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Lung cancer in Australia

An overview

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Foreword

Lung cancer in Australia: an overview is the first tumour-specific report including cancer registry data in a series of collaborations between Cancer Australia and the Australian Institute of Health and Welfare. It is aimed at documenting key cancer statistics to provide the research and health service sectors with relevant data to reduce the impact of cancer in Australia.

This report provides, for the first time, a comprehensive summary of national statistics on lung cancer in Australia.

Lung cancer is the leading cause of cancer death in Australia and represents the fourth most commonly diagnosed cancer. While the incidence rate for lung cancer in men has been decreasing, there has been a marked increase in the incidence rate in females. Similarly, while 5-year relative survival from lung cancer has increased for both sexes, survival from this disease remains low.

This report identifies the relationship between lung cancer incidence and mortality and geographical remoteness, socioeconomic status, Aboriginal and Torres Strait Islander status, and country of birth. In addition, information on survival, prevalence, hospitalisations, and the burden of disease from lung cancer contextualises the impact of this cancer on our population and health system.

This report highlights the significant burden of disease that lung cancer places on our community and underscores the concerted action required across the research and health service sectors to improve lung cancer outcomes in Australia.

The Commonwealth Government is funding a program of work in lung cancer through its national cancer agency, Cancer Australia. This work will build the evidence base for clinical best practice, fund research, and support the implementation of coordinated care to improve survival. Cancer Australia's lung cancer initiatives are an important step in addressing the impact of lung cancer on our community and this report provides the platform for monitoring trends and assessing changes in the impact of lung cancer in the future.

The Australian Institute of Health and Welfare's work informs and supports the development of policy and programs on Australia's health and welfare through the provision of relevant, timely and high-quality information. The Institute collaborates with the Commonwealth and state and territory governments and non-government organisations in undertaking its mission.

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This report was prepared by staff in the Cancer and Screening Unit of the Australian Institute of Health and Welfare (AIHW). The main authors were Ms Anne Ganner Bech, Ms Wendy Ho and Ms Candice Rabusa. Other AIHW staff who made a substantial contribution are, in alphabetical order, Dr Brett Davis, Ms Melissa Goodwin, Mr Paul Leonard, Dr Mark Short, Ms Christine Sturrock and Ms Kun Zhao. The authors would like to thank those AIHW staff who commented on earlier drafts of this report.

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The support of the Australasian Association of Cancer Registries in providing data and reviewing the draft report is gratefully acknowledged.

Abbreviations

AACR	Australasian Association of Cancer Registries
ABS	Australian Bureau of Statistics
ACD	Australian Cancer Database
ACHI	Australian Classification of Health Interventions
ACT	Australian Capital Territory
AIDS	Acquired Immunodeficiency Syndrome
AIHW	Australian Institute of Health and Welfare
ALOS	average length of stay
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASGC	Australian Standard Geographical Classification
ASR	age-standardised rate
CA	Cancer Australia
CI	confidence interval
CS	crude survival
DALY	disability-adjusted life year
DCIS	ductal carcinoma in situ
excl.	excluding
GRIM	General Record of Incidence of Mortality
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, third edition
IRSD	Index of Relative Socio-economic Disadvantage
MBS	Medicare Benefits Schedule
MIR	mortality-to-incidence ratio
NATSISS	National Aboriginal and Torres Strait Islander Social Survey
NCCH	National Centre for Classification in Health

NCSCH	National Cancer Statistics Clearing House
NDI	National Death Index
NHPA	National Health Priority Area
NHMD	National Hospital Morbidity Database
NMD	National Mortality Database
No.	number
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
OECD	Organisation for Economic Cooperation and Development
Qld	Queensland
RS	relative survival
SA	South Australia
SACC	Standard Australian Classification of Countries
SEER	Surveillance Epidemiology End Results
SEIFA	Socio-Economic Indexes for Areas
Tas	Tasmania
UICC	Union for International Cancer Control
UK	United Kingdom
USA	United States of America
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
+	and over
. .	not applicable
n.a.	not available
n.p.	not published (data cannot be released due to quality issues)

Summary

Lung cancer in Australia: an overview provides comprehensive national statistics on lung cancer using a range of data sources, presenting the latest data and trends over time. Differences by geographical area, socioeconomic status, Aboriginal and Torres Strait Islander status, country of birth and international comparisons are also discussed.

The incidence rate of lung cancer has fallen in males but risen in females

In 2007 in Australia, lung cancer was the fourth most commonly diagnosed cancer in both males and females (excluding basal and squamous cell carcinoma of the skin). A total of 5,948 lung cancers were diagnosed in males and 3,755 in females. The occurrence of lung cancer was strongly related to age, with 84% of new lung cancers in males and 80% in females diagnosed in those aged 60 and over.

Between 1982 and 2007 the number of new lung cancers increased markedly in both sexes. However, when the age structure and size of the population are taken into account, the incidence rate of lung cancer decreased in males by 32% but increased in females by 72%. The different pattern of incidence rates in males and females reflect historical differences in smoking behaviour.

Lung cancer causes more deaths than any other cancer

A total of 4,715 males and 2,911 females died from lung cancer in 2007. This makes it the leading cause of cancer deaths for both sexes, accounting for 21% of all cancer deaths in males and 17% in females. Furthermore, lung cancer ranked second for males and fourth for females when considering all causes of death.

The age-standardised mortality rate from lung cancer for males decreased by 41% between 1982 and 2007, while the mortality rate for females increased by 56%.

Lung cancer survival has improved but still remains low

The prognosis for those diagnosed with lung cancer is poor and has improved only a little over the previous 26 years. That is, the 5-year relative survival was 11% for males and 15% for females in 2000–2007, which compares with 8% for males and 10% for females in 1982–1987.

The number of hospitalisations for lung cancer has increased

In the 2008–09 financial year, lung cancer was responsible for one in 19 cancer-related hospitalisations and one in 187 hospitalisations for all causes in Australia. More than three-quarters (77%) of hospitalisations for lung cancer were for patients aged 60 years and over.

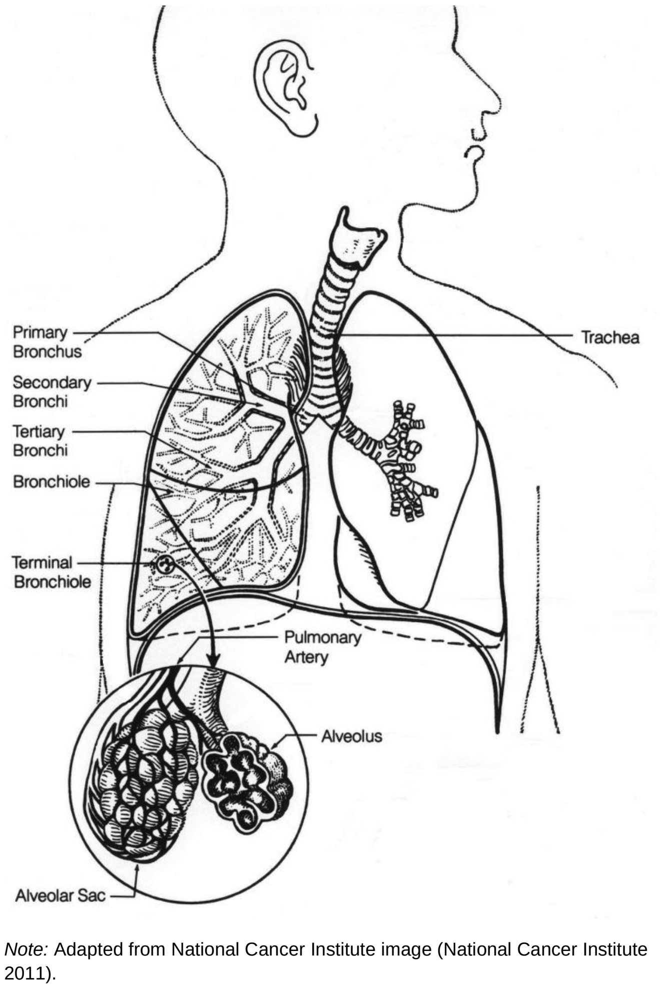
The number of hospitalisations for lung cancer increased by 29% between 2000–01 and 2008–09. Most of the increase related to a substantial increase in the number of same-day hospitalisations.

1 Introduction

Lung cancer is the fourth most commonly diagnosed invasive cancer in Australia (excluding basal and squamous cell carcinoma of the skin) and it causes more deaths than any other cancer in both males and females. Its high mortality rate results from both a high incidence rate and a low survival, with only 13% of those diagnosed with lung cancer surviving 5 years after diagnosis. The poor survival is due, at least partly, to the relatively high proportion of cases diagnosed at an advanced stage. Tobacco smoking is a major cause of lung cancer, and thus tobacco control is essential for lung cancer prevention (Jemal et al. 2011; The Cancer Council Australia 2007).

What is lung cancer?

Lung cancer is a malignant tumour starting in the tissue of one or both lungs. The lungs are the main organs of the respiratory system located in the chest cavity on either side of the heart (Figure 1.1). Lung cancer can originate anywhere in the lungs, including the trachea, bronchi, bronchioles and alveoli. It occurs when cells in the lung become abnormal, grow in an uncontrolled way and form a mass called a neoplasm or tumour. Tumours can be benign (not cancerous) or malignant (cancerous). Benign tumours do not spread to other parts of the body, although they may interfere with other areas of the body as they grow. A malignant tumour is characterised by its ability to spread to other parts of the body through a process known as metastasis. If the spread is not stopped, it can result in death.



Note: Adapted from National Cancer Institute image (National Cancer Institute 2011).

Figure 1.1: Anatomy of the lungs

Box 1.1: Pleural mesothelioma

Pleural mesothelioma is a rare type of cancer affecting the membrane that covers and protects the lungs (that is, pleura). It is almost always caused by exposure to asbestos; a mineral used in some building materials (Safe Work Australia 2009).

Because pleural mesothelioma occurs in the lining of the lung, it is sometimes referred to as lung cancer. However, pleural mesothelioma is not regarded as a malignant tumour of the lung in the current version of the international coding standards for cancer and is not considered in this report.

What are the different types of lung cancer?

There are several types of lung cancer, each beginning in a different type of cell in the lung. The types are commonly categorised into two main groups: *small cell carcinoma* and *non-small cell carcinoma*. They are categorised in this way not only because of their distinct histological features, but because their treatment differs.

Small cell carcinoma

Small cell carcinoma usually arises from epithelial cells that line the surface of the centrally located bronchi (Steele et al. 2002) (Figure 1.1). It is predominately caused by smoking and is the most aggressive type of lung cancer, tending to spread widely through the body early in the course of the disease. As a result, surgery may not be used to treat this type of tumour, with chemotherapy and radiotherapy the treatment of choice (ACS 2010a; Steele et al. 2002; The Cancer Council Australia 2004).

Non-small cell carcinoma

Non-small cell carcinoma consists of a heterogeneous set of invasive tumours that tend to grow and spread more slowly than small cell lung cancer. It mainly affects cells lining the bronchi and smaller airways. Some non-small cell carcinomas are confined to a part of the lung that can be removed by surgery. In other cases, these tumours will require other treatments because the cancer has spread to other parts of the body. There are three major types of non-small cell carcinoma: *squamous cell carcinoma*, *adenocarcinoma* and *large cell carcinoma*.

Squamous cell carcinoma

Squamous cell carcinoma usually begins in the squamous cells that line the airways in the larger and more central part of the lungs, such as the trachea and the bronchi (Sekido et al. 2001). While this type of lung cancer tends to metastasise later than other types, it grows rapidly at its site of origin and usually forms cavities in the lungs. The development of squamous cell carcinomas is caused by tobacco smoking (The Cancer Council Australia 2004).

Adenocarcinoma

Adenocarcinoma develops from the epithelium or glandular cells (that is, mucus producing cells) in the peripherally located bronchioles and alveoli. This type of tumour can become quite thick, impairing lung function and making breathing difficult. In most cases adenocarcinoma spreads slowly and causes few symptoms (ACS 2010b; The Cancer Council Australia 2004; Youlden et al. 2007). While adenocarcinoma is the most common type of lung cancer in non-smokers (Subramanian & Govindan 2007), smoking is also a major cause of this type of lung cancer.

Large cell carcinoma

Large cell carcinoma can form in any part of the lung and tends to grow and spread quickly (ACS 2010b). This type of lung cancer probably comprises undifferentiated tumours or poorly differentiated squamous cell carcinoma and adenocarcinoma (The Cancer Council Australia 2004).

Other types of lung cancer

Other types of cancer can also occur in the lungs, including carcinoid lung cancers, sarcomas and other specified malignant tumours. These are grouped into two broader categories—*other specified carcinoma* and *other and unspecified malignant lung cancer*—in this report.

Lung cancer in a policy context

Lung cancer has been a prominent policy issue for decades in Australia. In 1996 it was declared a National Health Priority Area (NHPA) by Australian health ministers in recognition of its significant contribution to the burden of disease in Australia and the potential for prevention (DHFS & AIHW 1997).

More recently, the Council of Australian Governments introduced a new set of health performance indicators for health services. Australian and state and territory health authorities have committed to regularly report on these indicators, including one that refers to lung cancer incidence. Further information about these can be found at <http://www.aihw.gov.au/health-indicators/>.

Purpose and structure of this report

This report provides a comprehensive snapshot of national statistics on lung cancer in Australia. It aims to increase understanding of this disease and inform decision-making, resource allocation and the evaluation of programs and policies. It is directed at a wide audience, including health professionals, policy makers, health planners, educators, researchers, consumers and the broader public.

It brings together the latest available information and statistics on:

- known risk factors for lung cancer(Chapter 2)
- number of lung cancer cases diagnosed each year (Chapter 3)
- number of people dying from lung cancer each year (Chapter 4)
- survival prospects for people diagnosed with lung cancer (Chapter 5)
- numbers of people alive with a diagnosis of lung cancer (Chapter 6)
- burden of disease due to lung cancer (Chapter 7)
- number of hospitalisations for lung cancer (Chapter 8)
- extent of health care spending on lung cancer (Chapter 9)

Data interpretation

The term 'lung cancer' refers to primary lung cancers which are invasive (that is, malignant). It does not include secondary lung cancers, or benign (non-invasive) tumours. Furthermore, lung cancer is defined as those cancers classified as 'C33' or 'C34' in the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (that is, ICD-10).

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

Tumour stage (that is, extent of spread) at diagnosis is an important determinant of prognosis and treatment. Information on change over time in stage at diagnosis may assist in the monitoring of lung cancer control policies and programs. While some Australian states and territories collect population-based information on stage of lung cancer at diagnosis, not all do and there are no nationally agreed standards for the collection of these data. Nonetheless, some state-level and overseas data on incidence and survival are presented by stage at diagnosis in this report.

Information on actual numbers of lung cancer cases and deaths is presented in this report, together with age-standardised rates. The use of age-standardised rates enables comparisons between groups and within groups over time that take into account differences in the age structure and size of the population. This is especially important for lung cancer since the risk of this disease increases sharply with age. Rates have been standardised to the Australian population at 30 June 2001 and are generally expressed per 100,000 population. In addition, for international comparisons, age-standardised rates based on a World Standard Population enable comparisons of Australian data with those of other countries. Further information on age-standardisation and other technical matters is in Appendix B.

Confidence intervals (at the 95% level) are shown in graphs (as error bars) and tables. As explained more fully in Appendix B, 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 is 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.

In this report, comparisons are often made with international and state or territory-based data. Caution should be taken when interpreting these since observed differences may be influenced not only by the underlying number of lung cancer cases (or number of lung cancer deaths when considering mortality data), but by differences between Australia and individual jurisdictions or countries in:

- methods of cancer detection
- 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 all lung cancer cases.

Box 1.2: Terminology

- **Incidence rate:** the number of new lung cancers diagnosed per 100,000 persons during a specific time period, usually one year.
- **Mortality rate:** the number of deaths per 100,000 persons for which the underlying cause was a lung cancer.
- **Relative survival:** the average survival experience. It compares the survival of people diagnosed with lung 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 lung cancer within a specified time period, such as the previous 5 years.
- **Burden of disease:** the quantified impact of lung cancer on an individual or population.
- **Hospitalisation:** the number of hospital admissions per 10,000 persons due to lung cancer.

Data sources

A key data source for this report was the Australian Cancer Database (ACD). The ACD is a database that holds information on 1.8 million Australian cancer cases diagnosed between 1982 and 2007. The AIHW compiles and maintains the ACD, in partnership with the Australasian Association of Cancer Registries (AACR) through the National Cancer Statistics Clearing House (NCSCH), whose member registries provide data to the AIHW on an annual basis. Each Australian state and territory has legislation that mandates the reporting of all cancers (other than two types of non-melanoma skin cancers).

Another key data source was the National Mortality Database (NMD). This database is a national collection of information for all deaths in Australia from 1964 to 2007 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 ABS. Unless stated otherwise, death information in this report relates the year of death, except for the most recent year (namely, 2007) where year of registration was 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, the Disease Expenditure Database and the 2008 GLOBOCAN database—have also been used to present a broad picture of lung cancer in Australia.

Additional information about each of the data sources used is in Appendix C.

Box 1.3: Why do some statistics in this report appear old?

While this report is published in 2011, the statistics in the main chapters refer to 2009 or earlier. The reason is that whether data are collected recently or not, it often takes a year or more before the data are fully processed and released to the AIHW. Also, once the AIHW receives the data, some time is needed to load, clean and analyse them before release.

2 Risk factors for lung cancer

Key findings

- In Australia, tobacco smoking is the largest single cause of lung cancer, responsible for about 90% of lung cancers in males and 65% in females.
- The risk of lung cancer among smokers is strongly related to duration of smoking and the number of cigarettes smoked.
- Exposure to second-hand smoke (also known as passive smoking) is also a cause of lung cancer.
- Other potential causes include radon gas, exposure to industrial and chemical carcinogens, air pollution, family history of lung cancer and previous lung diseases.

Introduction

A risk factor is any factor associated with an increased likelihood of a person developing a health disorder or health condition, such as lung cancer. There are different types of risk factors, some of which can be modified and some that cannot. While the cause of lung cancer is not fully understood, it is known that people with certain risk factors are more likely than others to develop this disease. The key risk factors are in Figure 2.1.

It should be noted that having a risk factor does not mean a person will develop lung cancer. Many people have at least one risk factor but will never develop this disease, while others with lung cancer may have had no known risk factors. Also, even if a person with lung cancer has a risk factor, it is often hard to know how much that risk factor contributed to the cancer.

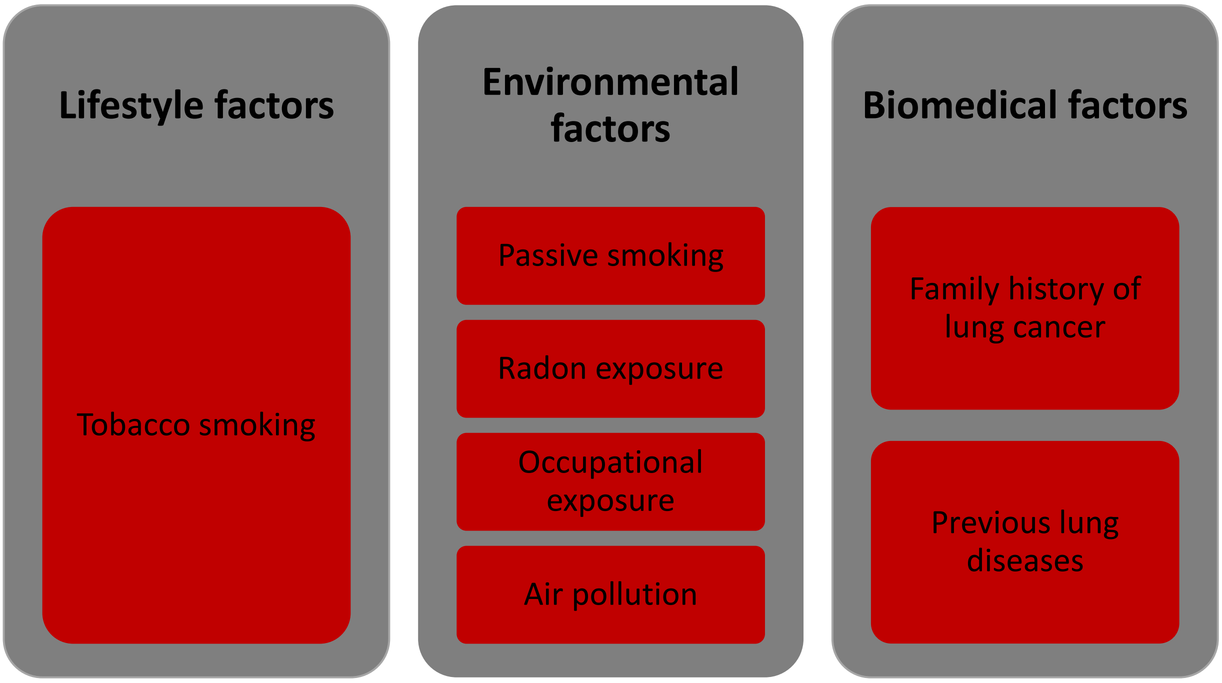


Figure 2.1: Risk factors for lung cancer

Lifestyle factors

Tobacco smoking

In Australia, tobacco smoking is the largest single cause of lung cancer, responsible for about 90% of lung cancers in males and 65% in females (AIHW: Ridolfo & Stevenson 2001).

Compared with non-smokers, smokers have more than a 10-fold increased risk of developing lung cancer (IARC 2008). The risk among smokers is strongly related to duration of smoking. That is, the earlier a person starts to smoke and the longer the person continues smoking, the greater is that person's risk of developing lung cancer. The risk of lung cancer also increases with the number of cigarettes a person smokes (Alberg & Samet 2003).

Tobacco smoking causes all types of lung cancer, although more so for small cell carcinoma, squamous cell carcinoma and large cell carcinoma than for adenocarcinoma (Thomas et al. 2005).

Giving up smoking reduces the risk of developing lung cancer as damaged lung cells start to repair. As the period of abstinence from cigarette smoking increases, the risk of lung cancer decreases, eventually approaching the risk for non-smokers (The Cancer Council Australia 2004).

How many Australians smoke

In 2007, one in six (17%) Australians aged 14 years and over smoked tobacco daily (that is, about 2.9 million people). A further 3% smoked tobacco weekly or less than weekly. Thus, overall, about 20% of Australians aged 14 years and over were current smokers in 2007, with a higher proportion of males being current smokers than females (21% vs. 18%) (AIHW 2008).

Trends

In Australia, the smoking rate among males has declined since the second half of the last century. In 1964, an estimated 58% of males smoked, while it was 18% in 2007. For females, the overall smoking rate increased slightly in the 1960s and 1970s, which was followed by an appreciable decline in the smoking rate from 31% in 1980 to 15% in 2007 (OECD 2010).

Differences by remoteness

Results from the 2007 National Drug Strategy Household Survey indicate that the prevalence of daily smoking increased with remoteness. In 2007, 18% of people living in *Major cities* were current smokers compared with 25% of people in *Remote* and *Very remote* areas of Australia (AIHW 2008). When adjusting for age structure, people in *Outer regional* and *Remote* areas were 1.5 times as likely to be smokers as their counterparts in *Major cities* (AIHW 2010a).

Differences by socioeconomic status

In 2007, the prevalence of smoking decreased with improving socioeconomic status. Specifically, the prevalence of daily smoking in the lowest socioeconomic status group was almost twice that of the highest (26% vs. 14%) (AIHW 2008).

Differences by Aboriginal and Torres Strait Islander Status

The National Aboriginal and Torres Strait Islander Social Survey (NATSISS) of 2008 showed that approximately 50% of the Indigenous population aged 18 years and over were daily smokers (ABS 2009a). After adjusting for age differences, Indigenous adults were more than twice as likely to be current smokers as other Australians (AIHW 2011a).

Differences by country of birth

The prevalence of smoking also varied by country of birth. In 2007–08, people from North Africa and the Middle East as well as those from Oceania (excluding Australia) were more likely than Australian-born people to be current smokers. In contrast, people born in the United Kingdom, North-West Europe (excluding the United Kingdom), Southern and Eastern Europe and South-East Asia were less likely to be current smokers than people born in Australia (AIHW 2010a).

Environmental factors

Passive smoking

Passive smoking (also called second-hand smoking, involuntary smoking and environmental smoking) refers to exposure to tobacco smoke, or the chemicals in tobacco smoke, without actually smoking. It usually refers to instances when a non-smoker breathes in smoke emitted into the environment by smokers.

Research studies have consistently shown that passive smoking causes lung cancer (IARC 2008; National Public Health Partnership 2000; Thun et al. 2008). The U.S. Surgeon General estimates that living with a smoker increases a non-smoker's chances of developing lung cancer by 20–30% (U.S. Department of Health and Human Services 2006).

Radon in homes

Radon gas is the second leading risk factor for lung cancer around the world. It is a naturally occurring radioactive gas released from the normal decay of uranium in rocks and soil. Radon gas usually exists at very low levels outdoor and it is not dangerous. However, when radon enters houses through cracks in floors and walls, its concentration can rise to levels that increase the risk of developing lung cancer (ACS 2010a; ARPANSA 2011b; President's Cancer Panel 2010; Wang Z. et al. 2002).

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has conducted a nationwide survey of radon in Australian homes. The results show that the average concentration of radon in Australian homes is much lower than in many other countries. In fact, the average level of radon in Australian homes is not much higher than the concentration in outside air (ARPANSA 2011a).

Occupational exposure

It has been recognised that lung cancer may result from inhalation of a range of industrial and chemical carcinogens (that is, cancer-causing substances), including asbestos, radiation, diesel exhaust fumes and certain metals such as arsenic, cadmium, chromium and nickel (IARC 2008). Many of these exposures are associated with specific occupations and industries. Occupations and industries reported to be associated with an increased risk of lung cancer include mining and quarrying, asbestos production, metals industries, shipbuilding, railroad equipment manufacturing, gas production and areas of construction (De Matteis et al. 2008).

Air pollution

Outdoor air pollution

Outdoor air pollution may increase the risk of lung cancer. Outdoor air pollution occurs when the air contains gases, dust or fumes in amounts that are considered harmful to the health or comfort of humans and animals, or which could cause damage to plants and materials. It can consist of many individual components, including carbon monoxide, nitrogen dioxide, sulphur dioxide, ozone and particles (SEWPaC 2009a, 2009b). Overall, outdoor air quality in Australia is considered to be relatively good (ABS 2008a). However, long-term exposure to urban air pollution was estimated to be the cause of 351 lung cancer deaths in 2003 (Begg et al. 2007).

Indoor air pollution

Indoor air quality has large potential health implications because Australians spend 90% or more of their time indoors (Environment Australia 2001). Indoor air pollution may arise from incoming outdoor air or may originate from household products, combustion from heating and cooking, tobacco smoke, building materials and soil gases (Gilbert & Black 2000). Chemicals and biological contaminants that may affect indoor air quality and possible human health include asbestos, radon gas, second-hand tobacco smoke, formaldehyde, acetone and dust mites. Indoor air pollutants which may affect lung cancer risk include asbestos and second-hand tobacco smoke (Scollo & Winstanley 2008).

Biomedical factors

Family history of lung cancer

People with a family history of lung cancer, especially in a first-degree relative (that is, parents or siblings), are at increased risk of developing lung cancer. The risk is higher for people with more than one first-degree relative who has developed lung cancer, and for people under 50 years (Bromen et al. 2000; Brownson et al. 1997; Lissowska et al. 2010). The increased risk might be due to genetic factors but could also be due to shared behaviours such as smoking.

Previous lung diseases

Having a disease that damages the lungs may increase the risk of lung cancer. For example, pulmonary tuberculosis can lead to the formation of scar tissues in the lungs, which increase vulnerability to lung cancer (Cancer Research UK 2010b). Other diseases that have been associated with lung cancer include lung fibrosis, chronic bronchitis and emphysema (IARC 2008).

3 Incidence of lung cancer

Key findings

In 2007 in Australia:

- 9,703 lung cancers (5,948 in males and 3,755 in females) were diagnosed.
- Lung cancer was the fourth most commonly diagnosed cancer in both males and females (excluding basal and squamous cell carcinoma of the skin).
- The age-standardised incidence rate was 58 per 100,000 for males and 31 per 100,000 for females.
- 84% of lung cancers in males and 80% in females occurred in the age range of 60 years and over.
- The risk of being diagnosed with lung cancer by the age of 85 years was 1 in 12 for males and 1 in 23 for females.

Between 1982 and 2007:

- The incidence rate of lung cancer decreased by 32% in males (from 85 to 58 per 100,000) and increased by 72% in females (from 18 to 31 per 100,000).

In the 5 years from 2003 to 2007:

- The incidence rate of lung cancer was higher for Indigenous than for non-Indigenous Australians.
- The incidence rate for males was highest in the Northern Territory (72 per 100,000) and lowest in the Australian Capital Territory (44 per 100,000), while the rate for females was highest in Tasmania (36 per 100,000) and lowest in the Australian Capital Territory (27 per 100,000).
- The incidence rate for males tended to increase with remoteness, while there was little variation in the rate for females by remoteness.
- The incidence rate of decreased with improving socioeconomic status for both males and females.

Introduction

Incidence data indicate the number of new lung cancers diagnosed during a specific period, usually one year. While these data refer to the number of lung cancers diagnosed and not the number of people diagnosed, it is rare (although possible) that a person would be diagnosed with two or more primary lung cancers in a one-year period. Thus, the annual number of new lung cancers is practically the same as the annual number of people diagnosed with lung cancer.

Details on the incidence of lung cancer over time are provided in this chapter. Information is also presented on the risk of a person being diagnosed with lung cancer by the age of 85 years, as is information on the estimated number of new lung cancers in 2010 and differences in the incidence by age, state and territory, remoteness area, socioeconomic status, Aboriginal and Torres Strait Islander status and country of birth. Data on how Australia's lung cancer rate compares internationally are also reported.

As mentioned in Chapter 1, only those lung cancers that were primary, invasive are considered. Additionally, to be counted, they must be a 'new' primary cancer and not a reoccurrence of a previous primary cancer (IARC 2004).

The main data source for this chapter is the Australian Cancer Database, which consists of data provided to the AIHW by state and territory cancer registries through the National Cancer Statistics Clearing House. Further detail about the Australian Cancer Database is in Appendix C.

How many people were newly diagnosed with lung cancer in 2007?

In 2007, a total of 9,703 new lung cancers were diagnosed in Australia. Of these, 5,948 were in males and 3,755 in females (Table 3.1). Excluding basal and squamous cell carcinoma of the skin (see Box 3.1), lung cancer was the fourth most commonly diagnosed cancer in both males and females, and the fifth most commonly diagnosed cancer overall. It accounted for 10% of all reported cancers in males and 8% in females.

The age-standardised incidence rate of lung cancer was 43 per 100,000 people. The incidence rate was markedly higher for males than females (58 and 31 per 100,000, respectively).

Table 3.1: The five most commonly diagnosed cancers, Australia, 2007

Males				Females			
Site/type of cancer	**Cases**	**ASR[(a)]**	**95% CI**	**Site/type of cancer**	**Cases**	**ASR[(a)]**	**95% CI**
Prostate (C61)	19,403	182.9	180.3–185.5	Breast (C50)	12,567	109.2	107.3–111.1
Bowel (C18–C20)	7,804	75.2	73.5–76.9	Bowel (C18–C20)	6,430	53.4	52.1–54.7
Melanoma of skin (C43)	5,980	57.2	55.7–58.7	Melanoma of skin (C43)	4,362	38.2	37.1–39.4
Lung (C33–C34)	5,948	57.9	56.5–59.4	Lung (C33–C34)	3,755	31.3	30.3–32.4
Lymphoid cancers[(b)]	4,116	39.6	38.4–40.8	Lymphoid cancers[(b)]	3,160	26.8	25.9–27.8
All cancers[(c)]	**62,019**	**595.1**	**590.4–599.8**	**All cancers[(c)]**	**46,349**	**393.9**	**390.3–397.5**

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

(b) Lymphoid cancers (ICD-10 codes of C81–C85, C88, C90, C91) are cancers that start in lymphocytes of the immune system. The most common types are lymphomas, lymphoid leukaemia and myeloma.

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

Source: AIHW Australian Cancer Database 2007.

Box 3.1: Cancer registration in Australia

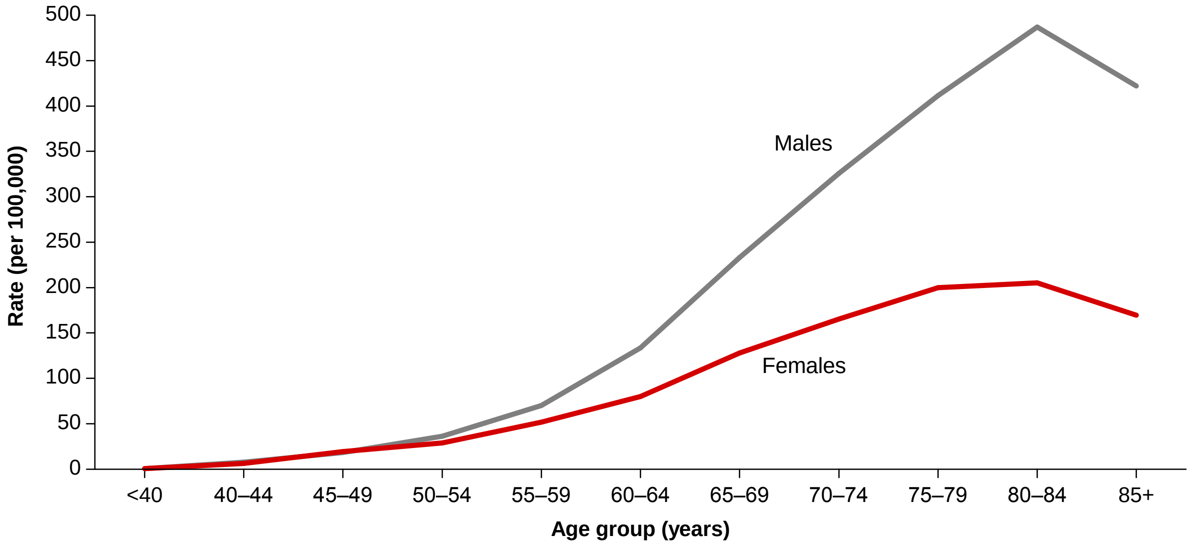
Registration of all cancers, excluding basal and squamous cell carcinomas of the skin, is required by law in each state and territory. Information on newly diagnosed cancers are collected by each state and territory cancer registry, which provide data to the AIHW annually, encompassing all cancer cases notified to the registry between 1982 and the most recent completed year of data, for example 1982 to 2007. The data are compiled to form the Australian Cancer Database (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 chapter. 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).

Does incidence differ by age?

The occurrence of lung cancer was strongly related to age in 2007, with 84% of new lung cancers in males and 80% in females diagnosed in the age range of 60 years and over. About 5% of all lung cancers were diagnosed in people under the age of 50 years. The mean age at diagnosis was 71 years for males and 70 years for females.

Figure 3.1 shows that the age-specific incidence rate increased with age in both males and females in 2007, with the rate rising more sharply in males than females after the age of 50 years. For both males and females the highest rate was in those aged 80 to 84 years (487 and 205 per 100,000, respectively).



Notes

1. The rates shown are age-specific rates.
2. The data for this figure are in Appendix Table D3.1.

Source: AIHW Australian Cancer Database 2007.

Figure 3.1: Incidence of lung cancer by age at diagnosis, Australia, 2007

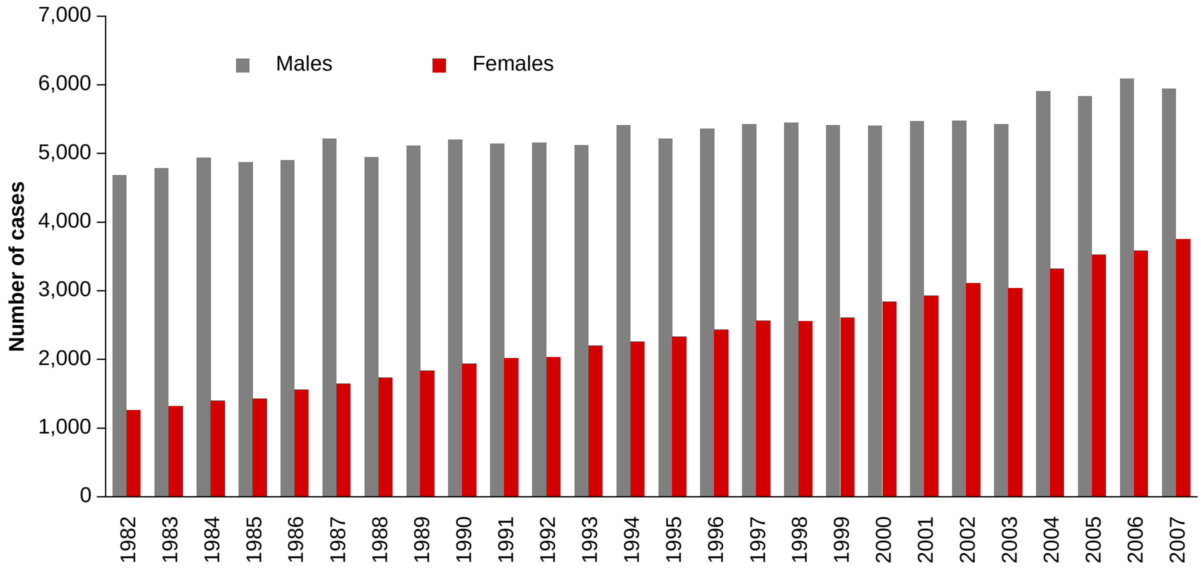
Has the occurrence of lung cancer changed over time?

Figure 3.2 shows that the number of new lung cancers diagnosed each year increased over the 26 years from 1982 (the year in which national cancer incidence data were first available) to 2007. Among males, the number of new lung cancers increased by 27% from 4,688 in 1982 to 5,948 in 2007. The increase was more marked among females, from 1,258 in 1982 to 3,755 in 2007.

The increase in number of new lung cancers over time is affected by changes in age and size of the population. It is also possible, however, that the increase observed in females could be due to smoking patterns in past decades.

Between 1982 and 2007, the age-standardised incidence rate of lung cancer decreased in males by 32% (from 85 to 58 per 100,000) but increased in females by 72% (from 18 to 31 per 100,000) (Figure 3.3). This has resulted in a pronounced narrowing of the male-to-female ratio from 4.7 in 1982 to 1.8 in 2007.

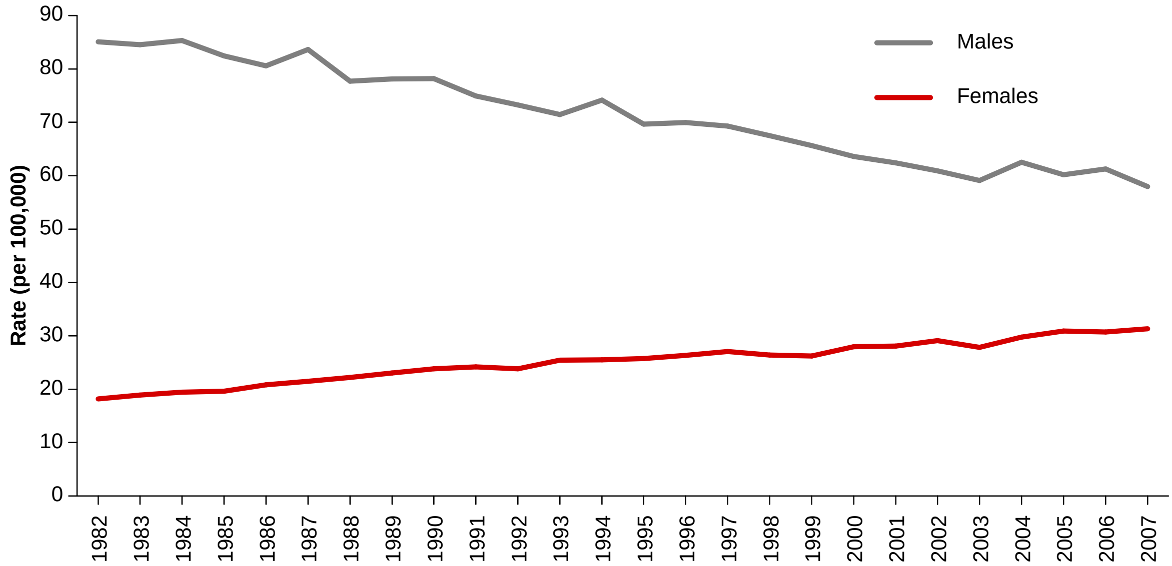
The different pattern of lung cancer incidence rates in males and females would have been affected by different histories of tobacco smoking (Scollo & Winstanley 2008). The rate of male smoking began to decline in the middle of the 20th century, which resulted in a sharp decline in the lung cancer incidence rate for males from the 1980s onwards. The prevalence of smoking in females peaked much later than in males (around the mid-1970s), which may explain the continued increase in the lung cancer incidence rate for females.



Note: The data for this figure are in Appendix Table D3.2.

Source: AIHW Australian Cancer Database 2007.

Figure 3.2: Number of new lung cancer cases, Australia, 1982 to 2007



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
2. The data for this figure are in Appendix Table D3.2.

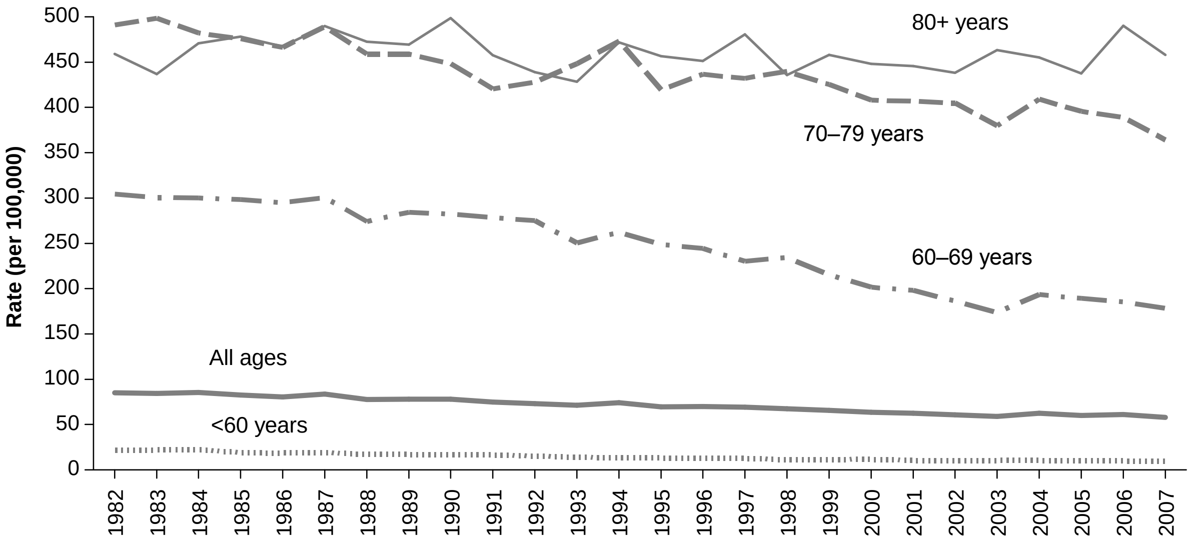
Source: AIHW Australian Cancer Database 2007.

Figure 3.3: Incidence rate of lung cancer, Australia, 1982 to 2007

Do trends in incidence differ by age at diagnosis?

While overall there was a decrease in the incidence rate of lung cancer in males from 1982 to 2007; this did not apply equally to all age groups (Figure 3.4). Between 1982 and 2007, the incidence rates decreased by 54% for males aged less than 60 years (from 22 to 10 per 100,000), by 41% for males aged 60 to 69 years (from 304 to 179 per 100,000) and by 26% for males aged 70 to 79 years (from 491 to 364 per 100,000). However, for males aged 80 years and over, incidence rates fluctuated considerably, with no statistical difference found between 1982 (459 per 100,000) and 2007 (458 per 100,000).

For females, the lung cancer incidence rate rose for all age groups from 1982 to 2007, with the sharpest increase observed for the age group of 80 years and over (Figure 3.5). For this oldest group the rates more than tripled between 1982 (53 per 100,000) and 2007 (189 per 100,000). A steep increase in incidence rates was also observed for females aged 70 to 79 years, with the rate more than doubling over the period considered (from 86 to 181 per 100,000). For females aged 60 to 69 years the incidence rates increased significantly by 33% (from 77 to 102 per 100,000), while they increased by 26% for females aged less than 60 years (from 6.6 to 8.3 per 100,000).

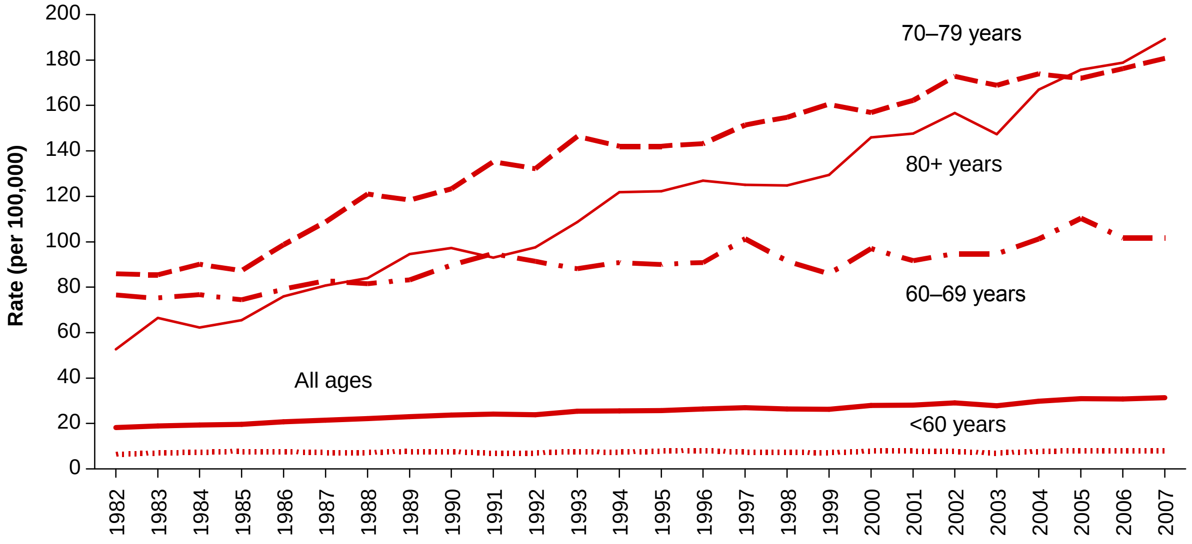


Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 males.
2. The data for this figure are in Appendix Table D3.3.

Source: AIHW Australian Cancer Database 2007.

Figure 3.4: Incidence of lung cancer by age at diagnosis, males, Australia, 1982 to 2007



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 females.
2. The data for this figure are in Appendix Table D3.4.

Source: AIHW Australian Cancer Database 2007.

Figure 3.5: Incidence of lung cancer by age at diagnosis, females, Australia, 1982 to 2007

What is the risk of being diagnosed with lung cancer?

During the 26 years from 1982 to 2007 there was an overall decrease in the risk of a male being diagnosed with lung cancer; from 1 in 9 to 1 in 12. In contrast, the risk of a female being diagnosed with lung cancer by the age of 85 increased from 1 in 42 in 1982 to 1 in 23 in 2007 (Table 3.2).

What is the average age at diagnosis?

Table 3.2 shows that the mean age at diagnosis of lung cancer increased over time for males and females. Specifically, it increased from 66 years in 1982 to 71 years in 2007 for males, and from 65 years to 70 years for females.

Table 3.2: Risk and mean age at diagnosis of lung cancer, Australia, 1982 to 2007

	Risk to 85 years		Mean age at first diagnosis	
Year	Males	Females	Males	Females
1982	1 in 9	1 in 42	66.3	65.1
1983	1 in 9	1 in 41	66.3	65.4
1984	1 in 9	1 in 40	66.3	65.1
1985	1 in 9	1 in 40	66.9	65.1
1986	1 in 9	1 in 37	67.0	65.6
1987	1 in 9	1 in 35	67.2	66.3
1988	1 in 9	1 in 33	67.4	66.7
1989	1 in 9	1 in 33	67.6	66.6
1990	1 in 9	1 in 32	67.8	66.8
1991	1 in 10	1 in 31	67.6	67.6
1992	1 in 10	1 in 31	68.0	67.5
1993	1 in 10	1 in 29	68.3	68.1
1994	1 in 10	1 in 28	68.9	68.3
1995	1 in 10	1 in 28	68.6	68.2
1996	1 in 10	1 in 28	68.9	68.1
1997	1 in 10	1 in 27	69.2	68.4
1998	1 in 11	1 in 27	69.4	68.5
1999	1 in 11	1 in 27	69.7	69.1
2000	1 in 11	1 in 26	69.6	69.1
2001	1 in 11	1 in 26	69.9	69.0
2002	1 in 12	1 in 25	70.1	69.3
2003	1 in 12	1 in 26	70.3	69.6
2004	1 in 11	1 in 24	70.1	69.6
2005	1 in 12	1 in 23	70.3	69.4
2006	1 in 11	1 in 23	70.6	69.6
2007	1 in 12	1 in 23	70.5	69.8

Source: AIHW Australian Cancer Database 2007.

How many people are expected to be diagnosed with cancer in 2010?

To estimate the incidence of lung cancer in 2010, data on the numbers of lung cancers diagnosed from 1998 to 2007 were extrapolated. This approach assumed that the trends in incidence of lung cancer during the 10 years from 1998 to 2007 would continue to 2010. Since it is impossible to anticipate and quantify future developments that might cause a change in the number of people diagnosed with lung cancer, these projections should be interpreted as only indicative of future trends (see Appendix B for further details on the methodology used).

The number of new lung cancers in 2010 is extrapolated to be about 6,300 in males and 4,200 in females (Table 3.3). This equates to a 6% increase for males and a 12% increase for females compared with the number diagnosed in 2007. The upward trend is largely due to ageing and growth of the population.

When expected changes in the age structure and size of the population are taken into account, the extrapolations suggest that the incidence rates of lung cancer will continue to decrease in males, to 57 per 100,000 in 2010. In comparison, the rates are expected to increase slightly in females through to 2010, to 32 per 100,000.

Table 3.3: Incidence of lung cancer, Australia, observed for 2007 and extrapolated[(a)] for 2010

	2007			2010	
Sex	Number of cases	Age-standardised rate[(b)]	95% confidence interval	Extrapolated number of cases[(a)]	Extrapolated age-standardised rate[(a, b)]
Males	5,948	57.9	56.5–59.4	6,300	57
Females	3,755	31.3	30.3–32.4	4,200	32

(a) The extrapolations were based on incidence data for 1998 to 2007. See Appendix B for further details on the methodology used.

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

Source: AIHW Australian Cancer Database 2007.

What are the most common types of lung cancer?

Lung cancer consists of a heterogeneous set of invasive tumours that arise from different cell types in the lung (as discussed in Chapter 1). Each type of cancer is associated with different risk factors, natural behaviour history and responsiveness to therapeutic interventions.

In this report, similar types of lung cancers have been categorised into four broader groups, with one of the groups divided further into subgroups. The histology types included in each group and subgroup are in Table 3.4. This system of grouping lung cancers was based primarily on documentation from the International Agency for Research on Cancer (Egevad et al. 2007), with additional input from Cancer Australia.

In 2007, 64% of lung cancers in males and 61% in females were classified as *non-small cell carcinoma* (group 2). *Adenocarcinoma* (group 2.2) was the most common type of *non-small cell carcinoma* for both sexes, although the proportional occurrence of *adenocarcinoma* was lower in males than in females (26% vs. 34%). Meanwhile, the proportional occurrence of *squamous cell carcinoma* (group 2.1) was higher in males than in females (20% vs. 10%). The proportion of lung cancers classified as *large cell carcinoma* (group 2.3) was around 17% for both sexes.

The proportion of lung cancers classified as *small cell carcinoma* (group 1) was 11% for males and 13% for females. Furthermore, o*ther specified carcinoma* (group 3) and *other and unspecified malignant neoplasm* (group 4) collectively comprised 25% of lung cancers in males and 26% in females (Table 3.5).

Studies based on data from Queensland (Youlden et al. 2007), Ireland (Kabir et al. 2008) and the United States of America (Fu et al. 2005) also found distinct sex differences in the proportional occurrence of the various types of lung cancer, with males having higher proportions of *squamous cell carcinoma* and lower proportions of *adenocarcinoma* than females. The reasons behind these histologic differences are not clear.

Table 3.4: Grouping of lung cancer histology types

Type of lung cancer[(a)]	Corresponding ICD-O-3 codes
1: Small cell carcinoma	8041–8045, 8246
2: Non-small cell carcinoma	8010–8012, 8014–8031, 8035, 8050–8078, 8083–8084, 8140, 8211, 8230–8231, 8250–8260, 8310, 8323, 8480–8490, 8550–8551, 8570–8574, 8576
2.1: Squamous cell carcinoma	8050–8078, 8083–8084
2.2: Adenocarcinoma	8140, 8211, 8230–8231, 8250–8260, 8323, 8480–8490, 8550–8551, 8570–8574, 8576
2.3: Large cell carcinoma[(b)]	8010–8012, 8014–8031, 8035, 8310
3: Other specified carcinoma	8013, 8032–8034, 8046, 8082, 8094, 8120, 8123, 8141, 8144, 8200, 8210, 8240–8243, 8245, 8249, 8261, 8263, 8430, 8440, 8470–8471, 8520, 8560, 8562
4: Other and unspecified malignant neoplasm	8000–8005, 8800–8811, 8830, 8840–8921, 8990–8991, 9040–9044, 9120–9133, 9150, 9540–9581, 8720, 8815, 8935, 8940, 8972–8973, 8980–8981, 9070, 9080, 9180, 9220, 9364, 9370, 9473

(a) The grouping of lung cancer histology types was based primarily on those recommended by the International Agency for Research on Cancer (Egevad et al. 2007), with additional input from Cancer Australia.

(b) Including giant cell, clear cell and large cell undifferentiated carcinoma.

Note: All cases included in each of the groups were coded by state and territory cancer registries as primary site, invasive lung cancers.

Table 3.5: Incidence by type of lung cancer, Australia, 2007

	Males		Females	
Type of lung cancer[(a)]	Number of cases	% of lung cancers	Number of cases	% of lung cancers
1: Small cell carcinoma	666	11.2	474	12.6
2: Non-small cell carcinoma	3,788	63.7	2,307	61.4
2.1: Squamous cell carcinoma	*1,181*	*19.9*	*390*	*10.4*
2.2: Adenocarcinoma	*1,572*	*26.4*	*1,281*	*34.1*
2.3: Large cell carcinoma	*1,035*	*17.4*	*636*	*16.9*
3: Other specified carcinoma	878	14.8	557	14.8
4: Other and unspecified malignant neoplasm	616	10.4	417	11.1
Total	**5,948**	**100.0**	**3,755**	**100.0**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 provides a list of the histology types included in each group.

Source: AIHW Australian Cancer Database 2007.

Does the age at diagnosis differ for the different types of lung cancer?

The average age at the first diagnosis of lung cancer differed by histology type (Table 3.6). For both sexes the mean age at diagnosis was highest for those cases in which the type of lung cancer was *other and unspecified malignant neoplasm* (group 4), with an average age of 76 years for males and 79 for females. In contrast, the mean age at diagnosis was lowest for people with *small cell carcinoma* (group 1), with an average age of 69 years for males and 67 for females. The mean age at diagnosis for those with *non-small cell carcinoma* (group 2) was 70 years for males and 69 for females.

Table 3.6: Average age at diagnosis by type of lung cancer, Australia, 2007

Type of lung cancer[(a)]	Males: Mean age at first diagnosis	Males: Median age at first diagnosis	Females: Mean age at first diagnosis	Females: Median age at first diagnosis
1: Small cell carcinoma	68.9	70.0	67.1	68.0
2: Non-small cell carcinoma	70.2	71.0	69.4	70.0
2.1: Squamous cell carcinoma	*70.3*	*71.0*	*71.6*	*73.0*
2.2: Adenocarcinoma	*68.8*	*69.5*	*67.3*	*68.0*
2.3: Large cell carcinoma	*72.3*	*73.0*	*72.1*	*74.0*
3: Other specified carcinoma	69.2	70.5	67.4	69.0
4: Other and unspecified malignant neoplasm	76.1	78.0	78.5	81.0
Total	**70.5**	**72.0**	**69.8**	**71.0**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 provides a list of the histology types included in each group.

Source: AIHW Australian Cancer Database 2007.

The distribution of the histological types of lung cancer according to six age groups is in Table 3.7.

- For each of the age groups, *non-small cell carcinoma* (group 2) was the most commonly diagnosed cancer, although its proportional distributions varied by age.
- The proportion of all lung cancers that was *squamous cell carcinoma* (group 2.1) tended to increase with age, with the highest proportion observed in those aged 70 to 79 years for both sexes.
- The proportion of all lung cancers that was *adenocarcinoma* (group 2.2) declined with age for males. For females, the proportion of all cancers that was *adenocarcinoma* was highest in those aged 40 to 49 years, while the lowest proportion was for those aged 80 years and over.
- Compared with other age groups, *large cell carcinoma* (group 2.3) made up a larger proportion of lung cancers in the oldest age group.
- The proportion of lung cancers that was *small cell carcinoma* (group 1) was highest for people in the middle age groups (that is, 40 to 79 years).
- *Other specified carcinoma* (group 3) was responsible for a larger proportion of lung cancers in the youngest age group (that is, those younger than 40 years).
- *Other and unspecified malignant neoplasm* (group 4) was responsible for a larger proportion of lung cancers in the oldest age group (that is, those aged 80 years and over).

Table 3.7: Incidence by type of lung cancer and age at diagnosis, Australia, 2007

	Number of cases							Per cent						
Type of lung cancer[(a)]	**<40**	**40–49**	**50–59**	**60–69**	**70–79**	**80+**	**Total**	**<40**	**40–49**	**50–59**	**60–69**	**70–79**	**80+**	**Total**
								Males						
1: Small cell carcinoma	3	25	94	201	241	102	666	7.3	12.8	13.6	12.2	11.7	7.8	11.2
2: Non-small cell carcinoma	20	134	454	1,080	1,312	788	3,788	48.8	68.4	65.6	65.7	63.7	59.9	63.7
2.1: Squamous cell carcinoma	*0*	*25*	*135*	*358*	*459*	*204*	*1,181*	*0.0*	*12.8*	*19.5*	*21.8*	*22.3*	*15.5*	*19.9*
2.2: Adenocarcinoma	*15*	*73*	*227*	*471*	*510*	*276*	*1,572*	*36.6*	*37.2*	*32.8*	*28.7*	*24.7*	*21.0*	*26.4*
2.3: Large cell carcinoma	*5*	*36*	*92*	*251*	*343*	*308*	*1,035*	*12.2*	*18.4*	*13.3*	*15.3*	*16.6*	*23.4*	*17.4*
3: Other specified carcinoma	14	31	112	263	293	165	878	34.1	15.8	16.2	16.0	14.2	12.5	14.8
4: Other and unspecified malignant neoplasm	4	6	32	99	215	260	616	9.8	3.1	4.6	6.0	10.4	19.8	10.4
Total	**41**	**196**	**692**	**1,643**	**2,061**	**1,315**	**5,948**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
								Females						
1: Small cell carcinoma	3	26	80	151	167	47	474	7.1	13.2	15.0	15.9	14.5	5.3	12.6
2: Non-small cell carcinoma	20	132	349	603	687	516	2,307	47.6	67.0	65.6	63.7	59.7	58.2	61.4
2.1: Squamous cell carcinoma	*3*	*12*	*42*	*93*	*138*	*102*	*390*	*7.1*	*6.1*	*7.9*	*9.8*	*12.0*	*11.5*	*10.4*
2.2: Adenocarcinoma	*12*	*94*	*221*	*381*	*362*	*211*	*1,281*	*28.6*	*47.7*	*41.5*	*40.2*	*31.5*	*23.8*	*34.1*
2.3: Large cell carcinoma	*5*	*26*	*86*	*129*	*187*	*203*	*636*	*11.9*	*13.2*	*16.2*	*13.6*	*16.2*	*22.9*	*16.9*
3: Other specified carcinoma	14	35	87	155	170	96	557	33.3	17.8	16.4	16.4	14.8	10.8	14.8
4: Other and unspecified malignant neoplasm	5	4	16	38	127	227	417	11.9	2.0	3.0	4.0	11.0	25.6	11.1
Total	**42**	**197**	**532**	**947**	**1,151**	**886**	**3,755**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, lung cancers. Table 3.4 provides a list of the histology types included in each group.

Source: AIHW Australian Cancer Database 2007.

Have there been changes in the distribution of lung cancer types?

Trends in proportions of the lung cancers by type are in Table 3.8, with the data grouped into four time periods. Caution should be exercised when interpreting these data since changes in histological assessment and coding practices may have affected observed trends.

For each period, *non-small cell carcinoma* (group 2) was the most commonly diagnosed cancer in both males and females. However, the proportion of *non-small cell carcinoma* fluctuated over the four time periods, with values ranking from 66% (in 2002–2007) to 77% (in 1989–1995) for males and from 64% (in 2002–2007) to 72% (in 1996–2001) for females.

Within the group of *non-small cell carcinoma*, changes over time were observed for all three subgroups. For both sexes there was a marked decrease in the proportion of *squamous cell carcinoma* (group 2.1). In 1982–1988, *squamous cell carcinoma* (group 2.1) accounted for 33% of male lung cancers and 20% of female lung cancers; these proportions were 20% and 12% in 2007. Over the same period, the proportion of lung cancers that were classified as *adenocarcinoma* (group 2.2) increased for both sexes. Specifically, 18% of male lung cancers and 26% of female lung cancers were classified as *adenocarcinoma* (group 2.2) in 1982–1988 but this proportion increased to 26% and 32% in 2002–2007. The proportion of lung cancers classified as *large cell carcinoma* (group 2.3) fluctuated over the four periods for both males and females, with the highest proportions in 1996–2001 (26% for males and 25% for females).

The proportion of lung cancers that were *small cell carcinoma* (group 1) fell from 15% in 1982–1988 to 12% in 2002–2007 for males. A similar decrease in the proportion of *small cell carcinoma* (group 1) was seen for females; from 18% in 1982–1988 to 13% in 2002–2007.

While there was an increase in the proportion of lung cancers coded as *other specified carcinoma* (group 3) between each of the four periods, by far the steepest increase was between 1996–2001 and 2002–2007 (from 2% to 12% for males and 3% to 13% for females). This steep increase between the two latest periods is most likely due to changes in coding practices following the introduction of a *non-small cell carcinoma* category.

The marked changes in histological distribution of lung cancers over time may be explained by changes in characteristics of cigarettes and consequent changes in the inhaled dose of carcinogens. In Australia, filtered cigarettes became available in the 1950s, with their market share rising steeply in the 1960s and 1970s (Walker 1984). The implementation of filters made it easier to draw in smoke, allowing smokers to take bigger and deeper puffs and thereby inhaling carcinogens further into the lungs. Furthermore, over the past decades the level of nitrates in tobacco smoke has increased. Nitrates enhance the combustion of tobacco smoke, which in turn leads to increased formation of tobacco-specific nitrosamines. Both the shift to filtered cigarettes and the increase in dose of nitrosamines have been postulated as factors leading to the increase in *adenocarcinoma* (Alberg & Samet 2003; Burns et al. 2011; Egleston et al. 2009; Gabrielson 2006; Thun et al. 1997).

Further information on the histological types of lung cancers by age group is in Appendix Tables D3.5 to D3.8, which show trends from 1982–1988 to 2002–2007 for four age groups: younger than 60 years, 60 to 69 years, 70 to 79 years and 80 years and over at diagnosis.

Table 3.8: Incidence by type of lung cancer, Australia, 1982–1988 to 2002–2007

	Number of cases				Per cent			
Type of lung cancer[(a)]	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**
					Males			
1: Small cell carcinoma	4,968	4,846	4,137	4,073	14.5	13.3	12.7	11.7
2: Non-small cell carcinoma	25,077	28,029	24,898	22,900	73.0	77.0	76.5	66.0
2.1: Squamous cell carcinoma	*11,239*	*11,344*	*8,453*	*6,985*	*32.7*	*31.2*	*26.0*	*20.1*
2.2: Adenocarcinoma	*6,326*	*7,981*	*8,004*	*9,131*	*18.4*	*21.9*	*24.6*	*26.3*
2.3: Large cell carcinoma	*7,512*	*8,704*	*8,441*	*6,784*	*21.9*	*23.9*	*25.9*	*19.6*
3: Other specified carcinoma[(b)]	449	680	696	4,194	1.3	1.9	2.1	12.1
4: Other and unspecified malignant neoplasm	3,876	2,826	2,821	3,530	11.3	7.8	8.7	10.2
Total	**34,370**	**36,381**	**32,552**	**34,697**	**100.0**	**100.0**	**100.0**	**100.0**
					Females			
1: Small cell carcinoma	1,836	2,479	2,379	2,610	17.7	16.9	14.9	12.8
2: Non-small cell carcinoma	6,994	10,423	11,452	12,968	67.4	71.2	71.8	63.7
2.1: Squamous cell carcinoma	*2,056*	*2,826*	*2,478*	*2,499*	*19.8*	*19.3*	*15.5*	*12.3*
2.2: Adenocarcinoma	*2,684*	*4,151*	*4,921*	*6,547*	*25.9*	*28.4*	*30.9*	*32.2*
2.3: Large cell carcinoma	*2,254*	*3,446*	*4,053*	*3,922*	*21.7*	*23.6*	*25.4*	*19.3*
3: Other specified carcinoma[(b)]	266	443	542	2,560	2.6	3.0	3.4	12.6
4: Other and unspecified malignant neoplasm	1,276	1,285	1,566	2,211	12.3	8.8	9.8	10.9
Total	**10,372**	**14,630**	**15,939**	**20,349**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 provides a list of the histology types included in each group.

(b) Includes 'non-small cell carcinoma' (8046), and this classification has only been used by state/territory cancer registries since around 2003 (vary by state/territory). Prior to 2003, 'non-small cell carcinoma' was coded to various histology codes, mainly to the group classified as 'large cell carcinoma'. The new coding practice has influenced the trends shown in the table.

Source: AIHW Australian Cancer Database 2007.

Does incidence differ by stage?

Stage at diagnosis refers to extent or spread of cancer at the time of diagnosis. Such information is essential for a number of reasons, including determining an individual's prognosis, assisting in the planning and evaluation of treatment, and contributing to cancer monitoring and research.

A number of different staging systems are used to classify lung cancer tumours, including the Union for International Cancer Control (UICC) TNM system and the Surveillance Epidemiology End Results (SEER) Summary Staging system (or 'summary stage' system for short). While the TNM system is frequently used in clinical settings, the summary stage system is used more commonly in reporting staging information to cancer registries and is also used as the basis of reporting data on stage in this report. Additional details about the summary stage system are in Box 3.1 and Appendix E.

There is currently no national requirement for collection of data on stage and not all states and territories collect this information; thus, no national data on staging of lung cancer are available. To give an indication of the proportion of lung cancers diagnosed at various stages, Table 3.9 shows data for New South Wales for 1995 to 2004 (Tracey E. et al. 2006) and the United States of America for 1999 to 2006 (Altekruse et al. 2010). Note that the time periods to which the data apply differ slightly from each other. Note also that the New South Wales data pertain to cancers coded as C33–C34 in the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), whereas the data from the United States of America pertain only to cancers coded as C34 in the ICD-10.

Both sets of data suggest that approximately 4 in 10 lung cancer cases were diagnosed when the cancer was still localised or at a regional stage (39% in New South Wales and 37% in United States of America). Meanwhile, one-third (32%) of the cases in New South Wales were distant at the time of diagnosis. This compares with 56% of the cases diagnosed in the United States of America. The stage at diagnosis was unknown in 29% of the cases recorded in New South Wales, but only in 8% in the United States of America. When only those lung cancers for which the stage of diagnosis was known are considered, the proportion of cases that was distant was 45% for New South Wales and 60% for the United States of America.

Box 3.1: Summary staging system—extent of disease at diagnosis

In the SEER Summary Stage system, tumours are allocated to one of three categories, as well as an 'unknown' category (Young et al. 2001):

Local: the tumour is confined to one or both lungs.

Regional: the tumour has spread to surrounding tissue or nearby lymph nodes.

Distant: the tumour has spread to distant organs and has begun to grow at the new location.

Unknown: there is not sufficient evidence available to adequately assign a stage.

Further details about each of the categories in the summary stage system are in Appendix E

Table 3.9: Incidence of lung cancer by stage at diagnosis[(a)], New South Wales, 1995–2004 and United States of America, 1999–2006[(b)]

	New South Wales (1995–2004)			United States of America (1999–2006)		
Stage at diagnosis	Number of cases	% of all cases	% of staged cases[(c)]	Number of cases	% of all cases	% of staged cases[(c)]
Localised	5,762	21.0	29.6	n.a.	15.0	16.1
Regional	5,047	18.0	25.4	n.a.	22.0	23.7
Distant	8,790	32.0	45.1	n.a.	56.0	60.2
Unknown	8,122	29.0	. .	n.a.	8.0	. .
Total[(d)]	**27,721**	**100.0**	**100.0**	**263,175**	**100.0**	**100.0**

n.a. Not available.

(a) Based on the SEER summary staging system (see Appendix E).

(b) Data were from the SEER 17 areas which cover approximately a quarter of the USA (see Table 15.12 in Altekruse et al. 2010).

(c) These values are approximations that were calculated by the AIHW since only the percentage (rather than the exact number) of unknown cases was provided.

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

Source: Tracey et al. 2006; Altekruse et al. 2010.

Differences between males and females in the proportion of lung cancers diagnosed at different stages in the United States of America are in Table 3.10. The data indicate that slightly more females than males were diagnosed when the lung cancer was at a localised stage (16% vs. 13%). In contrast, a slightly higher proportion of males than females were diagnosed when the tumour was at a distant stage (57% vs. 54%). In both sexes, 22% were diagnosed when the tumour was at a regional stage.

Table 3.10: Incidence of lung cancer by stage at diagnosis[(a)], United States of America, 1999–2006[(b)]

	Males			Females		
Stage at diagnosis	Number of cases	% of all cases	% of staged cases[(c)]	Number of cases	% of all cases	% of staged cases[(c)]
Localised	n.a.	13.0	14.1	n.a.	16.0	17.4
Regional	n.a.	22.0	23.9	n.a.	22.0	23.9
Distant	n.a.	57.0	62.0	n.a.	54.0	58.7
Unknown	n.a.	7.0	. .	n.a.	8.0	. .
Total[(d)]	**142,448**	**100.0**	**100.0**	**120,727**	**100.0**	**100.0**

n.a. Not available.

(a) Based on the SEER summary staging system (see Appendix E).

(b) Data were from the SEER 17 areas which cover approximately a quarter of the USA (see Table 15.12 in Altekruse et al. 2010).

(c) These values are approximations that were calculated by the AIHW since only the percentage (rather than the exact number) of unknown cases was provided.

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

Source: Altekruse et al. 2010.

Table 3.11 presents information on the stage at diagnosis for *small cell lung cancer* and *non-small cell lung cancer* in the United States of America from 1999 to 2006. One in 20 (5%) *small cell lung cancers* were diagnosed when the tumour was still localised, about one-fifth (21%) when the tumour was at a regional stage, and more than two-thirds (69%) when the tumour was at a distant stage. The majority *of non-small cell lung cancers* were also at the distant stage when diagnosed, although the proportion was considerably lower (54%) than suggested for *small cell lung cancer*. Moreover, 16% of *non-small cell lung cancers* were diagnosed when the cancer was localised, which compares with 5% for *small cell lung cancer*.

Differences between males and females in the stage at diagnosis for *small cell lung cancer* and *non-small cell lung cancer* are in Appendix Table D3.9.

Table 3.11: Incidence of lung cancer by stage at diagnosis[(a)], United States of America, 1999–2006[(b)]

	Small cell lung cancer[(c)]			Non-small cell lung cancer[(d)]		
Stage at diagnosis	**Number of cases**	**% of all cases**	**% of staged cases[(e)]**	**Number of cases**	**% of all cases**	**% of staged cases[(e)]**
Localised	n.a.	5	5.3	n.a.	16	17.4
Regional	n.a.	21	22.1	n.a.	22	23.9
Distant	n.a.	69	72.6	n.a.	54	58.7
Unknown	n.a.	5	. .	n.a.	8	. .
Total[(f)]	**35,769**	**100**	**100.0**	**227,406**	**100**	**100.0**

n.a. Not available.

(a) Based on the SEER summary staging system (see Appendix E).

(b) Data were from the SEER 17 areas which cover approximately a quarter of the USA (see Table 15.13 and Table 15.14 in Altekruse et al. 2010).

(c) Small cell cancer of the lung includes histologies 8041–8045.

(d) Non-small cell cancer of the lung includes histologies 8000–8040, 8046–9049, 9056–9139, 9141–9589.

(e) These values are approximations that were calculated by the AIHW since only the percentage (rather than the exact number) of unknown cases was provided.

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

Source: Altekruse et al. 2010

Do incidence rates differ across population groups?

In this section, data on the incidence of lung cancer are provided according to state and territory, remoteness area, socioeconomic status, Aboriginal and Torres Strait Islander status and country of birth. To take into account differences in age structures and size of the groups being compared, age-standardised rates are provided for each of the comparisons. The data are presented for the 5 years from 2003 to 2007 rather than for just one year, since presenting data for multiple years reduces random variation in data. This is especially important when comparing small subgroups (for example, Indigenous Australians or populations in smaller states and territories).

Rate ratios are used in this section to indicate the relative incidence between different groups. The rate ratio is obtained by dividing the age-standardised rate of lung cancer for one population (for example, Indigenous Australians) with that of another population (for example, non-Indigenous Australians). In this example, a ratio greater than 1 would indicate an excess in Indigenous Australians, while a ratio less than 1 would indicate an excess in non-Indigenous Australians. More information about rate ratios is in Appendix B.

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

- population characteristics (for example, a relatively greater proportion of Indigenous people in remote areas)
- the prevalence of risk factors (for example, smoking)
- the availability of diagnostic services.

Do incidence rates differ by state and territory?

Between 2003 and 2007, there was a clear relationship between size of jurisdiction and average number of lung cancers diagnosed annually, such that the largest number of lung cancers were diagnosed in New South Wales (1,928 cases annually for males and 1,162 for females) and the smallest in the Northern Territory (41 cases annually for males and 18 for females) (Table 3.12).

The age-standardised incidence rates varied between state and territories for both males and females. Among males, the rate was significantly lower in the Australian Capital Territory (44 per 100,000) than in the other states and territories. The highest rate was for the Northern Territory (72 per 100,000), which was significantly higher than for New South Wales (59 per 100,000) and the Australian Capital Territory (44 per 100,000). The higher rate for the Northern Territory may be due, at least in part, to the higher proportion of Aboriginal and Torres Strait Islander males living in the Northern Territory and their higher incidence rate of lung cancer.

Among females, the incidence rate was lowest in the Australian Capital Territory (27 per 100,000). In contrast, the highest rate was in Tasmania (36 cases per 100,000), with this rate significantly higher than that of other states and territories, with the exception of the Northern Territory (34 per 100,000).

Table 3.12: Incidence of lung cancer by state and territory, Australia, 2003–2007

	Males			Females		
State or territory[(a)]	**Average annual number of cases[(b)]**	**ASR[(c)]**	**95% CI**	**Average annual number of cases[(b)]**	**ASR[(c)]**	**95% CI**
New South Wales	1,928	58.5	57.3–59.7	1,162	29.9	29.1–30.7
Victoria	1,453	60.0	58.6–61.4	876	30.0	29.1–30.9
Queensland	1,160	62.6	61.0–64.3	630	30.1	29.1–31.2
Western Australia	551	62.0	59.7–64.4	329	31.8	30.3–33.4
South Australia	487	59.0	56.7–61.4	284	28.4	26.9–29.9
Tasmania	172	67.3	62.9–72.1	108	36.4	33.4–39.7
Australian Capital Territory	52	44.0	38.7–49.8	40	27.2	23.5–31.2
Northern Territory	41	72.0	60.6–84.6	18	33.8	26.3–42.5
Total	**5,844**	**60.2**	**59.5–60.9**	**3,448**	**30.2**	**29.7–30.6**

(a) Relates to the state or territory of usual residence.

(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 are based on the total number of cases over the 5 years from 2003–2007.

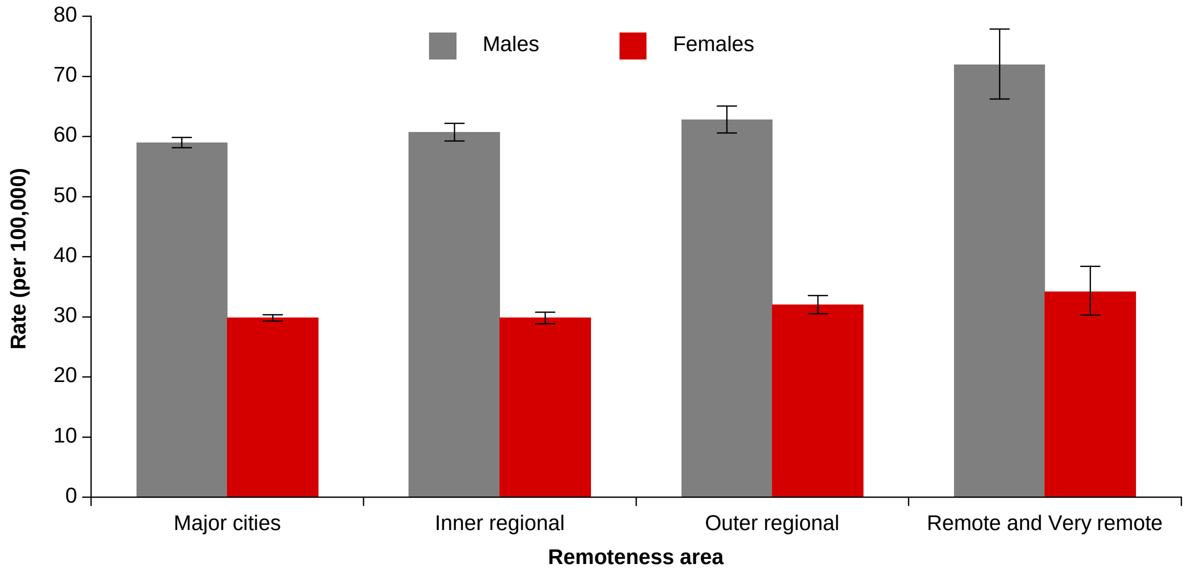
Source: AIHW Australian Cancer Database 2007.

Do incidence rates differ by remoteness area?

People living in more inaccessible regions of Australia are often disadvantaged in relation to access to goods and services (including primary health-care services), income, educational and employment opportunities and, in some instances, access to basic amenities, such as clean water and fresh food (AIHW 2010a). To compare incidence rates according to level of remoteness of the area in which people lived, the Australian Standard Geographical Classification Remoteness Area (ABS 2001) was used to indicate remoteness category across Australia. More information about this classification is in Appendix A.

During 2003 to 2007, incidence rates of lung cancer for males tended to increase with remoteness (Figure 3.6). While the rate in *Inner regional* areas was not significantly different from that in *Major cities*, the rates in *Outer regional* areas and *Remote* and *Very remote* areas were significantly higher (1.1 and 1.2 times the rate in *Major cities*, respectively).

There was little variation in rates for females by remoteness. The highest rate was in *Remote* and *Very remote* areas, but this was not significantly different from the rates for other areas of Australia.



Notes

1. Remoteness was classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007.
3. The data for this figure are shown in Appendix Table D3.10.

Source: AIHW Australian Cancer Database 2007.

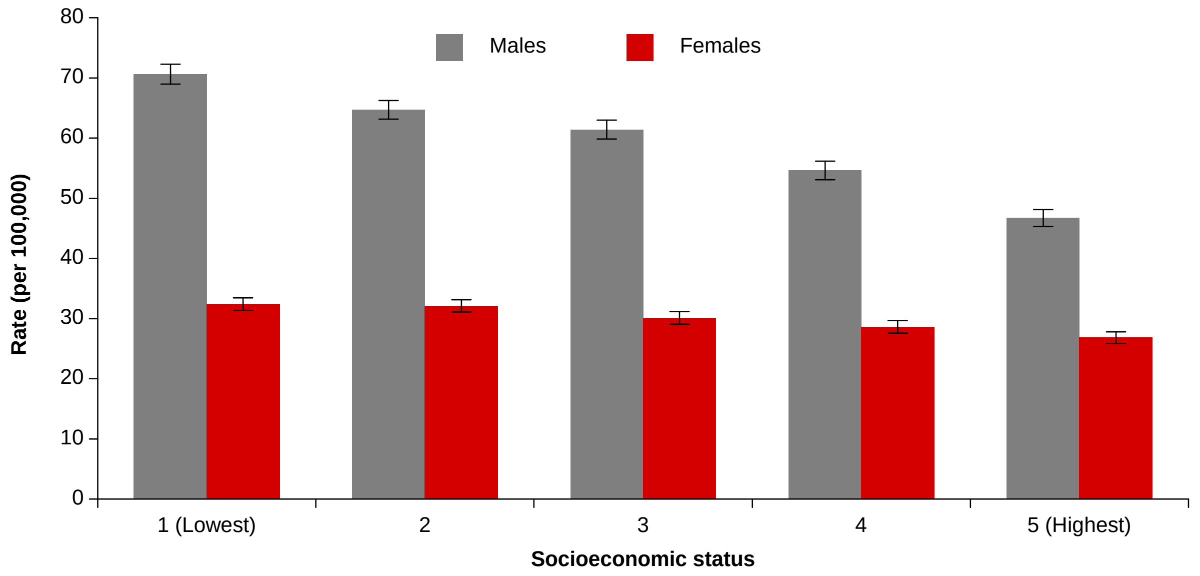
Figure 3.6: Incidence of lung cancer by remoteness area, Australia, 2003–2007

Do incidence rates differ by socioeconomic status?

Previous national and international studies have shown that individuals with a lower socioeconomic status have higher risk of lung cancer (Baade et al. 2005; Clegg et al. 2009; Faggiano et al. 1997; Mao et al. 2001; Shack et al. 2008; Sharp & Brewster 1999; Sidorchuk et al. 2009; Youlden et al. 2007). One possible explanation is that people of lower socioeconomic status are more likely to have higher levels of risk factors related to lung. For example, results from the 2007–08 National Health Survey indicate that the prevalence of smoking in the lowest socioeconomic status group is twice that of the highest group (AIHW 2010a).

In this report, the Index of Relative Socio-economic Disadvantage (IRSD) is used to indicate socioeconomic status (ABS 2008d). 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 according to the IRSD, and the fifth group corresponds to the 20% of the population with the highest status. Appendix A has further information about the IRSD.

When the age-standardised incidence rates in the five socioeconomic status groups are compared, the results are similar to those of earlier studies. That is, the incidence rates of lung cancer decreased with improving socioeconomic status. In particular, during 2003 to 2007, males in the lowest group (group 1) were 1.5 times as likely and females 1.2 times as likely to be diagnosed with lung cancer compared with their counterparts in the highest status group (group 5) (Figure 3.7).



Notes

1. Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007.
3. The data for this figure are in Appendix Table D3.11.

Source: AIHW Australian Cancer Database 2007.

Figure 3.7: Incidence of lung cancer by socioeconomic status, Australia, 2003–2007

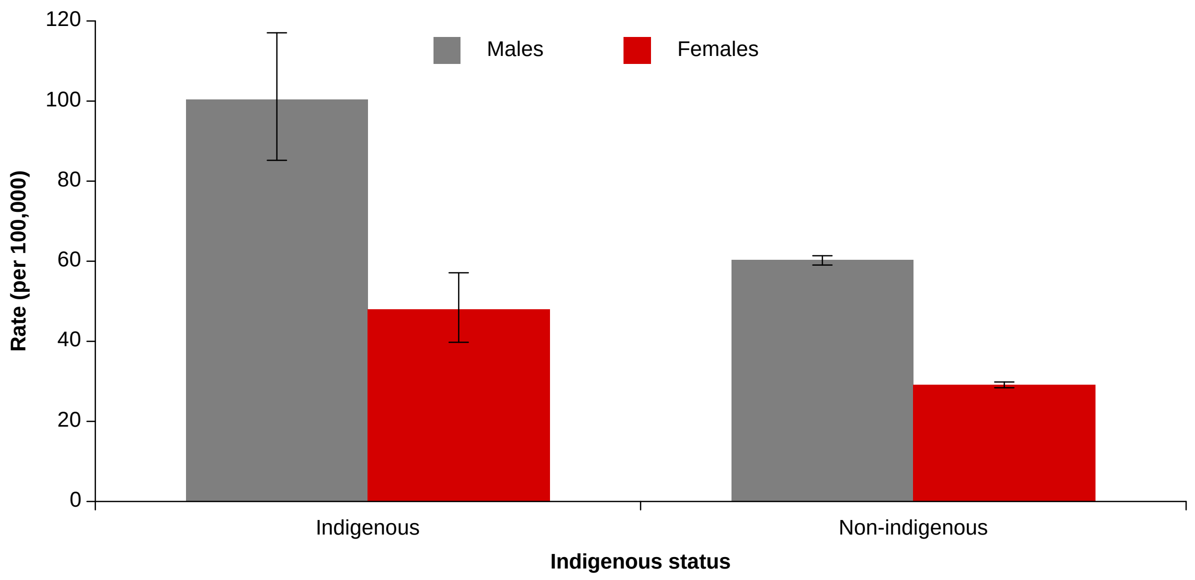
Do incidence rates differ by Aboriginal and Torres Strait Islander status?

Across a range of health-related and socioeconomic indicators, Aboriginal and Torres Strait Islander people show disadvantage relative to other Australians. They also are more likely to live in remote areas of Australia and have a relatively younger age structure, with a median age of 21 years compared with 37 years for the non-Indigenous population (AIHW 2011b). This age difference is thought to be largely due to higher rates of fertility, as well as a shorter life expectancy among the Indigenous population (ABS 2009b, 2009f).

Reliable national data on the incidence of cancer for Indigenous Australians are not available. While all state and territory cancer registries collect Indigenous status information, the quality of the data in some areas is insufficient for analysis. In this report, data for four states and territories—Queensland, Western Australia, South Australia and the Northern Territory—are used to examine the incidence of lung cancer by Indigenous status. While the majority (60%) of Australian Indigenous people live in these four jurisdictions (ABS 2009c), the degree to which data for these jurisdictions are representative of data for all Indigenous people is unknown.

Between 2003 and 2007, lung cancer was the most commonly diagnosed cancer in Indigenous males (average of 42 cases per year) and the second most commonly diagnosed cancer in Indigenous females (average of 29 cases per year) after breast cancer (49 per year) (Appendix Table D3.13).

The age-standardised incidence rate of lung cancer was significantly higher for Indigenous than non-Indigenous Australians (Figure 3.8). Specifically, Indigenous males were 1.7 times as likely to be diagnosed with lung cancer as non-Indigenous males and Indigenous females were 1.6 times as likely to be diagnosed with lung cancer as non-Indigenous females. This difference may be explained, at least in part, by the fact that Indigenous adults are more than twice as likely to be current daily smokers as non-Indigenous adults (AIHW 2010a).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007.
2. The data for this figure are shown in Appendix Table D3.12.

Source: AIHW Australian Cancer Database 2007.

Figure 3.8: Incidence of lung cancer by Indigenous status, Queensland, Western Australia, South Australia and the Northern Territory, 2003–2007

Do incidence rates differ by country of birth?

Australia has one of the largest proportions of immigrant populations in the world. In 2006, it was home to 4.4 million overseas-born people and one in four (25%) residents was born outside the country (ABS 2009d). Research has found that most migrants are at least as healthy, if not more so, as the Australian-born population. The 'healthy migrant effect' is believed to result from two main factors: a self-selection process in which those people who are physically and economically able to migrate are the ones who do; and government eligibility criteria for migrants based on health, education, language and job skills (AIHW 2010a).

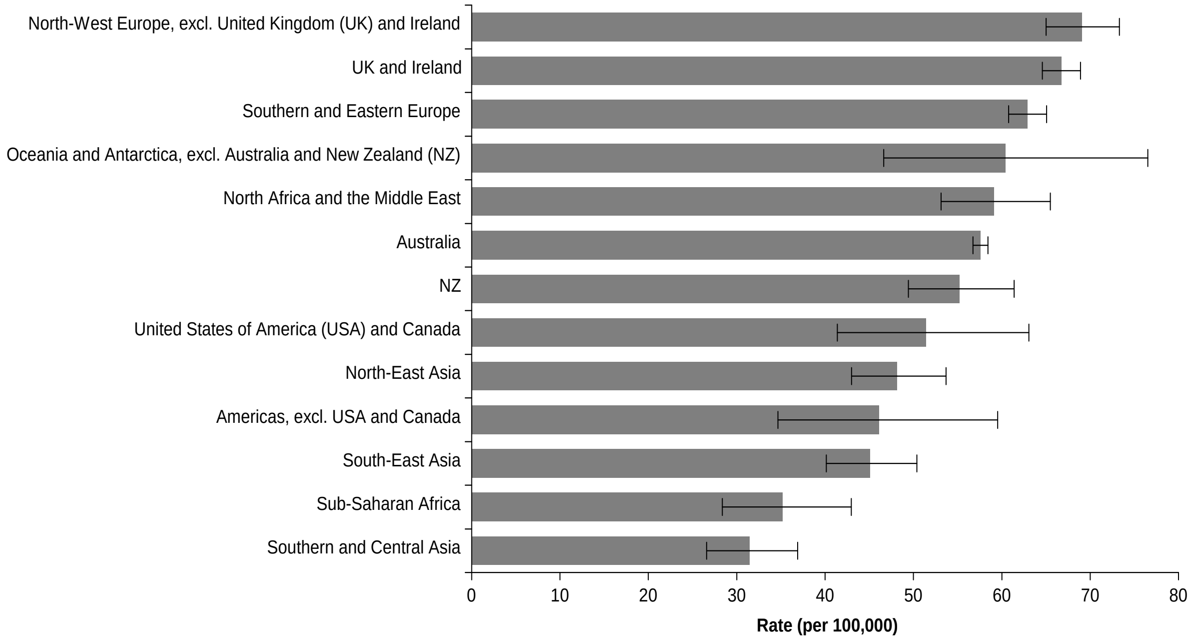
Immigrants are more likely than Australian-born people to live in urban areas (ABS 2009d); this often provides immigrants with relatively easier access to health-care services. At the same time, though, language and cultural barriers may mean that some immigrants are less likely or able to access available services.

In this report, national data on lung cancer incidence are provided. Note that these data do not take into account the length of time the immigrants lived in Australia, although some groups—for instance, people from Asia—tend to be more recent immigrants while people from many European countries tend to have been in Australia for longer (ABS 2009d). Note that information on the person's country of birth was not available for about 3% of lung cancers diagnosed in both males and females between 2003 and 2007.

In this report, country of birth data was classified using the Standard Australian Classification of Countries (SACC), second edition. Further information about this classification is in Appendix A.

From 2003 to 2007, the highest age-standardised incidence rates in males were for those born in North-Western Europe (69 per 100,000) and the United Kingdom and Ireland (67 per 100,000). These rates were significantly higher than that for Australian-born males (58 per 100,000). Males born in Southern and Central Asia had a relatively low lung cancer incidence rate (31 per 100,000), as did males born in Sub-Saharan Africa (35 per 100,000); these rates were significantly lower than the rate for Australian-born males (Figure 3.9).

Females living in Australia who were born in the United Kingdom and Ireland (41 per 100,000) and in New Zealand (37 per 100,000) had significantly higher age-standardised incidence rates of lung cancer than females born in Australia (29 per 100,000). The lowest age-standardised rate was for females who were born in Southern and Central Asia (17 per 100,000) and this rate was significantly lower than that for females born in Australia (Figure 3.10).

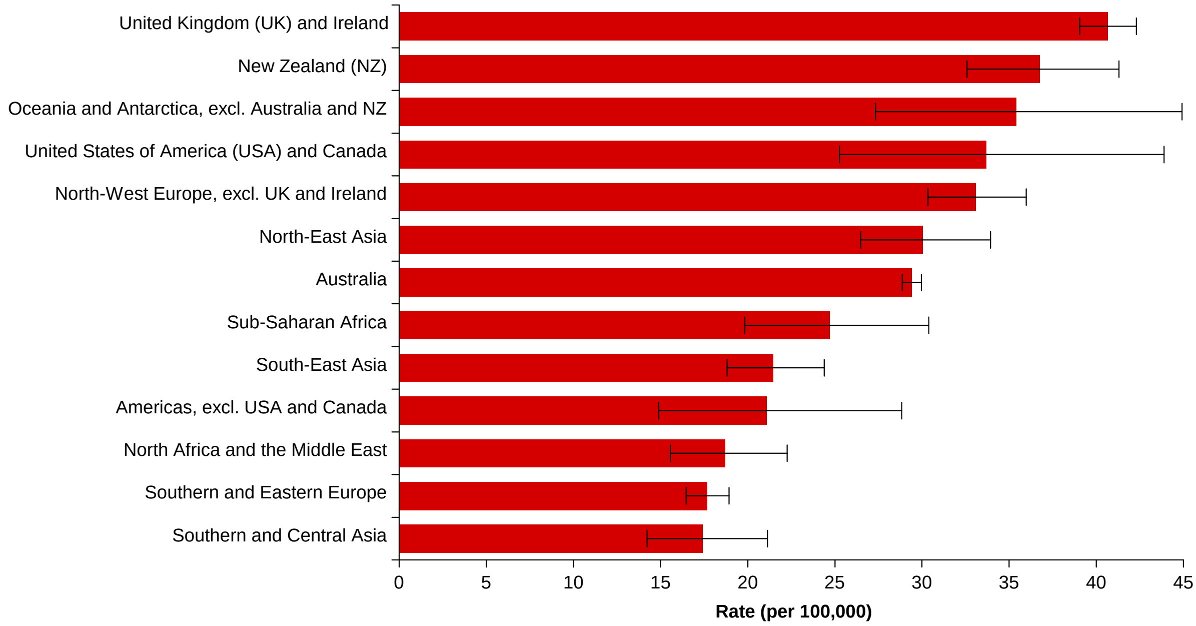


Notes

1. Country of birth is classified according to the Standard Australian Classification of Countries, 2nd edition (see Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 males. The rates are based on the total number of cases over the 5 years from 2003–2007.
3. The data for this figure are shown in Appendix Table D3.13.

Source: AIHW Australian Cancer Database 2007.

Figure 3.9: Incidence of lung cancer by country/region of birth, males, Australia, 2003–2007



Notes

1. Country of birth is classified according to the Standard Australian Classification of Countries, 2nd edition (see Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 females. The rates are based on the total number of cases over the 5 years from 2003–2007.
3. The data for this figure are shown in Appendix Table D3.14.

Source: AIHW Australian Cancer Database 2007.

Figure 3.10: Incidence of lung cancer by country/region of birth, females, Australia, 2003–2007

How does Australia compare internationally?

In this section, the incidence rate of lung cancer in Australia is compared with that for other countries and regions, with the rates age-standardised to the World Standard Population (1966). The data was sourced from the GLOBOCAN database, which is prepared by the International Agency for Research on Cancer (IARC) (Ferlay et al. 2010a). The most recent GLOBOCAN estimates are for 2008, and are based on incidence rates from about 2 to 5 years earlier. The GLOBOCAN data for lung cancer pertain to cancers coded in ICD-10 as C33–C34. See Appendix C for further details about this database.

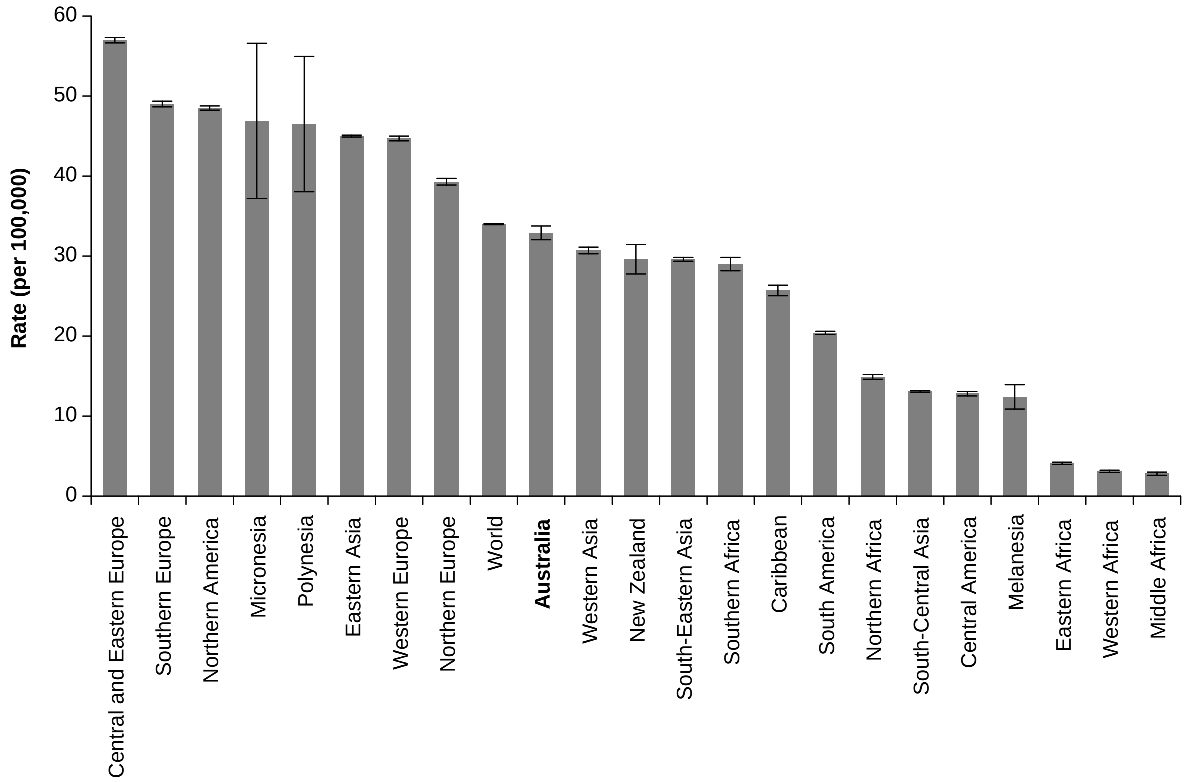
As discussed in Chapter 1, caution must be taken when comparing data from different countries since observed differences may be due to a range of methodological factors, not just differences in the underlying rates.

Figure 3.11 and Figure 3.12 show the estimated incidence rates of lung cancer by country (for Australia and New Zealand) and by region for males and females, respectively. For Australian males, the estimated age-standardised incidence rate was 33 per 100,000. This rate was significantly lower than the rates of other Westernised countries and regions, including Northern America (49 per 100,000) and all of the European regions (which ranged from 39 to 57 per 100,000). However, Australian males had a higher incidence rate of lung cancer than New Zealand and all the African regions.

The estimated age-standardised incidence rate of lung cancer for Australian females (19 per 100,000) was significantly higher than the rates for most of the European regions, including

Western Europe (17 per 100,000), Southern Europe (10 per 100,000) and Central and Eastern Europe (10 per 100,000). However, the rate estimated for Australian females was significantly lower than that for females in Northern America (36 per 100,000), as well as in New Zealand (23 per 100,000) and Northern Europe (22 per 100,000).

The differences by region and country in the incidence rates may be due to a number of factors, including differences in diagnostic and classification practices, completeness of cancer registration and the proportion of people with various risk and protective factors (for example, exposure to asbestos) (Ferlay et al. 2010b).

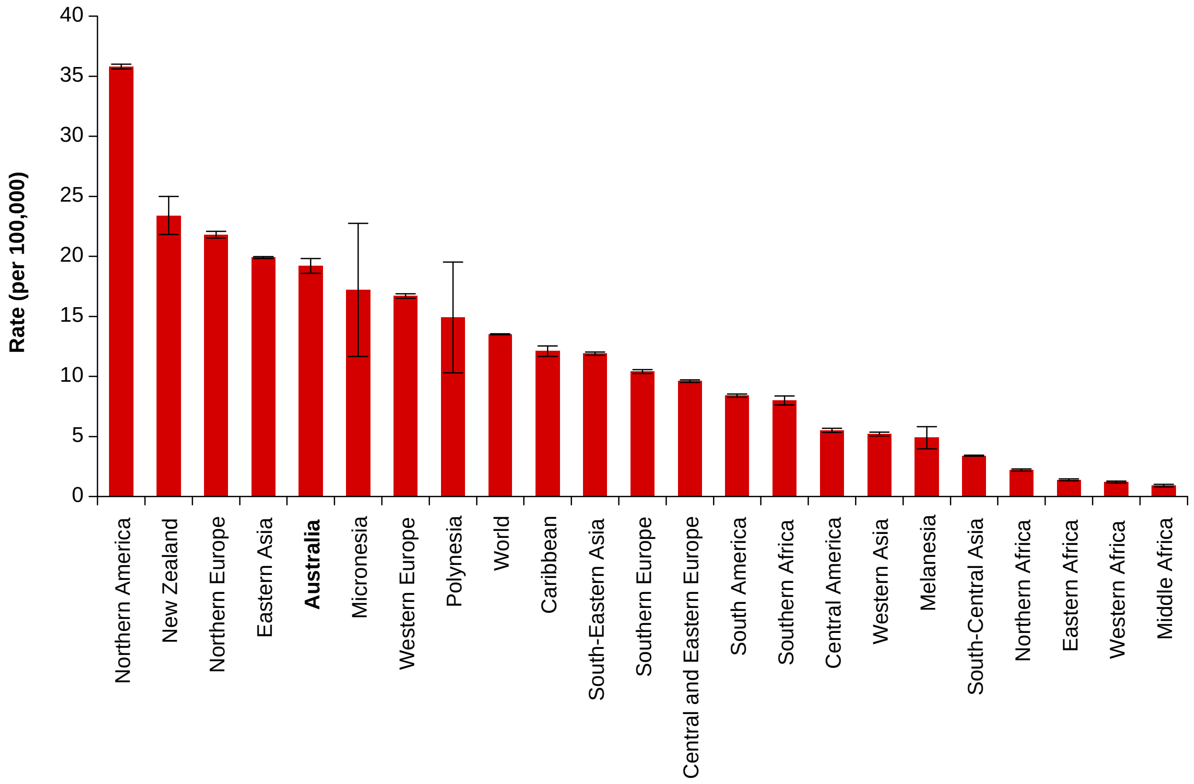


Notes

1. The data were estimated for 2008 and are based on data from about 3 to 5 years earlier.
2. The rates were age-standardised by the IARC using the Doll et al. (1966) World Standard Population. The confidence intervals (as shown by the error bars) are approximations and were calculated by the AIHW (see Appendix B).
3. The data for this figure are shown in Appendix Table D3.15.

Source: Ferlay et al. 2010a.

Figure 3.11: International comparison of estimated incidence of lung cancer, males, 2008



Notes

1. The data were estimated for 2008 and are based on data from approximately 3 to 5 years earlier.
2. The rates were age-standardised by the IARC using the Doll et al. (1966) World Standard Population. The confidence intervals (as shown by the error bars) are approximations and were calculated by the AIHW (see Appendix B).
3. The data for this figure are shown in Appendix Table D3.16.

Source: Ferlay et al. 2010a.

Figure 3.12: International comparison of estimated incidence of lung cancer, females, 2008

4 Mortality from lung cancer

Key findings

In 2007 in Australia:

- Lung cancer was the leading cause of cancer deaths in both males and females.
- 4,715 males and 2,911 females died from lung cancer.
- The mortality rate was 46 per 100,000 for males and 24 per 100,000 for females.
- The likelihood of dying from lung cancer increased with age.
- The risk of a male in the general population dying from lung cancer by the age of 85 years was 1 in 15. The corresponding risk for a female was 1 in 29.

Between 1982 and 2007:

- The mortality rate from lung cancer decreased by 41% for males (from 79 to 46 per 100,000), while it increased by 56% for females (from 15 to 24 per 100,000).

In the 5 years from 2003 to 2007:

- The mortality rate from lung cancer was highest in the Northern Territory and lowest in the Australian Capital Territory for both males and females.
- The mortality rate tended to increase with remoteness for both males and females.
- The mortality rate tended to decrease with improving socioeconomic status for both males and females.
- The mortality rate was significantly higher for Indigenous than for non-Indigenous Australians.

Introduction

The number of deaths from lung cancer in a given period is a result of the incidence of lung cancer, as well as factors that affect the likelihood of death from the disease such as the characteristics of the cancer diagnosed (for example, stage at diagnosis and histological type of lung cancer), and the nature and quality of treatments received.

In this report, mortality refers to the number of deaths for which the underlying cause was a lung cancer of primary site. The lung 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 issued by a certified medical practitioner.

The main data source used in this chapter was the National Mortality Database (NMD) (see Appendix C for further information).

In this chapter, information on the number of deaths attributed to lung cancer from 1982 to 2007 is presented. In addition, differences in mortality rates according to age, sex, state and territory, remoteness area, socioeconomic status, Aboriginal and Torres Strait Islander status and country of birth are provided. The mortality rates for Australia are also compared with those of other countries and regions.

Because the prognosis for people diagnosed with lung cancer is poor (see Chapter 5), the mortality trends and patterns in this chapter are similar to those for incidence (Chapter 3).

How many people died from lung cancer in 2007?

In 2007, a total of 7,626 people died from lung cancer in Australia, of which 4,715 were males (62%) and 2,911 females (38%) (Table 4.1). This means that, on average, 13 males and 8 females in Australia died from lung cancer every day in 2007.

Lung cancer was the leading cause of cancer deaths for both sexes in 2007, accounting for 21% of all cancer deaths in males and 17% in females. Also, in terms of all causes of deaths, it ranked second for males and fourth for females, representing 7% of all male deaths and 4% of all female deaths (AIHW 2010a).

The age-standardised mortality rate from lung cancer was 34 per 100,000 people. The mortality rate of males was almost twice that of females (46 and 24 per 100,000, respectively).

Table 4.1: The five most common causes of death from cancer, Australia, 2007

Males				Females			
Site/type of cancer	Deaths	ASR[(a)]	95% CI	Site/type of cancer	Deaths	ASR[(a)]	95% CI
Lung (C33–C34)	4,715	46.3	45.0–47.6	Lung (C33–C34)	2,911	24.0	23.1–24.9
Prostate (C61)	2,938	31.0	29.9–32.2	Breast (C50)	2,680	22.1	21.2–22.9
Bowel (C18–C20)	2,191	21.7	20.8–22.6	Bowel (C18–C20)	1,856	14.6	13.9–15.3
Lymphoid cancers[(b)]	1,423	14.2	13.4–14.9	Lymphoid cancers[(b)]	1,129	8.8	8.3–9.3
Unknown primary (C77–C80)	1,247	12.5	11.8–13.2	Unknown primary (C77–C80)	1,097	8.5	8.0–9.1
All cancers[(c)]	**22,562**	**224.9**	**222.0–227.9**	**All cancers[(c)]**	**17,322**	**139.1**	**137.0–141.2**

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

(b) Lymphoid cancers (ICD-10 codes of C81–C85, C88, C90, C91) are cancers that start in lymphocytes of the immune system. The most common types are lymphomas, lymphoid leukaemias and myeloma.

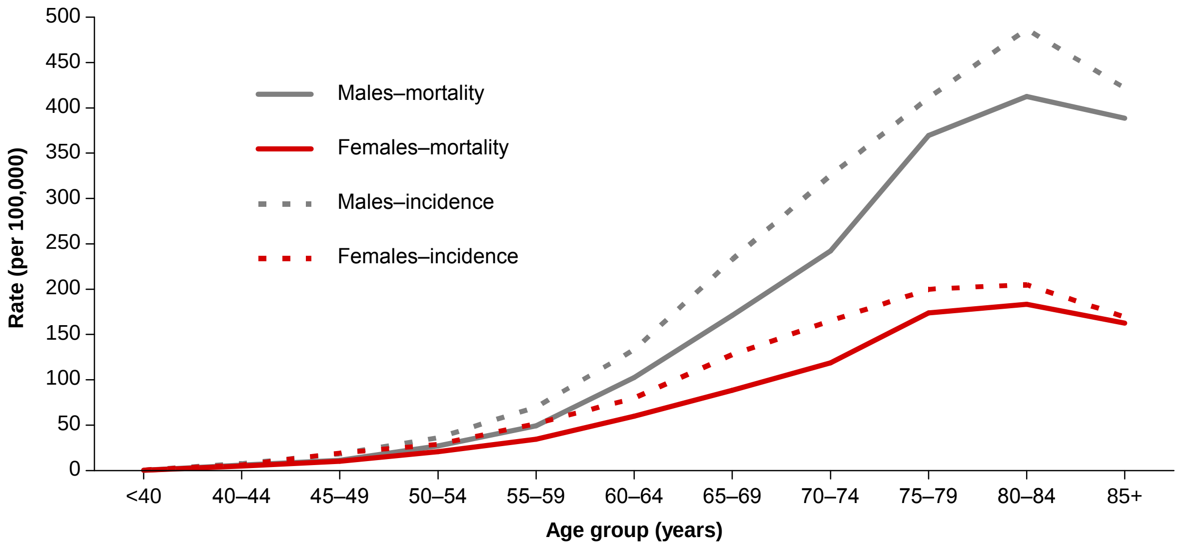
(c) Includes cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3.

Source: AIHW National Mortality Database.

Does mortality differ by age?

In 2007, the majority of lung cancer deaths were in the older age groups. More precisely, 86% of lung cancer deaths in males and 83% in females were in the age range of 60 years and over. The average age at death was 72 years for males and 71 years for females.

Figure 4.1 presents mortality rates of lung cancer according to age at deaths for males and females in 2007. To provide a point of comparison, the incidence rates by the age at diagnosis are also presented. The age-specific mortality rates followed a similar pattern to the age-specific incidence rates. That is, the likelihood of dying from lung cancer increased sharply in males and more gradually in females after the age of 50 years. The incidence rate peaked in those aged 80 to 84 years for both males and females, at 413 per 100,000 for males and 183 per 100,000 for females.



Notes

1. The rates shown are age-specific rates.
2. The data for this figure are shown in Appendix Table D3.1 and Appendix Table D4.1.

Source: AIHW Australian Cancer Database 2007; AIHW National Mortality Database.

Figure 4.1: Lung cancer incidence and mortality by age group, Australia, 2007

Have lung cancer mortality rates changed over time?

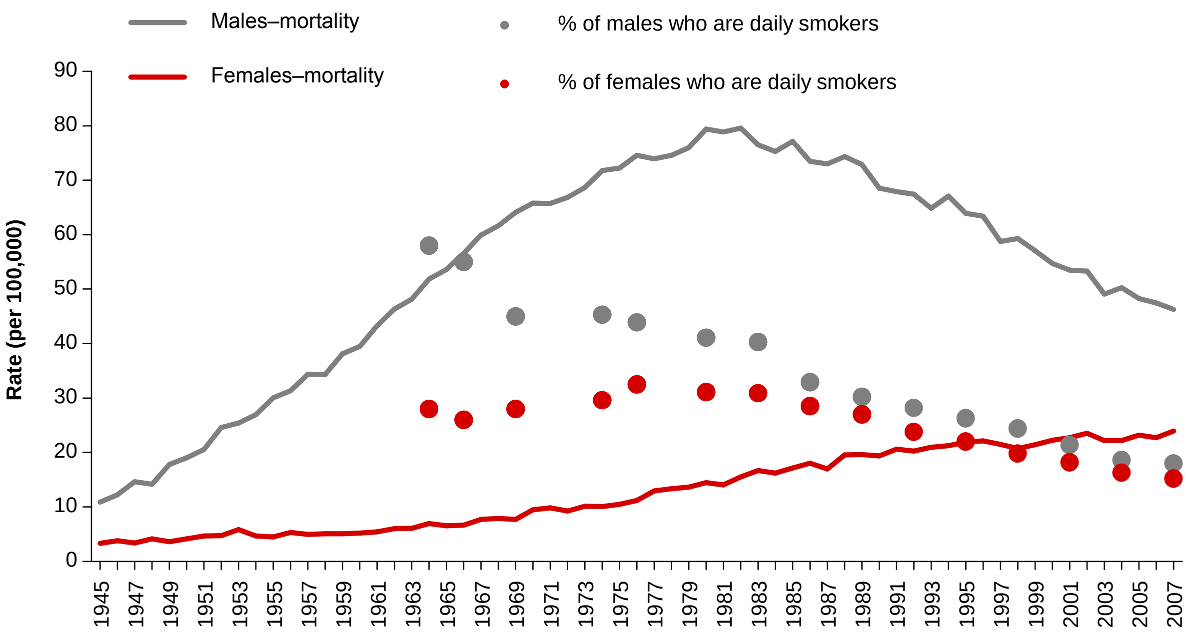
Smoking and long-term mortality trends

Tobacco smoking is by far the leading cause of lung cancer (as discussed in Chapter 1) and trends in smoking strongly predict lung cancer mortality rates, with a time lag of two to three decades (Scollo & Winstanley 2008). In Figure 4.2, age-standardised mortality rates for lung cancer are shown for 1945 to 2007, along with data on smoking prevalence for 1964 to 2007 sourced from the OECD Health Database (OECD 2010). Further information about the OECD Health Database is in Appendix C.

Note that the mortality rates are shown according to year of registration of death. While mortality data according to year of death are generally shown in this chapter, year of registration of death are shown here because such long-term trend data are not available for lung cancer mortality by year of death. As a result, the data in this figure are slightly different from the mortality data elsewhere in this report, but the overall trends are the same.

The age-standardised mortality rate from lung cancer for males was relatively low in 1945. It increased sharply in the following years due to an increased uptake of smoking among males in the previous two to three decades (Scollo & Winstanley 2008). The mortality rate peaked in males in the early 1980s and has since decreased markedly, reflecting the steady decrease in male smoking rates in the second half of the 20th century (from 58% in 1964 to 18% in 2007). By 2007, the mortality rate for males was at the same level as that observed in the early 1960s.

Compared with males, females took up smoking later and in lesser numbers. As a result, the mortality rates from lung cancer have increased more gradually in females than in males since the mid-1940s. The continued rise in the mortality rates for females over the period considered may be due to the increased uptake of smoking among females until the mid-1970s, when about 33% of Australian females reported to be daily smokers. Although the mortality rate from lung cancer for females is still increasing, the increase has been of a slower rate in the 1990s and 2000s compared with earlier decades.



Notes

1. The data for this figure are based on year of registration of death rather than year of death.
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
3. The data for this figure are shown in Appendix Table D4.2.

Source: AIHW 2010d; OECD Health Data 2010.

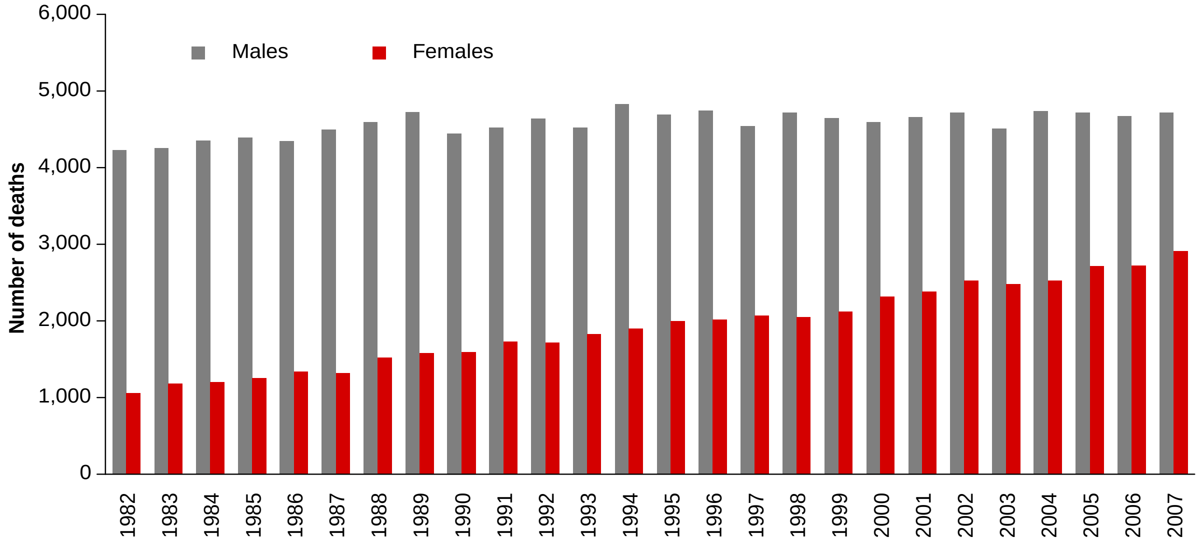
Figure 4.2: Lung cancer mortality, Australia, 1945 to 2007, and prevalence of daily smoking, Australia, 1964 to 2007

Recent trends in mortality rates, 1982 to 2007

Figure 4.3 shows that there has been an overall increase in the absolute number of male lung cancer deaths from 1982 to 2007. However, most of this increase occurred from 1982 (4,227 deaths) to 1994 (4,833 deaths). Since then the number has been fairly stable, ranging between 4,500 and 4,750 per year. For females, the absolute number of deaths increased steadily from 1,061 in 1982 to 2,911 in 2007. This is a threefold increase over the period.

The age-standardised mortality rates of lung cancer for males decreased significantly by 41% from 79 per 100,000 in 1982 to 46 per 100,000 in 2007 (Figure 4.4). In contrast, rates for females increased throughout the period considered. In 1982, the mortality rate for females was 15 per 100,000, while it was 24 per 100,000 in 2007, indicating an overall increase of 56%.

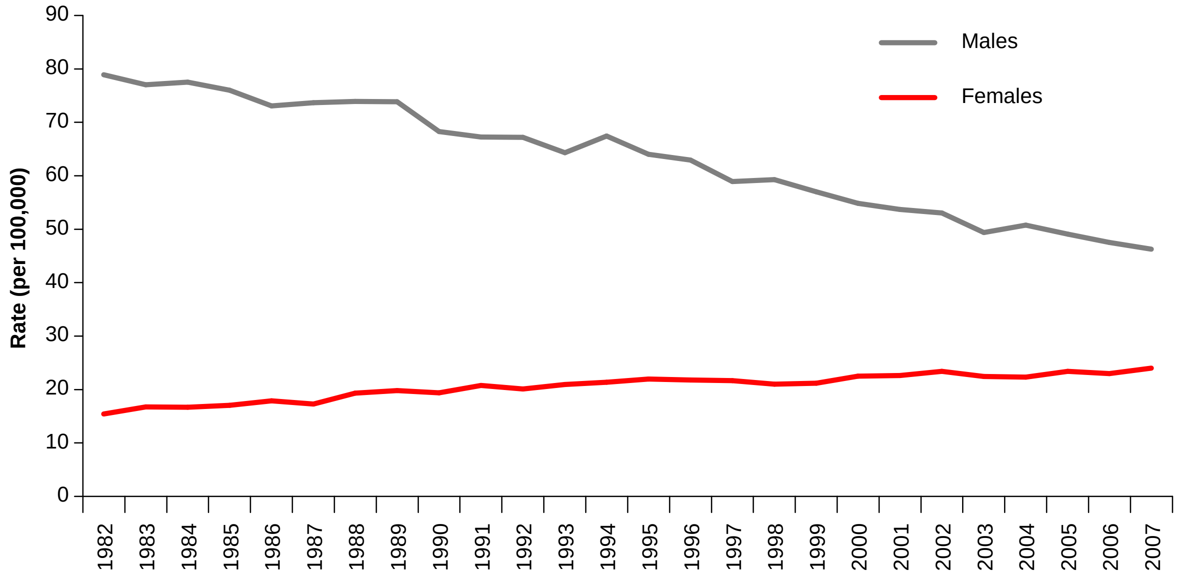
Thus, similar trends in incidence rates (Chapter 3) and corresponding mortality rates were observed for both sexes (that is, decreasing incidence and mortality for males and increasing incidence and mortality for females). The trends in incidence and mortality rates mirrored one another because of the poor survival of people diagnosed with lung cancer (see Chapter 5).



Note: The data for this figure are shown in Appendix Table D4.3.

Source: AIHW National Mortality Database.

Figure 4.3: Number of deaths from lung cancer, Australia, 1982 to 2007



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population.
2. The data for this figure are shown in Appendix Table D4.3.

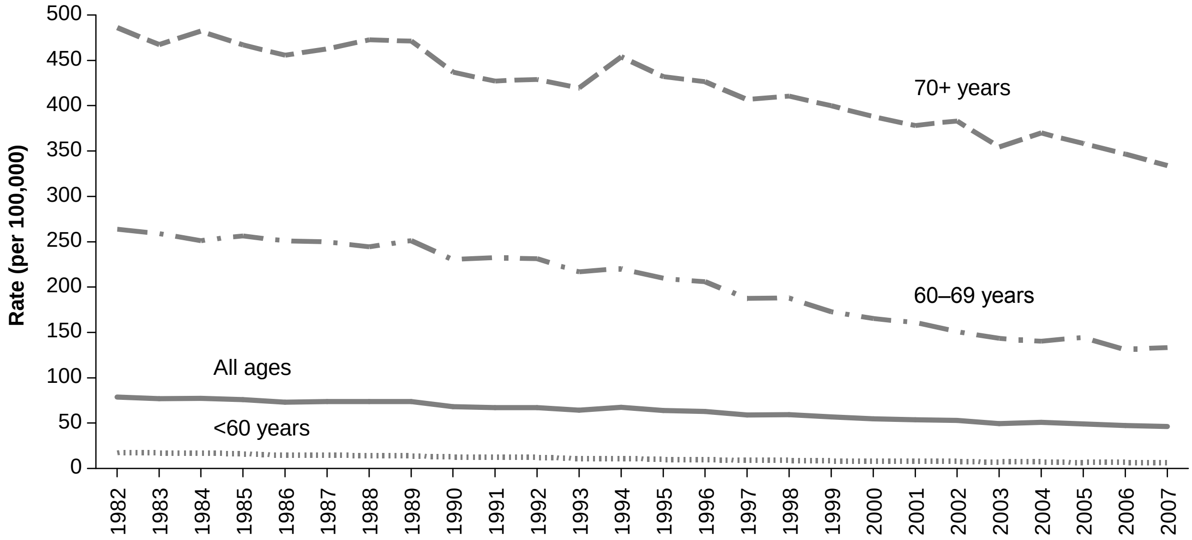
Source: AIHW National Mortality Database.

Figure 4.4: Mortality rates from lung cancer, Australia, 1982 to 2007

Do trends in mortality differ by age at death?

For males, the mortality rates from lung cancer decreased markedly for all age groups between 1982 and 2007 (Figure 4.5). Specifically, they decreased by 60% for males under 60 years (from 17 to 7 per 100,000), by 49% for males aged 60 to 69 years (from 264 to 134) and by 31% for males aged 70 years and over (from 486 to 334).

Between 1982 and 2007, the mortality rates from lung cancer for females increased sharply for those aged 70 years and over; from 68 per 100,000 in 1982 to 154 per 100,000 in 2007 (Figure 4.6). In contrast, no increase was seen for the two youngest age groups. For females under 60 years, the rate remained fairly stable between 5 and 6 per 100,000 for the entire 26 years. For females aged 60 to 69 years, numerous year-to-year fluctuations were observed, with no statistically significant difference found between the 1982 rate (62 per 100,000) and the 2007 rate (73 per 100,000).

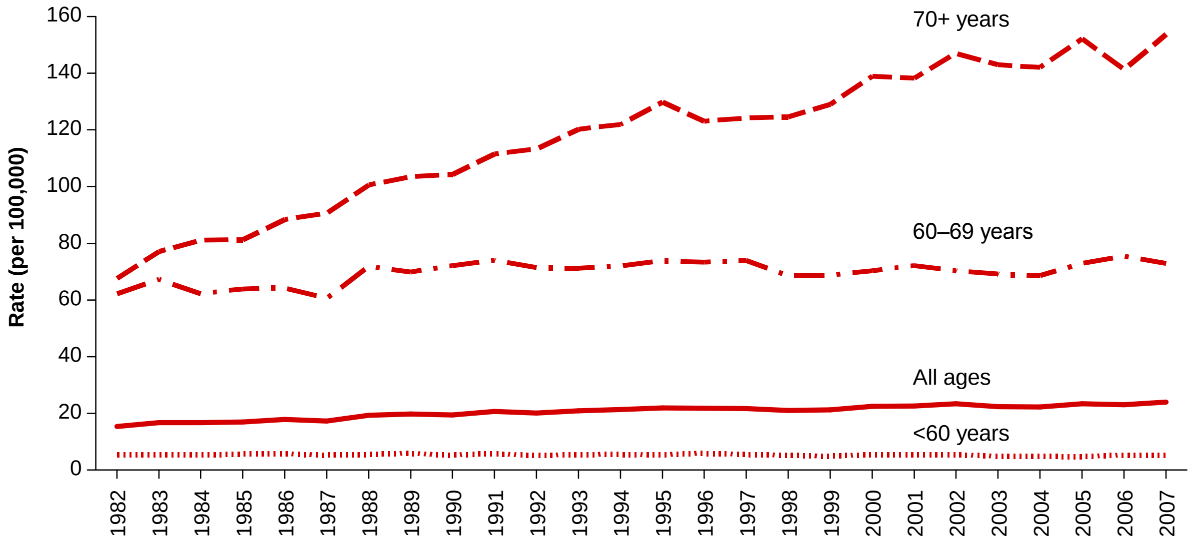


Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 males.
2. The data for this figure are shown in Appendix Table D4.4.

Source: AIHW National Mortality Database.

Figure 4.5: Mortality from lung cancer by age at death, males, Australia, 1982 to 2007



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 females.
2. The data for this figure are shown in Appendix Table D4.5.

Source: AIHW National Mortality Database.

Figure 4.6: Mortality from lung cancer by age at death, females, Australia, 1982 to 2007

What is the risk of death from lung cancer?

The risk of death from lung cancer has decreased for males but increased for females between 1982 and 2007. Based on 1982 data, the risk of death by the age of 85 was 1 in 9 for males and 1 in 49 for females, compared with 1 in 15 for males and 1 in 29 for females calculated from the 2007 data (Table 4.2).

What is the average age at death?

Table 4.2 shows that the mean age at death due to lung cancer has increased over time, from 67 years in 1982 to 72 years in 2007 for males, and from 66 years to 71 years for females.

Table 4.2: Risk of death from lung cancer and average age at death, Australia, 1982 to 2007

	Risk to age 85 years		Mean age at diagnosis	
Year	**Males**	**Females**	**Males**	**Females**
1982	1 in 9	1 in 49	67.3	66.1
1983	1 in 9	1 in 45	67.1	67.0
1984	1 in 9	1 in 45	67.4	66.6
1985	1 in 10	1 in 44	67.6	67.6
1986	1 in 10	1 in 42	67.9	67.1
1987	1 in 10	1 in 43	68.0	67.8
1988	1 in 10	1 in 37	68.5	67.8
1989	1 in 10	1 in 37	68.5	67.7
1990	1 in 11	1 in 38	68.7	68.3
1991	1 in 11	1 in 35	68.8	68.4
1992	1 in 11	1 in 36	68.8	69.3
1993	1 in 11	1 in 34	69.1	69.2
1994	1 in 11	1 in 33	69.7	69.3
1995	1 in 11	1 in 32	69.8	69.8
1996	1 in 11	1 in 33	70.0	69.5
1997	1 in 12	1 in 33	70.2	69.6
1998	1 in 12	1 in 34	70.3	69.9
1999	1 in 12	1 in 33	70.8	70.4
2000	1 in 13	1 in 32	70.8	70.7
2001	1 in 13	1 in 31	70.9	71.0
2002	1 in 13	1 in 30	71.0	71.1
2003	1 in 14	1 in 31	71.1	71.1
2004	1 in 14	1 in 31	71.3	71.2
2005	1 in 14	1 in 29	71.6	72.0
2006	1 in 15	1 in 31	71.6	71.0
2007	1 in 15	1 in 29	71.5	71.4

Source: AIHW National Mortality Database.

How many people are expected to die from lung cancer in 2010?

Estimates of mortality in 2010 were calculated in a similar manner to incidence; using mortality data for the 10 years from 1998 to 2007 (see Appendix B for further details on the methodology used).

The number of people dying from lung cancer is extrapolated to increase from 2007 to 2010, partly due to continued ageing and growth of the population (Table 4.3). The extrapolations suggest that 4,800 males and 3,300 females will die from lung cancer in 2010.

When expected changes in the age structure and size of the population are taken into account, the extrapolations suggest that the mortality rate from lung cancer will continue to decrease in males, reaching an estimated 43 per 100,000 in 2010. In contrast, the rate is expected to increase slightly in females to 25 per 100,000 in 2010.

Table 4.3: Mortality from lung cancer observed for 2007, and extrapolated[(a)] for 2010, Australia

	2007			2010	
Sex	Number of deaths	ASR[(b)]	95% CI	Extrapolated number of deaths[(a)]	Extrapolated ASR[(a, b)]
Males	4,715	46.3	45.0–47.6	4,800	43
Females	2,911	24.0	23.1–24.9	3,300	25

(a) The extrapolations were based on mortality data for 1998 to 2007. See Appendix B for further details on the methodology used.

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

Source: AIHW National Mortality Database.

Do mortality rates differ across population groups?

In this section, differences in mortality from lung cancer are presented according to state and territory, remoteness area, socioeconomic status, Aboriginal and Torres Strait Islander status and country of birth. Any observed differences among the groups compared may be due to a number of reasons, including differences in incidence rates of lung cancer, the characteristics of the lung cancers diagnosed (for example, stage at diagnosis and type of tumour), and access to, and quality of, treatment.

To examine differences in mortality across groups, age-standardised rates for the 5 years from 2003 to 2007 are compared by calculating rate ratios. The rate ratios are obtained by dividing the age-standardised rate of lung cancer for one population (for example, Indigenous Australians) with that of another (for example, non-Indigenous Australians). In this example, a ratio greater than 1 would indicate an excess in Indigenous Australians, while a ratio less than 1 would indicate an excess in non-indigenous Australians. More information about rate ratios is in Appendix B.

Do mortality rates differ by state and territory?

The average annual number of deaths in males from lung cancer ranged from 1,556 in New South Wales to 34 in the Northern Territory between 2003 and 2007. The age-standardised mortality rate for lung cancer in males was significantly lower in the Australian Capital Territory (38 per 100,000) than in other states and territories. In contrast, the highest mortality rates in males were in the Northern Territory (59 per 100,000) and Tasmania (58 per 100,000), with both of these rates significantly higher than those of other states and territories (Table 4.4).

From 2003 to 2007, the average annual number of deaths of females from lung cancer ranged from 895 in New South Wales to 14 in the Northern Territory (Table 4.4). The age-standardised mortality rates indicate that the Australian Capital Territory had the lowest mortality rate for females (19 per 100,000), which was significantly lower than the rates for Western Australia (25 per 100,000), Tasmania (29 per 100,000) and the Northern Territory (30 per 100,000). The highest mortality rate was for the Northern Territory (30 per 100,000).

Table 4.4: Mortality from lung cancer by state and territory, Australia, 2003–2007

	Males			Females		
State or territory[(a)]	**Average annual number of deaths[(b)]**	**ASR[(c)]**	**95% CI**	**Average annual number of deaths[(b)]**	**ASR[(c)]**	**95% CI**
New South Wales	1,556	47.6	46.6–48.7	895	22.6	22.0–23.3
Victoria	1,148	47.9	46.6–49.1	684	23.1	22.3–23.9
Queensland	911	49.8	48.4–51.3	479	22.8	21.8–23.7
Western Australia	438	49.8	47.7–52.0	259	24.9	23.5–26.3
South Australia	392	47.6	45.5–49.8	225	22.1	20.8–23.4
Tasmania	147	58.1	53.9–62.5	86	28.7	26.0–31.6
Australian Capital Territory	44	38.3	33.3–43.8	28	19.0	15.9–22.5
Northern Territory	34	58.8	48.6–70.2	14	30.4	22.9–39.2
Total	**4,670**	**48.6**	**47.9–49.2**	**2,672**	**23.0**	**22.7–23.4**

(a) Relates to the state or territory of usual residence.

(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 are based on the total number of deaths over the 5 years from 2003–2007.

Source: AIHW National Mortality Database.

Box 4.1: Mortality data differences

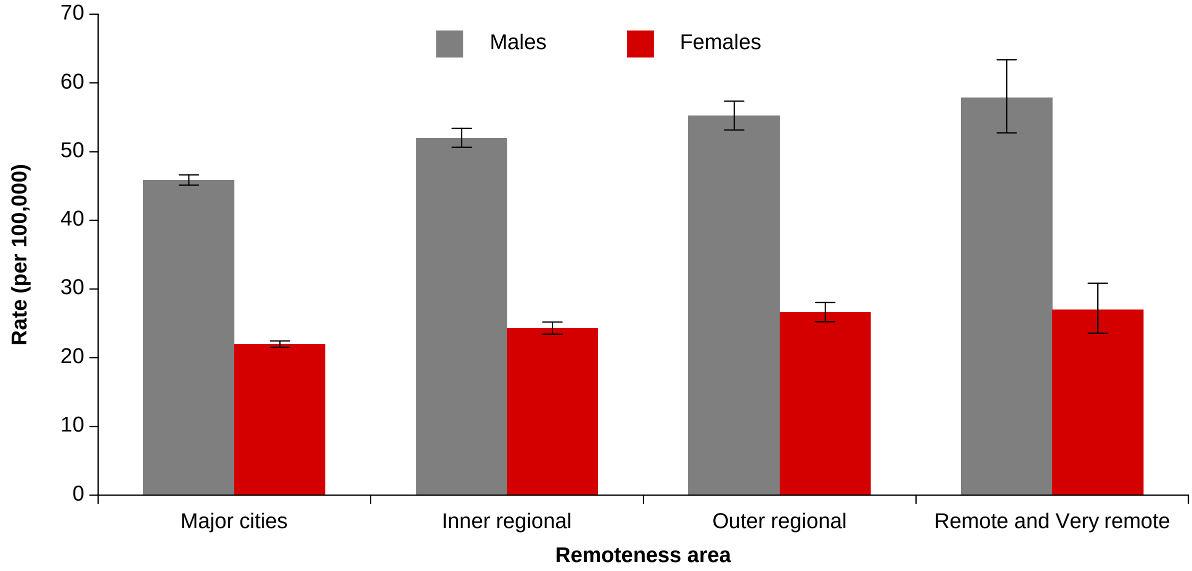
The state and territory data on mortality due to lung cancer in this report may not be comparable with data published by individual state and territory cancer registries for a number of reasons, including (Cancer Council Queensland 2009; Tracey EA. et al. 2008):

- The data in this report refer to the place of a person's residence at the time of *death*. In contrast, the state and territory cancer registries generally present mortality information based on a person's place of residence at the time of *diagnosis*. In these 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 National Mortality Database (NMD) (see Appendix C). Information on cause of death in the NMD is sourced from the Australian Bureau of Statistics (ABS) which makes use of death certificate information to assign cause of death. 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

Do mortality rates differ by remoteness area?

For both sexes the age-standardised mortality rates from lung cancer tended to increase with remoteness in the period 2003 to 2007 (Figure 4.7). For males, the mortality rate in *Remote* and *Very remote* areas was 58 per 100,000. This was 1.3 times higher than that in *Major cities* (46 per 100,000). The rate for female was 1.2 times higher in *Remote* and *Very remote* areas compared with *Major cities* (27 and 22 per 100,000, respectively).

Differences in the mortality rates between *Major cities* and more remote areas of Australia may be explained by the large population of Aboriginal and Torres Strait Islander people living in remote areas and the Indigenous population's higher rates of mortality from lung cancer. It is also possible, however, that the difference could be attributed to differences in risk factors such as smoking. For example, in 2007–2008, people living outside *Major cities* were 1.2 times as likely as their city counterparts to smoke daily (see Chapter 2).



Notes

1. Remoteness was classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of deaths over the 5 years from 2003–2007.
3. The data for this figure are in Appendix Table D4.6.

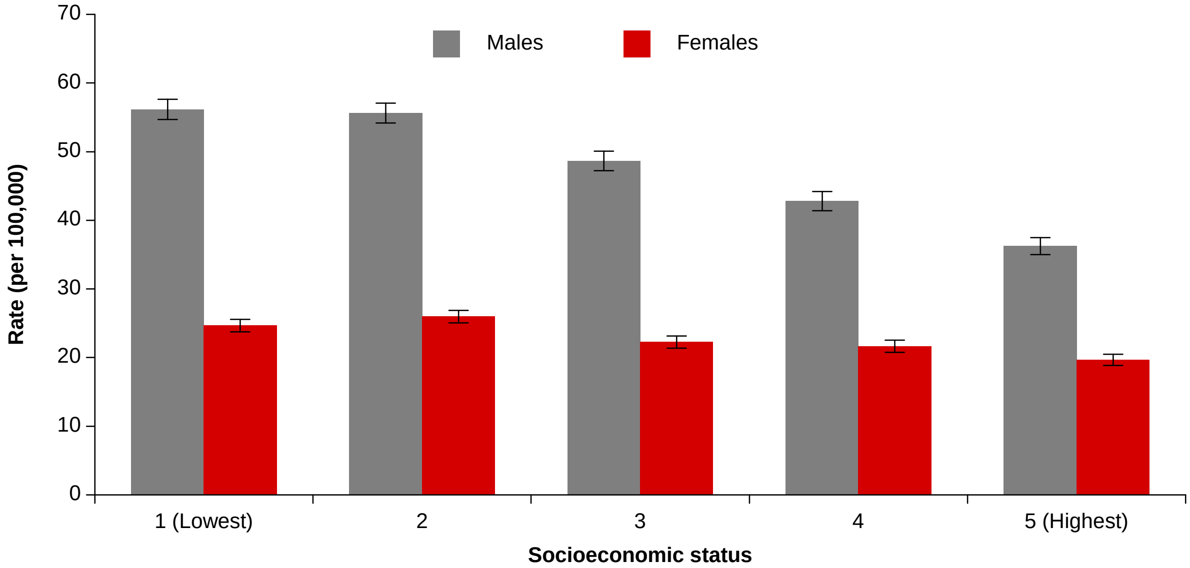
Source: AIHW National Mortality Database.

Figure 4.7: Mortality from lung cancer by remoteness area, Australia, 2003–2007

Do mortality rates differ by socioeconomic status?

As discussed in Chapter 3, the socioeconomic status measure used in this report pertains to the area in which people lived (see Appendix A). In the period 2003 to 2007, there was a graded relationship between the rate of death from lung cancer and socioeconomic status. For both sexes, the highest mortality rates were for people living in the lowest socioeconomic status areas (that is, groups 1 and 2) (Figure 4.8). In particular, the rate of death for males in the lowest socioeconomic status areas was 1.5 times the rate for males living in the highest socioeconomic status areas (group 5). The gap between the lowest and the highest socioeconomic status areas was smaller for females, with the rate in the lowest (group 1) 1.3 times higher than that in the highest (group 5).

The results presented here reflect those reported in earlier national and international studies (Anti-Cancer Council of Victoria Epidemiology Centre 2002; Ministry of Health 2010; Romeri et al. 2006; Sharp & Brewster 1999; Youlden et al. 2007). The gradient of decreasing mortality by improving socioeconomic status is likely to be explained by differences in smoking behaviour, with people living in the areas with the low socioeconomic status more likely to smoke than others (see Chapter 2).



Notes

1. Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of deaths over the 5 years from 2003–2007.
3. The data for this figure are in Appendix Table D4.7.

Source: AIHW National Mortality Database.

Figure 4.8: Mortality from lung cancer by socioeconomic status, Australia, 2003–2007

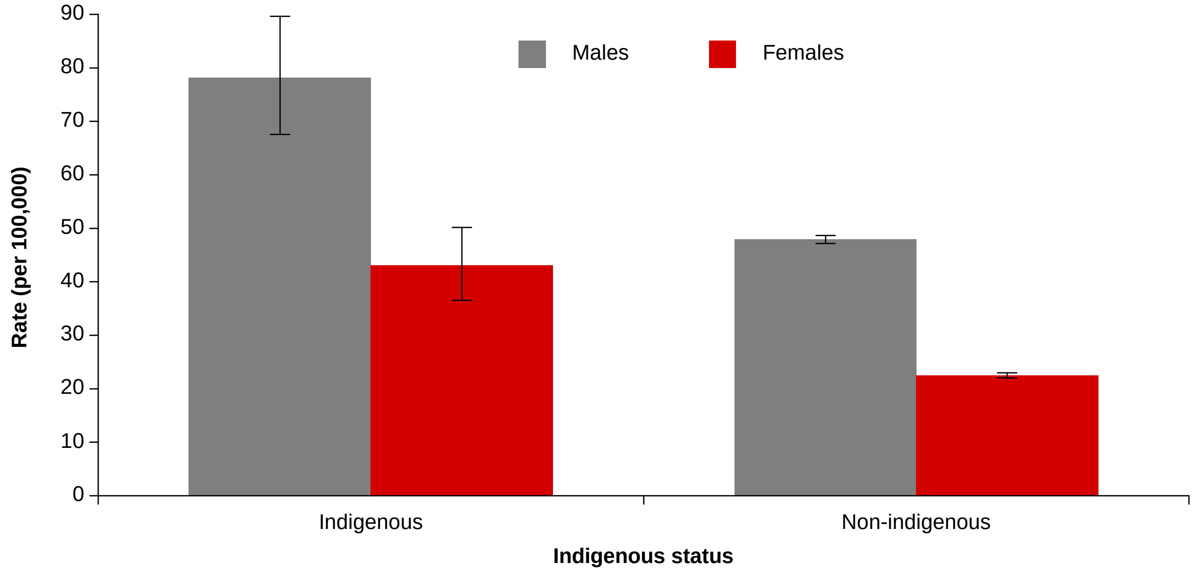
Do mortality rates differ by Aboriginal and Torres Strait Islander status?

Information in the NMD on Indigenous status for 2003 to 2007 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 2009c). In the NMD, the Indigenous status was not known for less than 1% of the people who had died from lung cancer in the five jurisdictions.

Between 2003 and 2007, there was an annual average of 54 lung cancer deaths recorded for Indigenous males (28% of all Indigenous male cancer deaths) and 38 for Indigenous females (22% of Indigenous female cancer deaths) in the five jurisdictions analysed. Similar to Australia overall, lung cancer was the leading cause of cancer deaths for both Indigenous males and Indigenous females.

Figure 4.9 illustrates that the mortality rate from lung cancer was significantly higher for Indigenous than non-Indigenous Australians. In particular, Indigenous males were 1.6 times as likely to die from lung cancer as non-Indigenous males (78 and 48 per 100,000, respectively), and Indigenous females were 1.9 times as likely to die from lung cancer as non-Indigenous females (43 and 23 per 100,000, respectively).

This finding mirrors those of a number of other studies, including research using data from South Australia, Western Australia and the Northern Territory (Threlfall & Thompson 2009); New South Wales (Supramaniam et al. 2006), Queensland (Moore et al. 2010) and New Zealand (Ministry of Health 2010). The higher rates of smoking among Indigenous Australians may have contributed to the increased mortality rate (see Chapter 2).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of deaths over the 5 years from 2003–2007.
2. The data for this figure are in Appendix Table D4.8.

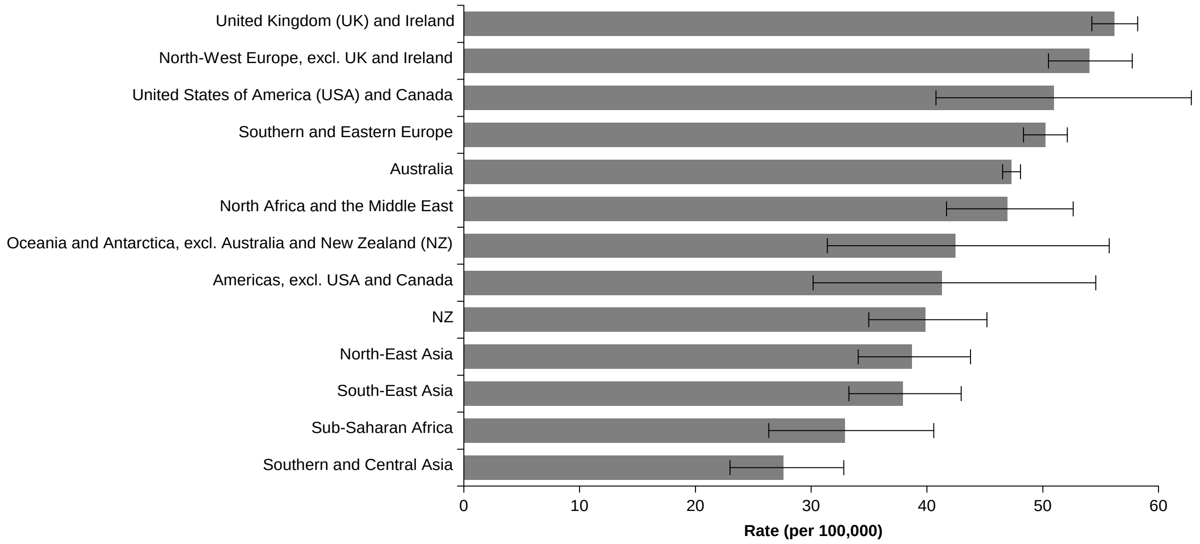
Source: AIHW National Mortality Database.

Figure 4.9: Mortality from lung cancer by Indigenous status, New South Wales, Queensland, Western Australia, South Australia and the Northern Territory, 2003–2007

Do mortality rates differ by country of birth?

From 2003 to 2007, males living in Australia who were born in the United Kingdom and Ireland had the highest age-standardised mortality rate from lung cancer (56 per 100,000), and this was significantly higher than the rate for males born in Australia (47 per 100,000) (Figure 4.10). The lowest rates were for males born in Southern and Central Asia (28 per 100,000), Sub-Saharan Africa (33 per 100,000), South-East Asia (38 per 100,000) and North-East Asia (39 per 100,000), and these were significantly lower than the rate for those born in Australia.

During the same period, females living in Australia who were born in the United Kingdom and Ireland (34 per 100,000) and those born in the New Zealand and North-West Europe (28 per 100,000 for both regions) had significantly higher age-standardised mortality rates than females born in Australia (23 deaths per 100,000 females). In contrast, the lowest mortality rates were for females born in North Africa and the Middle East (13 per 100,000) and Southern and Eastern Europe (14 per 100,000), and these rates were significantly lower than that for females born in Australia (Figure 4.11).

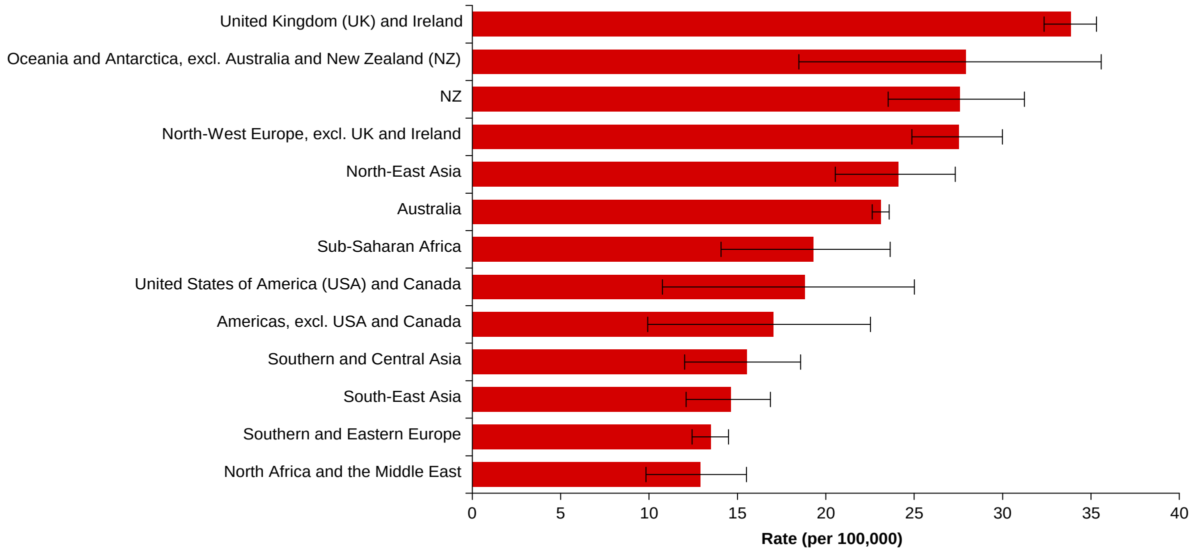


Notes

1. Country of birth is classified according to the Standard Australian Classification of Countries, 2nd edition (See Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 males. The rates are based on the total number of deaths over the 5 years from 2003–2007.
3. The data for this figure are in Appendix Table D4.9.

Source: AIHW National Mortality Database.

Figure 4.10: Mortality from lung cancer by country/region of birth, males, Australia, 2003–2007



Notes

1. Country of birth is classified according to the Standard Australian Classification of Countries, 2nd edition (see Appendix A).
2. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 females. The rates are based on the total number of deaths over the 5 years from 2003–2007.
3. The data for this figure are in Appendix Table D4.10.

Source: AIHW National Mortality Database.

Figure 4.11: Mortality from lung cancer by country/region of birth, females, Australia, 2003–2007

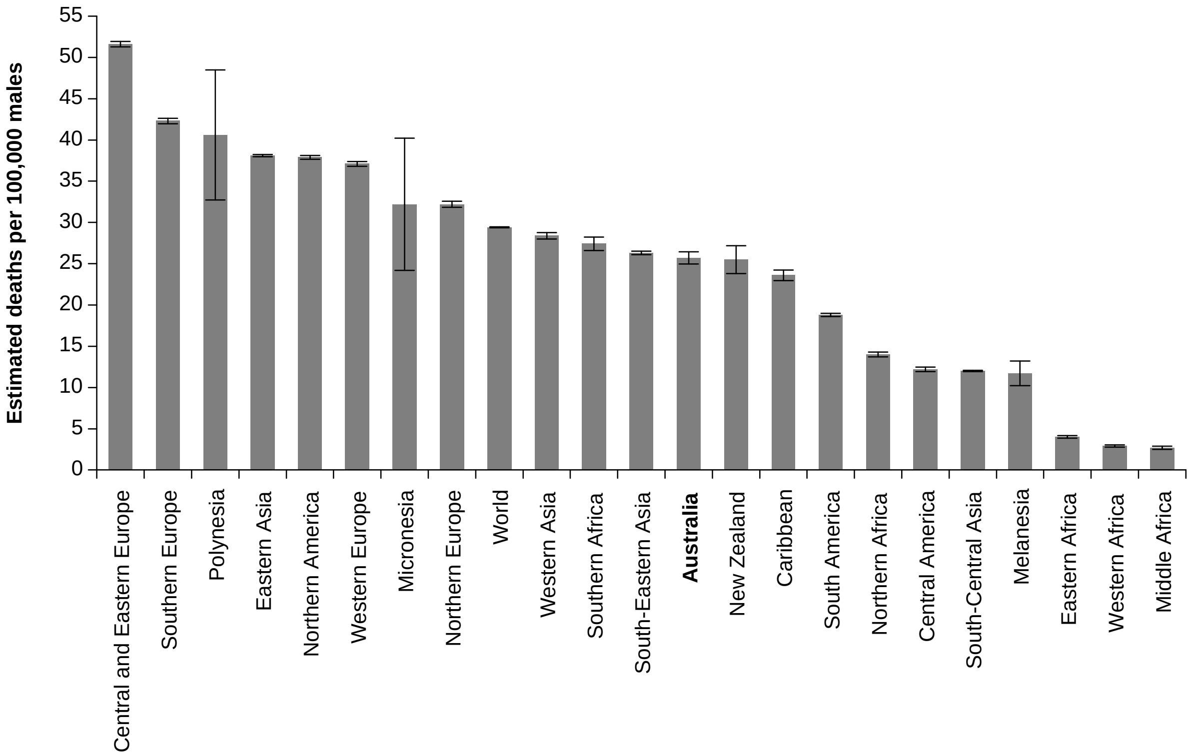
How does Australia compare internationally?

As discussed in Chapter 1, caution must be taken when comparing international data on cancer mortality since observed differences may be due to a range of factors, not just differences in the underlying mortality rates. Data on lung cancer deaths from the GLOBOCAN database (Ferlay et al. 2010a) are in Figure 4.12 and Figure 4.13. These are estimates for 2008 and are based on information from about 3 to 5 years earlier. Further information about these data is in Appendix C.

The estimates suggest that the age-standardised mortality rate for males from lung cancer was significantly lower in Australia (26 per 100,000) than in many regions around the world, including each of the European regions (which ranged from 32 to 52 per 100,000), Eastern Asia (38 per 100,000), Western Asia (28 per 100,000) and North America (38 per 100,000). In contrast, the rate for Australia was similar to that of New Zealand (26 per 100,000) and significantly higher than that of regions such as South America (19 per 100,000) and most of the African regions.

The age-standardised mortality rate for females in Australia (14 per 100,000) was significantly lower than that of Northern America (24 per 100,000), Northern Europe (19 per 100,000), New Zealand (19 per 100,000) and Eastern Asia (16 per 100,000). However, it was estimated to be significantly higher than the rate for each of the African and Asian regions (excluding Eastern Asia).

Differences in mortality rates by country could relate to a number of factors, including differences in incidence rates (see Chapter 3) and the prevalence of major risk factors (that is, tobacco smoking and indoor air pollution), features at diagnosis (for example, stage at diagnosis and histology type), and availability and quality of treatment (CCS & NCIC 2008; Garcia et al. 2007).

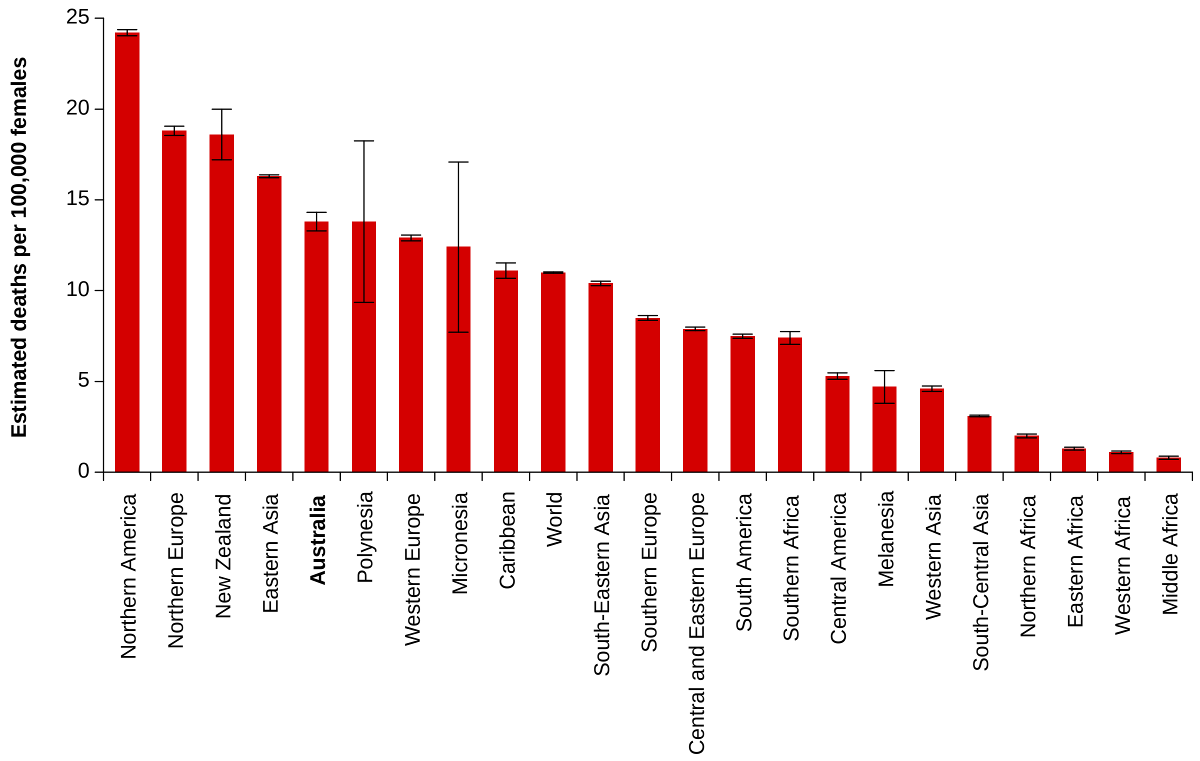


Notes

1. The data were estimated for 2008 and are based on data from approximately 3 to 5 years earlier.
2. The rates were age-standardised by the IARC using the Doll et al. (1966) World Standard Population. The confidence intervals (as shown by the error bars) are approximations and were calculated by the AIHW (see Appendix B).
3. The data for this figure are in Appendix Table D4.11.

Source: Ferlay et al. 2010a.

Figure 4.12: International comparison of estimated mortality from lung cancer, males, 2008



Notes

1. The data were estimated for 2008 and are based on data from approximately 3 to 5 years earlier.
2. The rates were age-standardised by the IARC using the Doll et al. (1966) World Standard Population. The confidence intervals (as shown by the error bars) are approximations and were calculated by the AIHW (see Appendix B).
3. The data for this figure are in Appendix Table D4.12.

Source: Ferlay et al. 2010a.

Figure 4.13: International comparison of estimated mortality from lung cancer, females, 2008

5 Survival after a diagnosis of lung cancer

Key findings

During 2000 to 2007 in Australia:

- People diagnosed with lung cancer were 13% as likely to live 5 years after diagnosis as their counterparts in the general population.
- Five-year relative survival was significantly higher in females (15%) than males (11%).
- Survival after a diagnosis with lung cancer decreased with increasing age.
- Five-year relative survival was significantly lower for *small cell carcinoma* than *non-small cell carcinoma* for both males and females.

From 1982–1987 to 2000–2007:

- Five-year relative survival increased from 8% to 11% for males diagnosed with lung cancer and from 10% to 15% for females.
- Survival improved for *small cell carcinoma* as well as *non-small cell carcinoma*.

Introduction

Along with details on incidence and mortality, information on the survival of people diagnosed with lung cancer is an indication of the effects of lung cancer and the success of control programs and treatments.

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

Most commonly 'relative survival' estimates are considered when examining survival from cancer. These are derived by comparing 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). The ratio of observed to expected survival is used as an indicator of the proportion of people who survived their cancer. 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 60% for people diagnosed with lung cancer means they had a 6 in 10 chance of surviving 5 years after diagnosis relative to comparable people in the general population. Box 5.1 provides additional information on how to interpret relative survival estimates. As well, further technical information about how the relative survival estimates were calculated is in Appendix B.

Box 5.1: What does 'relative survival' actually mean?

First, let's consider what relative survival does not mean. It does not reflect an individual's chance of surviving cancer. How long an individual will live after a diagnosis is affected by a range of factors, such as the 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.

So what does 'relative survival' tell us? Since relative survival estimates are based on the outcomes of a group of people with a diverse mix of cancer and other characteristics, they provide an indication of the average survival experience. Also, the survival estimates are based on specific years in the past and thus give an indication of survival for people diagnosed in those years. Depending on the degree of change that has occurred, the survival estimates may or may not be similar to the survival experience of those diagnosed more recently.

Often the period of 5 years after diagnosis is used when talking about relative survival. Survival to 5 years after diagnosis may or may not be of any medical significance in terms of indicating long-term survival prospects for a particular type of cancer. Instead, the use of this period is a statistical convention that allows for the easy comparison of survival estimates across cancer sites and over time.

Lastly, relative survival estimates can be presented in terms of either a probability of being alive or a probability of dying. For example, a 5-year relative survival estimate of 60% for a particular cancer can also be presented as a 40% chance of dying within 5 years of diagnosis, compared with the general population. When the data are examined from the 'mortality' perspective, the concept is referred to as 'excess mortality' due to cancer.

In this chapter, 1-year survival is shown, along with longer-term survival proportions, such as 5- and 10-year survival, after a diagnosis of invasive lung cancer. One, 5- and 10-year survival proportions may reflect effectiveness of treatment and the stage at which the cancer was detected.

Change over time in relative survival estimates for people diagnosed with lung cancer are described in this chapter, as are differences by age at diagnosis and by histological type of lung cancer. In addition, selected findings on survival by stage at diagnosis are presented from the published literature.

Relative survival proportions cannot be calculated according to Indigenous status due to data limitations and the lack of necessary life tables. However, *crude* survival estimates can be calculated according to Aboriginal and Torres Strait Islander status for people in four Australian states and territories and the results from these calculations are in this chapter. In addition, international data on survival are provided.

The survival estimates in this chapter are based on the analysis of records of lung cancers diagnosed between 1982 and 2007 held in the Australian Cancer Database 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 lung cancer had died and when this occurred.

What is the prospect of surviving lung cancer?

For people diagnosed with lung cancer between 2000 and 2007, the 1-year relative survival was 36%. In other words, those diagnosed with lung cancer between 2000 and 2007 were 36% as likely to live one year after diagnosis as comparable people in the general population. The corresponding 5-year and 10-year relative survival estimates were considerably lower at 13% and 9%, respectively.

As shown in Figure 5.1, the 1-, 5-, and 10-year survival rates were higher in females than males. For example, the 5-year relative survival was 15% for females but only 11% for males.

The reasons for the survival advantage in females have not been identified, but are likely to be due to a number of factors. These include a larger proportion of non-smokers among females who do not have smoking-related comorbidities (English et al. 2007), higher frequency of, and better response to, treatment among females (Fu et al. 2005; Thomas et al. 2005; Wisnivesky & Halm 2007). In addition, hormonal, genetic and metabolic factors have been proposed as potential explanations for the survival benefit experienced by females (Fu et al. 2005; Wisnivesky & Halm 2007).

Table 5.1: Relative survival for lung cancer, Australia, 2000–2007

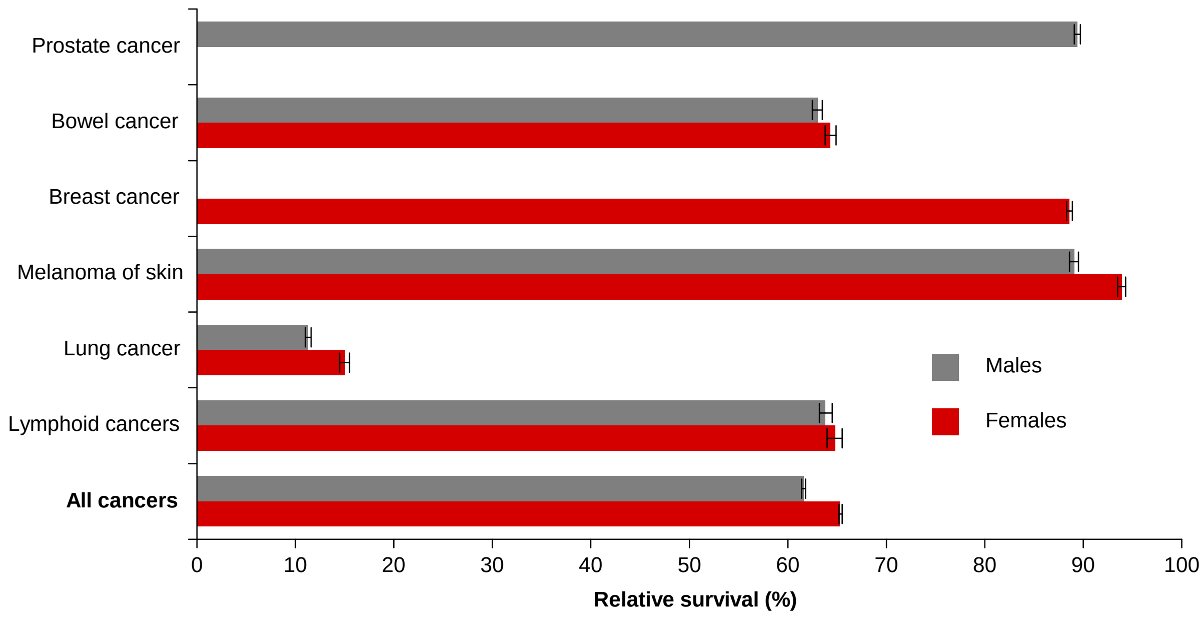
	Males		Females	
	RS (%)	95% CI	RS (%)	95% CI
1–year relative survival	34.2	33.8–34.7	39.8	39.2–40.3
5–year relative survival	11.3	11.0–11.6	15.0	14.5–15.5
10–year relative survival	7.9	7.5–8.3	11.1	10.5–11.7

Source: AIHW Australian Cancer Database 2007.

How does survival from lung cancer compare with other types of cancers?

To put the survival estimates for lung cancer into context, 5-year relative survival estimates for the 5 most frequently diagnosed cancers among males and females in Australia in 2007 are in Figure 5.1. The data indicate that the prognosis for people diagnosed with lung cancer was poorer than for people diagnosed with other frequently diagnosed cancers. In particular, the 5-year relative survival for males diagnosed with lung cancer (11%) was between 6 and 8 times lower than the estimates for males diagnosed with prostate cancer (89%), bowel cancer (63%), melanoma of the skin (89%) and lymphoid cancers (64%). For females, the 5-year relative survival for lung cancer (15%) was between 4 and 6 times lower than the estimates for females diagnosed with bowel cancer (64%), breast cancer (89%), melanoma of the skin (94%) and lymphoid cancers (65%).

The reasons for the poor survival outcomes for lung cancer compared with other frequently diagnosed cancers include the relatively high proportion of diagnoses at an advanced stage (see Chapter 3), when treatment is less effective. It is also possible that the poor survival is related to smoking. It has been suggested that smoking-related comorbidities such as chronic obstructive pulmonary disease have a negative impact on the survival of people with lung cancer (Tammemagi et al. 2004).



Notes

1. The most commonly diagnosed cancers, excluding non-melanoma skin cancer (C44), were determined using data for 2007; the cancers have been listed in order of how common they were.
2. Lymphoid cancers (ICD-10 codes of C81–C85, C88, C90, C91) are cancers that start in lymphocytes of the immune system. The most common types are lymphomas, lymphoid leukaemia and myeloma.
3. 'All cancers' includes cancers coded in ICD-10as C00–C97 (except for C44), D45, D46, D47.1 and D47.3.
4. The data for this figure are in Appendix Table D5.1.

Source: AIHW Australian Cancer Database 2007.

Figure 5.1: Five-year relative survival, most commonly diagnosed cancers, Australia, 2000–2007

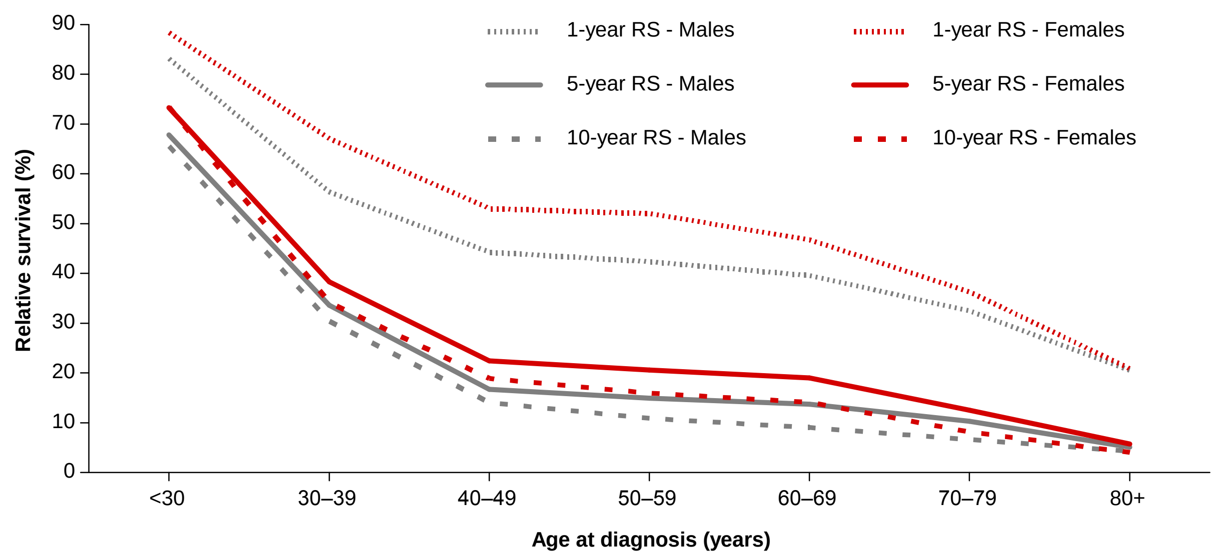
Does survival differ by age?

Figure 5.2 presents 1-, 5- and 10-year relative survival estimates by age at diagnosis for males and females diagnosed with lung cancer from 2000 to 2007. The 1-year relative survival was highest in those under 30 years (83% for males and 88% for females) and then generally decreased with age, with those aged 80 years and over having the lowest 1-year relative survival estimate (21% for both sexes). Note that the 1-year relative survival for males was significantly lower than that of females for those aged 40 to 79 years.

Like the 1-year survival, the 5- and 10-year survival also tended to decrease with increasing age for both males and females. The 5-year survival estimate ranged from 68% for males and 73% for females under 30 years to 5% for males and 6% for females aged 80 years and over. For the 10-year survival, the estimates were 66% for males and 74% for females under 30 years; these estimates decreased to 4% for those aged 80 years and over for both sexes.

Figure 5.2 also demonstrates that there are only modest absolute differences between the age-specific 5- and 10-year relative survival estimates for lung cancer, with the difference only statistically significant for those aged 50 to 79 years. This indicates that the relative risk of dying from lung cancer was small for people who survived 5 years after their diagnosis.

Research from other Western countries has also found that survival of males and females diagnosed with lung cancer at an older age is much poorer than for those diagnosed at a younger age (Altekruse et al. 2010; CCSSC 2009; Cancer Research UK 2010a; Donnelly et al. 2009). This difference may be due to a number of reasons, including differences in the histological type and stage at diagnosis of the tumours, a greater likelihood of comorbidities and frailty among those diagnosed at an older age, differences by age in treatments received, and the inclusion in clinical trials (Brenner & Arndt 2004; CCSSC 2009; Ellison & Gibbons 2006; English et al. 2007; Owonikoko et al. 2007).



Note: The data for this figure are shown in Appendix Table D5.2, D5.3, and D5.4.

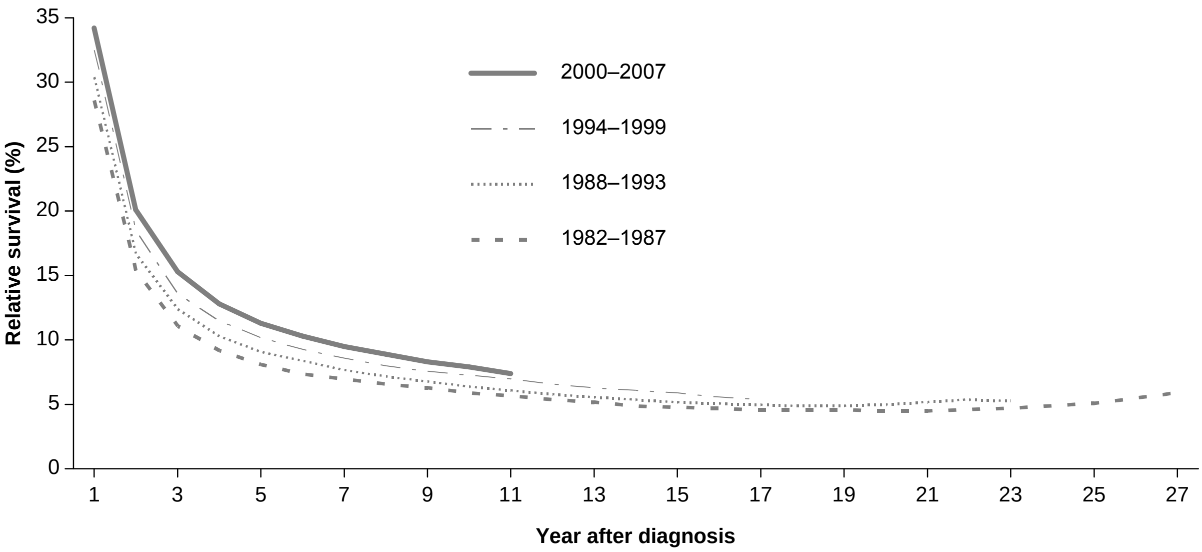
Source: AIHW Australian Cancer Database 2007.

Figure 5.2: Relative survival for lung cancer, by age at diagnosis, Australia, 2000–2007

Has survival from lung cancer changed over time?

Survival curves for lung cancer are in Figure 5.3 for males and Figure 5.4 for females for four time periods from 1982–1987 to 2000–2007. For each period the relative survival estimates for males and females fell most sharply during the first 5 to 7 years after diagnosis, indicating that the relative risk of dying from lung cancer was highest during the initial years after diagnosis. In contrast, from about 8 years after diagnosis onwards, the relative survival estimates were virtually stable for both sexes. This suggests that the risk of dying from lung cancer was small for people who survived for 8 years or more after their diagnosis.

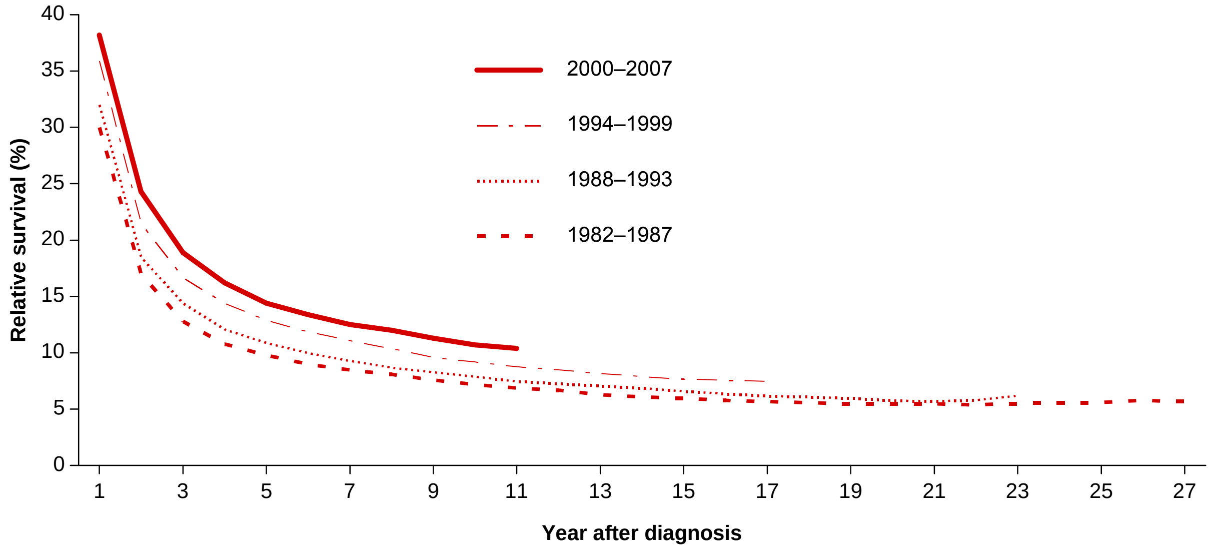
The data indicate that improvement in survival from lung cancer is evident, although survival remains poor for both sexes. When the entire time period from 1982–1987 to 2000–2007 is considered, the 1-year relative survival increased significantly from 29% to 34% for males and 31% to 40% for females. Furthermore, the 5-year relative survival increased significantly from 8% to 11% for males and 10% to 15% for females, while the 10-year relative survival increased significantly from 6% to 8% for males and 8% to 11% for females (Figure 5.3 and 5.4).



Note: The data for this figure are shown in Appendix Table D5.5.

Source: AIHW Australian Cancer Database 2007.

Figure 5.3: Relative survival for lung cancer, by period of diagnosis, males, 1982–1987 to 2000–2007



Note: The data for this figure are shown in Appendix Table D5.6.

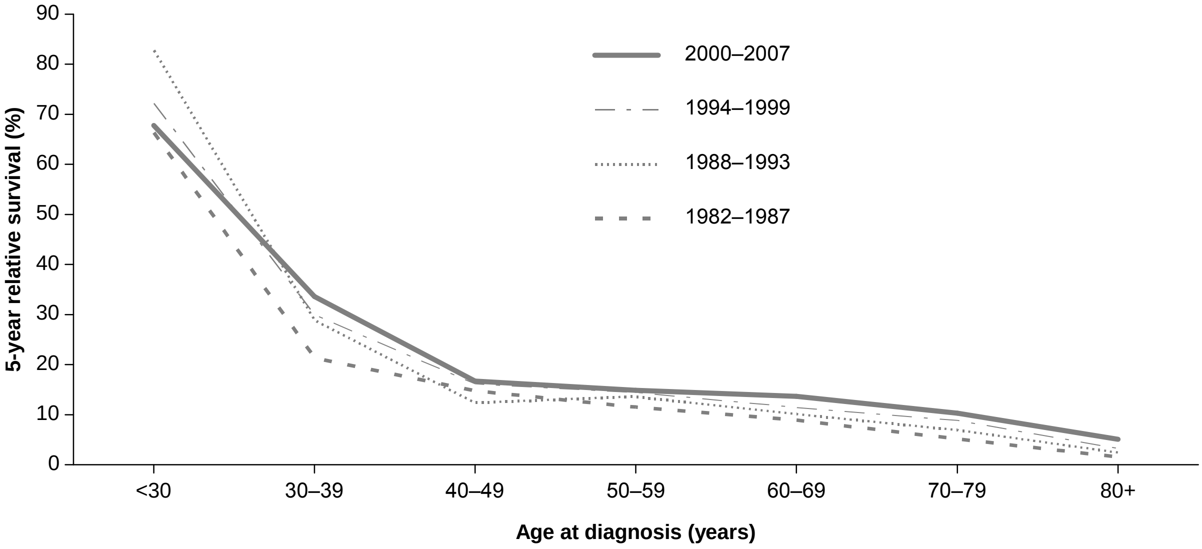
Source: AIHW Australian Cancer Database 2007.

Figure 5.4: Relative survival for lung cancer, by period of diagnosis, females, 1982–1987 to 2000–2007

Note that the method used to calculate the relative survival estimates in this chapter does not take into account differing age structures in the population over time. Since the average age of those diagnosed with lung cancer has increased somewhat for both males and females over the years considered (see Table 3.2 in Chapter 3), the improvement over time in relative survival estimates may actually be somewhat greater than is indicated. However, determining whether this is the case is beyond the scope of this report. See Appendix B for further discussion on the age-standardisation of relative survival estimates.

Is the gain in survival over time evident in all age groups?

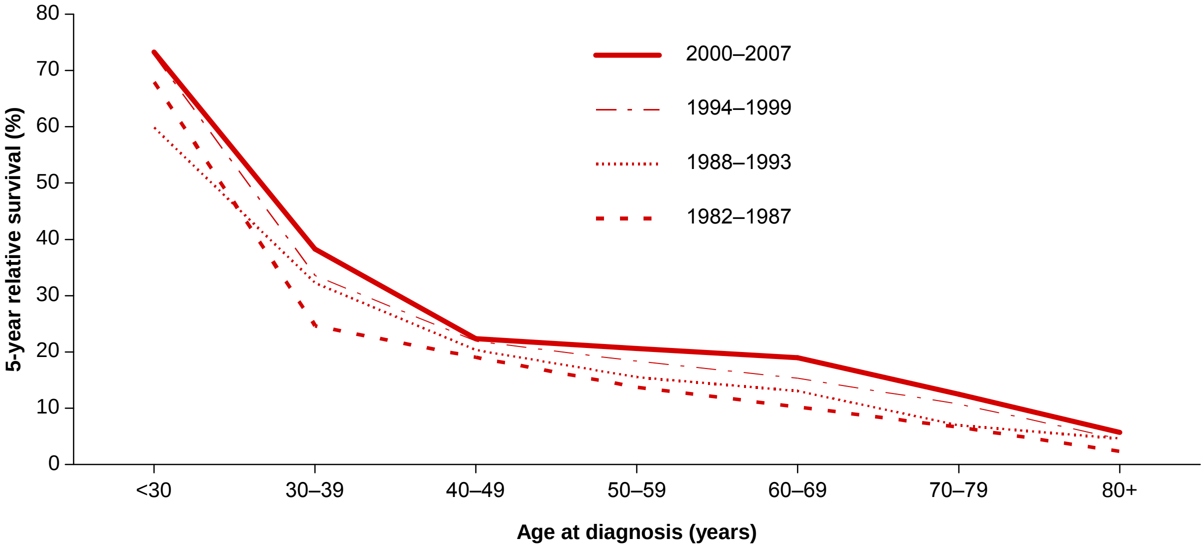
Figures 5.5 and 5.6 show 5-year relative survival curves by age at diagnosis for the periods 1982–1987 to 2000–2007 for males and females, respectively. For both sexes improvements in survival over time were concentrated on those aged 50 years and over. The biggest absolute improvement in 5-year relative survival estimates was for the 70 to 79 age group for males (from 5% in 1982–1987 to 10% in 2000–2007) and for the 60 to 69 age group for females (from 10% in 1982–1987 to 19% in 2000–2007). While there were some improvements between the first and the last of the four time periods for the youngest age groups (that is, those under 50 years), the difference was not statistically significant.



Note: The data for this figure are in Appendix Table D5.7.

Source: AIHW Australian Cancer Database 2007.

Figure 5.5: Five-year relative survival for lung cancer, by age at diagnosis, males, 1982–1987 to 2000–2007



Note: The data for this figure are in Appendix Table D5.7.

Source: AIHW Australian Cancer Database 2007.

Figure 5.6: Five-year relative survival for lung cancer, by age at diagnosis, females, 1982–1987 to 2000–2007

Does survival differ for the most common types of lung cancer?

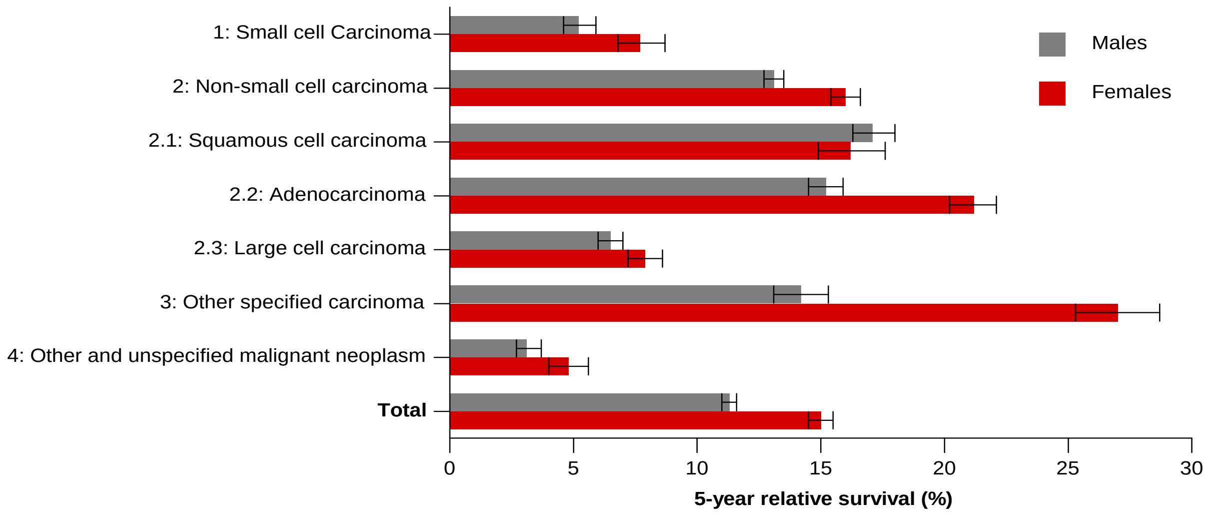
Five-year relative survival by histology types are shown for the period 2000 to 2007 in Figure 5.7 and Table 5.2. These data illustrate that lung cancer is a heterogeneous disease with widely varying clinical outcomes, depending on the type of cancer.

The highest 5-year relative survival estimate was for *other specified carcinoma* (group 3) for both sexes, at 14% for males and 27% for females. In contrast, males and females diagnosed with *other and unspecified malignant neoplasm* had the lowest 5-year survival, at 3% for males and 5% for females.

The 5-year relative survival for *small cell carcinoma* (group 1) was 5% for males and 8% for females. These estimates were significantly lower than those for *non-small cell carcinoma* (group 2) (13% for males and 16% for females).

Within the group of *non-small cell carcinoma*, there were variations in the 5-year relative survival estimates for both sexes. Among males, survival was highest for *squamous cell carcinoma* (17%), followed by *adenocarcinoma* (15%) and *large cell carcinoma* (7%). Among females, survival was highest for *adenocarcinoma* (21%), followed by *squamous cell carcinoma* (16%) and *large cell carcinoma* (8%).

A large body of research has also found that survival of those diagnosed with *non-small cell carcinoma* is higher than it is for those with *small cell carcinoma*; examples include studies using data from the United States of America (Altekruse et al. 2010), Ireland (Donnelly et al. 2009) and the United Kingdom (Cancer Research UK 2011). The higher survival in people with *non-small cell carcinoma* is due, at least in part, to the lower proportion of these cancers diagnosed at an advanced stage (Chapter 3).



Notes

1. All cases were coded as primary site, invasive lung cancers.
2. Table 3.4 in Chapter 3 provides a list of the histology types included in each group.
3. The data for this figure are in Table 5.2.

Source: AIHW Australian Cancer Database 2007.

Figure 5.7: Five-year relative survival by type of lung cancer, Australia, 2000–2007

How has the survival for the most common types of lung cancer changed over time?

Table 5.2 shows the 5-year relative survival by histology types of lung cancer for the four periods from 1982–1987 to 2000–2007. Between the first and the last period, there was a small but significant improvement in survival estimates for *small cell carcinoma* as well as *non-small cell carcinoma* (group 2). The survival for *small cell carcinoma* (group 1) increased from 3% to 5% for males and 5% to 8% for females, while survival for *non-small cell carcinoma* (group 2) increased from 9% to 13% for males and 11% to 16% for females.

A significant improvement in 5-year relative survival was also found for most of the subtypes of *non-small cell carcinoma*. In particular, there was a significant increase over the four periods for males and females diagnosed with *squamous cell carcinoma* (from 12% to 17% for males and 12% to 16% for females) and *adenocarcinoma* (from 10% to 15% for males and 14% to 21% for females). While the survival for males with *large cell carcinoma* also increased significantly between 1982–1987 (5%) and 2000–2007 (7%), the survival for females with such cancers remained stable over the same period (around 6% to 8%).

For males and females diagnosed with *other and unspecified lung cancers* (group 4), there was no statistically significant change in 5-year relative survival from 1982–1987 to 2000–2007.

Table 5.2: Incidence and 5–year relative survival by type of lung cancer, Australia, 1982–1987 to 2000–2007

	1982–1987			1988–1993			1994–1999			2000–2007		
Type of lung cancer[(a)]	**No.[(b)]**	**RS (%)**	**95% CI**	**No.[(b)]**	**RS (%)**	**95% CI**	**No.[(b)]**	**RS (%)**	**95% CI**	**No.[(b)]**	**RS (%)**	**95% CI**
						Males						
1: Small cell Carcinoma	4,287	3.2	2.7–3.7	4,094	4.5	3.9–5.2	4,187	4.3	3.7–4.9	5,455	5.2	4.6–5.9
2: Non–small cell carcinoma	21,261	9.3	8.9–9.8	23,645	10.0	9.6–10.4	24,840	11.2	10.8–11.7	31,138	13.1	12.7–13.5
2.1: Squamous cell carcinoma	*9,612*	*11.7*	*11.1–12.5*	*9,882*	*12.0*	*11.3–12.7*	*8,887*	*14.6*	*13.8–15.4*	*9,631*	*17.1*	*16.3–18.0*
2.2: Adenocarcinoma	*5,321*	*10.1*	*9.3–10.9*	*6,535*	*12.3*	*11.5–13.1*	*7,698*	*12.9*	*12.1–13.7*	*11,888*	*15.2*	*14.5–15.9*
2.3: Large cell carcinoma	*6,328*	*5.0*	*4.4–5.5*	*7,228*	*5.0*	*4.5–5.6*	*8,255*	*6.1*	*5.6–6.7*	*9,619*	*6.5*	*6.0–7.0*
3: Other specified carcinoma[(c)]	377	37.4	32.2–42.6	558	30.8	26.7–35.0	608	40.6	36.4–44.9	4,476	14.2	13.1–15.3
4: Other and unspecified malignant neoplasm	3,480	2.7	2.2–3.3	2,397	3.1	2.5–3.8	2,668	2.5	2.0–3.1	4,507	3.1	2.7–3.7
Total	**29,421**	**8.1**	**7.8–8.4**	**30,697**	**9.1**	**8.8–9.5**	**32,304**	**10.2**	**9.8–10.5**	**45,578**	**11.3**	**11.0–11.6**
						Females						
1: Small cell Carcinoma	1,552	5.1	4.2–6.3	2,025	5.1	4.2–6.2	2,296	6.3	5.4–7.4	3,431	7.7	6.8–8.7
2: Non–small cell carcinoma	5,736	10.9	10.1–11.7	8,350	11.6	10.9–12.3	10,652	13.9	13.2–14.5	17,092	16.0	15.4–16.6
2.1: Squamous cell carcinoma	*1,700*	*11.5*	*10.0–13.1*	*2,285*	*11.4*	*10.1–12.8*	*2,563*	*14.6*	*13.2–16.1*	*3,309*	*16.2*	*14.9–17.6*
2.2: Adenocarcinoma	*2,186*	*14.1*	*12.7–15.6*	*3,348*	*15.6*	*14.3–16.8*	*4,399*	*19.2*	*18.0–20.4*	*8,370*	*21.2*	*20.2–22.1*
2.3: Large cell carcinoma	*1,850*	*6.3*	*5.2–7.4*	*2,717*	*6.7*	*5.8–7.7*	*3,690*	*7.0*	*6.2–7.8*	*5,413*	*7.9*	*7.2–8.6*
3: Other specified carcinoma[(c)]	227	56.9	49.8–63.4	370	60.3	54.8–65.4	425	64.6	59.5–69.3	2,788	27.0	25.3–28.7
4: Other and unspecified malignant neoplasm	1,111	5.2	3.9–6.6	1,029	3.7	2.8–4.8	1,392	4.6	3.6–5.7	2,805	4.8	4.0–5.6
Total	**8,631**	**10.4**	**9.8–11.1**	**11,776**	**11.3**	**10.7–11.9**	**14,765**	**13.3**	**12.7–13.9**	**26,118**	**15.0**	**14.5–15.5**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 in Chapter 3 provides a list of the histology types included in each group.

(b) The number of cases equals the total number of diagnosed cases in the period considered.

(c) Includes 'non-small cell carcinoma' (8046), and this classification has only been used by state/territory cancer registries since around 2003 (vary by state/territory). Before 2003, 'non-small cell carcinoma' was coded to various histology codes, mainly to the group classified as 'large cell carcinoma'. The new coding practice has influenced the trends shown in the table.

Source: AIHW Australian Cancer Database 2007.

Does survival differ by stage?

Research studies have shown that stage at diagnosis of lung cancer is closely related to survival prospects, with advanced stage associated with poorer survival (Cancer Research UK 2011; Wang T. et al. 2010). Since no national data are available on stage at diagnosis in Australia, national relative survival estimates for lung cancer by stage at diagnosis cannot be calculated. However, to illustrate the trends, data from New South Wales (NSW) (Tracey E. et al. 2007) and the United States of America (USA) (Altekruse et al. 2010) based on the SEER summary stage system are shown. The NSW data pertain to cancers coded as C33 or C34 in the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), whereas the data from the USA pertain only to cancers coded as C34 in the ICD-10.

According to the NSW data, the 5-year relative survival estimate for lung cancers that were diagnosed at the localised stage between 1999 and 2003 was 30% (Table 5.3). The corresponding estimates for regional and distant cancers were significantly lower, at 19% and 3% respectively. For lung cancers with an unknown stage at diagnosis, the 5-year relative survival was 9%.

As was the case with the NSW data, there is a clear gradient in the survival estimates in the USA data according to stage at diagnosis, with a 5-year relative survival estimate of 53% for those diagnosed with localised lung cancers, 24% for those with regional cancers and 4% for those with distant cancers. In addition, the USA data indicate that the 5-year relative survival for those with an unknown stage at diagnosis was 9%.

Table 5.3: Five–year relative survival by stage at diagnosis[(a)], New South Wales, 1999–2003 and United States of America, 1999–2006[(b)]

	New South Wales (1999–2003)			United States of America (1999–2006)[(b)]		
Stage at diagnosis[(a)]	**Number of cases**	**% of staged cases**	**Relative survival (%)**	**Number of cases**	**% of staged cases**	**Relative survival (%)**
Localised	3,272	31.6	29.8	n.a.	16.3	52.9
Regional	2,582	24.9	18.7	n.a.	23.9	24.0
Distant	4,504	43.5	3.1	n.a.	60.9	3.5
Unknown	3,266	31.6	9.3	n.a.	. .	8.7
Total	**13,624**	**100.0**	**14.0**	**263,175**	**100.0**	**15.8**

n.a. Not available.

(a) Based on the SEER summary staging system (see Appendix E).

(b) Data were from the SEER 17 areas which cover approximately 25% of the USA (see Table 15.12 in Altekruse et al. 2010).

(c) These values are approximations that were calculated by the AIHW.

Source: Tracey et al. 2007; Altekruse et al. 2010.

The USA data also provide information on differences by sex in survival by stage at diagnosis (Table 5.4). The data indicate that the survival estimates for females were higher than males for all stages at diagnosis. This sex-related difference was greatest for localised disease and decreased as the extent of the disease increased.

Table 5.4: Five–year relative survival by stage at diagnosis[(a)] and by sex , United States of America, 1999–2006[(b)]

Stage at diagnosis[(a)]	Males: Number of cases	Males: % of staged cases[(c)]	Males: RS (%)	Females: Number of cases	Females: % of staged cases[(c)]	Females: RS (%)
Localised	n.a.	14.1	48.1	n.a.	17.4	57.4
Regional	n.a.	23.9	21.8	n.a.	23.9	26.6
Distant	n.a.	62.0	3.0	n.a.	58.7	4.2
Unknown	n.a.	. .	7.6	n.a.	. .	9.9
Total	**142,448**	**100.0**	**13.5**	**120,727**	**100.0**	**18.3**

n.a. Not available.

(a) Based on the SEER summary staging system (see Appendix E).

(b) Data were from the SEER 17 areas which cover approximately 25% of the USA (see Table 15.12 in Altekruse et al. 2010).

(c) These values are approximations that were calculated by the AIHW.

Source: Altekruse et al. 2010.

Five-year relative survival by stage at diagnosis for *small cell carcinoma* and *non-small cell carcinoma* in the USA from 1999 to 2006 are shown in Table 5.5. People diagnosed with *non-small cell carcinoma* had a higher 5-year relative survival than those diagnosed with *small cell carcinoma* for all stages at diagnosis. For localised lung tumours, the relative survival for *non-small cell carcinoma* was more than double that for *small cell carcinoma* (55% and 21%, respectively). Furthermore, for those diagnosed when the tumour was at the regional stage the estimated relative survival was 26% for *non-small cell carcinoma* compared with 13% for *small cell carcinoma*. Although less marked, there was also a difference for those diagnosed with tumours at a distant stage, with the relative survival equalling 4% for *non-small cell carcinoma* and 3% for *small cell carcinoma*.

Table 5.5: Five–year relative survival by stage at diagnosis[(a)] by type of lung cancer, United States of America, 1999–2006[(b)]

Stage at diagnosis[(a)]	Small cell lung carcinoma[(c)]: Number of cases	Small cell lung carcinoma[(c)]: % of staged cases[(e)]	Small cell lung carcinoma[(c)]: Relative survival (%)	Non-small cell lung carcinoma[(d)]: Number of cases	Non-small cell lung carcinoma[(d)]: % of staged cases[(e)]	Non-small cell lung carcinoma[(d)]: Relative survival (%)
Localised	n.a.	5.3	21.0	n.a.	17.4	54.5
Regional	n.a.	22.1	13.3	n.a.	23.9	25.7
Distant	n.a.	72.6	2.7	n.a.	58.7	3.7
Unknown	n.a.	. .	8.2	n.a.	. .	8.8
Total	**35,769**	**100**	**6.1**	**227,406**	**100**	**17.4**

n.a. Not available.

(a) Based on the SEER summary staging system (see Appendix E).

(b) Data were from the SEER 17 areas which cover approximately 25% of the USA (see Table 15.13 and Table 15.14 in Altekruse et al. 2010).

(c) Small cell cancer of the lung includes histologies 8041–8045.

(d) Non-small cell cancer of the lung includes histologies 8000–8040, 8046–9049, 9056–9139, 9141–9589.

(e) These values are approximations that were calculated by the AIHW.

Source: Altekruse et al. 2010

Does survival differ by Aboriginal and Torres Strait Islander status?

Relative survival estimates cannot be calculated for Indigenous Australians because of data issues and the lack of necessary life tables. However, 5-year *crude* survival estimates can be derived based on data from Queensland, Western Australia, South Australia and the Northern Territory. As discussed earlier in this chapter, crude survival estimates do not take into account the cause of death, nor do they compare observed survival with expected survival. Past research has shown that the life expectancy of Indigenous Australians is shorter than that of non-Indigenous Australians (ABS 2004, 2009e). At the same time, the mean age at which males and females were diagnosed with lung cancer differs by Indigenous status. Specifically, Indigenous males are diagnosed at a younger age than non-Indigenous males (mean of 62 and 70 years, respectively) and Indigenous females are diagnosed at a younger age than non-Indigenous females (mean of 61 and 69 years, respectively). It is not known how these underlying differences may have affected the crude survival estimates presented.

Given the small number of lung cancer cases reported among Indigenous Australians, an 8-year time period from 2000 to 2007 is considered in these analyses.

While the crude 5-year survival estimate for Indigenous males diagnosed with lung cancer was somewhat lower than for non-Indigenous males in the four jurisdictions (9% and 10%, respectively), the difference was not statistically significant. Similarly, the crude survival estimate for Indigenous females was lower than non-Indigenous females (11% and 14%, respectively), but the difference was not statistically significant.

Table 5.6: Five–year crude survival by Indigenous status, lung cancer, Queensland, Western Australia, South Australia and Northern Territory, 2000–2007

	Males				Females			
Indigenous status	**No.[(a)]**	**Mean age at diagnosis**	**CS (%)**	**95% CI**	**No.[(a)]**	**Mean age at diagnosis**	**CS (%)**	**95% CI**
Indigenous	320	61.9	8.9	6.0–12.6	221	60.5	10.6	6.8–15.2
Non-Indigenous	16,809	70.0	9.5	9.1–10.0	9,133	69.4	13.6	12.9–14.4
Not stated	269	69.0	40.2	33.9–46.3	203	67.2	51.8	44.4–58.7
Total	**17,398**	**69.9**	**10.0**	**9.5–10.4**	**9,557**	**69.1**	**14.3**	**13.6–15.1**

(a) Equals the total number of diagnosed cases in the period considered.

Source: AIHW Australian Cancer Database 2007.

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 wide variation across countries in:

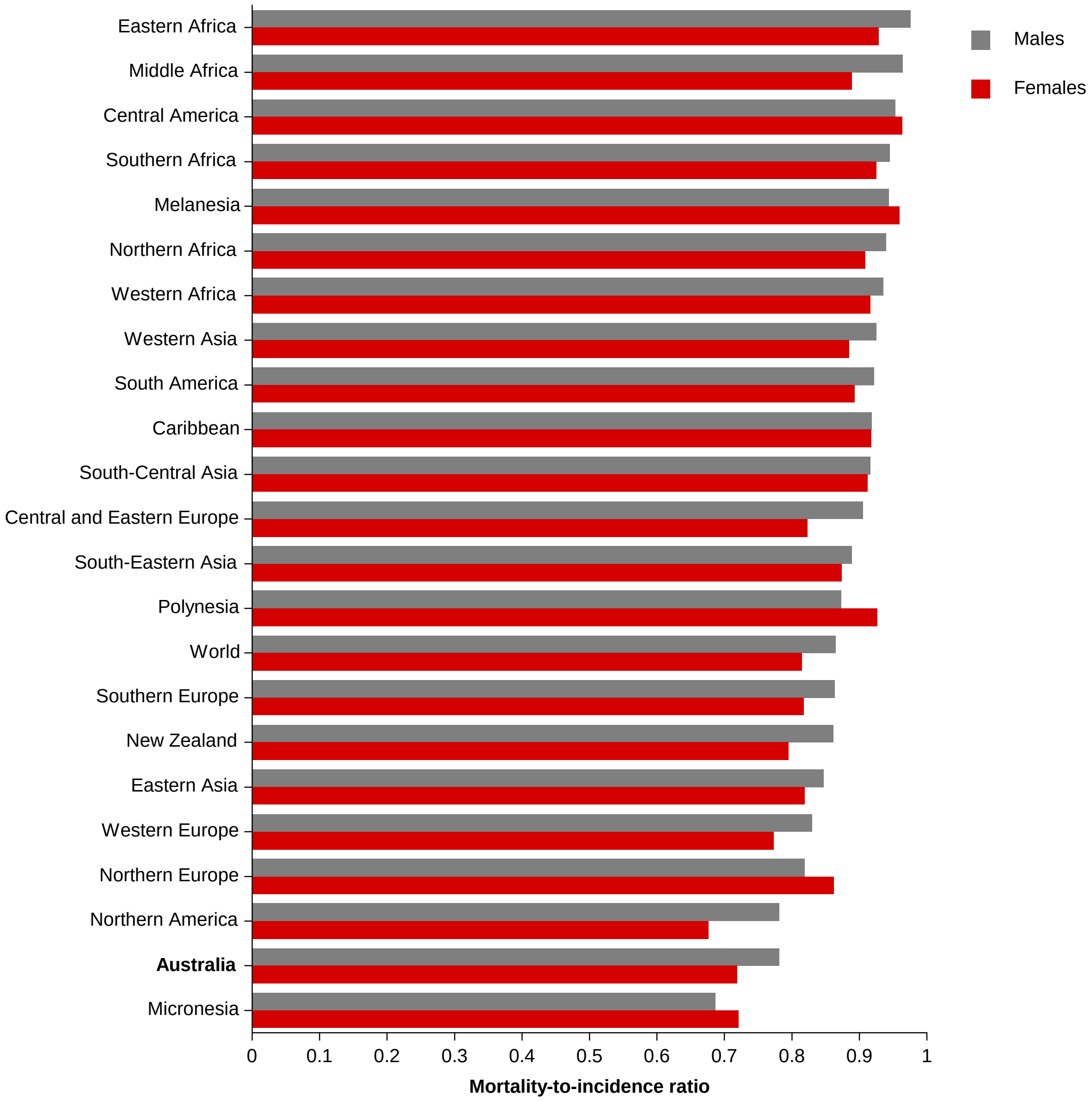
- years to which the relative survival estimates apply
- length of the follow-up period considered (for example 1-, 5-, 10-year and so forth);
- methods and age groups used to calculate the relative survival estimates.

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 0.70 for lung cancer would indicate that there were 70 deaths for every 100 new cases diagnosed in that year (though the deaths need not relate to the same people as the cases). If survival tends to be lower in a particular country relative to others, 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 B provides further information about interpreting MIRs.

For this report, mortality–to–incidence lung cancer ratios were calculated using data from the GLOBOCAN database (Ferlay et al. 2010a). The fact that the GLOBOCAN data were estimates for 2008 should be taken into account when interpreting the results in Figure 5.8.

The GLOBOCAN data suggest that the MIRs for lung cancer varied between different countries and regions. Survival was lowest among males in Eastern Africa, Middle Africa and Central Africa (MIR of 1.0 for all regions) and highest for males in Micronesia (MIR of 0.7). The estimated survival for females was lowest in Central America and Melanesia (both with MIR of 1.0) and highest for females living in Northern America, Australia and Micronesia (MIR of 0.7 for all regions). The MIRs of males and females in Australia were relatively low (0.8 and 0.7, respectively), which suggests that Australian males and females who were diagnosed with lung cancer had better survival prospects than their counterparts in many other countries and regions.



Notes

1. The ratios were based on estimates for 2008 and are based on data from approximately 3 to 5 years earlier. The rates were age-standardised by the IARC using the Doll et al. (1966) World Standard Population. The mortality-to-incidence ratio equals the age-standardised mortality rate divided by the age-standardised incidence rate.

2. The data for this figure are in Appendix Table D5.9.

Source: Ferlay et al. 2010a.

Figure 5.8: International comparison of mortality-to-incidence ratios for lung cancer, 2008

6 Prevalence of lung cancer

Key findings

At the end of 2007 in Australia:

- 7,417 males and 5,189 females were alive who had been diagnosed with lung cancer at any time within the previous 5 years.
- The 5-year prevalence was higher in males than females (7% and 5%, respectively) due to the higher incidence of lung cancer in males.
- The 5-year prevalence for lung cancer increased with age.
- The highest 5-year prevalence as a proportion of the respective male population was in Tasmania, while the highest proportion for females was in South Australia.
- The 5-year prevalence of both males and females, as a proportion of the respective population, was highest among those born in the European regions.

Introduction

‘Limited-duration prevalence’—the prevalence measure used in this report—provides information on the number of people alive who were diagnosed with lung cancer within a specified time period, such as the previous 5 years. Five-year prevalence data, for example, would indicate the number of people alive on 31 December of a specified year who were diagnosed with lung cancer at any time within the previous five years, while one-year prevalence data would indicate the number of people alive on 31 December of a particular year who were diagnosed with lung cancer during that same year.

The prevalence of a disease in a given population is influenced by the incidence of the disease, survival from the disease and the age at which people are diagnosed, because older people are more likely to die sooner due to age-related morbidity and frailty.

Along with information on incidence, mortality and survival, prevalence is another indicator of the impact of lung cancer in our society, both at the personal or family level and societal level, particularly in terms of health-care services.

In this report, limited-duration prevalence is presented using data from the Australian Cancer Database, with information on deaths (from any cause) sourced from the National Death Index. Limited-duration prevalence data is presented for a maximum of 5 years (from 1 January 2003 to 31 December 2007). In addition, information is provided on differences in prevalence by age, state and territory, and country of birth.

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 years) and the analytical methods used to calculate prevalence.

Unlike the incidence data, which pertain to the number of lung cancers, the prevalence data in this report pertain to the number of *people* who have been diagnosed with lung cancer and are still alive. However, as mentioned in Chapter 3, since it is rare that any one person would be diagnosed with more than one primary lung cancer in one year, the number of new lung cancers in a particular year would be very similar to the number of *people* diagnosed with lung cancer in that year.

How prevalent was lung cancer in 2007?

Table 6.1 presents limited prevalence-duration data for the five most commonly diagnosed cancers in males and females in 2007. At the end of 2007, 7,417males and 5,189 females were alive who had been diagnosed with lung cancer in the previous 5 years. This equated to 7 out of 10,000 males and 5 out of 10,000 females. At the same time, the 1-year prevalence was 3,336 males and 2,207 females. The 1-year prevalence compares with incidence of 5,948 lung cancers for males and 3,755 lung cancers for females in 2007 (see Table 3.1). Note that those people who were both diagnosed with lung cancer and died in 2007 (about 2,612 males and 1,548 females) may or may not have died as a result of lung cancer.

Males made up 60% of the 1-year prevalence and 59% of the 5-year prevalence. This difference by sex is due to the higher incidence rate of lung cancer in males.

Regardless of the prevalence duration, lung cancer had a relative low prevalence compared with other commonly diagnosed cancers. This is due to a number of factors including:

- A smaller number of people diagnosed with lung cancer each year compared with other commonly diagnosed cancers (see Chapter 3).
- Lower survival for those diagnosed with lung cancer compared with other cancers (see Chapter 5).
- The older average age at diagnosis of people with lung cancer compared with other types of cancers. For example, in 2007, the mean age at diagnosis of lung cancer for males was 71 years and for females it was 70 years. In comparison, the mean age at diagnosis was 68 years for prostate cancer in males and 60 years for breast cancer in females (AIHW & AACR 2010).

Table 6.1: Limited-duration prevalence of the 5 most commonly diagnosed cancers[(a)], Australia, end of 2007

Site/type of cancer	1-year prevalence	Per 10,000[(b)]	5-year prevalence	Per 10,000[(b)]
		Males		
Prostate (C61)	18,653	17.7	72,582	68.7
Bowel (C18–C20)	6,800	6.4	25,066	23.7
Melanoma of skin (C43)	5,784	5.5	25,740	24.4
Lung (C33–C34)	3,336	3.2	7,417	7.0
Lymphoid cancers[(c)]	3,585	3.4	14,224	13.5
All cancers[(d)]	**51,454**	**48.7**	**185,574**	**175.7**
		Females		
Breast (C50)	12,209	11.4	55,537	52.0
Bowel (C18–C20)	5,572	5.2	20,697	19.4
Melanoma of skin (C43)	4,294	4.0	20,013	18.7
Lung (C33–C34)	2,207	2.1	5,189	4.9
Lymphoid cancers[(c)]	2,734	2.6	10,959	10.3
All cancers[(d)]	**38,838**	**36.4**	**153,503**	**143.8**

(a) Determined by the most commonly diagnosed cancers in 2007 and ordered accordingly.

(b) Based on the number of males/females in the Australian population at 31 December 2007.

(c) Lymphoid cancers (ICD-10 codes of C81–C85, C88, C90, C91) are cancers that start in lymphocytes of the immune system. The most common types are lymphomas, lymphoid leukaemia and myeloma.

(d) Includes cancers coded in ICD-10 as C00–C97 (except C44), D45, D46, D47.1 and D47.3.

Note: Data refer to the number of people, not cancers.

Source: AIHW Australian Cancer Database 2007.

Does prevalence differ by age?

Table 6.2 presents 5-year prevalence of lung cancer by age group. At the end of 2007, the highest proportion of prevalence was for those aged 70 to 79 years for males (47 per 10,000) as well as females (39 per 10,000). The youngest age groups have the lowest proportion of prevalence, at 0.1 per 10,000 for both sexes.

Table 6.2: Five-year prevalence of lung cancer by age group, Australia, end of 2007

	Males		Females	
Age group (years)	Number[(a)]	Per 10,000 males[(b)]	Number[(a)]	Per 10,000 females[(b)]
<40	79	0.1	81	0.1
40–49	243	1.6	256	1.7
50–59	892	6.7	847	6.3
60–69	2,212	23.2	1,526	15.9
70–79	2,657	46.7	1,607	25.2
80+	1,334	45.6	872	18.2
Total	**7,417**	**7.0**	**5,189**	**4.9**

(a) Refers to the number of people, not cancers.

(b) Based on the number of males/females in the Australian population at 31 December 2007.

Source: AIHW Australian Cancer Database 2007.

Does prevalence differ across population groups?

As noted earlier in this chapter, the prevalence of lung cancer is influenced by the incidence of the disease, survival rates and the average age at diagnosis. Since these factors can differ across population groups, prevalence may also differ. In this section, prevalence data by state and territory, and by country of birth are presented.

Does prevalence differ by state and territory?

Table 6.3 presents prevalence data for the end of 2007 according to the state and territory in which the person lived at the time of diagnosis. Since it is unknown whether people lived in the same state and territory in 2007 as they did at the time of diagnosis, these data should be used with caution.

The 5-year prevalence as a proportion of the respective male population was highest in Tasmania (8 per 10 000) and lowest in the Australian Capital Territory (4.1 per 10,000). For females, the highest proportion was in South Australia (6 per 10,000) and the lowest in Northern Territory (3.5 per 10, 000 for both jurisdictions).

Table 6.3: Five-year prevalence of lung cancer by state and territory of diagnosis, Australia, end of 2007

State or territory	Males		Females	
	Number[(a)]	Per 10,000[(b)]	Number[(a)]	Per 10,000[(b)]
New South Wales	2,534	7.4	1,811	5.2
Victoria	1,834	7.0	1,254	4.7
Queensland	1,450	6.8	941	4.4
Western Australia	719	6.7	488	4.6
South Australia	574	7.3	448	5.6
Tasmania	187	7.7	131	5.2
Australian Capital Territory	70	4.1	79	4.6
Northern Territory	49	4.3	37	3.5
Total	**7,417**	**7.0**	**5,189**	**4.9**

(a) Refers to the number of people, not cancers

(b) Based on the number of males/females in the Australian population at 31 December 2007.

Source: AIHW Australian Cancer Database 2007.

Does prevalence differ by country of birth?

The prevalence of lung cancer according to country or region of birth is in Table 6.4. The 5-year prevalence, as a proportion of the respective male population, was highest among males born in European countries (22 per 10,000 for Southern and Eastern Europe, 20 per 10,000 for North-West Europe, excluding the United Kingdom and Ireland, and 15 per 10,000 for United Kingdom and Ireland). This compares with a figure of 5 per 10,000 for males born in Australia. The data also indicate that there were relatively lower proportions of males alive who had been diagnosed with lung cancer in the 5-year period among males born in Southern and Central Asia and Sub-Saharan Africa (2 per 10,000 for both regions).

Similarly, the 5-year prevalence of females, as a proportion of the respective female population, was highest among those born in the European regions (12 per 10,000 for United Kingdom and Ireland, 10 per 10,000 for North-West Europe and 7 per 10,000 for Southern and Eastern Europe). In comparison, the figure was 4 per 10,000 females for those born in Australia. Relatively lower proportions of females alive who had been diagnosed with lung cancer in the 5 years from 2003 to 2007 were observed among those born in Southern and Central Asia and the Americas, excluding USA and Canada (2 per 10,000 for both regions).

Table 6.4: Five-year prevalence of lung cancer by country/region of birth, Australia, end of 2007

	Males		Females	
Country/region of birth[(a)]	**Number[(b)]**	**Per 10,000[(c)]**	**Number[(b)]**	**Per 10,000[(c)]**
Southern and Eastern Europe	923	21.8	287	6.8
North-West Europe, excl. United Kingdom (UK) and Ireland	312	19.7	162	10.2
UK and Ireland	908	14.7	693	11.6
North Africa and the Middle East	128	7.9	45	3.1
Australia	4,179	5.3	3,187	4.0
North-East Asia	124	5.3	96	3.4
United States of America (USA) and Canada	31	5.3	27	4.6
New Zealand (NZ)	126	5.2	120	5.3
Americas, excl. USA and Canada	26	5.1	12	2.2
Oceania and Antarctica, excl. Australia and NZ	27	4.5	35	5.2
South-East Asia	121	4.1	122	3.2
Sub-Saharan Africa	29	2.4	33	2.8
Southern and Central Asia	46	2.2	34	2.1
Inadequately described, not stated or unknown	437	. .	336	. .
Total[(b)]	**7,417**	**7.0**	**5,189**	**4.9**

(a) Classified according to the Standard Australian Classification of Countries, second edition (see Appendix A).

(b) Refers to the number of males/females, not cases.

(c) Based on the number of males/females in the Australian population born in each country/region as at 30 June 2007, except for the 'Total' which is based on the number of males/females in the Australian population at 31 December 2007.

Source: AIHW Australian Cancer Database 2007.

7 Burden of disease due to lung cancer

Key findings

In 2011 in Australia:

- The burden of disease due to lung cancer is estimated to be 57,100 'disability-adjusted life years' (DALYs) for males and 42,300 for females.
- Lung cancer is estimated to be the fourth leading cause of burden of disease for males and the seventh for females.
- Lung cancer is estimated to rank first among males and second among females when considering the leading causes of the burden of disease due to cancer.
- It is estimated that the burden of disease due to lung cancer will be concentrated in those aged 50 to 89 years.

Introduction

The effect of cancer on the health of Australians can be summarised by using a variety of different measures that combine information on both fatal and non-fatal health outcomes into a single number. Such measures can be used for a range of purposes, including:

- comparing the burden associated with different cancers
- comparing the effect of a particular cancer on different population groups or over time
- setting priorities for health planning, public health programs, as well as research and development (Murray et al. 1999).

Of the available summary measures, one of the most commonly used is the 'disability-adjusted life year' (DALY), also commonly referred to as 'burden of disease'. The DALY combines information on the extent of:

- premature death—which is measured by the years of life lost (YLL) due to disease or injury
- non-fatal health outcomes—which are measured by years of 'healthy' life lost (YLD) due to disease, disability or injury.

In order to combine these two health measures into a summary measure, the DALY uses time as a common 'currency'. Hence, the DALY is a measure of the years of life lost due to premature death (YLL) *and* years of healthy life lost due to disease, disability or injury (YLD), or a combination of the two. The more DALYs associated with a particular disease, the greater the burden. Further information about DALYs is in Box 7.1 and Appendix C.

In this chapter, the estimated burden of disease in 2011 due to lung cancer is presented, along with comparisons with other diseases that are major contributors to the overall burden. The data were sourced from the AIHW Burden of Disease Database. Information about the methodology used to estimate the burden of disease for Australia can be found in the AIHW report by Begg and associates (2007) and Appendix C of this report.

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 his 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. 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, lung cancer) and also combined to give a grand total for a specific disease group, such as cancer (AIHW 2010a).

Estimated burden of disease in 2011

In 2011, the burden of disease and injury in Australia is estimated to be more than 2.8 million DALYs, while the burden due to cancer is estimated to be more than 500,000 DALYs. Males are expected to account for 51% of the total burden (1.48 million DALYs) and 53% of the burden due to cancer (291,100 DALYs).

Table 7.1 presents the estimated leading causes of the burden of disease for males and females in 2011. Lung cancer is expected to be the fourth leading cause of the burden of disease for males, with about 57,100 DALYs attributed to this disease. This equates to 4% of the total male burden. In terms of leading causes of burden due to cancer, lung cancer is expected to rank first, accounting for one-fifth of the male burden due to cancer.

In females, lung cancer is expected to be the seventh leading cause of the burden of disease, accounting for 42,300 DALYs and 3% of the total female burden. Furthermore, lung cancer is expected to account for 17% the female burden due to cancer, making it the second leading cause of the burden due to cancer; only exceeded by breast cancer (61,200 DALYs and 24% of the female burden due to cancer).

It is expected that there will be some difference in the experience of burden from lung cancer between males and females, with males responsible for 57% of the DALYs due to lung cancer.

Table 7.1: Estimated leading causes of burden of disease, Australia, 2011[(a)]

Males				Females			
Cause	DALYs	% of total burden	% of cancer burden	Cause	DALYs	% of total burden	% of cancer burden
Ischaemic heart disease	137,400	9.3	. .	Anxiety and depression	134,700	9.6	. .
Type 2 diabetes	96,900	6.5	. .	Ischaemic heart disease	107,700	7.7	. .
Anxiety and depression	70,400	4.7	. .	Type 2 diabetes	85,100	6.1	. .
Lung cancer	57,100	3.9	19.6	Dementia	79,200	5.7	. .
Stroke	53,400	3.6	. .	Stroke	63,100	4.5	. .
Adult-onset hearing loss	53,300	3.6	. .	Breast cancer	61,200	4.4	24.0
Dementia	46,200	3.1	. .	Lung cancer	42,300	3.0	16.6
Chronic obstructive pulmonary disease	44,600	3.0	. .	Chronic obstructive pulmonary disease	40,500	2.9	. .
Prostate cancer	43,400	2.9	14.9	Asthma	35,900	2.6	. .
Suicide and self-inflicted injuries	42,000	2.8	. .	Bowel cancer	30,500	2.2	12.0
All cancers[(b)]	*291,100*	*19.6*	. .	*All cancers[(b)]*	*254,500*	*18.2*	. .
Total for all causes	**1,482,800**	**100.0**	**. .**	**Total for all causes**	**1,396,900**	**100.0**	**. .**

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

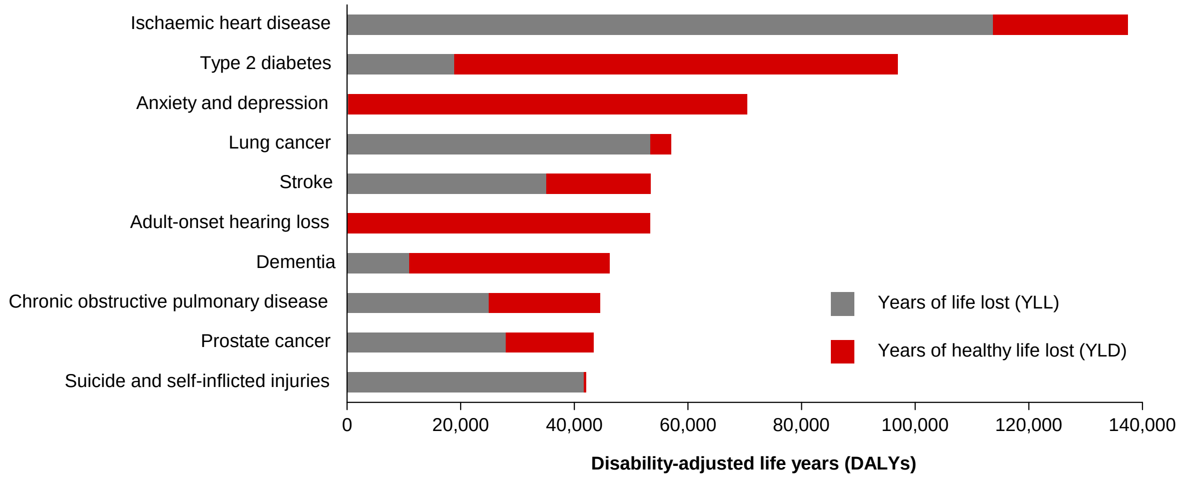
(b) Includes cancers coded in ICD-10 as C00–C96.

Source: AIHW Burden of Disease database.

Burden due to years of life lost (YLL) and years of life lost to disability (YLD)

Figure 7.1, Figure 7.2 and Table 7.2 show the extent of the estimated burden of disease associated with the leading causes in 2011, that is, the burden due to premature death (YLL) and the burden due to disease, disability or injury (YLD). For cancer, causes of the years of healthy life lost to disability (YLD) include side effects during and after treatment (for example, during and after radiotherapy or chemotherapy) and the psychosocial effects after diagnosis and treatment.

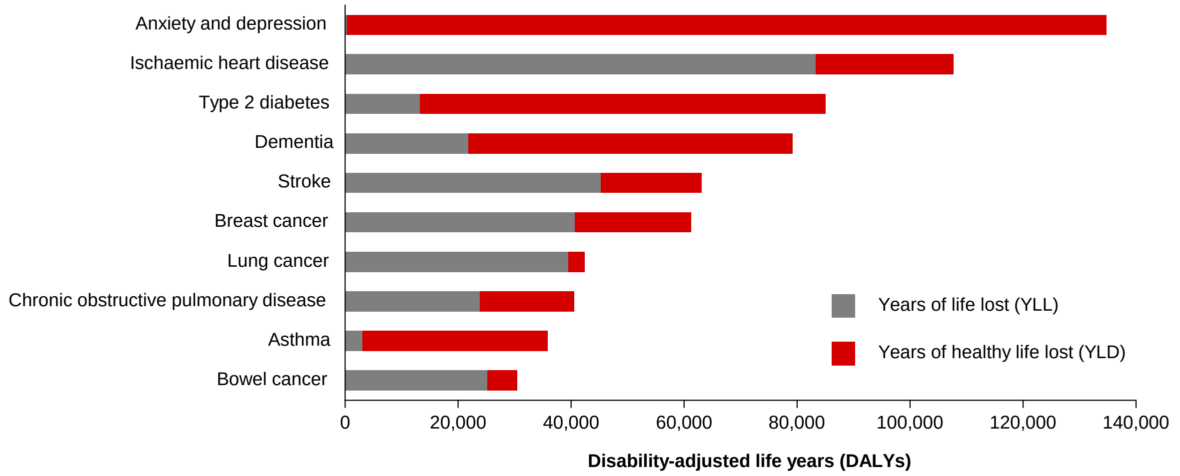
Due to the relatively poor prognosis for many cancers compared with the majority of other diseases, the majority of cancers are expected to contribute more years of life lost (YLL) than years of healthy life lost to disability (YLD). Lung cancer is no exception, with an expected 94% of the total DALYs for males and 93% of the total DALYs for females being due to premature mortality (53,400 and 39,500 YLLs, respectively).



Note: The data for this figure are in Table 7.2.

Source: AIHW Burden of Disease database.

Figure 7.1: Estimated leading causes of burden of disease by fatal (YLL) and non-fatal (YLD) components, males, Australia, 2011



Note: The data for this figure are in Table 7.2.

Source AIHW Burden of Disease database.

Figure 7.2: Estimated leading causes of burden of disease, by fatal (YLL) and non-fatal (YLD) components, females, Australia, 2011

Table 7.2: Estimated leading causes of burden of disease, by fatal (YLL) and non-fatal (YLD) components, Australia, 2011[(a)]

	Fatal component			Non-fatal component			Total[(c)]
Cause	**YLL**	**% of total YLL**	**Rank**	**YLD**	**% of total YLD**	**Rank**	**DALYs**
				Males			
Ischaemic heart disease	113,700	15.5	1	23,800	3.2	6	137,400
Type 2 diabetes	18,900	2.6	9	78,000	10.4	1	96,900
Anxiety and depression	200	0.0	101	70,200	9.4	2	70,400
Lung cancer	53,400	7.3	2	3,600	0.5	46	57,100
Stroke	35,100	4.8	4	18,300	2.4	9	53,400
Adult-onset hearing loss	0	0.0	175	53,300	7.1	3	53,300
Dementia	11,000	1.5	18	35,200	4.7	4	46,200
Chronic obstructive pulmonary disease	24,900	3.4	7	19,600	2.6	7	44,600
Prostate cancer	27,900	3.8	6	15,500	2.1	14	43,400
Suicide and self-inflicted injuries	41,700	5.7	3	300	0.0	120	42,000
All cancers[(b)]	*242,400*	*33.1*	. .	*48,700*	*6.5*	. .	*291,100*
Total for all causes	**733,200**	**100.0**	**. .**	**749,700**	**100.0**	**. .**	**1,482,800**
				Females			
Anxiety and depression	300	0.0	95	134,400	16.9	1	134,700
Ischaemic heart disease	83,300	13.8	1	24,400	3.1	7	107,700
Type 2 diabetes	13,300	2.2	9	71,800	9.0	2	85,100
Dementia	21,800	3.6	7	57,400	7.2	3	79,200
Stroke	45,300	7.5	2	17,800	2.2	10	63,100
Breast cancer	40,700	6.8	3	20,500	2.6	8	61,200
Lung cancer	39,500	6.6	4	2,800	0.4	49	42,300
Chronic obstructive pulmonary disease	23,900	4.0	6	16,600	2.1	13	40,500
Asthma	3,100	0.5	42	32,800	4.1	4	35,900
Bowel cancer	25,200	4.2	5	5,300	0.7	31	30,500
All cancers[(b)]	*210,000*	*34.9*	. .	*44,500*	*5.6*	. .	*254,500*
Total for all causes	**601,500**	**100.0**	**. .**	**795,400**	**100.0**	**. .**	**1,396,900**

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

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

(c) The estimates may not add up to the total due to rounding.

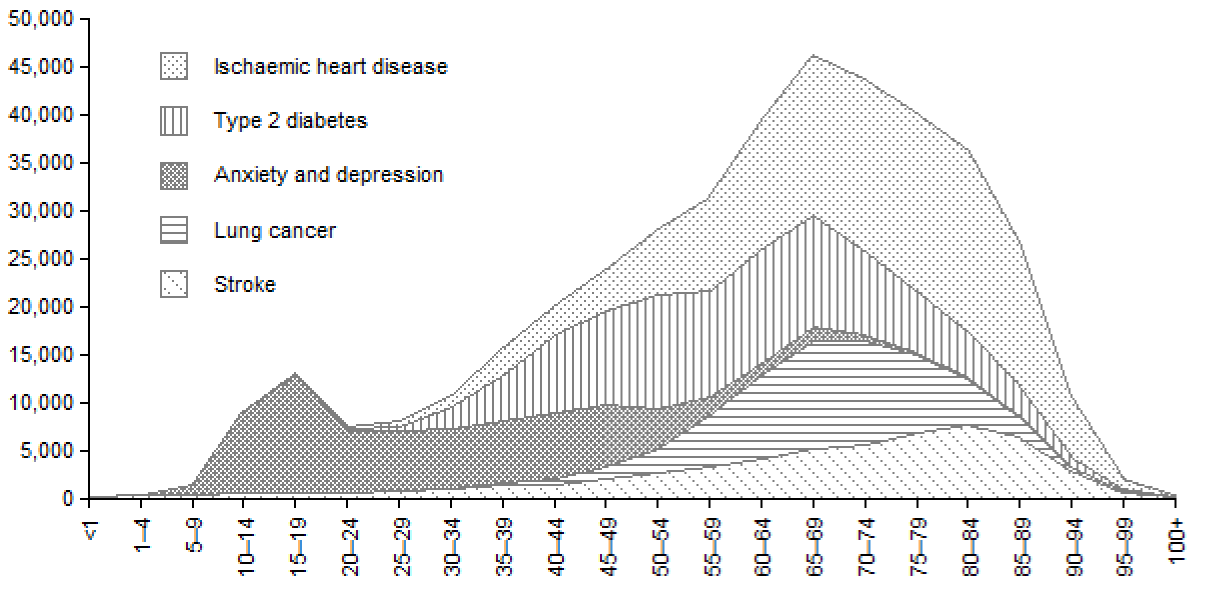
Source: AIHW Burden of Disease database.

The proportion of DALYs for lung cancer due to premature death is expected to be higher than that of a number of other commonly diagnosed cancers. For instance, it is expected that 64% of DALYs for prostate cancer and 67% of DALYs for breast cancer in females are due to premature death rather than disability. This is consistent with the results from the survival chapter (Chapter 5), where the relative survival for lung cancer was shown to be markedly lower than that of prostate cancer in males and breast cancer in females.

While lung cancer is expected to rank fourth for males and seventh for females in terms of cause of the burden of disease when DALYs are considered, it is expected to rank second for males and fourth for females in terms of the leading causes of the mortality burden. In terms of causes of disability burden, lung cancer is expected to rank 46th for males and 49th for females. Considering just the burden due to cancer, lung cancer in males is expected to account for 22% of total years of life lost from cancer and 7% of total years of life lost due to disability from cancer. The corresponding figures for females are 19% and 6%, respectively.

Differences by age

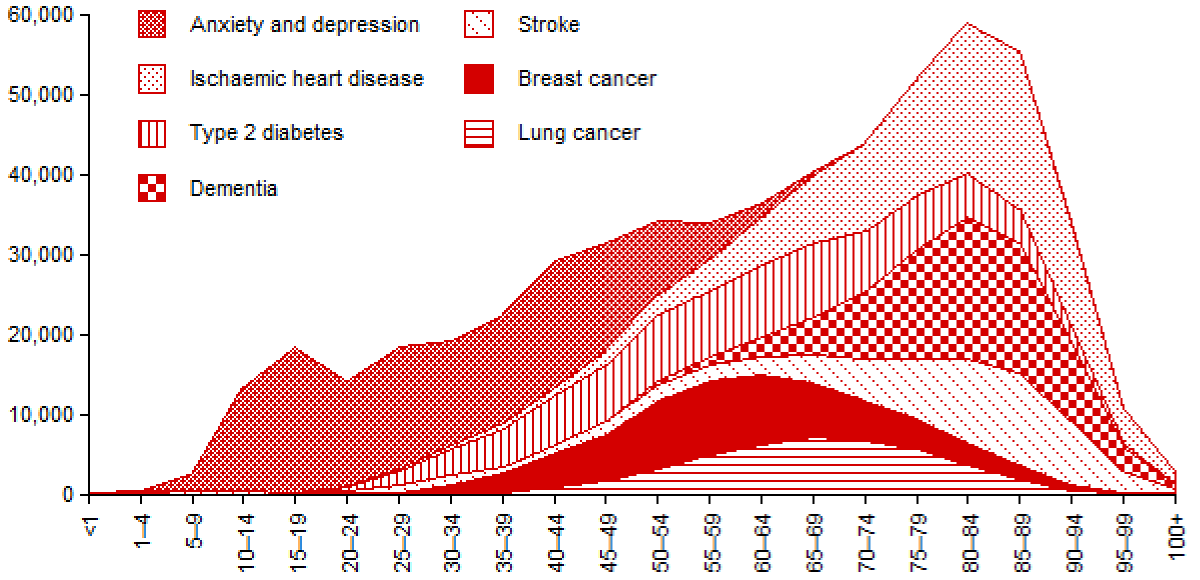
In 2011, the leading causes of the burden of disease are expected to affect people at different stages of life. As shown in Figure 7.3 and 7.4, anxiety and depression is expected to account for the highest burden of disease in the youngest age groups for both males and females. In contrast, lung cancer as well as stroke, dementia and ischaemic heart disease are expected to account for a relative high proportion of the burden at older ages. In particular, lung cancer is expected to account for 6% of the total burden of disease in males and 5% in females in those aged 50 to 89 years.



Note: The data for this figure are shown in Appendix Table D7.1.

Source: AIHW Burden of Disease database.

Figure 7.3: Estimated leading causes of burden of disease by age group, males, Australia, 2011



Note: The data for this figure are shown in Appendix Table D7.2.

Source: AIHW Burden of Disease database.

Figure 7.4: Estimated leading causes of burden of disease by age group, females, Australia, 2011

8 Hospitalisations for lung cancer

Key findings

In the 2008–09 financial year in Australia:

- Lung cancer was responsible for one in 19 cancer-related hospitalisations and one in 187 of all hospitalisations.
- 77% of hospitalisations for lung cancer were for patients aged 60 years and over; and these accounted for 83% of the total number of patient days for lung cancer.
- Males were hospitalised for lung cancer at a significantly higher rate than females, but with a shorter average length of stay in hospital.
- 60% of all lung cancer-related hospitalisations were in public hospitals, accounting for 71% of all patient days for lung cancer.
- *Administration of pharmacotherapy* (that is, *chemotherapy*) was the most commonly reported procedure for same-day lung cancer-related hospitalisations.
- A surgical procedure was reported for about 12% of all overnight lung cancer-related hospitalisations.
- Indigenous Australians were hospitalised for lung cancer-related care at a higher rate than non-Indigenous Australians and had a longer average length of stay.
- The rate of hospitalisations and patient days for lung cancer-related care increased with increasing remoteness of usual residence.
- The rate of hospitalisations and patient days for lung cancer declined with increasing socioeconomic status.

Introduction

Extent of hospitalisation for lung cancer is an important indicator of the burden of this cancer on the Australian population. The number of hospitalisations for lung cancer in any one year is related not only to the numbers of people with lung cancer, but also to the numbers of occasions on which they were admitted to hospital. Other factors include availability of alternative health-care services, relative accessibility of hospital care, and admission criteria and administrative policies.

This chapter provides details on numbers and characteristics of admitted patient hospitalisations that are related to lung cancer (see Box 8.1). The data were sourced from the National Hospital Morbidity Database (NHMD), which has data on admitted patient hospitalisations. The most recent data available pertain to the 2008–09 financial year. Note that the data from the NHMD refer to hospitalisations, 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. Further information about the NHMD is in Appendix C and in AIHW's annual *Australian hospital statistics* reports (AIHW 2010b).

There are two distinct types of diagnosis recorded in the NHMD—principal diagnosis and additional diagnosis. The principal diagnosis is the diagnosis established after study to be chiefly responsible for causing an episode of admitted patient care. The additional diagnosis is a condition or complaint that either coexists with the principal diagnosis or arose during treatment (NCCH 2008a).

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), 6th 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. As discussed in more detail in Appendix F, lung cancer–related hospitalisations are defined in this report (unless stated otherwise) as admitted patient hospitalisations in which:

- lung cancer (ICD-10-AM code of C33–C34) was recorded as the principal diagnosis, or
- lung cancer (ICD-10-AM code of C33–C34) was recorded as an additional diagnosis where the principal diagnosis code related specifically to the treatment or care of a lung cancer patient (see Appendix F for a list of these codes).

In this report, comparisons between groups and within groups over time are presented. These comparisons can be affected by changes in admission practices. For example, in public hospitals in New South Wales, South Australia and the Australian Capital Territory, most patients who receive same-day chemotherapy services are not admitted to hospital. Instead, these hospitals provided chemotherapy treatment on an outpatient (that is, non-admitted patient) basis (AIHW 2009a). For this reason, same-day chemotherapy hospitalisations have been analysed separately to other hospitalisations for lung cancer-related care when making comparisons by remoteness area of usual residence, socioeconomic status areas of usual residence and Aboriginal and Torres Strait Islander status. The data on same-day chemotherapy hospitalisations are a supplement in Appendix D.

Box 8.1: What measures are used in this chapter?

Three measures have been used:

- hospitalisation
- patient days
- average length of stay (ALOS) per episode of care (that is, per admission).

Note that the data from the NHMD refer to hospitalisations, not individuals. Note also that hospitalisations for which the care type was newborn (unqualified days only), hospital boarder or posthumous organ procurement were excluded.

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 who, after a clinical decision, receives hospital treatment for a minimum of 1 night (that is, who is admitted to and separated from the hospital on different dates).

Age-standardised hospitalisation rates are presented when making comparisons between groups and within groups over time in order to adjust for differences in age structure and size of the population. The Australian Bureau of Statistics' population estimates were used to calculate the observed hospitalisation rates. The estimates for 30 June 2008 were used to calculate the observed rates of population groups and estimates for 31 December 2008 to calculate all other rates. The observed rates have been directly standardised to the Australian population as at the 30 June 2001 and expressed per 10,000 persons. Ninety-five per cent confidence limits are provided for these rates, but should be regarded as indicative only, due to the potential for lack of independence between observations.

Patient days are defined as the total number of days for patients admitted for an episode of care and who separated during a specified reference period. A patient admitted and separated on the same day is allocated 1 patient day.

Like hospitalisation rate, the rate of patient days was directly standardised to the Australian population as at the 30 June 2001 and expressed per 10,000 persons.

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.

The crude ALOS is derived by dividing the total number of patient days by the corresponding total number of hospitalisations. All discussions relating to ALOS pertain to overnight ALOS. When comparing overnight ALOS by population groups, time trends and hospital sector, age-sex weighted ALOS is used instead of crude ALOS to adjust for differences in age and sex distribution.

Further information about age-standardisation and age-sex weighting is in Appendix B.

How many hospitalisations occurred due to lung cancer in 2008–09?

In the 2008–09 financial year, 43,513 hospitalisations occurred due to lung cancer (Table 8.1), accounting for one in 19 (5%) of all cancer-related hospitalisations and one in 187 (0.5%) of all hospitalisations in Australia. Of the total number of hospitalisations for lung cancer, almost two-thirds (65%) were same-day (28,324), while the rest (35%) were overnight (15,189). Overall, the age-standardised rate of lung cancer-related hospitalisations was 19 episodes per 10,000 people.

People hospitalised for lung cancer-related care accounted for 183,112 hospital patient days in 2008–09, representing about 8% of hospital patient days due to all cancers and 0.7% of all hospital patient days due to all diseases. The age-standardised rate of patient days for lung cancer was 79 days per 10,000 people.

Table 8.1: Hospitalisations for lung cancer, Australia, 2008–09

	Hospitalisations			Patient days		
	Number	ASR[(a)]	95% CI	Number	ASR[(a)]	95% CI
Lung cancer[(b)]	43,513	18.7	18.6–18.9	183,112	78.8	78.4–79.2
All cancers[(c)]	836,906	363.2	362.4–364.0	2,248,138	971.2	969.9–972.5
All hospitalisations	8,148,448	3,636.2	3,633.7–3,638.7	25,782,111	11,336.5	11,332.1–11,340.9

(a) The rates were standardised to the Australian population as at 30 June 2001 and expressed per 10,000 population.

(b) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(c) Pertain to 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 related to health services or treatment for cancer (ICD-10-AM codes Z03.1, Z08, Z12, Z40, Z51.0, Z51.1, Z54.1, Z54.2, Z80 and Z85) or iii) the principal diagnosis is a health service or treatment that may be related to diseases other than cancer (ICD-10-AM codes Z29.1, Z29.2, Z42.0, Z42.1 Z45.1 and Z45.2) but cancer is recorded as an additional diagnosis.

Source: AIHW National Hospital Morbidity Database.

The average length of stay for lung cancer-related hospitalisations that involved an overnight stay was 10.2 days, which was longer than the corresponding average for all overnight cancer-related hospitalisations (7.7 days) and that for all overnight hospitalisations in Australia (6.0 days) (Table 8.2).

Table 8.2: Crude average length of stay for overnight lung cancer-related hospitalisations, Australia, 2008–09

	Crude average length of stay
Lung cancer[(a)]	10.2
All cancers[(b)]	7.7
All hospitalisations	6.0

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) Pertain to 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 related to health services or treatment for cancer (ICD-10-AM codes Z03.1, Z08, Z12, Z40, Z51.0, Z51.1, Z54.1, Z54.2, Z80 and Z85) or iii) the principal diagnosis is a health service or treatment that may be related to diseases other than cancer (ICD-10-AM codes Z29.1, Z29.2, Z42.0, Z42.1 Z45.1 and Z45.2) but cancer is recorded as an additional diagnosis.

Source: AIHW National Hospital Morbidity Database.

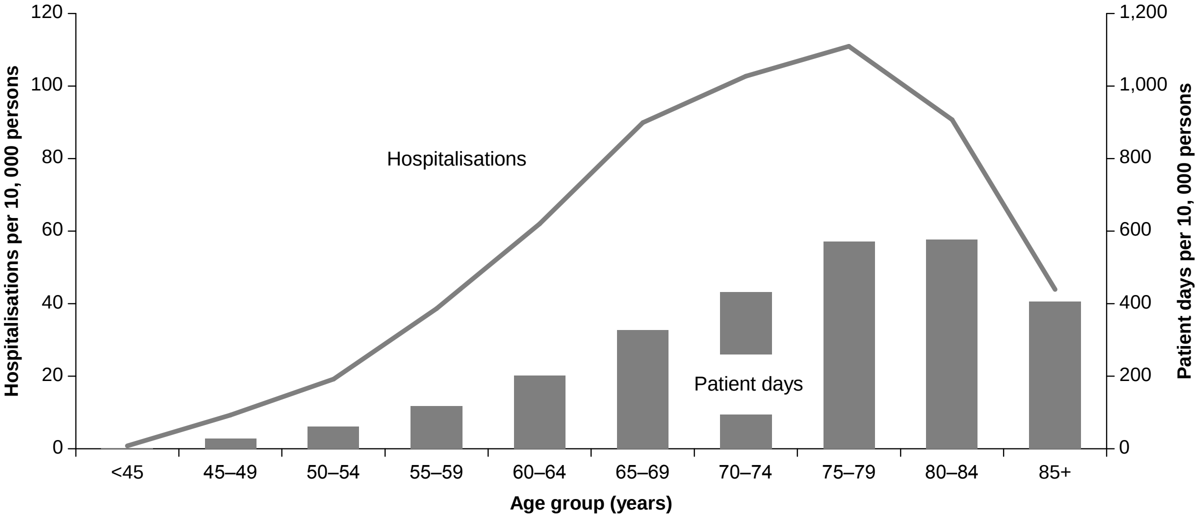
Does hospitalisation differ by age?

In 2008–09, more than three-quarters (77%) of lung cancer–related hospitalisations and more than four-fifths (83%) of patient days due to lung cancer were for people aged 60 years and over (Appendix Table D8.1).

In 2008–09, the rate of hospitalisation increased steadily with age until 75 to 79 years where it peaked at 111 per 10,000 (Figure 8.1). The rates for people aged 80 to 84 years and 85 years and over were considerably lower than that of the 75- to 79-year-olds. The higher hospitalisation rate in the older age groups reflects that the majority of lung cancers are diagnosed among people aged 60 years and over (see Chapter 3).

Figure 8.1 also shows that the age-specific rate of patient days for lung cancer increased with age, with the highest rate experienced by people aged 80 to 84 years (578 per 10,000). The rate for those aged 85 years and over (406 per 10,000) was lower than the rate of those aged 80 to 84 years.

Figure 8.2 illustrates that the average of length of stay for lung cancer-related hospitalisation increased with age from the age group of 65 to 69 years, reaching 12.9 days in people aged 85 and over.

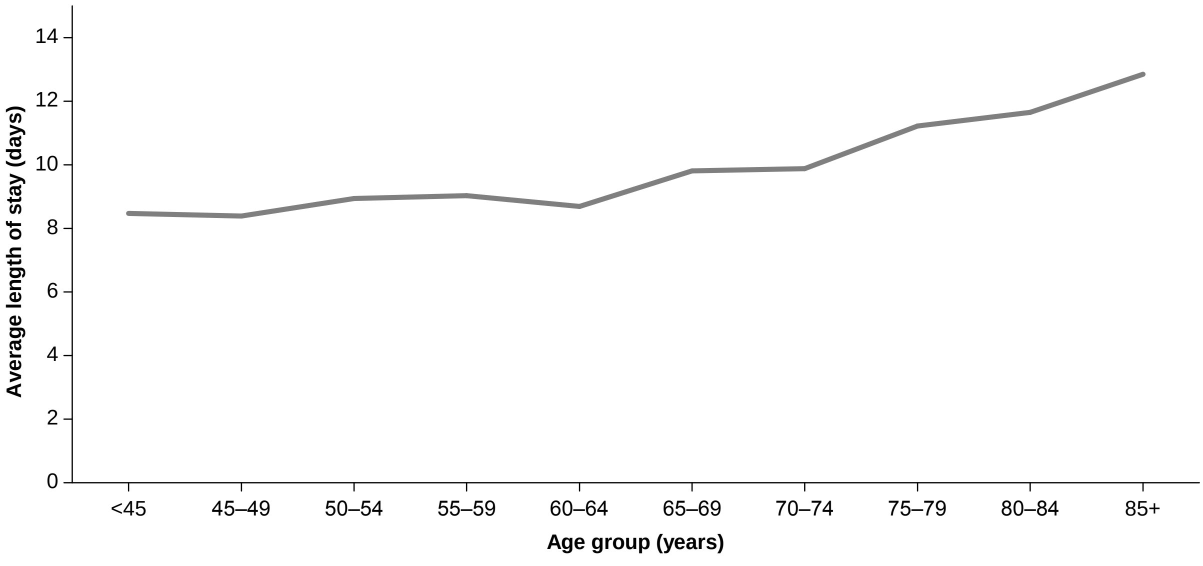


Notes

1. Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.
2. The data for this figure are in Appendix Table D8.1.

Source: AIHW National Hospital Morbidity Database.

Figure 8.1: Hospitalisations for lung cancer by age group, Australia, 2008–09



Notes

1. Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.
2. The data for this figure are in Appendix Table D8.2.

Source: AIHW National Hospital Morbidity Database.

Figure 8.2: Crude average length of stay for overnight lung cancer-related hospitalisations, by age at hospitalisation, Australia, 2008–09

Does hospitalisation differ by sex?

In 2008–09, males accounted for 60% of lung cancer-related hospitalisations and 59% of patient days for lung cancer-related care.

When considering the age-standardised hospitalisation rate for lung cancer-related care, males were 1.6 times as likely as females to be hospitalised (24 and 15 per 10,000, respectively). A similar sex difference was seen in rates of patient days for lung cancer, with the rate being 1.6 times as high for males as females (101 and 61 per 10,000, respectively) (Table 8.3).

These higher rates of hospitalisations and patient days in males probably reflect the historically higher incidence of lung cancer in males (see Chapter 3).

Table 8.3: Hospitalisations for lung cancer[(a)], by sex, Australia, 2008–09

	Hospitalisations			Patient days		
Sex	**Number**	**ASR [(b)]**	**95% CI**	**Number**	**ASR [(b)]**	**95% CI**
Males	25,962	23.7	23.4–24.0	107,711	100.5	99.9–101.1
Females	17,551	14.5	14.3–14.7	75,401	61.2	60.7–61.6
Persons	**43,513**	**18.7**	**18.6–18.9**	**183,112**	**78.8**	**78.4–79.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) The rates were standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

In contrast, the average length of stay for overnight lung cancer-related hospitalisations was slightly higher among females (10.4 days) than among males (10 days) (Table 8.4).

Table 8.4: Crude average length of stay for overnight lung cancer-related hospitalisations[(a)], Australia, by sex, 2008–09

Sex	**Crude average length of stay**
Males	10.0
Females	10.4
Persons	**10.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

Source: AIHW National Hospital Morbidity Database.

Does admitted patient activity differ by hospital sector?

In this section, lung cancer-related hospitalisations are presented according to public and private hospitals. Note that the comparison might be affected by differences in admission practices for same-day chemotherapy between public and private hospitals. For example, public hospitals in New South Wales, South Australia and the Australian Capital Territory do not admit patients for same-day chemotherapy.

In the financial year 2008–09, about 60% of all lung cancer-related hospitalisations were in public hospitals, accounting for 71% of all patient days for lung cancer.

When adjusted for age, the hospitalisation rate due to lung cancer for public hospitals was 1.5 times that for private hospitals (11 and 7 per 10,000, respectively). Likewise, the rate of patient days for public hospitals was 2.5 times that for private hospitals (56 and 23 per 10,000, respectively) (Table 8.5).

Table 8.5: Hospitalisations for lung cancer[(a)], by hospital sector, Australia, 2008–09

Hospital sector	Hospitalisations			Patient days		
	Number	Rate[(b)]	95% CI	Number	Rate[(b)]	95% CI
Public[(c)]	26,254	11.3	12.7–13.0	129,947	56.1	55.8–56.4
Private	17,259	7.4	10.8–11.1	53,165	22.7	22.5–22.9
Total	**43,513**	**18.7**	**18.6–18.9**	**183,112**	**78.8**	**78.4–79.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) The rates were standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

(c) The estimates may be underestimated as public hospitals in New South Wales, South Australia and the Australian Capital Territory report same-day chemotherapy patients as receiving treatment on an outpatient basis.

Source: AIHW National Hospital Morbidity Database.

In addition, the average length of stay for lung cancer-related hospitalisations in public hospitals (10.3 days) was slightly longer than private hospitals (9.8 days) (Table 8.6).

Table 8.6: Average length of stay for overnight lung cancer-related hospitalisations[(a)], by hospital sector, Australia, 2008–09

Hospital sector	Overnight ALOS	
	Crude ALOS	Age-sex weighted ALOS[(b)]
Public	10.3	10.3
Private	10.0	9.8
Total	**10.2**	**10.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) Age-sex weighted to the national distribution of overnight lung cancer hospitalisations in 2008–09 and expressed in number of days per hospitalisation.

Source: AIHW National Hospital Morbidity Database.

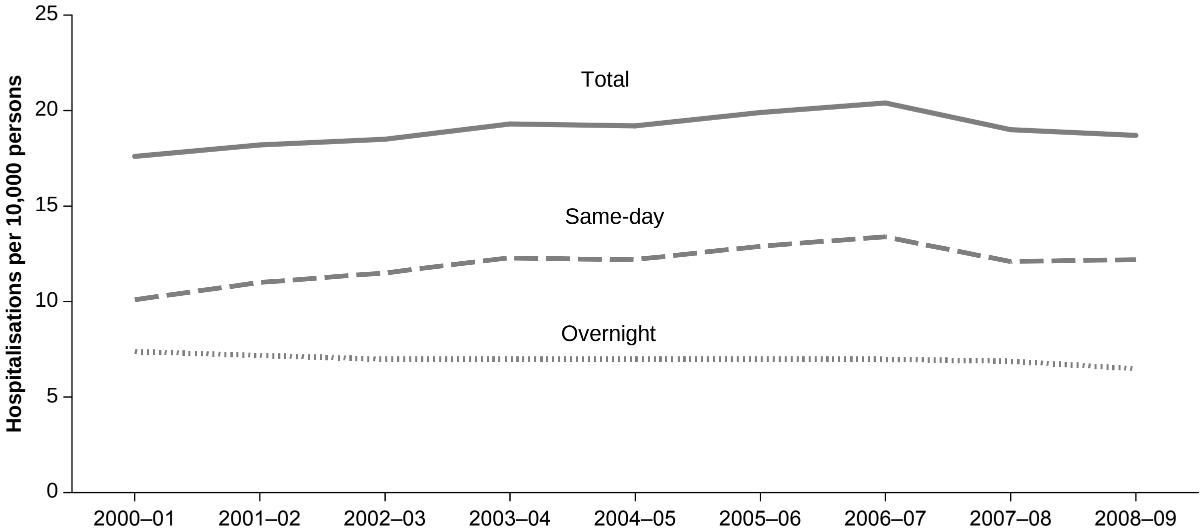
Has hospitalisation of lung cancer changed over time?

In this section, trends in hospitalisation are presented for the 9 years from the 2000–01 to 2008–09 financial year. As noted earlier, changes occurred in hospital admission procedures during this period such that by 2008–09 some lung cancer patients in New South Wales, South Australian and the Australian Capital Territory who received same-day chemotherapy were not classified as admitted patients and thus not included in the data (whereas in earlier years they would have been included). These changes should be taken into account when interpreting trends over time and may indicate the need for a standardised approach to more accurately reflect clinical and admission practice.

The number of hospitalisations for lung cancer has increased by 29% between 2000–01 and 2008–09 (from 33,658 to 43,513). A majority of the change related to a substantial increase in the number of same-day hospitalisations from 19,420 in 2000–01 to 28,324 in 2008–09.

Figure 8.3 shows that the rate of all lung cancer-related hospitalisations increased significantly by 16% between 2000–01 (18 per 10,000) and 2006–07, (20 per 10,000). The hospitalisation rate then decreased significantly over the following two financial years, such that by 2008–09 (19 per 10, 000) it had decreased by 8% from its 2006–07 peak. As shown, the trend in the rate of lung cancer-related hospitalisations was mostly driven by changes in the rate of same-day hospitalisations, which has been affected by changes in admission practices for same-day chemotherapy. Meanwhile, the rate of overnight hospitalisations decreased slightly but significantly over the period (from 7.4 per 10,000 in 2000–01 to 6.5 in 2008–09).

Trends in the rate of the patient days associated with lung cancer hospitalisations are in Figure 8.4. The data indicate that the rate of patient days for lung cancer increased slightly from 2000–01 to 2005–06 (from 83 to 85 per 10,000, respectively). This was followed by a significant decline of 7% to 2008–09 (79 per 10,000). The overall trend has mainly been influenced by the changes in the rate of patient days for overnight hospitalisations.

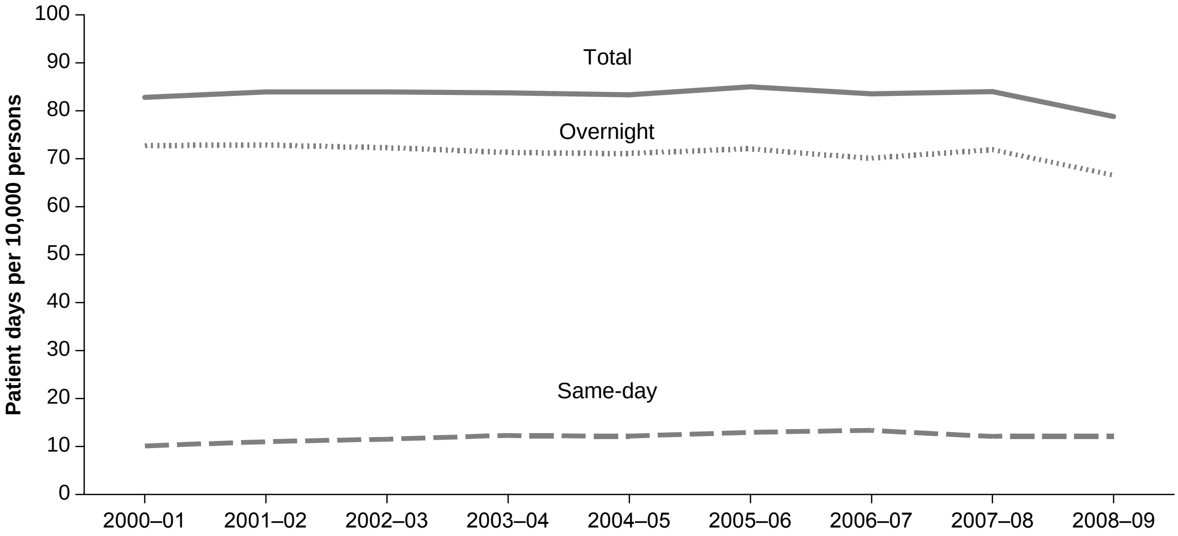


Notes

1. Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.
2. The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.
3. The data for this figure are in Appendix Table D8.3, D8.4 and D8.5.

Source: AIHW National Hospital Morbidity Database.

Figure 8.3: Hospitalisations for lung cancer by same-day and overnight status, Australia, 2000–01 to 2008–09



Notes

1. Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.
2. The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.
3. The data for this figure are in Appendix Table D8.3, D8.4 and D8.5.

Source: AIHW National Hospital Morbidity Database.

Figure 8.4: Patient days for lung cancer-related hospitalisations by same-day and overnight status, Australia, 2000–01 to 2008–09

The average length of stay for overnight lung cancer-related hospitalisations fluctuated over the years (from 10.1 to 10.5 days), with no apparent trend evident (Appendix Table D8.4).

Trends in the rate of hospitalisation, patient days and average length of stay by age group are in Appendix Tables D8.6, D8.7 and D8.8.

Do hospitalisation rates differ across population groups?

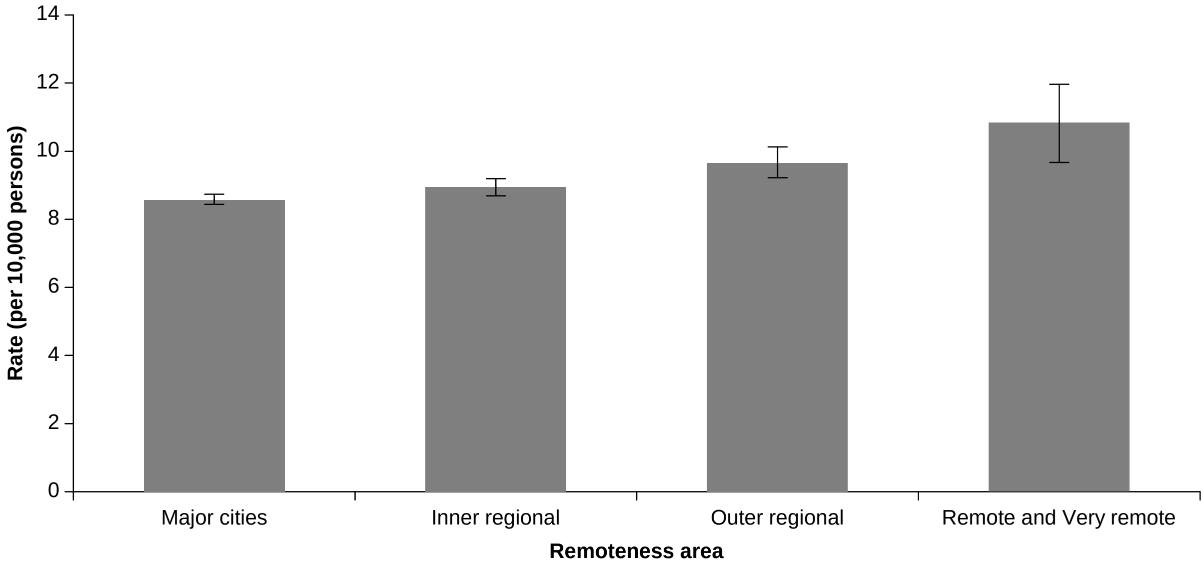
In this section, differences in hospitalisations for lung cancer are discussed by geographic area and Aboriginal and Torres Strait Islander status. As discussed earlier, the analysis does not include hospitalisations for same-day chemotherapy services as not all states and territories formally admit patients for these services. Instead, data on same-day chemotherapy according to the population groups are in Appendix D. Note that this approach differs from that used in other sections of the chapter.

Do hospitalisation rates differ by remoteness area?

The hospitalisation rate for lung cancer tended to increase slightly with increasing remoteness of usual residence in 2008–09. People living in *Remote* and *Very remote* areas were 1.3 times as likely to be hospitalised for lung cancer as their counterparts in *Major cities.*

People living in *Outer regional* and *Remote* and *Very remote* areas of Australia had significantly higher rates of patient days due to lung cancer than those in *Major cities* (1.1 and 1.3 times the rate for *Major cities*, respectively). Meanwhile, people in *Inner regional* areas had a significantly lower rate of patient days due to lung cancer than people in *Major cities* (0.9 times the rate for *Major cities*) (Appendix Table D8.9).

The average length of stay for lung cancer-related hospitalisations was longest among those in the *Outer regional* areas (10.6 days) and shortest among those in *Inner regional* areas (9.2 days) (Appendix Table D8.9).



Notes

1. Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.
2. Remoteness was classified using the Australian Standard Geographical Classification (ASGC) Remoteness Area (see Appendix A).
3. The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.
4. The data for this figure are in Appendix Table D8.9.

Source: AIHW National Hospital Morbidity Database.

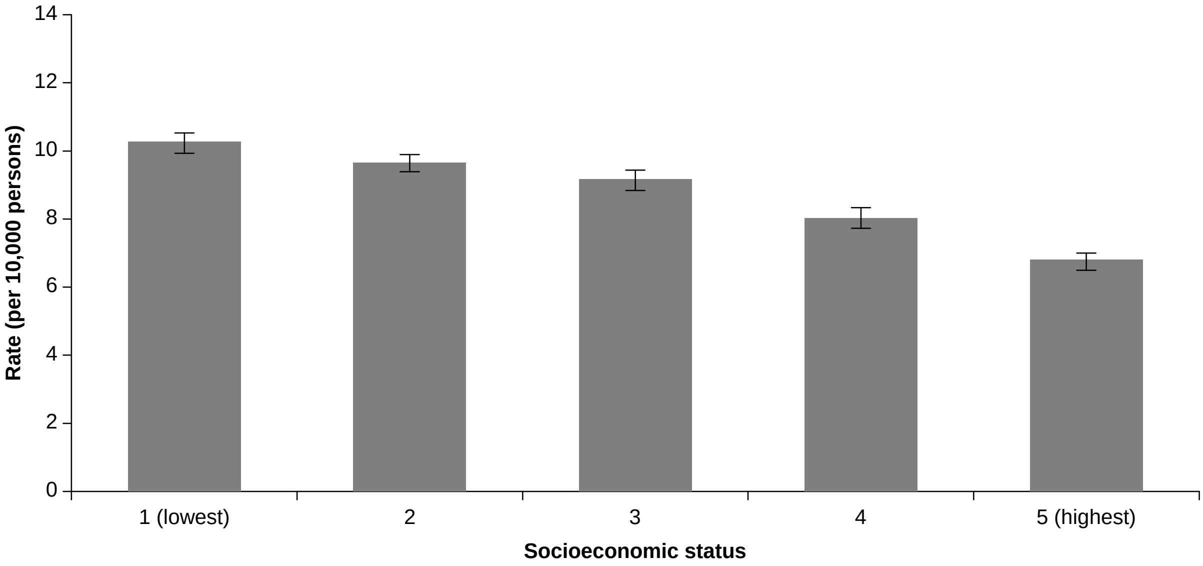
Figure 8.5: Hospitalisations for lung cancer, by remoteness area of usual residence, Australia, 2008–09

Do hospitalisation rates differ by socioeconomic status?

In 2008–09, there was a significant decline in the rate of hospitalisations for lung cancer as socioeconomic status increased (Figure 8.6). People living in areas with the lowest socioeconomic status were 1.5 times as likely to be hospitalised as those in areas with the highest status (10 and 7 per 10,000, respectively).

Similar trends were seen when examining the rate of patient days, with the rate for people living in areas with the lowest socioeconomic status 1.4 times the rate for those in areas with the highest status (82 and 58 per 10,000, respectively) (Appendix Table D8.11).

The average length of stay of people who were hospitalised for lung cancer in 2008–09 was lowest for the second socioeconomic status group (9.7 days). The highest average length of stay was for the highest (group 5) socioeconomic status group (11 days) (Appendix Table D8.11).



Notes

1. Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.
2. Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix A).
3. The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.
4. The data for this figure are in Appendix Table D8.11.

Source: AIHW National Hospital Morbidity Database.

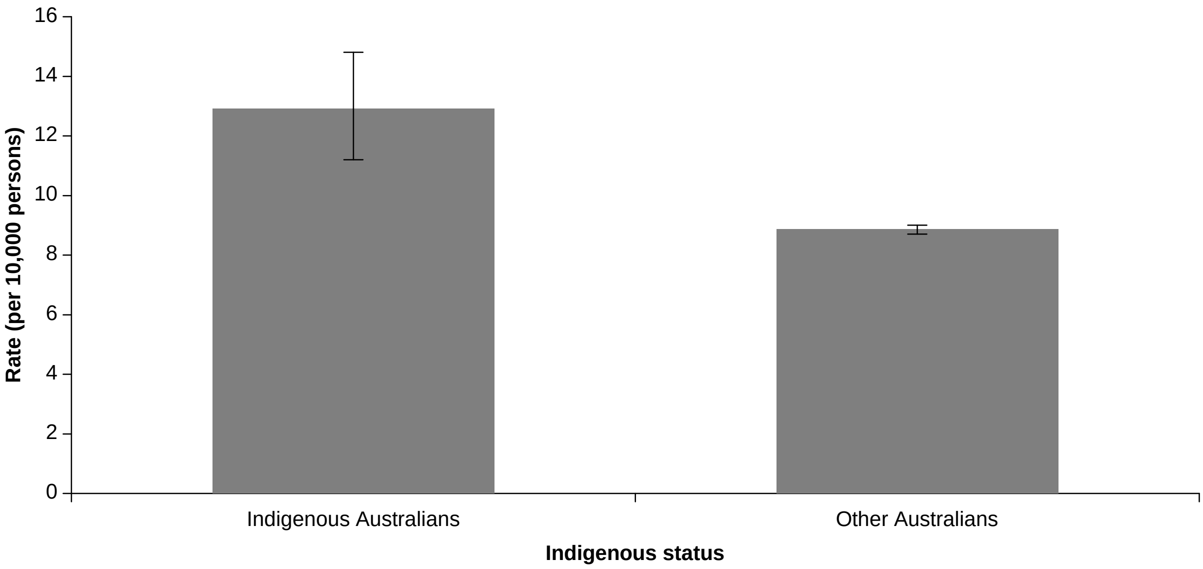
Figure 8.6: Hospitalisations for lung cancer, by socioeconomic status of area of usual residence, Australia, 2008–09

Do hospitalisation rates differ by Aboriginal and Torres Strait Islander status?

The quality of the Indigenous status data provided for admitted patients in 2008–09 is considered to be sufficient for analysis for all hospitals in New South Wales, Victoria, Queensland, Western Australia, and South Australia, as well as public hospitals in the Northern Territory. Thus, the hospitalisation rates below are thought to be an underestimate of the true overall Australian rates. See Box 8.2 for further details.

Indigenous Australians accounted for 1.3% of the total number of lung cancer-related hospitalisations (252) and 1.5% of all patient days for lung cancer (2,350) in 2008–09. Indigenous Australians were hospitalised for lung cancer-related care at 1.5 times the rate of other Australians (13 and 9 per 10,000, respectively). Also, the rate of the total patient days was 1.7 times higher for Indigenous than for other Australians (120 and 69 per 10,000, respectively) (Figure 8.7).

The average length of stay for lung cancer-related care that involved an overnight stay was 11.7 days per hospitalisation for Indigenous Australians compared with 10.2 for other Australians (Appendix Table D8.13).



Notes

1. Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.
2. Data restricted to hospitals in NSW, Vic, Qld, WA, SA and public hospitals in the NT only.
3. The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.
4. The data for this figure are in Appendix Table D8.13.

Source: AIHW National Hospital Morbidity Database.

Figure 8.7: Hospitalisations for lung cancer, by Indigenous status, New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory, 2008–09

Box 8.2: Quality of Indigenous data

The AIHW report Indigenous identification in hospital separations data–quality report (AIHW 2010g) found that the level of Indigenous identification was acceptable for analysis purposes (greater than 80%) for New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory (public hospitals only).

The same report found that in Australia about 89% of Indigenous Australians were identified correctly in hospital admissions data and the 'true' number of separations for Indigenous Australians was about 12% higher than reported.

Caution must be taken when comparing hospitalisations by Indigenous status, since observed differences may be influenced by jurisdictional differences in data quality. It should also be noted that data for the six jurisdictions with data of acceptable quality for analysis purposes are not necessarily representative of the jurisdictions excluded (AIHW 2010f).

Box 8.3: Agreement between the hospital and incidence populations

The hospitalisation chapter has shown that the demographic profile for the lung cancer hospitalisation population in 2008–09 was similar to the profile of the incidence population in 2007.

As for the incidence rates, hospitalisation rates were higher in:

- males than in females
- more remote areas than in more urbanised areas
- lower socioeconomic status areas than in higher socioeconomic status areas
- Indigenous Australians than non-Indigenous Australians.

The similar profiles indicate that hospital data can provide useful information on admitted patient care provided for people living with lung cancer.

In addition, hospitalisation data provide the opportunity to gain important complementary data not available through cancer registries, including data on additional diagnoses, as exemplified in this report.

Which procedures were most frequently undertaken for lung cancer?

Procedures undertaken in hospitals are a mix of surgical procedures, non-surgical procedures for investigative and therapeutic purposes (such as X-rays and chemotherapy) and client support interventions (for example, anaesthesia). One or more procedures can be reported for each hospitalisation, but because procedures are not undertaken during all hospitalisations only some hospitalisations include data on them. The classification system used to code the 2008–09 data on procedures was the 6th edition of the Australian Classification of Health Interventions (ACHI) (see Appendix A) (NCCH 2008c). Note that analyses in this section include hospitalisations for same-day chemotherapy.

Lung cancer treatment and care depend on a number of factors, including the type of cancer, its stage and the patient's fitness (Cancer Council Victoria 2010). Table 8.7 shows the number of lung cancer-related hospitalisations in which the indicated procedure was undertaken at least once during 2008–09. Note that data for the top 20 procedures are in Appendix Tables D8.15, D8.16 and D8.17.

The majority of same-day hospitalisations for lung cancer-related care included *administration of pharmacotherapy* (that is, chemotherapy). This procedure was undertaken in 83% of same-day hospitalisations. *Cerebral anaesthesia* was the next most common procedure at 6%. This was followed by *bronchoscopy with biopsy or removal of the foreign body* (5.5%), *administration of blood and blood products* (5%) and *generalised allied health interventions* (that is, physiotherapy and psychology) (2%).

For overnight hospitalisations due to lung cancer, the most commonly reported procedure was *generalised allied health interventions,* undertaken in 65% of the hospitalisations. It involves various interventions such as physiotherapy, social work, occupational therapy and pharmacy, which are commonly provided for patients admitted for medical or surgical care. In addition, about one-quarter (24%) of lung cancer-related hospitalisations involved *cerebral anaesthesia*, reflecting its usage as a companion procedure for many other overnight procedures (AIHW

2010b). The third most common procedure was *administration of pharmacotherapy* (11%), followed by *computerised tomography of the brain* (10%) and *administration of blood and blood products* (10%).

Table 8.7: Most common procedures for lung cancer–related hospitalisations[(a)], Australia, 2008–09

Procedure description (ACHI[(b)] block code)	Same-day			Overnight			Total		
	No.[(c, d)]	%[(d)]	Rank	No.[(c, d)]	%[(d)]	Rank	No.[(c, d)]	%[(d)]	Rank
Administration of pharmacotherapy (1920)	23,448	82.8	1	1,693	11.1	3	25,141	57.8	1
Generalised allied health interventions (1916)	612	2.2	5	9,791	64.5	1	10,403	23.9	2
Cerebral anaesthesia (1910)	1,689	6.0	2	3,594	23.7	2	5,283	12.1	3
Administration of blood and blood products (1893)	1,515	5.3	4	1,496	9.8	5	3,011	6.9	4
Bronchoscopy with biopsy or removal of foreign body (544)	1,565	5.5	3	1,364	9.0	6	2,929	6.7	5
Computerised tomography of brain (1952)	27	0.1	21	1,549	10.2	4	1,576	3.6	6
Total lung cancer-related hospitalisations	**28,324**	**100.0**	**. .**	**15,189**	**100.0**	**. .**	**43,513**	**100.0**	**. .**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) Australian Classification of Health Interventions, 6th edition.

(c) Indicates the number of hospitalisations in which the listed procedure was undertaken.

(d) The sum of the count of hospitalisations does not equal the total number of hospitalisations since no procedures, or multiple procedures, may be undertaken during each hospitalisation. For the same reason, the sum of the percentages does not equal 100. Furthermore, if multiple procedures were recorded from the same block number, only one procedure was counted.

Source: AIHW National Hospital Morbidity Database.

How many surgical procedures were undertaken for people with lung cancer?

While chemotherapy is the main treatment for small cell lung cancer, surgical removal of non-small cell lung cancer provides the best chance of cure for patients who have an early stage disease (Sekido et al. 2001). Hence, it is of key interest how frequently surgery is undertaken for lung cancer-related hospitalisations.

In this section, information is presented on the number of hospitalisations in which:

- partial resection (removal of a segment of the lung)
- lobectomy (removal of lobe of the lung)
- pneumonectomy (removal of the entire lung) and/or
- other procedures on the lung or pleura (includes destruction procedure on lung and other intrathoracic approach)

was undertaken at least once. These procedures have been identified as surgical procedures for lung cancer by the Health Information Program Managers of Australia in 2007 and are defined to be curative, major and non-diagnostic. The procedure codes included in each group are in Appendix Table D8.18. Note that in 2008–09, all separations with a surgical procedure for lung cancer analysed involved an overnight stay.

In 2008–09, a surgical procedure was reported for 12% (1,814 procedures) of lung cancer-related hospitalisations that involved an overnight stay. The most commonly reported surgical procedure group was *lobectomy of the lung* (6.3% of hospitalisations), followed by *partial resection of the lung* (4.6%) and *pneumonectomy* (0.9%) (Table 8.8).

Does the number of surgical procedures vary by hospital sector?

Table 8.8 shows that the proportion of overnight lung cancer-related hospitalisations with a surgical procedure was lower for public than private hospitals. Specifically, 9.3% of all overnight lung cancer-related hospitalisations in the public hospital sector had a surgical procedure reported, compared with 19.3% in the private hospital sector.

In both public and private hospitals, the most commonly reported type of surgery was *lobectomy of the lung*, which was undertaken in 5% of all lung cancer-related hospitalisations in public hospitals and 11% in private hospitals.

Table 8.8: Surgical procedures[(a)] for overnight lung cancer-related hospitalisations[(b)], Australia, 2008–09

	Number[(c)]			Per cent of overnight hospitalisations		
Surgical procedure description (curative, major, not diagnostic) (ACHI[(d)] procedure block)	**Public**	**Private**	**Total[(e)]**	**Public**	**Private**	**Total[(e)]**
Lobectomy of the lung (552)	525	429	954	4.7	10.7	6.3
Partial resection of the lung (551)[(f)]	417	284	701	3.7	7.1	4.6
Pneumonectomy of lung (553)[(g)]	86	51	137	0.8	1.3	0.9
Other procedures on the lung or pleura (558)	13	9	22	0.1	0.2	0.1
Total surgical procedures	**1,041**	**773**	**1,814**	**9.3**	**19.3**	**11.9**
Total overnight lung cancer-related hospitalisations	**11,182**	**4,007**	**15,189**	**100.0**	**100.0**	**100.0**

(a) Defined as surgical procedures for lung cancer by the Health Information Program Managers of Australia in 2007 and are defined to be curative, major and non-diagnostic.

(b) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(c) Indicates the number of hospitalisations in which the listed procedure was undertaken

(d) Australian Classification of Health Interventions, 6th edition.

(e) The sum of the count of hospitalisations does not equal the total number of hospitalisations since no procedures, or multiple procedures, may be undertaken during each hospitalisation. For the same reason, the sum of the percentages does not equal 100. Furthermore, if multiple procedures were recorded from the same block number, only one procedure was counted.

(f) Excludes lung volume reduction surgery (90170-00).

(g) Excludes removal of donor lung for transplantation (38438-03).

Source: AIHW National Hospital Morbidity Database.

Does the number of surgical procedures vary by remoteness?

Table 8.9 shows the number and proportion of the surgical procedures for lung cancer by remoteness of the patient's area of usual residence at time of hospitalisation. In 2008–09, the proportion of lung cancer-related hospitalisations with a surgical procedure reported decreased with remoteness. People in Major cities had a surgical procedure in about 13% of their lung cancer-related hospitalisations, compared with 5% for people in *Remote* and *Very remote areas.*

For all remoteness areas, *lobectomy of the lung* was the most commonly reported type of surgery, although the proportion of hospitalisations with this procedure tended to decrease with remoteness.

Table 8.9: Surgical procedures[(a)] for overnight lung cancer-related hospitalisations by remoteness area[(b)], Australia, 2008–09

Surgical procedure description (curative, major, not diagnostic) (ACHI[(c)] procedure block))	Major cities	Inner regional	Outer regional	Remote and Very remote	Total[(d, e)]
			Number[(f)]		
Lobectomy of the lung (552)	647	199	90	13	954
Partial resection of the lung (551)[(g)]	463	154	77	<5	701
Pneumonectomy of lung (553)[(h)]	81	39	<15	<3	137
Other procedures on the lung or pleura (558)	15	5	<3	0	22
Total surgical procedures	**1,206**	**397**	**182**	**18**	**1,814**
Total overnight lung cancer-related hospitalisations	**9,394**	**3,583**	**1,803**	**362**	**15,189**
			Per cent		
Lobectomy of the lung (552)	6.9	5.6	5.0	3.6	6.3
Partial resection of the lung (551)[(g)]	4.9	4.3	4.3	n.p.	4.6
Pneumonectomy of lung (553)[(h)]	0.9	1.1	n.p.	n.p.	0.9
Other procedures on the lung or pleura (558)	0.2	0.1	n.p.	0	0.1
Total surgical procedures	**12.8**	**11.1**	**10.1**	**5.0**	**11.9**
Total overnight lung cancer-related hospitalisations	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

n.p. Not published.

(a) Identified as surgical procedures for lung cancer by the Health Information Program Managers of Australia in 2007 and are defined to be curative, major and non-diagnostic.

(b) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(c) Australian Classification of Health Interventions, 6th edition.

(d) Includes hospitalisations for which remoteness area of the patient was not stated.

(e) The sum of the count of hospitalisations does not equal the total number of hospitalisations since no procedures, or multiple procedures, may be undertaken during each hospitalisation. For the same reason, the sum of the percentages does not equal 100. Furthermore, if multiple procedures were recorded from the same block number, only one procedure was counted.

(f) Indicates the number of hospitalisations in which the listed procedure was undertaken.

(g) Excludes lung volume reduction surgery (90170-00).

(h) Excludes removal of donor lung for transplantation (38438-03).

Source: AIHW National Hospital Morbidity Database.

Which disease groups co-existed with lung cancer?

Comorbidity exists when a person has two or more health conditions at the same time. The presence of one or more comorbid conditions in people with lung cancer is likely to compromise their quality of life and may complicate the management of this cancer.

In this section, comorbidity in relation to lung cancer is examined by looking at:

- the most common additional diagnoses in people admitted to hospital with a principal diagnosis of lung cancer
- the most common principal diagnosis for people admitted to hospital with an additional diagnosis of lung cancer.

Box 8.4: What are the things to consider when interpreting comorbidities?

There are two things to note when considering the results in this section. The first relates to the way additional diagnosis is recorded. A disease or condition is recorded as an additional diagnosis if it is known to affect the treatment of lung cancer or if it arose during the treatment. Therefore, the additional diagnoses in the hospital morbidity data would not be a complete list of all comorbidities occurring with lung cancer. The data are likely to be indicative, however, of the types of comorbidity experienced by lung cancer patients.

The second consideration is that additional diagnoses of lung cancer are not restricted to those hospitalisations where the principal diagnosis relates specifically to the treatment or care of a lung cancer patient. Instead, all hospitalisations for which lung cancer was an additional diagnosis are examined; hence the sum of the hospitalisations shown in tables 8.9 and 8.10 does not equal the total number of lung cancer-related hospitalisations described in previous sections of this report.

In 2008–09, there were 18,974 hospitalisations reported with lung cancer as a principal diagnosis (Table 8.9), comprising 0.2% of all hospitalisations. One in two (52%) of these had one or more cancer sites (other than the lung) recorded as an additional diagnosis, with cancer of *secondary sites* (C77–C79) being the most common additional diagnosis within this group. This would reflect the aggressive nature of lung cancer in spreading to other organ sites.

The second most commonly recorded additional diagnosis, where the principal diagnosis was lung cancer, was *respiratory diseases* (24% of hospitalisations). Within this group, *chronic obstructive pulmonary disease group (COPD)* was the most frequently recorded additional diagnosis (9%).

Other common additional diagnoses, where lung cancer was the principal diagnosis, included *diseases of the circulatory system* (19%) and *endocrine, nutritional and metabolic disease* (16%).

Table 8.10: Hospitalisations with a principal diagnosis of lung cancer[(a)] by disease groups, Australia, 2008–09

Additional diagnosis (ICD-10-AM codes)	Number[(a,b)]	Per cent
Cancer (C00–C97, D45, D46, D47.1, D47.3) excluding C33–C34	9,911	52.2
Secondary sites (C77–C79)	*9,545*	*50.3*
Diseases of the respiratory system (J00–J99)	4,587	24.2
Chronic lower respiratory diseases (J40–J47)	*1,724*	*9.1*
Chronic obstructive pulmonary disease (J41–J44)	*1,652*	*8.7*
Diseases of the circulatory system (I00–I99)	3,526	18.6
Other forms of heart disease (I30–I52)	*1,306*	*6.9*
Endocrine, nutritional and metabolic diseases (E00–E89)	3,119	16.4
Diseases of the blood and blood-forming organs (D50–D89)	2,507	13.2
Diseases of the digestive system (K00–K93)	1,912	10.1
Mental and behavioural disorders (F00–F99)	1,542	8.1
Certain infectious and parasitic diseases (A00–B99)	1,301	6.9
Diseases of the genitourinary system (N00–N99)	1,116	5.9
Diseases of the skin and subcutaneous tissue (L00–L99)	948	5.0
Diseases of the musculoskeletal system (M00–M99)	921	4.9
Injury, poisoning and other external (S00–T98)	920	4.8
Diseases of the nervous system (G00–G99)	815	4.3
Diseases of the eye and ear (H00–H95)	247	1.3
Congenital malformations (Q00–Q99)	10	0.1
Other diseases and conditions		
Factors influencing health and contact with health services (Z00–Z99)	13,131	69.2
Symptoms, signs and abnormal clinical laboratory findings, not elsewhere classified (R00–R99)	4,354	22.9
Total number of hospitalisations with lung cancer as the principal diagnosis	**18,974**	**100.0**

(a) Pertains to hospitalisations with principal diagnosis of C33–C34.

(b) Indicates the number of hospitalisations in which the listed additional diagnosis was recorded. A hospitalisation can have more than one additional diagnosis hence the numbers do not add up to the total.

(c) If more than one additional diagnosis (4-digit level) in each group (3-digit level) is listed to a principal diagnosis of C33–C34 then only one is counted.

Source: AIHW National Hospital Morbidity Database.

In 2008–09, there were 39,854 hospitalisations where lung cancer was recorded as an additional diagnosis, representing 0.5% of all hospitalisation occurring in that financial year (Table 8.10).

For people admitted to hospital with an additional diagnosis of lung cancer in 2008–09, the most common principal diagnosis was *cancer* (other than lung cancer), accounting for 13% of hospitalisation where lung cancer was recorded as an additional diagnosis. The biggest among this group was *secondary cancer sites* (13%). Most of these cases would probably be metastatic lesions in distant organ sites following a primary cancer in the lung.

Diseases of the respiratory system were the second most common principal diagnosis when lung cancer was an additional diagnosis (8%). *Pneumonia* and *chronic obstructive pulmonary diseases* were the most common in this group (3% and 2% of all hospitalisations, respectively).

The third most common principal diagnosis when lung cancer was an additional diagnosis was *diseases of the circulatory system* (4%). Within this group, *other forms of heart disease* were the most commonly recorded principal diagnosis (1%).

Table 8.11: Hospitalisations with an additional diagnosis of lung cancer[(a)] by disease groups, Australia, 2008–09

Principal diagnosis (ICD-10-AM codes)	Number[(b)]	Per cent
Cancer (C00–C97, D45, D46, D47.1, D47.3) excluding C33–C34	5,259	13.2
Secondary sites (C77–C79)	*4,997*	*12.5*
Diseases of the respiratory system (J00–J99)	3,225	8.1
Pneumonia (J12–J18)	*1,171*	*2.9*
Chronic obstructive pulmonary disease (J41–J44)	*768*	*1.9*
Diseases of the circulatory system (I00–I99)	1,405	3.5
Other forms of heart disease (I30–I52)	421	1.1
Diseases of the digestive system (K00–K93)	663	1.7
Diseases of the blood and blood-forming organs (D50–D89)	567	1.4
Endocrine, nutritional and metabolic diseases (E00–E89)	461	1.2
Injury, poisoning and other external (S00–T98)	430	1.1
Certain infectious and parasitic diseases (A00–B99)	388	1.0
Diseases of the musculoskeletal system (M00–M99)	288	0.7
Diseases of the genitourinary system (N00–N99)	259	0.6
Diseases of the nervous system (G00–G99)	195	0.5
Mental and behavioural disorders (F00–F99)	150	0.4
Diseases of the skin and subcutaneous tissue (L00–L99)	118	0.3
Diseases of the eye and ear (H00–H95)	27	0.1
Other diseases and conditions		
Factors influencing health and contact with health services (Z00–Z99)	24,880	62.4
Symptoms, signs and abnormal clinical laboratory findings, not elsewhere classified (R00–R99)	1,518	3.8
Total number of hospitalisations with lung cancer as the additional diagnosis	**39,854**	**100.0**

(a) Pertains to hospitalisations with additional diagnosis of C33–C34.

(b) Indicates the number of hospitalisations in which the listed principal diagnosis was recorded.

Source: AIHW National Hospital Morbidity Database.

9 Expenditure on lung cancer

Key findings

In the 2004–05 financial year in Australia:

- Total expenditure on lung cancer was estimated to be $166 million.
- Four-fifths (79%) of the total health expenditure on lung cancer was spent on hospital admitted patient services ($131 million).
- Males accounted for 61% of the expenditure on lung cancer and females 39%.
- Almost two-thirds (63%) of all expenditure for hospital admitted patient services for lung cancer was spent on people aged 65 to 84 years.

Between 2000–01 and 2004–05:

- Total expenditure on lung cancer grew by 33% from $125 to $166 million.

Introduction

This chapter focuses on direct health-care costs for lung cancer—that is, money spent by all levels of government, private health insurers, companies, households and individuals to screen for, diagnose and treat lung cancer. It excludes costs that the health system does not accrue, such as patients' travel costs, costs associated with the social and economic burden on carers and families, and costs relating to lost productivity or quality and length of life. Furthermore, only information on *recurrent* health expenditure (that is, expenditure on health goods, health services, public health activities and other activities that support health systems) and not on capital health expenditure (that is, expenditure on fixed assets such as new buildings and equipment) is shown.

The latest data available pertain to the 2004–05 financial year, with comparable data available for 2000–01. The data in this chapter were sourced from the Disease Expenditure Database, which is maintained by the AIHW. Appendix C has further information about the Disease Expenditure Database.

It is not possible to allocate all expenditure on health goods and services to a specific disease such as lung cancer. For example, data on cancer research are not available for separate types of cancers. In addition, expenditure on non-admitted patient hospital services, over-the-counter drugs and services by 'other health practitioners' are not allocated by disease in the Disease Expenditure Database. Thus, the expenditure figures in this chapter provide a minimum estimate of all direct health-care costs for lung cancer. The exclusion of non-admitted hospitals services would lead to an underestimation of expenditure associated with lung cancer as some states and territories provide same-day chemotherapy on a non-admitted patient basis (see Appendix F for further details).

The specific sectors of health expenditure covered in this chapter are:

- hospital admitted patient services—expenditure on services provided to an admitted patient in a hospital, including medical services delivered to privately admitted patients
- out-of-hospital medical expenses—expenditure on medical services funded under the Medicare Benefits Schedule, such as visits to general practitioners and specialists, as well as pathology services
- prescription pharmaceuticals—expenditure on prescriptions subsidised under government schemes (such as the Pharmaceutical Benefits Scheme) and those that are paid for privately; excludes pharmaceuticals dispensed in hospitals (these are included in the 'hospital admitted patient services' category)

Expenditure for these sectors as well as cancer screening (expenditure by the Australian Government and state and territory governments for mammographic screening through the BreastScreen Australia Program and cervical screening through the National Cervical Screening Program) is considered when comparisons are made between expenditure on lung cancer and expenditure on all cancers and then all diseases.

In the Disease Expenditure Database (unlike the approach taken in the hospital chapter of this report), the data on hospital expenditure for lung cancer pertain only to those hospitalisations for which the principal diagnosis was 'lung cancer'. Therefore, expenditure related to same-day hospitalisations for the administration of chemotherapy, with lung cancer coded as an additional, rather than a principal, diagnosis is not included. As a result, the data shown are a minimum estimate of total hospital admitted patient services expenditure on lung cancer patients.

Further information about the Disease Expenditure Database and how the expenditure estimates were derived can be found in health expenditure reports produced by the AIHW (AIHW 2005, 2010c, 2010e).

How much was spent on lung cancer in 2004–05?

The total expenditure on lung cancer was estimated to be $166 million in the 2004–05 financial year (Table 9.1). The corresponding expenditure for all cancers was $2,876 million and, for all diseases, $44,486 million. Overall, the funding for lung cancer comprised 5.8% of the expenditure for all cancers and 0.4% of expenditure for all diseases.

In 2004–05, four-fifths (79%) of the health expenditure on lung cancer was for hospital admitted patient services ($131 million). Another 18% ($30 million) was spent on out-of-hospital medical services and 3% ($5 million) on prescription pharmaceuticals.

The proportion of health-care expenditure that consisted of hospital admitted patient services was higher for lung cancer compared with all cancers and all diseases—that is, it equalled 79% of health-care expenditure on lung cancer compared with 70% for all cancers and 54% for all diseases. In contrast, the proportion of health-care expenditure on prescription pharmaceuticals was lower for lung cancer (3%) compared with all cancers (8%) and all diseases (18%).

Table 9.1: Expenditure by health-care sector and disease, Australia, 2004–05

	Lung cancer		All cancers[a]		All diseases	
Health-care sector	**$ (million)**	**Per cent**	**$ (million)**	**Per cent**	**$ (million)**	**Per cent**
Hospital admitted patient services[b]	131	78.9	2,007	69.8	24,221	54.4
Out-of-hospital medical expenses	30	18.1	417	14.5	11,900	26.7
Prescription pharmaceuticals	5	3.0	231	8.0	8,144	18.3
Cancer screening	. .	. .	222	7.7	222	0.5
Total allocated expenditure[c]	**166**	**100.0**	**2,876**	**100.0**	**44,486**	**100.0**

(a) Includes cancers coded in the International Statistical Classification of Diseases and Related Health Problems, 10th edition (ICD-10) as C00–C97. Does not include cancers coded as D45, D46, D47.1 and D47.3.

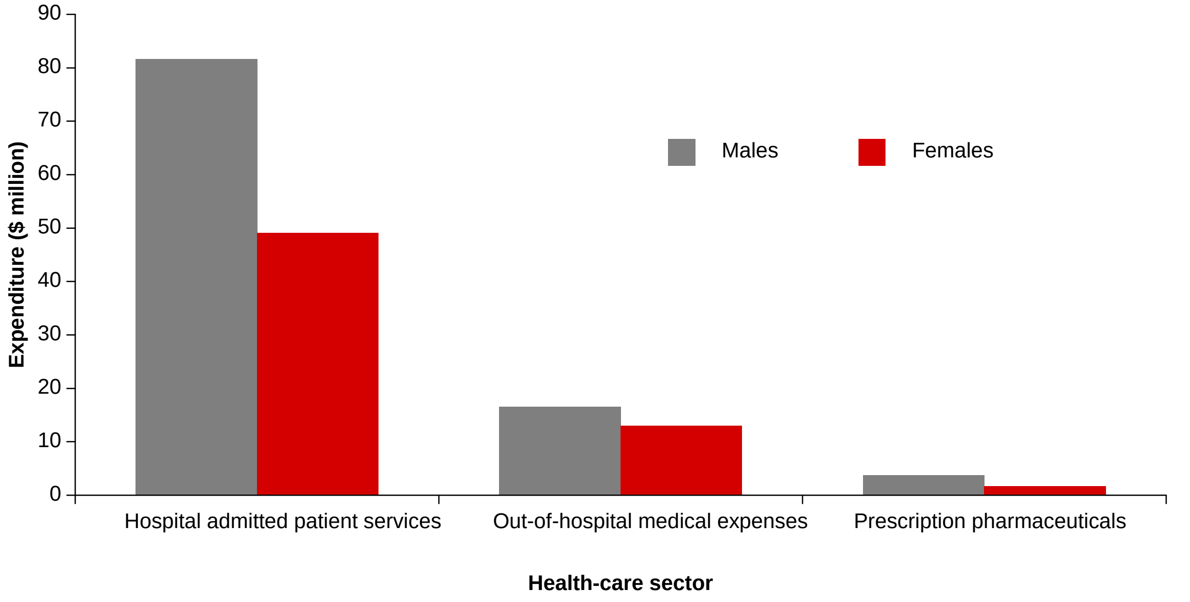
(b) Expenditure for hospital admitted patient services for lung cancer pertains to those hospitalisations for which the principal diagnosis was lung cancer (ICD-10 code of C33–C34). It does not pertain to hospitalisations for which lung cancer was an additional diagnosis, with the principal diagnosis related specifically to the type of cancer treatment or care received.

(c) Values may not sum to the total due to rounding.

Source: AIHW Disease Expenditure Database.

Does expenditure differ by sex?

Of the total $166 million spent on lung cancer in 2004–05, 61% ($102 million) was spent on males and 39% ($64 million) on females. Most of this difference was related to expenditure on hospital admitted patient services where $82 million was spent on males compared with $49 million on females (Figure 9.1).



Notes

1. Expenditure for hospital admitted patient services for lung cancer pertains to those hospitalisations for which the principal diagnosis was lung cancer (ICD-10 code of C33–C34). It does not pertain to hospitalisations for which lung cancer was an additional diagnosis, with the principal diagnosis related specifically to the type of cancer treatment or care received.
2. The data for this figure are in Appendix Table D9.1.

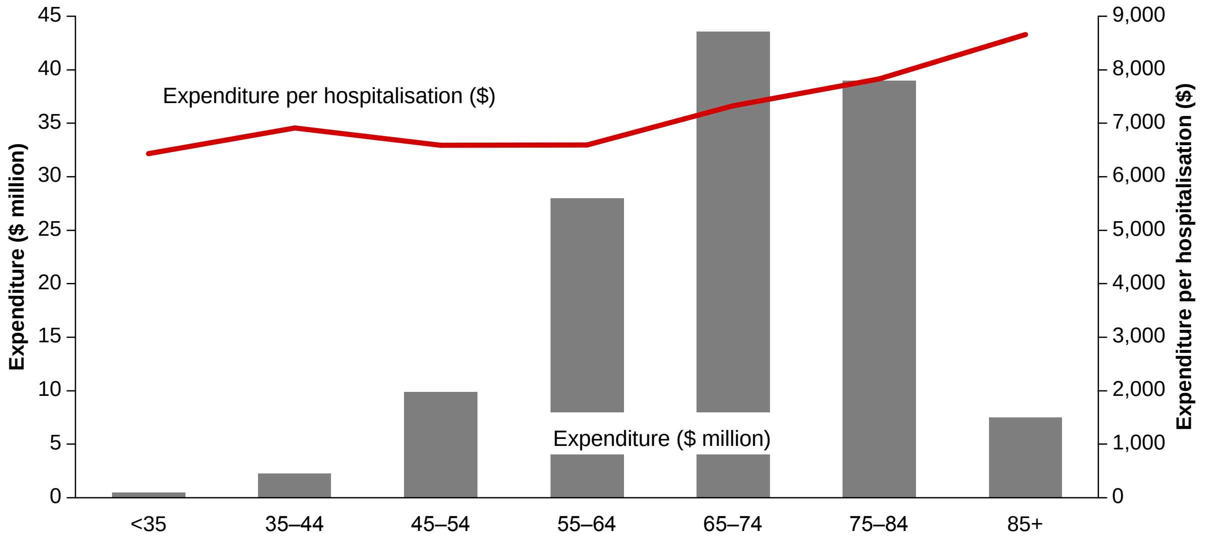
Source: AIHW Disease Expenditure Database.

Figure 9.1: Expenditure on lung cancer by health-care sector, Australia, 2004–05

Does expenditure differ by age?

Information is available to describe age-related differences in expenditure on hospital admitted patient services for people with lung cancer. In 2004–05, one-third (33%) of the total $131 million for admitted hospital patient services was spent on people aged 65 to 74 years ($44 million). An additional 30% was spent on people aged 75 to 84 years ($39 million), while 21% ($28 million) was spent on people aged 55 to 64 years (Figure 9.2).

The average expenditure on lung cancer per hospitalisation in 2004–05 was highest for people in the older age groups. In particular, average expenditure for those aged 85 years and over was $8,660 per hospitalisation, and for those aged 75 to 84 years, it was $7,827 per hospitalisation. The lowest average expenditure per hospitalisation of $6,429 was for people under 35 years.



Notes

1. Expenditure for hospital admitted patient services for lung cancer pertains to those hospitalisations for which the principal diagnosis was lung cancer (ICD-10 code of C33, C34). It does not pertain to hospitalisations for which lung cancer was an additional diagnosis, with the principal diagnosis related specifically to the type of cancer treatment or care received.
2. The data for this figure are shown in Appendix Table D9.2.

Source: AIHW Disease Expenditure Database.

Figure 9.2: Hospital admitted patient services expenditure on lung cancer by age group, Australia, 2004–05

Has expenditure on lung cancer changed over time?

The change over time in health expenditure on lung cancer is in Table 9.2. After prices were adjusted for inflation (with all prices in 2004–05 dollars), the data indicate that the total expenditure on lung cancer grew by 33%, from $125 million in 2000–01 to $166 million in 2004–05. When considering the three specific sectors of health expenditure, the out-of-hospital medical services stands out, with a 400% increase between 2000–01 and 2004–05. In 2004–05, $30 million was spent on out-of-hospital medical services compared with $6 million in 2000–01. This finding is likely to be related to the changes in admission procedures in some states and territories for the administration of chemotherapy. As discussed in Chapter 8, in some states and territories there has been a move away from admitting patients to hospital for same-day chemotherapy services and, instead, providing such services as an outpatient basis—either as a public or private service. Other possible explanations for the increased cost of out-of-hospital medical expenses could be related to changes or advances in treatment of lung cancer.

Expenditure for hospital admitted patient services also grew over the time considered; from $110 million in 2000–01 to $131 million in 2004–05, indicating an increase of 19%. In contrast, the expenditure on prescription pharmaceuticals decreased by 39% from 2000–01 to 2004–05.

Table 9.2 also shows that the overall increase in expenditure on lung cancer (33%) was higher than the increase in the expenditure for all cancers (31%) and all diseases (20%).

Table 9.2: Health expenditure by disease and health-care sector, constant prices[(a)], Australia, 2000–01 and 2004–05

Health-care sector	2000–01 $ (million)[(a)]	2004–05 $ (million)	Change (%)[(b)]
Lung cancer			
Hospital admitted patient services[(c)]	110	131	18.9
Out-of-hospital medical expenses	6	30	401.1
Prescription pharmaceuticals	9	5	-39.4
Lung cancer screening	. .	. .	. .
Total health expenditure on lung cancer[(d)]	**125**	**166**	**32.9**
All cancers[(e)]	2,199	2,876	30.8
All diseases	37,177	44,486	19.7

(a) Constant price health expenditure for 2000–01 is shown in terms of 2004–05 dollars.

(b) These calculations were based on unrounded numbers.

(c) Expenditure for hospital admitted patient services for lung cancer pertains to those hospitalisations for which the principal diagnosis was lung cancer (ICD-10 code of C33, C34). It does not pertain to hospitalisations for which lung cancer was an additional diagnosis, with the principal diagnosis related specifically to the type of cancer treatment or care received.

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

(e) Includes cancers coded in ICD-10 as C00–C97. Does not include cancers coded as D45, D46, D47.1 and D47.3.

Source: AIHW Disease Expenditure Database.

Appendix A: 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 2001). 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.

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 2008d). 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. 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 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 (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 World Health Organization (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 2008b), is based on ICD-10. ICD-10 was modified for the Australian setting by the National Centre for Classification in Health (NCCH) 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 2008c). 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 2008b). 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 B: Statistical methods and technical notes

2010 estimated incidence and mortality

To calculate the estimated 2010 incidence in Chapter 3, site-specific lung cancer incidence data for males and females for the 10-year period from 1998 to 2007 were divided into 18 series—one for each 5-year age group. The incidence numbers were divided by the age-specific mid-year populations to obtain the age-specific incidence rates. Least squares linear regression was used to find the straight line of best fit through the 1998 to 2007 rates. 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 different from zero, the mean of the rates was used as the estimate of the 2010 rate. If the slope was found to be positive, the straight line of best fit was extrapolated to obtain the estimate of the 2010 rate. Finally, if the slope was negative, the historical data series was fitted with the exponentially decaying line of best fit and the estimated rate for 2010 was based on extrapolating this line. The projected incidence rates for 2010 were then multiplied by the estimated resident population for 2010 to obtain the projected incidence numbers. The populations used were the Australian Bureau of Statistics (ABS) projected populations from Series 29(B) (ABS 2008c).

Estimates of mortality in 2010 were calculated in a similar manner to incidence using mortality data for the 10-year period 1998–2007.

In the projections work described above, historical data 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.

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 cases of lung cancer indicators (such as incidence, mortality and hospitalisation) relative to the number of people in the population at risk in a specified period. No age adjustments are made when calculating a crude rate. Since the risk of lung cancer depends heavily on age, crude rates are not suitable for looking at trends or making comparisons across groups in cancer incidence and mortality.

More meaningful comparisons can be made by 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 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 can be converted to a rate per 1,000 or 100,000 as appropriate.

Age-sex weighted average length of stay

Another type of standardisation used in this report is the age-sex weighted average length of stay (ALOS). Age-sex weighted ALOS are presented when making comparisons between groups and within groups over time in order to take into account differences in the age and/or sex structure and size of the population.

The weighted ALOS are presented as age-sex weighted ALOS, age-weighted ALOS and sex-weighted ALOS.

Calculating age-sex weighted ALOS is a three-step process. Within each population of interest, the crude ALOS for each age and sex categories are derived first by dividing the number of patient days for each age-sex 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-sex category by the overall total of the standard population. The standard population chosen is the Australian overnight lung cancer hospitalisations population in 2008–09. The third step is to multiply the crude ALOS with the corresponding weights and then sum up to obtain the total age-sex weighted 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 which 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 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; U.S. Cancer Statistics Working Group 2010).

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:

$$\text{95\% CI approximation} = \text{AS rate} \pm 1.96 \times \sqrt{\frac{\text{AS rate}}{\text{Number of cases}}}$$

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).

AIHW intends in the near future to undertake some analytical work to study the underlying distribution of Australian cancer data to provide a better understanding of the accuracy of the calculated rates.

Mortality-to-incidence ratio

Both mortality-to-incidence ratios (MIRs) and relative survival ratios can be used to estimate survival from a particular disease, such as lung 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 5). 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. 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
- 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 5 were extracted from the 2008 GLOBOCAN database (Ferlay et al. 2010a).

Rate ratio

This measure indicates the relative incidence rate, mortality rate or hospitalisation rate between two population groups (for example, Indigenous and non-Indigenous people). It can be calculated based on crude rates, age-standardised rates and cumulative rates. In this publication it is calculated using the age-standardised rates as:

Rate ratio = ASR of population group A / ASR of population group B

Ratios greater than 1 indicate an excess in population group A, while ratios less than 1 indicate an excess in population group B.

Relative survival analysis

Relative survival estimates compare the survival of persons diagnosed with a cancer (that is, the observed survival) with the survival of the entire Australian population of the same sex and age in the same calendar year as the cancer cohort (that is, the expected survival). Note that the actual cause of death (whether it is from cancer or another cause) is not of importance in these analyses. Thus, relative survival is defined as follows:

$$\text{relative survival} = \frac{\text{observed survival for cancer cohort}}{\text{expected survival for 'matched' general population}}$$

The resulting value is usually given as a proportion. For example, if the observed 5-year survival of a particular cohort diagnosed with a particular type of cancer was 0.60 (that is, 60% of them were still alive 5 years after diagnosis) and their expected survival, based on Australian life-tables, was 0.90 (that is, 90% of people with the same age- and sex-profile as the cohort would be expected to be alive 5 years later), then the 5-year relative survival would be 0.6/0.9 = 0.67 or 67%. One way to interpret this figure is that the 'average' person in that particular cancer cohort has a 67% chance of being alive 5 years after diagnosis *relative to others of the same sex and age*.

In order for the relative survival estimate to be a valid approximation of the probability that a person will not die of their diagnosed cancer within the given time interval, the presence of the cancer is assumed to be the only factor that distinguishes the cancer cohort from the general population (Reis et al. 2008). The degree to which this is true is not known.

The relative survival proportions in this report have been calculated using the 'cohort method'. In the cohort method, a cohort of people diagnosed with cancer is followed over time to estimate the proportion surviving for a selected time frame (for example 5 years). An alternative approach to calculating relative survival is the period method which was developed by Brenner and Gefeller (1996). This method examines the survival experience of people who were alive at the beginning of a particular recent calendar period and who were diagnosed with cancer before this period. Therefore, the period method might provide more up-to-date estimates of survival, especially in the presence of temporal trends affected by improvements in cancer detection and treatment. However, the cohort method generally includes more cancer cases and thus provides more precise estimates (that is, estimates with narrower confidence intervals).

The survival analyses were based on records of cancer cases diagnosed between 1982 and 2007. Data from the National Death Index on deaths (from any cause) that occurred up to 31 December 2010 were used to determine which person with cancer had died and when this occurred (see Appendix C for more information on these data sources). In order to calculate the expected survival belonging to the age-, sex- and calendar-year matched population, life tables for the population under study were used. These were obtained from the Australian Bureau of Statistics.

When comparing relative (or crude) survival estimates over time and/or between population subgroups, it would seem appropriate to age-standardise the figures to remove potential confounding by different age-structures. However, there are some undesirable features of doing so, as well as some difficulties in interpreting directly age-standardised survival estimates (Brenner et al. 2004; Brenner & Hakulinen 2003). For example, when numbers are small the age-specific survival for a certain age group and population subgroup may be undefined, hence the age-standardisation procedure breaks down. Also, the calculation of age-standardised survival can produce a figure that differs substantially from the unadjusted survival, even if it is adjusted to the original age distribution of the study population. In light of these and related shortcomings in the procedure, it was decided not to age-standardise the survival estimates produced for this report.

The software used to calculate the relative survival proportions was written by Dickman (Dickman 2004). It uses the Ederer II method of calculating the interval-specific expected survivals. Further details on the approach used to calculate the relative survival estimates, including rules which were applied during data preparation, can be found in the 2008 report prepared by the AIHW on cancer survival and prevalence (AIHW et al. 2008).

Risk to age 85

The calculations of risk shown in this report are measures that approximate the risk of developing (or dying from) lung cancer before the age of 85 years, 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:

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

Where the rate is expressed as a percentage.

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

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

For example, if *n* equals 3, then the risk of a person in the general population being diagnosed with cancer before the age of 85 years 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 C: Data sources

To provide a comprehensive picture of national cancer statistics in this report, AIHW and external data sources were used. These are described in this appendix.

Australian Cancer Database

The Australian Cancer Database (ACD) holds information on about 1.8 million cancer cases of Australians who were diagnosed with cancer (other than basal cell and squamous cell carcinomas of the skin) between 1982 and 2007. Data from this source are used in chapters 3, 5 and 6.

The AIHW compiles and maintains the ACD, in partnership with the Australasian Association of Cancer Registries (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 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, the characteristics of the cancer and, where relevant, deaths from malignant tumours (see Table C.1). 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) 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, reducing the degree of duplication within the ACD to a negligible rate. The ACD is also linked with information on deaths (from the National Death Index) to add information on which people with cancer 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 and 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 2009b).

The data in the ACD is protected both physically, with built-in computer security systems, and legislatively under the *Australian Institute of Health and Welfare Act 1987* as well as agreements with the state and territory cancer registries. More information about physical security and legislative protection of the ACD can be found in the National Cancer Statistics Clearing House protocol (AIHW 2009b).

Table C.1: 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 flag
Second given name	Age at diagnosis
Third given name	ICD-O-3[(a)] topography code
Sex	ICD-O-3[(a)] morphology code
Date of birth	ICD-10[(b)] disease code
Date of birth flag	Most valid basis of diagnosis
Indigenous status	Statistical local area at diagnosis
Country of birth	Postcode at diagnosis
Date of death	Melanoma thickness (mm)
Age at death	
Cause of death	

(a) International Classification of Diseases for Oncology, 3rd edition.

(b) International Statistical Classification of Diseases and Related Health Problems, 10th revision.

Source: AIHW 2009b.

Burden of disease data

Information on the burden of disease from lung cancer is in Chapter 7.

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, can be found in Begg and associates (2007).

This report presents the projected burden of disease due to lung cancer for 2011. These data were estimated by Begg and associates using 2003 baseline data. More information about how these projection estimates were derived can be found in the report by Begg and associates (Begg et al. 2007).

Disease Expenditure Database

Expenditure data are used in Chapter 9 to describe health expenditure on lung cancer. These data were obtained from the Disease Expenditure Database, which is maintained by the AIHW.

Since 1984, the AIHW has had responsibility for developing estimates of national health expenditure. Data are obtained from a variety of sources in the public and private sectors, with most provided by the ABS, the Australian Government Department of Health and Ageing, and state and territory health authorities. Other major sources are the Department of Veterans' Affairs, the Private Health Insurance Administration Council, Comcare, and the major worker's compensation and compulsory third-party motor vehicle insurers in each state and territory.

The definition of 'all cancers' used in Chapter 9 is somewhat different from that used in earlier chapters, as it only includes the ICD-10 'C' codes and excludes those malignant cancers with the ICD-10 'D' codes (such as polycythaemia vera). Separate expenditure data were not readily available for the required subset of ICD-10 'D' cancers. Since the forms of malignant cancers covered by the ICD-10 'D' codes are not common (AIHW & AACR 2008), their exclusion is not expected to have a large effect on the health expenditure estimates shown in this report.

Further information about the Disease Expenditure Database can be found in the annual health expenditure reports published by the AIHW (AIHW 2005, 2010c, 2010e).

GLOBOCAN

One of the main sources of internationally comparable data on cancer is the GLOBOCAN database, which is prepared by the International Agency for Research on Cancer (IARC) (Ferlay et al. 2010a). 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 3, 4 and 5.

In the GLOBOCAN database, age-standardised incidence and mortality rates are provided, with the data standardised to the 1966 WHO World Standard Population. However, the database does not include confidence intervals. To provide some guidance as to whether the differences were statistically significant, the AIHW calculated 'approximate' confidence intervals (with the methodology for doing so explained in Appendix B).

National Death Index

Cancer incidence data were linked to the National Death Index (NDI) to provide survival and prevalence information (Chapters 5 and 6). The NDI is a database that is maintained by the AIHW; 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, Indigenous status, state or territory of registration; and registration number. 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.

National Hospital Morbidity Database

Data from the National Hospital Morbidity Database (NHMD) are used in Chapter 8 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 2008–09, all public hospitals were included except for a small mothercraft hospital in the Australian Capital Territory. Private hospital data were not provided for private free-standing day facilities in the Australian Capital Territory and the Northern Territory, and for one private free-standing 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 hospitals. For 2008–09, data were not provided for private day hospitals 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 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 2010b). Further information about this data source is available in those reports.

Data are held in the NHMD for the years from 1993–94 to 2009–10. In this report data on cancer-related hospitalisations are presented for 2008–2009, with time trends going back to 2000–01.

The hospitalisations data in this report exclude those hospitalisations for which the care type was reported as newborn (unqualified days only), or records for 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.

National Mortality Database

Data from the National Mortality Database (NMD) are used in Chapter 4 to provide statistical information on mortality in Australia due to cancer.

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, maintained by the AIHW, contains information for all deaths in Australia registered from 1964 to 2007. In this report data is presented for the 26 years from 1982 to 2007.

The information on deaths from the Registrars is coded nationally by the Australian Bureau of Statistics (ABS) according to rules set forward in various versions of the ICD. Deaths are coded to reflect the underlying cause of death. Since 1997, multiple causes of death have been available in the NMD.

The National Mortality Database indicates the year of *registration* of death and also the year of *occurrence* of death. For this report, mortality data are shown based on the year of *occurrence* of death, except for the most recent year (namely, 2007) 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.

OECD Health Data 2010

OECD Health Data 2010 is used in Chapter 4 to examine trends in the prevalence of daily smokers in Australia from 1964 to 2007.

In the OECD Health Data 2010, daily smokers is generally defined as the percentage of the population aged 15 years and over who report that they are daily smokers. However, the Australian data from 1974 to 1992 are for the age group 16 years and over, while the data from 1995 to 2007 are for the age group 14 years and over.

The Australian data on smoking from 1964 to 1972 were sourced from Gallup polls and Busselton population study; data from 1974 to 1992 were sourced from Anti-Cancer Council of Victoria Survey Data, and data from 1995 onwards were sourced from the National Drug Strategy Household Survey.

More information about OECD Health Data 2010 is available at <www.oecd.org/health/health date>.

Population data

Throughout this report, population data were used to derive rates of, for example, lung cancer incidence and mortality. The 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>.

For the Indigenous comparisons in this report (Chapter 3, 4 and 8), the most recently released Indigenous experimental estimated resident populations from the ABS were used (ABS 2009c). Those were based on the 2006 Census of Population and Housing.

Appendix D: Additional tables

Additional tables for Chapter 3: Incidence of lung cancer

Table D3.1: Incidence of lung cancer by age at diagnosis, Australia, 2007

	Males			Females		
Age group (years)	**Number of cases**	**Age-specific rate[(a)]**	**95% CI**	**Number of cases**	**Age-specific rate[(a)]**	**95% CI**
<40	41	0.7	0.5–0.9	42	0.7	0.5–1.0
40–44	57	7.5	5.7–9.8	49	6.4	4.7–8.5
45–49	139	18.4	15.5–21.8	148	19.2	16.3–22.6
50–54	249	36.2	31.8–40.9	202	28.9	25.1–33.2
55–59	443	70.0	63.6–76.9	330	51.8	46.4–57.7
60–64	712	133.5	123.9–143.7	425	80.0	72.5–87.9
65–69	931	232.9	218.2–248.3	522	128.0	117.2–139.4
70–74	1,015	325.9	306.1–346.5	554	165.3	151.8–179.6
75–79	1,046	411.6	387.0–437.3	597	199.8	184.1–216.5
80–84	839	486.9	454.5–521.0	498	205.1	187.5–224.0
85+	476	422.2	385.1–461.9	388	169.4	152.9–187.1
All ages[(b)]	**5,948**	**57.9**	**56.5–59.4**	**3,755**	**31.3**	**30.3–32.4**

(a) The rates are expressed per 100,000 population.

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

Source: AIHW Australian Cancer Database 2007.

Table D3.2: Incidence of lung cancer, Australia, 1982 to 2007

	Males			Females		
Year	Number of cases	ASR[(a)]	95% CI	Number of cases	ASR[(a)]	95% CI
1982	4,688	85.1	82.5–87.7	1,258	18.2	17.2–19.2
1983	4,789	84.5	82.0–87.1	1,327	18.9	17.9–19.9
1984	4,940	85.3	82.8–87.9	1,403	19.4	18.4–20.5
1985	4,878	82.5	80.0–84.9	1,432	19.6	18.6–20.6
1986	4,904	80.6	78.2–83.0	1,558	20.8	19.8–21.9
1987	5,222	83.6	81.2–86.0	1,653	21.5	20.4–22.5
1988	4,949	77.7	75.5–80.0	1,741	22.2	21.1–23.2
1989	5,113	78.1	75.9–80.4	1,837	23.0	22.0–24.1
1990	5,205	78.2	76.0–80.4	1,941	23.8	22.7–24.9
1991	5,145	74.9	72.8–77.1	2,020	24.1	23.1–25.2
1992	5,162	73.2	71.2–75.3	2,034	23.8	22.8–24.9
1993	5,123	71.5	69.5–73.5	2,203	25.4	24.4–26.5
1994	5,416	74.2	72.2–76.2	2,262	25.5	24.5–26.6
1995	5,217	69.7	67.8–71.7	2,333	25.8	24.7–26.8
1996	5,365	69.9	68.0–71.9	2,435	26.4	25.3–27.4
1997	5,432	69.3	67.4–71.2	2,565	27.1	26.0–28.1
1998	5,455	67.5	65.7–69.4	2,559	26.4	25.4–27.4
1999	5,419	65.6	63.8–67.4	2,611	26.2	25.2–27.3
2000	5,407	63.6	61.9–65.4	2,840	27.9	26.9–29.0
2001	5,474	62.4	60.7–64.1	2,929	28.1	27.1–29.1
2002	5,479	60.9	59.3–62.6	3,110	29.1	28.1–30.2
2003	5,433	59.1	57.5–60.7	3,042	27.8	26.9–28.9
2004	5,910	62.5	60.9–64.1	3,325	29.8	28.8–30.8
2005	5,838	60.2	58.6–61.7	3,527	30.9	29.9–31.9
2006	6,089	61.2	59.7–62.8	3,590	30.7	29.7–31.8
2007	5,948	57.9	56.5–59.4	3,755	31.3	30.3–32.4

(a) 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 2007.

Table D3.3: Incidence of lung cancer by age at diagnosis, males, Australia, 1982 to 2007

	<60 years		60–69 years		70–79 years		80+ years		All ages	
Year	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI
1982	21.8	20.5–23.0	304.4	290.0–319.2	491.2	465.8–517.5	459.2	413.6–508.4	85.1	82.5–87.7
1983	21.8	20.5–23.0	300.9	286.8–315.5	498.6	473.5–524.7	436.7	393.0–483.7	84.5	82.0–87.1
1984	22.7	21.4–24.0	300.4	286.4–314.9	482.2	458.0–507.3	470.7	426.6–517.9	85.3	82.8–87.9
1985	19.6	18.4–20.8	298.5	284.8–312.8	475.9	452.4–500.3	477.9	434.3–524.6	82.5	80.0–84.9
1986	18.7	17.6–19.9	294.9	281.4–308.8	466.6	443.7–490.3	467.0	424.9–512.0	80.6	78.2–83.0
1987	19.4	18.2–20.5	300.8	287.4–314.7	489.3	466.2–513.2	489.8	448.1–534.4	83.6	81.2–86.0
1988	17.5	16.5–18.7	274.3	261.8–287.4	459.2	437.0–482.2	472.3	432.4–514.9	77.7	75.5–80.0
1989	17.2	16.1–18.3	284.3	271.7–297.3	458.9	437.0–481.6	469.4	430.6–510.8	78.1	75.9–80.4
1990	17.1	16.0–18.2	282.8	270.3–295.7	448.5	427.1–470.7	498.6	459.4–540.2	78.2	76.0–80.4
1991	17.1	16.0–18.1	278.9	266.6–291.6	420.5	400.2–441.5	457.5	420.6–496.6	74.9	72.8–77.1
1992	15.5	14.6–16.6	275.2	263.0–287.9	427.9	407.8–448.8	438.9	404.0–475.9	73.2	71.2–75.3
1993	14.6	13.7–15.6	250.4	238.7–262.4	448.3	428.0–469.3	428.3	394.7–464.0	71.5	69.5–73.5
1994	13.4	12.5–14.4	262.1	250.2–274.4	473.1	452.4–494.4	471.9	437.5–508.3	74.2	72.2–76.2
1995	13.6	12.8–14.6	249.2	237.6–261.2	419.6	400.5–439.4	456.6	423.6–491.5	69.7	67.8–71.7
1996	13.3	12.5–14.2	244.7	233.3–256.6	436.7	417.6–456.5	451.2	419.2–484.9	69.9	68.0–71.9
1997	13.2	12.3–14.0	230.3	219.3–241.8	432.2	413.5–451.5	480.5	448.1–514.7	69.3	67.4–71.2
1998	11.8	11.0–12.6	234.2	223.1–245.7	439.8	421.3–458.9	435.7	405.3–467.7	67.5	65.7–69.4
1999	11.4	10.7–12.2	215.5	204.9–226.5	425.6	407.7–444.0	457.9	427.5–490.0	65.6	63.8–67.4
2000	11.9	11.1–12.7	201.7	191.6–212.3	408.3	391.0–426.1	448.2	419.0–478.9	63.6	61.9–65.4
2001	10.9	10.2–11.7	198.3	188.3–208.6	407.0	390.0–424.6	445.7	417.7–475.2	62.4	60.7–64.1
2002	10.6	9.9–11.3	186.6	177.0–196.5	405.1	388.2–422.5	438.2	411.0–466.8	60.9	59.3–62.6
2003	10.5	9.8–11.2	173.9	164.8–183.3	380.1	363.8–396.9	463.4	436.1–492.1	59.1	57.5–60.7
2004	11.0	10.3–11.7	193.8	184.4–203.6	409.2	392.4–426.5	455.2	428.7–483.0	62.5	60.9–64.1
2005	10.2	9.5–10.8	189.5	180.3–199.0	395.9	379.4–412.9	437.4	412.1–463.9	60.2	58.6–61.7
2006	10.3	9.7–11.0	185.6	176.7–194.9	389.3	373.1–406.1	490.1	464.0–517.2	61.2	59.7–62.8
2007	10.0	9.4–10.7	178.6	170.1–187.5	364.3	348.8–380.4	458.1	433.5–483.6	57.9	56.5–59.4

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

Source: AIHW Australian Cancer Database 2007.

Table D3.4: Incidence of lung cancer by age at diagnosis, females, Australia, 1982 to 2007

	<60 years		60–69 years		70–79 years		80+ years		All ages	
Year	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI
1982	6.6	5.9–7.3	76.7	70.0–83.9	86.0	77.1–95.7	52.6	42.7–64.2	18.2	17.2–19.2
1983	7.1	6.4–7.9	75.3	68.7–82.3	85.6	76.9–95.0	66.5	55.4–79.2	18.9	17.9–19.9
1984	7.4	6.7–8.2	76.8	70.2–83.9	90.2	81.4–99.7	62.3	51.7–74.3	19.4	18.4–20.5
1985	7.9	7.2–8.7	74.5	68.1–81.5	87.4	78.9–96.6	65.5	54.9–77.6	19.6	18.6–20.6
1986	7.8	7.0–8.6	79.2	72.6–86.2	98.9	89.9–108.4	75.9	64.7–88.5	20.8	19.8–21.9
1987	7.3	6.6–8.1	82.8	76.1–89.9	108.8	99.5–118.7	80.8	69.4–93.5	21.5	20.4–22.5
1988	7.3	6.6–8.0	81.6	75.0–88.6	121.1	111.4–131.5	83.9	72.5–96.7	22.2	21.1–23.2
1989	8.0	7.2–8.7	83.3	76.8–90.3	118.4	108.9–128.5	94.6	82.7–107.8	23.0	22.0–24.1
1990	7.8	7.1–8.6	89.7	83.0–96.9	123.3	113.7–133.6	97.3	85.4–110.5	23.8	22.7–24.9
1991	7.1	6.4–7.8	94.9	87.9–102.2	135.3	125.4–145.8	93.0	81.5–105.6	24.1	23.1–25.2
1992	7.0	6.4–7.7	91.5	84.6–98.7	132.3	122.6–142.5	97.5	86.0–110.1	23.8	22.8–24.9
1993	7.8	7.2–8.6	88.3	81.5–95.4	146.5	136.4–157.2	108.7	96.8–121.6	25.4	24.4–26.5
1994	7.5	6.8–8.2	90.9	84.0–98.1	142.2	132.3–152.6	121.8	109.6–135.1	25.5	24.5–26.6
1995	7.9	7.2–8.6	90.0	83.2–97.2	142.2	132.4–152.5	122.3	110.2–135.3	25.8	24.7–26.8
1996	8.3	7.6–9.0	90.9	84.1–98.2	143.2	133.6–153.4	126.9	114.9–139.9	26.4	25.3–27.4
1997	7.6	7.0–8.3	101.4	94.2–109.0	151.5	141.7–161.8	125.0	113.2–137.7	27.1	26.0–28.1
1998	7.5	6.8–8.1	91.7	84.8–98.9	154.9	145.1–165.2	124.7	113.1–137.2	26.4	25.4–27.4
1999	7.2	6.7–7.9	85.9	79.3–92.9	160.6	150.7–170.9	129.4	117.7–142.0	26.2	25.2–27.3
2000	7.9	7.3–8.5	97.2	90.2–104.5	156.9	147.2–167.0	146.0	133.8–159.0	27.9	26.9–29.0
2001	8.1	7.5–8.8	91.7	85.0–98.8	162.4	152.5–172.6	147.6	135.7–160.4	28.1	27.1–29.1
2002	8.0	7.4–8.6	94.7	88.0–101.8	172.9	162.8–183.5	156.7	144.6–169.5	29.1	28.1–30.2
2003	7.1	6.6–7.7	94.7	88.0–101.7	168.9	158.9–179.4	147.3	135.8–159.5	27.8	26.9–28.9
2004	7.7	7.2–8.3	101.3	94.5–108.4	174.0	163.8–184.6	166.9	154.8–179.6	29.8	28.8–30.8
2005	8.0	7.5–8.7	110.4	103.4–117.7	172.0	161.9–182.6	175.7	163.5–188.5	30.9	29.9–31.9
2006	8.2	7.7–8.8	101.7	95.2–108.6	176.3	166.1–187.0	178.8	166.6–191.5	30.7	29.7–31.8
2007	8.3	7.7–8.9	101.7	95.4–108.4	180.8	170.5–191.5	189.2	176.9–202.1	31.3	30.3–32.4

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

Source: AIHW Australian Cancer Database 2007.

Table D3.5: Incidence by type of lung cancer, people under 60 years at diagnosis, Australia, 1982–1988 to 2002–2007

	Number of cases				Per cent			
Type of lung cancer[a]	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**
					Males			
1: Small cell carcinoma	1,327	1,045	817	797	17.1	15.9	15.1	14.2
2: Non-small cell carcinoma	5,781	5,118	4,200	3,708	74.3	77.7	77.7	66.2
2.1: Squamous cell carcinoma	*2,309*	*1,815*	*1,161*	*911*	*29.7*	*27.6*	*21.5*	*16.3*
2.2: Adenocarcinoma	*1,887*	*1,869*	*1,676*	*1,844*	*24.3*	*28.4*	*31.0*	*32.9*
2.3: Large cell carcinoma	*1,585*	*1,434*	*1,363*	*953*	*20.4*	*21.8*	*25.2*	*17.0*
3: Other specified carcinoma[b]	187	208	217	867	2.4	3.2	4.0	15.5
4: Other and unspecified malignant neoplasm	486	212	173	226	6.2	3.2	3.2	4.0
Total	**7,781**	**6,583**	**5,407**	**5,598**	**100.0**	**100.0**	**100.0**	**100.0**
					Females			
1: Small cell carcinoma	538	576	547	577	19.6	18.1	15.9	13.7
2: Non-small cell carcinoma	1,898	2,309	2,552	2,812	69.2	72.6	74.3	66.5
2.1: Squamous cell carcinoma	*441*	*443*	*356*	*349*	*16.1*	*13.9*	*10.4*	*8.3*
2.2: Adenocarcinoma	*936*	*1,210*	*1,407*	*1,791*	*34.1*	*38.1*	*40.9*	*42.4*
2.3: Large cell carcinoma	*521*	*656*	*789*	*672*	*19.0*	*20.6*	*23.0*	*15.9*
3: Other specified carcinoma[b]	136	195	236	706	5.0	6.1	6.9	16.7
4: Other and unspecified malignant neoplasm	169	100	101	132	6.2	3.1	2.9	3.1
Total	**2,741**	**3,180**	**3,436**	**4,227**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 in Chapter 3 provides a list of the histology types included in each group.

(b) Includes 'non-small cell carcinoma' (8046), and this classification has only been used by state/territory cancer registries since around 2003 (vary by state/territory). Prior to 2003, 'non-small cell carcinoma' were coded to various histology codes, mainly to the group classified as 'large cell carcinoma'. The new coding practice has influenced the trends shown in the table.

Source: AIHW Australian Cancer Database 2007.

Table D3.6: Incidence by type of lung cancer, people aged 60 to 69 years at diagnosis, Australia, 1982–1988 to 2002–2007

	Number of cases				Per cent			
Type of lung cancer[(a)]	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**
				Males				
1: Small cell carcinoma	2,020	1,940	1,367	1,202	16.3	14.9	14.3	13.0
2: Non-small cell carcinoma	9,287	10,164	7,463	6,333	74.8	78.3	78.2	68.4
2.1: Squamous cell carcinoma	*4,375*	*4,256*	*2,666*	*1,998*	*35.2*	*32.8*	*27.9*	*21.6*
2.2: Adenocarcinoma	*2,339*	*3,065*	*2,548*	*2,700*	*18.8*	*23.6*	*26.7*	*29.2*
2.3: Large cell carcinoma	*2,573*	*2,843*	*2,249*	*1,635*	*20.7*	*21.9*	*23.6*	*17.7*
3: Other specified carcinoma[(b)]	159	226	191	1,182	1.3	1.7	2.0	12.8
4: Other and unspecified malignant neoplasm	947	658	522	541	7.6	5.1	5.5	5.8
Total	**12,413**	**12,988**	**9,543**	**9,258**	**100.0**	**100.0**	**100.0**	**100.0**
				Females				
1: Small cell carcinoma	769	942	728	809	21.3	20.7	17.7	15.8
2: Non-small cell carcinoma	2,454	3,248	3,022	3,344	67.9	71.4	73.4	65.4
2.1: Squamous cell carcinoma	*810*	*958*	*715*	*651*	*22.4*	*21.1*	*17.4*	*12.7*
2.2: Adenocarcinoma	*888*	*1,340*	*1,351*	*1,829*	*24.6*	*29.4*	*32.8*	*35.8*
2.3: Large cell carcinoma	*756*	*950*	*956*	*864*	*20.9*	*20.9*	*23.2*	*16.9*
3: Other specified carcinoma[(b)]	81	145	140	701	2.2	3.2	3.4	13.7
4: Other and unspecified malignant neoplasm	308	216	226	260	8.5	4.7	5.5	5.1
Total	**3,612**	**4,551**	**4,116**	**5,114**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 in Chapter 3 provides a list of the histology types included in each group.

(b) Includes 'non-small cell carcinoma' (8046), and this classification has only been used by state/territory cancer registries since around 2003 (vary by state/territory). Prior to 2003, 'non-small cell carcinoma' were coded to various histology codes, mainly to the group classified as 'large cell carcinoma'. The new coding practice has influenced the trends shown in the table.

Source: AIHW Australian Cancer Database 2007.

Table D3.7: Incidence by type of lung cancer, people aged 70 to 79 years at diagnosis, Australia, 1982–1988 to 2002–2007

	Number of cases				Per cent			
Type of lung cancer[(a)]	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**
				Males				
1: Small cell carcinoma	1,365	1,484	1,512	1,509	12.5	12.0	12.0	11.7
2: Non-small cell carcinoma	7,958	9,594	9,714	8,636	72.7	77.8	77.4	67.1
2.1: Squamous cell carcinoma	*3,796*	*4,152*	*3,595*	*2,889*	*34.7*	*33.7*	*28.6*	*22.5*
2.2: Adenocarcinoma	*1,712*	*2,440*	*2,902*	*3,241*	*15.6*	*19.8*	*23.1*	*25.2*
2.3: Large cell carcinoma	*2,450*	*3,002*	*3,217*	*2,506*	*22.4*	*24.3*	*25.6*	*19.5*
3: Other specified carcinoma[(b)]	89	208	235	1,458	0.8	1.7	1.9	11.3
4: Other and unspecified malignant neoplasm	1,528	1,051	1,090	1,261	14.0	8.5	8.7	9.8
Total	**10,940**	**12,337**	**12,551**	**12,864**	**100.0**	**100.0**	**100.0**	**100.0**
				Females				
1: Small cell carcinoma	463	811	860	916	15.4	16.6	15.3	13.9
2: Non-small cell carcinoma	2,026	3,519	4,080	4,241	67.5	71.9	72.7	64.3
2.1: Squamous cell carcinoma	*649*	*1,102*	*1,063*	*1,002*	*21.6*	*22.5*	*18.9*	*15.2*
2.2: Adenocarcinoma	*684*	*1,218*	*1,569*	*1,967*	*22.8*	*24.9*	*28.0*	*29.8*
2.3: Large cell carcinoma	*693*	*1,199*	*1,448*	*1,272*	*23.1*	*24.5*	*25.8*	*19.3*
3: Other specified carcinoma[(b)]	43	80	135	760	1.4	1.6	2.4	11.5
4: Other and unspecified malignant neoplasm	469	482	538	678	15.6	9.9	9.6	10.3
Total	**3,001**	**4,892**	**5,613**	**6,595**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 in Chapter 3 provides a list of the histology types included in each group.

(b) Includes 'non-small cell carcinoma' (8046), and this classification has only been used by state/territory cancer registries since around 2003 (vary by state/territory). Prior to 2003, 'non-small cell carcinoma' were coded to various histology codes, mainly to the group classified as 'large cell carcinoma'. The new coding practice has influenced the trends shown in the table.

Source: AIHW Australian Cancer Database 2007.

Table D3.8: Incidence by type of lung cancer, people aged 80 years and over at diagnosis, Australia, 1982–1988 to 2002–2007

	Number of cases				Per cent			
Type of lung cancer[(a)]	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**	**1982–1988**	**1989–1995**	**1996–2001**	**2002–2007**
					Males			
1: Small cell carcinoma	256	377	441	565	7.9	8.4	8.7	8.1
2: Non-small cell carcinoma	2,040	3,151	3,521	4,223	63.3	70.5	69.7	60.5
2.1: Squamous cell carcinoma	*756*	*1,121*	*1,031*	*1,187*	*23.4*	*25.1*	*20.4*	*17.0*
2.2: Adenocarcinoma	*388*	*607*	*878*	*1,346*	*12.0*	*13.6*	*17.4*	*19.3*
2.3: Large cell carcinoma	*896*	*1,423*	*1,612*	*1,690*	*27.8*	*31.8*	*31.9*	*24.2*
3: Other specified carcinoma[(b)]	14	38	53	687	0.4	0.8	1.0	9.8
4: Other and unspecified malignant neoplasm	915	905	1,036	1,502	28.4	20.2	20.5	21.5
Total	**3,225**	**4,471**	**5,051**	**6,977**	**100.0**	**100.0**	**100.0**	**100.0**
					Females			
1: Small cell carcinoma	66	150	244	308	6.5	7.5	8.8	7.0
2: Non-small cell carcinoma	612	1,346	1,798	2,571	60.4	67.1	64.8	58.3
2.1: Squamous cell carcinoma	*155*	*323*	*344*	*497*	*15.3*	*16.1*	*12.4*	*11.3*
2.2: Adenocarcinoma	*176*	*383*	*594*	*960*	*17.4*	*19.1*	*21.4*	*21.8*
2.3: Large cell carcinoma	*281*	*640*	*860*	*1,114*	*27.7*	*31.9*	*31.0*	*25.2*
3: Other specified carcinoma[(b)]	6	23	31	393	0.6	1.1	1.1	8.9
4: Other and unspecified malignant neoplasm	330	487	701	1,141	32.5	24.3	25.3	25.9
Total	**1,014**	**2,006**	**2,774**	**4,413**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 in Chapter 3 provides a list of the histology types included in each group.

(b) Includes 'non-small cell carcinoma' (8046), and this classification has only been used by state/territory cancer registries since around 2003 (vary by state/territory). Prior to 2003, 'non-small cell carcinoma' were coded to various histology codes, mainly to the group classified as 'large cell carcinoma'. The new coding practice has influenced the trends shown in the table.

Source: AIHW Australian Cancer Database 2007.

Table D3.9: Incidence of small cell and non-small cell lung cancer by stage at diagnosis[(a)], United States of America, 1999–2006[(b)]

	Small cell[(c)]						Non-small cell[(d)]					
	Males			Females			Males			Females		
Stage at diagnosis	No. of cases	% of all cases	% of staged cases[(e)]	No. of cases	% of all cases	% of staged cases[(e)]	No. of cases	% of all cases	% of staged cases[(e)]	No. of cases	% of all cases	% of staged cases[(e)]
Localised	n.a	5.0	5.3	n.a	5.0	5.3	n.a	15.0	16.1	n.a	18.0	19.6
Regional	n.a	19.0	20.0	n.a	22.0	23.4	n.a	23.0	24.7	n.a	22.0	23.9
Distant	n.a	71.0	74.7	n.a	67.0	71.3	n.a	55.0	59.1	n.a	52.0	56.5
Unknown	n.a	5.0	. .	n.a	5.0	. .	n.a	8.0	. .	n.a	8.0	. .
Total[(f)]	**18,256**	**100**	**100.0**	**17,513**	**100.0**	**100.0**	**124,192**	**100.0**	**100.0**	**103,214**	**100.0**	**100.0**

(a) Based on the SEER summary staging system (see Appendix E).

(b) Data were from the SEER 17 areas which cover approximately a quarter of the USA (see Table 15.13 and Table 15.14 in Altekruse et al. 2010).

(c) Small cell cancer of the lung includes histologies 8041–8045.

(d) Non-small cell cancer of the lung includes histologies 8000–8040, 8046–9049, 9056–9139, 9141–9589.

(e) These values are approximations that were calculated by the AIHW since only the percentage (rather than the exact number) of unknown cases was provided.

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

Source: Altekruse et al. 2010.

Table D3.10: Incidence of lung cancer by remoteness area, Australia, 2003–2007

	Males			Females		
Remoteness area[(a)]	Average annual number of cases[(b)]	ASR[(c)]	95% CI	Average annual number of cases[(b)]	ASR[(c)]	95% CI
Major cities	3,724	59.0	58.1–59.9	2,298	29.8	29.2–30.3
Inner regional	1,335	60.7	59.2–62.2	741	29.8	28.8–30.7
Outer regional	641	62.8	60.6–65.1	341	32.0	30.5–33.6
Remote and Very remote	134	71.9	66.3–77.9	59	34.2	30.4–38.4
Not stated	10	. .	. .	8	. .	. .
Total	**5,844**	**60.2**	**59.5–60.9**	**3,448**	**30.2**	**29.7–30.6**

(a) Classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix A).

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

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007.

Source: AIHW Australian Cancer Database 2007.

Table D3.11: Incidence of lung cancer by socioeconomic status, Australia, 2003–2007

	Males			Females		
Socioeconomic status[(a)]	Average annual number of cases[(b)]	ASR[(c)]	95% CI	Average annual number of cases[(b)]	ASR[(c)]	95% CI
1 (Lowest)	1,437	70.6	69.0–72.3	746	32.4	31.3–33.4
2	1,378	64.7	63.2–66.3	786	32.1	31.1–33.1
3	1,175	61.4	59.8–63.0	669	30.1	29.1–31.2
4	976	54.6	53.1–56.2	613	28.6	27.6–29.7
5 (Highest)	859	46.7	45.3–48.1	621	26.8	25.8–27.7
Not stated	18	. .	. .	14	. .	. .
Total	**5,844**	**60.2**	**59.5–60.9**	**3,448**	**30.2**	**29.7–30.6**

(a) Classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix A).

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

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007.

Source: AIHW Australian Cancer Database 2007.

Table D3.12: Incidence of lung cancer by Indigenous status, Queensland, Western Australia, South Australia and the Northern Territory, 2003–2007

	Males			Females		
Indigenous status	**Average annual number of cases(a)**	**ASR(b)**	**95% CI**	**Average annual number of cases(a)**	**ASR(b)**	**95% CI**
Indigenous	42	100.3	85.2–117.1	29	47.9	39.8–57.1
Non-indigenous	2,156	60.2	59.1–61.4	1,202	29.1	28.4–29.9
Not stated	41	. .	. .	30	. .	. .
Total	**2,239**	**61.9**	**60.7–63.0**	**1,261**	**30.2**	**29.5–31.0**

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

(b) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007.

Source: AIHW Australian Cancer Database 2007.

Table D3.13: Incidence of lung cancer by country/region of birth, males, 2003–2007

Country/region of birth(a)	Average annual number of cases	Age-standardised rate(b)	95% confidence interval
North-West Europe, excl. United Kingdom and Ireland	236	69.1	65.0–73.3
United Kingdom and Ireland	753	66.7	64.6–68.9
Southern and Eastern Europe	710	62.9	60.8–65.1
Oceania and Antarctica, excl. Australia and New Zealand	17	60.4	46.6–76.5
North Africa and the Middle East	83	59.1	53.1–65.5
Australia	3,584	57.6	56.7–58.4
New Zealand	83	55.2	49.4–61.4
United States of America (USA) and Canada	20	51.4	41.4–63.1
North-East Asia	68	48.1	43.0–53.7
Americas, excl. USA and Canada	16	46.1	34.7–59.5
South-East Asia	72	45.1	40.1–50.4
Sub-Saharan Africa	22	35.1	28.4–43.0
Southern and Central Asia	32	31.4	26.6–36.9
Inadequately described, not stated or unknown	147	. .	. .
Total(c)	**5,844**	**60.2**	**59.5–60.9**

(a) Classified according to the Standard Australian Classification of Countries, second edition (see Appendix A).

(b) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007. Countries/regions of birth are ordered in descending order according to the age-standardised rate.

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

Source: AIHW Australian Cancer Database 2007.

Table D3.14: Incidence of lung cancer by country/region of birth, females, 2003–2007

Country/region of birth[(a)]	Average annual number of cases	Age-standardised rate[(b)]	95% confidence interval
United Kingdom (UK) and Ireland	497	40.6	39.0–42.3
New Zealand (NZ)	64	36.8	32.6–41.3
Oceania and Antarctica, excl. Australia and NZ	16	35.4	27.3–44.9
United States of America (USA) and Canada	12	33.7	25.3–43.9
North-West Europe, excl. UK and Ireland	118	33.1	30.3–36.0
North-East Asia	54	30.0	26.5–33.9
Australia	2,266	29.4	28.9–30.0
Sub-Saharan Africa	19	24.7	19.8–30.4
South-East Asia	56	21.5	18.8–24.4
Americas, excl. USA and Canada	9	21.1	14.9–28.8
North Africa and the Middle East	26	18.7	15.6–22.3
Southern and Eastern Europe	186	17.7	16.5–18.9
Southern and Central Asia	21	17.4	14.2–21.1
Inadequately described, not stated or unknown	103	. .	. .
Total[(c)]	**3,448**	**30.2**	**29.7–30.6**

(a) Classified according to the Standard Australian Classification of Countries, second edition (see Appendix A).

(b) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007. Countries/regions of birth are ordered in descending order according to the age-standardised rate.

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

Source: AIHW Australian Cancer Database 2007.

Table D3.15: International comparison of estimated incidence of lung cancer, males, 2008[(a)]

Country or region	Estimated number of cases	Age-standardised rate[(b)]	95% confidence interval[(c)]
Central and Eastern Europe	109,596	57.0	56.7–57.3
Southern Europe	67,753	49.0	48.6–49.4
Northern America	125,948	48.5	48.2–48.8
Micronesia	90	46.9	37.2–56.6
Polynesia	116	46.5	38.0–55.0
Eastern Asia	435,815	45.0	44.9–45.1
Western Europe	76,581	44.7	44.4–45.0
Northern Europe	35,378	39.3	38.9–39.7
World	***1,095,186***	***34.0***	***33.9–34.1***
Australia	***5,873***	***32.9***	***32.1–33.7***
Western Asia	22,450	30.7	30.3–31.1
New Zealand	984	29.6	27.8–31.4
South-Eastern Asia	66,592	29.6	29.4–29.8
Southern Africa	4,672	29.0	28.2–29.8
Caribbean	5,555	25.7	25.0–26.4
South America	33,824	20.4	20.2–20.6
Northern Africa	10,365	14.9	14.6–15.2
South-Central Asia	79,987	13.1	13.0–13.2
Central America	7,573	12.8	12.5–13.1
Melanesia	252	12.4	10.9–13.9
Eastern Africa	2,831	4.1	3.9–4.3
Western Africa	2,134	3.1	3.0–3.2
Middle Africa	819	2.8	2.6–3.0

(a) The data were estimated for 2008 and are based on data from approximately 3 to 5 years earlier.

(b) The rates were standardised by the IARC using the Doll et al. (1966) World Standard Population and are expressed per 100,000 males. Countries or regions are ordered in descending order according to the age-standardised rate.

(c) The confidence intervals are approximations and were calculated by the AIHW (see Appendix B).

Source: Ferlay et al. 2010a.

Table D3.16: International comparison of estimated incidence of lung cancer, females, 2008[(a)]

Country or region	Estimated number of cases	Age-standardised rate[(b)]	95% confidence interval[(c)]
Northern America	110,749	35.8	35.6–36.0
New Zealand	823	23.4	21.8–25.0
Northern Europe	23,437	21.8	21.5–22.1
Eastern Asia	209,949	19.9	19.8–20.0
Australia	***3,751***	***19.2***	***18.6–19.8***
Micronesia	37	17.2	11.7–22.7
Western Europe	31,417	16.7	16.5–16.9
Polynesia	40	14.9	10.3–19.5
World	***513,637***	***13.5***	***13.5–13.5***
Caribbean	2,919	12.1	11.7–12.5
South-Eastern Asia	31,664	11.9	11.8–12.0
Southern Europe	16,872	10.4	10.2–10.6
Central and Eastern Europe	28,348	9.6	9.5–9.7
South America	17,151	8.4	8.3–8.5
Southern Africa	1,790	8.0	7.6–8.4
Central America	3,763	5.5	5.3–5.7
Western Asia	4,395	5.2	5.0–5.4
Melanesia	109	4.9	4.0–5.8
South-Central Asia	22,350	3.4	3.4–3.4
Northern Africa	1,694	2.2	2.1–2.3
Eastern Africa	1,152	1.4	1.3–1.5
Western Africa	933	1.2	1.1–1.3
Middle Africa	295	0.9	0.8–1.0

(a) The data were estimated for 2008 and are based on data from approximately 3 to 5 years earlier.

(b) The rates were standardised by the IARC using the Doll et al. (1966) World Standard Population and are expressed per 100,000 females. Countries or regions are ordered in descending order according to the age-standardised rate.

(c) The confidence intervals are approximations and were calculated by the AIHW (see Appendix B).

Source: Ferlay et al. 2010a.

Additional tables for Chapter 4: Mortality from lung cancer

Table D4.1: Mortality from lung cancer by age at death, Australia, 2007

	Males			Females		
Age group (years)	**Number of deaths**	**Age-specific rate[(a)]**	**95% CI**	**Number of deaths**	**Age-specific rate[(a)]**	**95% CI**
<40	18	0.3	0.2–0.5	20	0.4	0.2–0.5
40–44	43	5.7	4.1–7.7	36	4.7	3.3–6.5
45–49	85	11.3	9.0–13.9	77	10.0	7.9–12.5
50–54	186	27.0	23.3–31.2	145	20.8	17.5–24.4
55–59	311	49.2	43.8–54.9	219	34.4	30.0–39.3
60–64	547	102.6	94.2–111.6	319	60.0	53.6–67.0
65–69	683	170.8	158.3–184.1	361	88.5	79.6–98.1
70–74	754	242.1	225.1–260.0	398	118.7	107.4–131.0
75–79	939	369.5	346.2–393.9	519	173.7	159.1–189.3
80–84	711	412.6	382.9–444.1	445	183.3	166.7–201.1
85+	438	388.5	352.9–426.6	372	162.4	146.3–179.8
All ages[(b)]	**4,715**	**46.3**	**45.0–47.6**	**2,911**	**24.0**	**23.1–24.9**

(a) The rates are expressed per 100,000 population.

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

Source: AIHW National Mortality Database.

Table D4.2: Mortality from lung cancer by year of registration of death[(a)], Australia, 1945 to 2007

	Males			Females		
Year	ASR[(a)]	95% CI	Current daily smokers (%)	ASR[(a)]	95% CI	Current daily smokers (%)
1945	10.9	9.7–12.1	. .	3.3	2.7–4.0	. .
1946	12.2	11.0–13.5	. .	3.8	3.1–4.5	. .
1947	14.6	13.2–16.0	. .	3.4	2.7–4.0	. .
1948	14.2	12.8–15.5	. .	4.1	3.4–4.8	. .
1949	17.8	16.3–19.2	. .	3.6	3.0–4.3	. .
1950	19.0	17.5–20.6	. .	4.1	3.4–4.8	. .
1951	20.5	19.0–22.1	. .	4.7	3.9–5.4	. .
1952	24.6	22.9–26.3	. .	4.7	4.0–5.5	. .
1953	25.4	23.7–27.1	. .	5.9	5.0–6.7	. .
1954	27.0	25.2–28.7	. .	4.7	4.0–5.4	. .
1955	30.0	28.2–31.9	. .	4.5	3.8–5.2	. .
1956	31.3	29.5–33.2	. .	5.3	4.6–6.0	. .
1957	34.4	32.4–36.3	. .	5.0	4.3–5.7	. .
1958	34.3	32.4–36.2	. .	5.1	4.4–5.8	. .
1959	38.1	36.1–40.1	. .	5.1	4.4–5.8	. .
1960	39.5	37.4–41.5	. .	5.2	4.5–5.9	. .
1961	43.3	41.2–45.4	. .	5.4	4.7–6.1	. .
1962	46.3	44.2–48.5	. .	6.0	5.3–6.7	. .
1963	48.1	45.9–50.3	. .	6.1	5.4–6.8	. .
1964	51.9	49.6–54.1	58.0	6.9	6.2–7.7	28.0
1965	53.6	51.3–55.9	. .	6.5	5.8–7.3	. .
1966	56.6	54.3–58.9	55.0	6.7	5.9–7.4	26.0
1967	59.9	57.5–62.3	. .	7.7	6.9–8.5	. .
1968	61.6	59.2–64.1	. .	7.9	7.1–8.7	. .
1969	64.1	61.7–66.6	45.0	7.7	6.9–8.5	28.0
1970	65.8	63.3–68.2	. .	9.5	8.6–10.3	. .
1971	65.7	63.3–68.1	. .	9.8	9.0–10.6	. .
1972	66.9	64.5–69.3	. .	9.2	8.4–10.1	. .
1973	68.7	66.2–71.1	. .	10.1	9.3–10.9	. .
1974	71.8	69.3–74.3	45.3	10.1	9.2–10.9	29.6
1975	72.3	69.8–74.7	. .	10.5	9.7–11.3	. .
1976	74.6	72.1–77.1	43.9	11.2	10.3–12.0	32.5
1977	73.9	71.5–76.4	. .	12.9	12.0–13.8	. .
1978	74.6	72.2–77.0	. .	13.3	12.4–14.2	. .
1979	76.0	73.6–78.4	. .	13.6	12.7–14.5	. .
1980	79.4	76.9–81.8	41.1	14.4	13.5–15.4	31.1
1981	78.9	76.5–81.3	. .	14.0	13.1–14.9	. .
1982	79.6	77.2–82.0	. .	15.5	14.6–16.4	. .
1983	76.5	74.2–78.8	40.3	16.7	15.7–17.6	30.9
1984	75.3	73.0–77.6	. .	16.2	15.3–17.2	. .
1985	77.2	74.9–79.4	. .	17.1	16.2–18.1	. .

(Continued)

Table D4.2 (continued): Mortality from lung cancer by year of death registration[(a)], Australia, 1945 to 2007

	Males			Females		
Year	ASR[(b)]	95% CI	Current daily smokers (%)	ASR[(b)]	95% CI	Current daily smokers (%)
1986	73.5	71.3–75.6	32.9	18.0	17.1–19.0	28.5
1987	73.0	70.8–75.1	. .	17.0	16.0–17.9	. .
1988	74.3	72.2–76.5	. .	19.5	18.5–20.5	. .
1989	72.9	70.8–75.0	30.2	19.6	18.6–20.6	27.0
1990	68.5	66.5–70.5	. .	19.3	18.4–20.3	. .
1991	67.9	65.9–69.9	. .	20.6	19.6–21.6	. .
1992	67.4	65.5–69.4	28.2	20.3	19.3–21.2	23.8
1993	64.8	63.0–66.7	. .	21.0	20.0–21.9	. .
1994	67.1	65.2–69.0	. .	21.2	20.3–22.2	. .
1995	63.9	62.1–65.8	26.3	21.9	20.9–22.8	22.0
1996	63.4	61.6–65.2	. .	22.1	21.2–23.1	. .
1997	58.8	57.1–60.5	. .	21.5	20.6–22.4	. .
1998	59.3	57.6–61.0	24.4	20.7	19.8–21.6	19.8
1999	57.1	55.4–58.7	. .	21.4	20.5–22.3	. .
2000	54.7	53.2–56.3	. .	22.2	21.3–23.2	. .
2001	53.5	52.0–55.1	21.4	22.7	21.8–23.6	18.2
2002	53.3	51.8–54.8	. .	23.5	22.6–24.4	. .
2003	49.1	47.7–50.5	. .	22.2	21.3–23.1	. .
2004	50.3	48.8–51.7	18.6	22.2	21.3–23.1	16.3
2005	48.3	46.9–49.7	. .	23.2	22.3–24.0	. .
2006	47.4	46.1–48.8	. .	22.7	21.9–23.6	. .
2007	46.3	45.0–47.6	18.0	24.0	23.1–24.8	15.2

(a) The data are based on year of registration of death rather than year of death.

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

Source: AIHW 2010d; OECD Health Data 2010.

Table D4.3: Mortality from lung cancer, Australia, 1982 to 2007

	Males			Females		
Year	Number of deaths	ASR[(a)]	95% CI	Number of deaths	ASR[(a)]	95% CI
1982	4,227	78.9	76.3–81.5	1,061	15.4	14.5–16.4
1983	4,255	77.0	74.6–79.5	1,178	16.7	15.8–17.7
1984	4,355	77.5	75.1–80.0	1,200	16.7	15.8–17.7
1985	4,396	76.0	73.7–78.5	1,252	17.0	16.1–18.0
1986	4,346	73.1	70.8–75.4	1,341	17.9	16.9–18.9
1987	4,494	73.7	71.4–76.0	1,320	17.3	16.3–18.2
1988	4,595	73.9	71.7–76.2	1,521	19.3	18.3–20.3
1989	4,724	73.8	71.6–76.1	1,584	19.8	18.8–20.8
1990	4,448	68.3	66.2–70.4	1,593	19.4	18.4–20.4
1991	4,518	67.2	65.2–69.3	1,730	20.7	19.8–21.7
1992	4,639	67.2	65.2–69.3	1,720	20.1	19.2–21.1
1993	4,524	64.3	62.4–66.3	1,828	20.9	20.0–21.9
1994	4,833	67.5	65.5–69.5	1,901	21.4	20.4–22.4
1995	4,697	64.0	62.1–65.9	1,999	21.9	21.0–22.9
1996	4,745	63.0	61.1–64.8	2,020	21.8	20.8–22.7
1997	4,545	58.9	57.2–60.7	2,067	21.7	20.7–22.6
1998	4,714	59.3	57.6–61.0	2,050	21.0	20.1–21.9
1999	4,647	57.0	55.3–58.7	2,124	21.2	20.3–22.1
2000	4,595	54.8	53.3–56.5	2,318	22.5	21.6–23.5
2001	4,660	53.7	52.2–55.3	2,384	22.6	21.7–23.5
2002	4,720	53.0	51.5–54.6	2,526	23.4	22.5–24.3
2003	4,507	49.4	47.9–50.9	2,482	22.4	21.6–23.3
2004	4,735	50.8	49.3–52.2	2,527	22.3	21.4–23.2
2005	4,715	49.1	47.7–50.5	2,717	23.4	22.5–24.3
2006	4,676	47.5	46.1–48.9	2,721	23.0	22.1–23.9
2007	4,715	46.3	45.0–47.6	2,911	24.0	23.1–24.9

(a) 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.

Table D4.4: Mortality from lung cancer by age at death, males, Australia, 1982 to 2007

	<60 years		60–69 years		70+ years		All ages	
Year	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI
1982	17.4	16.3–18.6	264.1	250.8–278.0	486.2	462.9–510.4	78.9	76.3–81.5
1983	17.7	16.5–18.8	259.5	246.4–273.1	467.5	445.1–490.7	77.0	74.6–79.5
1984	17.5	16.4–18.6	251.2	238.4–264.5	482.2	459.9–505.3	77.5	75.1–80.0
1985	16.8	15.7–17.9	256.7	243.9–270.0	467.2	445.6–489.6	76.0	73.7–78.5
1986	15.0	14.0–16.0	251.1	238.6–264.0	456.0	435.1–477.5	73.1	70.8–75.4
1987	15.1	14.1–16.1	250.1	237.9–262.8	462.7	442.0–484.0	73.7	71.4–76.0
1988	14.7	13.7–15.8	244.6	232.7–256.9	472.8	452.3–494.0	73.9	71.7–76.2
1989	14.2	13.2–15.2	251.1	239.2–263.3	471.2	451.1–491.9	73.8	71.6–76.1
1990	13.2	12.2–14.1	230.6	219.3–242.2	437.0	417.9–456.7	68.3	66.2–70.4
1991	12.8	11.9–13.7	232.6	221.3–244.2	427.2	408.8–446.2	67.2	65.2–69.3
1992	12.7	11.8–13.6	231.4	220.2–243.0	429.1	411.1–447.6	67.2	65.2–69.3
1993	11.5	10.7–12.4	216.9	206.1–228.2	419.9	402.4–437.9	64.3	62.4–66.3
1994	11.2	10.4–12.1	220.7	209.8–232.0	454.0	436.1–472.5	67.5	65.5–69.5
1995	10.5	9.7–11.3	209.8	199.2–220.9	432.3	415.2–449.9	64.0	62.1–65.9
1996	10.2	9.4–11.0	206.1	195.6–217.0	426.6	410.0–443.7	63.0	61.1–64.8
1997	9.2	8.5–9.9	187.7	177.8–198.1	406.8	390.9–423.2	58.9	57.2–60.7
1998	9.1	8.5–9.9	188.1	178.2–198.4	410.8	395.2–426.9	59.3	57.6–61.0
1999	9.0	8.3–9.7	172.8	163.4–182.7	400.2	385.0–415.8	57.0	55.3–58.7
2000	8.4	7.8–9.0	165.4	156.2–175.0	388.2	373.5–403.2	54.8	53.3–56.5
2001	8.5	7.8–9.1	161.3	152.3–170.7	378.4	364.2–392.9	53.7	52.2–55.3
2002	8.1	7.5–8.7	150.9	142.4–159.9	383.0	369.0–397.3	53.0	51.5–54.6
2003	7.5	6.9–8.1	143.6	135.4–152.2	354.5	341.2–368.2	49.4	47.9–50.9
2004	7.7	7.2–8.3	140.4	132.4–148.8	370.2	356.7–384.0	50.8	49.3–52.2
2005	6.7	6.1–7.2	144.3	136.4–152.7	358.5	345.5–371.9	49.1	47.7–50.5
2006	7.2	6.7–7.8	131.2	123.8–139.1	346.9	334.2–359.9	47.5	46.1–48.9
2007	6.9	6.4–7.5	133.6	126.2–141.2	334.1	321.9–346.6	46.3	45.0–47.6

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

Source: AIHW National Mortality Database.

Table D4.5: Mortality from lung cancer by age at death, females, Australia, 1982 to 2007

	<60 years		60–69 years		70+ years		All ages	
Year	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI	ASR[(a)]	95% CI
1982	5.4	4.8–6.1	62.2	56.2–68.7	67.6	61.1–74.7	15.4	14.5–16.4
1983	5.5	4.8–6.1	67.3	61.1–74.0	77.1	70.2–84.5	16.7	15.8–17.7
1984	5.5	4.9–6.2	62.2	56.2–68.6	81.1	74.2–88.5	16.7	15.8–17.7
1985	5.7	5.1–6.4	63.9	57.9–70.3	81.3	74.5–88.5	17.0	16.1–18.0
1986	5.9	5.3–6.6	64.2	58.3–70.5	88.4	81.4–95.9	17.9	16.9–18.9
1987	5.3	4.7–5.9	60.6	54.9–66.7	90.7	83.8–98.2	17.3	16.3–18.2
1988	5.6	5.0–6.2	71.9	65.8–78.5	100.6	93.3–108.3	19.3	18.3–20.3
1989	6.0	5.4–6.7	69.9	63.9–76.3	103.5	96.2–111.2	19.8	18.8–20.8
1990	5.3	4.7–5.9	72.2	66.1–78.7	104.3	97.0–111.9	19.4	18.4–20.4
1991	5.9	5.3–6.6	74.1	67.9–80.6	111.6	104.2–119.3	20.7	19.8–21.7
1992	5.2	4.6–5.8	71.5	65.5–77.9	113.4	106.1–121.1	20.1	19.2–21.1
1993	5.5	4.9–6.1	71.2	65.2–77.6	120.3	112.8–128.1	20.9	20.0–21.9
1994	5.7	5.2–6.4	72.0	66.0–78.5	121.9	114.5–129.6	21.4	20.4–22.4
1995	5.4	4.8–6.0	74.0	67.8–80.5	129.8	122.3–137.7	21.9	21.0–22.9
1996	6.0	5.4–6.6	73.4	67.2–79.9	123.1	115.9–130.6	21.8	20.8–22.7
1997	5.7	5.1–6.2	74.0	67.9–80.6	124.2	117.1–131.7	21.7	20.7–22.6
1998	5.3	4.7–5.8	68.7	62.8–75.0	124.7	117.7–132.1	21.0	20.1–21.9
1999	5.0	4.5–5.6	68.8	63.0–75.1	129.0	121.9–136.4	21.2	20.3–22.1
2000	5.4	4.9–6.0	70.4	64.5–76.7	139.0	131.7–146.5	22.5	21.6–23.5
2001	5.4	4.9–6.0	72.2	66.3–78.5	138.3	131.1–145.8	22.6	21.7–23.5
2002	5.6	5.1–6.1	70.3	64.5–76.5	147.1	139.7–154.8	23.4	22.5–24.3
2003	5.0	4.5–5.5	69.2	63.6–75.3	143.0	135.8–150.5	22.4	21.6–23.3
2004	5.0	4.5–5.5	68.7	63.1–74.6	142.2	135.1–149.6	22.3	21.4–23.2
2005	4.8	4.4–5.3	72.9	67.3–78.8	152.2	144.9–159.8	23.4	22.5–24.3
2006	5.3	4.8–5.8	75.5	69.9–81.5	141.3	134.3–148.6	23.0	22.1–23.9
2007	5.3	4.9–5.8	72.9	67.5–78.6	153.8	146.5–161.3	24.0	23.1–24.9

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

Source: AIHW National Mortality Database.

Table D4.6: Mortality from lung cancer by remoteness area, Australia, 2003–2007

	Males			Females		
Remoteness area[(a)]	**Average annual number of deaths[(b)]**	**ASR[(c)]**	**95% CI**	**Average annual number of deaths[(b)]**	**ASR[(c)]**	**95% CI**
Major cities	2,871	45.9	45.1–46.6	1,725	22.0	21.5–22.4
Inner regional	1,132	52.0	50.6–53.4	613	24.3	23.4–25.2
Outer regional	555	55.2	53.2–57.4	285	26.6	25.2–28.0
Remote and very remote	104	57.9	52.7–63.4	46	27.0	23.6–30.9
Not stated	8	. .	. .	4	. .	. .
Total	**4,670**	**48.6**	**47.9–49.2**	**2,671**	**23.0**	**22.7–23.4**

(a) Classified according to the Australian Standard Geographical Classification (ASGC) Remoteness Areas (see Appendix A).

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

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of deaths over the 5 years from 2003–2007.

Source: AIHW National Mortality Database.

Table D4.7: Mortality from lung cancer by socioeconomic status, Australia, 2003–2007

	Males			Females		
Socioeconomic status[(a)]	**Average annual number of deaths[(b)]**	**ASR[(c)]**	**95% CI**	**Average annual number of deaths[(b)]**	**ASR[(c)]**	**95% CI**
1 (Lowest)	1,130	56.1	54.7–57.6	576	24.7	23.8–25.6
2	1,174	55.6	54.2–57.1	646	26.0	25.1–26.9
3	924	48.6	47.2–50.1	498	22.3	21.4–23.1
4	755	42.8	41.4–44.2	470	21.6	20.8–22.5
5 (Highest)	660	36.2	35.0–37.5	466	19.6	18.8–20.5
Not stated	25	. .	. .	15	. .	. .
Total	**4,670**	**48.6**	**47.9–49.2**	**2,671**	**23.0**	**22.7–23.4**

(a) Classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix A).

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

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of deaths over the 5 years from 2003–2007.

Source: AIHW National Mortality Database.

Table D4.8: Mortality from lung cancer by Indigenous status, New South Wales, Queensland, Western Australia, South Australia and the Northern Territory, 2003–2007

	Males			Females		
Indigenous status	**Average annual number of deaths[(a)]**	**ASR[(b)]**	**95% CI**	**Average annual number of deaths[(a)]**	**ASR[(b)]**	**95% CI**
Indigenous	54	78.1	67.5–89.6	38	43.0	36.5–50.1
Non-indigenous	3,250	47.9	47.1–48.6	1,821	22.5	22.0–22.9
Not stated	27	..	..	14	..	..
Total	**3,330**	**48.6**	**47.9–49.4**	**1,873**	**22.9**	**22.4–23.4**

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

(b) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of deaths over the 5 years from 2003–2007.

Source: AIHW National Mortality Database.

Table D4.9: Mortality from lung cancer by country/region of birth, males, Australia, 2003–2007

Country/region of birth[(a)]	Average annual number of deaths[(b)]	Age-standardised rate[(c)]	95% confidence interval
United Kingdom (UK) and Ireland	631	56.2	54.2–58.2
North-West Europe, excl. UK and Ireland	184	54.0	50.5–57.7
United States of America (USA) and Canada	19	51.0	40.8–62.8
Southern and Eastern Europe	571	50.2	48.3–52.1
Australia	2,922	47.3	46.5–48.1
North Africa and the Middle East	65	46.9	41.7–52.6
Oceania and Antarctica, excl. Australia and New Zealand	13	42.4	31.4–55.7
Americas, excl. USA and Canada	13	41.3	30.2–54.6
New Zealand	61	39.9	35.0–45.2
North-East Asia	53	38.7	34.1–43.8
South-East Asia	58	37.9	33.3–43.0
Sub-Saharan Africa	20	32.9	26.3–40.6
Southern and Central Asia	27	27.6	23.0–32.8
Inadequately described, not stated or unknown	31	. .	. .
Total	**4,670**	**48.6**	**47.9–49.2**

(a) Classified according to the Standard Australian Classification of Countries, second edition (see Appendix A).

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

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007. Countries/regions of birth are ordered in descending order according to the age-standardised rate.

Source: AIHW National Mortality Database.

Table D4.10: Mortality from lung cancer by country/region of birth, females, Australia, 2003–2007

Country/region of birth[(a)]	Average annual number of deaths[(b)]	Age-standardised rate[(c)]	95% confidence interval
United Kingdom (UK) and Ireland	418	33.9	32.4–35.4
Oceania and Antarctica, excl. Australia and New Zealand	10	27.9	20.2–37.3
New Zealand	46	27.6	23.9–31.6
North-West Europe, excl. UK and Ireland	99	27.5	25.0–30.2
North-East Asia	42	24.1	20.9–27.7
Australia	1,802	23.1	22.6–23.6
Sub-Saharan Africa	14	19.3	14.9–24.5
United States of America (USA) and Canada	7	18.8	12.6–26.9
Americas, excl. USA and Canada	7	17.0	11.5–24.1
Southern and Central Asia	18	15.5	12.5–19.1
South-East Asia	35	14.6	12.4–17.1
Southern and Eastern Europe	148	13.5	12.5–14.6
North Africa and the Middle East	17	12.9	10.3–16.0
Inadequately described, not stated or unknown	8	. .	. .
Total	**2,671**	**23.0**	**22.7–23.4**

(a) Classified according to the Standard Australian Classification of Countries, second edition (see Appendix A).

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

(c) The rates were standardised to the Australian population as at 30 June 2001 and are expressed per 100,000 population. The rates are based on the total number of cases over the 5 years from 2003–2007. Countries/regions of birth are ordered in descending order according to the age-standardised rate.

Source: AIHW National Mortality Database.

Table D4.11: International comparison of estimated mortality from lung cancer, males, 2008[(a)]

Country or region	Estimated number of deaths	Age-standardised rate[(b)]	95% confidence interval[(c)]
Central and Eastern Europe	99,480	51.6	51.3–51.9
Southern Europe	61,009	42.3	42.0–42.6
Polynesia	102	40.6	32.7–48.5
Eastern Asia	372,983	38.1	38.0–38.2
Northern America	101,221	37.9	37.7–38.1
Western Europe	66,308	37.1	36.8–37.4
Micronesia	62	32.2	24.2–40.2
Northern Europe	29,800	32.2	31.8–32.6
World	***951,023***	***29.4***	***29.3–29.5***
Western Asia	20,562	28.4	28.0–28.8
Southern Africa	4,331	27.4	26.6–28.2
South-Eastern Asia	58,000	26.3	26.1–26.5
Australia	***4,697***	***25.7***	***25.0–26.4***
New Zealand	868	25.5	23.8–27.2
Caribbean	5,157	23.6	23.0–24.2
South America	31,326	18.8	18.6–19.0
Northern Africa	9,634	14.0	13.7–14.3
Central America	7,253	12.2	11.9–12.5
South-Central Asia	72,531	12.0	11.9–12.1
Melanesia	235	11.7	10.2–13.2
Eastern Africa	2,695	4.0	3.8–4.2
Western Africa	2,000	2.9	2.8–3.0
Middle Africa	769	2.7	2.5–2.9

(a) The data were estimated for 2008 and are based on data from approximately 3 to 5 years earlier.

(b) The rates were standardised by the IARC using the Doll et al. (1966) World Standard Population and are expressed per 100,000 males. Countries or regions are ordered in descending order according to the age-standardised rate.

(c) The confidence intervals are approximations and were calculated by the AIHW (see Appendix B).

Source: Ferlay et al. 2010a.

Table D4.12: International comparison of estimated mortality from lung cancer, females, 2008[(a)]

Country or region	Estimated number of deaths	Age-standardised rate[(b)]	95% confidence interval[(c)]
Northern America	79,260	24.2	24.0–24.4
Northern Europe	21,649	18.8	18.5–19.1
New Zealand	683	18.6	17.2–20.0
Eastern Asia	177,535	16.3	16.2–16.4
Australia	***2,835***	***13.8***	***13.3–14.3***
Polynesia	37	13.8	9.4–18.2
Western Europe	26,604	12.9	12.7–13.1
Micronesia	27	12.4	7.7–17.1
Caribbean	2,724	11.1	10.7–11.5
World	***427,392***	***11.0***	***11.0–11.0***
South-Eastern Asia	27,865	10.4	10.3–10.5
Southern Europe	14,830	8.5	8.4–8.6
Central and Eastern Europe	24,279	7.9	7.8–8.0
South America	15,479	7.5	7.4–7.6
Southern Africa	1,661	7.4	7.0–7.8
Central America	3,673	5.3	5.1–5.5
Melanesia	103	4.7	3.8–5.6
Western Asia	3,922	4.6	4.5–4.7
South-Central Asia	20,374	3.1	3.1–3.1
Northern Africa	1,576	2.0	1.9–2.1
Eastern Africa	1,119	1.3	1.2–1.4
Western Africa	876	1.1	1.0–1.2
Middle Africa	281	0.8	0.7–0.9

(a) The data were estimated for 2008 and are based on data from approximately 3 to 5 years earlier.

(b) The rates were standardised by the IARC using the Doll et al. (1966) World Standard Population and are expressed per 100,000 females. Countries or regions are ordered in descending order according to the age-standardised rate.

(c) The confidence intervals are approximations and were calculated by the AIHW (see Appendix B).

Source: Ferlay et al. 2010a.

Additional tables for Chapter 5: Survival after a diagnosis of lung cancer

Table D5.1: Five-year relative survival, most commonly diagnosed cancers[(a)], Australia, 2000–2007

	Males		Females	
Cancer type	**RS (%)**	**95% CI**	**RS (%)**	**95% CI**
Prostate cancer	89.4	89.1–89.7	. .	. .
Bowel cancer	63.0	62.5–63.5	64.3	63.8–64.9
Breast cancer	. .	. .	88.6	88.3–88.9
Melanoma of skin	89.1	88.6–89.5	93.9	93.5–94.3
Lung cancer	11.3	11.0–11.6	15.0	14.5–15.5
Lymphoid cancers[(b)]	63.8	63.2–64.5	64.8	64.0–65.5
All cancers[(c)]	**61.6**	**61.4–61.8**	**65.3**	**65.2–65.5**

(a) Determined by most commonly diagnosed cancers in 2007 and ordered accordingly. Excludes non-melanoma skin cancer (C44).

(b) Lymphoid cancers (ICD-10 codes of C81–C85, C88, C90, C91) are cancers that start in lymphocytes of the immune system. The most common types are lymphomas, lymphoid leukaemia and myeloma.

(c) Includes cancers coded in ICD–10 as C00–C97 (except for C44), D45, D46, D47.1 and D47.3.

Source: AIHW Australian Cancer Database 2007.

Table D5.2: One–year relative survival by age at diagnosis, lung cancer, Australia, 2000–2007

	Males			Females		
Age at diagnosis (years)	**No. of diagnosed cases[(a)]**	**RS (%)**	**95% CI**	**No. of diagnosed cases[(a)]**	**RS (%)**	**95% CI**
<30	60	83.2	71.2–90.6	51	88.4	75.7–94.6
30–39	223	56.4	49.6–62.6	221	67.1	60.5–72.9
40–49	1,429	44.3	41.7–46.8	1,363	53.1	50.4–55.7
50–59	5,711	42.4	41.1–43.7	3,855	52.1	50.5–53.7
60–69	12,218	39.6	38.8–40.5	6,533	46.8	45.6–48.0
70–79	17,127	32.5	31.9–33.2	8,591	36.3	35.3–37.2
80+	8,810	20.6	19.8–21.4	5,504	20.9	19.9–21.9
All ages	**45,578**	**34.2**	**33.8–34.7**	**26,118**	**39.8**	**39.2–40.3**

(a) Equals the total number of cases diagnosed in the period considered.

Source: AIHW Australian Cancer Database 2007.

Table D5.3: Five–year relative survival by age at diagnosis, lung cancer, Australia, 2000–2007

Age at diagnosis (years)	Males			Females		
	No. of diagnosed cases[(a)]	RS (%)	95% CI	No. of diagnosed cases[(a)]	RS (%)	95% CI
<30	60	67.8	54.2–78.2	51	73.3	58.3–83.7
30–39	223	33.6	27.4–39.8	221	38.3	31.8–44.8
40–49	1,429	16.7	14.8–18.8	1,363	22.4	20.2–24.7
50–59	5,711	14.9	13.9–15.8	3,855	20.6	19.3–21.9
60–69	12,218	13.7	13.1–14.3	6,533	19.0	18.1–20.0
70–79	17,127	10.3	9.8–10.8	8,591	12.5	11.8–13.3
80+	8,810	5.1	4.6–5.7	5,504	5.7	5.0–6.5
All ages	**45,578**	**11.3**	**11.0–11.6**	**26,118**	**15.0**	**14.5–15.5**

(a) Equals the total number of cases diagnosed in the period considered.

Source: AIHW Australian Cancer Database 2007.

Table D5.4: Ten–year relative survival by age at diagnosis, lung cancer, Australia, 2000–2007

Age at diagnosis (years)	Males			Females		
	No. of diagnosed cases[(a)]	RS (%)	95% CI	No. of diagnosed cases[(a)]	RS (%)	95% CI
<30	60	65.6	51.6–76.5	51	73.5	58.4–83.8
30–39	223	30.4	24.1–37.1	221	34.2	27.1–41.3
40–49	1,429	14.1	12.1–16.2	1,363	18.9	16.5–21.5
50–59	5,711	10.9	9.9–12.1	3,855	16.0	14.5–17.6
60–69	12,218	9.1	8.3–9.9	6,533	14.2	13.0–15.4
70–79	17,127	6.7	6.1–7.5	8,591	8.2	7.2–9.3
80+	8,810	4.3	3.1–5.8	5,504	4.1	2.8–5.9
All ages	**45,578**	**7.9**	**7.5–8.3**	**26,118**	**11.1**	**10.5–11.7**

(a) Equals the total number of cases diagnosed in the period considered.

Source: AIHW Australian Cancer Database 2007.

Table D5.5: Relative survival by period of diagnosis, lung cancer, males, Australia, 1982–1987 to 2000–2007

Years after diagnosis	1982–1987		1988–1993		1994–1999		2000–2007	
	RS (%)	95% CI	RS (%)	95% CI	RS (%)	95% CI	RS (%)	95% CI
1	28.6	28.1–29.2	30.4	29.9–30.9	32.5	32.0–33.0	34.2	33.8–34.7
2	15.4	14.9–15.8	16.7	16.3–17.2	18.5	18.1–18.9	20.1	19.7–20.4
3	11.1	10.8–11.5	12.4	12.0–12.7	13.6	13.2–13.9	15.3	14.9–15.6
4	9.2	8.9–9.6	10.3	10.0–10.7	11.5	11.1–11.8	12.8	12.5–13.1
5	8.1	7.8–8.4	9.1	8.8–9.5	10.2	9.8–10.5	11.3	11.0–11.6
6	7.4	7.1–7.7	8.4	8.0–8.7	9.3	8.9–9.6	10.3	10.0–10.6
7	7.0	6.7–7.3	7.7	7.4–8.0	8.6	8.2–8.9	9.5	9.2–9.8
8	6.6	6.2–6.9	7.2	6.9–7.5	8.0	7.7–8.3	8.9	8.5–9.2
9	6.3	6.0–6.6	6.8	6.4–7.1	7.6	7.3–7.9	8.3	7.9–8.7
10	5.9	5.6–6.2	6.4	6.1–6.7	7.3	6.9–7.6	7.9	7.5–8.3
11	5.7	5.4–6.0	6.1	5.8–6.4	7.0	6.6–7.3	7.4	6.8–7.9
12	5.4	5.1–5.7	5.8	5.5–6.1	6.6	6.3–6.9	. .	. .
13	5.2	4.9–5.5	5.6	5.3–5.9	6.3	6.0–6.7	. .	. .
14	4.9	4.6–5.3	5.4	5.1–5.7	6.1	5.7–6.4	. .	. .
15	4.8	4.5–5.1	5.2	4.9–5.5	5.9	5.5–6.2	. .	. .
16	4.7	4.4–5.1	5.1	4.8–5.4	5.6	5.2–6.0	. .	. .
17	4.6	4.3–5.0	5.0	4.7–5.4	5.4	5.0–6.0	. .	. .
18	4.6	4.3–4.9	4.9	4.5–5.2	. .	. .	. .	. .
19	4.6	4.3–4.9	4.9	4.6–5.3	. .	. .	. .	. .
20	4.5	4.2–4.9	5.0	4.6–5.4	. .	. .	. .	. .
21	4.5	4.2–4.9	5.2	4.8–5.6	. .	. .	. .	. .
22	4.6	4.3–5.0	5.4	4.9–5.9	. .	. .	. .	. .
23	4.7	4.3–5.2	5.3	4.7–6.1	. .	. .	. .	. .
24	4.9	4.5–5.4	. .	. .	. .	. .	. .	. .
25	5.1	4.6–5.6	. .	. .	. .	. .	. .	. .
26	5.5	5.0–6.0	. .	. .	. .	. .	. .	. .
27	5.9	5.3–6.5	. .	. .	. .	. .	. .	. .
28	6.4	5.7–7.1	. .	. .	. .	. .	. .	. .

Source: AIHW Australian Cancer Database 2007.

Table D5.6: Relative survival by period of diagnosis, lung cancer, females, Australia, 1982–1987 to 2000–2007

Years after diagnosis	1982–1987		1988–1993		1994–1999		2000–2007	
	RS (%)	95% CI	RS (%)	95% CI	RS (%)	95% CI	RS (%)	95% CI
1	31.1	30.1–32.1	33.0	32.1–33.8	36.9	36.2–37.7	39.8	39.2–40.3
2	17.7	16.9–18.5	19.1	18.4–19.8	22.1	21.5–22.8	25.3	24.8–25.8
3	13.4	12.7–14.2	14.8	14.2–15.5	17.2	16.6–17.8	19.7	19.2–20.1
4	11.5	10.8–12.1	12.5	11.9–13.1	14.8	14.3–15.4	16.9	16.4–17.4
5	10.4	9.8–11.1	11.3	10.7–11.9	13.3	12.7–13.9	15.0	14.5–15.5
6	9.5	8.9–10.2	10.4	9.8–11.0	12.2	11.7–12.8	13.9	13.5–14.4
7	9.1	8.4–9.7	9.6	9.1–10.2	11.4	10.9–12.0	13.1	12.6–13.5
8	8.6	8.0–9.3	9.0	8.5–9.6	10.7	10.2–11.2	12.5	12.0–13.0
9	8.0	7.4–8.7	8.6	8.1–9.1	9.9	9.4–10.4	11.8	11.3–12.3
10	7.7	7.1–8.3	8.2	7.6–8.7	9.5	9.0–10.0	11.1	10.5–11.7
11	7.4	6.8–8.0	7.8	7.3–8.3	9.1	8.6–9.6	10.8	10.1–11.5
12	7.1	6.5–7.7	7.5	7.0–8.1	8.7	8.2–9.2	. .	. .
13	6.7	6.1–7.3	7.4	6.8–7.9	8.5	8.0–9.0	. .	. .
14	6.5	6.0–7.1	7.1	6.6–7.7	8.2	7.6–8.7	. .	. .
15	6.4	5.8–7.0	6.9	6.3–7.4	7.9	7.4–8.5	. .	. .
16	6.2	5.6–6.8	6.6	6.1–7.2	7.8	7.2–8.4	. .	. .
17	6.0	5.4–6.6	6.4	5.9–6.9	7.8	7.0–8.5	. .	. .
18	6.0	5.4–6.6	6.3	5.7–6.8	. .	. .	. .	. .
19	5.9	5.3–6.5	6.2	5.6–6.7	. .	. .	. .	. .
20	5.8	5.2–6.5	6.0	5.4–6.5	. .	. .	. .	. .
21	5.8	5.2–6.5	5.9	5.4–6.6	. .	. .	. .	. .
22	5.8	5.1–6.4	6.0	5.4–6.7	. .	. .	. .	. .
23	5.8	5.2–6.5	6.4	5.7–7.1	. .	. .	. .	. .
24	5.9	5.2–6.7	. .	. .	. .	. .	. .	. .
25	5.9	5.2–6.7	. .	. .	. .	. .	. .	. .
26	6.1	5.4–6.9	. .	. .	. .	. .	. .	. .
27	6.1	5.3–7.0	. .	. .	. .	. .	. .	. .
28	6.4	5.4–7.4	. .	. .	. .	. .	. .	. .

Source: AIHW Australian Cancer Database 2007.

Table D5.7: Five–year relative survival by age at diagnosis, lung cancer, Australia, 1982–1987 to 2000–2007

Age at diagnosis (years)	1982–1987			1988–1993			1994–1999			2000–2007		
	No.[(a)]	RS(%)	95% CI	No.[(a)]	RS(%)	95% CI	No.[(a)]	RS(%)	95% CI	No.[(a)]	RS(%)	95% CI
						Males						
<30	24	66.4	44.3–81.5	29	82.8	63.7–92.6	43	72.2	56.3–83.3	60	67.8	54.2–78.2
30–39	161	21.4	15.5–27.9	141	28.9	21.7–36.4	171	30.0	23.4–36.8	223	33.6	27.4–39.8
40–49	1,223	14.8	12.8–16.8	1,208	12.4	10.6–14.3	1,062	16.2	14.1–18.4	1,429	16.7	14.8–18.8
50–59	5,377	11.6	10.8–12.5	4,437	13.7	12.7–14.7	4,070	14.5	13.4–15.6	5,711	14.9	13.9–15.8
60–69	10,624	9.0	8.5–9.6	11,210	10.2	9.6–10.8	10,150	11.5	10.8–12.1	12,218	13.7	13.1–14.3
70–79	9,318	5.2	4.7–5.7	10,111	7.0	6.5–7.5	12,136	8.9	8.4–9.5	17,127	10.3	9.8–10.8
80+	2,684	1.6	1.1–2.3	3,558	2.5	1.9–3.1	4,672	3.3	2.8–4.0	8,810	5.1	4.6–5.7
All ages	**29,421**	**8.1**	**7.8–8.4**	**30,697**	**9.1**	**8.8–9.5**	**32,304**	**10.2**	**9.8–10.5**	**45,578**	**11.3**	**11.0–11.6**
						Females						
<30	35	68.0	50.2–80.7	28	59.9	40.0–75.1	29	72.8	52.6–85.6	51	73.3	58.3–83.7
30–39	153	24.7	18.2–31.9	148	32.3	25.0–39.9	148	33.6	26.1–41.1	221	38.3	31.8–44.8
40–49	541	19.1	15.9–22.5	712	20.4	17.6–23.4	854	22.0	19.3–24.8	1,363	22.4	20.2–24.7
50–59	1,610	13.8	12.2–15.6	1,708	15.6	14.0–17.4	2,128	18.4	16.8–20.0	3,855	20.6	19.3–21.9
60–69	3,040	10.3	9.2–11.4	3,813	13.1	12.0–14.2	4,007	15.4	14.3–16.6	6,533	19.0	18.1–20.0
70–79	2,427	6.7	5.7–7.8	3,904	7.0	6.2–7.9	5,179	10.8	9.9–11.7	8,591	12.5	11.8–13.3
80+	821	2.4	1.4–3.9	1,462	4.7	3.6–6.0	2,420	4.6	3.7–5.6	5,504	5.7	5.0–6.5
All ages	**8,631**	**10.4**	**9.8–11.1**	**11,776**	**11.3**	**10.7–11.9**	**14,765**	**13.3**	**12.7–13.9**	**26,118**	**15.0**	**14.5–15.5**

(a) Equals the total number of diagnosed cases in the period considered.

Source: AIHW Australian Cancer Database 2007.

Table D5.8: Five–year relative survival by type of lung cancer and age at diagnosis, Australia, 1982–2007

	<60 years			60–69 years			70–79 years			80+ years		
Type of lung cancer[(a)]	**No.**[(b)]	**RS (%)**	**95% CI**	**No.**[(b)]	**RS (%)**	**95% CI**	**No.**[(b)]	**RS (%)**	**95% CI**	**No.**[(b)]	**RS (%)**	**95% CI**
					Males							
1: Small cell Carcinoma	3,986	6.4	5.7–7.2	6,529	4.6	4.1–5.2	5,870	3.4	2.9–3.9	1,638	1.1	0.7–1.8
2: Non–small cell carcinoma	18,806	14.9	14.4–15.4	33,247	12.6	12.3–13.0	35,901	9.7	9.4–10.1	12,930	4.7	4.3–5.2
2.1: Squamous cell carcinoma	*6,195*	*18.3*	*17.4–19.3*	*13,295*	*15.3*	*14.6–15.9*	*14,431*	*12.2*	*11.6–12.8*	*4,091*	*6.8*	*5.8–7.9*
2.2: Adenocarcinoma	*7,276*	*16.2*	*15.4–17.1*	*10,652*	*14.3*	*13.6–15.0*	*10,295*	*11.7*	*11.1–12.4*	*3,219*	*6.2*	*5.3–7.3*
2.3: Large cell carcinoma	*5,335*	*9.1*	*8.4–9.9*	*9,300*	*6.9*	*6.4–7.5*	*11,175*	*4.7*	*4.3–5.1*	*5,620*	*2.3*	*1.9–2.8*
3: Other specified carcinoma	1,479	35.5	33.0–37.9	1,758	18.2	16.3–20.1	1,990	13.4	11.8–15.1	792	7.6	5.5–10.2
4: Other and unspecified malignant neoplasm	1,097	10.9	9.2–12.7	2,668	3.6	3.0–4.3	4,930	2.1	1.8–2.5	4,357	1.3	0.9–1.7
Total	**25,369**	**14.7**	**14.2–15.1**	**44,202**	**11.2**	**10.9–11.5**	**48,692**	**8.3**	**8.0–8.6**	**19,724**	**3.7**	**3.4–4.1**
					Females							
1: Small cell Carcinoma	2,238	10.0	8.8–11.3	3,248	7.1	6.2–8.0	3,050	3.9	3.3–4.7	768	2.5	1.6–3.9
2: Non–small cell carcinoma	9,571	18.5	17.7–19.2	12,068	16.5	15.8–17.2	13,866	11.7	11.1–12.2	6,325	5.8	5.1–6.5
2.1: Squamous cell carcinoma	*1,589*	*18.1*	*16.2–20.0*	*3,134*	*17.3*	*16.0–18.7*	*3,816*	*11.8*	*10.7–12.9*	*1,318*	*5.6*	*4.2–7.2*
2.2: Adenocarcinoma	*5,344*	*21.8*	*20.7–23.0*	*5,408*	*21.2*	*20.1–22.3*	*5,438*	*17.0*	*15.9–18.0*	*2,113*	*9.3*	*7.9–10.8*
2.3: Large cell carcinoma	*2,638*	*11.9*	*10.7–13.1*	*3,526*	*8.7*	*7.8–9.7*	*4,612*	*5.5*	*4.8–6.2*	*2,894*	*3.2*	*2.6–4.0*
3: Other specified carcinoma	1,272	52.8	50.0–55.5	1,067	33.5	30.5–36.4	1,018	27.2	24.3–30.2	453	13.6	10.2–17.7
4: Other and unspecified malignant neoplasm	502	14.7	11.8–18.0	1,010	8.2	6.7–9.8	2,167	3.1	2.5–3.9	2,658	2.6	2.0–3.3
Total	**13,583**	**20.2**	**19.5–20.9**	**17,393**	**15.4**	**14.8–15.9**	**20,101**	**10.3**	**9.9–10.7**	**10,207**	**5.0**	**4.6–5.5**

(a) All cases were coded as primary site, invasive lung cancers. Table 3.4 in Chapter 3 provides a list of the histology types included in each group.

(b) The number of cases equals the total number of diagnosed cases in the period considered.

Source: AIHW Australian Cancer Database 2007.

Table D5.9: International comparison of mortality-to-incidence ratios for lung cancer(a, b), 2008

Country or region	Males			Females		
	Mortality: ASR	Incidence: ASR	Mortality-to-Incidence ratio	Mortality: ASR	Incidence: ASR	Mortality-to-Incidence ratio
Eastern Africa	4.0	4.1	1.0	1.3	1.4	0.9
Middle Africa	2.7	2.8	1.0	0.8	0.9	0.9
Central America	12.2	12.8	1.0	5.3	5.5	1.0
Southern Africa	27.4	29.0	0.9	7.4	8.0	0.9
Melanesia	11.7	12.4	0.9	4.7	4.9	1.0
Northern Africa	14.0	14.9	0.9	2.0	2.2	0.9
Western Africa	2.9	3.1	0.9	1.1	1.2	0.9
Western Asia	28.4	30.7	0.9	4.6	5.2	0.9
South America	18.8	20.4	0.9	7.5	8.4	0.9
Caribbean	23.6	25.7	0.9	11.1	12.1	0.9
South-Central Asia	12.0	13.1	0.9	3.1	3.4	0.9
Central and Eastern Europe	51.6	57.0	0.9	7.9	9.6	0.8
South-Eastern Asia	26.3	29.6	0.9	10.4	11.9	0.9
Polynesia	40.6	46.5	0.9	13.8	14.9	0.9
World	***29.4***	***34.0***	***0.9***	***11.0***	***13.5***	***0.8***
Southern Europe	42.3	49.0	0.9	8.5	10.4	0.8
New Zealand	25.5	29.6	0.9	18.6	23.4	0.8
Eastern Asia	38.1	45.0	0.8	16.3	19.9	0.8
Western Europe	37.1	44.7	0.8	12.9	16.7	0.8
Northern Europe	32.2	39.3	0.8	18.8	21.8	0.9
Northern America	37.9	48.5	0.8	24.2	35.8	0.7
Australia	***25.7***	***32.9***	***0.8***	***13.8***	***19.2***	***0.7***
Micronesia	32.2	46.9	0.7	12.4	17.2	0.7

(a) The ratios were based on estimates for 2008 and are based on data from approximately 3 to 5 years earlier. The rates were age-standardised by the IARC using the Doll et al. (1966) World Standard Population. The confidence intervals (as shown by the error bars) are approximations and were calculated by the AIHW (see Appendix F).

(b) The mortality-to-incidence ratio equals the age-standardised mortality rate divided by the age-standardised incidence rate.

Source: Ferlay et al. 2010.

Additional tables for Chapter 7: Burden of disease due to lung cancer

Table D7.1: Estimated leading causes of burden of disease by age, males, Australia, 2011

Age group (years)	Ischaemic heart disease	Type 2 diabetes	Anxiety and depression	Lung cancer	Stroke
<1	5	4	0	6	83
1–4	3	22	0	1	331
5–9	4	40	920	6	411
10–14	5	60	8,558	1	441
15–19	101	68	12,392	3	492
20–24	154	101	6,483	13	611
25–29	557	562	6,241	14	661
30–34	1,394	2,282	6,241	105	846
35–39	2,810	4,812	6,568	309	1,264
40–44	3,156	8,106	6,911	660	1,396
45–49	4,511	9,857	6,289	1,299	2,049
50–54	6,944	11,953	4,012	2,655	2,569
55–59	9,750	11,042	1,884	5,498	3,171
60–64	13,538	11,775	1,391	8,754	4,012
65–69	16,771	11,546	1,423	11,399	5,089
70–74	17,867	8,916	606	10,739	5,601
75–79	18,555	6,450	207	8,085	6,819
80–84	18,908	4,914	141	4,864	7,613
85–89	14,964	3,058	82	2,117	6,448
90–94	6,180	1,068	36	463	2,820
95–99	1,156	219	5	65	585
100+	116	45	2	0	68
All ages[(a)]	**137,400**	**96,900**	**70,400**	**57,100**	**53,400**

(a) The estimates may not add up due to rounding.

Source: AIHW Burden of disease Database.

Table D7.2: Estimated leading causes of burden of disease by age, females, Australia, 2011

Age group (years)	Anxiety and depression	Ischaemic heart disease	Type 2 diabetes	Dementia	Stroke	Breast cancer	Lung cancer
<1	0	1	6	32	65	0	0
1–4	0	3	32	35	214	0	0
5–9	2,405	4	58	20	277	0	0
10–14	12,900	4	78	14	305	0	1
15–19	18,225	19	80	24	82	0	0
20–24	13,264	52	472	1	327	24	7
25–29	15,453	196	1,704	1	953	197	10
30–34	13,036	414	3,341	15	1,316	1,015	63
35–39	13,668	751	4,656	5	869	2,360	176
40–44	15,700	1,064	6,230	46	999	4,217	833
45–49	13,470	1,764	6,947	91	1,690	5,830	1,628
50–54	9,464	2,464	8,120	557	2,087	8,358	3,257
55–59	4,496	3,941	8,179	1,044	2,007	9,394	4,856
60–64	1,895	5,866	9,044	2,562	2,302	8,793	6,119
65–69	434	8,563	9,256	4,806	3,612	6,749	7,119
70–74	37	10,982	7,621	8,567	5,219	4,924	6,758
75–79	37	14,491	6,633	13,944	7,455	3,822	5,584
80–84	68	18,752	5,618	17,737	10,657	2,760	3,551
85–89	86	19,856	4,189	16,341	11,549	1,794	1,825
90–94	51	12,901	2,111	9,677	7,897	768	486
95–99	14	4,351	567	2,963	2,593	164	71
100+	3	1,241	112	703	590	30	1
All ages[(a)]	**134,700**	**107,700**	**85,100**	**79,200**	**63,100**	**61,200**	**42,300**

(a) The estimates may not add up due to rounding.

Source: AIHW Burden of disease Database.

Additional tables for Chapter 8: Hospitalisations for lung cancer

Table D8.1: Hospitalisations for lung cancer[(a)], by age at hospitalisation, Australia, 2008–09

	Hospitalisations			Patient days		
Age group (years)	**Number**	**Age-specific rate**	**95% CI**	**Number**	**Age-specific rate**	**95% CI**
<45	1,037	0.8	0.7–0.8	3,122	2.3	2.3–2.4
45–49	1,456	9.3	8.9–9.8	4,531	29.0	28.2–29.9
50–54	2,732	19.2	18.5–19.9	8,816	61.9	60.6–63.2
55–59	4,994	38.6	37.5–39.6	15,350	118.5	116.7–120.4
60–64	7,124	62.0	60.6–63.5	23,107	201.2	198.6–203.8
65–69	7,650	89.9	87.9–92.0	27,885	327.8	324.0–331.7
70–74	6,924	102.7	100.3–105.1	29,183	432.7	427.8–437.7
75–79	6,089	111.0	108.2–113.8	31,347	571.3	565.0–577.6
80–84	3,869	90.7	87.9–93.6	24,645	577.8	570.6–585.0
85+	1,638	43.9	41.8–46.1	15,126	405.8	399.4–412.3
All ages (crude)	**43,513**	**20.1**	**19.9–20.3**	**183,112**	**84.6**	**84.2–85.0**
All ages (ASR)[(b)]	**43,513**	**18.7**	**18.6–18.9**	**183,112**	**78.8**	**78.4–79.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

Table D8.2: Crude average length of stay for overnight lung cancer-related hospitalisations[(a)], by age at hospitalisation, Australia, 2008–09

Age group (years)	Age-specific ALOS
<45	8.5
45–49	8.4
50–54	8.9
55–59	9.0
60–64	8.7
65–69	9.8
70–74	9.9
75–79	11.2
80–84	11.7
85+	12.9
All ages	**10.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

Source: AIHW National Hospital Morbidity Database.

Table D8.3: Same-day lung cancer-related hospitalisations[(a, b)], Australia, 2000-01 to 2008–09

	Hospitalisations		
Year	Number	Age-standardised rate[(b)]	95% confidence interval
2000–01	19,420	10.1	10.0–10.3
2001–02	21,577	11.0	10.8–11.1
2002–03	23,096	11.5	11.3–11.6
2003–04	25,315	12.3	12.2–12.5
2004–05	25,670	12.2	12.0–12.3
2005–06	27,778	12.9	12.8–13.1
2006–07	29,585	13.4	13.3–13.6
2007–08	27,493	12.1	12.0–12.3
2008–09	28,324	12.2	12.1–12.3

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) The number of patient days per same-day hospitalisation, as well as the average length of stay, is 1, hence they are not shown in the table above.

(c) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

Table D8.4: Overnight lung cancer-related hospitalisations[(a)], Australia, 2000-01 to 2008–09

	Hospitalisations			Patient days			ALOS	
Year	Number	ASR[(b)]	95% CI	Number	ASR[(b)]	95% CI	Crude ALOS	Age-sex weighted ALOS[(b)]
2000–01	14,238	7.4	7.3–7.6	139,073	72.7	72.3–73.0	9.8	10.2
2001–02	14,211	7.2	7.1–7.4	143,084	72.9	72.5–73.3	10.1	10.2
2002–03	14,143	7.0	6.9–7.2	145,410	72.4	72.0–72.7	10.3	10.5
2003–04	14,437	7.0	6.9–7.1	146,621	71.4	71.0–71.8	10.2	10.3
2004–05	14,762	7.0	6.9–7.1	149,752	71.1	70.8–71.5	10.1	10.3
2005–06	15,141	7.0	6.9–7.1	155,740	72.1	71.7–72.5	10.3	10.4
2006–07	15,405	7.0	6.9–7.1	155,059	70.1	69.8–70.5	10.1	10.1
2007–08	15,637	6.9	6.8–7.0	163,295	71.9	71.6–72.3	10.4	10.5
2008–09	15,189	6.5	6.4–6.6	154,788	66.6	66.3–67.0	10.2	10.2

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) Age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

(c) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

Table D8.5: Total lung cancer-related hospitalisations[(a)], Australia, 2000-01 to 2008–09

	Hospitalisations			Patient days			ALOS	
Year	Number	ASR [(b)]	95% CI	Number	ASR [(b)]	95% CI	Crude ALOS	Age-sex weighted ALOS[(c)]
2000–01	33,658	17.6	17.4–17.7	158,493	82.8	82.4–83.2	4.7	5.5
2001–02	35,788	18.2	18.0–18.4	164,661	83.9	83.5–84.3	4.6	5.2
2002–03	37,239	18.5	18.3–18.7	168,506	83.9	83.5–84.3	4.5	5.3
2003–04	39,752	19.3	19.2–19.5	171,936	83.7	83.3–84.1	4.3	5.0
2004–05	40,432	19.2	19.0–19.4	175,422	83.3	82.9–83.7	4.3	5.0
2005–06	42,919	19.9	19.7–20.1	183,518	85.0	84.6–85.4	4.3	4.9
2006–07	44,990	20.4	20.2–20.6	184,644	83.5	83.1–83.9	4.1	4.8
2007–08	43,130	19.0	18.9–19.2	190,788	84.0	83.7–84.4	4.4	4.9
2008–09	43,513	18.7	18.6–18.9	183,112	78.8	78.4–79.2	4.2	4.6

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

(c) Age-sex weighted to the national distribution of overnight lung cancer hospitalisations in 2008–09 and expressed in number of days per hospitalisation.

Source: AIHW National Hospital Morbidity Database.

Table D8.6: Hospitalisations for lung cancer[(a)] by age group, Australia, 2000-01 to 2008–09

	<60			60-79			80+			All ages		
Year	Number	ASR[(b)]	95% CI	Number	ASR[(b)]	95% CI	Number	ASR[(b)]	95% CI	Number	ASR[(b)]	95% CI
2000–01	8,628	5.4	5.3–5.5	22,169	84.0	82.9–85.1	2,859	49.6	47.8–51.5	33,658	17.6	17.4–17.7
2001–02	9,324	5.7	5.5–5.8	22,992	85.8	84.7–86.9	3,472	57.0	55.1–58.9	35,788	18.2	18.0–18.4
2002–03	10,051	5.9	5.7–6.0	23,622	86.9	85.8–88.0	3,565	56.0	54.2–57.9	37,239	18.5	18.3–18.7
2003–04	10,180	5.8	5.6–5.9	25,418	91.9	90.8–93.1	4,154	62.5	60.6–64.4	39,752	19.3	19.2–19.5
2004–05	10,842	6.0	5.9–6.2	25,334	89.8	88.7–90.9	4,256	61.5	59.7–63.4	40,432	19.2	19.0–19.4
2005–06	10,941	6.0	5.8–6.1	27,419	95.0	93.9–96.1	4,559	63.6	61.7–65.4	42,919	19.9	19.7–20.1
2006–07	11,084	6.0	5.8–6.1	29,157	98.1	97.0–99.2	4,749	64.1	62.3–66.0	44,990	20.4	20.2–20.6
2007–08	10,038	5.3	5.2–5.5	27,711	90.6	89.6–91.7	5,381	70.3	68.5–72.2	43,130	19.0	18.9–19.2
2008–09	10,219	5.4	5.2–5.5	27,787	88.5	87.4–89.5	5,507	69.9	68.0–71.7	43,513	18.7	18.6–18.9

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

Table D8.7: Patient days for lung cancer-related hospitalisations(a) by age group, Australia, 2000-01 to 2008–09

	<60			60-79			80+			All ages		
Year	Number	ASR(b)	95% CI	Number	ASR(b)	95% CI	Number	ASR(b)	95% CI	Number	ASR(b)	95% CI
2000–01	27,810	17.5	17.3–17.7	104,378	395.5	393.1–397.9	26,284	455.7	450.2–461.2	158,493	82.8	82.4–83.2
2001–02	30,730	18.7	18.4–18.9	105,029	392.1	389.8–394.5	28,902	474.9	469.4–480.4	164,661	83.9	83.5–84.3
2002–03	30,630	17.9	17.7–18.2	106,346	391.6	389.3–394.0	31,529	496.6	491.2–502.1	168,506	83.9	83.5–84.3
2003–04	29,818	17.0	16.7–17.2	108,052	392.3	389.9–394.6	34,066	515.6	510.1–521.1	171,936	83.7	83.3–84.1
2004–05	33,160	18.4	18.1–18.7	107,280	382.5	380.2–384.8	34,982	507.8	502.5–513.1	175,422	83.3	82.9–83.7
2005–06	32,841	17.8	17.6–18.1	113,532	395.8	393.5–398.1	37,145	518.9	513.7–524.2	183,518	85.0	84.6–85.4
2006–07	32,299	17.4	17.2–17.7	112,523	383.1	380.9–385.4	39,822	537.2	531.9–542.5	184,644	83.5	83.1–83.9
2007–08	32,070	17.1	16.8–17.4	115,138	382.2	380.0–384.4	43,580	567.6	562.3–573.0	190,788	84.0	83.7–84.4
2008–09	31,819	16.7	16.4–16.9	111,522	361.4	359.2–363.5	39,771	501.1	496.2–506.1	183,112	78.8	78.4–79.2

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

Table D8.8: Crude average length of stay for overnight lung cancer-related hospitalisations[(a)] by age group, Australia, 2000-01 to 2008–09

Year	<60	60–79	80+	All ages
2000–01	7.5	9.8	13.3	9.8
2001–02	8.2	10.1	12.5	10.1
2002–03	8.2	10.2	13.3	10.3
2003–04	7.9	10.1	12.8	10.2
2004–05	8.6	9.9	12.6	10.1
2005–06	8.1	10.3	12.9	10.3
2006–07	8.3	9.7	13.2	10.1
2007–08	8.4	10.2	13.1	10.4
2008–09	8.9	10.0	12.1	10.2

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

Source: AIHW National Hospital Morbidity Database.

TableD8.9: Hospitalisations for lung cancer[(a)], by remoteness area of usual residence[(b)], Australia, 2008–09

	Hospitalisations			Patient days			Overnight ALOS	
Remoteness area[(b)]	**Number**	**ASR[(c)]**	**95% CI**	**Number**	**ASR[(c)]**	**95% CI**	**Crude ALOS**	**Age-sex weighted ALOS[(d)]**
Major cities	12,905	8.6	8.4–8.7	103,150	68.4	68.0–68.9	10.6	10.5
Inner regional	4,644	8.9	8.7–9.2	33,502	64.4	63.7–65.2	9.1	9.2
Outer regional	2,245	9.7	9.2–10.1	18,846	81.5	80.2–82.7	10.2	10.6
Remote and Very remote	431	10.8	9.7–12.0	3,833	94.5	91.2–97.9	10.4	9.9
Not stated	56	. .	. .	549	. .	. .	11.5	. .
Total	**20,281**	**8.7**	**8.6–8.9**	**159,880**	**68.8**	**68.5–69.2**	**10.2**	**10.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis, or iii) overnight hospitalisations where the principal diagnosis is Z51.1 and lung cancer is recorded as an additional diagnosis.

(b) Remoteness was classified using the Australian Standard Geographical Classification (ASGC) Remoteness Area (see Appendix A).

(c) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

(d) Age-sex weighted to the national distribution of overnight lung cancer hospitalisations in 2008–09 and expressed in number of days per hospitalisation.

Source: AIHW National Hospital Morbidity Database.

Table D8.10: Same-day chemotherapy hospitalisations for lung cancer[(a)], by remoteness area of usual residence[(b)], Australia, 2008–09

	Hospitalisations		
Remoteness area[(b)]	Number	ASR[(c)]	95% CI
Major cities	16,100	10.7	10.6–10.9
Inner regional	4,844	9.3	9.0–9.5
Outer regional	1,921	8.2	7.8–8.5
Remote and Very remote	347	8.4	7.5–9.4
Not stated	20	. .	. .
Total	**23,232**	**10.0**	**9.9–10.1**

(a) Same-day additional diagnosis of lung cancer (C33–C34) and a principal diagnosis of Pharmacotherapy of neoplasm (Z51.1). Note that the number of patient days per same-day hospitalisation, as well as the average length of stay, is 1, hence they are not shown in the table above.

(b) Remoteness was classified using the Australian Standard Geographical Classification (ASGC) Remoteness Area (see Appendix A).

(c) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

Table D8.11: Hospitalisations for lung cancer[(a)], by socioeconomic status of area of usual residence[(b)], Australia, 2008–09

	Hospitalisations			Patient days			Overnight ALOS	
Socioeconomic status[(b)]	Number	ASR[(c)]	95% CI	Number	ASR[(c)]	95% CI	Crude ALOS	Age-sex weighted ALOS[(d)]
1 (lowest)	4,832	10.3	10.0–10.6	38,837	82.4	81.5–83.3	10.2	10.4
2	4,779	9.6	9.4–9.9	35,461	71.1	70.3–71.9	9.6	9.7
3	4,149	9.2	8.9–9.5	31,541	69.6	68.8–70.5	9.9	9.9
4	3,452	8.0	7.7–8.3	28,210	65.6	64.8–66.5	10.5	10.4
5 (highest)	3,013	6.8	6.6–7.1	25,282	57.5	56.8–58.3	11.1	11.0
Not stated	56	. .	. .	549	. .	. .	10.2	. .
Total	**20,281**	**8.7**	**8.6–8.9**	**159,880**	**68.8**	**68.5–69.2**	**10.2**	**10.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis, or iii) overnight hospitalisations where the principal diagnosis is Z51.1 and lung cancer is recorded as an additional diagnosis.

(b) Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix A).

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

(d) Age-sex weighted to the national distribution of overnight lung cancer hospitalisations in 2008–09 and expressed in number of days per hospitalisation.

Source: AIHW National Hospital Morbidity Database.

Table D8.12: Same-day chemotherapy hospitalisations for lung cancer[(a)], by socioeconomic status of area of usual residence[(b)], Australia, 2008–09

	Hospitalisations		
Socioeconomic status[(b)]	**Number**	**ASR[(c)]**	**95% CI**
1 (lowest)	3,967	8.5	8.2–8.8
2	4,410	8.9	8.7–9.2
3	5,124	11.3	11.0–11.6
4	4,735	10.9	10.6–11.3
5 (highest)	4,976	11.2	10.9–11.6
Not stated	20	. .	. .
Total	**23,232**	**10.0**	**9.9–10.1**

(a) Same-day additional diagnosis of lung cancer (C33–C34) and a principal diagnosis of Pharmacotherapy of neoplasm (Z51.1). Note that the number of patient days per same-day hospitalisation, as well as the average length of stay, is 1, hence they are not shown in the table above.

(b) Socioeconomic status was classified using the ABS Index of Relative Socio-economic Disadvantage (see Appendix A).

(c) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

Source: AIHW National Hospital Morbidity Database.

Table D8.13: Hospitalisations for lung cancer[(a)], by Indigenous status, New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory[(b)], 2008–09

	Hospitalisations			Patient days			Overnight ALOS	
Indigenous status[(b)]	**Number**	**ASR[(c)]**	**95% CI**	**Number**	**Number**	**ASR[(c)]**	**Crude ALOS**	**Age-sex weighted ALOS[(d)]**
Indigenous Australians	252	12.9	11.2–14.8	2,350	119.9	114.4–125.5	10.7	11.7
Other Australians[(e)]	19,369	8.9	8.7–9.0	152,037	69.4	69.0–69.7	10.2	10.2
Total	**19,621**	**8.9**	**8.9–8.9**	**154,387**	**70.0**	**69.6–70.3**	**10.2**	**10.2**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis, or iii) overnight hospitalisations where the principal diagnosis is Z51.1 and lung cancer is recorded as an additional diagnosis.

(b) Data restricted to hospitals in NSW, Vic, Qld, WA, SA and public hospitals in the NT only.

(c) The rates were age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

(d) Age-sex weighted to the national distribution of overnight lung cancer hospitalisations in 2008–09 and expressed in number of days per hospitalisation.

(e) Includes hospitalisations for which Indigenous status was not reported.

Source: AIHW National Hospital Morbidity Database.

Table D8.14: Same-day chemotherapy hospitalisations for lung cancer[(a)], by Indigenous status, New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory[(b)], 2008–09

	Hospitalisations		
Indigenous status[(b)]	**Number**	**Rate[(c)]**	**95% CI**
Indigenous Australians	179	7.6	6.4–8.9
Other Australians[(d)]	22,629	10.4	10.2–10.5
Total	**22,808**	**10.3**	**10.2–10.5**

(a) Same-day additional diagnosis of lung cancer (C33–C34) and a principal diagnosis of Pharmacotherapy of neoplasm (Z51.1). Note that the number of patient days per same-day hospitalisation, as well as the average length of stay, is 1, hence they are not shown in the table above.

(b) Data restricted to hospitals in NSW, Vic, Qld, WA, SA and public hospitals in the NT only.

(c) Age-standardised to the Australian population as at 30 June 2001 and expressed per 10,000 persons.

(d) Includes hospitalisations for which Indigenous status was not reported.

Source: AIHW National Hospital Morbidity Database.

Table D8.15: Twenty most common procedure blocks for same-day lung cancer–related hospitalisations[(a)], Australia, 2008–09

Procedure description (ACHI[(b)] code)	Number[(c, d)]	Per cent[(d)]	Rank
Non-invasive, cognitive and other interventions, not elsewhere classified (1820–1922)			
Administration of pharmacotherapy (1920)	23,448	82.8	1
Cerebral anaesthesia (1910)	1,689	6.0	2
Administration of blood and blood products (1893)	1,515	5.3	4
Generalised allied health interventions (1916)	612	2.2	5
Other procedures related to pharmacotherapy (1922)	279	1.0	8
Other therapeutic interventions (1908)	74	0.3	11
Therapeutic interventions on cardiovascular system (1890)	61	0.2	14
Other counselling or education (1869)	30	0.1	19
Skills training in movement (1876)	30	0.1	20
Procedures on respiratory system (520–570)			
Bronchoscopy with biopsy or removal of foreign body (544)	1,565	5.5	3
Biopsy of lung or pleura (550)	548	1.9	6
Application, insertion or removal procedures on chest wall, mediastinum or diaphragm (560)	46	0.2	17
Examination procedures on bronchus (543)	64	0.2	13
Imaging services (1940–2016)			
Intraoperative ultrasound (1949)	169	0.6	9
Computerised tomography of chest (1960)	143	0.5	10
Other computerised tomography (1966)	335	1.2	7
Radiation oncology (1786–1799)			
Megavoltage radiation treatment (1788)	51	0.2	16
Procedures on cardiovascular system (600–777)			
Vascular access device (766)	69	0.2	12
Venous catheterisation (738)	53	0.2	15
Procedures on blood and blood-forming organs (800–817)			
Biopsy of lymphatic structure (805)	38	0.1	18
Total same-day lung cancer-related hospitalisations	**28,324**	**100.0**	. .

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) Australian Classification of Health Interventions, 6th edition.

(c) Indicates the number of hospitalisations in which the listed procedure block was undertaken.

(d) The sum of the count of hospitalisations does not equal the total number of hospitalisations since no procedures, or multiple procedures, may be undertaken during each hospitalisation. For the same reason, the sum of the percentages does not equal 100. Furthermore, if multiple procedures were recorded from the same block number, only one procedure was counted.

Source: AIHW National Hospital Morbidity Database.

Table D8.16: Twenty most common procedure blocks for overnight lung cancer–related hospitalisations[(a)], Australia, 2008–09

Procedure description (ACHI[(b)] code)	Number[(c, d)]	Per cent[(d)]	Rank
Non-invasive, cognitive and other interventions, not elsewhere classified (1820–1922)			
Generalised allied health interventions (1916)	9,791	64.5	1
Cerebral anaesthesia (1910)	3,594	23.7	2
Administration of pharmacotherapy (1920)	1,693	11.1	3
Administration of blood and blood products (1893)	1,496	9.8	5
Postprocedural analgesia (1912)	929	6.1	11
Conduction anaesthesia (1909)	652	4.3	16
Procedures on respiratory system (520–570)			
Bronchoscopy with biopsy or removal of foreign body (544)	1,364	9.0	6
Application, insertion or removal procedures on chest wall, mediastinum or diaphragm (560)	1,099	7.2	9
Lobectomy of lung (552)	954	6.3	10
Biopsy of lung or pleura (550)	912	6.0	12
Partial resection of lung (551)	701	4.6	15
Examination procedures on bronchus (543)	575	3.8	17
Imaging services (1940–2016)			
Computerised tomography of brain (1952)	1,549	10.2	4
Computerised tomography of chest (1960)	1,336	8.8	7
Other computerised tomography (1966)	1,127	7.4	8
Computerised tomography of chest, abdomen and pelvis (1961)	829	5.5	13
Whole body bone nuclear medicine imaging study (2011)	789	5.2	14
Computerised tomography of abdomen and pelvis (1963)	434	2.9	19
Magnetic resonance imaging (2015)	411	2.7	20
Radiation oncology (1786–1799)			
Megavoltage radiation treatment (1788)	552	3.6	18
Total overnight lung cancer-related hospitalisations	**15,189**	**100.0**	**. .**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) Australian Classification of Health Interventions, 6th edition.

(c) Indicates the number of hospitalisations in which the listed procedure block was undertaken.

(d) The sum of the count of hospitalisations does not equal the total number of hospitalisations since no procedures, or multiple procedures, may be undertaken during each hospitalisation. For the same reason, the sum of the percentages does not equal 100. Furthermore, if multiple procedures were recorded from the same block number, only one procedure was counted.

Source: AIHW National Hospital Morbidity Database.

Table D8.17: Twenty most common procedure block for overall lung cancer-related hospitalisations[(a)], Australia, 2008–09

Procedure description (ACHI[(b)] code)	Number[(c, d)]	Per cent[(d)]	Rank
Non-invasive, cognitive and other interventions, not elsewhere classified (1820–1922)			
Administration of pharmacotherapy (1920)	25,141	57.8	1
Generalised allied health interventions (1916)	10,403	23.9	2
Cerebral anaesthesia (1910)	5,283	12.1	3
Administration of blood and blood products (1893)	3,011	6.9	4
Postprocedural analgesia (1912)	929	2.1	12
Conduction anaesthesia (1909)	661	1.5	16
Procedures on respiratory system (520–570)			
Bronchoscopy with biopsy or removal of foreign body (544)	2,929	6.7	5
Biopsy of lung or pleura (550)	1,460	3.4	9
Application, insertion or removal procedures on chest wall, mediastinum or diaphragm (560)	1,145	2.6	10
Lobectomy of lung (552)	955	2.2	11
Partial resection of lung (551)	702	1.6	15
Examination procedures on bronchus (543)	639	1.5	17
Imaging services (1940–2016)			
Computerised tomography of brain (1952)	1,576	3.6	6
Computerised tomography of chest (1960)	1,479	3.4	7
Other computerised tomography (1966)	1,462	3.4	8
Computerised tomography of chest, abdomen and pelvis (1961)	845	1.9	13
Whole body bone nuclear medicine imaging study (2011)	792	1.8	14
Magnetic resonance imaging (2015)	417	1.0	20
Computerised tomography of abdomen and pelvis (1963)	438	1.0	19
Radiation oncology (1786–1799)			
Megavoltage radiation treatment (1788)	603	1.4	18
Total lung cancer-related hospitalisations	**43,513**	**100.0**	**. .**

(a) Pertain to hospitalisations in which i) the principal diagnosis is lung cancer (ICD-10-AM codes C33–C34), or ii) the principal diagnosis is a health service or treatment that may be related to the treatment of lung cancer (ICD-10-AM codes Z08, Z12.2, Z29.1, Z29.2, Z45.1, Z45.2, Z48.8, Z50.8, Z50.9, Z51.0, Z51.1, Z54.1, Z54.2, Z74 and Z75) and lung cancer is recorded as an additional diagnosis.

(b) Australian Classification of Health Interventions, 6th edition.

(c) Indicates the number of hospitalisations in which the listed procedure block was undertaken.

(d) The sum of the count of hospitalisations does not equal the total number of hospitalisations since no procedures, or multiple procedures, may be undertaken during each hospitalisation. For the same reason, the sum of the percentages does not equal 100. Furthermore, if multiple procedures were recorded from the same block number, only one procedure was counted.

Source: AIHW National Hospital Morbidity Database.

Table D8.18: Grouping of surgical procedures[(a)] for lung cancer

Surgical procedure description (curative, major, not diagnostic) (ACHI[(b)] procedure block)	Corresponding procedure codes
Partial resection of the lung (551)[(d)]	90169-00, 38440-00, 38440-01, 38438-00
Lobectomy of the lung (552)	38438-01, 38441-00
Pneumonectomy of lung (553)[(e)]	38438-02, 38441-01
Other procedures on the lung or pleura (558)	90181-00, 38456-02

(a) Defined as surgical procedures for lung cancer by the Health Information Program Managers of Australia in 2007 and are defined to be curative, major and non-diagnostic

(b) Australian Classification of Health Interventions, 6th edition.

(c) Excludes lung volume reduction surgery (90170-00)

(d) Excludes removal of donor lung for transplantation (38438-03)

Additional tables for Chapter 9: Expenditure on lung cancer

Table D9.1: Expenditure on lung cancer by health care sector, Australia, 2004–05

	Males		Females		Total	
Health care sector	**$ (million)**	**Per cent**	**$ (million)**	**Per cent**	**$ (million)**	**Per cent**
Hospital admitted patient services[(a)]	82	80.4	49	76.6	131	78.9
Out-of-hospital medical expenses	17	16.7	13	20.3	30	18.1
Prescription pharmaceuticals	4	3.9	2	3.1	5	3.0
Total health expenditure[(b)]	**102**	**100.0**	**64**	**100.0**	**166**	**100.0**

(a) Expenditure for hospital admitted patient services for lung cancer pertains to those hospitalisations for which the principal diagnosis was lung cancer (ICD-10 code of C33, C34). It does not pertain to hospitalisations for which lung cancer was an additional diagnosis, with the principal diagnosis related specifically to the type of cancer treatment or care received.

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

Source: AIHW Disease Expenditure Database.

Table D9.2: Expenditure on hospital admitted patient services and number of hospitalisations for lung cancer by age group, Australia, 2004–05

Age group (years)	Hospital admitted patient expenditure		Number of admitted patient hospitalisations[(a)]	Average expenditure per hospitalisation ($)
	$ (million)	**Per cent**		
<35	0.5	0.4	80	6,429
35–44	2.2	1.7	325	6,910
45–54	9.9	7.6	1,503	6,586
55–64	28.0	21.4	4,251	6,594
65–74	43.5	33.3	5,943	7,328
75–84	39.0	29.8	4,979	7,827
85+	7.5	5.7	865	8,660
Total	**130.7**	**100.0**	**17,946**	**7,283**

(a) Expenditure for hospital admitted patient services for lung cancer pertains to those hospitalisations for which the principal diagnosis was lung cancer (ICD-10 code of C33, C34). It does not pertain to hospitalisations for which lung cancer was an additional diagnosis, with the principal diagnosis related specifically to the type of cancer treatment or care received.

Source: AIHW Disease Expenditure Database.

Appendix E: Stage at diagnosis

A number of staging systems are used to classify lung cancers. These are described in this appendix.

TNM staging system

Lung cancers can be staged according to the TNM system, which was initially developed by the Union for International Cancer Control (UICC). This system describes the size of the primary tumour (T), the absence or presence of metastasis to nearby lymph nodes (N) and the absence or presence of distant metastasis (M). Further information about the TNM staging system can be found on the UICC website (UICC 2009).

Summary staging system

The Surveillance Epidemiology End Results (SEER) Summary staging system (or 'summary staging system' for short) is a simpler method to stage lung cancers. According to Tracey and associates (2009), this summary measure is preferred by a number of cancer registries overseas and in Australia (such as the New South Wales registry) since the required information can be sourced more readily from the pathology and clinical reports to which the registries have access. In this staging system, tumours are allocated to one of three categories, as well as an 'unknown' category, as shown in Table E.1.

Table E.1: Summary staging system—extent of disease at diagnosis

Stage	Description
Localised	A malignancy limited to the organ of origin; it has spread no farther than the organ in which it started. There is infiltration past the basement membrane of the epithelium into the functional part of the organ, but there is no spread beyond the boundaries of the organ.
Regional	There is tumour extension beyond the limits of the organ of origin. There is invasion through the entire wall of the organ into surrounding organs and/or adjacent issues or by direct extension or contiguous spread to nearby lymph nodes.
Distant metastases	Tumour cells that have broken away from the primary tumour, have travelled to other parts of the body and have begun to grow at the new location. Distant stage is also called remote, diffuse, disseminated, metastatic or secondary disease. In most cases there is no continuous trail of tumour cells between the primary site and the distant site.
Unknown	There are cases for which sufficient evidence is not available to adequately assign a stage. Examples include occasions when the patient dies before workup is completed, when a patient refuses a diagnostic or treatment procedure, and when there is limited workup due to the patient's age or a simultaneous contraindicating condition. If there is insufficient information the case cannot be assigned a stage.

Source: Tracey et al. 2006.

Appendix F: Definition of lung cancer-related hospitalisations

Data on hospitalisations include principal diagnosis—this is the reason determined to be chiefly responsible for the person's hospitalisation. Coding of diseases is based on the principles stated in International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10-AM). Based on ICD-10-AM, 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 (Z00–Z99) defined in ICD-10-AM Chapter 21 'Factors influencing health status and contact with health services' (NCCH 2008b).

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 health services recorded as a principal diagnosis (such as Z51.1 Chemotherapy or Z12.2 Special screening examination for neoplasm of respiratory organs) are specific only to suspected 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 health services (such as same-day chemotherapy), the Australian Coding Standards (NCCH 2008a) 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 health services.

Thus, for the purposes of examining the number of admitted patient hospitalisations that arose specifically due to invasive lung cancer and were directly related to treatment/care for lung cancer, '*lung cancer–related hospitalisations*' were identified in this report as those hospitalisations in which:

- lung cancer (ICD-10 AM code of C33–C34) was recorded as the principal diagnosis

or

- lung cancer (ICD-10 AM code of C33–C34) was recorded as an additional diagnosis to the principal diagnosis of one of the following ICD-10-AM 'Z' codes within Chapter 21 'Factors Influencing health status and contact with health services':
  - Z08 Follow-up examination after treatment for malignant neoplasms
  - Z12.2 Special screening examination for neoplasm of respiratory organs
  - Z29.1 Prophylactic immunotherapy
  - Z29.2 Other prophylactic chemotherapy
  - Z45.1 Adjustment and management of drug delivery and implanted service
  - Z45.2 Adjustment and management of vascular access device
  - Z48.8 Other specified follow-up care
  - Z50.8 Care involving use of other rehabilitation procedures
  - Z50.9 Care involving use of rehabilitation procedure, unspecified

- Z51.0 Radiotherapy session
- Z51.1 Pharmacotherapy session for neoplasm
- Z54.1 Convalescence following radiotherapy
- Z54.2 Convalescence following chemotherapy
- Z74 Problems related to care-provider dependency
- Z75 Problems related to medical facilities and other health care

Using data from the National Hospital Morbidity Database (NHMD) for 2008–09, Table F.1 shows the number of hospitalisations for each of the relevant Z code principal diagnoses, as well as for those hospitalisations in which lung cancer was the principal diagnosis. The principal diagnosis was 'lung cancer' for two in five (44%) of all lung cancer–related hospitalisations. For almost one in two (53%) lung cancer-related hospitalisations, the principal diagnosis was 'pharmacotherapy session for neoplasm' (for example, chemotherapy) with lung cancer listed as an additional diagnosis.

Table F.1: Hospitalisations for lung cancer by same-day and overnight status, 2008–09

	Same-day		Overnight		Total	
Diagnosis (ICD-10-AM code)	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Lung cancer as principal diagnosis (C33-C34)	4,616	16.3	14,358	94.5	18,974	43.6
Lung cancer as additional diagnosis (C33-C34) AND principal diagnosis of:						
Follow-up examination after treatment for malignant neoplasms (Z08)	5	0.0	3	0.0	8	0.0
Special screening examination for neoplasm of respiratory organs (Z12.2)	<3	n.p.	<3	n.p.	<3	n.p.
Prophylactic immunotherapy (Z29.1) and Other prophylactic chemotherapy (Z29.2)	<3	n.p.	<3	n.p.	<3	n.p.
Adjustment and management of drug delivery and implanted service (Z45.1)	51	0.2	0	0.0	51	0.1
Adjustment and management of vascular access device (Z45.2)	311	1.1	10	0.1	321	0.7
Other specified follow-up care (Z48.8)	3	0.0	62	0.4	65	0.1
Care involving use of other rehabilitation procedures (Z50.8) and Care involving use of rehabilitation procedure, unspecified (Z50.9)[(a)]	90	0.3	461	3.0	551	1.3
Radiotherapy session (Z51.0)	12	0.0	0	0.0	12	0.0
Pharmacotherapy session for neoplasm (Z51.1)	23,232	82.0	11	0.1	23,243	53.4
Convalescence following radiotherapy (Z54.1) and Convalescence following chemotherapy (Z54.2)	<3	n.p.	<24	n.p.	<26	n.p.
Problems related to care-provider dependency (Z74)	0	0.0	25	0.2	25	0.1
Problems related to medical facilities and other health care (Z75)	0	0.0	236	1.6	236	0.5
Total lung cancer-related hospitalisations	**28,324**	**100.0**	**15,189**	**100.0**	**43,513**	**100.0**

n.p. Not published.

(a) Collapsed due to small cell sizes.

Source: AIHW National Hospital Morbidity Database.

Over the last decade, public hospitals in New South Wales, South Australia and the Australian Capital Territory have changed their admission practice so that not all patients who receive same-day chemotherapy services were admitted to hospital. Instead these hospitals provided chemotherapy treatment on an outpatient (that is, non-admitted patient) basis. Thus, the recorded data on this type of admitted patient service is likely to be under-reported and are not comparable over time.

To illustrate the effect on the data of this change in admission processes, data on the number of hospitalisations for same-day chemotherapy sessions (referred to as 'pharmacotherapy sessions for neoplasms' in ICD-10-AM) for lung cancer are shown for each state and territory over time in Table F.2. While the number of such sessions increased by more than 40% between 2000–01 and 2008–09 in Victoria (62%), Queensland (41%), Western Australia (88%), Tasmania (166%) and Northern Territory (735%), the level of change was much smaller for New South Wales (21%). A drop in the number of such sessions in the Australian Capital Territory is evident from 2004–05 onwards. There is also a more recent drop in South Australia from 2007–08 such that the same-day admissions from this financial year reflect private hospitals only.

Table F.2: Number of lung cancer–related hospitalisations for same-day 'Pharmacotherapy sessions for neoplasm'[(a)] by state and territory, 2000–01 to 2008–09

Year	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
2000–01	1,782	6,024	4,000	2,106	1,254	64	310	20	15,560
2001–02	1,541	6,568	4,499	2,579	1,586	280	380	23	17,456
2002–03	1,480	7,416	4,736	2,548	1,968	230	421	62	18,861
2003–04	1,763	7,629	5,100	3,596	2,036	363	300	134	20,921
2004–05	1,864	8,378	4,960	3,236	2,273	301	51	230	21,293
2005–06	1,864	8,767	5,228	3,733	2,811	336	143	205	23,087
2006–07	1,752	9,443	5,533	3,768	2,873	324	68	440	24,201
2007–08	1,805	9,594	5,215	3,928	1,121	251	87	213	22,214
2008–09	2,153	9,781	5,626	3,950	1,246	170	139	167	23,232

(a) Same-day additional diagnosis of lung cancer (C33–C34) and a principal diagnosis of Pharmacotherapy of neoplasm (Z51.1).

Source: National Hospital Morbidity Database, AIHW.

Information on outpatient chemotherapy services is included in the National Outpatient Care Database (NOCD). However, there are variations among jurisdictions in the reporting of chemotherapy services because of differences in admission practices and in the types of facilities offering these services, hence data from this source was not included in the analyses. Note also that the data in the NOCD relates to all public hospitals classified as either peer group A (principal referral and specialist women's and children's hospitals) or B (large hospitals) and to some public hospitals classified to other peer groups (AIHW 2010b).

Glossary

This section provides a general description of the terms used in this report. The terms have been defined in the context of this report; some terms may have other meanings in other contexts.

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.

Associated cause of death: Any other condition or event that was not related to the underlying cause of death but was still considered to contribute to the individual's death.

Average length of stay: 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.

Chronic bronchitis: Long-term condition with inflammation of the lung's main air passages (bronchi), causing frequent coughing attacks and coughing up mucus.

Cancer (malignant neoplasm): A large range of diseases in which some of the body's cells become defective, begin to multiply out of control, can invade and damage the area around them, and can also spread to other parts of the body to cause further damage.

Carcinoma: A cancer that begins in the lining layer (epithelial cells) of organs such as the lungs.

Chemotherapy: The use of drugs (chemicals) to prevent or treat disease, with the term being applied for treatment of cancer rather than for other uses.

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 good 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.

DALYs (disability-adjusted life years): 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.

Emphysema: A chronic lung disease where over-expansion or destruction of the lung tissue blocks oxygen intake, leading to shortness of breath and other problems.

Heath expenditure: Includes expenditure on health goods and services (for example, medications, aids and appliances, medical treatment, public health, research) which collectively are termed current expenditure; and on health-related investment which is often referred to as capital expenditure.

Hospitalisation: See *Separation*.

Incidence: The number of new cases (of an illness or event, and so on) occurring during a given period.

Indigenous: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander and is accepted as such by the community with which he or she is associated.

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.

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).

Lung fibrosis: The formation or development of excess fibrous connective tissue (fibrosis) in the lungs. It can be described as 'scarring of the lung', leading to shortness of breath, coughing and other problems.

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: 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 they are not of Aboriginal or Torres Strait Islander descent. Used interchangeably with *other Australians*.

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.

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 (also see *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.

Pulmonary tuberculosis: A bacterial disease that affects the lungs especially, with serious fever-like symptoms and destruction of tissue. It can spread to other parts of the body, causing secondary problems and often death if not treated.

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 F 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.

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.

YLD (years of healthy life lost due to disability): 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).

YLL (years of life lost): For each new case, YLL equals the number of years between premature death and the standard life expectancy for the individual.

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