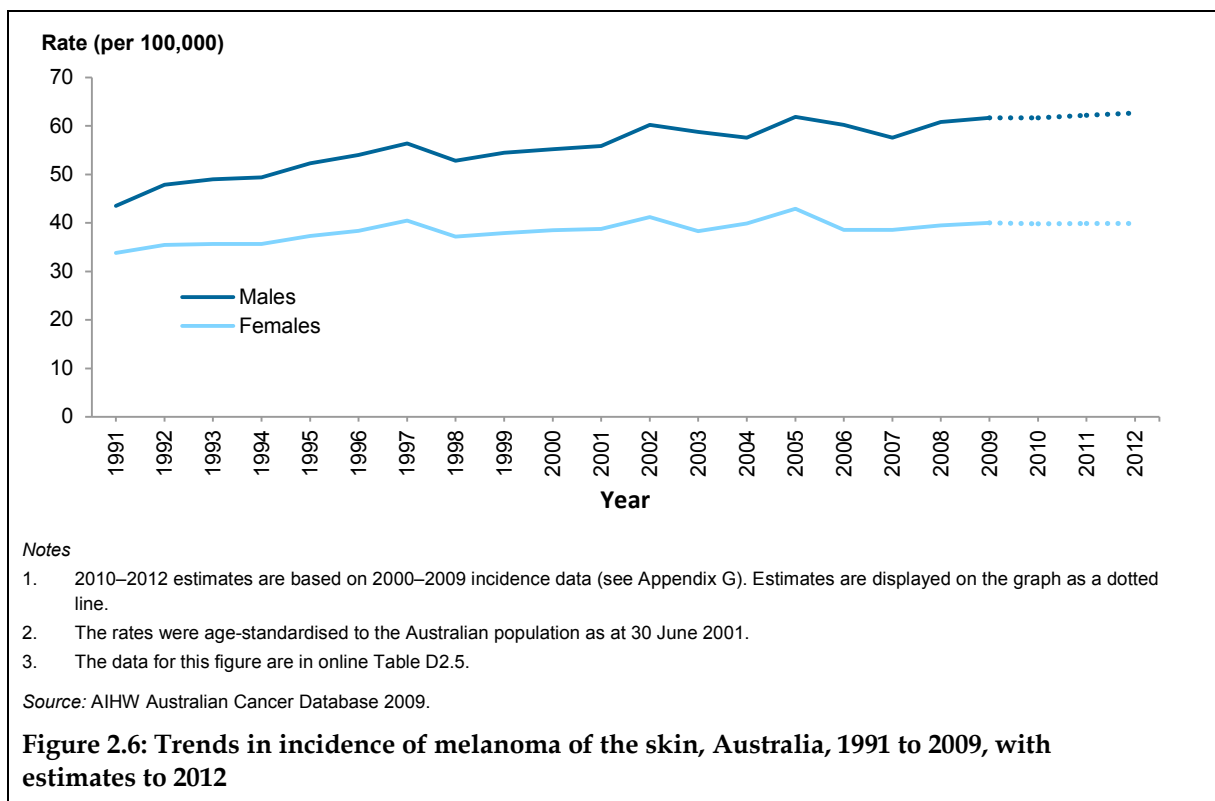
The incidence rate of bowel cancer for females varied between 51 and 55 per 100,000 from 1991 to 2009. It was considerably lower than that for males during the entire period. This may be related to differences in behaviour that increases the risk of bowel cancer and the differing effect of obesity in males and females (Center et al. 2009). The rate is expected to remain fairly stable between 2010 and 2012.



## Melanoma of the skin

The age-standardised incidence rate of melanoma of the skin increased for both males and females from 1991 to 2009. The increase was more marked for males – from 44 per 100,000 in 1991 to 62 per 100,000 in 2009 (an increase of 42%). For females, the incidence rate increased by 18%, from 34 per 100,000 to 40 per 100,000 over the same period. The rate is expected to remain stable between 2010 and 2012 (Figure 2.6).

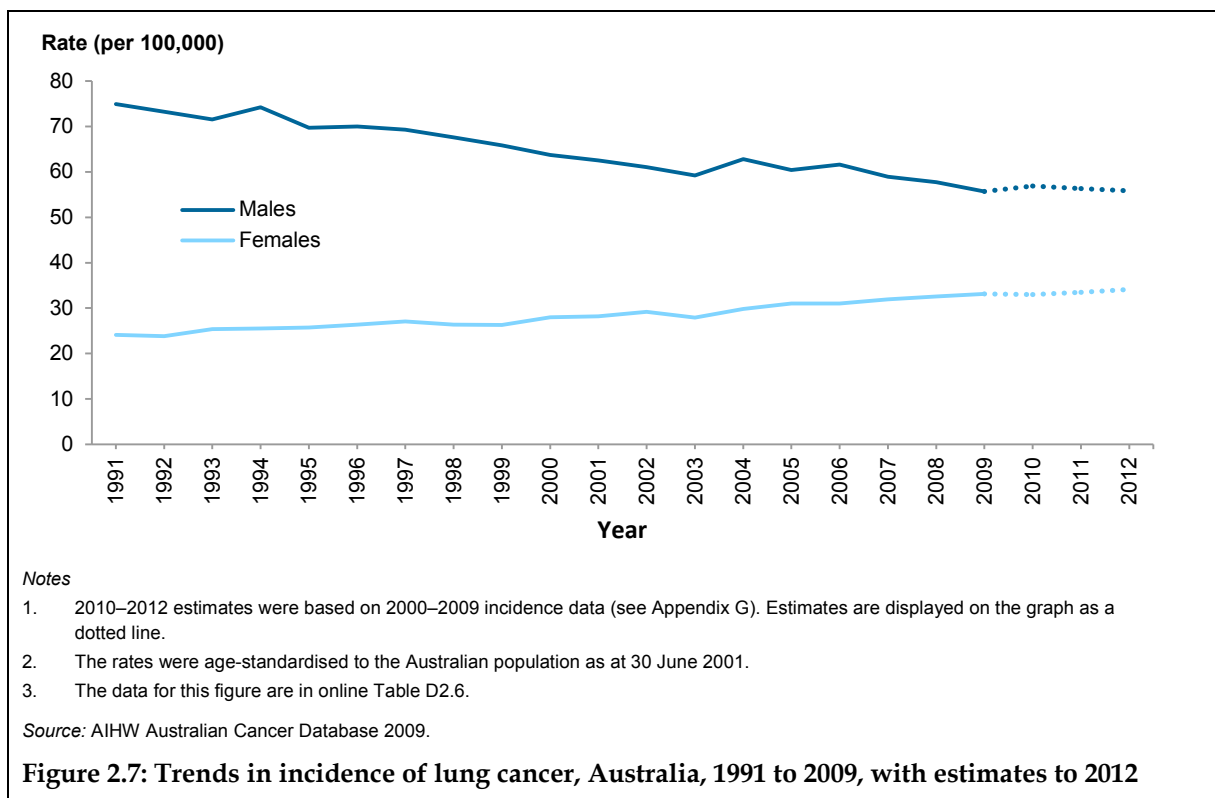




## Lung cancer

Between 1991 and 2009, the age-standardised incidence rate of lung cancer in males fell by 26%, from 75 to 56 per 100,000, but rose by 37% in females, from 24 to 33 per 100,000. These trends in males and females are expected to continue between 2010 and 2012 (Figure 2.7).

The different pattern of lung cancer incidence rates in males and females is probably due to their different histories of tobacco smoking. As overall tobacco consumption began to decline in males in the second half of the 20th century, the incidence rate of lung cancer for males also declined, with a time lag of about 20 years. Cigarette smoking in women peaked later than in men, which may explain why the lung cancer incidence rate for females is still rising (AIHW & CA 2011).



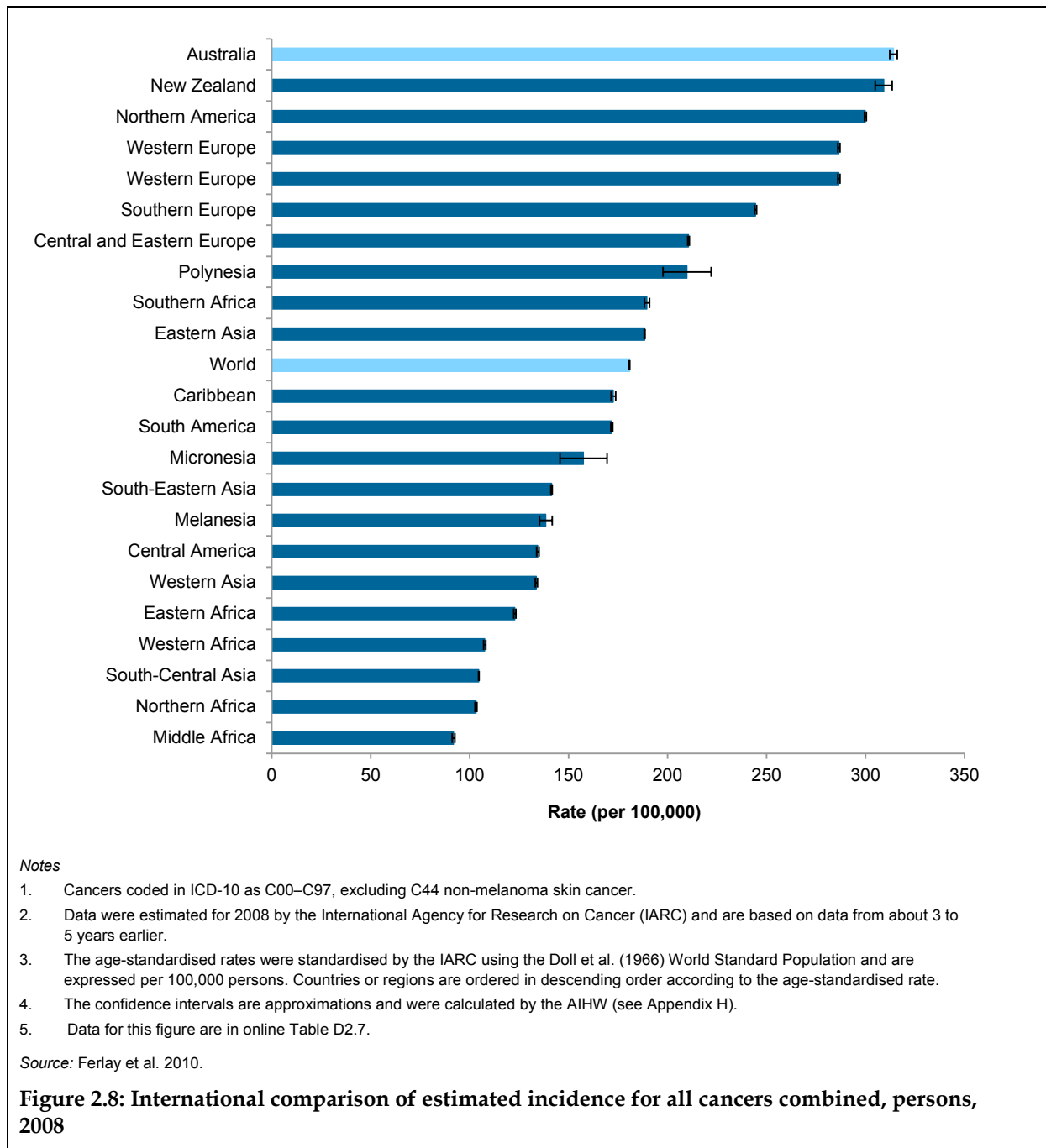
## How does Australia compare internationally?

In this section, the incidence rate of cancer in Australia is compared with that for other countries and regions using data from the GLOBOCAN database, which is prepared by the International Agency for Research on Cancer (IARC) (Ferlay et al. 2010). The most recent GLOBOCAN estimates are for 2008, and are based on cancer incidence rates from about 3 to 5 years earlier. The GLOBOCAN data for all cancers combined pertain to cancers coded in ICD-10 as C00–C97, excluding C44 (that is, non-melanoma skin cancer), and thus encompass a narrower range of cancers than is generally considered in this report (see Appendix I).

As discussed in Chapter 1, caution must be taken when comparing data from different countries since observed differences may be due to differences in the composition of the populations, cancer detection and screening, types of treatment provided, and cancer coding and registration practices. In Australia, all states and territories have legislation that makes cancer a notifiable disease (see Appendix I) and the completeness of cancer data is relatively high in comparison to a number of countries or regions (Curado et al. 2007).

The estimated number of new cases of cancer around the world in 2008 was 12.7 million. Figure 2.8 shows the estimated incidence rates of cancer by region. The estimated age-standardised incidence rate for Australia was 314 per 100,000 (online Table D2.7). While this rate was generally at the same level as that estimated for people in New Zealand (309 per 100,000), it was significantly higher than the rates estimated for all other regions in the world. This is probably a consequence of the high rate of melanoma of the skin in Australia. In 2008, Australia had the world's highest age-standardised incidence rate of melanoma of the skin (37 per 100,000), which was more than 12 times the average world rate (3 per 100,000). Australia also had the highest incidence rate of prostate cancer (105 per 100,000)

and the fourth highest rate of breast cancer in females (85 per 100,000) in 2008 (Ferlay et al. 2010).



### 3 Mortality from cancer

#### Key findings

In 2010 in Australia:

- A total of 42,844 people died from cancer, an average of 117 deaths every day.
- Cancer was the second most common cause of death, exceeded only by cardiovascular diseases.
- The majority of cancer deaths were in males (57%).
- Lung cancer was the leading cause of cancer death among males (4,934 deaths), followed by prostate cancer (3,235), bowel cancer (2,205), pancreatic cancer (1,233) and cancer of unknown primary site (1,167).
- The most common cancers causing death in females were lung cancer (3,165 deaths), breast cancer (2,840), bowel cancer (1,777), pancreatic cancer (1,201) and cancer of unknown primary site (1,113).
- For both males and females, the average age at death due to cancer was 73.
- The age-standardised mortality rate for all cancers combined was 174 per 100,000, a fall of 17% from 1991 (210 per 100,000).
- The risk of a person in the general population dying from cancer before the age of 85 was 1 in 4 for males and 1 in 6 for females.

## About mortality

In this report, mortality refers to the number of deaths for which the underlying cause was a primary cancer. The cancer that led to the death of the person may have been diagnosed many years previously, in the same year in which the person died or, in some cases, after death (for example at autopsy). Information on the underlying cause of death is derived from the medical certificate of cause of death, which is usually completed by a medical practitioner.

The main data source used in this chapter was the AIHW National Mortality Database, which contains information about all deaths registered in Australia (see Appendix I for more information).

Data on mortality from cancer are based on the year of *occurrence* of death, except in 2010 (the latest year for which mortality data are available), where the year of *registration* of death is used. Previous investigation has shown that the year of death and its registration correspond for most part of the year. However, deaths that occur at the end of the calendar year often do not get registered till the following year due to a lag in processing of deaths. Therefore, the number of death registered for the most recent year (2010) is used as an estimate to account for these deaths. Additional information on mortality from 'all cancers combined' and the selected cancer sites is in online tables (see Appendix D) that are available on the AIHW website.

Summary pages for selected cancers are in Appendix B. These pages present the latest available mortality data and estimates for 2012. An overview of mortality statistics for all cancers is in Appendix C.

## How many people died from cancer in 2010?

Cancer accounted for about 3 of every 10 deaths (30%) registered in Australia in 2010 (Table 3.1). This makes cancer the second most common cause of death, exceeded only by cardiovascular diseases (32% of all deaths) (ABS 2012a).

In 2010, 42,844 people died from cancer in Australia, an average of 117 deaths every day. More males (57%) than females (43%) died from cancer, with cancer accounting for 33% of all male deaths and 27% of all female deaths.

The age-standardised mortality rate for all cancers combined was 174 per 100,000 in 2010. The mortality rate of males (222 per 100,000) was significantly higher than that of females (138 per 100,000).

**Table 3.1: Deaths from all cancers combined<sup>(a)</sup>, Australia, 2010<sup>(b)</sup>**

	<b>Males</b>	<b>Females</b>	<b>Persons</b>
Number of deaths	24,328	18,516	42,844
Age-standardised rate <sup>(c)</sup>	221.7	137.6	174.3
95% confidence interval	218.9–224.5	135.6–139.7	172.7–176.0
Per cent of all cancer deaths	56.8	43.2	100.0
Per cent of all deaths	33.1	26.5	29.9

(a) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3.

(b) Mortality data for 2010 are preliminary and are subject to further revision.

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

Source: AIHW National Mortality Database.

## Which cancers lead to most deaths?

In 2010, lung cancer (8,099 deaths), bowel cancer (3,982), prostate cancer (3,235), breast cancer (2,864) and pancreatic cancer (2,434) were the most common causes of cancer death. Together these five cancers represented just under half (48%) of the total mortality from cancer, with lung cancer alone accounting for 1 in every 5 deaths due to cancer (19%).

Lung cancer was the leading cause of cancer death among Australian males, with 4,934 deaths in 2010. Prostate cancer (3,235) and bowel cancer (2,205) were the second and third leading cause of cancer death in males, followed by pancreatic cancer (1,233) and cancer of unknown primary site (1,167). These five cancers accounted for 53% of all cancer deaths in males.

Lung cancer was also the most common cause of cancer deaths in females in 2010 (3,165 deaths). This was followed by breast cancer (2,840), bowel cancer (1,777), pancreatic cancer (1,201) and cancer of unknown primary site (1,113). These five cancers accounted for 55% of all cancer deaths in females.

**Table 3.2: The 10 most common causes of death from cancer, Australia, 2010<sup>(a)</sup>**

Cancer site/type (ICD-10 codes)	Males			Females			
	Deaths	ASR <sup>(b)</sup>	95% CI	Cancer site/type (ICD-10 codes)	Deaths	ASR <sup>(b)</sup>	95% CI
Lung (C33–C34)	4,934	44.6	43.3–45.9	Lung (C33–C34)	3,165	24.2	23.3–25.0
Prostate (C61)	3,235	30.6	29.6–31.7	Breast (C50)	2,840	21.6	20.8–22.4
Bowel (C18–C20)	2,205	20.1	19.2–20.9	Bowel (C18–C20)	1,777	13.0	12.4–13.6
Pancreas (C25)	1,233	11.1	10.5–11.7	Pancreas (C25)	1,201	8.9	8.4–9.4
Unknown primary site (C80)	1,167	10.7	10.1–11.3	Unknown primary site (C80)	1,113	7.8	7.4–8.3
Melanoma of the skin (C43)	993	8.9	8.4–9.5	Ovary (C56)	912	7.0	6.6–7.5
Liver (C22)	890	7.9	7.4–8.4	Other digestive organs (C26)	641	4.4	4.1–4.8
Oesophagus (C15)	879	7.8	7.2–8.3	Non-Hodgkin lymphoma (C82–C85)	557	4.0	3.7–4.3
Non-Hodgkin lymphoma (C82–C85)	781	7.1	6.6–7.6	Brain (C71)	512	4.1	3.8–4.5
Bladder (C67)	736	6.9	6.4–7.4	Melanoma of the skin (C43)	459	3.5	3.2–3.8
<b>All cancers<sup>(c)</sup></b>	<b>24,328</b>	<b>221.7</b>	<b>218.9–224.5</b>	<b>All cancers<sup>(c)</sup></b>	<b>18,516</b>	<b>137.6</b>	<b>135.6–139.7</b>

(a) Mortality data for 2010 are preliminary and are subject to further revision.

(b) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

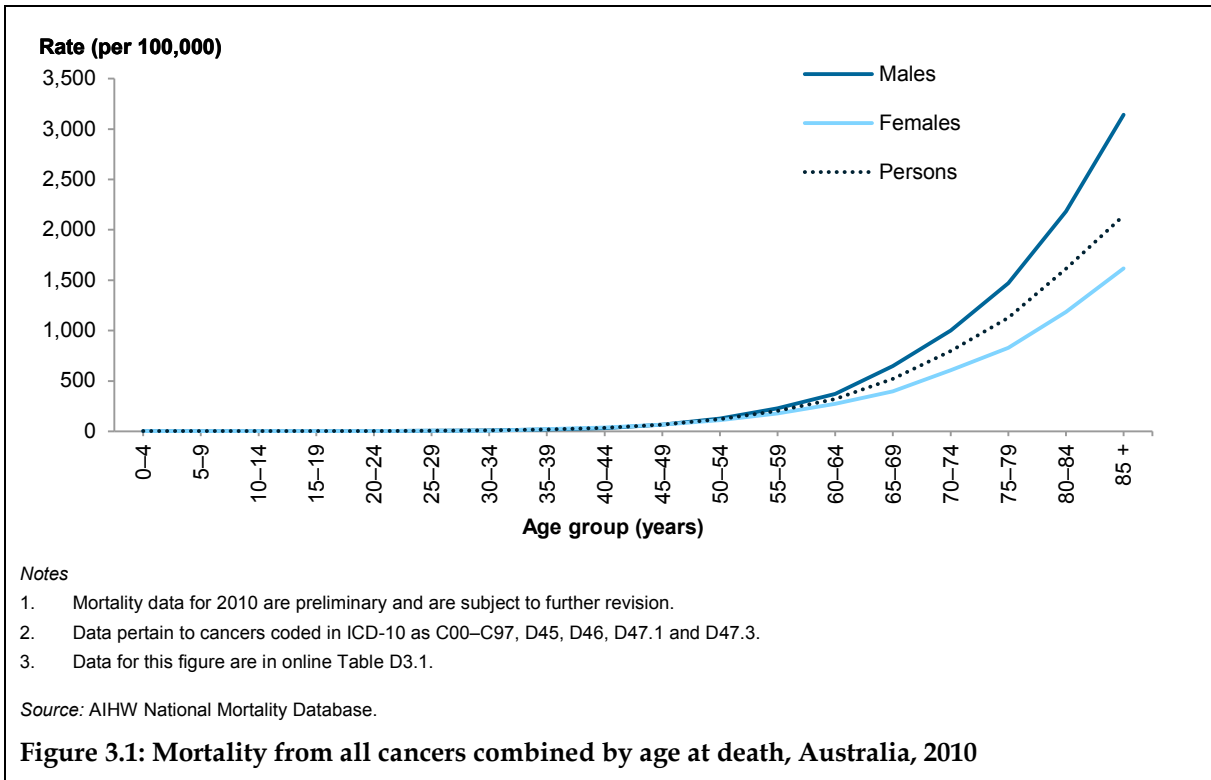
(c) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3.

Source: AIHW National Mortality Database.

## Does mortality differ by age?

The age-specific mortality rate from all cancers combined increased with age (Figure 3.1). In 2010, 85% of all cancer deaths in males and 83% all cancer deaths in females occurred in people aged over 60. The average age at death due to cancer was 73 for both males and females.

The mortality rate was similar for males and females up to the age of 50–54. After 55, the mortality rates were higher and increased more steeply in males. Mortality from lung cancer, prostate cancer and bowel cancer accounted for the high cancer mortality in older men.



## What is the risk of death from cancer?

In 2010, the risk of dying from cancer before the age of 75 years was 1 in 8 for males and 1 in 12 for females. By the age of 85, the risk increased to 1 in 4 for males and 1 in 6 for females (Table 3.3) (see Appendix H for an explanation of how these risks were calculated).

**Table 3.3: Risk of death from cancer, Australia, 2010<sup>(a)</sup>**

	Risk to age 75	Risk to age 85
Males	1 in 8	1 in 4
Females	1 in 12	1 in 6
<b>Persons</b>	<b>1 in 10</b>	<b>1 in 5</b>

(a) Mortality data for 2010 are preliminary and are subject to further revision.

Source: AIHW National Mortality Database.

The risk of dying from lung cancer was high for both males and females. Specifically, before the age of 75, the risk was 1 in 36 males and 1 in 58 females. By the age of 85, the risk of dying from lung cancer doubled to be 1 in 16 for males and 1 in 29 for females.

## What has changed over time?

In this section, trends in mortality from all cancers combined and selected cancer sites are presented from 1991 to 2010.



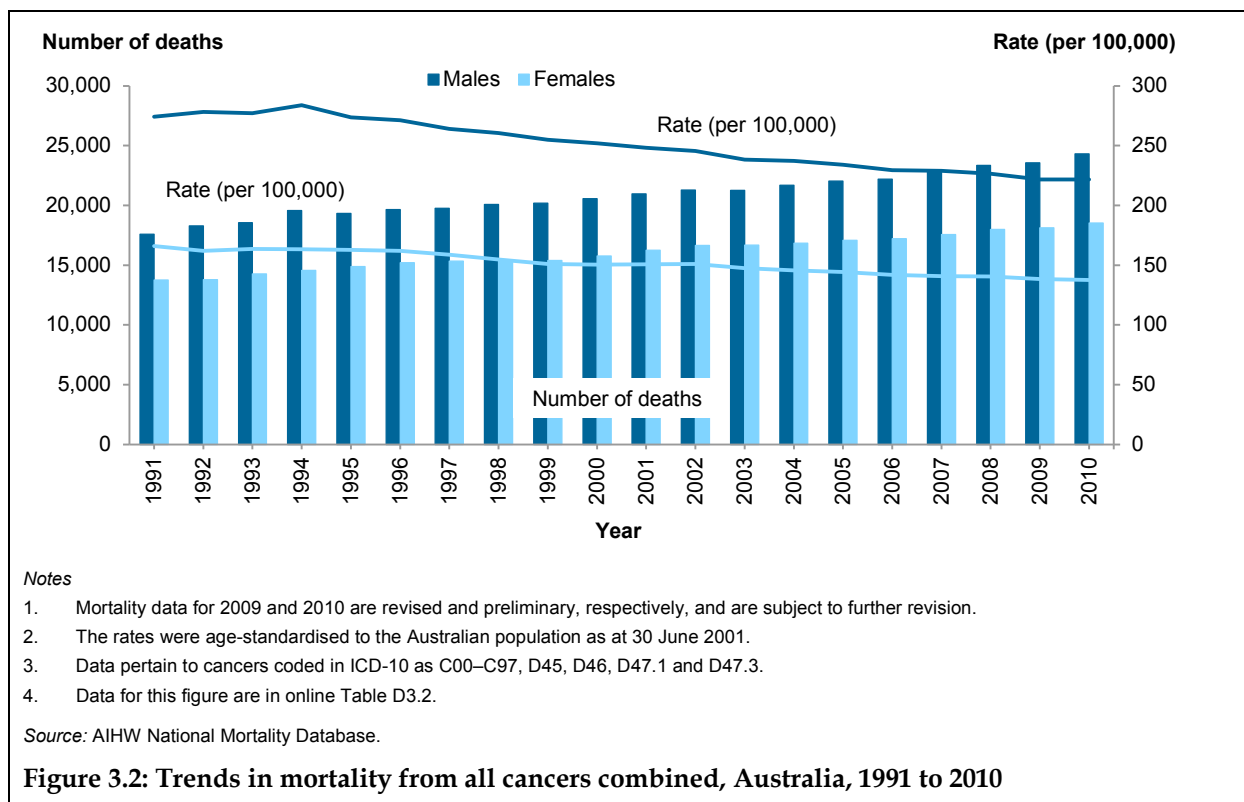
## Trends for all cancers combined

The number of deaths from all cancers combined has steadily increased over time. In 2010, 42,844 Australians died from cancer, compared with 31,356 in 1991, an increase of 37%. The number of deaths recorded for 2010 was the largest number reported in any year to date.

In contrast, there was a statistically significant decrease in the age-standardised mortality rate. Between 1991 and 2010, the mortality rate fell by 17% from 210 to 174 per 100,000.

For males, after the mortality rate reached a peak in 1994, it fell by 22% over the period to 2010 (from 284 to 222 per 100,000) (Figure 3.2). The trend of cancer mortality in males was heavily influenced by declines in mortality rates for lung cancer, prostate cancer and bowel cancer, which accounted for most of the total decrease between 1994 and 2010.

The cancer mortality rate for females was consistently lower than that of males throughout the 20 years considered. The female mortality rate remained fairly stable before 1993 and decreased thereafter. The mortality rate among females fell by 16% from 1993 (164 per 100,000) to 2010 (138 per 100,000) (Figure 3.2). The fall was largely due to declines in mortality rates of breast cancer and bowel cancer.



## Trends for specific cancers

Figure 3.3 summaries the percentage change in age-standardised mortality rates between 1991 and 2010 for selected cancers.

In general, the mortality rate of many cancers decreased over time. Of the selected cancers, those that showed the greatest statistically significant percentage-point decrease in mortality rate were:

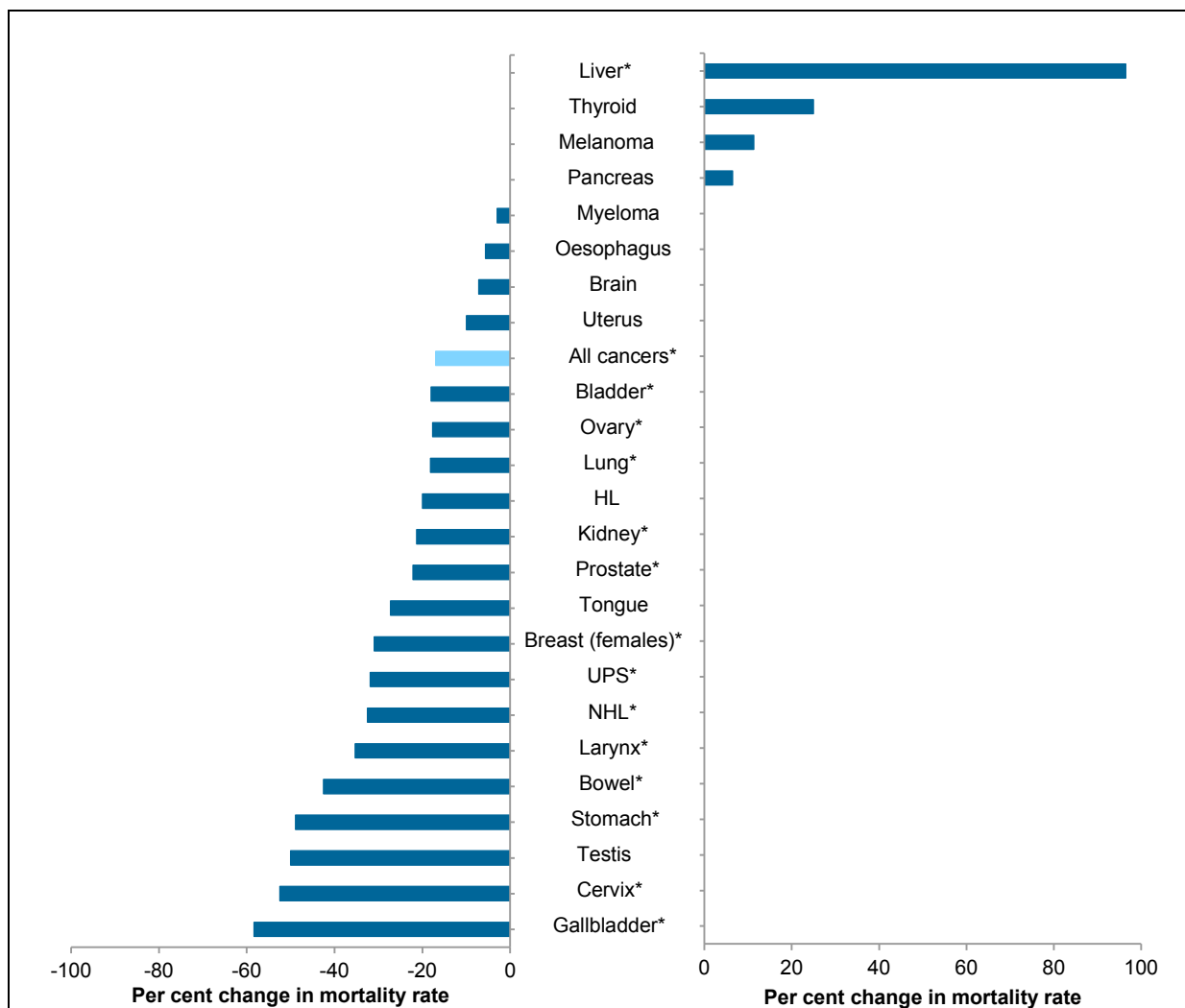
- cancer of the gallbladder (from 2.4 to 1.0 per 100,000)

- cervical cancer (from 4.0 to 1.9 per 100,000)
- stomach cancer (from 8.8 to 4.5 per 100,000)
- bowel cancer (from 28 to 16 per 100,000).

Mortality rate of these cancers decreased by more than 40 per cent.

Of the selected cancers, only liver cancer showed a significant increase in mortality rate between 1991 and 2010 (from 2.8 to 5.5 per 100,000).

More information about the trends in the mortality rates of lung cancer, bowel cancer prostate cancer and breast cancer in females is provided in the following section.



**Notes**

1. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
2. The bars indicate the percentage change in mortality rates from 1991 to 2010.
3. The percentage change from 1991 to 2010 is a summary measure that allows the use of a single number to describe the change over a period of multiple years. However, it is not always reasonable to expect that a single measure can accurately describe the trend over the entire period.
4. Cancers labelled with an asterisk (\*) indicate changes that were statistically significant.
5. HL=Hodgkin lymphoma, UPS=Cancer of unknown primary site, NHL=Non-Hodgkin lymphoma. Melanoma refers to melanoma of the skin.
6. The rates were age-standardised to the Australian population as at 30 June 2001.

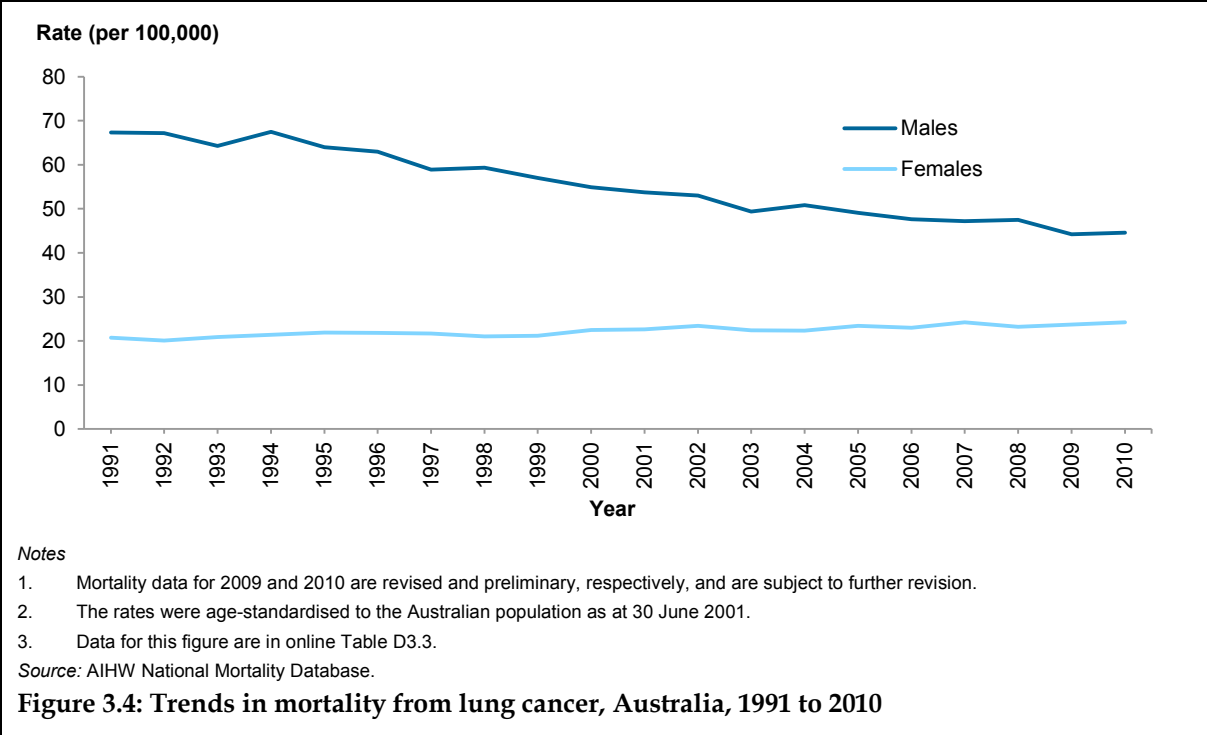
Source: AIHW National Mortality Database.

**Figure 3.3: Percentage change in age-standardised mortality rates, Australia, 1991 to 2010**

**Lung cancer**

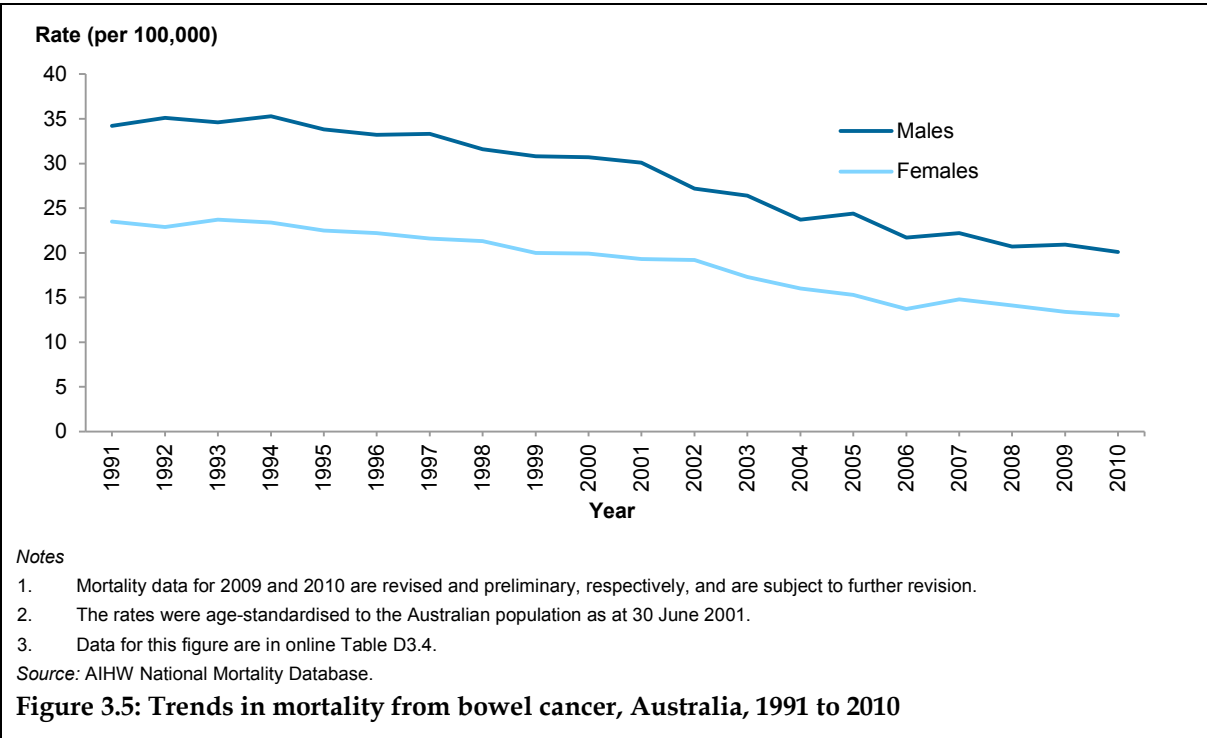
Trends in the age-standardised mortality rates of lung cancer differ starkly for males and females. As illustrated in Figure 3.4, the mortality rate for males has fallen steadily from 67 per 100,000 in 1991 to 45 per 100,000 in 2010; an overall fall of 33%. Over the same period, mortality rate for females increased, and by 2010 the rate (24 per 100,000) was 17% higher than it was in 1991 (21 per 100,000). While the mortality rate for females was still lower than that for males in 2010, the gap has narrowed considerably over the last decades.

The different patterns of mortality rates for males and females may reflect the historical differences in smoking behaviour described earlier (see Chapter 2).



### Bowel cancer

The age-standardised mortality rate of bowel cancer decreased for males and females (Figure 3.5). Between 1991 and 2010, it fell by 41% for males (from 34 to 20 per 100,000) and 45% for females (from 24 to 13 per 100,000). The reasons for the continued fall are not clear, but may be due to earlier detection of pre-cancerous polyps and improved treatment.



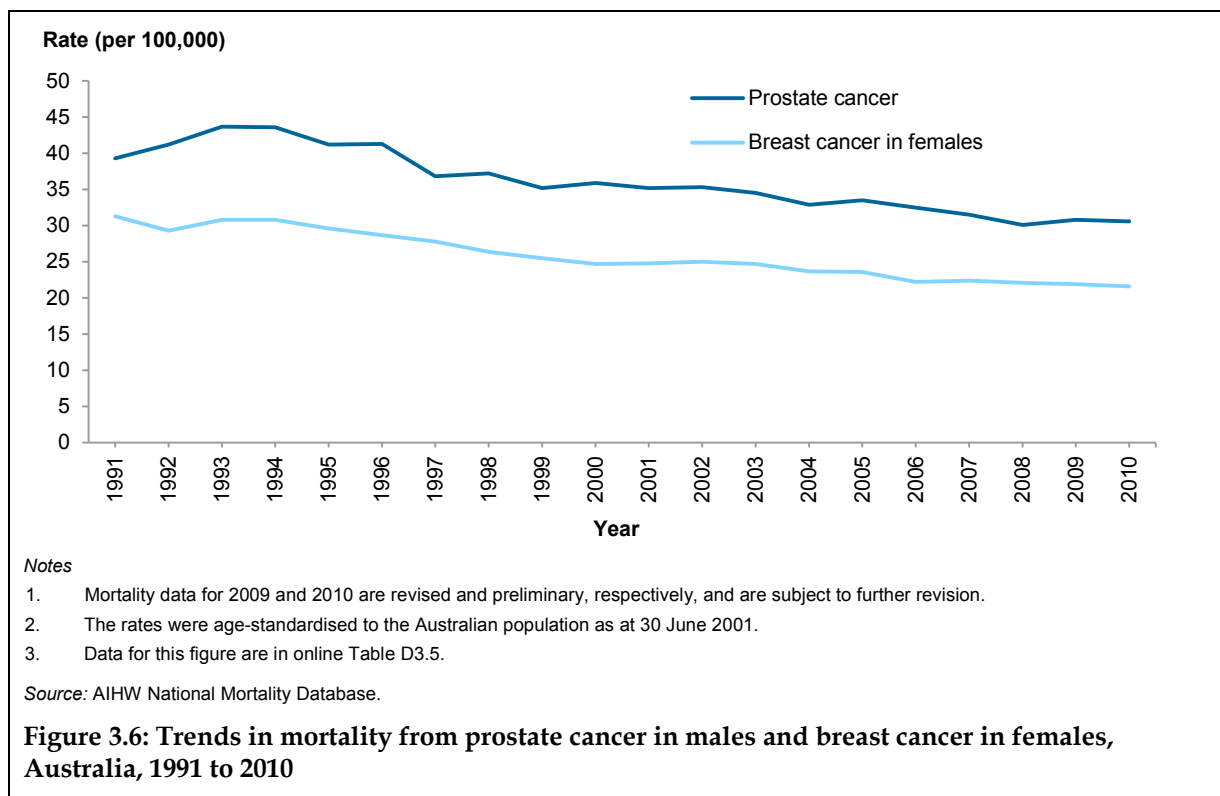
## Prostate cancer

The age-standardised mortality rate of prostate cancer rose until 1993, where it peaked at 44 per 100,000 (Figure 3.6). Since then the rate tended to fall, with a much sharper decline occurring in the 1990s than in the 2000s. By 2010, the mortality rate was 31 per 100,000, indicating an overall decrease of 30% between 1993 and 2010.

The fall partly due to early detection of prostate cancer cases by prostate-specific antigen testing. Improvements in general health and treatments for men may be other contributing factors leading to improved mortality rates (Baade et al. 2004; CCS 2010; Schroder et al. 2009).

## Breast cancer in females

Figure 3.6 shows that the age-standardised mortality rate of breast cancer in females remained fairly stable throughout the early 1990s (29 to 31 per 100,000). After this time, there was an appreciable decline in the rate, from 31 per 100,000 in 1994 to 22 per 100,000 in 2010 – a fall of 30%. The decline in recent decades is believed to be due to increased availability and quality of screening mammography and improved treatments (ACS 2009).



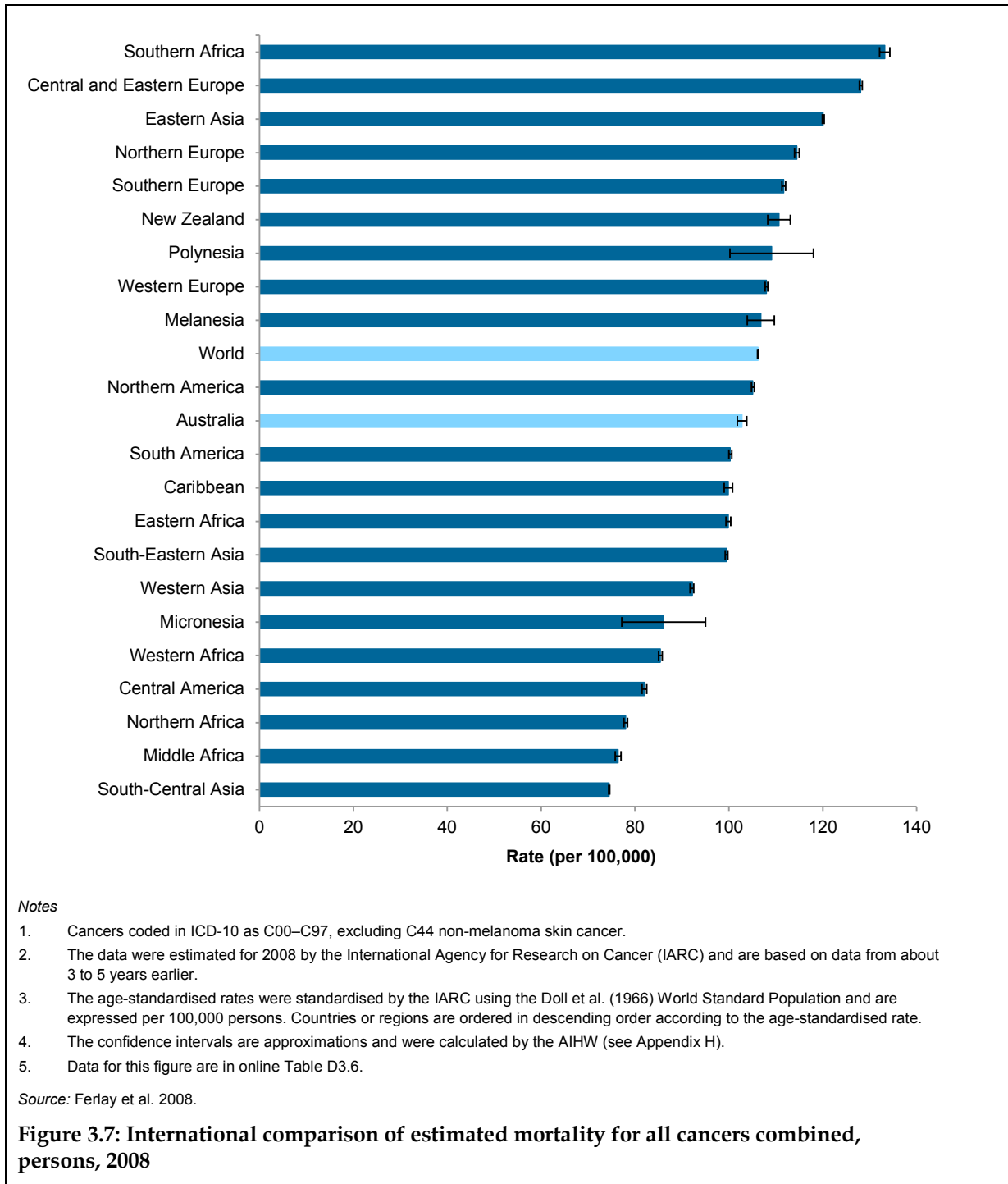
## How does Australia compare internationally?

Data on deaths of persons from all cancers combined for different regions and countries are shown in Figure 3.7. The data is from the GLOBOCAN database (Ferlay et al. 2010) (see Appendix I).

International differences in cancer mortality rates by country could relate to a number of factors including differences in:

- the composition of the populations
- cancer detection and screening
- cancer coding and registration practices
- cancer incidence rates (see Chapter 2)
- features at diagnosis (for example, stage at diagnosis and cancer histology type)
- individual's level of co-morbidity
- availability and quality of treatment (CCS & NCIC 2007).

The age-standardised mortality rate for cancer varied considerably between countries and regions. It was highest for Southern Africa (133 per 100,000) and lowest for South Central Asia (100 per 100,000). The rate for Australia was 103 per 100,000, which was slightly lower than the average world rate (106 per 100,000).



## 4 Survival after a diagnosis of cancer

### Key findings

In 2006–2010 in Australia:

- Five-year relative survival was 66% for all cancers combined.
- Females had slightly higher survival than males (5-year relative survival of 67% and 65%, respectively).
- For males diagnosed with cancer, 5-year relative survival was highest for testicular cancer (98%), lip cancer (93%) and prostate cancer (92%).
- For females diagnosed with cancer, 5-year relative survival was highest for thyroid cancer (98%), melanoma of the skin (94%) and lip cancer (92%).
- For all cancers combined, 5-year relative survival decreased with age.

From 1982–1987 to 2006–2010:

- Five-year relative survival increased significantly from 41% to 65% for males and 53% to 67% for females for all cancers combined.



## About survival

Information on the survival from cancer provides not only an indication of cancer prognosis but also the success of control programs as well as treatments available. It refers to the probability of being alive for a given amount of time after diagnosis and reflects the impact of a cancer diagnosis.

Survival is influenced by a range of factors, including the characteristics of those diagnosed with cancer (such as age, sex, additional illness and lifestyle); the nature of the tumours (such as primary site, stage at diagnosis and histology type); and the health-care system (such as availability of screening, diagnostic and treatment facilities, and follow-up services) (Black et al. 1998; WCRF & AICR 2007).

Since survival estimates are based on the outcomes of people diagnosed with cancer with diverse characteristics, they provide an indication of the *average* survival experience. They do not reflect an *individual's* chance of surviving since this is affected by specific characteristics of the individual, the cancer they have and the treatments received. A doctor is the best source of information about an individual's survival prospects.

In this report, 'relative survival' statistics are used to examine survival from cancer. These estimates are derived by comparing the survival of people diagnosed with cancer (that is, observed survival) with that experienced by people in the general population, matched for age and in the same calendar year (that is, expected survival). An estimate of less than 100% suggests that those with cancer had a lower chance of survival than the general population. For example, 5-year relative survival of 50% for people with cancer means that these people had half the chance of surviving at least 5 years after diagnosis relative to comparable people in the general population.

Note that all survival estimates in this report are relative survival estimates. That is, all survival probabilities presented are relative to those of the general population. For brevity, they will be referred to simply as 'survival', without a comparison to the general population each time.

The period method developed by Brenner and Gefeller (1996) was used to calculate relative survival estimates. The period method examines the survival experience of people during a particular at-risk period and who were diagnosed with cancer before or during this period (see Box 4.1 and Appendix H for further information).

Information on survival differences by the level of remoteness area and socioeconomic status of residence at diagnosis is in Chapter 6.

#### **Box 4.1: Period survival**

In this report, relative survival (see Box 4.2 for definition) was calculated using the period method (Brenner & Gefeller 1996). This method calculates survival from a given follow-up or at-risk period. Survival estimates are based on the survival experience of people who were diagnosed before or during this period, and who were at risk of dying during this period. More information about the period method is in Appendix H.

Note that the period method is an alternative to the traditional cohort method, which focuses on a group of people diagnosed with cancer in the past time period, and follows these people over time. By its nature the period method produces more up-to-date estimates of survival than the cohort method. Because the cohort method was used in previous *Cancer in Australia* reports (for example, AIHW & AACR 2010), survival estimates in this report should not be directly compared with those in earlier reports.

In this chapter, 5-year survival is shown after a diagnosis of invasive cancer. Further information on survival over time, by age group and cancer type are in the AIHW publication *Cancer survival and prevalence in Australia: period estimates from 1982 to 2010* (AIHW 2012d).

The survival estimates in this chapter are based on the 2007 ACD. Data from the National Death Index (NDI) on deaths (from any cause) that occurred up to 31 December 2010 were used to determine which people with cancer had died and when this occurred. International comparisons were calculated using the GLOBOCAN database (Ferlay et al. 2010).

#### **Box 4.2: Survival terminology in this report**

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

**Observed survival:** the proportion of people alive for a given amount of time after a diagnosis of cancer. Observed survival estimates are crude estimates calculated from population-based cancer data.

**Expected survival:** the proportion of people in the general population alive for a given amount of time. Expected survival estimates are crude estimates calculated from life tables of the entire Australian population.

**Relative survival:** the ratio of observed survival to expected survival. Relative survival measures inversely the excess mortality associated with a cancer diagnosis. *All* survival estimates in this report are relative survival estimates.

**Conditional relative survival:** the probability that individuals with cancer will be alive for a given amount of time provided that they have already survived for a specified time after diagnosis. *All* conditional survival estimates in this report are conditional *relative* survival estimates as they were derived from relative survival.

## What is the prospect of survival?

In 2006–2010, 5-year survival was 66% for all cancer combined. This means that people diagnosed with cancer had a 66% chance of surviving for at least 5 years compared with their counterparts in the general population.

Females had slightly higher 5-year survival than males, at 67% compared with 65% for males (Table 4.1).

**Table 4.1: Five-year relative survival from all cancers combined<sup>(a)</sup>, Australia, 2006–2010**

<b>Sex</b>	<b>5-year relative survival (%)</b>	<b>95% confidence interval</b>
Males	65.1	64.9–65.4
Females	67.4	67.1–67.6
<b>Persons</b>	<b>66.1</b>	<b>65.9–66.3</b>

(a) Cancers coded in ICD-10 as C00–C97 D45, D46, D47.1 and D47.3 with the exception of C44 codes that indicate a basal or squamous cell carcinoma of the skin.

Source: AIHW Australian Cancer Database 2007.

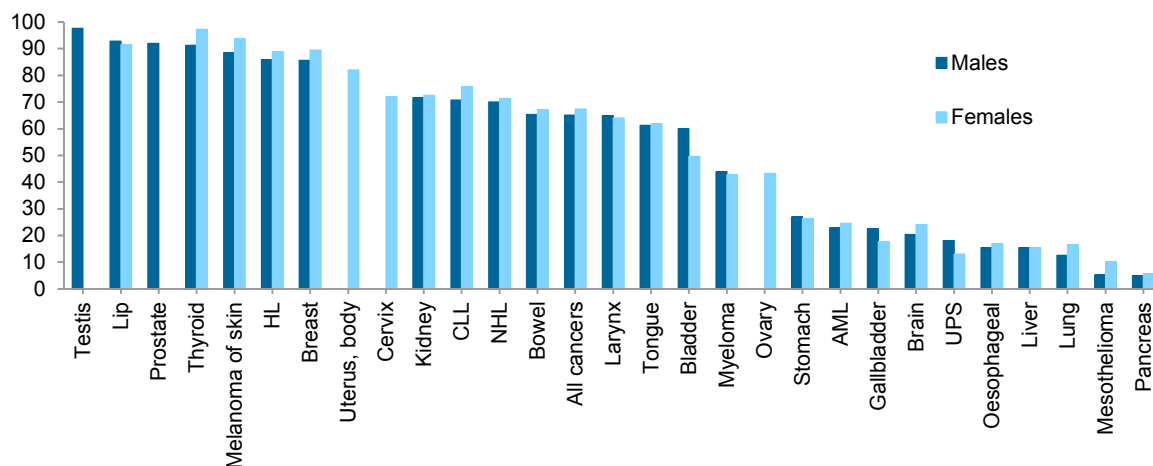
## Is the prospect of survival similar for all cancer sites?

In 2006–2010, 5-year survival was highest for people diagnosed with thyroid cancer (96%), lip cancer (93%) and melanoma of the skin (92%), and lowest for those diagnosed with pancreatic cancer (5%) and mesothelioma (6%).

For males, 5-year survival was highest for those diagnosed with testicular cancer (98%), lip cancer (93%) and prostate cancer (92%). For females, it was highest for those diagnosed with thyroid cancer (98%), melanoma of the skin (94%) and lip cancer (92%) (Figure 4.1).

For both males and females, 5-year survival was lowest for pancreatic cancer (5% and 6% respectively) and mesothelioma (5% and 10% respectively).

**5-year relative survival (%)**



**Notes**

1. All cancers include cancers coded in ICD-10 as C00–C97 D45, D46, D47.1 and D47.3 with the exception of C44 codes that indicate a basal or squamous cell carcinoma of the skin.
2. HL=Hodgkin lymphoma, AML=Acute myeloid leukaemia, CLL=Chronic lymphocytic leukaemia, NHL=Non-Hodgkin lymphoma, UPS=Cancer of unknown primary site.
3. Data for this figure are in online Table D4.1.

Source: AIHW Australian Cancer Database 2007.

**Figure 4.1: Five-year relative survival from selected cancers, Australia, 2006–2010**

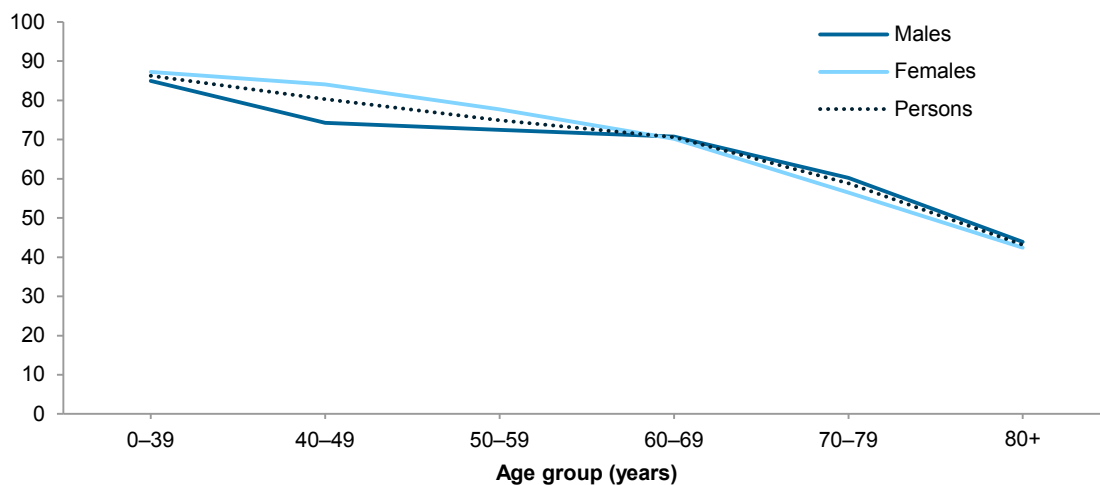
In 2006–2010, 5-year survival was significantly higher for males than for females for bladder cancer (1.2 times of females) and cancer of unknown primary site (1.4 times of females). Five-year survival was significantly higher for females than for males for mesothelioma (1.9 times of males), lung cancer (1.3 times of males) and brain cancer (1.2 times of males).

**Does survival differ by age?**

In 2006–2010 for all cancers combined, 5-year survival was highest for those aged under 40 (86%) and decreased with age so that it was the lowest (43%) for those aged 80 and over (Figure 4.2). The difference by age in survival may be due to a number of reasons, including the stage at diagnosis of tumours, a greater likelihood of co-morbidity among those diagnosed at an older age, differences in treatment received and the inclusion in clinical trials (Brenner & Arndt 2004; Ellison & Gibbons 2006; NCRI & WHC 2006).

Females had a survival advantage up to the 60–69 year age group. The difference was most marked for those aged 40–49, where 5-year survival was 84% for females and 74% for males. After the age of 60–69, survival was slightly higher for males, with a significant difference for those aged 70–79. The difference in the age-related pattern of survival by sex may be due to the age distributions and survival outcomes for prostate cancer and breast cancer.

**5-year relative survival (%)**



Note: Data for this figure are in online Table D4.2.

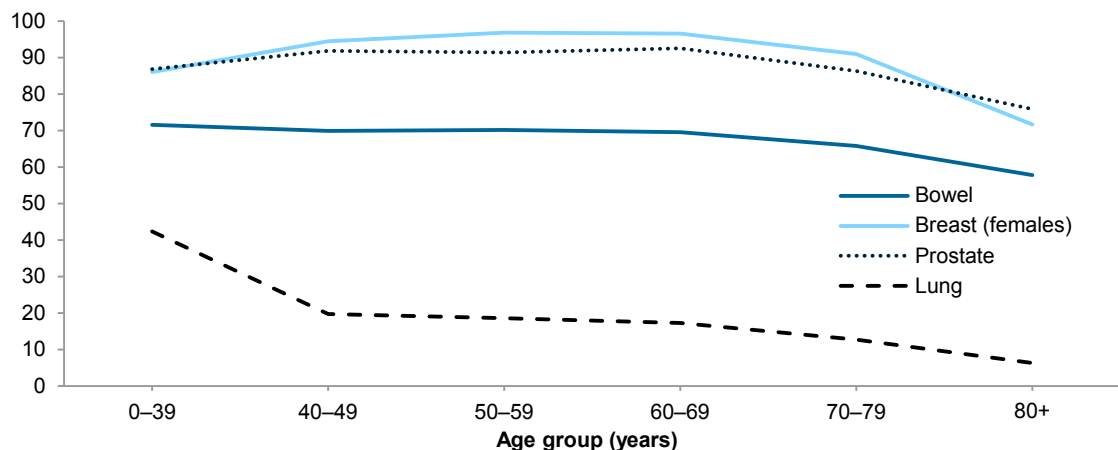
Source: AIHW Australian Cancer Database 2007.

**Figure 4.2: Five-year relative survival from all cancers combined by age at diagnosis, Australia, 2006–2010**

The age-related pattern of survival for all cancers combined was characteristic of most individual cancer types. The reduction in survival with age was more pronounced in the second half of the lifespan, however the pattern of decline varied across cancer types. For example, survival from bowel cancer declined slowly with age – 72% for people aged 0–39 and 58% for those aged 80 and over. In contrast, survival from lung cancer fell sharply with age, from 42% for those aged under 40 to 20% for those aged 40–49 to 6.3% for those aged 80 and over (Figure 4.3).

Some cancers showed a rise in 5-year survival with age before declining in the older age groups. For prostate cancer in males and breast cancer in females, 5-year survival was highest for those aged 50–59 and 60–69 (Figure 4.3).

5-year relative survival (%)



Note: Data for this figure are presented in online Table D4.2.

Source: AIHW Australian Cancer Database 2007.

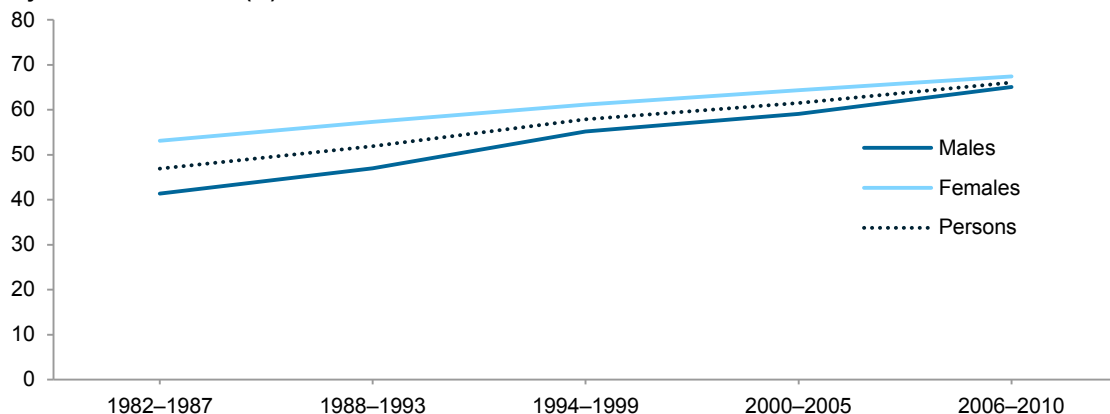
**Figure 4.3: Five-year relative survival from selected cancers by age at diagnosis, Australia, 2006-2010**

## How has survival changed over time?

Five-year survival for people diagnosed with cancer increased significantly over time, from 47% in 1982-1987 to 66% in 2006-2010 (Figure 4.4).

The increase in 5-year survival is evident in both males and females, although the gain was greater for males. For all cancers combined, 5-year survival for males increased from 41% in 1982-1987 to 65% in 2006-2010, compared with 53% to 67% for females. These gains can be explained by better diagnostic methods, earlier detection and improvements in treatment (Dickman & Adami 2006).

5-year relative survival (%)



Note: Data for this figure are in online Table D4.3.

Source: AIHW Australian Cancer Database 2007.

**Figure 4.4: Five-year relative survival from all cancers combined, Australia, 1982-1987 to 2006-2010**

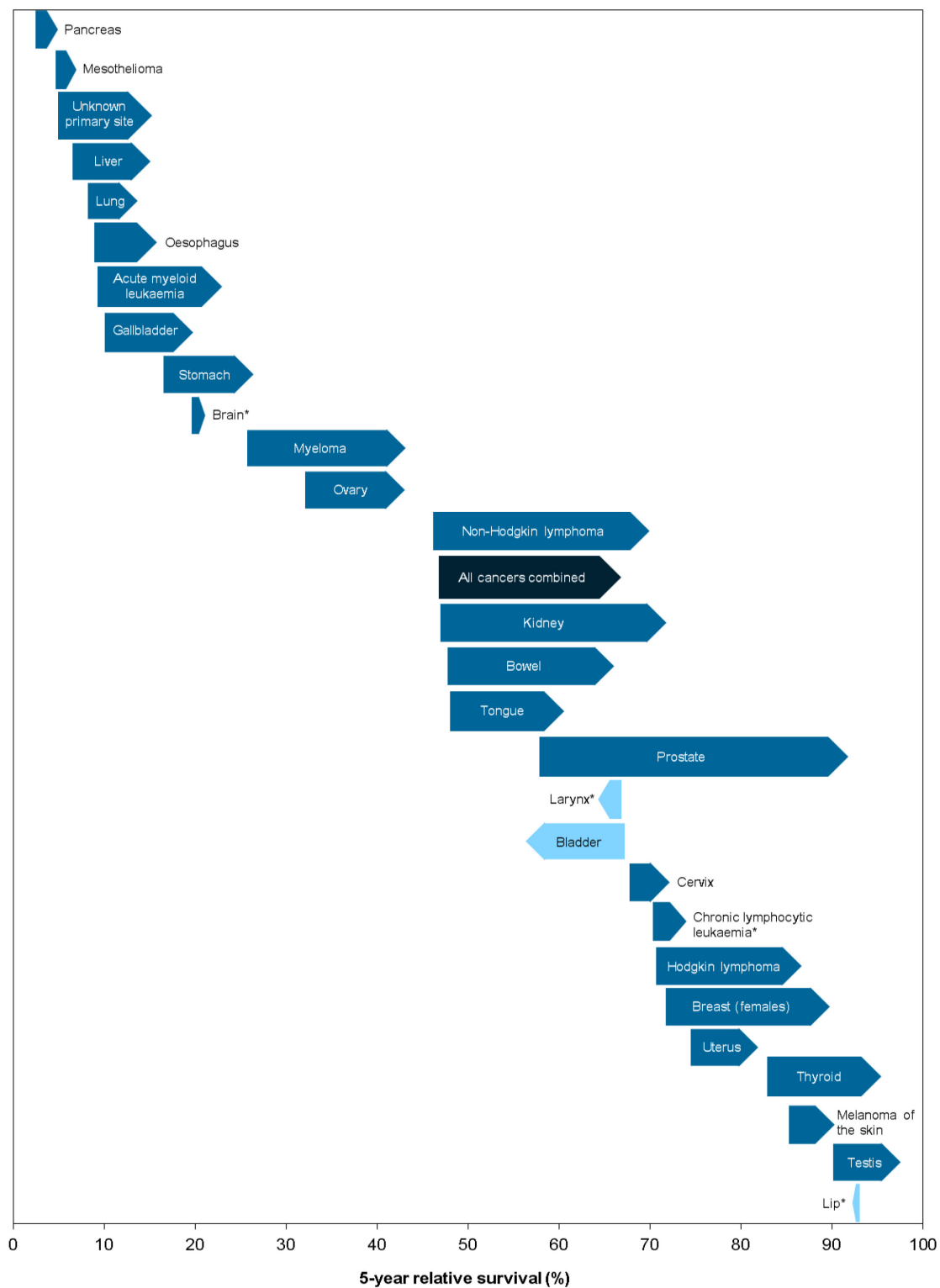
Between 1982–1987 and 2006–2010, survival from most cancers improved, but the change was not uniform over time and across cancer types (Figure 4.5).

The cancers that had the largest absolute increase in survival were prostate cancer, kidney cancer, non-Hodgkin lymphoma, bowel cancer, breast cancer in females and myeloma, where 5-year survival increased by 17 percentage points or more.

Other cancers that showed a greater proportional increase in survival included liver cancer, cancer of unknown primary site, and acute myeloid leukaemia. Five-year survival from these cancers more than doubled between 1982–1987 and 2006–2010, despite remaining lower than the average.

However, gains in survival have not been consistent across all cancers. Many of the cancers that already had low survival in 1982–1987 showed only small gains, such as mesothelioma (from 5.5% to 6.2%), brain cancer (from 20% to 22%), pancreatic cancer (from 3% to 5%) and lung cancer (from 9% to 14%).

Cancer of the bladder showed a statistically significant decrease in 5-year survival (68% to 58%). The negative trend in bladder cancer survival has been observed elsewhere in Australia and is believed to be related to changes in the coding of invasive cancers and changes in the age at diagnosis over time (English et al. 2007; Duncombe et al. 2009; Luke et al. 2010).



**Notes**

1. Arrow positions indicate survival estimates and arrow lengths indicate the change in survival between the periods 1982–1987 and 2006–2010. Cancers labelled with an asterisk (\*) indicate changes that were not statistically significant.
2. Data for 1988–1993, instead of 1982–1987, are used for liver cancer due to the small number of cases from the earlier time period.

Source: AIHW Australian Cancer Database 2007.

**Figure 4.5: Survival trends for selected cancers, Australia, 1982–1987 to 2006–2010**



## Conditional survival

Conditional survival shows the probability of surviving a given number of years provided that an individual has *already* survived a specified amount of time after diagnosis. Ordinary relative survival estimates show the probability of survival at diagnosis: they may be less informative or even overly pessimistic when applied to those who have already survived for some time after their diagnosis (Xing et al. 2010). Conditional relative survival may therefore be a more realistic and clinically-relevant measure of survival for individuals who are already living with cancer (Baade et al. 2011).

Note that all conditional survival estimates in this report are conditional relative survival estimates. That is, they have been derived from relative survival but are referred simply as 'conditional survival'.

For all cancers combined, the prospect of surviving for at least 5 more years increased markedly with the number of years already survived. At diagnosis, the probability of surviving for at least 5 years was 66%. However, by 1 year after diagnosis, individuals with cancer had an 80% chance of surviving at least 5 more years (Table 4.2). This increased further to 97% by 15 years after diagnosis, at which survival prospects were almost the same as in the general population.

**Table 4.2: Summary of conditional relative survival from all cancers combined<sup>(a)</sup>, Australia, 2006–2010**

Years already survived	5-year conditional relative survival (%)	95% confidence interval
At diagnosis	66.1	65.9–66.3
Already survived 1 year after diagnosis	80.0	79.9–80.2
Already survived 5 years after diagnosis	91.1	90.9–91.2
Already survived 10 years after diagnosis	94.0	93.8–94.2

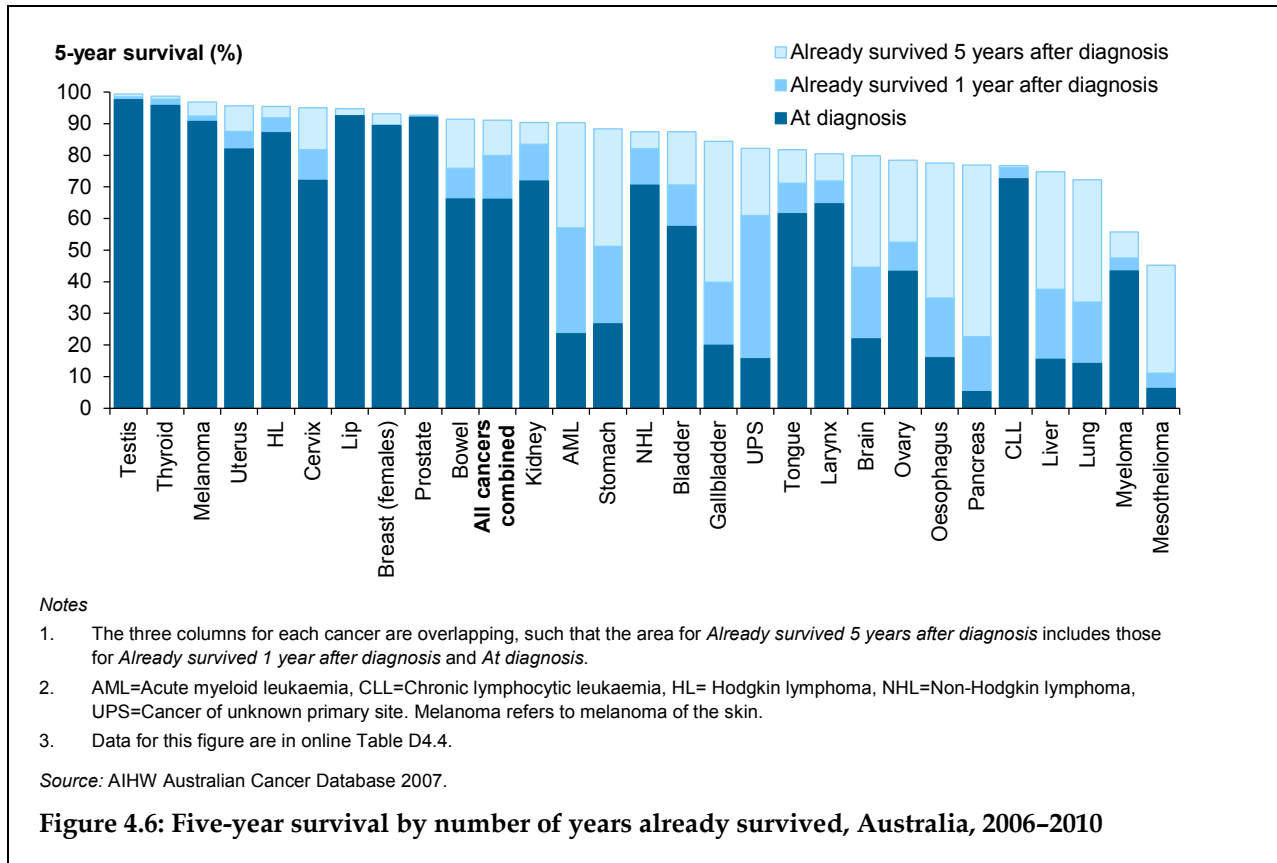
(a) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3, with exception of those C44 codes that indicate basal cell and squamous cell carcinoma of the skin.

Source: AIHW Australian Cancer Database 2007.

Figure 4.6 presents the probability of surviving for at least 5 more years by the amount of time already survived by cancer sites: at diagnosis, 1 year after diagnosis, and 5 years after diagnosis. Note that the three columns for each cancer are overlapping, such that the area for *Already survived 5 years after diagnosis* includes those for *Already survived 1 year after diagnosis* and *At diagnosis*.

The relationship between conditional survival and survival at diagnosis varied for different cancer sites. Some cancers that had poor survival prospects at diagnosis were observed to have substantial increases in conditional survival with the number of additional years survived. These included stomach cancer, gallbladder cancer, cancer of unknown primary site and acute myeloid leukaemia. All of these had a 5-year survival at diagnosis of less than 30%, and 5 years after diagnosis, survival for an additional 5 years was more than 80%.

Some cancers that had relatively high survival at diagnosis were observed to have little increase in conditional survival by 5 years after diagnosis. For example, survival from testicular cancer, thyroid cancer and prostate cancer was comparatively high at diagnosis (more than 90%), but there were only marginal gains in conditional survival by 5 years after diagnosis.



## How does Australia compare internationally?

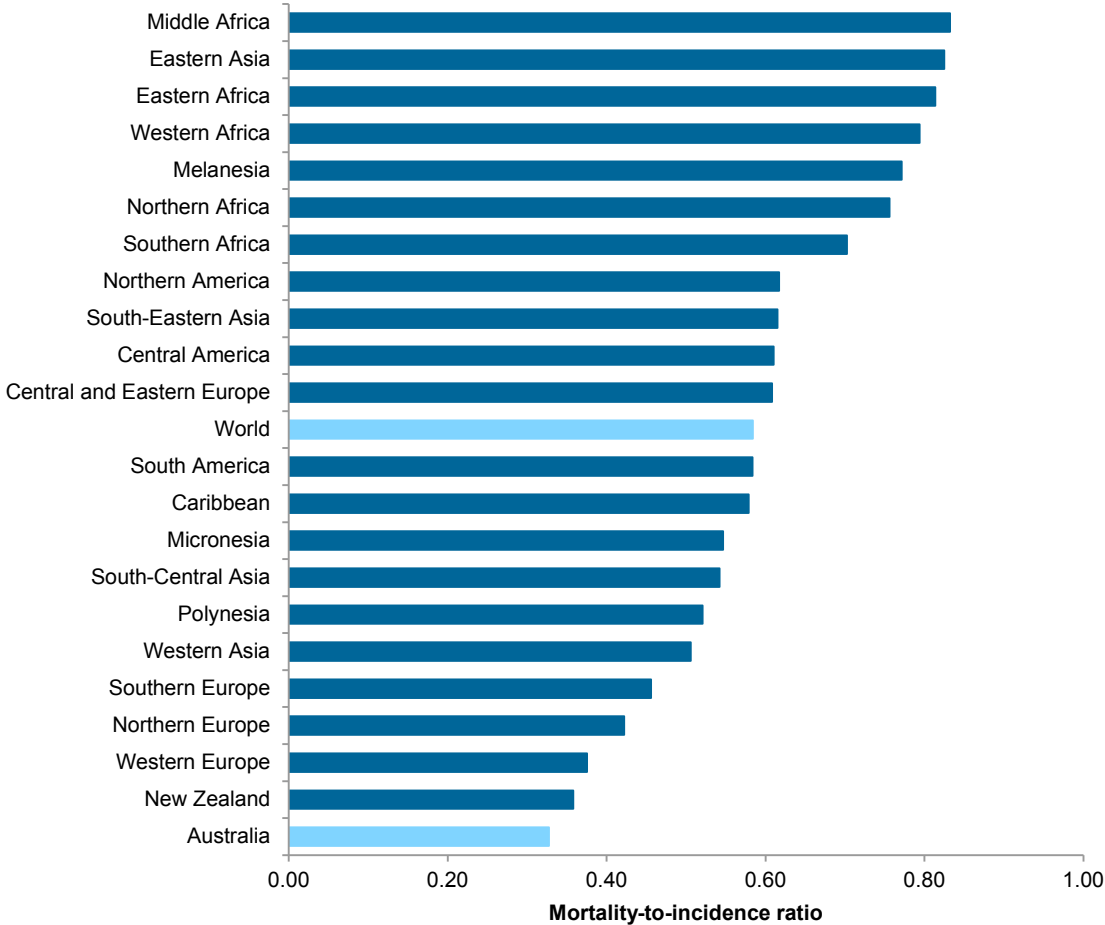
In addition to the methodological challenges associated with comparing cancer statistics from different countries (as discussed in Chapter 1), additional uncertainties arise when comparing relative survival estimates. In particular, there tends to be variation across countries in: the years to which the relative survival estimates apply, the length of the follow-up period considered (for example, 1, 5, 10 years and so forth), and the methods used to calculate the relative survival estimates. For these reasons, relative survival estimates for different countries are not compared in this report.

Although more rudimentary than relative survival estimates, the mortality-to-incidence ratio (MIR) is used in this report to make international comparisons. This ratio describes how many deaths there were in a particular year due to a particular disease, relative to the number of new cases diagnosed that year (using age-standardised data). For example, an MIR of 0.30 for cancer would indicate that there were 30 deaths for every 100 new cases of cancer diagnosed in that year (though the deaths need not relate to the same people as the cases). If survival tends to be comparatively lower in a particular country, then the MIR for that country generally would be expected to be higher (that is, closer to 1.00). In contrast, if survival is higher, the ratio generally would be closer to zero. Appendix H provides further information about interpreting MIRs.

For this report, mortality-to-incidence for cancer ratios were calculated using data from GLOBOCAN (Ferlay et al. 2010). The fact that the GLOBOCAN data were estimates for 2008 should be taken into account when interpreting the results shown in Figure 4.7.

The 2008 GLOBOCAN data suggest that the MIRs for all cancers varied markedly between countries and regions. The MIR for Australia was 0.33, suggesting that the survival of people in Australia who were diagnosed with cancer was higher than that of people in other countries and regions. By comparison, the MIR for African regions, Melanesia and Eastern Asia was 0.70 or higher, suggesting relatively poorer survival.

Differences in survival across the world could relate not only to the underlying number of cancer cases and deaths but also to differences in the age-distribution and composition of populations, availability and quality of treatment, availability and completeness of cancer surveillance programs, cancer coding and registration practices, and characteristics of the cancers diagnosed (for example, stage at diagnosis and histological type).



- Notes
1. The ratios are based on incidence and mortality data for 2008.
  2. The mortality-to-incidence ratio equals the age-standardised mortality rate divided by the age-standardised incidence rate.
  3. Cancers coded in ICD-10 as C00–C97 with the exception of code C44 that indicates non-melanoma skin cancer.
  4. Data for this figure are in online Table D4.5.

Source: Ferlay et al. 2010.

**Figure 4.7: International comparison of mortality-to-incidence ratios for all cancers, 2008**

## 5 Prevalence of cancer

### Key findings

At the end of 2007 in Australia:

- More than 339,000 people were alive who had been diagnosed with cancer within the previous 5 years. This represented 1.6% of the Australian population.
- Five-year prevalence was higher in males than in females (55% and 45% of all prevalent cases, respectively).
- Twenty-six-year prevalence increased with age, with the highest prevalence among those aged 80 and over.
- Among males, 5-year prevalence was highest for prostate cancer (39% of total male 5-year prevalence), followed by melanoma of the skin (14%) and bowel cancer (14%).
- Among females, 5-year prevalence was highest for breast cancer (36% of total female 5-year prevalence), followed by bowel cancer (13%) and melanoma of the skin (13%).

## About prevalence

Prevalence refers to the number of people alive who have ever been diagnosed with cancer. It is different from incidence, which is number of new cancer cases diagnosed in a given period.

Along with information on incidence, mortality and survival, prevalence is another indicator of the impact of cancer in our society, both at the personal or family level and societal level, particularly in terms of need for health-care services. Prevalence contributes to hospitalisations due to the disease as well as expenditure for health-care services, and therefore it is important for workforce planning, resource allocation and service delivery.

Prevalence is a direct product of incidence and survival. Cancers with high incidence and high survival (such as melanoma of the skin) tend to have high prevalence, whereas cancers with low incidence and low survival (such as pancreatic cancer) tend to have low prevalence. In other cancers, prevalence may represent a balance between conflicting patterns of incidence and survival. Lung cancer, for example, had low prevalence compared with other cancers despite being the fifth most common cancer diagnosed. This is because people with lung cancer tend not to live as long as those diagnosed with other cancers (AIHW & CA 2011).

Prevalence is also influenced by deaths from other causes and the age at which people are diagnosed, because older people are more likely to die sooner due to age-related morbidity and frailty.

In this chapter, limited-duration prevalence is presented, which provides information on the number of people alive who were diagnosed with cancer within a given period up to a specified (or index) date. For example, limited-duration prevalence data are presented for 5 years with an index date of 31 December 2007. Note that 26-year prevalence is the longest duration that can be calculated based on incidence data from 1982 to 2007.

Unlike the incidence data, which pertain to the number of cancers, the prevalence data in this report pertain to the number of people who have been diagnosed with cancer and are still alive. Note that a person who was diagnosed with two separate cancers contributed separately to the prevalence of each cancer. However, this person would contribute only once towards prevalence of all cancers combined.

In this chapter, no international comparisons are made. Making such comparisons is difficult, since prevalence data from other countries often differ from Australian data in the years to which they apply, the number of years considered (for example, 1 and 5) and the analytical methods used to calculate prevalence.

A summary of prevalence data is provided in this chapter. This includes prevalence estimates for selected cancers at the end of 2007 and differences in prevalence by sex. Further information on prevalence, by age group and cancer type are in the AIHW publication *Cancer survival and prevalence in Australia: period estimates from 1982 to 2010* (AIHW 2012d).

## How prevalent was cancer in 2007?

At the end of 2007, 339,077 people were alive who had been diagnosed with cancer in the previous 5 years (Table 5.1). This represented 1.6% of the Australian population. Males made up 55% of the 5-year prevalence. At the same time, the 10-year prevalence of cancer was 531,357 and the 26-year prevalence was 774,674 (Table 5.1).

**Table 5.1: Limited-duration prevalence of all cancers combined<sup>(a)</sup>, Australia, as at end of 2007**

	5-year prevalence			10-year prevalence	26-year prevalence
	Number <sup>(b)</sup>	Per cent of prevalent cases	Per cent of population <sup>(c)</sup>	Number <sup>(b)</sup>	Number <sup>(b)</sup>
Males	185,574	54.7	1.8	277,939	381,164
Females	153,503	45.3	1.4	253,418	393,510
<b>Persons</b>	<b>339,077</b>	<b>100.0</b>	<b>1.6</b>	<b>531,357</b>	<b>774,674</b>

(a) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3, with exception of those C44 codes that indicate basal cell and squamous cell carcinoma of the skin.

(b) Prevalence refers to number of living people previously diagnosed with cancer, not the number of cancer cases.

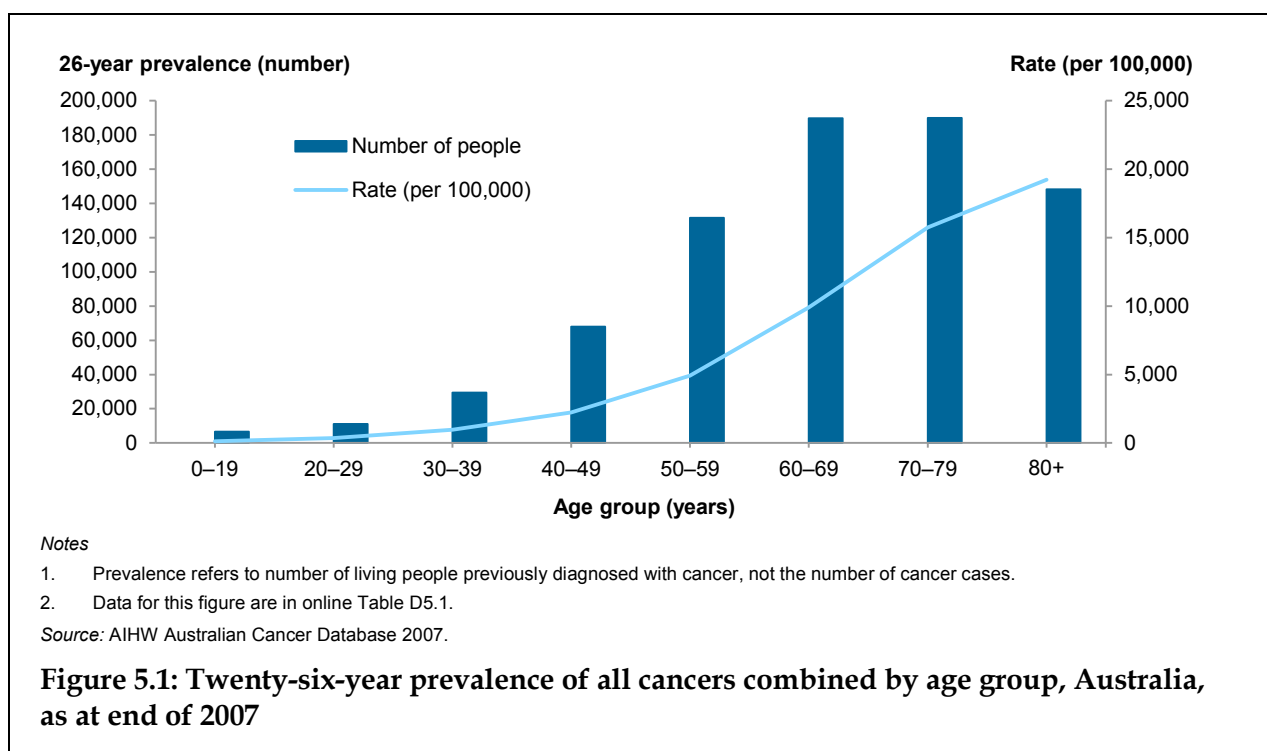
(c) Based on the number of persons in the Australian population at 31 December 2007.

Source: AIHW Australian Cancer Database 2007.

## Does prevalence differ by age?

Twenty-six-year prevalence for all cancers combined increased with age. Note that in these prevalence statistics, age refers to the age of a person on the index date of 31 December 2007. At the end of 2007, almost one-fifth (19%) of all Australian aged 80 and over had had a diagnosis of cancer within the previous 26 years.

Twenty-six-year prevalence rate was highest for those aged 80 and over (19,222 per 100,000) and lowest for those under 20 (119 per 100,000) (Figure 5.1).



### Does prevalence differ by cancer sites?

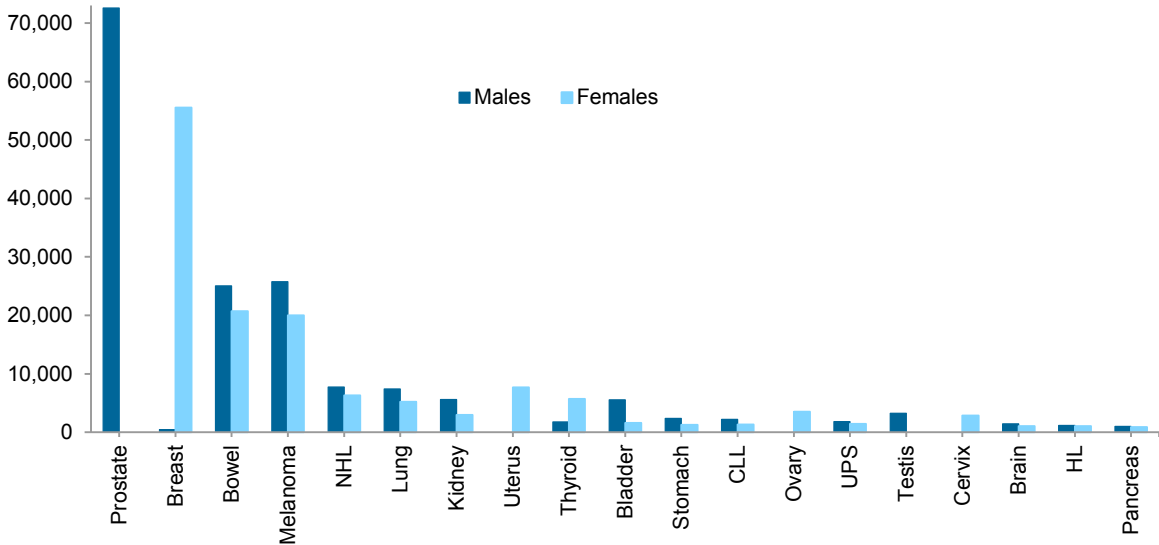
Five-year prevalence data for selected cancer sites are shown in Figure 5.2. Among males, prostate cancer had the highest 5-year prevalence of 72,582 people. This was followed by melanoma of the skin (25,740), and bowel cancer (25,066). Prostate cancer accounted for 39% of the total 5-year prevalence in males, while melanoma of the skin and bowel cancer contributed 14% each.

Among females, breast cancer had the highest 5-year prevalence (55,537 people), followed by bowel cancer (20,697) and melanoma of the skin (20,013). Breast cancer accounted for 36% of the total 5-year prevalence in females, while both bowel cancer and melanoma of the skin contributed 13% each.

Of the selected cancer sites, the lowest 5-year prevalence was observed for pancreatic cancer (981 males and 882 females), Hodgkin lymphoma (1,166 males and 1,034 females) and brain cancer (1,416 males and 1,028 females).

For the majority of cancer sites, 5-year prevalence was higher in males than in females. This trend was most pronounced in bladder cancer, kidney cancer and stomach cancer. For bladder cancer, 5-year prevalence was more than 3 times higher in males than in females (5,564 males and 1,614 females). For kidney cancer and stomach cancer, 5-year prevalence was almost twice as high in males as in females (5,620 males and 2,962 females, and 2,335 males and 1,257 females, respectively). In contrast, the 5-year prevalence for thyroid cancer was more than 3 times higher in females than in males (1,769 males and 5,693 females).

5-year prevalence (number)



Notes

1. Prevalence refers to number of living people previously diagnosed with cancer, not the number of cancer cases.
2. NHL=Non-Hodgkin lymphoma, CLL=Chronic lymphocytic leukaemia, UPS=Cancer of unknown primary site, HL=Hodgkin lymphoma. Melanoma refers to melanoma of the skin.
3. Data for this figure are in Appendix Table C5.2.

Source: AIHW Australian Cancer Database 2007.

Figure 5.2: Five-year prevalence of selected cancers, Australia, as at the end of 2007

## 6 Differences across population groups

### Key findings

#### Incidence

In the 5 years from 2004 to 2008:

- The age-standardised incidence rate was significantly higher for Indigenous than for non-Indigenous Australians for cervical cancer (2.8 times higher), cancer of unknown primary site (1.9), lung cancer (1.9) and pancreatic cancer (1.5).
- The incidence rate for all cancers combined was highest in Queensland (516 per 100,000) and lowest in the Northern Territory (442 per 100,000).
- People living in *Remote and very remote* areas of Australia had 1.3–1.4 times higher incidence rates of cervical cancer, cancer of unknown primary site and lung cancer than people living in *Major cities*, but 0.8–0.9 times lower rates of prostate cancer, breast cancer in females and non-Hodgkin lymphoma.
- People living in the lowest socioeconomic status areas had (1.1–1.6 times) higher incidence rates of cervical cancer, cancer of unknown primary site, lung cancer and bowel cancer than those living in the highest socioeconomic status areas, but they had 0.8–0.9 times lower rates of non-Hodgkin lymphoma, breast cancer in females and prostate cancer.

#### Mortality

In the 5 years from 2006 to 2010:

- The age-standardised mortality rate was significantly higher for Indigenous than for non-Indigenous Australians for cervical cancer (4.4 times higher), lung cancer (1.8), cancer of unknown primary site (1.7), breast cancer in females (1.3) and pancreatic cancer (1.3).
- The mortality rate for all cancers combined was highest in the Northern Territory (216 per 100,000) and Tasmania (199 per 100,000) and lowest in the Australian Capital Territory (163 per 100,000).
- People living in *Remote and very remote* areas of Australia had higher mortality rates of cervical cancer (3.2 times higher), cancer of unknown primary site (1.4), breast cancer in females (1.3) and lung cancer (1.3) than those living in *Major cities*.
- People living in the lowest socioeconomic areas had higher mortality rates of cervical cancer (1.8 times higher), lung cancer (1.5), cancer of unknown primary site (1.3) and bowel cancer (1.1) than those living in the lowest socioeconomic areas.

#### Survival

In the period 2006–2010:

- Five-year relative survival from all cancers combined decreased with greater remoteness – from 67% in *Major cities* to 63% in *Remote and very remote* areas.
- Five-year relative survival from all cancers combined decreased with greater socioeconomic disadvantage – from 71% in the highest socioeconomic status areas to 63% in lowest socioeconomic status areas.



## About differences across population groups

Cancer incidence and mortality data are presented according to four population characteristics: Aboriginal and Torres Strait Islander status, state and territory, remoteness area and socioeconomic status. Data are presented for all cancers combined and for nine selected cancers: bowel cancer, melanoma of the skin, lung cancer, breast cancer in females, prostate cancer, cervical cancer, pancreatic cancer, non-Hodgkin lymphoma and cancer of unknown primary site. These cancers are not only among the most commonly diagnosed (see Chapter 2), but are also among the leading causes of mortality from cancer (see Chapter 3). Some of these cancers are included in the health performance indicator as part of the National Healthcare Agreement, and are reported annually to the Council of Australian Governments.

Age-standardised rates are provided for incidence and mortality to account for differences in the age structure and the size of the population groups. The data are presented for the five years from 2004 to 2008 for incidence and from 2006 to 2010 for mortality rather than for just 1 year, since presenting the data for multiple years reduces random variation in the rates. This is especially important for comparisons of small groups (for example, Aboriginal and Torres Strait Islander people or populations in smaller states and territories). Apart from breast cancer in females, cervical cancer and prostate cancer, results are presented for males and females combined in a further attempt to reduce the random variation in the data.

Relative survival data are presented by remoteness area and socioeconomic status. They were sourced from the AIHW publication *Cancer survival and prevalence in Australia: period estimates from 1982 to 2010* (AIHW 2012d). Relative survival proportions cannot be calculated according to Aboriginal and Torres Strait Islander status due to data limitations and the lack of necessary life tables. See Chapter 4 for further information on survival data.

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

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

The main data source for this chapter was the 2009 ACD and the NMD. The 5 years of incidence data from 2004 to 2008 was used for this chapter because 2008 is the latest year for which actual data were available for all states and territories (see Appendix F).

## Aboriginal and Torres Strait Islander status

Aboriginal and Torres Strait Islander peoples are disadvantaged across a range of health-related and socioeconomic indicators compared with other Australians (AIHW 2011a). They are more likely to live in remote areas of Australia and have a relatively younger age structure than the non-Indigenous population. For instance, in 2005–2007, the average life expectancy at birth was estimated to be about 10–12 years lower for Indigenous people than other Australians (ABS 2009b).

The disparity in health experienced by Indigenous Australians may be further explained by differences in socioeconomic status, with Indigenous Australians reporting lower incomes,

higher rates of unemployment, lower educational attainment and more overcrowded households than other Australians. Also, cultural, social and environmental factors may contribute to the poorer health of Indigenous Australians (AIHW 2012a).

## **Do incidence rates differ for Indigenous Australians?**

Reliable national data on the incidence of cancer for Indigenous Australians are not available. While all state and territory cancer registries collect information on Indigenous status, in some jurisdictions, the quality of the data is insufficient for analyses. In this report, data for four states and territories – New South Wales, Queensland, Western Australia and the Northern Territory – are used to examine the incidence of cancer by Indigenous status. While the majority (84%) of Australian Indigenous people live in these four jurisdictions (ABS 2009a), the degree to which data for these jurisdictions are representative of data for all Indigenous people is unknown.

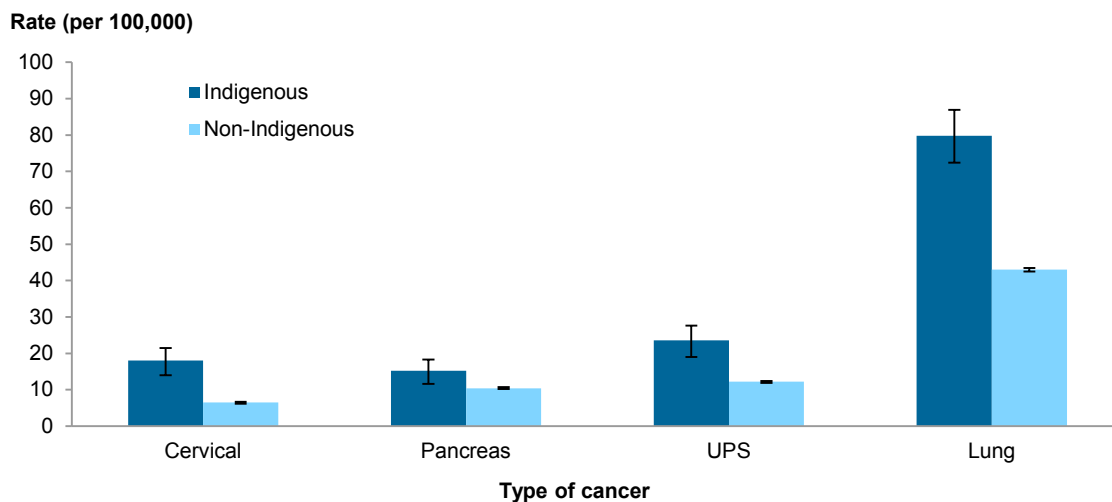
For the four jurisdictions analysed, the overall level of missing data on Indigenous status for all cancers combined diagnosed between 2004 and 2008 was 12% (online Table D6.1). It should be noted, however, that the level of missing data was particularly high for prostate cancer (16%) and melanoma of the skin (41%). This may be because these cancers are more likely to be treated outside the hospital setting where the level of Indigenous identification is generally lower than within the hospital system.

Between 2004 and 2008, an average of 775 Indigenous Australians were diagnosed with cancer each year – this comprises 1% of all cancer cases diagnosed in that period. Of the nine selected cancers, lung cancer (average of 121 cases per year) was the most commonly diagnosed cancer among Indigenous people, followed by breast cancer in females (88 cases per year) and bowel cancer (70 cases per year).

The age-standardised incidence rate of all cancers combined was significantly higher for Indigenous Australians than their non-Indigenous counterparts (461 and 434 per 100,000 respectively). This contrasts with the finding in previous editions of this report, where Indigenous Australians had a lower incidence rate of all cancers combined than non-Indigenous Australians (AIHW & AACR 2010). However, these data by Indigenous status are not comparable across publications as different sets of states and territories were used.

There was a similar trend for cervical cancer, where the incidence rate was almost 3 times as high for Indigenous Australians as non-Indigenous Australians (18 and 7 per 100,000 respectively). Incidence rates of cancer of unknown primary site and lung cancer were also significantly higher for Indigenous Australians than for non-Indigenous Australians (1.9 times for both) (Figure 6.1).

The higher incidence rate of cervical cancer observed for Indigenous Australians is likely to be associated with lower participation in cervical screening and higher rates of infection with human papilloma virus (Condon 2004; Condon et al. 2005; Roder 2005), while the higher incidence rate of lung cancer is consistent with Indigenous Australians' higher rate of smoking (Scollo & Winstanley 2008; Stumpers & Thomson 2009). The higher incidence of cancer of unknown primary site may be related to late diagnosis (ABS & AIHW 2008; Stumpers & Thomson 2009).



*Notes*

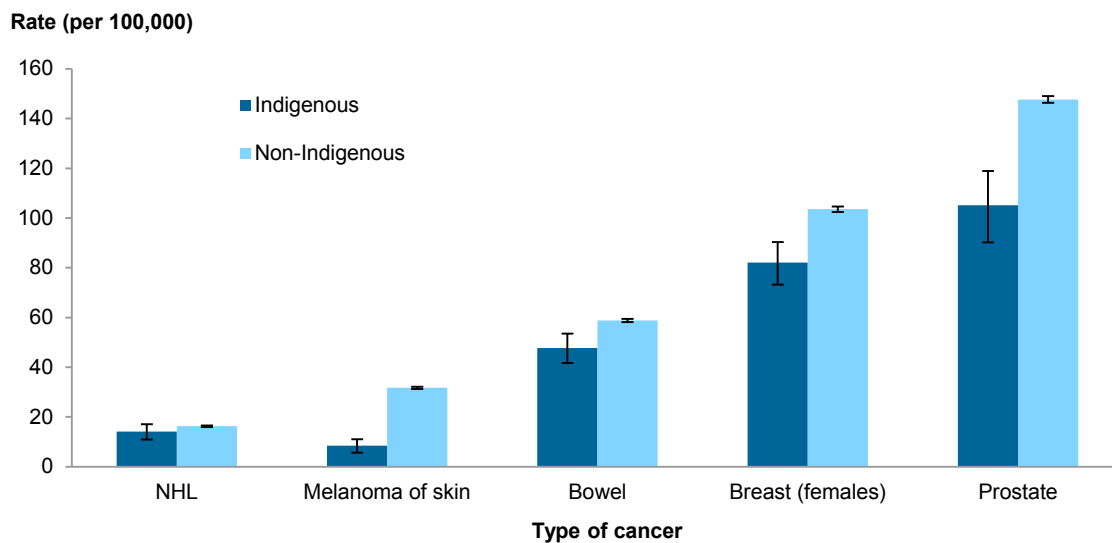
1. The rates were age-standardised to the Australian population as at 30 June 2001 and based on the total number of cases over the 5 years from 2004 to 2008.
2. Some states and territories use an imputation method for determining Indigenous cancers, which may lead to differences between these data and those shown in jurisdictional cancer incidence reports.
3. UPS=Cancer of unknown primary site.
4. Data for this figure are in online Tables D6.4, D6.5, D6.8 and D6.10.

Source: AIHW Australian Cancer Database 2009.

**Figure 6.1: Incidence of cervical cancer, pancreatic cancer, cancer of unknown primary site and lung cancer by Indigenous status, New South Wales, Queensland, Western Australia and the Northern Territory, 2004–2008**

Conversely, incidence rates were significantly lower for Indigenous Australians than non-Indigenous Australians for non-Hodgkin lymphoma, melanoma of the skin, bowel cancer, breast cancer in females and prostate cancer (Figure 6.2).

The reasons for the lower incidence of some cancers among Indigenous Australians are not clear. It may either be a true lower incidence (that is, Indigenous Australians are less likely to develop these cancers) or a lower rate of diagnosis. The former seems most likely for melanoma of the skin and is consistent with the high level of pigment in the skin of Indigenous Australians. It is possible that the latter is true for non-Hodgkin lymphoma, breast cancer in females, bowel cancer and prostate cancer for a number of reasons. Non-Hodgkin lymphoma, breast cancer in females, bowel cancer and prostate cancer are primarily diseases that affect older people (see Chapter 2), and the shorter life expectancy of Indigenous Australians may mean that these cancers may not have presented at the time of death. Further, the uptake of screening and diagnostics testing (such as breast and bowel screening and prostate-specific antigen testing) is low among Indigenous people (ABS 2009a; Condon et al. 2001; Roder 2005; Stumpers & Thomson 2009; Threlfall & Thompson 2009), which may also contribute to a low rate of diagnosis.



**Notes**

1. The rates were age-standardised to the Australian population as at 30 June 2001 and based on the total number of cases over the 5-year period from 2004 to 2008.
2. Some states and territories use an imputation method for determining Indigenous cancers, which may lead to differences between these data and those shown in jurisdictional cancer incidence reports.
3. NHL=Non-Hodgkin lymphoma.
4. Data for this figure are in online Tables D6.2, D6.3, D6.6, D6.7 and D6.9.

Source: AIHW Australian Cancer Database 2009.

**Figure 6.2: Incidence of non-Hodgkin lymphoma, melanoma of skin, bowel cancer, breast cancer in females and prostate cancer by Indigenous status, New South Wales, Queensland, Western Australia and the Northern Territory, 2004–2008**

## Do mortality rates differ for Indigenous Australians?

Information in the NMD on Indigenous status from 2006 to 2010 is considered to be of sufficient quality for use for five jurisdictions: New South Wales, Queensland, Western Australia, South Australia and the Northern Territory. Almost 9 in 10 (89%) Indigenous people live in these jurisdictions (ABS 2009a). In the NMD, the level of missing data on Indigenous status for all cancers combined was about 1% (online Table D6.1).

Between 2006 and 2010, there was an annual average of 424 cancer deaths (1% of all deaths due to cancer), making cancer the second leading cause of death among Indigenous Australians in that period (ABS 2012a).

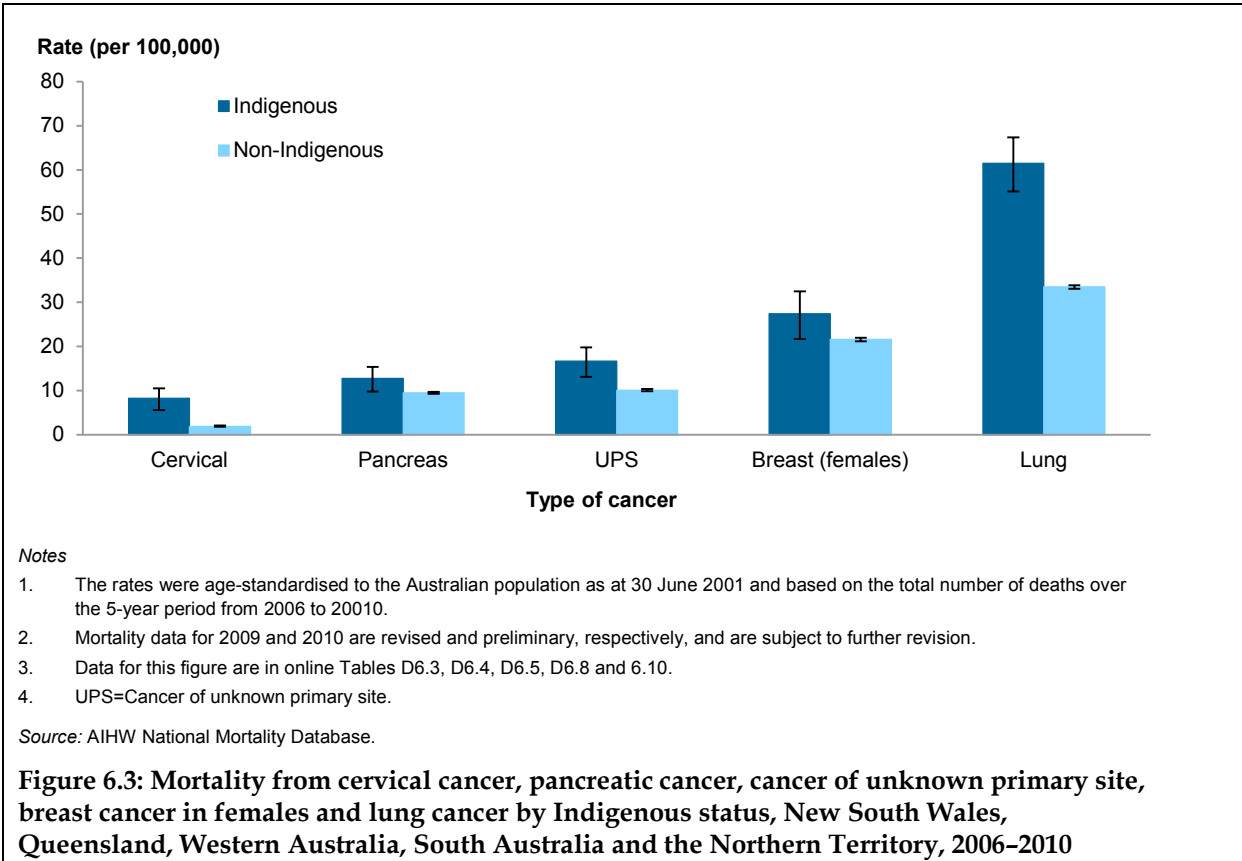
Of the selected cancer sites, lung cancer (average of 104 deaths per year), cancer of unknown primary site, breast cancer in females (27 deaths per year for both) and bowel cancer (22 deaths per year) were the most common causes of cancer death in Indigenous Australians.

The age-standardised mortality rate of all cancers combined was significantly higher for Indigenous Australians than for their non-Indigenous counterparts (249 and 174 per 100,000 respectively). The higher mortality rate for Indigenous Australians may be explained by their greater likelihood of being diagnosed with cancers where the prospect of successful treatment and survival is poorer (for example, lung cancer and cancer of unknown primary site) (Condon et al. 2003; Threlfall & Thompson 2009) or being diagnosed at an advanced

stage, as well as a lesser likelihood of receiving adequate treatment (AIHW 2012a; Cunningham et al. 2008).

The mortality rate was significantly higher for Indigenous than for non-Indigenous Australians for cervical cancer (4.4 times), lung cancer (1.8), cancer of unknown primary site (1.7), pancreatic cancer (1.3) and breast cancer in females (1.3) (Figure 6.3).

In contrast, the mortality rate of melanoma of the skin was significantly lower for Indigenous Australians than for non-Indigenous Australians (0.4 times) (online Table D6.7). There was no statistically significant difference in the mortality rates of bowel cancer, non-Hodgkin lymphoma and prostate cancer for Indigenous Australians compared with non-Indigenous Australians (online Tables D6.2, D6.6 and D6.9).



## State and territory

### Do incidence rates differ by state and territory?

Between 2004 and 2008, the average annual number of cancer cases diagnosed ranged from 35,771 cases in New South Wales to 567 cases in the Northern Territory (Table 6.1).

When the size and age structure of the population in each state and territory was taken into account, the highest incidence rates of all cancers combined was in Queensland (516 per 100,000), followed by Tasmania (510 per 100,000), with both of these rates significantly higher than that of the other states and territories. In contrast, the incidence rate was lowest in the Northern Territory (442 per 100,000) and the Australian Capital Territory (461 per 100,000).

**Table 6.1: Incidence of all cancers combined<sup>(a)</sup> by state and territory, Australia, 2004–2008**

State or territory	Average annual number of cases <sup>(b)</sup>	Total number of cases	Age-standardised rate <sup>(c)</sup>	95% confidence interval
New South Wales	35,771	178,857	487.1	484.9–489.4
Victoria	26,070	130,349	476.9	474.3–479.5
Queensland	21,314	106,568	515.6	512.5–518.7
Western Australia	9,812	49,060	480.1	475.9–484.4
South Australia	8,768	43,842	479.4	474.9–483.9
Tasmania	2,875	14,373	509.6	501.3–518.1
Australian Capital Territory	1,364	6,818	461.4	450.4–472.7
Northern Territory	567	2,833	442.3	423.0–462.1
<b>Total</b>	<b>106,540</b>	<b>532,700</b>	<b>488.2</b>	<b>486.9–489.5</b>

(a) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3, with the exception of those C44 codes that indicate a basal or squamous cell carcinoma of the skin.

(b) Numbers may not sum to the total due to rounding.

(c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates were based on the total number of cases over the 5 years from 2004 to 2008.

Source: AIHW Australian Cancer Database 2009.

The age-standardised incidence rates for selected cancer sites varied widely according to state and territory in 2004 to 2008. Particularly notable variations were evident for cervical cancer, lung cancer and cancer of unknown primary site, where the incidence rates for the Northern Territory were 1.2–2.2 times higher than that for other jurisdictions (online Tables D6.4, D6.5 and D6.10).

## Do mortality rates differ by state and territory?

The average annual number of deaths from cancer ranged from 13,792 in New South Wales to 238 in Northern Territory between 2006 and 2010. The age-standardised mortality rate of all cancers combined was significantly lower for the Australian Capital Territory (163 per 100,000) than for other states and territories. In contrast, the highest mortality rates were observed for the Northern Territory (216 per 100,000) and Tasmania (199 per 100,000), with both of these rates significantly higher than other states and territories (Table 6.2).

**Table 6.2: Mortality from all cancers combined<sup>(a)</sup> by state and territory, Australia, 2006–2010<sup>(b)</sup>**

State or territory <sup>(c)</sup>	Average annual number of deaths <sup>(d)</sup>	Total number of deaths	Age-standardised rate <sup>(e)</sup>	95% confidence interval
New South Wales	13,792	68,958	175.4	174.0–176.7
Victoria	10,414	52,071	176.8	175.3–178.4
Queensland	7,725	38,624	177.3	175.6–179.1
Western Australia	3,748	18,738	174.8	172.3–177.4
South Australia	3,567	17,837	177.7	175.0–180.3
Tasmania	1,199	5,996	198.9	193.8–204.0
Australian Capital Territory	484	2,419	163.1	156.6–169.8
Northern Territory	238	1,189	215.6	201.5–230.3
<b>Total</b>	<b>41,166</b>	<b>205,832</b>	<b>176.9</b>	<b>176.1–177.6</b>

(a) Cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3.

(b) Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.

(c) Mortality data may not be comparable with mortality data published in state and territory cancer reports since the data shown in this report relate to the place of residence at the time of *death*, not the place of residence at the time of *diagnosis* as shown in some state and territory reports. Further, the state and territory cancer registries may use a different methodology from that used by the AIHW to determine the cause of death (see Box 6.1).

(d) Numbers may not sum to the total due to rounding.

(e) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates were based on the total number of deaths over the 5 years from 2006 to 2010.

Source: AIHW National Mortality Database.

The age-standardised mortality rates of some cancers showed greater variability between states and territories. For cervical cancer, the mortality rate of the Northern Territory (4 per 100,000) was almost 3 times the rate of Victoria (1.5 per 100,000). The mortality rate of lung cancer in the Northern Territory was twice the mortality rate of the Australian Capital Territory (52 and 26 per 100,000 respectively). For melanoma of the skin, the mortality rate of Queensland was 2.5 times that of the Northern Territory (7.2 and 2.7 per 100,000 respectively) (online Table D6.4).

#### **Box 6.1: Differences in mortality data reported by state and territory**

The state and territory data on mortality due to cancer shown in this report may not be comparable with data published by individual state and territory cancer registries for a number of reasons, including (Cancer Council Queensland 2011; Tracey et al. 2010):

- The state and territory mortality data in this report refer to the place of a person's residence at the time of *death*. In contrast, some state and territory cancer registries present mortality information based on a person's place of residence at the time of *diagnosis*. In the latter data, the deaths may or may not have occurred in the state or territory indicated.
- Different approaches were used to assign cause of death. In this report, data on mortality for each jurisdiction were derived from the NMD (see Appendix I). Information on cause of death in the NMD is coded by the Australian Bureau of Statistics. This process uses an automated coding system which selects the underlying cause of death from all the information documented on the death certificate. In contrast, the state and territory cancer registries may make use of information from a number of different sources, including pathology reports and other notifications, to assign a cause of death.

## Remoteness area

People living in remote areas of Australia are often disadvantaged in relation to access to primary health-care services, educational and employment opportunities and income. Further, they are more likely to have higher rates of risky health behaviours, such as smoking, heavy alcohol use and poor nutrition (AIHW 2012a).

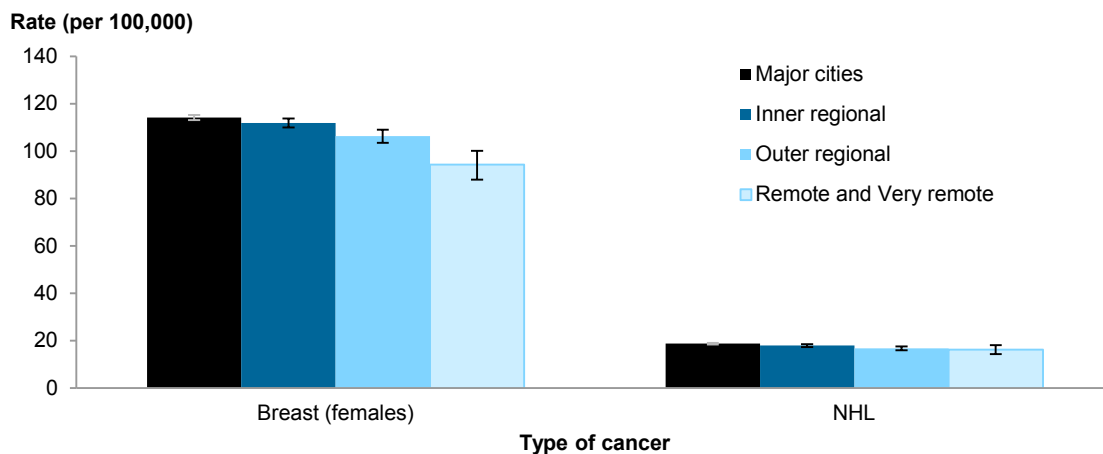
To compare incidence, mortality and survival rates according to the level of remoteness area of residence at diagnosis, the Australian Standard Geographical Classification Remoteness Area classification (ABS 2006) was used to allocate remoteness categories to areas across Australia (AIHW 2004). More information about this classification is in Appendix E. This classification divides all areas into five categories: *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote* (AIHW 2004). For this report, the categories of *Remote* and *Very remote* were collapsed due to the small number of cases in these two subgroups.

### Do incidence rates differ by remoteness area?

Between 2004 and 2008, the age-standardised incidence rate of all cancers combined was significantly higher in *Inner regional* (504 per 100,000) than other areas.

Variation by geographical region of residence was also evident for the selected cancers. *Inner regional* areas of Australia had higher incidence rates of bowel cancer, melanoma of the skin and prostate cancer. For these cancers, the lowest rates were observed for people living in *Remote and very remote* areas at the time of diagnosis (online Tables D6.2, D6.6 and D6.9).

The incidence rates of breast cancer in females and non-Hodgkin lymphoma decreased with remoteness, with *Remote and very remote* areas 0.8–0.9 times the rate in *Major cities* respectively (Figure 6.4).



#### Notes

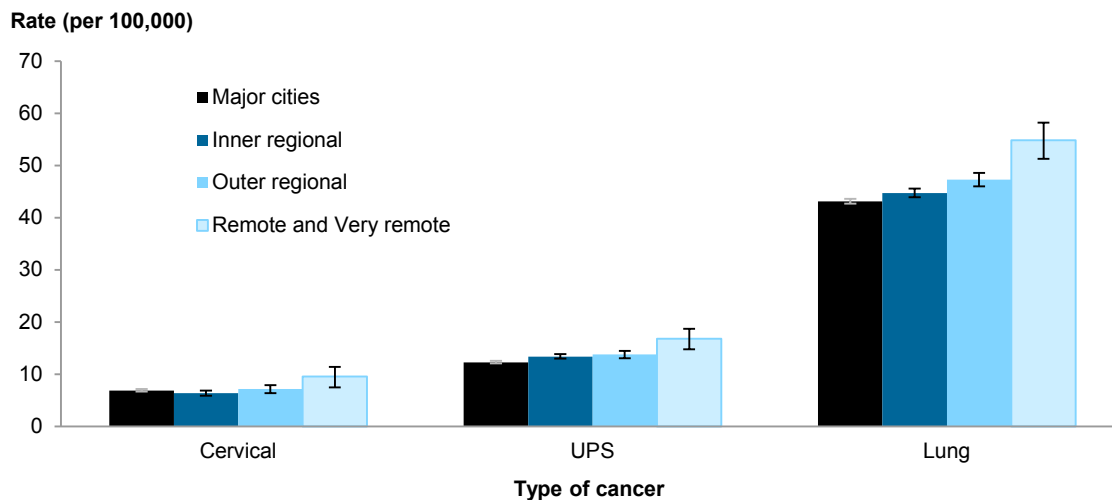
1. Remoteness was classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix E).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and based on the total number of cases over the 5 years from 2004 to 2008.
3. NHL=Non-Hodgkin lymphoma.
4. Data for this figure are in online Tables D6.3 and D6.7.

Source: AIHW Australian Cancer Database 2009.

**Figure 6.4: Incidence of prostate cancer, breast cancer in females and non-Hodgkin lymphoma by remoteness area, Australia, 2004–2008**



The incidence rates of cervical cancer, cancer of unknown primary site and lung cancer increased with remoteness. People living in *Remote and very remote* areas had 1.4 times the rate of cervical cancer and cancer of unknown primary site, and 1.3 times the rate of lung cancer than those living in *Major cities* (Figure 6.5).



**Notes**

1. Remoteness was classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix E).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and based on the total number of cases over the 5 years from 2004 to 2008.
3. UPS=Cancer of unknown primary site.
4. Data for this figure are in online Tables D6.4, D6.5 and D6.10.

Source: AIHW Australian Cancer Database 2009.

**Figure 6.5: Incidence of cervical cancer, cancer of unknown primary site and lung cancer by remoteness area, Australia, 2004–2008**

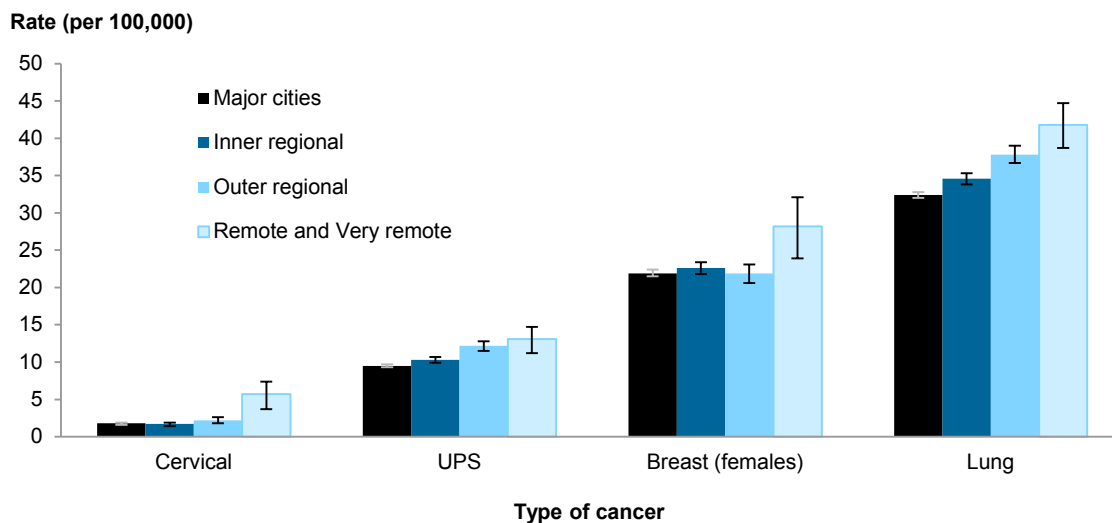
### Do mortality rates differ by remoteness area?

Between 2006 and 2010, the age-standardised mortality rate of all cancers combined was significantly higher in *Remote and very remote* areas (196 per 100,000) than in *Major cities* (171 per 100,000) (online Table D6.1).

The mortality rates of cervical cancer, cancer of unknown primary site, breast cancer in females and lung cancer increased with remoteness (Figure 6.6). People living in *Remote and very remote* areas had 3.2 times the mortality rate of cervical cancer, 1.4 times the rate of cancer of unknown primary site and 1.3 times the rate of lung cancer and breast cancer in females than those living in *Major cities*.

Some of the differences in mortality from cervical cancer, cancer of unknown primary site, breast cancer in females and lung cancer may be explained by the high proportion of Indigenous people who live in more remote areas and who have higher mortality rates than non-Indigenous people from these cancers (see section about Aboriginal and Torres Strait Islander status).

For prostate cancer, bowel cancer, pancreatic cancer, non-Hodgkin lymphoma and melanoma of the skin, particularly high mortality rates were observed for those who lived in *Inner or Outer regional* areas (online Tables D6.2, D6.6–D6.9).



**Notes**

1. Remoteness was classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix E).
2. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
3. The rates were age-standardised to the Australian population as at 30 June 2001 and based on the total number of deaths over the 5 years from 2006 to 2010.
4. UPS=Cancer of unknown primary site.
5. The data for this figure are in online Tables D6.3, D6.4, D6.5 and D6.10.

Source: AIHW National Mortality Database.

**Figure 6.6: Mortality from cervical cancer, cancer of unknown primary site, breast cancer in females and lung cancer by remoteness area, Australia, 2006–2010**

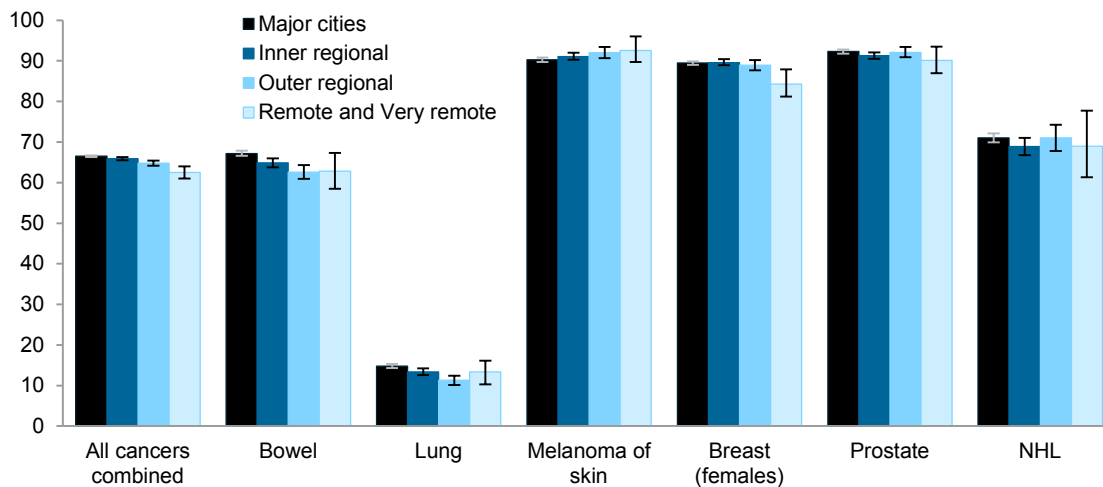
## Does survival differ by remoteness area?

In the period 2006–2010, 5-year survival from all cancers combined was higher in *Major cities* compared with other areas; similar trend was observed for bowel cancer, breast cancer in females and lung cancer.

Melanoma of skin had a higher 5-year survival in *Remote and very remote* areas than in other areas (Figure 6.7).

Cancer survival outcomes may vary across regions due to differences in the age at diagnosis, the extent of disease at diagnosis and cancer histology and subtypes. The effects of these covariates on survival have been modelled and further explored in other Australian reports (English et al. 2007; Tracey et al. 2010).

### 5-year relative survival (%)



#### Notes

1. Remoteness is classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix E).
2. NHL=Non-Hodgkin lymphoma.
3. Data for this figure are in online Table D6.11

Source: AIHW Australian Cancer Database 2007.

**Figure 6.7: Five-year relative survival from selected cancers by remoteness area, Australia, 2006–2010**

## Socioeconomic status

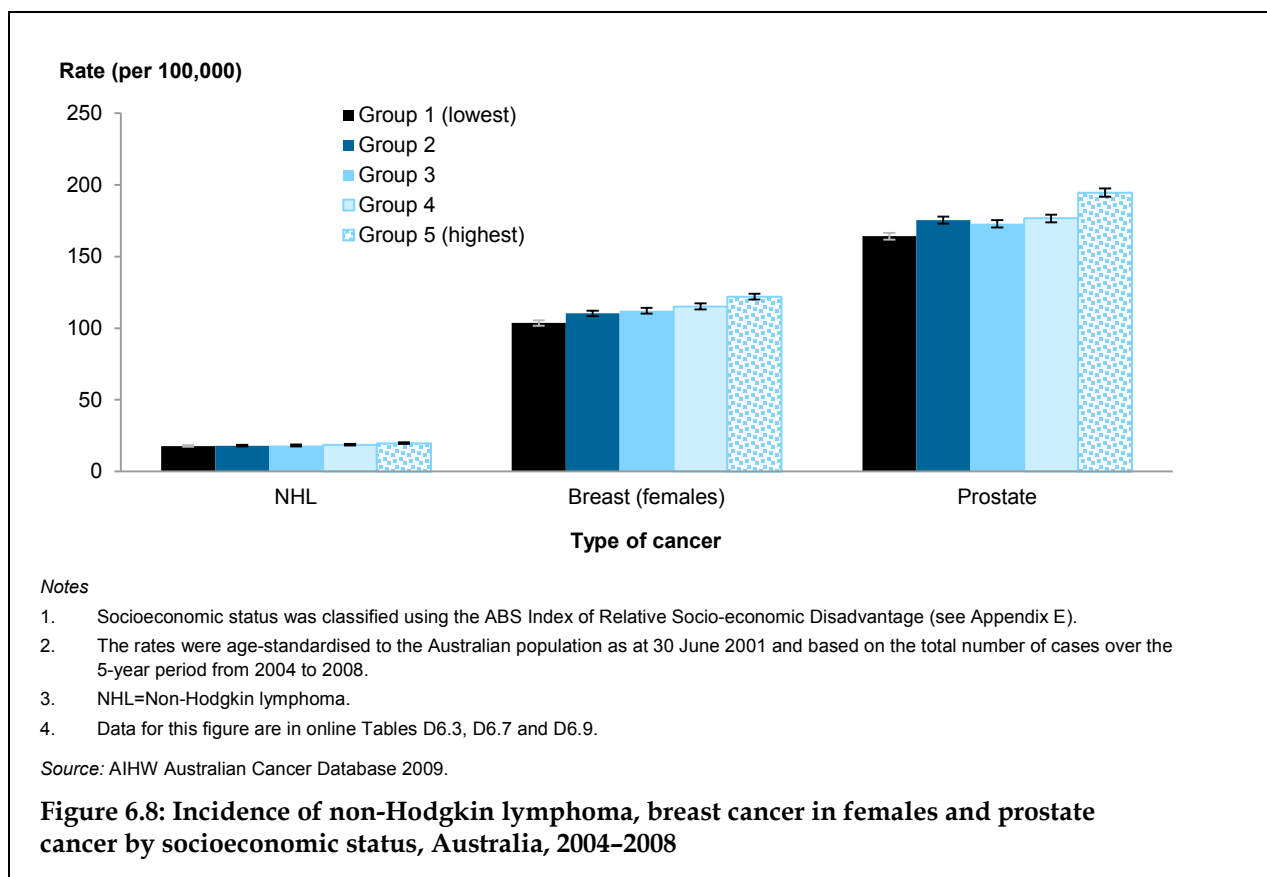
Socioeconomic status is associated with access to health services, material resources and educational opportunities. Persons of a lower socioeconomic status are more likely to have higher levels of cancer and lifestyle related risk factors, such as physical inactivity, tobacco use and poor diet (AIHW 2012a).

The Index of Relative Socio-economic Disadvantage (IRSD) is used to indicate socioeconomic status. The IRSD scores each area by summarising attributes of the population such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations. In this report, the first socioeconomic status group (labelled '1') corresponds to geographical areas containing the 20% of the population with the lowest socioeconomic status, and the fifth group corresponds to the 20% of the population with the highest socioeconomic status. Note that the IRSD is an area-based measure of socioeconomic status rather than a person-based measure. It is used as a proxy for the socioeconomic status of people living in those areas and would not be correct for each person living in that area. More information is in Appendix E.

### Do incidence rates differ by socioeconomic status?

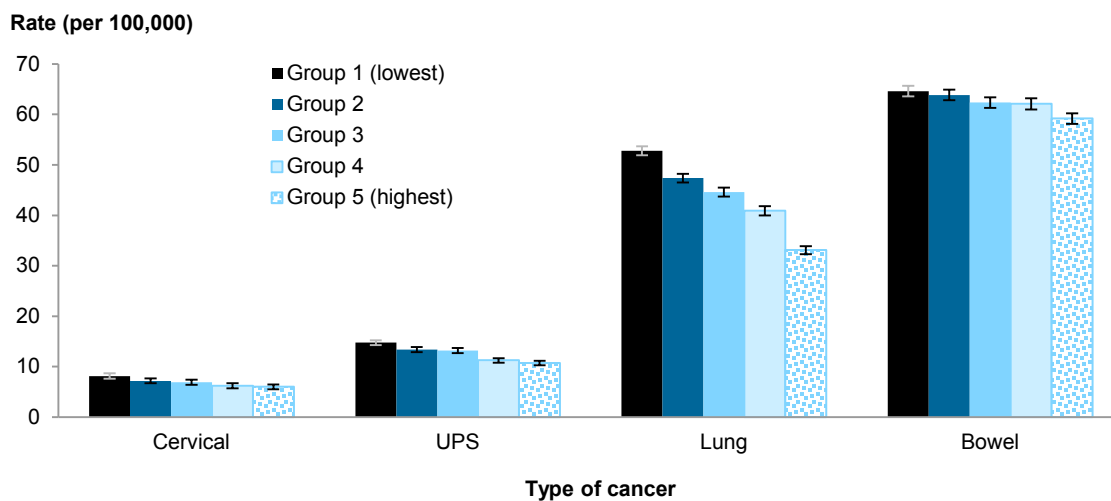
Between 2004 and 2008, the age-standardised incidence rate of all cancers combined showed that people living in lower socioeconomic status areas (group 1 to 3) had a higher incidence rate than those living in higher socioeconomic status areas (group 4 and 5) (online Table D6.1).

People living in the lowest socioeconomic status areas (group 1) had 1.1–1.6 times higher incidence rates of cervical cancer, cancer of unknown primary site, lung cancer and bowel cancer than those living in the highest socioeconomic status areas (group 5), but they had 0.8–0.9 times lower rates of non-Hodgkin lymphoma, breast cancer in females and prostate cancer (Figure 6.8).



People living in the lowest socioeconomic status areas had higher incidence rates of cervical cancer, cancer of unknown primary site, lung cancer and bowel cancer (Figure 6.9). Of particular note, the incidence rate of lung cancer for people living in the lowest socioeconomic status areas was 1.6 times the rate for those living in the highest socioeconomic status areas.

For melanoma of the skin and pancreatic cancer, the association with socioeconomic status was either inconsistent or non-existent (online Tables D6.6 and D6.8).



**Notes**

1. Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix E).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and based on the total number of cases over the 5 years from 2004 to 2008.
3. UPS=Cancer of unknown primary site.
4. Data for this figure are in online Tables D6.2, D6.4, D6.5 and D6.10.

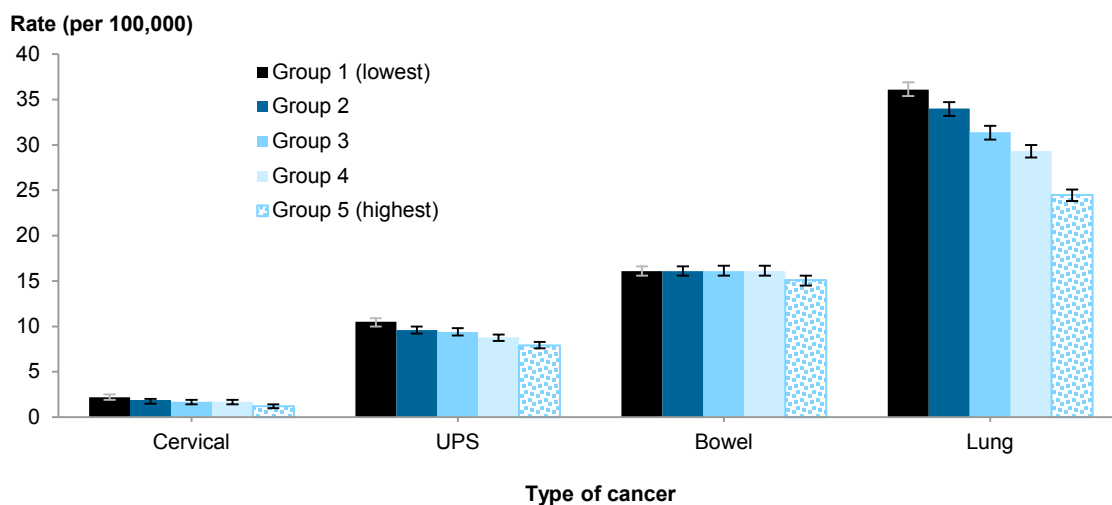
Source: AIHW Australian Cancer Database 2009.

**Figure 6.9: Incidence of cervical cancer, cancer of unknown primary site, lung cancer and bowel cancer by socioeconomic status, Australia, 2004–2008**

## Do mortality rates differ by socioeconomic status?

Between 2006 and 2010, for all cancers combined, people living in the lowest socioeconomic status areas had significantly higher mortality rates (1.1 times) than those living in the highest socioeconomic status areas (online Table D6.1).

There was a gradient between age-standardised mortality rate and the level of socioeconomic status for four of the nine selected cancers (Figure 6.10). Specifically, people living in the lowest socioeconomic areas had higher mortality rates of cervical cancer (1.8 times higher), lung cancer (1.5), cancer of unknown primary site (1.3) and bowel cancer (1.1) than those living in the highest socioeconomic areas. The largest relative difference in mortality rate across socioeconomic groups was for cervical cancer, where the mortality rate for people living in the lowest socioeconomic areas was almost double the rate for people living in the highest socioeconomic status areas (2.2 and 1.2 per 100,000 respectively).



**Notes**

1. Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix E).
2. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
3. The rates were age-standardised to the Australian population as at 30 June 2001 and based on the total number of deaths over the 5 years from 2006 to 2010.
4. UPS=Cancer of unknown primary site.
5. Data for this figure are in online Tables D6.2, D6.4, D6.5 and D6.10.

Source: AIHW National Mortality Database.

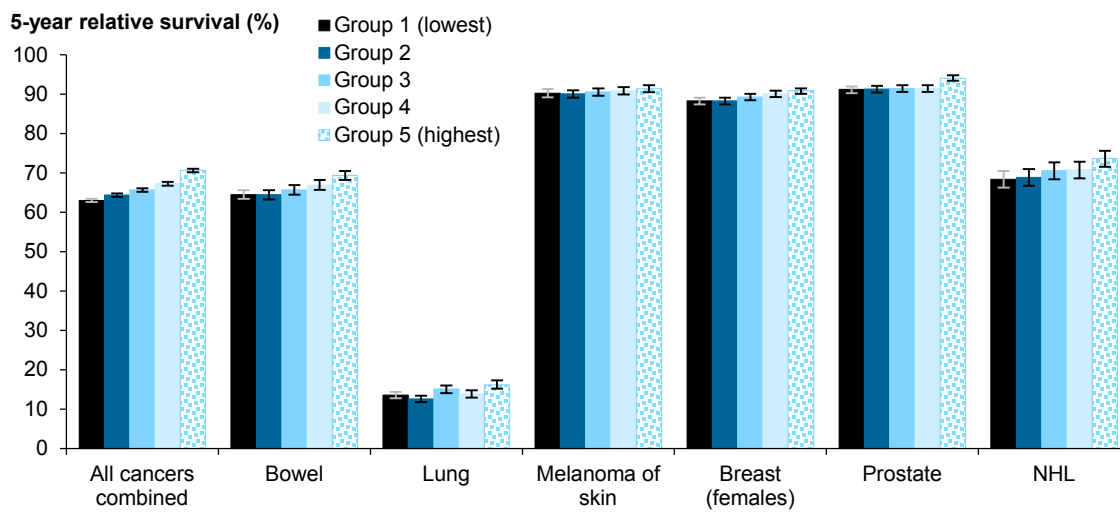
**Figure 6.10: Mortality from cervical cancer, cancer of unknown primary site, bowel cancer and lung cancer by socioeconomic status, Australia, 2006–2010**

## Does survival differ by socioeconomic status?

Some cancers demonstrated survival differences by socioeconomic status of the area of residence at diagnosis. In the period 2006–2010, 5-year survival from all cancers combined was significantly higher in the highest socioeconomic status areas compared with the lowest areas. Similar trends can be observed for other selected cancers, including bowel cancer, lung cancer, breast cancer in females, prostate cancer and non-Hodgkin lymphoma (Figure 6.11).

Notably in males, prostate cancer had significantly higher survival in the highest socioeconomic status areas than for other areas. This may be related to PSA testing, which may be more prevalent in socioeconomically advantaged population groups (Brenner & Arndt 2004) and which can lead to earlier detection.

Differences in survival may be affected by the overlap between remoteness and socioeconomic status. For example, an earlier report showed that almost 30% of people with cancer in *Remote and Very remote* areas lived in areas of the lowest socioeconomic status, while almost 95% of people with cancer in the highest socioeconomic status areas lived in *Major cities* (AIHW et al. 2008).



*Notes*

1. Socioeconomic status is classified according to the ABS Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-economic Disadvantage (see Appendix E).
2. NHL=Non-Hodgkin lymphoma.
3. Data for this figure are in online Table D6.12.

Source: AIHW Australian Cancer Database 2007.

**Figure 6.11: Five-year relative survival from selected cancers by socioeconomic status, Australia, 2006–2010**

## 7 Burden of disease due to cancer

### Key findings

In 2012 in Australia,

- In males, lung cancer is expected to be the leading cause of the burden of disease due to cancer.
- In females, breast cancer is expected to be the leading cause of the burden of disease due to cancer.
- Cancer is estimated to be the leading cause of the burden of disease in Australia, accounting for about 19% of the total burden.
- Males are expected to account for more of the total burden of disease due to cancer than females (53% compared with 47%).
- The majority of cancers are expected to contribute more years of life lost to premature death than years of healthy life lost to disease, disability or injury.



## About burden of disease

Burden of disease analysis is a technique used to assess and compare the fatal and non-fatal effects of different diseases (such as prostate cancer) among population groups and over time. It combines data around premature death, measured by the years of life lost (YLL) and non-fatal health outcomes, measured by years lost due to disability (YLD) into a summary measure called the DALY (disability-adjusted life years). This allows the effects of different diseases (such as cancer) and injuries to be compared on an equal basis.

The DALY uses time as a common currency. One DALY is one year of 'healthy life' lost due to premature death, prolonged illness or disability. The more DALYs associated with a particular disease, the greater the burden (see Box 7.1 for more details). The main advantage of DALYs is that they give weight to health problems that cause substantial illness and disability even if they are not fatal. Further information about DALYs is in *The burden of disease and injury in Australia* (Begg et al. 2007) and Appendix I.

The most recent national burden of disease analysis, based on 2003 data, was conducted by the AIHW and the University of Queensland (Begg et al. 2007). Since then no updates have been made to the national data. However, projections that were calculated as part of the 2003 study provide estimates of updated national burden of disease, and this has been used in this chapter.

This chapter presents 2012 estimated burden of disease in Australia for selected cancers and all cancers combined. Although sophisticated statistical methods were used to produce the projected results, caution should be taken when interpreting these results because of uncertainties about how incidence, mortality and other factors might change over time (AIHW 2012a).

Note that in this section of the report, some cancer groupings are defined differently from that used in most other sections of this report (see Appendix I).

### Box 7.1: What is a 'DALY'?

One disability-adjusted life year or 'DALY' is one year of 'healthy life' lost due to a disease or injury. To illustrate the basic concept, a person who has been healthy all their life but who suddenly dies of a heart attack 20 years early than expected has lost 20 years of healthy life – 20 DALYs. For a person who lives to a normal old age but has been only 'half-well' for 30 years, there are 15 DALYs lost. Using information about the duration and severity of diseases and injuries in individuals, and the pattern of these conditions among the community, DALYs can be added up for each problem (for example, breast cancer) and also combined to give a grand total for a specific disease group, such as cancer (AIHW 2012a).

## What is estimated burden of disease due to cancer in 2012?

In 2012, the total burden of disease in Australia is estimated to be more than 2.9 million DALYs, with males accounting for slightly more of this burden than females (1.5 million compared with 1.4 million).

Cancer is estimated to be the leading cause of the burden of disease in Australia (19% of the total DALYs), followed by cardiovascular disease (16%), nervous system and sense organ disorders (14%), mental disorders (13%) and diabetes (7%).

## Which cancers were the leading causes of burden of disease?

In males, lung cancer is expected to be the leading cause of the burden of disease due to cancer (57,300 DALYs) in 2012, followed by prostate cancer (44,300) and bowel cancer (38,800) (Table 7.1). Together, these cancers are expected to account for almost half (48%) of the total burden of disease due to cancer and for 9% of all male burden of disease. In terms of the leading causes of burden of disease for males, lung, prostate and bowel cancer are expected to rank fourth, eighth and eleventh, respectively.

In females, the leading contributors to the female burden of disease due to cancer in 2012 are expected to be breast cancer (61,300 DALYs), lung cancer (43,400) and bowel cancer (30,700). These cancers are estimated to account for about 53% of the total burden of disease due to cancer in females and for about 10% of all female burden of disease. In terms of the leading causes of burden of disease for females, breast, lung and bowel cancer are expected to rank sixth, seventh and tenth, respectively.

**Table 7.1: Estimated leading cancer causes of burden of disease, Australia, 2012<sup>(a)</sup>**

Site/type	Males				Females				
	DALYs <sup>(b)</sup>	% of cancer burden	% of total burden	Rank	Site/type	DALYs <sup>(b)</sup>	% of cancer burden	% of total burden	Rank
Lung	57,300	19	4	4	Breast	61,300	24	4	6
Prostate	44,300	15	3	8	Lung	43,400	17	3	7
Bowel	38,800	13	3	11	Bowel	30,700	12	2	10
Melanoma	15,700	5	1	23	Ovary	13,200	5	1	26
Lymphoma	14,700	5	1	25	Pancreas	12,700	5	1	28
Leukaemia	13,000	4	1	30	Lymphoma	12,600	5	1	29
Pancreas	12,800	4	1	32	Leukaemia	9,300	4	1	34
Brain	12,600	4	1	33	Brain	9,000	4	1	36
Oesophagus	10,600	4	1	38	Melanoma	7,100	3	1	44
Kidney	8,900	3	1	43	Kidney	5,500	2	0	56
<i>All cancers<sup>(c)</sup></i>	<i>294,400</i>	<i>100</i>	<i>20</i>	<i>..</i>	<i>All cancers<sup>(c)</sup></i>	<i>256,900</i>	<i>100</i>	<i>18</i>	<i>..</i>
<b>All causes</b>	<b>1,497,600</b>	<b>..</b>	<b>100</b>	<b>..</b>	<b>All causes</b>	<b>1,413,000</b>	<b>..</b>	<b>100</b>	<b>..</b>

(a) The estimates are projected from a 2003 baseline. See Appendix I for further details.

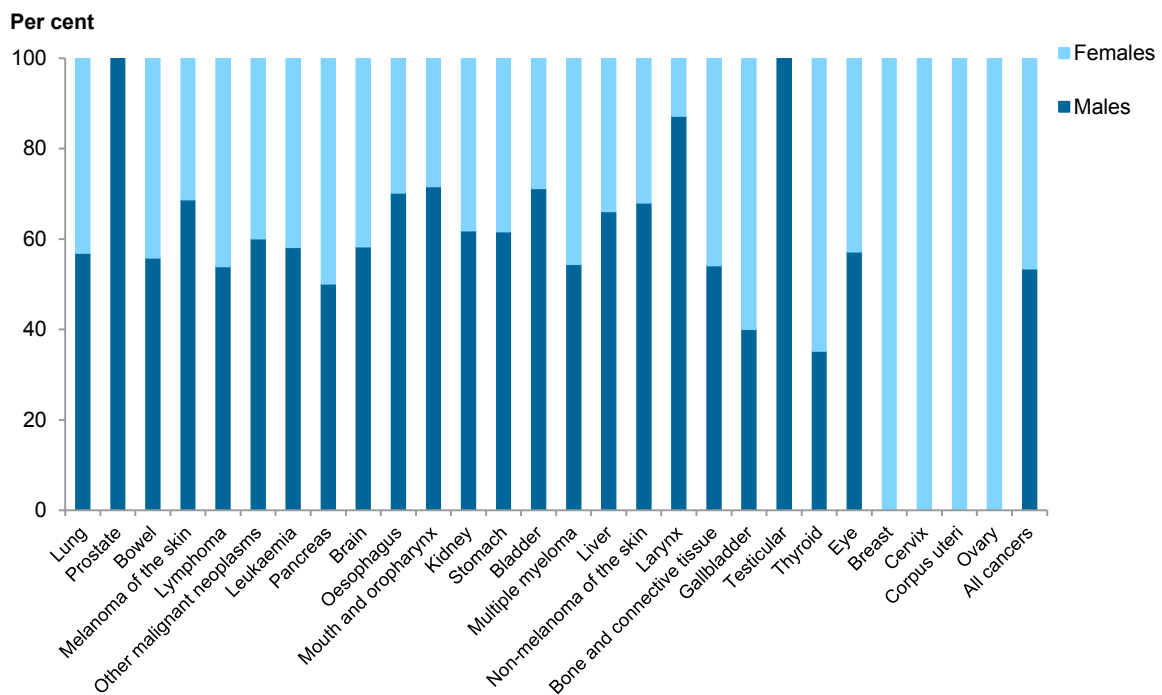
(b) The estimates are rounded to the nearest 100.

(c) Includes cancers coded in ICD-10 as C00–C96.

Source: AIHW Burden of Disease Database.

## Differences by sex

In 2012, males is expected to account for more of the total burden of disease due cancer than females (53% compared with 47%). Apart from the sex-specific cancers (that is, prostate, testicular, ovarian, cervical and uterine cancer), considerably differences in the experience of burden from cancer between the sexes are expected in 2012 (Figure 7.1). Males are expected to have a greater share of the burden of disease from the majority of individual cancer sites, with the imbalance expected to be greatest for laryngeal cancer (87% compared with 13%). In contrast, females are expected to have a greater share of the burden of disease from cancer of the gallbladder, thyroid cancer and breast cancer.



### Notes

1. The estimates are projected from a 2003 baseline. See Appendix I for further details.
2. The data for this figure are in online Table D7.1.

Source: AIHW Burden of Disease Database.

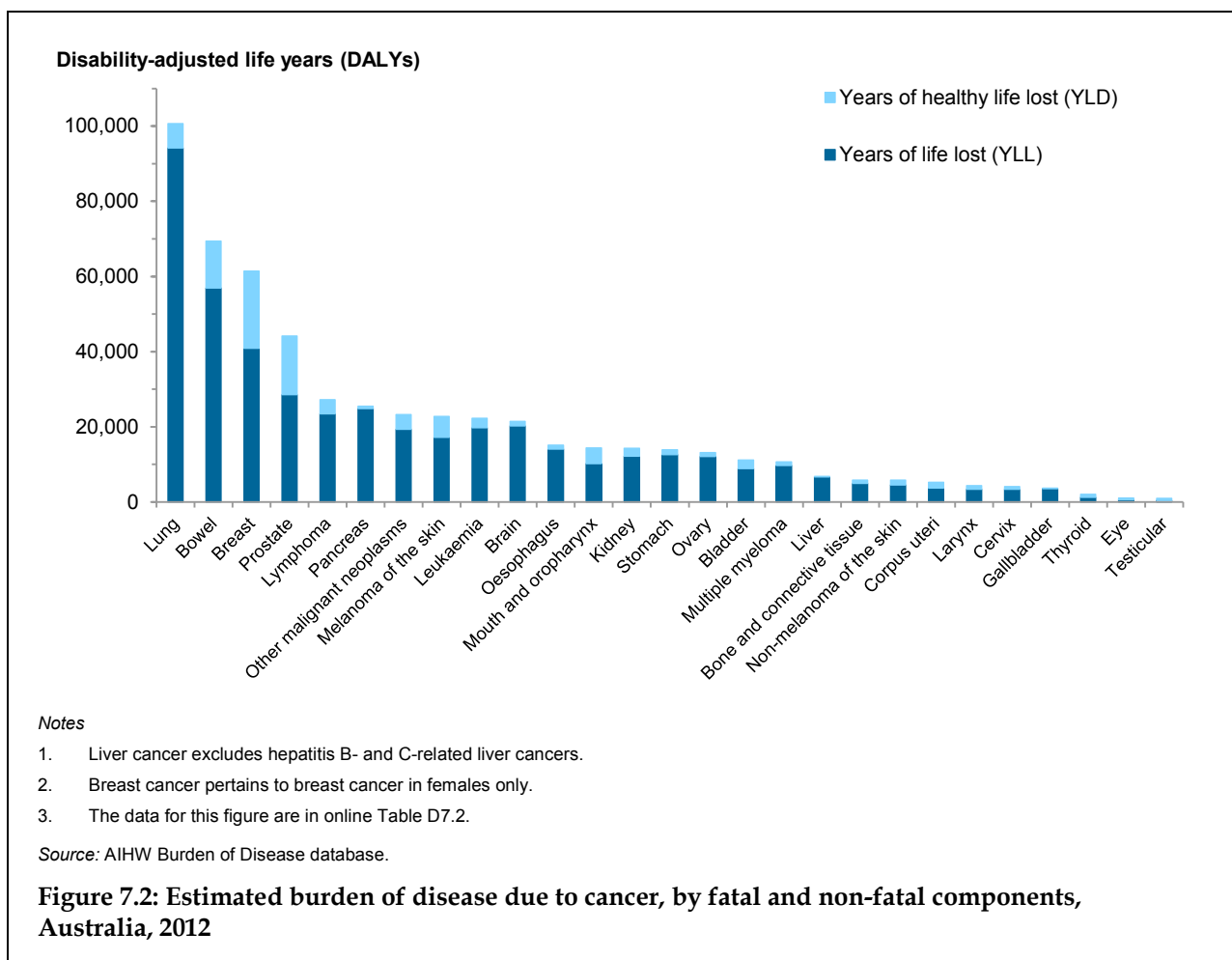
**Figure 7.1: Proportion by sex for estimated leading cancer causes of burden of disease, Australia, 2012**

## Burden due to years of life lost and years of life lost to disability

In this section, information on the leading cause of disease burden for males is presented by the extent of burden due to premature death (YLL) and due to disease, disability or injury (YLD). For cancer, causes of YLD include side effects during and after treatment (for example during and after radiotherapy or chemotherapy) and the psychosocial affects after diagnosis and treatment.

In 2012, cancers as a group is expected to account for about 34% (457,400 YLLs) of the total years of life lost to premature death and 6% (93,900 YLDs) of the total years of healthy life lost due to disability. Lung, bowel and breast cancer are expected to result in the highest number of years lost to premature death (Figure 7.2). Together, these three cancers are expected to account for 14% of total years of life lost to premature death. Meanwhile, breast, prostate and bowel cancer are expected to account for the highest number of years lost due to disability, with these three cancers combined expected to account for 3% of the total years of healthy life lost due to disability.

Due to the relatively poor prognosis for many cancers compared with other diseases, most cancers contribute more years of life lost to premature death than years of healthy life lost to disease, disability or injury. In 2012, this discrepancy is expected to be most marked for pancreatic and liver cancer, with close to 100% of the burden from these cancers coming from years of life lost due to premature death (97% for pancreatic cancer and 98% for liver cancer).



## 8 Hospitalisations and palliative care for cancer

### Key findings

In the 2010–11 financial year in Australia:

- Cancer was responsible for 1 in 10 of all hospitalisations.
- Three-quarters (75%) of cancer-related hospitalisations were for same-day care.
- Cancer patients accounted for 2.31 million patient days.
- When same-day hospitalisations were excluded, the average length of stay was 7.6 days.
- Non-melanoma skin cancer was the most common cancer type recorded as the primary reason for hospitalisation, with about 95,000 hospitalisations.
- Chemotherapy was the most common type of other cancer-related hospitalisation, with about 350,000 hospitalisations.

Between 2001–02 and 2010–11:

- The number of all cancer-related hospitalisations has increased by 36% (from 649,352 to 880,432).
- The age-standardised rate of all cancer-related hospitalisations increased by 10%, from 311 per 10,000 (in 2001–02) to 364 per 10,000 (in 2010–11).

In the 2009–10 financial year in Australia:

- Cancer was the most common principal diagnosis for palliative care separations, accounting for 33,278 of these hospitalisations (59%).

## About hospitalisations

The extent of hospitalisation for cancer is an important indicator of the burden of cancer on the Australian population. Hospital morbidity data provide information on people requiring hospitalisation as an admitted patient for a variety of reasons including both diagnostic procedures and treatment. The number of such hospitalisations for cancer in any 1 year is related not only to the number of people with cancer, but also to the number of cancer-related health services requiring admission to hospital. Other factors that may influence the number of cancer-related hospitalisations in any 1 year include the availability of alternative health-care services, relative accessibility of hospital care, admission criteria and administrative policies.

In this chapter, a summary is provided on the number of admitted patient hospitalisations that are related to the care and/or treatment of persons with cancer. The data source for this chapter was the National Hospital Morbidity Database (NHMD), which contains data on admitted patient hospitalisations. Note that the data from the NHMD refer to hospitalisations and not individuals. Any person may have multiple hospitalisations during the course of a year but data on the number of people hospitalised for a particular disease are not available. The most recent data available relate to the 2010–11 financial year. Further information about the NHMD is in Appendix I and in AIHW's annual *Australian hospital statistics* reports (AIHW 2012b).

There are two distinct types of diagnosis recorded in the NHMD – principal diagnosis and additional diagnosis (see Box 8.1 for definitions). The principal and additional diagnoses are coded using the *International statistical classification of diseases and related health problems, tenth revision, Australian modification* (ICD-10-AM), 7th edition. The diagnosis can include a disease or a specific treatment for a current condition. Where a treatment is recorded as the principal diagnosis, the disease being treated is usually recorded as an additional diagnosis (NCCH 2010).

As discussed in more detail in Appendix J, cancer-related hospitalisations are defined in this report (unless stated otherwise) as admitted patient hospitalisations in which:

- cancer was recorded as the principal diagnosis (ICD-10 AM codes C00–C97, D45, D46, D47.1 and D47.3)

or

- cancer was recorded as an additional diagnosis where the principal diagnosis code related specifically to health services or treatments of patients with cancer (such as Z51.1 Pharmacotherapy session for neoplasm).

For the purposes of this report, hospitalisations with a principal diagnosis of cancer are called 'Cancer as principal diagnosis' whereas those hospitalisations with principal diagnoses related to health services or treatments (such as follow-up care or screening) of cancer are called 'Other cancer-related principal diagnosis'. See Appendix J for further details on the classification of cancer-related hospitalisations.

Over the last decade, a number of public hospitals in New South Wales, South Australia and the Australian Capital Territory changed their admissions practices so that not all patients who receive same-day chemotherapy treatment were admitted to hospital. Instead, these hospitals provided chemotherapy treatment on an outpatient (that is, non-admitted patient) basis. This change must be taken into account when interpreting numbers and rates in this report (see Appendix I).

This chapter discusses the total number of cancer-related hospitalisations and provides information on cancer-related palliative care hospitalisations.

**Box 8.1: Summary of terms used in the hospitalisation chapter?**

**Admitted patient:** a patient who undergoes a hospital’s formal admission process to receive treatment and/or care. This treatment and/or care is provided over a period of time and can occur in hospital and/or in the person’s home (for hospital-in-the-home patients)

**Hospitalisation:** refers to an episode of care for an admitted patient, which can be a total hospital stay (from admission to discharge, transfer or death), or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute to rehabilitation). A hospitalisation is classified as *same-day* when a patient is admitted and separates (that is, the process by which an admitted patient completes an episode of care either by being discharged, dying, transferring to another hospital or changing type of care) on the same date. A hospitalisation is classified as *overnight* when a patient is admitted to and separated from the hospital on different dates.

**Average length of stay (ALOS):** is the average number of patient days for admitted patient episodes. Patients admitted and separated on the same day are allocated a length of stay of 1 day.

**Principal diagnosis:** is the diagnosis established after study to be chiefly responsible for occasioning the patient’s episode of admitted patient care.

**Additional diagnosis:** is a condition or complaint that either coexists with the principal diagnosis or arises during the episode of care. Additional diagnoses are reported if the conditions affect patient management.

**Palliative care:** is care in which the clinical intent or treatment goal is primarily quality of life for a patient with an active, progressive disease with little or no prospect of cure. It is usually evidenced by an interdisciplinary assessment and/or management of the physical, psychological, emotional and spiritual needs of the patient; and a grief and bereavement support service for the patient and their carers/family.

## How many hospitalisations occurred in 2010–11?

In the 2010–11, there were 880,432 cancer-related hospitalisations. Cancer was responsible for 1 in 10 hospitalisations in Australia. Three-quarters (75%) of the total number of hospitalisations for cancer were same-day hospitalisations (Table 8.1).

**Table 8.1: Number of hospitalisations, persons, Australia, 2010–11**

	Same-day	Overnight	Total
All cancer-related hospitalisations <sup>(a)</sup>	664,556	215,876	880,432
<i>Per cent of total cancer-related hospitalisations</i>	75.5	24.5	100.0
<b>All hospitalisations<sup>(b)</sup></b>	<b>5,120,417</b>	<b>3,732,133</b>	<b>8,852,550</b>

(a) Hospitalisations in which (i) the principal diagnosis is cancer (ICD-10-AM codes C00–C97, D45, D47.1 and D47.3), or (ii) the principal diagnosis is a health service or treatment that may be related to treatment of cancer (see Appendix J).

(b) ICD-10-AM codes A00–Z89.

Source: AIHW National Hospital Morbidity Database.

## How long did cancer patients stay in hospital?

In 2010–11, cancer patients accounted for 2.31 million patient days (8.6% of all hospitalisations). When same-day hospitalisations were excluded, the crude average length of stay for overnight cancer-related hospitalisations was 7.6 days. This is longer than the overnight average length of stay for all hospitalisations (5.8 days) (Table 8.2).

**Table 8.2: Average length of stay (days) for cancer-related overnight hospitalisations, persons, Australia, 2010–11**

	<b>Overnight ALOS</b>
All cancer-related hospitalisations <sup>(a)</sup>	7.6
<b>All hospitalisations<sup>(b)</sup></b>	<b>5.8</b>

(a) Hospitalisations in which (i) the principal diagnosis is cancer (ICD-10-AM codes C00–C97, D45, D47.1 and D47.3), or (ii) the principal diagnosis is a health service or treatment that may be related to treatment of cancer (see Appendix J).

(b) ICD-10-AM codes A00–Z89.

Source: AIHW National Hospital Morbidity Database.

In 2010–11, the five cancer types with the longest average length of stay (excluding same-day hospitalisations) were acute myeloid leukaemia (17.5 days), Kaposi sarcoma (14.8 days), brain cancer, cancer of the small intestine (11.9 days), and myeloma (11.4 days).

## Which cancers and related treatments lead to the most hospitalisations?

Due to the way in which hospital morbidity data is coded, not all cancer-related hospitalisations can be classified by a specific cancer type. In many instances, those hospitalisations for health services related to cancer do not specify the type of cancer, or specify multiple cancers as responsible. As such, examination of cancer types responsible for hospitalisations in Australia are confined to those hospitalisations where cancer is listed as the principal diagnosis. For other cancer-related hospitalisations, variations are examined by treatment type.

### Cancer as a principal diagnosis

The 10 types of cancer most commonly recorded in Australia as the primary reason for hospitalisation for 2010–11 are listed in Table 8.3. Non-melanoma skin cancer was the most common cause of hospitalisations with cancer as principal diagnosis. It accounted for 11% of all cancer-related hospitalisations. This was followed by cancer of secondary site, prostate, bowel and breast cancers.



**Table 8.3: Ten most common hospitalisations with a principal diagnosis of cancer, persons, Australia, 2010–11**

Principal Diagnosis (ICD-10-AM codes)	Same-day	Overnight	Total
<b>Cancer site/type</b>			
Non-melanoma skin (C44)	80,122	15,190	95,312
Secondary site (C77–C79)	6,347	34,880	41,227
Prostate (C61)	18,241	16,935	35,176
Bowel (C18–C20)	8,504	20,759	29,263
Breast (C50)	4,917	19,100	24,017
Non-Hodgkin lymphoma (C82–C85)	8,759	10,238	18,997
Lung (C33–C34)	3,887	13,845	17,732
Bladder (C67)	6,771	7,784	14,555
Myelodysplastic syndrome (D46)	10,729	2,629	13,358
Melanoma skin (C43)	7,026	3,431	10,457
<i>Cancer as principal diagnosis</i>	<i>195,767</i>	<i>210,837</i>	<i>406,604</i>
<b>All cancer-related hospitalisations<sup>(a)</sup></b>	<b>664,556</b>	<b>215,876</b>	<b>880,432</b>

(a) Hospitalisations in which (i) the principal diagnosis is cancer (ICD-10-AM codes C00–C97, D45, D47.1 and D47.3), or (ii) the principal diagnosis is a health service or treatment that may be related to treatment of cancer (see Appendix J).

Source: AIHW National Hospital Morbidity Database.

The 10 most common cancer types represented more than two-thirds of all overnight cancer-related hospitalisations. Cancer of secondary site was the most common cause of overnight hospitalisations, representing 17% of total overnight cancer-related hospitalisation. Meanwhile, 1 in 8 (12%) of all same-day cancer-related hospitalisations were for non-melanoma skin cancer.

### Other cancer-related hospitalisations

Other cancer-related hospitalisations were dominated by chemotherapy sessions, which accounted for 40% of all cancer-related hospitalisations in 2010–11. This was followed by special screening examination for neoplasms, follow-up after surgery for cancer, and adjustment and management of infusion pumps and vascular devices (Table 8.4).

Most other cancer-related hospitalisations are for same-day services. The five leading treatments accounted for about 7 in 10 (69%) of all same-day cancer-related hospitalisations in 2010–11. Although the total number of overnight hospitalisations for other cancer-related hospitalisations was small, follow-up after surgery was the most common.

**Table 8.4: Five most common other cancer-related hospitalisations, persons, Australia, 2010–11**

Principal diagnosis (ICD-10-AM codes)	Same-day	Overnight	Total
Chemotherapy session (Z51.1)	352,704	168	352,872
Special screening examination (Z12)	53,177	517	53,694
Follow-up after surgery for cancer (Z08.0)	38,331	2,100	40,431
Follow-up after multiple treatment (Z08.7–Z08.9)	8,397	409	8,806
Adjustment and management of infusion pumps and vascular device (Z45.1, Z45.2)	7,082	233	7,321
<i>Other cancer-related hospitalisations</i>	<i>468,789</i>	<i>5,039</i>	<i>473,828</i>
<b>All cancer-related hospitalisations<sup>(a)</sup></b>	<b>664,556</b>	<b>215,876</b>	<b>880,432</b>

(a) Hospitalisations in which (i) the principal diagnosis is cancer (ICD-10-AM codes C00–C97, D45, D47.1 and D47.3), or (ii) the principal diagnosis is a health service or treatment that may be related to treatment of cancer (see Appendix J).

Source: AIHW National Hospital Morbidity Database.

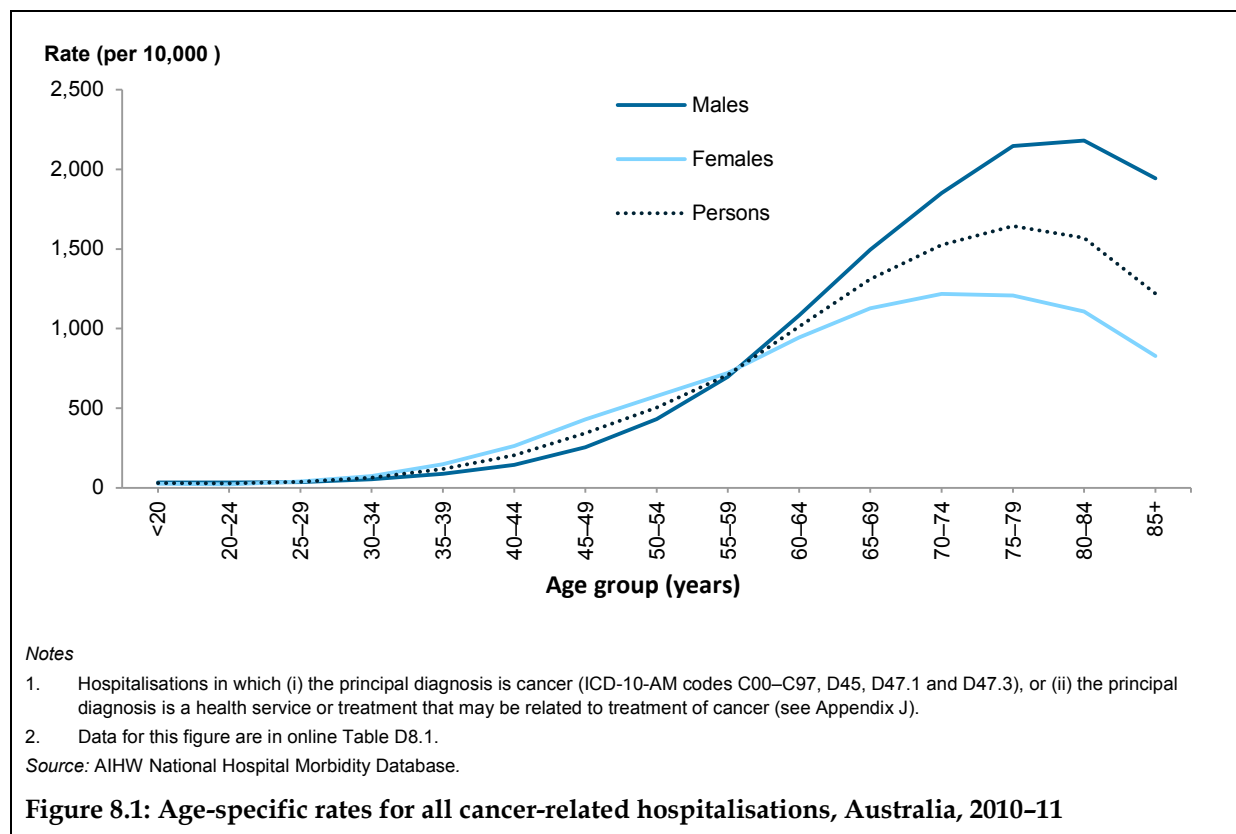
It is important to note that the number of same day services for chemotherapy does not include chemotherapy treatment on an outpatient (that is, non-admitted patient) basis. Over the past decade, a number of hospitals (mainly public sector) in New South Wales, South Australia and Australian Capital Territory changed their admissions practices so that not all patients who receive same-day chemotherapy services are admitted to hospital and instead receive treatment on an outpatient basis.

Information on outpatient chemotherapy services is included in the National Outpatient Care Database (NOCD). However, there is variation across jurisdictions in the reporting of chemotherapy services due to differences in admission practices and in the types of facilities offering these services. In 2010–11, there were 130,205 outpatient services recorded for chemotherapy in the NOCD. More detail about the scope of the NOCD is in the AIHW report *Australian hospital statistics 2010–11* (AIHW 2012b).

## Does hospitalisation differ by age?

Cancer-related hospitalisation was more common in the older age groups. The rate of hospitalisation for patients with cancer was relatively low in the younger age groups and started to increase after the age of 30. The highest hospitalisation rate of 1,644 per 10,000 was in those aged 75–79.

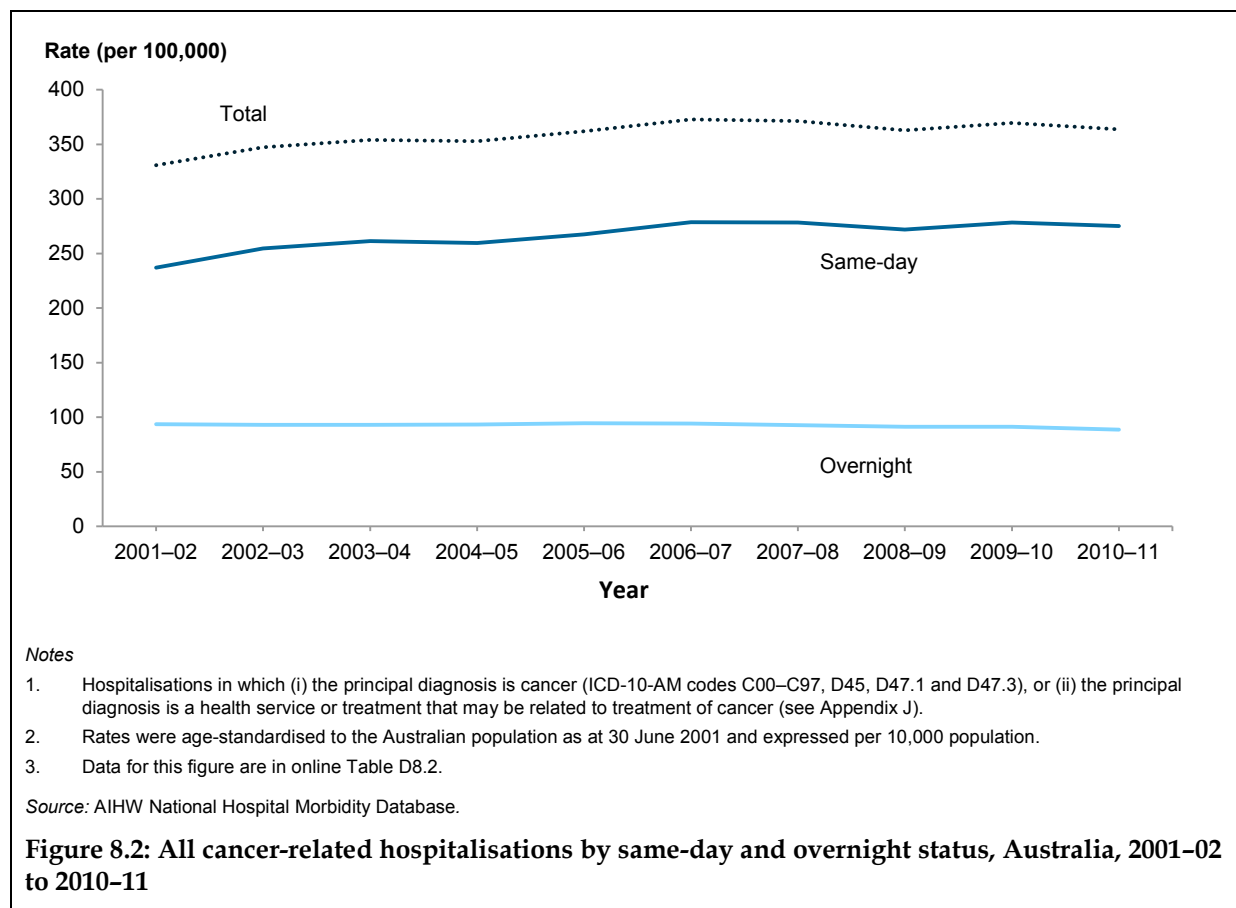
The cancer-related hospitalisation rate was similar for males and females aged under 30. Females aged 30–54 had a slightly higher rate of hospitalisation than males. The rate in males increased more steeply after the age of 55 and was markedly higher than that of females thereafter (Figure 8.1).



## Has cancer-related hospitalisation changed over time?

In this section, trends in hospitalisation are presented from 2001-02 to 2010-11. As noted earlier, changes in hospital admission procedures during this period should be taken into account when interpreting trends over time. The number of all cancer-related hospitalisations has increased by 36% between 2001-02 and 2010-11 (from 649,352 to 880,432). A majority of the change is related to a substantial increase (43%) in the number of same-day hospitalisations (from 465,439 in 2001-02 to 664,556 in 2010-11) (Figure 8.2).

The age-standardised rate of all cancer-related hospitalisations increased by 10% over this period, from 331 per 10,000 (in 2001-02) to 364 per 10,000 (in 2010-11). The trend in the rate of all cancer-related hospitalisations was mostly driven by the changes in the rate of same-day hospitalisations, which has been affected by changes in the admission practices for same-day chemotherapy.



## Palliative care for cancer in the hospital setting

A growing number of people die from cancer each year and this trend is expected to continue with Australia's ageing population. While medical care is often focused on the treatment and cure of disease, for patients diagnosed with advanced cancer where it is not expected that they will recover from the disease, the doctors, in consultation with the patient and family members, may pursue a course of treatment that focuses on 'quality of life' aiming to reduce the pain and suffering from the disease (WHO 2002).

Palliative care describes care in which the clinical intent or treatment goal is to maintain the quality of life for a patient with an active, progressive disease with little or no prospect of cure. Palliative care usually includes an interdisciplinary assessment and/or management of the physical, psychological, emotional and spiritual needs of the patient and a grief and bereavement support service for the patient and their carers/family (see Box 8.2).

This section presents a summary of cancer-related palliative care separations within an admitted patient setting in 2009-10. The palliative care may have been delivered in a hospice, a dedicated palliative care ward or in other admitted patient beds in a hospital. For the purpose of this report, a 'palliative care separation' is defined as a separation for which palliation was a substantial component of the care provided, and in which the principal clinical intent of the care was palliation during part or all of the separation, as evidenced by a code of *Palliative care* for the 'Care type' and /or diagnosis data items in the NHMD. Further information is in Appendix J and the AIHW's report *Palliative care services in Australia* (AIHW 2012g).

### Box 8.2: World Health Organization definition of palliative care

Palliative care is defined by the World Health Organization (WHO) as 'an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual' (WHO 2002).

## How many cancer-related palliative care hospitalisations occurred in 2009–10?

In 2009–10, there were 55,983 palliative care hospitalisations in Australia. Cancer was the most common principal diagnosis, accounting for 33,278 of these hospitalisations (59%) of these hospitalisations (Table 8.5). Cancer-related palliative care separations accounted for 3.8% of all cancer-related hospitalisations.

**Table 8.5: Palliative care hospitalisations, Australia, 2009–10**

	Number of hospitalisations
All cancer-related palliative care hospitalisations <sup>(a)</sup>	33,278
<b>All palliative care hospitalisations</b>	<b>55,983</b>

(a) Palliative care hospitalisations in which (i) the principal diagnosis is cancer (ICD-10-AM codes C00–C97, D45, D47.1 and D47.3), or (ii) the principal diagnosis is a health service or treatment that may be related to treatment of cancer (see Appendix J).

Source: AIHW National Hospital Morbidity Database.

## Which cancers lead to the most palliative care hospitalisations?

Most palliative care hospitalisations for cancer involved overnight hospital care (93%), with a small number of same-day hospitalisations.

The most common type of cancer recorded for the palliative care separations was secondary site cancer, which refers to a malignant tumour that originated elsewhere in the body; this principal diagnosis was reported in 15% of palliative care separations in 2010–11 (Table 8.6).

**Table 8.6: Ten most common palliative care hospitalisations with a principal diagnosis of cancer, persons, Australia, 2009–10**

Principal diagnosis (ICD-10-AM codes)	Total	Proportion of palliative care hospitalisations (%)
<b>Cancer site/type</b>		
Secondary site (C77–C79)	8,192	14.6
Lung (C33–C34)	5,552	9.9
Bowel (C18–C20)	2,686	4.8
Pancreas (C25)	1,736	3.1
Prostate (C61)	1,579	2.8
Breast (C50)	1,390	2.5
Brain (C71)	1,267	2.3
Stomach (C16)	932	1.7
Oesophagus (C15)	759	1.4
Liver (C22)	742	1.3
<b>All cancer-related palliative care hospitalisations<sup>(a)</sup></b>	<b>33,278</b>	<b>59.4</b>

(a) Palliative care hospitalisations in which (i) the principal diagnosis is cancer (ICD-10-AM codes C00–C97, D45, D47.1 and D47.3), or (ii) the principal diagnosis is a health service or treatment that may be related to treatment of cancer (see Appendix J).

Source: AIHW National Hospital Morbidity Database.

## Palliative care and deaths in hospital

In the previous section, the focus has been on all palliative care hospitalisations that occurred in an admitted patient setting. In this section, the focus is on a subset of these palliative care hospitalisations: those that ended with their death in the admitted patient setting. Further information is in the AIHW's report *Palliative care services in Australia* (AIHW 2012g).

Around half of all palliative care hospitalisations result in a patient's death, and this proportion is the same among palliative care patients diagnosed with cancer. There are a number of other reasons that a person with a terminal illness may be admitted as a palliative care patient, including for pain management or to perform procedures to alleviate symptoms.

Research has shown that the majority of palliative care services are provided to cancer patients, and this may be due to the recognised disease pathway and prognosis of decline for cancer patients compared with non-cancer patients (AIHW 2011b). This is particularly evident when we examine the proportion of admitted patients who died who were palliative care patients at the time of their death. Among those with cancer as a principal diagnosis who died during their hospitalisation, 7 out of 10 (71%) had been a palliative care patient (Table 8.7). This is much higher than the overall proportion (37%) of patients that had been a palliative care patient during the stay that ended in their deaths when all hospitalisations were considered.

**Table 8.7: Palliative care patients among those who died as an admitted patient, persons, Australia, 2009–10**

	<b>Palliative care patient deaths<sup>(a)</sup></b>	<b>Total admitted patient deaths</b>	<b>Per cent of palliative care patient deaths<sup>(a)</sup></b>
All cancer-related hospitalisations <sup>(b)</sup>	16,459	23,082	71.3
<b>All hospitalisations<sup>(c)</sup></b>	<b>27,270</b>	<b>73,021</b>	<b>37.3</b>

(a) Refers to patients for whom palliative care was the principal clinical intent during part or all of the separation that ended with their death.

(b) Hospitalisations in which (i) the principal diagnosis is cancer (ICD-10-AM codes C00–C97, D45, D47.1 and D47.3), or (ii) the principal diagnosis is a health service or treatment that may be related to treatment of cancer (see Appendix J).

(c) ICD-10-AM codes A00–Z89.

Source: AIHW National Hospital Morbidity Database.

## 9 National cancer screening programs

### Key findings

#### BreastScreen Australia

- More than 1.7 million women participated in BreastScreen Australia in 2009–2010. Participation by women in the target age group of 50–69 has remained between 55% and 57% for the past decade.
- Sixty per cent of all invasive breast cancers detected by BreastScreen Australia were small (that is, less than or equal to 15mm). Small breast cancers are associated with better treatment options and improved survival.
- In line with BreastScreen Australia's aim to reduce death from breast cancer, the age-standardised mortality rate has decreased since the program began in 1991. Between 1991 and 2010, the mortality rate for women aged 50–69 decreased by 37% from 68 to 43 deaths per 100,000.

#### National Cervical Screening Program

- Nearly 3.8 million women participated in the National Cervical Screening Program in 2009–2010. Participation by women in the target age group of 20–69 has remained between 57% and 59% for the past 5 years.
- The overall incidence rate of cervical cancer in women aged 20–69 (the target age group) has fallen by about 50% since the introduction of the National Cervical Screening Program in 1991.

#### National Bowel Cancer Screening Program

- About 38% of the 2.1 million people invited to participate in the National Bowel Cancer Screening Program between July 2008 and June 2011 returned a completed bowel cancer screening kit for analysis.
- Women were more likely to participate than men (41% and 36%, respectively), but men were more likely to have a positive screening test. Participants who receive a positive screening result are encouraged to discuss this result with their doctor, who will refer them for colonoscopy, if necessary.
- Three per cent of participants who had a colonoscopy to follow-up a positive screening test were found to have suspected or confirmed cancer. In addition, 14% had adenomas (benign growths that have the potential to become cancerous) detected.



## About national population screening programs

In Australia, there are organised national population screening programs for breast, cervical and bowel cancers. Their goals are to reduce illness and death from these cancers through early detection of cancer and pre-cancerous abnormalities and effective follow-up treatment. The programs are BreastScreen Australia, the National Cervical Screening Program and the National Bowel Cancer Screening Program. They provide screening services that are free to individuals in the target population (for breast and bowel screening) or are covered by a Medicare rebate (for cervical screening).

In this chapter, information on the performance of each of the three programs is presented. While the focus is on people who have had a screening test through one of the programs, because out-of-program screening may occur in the case of breast cancer and bowel cancer, the data presented underestimate the level of breast and bowel cancer screening in Australia.

Note that, except where otherwise specified, rates are expressed per 100 people (not per 100,000 people as was used for the cancer incidence and mortality chapters) and are often referred to as a percentage.

### **Box 9.1: What is cancer screening?**

Cancer screening involves the use of a test to identify individuals at risk of cancer. The screening test itself is not diagnostic; rather, individuals with a positive screening result are usually referred for further investigation with diagnostic tests. The aim of screening is to either detect cancer at an earlier stage where treatment options are often more effective, or detect and treat abnormalities that, if left untreated, may become cancerous.

Population-based cancer screening is an organised, integrated process that uses systematic testing within a defined target group. It does not include testing when an individual presents to a health-care practitioner because of symptoms, or when a test is offered to an individual without symptoms as part of a general health check.

Population-based screening programs should ideally meet a number of criteria defined by the WHO: the condition must be an important health problem and have a recognisable latent or early symptomatic stage; a validated, safe and acceptable test that is able to accurately predict the presence of the disease must be available; and effective, available and accessible treatment options must be available to all people diagnosed with the disease.

### **Why doesn't Australia have a prostate cancer screening program?**

In Australia there are national population-based screening programs for breast, cervical and bowel cancer that meet the above criteria defined by the WHO. While prostate cancer is also an important health condition, current evidence is that the commonly used PSA test, either alone or combined with digital rectal examination, is not suitable for use in a population-based screening program, and the harms of such screening outweigh the benefits (Australian Health Ministers' Advisory Council 2010).

# BreastScreen Australia

BreastScreen Australia was established in 1991 and operates as a joint program of the Australian and state and territory governments. It aims to reduce illness and death resulting from breast cancer in Australia through organised mammographic screening to detect cases of unsuspected cancer in women, enabling intervention at an early stage.

BreastScreen Australia provides free mammographic screening and assessment for women aged 40 and over. However, the primary target group is women aged 50 to 69. Women in this age group are targeted because they have a relatively high incidence of breast cancer and screening mammography is known to be effective in reducing mortality in this age group (BreastScreen Australia 2004). If mammographic screening identifies signs suspicious for breast cancer, a woman is recalled for further investigation.

In this section, data on the number of women obtaining a screening mammogram through BreastScreen Australia are presented. Participation is measured over 2 years to align with the recommended screening interval (time between screening mammograms) of BreastScreen Australia, and is based on the number of women screened (not the number of screening mammograms performed) as a proportion of the target population. Data on the number of breast cancers detected through the program in 2010 are also presented. The data were sourced from the AIHW report *BreastScreen Australia monitoring report 2009–2010* (AIHW 2012c). The data for this report were provided to the AIHW by the state and territory BreastScreen programs and pertain to the 2-year period 2009–2010.

For more detailed information about BreastScreen Australia, see the *BreastScreen Australia monitoring report 2009–2010* (AIHW 2012c).

## How many women participated?

More than 1.7 million women participated in BreastScreen Australia in 2009–2010, of which 79% were in the target age group of 50–69 (Table 9.1).

**Table 9.1: Participation in the BreastScreen Australia Program, females, Australia, 2009–2010**

Age	Number of females <sup>(a)</sup>	Rate (per cent) <sup>(b)</sup>	95% confidence interval
50–69 years	1,352,112	55.0	54.9–55.0
<b>Total (40+ years)</b>	<b>1,710,312</b>	<b>32.4</b>	<b>32.4–32.5</b>

(a) Participants are the number of females screened through BreastScreen Australia in each 2-year reporting period. The screening periods cover 1 January of the initial year to 31 December of the latter year indicated.

(b) Participation rates were based on the number of females screened in the 2-year reporting period through BreastScreen Australia as a proportion of the average of the ABS estimated resident population for 2009 and 2010, age-standardised to the Australian population as at 30 June 2001 and expressed per 100 females.

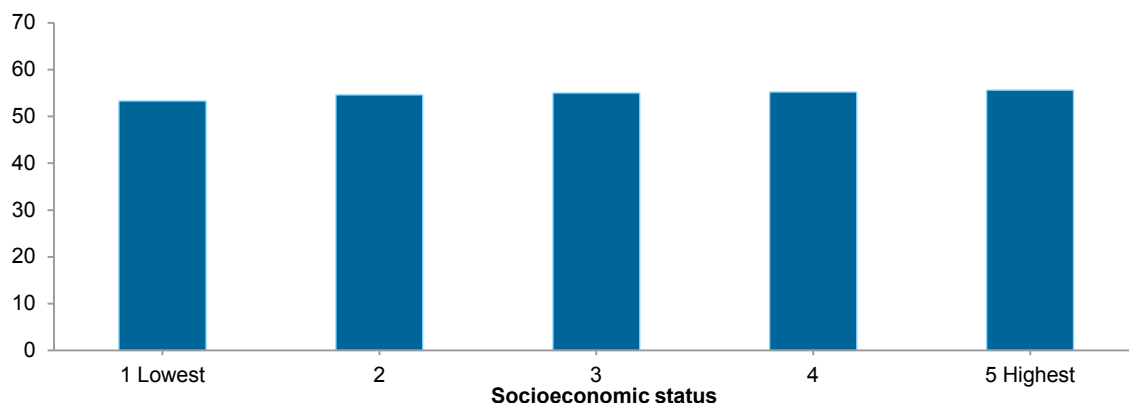
Source: AIHW analysis of BreastScreen Australia data.

The age-standardised rate of participation by women aged 50–69 has remained steady at 55% to 57% between 1997–1998 and 2009–2010, despite a steady increase in the actual number of women participating over this time.

## Does participation differ for different population groups?

Aboriginal and Torres Strait Islander women participate in BreastScreen Australia at a lower rate than non-Indigenous women. However, participation rates for Aboriginal and Torres Strait Islander women have increased from 34.9% in 1999–2000 to 36.2% in 2009–2010. While participation increases with improving socioeconomic status, this trend is small, with all socioeconomic groups recording participation rates of 53–56% (Figure 9.1).

Participation (per cent)



Notes

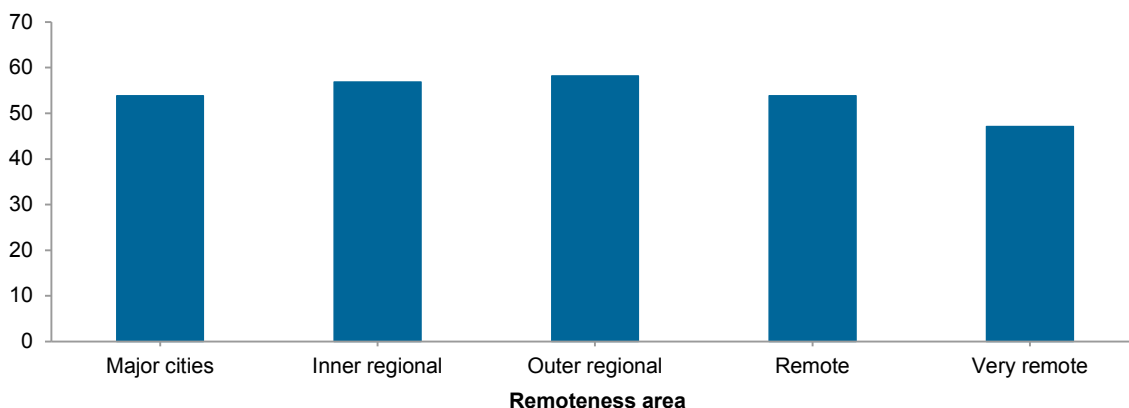
1. Participation rates were based on the number of females aged 50–69 screened through BreastScreen Australia as a proportion of the average of the ABS estimated resident population for 2009 and 2010 for females aged 50–69, age-standardised to the Australian population as at 30 June 2001 and expressed per 100 females.
2. Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix E).
3. Data for this figure are in online Table D9.1.

Source: AIHW analysis of BreastScreen Australia data.

**Figure 9.1: Participation in BreastScreen Australia by socioeconomic status, females aged 50–69, 2009–2010**

Participation was highest in *Outer regional* locations at 58%. BreastScreen also reaches 47% of women in *Very remote* locations (Figure 9.2). To improve access for women in *Remote* and *Very remote* areas, states and territories use relocatable screening services, mobile screening vans and community buses to overcome transport barriers.

Participation (per cent)



Notes

1. Participation rates were based on the number of females aged 50–69 screened through BreastScreen Australia as a proportion of the average of the ABS estimated resident population for 2009 and 2010 for females aged 50–69, age-standardised to the Australian population as at 30 June 2001 and expressed per 100 females.
2. Remoteness was classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix E).
3. Data for this figure are in online Table D9.1.

Source: AIHW analysis of BreastScreen Australia data.

**Figure 9.2: Participation in BreastScreen Australia by remoteness area, females aged 50–69, 2009–2010**

## How many women had a breast cancer detected?

The aim of BreastScreen Australia is to reduce illness and death from breast cancer. This can be achieved by maximising the detection of unsuspected cancers, and in particular small cancers, since this leads to better treatment options (NBOCC 2009) and improved survival (AIHW & NBCC 2007).

In 2010, BreastScreen New South Wales data for cancer detection were not available because of issues relating to the implementation of a new business information system. It is anticipated that future BreastScreen Australia monitoring reports will include data for this year (these can be accessed on the AIHW website <[www.aihw.gov.au](http://www.aihw.gov.au)>). In 2010, 381 women who screened for the first time and 2,033 women who attended subsequent screens were diagnosed with breast cancer. This means that for every 10,000 women aged 50–69 screened for the first time, 97 had a breast cancer detected, and for every 10,000 women attending subsequent screens, 46 had a breast cancer detected (AIHW 2012c).

A high proportion of breast cancers detected through BreastScreen Australia in 2010 were small—47% of breast cancers detected in women at their first screen, and 63% of those in women attending subsequent screens. It is thought that a woman is more likely to be diagnosed with a small cancer in subsequent screens than in her first screen because a first screen detects prevalent cancers that may have been present for some time, whereas subsequent screens detect incident cancers that have grown between screens, and are more likely to be small, having had less time in which to grow.

## What impact has BreastScreen Australia had on mortality?

After a period of relative stability from 1982 to 1994, mortality from breast cancer in women aged 50–69 began to decrease steadily from 1995. Mortality rates decreased from 66 per 100,000 women in 1995, to 43 per 100,000 women in 2010. The decrease in mortality has been attributed to the early detection of breast cancer through BreastScreen Australia, along with advances in the management and treatment of breast cancer (BreastScreen Australia Evaluation Advisory Committee 2009).

## National Cervical Screening Program

The National Cervical Screening Program (NCSP), established in 1991, operates as a joint program of the Australian and state and territory governments. It aims to reduce cervical cancer cases, as well as illness and death resulting from cervical cancer in Australia, by detecting and treating high-grade abnormalities of the cervix before any possible progression to cervical cancer. It achieves this through an organised approach to cervical screening targeting women aged 20–69 for 2-yearly Papanicolaou smears (or Pap tests).

National policy recommends that women aged between 18 and 20 should begin screening within 1 or 2 years of becoming sexually active, while Pap tests may cease at the age of 70 for women who have had two normal results within the last 5 years (DoHA 2012). These recommendations apply to women who have received the vaccine introduced in 2007 against human papilloma virus (HPV) as well as to unvaccinated women. For more information on the HPV vaccine, see Box 9.2.

In this section, data on participation in the NCSP are presented. Participation is measured over 2 years to align with the recommended screening interval (time between Pap tests) of the NCSP, and is based on the number of women screened (not the number of Pap tests

performed) as a proportion of the target population. The impact of the program on the number of new cases of cervical cancer is also discussed. The data were sourced from the AIHW report *Cervical screening in Australia 2009–2010* (AIHW 2012e). The data were provided to the AIHW by the state and territory cervical screening programs and pertain to the 2-year period 2009–2010.

More information about the National Cervical Screening Program and the method by which estimates were derived is in the *Cervical screening in Australia 2009–2010* report (AIHW 2012e).

## How many women participated?

Nearly 3.8 million women participated in the NCSP in 2009–2010, of which 96% were in the target age group of 20–69. Participation in this age group has remained steady at 57% to 59% between 2004–2005 and 2009–2010. There has been a steady increase in the actual number of women participating over this time.

While 2 years is the recommended screening interval, the NCSP also monitors participation over 3 and 5 years. In the 3-year period 2008–2010, 70% of women aged 20–69 participated in the NCSP at least once, while in the 5-year period 2006–2010, 83% did (Table 9.2).

**Table 9.2: Participation in the National Cervical Screening Program, females aged 20–69, Australia, over 2-year (2009–2010), 3-year (2008–2010), and 5-year (2006–2010) period**

	Number of females	Rate (per cent) <sup>(a)</sup>	95% confidence interval
2-year <sup>(b)</sup>	3,635,929	57.4	57.3–57.5
3-year <sup>(b)</sup>	4,412,027	70.2	70.1–70.3
5-year <sup>(b)</sup>	5,154,472	83.3	83.2–83.4

(a) Equals the number of females screened as a percentage of the ABS estimated resident population for females aged 20–69, adjusted to include only women with an intact cervix using age-specific hysterectomy fractions derived from the AIHW National Hospitals Morbidity Database, age-standardised to the Australian population as at 30 June 2001.

(b) The 2-year period covers 1 January 2009 to 31 December 2010; the 3-year period covers 1 January 2008 to 31 December 2010; and the 5-year period covers 1 January 2006 to 31 December 2010.

Source: AIHW analysis of NCSP Register data.

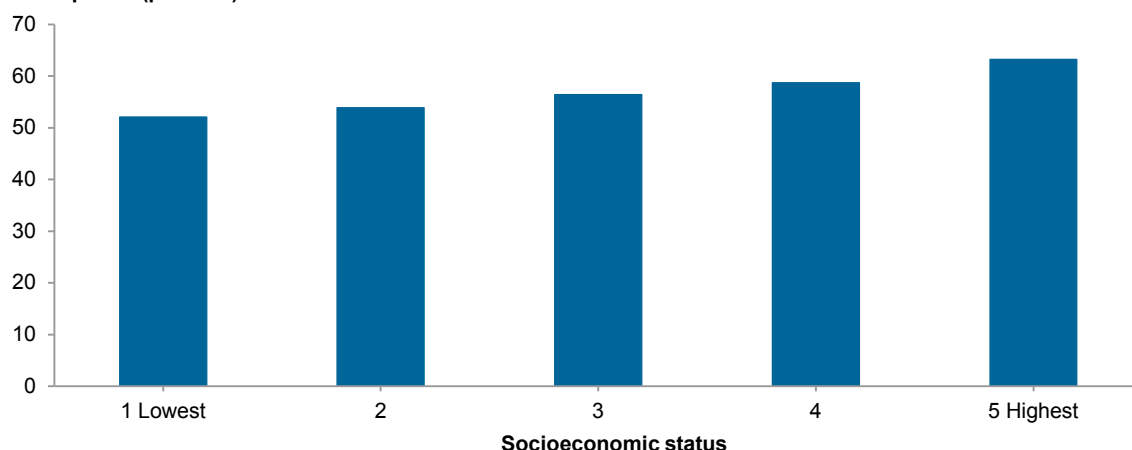
## Does participation differ for different population groups?

Information on participation for Aboriginal and Torres Strait Islander women is not available, as Indigenous status of participants is not collected, although there is evidence that this population group is under-screened (Binns & Condon 2006; Coory 2002).

There was a clear trend of increasing participation with increasing socioeconomic status of area of usual residence, ranging from 52% in the most disadvantaged areas to 63% in the least disadvantaged (Figure 9.3).

While participation in the NCSP was significantly higher in *Major cities*, *Inner regional* and *Very remote* areas compared with other geographic areas, this difference was small, with all areas recording participation rates of 55–58% (Figure 9.4).

**Participation (per cent)**



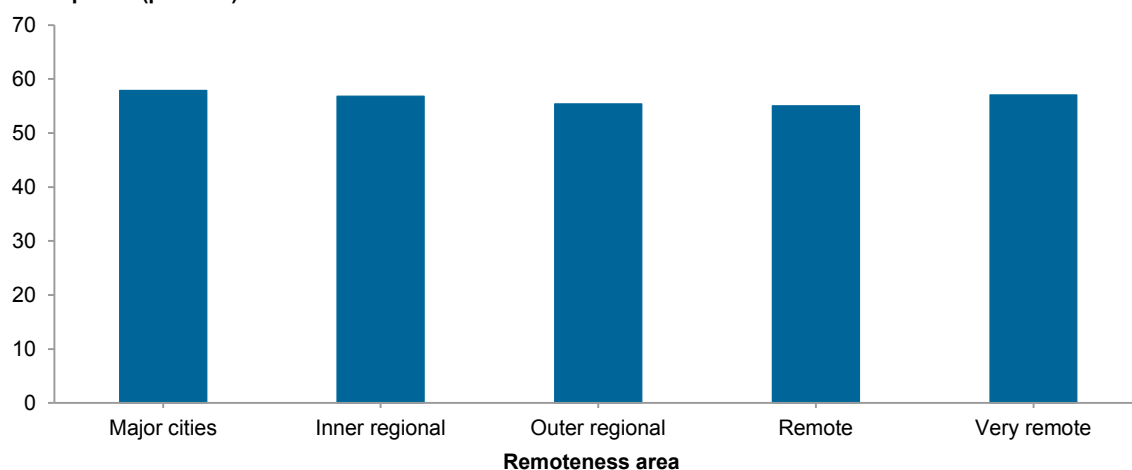
*Notes*

1. Participation rates were based on the number of females aged 20–69 screened as a proportion of the average of the ABS estimated resident population for 2009 and 2010 for females aged 20–69, adjusted for the estimated proportion of women who have had a hysterectomy, age-standardised to the Australian population as at 30 June 2001 and expressed per 100 females.
2. Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix E).
3. Data for this figure are in online Table D9.2.

Source: AIHW analysis of NCSP register data.

**Figure 9.3: Participation in the National Cervical Screening Program by socioeconomic status, females aged 20–69, 2009–2010**

**Participation (per cent)**



*Notes*

1. Participation rates were based on the number of females aged 20–69 screened as a proportion of the average of the ABS estimated resident population for 2009 and 2010 for females aged 20–69, adjusted for the estimated proportion of women who have had a hysterectomy, age-standardised to the Australian population as at 30 June 2001 and expressed per 100 females.
2. Remoteness was classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix E).
3. Data for this figure are in online Table D9.2.

Source: AIHW analysis of NCSP register data.

**Figure 9.4: Participation in the National Cervical Screening Program by remoteness area, females aged 20–69, 2009–2010**

## How many women had a high-grade abnormality detected?

In 2010, for every 1,000 women aged 20–69 screened, 8 had a high-grade abnormality detected, providing an opportunity for treatment before possible progression to cervical cancer.

### **Box 9.2: The effect of the National HPV Vaccination Program on cervical screening and the incidence of cervical cancer**

During the past decade much research has been aimed at identifying what causes cervical cancer. It is now recognised that cervical cancer is a rare outcome of persistent infection with HPV. HPV infection with one or more of the 40 genital HPV types is the most common sexually transmitted infection of both men and women, with infection rates highest in women in young adulthood. Persistent infection with a high-risk HPV type is necessary, although not sufficient, for the development of cervical cancer (Bosch et al. 2002; Walboomers et al. 1999).

Australia was the first country to introduce a national HPV vaccination program in 2007. The National HPV Vaccination Program (NHVP), funded by the Australian Government, offers a course of three injections to be given over 6 months. Currently, the NHVP is an ongoing program for girls aged 12–13 administered through schools, although between 2007 and 2009 it also included a catch-up program for girls and women aged 12–26 (National HPV Vaccination Register 2011). To be effective, the vaccines need to be administered before first HPV infection with the specific HPV types; that is, before first sexual activity.

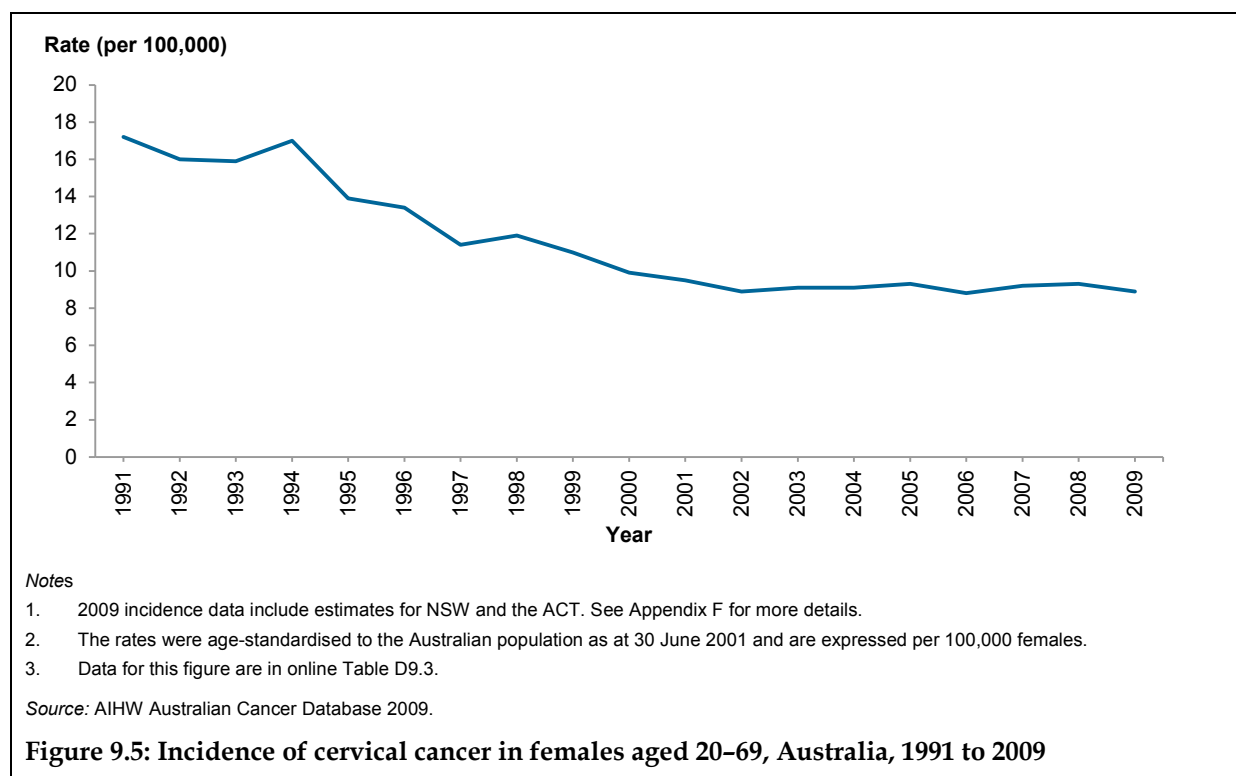
It is important that women who have received the vaccination continue to participate in cervical screening because the vaccine protects against only two of the HPV types, infection with which can lead to cervical cancer. Also, women who received the vaccine after becoming sexually active may not get the full benefit of the vaccine if they had already acquired HPV.

#### **What are the effects of vaccination on the incidence of cervical cancer?**

Effects on cervical cancer incidence require sufficient time to pass for cancers that would otherwise have developed to be averted by HPV vaccination. However, since the program began, there has been a decline in genital warts among young women (Donovan et al. 2011; Read et al. 2011), as well as the first evidence of a decline in cervical abnormalities (changes to cells in the cervix caused by infection with HPV) in girls younger than 18 in the 3 years after the introduction of the HPV vaccine in Australia (Brotherton et al. 2011)—both conditions associated with HPV infection.

## What impact has the National Cervical Screening Program had on the incidence of cervical cancer?

Overall, the cervical cancer incidence rate of women aged 20–69 decreased by about 50% between 1991 (the year the NCSP was introduced) and 2009 (Figure 9.5).



**Figure 9.5: Incidence of cervical cancer in females aged 20–69, Australia, 1991 to 2009**

## National Bowel Cancer Screening Program

The NBCSP aims to reduce both the number of new cases of bowel cancer, as well as illness and death resulting from bowel cancer, by detecting abnormalities of the colon and rectum early. The program is coordinated at the national level by the Australian Government Department of Health and Ageing, in partnership with state and territory governments. Eligible people are individually invited to participate in the program through the Department of Human Services (formerly Medicare Australia). Invitation packs include a free faecal occult blood test (FOBT) kit that enables a person to take a sample of their faeces, which is sent to the program's pathology laboratory to be tested for microscopic traces of blood.

The NBCSP is being phased in gradually to help ensure that health services, such as colonoscopy and treatment services, are well-placed to meet any increased demand. The program began in 2006 with screening offered to men and women aged 55 and 65. In July 2008, it extended screening to include people aged 50. From 2013, it will include people aged 60, and from 2015 those aged 70. The program will be further expanded in 2017–18 to include biennial screening.

While annual participation rates provide an important indicator of the proportion of the population screened in a given year, the NBCSP is a relatively new screening program, and there have been a number of factors that may have affected annual participation rates. These include a change in the target population, an issue with the reliability of the screening FOBT



kit in 2009, and uncertainty over ongoing funding. These factors, combined with the unique design of the NBCSP, mean that a more meaningful measure of program participation uses a longer time frame. Accordingly, participation is presented for 1 July 2008 to 30 June 2011.

## How many people participated?

About 38% of the 2.1 million people invited between 1 July 2008 and 30 June 2011 returned a completed bowel cancer screening kit for analysis.

Women (41%) were 1.1 times as likely to screen as men (36%). The highest rate of participation was by people aged 65 (47%), while those aged 50 had the lowest (34%) (Table 9.3, Figure 9.6).

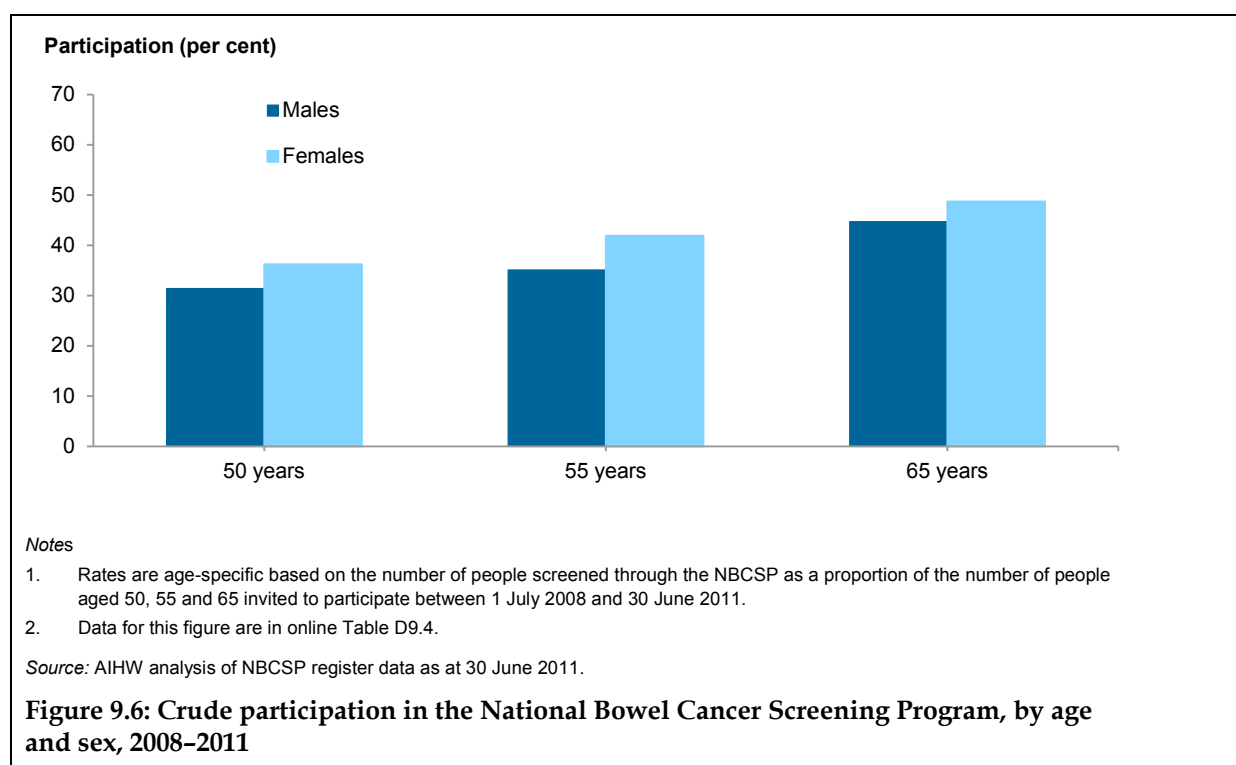
**Table 9.3: Participation in the National Bowel Cancer Screening Program, 1 July 2008–30 June 2011**

	Invitations <sup>(a)</sup>	Participation <sup>(b)</sup>	Rate (per cent)	95% CI
Males	1,044,445	374,144	35.8	35.7–35.9
Females	1,053,075	432,336	41.1	41.0–41.1
<b>Persons</b>	<b>2,092,520</b>	<b>806,480</b>	<b>38.4</b>	<b>38.4–38.5</b>

(a) Pertains to valid invitations sent to people aged 50, 55 and 65.

(b) Participants in the program are defined as members of the eligible population who have been sent an invitation to screen and who returned a completed faecal occult blood test (FOBT) kit. This includes people who suspended or opted off the program.

Source: AIHW analysis of NBCSP Register data.

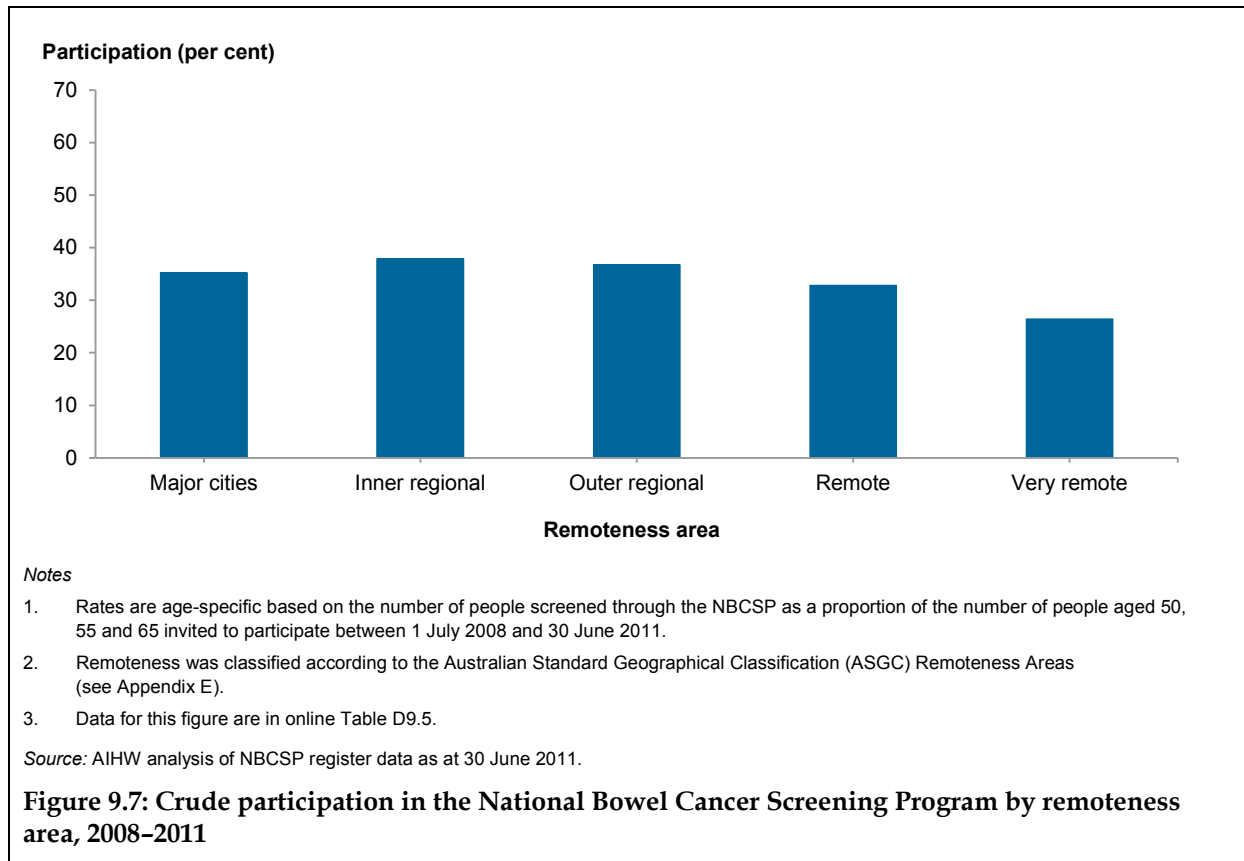


## Does participation differ for different population groups?

Participation rates for Aboriginal and Torres Strait Islander people were not available as it is unknown how many of those invited identify as Indigenous. However, comparison with data from the 2006 ABS Census of Population and Housing indicate that it is likely that they under-screen.

People living in the most disadvantaged areas had a significantly lower level of participation than people from other socioeconomic areas (see online Table 9.5).

People invited in *Remote* and *Very remote* regions had a significantly lower level of participation than people invited from other regions (Figure 9.7).



## How many people needed to be followed-up after a positive screening result?

About 62,000 participants (7.8%) who returned a valid screening test had a positive screening result. Participants who receive a positive screening result are encouraged to discuss this result with their doctor, who will refer them for colonoscopy, if necessary (Table 9.4).

About 71% of those with a positive screening result were recorded as having had a colonoscopy.

## Does follow-up differ for different population groups?

Males were more likely than females to have blood detected in their faeces and require follow-up, but were less likely to screen.

Older people were more likely to have blood detected and require follow-up than younger people, but were also more likely to screen.

## **How many people had bowel cancers or adenomas detected at colonoscopy?**

Of those people invited between 1 July 2008 and 30 June 2011, there were about 1,100 confirmed or suspected cancers reported to the NBCSP Register by clinicians (Table 9.4). This equates to about 1 confirmed or suspected cancer found for every 33 colonoscopies performed after a positive screening test.

About a further 3,300 advanced adenomas were also detected during colonoscopy. When all adenomas are taken into account, 5,120 were detected, which equates to 13.7% of participants having an adenoma detected at colonoscopy. Adenomas are benign growths that have the potential to become cancerous, and their removal is likely to lower the risk of future bowel cancer in these patients.

From the available NBCSP data, almost 80% of bowel cancers removed (resected) were in the earliest two (out of four) stages of cancer spread. Cancers diagnosed at earlier stages are generally associated with improved patient prognosis (Morris et al. 2007).

**Table 9.4: National Bowel Cancer Screening Program outcomes from colonoscopic investigation of positive FOBT (including histopathology), by age and sex, 1 July 2008–30 June 2011<sup>(a)</sup>**

		FOBT positive										
		Invitations issued <sup>(b)</sup>	Number screened <sup>(c)</sup>	Total positive FOBT	Colonoscopy recorded <sup>(d)</sup>	No cancer or adenoma <sup>(e)</sup>	Polyps awaiting histopathology <sup>(f)</sup>	Confirmed diminutive adenoma <sup>(g)</sup>	Confirmed small adenoma <sup>(g)</sup>	Confirmed advanced adenoma <sup>(g)</sup>	Suspected cancer <sup>(h)</sup>	Confirmed cancer <sup>(i)</sup>
Males	Number	1,044,445	374,144	32,456	19,517	7,709	7,917	503	561	2,150	521	156
	Per cent	..	..	..	..	39.5	40.6	2.6	2.9	11.0	2.7	0.8
Females	Number	1,053,075	432,336	29,611	17,927	10,408	5,169	362	361	1,183	347	97
	Per cent	..	..	..	..	58.1	28.8	2.0	2.0	6.6	1.9	0.5
<b>Persons</b>	<b>Number</b>	<b>2,097,520</b>	<b>806,480</b>	<b>62,067</b>	<b>37,444</b>	<b>18,117</b>	<b>13,086</b>	<b>865</b>	<b>922</b>	<b>3,333</b>	<b>868</b>	<b>253</b>
	<b>Per cent</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>48.4</b>	<b>34.9</b>	<b>2.3</b>	<b>2.5</b>	<b>8.9</b>	<b>2.3</b>	<b>0.7</b>

(a) Data are based on data recorded in the NBCSP Register to 21 July 2011 for persons invited between 1 July 2008 and 30 June 2011.

(b) 'Invitations issued' equals the number of eligible people who were issued an invitation to screen in the NBCSP.

(c) 'Number screened' equals the number of people who completed an FOBT kit and had results forwarded to the Register.

(d) 'Colonoscopy recorded' includes colonoscopies recorded via the Colonoscopy Report and/or Histopathology Report forms. It does not include colonoscopies identified through Medicare claims.

(e) No cancers were suspected at colonoscopy or confirmed non-cancerous by histopathology; no polyps identified at colonoscopy, or polyps confirmed as non-adenomatous at histopathology.

(f) Polyps detected at colonoscopy and sent to histopathology for analysis. No Histopathology Report form received by Register.

(g) Confirmed adenoma figures were based on a combination of the Colonoscopy and Histopathology Report forms for a person received by the Register.

(h) Cancer suspected at colonoscopy but not yet confirmed by histopathology.

(i) Cancer confirmed by histopathology.

Source: National Bowel Cancer Screening Program Register as at 21 July 2011.

# Appendix A Cancer codes

Table A1: Cancer codes

Cancer site/type	ICD-10 codes
<b>Lip, oral cavity and pharynx</b>	
Lip	C00
Tongue	C01–C02
Mouth	C03–C06
Salivary glands	C07–C08
Oropharynx	C09–C10
Nasopharynx	C11
Hypopharynx	C12–C13
Other sites in pharynx, etc.	C14
<b>Digestive organs</b>	
Oesophagus	C15
Stomach	C16
Small intestine	C17
Bowel	C18–C20
Anus	C21
Liver	C22
Gallbladder & bile ducts	C23–C24
Pancreas	C25
Other digestive organs	C26
<b>Respiratory system and intrathoracic organs</b>	
Nose, sinuses, etc.	C30–C31
Larynx	C32
Lung	C33–C34
Other thoracic and respiratory organs	C37–C39
<b>Bone</b>	C40–C41
<b>Skin</b>	
Melanoma of the skin	C43
Non-melanoma of the skin	C44 <sup>(a)</sup>
<b>Mesothelioma and soft tissue</b>	
Mesothelioma	C45
Kaposi sarcoma	C46
Peritoneum	C48
Other soft tissue	C47, C49
<b>Breast</b>	C50

(continued)

**Table A1 (continued): Cancer codes**

<b>Cancer site/type</b>	<b>ICD-10 codes</b>
<b>Female genital organs</b>	
Vulva	C51
Vagina	C52
Cervix	C53
Uterus	C54–C55
Ovary	C56
Other female genital organs and placenta	C57–C58
<b>Male genital organs</b>	
Penis	C60
Prostate	C61
Testis	C62
Other male genital organs	C63
<b>Urinary tract</b>	
Kidney	C64
Bladder	C67
Other urinary organs	C65–C66, C68
<b>Eye, brain and other parts of the central nervous system</b>	
Eye	C69
Brain	C71
Other central nervous system	C70, C72
<b>Thyroid and other endocrine glands</b>	
Thyroid	C73
Other endocrine glands	C74–C75
<b>Blood and lymphatic system</b>	
Hodgkin lymphoma	C81
Non-Hodgkin lymphoma	C82–C85
Immunoproliferative cancers	C88
Myeloma	C90
Acute lymphoblastic leukaemia	C91.0
Chronic lymphocytic leukaemia	C91.1
Other and unspecified lymphoid leukaemia	C91.2–C91.9
<i>Total lymphoid cancers</i>	<i>C81–C85, C88, C90, C91</i>
Chronic myelogenous leukaemia	C92.1
Other myeloproliferative cancers	C94.1, C94.3, C96.2, D45, D47.1, D47.3
Myelodysplastic syndrome	D46
Acute myeloid leukaemia	C92.0, C92.3–C92.5, C93.0, C94.0, C94.2, C94.4, C94.5

(continued)

**Table A1 (continued): Cancer codes**

<b>Cancer site/type</b>	<b>ICD-10 codes</b>
Unspecified myeloid leukaemia	C92.2, C92.7, C92.9, C93.1–C93.9, C94.7
<i>Total myeloid cancers</i>	<i>C92–C94, C96.2, D45, D46, D47.1, D47.3</i>
Other cancers of the blood and lymphatic system	C95, C96.0, C96.1, C96.3–C96.9
<b>Other</b>	
Other and ill-defined sites	C76
Unknown primary site	C80 <sup>(b)</sup>
Multiple primary	C97 <sup>(c)</sup>
<b>All cancers</b>	<b>C00–C97<sup>(a)</sup>, D45, D46, D47.1, D47.3</b>

(a) For incidence data, those C44 codes that indicate basal or squamous cell carcinoma of the skin are not included.

(b) For mortality data prior to 2008, the applicable codes are C77–C80.

(c) Of relevance for mortality data only.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

## **Appendix B Summary pages for selected cancers**

This appendix provides summary pages on the incidence and mortality statistics for selected cancers that were commonly diagnosed or were common causes of cancer deaths.

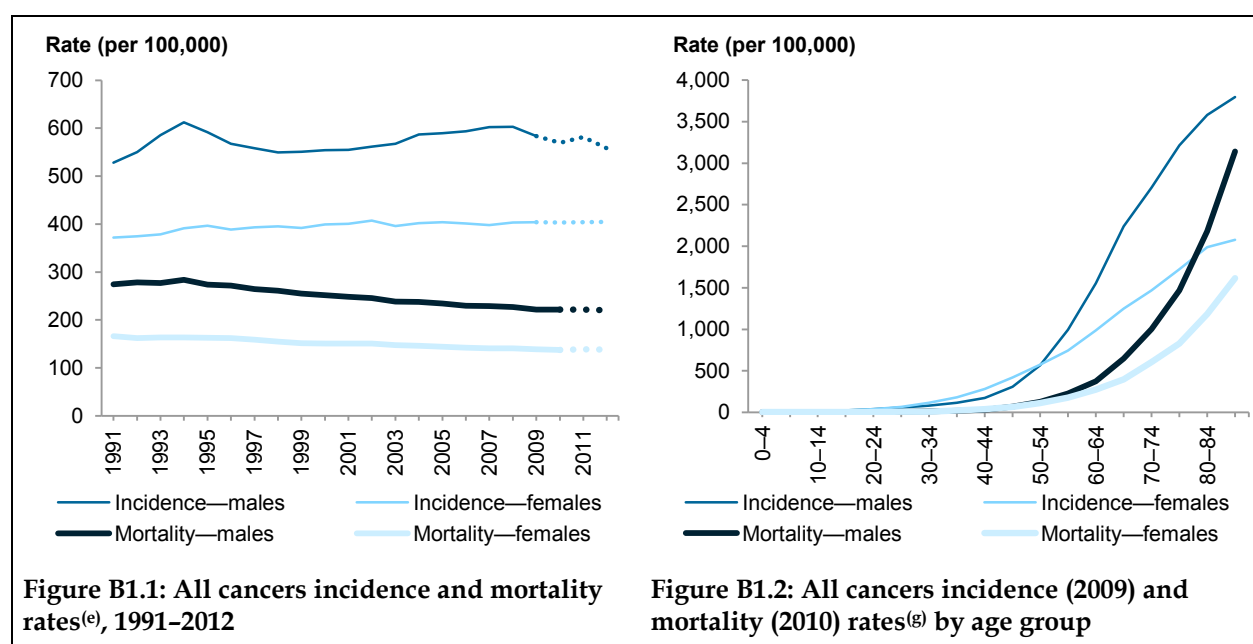


# All cancers (C00–C97<sup>(a)</sup>, D45, D46, D47.1, D47.3)



Table B1: Observed incidence (2009) and mortality (2010) of all cancers, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(c)</sup>	64,342	49,795	114,137	24,328	18,516	42,844
2012 (estimated) <sup>(d)</sup>	67,260	53,460	120,710	25,860	19,650	45,520
<b>Age-standardised rate<sup>(e)</sup></b>						
2009 incidence/2010 mortality	583.5	404.2	485.7	221.7	137.6	174.3
95% CI	579.0–588.1	400.6–407.8	484.3–488.6	218.9–224.5	135.6–139.7	172.7–176.0
2012 (estimated) <sup>(d)</sup>	557.9	404.5	474.4	220.1	138.0	174.1
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	100.0	100.0	100.0	100.0	100.0	100.0
Risk to age 75	1 in 3	1 in 4	1 in 3	1 in 8	1 in 12	1 in 10
Risk to age 85	1 in 2	1 in 3	1 in 2	1 in 4	1 in 6	1 in 5
Mean age <sup>(f)</sup>	66.3	64.2	65.4	72.8	72.9	72.8



- (a) For incidence data, those ICD-10 C44 codes that indicate a basal or squamous cell carcinoma of the skin are not included.
- (b) Based on the IARC (2008) and WCRF & AICR (2007).
- (c) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (d) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (e) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (f) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (g) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Acute myeloid leukaemia (C92.0, C92.3–C92.5, C93.0, C94.0, C94.2, C94.4, C94.5)

Risk factors<sup>(a)</sup>:



Table B2: Observed incidence (2009) and mortality (2010) of acute myeloid leukaemia, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	502	396	898	450	350	800
2012 (estimated) <sup>(c)</sup>	475	375	845	495	350	845
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	4.7	3.2	3.9	4.1	2.6	3.3
95% CI	4.3–5.1	2.9–3.6	3.6–4.1	3.7–4.5	2.4–2.9	3.1–3.5
2012 (estimated) <sup>(c)</sup>	4.1	2.8	3.4	4.2	2.5	3.3
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.8	0.8	0.8	1.8	1.9	1.9
Risk to age 75	1 in 330	1 in 440	1 in 379	1 in 370	1 in 594	1 in 458
Risk to age 85	1 in 168	1 in 253	1 in 205	1 in 168	1 in 261	1 in 207
Mean age <sup>(e)</sup>	63.0	61.4	62.3	70.4	72.6	71.4

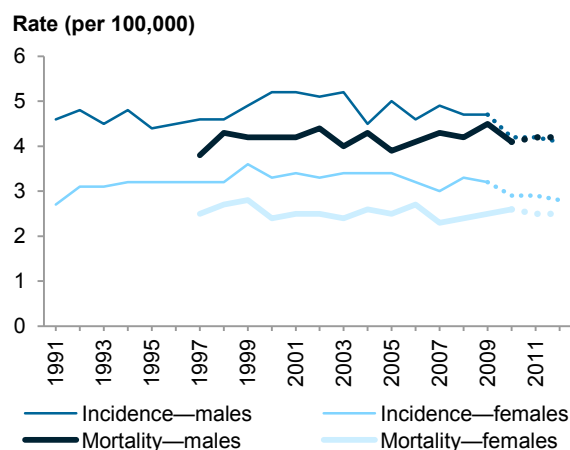


Figure B2.1: Acute myeloid leukaemia incidence and mortality rates<sup>(d)</sup>, 1991–2012

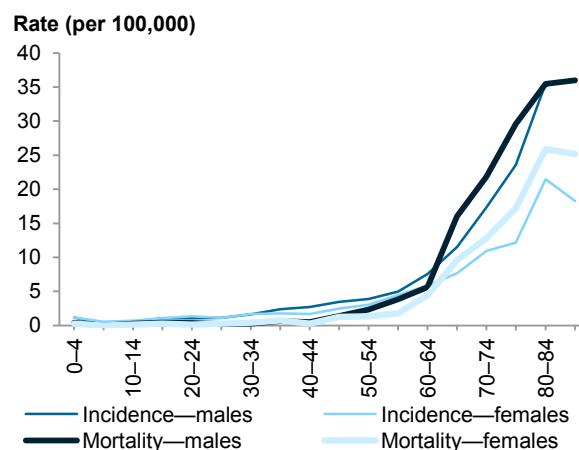


Figure B2.2: Acute myeloid leukaemia incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

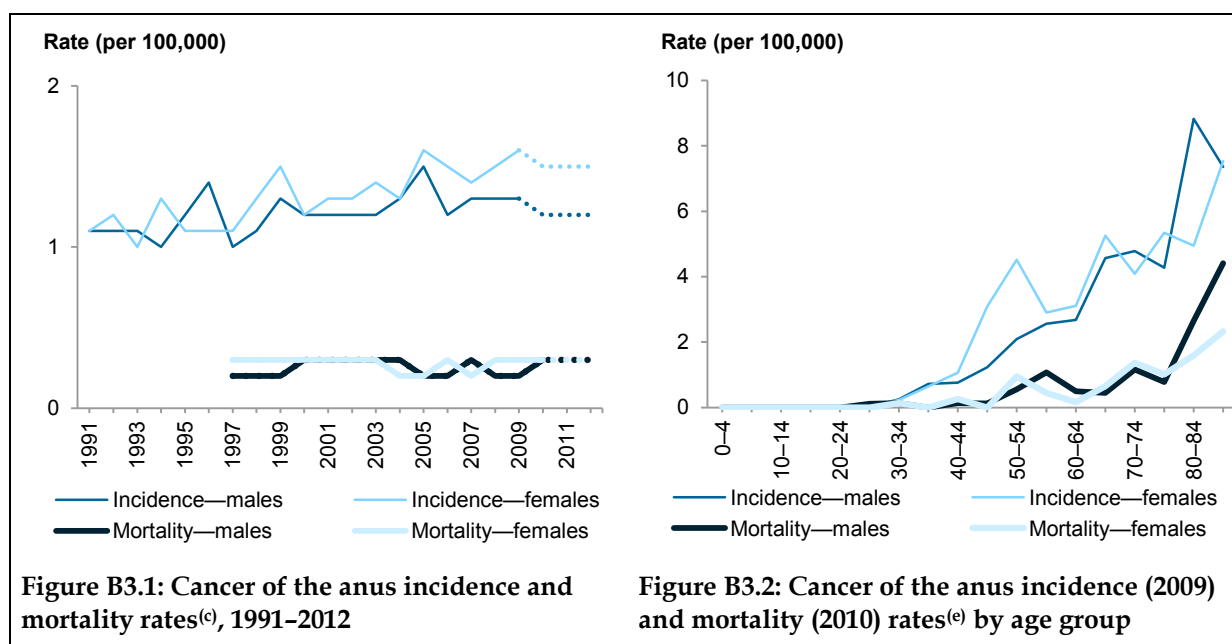
- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database 2010.

# Cancer of the anus (C21)

Table B3: Observed incidence (2009) and mortality (2010) of cancer of the anus, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(a)</sup>	142	194	337	37	37	74
2012 (estimated) <sup>(b)</sup>	145	200	345	35	40	70
<b>Age-standardised rate<sup>(c)</sup></b>						
2009 incidence/2010 mortality	1.3	1.6	1.4	0.3	0.3	0.3
95% CI	1.1–1.5	1.4–1.8	1.3–1.6	0.2–0.5	0.2–0.4	0.2–0.4
2012 (estimated) <sup>(b)</sup>	1.2	1.5	1.4	0.3	0.3	0.3
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.2	0.4	0.3	0.2	0.2	0.2
Risk to age 75	1 in 1,017	1 in 803	1 in 897	1 in 4,724	1 in 4,606	1 in 4,659
Risk to age 85	1 in 611	1 in 568	1 in 593	1 in 2,612	1 in 2,878	1 in 2,762
Mean age <sup>(d)</sup>	64.3	62.3	63.1	66.2	67.5	66.8



- (a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (b) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (d) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

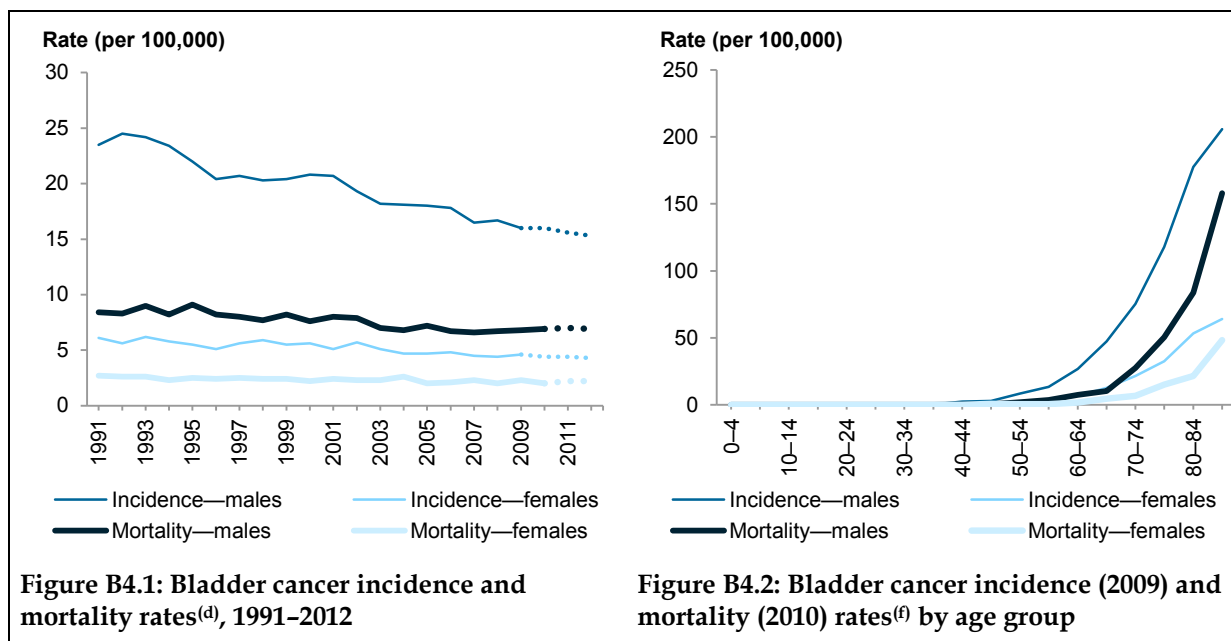
# Bladder cancer (C67)

Risk factors(a):



Table B4: Observed incidence (2009) and mortality (2010) of bladder cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	1,695	621	2,316	736	295	1,031
2012 (estimated) <sup>(c)</sup>	1,800	625	2,420	795	340	1,140
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	16.0	4.6	9.7	6.9	2.0	4.1
95% CI	15.2–16.8	4.3–5.0	9.3–10.1	6.4–7.4	1.8–2.3	3.9–4.4
2012 (estimated) <sup>(c)</sup>	15.3	4.3	9.2	6.9	2.2	4.3
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	2.6	1.2	2.0	3.0	1.6	2.4
Risk to age 75	1 in 113	1 in 403	1 in 178	1 in 384	1 in 1,327	1 in 602
Risk to age 85	1 in 43	1 in 148	1 in 69	1 in 108	1 in 387	1 in 177
Mean age <sup>(e)</sup>	73.5	76.2	74.2	77.9	80.7	78.7



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

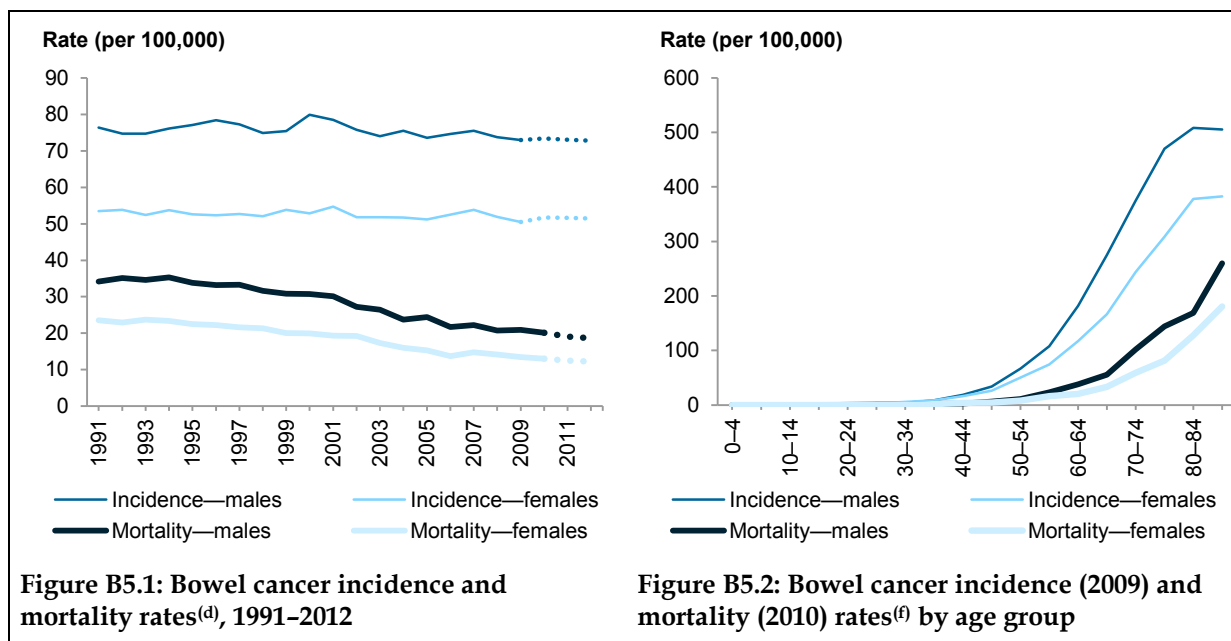
# Bowel cancer (C18–C20)

Risk factors<sup>(a)</sup>:



Table B5: Observed incidence (2009) and mortality (2010) of bowel cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	7,982	6,428	14,410	2,205	1,777	3,982
2012 (estimated) <sup>(c)</sup>	8,760	7,080	15,840	2,200	1,760	3,950
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	73.0	50.5	61.1	20.1	13.0	16.2
95% CI	71.4–74.6	49.3–51.8	60.1–62.1	19.2–20.9	12.4–13.6	15.7–16.7
2012 (estimated) <sup>(c)</sup>	72.8	51.5	61.5	18.6	12.2	15.1
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	12.4	12.9	12.6	9.1	9.6	9.3
Risk to age 75	1 in 19	1 in 28	1 in 23	1 in 83	1 in 136	1 in 103
Risk to age 85	1 in 10	1 in 15	1 in 12	1 in 37	1 in 57	1 in 45
Mean age <sup>(e)</sup>	68.5	70.3	69.3	72.3	74.7	73.4



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Brain cancer (C71)

Table B6: Observed incidence (2009) and mortality (2010) of brain cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(a)</sup>	928	667	1,596	735	512	1,247
2012 (estimated) <sup>(b)</sup>	960	680	1,640	745	520	1,270
<b>Age-standardised rate<sup>(c)</sup></b>						
2009 incidence/2010 mortality	8.4	5.7	7.0	6.4	4.1	5.2
95% CI	7.8–8.9	5.2–6.1	6.6–7.3	6.0–6.9	3.8–4.5	4.9–5.5
2012 (estimated) <sup>(b)</sup>	8.1	5.4	6.7	6.2	4.0	5.1
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.4	1.3	1.4	3.0	2.8	2.9
Risk to age 75	1 in 148	1 in 226	1 in 179	1 in 190	1 in 300	1 in 233
Risk to age 85	1 in 100	1 in 151	1 in 122	1 in 122	1 in 190	1 in 150
Mean age <sup>(d)</sup>	56.8	56.0	56.5	62.3	63.3	62.8

Rate (per 100,000)

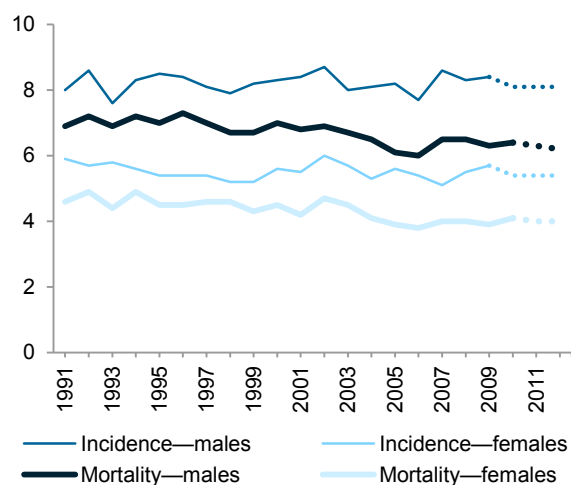


Figure B6.1: Brain cancer incidence and mortality rates<sup>(c)</sup>, 1991–2012

Rate (per 100,000)

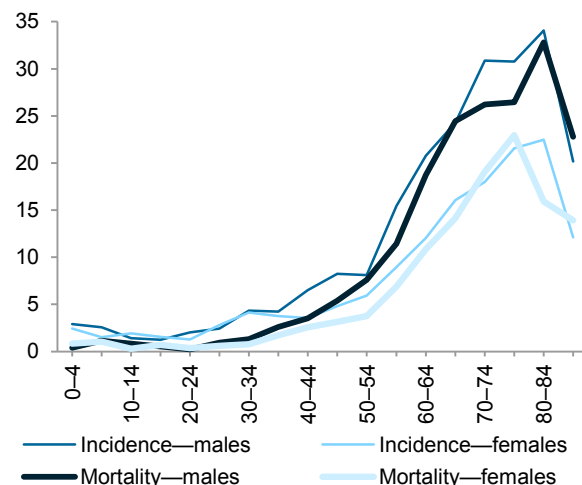


Figure B6.2: Brain cancer incidence (2009) and mortality (2010) rates<sup>(e)</sup> by age group

- (a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (b) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (d) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

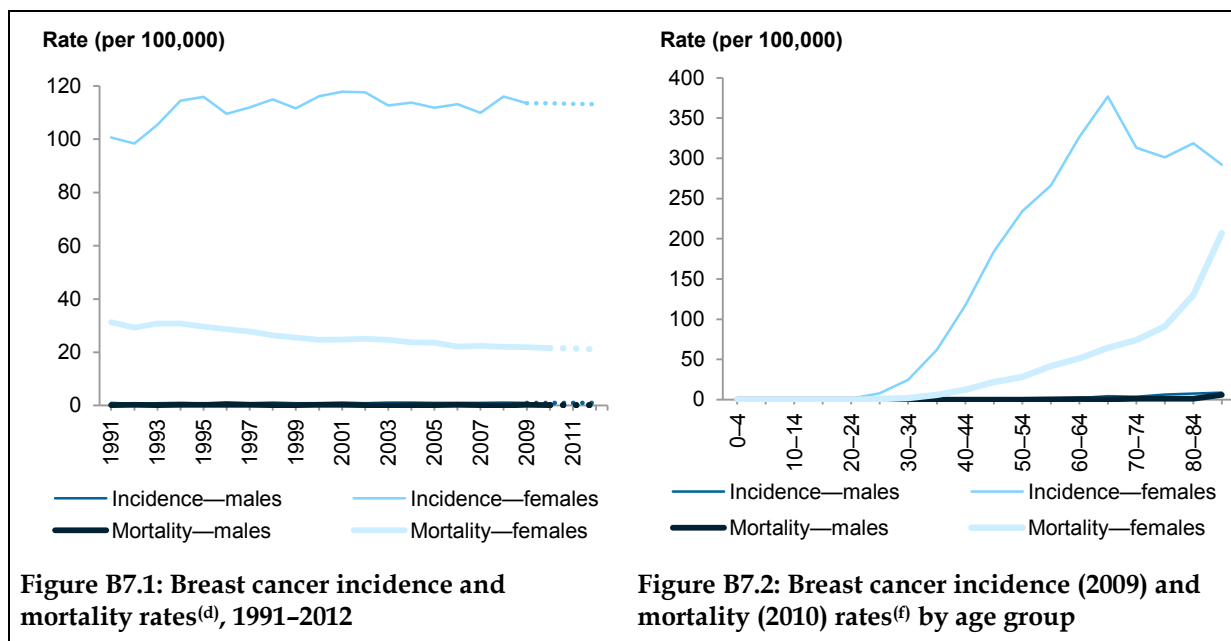
# Breast cancer (C50)

Risk factors(a):



Table B7: Observed incidence (2009) and mortality (2010) of breast cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	110	13,668	13,778	24	2,840	2,864
2012 (estimated) <sup>(c)</sup>	120	14,560	14,680	25	2,920	2,940
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	1.0	113.5	59.1	0.2	21.6	11.6
95% CI	0.8–1.2	111.6–115.4	58.1–60.1	0.1–0.3	20.8–22.4	11.2–12.1
2012 (estimated) <sup>(c)</sup>	1.0	113.2	58.8	0.2	21.1	11.3
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.2	27.4	12.1	0.1	15.3	6.7
Risk to age 75	1 in 1,457	1 in 11	1 in 21	1 in 8,492	1 in 67	1 in 130
Risk to age 85	1 in 724	1 in 8	1 in 16	1 in 4,367	1 in 39	1 in 72
Mean age <sup>(e)</sup>	68.9	60.6	60.7	75.9	69.0	69.0



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Cervical cancer (C53)

Risk factors(a):



Table B8: Observed incidence (2009) and mortality (2010) of cervical cancer, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	..	771	771	..	232	232
2012 (estimated) <sup>(c)</sup>	..	785	785	..	255	255
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	..	6.7	..	..	1.9	..
95% CI	..	6.3–7.2	..	..	1.6–2.1	..
2012 (estimated) <sup>(c)</sup>	..	6.6	..	..	1.9	..
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	..	1.5	..	..	1.3	..
Risk to age 75	..	1 in 198	..	..	1 in 728	..
Risk to age 85	..	1 in 162	..	..	1 in 494	..
Mean age <sup>(e)</sup>	..	50.2	..	..	62.2	..

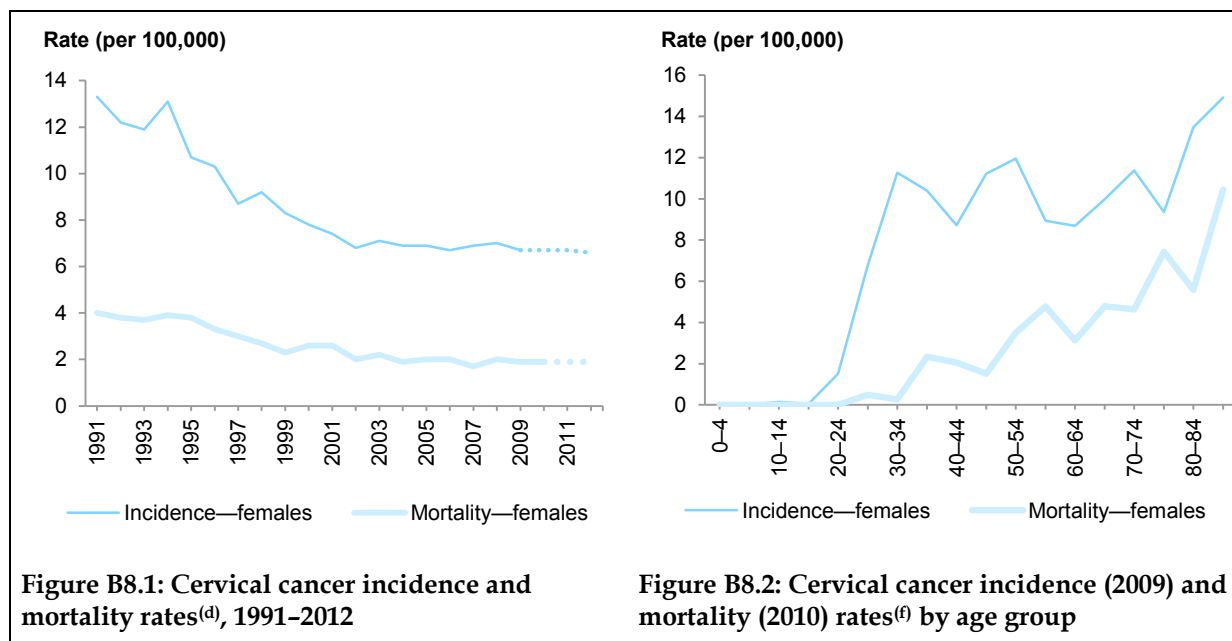


Figure B8.1: Cervical cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Figure B8.2: Cervical cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.



# Chronic lymphocytic leukaemia (C91.1)

Risk factors<sup>(a)</sup>:



Table B9: Observed incidence (2009) and mortality (2010) of chronic lymphocytic leukaemia, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	652	410	1,062	212	142	354
2012 (estimated) <sup>(c)</sup>	765	465	1,230	230	135	365
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	6.0	3.2	4.5	2.0	0.9	1.4
95% CI	5.5–6.5	2.9–3.5	4.2–4.8	1.7–2.3	0.8–1.1	1.3–1.6
2012 (estimated) <sup>(c)</sup>	6.4	3.3	4.8	2.0	0.9	1.4
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.0	0.8	0.9	0.9	0.8	0.8
Risk to age 75	1 in 228	1 in 448	1 in 304	1 in 1,118	1 in 2,996	1 in 1,641
Risk to age 85	1 in 122	1 in 226	1 in 161	1 in 404	1 in 868	1 in 567
Mean age <sup>(e)</sup>	69.6	70.4	69.9	77.0	82.4	79.2

Rate (per 100,000)

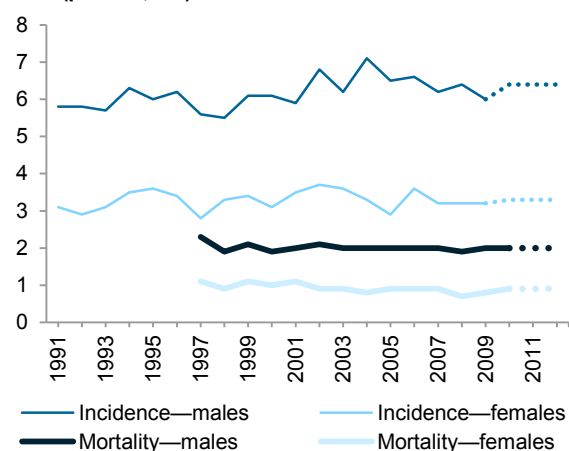


Figure B9.1: Chronic lymphocytic leukaemia incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

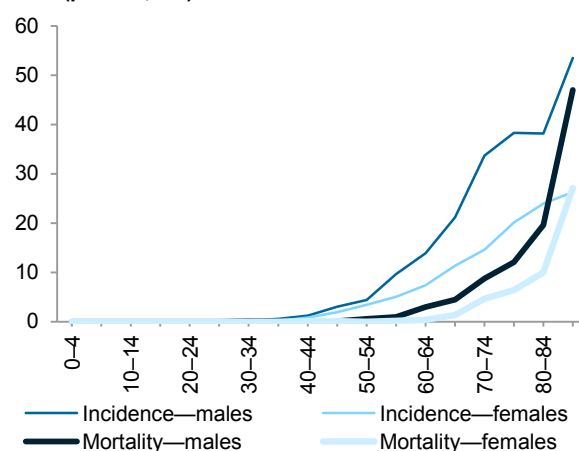


Figure B9.2: Chronic lymphocytic leukaemia incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Cancer of the gallbladder and bile ducts cancer (C23–C24)

Risk factors<sup>(a)</sup>: 

Table B10: Observed incidence (2009) and mortality (2010) of cancer of the gallbladder and bile ducts cancer, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	313	369	682	98	159	257
2012 (estimated) <sup>(c)</sup>	345	415	760	115	185	300
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	2.9	2.8	2.9	0.9	1.2	1.0
95% CI	2.6–3.2	2.6–3.2	2.7–3.1	0.7–1.1	1.0–1.4	0.9–1.2
2012 (estimated) <sup>(c)</sup>	2.9	2.9	2.9	1	1.3	1.1
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.5	0.7	0.6	0.4	0.9	0.6
Risk to age 75	1 in 541	1 in 551	1 in 546	1 in 1,979	1 in 1,657	1 in 1,800
Risk to age 85	1 in 256	1 in 243	1 in 248	1 in 737	1 in 597	1 in 654
Mean age <sup>(e)</sup>	71.1	74.1	72.7	74.1	77	75.9

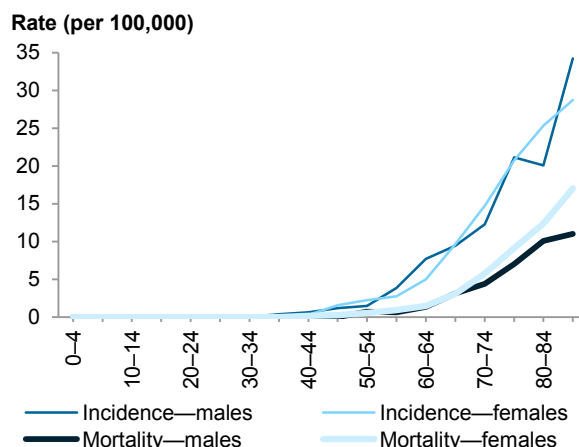
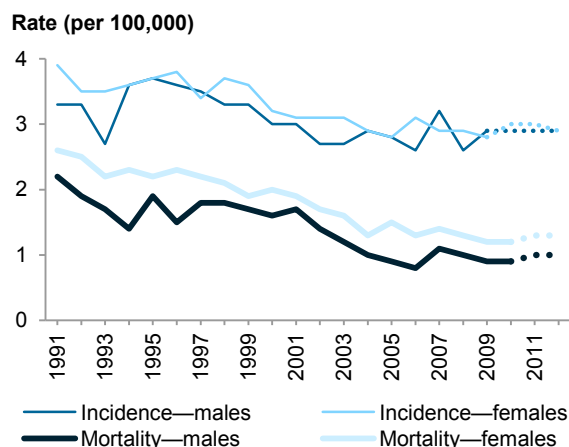


Figure B10.1: Cancer of the gallbladder and bile ducts cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Figure B10.2: Cancer of the gallbladder and bile ducts cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

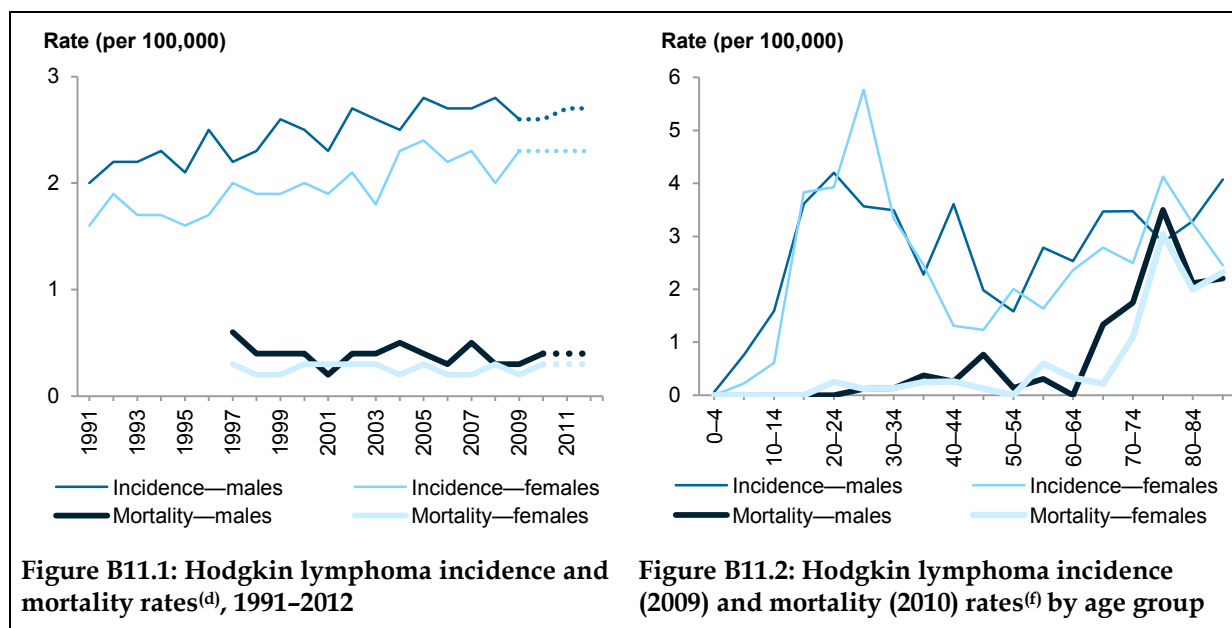
# Hodgkin lymphoma (C81)

Risk factors(a):



Table B11: Observed incidence (2009) and mortality (2010) of hodgkin lymphoma, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	286	261	547	44	40	84
2012 (estimated) <sup>(c)</sup>	305	265	570	40	35	75
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	2.6	2.3	2.5	0.4	0.3	0.4
95% CI	2.3–2.9	2.1–2.6	2.3–2.7	0.3–0.6	0.2–0.4	0.3–0.4
2012 (estimated) <sup>(c)</sup>	2.7	2.3	2.5	0.4	0.3	0.3
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.4	0.5	0.5	0.2	0.2	0.2
Risk to age 75	1 in 513	1 in 589	1 in 549	1 in 3,864	1 in 5,938	1 in 4,706
Risk to age 85	1 in 443	1 in 484	1 in 463	1 in 1,853	1 in 2,382	1 in 2,095
Mean age <sup>(e)</sup>	39.4	40.5	40.0	64.0	66.1	65.0



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Kidney cancer (C64)

Risk factors(a):



Table B12: Observed incidence (2009) and mortality (2010) of kidney cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	1,746	961	2,708	575	352	927
2012 (estimated) <sup>(c)</sup>	2,000	995	3,000	605	365	970
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	15.6	7.9	11.5	5.1	2.6	3.7
95% CI	14.9–16.4	7.4–8.4	11.1–12.0	4.7–5.6	2.3–2.9	3.5–4.0
2012 (estimated) <sup>(c)</sup>	16.6	7.6	11.9	5.1	2.5	3.7
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	2.7	1.9	2.4	2.4	1.9	2.2
Risk to age 75	1 in 80	1 in 157	1 in 106	1 in 317	1 in 691	1 in 437
Risk to age 85	1 in 51	1 in 103	1 in 69	1 in 144	1 in 271	1 in 191
Mean age <sup>(e)</sup>	63.7	62.9	63.4	71.1	75	72.5

Rate (per 100,000)

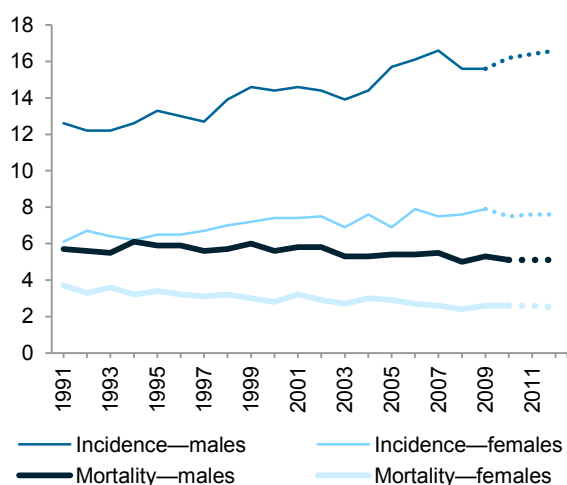


Figure B12.1: Kidney cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

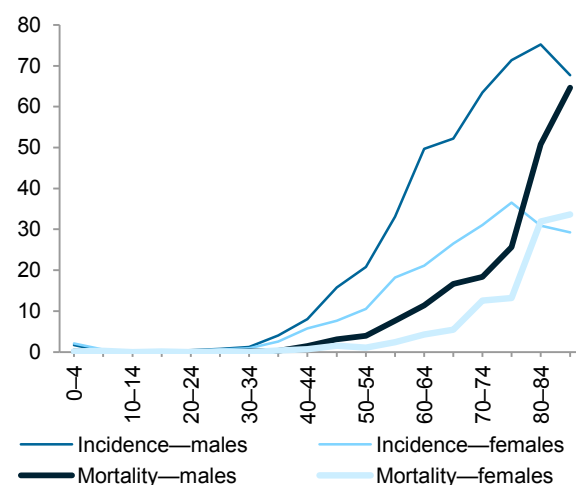


Figure B12.2: Kidney cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

(a) Based on the IARC (2008) and WCRF & AICR (2007).

(b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.

(c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.

(d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

(e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.

(f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Laryngeal cancer (C32)

Risk factors<sup>(a)</sup>:



Table B13: Observed incidence (2009) and mortality (2010) of laryngeal cancer, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	537	69	606	223	32	255
2012 (estimated) <sup>(c)</sup>	580	75	660	210	30	245
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	4.8	0.6	2.6	2.0	0.2	1.1
95% CI	4.4–5.2	0.4–0.7	2.4–2.8	1.8–2.3	0.2–0.3	0.9–1.2
2012 (estimated) <sup>(c)</sup>	4.8	0.6	2.6	1.8	0.2	0.9
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.8	0.1	0.5	0.9	0.2	0.6
Risk to age 75	1 in 242	1 in 2,072	1 in 438	1 in 740	1 in 6,140	1 in 1,341
Risk to age 85	1 in 152	1 in 1,401	1 in 286	1 in 336	1 in 2,726	1 in 632
Mean age <sup>(e)</sup>	66.2	68.2	66.5	71.9	72.8	72.1

Rate (per 100,000)

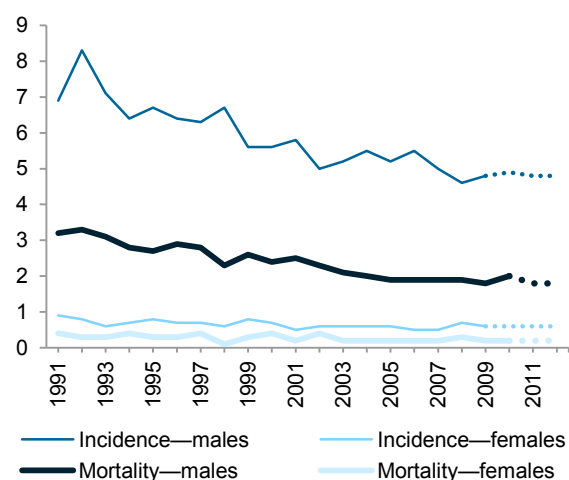


Figure B13.1: Laryngeal cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

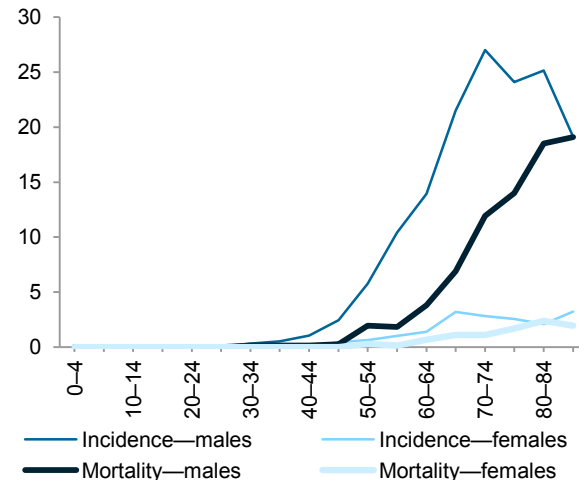


Figure B13.2: Laryngeal cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

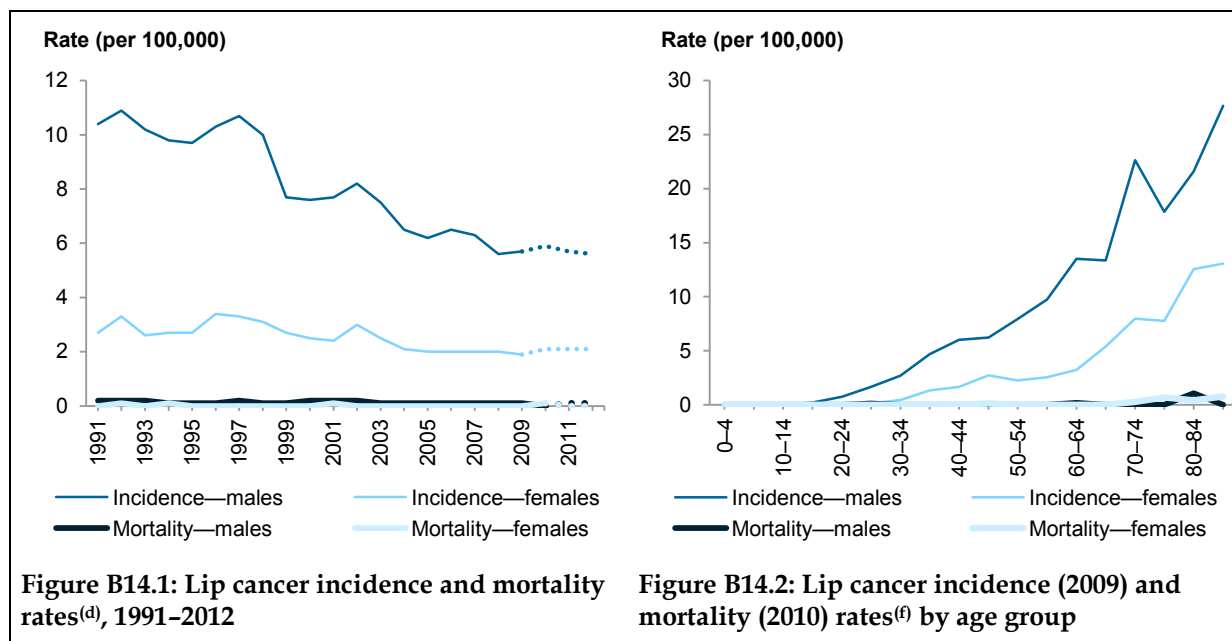
# Lip cancer (C00)

Risk factors<sup>(a)</sup>:



Table B14: Observed incidence (2009) and mortality (2010) of lip cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	625	241	865	4	7	11
2012 (estimated) <sup>(c)</sup>	660	280	945	10	5	15
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	5.7	1.9	3.7	0.0	0.1	0.0
95% CI	5.2–6.2	1.7–2.2	3.5–4.0	0.0–0.1	0.0–0.1	0.0–0.1
2012 (estimated) <sup>(c)</sup>	5.6	2.1	3.8	0.1	0.0	0.1
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.0	0.5	0.8	0.0	0.0	0.0
Risk to age 75	1 in 224	1 in 722	1 in 344	1 in 70,287	1 in 50,168	1 in 57,608
Risk to age 85	1 in 156	1 in 417	1 in 230	1 in 14,895	1 in 13,583	1 in 14,382
Mean age <sup>(e)</sup>	59.2	65.9	61.0	63.5	77.7	72.5



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

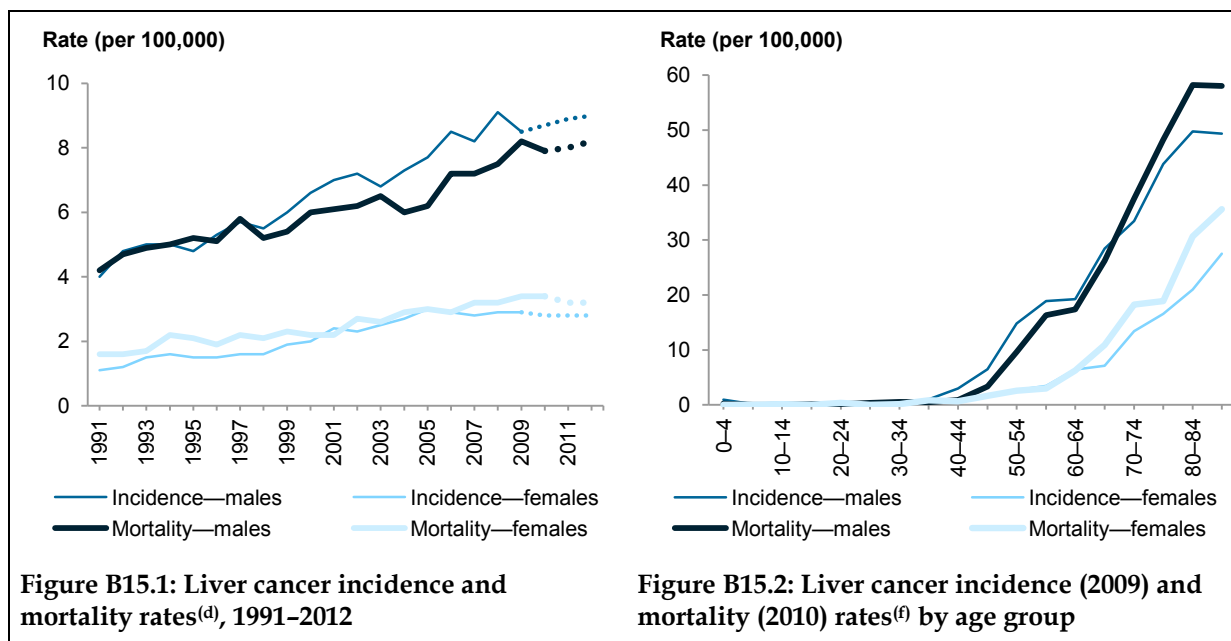
Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Liver cancer (C22)



Table B15: Observed incidence (2009) and mortality (2010) of liver cancer, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	936	368	1,304	890	449	1,339
2012 (estimated) <sup>(c)</sup>	1,080	395	1,470	975	465	1,440
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	8.5	2.9	5.5	7.9	3.4	5.5
95% CI	7.9–9.0	2.6–3.2	5.2–5.9	7.4–8.4	3.1–3.7	5.2–5.8
2012 (estimated) <sup>(c)</sup>	9.0	2.8	5.8	8.2	3.2	5.6
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.5	0.7	1.1	3.7	2.4	3.1
Risk to age 75	1 in 158	1 in 522	1 in 244	1 in 177	1 in 447	1 in 255
Risk to age 85	1 in 91	1 in 264	1 in 139	1 in 92	1 in 212	1 in 131
Mean age <sup>(e)</sup>	65.8	68.7	66.6	68.7	72.8	70.0



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Lung cancer (C33–C34)

Risk factors(a):



Table B16: Observed incidence (2009) and mortality (2010) of lung cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	6,034	4,159	10,193	4,934	3,165	8,099
2012 (estimated) <sup>(c)</sup>	6,620	4,650	11,280	5,070	3,340	8,410
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	55.7	33.1	43.2	44.6	24.2	33.3
95% CI	54.3–57.1	32.1–34.1	42.4–44.1	43.3–45.9	23.3–25.0	32.5–34.0
2012 (estimated) <sup>(c)</sup>	55.8	34.1	43.9	42.9	24.0	32.5
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	9.4	8.4	8.9	20.3	17.1	18.9
Risk to age 75	1 in 26	1 in 39	1 in 32	1 in 36	1 in 58	1 in 44
Risk to age 85	1 in 13	1 in 22	1 in 16	1 in 16	1 in 29	1 in 21
Mean age <sup>(e)</sup>	71.0	69.9	70.5	72.4	72.0	72.2

Rate (per 100,000)

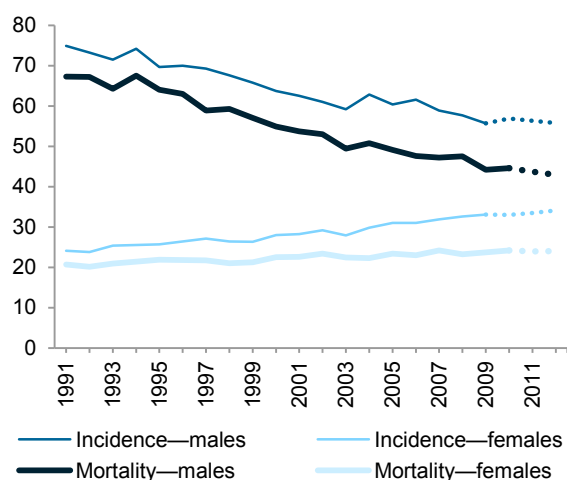


Figure B16.1: Lung cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

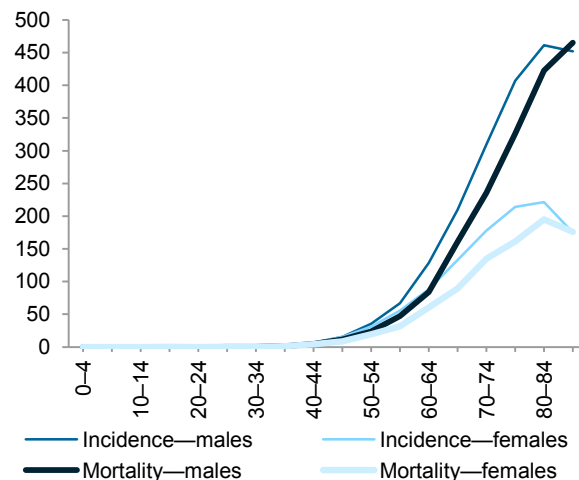


Figure B16.2: Lung cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

(a) Based on the IARC (2008) and WCRF & AICR (2007).

(b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.

(c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.

(d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

(e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.

(f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

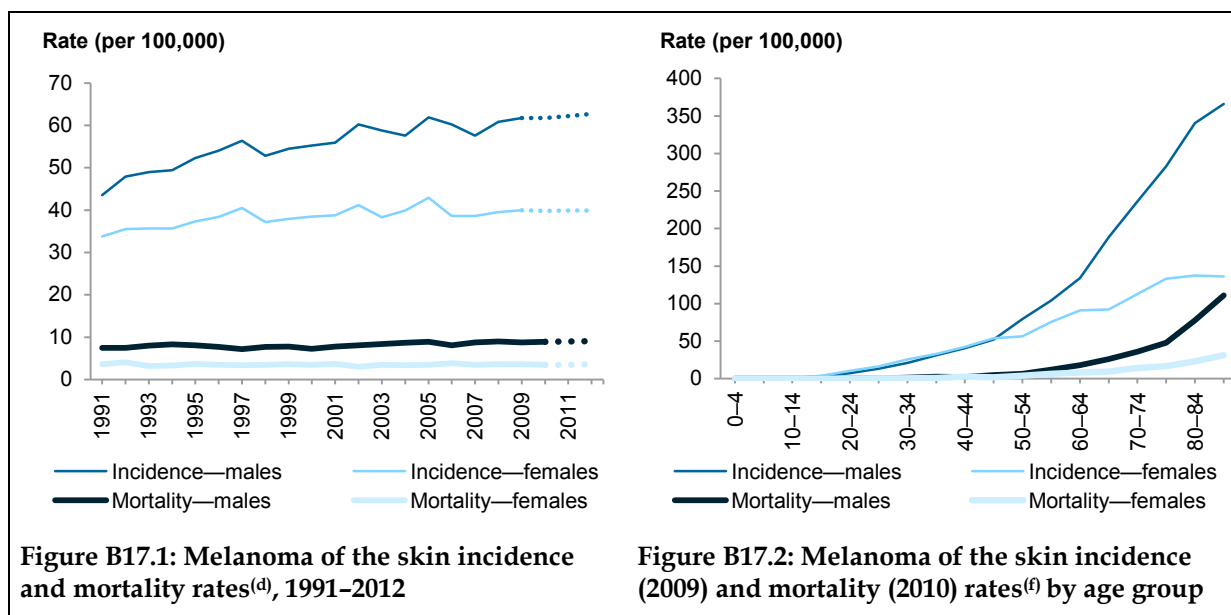


# Melanoma of the skin (C43)

Risk factors<sup>(a)</sup>: 

Table B17: Observed incidence (2009) and mortality (2010) of melanoma of the skin, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	6,764	4,781	11,545	993	459	1,452
2012 (estimated) <sup>(c)</sup>	7,440	5,070	12,510	1,070	495	1,560
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	61.7	40.0	49.8	8.9	3.5	5.9
95% CI	60.3–63.2	38.8–41.1	48.9–50.8	8.4–9.5	3.2–3.8	5.6–6.3
2012 (estimated) <sup>(c)</sup>	62.7	39.9	50.3	9.1	3.6	6.1
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	10.5	9.6	10.1	4.1	2.5	3.4
Risk to age 75	1 in 22	1 in 33	1 in 27	1 in 181	1 in 410	1 in 253
Risk to age 85	1 in 14	1 in 23	1 in 17	1 in 85	1 in 226	1 in 128
Mean age <sup>(e)</sup>	62.3	58.8	60.8	69.5	69.0	69.4



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Mesothelioma (C45)

Risk factors<sup>(a)</sup>:



Table B18: Observed incidence (2009) and mortality (2010) of mesothelioma, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	540	126	666	516	126	642
2012 (estimated) <sup>(c)</sup>	580	125	705	540	110	645
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	5.0	1.0	2.8	4.7	1.0	2.6
95% CI	4.6–5.5	0.8–1.2	2.6–3.1	4.3–5.1	0.8–1.1	2.4–2.9
2012 (estimated) <sup>(c)</sup>	4.9	0.9	2.7	4.6	0.8	2.5
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.8	0.3	0.6	2.1	0.7	1.5
Risk to age 75	1 in 287	1 in 1,522	1 in 489	1 in 334	1 in 1,356	1 in 543
Risk to age 85	1 in 130	1 in 705	1 in 231	1 in 135	1 in 684	1 in 237
Mean age <sup>(e)</sup>	71.8	72.6	72.0	73.9	72.9	73.7

Rate (per 100,000)

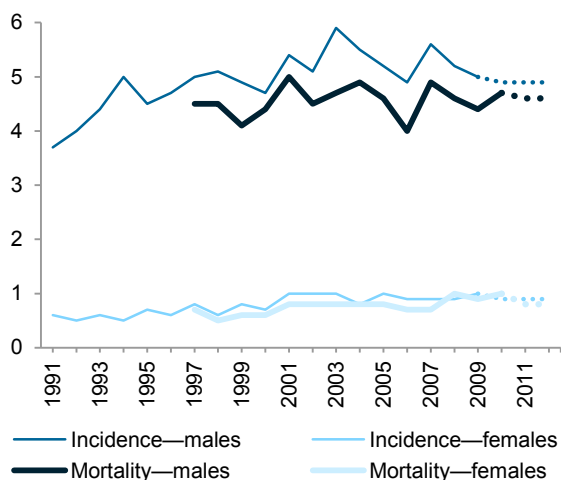


Figure B18.1: Mesothelioma incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

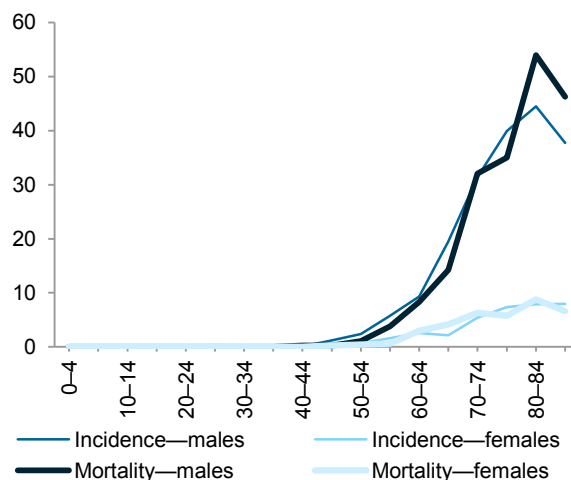


Figure B18.2: Mesothelioma incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

(a) Based on the IARC (2008) and WCRF & AICR (2007).

(b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.

(c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.

(d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

(e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.

(f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

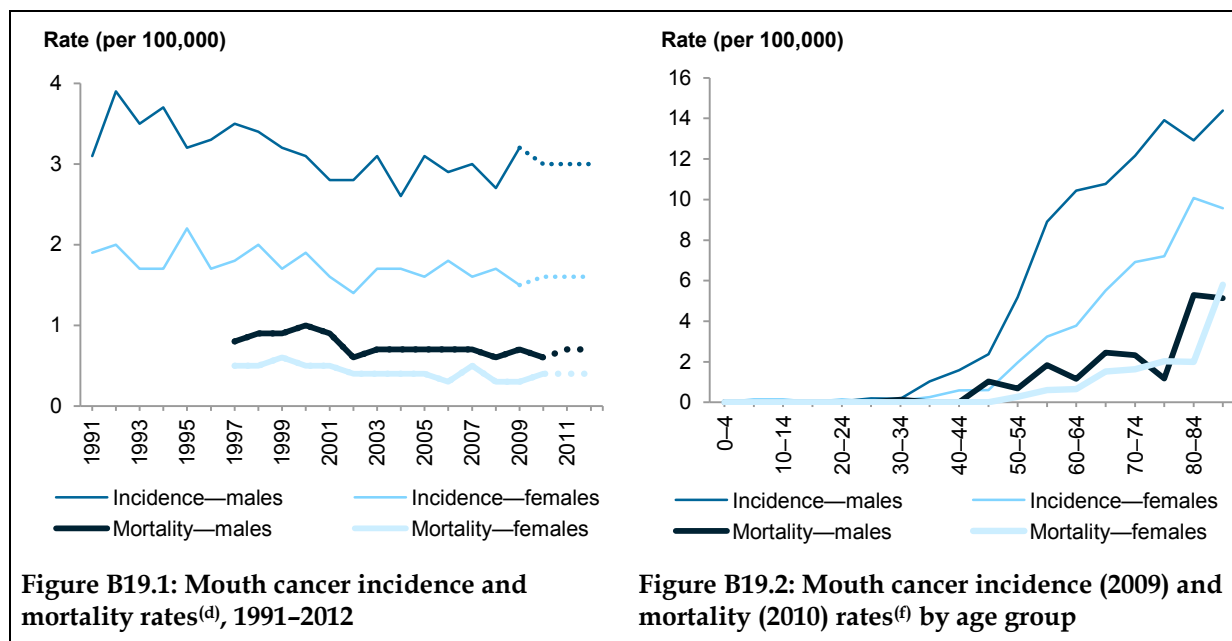
# Mouth cancer (C03–C06)

Risk factors(a):



Table B19: Observed incidence (2009) and mortality (2010) of mouth cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	362	192	554	72	49	121
2012 (estimated) <sup>(c)</sup>	360	220	580	80	60	140
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	3.2	1.5	2.3	0.6	0.4	0.5
95% CI	2.9–3.6	1.3–1.8	2.2–2.5	0.5–0.8	0.3–0.5	0.4–0.6
2012 (estimated) <sup>(c)</sup>	3.0	1.6	2.3	0.7	0.4	0.5
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.6	0.4	0.5	0.3	0.3	0.3
Risk to age 75	1 in 378	1 in 853	1 in 527	1 in 2,081	1 in 4,267	1 in 2,810
Risk to age 85	1 in 251	1 in 491	1 in 336	1 in 1,245	1 in 2,298	1 in 1,646
Mean age <sup>(e)</sup>	63.8	68.1	65.2	66.1	75.3	69.9



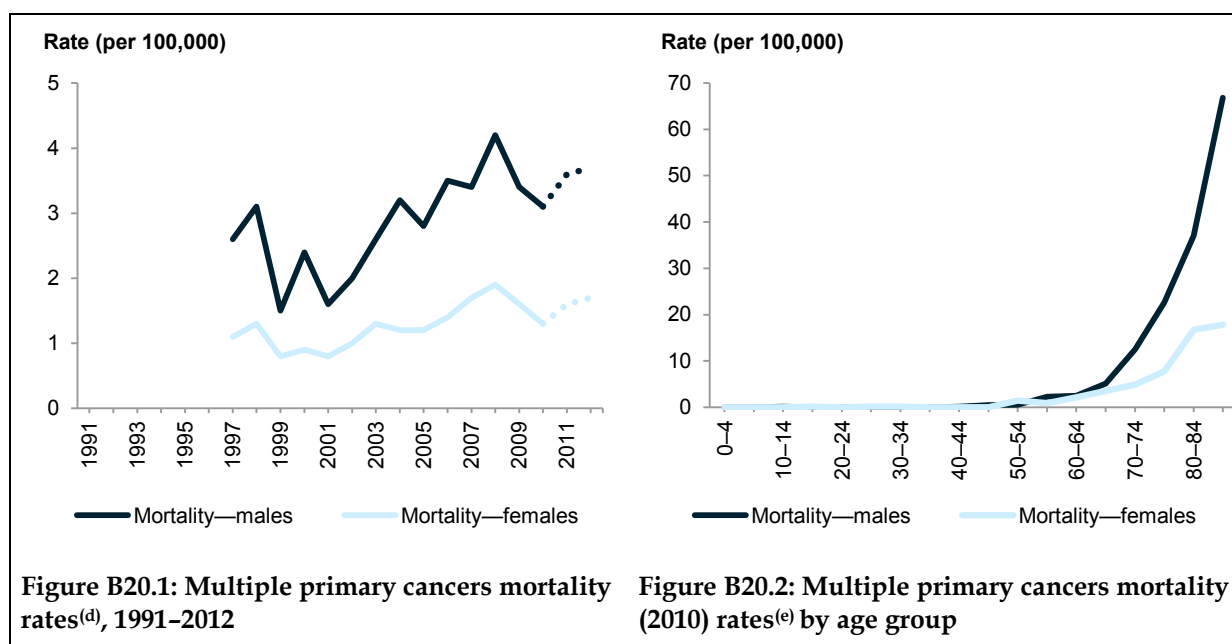
- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Multiple primary cancers (C97)

Table B20: Observed mortality (2010) of multiple primary cancers, and estimated for 2012

	Incidence <sup>(a)</sup>			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	..	..	..	325	178	503
2012 (estimated) <sup>(c)</sup>	..	..	..	430	250	680
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	..	..	..	3.1	1.3	2.0
95% CI	..	..	..	2.7–3.4	1.1–1.5	1.8–2.2
2012 (estimated) <sup>(c)</sup>	..	..	..	3.7	1.7	2.5
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	..	..	..	1.3	1.0	1.2
Risk to age 75	..	..	..	1 in 843	1 in 1,504	1 in 1,088
Risk to age 85	..	..	..	1 in 240	1 in 530	1 in 342
Mean age	..	..	..	77.5	75.8	76.9



- (a) Of relevance for mortality data only.
- (b) Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Myelodysplastic syndrome (D46)

Table B21: Observed incidence (2009) and mortality (2010) of myelodysplastic syndrome, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(a)</sup>	713	471	1,185	209	144	353
2012 (estimated) <sup>(b)</sup>	810	520	1,330	265	180	440
<b>Age-standardised rate<sup>(c)</sup></b>						
2009 incidence/2010 mortality	6.9	3.5	5.0	2.0	0.9	1.4
95% CI	6.4–7.4	3.2–3.8	4.7–5.3	1.8–2.3	0.8–1.1	1.2–1.5
2012 (estimated) <sup>(b)</sup>	7.0	3.5	5.1	2.3	1.1	1.6
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.1	0.9	1.0	0.9	0.8	0.8
Risk to age 75	1 in 318	1 in 531	1 in 401	1 in 2,607	1 in 7,496	1 in 3,909
Risk to age 85	1 in 103	1 in 214	1 in 144	1 in 434	1 in 886	1 in 600
Mean age <sup>(d)</sup>	75.3	75.7	75.4	81.9	84.4	82.9

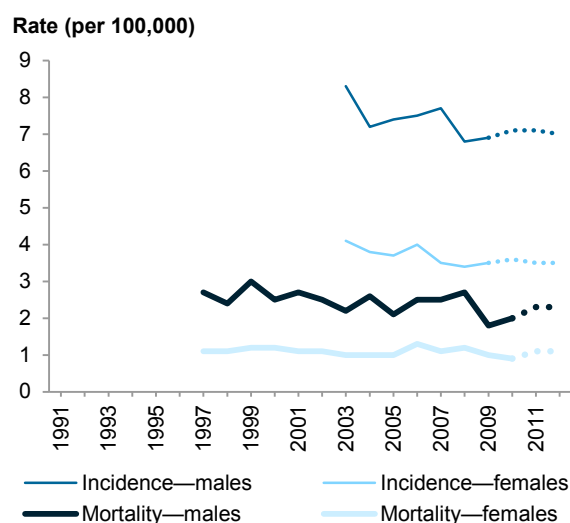


Figure B21.1: Myelodysplastic syndrome incidence and mortality rates<sup>(c)</sup>, 1991–2012

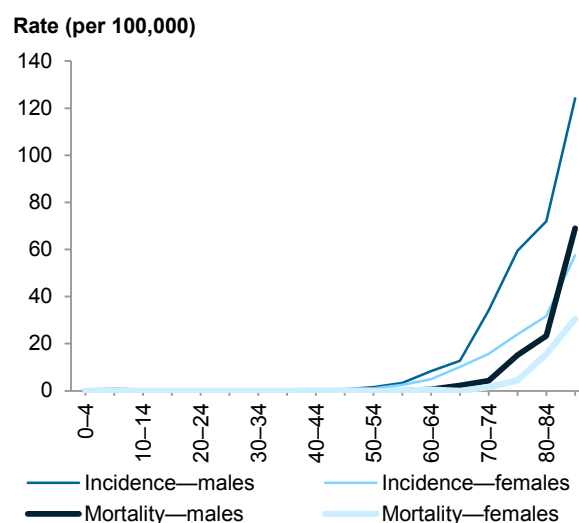


Figure B21.2: Myelodysplastic syndrome incidence (2009) and mortality (2010) rates<sup>(e)</sup> by age group

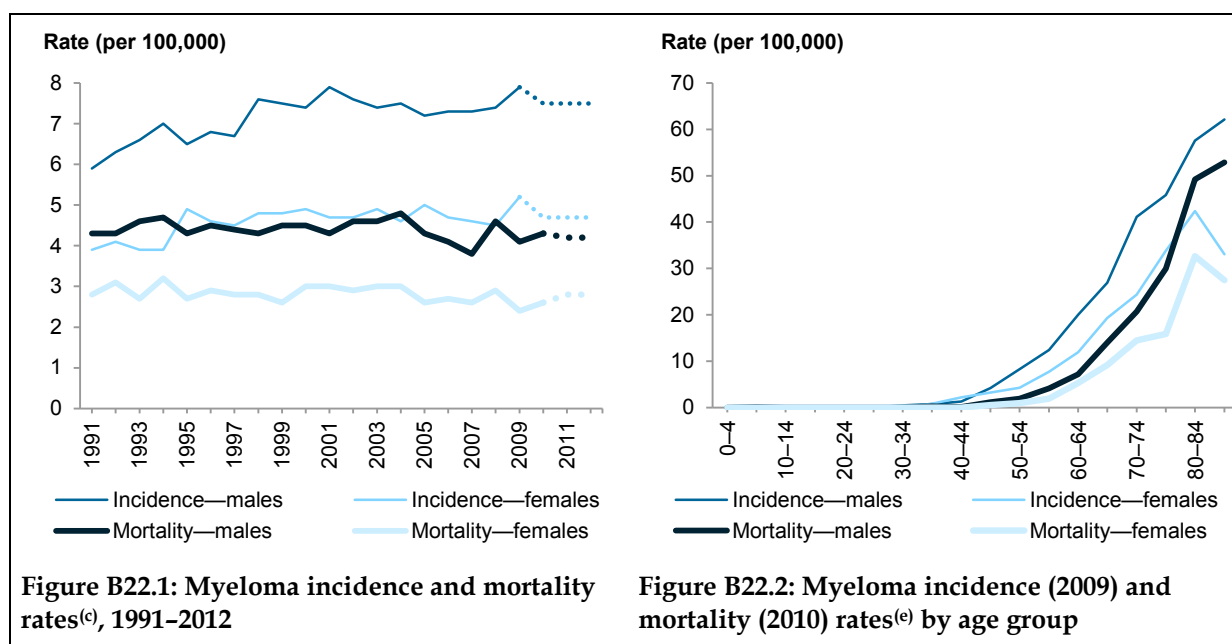
- (a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (b) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (d) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Myeloma (C90)

Table B22: Observed incidence (2009) and mortality (2010) of myeloma, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(a)</sup>	864	661	1,525	473	351	824
2012 (estimated) <sup>(b)</sup>	895	650	1,540	495	395	890
<b>Age-standardised rate<sup>(c)</sup></b>						
2009 incidence/2010 mortality	7.9	5.2	6.5	4.3	2.6	3.3
95% CI	7.4–8.4	4.8–5.6	6.1–6.8	3.9–4.7	2.3–2.9	3.1–3.6
2012 (estimated) <sup>(b)</sup>	7.5	4.7	6.0	4.2	2.8	3.4
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.3	1.3	1.3	1.9	1.9	1.9
Risk to age 75	1 in 173	1 in 271	1 in 212	1 in 404	1 in 620	1 in 491
Risk to age 85	1 in 92	1 in 134	1 in 110	1 in 156	1 in 248	1 in 195
Mean age <sup>(d)</sup>	68.6	70.0	69.2	73.2	75.7	74.3



- (a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (b) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (d) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Non-Hodgkin lymphoma (C82–C85)

Risk factors(a):



Table B23: Observed incidence (2009) and mortality (2010) of non-Hodgkin lymphoma, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	2,466	1,915	4,381	781	557	1,338
2012 (estimated) <sup>(c)</sup>	2,620	2,070	4,680	800	640	1,440
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	22.5	15.5	18.7	7.1	4.0	5.4
95% CI	21.6–23.4	14.8–16.2	18.2–19.3	6.6–7.6	3.7–4.3	5.1–5.7
2012 (estimated) <sup>(c)</sup>	22.0	15.6	18.6	6.8	4.3	5.5
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	3.8	3.8	3.8	3.2	3.0	3.1
Risk to age 75	1 in 62	1 in 87	1 in 72	1 in 243	1 in 531	1 in 336
Risk to age 85	1 in 35	1 in 51	1 in 42	1 in 100	1 in 175	1 in 130
Mean age <sup>(e)</sup>	63.8	66.0	64.7	72.1	76.2	73.8

Rate (per 100,000)

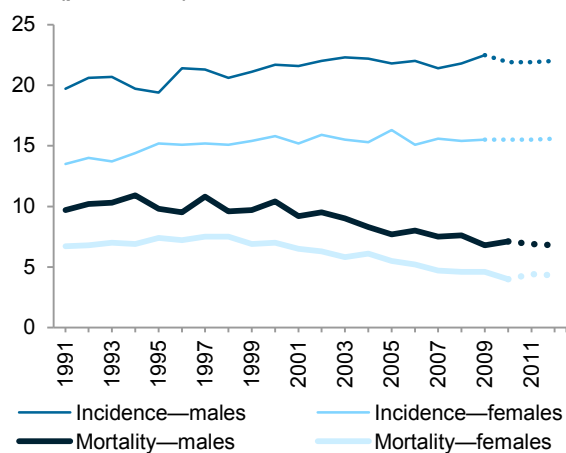


Figure B23.1: Non-Hodgkin lymphoma incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

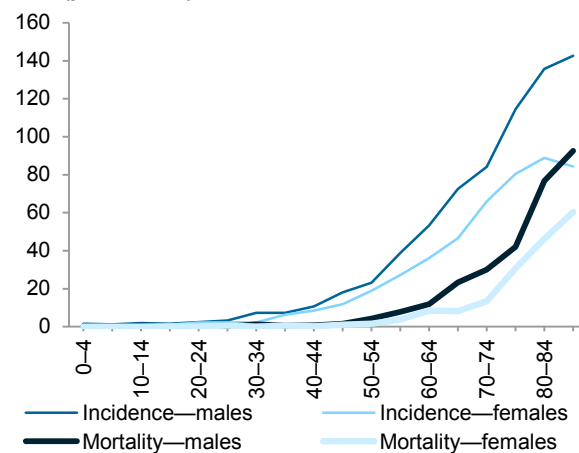


Figure B23.2: Non-Hodgkin lymphoma incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

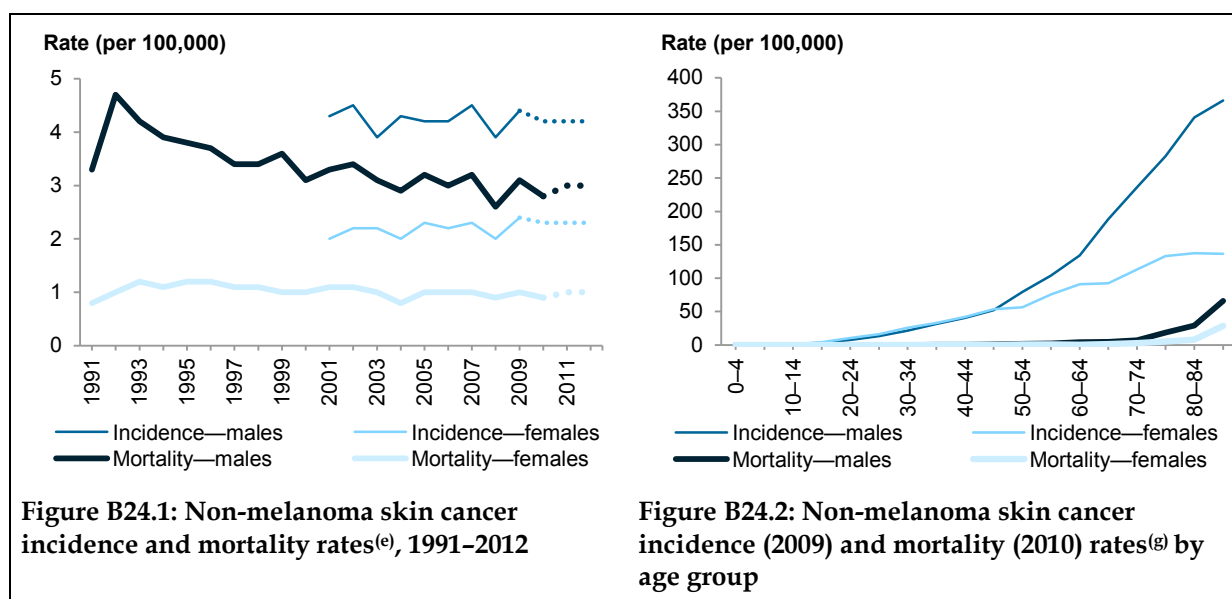
# Non-melanoma skin cancer (C44)<sup>(a)</sup>

Risk factors<sup>(b)</sup>:



Table B24: Observed incidence (2009) and mortality (2010) of non-melanoma skin cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(c)</sup>	469	313	782	304	141	445
2012 (estimated) <sup>(d)</sup>	490	325	815	350	155	505
<b>Age-standardised rate<sup>(e)</sup></b>						
2009 incidence/2010 mortality	4.4	2.4	3.3	2.8	0.9	1.8
95% CI	4.0–4.9	2.1–2.7	3.1–3.5	2.5–3.2	0.8–1.1	1.6–1.9
2012 (estimated) <sup>(d)</sup>	4.2	2.3	3.1	3.0	1.0	1.9
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.7	0.6	0.7	1.2	0.8	1.0
Risk to age 75	1 in 406	1 in 797	1 in 542	1 in 930	1 in 3,165	1 in 1,449
Risk to age 85	1 in 162	1 in 341	1 in 227	1 in 289	1 in 1,034	1 in 474
Mean age <sup>(f)</sup>	70.9	70.6	70.8	75.8	81.9	77.8



- (a) For incidence data, those C44 codes that indicate basal or squamous cell carcinoma of the skin are not included.
- (b) Based on the IARC (2008) and WCRF & AICR (2007).
- (c) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (d) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (e) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (f) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (g) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.



# Oesophageal cancer (C15)

Risk factors<sup>(a)</sup>:



Table B25: Observed incidence (2009) and mortality (2010) of oesophageal cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	917	397	1,314	879	344	1,223
2012 (estimated) <sup>(c)</sup>	1,000	445	1,450	960	395	1,350
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	8.3	3.0	5.5	7.8	2.5	5.0
95% CI	7.8–8.9	2.7–3.3	5.2–5.8	7.2–8.3	2.2–2.7	4.7–5.3
2012 (estimated) <sup>(c)</sup>	8.4	3.1	5.6	8.0	2.7	5.2
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.4	0.8	1.2	3.6	1.9	2.9
Risk to age 75	1 in 158	1 in 547	1 in 247	1 in 173	1 in 735	1 in 282
Risk to age 85	1 in 86	1 in 233	1 in 129	1 in 92	1 in 297	1 in 144
Mean age <sup>(e)</sup>	68.0	74.1	69.7	68.9	75.9	70.9

Rate (per 100,000)

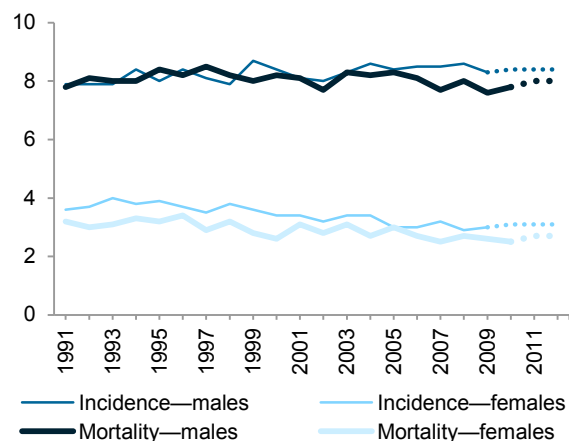


Figure B25.1: Oesophageal cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

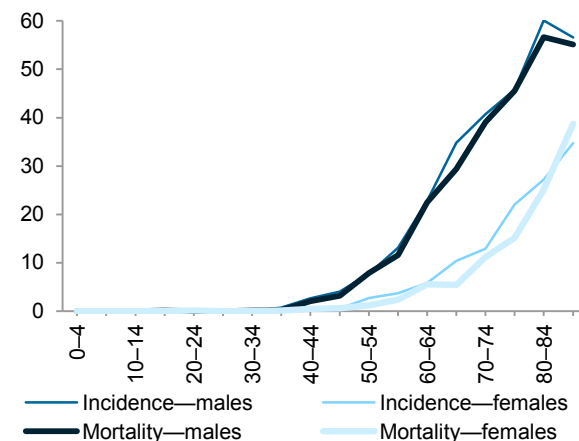


Figure B25.2: Oesophageal cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Cancer of other digestive organs (C26)

Table B26: Observed incidence (2009) and mortality (2010) of cancer of other digestive organs, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(a)</sup>	74	95	169	713	641	1,354
2012 (estimated) <sup>(b)</sup>	80	95	180	965	835	1,800
<b>Age-standardised rate<sup>(c)</sup></b>						
2009 incidence/2010 mortality	0.7	0.7	0.7	6.5	4.4	5.4
95% CI	0.6–0.9	0.5–0.8	0.6–0.8	6.0–7.0	4.1–4.8	5.1–5.7
2012 (estimated) <sup>(b)</sup>	0.7	0.6	0.7	8.2	5.5	6.8
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.1	0.2	0.1	2.9	3.5	3.2
Risk to age 75	1 in 3,343	1 in 4,199	1 in 3,725	1 in 270	1 in 526	1 in 359
Risk to age 85	1 in 1,044	1 in 1,245	1 in 1,142	1 in 111	1 in 176	1 in 138
Mean age <sup>(d)</sup>	75.4	80.9	78.5	73.6	78.4	75.9

Rate (per 100,000)

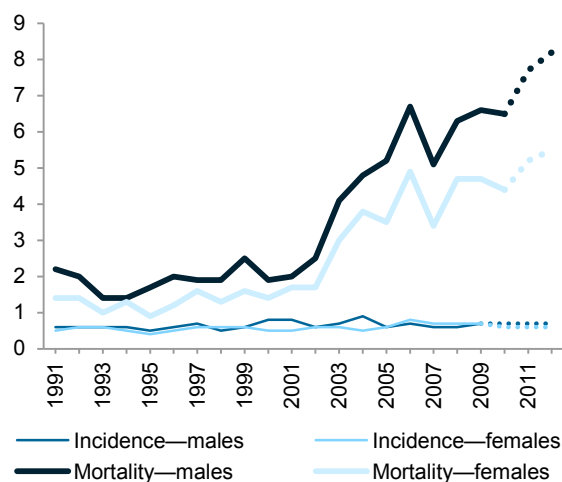


Figure B26.1: Cancer of other digestive organs incidence and mortality rates<sup>(c)</sup>, 1991–2012

Rate (per 100,000)

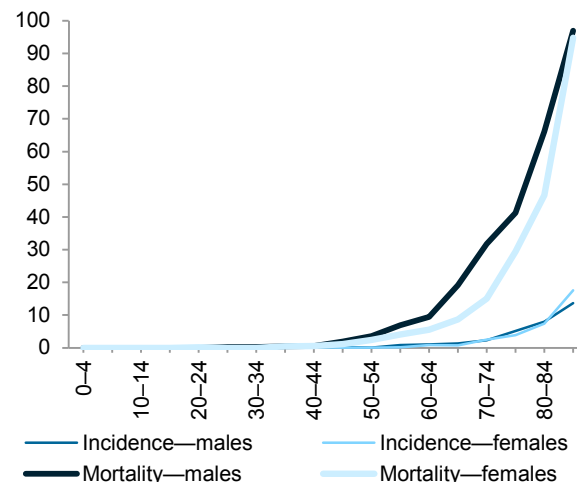


Figure B26.2: Cancer of other digestive organs incidence (2009) and mortality (2010) rates<sup>(e)</sup> by age group

- (a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (b) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (d) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Other myeloproliferative cancers (C94.1, C94.3, C96.2, D45, D47.1, D47.3)

Table B27: Observed incidence (2009) and mortality (2010) of other myeloproliferative cancers, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(a)</sup>	360	313	673	90	72	162
2012 (estimated) <sup>(b)</sup>	375	340	710	100	90	190
<b>Age-standardised rate<sup>(c)</sup></b>						
2009 incidence/2010 mortality	3.3	2.5	2.9	0.8	0.5	0.6
95% CI	3.0–3.7	2.2–2.8	2.7–3.1	0.7–1.0	0.4–0.6	0.5–0.7
2012 (estimated) <sup>(b)</sup>	3.2	2.5	2.8	0.9	0.6	0.7
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.6	0.6	0.6	0.4	0.4	0.4
Risk to age 75	1 in 449	1 in 540	1 in 492	1 in 2,852	1 in 6,147	1 in 3,932
Risk to age 85	1 in 226	1 in 310	1 in 265	1 in 933	1 in 2,288	1 in 1,378
Mean age <sup>(d)</sup>	66.6	66.4	66.5	75.5	81.4	78.1

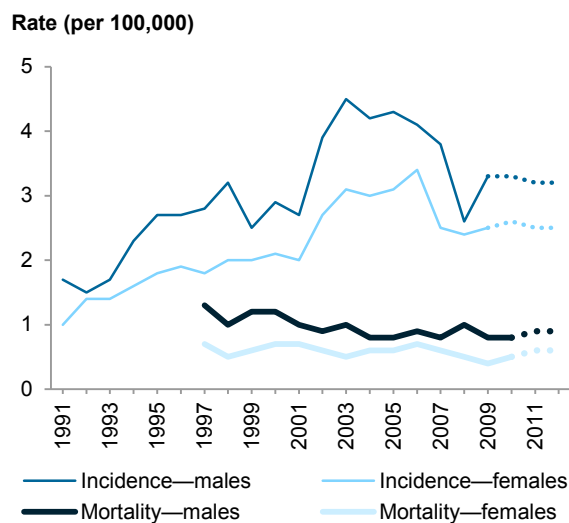


Figure B27.1: Other myeloproliferative cancers incidence and mortality rates<sup>(c)</sup>, 1991–2012

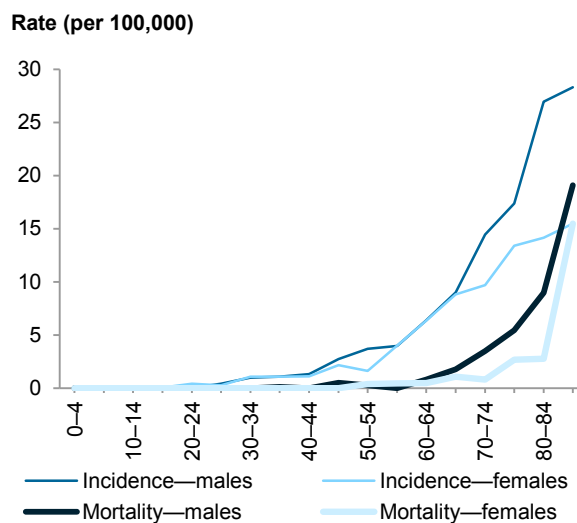


Figure B27.2: Other myeloproliferative cancers incidence (2009) and mortality (2010) rates<sup>(e)</sup> by age group

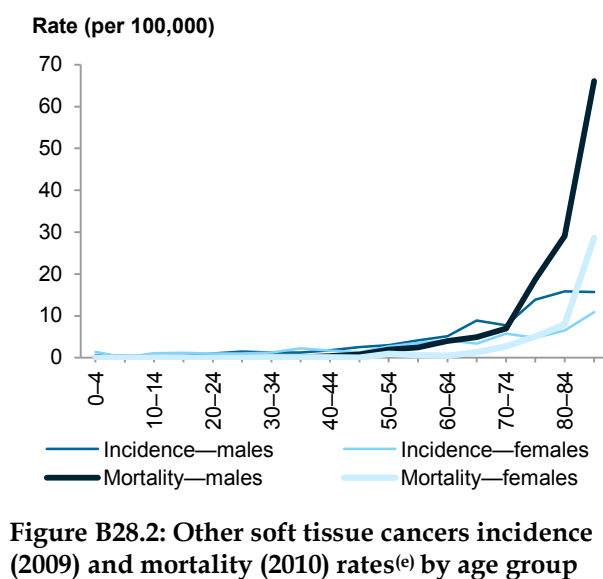
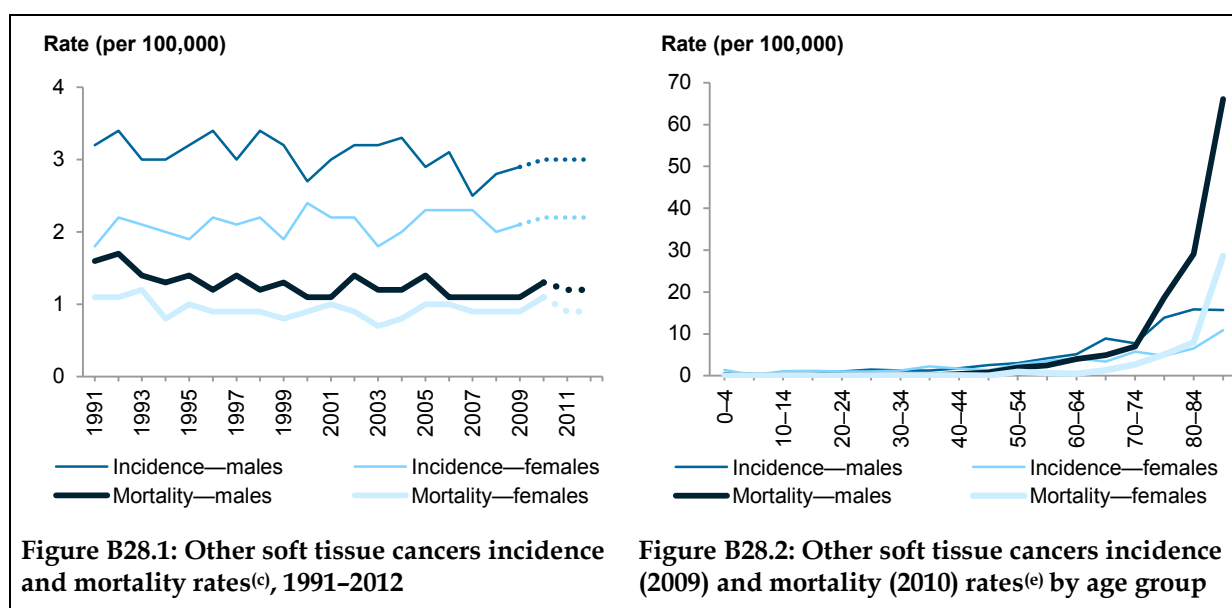
- (a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (b) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (d) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

## Other soft tissue cancers (C47, C49)

Table B28: Observed incidence (2009) and mortality (2010) of other soft tissue cancers, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(a)</sup>	313	254	567	147	134	281
2012 (estimated) <sup>(b)</sup>	345	275	620	135	120	255
<b>Age-standardised rate<sup>(c)</sup></b>						
2009 incidence/2010 mortality	2.9	2.1	2.5	1.3	1.1	1.2
95% CI	2.6–3.2	1.9–2.4	2.3–2.7	1.1–1.6	0.9–1.2	1.0–1.3
2012 (estimated) <sup>(b)</sup>	3.0	2.2	2.5	1.2	0.9	1.0
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.5	0.5	0.5	0.6	0.7	0.7
Risk to age 75	1 in 499	1 in 627	1 in 557	1 in 1,018	1 in 1,308	1 in 1,147
Risk to age 85	1 in 287	1 in 464	1 in 362	1 in 624	1 in 839	1 in 721
Mean age <sup>(d)</sup>	59.8	55.1	57.7	62.0	64.3	63.1



- (a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (b) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (c) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (d) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (e) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Ovarian cancer (C56)

Risk factors<sup>(a)</sup>:



Table B29: Observed incidence (2009) and mortality (2010) of ovarian cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	..	1,338	1,338	..	912	912
2012 (estimated) <sup>(c)</sup>	..	1,410	1,410	..	975	975
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	..	10.9	..	..	7.0	..
95% CI	..	10.3–11.5	..	..	6.6–7.5	..
2012 (estimated) <sup>(c)</sup>	..	10.7	..	..	7.0	..
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	..	2.7	..	..	4.9	..
Risk to age 75	..	1 in 116	..	..	1 in 194	..
Risk to age 85	..	1 in 75	..	..	1 in 103	..
Mean age <sup>(e)</sup>	..	64.4	..	..	69.9	..

Rate (per 100,000)

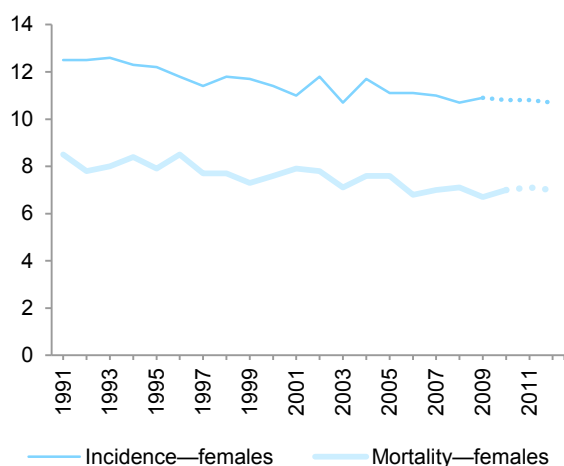


Figure B29.1: Ovarian cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

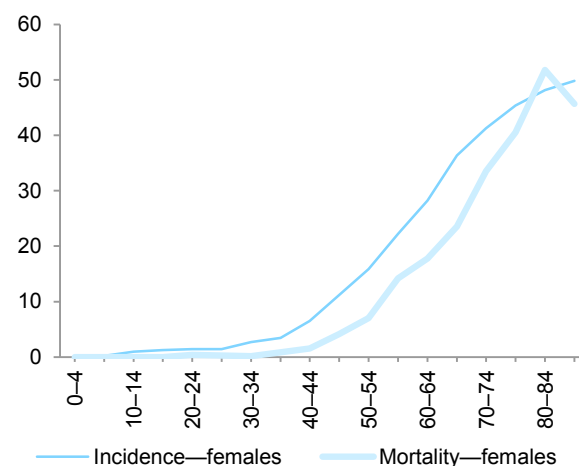


Figure B29.2: Ovarian cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

(a) Based on the IARC (2008) and WCRF & AICR (2007).

(b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.

(c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.

(d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

(e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.

(f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

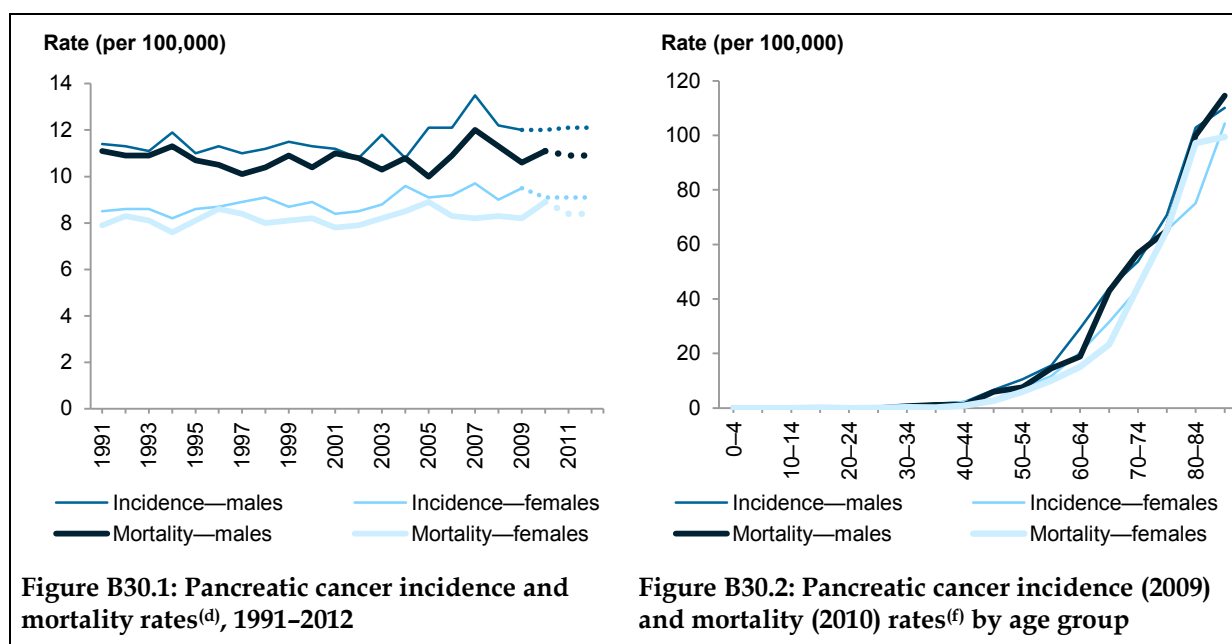
# Pancreatic cancer (C25)

Risk factors<sup>(a)</sup>:



Table B30: Observed incidence (2009) and mortality (2010) of pancreatic cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	1,309	1,237	2,546	1,233	1,201	2,434
2012 (estimated) <sup>(c)</sup>	1,450	1,290	2,740	1,300	1,200	2,500
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	12.0	9.5	10.7	11.1	8.9	9.9
95% CI	11.4–12.7	8.9–10.0	10.3–11.1	10.5–11.7	8.4–9.4	9.5–10.3
2012 (estimated) <sup>(c)</sup>	12.1	9.1	10.5	10.9	8.4	9.6
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	2.0	2.5	2.2	5.1	6.5	5.7
Risk to age 75	1 in 122	1 in 165	1 in 141	1 in 134	1 in 194	1 in 159
Risk to age 85	1 in 60	1 in 77	1 in 68	1 in 64	1 in 76	1 in 70
Mean age <sup>(e)</sup>	69.4	72.5	70.9	71.0	75.0	73.0



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

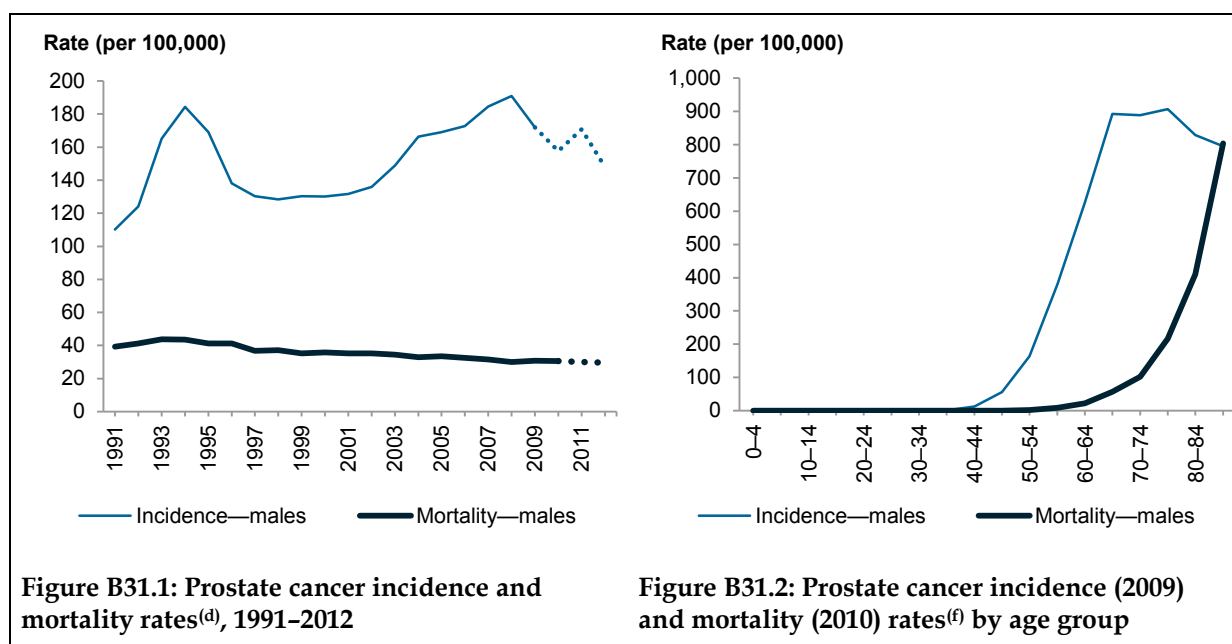
# Prostate cancer (C61)

Risk factors<sup>(a)</sup>:



Table B31: Observed incidence (2009) and mortality (2010) of prostate cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	19,438	..	19,438	3,235	..	3,235
2012 (estimated) <sup>(c)</sup>	18,560	..	18,560	3,410	..	3,410
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	171.9	..	..	30.6	..	..
95% CI	169.5–174.3	..	..	29.6–31.7	..	..
2012 (estimated) <sup>(c)</sup>	147.9	..	..	29.7	..	..
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	30.2	..	..	13.3	..	..
Risk to age 75	1 in 7	..	..	1 in 105	..	..
Risk to age 85	1 in 5	..	..	1 in 25	..	..
Mean age <sup>(e)</sup>	67.4	..	..	80.0	..	..



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Stomach cancer (C16)



Table B32: Observed incidence (2009) and mortality (2010) of stomach cancer, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	1,317	702	2,019	719	375	1,094
2012 (estimated) <sup>(c)</sup>	1,420	770	2,190	700	415	1,120
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	12.1	5.5	8.5	6.6	2.8	4.5
95% CI	11.5–12.8	5.1–5.9	8.2–8.9	6.1–7.1	2.5–3.1	4.2–4.8
2012 (estimated) <sup>(c)</sup>	11.9	5.5	8.5	5.9	2.9	4.3
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	2.0	1.4	1.8	3.0	2.0	2.6
Risk to age 75	1 in 115	1 in 275	1 in 163	1 in 256	1 in 666	1 in 374
Risk to age 85	1 in 61	1 in 137	1 in 86	1 in 112	1 in 272	1 in 163
Mean age <sup>(e)</sup>	68.9	71	69.6	71.6	73.6	72.3

Rate (per 100,000)

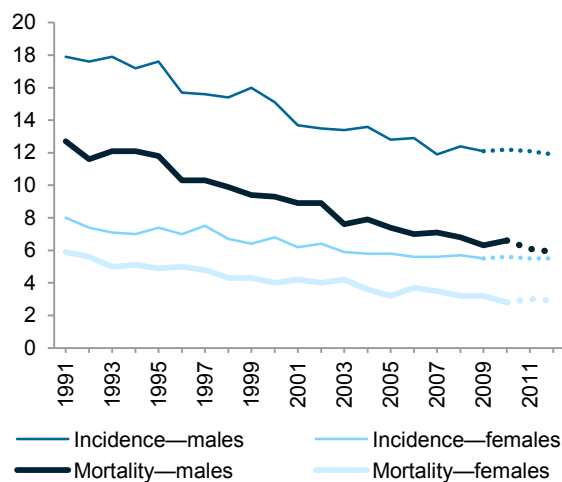


Figure B32.1: Stomach cancer incidence and mortality rates<sup>(d)</sup>, 1991–2012

Rate (per 100,000)

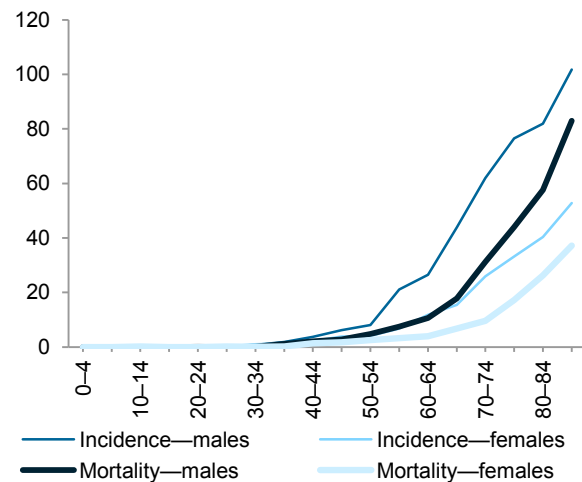


Figure B32.2: Stomach cancer incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

(a) Based on the IARC (2008) and WCRF & AICR (2007).

(b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.

(c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.

(d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.

(e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.

(f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.



# Testicular cancer (C62)


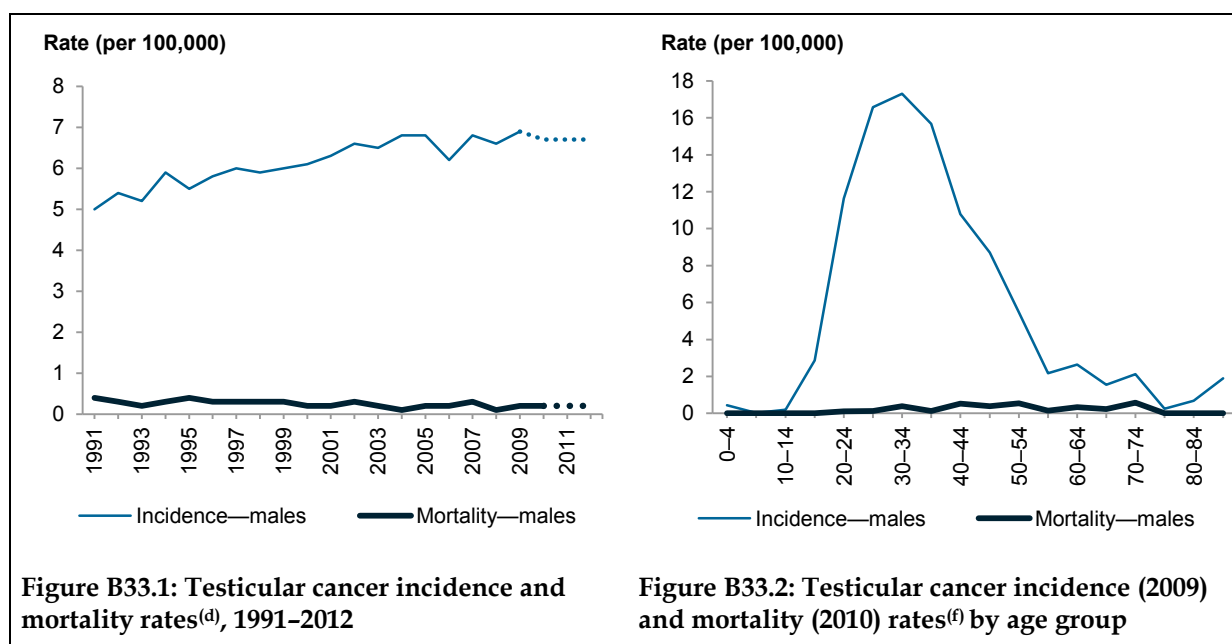
Risk factors<sup>(a)</sup>: 

Table B33: Observed incidence (2009) and mortality (2010) of testicular cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	751	..	751	23	..	23
2012 (estimated) <sup>(c)</sup>	740	..	740	20	..	20
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	6.9	..	..	0.2	..	..
95% CI	6.4–7.4	..	..	0.1–0.3	..	..
2012 (estimated) <sup>(c)</sup>	6.7	..	..	0.2	..	..
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	1.2	..	..	0.1	..	..
Risk to age 75	1 in 204	..	..	1 in 5,719	..	..
Risk to age 85	1 in 202	..	..	1 in 5,719	..	..
Mean age <sup>(e)</sup>	35.6	..	..	47.6	..	..



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

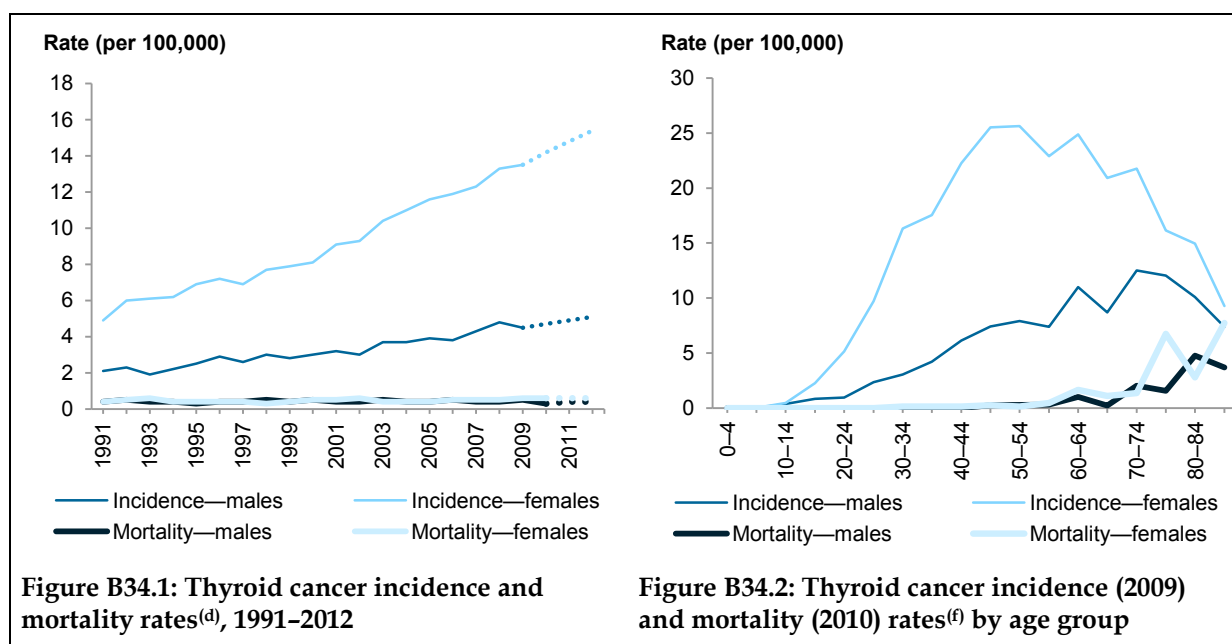
# Thyroid cancer (C73)

Risk factors<sup>(a)</sup>:



Table B34: Observed incidence (2009) and mortality (2010) of thyroid cancer, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	503	1,536	2,039	38	76	114
2012 (estimated) <sup>(c)</sup>	595	1,830	2,420	55	80	130
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	4.5	13.5	9.1	0.3	0.6	0.5
95% CI	4.2–5.0	12.9–14.2	8.7–9.5	0.2–0.5	0.4–0.7	0.4–0.6
2012 (estimated) <sup>(c)</sup>	5.1	15.4	10.3	0.4	0.6	0.5
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.8	3.1	1.8	0.2	0.4	0.3
Risk to age 75	1 in 275	1 in 93	1 in 139	1 in 4,888	1 in 3,763	1 in 4,257
Risk to age 85	1 in 211	1 in 82	1 in 117	1 in 1,922	1 in 1,347	1 in 1,578
Mean age <sup>(e)</sup>	54.9	49.6	51.0	72.0	74.1	73.4



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

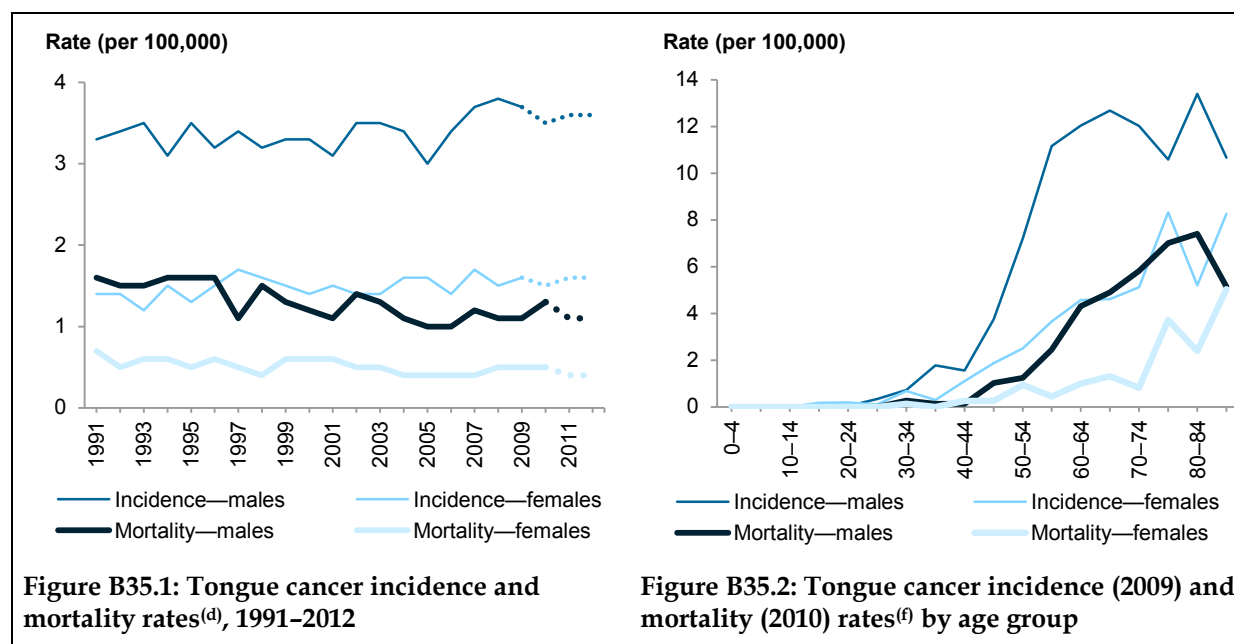
# Tongue cancer (C01–C02)

Risk factors<sup>(a)</sup>:



Table B35: Observed incidence (2009) and mortality (2010) of tongue cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	418	200	618	144	60	204
2012 (estimated) <sup>(c)</sup>	440	205	645	140	65	200
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	3.7	1.6	2.6	1.3	0.5	0.8
95% CI	3.3–4.1	1.4–1.9	2.4–2.8	1.1–1.5	0.3–0.6	0.7–1.0
2012 (estimated) <sup>(c)</sup>	3.6	1.6	2.6	1.1	0.4	0.8
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	0.6	0.4	0.5	0.6	0.3	0.5
Risk to age 75	1 in 316	1 in 805	1 in 456	1 in 988	1 in 3,889	1 in 1,591
Risk to age 85	1 in 229	1 in 521	1 in 323	1 in 578	1 in 1,779	1 in 895
Mean age <sup>(e)</sup>	61.0	63.4	61.8	66.4	70.6	67.6



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Unknown primary site (C80)<sup>(a)</sup>

Table B36: Observed incidence (2009) and mortality (2010) of unknown primary site, and estimated for 2012

Number	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
2009 incidence/2010 mortality <sup>(b)</sup>	1,496	1,399	2,895	1,167	1,113	2,280
2012 (estimated) <sup>(c)</sup>	1,490	1,360	2,850	1,380	1,170	2,550
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	14.0	10.4	12.0	10.7	7.8	9.2
95% CI	13.3–14.8	9.8–11.0	11.6–12.5	10.1–11.3	7.4–8.3	8.8–9.6
2012 (estimated) <sup>(c)</sup>	12.7	9.2	10.8	11.7	7.9	9.6
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	2.3	2.8	2.5	4.8	6.0	5.3
Risk to age 75	1 in 129	1 in 183	1 in 152	1 in 190	1 in 266	1 in 222
Risk to age 85	1 in 53	1 in 72	1 in 62	1 in 66	1 in 98	1 in 80
Mean age <sup>(e)</sup>	71.7	74.8	73.3	73.8	77.7	75.7

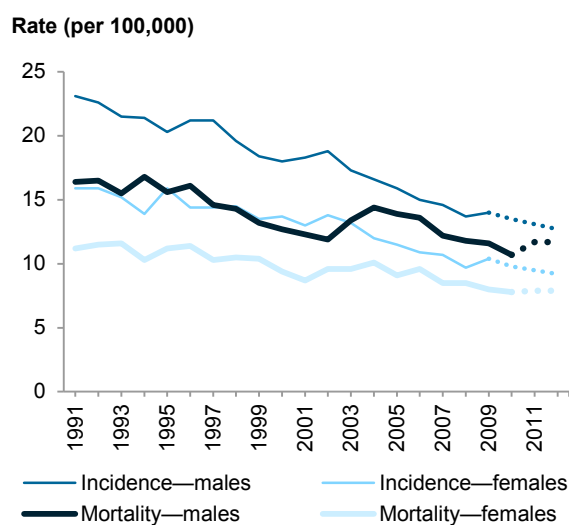


Figure B36.1: Unknown primary site incidence and mortality rates<sup>(d)</sup>, 1991–2012

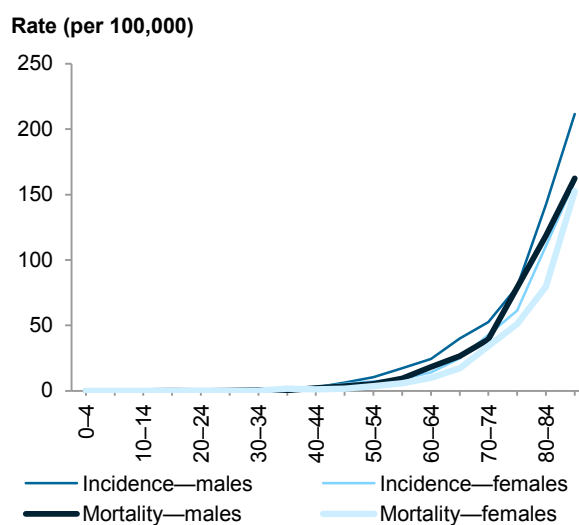


Figure B36.2: Unknown primary site incidence (2009) and mortality (2010) rates<sup>(f)</sup> by age group

- (a) For mortality data prior to 2008, the applicable codes are C77–C80.
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Uterine cancer (C54–C55)

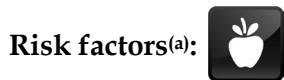
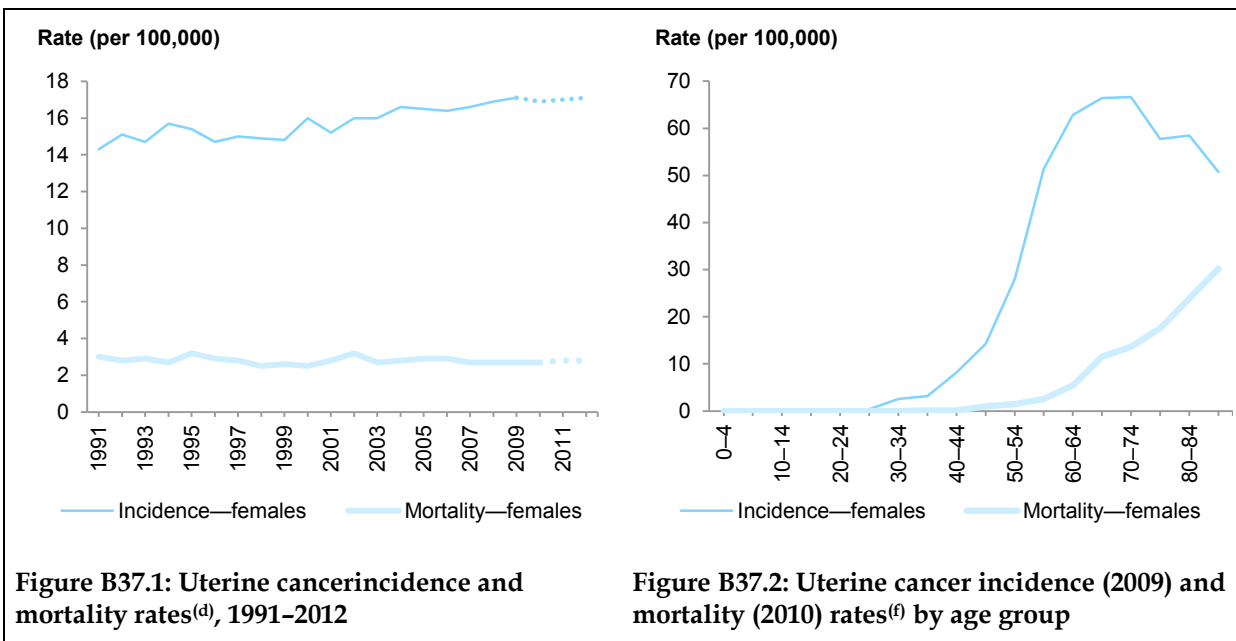


Table B37: Observed incidence (2009) and mortality (2010) of uterine cancer, and estimated for 2012

	Incidence			Mortality		
	Males	Females	Persons	Males	Females	Persons
<b>Number</b>						
2009 incidence/2010 mortality <sup>(b)</sup>	..	2,105	2,105	..	364	364
2012 (estimated) <sup>(c)</sup>	..	2,270	2,270	..	395	395
<b>Age-standardised rate<sup>(d)</sup></b>						
2009 incidence/2010 mortality	..	17.1	..	..	2.7	..
95% CI	..	16.3–17.8	..	..	2.4–3.0	..
2012 (estimated) <sup>(c)</sup>	..	17.1	..	..	2.8	..
<b>Other information for 2009 incidence/2010 mortality</b>						
Per cent of all cancer	..	4.2	..	..	2.0	..
Risk to age 75	..	1 in 66	..	..	1 in 558	..
Risk to age 85	..	1 in 48	..	..	1 in 259	..
Mean age <sup>(e)</sup>	..	64.1	..	..	74.3	..



- (a) Based on the IARC (2008) and WCRF & AICR (2007).
- (b) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
- (c) 2010–2012 estimates for incidence are based on 2000–2009 incidence data. 2011–2012 estimates for mortality are based on 2001–2010 mortality data (see Appendix G). They are rounded to the nearest 10. For estimates less than 1,000 they are rounded to nearest 5. The estimates for males and females may not add to estimates for persons due to rounding. Estimates are displayed on graph as dotted lines.
- (d) The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
- (e) Mean age for 2009 incidence was calculated excluding NSW and the ACT.
- (f) The rates shown are age-specific rates.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.

# Appendix C Cancer incidence and mortality for all cancer groupings

Table C1: Number of new cases (2009) and deaths (2010) by cancer type, persons, Australia

Cancer site/type (ICD-10 codes)	Incidence <sup>(a)</sup>			Mortality <sup>(a)</sup>		
	Number	ASR <sup>(b)</sup>	95% CI	Number	ASR <sup>(b)</sup>	95% CI
<b>Lip, oral cavity and pharynx</b>						
Lip (C00)	865	3.7	3.5–4.0	11	0.0	0.0–0.1
Tongue (C01–C02)	618	2.6	2.4–2.8	204	0.8	0.7–1.0
Mouth (C03–C06)	554	2.3	2.2–2.5	121	0.5	0.4–0.6
Salivary glands (C07–C08)	265	1.1	1.0–1.3	88	0.4	0.3–0.4
Oropharynx (C09–C10)	447	1.9	1.7–2.1	147	0.6	0.5–0.7
Nasopharynx (C11)	118	0.5	0.4–0.6	48	0.2	0.1–0.3
Hypopharynx (C12–C13)	174	0.7	0.6–0.9	65	0.3	0.2–0.3
Other sites in pharynx, etc. (C14)	82	0.3	0.3–0.4	79	0.3	0.3–0.4
<b>Digestive organs</b>						
Oesophagus (C15)	1,314	5.5	5.2–5.8	1,223	5.0	4.7–5.3
Stomach (C16)	2,019	8.5	8.2–8.9	1,094	4.5	4.2–4.8
Small intestine (C17)	404	1.7	1.6–1.9	99	0.4	0.3–0.5
Bowel (C18–C20)	14,410	61.1	60.1–62.1	3,982	16.2	15.7–16.7
Anus (C21)	337	1.4	1.3–1.6	74	0.3	0.2–0.4
Liver (C22)	1,304	5.5	5.2–5.9	1,339	5.5	5.2–5.8
Gallbladder & bile ducts (C23–C24)	682	2.9	2.7–3.1	257	1.0	0.9–1.2
Pancreas (C25)	2,546	10.7	10.3–11.1	2,434	9.9	9.5–10.3
Other digestive organs (C26)	169	0.7	0.6–0.8	1,354	5.4	5.1–5.7
<b>Respiratory system and intrathoracic organs</b>						
Nose, sinuses, etc. (C30–C31)	166	0.7	0.6–0.8	38	0.2	0.1–0.2
Larynx (C32)	606	2.6	2.4–2.8	255	1.1	0.9–1.2
Lung (C33–C34)	10,193	43.2	42.4–44.1	8,099	33.3	32.5–34.0
Other thoracic and respiratory organs (C37–C39)	104	0.5	0.4–0.6	57	0.2	0.2–0.3
<b>Bone (C40–C41)</b>	<b>185</b>	<b>0.8</b>	<b>0.7–1.0</b>	<b>114</b>	<b>0.5</b>	<b>0.4–0.6</b>
<b>Skin</b>						
Melanoma of skin (C43)	11,545	49.8	48.9–50.8	1,452	5.9	5.6–6.3
Non-melanoma of the skin (C44) <sup>(c)</sup>	782	3.3	3.1–3.5	445	1.8	1.6–1.9

(continued)

**Table C1 (continued): Number of new cases (2009) and deaths (2010) by cancer type, persons, Australia**

Cancer site/type (ICD-10 codes)	Incidence <sup>(a)</sup>			Mortality <sup>(a)</sup>		
	Number	ASR <sup>(b)</sup>	95% CI	Number	ASR <sup>(b)</sup>	95% CI
<b>Mesothelioma and soft tissue</b>						
Mesothelioma (C45)	666	2.8	2.6–3.1	642	2.6	2.4–2.9
Kaposi sarcoma (C46)	60	0.3	0.2–0.3	4	0.0	0.0–0.0
Peritoneum (C48)	206	0.9	0.8–1.0	95	0.4	0.3–0.5
Other soft tissue (C47, C49)	567	2.5	2.3–2.7	281	1.2	1.0–1.3
<b>Breast (C50)</b>	<b>13,778</b>	<b>59.1</b>	<b>58.1–60.1</b>	<b>2,864</b>	<b>11.6</b>	<b>11.2–12.1</b>
<b>Female genital organs</b>						
Vulva (C51)	311	..	..	68	..	..
Vagina (C52)	69	..	..	21	..	..
Cervix (C53)	771	..	..	232	..	..
Uterus (C54–C55)	2,105	..	..	364	..	..
Ovary (C56)	1,338	..	..	912	..	..
Other female genital organs and placenta (C57–C58)	112	..	..	39	..	..
<b>Male genital organs</b>						
Penis (C60)	82	..	..	17	..	..
Prostate (C61)	19,438	..	..	3,235	..	..
Testis (C62)	751	..	..	23	..	..
Other male genital organs (C63)	22	..	..	4	..	..
<b>Urinary tract</b>						
Kidney (C64)	2,708	11.5	11.1–12.0	927	3.7	3.5–4.0
Bladder (C67)	2,316	9.7	9.3–10.1	1,031	4.1	3.9–4.4
Other urinary organs (C65–C66, C68)	460	2.0	1.8–2.1	110	0.4	0.4–0.5
<b>Eye, brain and other parts of the central nervous system</b>						
Eye (C69)	252	1.1	1.0–1.2	46	0.2	0.1–0.3
Brain (C71)	1,596	7.0	6.6–7.3	1,247	5.2	4.9–5.5
Other central nervous system (C70, C72)	88	0.4	0.3–0.5	20	0.1	0.1–0.1
<b>Thyroid and other endocrine glands</b>						
Thyroid (C73)	2,039	9.1	8.7–9.5	114	0.5	0.4–0.6
Other endocrine glands (C74–C75)	101	0.5	0.4–0.6	59	0.3	0.2–0.3
<b>Blood and lymphatic system</b>						
Hodgkin lymphoma (C81)	547	2.5	2.3–2.7	84	0.4	0.3–0.4
Non-Hodgkin lymphoma (C82–C85)	4,381	18.7	18.2–19.3	1,338	5.4	5.1–5.7
Immunoproliferative cancers (C88)	103	0.4	0.4–0.5	38	0.1	0.1–0.2
Myeloma (C90)	1,525	6.5	6.1–6.8	824	3.3	3.1–3.6
Acute lymphoblastic leukaemia (C91.0)	326	1.5	1.4–1.7	97	0.4	0.3–0.5

(continued)

**Table C1 (continued): Number of new cases (2009) and deaths (2010) by cancer type, persons, Australia**

Cancer site/type (ICD-10 codes)	Incidence <sup>(a)</sup>			Mortality <sup>(a)</sup>		
	Number	ASR <sup>(b)</sup>	95% CI	Number	ASR <sup>(b)</sup>	95% CI
Chronic lymphocytic leukaemia (C91.1)	1,062	4.5	4.2–4.8	354	1.4	1.3–1.6
Other and unspecified lymphoid leukaemia (C91.2–C91.9)	111	0.5	0.4–0.6	34	0.1	0.1–0.2
<b>Total lymphoid cancers (C81–C85, C88, C90, C91)</b>	<b>6,531</b>	<b>28.1</b>	<b>27.4–28.8</b>	<b>2,769</b>	<b>11.2</b>	<b>10.8–11.7</b>
Chronic myelogenous leukaemia (C92.1)	290	1.3	1.1–1.4	95	0.4	0.3–0.5
Other myeloproliferative cancer (C94.1, C94.3, C96.2, D45, D47.1, D47.3)	673	2.9	2.7–3.1	162	0.6	0.5–0.7
Myelodysplastic syndrome (D46)	1,185	5.0	4.7–5.3	353	1.4	1.2–1.5
Acute myeloid leukaemia (C92.0, C92.3–C92.5, C93.0, C94.0, C94.2, C94.4, C94.5)	898	3.9	3.6–4.1	800	3.3	3.1–3.5
Unspecified myeloid leukaemia (C92.2, C92.7, C92.9, C93.1–C93.9, C94.7)	274	1.1	1.0–1.3	114	0.5	0.4–0.5
<b>Total myeloid cancers (C92–C94, C96.2, D45, D46, D47.1, D47.3)</b>	<b>3,319</b>	<b>14.1</b>	<b>13.6–14.6</b>	<b>1,524</b>	<b>6.1</b>	<b>5.8–6.5</b>
Other cancers of blood and lymphatic system (C95, C96.0, C96.1, C96.3–C96.9)	105	0.4	0.4–0.5	154	0.6	0.5–0.7
<b>Other</b>						
Other and ill-defined sites (C76)	37	0.2	0.1–0.2	180	0.7	0.6–0.8
Unknown primary site (C80) <sup>(d)</sup>	2,895	12.0	11.6–12.5	2,280	9.2	8.8–9.6
Multiple primary cancers (C97) <sup>(e)</sup>	..	..	..	503	2.0	1.8–2.2
<b>All cancers (C00–C97<sup>(c)</sup>, D45, D46, D47.1, D47.3)</b>	<b>114,137</b>	<b>485.7</b>	<b>484.3–488.6</b>	<b>42,844</b>	<b>174.3</b>	<b>172.7–176.0</b>

(a) 2009 incidence data include estimates for NSW and the ACT. See Appendix F for more details. Mortality data for 2010 are preliminary and are subject to further revision.

(b) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed by 100,000 population.

(c) For incidence data, those C44 codes that indicate basal or squamous cell carcinoma of the skin are not included.

(d) For mortality data before 2008, the applicable codes are C77–C80.

(e) Of relevance for mortality data only.

Source: AIHW Australian Cancer Database 2009, AIHW National Mortality Database.



## Appendix D Guide to online supplementary tables

Additional tables are available as online Excel tables at <[www.aihw.gov.au](http://www.aihw.gov.au)>. These tables contain detailed statistics, some of which are presented in summary form in the body of the report. Throughout the report, online additional tables are referred to with a 'D', for example, 'See online Table D1.1'.

There are 8 Excel files, each representing a chapter from the report:

- Chapter 2 – Incidence of cancer
- Chapter 3 – Mortality from cancer
- Chapter 4 – Survival after a diagnosis of cancer
- Chapter 5 – Prevalence of cancer
- Chapter 6 – Differences across population groups
- Chapter 7 – Burden of disease due to cancer
- Chapter 8 – Hospitalisations and palliative care for cancer
- Chapter 9 – National cancer screening programs.

# Appendix E Classifications

## Australian Standard Geographical Classification Remoteness Areas

The Australian Standard Geographical Classification (ASGC) Remoteness Areas was used to assign areas across Australia to a remoteness category (ABS 2006). This classification allocates one in five remoteness categories to areas depending on their distance from different-sized urban centres, where the population size of the urban centre is considered to govern the range and type of services available.

Areas are classified as *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote* (AIHW 2004). The category *Major cities* includes Australia's capital cities, with the exceptions of Hobart and Darwin, which are classified as *Inner regional*. For this report, the categories of *Remote* and *Very remote* were collapsed due to the small number of cases in these two subgroups.

The remoteness category was assigned to a cancer case according to the postal areas of residence at the time of diagnosis, and it was assigned to a cancer death according to the statistical local area of residence at time of death.

## Index of Relative Socio-economic Disadvantage

The Index of Relative Socio-economic Disadvantage (IRSD) is one of four Socio-Economic Indexes for Areas (SEIFAs) developed by the Australian Bureau of Statistics (ABS 2008a). This index is based on factors such as average household income, education levels and unemployment rates. Rather than being a person-based measure, the IRSD is an area-based measure of socioeconomic status in which small areas of Australia are classified on a continuum from disadvantaged to affluent. This information is used as a proxy for the socioeconomic status of people living in those areas and may not be correct for each person in that area.

Socioeconomic status quintiles were assigned to cancer cases and deaths according to the IRSD of the statistical local area of residence at the time of diagnosis or death.

In this report, the first socioeconomic status group (labelled '1') corresponds to geographical areas containing the 20% of the population with the lowest socioeconomic status according to the IRSD, and the fifth group (labelled '5') corresponds to the 20% of the population with the highest socioeconomic status.

## International Classification of Diseases for Oncology

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

Since the first edition of the ICD-O, a number of revisions have been made, mainly in the area of lymphomas and leukaemias. The current edition, the third, was released in 2000 (Fritz et al. 2000) and is used by most state and territory cancer registries in Australia, as well as by the AIHW in regard to the Australian Cancer Database.

## **International Statistical Classification of Diseases and Related Health Problems**

The International Statistical Classification of Diseases and Related Health Problems (ICD) is used to classify diseases and other health problems (including symptoms and injuries) in clinical and administrative records. The use of a standard classification system enables the storage and retrieval of diagnostic information for clinical and epidemiological purposes that is comparable between different service providers, across countries and over time.

In 1903, Australia adopted the ICD to classify causes of death and it was fully phased in by 1906. Since 1906, the ICD has been revised nine times in response to the recognition of new diseases (for example, Acquired Immunodeficiency Syndrome, or AIDS), increased knowledge of diseases, and changing terminology in the description of diseases. The version currently in use, ICD-10 (WHO 1992), was endorsed by the 43rd World Health Assembly in May 1990 and officially came into use in WHO member states from 1994.

## **International Statistical Classification of Diseases and Related Health Problems, Australian Modification**

The Australian modification of ICD-10, which is referred to as the ICD-10-AM (NCCH 2010), is based on ICD-10. ICD-10 was modified for the Australian setting by the National Centre for Classification in Health with assistance from clinicians and clinical coders. Despite the modifications, compatibility with ICD-10 at the higher levels (that is, up to 4 character codes) of the classification has been maintained. ICD-10-AM has been used for classifying diagnoses in hospital records in all states and territories since 1999–00 (AIHW 2000).

## **Australian Classification of Health Interventions**

The current version of the ICD does not incorporate a classification system for coding health interventions (that is, procedures). In Australia, a health intervention classification system was designed to be implemented at the same time as the ICD-10-AM in July 1998. The system was based on the Medicare Benefits Schedule (MBS) coding system and originally called MBS-Extended. The name was changed to the Australian Classification of Health Interventions (ACHI) with the release of the third revision of the ICD-10-AM in July 2002 (NCCH 2010). ACHI and ICD-10-AM are used together for classifying morbidity, surgical procedures and other health interventions in Australian hospital records.

## **Standard Australian Classification of Countries**

The Standard Australian Classification of Countries (SACC) is the Australian statistical standard for statistics classified by country (ABS 2008c). It is a classification of countries that

is essentially based on the concept of geographic proximity. It groups neighbouring countries into progressively broader geographical areas on the basis of their similarity in terms of social, cultural, economic and political characteristics. The first edition of the SACC was published in 1998, and the second – the one used in this report – was released by the ABS in 2008.

## Appendix F Constructing the 2009 Australian Cancer Database

The 1982–2009 data files for New South Wales and the Australian Capital Territory were not available for inclusion in the 2009 version of the Australian Cancer Database (ACD). An extended delay of the receipt of mortality data has meant that New South Wales and the Australian Capital Territory have not been able to close off their 2009 data sets. As a consequence, 2009 cancer data for these jurisdictions are not available for reporting purposes. The 2009 incidence data for New South Wales and the Australian Capital Territory were estimated by the AIHW in consultation with New South Wales and the Australian Capital Territory cancer registries. The estimates were combined with the actual data supplied by other state and territory cancer registries to form a 1982–2009 national cancer data set. These steps are explained in more details below.

To construct the 2009 ACD, the 2009 estimates for New South Wales and the Australian Capital Territory were combined with the actual data supplied by other state and territory cancer registries to form a 1982–2009 national cancer data set. The process is summarised in Figure F1.

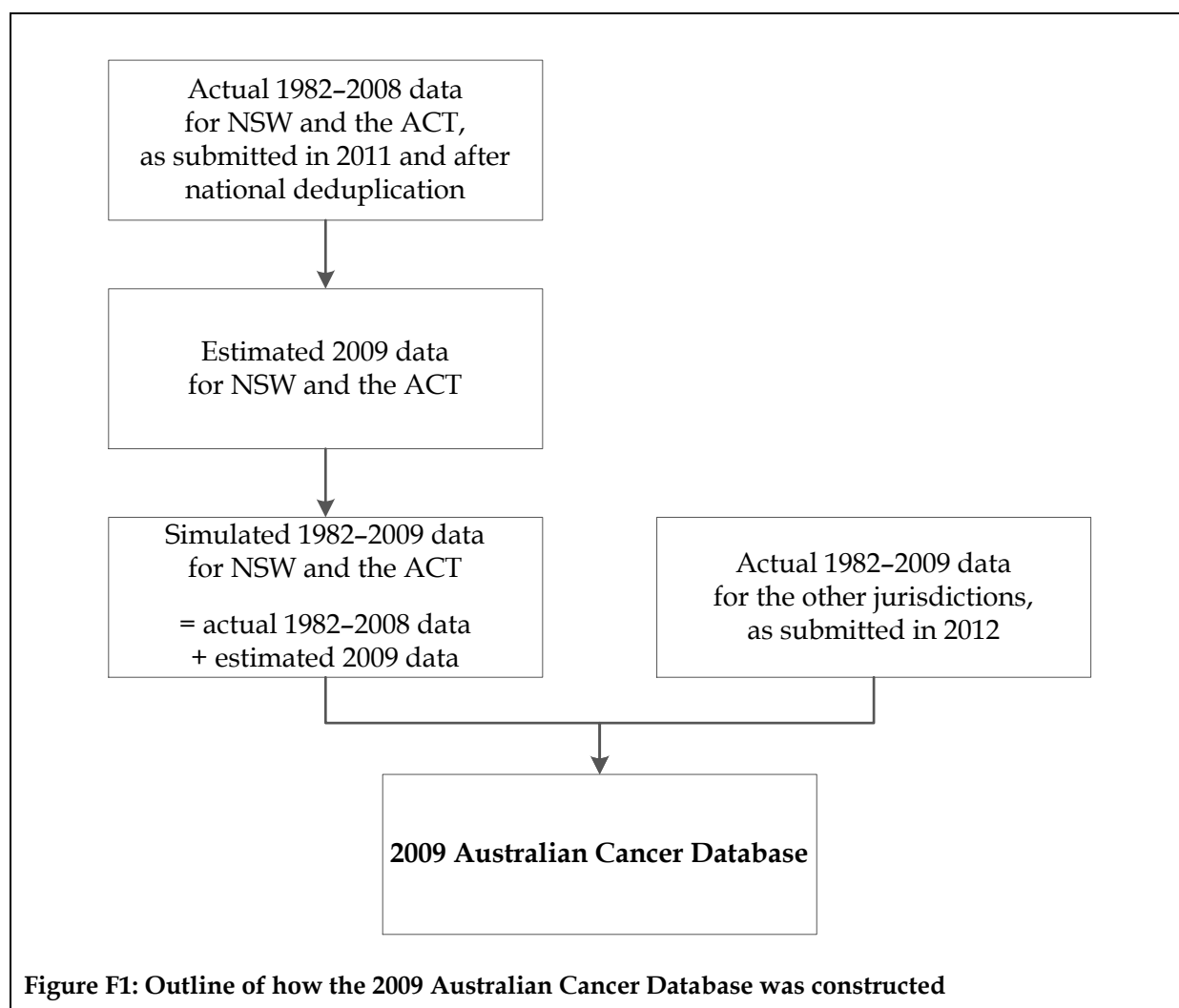


Figure F1: Outline of how the 2009 Australian Cancer Database was constructed

## Estimating 2009 cancer incidence for New South Wales and the Australian Capital Territory

To estimate 2009 cancer incidence for New South Wales and the Australian Capital Territory, with the exception of prostate cancer (detailed below), the most recent 10 years of incidence count data from the 2008 version of the ACD were divided into time series stratified by the following:

- Year of diagnosis: 1999, ..., 2008.
- Jurisdiction: New South Wales, Australian Capital Territory.
- Sex: Male, female.
- Age group: 5-year age groups 0–4, ..., 80–84, and 85+.
- Cancer type: For the non-haematological cancers, cancer type was defined by the 3-character ICD-10 codes C00–C80 (excluding C61 prostate cancer). For the haematological cancers, cancer type was defined by the 3rd edition of the International Classification of Diseases for Oncology (ICD-O-3) histology codes M9590–M9989. This enabled flexibility for grouping according to different classification schemes.

For each time series, the following steps were undertaken to estimate cancer incidence:

- The incidence numbers were divided by the sex-age-specific mid-year populations to obtain the age-specific incidence rates from 1999 to 2008.
- Least squares linear regression was used to find the straight line of best fit through the time series.
- A 5% level of significance was used to test the hypothesis that the slope of the line was different from zero.
- If the slope was not found to be significantly different from zero, the mean of the rates was used as the estimate of the 2009 rate.
- If the slope was found to be positive, the straight line of best fit was extrapolated to obtain the estimate of the 2009 rate.
- If the slope was negative, the time series was fitted with a log-linear model (that is, the logs of the rates were fitted with a straight line) and the estimated rate for 2009 was found by extrapolating this line.
- The estimated incidence rates for 2009 were then multiplied by the Estimated Resident Population for 2009 to obtain the estimated incidence numbers.
- Time series that contained a rate of zero were always fitted with the mean value of the series, irrespective of the outcome of the significance test. This was done to ensure that fitted lines never crossed the x-axis no matter how far forward or backward they were extrapolated.

There were a small number of series that did not have a history of 10 years of incidence data. These were non-melanoma skin cancer (ICD-10 code C44; series begins at 2001) and the myelodysplastic and/or myeloproliferative cancers (M9950, M9960–M9962, M9980–M9989; series begin at 2003). In these cases, the method was adjusted to account for the shorter time series.

## Estimating the incidence of prostate cancer

Due to the effect of PSA testing, prostate cancer incidence rates have fluctuated considerably over time making the above methodology unsuitable for estimating the incidence of prostate cancer. Instead, the relationship between prostate cancer incidence and PSA testing were used in conjunction with Medicare Benefits Schedule data on PSA tests to estimate the incidence of prostate cancer in 2009.

In May 2001, a single item (66655) which covered one PSA test for screening in a 12-month period was listed, enabling screening activity for prostate cancer to be quantified.

Examination of the time trends in services of item 66655 shows a relationship between the level of PSA testing for screening purposes and prostate cancer incidence and may provide some insight into future trends.

The data used were:

- Year of test/diagnosis: 2002, ..., 2009 (2001 was excluded because it was an incomplete year for item 66655).
- Jurisdiction: New South Wales, Australian Capital Territory.
- MBS age group: 0-4, then 10-year age groups 5-14, ..., 75-84, and 85+.
- PSA tests: Number of services of item 66655 (known for 2009), downloaded from <[www.medicareaustralia.gov.au/statistics/mbs\\_item.shtml](http://www.medicareaustralia.gov.au/statistics/mbs_item.shtml)>.
- Prostate cancer incidence: Number of cases of prostate cancer (unknown for 2009).

The ratio 'number of cases' divided by 'number of tests' was computed for each stratum in the above data set to form a time series of ratios from 2002 to 2008.

For each of these time series, the following steps were undertaken to estimate prostate cancer incidence:

- Least squares linear regression was used to find the straight line of best fit through the time series.
- A 5% level of significance was used to test the hypothesis that the slope of the line was different from zero.
- If the slope was not found to be significantly different from zero, the pooled mean of the ratios was used as the estimate of the 2009 ratio (pooled mean is the total number of cases in 2002-2008 divided by the total number of tests in 2002-2008).
- If the slope was found to be positive, the straight line of best fit was extrapolated to obtain the estimate of the 2009 ratio.
- If the slope was negative, the time series was fitted with a log-linear model and the estimated ratio for 2009 was found by extrapolating this line.
- The estimated incidence counts for 2009 were then obtained by multiplying the estimated ratios for 2009 by the number of services of item 66655 for 2009.
- Time series that contained a ratio of zero were always fitted with the pooled mean of the ratios, irrespective of the outcome of the significance test. This was done to ensure that fitted lines never crossed the x-axis no matter how far forward or backward they were extrapolated.

The final step was to convert the estimated incidence counts for the 10-year MBS age groups to 5-year age groups consistent with incidence data. The data used in this step were:

- Year of diagnosis: 2002, ..., 2008.
- Jurisdiction: New South Wales, Australian Capital Territory.
- MBS age group: 10-year age groups 5–14, ..., 75–84 (0–4 and 85+ not required).
- 5-year age group within the 10-year age group. For example, in MBS age group 5–14 there would be the ‘younger’ age group 5–9 and the ‘older’ age group 10–14.
- Prostate cancer incidence: Number of cases of prostate cancer in each 5-year age group.

The ‘younger ratio’ is defined to be ‘number of cases of prostate cancer in younger age group’ divided by ‘number of cases of prostate cancer in corresponding 10-year age group’ and the ‘older ratio’ is the analogous ratio. Note the older ratio can also be defined as 1 minus the younger ratio.

The following steps were then undertaken:

- The younger ratios were computed for each stratum in the above data set to form a time series of ratios from 2002 to 2008.
- Least squares linear regression was used to find the straight line of best fit through the time series.
- A 5% level of significance was used to test the hypothesis that the slope of the line was different from zero.
- If the slope was not found to be significantly different from zero, the pooled mean of the ratios was used as the estimate of the 2009 younger ratio.
- If the slope was found to be significantly different from zero, then the slope of the younger ratio time series will be equal but of opposite sign to the slope of the older ratio time series.
- The series (of younger or older ratios) with negative slope was selected at this point and fitted with a log-linear model and the estimated ratio for 2009 was found by extrapolating this line.
- For each 2009 ratio that has been determined above (by either the pooled mean or a log-linear model), the other ratio for 2009 is computed to be 1 minus the ratio determined. There is now a complete set of estimated younger and older ratios for 2009.
- The estimated number of cases for each 5-year age group for 2009 was then obtained by multiplying the estimated number of cases for the corresponding 10-year age group by the appropriate ratio (that is, younger or older) for 2009.
- Time series that contained a ratio of zero were always fitted with the pooled mean of the ratios, irrespective of the outcome of the significance test. This was done to ensure that fitted lines never crossed the x-axis no matter how far forward or backward they were extrapolated.



# Appendix G Year-to-date estimates for Australian cancer incidence and mortality

## Incidence

Estimates of incidence in 2010–2012 were calculated using the approach described for estimating 2009 cancer incidence for New South Wales and the Australian Capital Territory. (see Appendix F). The following data were used:

- Year of diagnosis: 2000, ..., 2009.
- Sex: Male, female.
- Age group: 5-year age groups 0–4, ..., 80–84, and 85+.
- Cancer type: For the non-haematological cancers, cancer type was defined by the 3-character ICD-10 codes C00–C80 (excluding C61 prostate cancer). For the haematological cancers, cancer type was defined by ICD-O-3 histology codes M9590–M9989. This enabled flexibility for grouping according to different classification schemes.
- ABS population projection series 29(B) was used for 2012 population estimates (ABS 2008b).

## Estimating the incidence of prostate cancer

As explained in Appendix F, Medicare Benefits Schedule item 66655 enables screening activity for prostate cancer to be quantified.

At the time this analysis was undertaken, the number of services of item 66655 was available up to and including May 2012. The total number of services for 2012 was estimated using the following data:

- Year of test: 2002, ..., 2011 (2001 was excluded because it was an incomplete year for item 66655).
- MBS age group: 0–4, then 10-year age groups 5–14, ..., 75–84, and 85+.
- Total number of services of item 66655 from January to May inclusive.
- Total number of services of item 66655 from January to December inclusive.

The ratio 'January to May total' divided by 'January to December total' was computed for each unit record in the above data set to form a time series from 2002 to 2011. The same approach for estimation was used to derive the estimated number of services for 2012 (see Appendix F).

Prostate cancer incidence was then estimated using the following data:

- Year of test/diagnosis: 2002, ..., 2012.
- MBS age group: 0–4, then 10-year age groups 5–14, ..., 75–84, and 85+.
- PSA tests: Number of services of item 66655, downloaded from [www.medicareaustralia.gov.au/statistics/mbs\\_item.shtml](http://www.medicareaustralia.gov.au/statistics/mbs_item.shtml).
- Prostate cancer incidence: Number of cases of prostate cancer (unknown for 2010–2012).

Estimates of prostate cancer incidence for 2010–2012 were calculated using the approach described for estimating 2009 prostate cancer incidence for New South Wales and the Australian Capital Territory. (see Appendix F).

## **Mortality**

The method used for producing year-to-date estimates of cancer mortality for Australia was almost the same as the approach used to derive year-to-date estimates of cancer incidence. The only differences were:

- The AIHW has the national mortality data set for 2010. The most recent 10-year period available is 2001–2010 and only 2011 and 2012 cancer mortality needed to be estimated.
- ‘Cancer type’ for the non-haematological cancers is defined by the 3-character ICD-10 codes C00–C76, C80 and C97. This excludes C77–C79, as these codes are no longer used to classify underlying cause of death (last used for 2007 year of death registration).
- Prostate cancer mortality is estimated by the same method as all other cancers.
- ‘Cancer type’ for the haematological cancers is defined by the 4-character ICD-10 codes C81.0–C96.9, D45, D46.0–D46.9, D47.1 and D47.3.
- All cancer types have a history of at least 10 years.

# Appendix H Statistical methods and technical notes

## Age-specific rates

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

## Age-standardised rates

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

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

There are two methods commonly used to adjust for age: direct and indirect standardisation. In this report, the direct standardisation approach presented by Jensen and colleagues (1991) is used. To age-standardise using the direct method, the first step is to obtain population numbers and numbers of cases (or deaths) in age ranges – typically 5-year age ranges. The next step is to multiply the age-specific population numbers for the standard population (in this case the Australian population as at 30 June 2001) by the age-specific incidence rates (or death rates) for the population of interest (such as those in a certain socioeconomic status group or those who lived in *Major cities*). The next step is to sum across the age groups and divide this sum by the total of the standard population to give an age-standardised rate for the population of interest. Finally, this is expressed per 1,000 or 100,000 as appropriate.

## Age-standardised average length of stay

Information on age-standardised ALOS is in Chapter 8. The use of age-standardised ALOS enables comparisons between groups and within groups over time taking into account differences in the age structure and size of the population.

Calculating age-standardised ALOS is a three-step process. Within each population of interest, the crude ALOS for each age category is derived first by dividing the number of patient days for each age category by the corresponding number of hospitalisations. The second step is to calculate the weights using the selected standard population. The weights are derived by dividing the number of hospitalisations for each age category by the overall

total of the standard population. The standard population chosen is the Australian female overnight hospitalisations population in 2009–10 where the principal diagnosis was cancer (ICD-10-AM codes of C00–C97, D45, D47.1 and D47.3). The third step is to multiply the crude ALOS with the corresponding weights and then sum up to obtain the total age-standardised ALOS.

## Confidence intervals

An observed value of a rate may vary due to chance, even where there is no variation in the underlying value of the rate. A confidence interval provides a range of values that has a specified probability of containing the true rate or trend. The 95% ( $p$ -value = 0.05) confidence interval is used in this report, thus, there is a 95% likelihood that the true value of the rate is somewhere within the stated range. Confidence intervals can be used as a guide to whether or not differences are consistent with chance variation. In cases where no values within the confidence intervals overlap, the difference between rates is greater than that which could be explained by chance and is regarded as statistically significant. Note, however, that overlapping confidence intervals do not necessarily mean that the difference between two rates is definitely due to chance. Instead, an overlapping confidence interval represents a difference in rates that is too small to allow differentiation between a real difference and one which is due to chance variation. It can, therefore, only be stated that no statistically significant differences were found, and not that no differences exist. The approximate comparisons presented might understate the statistical significance of some differences, but they are sufficiently accurate for the purposes of this report.

As with all statistical comparisons, care should be exercised in interpreting the results of the comparison of rates. If two rates are statistically significantly different from each other, this means that the difference is unlikely to have arisen by chance. Judgment should, however, be exercised in deciding whether or not the difference is in fact due to chance or whether it is of any practical significance.

The variances of the age-specific rates were calculated by assuming that the counts follow a Poisson distribution, as recommended in Jensen et al. (1991) and Breslow and Day (1987). When the age-specific rates are low relative to the population at risk, the variability in the observed counts is accepted to be Poisson. However, even if the age-specific rates are not low, Poisson distribution is still generally assumed (Brillinger 1986; Eayres et al. 2008).

With one exception, the confidence intervals of the age-standardised rates in this report were calculated using a method developed by Dobson et al. 1991. This method calculates approximate confidence intervals for a weighted sum of Poisson parameters.

The one exception applies to the confidence intervals that were calculated for the international comparisons of incidence and mortality data using GLOBOCAN data. For those data, the lack of the required data meant that the Dobson method could not be used and the AIHW approximated the confidence intervals using the following formula:

$$95\% \text{ CI approximation} = \text{AS rate} \pm 1.96 \times \sqrt{\frac{\text{AS rate}}{\text{Number of cases}}}$$

Since the GLOBOCAN data are based on the estimates of the number of new cases and deaths from cancer, the associated confidence intervals indicate the range of random variation that might be expected, should those estimates be 100% accurate.

Note that statistical independence of observations is assumed in the calculations of the confidence intervals for this report. This assumption may not always be valid for episode-based data (such as data from the National Hospital Morbidity Database).

## Mortality-to-incidence ratio

Both MIRs and relative survival ratios can be used to estimate survival from a particular disease, such as cancer, for a population. Although MIRs are the cruder of the two ratios, MIRs do not have the same comparability and interpretation problems associated with them when attempting to make international comparisons (see Chapter 6). Thus, the MIR is considered to be a better measure when comparing survival between countries.

The MIR is defined as the age-standardised mortality rate divided by the age-standardised incidence rate. For example, an MIR of 0.42 in a given year for all types of cancers means that for every 100 new cancer cases diagnosed that year, there were 42 deaths due to cancer in the same year (though the deaths need not be of the same people as the cases). If people tend to die relatively soon after diagnosis from a particular cancer (that is, the death rate is nearly as high as the incidence rate for that cancer), then the MIR will be close to 1.00. In contrast, if people tend to survive a long time after being diagnosed, then the MIR will be close to zero.

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

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

The incidence and mortality data used to calculate the MIRs in Chapter 4 were extracted from the 2008 GLOBOCAN database (Ferlay et al. 2010).

## Prevalence

Limited-duration prevalence is expressed as *N-year prevalence* throughout this report. *N-year prevalence* on a given index date (31 December 2007), where *N* is any number 1, 2, 3 and so forth, is defined as the number of people alive at the end of that day who had been diagnosed with cancer in the past *N* years. For example:

- One-year prevalence is the number of living people who were diagnosed in the past year to 31 December 2007.
- Five-year prevalence is the number of living people who were diagnosed in the past 5 years to 31 December 2007. This includes the people defined by 1-year prevalence.

In this report, 26-year prevalence is the longest duration that can be calculated based on the earliest (1982) and latest (2007) years of available incidence data. People who were diagnosed with cancer between 1982 and 2007 and who were alive on 31 December 2007 would be counted in 26-year prevalence. It is presented in this report as an approximation of the number of people alive who have ever been diagnosed with cancer, known as *complete prevalence*. Limited-duration prevalence was selected given its advantages in the ease of

interpretation and calculation. Twenty-six years was deemed a sufficiently long period for approximating complete prevalence, especially given that most cancers are diagnosed in the later years of life.

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

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

Differences in limited-duration prevalence are presented according to age in the report. Note that while age for survival and incidence statistics refers to the age at diagnosis, prevalence age refers to the age at the point in time from which prevalence was calculated, or 31 December 2007, in this report. Therefore, a person diagnosed with cancer in 1982 when they turned 50 that year would be counted as age 75 in the prevalence statistics (as at the end of 2007).

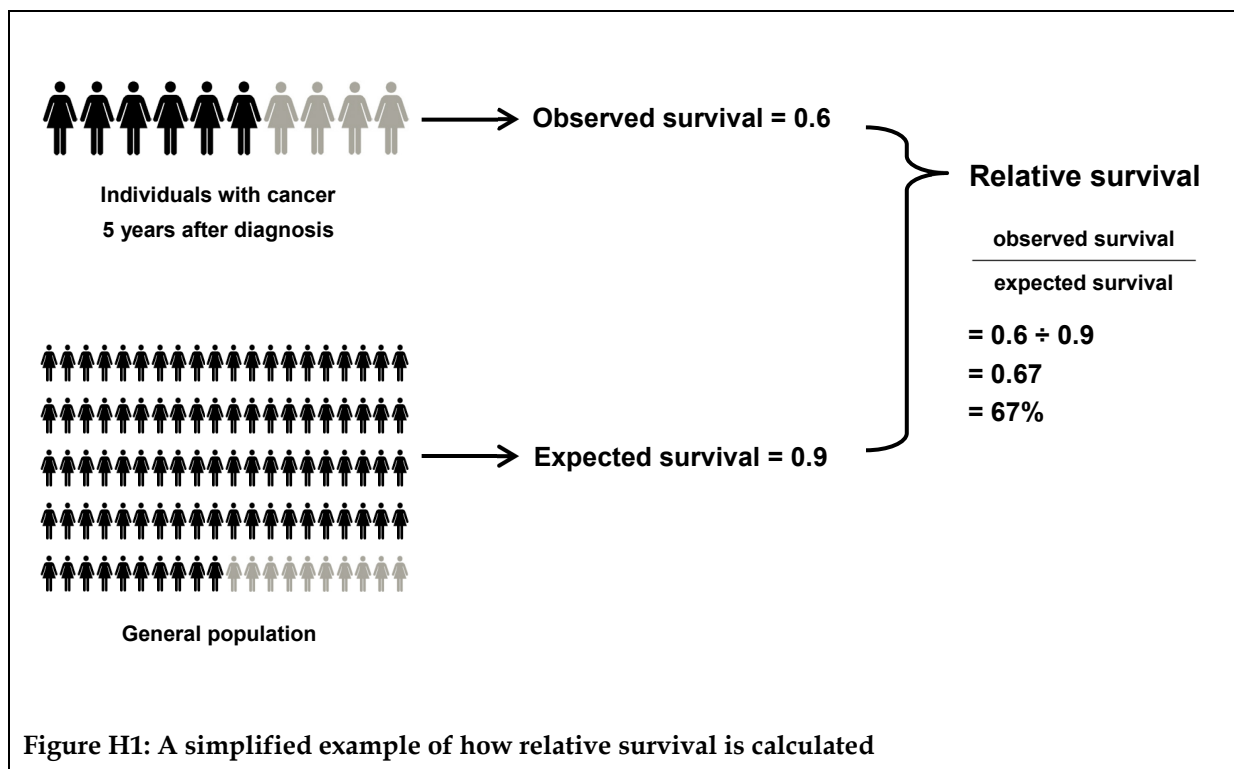
## Relative survival

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

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

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

A simplified example of how relative survival is interpreted is shown in Figure H1. Given that 6 in 10 people with cancer are alive 5 years after their diagnosis (observed survival of 0.6) and that 9 in 10 people from the general population are alive after the same 5 years (expected survival of 0.9), the relative survival of people with cancer would be calculated as 0.6 divided by 0.9, or 0.67. This means that individuals with cancer are 67% as likely to be alive for at least 5 years after their diagnosis compared with their counterparts in the general population.



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

The survival analysis was based on records of primary and invasive cancers diagnosed between 1982 and 2007. At the time of analysis, these cases had been followed for deaths (from any cause) to the end of 2010. Therefore, the censor date selected for survival analysis was 31 December 2010.

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

The main follow-up period in this report was for the 5-year period 2006–2010, which was used for the most up-to-date estimates of survival by age, histological subtype, remoteness and socioeconomic status.

Trends are also analysed by five periods of follow-up: 1982–1987, 1988–1993, 1994–1999, 2000–2005 and 2006–2010. In each period, 5 or 6 years of follow-up have been combined to draw upon a greater number of cases to produce more precise estimates.

All survival statistics in this report were produced using SAS statistical software and calculated using software written by Dickman (2004). Further details on the approach used

to calculate the relative survival estimates, including rules which were applied during data preparation, are in AIHW publication *Cancer survival and prevalence in Australia: period estimates from 1982 to 2010* (AIHW 2012d).

## Risk to age 75 or 85

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

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

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

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

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

Where the rate is expressed as a percentage.

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

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

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



# Appendix I Data sources

To provide a comprehensive picture of national cancer statistics in this report, a range of data sources were used, including AIHW and external data sources. These data sources are described in this appendix.

## Australian Cancer Database

The Australian Cancer Database (ACD) is a database that holds information about 2.2 million cancer cases of Australians who were diagnosed with cancer (other than basal cell and squamous cell carcinomas of the skin) between 1982 and 2009. Data from this source are used in Chapters 2, 4 and 5.

The AIHW compiles and maintains the ACD, in partnership with the AACR, whose member registries provide data to the AIHW on an annual basis. Each Australian state and territory has legislation that makes the reporting of all cancers (excluding basal cell and squamous cell carcinomas of the skin) mandatory. Pathology laboratories and Registrars of Births, Deaths and Marriages across Australia must report on cancer cases, as do hospitals, radiation oncology units and nursing homes in some (but not all) jurisdictions.

The earliest cancer registries have been operating since 1972 but it was not until 1982 that cancer registration was nearly universal in Australia, the only jurisdictions missing being the Northern Territory and the Australian Capital Territory. These two territories were registering cancers from before 1982 but the legislation making notification compulsory was not enacted until later, so that Northern Territory registrations are considered complete from 1991 and Australian Capital Territory registrations from 1994.

The data provided to the AIHW by the state and territory cancer registries include, at a minimum, an agreed set of items that provide information about the individual with the cancer and the characteristics of the cancer (see Table I1). In addition to the agreed set of items, registries often provide other data which are also included in the ACD. For example, data on ductal carcinoma in situ (DCIS) of the breast are not part of the agreed ACD data set but are regularly provided by the state and territory registries.

Once the data are received from the state and territory cancer registries, the AIHW assembles the data into the ACD. Internal linking checks are undertaken to identify those who had tumours diagnosed in more than one state or territory; this process reduces the degree of duplication within the ACD to a negligible amount. The ACD is also linked with information on deaths (from the National Death Index) to add the date of death for those people who have died (from any cause). Any conflicting information and other issues with the cancer data are resolved through consultation with the relevant state or territory cancer registry.

The registration of cases of cancer is a dynamic process such that records in the state and territory cancer registries may be modified if new information is received. Thus, records in the cancer registries are always open and updated as required. For these changes to be incorporated into the ACD, a new complete file for all years of cancer data is provided by each of the jurisdictions annually. As a result, the number of cancer cases reported by the AIHW for any particular year may change slightly over time and, in addition, data published by a cancer registry at a certain point in time may differ to some extent from what is published by the AIHW (AIHW 2009).

The data in the ACD are protected physically, electronically with built-in computer security systems and legislatively under the *Australian Institute of Health and Welfare Act 1987* as well as under agreements with the state and territory cancer registries. More information about physical security and legislative protection of the ACD is in the National Cancer Statistics Clearing House protocol (AIHW 2009).

**Table I1: Agreed set of items to be provided by the states and territories to the AIHW for inclusion in the Australian Cancer Database**

Person-level attributes	Tumour-level attributes
Person identification number (assigned by the state/territory)	Tumour identification number (assigned by the state/territory)
Surname	Date of diagnosis
First given name	Date of diagnosis accuracy indicator
Second given name	ICD-O-3 <sup>(a)</sup> topography code
Third given name	ICD-O-3 <sup>(a)</sup> morphology code
Sex	ICD-10 <sup>(b)</sup> disease code
Date of birth	Most valid basis of diagnosis
Date of birth accuracy indicator	Statistical local area at diagnosis
Indigenous status	Postcode at diagnosis
Country of birth	Melanoma thickness (mm)
Date of death	Breast tumour size (mm)
Cause of death	

(a) International Classification of Diseases for Oncology, 3rd edition.

(b) International Statistical Classification of Diseases and Related Health Problems, Tenth Revision.

Source: AIHW 2009.

## Non-melanoma skin cancers

Data on all types of cancer, other than two types of non-melanoma skin cancer (NMSC), are reportable and collected by the state and territory registries. The two most common types of NMSC – basal cell carcinoma and squamous cell carcinoma – are not reportable and are thus not generally recorded in cancer registries in Australia. These two types of skin cancers are by far the most frequently diagnosed cancers in Australia for both males and females (AIHW & CA 2008). A number of other, rarer types of cancer also fall within the NMSC category (for example, Merkel cell carcinoma). These are reportable cancers and hence do occur in the ACD.

## Data Quality Statement: Australian Cancer Database 2009

### Important note

To avoid excessive repetition in what follows, the word 'cancer' is used to mean 'cancer, excluding basal cell carcinomas of the skin and squamous cell carcinomas of the skin'. In most states and territories these two very common skin cancers are not notifiable diseases and as such are not in the scope of the Australian Cancer Database (ACD).

## Summary of key issues

- All states and territories maintain a population-based cancer registry to which all cancer cases and deaths must be reported.
- The Australian Institute of Health and Welfare (AIHW) compiles the ACD using information from state and territory registers.
- Some duplication may occur where the same person and cancer have been registered in two or more jurisdictions. The AIHW provisionally resolves these instances and notifies the relevant states and territories of possible duplicates. Full resolution has usually occurred by the following year's version of the ACD.
- The level of duplication is small, about 0.17% of all records.
- Cancer registry databases change every day, adding new records and improving the quality of existing records as new information becomes available. Information on ACD records may therefore change from year to year.

## Description

All states and territories have legislation that makes cancer a notifiable disease. All hospitals, pathology laboratories, radiotherapy centres and registries of births, deaths and marriages must report cancer cases and deaths to the state or territory population-based cancer registry.

Each registry supplies incidence data annually to the AIHW under an agreement between the registries and the AIHW. These data are compiled into the ACD, the only repository of national cancer incidence data.

## Institutional environment

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national datasets based on data from each jurisdiction, to analyse these datasets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance to the *Privacy Act 1988* (Cwlth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information, see the AIHW website <[www.aihw.gov.au](http://www.aihw.gov.au)>.

The AIHW has been maintaining the ACD since 1986.

### **Timeliness**

**This data quality statement refers to the 2009 version of the ACD, which contains data on all cancer cases diagnosed between 1982 and 2009. However, the number of cases in 2009 for New South Wales and the Australian Capital Territory was estimated (see 'Accuracy' section below).**

Each jurisdictional cancer registry supplies data annually to the AIHW. Because each jurisdiction operates on its own data compilation and reporting cycle, the ACD cannot be fully compiled until the final jurisdiction supplies its data.

It generally takes a year or more for the state and territory cancer registries to fully process and release their latest full-year of cancer data to the AIHW. Once the AIHW receives all the data sets from cancer registries, time is needed to check for data consistency and to deduplicate the data before the new version of the ACD is available for reporting purposes.

### **Accessibility**

The AIHW website provides cancer incidence and mortality data that can be downloaded without charge. Numerous reports, including the biennial *Cancer in Australia*, are published and are available on the AIHW website where they can also be downloaded without charge. Users can request data not available online or in reports via the Cancer and Screening Unit of the AIHW on (02) 6244 1000 or via email to <cancer@aihw.gov.au>. Requests that take longer than half an hour to compile are charged on a cost-recovery basis. General enquiries about AIHW publications can be made to the Communications, Media and Marketing Unit on (02) 6244 1032 or via email to <info@aihw.gov.au>.

Researchers following a cohort of people enrolled in a longitudinal study of health outcomes can request the AIHW to undertake data linkage of their cohort to the ACD. Such requests must be approved by the AIHW Ethics Committee as well as the ethics committees governing access to the state and territory cancer registries.

### **Interpretability**

Information on the ACD is available on the AIHW website.

While numbers of new cancers are easy to interpret, other statistical calculations (for example, calculations of age-standardised rates and confidence intervals) are more complex and their concepts may be confusing to some users. In most publications there is an appendix on statistical methods as well as technical notes.

### **Relevance**

The ACD is highly relevant for monitoring trends in cancer incidence. The data are used for many purposes, such as by policy makers to evaluate health intervention programs and as background data for health labour force planning and health expenditure; by pharmaceutical companies to assess the size of the market for new drugs; by researchers to explore the epidemiology of cancer; and by insurance companies to evaluate the risk of people being diagnosed with cancer.

The ACD contains information on all reported cancer cases and deaths in Australia. Data can be provided at state and territory level and at Remoteness Area level.

The 3rd edition of the International Classification of Diseases for Oncology (ICD-O-3) is used to classify cancer cases. Data can also be classified according to the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10).

The ACD also contains the name and date of birth of each person diagnosed with cancer. This allows researchers who have enrolled people in a study to link their database to the ACD to find out which of their study subjects have been diagnosed with cancer, what kind of cancer, and when. (Such data linkage can only be undertaken after receiving approvals from various ethics committees.) This kind of research gives insight into cancer risk factors. Data linkage is also undertaken when a researcher has been contracted to investigate a potential cancer cluster in a workplace or small area.

### **Accuracy**

The 1982–2009 data files for New South Wales and the Australian Capital Territory were not available for inclusion in the 2009 version of the ACD. An extended delay of the receipt of mortality data has meant that New South Wales and the Australian Capital Territory have not been able to close off their 2009 data sets. As a consequence, 2009 cancer data for these jurisdictions are not available for reporting purposes. The 2009 incidence data for New South Wales and the Australian Capital Territory were estimated by the AIHW in consultation with New South Wales and the Australian Capital Territory cancer registries. The estimates were combined with the actual data supplied by these two jurisdictions for the 2008 ACD to form their 1982–2009 data sets for inclusion in the 2009 ACD. Although the estimation procedure has been shown to be reasonably accurate for estimating overall cancer incidence, its accuracy with respect to individual cancers will vary. As New South Wales and the Australian Capital Territory make up about a third of Australia's population, the national incidence data for 2009 is likely to be somewhat inaccurate for some individual cancers – which cancers these are is not predictable.

It is anticipated that future versions of the ACD will include 2009 actual data for New South Wales and the Australian Capital Territory and the data will then be made available in subsequent cancer publications.

The publication *Cancer incidence in five continents* is issued about every 5 years as a collaborative effort by the International Agency for Research on Cancer (IARC) and the worldwide network of cancer registries. Australia's cancer registries continue to pass IARC's numerous tests for data quality. Details of the tests and Australia's cancer registries' results are in the above-mentioned book and the registries' annual incidence reports.

Each year, when all the registries' new data have been compiled into the new ACD, a data linkage process called the national deduplication is undertaken. This process detects instances where the same person and cancer have been registered in two or more jurisdictions. This could happen, for example, when a person attends hospitals in different jurisdictions. All such instances are provisionally resolved at the AIHW by removing one record and the relevant jurisdictions are notified so that they can determine in which jurisdiction the person was a usual resident at the time of diagnosis. Their resolution will flow through to the ACD in the next year's data supply. In recent years the national deduplication has resulted in the removal of about 3,500 records from the ACD, which is about 0.17% of all records supplied by the jurisdictions.

While all state and territory cancer registries collect information on Indigenous status, in some jurisdictions the level of identification of Indigenous Australians is considered to be insufficient to enable analysis. Data for four states and territories – New South Wales,

Queensland, Western Australia and the Northern Territory – are considered suitable for analysis.

Cancer registry databases change every day, and not just because new records are added. Existing records are changed if new, more precise, information about the diagnosis becomes available. Also, any typographical errors that are discovered by routine data checking procedures are corrected by referring to the source documentation. Finally, existing records can be deleted if it is discovered that the initial diagnosis of cancer was incorrect (for example, the tumour was benign) or the person is found to be not a resident of that state or territory. As a result, the number of cancer cases reported by AIHW for any particular year may change slightly over time, and data published by a cancer registry at a certain point may differ slightly from what is published by the AIHW at a different time.

### **Coherence**

Cancer data are reported and published annually by the AIHW. While there are sometimes changes to coding for particular cancers, it is possible to map coding changes to make meaningful comparisons over time.

## **BreastScreen Australia Program data**

Data from BreastScreen Australia were used in Chapter 9 to indicate the number of women who had a screening mammogram and the number of cancers detected through BreastScreen Australia. These data are supplied annually to the AIHW by state and territory BreastScreen programs for monitoring purposes. They are compiled by the AIHW and reports are produced annually (AIHW 2012c). Mortality data came from the AIHW's National Mortality Database.

### **Data Quality Statement: BreastScreen Australia data 2009–2010**

#### **Summary of key issues**

- All states and territories maintain a population-based BreastScreen register which records the data collected during a woman's contact with a BreastScreen service.
- The Australian Institute of Health and Welfare (AIHW) compiles BreastScreen Australia data supplied from state and territory BreastScreen registers in order to monitor BreastScreen Australia annually at a national level.
- State and territory BreastScreen registers change every day, adding new records and improving the quality of existing records as new information becomes available. BreastScreen Australia data may therefore change from year to year.
- For 2009–2010 data, New South Wales data are not available for participation by main language spoken at home, rescreening, recall to assessment, invasive breast cancer and DCIS detection and sensitivity due to issues relating to the implementation of a new Business Information System in NSW. It is anticipated that future reports will include data for these years.

#### **Description**

BreastScreen Australia is Australia's national, population-based breast cancer screening program and is a joint program of the Australian and state and territory governments.

BreastScreen registers in each state and territory record data collected during a woman's contact with a BreastScreen service.

Each BreastScreen program supplies BreastScreen data annually to the AIHW. These data are compiled into the BreastScreen Australia database, held at the AIHW to enable national monitoring of BreastScreen Australia.

Some BreastScreen data are supplied as aggregate data, which are not included in the BreastScreen Australia database.

### **Institutional environment**

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national datasets based on data from each jurisdiction, to analyse these datasets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance to the *Privacy Act 1988* (Cwlth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information, see the AIHW website <[www.aihw.gov.au](http://www.aihw.gov.au)>.

The AIHW has been receiving BreastScreen data since 1996.

### **Timeliness**

BreastScreen data are available within about 6–12 months (it can take up to 6–12 months for final pathology results on all breast tissue samples to be received by BreastScreen registers). The BreastScreen Australia database cannot be fully compiled until the final jurisdiction supplies its data.

Participation data for the previous calendar year are supplied in July each year; rescreening and invasive breast cancer and DCIS detection data for the previous calendar year are supplied July–December each year (rescreening and sensitivity data lag behind, as the specifications for these require a specified period of time to pass before they can be accurately calculated).

The current BreastScreen Australia database contains data on women who participated in BreastScreen Australia between 1996 and 2010.

## **Accessibility**

BreastScreen Australia data are published annually in the *BreastScreen Australia monitoring report* available on the AIHW website <<http://www.aihw.gov.au/breast-cancer-screening/>>, where they can be downloaded without charge. Supplementary data tables that provide more detailed data are also provided to accompany each report, and these, too, are available on the AIHW website where they can be downloaded without charge.

General enquiries about AIHW publications can be made to the Communications, Media and Marketing Unit on (02) 6244 1032 or via email to <[info@aihw.gov.au](mailto:info@aihw.gov.au)>.

## **Interpretability**

While many concepts in the *BreastScreen Australia monitoring report* are easy to interpret, other concepts and statistical calculations are more complex. All concepts are explained within the body of the report presenting these data, along with footnotes to provide further details and caveats. Appendix C provides additional detail on the data sources and classifications, and Appendix E provides details on the statistical methods used.

## **Relevance**

Breast cancer screening data are highly relevant for monitoring trends in breast screening participation and the detection of invasive breast cancer and DCIS, as well as other measures of program performance, such as recall rates and sensitivity measures. The data are used for many purposes by policy makers and researchers, but are supplied and analysed specifically to monitor and inform BreastScreen Australia.

## **Accuracy**

All data provided by state and territory BreastScreen programs, once analysed, are supplied back for verification.

Women attending a BreastScreen service are able to self-report Aboriginal and Torres Strait Islander status; this database field is therefore considered to be of high quality. However, use of the 'not stated' category has decreased substantially over time, which provides much more accurate data on current participation in BreastScreen Australia by Aboriginal and Torres Strait Islander status, but makes trend data difficult to interpret.

State and territory BreastScreen databases change every day, and not just because new records are added; existing records are changed if new, more precise information becomes available or if typographical errors are discovered by routine data checking procedures. As a result, the number of women participating, as well as DCIS and invasive breast cancer cases reported by the AIHW for any particular year, may change slightly over time, and data published by a jurisdictional BreastScreen program at a certain point may differ slightly from what is published by the AIHW at a different time.

## **Coherence**

BreastScreen data are reported and published annually by the AIHW.

For 2009–2010 data, New South Wales data are not available for participation by main language spoken at home, rescreening, recall to assessment, invasive breast cancer and DCIS detection and sensitivity due to issues relating to the implementation of a new Business Information System in that state. It is anticipated that future reports will include data for these years.



## Burden of disease data

Information on the burden of disease from selected cancer sites and all cancers combined is in Chapter 7 of this report.

The first study that provided an overview of disease and injury burden in Australia was published in 1999 (AIHW: Mathers et al. 1999). The second and most recent study was published in 2007 and provides burden of disease information in relation to 2003 as well as backwards and forwards projections from 1993 to 2023 (Begg et al. 2007). The summary measure used in that study is the disability-adjusted life year, or DALY, with this term used interchangeably with 'burden of disease'. The DALY quantifies the gap between a population's actual health status and some 'ideal' or reference status, with time (either lived in health states or lost through premature death and illness) being the unifying 'currency' for combining the impact of mortality and non-fatal health outcomes.

A DALY for a disease or health condition is calculated as the sum of the years of life lost due to premature mortality (YLL) in the population and the equivalent 'healthy' years lost due to disability (YLD) for incident cases of the health condition such that:

$$\text{DALY} = \text{YLL} + \text{YLD}$$

where

YLL = number of deaths x standard life expectancy at age of death, and

YLD = incidence x duration x severity weight.

Further information about how the DALY was derived, as well as further information on interpretation of burden of disease data, is in Begg et al. (2007).

This report presents the projected burden of disease due to cancer for 2012. These data were estimated by Begg and associates using data on the burden of cancer over the period from 1979 to 2003. More information about how these projection estimates were derived is in the report by Begg and associates (Begg et al. 2007).

In the burden of disease study, some cancer groupings are defined differently from that used in most other sections of this report. Table I2 summarises the cancer groupings used in the report by Begg and associates and their respective ICD-10 codes.

**Table I2: Cancer groupings and ICD-10 codes used for calculation of burden of disease**

<b>Cancer site/type</b>	<b>ICD-10 codes</b>
Mouth and oropharynx cancers	C00–C14
Oesophagus cancer	C15
Stomach cancer	C16
Colorectal cancer	C18–C21
Liver cancer <sup>(a)</sup>	C22
Gallbladder cancer	C23–C24
Pancreas cancer	C25
Larynx cancer	C32
Lung cancer	C33–C34
Bone and connective tissue cancer	C40–C41, C49
Melanoma of the skin	C43
Non-melanoma skin cancers	C44
Breast cancer <sup>(b)</sup>	C50
Cervix cancer	C53
Corpus uteri cancer	C54
Ovary cancer	C56, C57.0–C57.4
Prostate cancer	C61
Testicular cancer	C62
Kidney cancer	C64–C66, C68
Bladder cancer	C67
Eye cancer	C69
Brain cancer	C71
Thyroid cancer	C73
Lymphoma	C81–C85, C96
Multiple myeloma	C88–C90
Leukaemia	C91–C95
Other malignant neoplasms	C17, C26–C31, C37–C39, C45–C48, C51–C52, C57.7–C57.9, C58–C60, C36, C70, C72, C74–C75
<b>All cancers</b>	<b>C00–C96</b>

(a) Excluding hepatitis B- and C-related liver cancer.

(b) Pertains to breast cancer in females only.

Source: Begg et al. 2007.

## GLOBOCAN

One of the main sources of internationally comparable data on cancer is the GLOBOCAN database which is prepared by the IARC (Ferlay et al. 2010). The IARC collates cancer incidence and mortality data from cancer registries around the world and uses those data to produce estimates for a 'common year'. The most recent GLOBOCAN estimates for which data could be obtained are for 2008. GLOBOCAN data are in Chapters 2, 3 and 4 of this report for all cancers combined.

For the GLOBOCAN data, all cancers combined were defined as those coded as 'C00 to C97' in ICD-10, with the exception of code C44 which indicates non-melanoma skin cancer. Thus the definition used in those data is different from that used in most other sections of this report.

In the GLOBOCAN database, age-standardised incidence and mortality rates are provided, with the data standardised to the 1966 WHO World Standard Population.

The database does not include confidence intervals. To provide some guidance on whether the differences were statistically significant, the AIHW calculated 'approximate' confidence intervals (with the methodology for doing so explained in Appendix H).

## **National Bowel Cancer Screening Program data**

Data from the National Bowel Cancer Screening Register were used in Chapter 9 to indicate the number of persons who participated in the National Bowel Cancer Screening Program (NBCSP) as well as to indicate the number of bowel cancers detected through the program. These data are supplied twice a year to the AIHW by the Department of Human Services (formerly Medicare Australia) for monitoring purposes. They are compiled by the AIHW and reports are produced annually (AIHW 2012f).

### **Data Quality Statement: National Bowel Cancer Screening Program screening data: July 2008–June 2011**

#### **Summary of key issues**

- The National Bowel Cancer Screening Program (NBCSP) is a joint program of the Australian Government Department of Health and Ageing and state and territory governments. The NBCSP is monitored annually by the Australian Institute of Health and Welfare (AIHW). Results are compiled and reported at the national level by the AIHW in an annual NBCSP monitoring report.
- NBCSP data depend on the return of data forms from participants, general practitioners, colonoscopists and pathologists to the NBCSP register. The register is maintained by Medicare Australia. Data from the register are provided to the AIHW every 6 months as de-identified unit record data.
- Analysis of remoteness and socioeconomic status are based on postcode of residential address of NBCSP invitees at the time of screening. Concordances for these disaggregations may be unavoidably older than the year(s) of screening data being reported, leading to inaccuracies.
- Aboriginal and Torres Strait Islander, language and disability status are self-reported by participating individuals.
- Exclusion of people screened outside the NBCSP will result in an underestimation of population screening rates in the target ages.
- Data return for later stages in the NBCSP screening pathway (GP, colonoscopy and pathology follow-up, as required) is not mandatory. Further, not all people who received a positive (abnormal) screening result may have had time to complete follow-up steps at the time of reporting. These factors may result in under-reporting of outcome data.

- Data may be suppressed for confidentiality and reliability reasons (for example, if the denominator is less than 1,000, the numerator is less than 5, or the rate could not be sensibly estimated).

### **Description**

The NBCSP is a joint program of the Australian Government Department of Health and Ageing and state and territory governments. It started in 2006 and uses national invitation and screening analysis processes. A 'usual care' model is then used for follow-up functions for those with a positive (abnormal) screening result; that is, these people are encouraged to see their doctor to discuss the test result and seek further diagnostic testing (such as colonoscopy) as required. Data from these follow-up functions are returned to the national NBCSP register via non-mandatory form return.

Currently those Australians registered at Medicare Australia or the Department of Veterans' Affairs receive a screening invitation at, or around, their 50th, 55th and 65th birthdays. From 2013 the program will also include people aged 60, and from 2015 those aged 70. The program will be further expanded in 2017-18 with a phased roll out of biennial screening for those aged 50-74.

NBCSP data depend on the return of data forms from participants, general practitioners, colonoscopists and pathologists to the NBCSP register. The register is maintained by Medicare Australia. Data from the register are provided to the AIHW every 6 months as de-identified unit record data.

The NBCSP is monitored annually by the AIHW. Results are compiled and reported at the national level by the AIHW in an annual NBCSP monitoring report.

### **Institutional environment**

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance to the *Privacy Act 1988* (Cwlth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information, see the AIHW website <[www.aihw.gov.au](http://www.aihw.gov.au)>.

The AIHW has been receiving NBCSP screening data since 2006.

## **Timeliness**

The data discussed in this data quality statement are for the period July 2008–June 2011.

A snapshot of all NBCSP activity is made available to the AIHW regularly at 6-month intervals for analysis. However, as there is a time lag between issuing invitations and confirmed diagnosis of bowel cancer, the monitoring reports are based on outcomes of a cohort of people sent invitations in a given period – this is usually cut off about 6 months before the date of the data supply to allow for sufficient follow-up data for analysis.

Therefore, the NBCSP data held at the AIHW at any given time is about 6 months behind the current date.

## **Accessibility**

The NBCSP annual monitoring reports, and any supplementary data, are available via the AIHW website where they can be downloaded without charge. Users can request data not available online or in reports via the Cancer and Screening Unit of the AIHW on (02) 6244 1000 or via email to <screening@aihw.gov.au>. Requests that take longer than half an hour to compile are charged on a cost-recovery basis. General enquiries about AIHW publications can be made to the Communications, Media and Marketing Unit on (02) 6244 1032 or via email to <info@aihw.gov.au>.

General enquiries about AIHW publications can be made to the Communications, Media and Marketing Unit on (02) 6244 1032 or via email to <info@aihw.gov.au>.

## **Interpretability**

While the concept of participation in the NBCSP is easy to interpret, the NBCSP screening pathway and other concepts and statistical calculations are more complex and may be confusing to some users. All concepts are explained within the body of the reports presenting these data, along with footnotes to provide further details and caveats. The appendices provide additional detail on the data sources and classifications, and on the statistical methods used.

## **Relevance**

NBCSP screening data are highly relevant for monitoring trends and outcomes from NBCSP screening participation. It is important to note that additional bowel cancer screening is undertaken outside the NBCSP. Data on people screened outside the program are not routinely collected, therefore, the level of underestimation of overall bowel cancer screening in Australia is unknown.

Socioeconomic status Index of Relative Socio-economic Disadvantage (IRSD) rankings are calculated by postal area (POA) using a population-based method at the Australia-wide level. These ranked socioeconomic status POAs are then allocated to their relevant jurisdiction, meaning quintiles should contain similar socioeconomic groups across jurisdictions.

## **Accuracy**

Self-reporting of Aboriginal and Torres Strait Islander, language spoken at home and disability status within the program means these data are dependent on accurate, and complete, information.

Socioeconomic status Index of Relative Socio-economic Disadvantage (IRSD) rankings are only measured at the time of the census and are not available for about 18 months from the census date. Consequently, socioeconomic status for a geographic area may be up to 6 years out of date and not an accurate representation of the status of residents at the time the data is analysed.

An Australian Bureau of Statistics POA to remoteness concordance and a POA to socioeconomic status concordance are used to allocate persons screened to remoteness and socioeconomic status categories based on their postcode of residence. Postal areas are defined to match Australia Post postcodes as closely as possible, but for various reasons, they do not match identically. Socioeconomic status is calculated using a population-based method at the Australia-wide level.

The remoteness (and socioeconomic status) to POA concordances are based on postal areas, boundaries and classifications as at the year of the last Australian census, which may have been up to 5 years earlier, and boundaries, socioeconomic status and remoteness regions may have changed over time, creating inaccuracies. New postal areas defined since the last census will not have valid remoteness or socioeconomic status concordance data available as they will not match the old postal areas.

NBCSP outcome data is via non-mandatory form return from GP visits, colonoscopy, histopathology, adverse events and surgical resection. The level of form return is unknown, therefore, there is an unknown amount of missing outcome data, which needs to be taken into consideration when reviewing NBCSP outcome analyses.

The data used in NBCSP monitoring reports allows for 6 months of follow-up time post-invitation. However, this may not be enough time for all people who had a positive screening result to have completed the screening pathway and had outcomes returned to the Register. This may also result in some under-reporting of outcome data.

Some data cells have been suppressed for confidentiality and reliability reasons (for example, if the denominator is less than 1,000, the numerator is less than 5, or the rate could not be sensibly estimated).

### **Coherence**

NBCSP screening data are reported and published annually by the AIHW. Changes in reporting practices over time are clearly noted throughout the monitoring reports. In future, the addition of extra screening ages and biennial rescreening are expected to affect results in most areas of the screening pathway.

## **National Cervical Screening Program data**

Data from the National Cervical Screening Program were used in Chapter 9 to indicate the number of women who participated and the number of high-grade cervical abnormalities detected through the program. Participation data are supplied to the AIHW by state and territory cervical screening programs and include all women screened in each jurisdiction, not just those women resident in each jurisdiction (AIHW 2012e). The two exceptions to this are Victoria, which only supplies data on women resident in Victoria, and the Australian Capital Territory, which only registers women resident in the Australian Capital Territory. Incidence data came from the Australian Cancer Database.

## Data Quality Statement: cervical screening data

### Summary of key issues

- All states and territories maintain a population-based cervical cytology register (also referred to as 'Pap test registers' or 'Pap smear registers') to which all cervical cytology, histology, and human papillomavirus (HPV) DNA tests are reported.
- State and territory cervical cytology registers were established to support the National Cervical Screening Program (NCSP) which began in 1991.
- The Australian Institute of Health and Welfare (AIHW) compiles cervical screening data using aggregate data supplied from state and territory cervical cytology registers in order to monitor the NCSP annually.
- Some duplication may occur where the same test is reported to the cervical cytology data in two or more jurisdictions. The AIHW is unable to identify or resolve these instances, and although the level of duplication is unknown, it is believed to be small.
- Cervical cytology register databases change every day, adding new records and improving the quality of existing records as new information becomes available.

### Description

All states and territories have legislation that requires pathology laboratories to send all cervical tests to the relevant state or territory population-based cervical cytology register.

Cervical screening programs in each state and territory interrogate their own cervical cytology register in accordance with detailed data specifications to supply aggregate data annually to the AIHW. These data are compiled into the only repository of national cervical screening data, although because these are aggregate and not unit record data, these data do not exist in a database *per se*, and cannot be interrogated further.

### Institutional environment

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national datasets based on data from each jurisdiction, to analyse these datasets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance to the *Privacy Act 1988* (Cwlth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information, see the AIHW website <[www.aihw.gov.au](http://www.aihw.gov.au)>.

The AIHW has been receiving cervical screening data since 1989.

### **Timeliness**

Cervical cytology data are available within about 6 months (there can be a lag of up to 6 months in the transmission of test results from pathology laboratories to cervical cytology registers), and data for the previous calendar year are supplied in July each year (rescreening and correlation data lag behind, as the specifications for these require a specified period of time to pass before this can be accurately calculated).

The current cervical screening data contains all cytology and histology tests performed in 2010.

### **Accessibility**

Cervical screening data are published annually in the report *Cervical screening in Australia*, available on the AIHW website <<http://www.aihw.gov.au/cervical-cancer-screening/>> where they can be downloaded without charge. Supplementary data tables that provide more detailed data are also provided to accompany each report, and these, too, are available on the AIHW website where they can be downloaded without charge.

General enquiries about AIHW publications can be made to the Communications, Media and Marketing Unit on (02) 6244 1032 or via email to <[info@aihw.gov.au](mailto:info@aihw.gov.au)>.

### **Interpretability**

While many concepts in the report *Cervical screening in Australia* are easy to interpret, other concepts and statistical calculations are more complex and may be confusing to some users. All concepts are explained within the body of the report presenting these data, along with footnotes to provide further details and caveats. Appendix C provides additional detail on the data sources and classifications, and Appendix E provides details on the statistical methods used.

### **Relevance**

Cervical screening data are highly relevant for monitoring trends in cervical screening participation and abnormality detection trends. The data are used for many purposes by policy makers and researchers, but are supplied and analysed specifically to monitor and inform the NCSP.

### **Accuracy**

All data provided by state and territory cervical screening programs, once analysed, are supplied back for verification.

Further, the National Pathology Accreditation Advisory Council (NPAAC) *Performance Measures for Australian Laboratories Reporting Cervical Cytology* allow some cervical screening data compiled and reported by the AIHW to be compared with data that are also sourced from state and territory cervical cytology registers for a different purpose.



## Coherence

Cervical screening data are reported and published annually by the AIHW. Changes in reporting practices over time are clearly noted throughout the reports.

## National Death Index

Cancer incidence data were linked to the National Death Index (NDI) to provide survival and prevalence information (Chapters 4 and 5). The NDI is a database that is maintained by the AIHW, and it contains information on all deaths in Australia since 1980.

The NDI database comprises the following variables for each deceased person: name, alternative names (including maiden names), date of birth (or estimated year of birth), age at death, sex, date of death, marital status, Aboriginal and Torres Strait Islander status, and state or territory of registration. Cause of death information in a coded form is also available. For records to 1996, only the code for underlying cause of death is available. For records from 1997, the codes for the underlying cause of death and all other causes of death mentioned on the death certificate are available.

This database exists solely for research linkage purposes, such as to gain epidemiological mortality information on individuals in a particular cohort, or with a known disease state. Ethics approval is required for the NDI to be used for any particular research project.

## Data Quality Statement: National Death Index

### Summary of key issues

- Deaths occurring in Australia are registered and maintained by the Registrars of Births, Deaths and Marriages in each state and territory. These registration details are then provided to the Australian Institute of Health and Welfare (AIHW) and are assumed to be as correct as possible. The AIHW has no ability to confirm the correctness and completeness of these data.
- It is expected that some death registration details may contain errors and some information that is critical might be missing. The AIHW uses a probabilistic data linking technique to link researchers' data to the NDI. Consequently, the linkage result is an indication or index of death, rather than an absolute fact of death.
- Incorrect linkages can result because of errors or incorrect details in personal information supplied when deaths are registered. Examples of such errors are: the changed surname when women marry is not provided; given names are transposed, incorrectly spelt, or partly replaced by nicknames; the date of birth is wrong, the birth day of an elderly relative might be known, but not the year of birth.
- Linkages are tailored to the needs of the researcher, in terms of the matching tightness.

### Description

The NDI is a database, housed at the AIHW, which contains records of all deaths occurring in Australia since 1980. The data are obtained from the Registrars of Births, Deaths and Marriages in each state and territory. The Index is designed to facilitate the conduct of epidemiological studies and its use is strictly confined to medical research.

Researchers undertaking such studies need to follow up groups of persons who, for example take part in clinical trials, or who have suffered from particular diseases, or are known to

have been exposed to specific hazards, in order to determine, whether death has occurred, and if so to analyse the survival rate and causes of death.

Each Registry records only those deaths that occur in its own state or territory, and if a person dies in a state or territory other than the one in which the circumstances being studied were experienced, without the NDI the researchers would have to contact every Registry to determine whether or not a death has been registered.

### **Institutional environment**

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national datasets based on data from each jurisdiction, to analyse these datasets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance to the *Privacy Act 1988* (Cwlth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information see the AIHW website <[www.aihw.gov.au](http://www.aihw.gov.au)>.

### **Timeliness**

The Registrars of Births, Deaths and Marriages in each state and territory provide to the AIHW on a monthly basis, the details of deaths registered in a given month, as soon as that month ends, usually within the first two weeks of the following month.

In most cases, deaths that were registered in a given month did happen in that month, however some deaths are registered many years after death occurs, for example in cases when the remains are found.

Cause of death information is derived from the National Mortality Database (NMD), which records the underlying and other causes of death as ICD10 codes derived by the Australian Bureau of Statistics (ABS) from the death certificates. This information is generally not available for the most recent two years of data.

The latest and the most current NDI data are available to link to the researchers' cohort.

## Accessibility

Researchers can access the NDI if their study generally meets the following set of conditions:

- the study focuses on health issues
- the study has been approved by the researcher's host institution ethics committee and the AIHW Ethics Committee. Typically this review concentrates on the issues of public interest and use of confidential information
- the study is scientifically valid (as judged by a peer review process)
- the study results will be placed in the public domain (for example, published papers or books, conference presentations, feedback to patients)
- the study will not break confidentiality provisions
- the study investigators comply with the AIHW legislation under which the data are released
- the data will be secured in an environment that guarantees confidentiality of individual's data.

Given that the study can meet these conditions, it can be best progressed by researchers discussing feasibility and likely costs with one of the contact officers in the AIHW. To formally apply for NDI use, researchers can obtain from the Institute's web page an *NDI data provision package* (<[www.aihw.gov.au/national-death-index/](http://www.aihw.gov.au/national-death-index/)>). This package includes instructions as to what data formats are required, a description of the NDI, the legislation covering the use of NDI data and the AIHW Ethics Committee application forms. These forms contain questions relating to the objectives of the project, the security of the confidential information, the intended release of the study results and the public benefit that might be gained from conducting the study. The Ethics Committee will consider these factors in determining whether to grant approval to the project. The Committee meets four times a year. Once a study is given an Ethics Committee certificate, the project can proceed.

## Interpretability

The NDI database held by the AIHW comprises such variables for each deceased person as: name, alternative names (including maiden names), dates of birth (or estimated year of birth), age at death, sex, date of death, marital status, indigenous status, state/territory of registration and registration number. In some records, the additional information of address and the text related to cause of death is available.

Cause of death information in a coded form is derived by linking the NDI registration numbers for deaths with the NMD. This latter data base records underlying cause of death in ICD10 codes as derived by Australian Bureau of Statistics (ABS) from the death certificates. This information is generally not available for the most recent two years of data.

A description of the NDI is included in the application package that researchers use when applying to link their data to the NDI. The researchers are made aware of the probabilistic nature of the data linkage method and are instructed to treat the linkage results as indication or index of death, rather than as an absolute fact.

## Relevance

The NDI contains records of all deaths that occurred in Australia since 1980 to the most recent month past.

Researchers are made aware of the limitation of the probabilistic data linkage method and that they need to provide sufficient details of their subjects for the technique to be effective.

### **Accuracy**

Deaths occurring in Australia are registered and maintained by the Registrars of Births, Deaths and Marriages in each state and territory. These registration details are then provided to the AIHW and are assumed to be as correct as possible. The AIHW has no ability to confirm the correctness and completeness of these data.

It is expected that some death registration details may contain errors and some information that is critical might be missing. The AIHW uses a probabilistic data linking technique to link researchers' data to the NDI. Consequently, the linkage result is an indication or index of death, rather than an absolute fact of death. These issues are communicated to the researchers.

Incorrect linkages can result because of errors or incorrect details in personal information supplied when deaths are registered. Examples of such errors are: the changed surname when women marry is not provided; given names are transposed, incorrectly spelt, or partly replaced by nicknames; the date of birth is wrong, the birth day of an elderly relative might be known, but not the year of birth.

Linkages are tailored to the needs of the researcher, in terms of the matching tightness. For example some studies require that the matching be very precise and the researchers will only accept matches that are identical in terms of name, date of birth/ death and sex, whereas others will allow for variations in names and dates at least. These scenarios are catered for by using probabilistic record linkage software. The AIHW undertakes the linkage and in some cases clerical reviews of marginal matches. Reports of the final matches are then provided to the researchers. The linkage result is an indication or index of death, rather than an absolute fact of death.

### **Coherence**

Only a small number of variables such as: names, sex, date of birth, date of death and components of address are utilised from the NDI for the linking purpose. Although the file formats in which data are provided by the Registrars changes from time to time, the contents of data remains constant. To ensure consistency, a substantial cleaning and standardisation of data takes place before loading to the database. For example, names are converted to upper case, dates are standardised to 'yyyymmdd' format and gender is set to '1' for males and '2' for females.

The one serious exception from the consistency over time is coded cause of death. This field was derived by ABS from the death certificates and is obtained from the NMD, by linking it to the NDI. The causes of death are coded using the International Classification of Diseases (ICD) that originated in the 1800s and undergoes revisions from time to time. The current version is ICD-10. It is critical to know the version of the ICD that relates to given data. This information and the description of data items are provided to the researchers with the linking results.

## **National Hospital Morbidity Database**

Data from the National Hospital Morbidity Database (NHMD) are used in Chapter 8 of this report to examine the number of cancer-related hospitalisations. The NHMD contains

demographic, diagnostic, procedural and duration of stay information on episodes of care for patients admitted to hospital. This annual collection is compiled and maintained by the AIHW, using data supplied by state and territory health authorities. Information from almost all hospitals in Australia is included in the database: public acute and public psychiatric hospitals; private acute and private psychiatric hospitals; and private free-standing day hospital facilities. The database is episode-based and it is not possible to count patients individually.

Coverage for the NHMD is essentially complete. For 2010–11, all public hospitals were included, except for a small mothercraft hospital in the Australian Capital Territory. Private hospital data were not provided for private freestanding day facilities in the Australian Capital Territory and the Northern Territory, and for one private freestanding day facility in Tasmania.

The majority of private hospitals were also included. Most of the private facilities that did not report to the NHMD were free-standing day hospital facilities. For 2010–11, data were not provided for private day hospital facilities in the Australian Capital Territory and the Northern Territory, and for a small private hospital in Victoria. Victoria estimated that its data were essentially complete. Counts of private hospital hospitalisations presented in this report are therefore likely to be underestimates of the actual counts.

Comprehensive hospital statistics from this database are released by the AIHW annually (AIHW 2012b). Further information about this data source is available in those reports.

Data are held in the NHMD for the years from 1993–94 to 2010–11. In this report data on cancer-related hospitalisations are presented for 2010–11.

The hospitalisations data presented in this report exclude those hospitalisations for which the care type was reported as newborn (unqualified days only), hospital boarder or posthumous organ procurement. Thus, it includes all other admitted care hospitalisations including those with a care type of acute care, rehabilitation care and palliative care.

## **Data Quality Statement: National Hospital Morbidity Database**

### **Summary of key issues**

- The National Hospital Morbidity Database (NHMD) is a comprehensive dataset that has records for all separations of admitted patients from essentially all public and private hospitals in Australia.
- A record is included for each separation, not for each patient, so patients who separated more than once in the year have more than one record in the NHMD.
- For 2010–11, almost all public hospitals provided data for the NHMD. The exception was a mothercraft hospital in the Australian Capital Territory. The great majority of private hospitals also provided data, the exceptions being the private day hospital facilities in the Australian Capital Territory, the single private free-standing day hospital facility in the Northern Territory, and a small private hospital in Victoria.
- Hospitals may be re-categorised as public or private between or within years.
- There is apparent variation between states and territories in the use of statistical discharges and associated assignment of care types.
- There was variation between states and territories in the reporting of separations for *Newborns* (without qualified days):

- For 2010–11, private hospitals in Victoria did not report most *Newborn* episodes without qualified days, therefore the count of newborn episodes will be underestimated.
  - South Australian private hospitals are not required to provide records for *Newborn* episodes without qualified days.
  - For Tasmania, where a newborn’s qualification status was considered qualified at any point during the episode of care, the entire episode was reported as qualified days. As a consequence, the average length of stay for *Newborn* episodes with qualified days only in Tasmanian public hospitals is not directly comparable with that in other states.
- Data on state of hospitalisation should be interpreted with caution because of cross-border flows of patients. This is particularly the case for the Australian Capital Territory. In 2010–11, about 23% of separations for Australian Capital Territory hospitals were for patients who resided in New South Wales.
  - Variations in admission practices and policies lead to variation among providers in the number of admissions for some conditions.
  - Caution should be used in comparing diagnosis, procedure and external cause data over time, as the classifications and coding standards for those data can change over time. In particular, in 2010–11, there were significant changes in the coding of diagnoses for diabetes, obstetrics and imaging procedures.
  - The Indigenous status data are of sufficient quality for statistical reporting purposes for the following jurisdictions: New South Wales, Victoria, Queensland, South Australia, Western Australia and the Northern Territory (public hospitals only). National totals include these six jurisdictions only. Indigenous status data reported for Tasmania and the Australian Capital Territory should be interpreted with caution until further assessment of Indigenous identification is completed.

## Description

The National Hospital Morbidity Database (NHMD) is a compilation of episode-level records from admitted patient morbidity data collection systems in Australian hospitals. It is a comprehensive data set that has records for all episodes of admitted patient care from essentially all public and private hospitals in Australia.

The data supplied are based on the National Minimum Data Set (NMDS) for admitted patient care and include demographic, administrative and length of stay data, as well as data on the diagnoses of the patients, the procedures they underwent in hospital and external causes of injury and poisoning.

In 2010–11, diagnoses and external causes of injury and poisoning were recorded using the 7th edition of the *International statistical classification of diseases and related health problems, tenth revision, Australian modification* (ICD-10-AM). Procedures were recorded using the seventh edition of the *Australian Classification of Health Interventions* (ACHI).

The counting unit for the NHMD is the ‘separation’. Separation is the term used to refer to the episode of admitted patient care, which can be a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay beginning or ending in a change of type of care (for example, from acute care to rehabilitation).

The NHMD contains records from 1993–94 to 2010–11. For each reference year, the NHMD includes records for admitted patient separations between 1 July and 30 June.

## **Timeliness**

The reference period for this data set is 2010–11. This includes records for admitted patient separations between 1 July 2010 and 30 June 2011.

States and territories provided a first version of 2010–11 data to the AIHW at the end of December 2011. The data were published on 30 April 2012. Data provision and publication were in accordance with agreed timetables.

## **Relevance**

The purpose of the NHMD is to collect information about care provided to admitted patients in Australian hospitals. The scope of the NHMD is episodes of care for admitted patients in all public and private acute and psychiatric hospitals, free-standing day hospital facilities and alcohol and drug treatment centres in Australia. Hospitals operated by the Australian Defence Force, corrections authorities and in Australia's off-shore territories are not in scope but some are included.

The hospital separations data do not include episodes of non-admitted patient care provided in outpatient clinics or emergency departments. Patients in these settings may be admitted subsequently, with the care provided to them as admitted patients being included in the NHMD.

The NHMD is the source of information for 12 performance indicators for the National Healthcare Agreement and other national performance reporting.

Although the NHMD is a valuable source of information on admitted patient care, the data have limitations. For example, variations in admission practices and policies lead to variation among providers in the number of admissions for some conditions (such as chemotherapy and endoscopies).

## **Accuracy**

Although there are national standards for data on admitted patient care, statistics may be affected by variations in admission and reporting practices across states and territories.

There is apparent variation between states and territories in the use of statistical discharges and associated assignment of care types.

For 2010–11, principal diagnosis information was not provided for 882 public hospital separations and 3,306 private hospital separations.

There was variation between public and private hospitals and, for private hospitals, between states and territories in the timing of the implementation of the seventh edition ICD-10-AM coding standards for obstetrics cases in 2010–11. Therefore, the principal diagnosis data for obstetrics cases are not comparable between public and private hospitals, and are not comparable over time.

There was variation between states and territories in the reporting of separations for *Newborns* (without qualified days):

- For 2010–11, private hospitals in Victoria did not report most *Newborn* episodes without qualified days, therefore the count of newborns will be underestimated.
- South Australian private hospitals are not required to provide records for *Newborn* episodes without qualified days.
- For Tasmania, where a newborn's qualification status was considered qualified at any point during the episode of care, the entire episode was reported as qualified days. As a

consequence, the average length of stay for *Newborn* episodes with qualified days only in Tasmanian public hospitals is not directly comparable with that in other jurisdictions.

The quality of the data reported for Indigenous status are of sufficient quality for statistical reporting purposes for the following jurisdictions: New South Wales, Victoria, Queensland, South Australia, Western Australia and the Northern Territory (public hospitals only). National totals include these six jurisdictions only. Indigenous status data reported for public hospitals in Tasmania and the Australian Capital Territory should be interpreted with caution until further assessment of Indigenous identification is completed.

Not all states provided information on the area of usual residence of the patient in the form of a statistical local area (SLA) code for all presentations. In addition, not all states and territories provided the version of SLA specified in the NMDS.

Where necessary, the AIHW mapped the supplied area of residence data for each presentation to the same SLA and to remoteness area categories based on the Australian Bureau of Statistics (ABS) Australian Standard Geographical Classification (ASGC) Remoteness Structure for 2006. This mapping was done on a probabilistic basis. Because of the probabilistic nature of the mapping, the SLA and remoteness areas data for individual records may not be accurate; however, the overall distribution of records by geographical area is considered useful.

Socioeconomic status is based on the reported area of usual residence of the patient. The Socio-Economic Indexes for Areas (SEIFA) categories for socioeconomic status are assigned at the national level, not at the individual state/territory level.

### **Coherence**

The NHMD includes data for each year from 1993–94 to 2010–11.

The data reported for 2010–11 are broadly consistent with data reported for the NHMD for previous years.

Time series presentations may be affected by changes in admission practices, particularly for same-day activity such as dialysis, chemotherapy and endoscopy.

Between 2009–10 and 2010–11:

- there was a decrease in private hospital separations for Victoria due to the reclassification of some same-day mental health care as non-admitted patient activity (which was previously classified as admitted patient activity)
- there was a decrease in separations (and patient days) for psychiatric care reported for Tasmanian public hospitals due to the categorisation of some care as residential care. In previous years, this care was categorised as admitted patient care.

Changes in the ICD-10-AM/ACHI classifications and the associated Australian Coding Standards may affect the comparability of the data over time. In particular, in 2010–11, there were significant changes in the coding of diagnoses for diabetes, obstetrics and imaging procedures.

## **National Mortality Database**

Data from the National Mortality Database are used in Chapter 3 and 6 to provide statistical information on mortality in Australia due to cancer. The mortality data used in this report were provided by the Registries of Births, Deaths and Marriages, the ABS and the National



Coroners Information System. These data are maintained at the AIHW in the National Mortality Database.

The registration of deaths has been compulsory since the mid-1850s and this information is registered with the relevant state and territory Registrar of Births, Deaths and Marriages. Since 1906, the Commonwealth Statistician has compiled the information collected by the Registrars and published national death information.

The National Mortality Database contains information for all deaths in Australia registered from 1964 to 2010. In this report, data are presented for the 20 years from 1991 to 2010.

The information on cause of death is coded by the ABS to an international standard, the *International classification of disease and related health problems*, currently the tenth revision (ICD-10).

Over time, changes have been made to the coding and processing of mortality data that affect comparability of the data. For instance, data holdings on cause of death for 1987 to 1996 were manually coded using the ninth revision of the ICD, while the data for 1997 onwards were coded to the ICD-10 standard, using an automated system. The change to the coding and processing of mortality data introduced a break, in 1997, in the time series.

In the National Mortality Database, both the year of *occurrence* of the death and the year in which the death was *registered* are provided. For the purposes of this report, mortality data are shown based on the year of *death*, except for the most recent year (namely, 2010) where the number of people whose death was *registered* is used. Previous investigation has shown that the year of death and its registration coincide for the most part. However, in some instances, deaths at the end of each calendar year may not be registered until the following year. Thus, year of death information for the latest available year is generally an underestimate of the actual number of deaths that occurred in that year.

Queensland mortality data by Aboriginal and Torres Strait Islander status have been adjusted for late registrations in 2010. More information is available in the ABS Causes of death 2010 (cat. no. 3303.0) (ABS 2012a) from <[www.abs.gov.au](http://www.abs.gov.au)>.

The data quality statements underpinning the National Mortality Database can be found in the following ABS publications: ABS Quality declaration summary for Causes of death 2010 (cat. no. 3303.0) (ABS 2012a) and ABS Quality declaration summary for Deaths, Australia 2010 (cat. no. 3302.0) (ABS 2012b) from <<http://www.abs.gov.au>>.

## Population data

Throughout this report, population data were used to derive rates of, for example, cancer incidence and mortality. The population data were sourced from the ABS demography section using the most up-to-date estimates available at the time of analysis.

To derive their estimates of the resident populations, the ABS uses the 5-yearly Census of Population and Housing data and adjusts it as follows:

- all respondents in the Census are placed in their state or territory, statistical local area and postcode of usual residence; overseas visitors are excluded
- an adjustment is made for persons missed in the Census (about 2%)
- Australians temporarily overseas on Census night are added to the usual residence Census count.

Estimated resident populations are then updated each year from the census data using indicators of population change, such as births, deaths and net migration. More information is available from the ABS website <[www.abs.gov.au](http://www.abs.gov.au)>.

For the Indigenous comparisons in this report (Chapter 6), the most recently released Indigenous experimental estimated resident populations as released by the ABS were used (ABS 2009a). Those estimates were based on the 2006 Census of Population and Housing.

## Appendix J Definition of cancer-related hospitalisations

Data on hospitalisations include principal diagnosis – this is the reason determined to be chiefly responsible for the person’s hospitalisation. The principal diagnosis recorded is usually a disease, (or injury or poisoning), but can also be a specific treatment of an already diagnosed condition, such as chemotherapy for cancer. These treatments are usually coded using Z-codes defined in ICD-10-AM Chapter 21 ‘Factors influencing health status and contact with health services’ (NCCH 2010).

Due to the method in which the principal diagnosis for hospitalisations of cancer patients is coded, it is insufficient to simply select those hospitalisations for which cancer was recorded as the principal diagnosis – it must also include those hospitalisations where a treatment relating to cancer was recorded as the principal diagnosis.

Many cancer-related interventions recorded as a principal diagnosis (such as Z51.1 Chemotherapy or Z12 Special screening examination for neoplasm) are specific only to the investigation for, or treatment of cancer. However, some (Z45.1 and Z45.2 Adjustment and management of infusion pumps or vascular devices) apply to a number of disease types.

For some cancer-related interventions (such as same-day chemotherapy), the Australian Coding Standards (NCCH 2010) stipulate that the principal diagnosis is to be coded to reflect the treatment with the type(s) of cancer listed as an additional diagnosis. This standard does not apply, however, to all cancer-related interventions.

Thus, for the purposes of examining the number of admitted patient hospitalisations that arose due to invasive cancer or were directly related to the investigation, treatment or care for cancer, ‘cancer-related hospitalisations’ were identified in this report as those hospitalisations in which:

- the principal diagnosis was cancer (ICD-10 AM codes C00–C97, D45, D46, D47.1 and D47.3)

or

- the principal diagnosis was related to health services or treatment for cancer. This includes a principal diagnosis of one of the following cancer-specific ICD-10-AM Z-codes:
  - Z08 Follow-up examination after treatment for malignant neoplasms
  - Z12 Special screening examination for neoplasm
  - Z40.0 Prophylactic surgery
  - Z51.0 Radiotherapy session
  - Z51.1 Pharmacotherapy session for neoplasm
  - Z54.1 Convalescence following radiotherapy
  - Z54.2 Convalescence following chemotherapy
  - Z80 Family history of malignant neoplasm
  - Z85 Personal history of malignant neoplasm

or

- a principal diagnosis of one of the following non-cancer specific ICD-10-AM Z codes with an additional diagnosis of cancer (ICD-10 AM codes C00–C97, D45, D46, D47.1 and D47.3):
  - Z29.1 Prophylactic immunotherapy
  - Z29.2 Other prophylactic chemotherapy
  - Z42.0 Follow-up care involving plastic surgery of head and neck
  - Z42.1 Follow-up care involving plastic surgery of breast
  - Z45.1 Adjustment and management of infusion pump
  - Z45.2 Adjustment and management of vascular access device.

## Identifying palliative care separations

Information on the provision of palliative care is captured by two NHMD data items, 'care type' and 'diagnosis'. They can be used to identify separations in an admitted patient setting for which palliation was a substantial component of the care provided.

A 'Care type' is assigned for each admitted patient separation, with any one separation equal to either a total hospital stay (from admission to discharge, transfer or death) or to a portion of a hospital stay beginning or ending in a change of care type (for example, from a 'Care type' of *Acute care* to a 'Care type' of *Palliative care*).

In addition, information on palliative care is also recorded in the NHMD under the 'diagnosis' data items. While diagnosis codes usually describe a disease, injury or poisoning, they can also be used in certain instances to indicate the specific care or service provided for a current condition or other reasons for hospitalisation. This is the case when *Palliative care* is recorded as a diagnosis code 'Z51.5'.

For the purpose of this report, a palliative care separation is defined as a separation for which palliation was a substantial component of the care provided, and those in which the principal clinical intent of the care was palliation during part or all of the separation, as evidenced by a code of *Palliative care* for the 'Care type' and/or diagnosis data items in the NHMD. Further information is in the AIHW's report *Palliative Care Services in Australia* (AIHW 2012g).

# Glossary

**Aboriginal or Torres Strait Islander:** A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also *Indigenous*.

**Additional diagnosis:** A condition or complaint either coexisting with the principal diagnosis or arising during the episode of care.

**Administrative databases:** Observations about events that are routinely recorded or required by law to be recorded. Such events include births, deaths, hospital separations and cancer incidence. Administrative databases include the Australian Cancer Database, the National Mortality Database and the National Hospital Morbidity Database.

**Admitted patient:** A person who undergoes a hospital's formal admission process to receive treatment and/or care. Such treatment or care can occur in hospital and/or in the person's home (as a 'hospital-in-home' patient).

**Age-specific rate:** A rate for a specific age group. The numerator and denominator relate to the same age group.

**Age-standardisation:** A method of removing the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly (usually increasing) with age. The age structures of the different populations are converted to the same 'standard' structure; then the disease rates that would have occurred with that structure are calculated and compared.

**Average length of stay (ALOS):** The average (mean) number of patient days for admitted patient episodes. Patients admitted and separated on the same date are allocated a length of stay of 1 day.

**Benign:** Non-cancerous tumours that may grow larger but do not spread to other parts of the body.

**Burden of disease and injury:** Term referring to the quantified impact of a disease or injury on an individual or population, using the *disability-adjusted life year* (DALY) measure.

**Cancer (malignant neoplasm):** A large range of diseases in which some of the body's cells become defective, begin to multiply out of control, can invade and damage the area around them, and can also spread to other parts of the body to cause further damage.

**Carcinoma:** A cancer that begins in the lining layer (epithelial cells) of organs such as the ovaries.

**Chemotherapy:** The use of drugs (chemicals) to prevent or treat disease, with the term being applied for treatment of cancer rather than for other uses.

**Cohort method:** A method of calculating *survival* that is based on a cohort of people diagnosed with cancer in a previous time period and followed over time.

**Combined hormone replacement therapy:** Daily hormone therapy/hormone replacement therapy containing oestrogen plus progestin, a synthetic form of the natural hormone.

**Comorbidity:** When a person has two or more health problems at the same time.

**Confidence interval (CI):** A statistical term describing a range (interval) of values within which we can be 'confident' that the true value lies, usually because it has a 95% or higher chance of doing so.

**Constant prices:** Dollar amounts for different years that are adjusted to reflect the prices in a chosen reference year. This provides a way of comparing expenditure over time on an equal value-for-value basis without the distorting effects of inflation. The comparison will reflect only the changes in the amount of goods and services purchased – changes in the 'buying power' – not the changes in prices of these goods and services caused by inflation.

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

**Crude survival:** The proportion of people alive at a specified point in time subsequent to the diagnosis of cancer.

**Disability-adjusted life years (DALYs):** A year of healthy life lost, either through premature death or equivalently through living with disability due to illness or injury. It is the basis unit used in *burden of disease and injury* estimates.

**Death due to cancer:** A death where the underlying cause is indicated as cancer.

**Expected survival:** A measure of *survival* that reflects the proportion of people in the general population alive for a given amount of time. Expected survival estimates are crude estimates calculated from *life tables* of the general population by age, sex and calendar year.

**Health expenditure:** Includes expenditure on health goods and services (for example, medications, aids and appliances, medical treatment, public health, research) that collectively are termed current expenditure; and on health-related investment which is often referred to as capital expenditure.

**Histology:** The microscopic characteristics of cellular structure and composition of tissue.

**Hospitalisation:** See *Separation*.

**Incidence:** The number of new cases (of an illness or event, and so on) in a given period.

**Indigenous:** A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also *Aboriginal or Torres Strait Islander*.

**International Statistical Classification of Diseases and Related Health Problems:** The World Health Organization's internationally accepted classification of death and disease. The tenth revision (ICD-10) is currently in use. ICD-10-AM is the Australian modification of ICD-10; it is used for diagnoses and procedures recorded for patients admitted to hospitals (see Appendix E).

**Invasive:** See *Malignant*.

**Length of stay:** Duration of hospital stay, calculated by subtracting the date the patient was admitted from the day of separation. All leave days, including the day the patient went on leave, are excluded. A same-day patient is allocated a length of stay of 1 day.

**Life tables:** Tables of annual probabilities of death in the general population.

**Limited-duration prevalence:** The number of people alive at a specific time who have been diagnosed with cancer over a specified period (such as the previous 5 or 25 years).

**Malignant:** A tumour with the capacity to spread to surrounding tissue or to other sites in the body.

**Median:** The midpoint of a list of observations that have been ranked from the smallest to the largest.

**Metastasis:** See *Secondary cancer*.

**Mortality due to cancer:** The number of deaths which occurred during a specified period (usually a year) for which the underlying cause of death was recorded as cancer.

**Mortality-to-incidence ratio (MIR):** The ratio of the age-standardised mortality rate for cancer to the age-standardised incidence rate for cancer.

**New cancer case:** See *Incidence*.

**Neoplasm:** An abnormal ('neo', new) growth of tissue. Can be 'benign' (not a cancer) or 'malignant' (a cancer). Also known as a tumour.

**Non-Indigenous:** People who have declared that they are not of Aboriginal or Torres Strait Islander descent.

**Observed survival:** A measure of *survival* that reflects the proportion of people alive for a given amount of time after a diagnosis of cancer. Observed survival estimates are crude estimates calculated from population-based cancer data.

**Other Australians:** Includes people who have declared that they are not of Aboriginal or Torres Strait Islander descent as well as those who have not stated their Indigenous status.

**Overnight patient:** An admitted patient who receives hospital treatment for a minimum of 1 night (that is, is admitted to, and separates from, hospital on different dates).

**Patient days:** The number of full or partial days of stay for patients who were admitted for an episode of care and who underwent separation during the reporting period. A patient who is admitted and separated on the same day is allocated one patient day.

**Period method:** A method of calculating *survival* that is based on the survival experience during a recent *at-risk* or *follow-up* time period.

**Population estimates:** Official population numbers compiled by the Australian Bureau of Statistics at both state and territory and statistical local area levels by age and sex, as at 30 June each year. These estimates allow comparisons to be made between geographical areas of differing population sizes and age structures (see Appendix E).

**Prevalence (or complete prevalence):** The total number of people alive at a specific date who have ever been diagnosed with a particular disease such as cancer.

**Primary cancer:** A tumour that is at the site where it first formed (see also *Secondary cancer*).

**Principal diagnosis:** The diagnosis listed in hospital records to describe the problem that was chiefly responsible for the patient's episode of care in hospital.

**Procedure:** A clinical intervention that is surgical in nature, carries a procedural risk, carries an anaesthetic risk, requires specialised training and/or requires special facilities or equipment available only in the acute care setting.

**Relative survival:** The ratio of *observed survival* of a group of persons diagnosed with cancer to *expected survival* of those in the corresponding general population after a specified interval following diagnosis (such as 5 or 10 years).

**Risk factor:** Any factor that represents a greater risk of a health disorder or other unwanted condition or event. Some risk factors are regarded as causes of disease, others are not

necessarily so. Along with their opposites, namely protective factors, risk factors are known as 'determinants'.

**Same-day patient:** A patient who is admitted to, and separates from, hospital on the same date.

**Secondary cancer:** A tumour that originated from a cancer elsewhere in the body. Also referred to as a metastasis.

**Separation:** An episode of care for an admitted patient which may include a total hospital stay (from admission to discharge, transfer or death) or a portion of a hospital stay that begins or ends in a change of type of care (for example, from acute to rehabilitation). In this report, separations are also referred to as hospitalisations.

**Statistical significance:** An indication from a statistical test that an observed difference or association may be significant or 'real' because it is unlikely to be due just to chance. A statistical result is usually said to be 'significant' if it would occur by chance only once in 20 times or less often (see Appendix B for more information about statistical significance).

**Stage:** The extent of a cancer in the body. Staging is usually based on the size of the tumour, whether lymph nodes contain cancer, and whether the cancer has spread from the original site to other parts of the body.

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

**Symptom:** Any indication of a disorder that is apparent to the person affected.

**Underlying cause of death:** The disease or injury that initiated the sequence of events leading directly to death.

**Valid FOBT test:** Only faecal occult blood test (FOBT) results that are either positive or negative are classified as valid results. Inconclusive results are excluded from analysis.

**Years of healthy life lost due to disability (YLD):** For each new case of cancer, YLD equals the average duration of the cancer (to remission or death) multiplied by a severity weight for cancer (which depends upon its disabling effect over the disease duration).

**Years of life lost (YLL):** For each new case, YLL equals the number of years between premature death and the standard life expectancy for the individual.



# References

- ABS (Australian Bureau of Statistics) 2006. Statistical Geography Volume 1 – Australian Standard Geographical Classification (ASGC). Canberra: ABS. Viewed 4 April 2012, <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/1216.0Contents1Jul%202006?opendocument&tabname=Summary&prodno=1216.0&issue=Jul%202006&num=&view=>>>.
- ABS 2008a. Information paper: an introduction to Socio-Economic Indexes for Areas (SEIFA) 2006. ABS cat. no. 2039.0. Canberra: ABS.
- ABS 2008b. Population projections, Australia 2006 to 2101. ABS cat. no. 3222.0. Canberra: ABS.
- ABS 2008c. Standard Australian Classification of Countries (SACC). ABS cat. no. 1269. Canberra: ABS.
- ABS 2009a. Experimental Estimates and Projections, Aboriginal and Torres Strait Islander Australians, 1991 to 2021. ABS cat. no. 3238.0. Canberra: ABS.
- ABS 2009b. Experimental life tables for Aboriginal and Torres Strait Islander Australians, 2005–2007. ABS cat. no. 3303.0.55.003. Canberra: ABS.
- ABS 2012a. Causes of Death, Australia, 2010. ABS cat. no. 3303.0. Canberra: ABS.
- ABS 2012b. Causes of Death, Australia, 2010. ABS cat. no. 3303.0. Canberra: ABS.
- ABS & AIHW (Australian Institute of Health and Welfare) 2008. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples 2008. ABS cat. no. 4704.0 and AIHW Cat. no. AIHW 21. Canberra: ABS & AIHW.
- ACS (American Cancer Society) 2009. Breast cancer facts and figures 2009–2010. Atlanta: ACS.
- AIHW (Australian Institute of Health and Welfare) 2000. Australian hospital statistics 1998–99. Health services series no. 15. Cat. no. HSE 11. Canberra: AIHW.
- AIHW 2004. Rural, regional and remote health: a guide to remoteness classifications. Cat. no. PHE 53. Canberra: AIHW.
- AIHW 2009. National Cancer Statistics Clearing House protocol 2009. Canberra: AIHW.
- AIHW 2011a. The health and welfare of Australia's Aboriginal and Torres Strait Islander peoples: an overview. Cat. no. IHW 42. Canberra: AIHW.
- AIHW 2011b. Trends in palliative care in Australian hospitals. Cat. no. HWI 112. Canberra: AIHW.
- AIHW 2012a. Australia's health 2012. Australia's health series no.13. Cat. no. AUS 156. Canberra: AIHW.
- AIHW 2012b. Australian hospital statistics 2010-11. Health services series no. 43. Cat. no. HSE 117. Canberra: AIHW.
- AIHW 2012c. BreastScreen Australia monitoring report 2009–2010. Cancer series no. 72. Cat. no. CAN 68. Canberra: AIHW.
- AIHW 2012d. Cancer survival and prevalence in Australia: period estimates from 1982 to 2010. Cancer Series no. 69. Cat. no. CAN 65. Canberra: AIHW.
- AIHW 2012e. Cervical screening in Australia 2009–2010. Cancer series 67. Cat. no. CAN 63. Canberra: AIHW.

AIHW 2012f. National Bowel Cancer Screening Program monitoring report: phase 2, July 2008–June 2011. Cancer series no. 65. CAN 61. Canberra: AIHW.

AIHW 2012g. Palliative care services in Australia. Cat. no. HWI 120. Canberra: AIHW.

AIHW & AACR (Australasian Association of Cancer Registries) 2010. Cancer in Australia: an overview, 2010. Cancer series no. 60. Cat. no. CAN 56. Canberra: AIHW.

AIHW & CA (Cancer Australia) 2008. Non-melanoma skin cancer: general practice consultations, hospitalisation and mortality. Cancer series 43 Cat. no. CAN 39. Canberra: AIHW.

AIHW & CA 2011. Lung cancer in Australia: an overview. Cat. no. CAN 58. Canberra: AIHW.

AIHW, CA & AACR 2008. Cancer survival and prevalence in Australia: cancers diagnosed from 1982 to 2004. Cancer series 42 Cat. no. CAN 38. Canberra: AIHW.

AIHW & DHFS (Department of Health and Family Services) 1997. First Report on National Health Priority Areas 1996. AIHW Cat. No. PHE 1. Canberra: AIHW & DHFS.

AIHW & NBCC (National Breast Cancer Centre) 2007. Breast cancer survival by size and nodal status. Cancer series no. 39 Cat. no. CAN34. Canberra: AIHW.

AIHW: Mathers C, Vos T & Stevenson C 1999. The burden of disease and injury in Australia. Cat. no. PHE 17. Canberra: AIHW.

Australian Health Ministers' Advisory Council 2010. Prostate cancer screening in Australia: position statement. Viewed 28 June 2012, <[http://www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/449D837448F6BA03CA25752700062313/\\$File/joint%20prostate%20screening%20statement.pdf](http://www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/449D837448F6BA03CA25752700062313/$File/joint%20prostate%20screening%20statement.pdf)>.

Baade P, Youlden D & Chambers S 2011. When do I know I am cured? Using conditional estimates to provide better information about cancer survival prospects. *Medical Journal of Australia* 194(2):1784–92.

Baade PD, Coory MD & Aitken JF 2004. International trends in prostate-cancer mortality: the decrease is continuing and spreading. *Cancer Causes Control* 15:237–41.

Begg S, Vos T, Barker B, Stevenson C, Stanley L & Lopez A 2007. The burden of disease and injury in Australia 2003. Cat. no. PHE 82. Canberra: AIHW.

Binns PL & Condon JR 2006. Participation in cervical screening by Indigenous women in the Northern Territory: a longitudinal study. *Medical Journal of Australia* 185:490–4.

Black R, Sankaranarayanan R & Parkin D 1998. Interpretation of population-based cancer survival data. In: Sankaranarayanan R, Black R & Parkin D (eds). *Cancer survival in developing countries*. Lyon: IARC Scientific Publication, 13–7.

Bosch FX, Lorincz A, Munoz N, Meijer CJ & Shah KV 2002. The causal relation between human papillomavirus and cervical cancer. *Journal of Clinical Pathology* 55:244–65.

BreastScreen Australia 2004. BreastScreen Australia National Accreditation Standards. Canberra: DoHA.

BreastScreen Australia Evaluation Advisory Committee 2009. BreastScreen Australia Evaluation: evaluation final report. Screening Monograph No. 1/2009. Canberra: DoHA. Viewed 28 June 2012, <<http://www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/br-evaluation-report-cnt>>.

Brenner H & Arndt V 2004. Recent increase in cancer survival according to age: higher survival in all age groups, but widening age gradient. *Cancer Causes Control* 15:903–10.

- Brenner H & Gefeller O 1996. An alternative approach to monitoring cancer patient survival. *Cancer* 78:2004–10.
- Breslow N & Day N 1987. *Statistical methods in cancer research*. Lyon: International Agency for Research on Cancer.
- Brillinger DR 1986. The natural variability of vital rates and associated statistics. *Biometrics* 42:693–734.
- Brotherton JM, Fridman M, May CL, Chappell G, Saville AM & Gertig DM 2011. Early effect of the HPV vaccination programme on cervical abnormalities in Victoria, Australia: an ecological study. *Lancet* 377:2085–92.
- Cancer Australia 2010. *Cancer data to improve cancer survival*. Canberra: Cancer Australia.
- Cancer Council Queensland 2011. *Cancer in Queensland: Incidence, Mortality, Survival and Prevalence – 1982 to 2008*. Spring Hill: Cancer Council Queensland.
- Center MM, Jemal A, Smith RA & Ward E 2009. Worldwide variations in colorectal cancer. *CA Cancer Journal for Clinicians* 59:366–78.
- CCS (Canadian Cancer Statistics) 2010. *Canadian Cancer Statistics 2010*. Toronto: CCS.
- CCS & NCIC (National Cancer Institute of Canada) 2007. *Canadian cancer statistics 2007*. Toronto: CCS.
- Coleman MP, Forman D, Bryant H, Butler J, Rachet B, Maringe C et al. 2011. Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995–2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data. *Lancet* 377:127–38.
- COAG (Council of Australian Governments) Reform Council 2011. *National Healthcare Agreement: performance report for 2009–10*. Sydney: COAG Reform Council.
- Condon J 2004. *Cancer, health services and indigenous Australians*. Canberra: OATSIH.
- Condon J, Armstrong B, Barnes A & Cunningham J 2003. Cancer in Indigenous Australians: a review. *Cancer Causes Control* 14:109–21.
- Condon J, Armstrong B, Barnes T & Zhao Y 2005. Cancer incidence and survival for Indigenous Australians in the Northern Territory. *Australian and New Zealand Journal of Public Health* 29:123–8.
- Condon J, Warman G & Arnold L (eds) 2001. *The health and welfare of Territorians*. Darwin: Epidemiology Branch, Territory Health Services.
- Coory MF, P. Muller, J. Dunn, N. 2002. Participation in cervical screening by women in rural and remote Aboriginal and Torres Strait Islander communities in Queensland. *Medical Journal of Australia* 177:544–7.
- Cunningham J, Rumbold AR, Zhang X & Condon JR 2008. Incidence, aetiology, and outcomes of cancer in Indigenous peoples in Australia. *Lancet Oncology* 9:585–95.
- Curado M, Edwards B, Shin H, Storm H, Ferlay J, Heanue M et al. (eds) 2007. *Cancer Incidence in Five Continents Vol. IX*. Lyon: IACR.
- Department of Health and Ageing 2012. *National Cervical Screening Program*. 11 November 2009. Canberra: Department of Health and Ageing. Viewed 10 July 2012, <<http://www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/cervical-about>>.
- DHFS (Department of Health and Family Services) & AIHW 1998. *National Health Priority Areas Report on Cancer Control 1997*. AIHW Cat. No. PHE 4. Canberra: DHFS & AIHW.

Dickman PW & Adami H-O 2006. Interpreting trends in cancer patient survival. *Journal of Internal Medicine* 260:103–17.

Dobson AJ, Kuulasmaa K, Eberle E & Scherer J 1991. Confidence intervals for weighted sums of Poisson parameters. *Stat Med* 10:457–62.

Donovan B, Franklin N, Guy R, Grulich AE, Regan DG, Ali H et al. 2011. Quadrivalent human papillomavirus vaccination and trends in genital warts in Australia: analysis of national sentinel surveillance data. *Lancet Infectious Diseases* 11:39–44.

Duncombe J, Stavrou E, Chen W, Baker D, Tracey E & Bishop J 2009. Bladder cancer in New South Wales. Sydney: Cancer Institute NSW.

Eayres D, Cunningham A, Fryers P, Abbas J, Flowers J & Stockton D 2008. APHO technical briefing 3: commonly used public health statistics and their confidence intervals. York: Association of Public Health Observatories. Viewed 10 December 2010, <<http://www.apho.org.uk/resource/item.aspx?RID=48457>>.

Ederer F & Heise H 1959. Instructions to IBM 650 programmers in processing survival computations. Methodological note No.10. Bethesda: National Cancer Institute.

Ellison LF & Gibbons L 2006. Survival from cancer – up-to-date predictions using period analysis. *Health Reports* 17:19–30.

English D, Farrugia H, Thursfield V, Chang P & Giles G 2007. Cancer survival Victoria 2007. Melbourne: The Cancer Council Victoria Epidemiology Centre.

Ferlay J, Shin H, Bary F, Forman D, Mathers C & Parkin D 2010. GLOBOCAN 2008 version 1.2. Cancer incidence and mortality worldwide. IARC CancerBase No. 10. Lyon: IARC.

Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin L & Parkin D 2000. International Classification of Disease for Oncology. Geneva: WHO.

IARC (International Agency of Research on Cancer) 2004. International rules for multiple primary cancers (ICD-O 3rd edn). Lyon: IARC. Viewed 2 August 2011, <[www.iacr.com.fr/MPrules\\_july2004.pdf](http://www.iacr.com.fr/MPrules_july2004.pdf)>.

IARC 2008. World cancer report 2008. Lyon: IARC.

Jensen O, Parkin D, MacLennan R, Muir C & Skeet R (eds) 1991. Cancer registration: principles and methods. IARC scientific publications no. 95. Lyon: IARC.

Luke C, Tracey E, Stapleton A & Roder D 2010. Exploring contrary trends in bladder cancer incidence, mortality and survival: implications for research and cancer control. *Internal Medicine Journal* 40:357–63.

Morris M, Lacopetta B & Platell C 2007. Comparing survival outcomes for patients with colorectal cancer treated in public and private hospitals. *Medical Journal of Australia* 186(6):296–300.

National HPV Vaccination Register 2011. Information for health professionals. May 2011. Melbourne: Victorian Cytology Service Inc. Viewed 16 June 2012, <<http://www.hpvregister.org.au/health-professionals.aspx>>.

NBOCC (National Breast and Ovarian Cancer Centre) 2009. National Breast and Ovarian Cancer Centre and Royal Australasian College of Surgeons National Breast Cancer Audit. Public Health Monitoring Series 2007 Data. Sydney: NBOCC.

NCCH (National Centre for Classification in Health) 2010. The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM), Australian Classification of Health Interventions (ACHI) and Australian Coding Standards (ACS), 7th edn. Sydney: University of Sydney.

- NCRI (National Cancer Registry Ireland) & WHC (Women's Health Council) 2006. Women and cancer in Ireland 1994-2001. Dublin: WHC.
- NHPAC (National Health Priority Action Council) 2006a. National Chronic Disease Strategy. Canberra: DoHA.
- NHPAC 2006b. National service improvement framework for cancer. Canberra: DoHA.
- Read TR, Hocking JS, Chen MY, Donovan B, Bradshaw CS & Fairley CK 2011. The near disappearance of genital warts in young women 4 years after commencing a national human papillomavirus (HPV) vaccination programme. *Sexually Transmitted Infections* doi:10.1136/sextrans-2011-050234
- Roder D 2005. Comparative cancer incidence, mortality and survival in Indigenous and non-Indigenous residents of South Australia and the Northern Territory. *Cancer Forum* 29(1):7-9.
- Schroder FH, Hugosson J, Roobol MJ, Tammela TL, Ciatto S, Nelen V et al. 2009. Screening and prostate-cancer mortality in a randomized European study. *New England Journal of Medicine* 360:1320-8.
- Scollo M & Winstanley M (eds) 2008. Tobacco in Australia: facts and issues. Melbourne: Cancer Council Victoria.
- Smith DP, Supramaniam R, Marshall VR & BK A 2008. Prostate cancer and prostate-specific antigen testing in New South Wales. *Medical Journal of Australia* 189:315-8.
- Stumpers S & Thomson N 2009. Review of cancer among indigenous peoples.: Australian Indigenous Health Infonet. Viewed 22-02-2010 2010, <<http://www.healthinfonet.ecu.edu.au/chronic-conditions/cancer/reviews/our-review>>.
- Threlfall TJ & Thompson JR 2009. Cancer incidence and mortality in Western Australia, 2007. Perth: Department of Health, Western Australia.
- Tracey E, Kerr T, Dobrovic A & Currow D 2010. Cancer in NSW: Incidence and mortality report 2008. Sydney: Cancer Institute NSW.
- Walboomers JM, Jacobs MV, Manos MM, Bosch FX, Kummer JA, Shah KV et al. 1999. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. *Journal of Pathology* 189:12-9.
- WCRF (World Cancer Research Fund) & AICR (American Institute for Cancer Research) 2007. Food, nutrition, physical activity and the prevention of cancer: a global perspective. Washington: AICR.
- WHO (World Health Organisation) 1992. International statistical classification of diseases and related health problems, 10th revision. Volume 1. Geneva: WHO.
- WHO 2002. National cancer control programmes: policies and managerial guidelines, second edition. Geneva: WHO.
- Xing Y, Chang G, Hu C, Askew R, Ross M & Gershenwald Jea 2010. Conditional survival estimates improve over time for patients with advanced melanoma: results from a population-based analysis. *Cancer* 116:2234-41.

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*Cancer in Australia: an overview, 2012* presents the latest available information on incidence, mortality, survival, prevalence, burden of cancer, hospitalisations and national cancer screening programs. It is estimated that the most commonly diagnosed cancers in 2012 will be prostate cancer, bowel cancer and breast cancer. For all cancers combined, the incidence rate increased by 12% from 1991 to 2009, but the mortality rate decreased and survival improved over time. Cancer outcomes differ by Aboriginal and Torres Strait Islander status, remoteness area and socioeconomic status.