1 Introduction

Cancer is a notifiable disease in all states and territories and is the only major disease category for which an almost complete coverage of incidence data is available. Cancer is also a major cause of death in Australia. Good information on the occurrence of different types of cancer, the characteristics of patients, and survival and mortality facilitates the monitoring of trends and the impact of interventions, and provides a sound basis for epidemiological studies and the initiation of prevention and treatment programs.

What is cancer?

Cancer describes a range of diseases in which abnormal cells proliferate and spread out of control. Other terms for cancer are tumours and neoplasms, although these terms can also be used for non-cancerous growths.

Normally, cells grow and multiply in an orderly way to form organs that have a specific function in the body. Occasionally, however, cells multiply in an uncontrolled way after being affected by a carcinogen, or after developing from a random genetic mutation, and form a mass which is called a tumour or neoplasm. Tumours can be benign (not a cancer) or malignant (a cancer). Benign tumours do not invade other tissues or spread to other parts of the body, although they can expand to interfere with healthy structures. In 2001 there were 126 registered deaths from benign tumours.

The main features of a malignant tumour (cancer) are its ability to grow in an uncontrolled way and to invade and spread to other parts of the body (metastasise). Invasion occurs when cancer cells push between and break through other surrounding cells and structures. Spread to other parts of the body occurs when some cancer cells are carried by the bloodstream or the lymphatic system and lodge some distance away. They can then start a new tumour (a secondary cancer) and begin invading again.

Cancer can develop from most types of cells in different parts of the body, and each cancer has its own pattern of growth and spread. Some cancers remain in the body for years without showing any symptoms. Others can grow, invade and spread rapidly, and are fatal in a short period of time. Apart from the cancer's natural behaviour, its effects can also depend on how much room it has before it damages nearby structures, and whether it starts in a vital organ or is close to other vital organs.

Although a number of cancers share risk factors, most cancers have a unique set of risk factors that are responsible for their onset. Some cancers occur as a direct result of smoking, dietary influences, infectious agents or exposure to radiation (for example, ultraviolet radiation), while others may be a result of inherited genetic faults. It should be noted that for many cancers the causes are unknown. While some of the causes are modifiable through lifestyle changes, some others are inherited and cannot be avoided through personal action. However, the risk of death due to particular cancers may be reduced through intensive monitoring of individuals at high risk, reducing external risk factors, detecting and treating cancers early in their development, and treating them in accordance with the best available evidence.

Many cancers can be serious and fatal. However, medical treatment is often successful if the cancer is detected early. The aim is to destroy the cancer cells and stop them from returning. This can be done by surgery to remove the growth or by other methods such as cancer-destroying drugs (chemotherapy) or ray treatment (radiation therapy). The growth of some cancers can also be controlled through hormone therapy.

The treatment approach often combines a number of these methods and uses them in stages. The first line of treatment aims to remove as many cancer cells as possible; the second line, which may go on for a long time, aims to ensure the cancer does not recur.

Cancer surveillance in Australia

National data on cancer deaths have been available since the early 1900s, based on information in medical certificates of cause of death, as provided to the Registrar of Births, Deaths and Marriages in each state and territory. The Australian Institute of Health and Welfare (AIHW) and the Australian Bureau of Statistics (ABS) use these data to report national cause of death statistics. Information concerning cancer deaths and non-cancer deaths of cancer cases is also collected by state and territory cancer registries, based on death certificates and other diagnostic information.

The only effective method of obtaining cancer incidence data is through universal registration of cancer diagnoses. In Australia, cancer registration is required under state and territory legislation. The cancer registrations are collated by cancer registries that are supported by a mix of state and territory government and non-government organisations. Some state and territory cancer registries have been operating for nearly 30 years and obtain their information from hospital, pathology, radiotherapy and physician records (Appendix D). It was not until 1982, however, that cancer registration was universal in Australia for all states and territories excluding the Australian Capital Territory (data were published in *Cancer in Australia 1982* (Giles, Armstrong & Smith 1987). Before then, there was no registration in some states and in some others registries covered only particular areas, hospitals or cancer sites. Cancer notification in the Australian Capital Territory was not legislated until 1994 so pre-1994 cancer data for this territory are not considered to be complete.

The National Cancer Statistics Clearing House

In June 1984 the National Health and Medical Research Council endorsed the concept of a national collection of cancer statistics. In April 1985 the National Committee on Health and Vital Statistics agreed that the National Cancer Statistics Clearing House (NCSCH) should be operated by the then Australian Institute of Health under the supervision of the Australasian Association of Cancer Registries (AACR).

Following the enactment of Commonwealth legislation establishing the then Australian Institute of Health as a statutory body in 1987, and subsequent legislation providing for the protection of confidentiality of records supplied to it, the Institute and the AACR established the NCSCH. This provides a facility for compiling data produced by individual state and territory registries on a continuing basis.

The aim of the NCSCH is to foster the development and dissemination of national cancer statistics for Australia and specifically to:

- enable computation and publication of national statistics on cancer;
- allow tracking of interstate movement of cancer cases via record linkage so that the same cancer case in not counted more than once;
- facilitate exchange of scientific and technical information between cancer registries and promote standardisation in the collection and classification of cancer data; and
- facilitate cancer research both nationally and internationally.

The NCSCH receives data from individual state and territory cancer registries on cancers diagnosed in residents of Australia. This commenced with cases first diagnosed in 1982. The data items provided to the NCSCH by the state and territory cancer registries enable record linkage to be performed to identify possible duplicate records and the analysis of cancer by site and behaviour.

The NCSCH produces reports of national incidence and mortality data. Periodically, analyses of specific cancer sites, cancer histology, differentials in cancer rates by country of birth, geographical variation, trends over time and survival are undertaken on an accumulation of data which permits examination of the data in greater depth. The section 'Related publications' sets out the range of publications based on these data.

The NCSCH is able to make available a broad range of statistical data. Data identifying individuals may only be released to bona fide researchers after a strict scientific and ethical review process which involves the AACR executive, the AIHW Ethics Committee and the state and territory cancer registries. General database enquiries and enquiries about the release of statistical data should be addressed to:

Australian Institute of Health and Welfare
National Cancer Statistics Clearing House
GPO Box 570
Canberra ACT 2601
Phone: (02) 6244 1230
E-mail: cancer@aihw.gov.au

Other sources of data on cancer

In addition to the NCSCH, the AIHW holds several other national databases containing cancer-related data. Many factors determine and influence health. Indeed, the dominant view presently is a 'multicausal' one, in which disease, disability and (ultimately) death are to be seen as the result of the interaction of human biology, lifestyle and environmental (including social) factors, modified by healthcare interventions. Therefore, while the main focus of this report is the presentation of cancer incidence and mortality data, it also includes summary data from these other databases which contribute to a more complete picture of cancer in Australia.

Structure of this report

This report is divided into six major components:

- an introduction and overview of cancer in Australia in 2001;
- summary tables of incidence and mortality for all cancer sites for 2001;
- a series of incidence and mortality data tables for the most common cancer sites, and some less common but topical cancer sites, for 2001;
- an overview of some additional sources of data on cancer in Australia covering multiple causes of death, mortality by remoteness, cancer screening, expenditure on cancer, the cancer workforce, general practice management of cancer and international comparisons;
- glossary and reference sections; and
- appendixes comprising the cancer coding system and methods used in this report and state and territory registration features.

In addition, a full set of statistical tables is published separately on the AIHW's web site at <www.aihw.gov.au>. Also on the web site are two interactive data cubes with cancer incidence data for Australia for 1983–2001. An interactive data cube is a multidimensional representation of data. It contains information organised into dimensions to provide fast retrieval of data and cross-tabulation facilities. Historical cancer mortality data is available from the AIHW's General Record of Incidence of Mortality (GRIM) books. For more information go to <http://www.aihw.gov.au/mortality/whatsnew.html>.

Introduction and overview

The overview of cancer in Australia provides a selection of highlights from the data tables. It describes the patterns of cancer incidence and mortality by site, age, sex, and state and territory. Trends in cancer incidence and mortality are discussed and a series of graphs are provided presenting the most common cancers by sex and age group, and trends in national cancer incidence (1983–2001) and mortality (1983–2002).

Summary tables

Summary tables of incidence and mortality for 2001 for all cancer sites are provided. These tables list numbers of new cases and deaths, and crude and age-standardised incidence and mortality rates for Australia. Cumulative rates are given for incidence, while the mortality tables provide estimates of the person-years of life lost. Sex ratios are presented in both the incidence and mortality tables.

Series of data tables

The series of data tables for the most common or topical cancers in 2001 contain age-specific, crude, and age-standardised incidence and mortality rates for males, females and persons for each cancer site. The order of the tables is based on AACR agreed site and site groupings of the International Classification of Diseases 10th Revision (World Health Organization 1992) (Appendix A). All rates are expressed per 100,000 population and, at the Australian level, are directly age-standardised (Appendix B) to both the total estimated resident population of Australia at 30 June 2001 and the WHO 2000 World Standard Population (Appendix C).

These tables include estimates of the lifetime risk of contracting each cancer, the person-years of life lost and the numbers of each cancer as a proportion of the total (excluding non-melanoma skin cancers).

The data tables also include 5-year average annual numbers of new cancer cases and deaths, and age-standardised incidence and mortality rates for each state and territory. It should be noted that the incidence and mortality rates have been directly age-standardised to the total estimated resident population of Australia at 30 June 2001. Particular care should be taken not to compare these rates with previous Cancer Series publications where age standardisation used the 1991 Australian standard population.

Care should also be taken when comparing state and territory rates with previous Cancer Series publications—*Cancer in Australia 1989–1990 (with Projections to 1995)*, *Cancer in Australia 1986–1988* or *Cancer in Australia 1983–1985*—where age standardisation used the 1960 Segi World Standard Population instead of the current WHO 2000 Standard Population.

Appendixes

The appendixes include a listing of the International Classification of Diseases 10th Revision codes used in this report; a methods section providing formulae, explanations and examples of the techniques used to present the data in the report; population data for Australia for 2001; and a summary table of state and territory cancer registry characteristics.

This report, together with a comprehensive set of Excel tables for all cancer sites, is available on the AIHW's web site at <www.aihw.gov.au/publications>.

2 Cancer in Australia

General

Excluding non-melanoma skin cancers, there were 88,398 new cancer cases and 36,319 deaths due to cancer in Australia in 2001. This compares with 65,966 new cases and 30,928 deaths in 1991. Even allowing for the fact that a person may have more than one cancer, at the incidence rates prevailing in 2001, it would be expected that 1 in 3 men and 1 in 4 women will be diagnosed with a cancer in the first 75 years of life. Further, an estimated 257,458 potential years of life would be lost to the community each year as a result of people dying of cancer before the age of 75. Cancer currently accounts for 31% of male deaths and 26% of female deaths.

In this publication the term 'cancer site' is used to represent cancers located in specific organs or tissues as well as systemic cancers such as leukaemia and lymphoma.

Non-melanoma skin cancers

Complete incidence data on non-melanoma skin cancer are not routinely collected by state and territory cancer registries. Two common non-melanoma skin cancers, basal cell carcinoma and squamous cell carcinoma, are not legally notifiable and therefore not routinely reported. Estimates of the frequency of treated basal cell carcinoma and squamous cell carcinoma are derived from data that have been collected in national household surveys in 1985, 1990, 1995 and 2002 (NCCI 2003).

The 2002 survey report (NCCI 2003) indicates that approximately 256,000 people were diagnosed with basal cell carcinoma and 118,000 with squamous cell carcinoma in Australia during 2002, a total of 374,000 people. Males accounted for 56% of basal cell carcinoma and 61% of squamous cell carcinoma. Persons aged 40 years and over accounted for 96% of basal cell carcinoma and almost 100% of squamous cell carcinoma, with persons aged 70 years and over accounting for 37% of basal cell carcinoma and 45% of squamous cell carcinoma.

For details of the age-specific incidence rates for the 2002 survey, please see the survey report (NCCI 2003). Age-standardised incidence estimates in the survey report are not directly comparable to incidence rates for other cancers published elsewhere in this report as survey estimates are standardised to an earlier World Standard Population.

The age-standardised incidence estimates, recalculated using the 2000 World Standard Population were, for basal cell carcinoma 1,150 per 100,000 population in males and 820 per 100,000 in females and for squamous cell carcinoma 560 per 100,000 in males and 320 per 100,000 in females. These incidence rates are considerably higher than the equivalent age-standardised rates for the next most common male cancer, prostate (88.1 per 100,000) and the next most common female cancer, breast (93.1 per 100,000).

Despite the high incidence rate of non-melanoma skin cancer, mortality rates are relatively low at 2.0 per 100,000 population for males and 0.6 per 100,000 for females, compared with the high mortality rates of male lung cancer at 36.4 per 100,000 population, male colorectal cancer (20.4 per 100,000), prostate cancer (20.2 per 100,000) and female breast cancer (18.2 per 100,000) (2001 data standardised to the 2000 World Standard Population).

Non-melanoma skin cancers are excluded from further incidence and mortality comparisons in this publication. Further data on the management of basal cell and squamous cell carcinoma in general practice are included in chapter 5.

Most common cancers

Persons

- Among all persons, the combination of cancers of the colon and rectum (12,844 new cases), often referred to as bowel or colorectal cancer, is the most common registrable cancer in 2001 (Table 1). Colorectal cancer, breast cancer (11,886), prostate cancer (11,191), melanoma (8,885) and lung cancer (8,275) together account for 60% of all registrable cancers in 2001.

Males

- In males, the most common registrable cancers after prostate cancer are colorectal cancer (6,961 new cases diagnosed in 2001), lung cancer (5,384) and melanoma (5,024) (Table 1, Figure 1). These four cancers account for 60% of all registrable cancers in males.

Females

- In females, breast cancer (11,791) is the most common registrable cancer, followed by colorectal cancer (5,883), melanoma (3,861) and lung cancer (2,891), which in total account for 60% of all registrable cancers in females.

Cancers causing death

- The cancers most commonly causing death are lung (4,657), prostate (2,718) and colorectal (2,601) in males, and breast (2,594), lung (2,382) and colorectal (2,153) in females (Table 1).

PYLL—person-years of life lost

The number of person-years of life lost due to cancer is generally dominated by the most common cancers due to the large numbers of cases diagnosed, rather than by those less common cancers that occur earlier in life. Lung cancer is responsible for the highest number of person-years of life lost before 75 years of age (44,978 in 2001), followed by colorectal cancer (29,768) and breast cancer (28,733) (Table 1). Cancer of the brain and nervous system is responsible for the fourth highest number of person-years of life lost (16,968). This contrasts with its ranking as the fourteenth most common cancer (1,421 new cases diagnosed in 2001). Further, the ratio of person-years life lost to new cases for cancer of the brain and nervious system (11.9) is much higher than that for lung cancer (5.4), breast (2.4) or colorectal cancer (2.3). This is a direct result of the relatively large number of younger people dying from cancer of the brain and nervous system.

The most common cancers by age

The most common cancers vary depending on age (Figure 2). In people aged less than 15 years, the most common cancers diagnosed are leukaemia and cancers of the brain and central nervous system. These two cancer sites account for 37% of all cancers in this age group. In those aged 15–44 years, melanoma and breast cancer are the most common cancers, while breast, colorectal, melanoma, prostate and lung cancers are predominant in people aged over 45 years.

The ranking of the most frequently occurring cancers by age group (Figure 2) is based on the number of new cases, and for those cancers the number of deaths is also shown. However, some cancers that would be ranked in the top five cancers based on number of deaths (rather than new cases) are not presented in Figure 2. Cancers that have a substantial number of deaths in each age group that are not presented in Figure 2 are cancer of the adrenal gland (10 deaths) in the 0–14 years age group and cancer of the brain and nervous system (140) and cancer of the lung (124) in the 15–44 year age group. In the age group 45–64 years, cancers of unknown primary site (424 deaths), cancer of the brain and nervous system (391), pancreatic cancer (406), and non-Hodgkin's lymphoma (335) are responsible for a substantial number of deaths. Cancers of unknown primary site (1,930 deaths), cancer of the pancreas (1,382) and non-Hodgkin's lymphoma (1,097) are also significant causes of death in the 65 years and over age group.

Onset of cancer

In 2001 the average age of first diagnosis of a cancer for males was 66 years and the median age was 69 years. The average age of first diagnosis for females was 64 years and the median age was 65 years. For the overall population, the average age of first diagnosis was 65 years and the median age was 68 years.

The population in the age groups from 50–59 years and above is increasing rapidly as the generation born during the baby boom (1946 to 1961) reaches these ages. This is leading to an increase in new cases of cancer much greater than overall population growth, despite a small decline in age-standardised incidence in recent years.

Table 1: Most frequently occurring cancers, Australia, 2001[a], [b]

	New cases					Deaths				
Cancer site	Number	% of all new cancer cases	ASR (A)	ASR (W)	Lifetime risk[c]	Number	% of all cancer deaths	ASR (A)	ASR (W)	PYLL[c]
Males										
Prostate	11,191	23.4	128.5	88.1	1 in 11	2,718	13.3	35.2	20.2	5,665
Colorectal	6,961	14.6	79.0	55.4	1 in 17	2,601	12.7	30.5	20.4	17,183
Lung	5,384	11.3	61.4	42.3	1 in 22	4,657	22.8	53.7	36.4	28,948
Melanoma	5,024	10.5	55.2	42.4	1 in 25	684	3.4	7.8	5.5	7,568
Bladder	2,258	4.7	26.6	17.5	1 in 60	633	3.1	8.0	4.8	2,155
NHL	1,923	4.0	21.4	16.1	1 in 64	787	3.9	9.2	6.3	6,628
Unknown site	1,736	3.6	20.5	13.6	1 in 80	1,213	5.9	14.7	9.4	7,173
Kidney	1,514	3.2	16.9	12.3	1 in 78	540	2.6	6.3	4.3	4,425
Stomach	1,202	2.5	13.8	9.5	1 in 104	753	3.7	8.9	5.9	5,140
Pancreas	958	2.0	11.0	7.6	1 in 133	946	4.6	11.0	7.4	6,465
All cancers	*47,820*	*100.0*	*541.4*	*387.6*	*1 in 3*	*20,417*	*100.0*	*241.2*	*160.0*	*139,913*
Females										
Breast	11,791	29.1	117.2	93.1	1 in 11	2,594	16.3	24.8	18.2	28,540
Colorectal	5,883	14.5	55.4	38.9	1 in 26	2,153	13.5	19.7	13.1	12,585
Melanoma	3,861	9.5	38.3	31.6	1 in 34	390	2.5	3.7	2.7	4,300
Lung	2,891	7.1	27.7	20.0	1 in 46	2,382	15.0	22.6	15.9	16,030
NHL	1,576	3.9	15.1	11.3	1 in 88	715	4.5	6.5	4.4	3,935
Unknown site	1,568	3.9	14.3	9.5	1 in 117	1,217	7.7	10.9	6.9	5,640
Uterus	1,537	3.8	15.1	11.7	1 in 77	299	1.9	2.8	2.0	2,225
Ovary	1,295	3.2	12.6	9.8	1 in 104	857	5.4	8.1	5.7	6,598
Kidney	944	2.3	9.1	6.8	1 in 142	386	2.4	3.6	2.4	1,923
Pancreas	900	2.2	8.2	5.5	1 in 207	865	5.4	7.8	5.1	3,908
All cancers	*40,578*	*100.0*	*393.3*	*300.3*	*1 in 4*	*15,902*	*100.0*	*147.8*	*102.2*	*117,545*
Persons										
Colorectal	12,844	14.5	66.2	46.6	1 in 21	4,754	13.1	24.5	16.5	29,768
Breast	11,886	13.4	61.2	48.0	1 in 20	2,620	7.2	13.5	9.7	28,733
Prostate	11,191	12.7	57.6	40.6	1 in 22	2,718	7.5	14.0	8.3	5,665
Melanoma	8,885	10.1	45.8	36.5	1 in 29	1,074	3.0	5.5	4.0	11,868
Lung	8,275	9.4	42.6	30.1	1 in 30	7,039	19.4	36.3	25.1	44,978
NHL	3,499	4.0	18.0	13.6	1 in 74	1,502	4.1	7.7	5.3	10,563
Unknown site	3,304	3.7	17.0	11.4	1 in 96	2,430	6.7	12.5	8.0	12,813
Bladder	2,954	3.3	15.2	10.3	1 in 96	908	2.5	4.7	2.9	2,930
Kidney	2,458	2.8	12.7	9.3	1 in 101	926	2.5	4.8	3.2	6,348
Stomach	1,902	2.2	9.8	6.8	1 in 143	1,209	3.3	6.2	4.2	8,133
All cancers	*88,398*	*100.0*	*455.3*	*337.6*	*1 in 3*	*36,319*	*100.0*	*187.1*	*127.3*	*257,458*

(a) Rates are expressed per 100,000 population and age-standardised to the Australian 2001 Standard Population (ASR (A)) and to the WHO 2000 World Standard Population (ASR (W)). The rates age-standardised to the two populations (World 2000 and Australia 2001) differ due to the age distributions of these populations. For example, the world population gives more weight to younger age groups where there are fewer cancers, and consequently the rate is lower compared with the Australian 2001 population. A greater weight is given to the older age groups in the Australian 2001 population where there are more cancers, and consequently these rates tend to be higher.

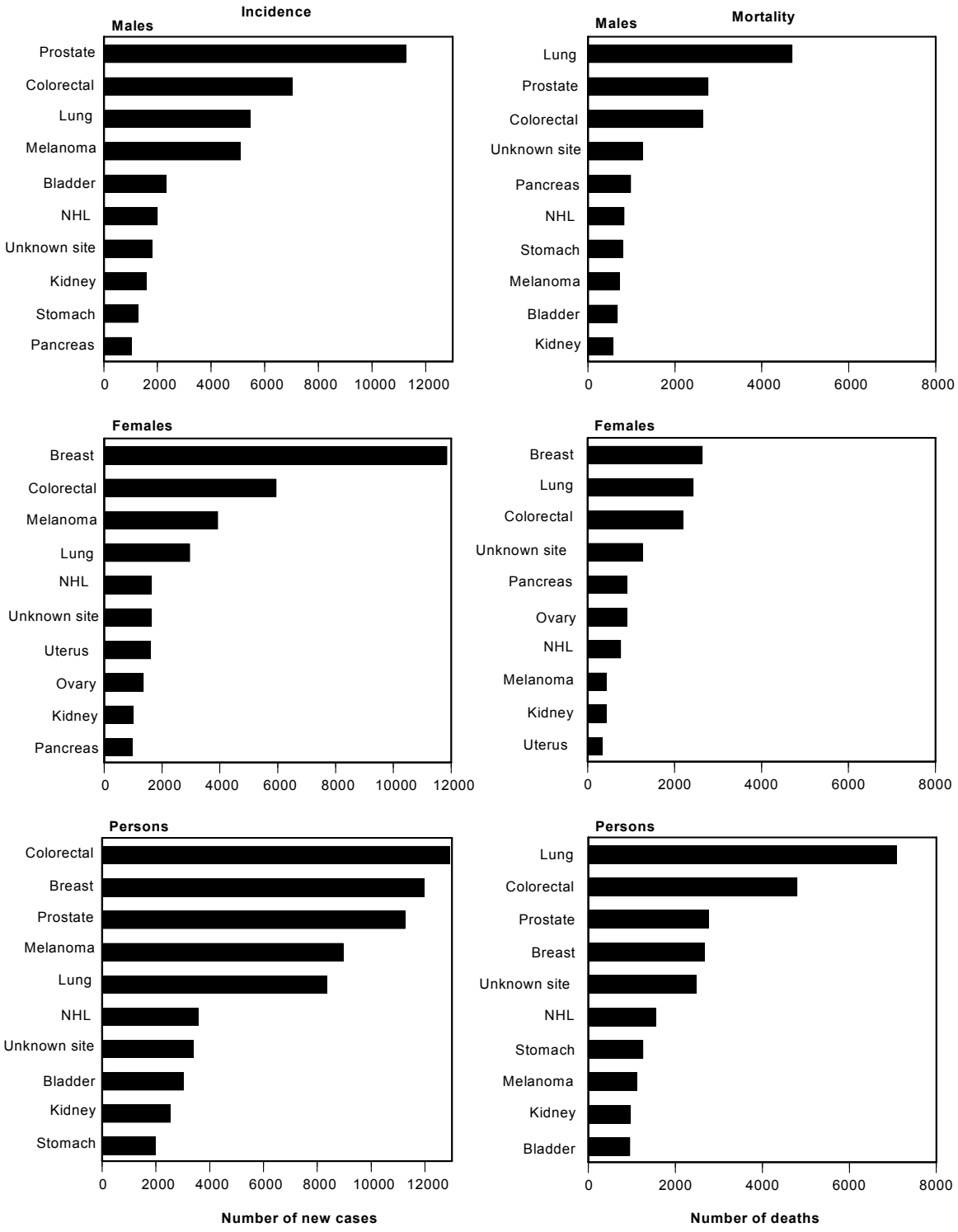
(b) Non-melanoma skin cancers, known to be the most common cancer type, are excluded from this list as basal cell carcinoma and squamous cell carcinoma, the two most common types of non-melanoma skin cancer, are not notifiable cancers.

(c) These measures are calculated for ages 0–74 years; PYLL refers to person-years of life lost. Methods for the calculation of these measures are presented in Appendix B.

Note: NHL refers to non-Hodgkin's lymphoma. In this table colorectal cancer includes anus; kidney includes ureter and urethra; ovary includes other and unspecified female organs. Methods for calculation of these measures are presented in Appendix B.

Source: Cancer in Australia 2001 (AIHW & AACR 2004).

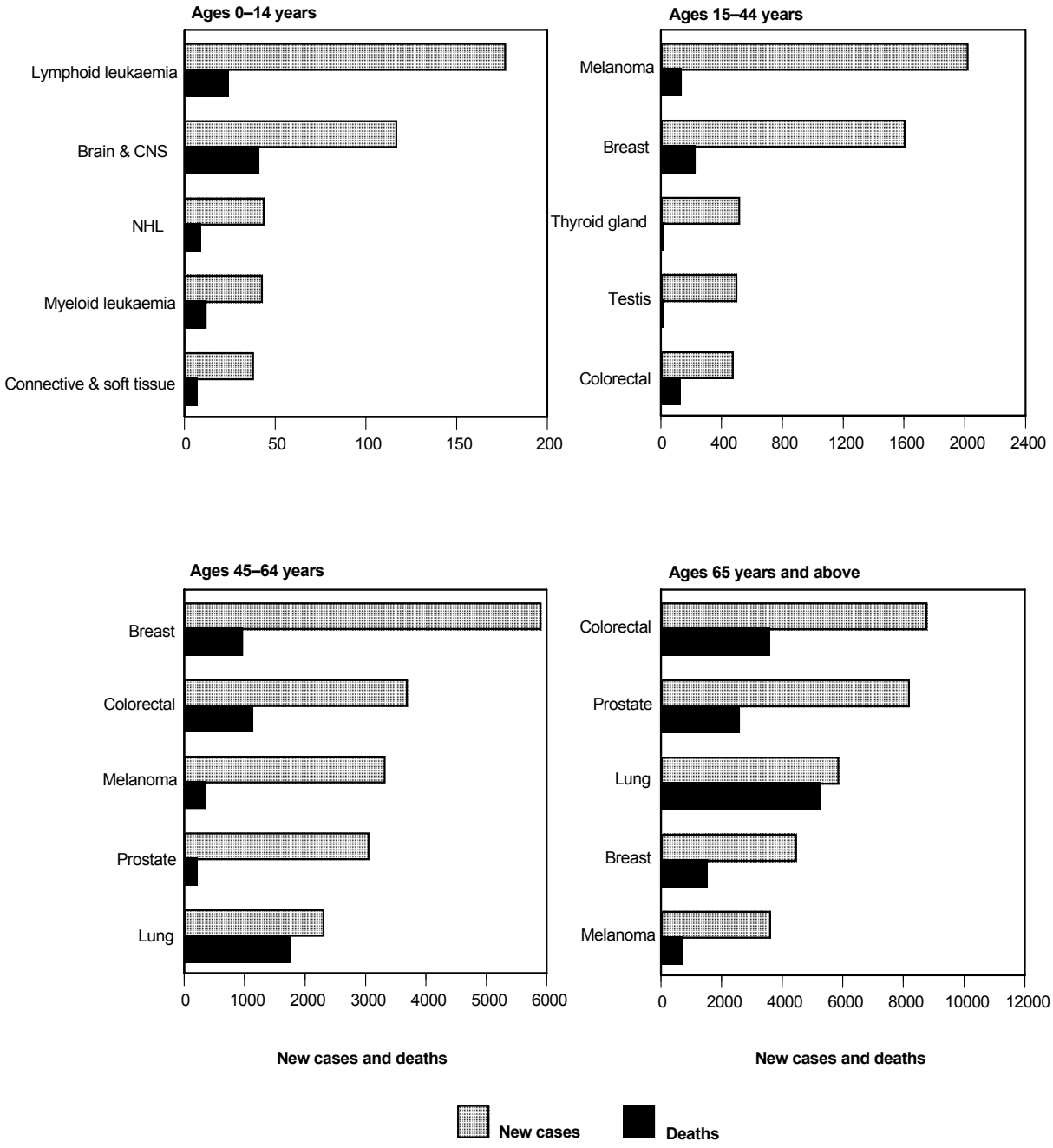
Most frequently occurring cancers



Source: Cancer in Australia 2001 (AIHW & AACR 2004).

Figure 1: Most frequently occurring cancers, Australia, 2001

Most frequently occurring cancers by age group



Notes

1. NHL refers to non-Hodgkin's lymphoma. CNS refers to central nervous system.
2. Each age group is graphed on a different scale.

Source: Cancer in Australia 2001 (AIHW & AACR 2004).

Figure 2: Most frequently occurring cancers by age group, ranked by number of new cases (persons), Australia, 2001

Age and sex differences

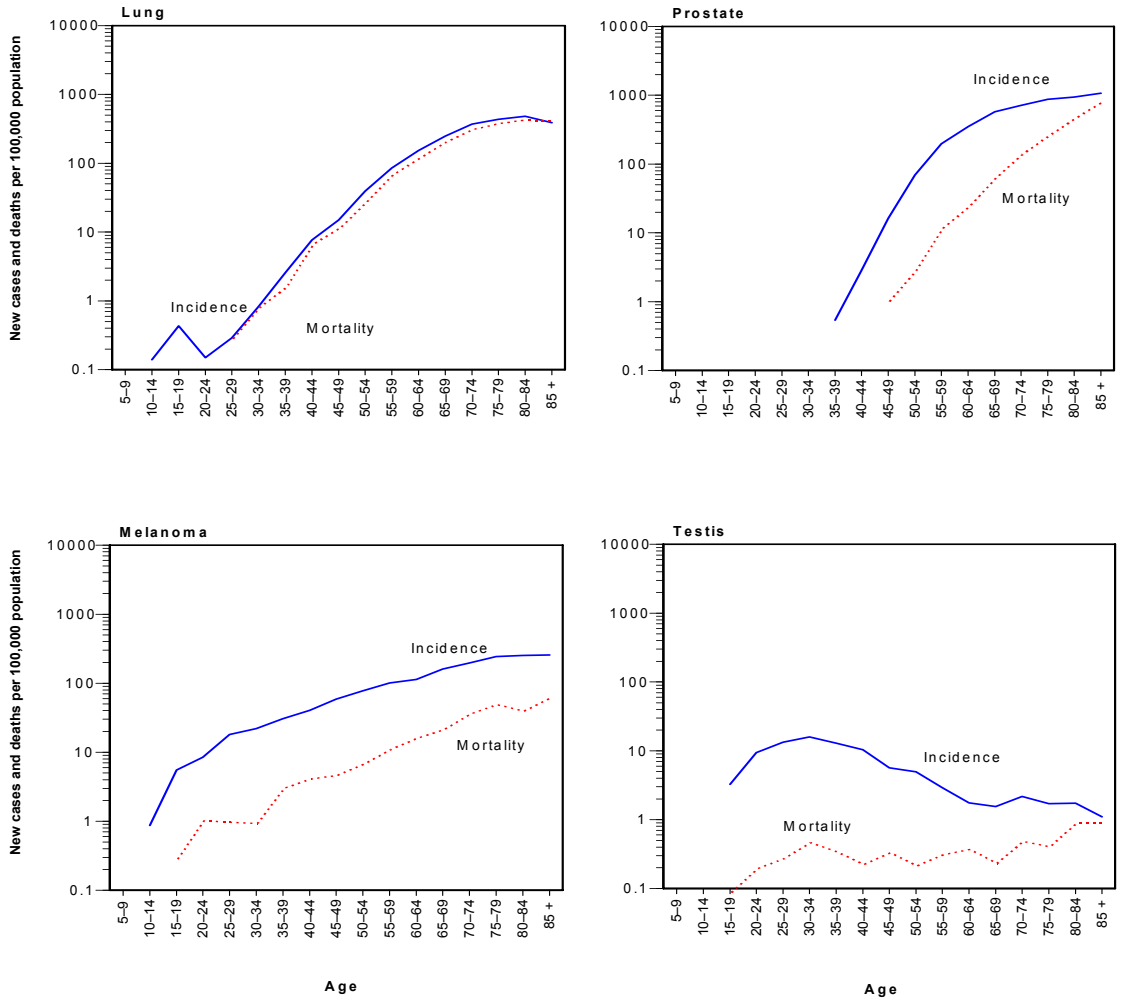
Cancer occurs more commonly in males than females. The age-standardised incidence rate in 2001 for all cancers combined (excluding non-melanoma skin cancers) was 541.4 new cases per 100,000 for males and 393.3 per 100,000 for females, resulting in an age-adjusted sex ratio of 1.4. Males have a higher incidence rate for every cancer site, except for breast, thyroid, anus, bone, and connective and soft tissue.

Of people diagnosed with cancer, 0.7% of all cancers (excluding non-melanoma skin cancers) occur in those aged less than 15 years, 9.4% in the 15–44 year age group, 32.6% in the 45–64 year age group, and 57.2% in those aged 65 years and over. While the pattern of deaths across age groups is similar to that of incidence, a larger proportion (72.5%) of cancer deaths occurs in those aged 65 years and over. Peripheral nerves and autonomic nervous system cancers are exceptions to the age pattern, with the number of cases in the 15–44 year age group exceeding that in the 45 years and over age groups.

The risk of cancer increases with age. The age-specific incidence rate in 2001 for all cancers combined (excluding non-melanoma skin cancers) was 15.2 per 100,000 population for people aged less than 15 years; 95.6 per 100,000 population for 15–44 year olds; 700.5 per 100,000 population for 45–64 year olds; and 2,190.2 per 100,000 population for people aged 65 years and over.

Age-specific incidence and mortality rates vary depending upon the cancer site (Figures 3–6). For example, because of relatively low survival lung cancer incidence and mortality rates parallel each other closely from age group 30–34 years, rising from ages 20–24 years through to 80–84 years (men) and from ages 20–24 years through to 75–79 years (women) before falling slightly in the oldest age groups. The age-specific incidence rates for melanoma of the skin, on the other hand, rise much more steadily across the whole age range. Some cancers, however, have their highest rates in early or middle life and remain fairly constant in the higher age groups (for example, cancers of the breast and cervix) or even decline with age (for example, cancer of the testis).

Age-specific incidence and mortality rates—males

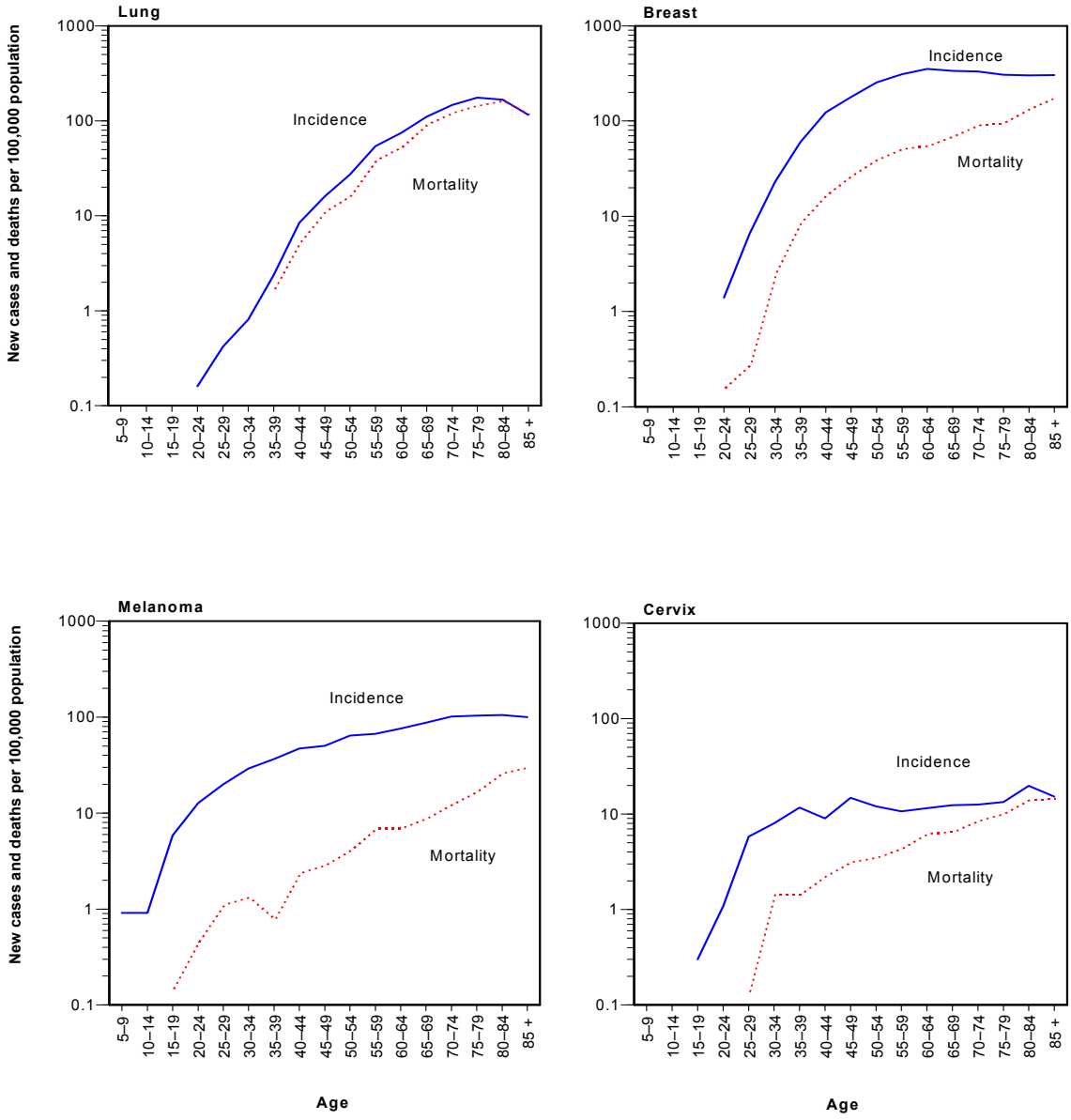


Note: Data for cancer of the testis have been averaged over 1997–2001 to provide more stable estimates.

Source: Cancer in Australia 2001 (AIHW & AACR 2004).

Figure 3: Age-specific incidence and mortality rates for melanoma and cancers of the lung, prostate and testis in males, Australia, 2001

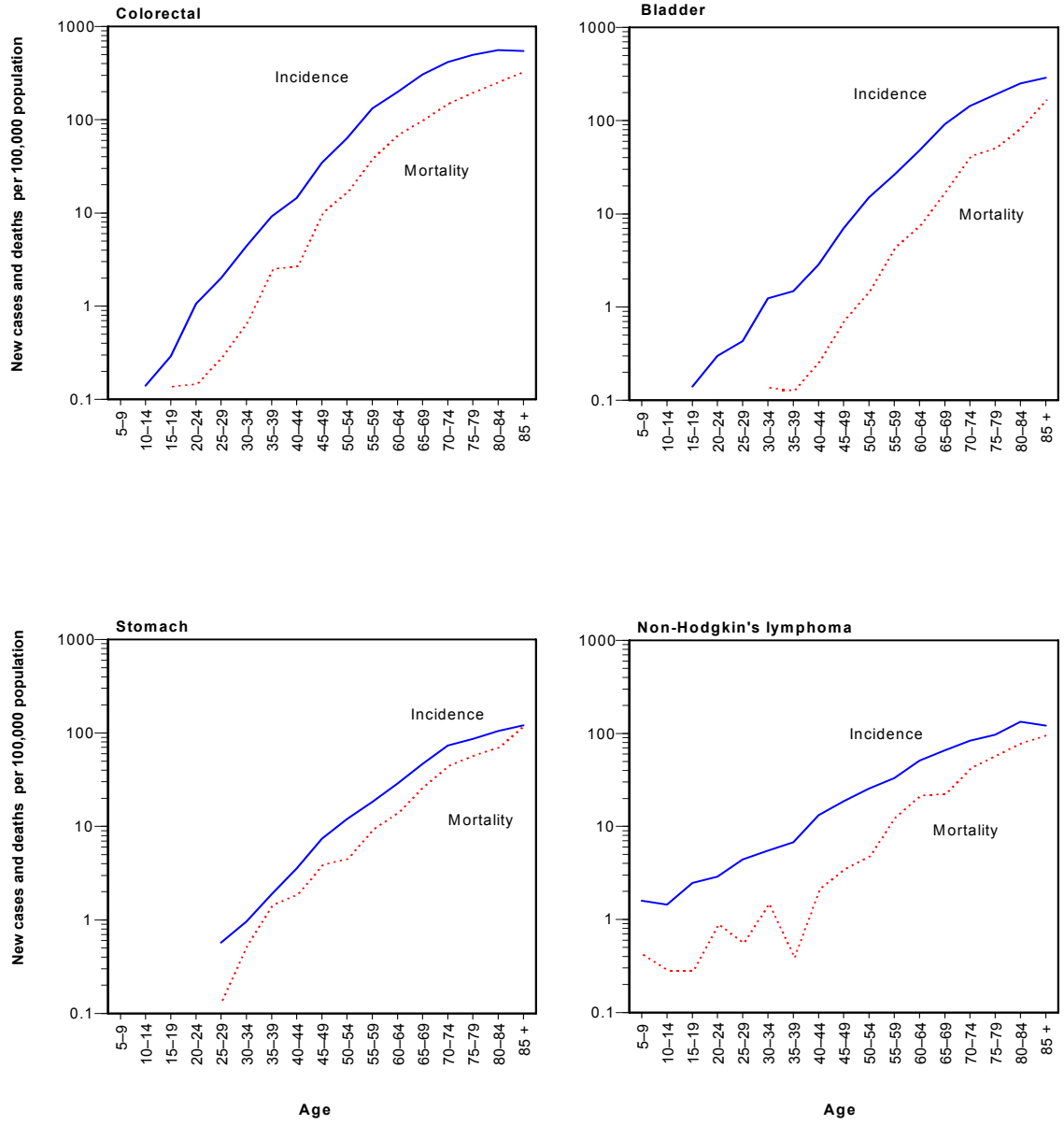
Age-specific incidence and mortality rates—females



Source: Cancer in Australia 2001 (AIHW & AACR 2004).

Figure 4: Age-specific incidence and mortality rates for melanoma and cancers of the lung, breast and cervix in females, Australia, 2001

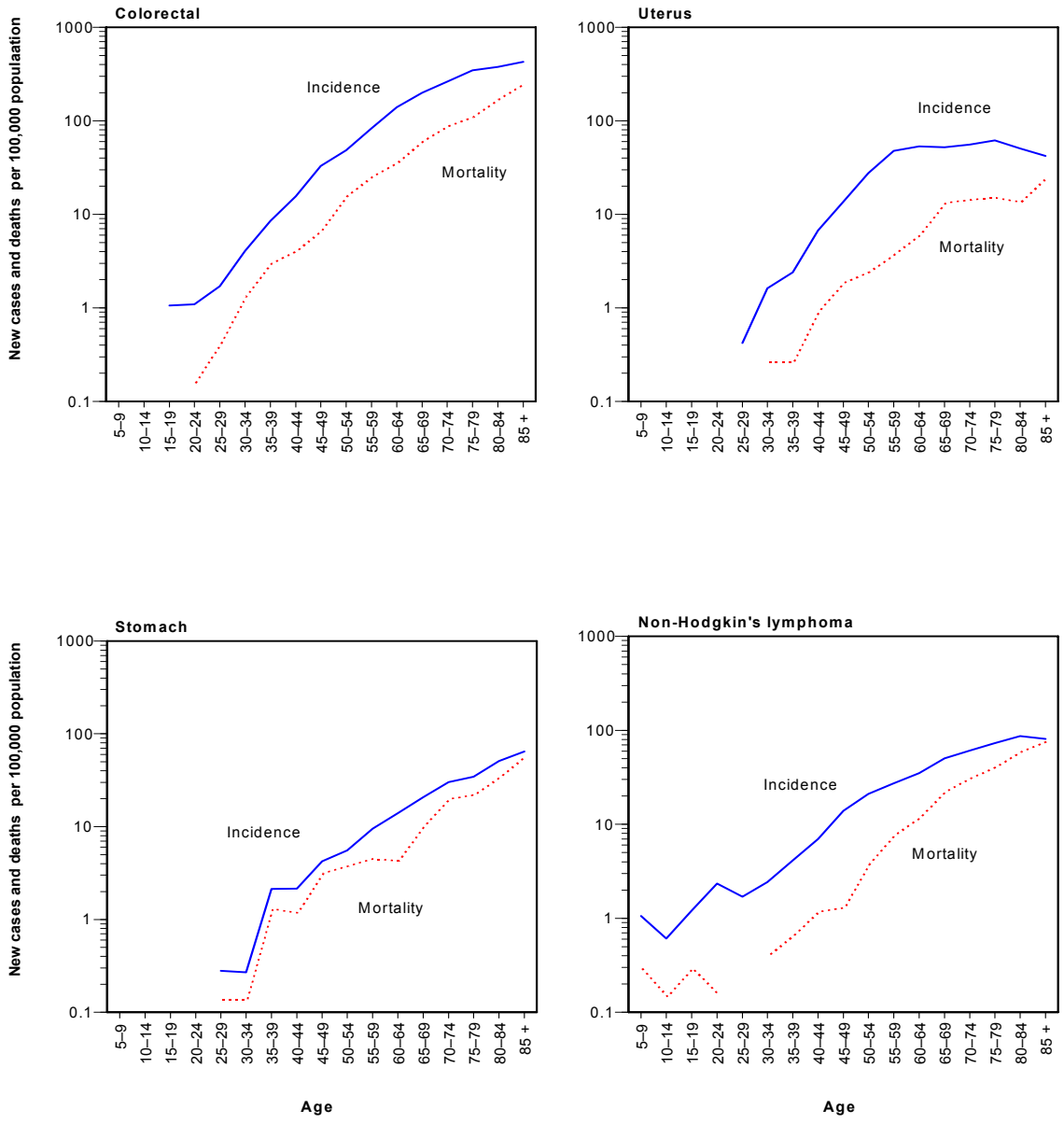
Age-specific incidence and mortality rates—males



Source: Cancer in Australia 2001 (AIHW & AACR 2004).

Figure 5: Age-specific incidence and mortality rates for colorectal cancer, cancers of the bladder and stomach, and non-Hodgkin's lymphoma in males, Australia, 2001

Age-specific incidence and mortality rates—females



Source: Cancer in Australia 2001 (AIHW & AACR 2004).

Figure 6: Age-specific incidence and mortality rates for colorectal cancer, cancers of the uterus and stomach, and non-Hodgkin's lymphoma in females, Australia, 2001

Cancers attributed to smoking and alcohol consumption

Alcohol and smoking are risk factors for many cancers. In 2001, cancers attributed to excessive alcohol consumption accounted for 3.2% of all new cases of cancer, while those cases attributed to smoking accounted for 12.0% of all new cases of cancer. Cancers attributed to smoking also accounted for a large proportion of deaths from cancer in 2001 (21.5% of all cancer deaths). These data and those in Tables 54 and 55 are derived from a series of age- and sex-specific aetiological fractions developed by Ridolfo and Stevenson (2001) and from cancer incidence estimates for specific cancer sites for 2001. These fractions are based on an analysis of international and Australian studies and estimate the probability that a specific agent (alcohol or tobacco) causes a specific disease (cancer). The cancers thought to be directly attributable to smoking (excluding passive smoking) and alcohol are listed in Table 2.

Table 2: Cancer site and percentage of new cancers attributed to excessive alcohol consumption and to smoking, Australia, 2001

Cancer site	Males (%)	Females (%)
Cancers attributable to excessive alcohol consumption		
Oral cancers[(a)]	38	28
Oesophagus	45	36
Liver	37	29
Larynx	50	41
Female breast cancer	—	11
Cancers attributable to smoking		
Oral cancers[(a)]	52	42
Oesophagus	50	41
Stomach	12	8
Anus	39	29
Pancreas	23	16
Larynx	69	60
Lung	89	70
Vulva	—	32
Penis	21	—
Kidney	17	12
Renal pelvis	51	43
Bladder	38	28

(a) Oral cancers include C01–C06, C09–C10 and C12–C14.

Note: In editions prior to *Cancer in Australia 1999*, cancers of the uterus and cervix were included among cancers attributable to smoking. However, more recent research has shown that this is not the case.

Source: Aetiological fractions from Ridolfo & Stevenson 2001 applied to 2001 cancer incidence data.

While tobacco and alcohol have each been associated with cancer in their own right, they often occur together and may interact to produce higher or lower risks. To the extent possible, the estimates of the aetiological fractions have been derived to represent the independent contribution of each risk factor. However, it is not possible to allow for all the complexities of the interactions between risk factors using this methodology. Hence the

fractions for tobacco and alcohol cannot be summed to give a combined effect of the two risk factors.

It is estimated that 2,791 new cases of cancer were directly attributable to alcohol consumption in 2001 at a rate of 14.4 cases per 100,000 population, as were 1,291 deaths at a rate of 6.6 per 100,000 population. While other cancers may be indirectly caused by alcohol consumption in combination with other risk factors, alcohol is believed to be the primary causative agent for differing proportions of specific cancers. The mechanism by which alcohol causes cancer has not been fully determined, but the major metabolite of ethanol has been shown to be carcinogenic in animal experiments (English et al. 1995). The lifetime risk of cancers attributable to alcohol consumption is 1 in 95 for males and 1 in 75 for females. Between 1991 and 2001, the incidence rate for cancers attributable to alcohol consumption in females increased by an average of 1.2% per annum, while the male rate decreased by an average of 0.3% per annum.

Cancers attributable to smoking account for 16.5% of all new cases of cancer in males and 7.8% of all new cases of cancer in females. This large difference is attributable to the higher rates of smoking among men than women in the past 30 years. Twenty-five years ago smoking rates in men were almost double those in women. This is no longer the case. In 2001, 26% of men and 21% of women aged over 14 years were current smokers (AIHW 2003). Organs associated with the respiratory system are the ones most affected by cigarette smoke, as a result of the known carcinogens in cigarette smoke such as polycyclic aromatic hydrocarbons (Table 2). Epidemiological evidence indicates that other cancers, including cancers of the upper digestive tract, bladder, renal pelvis (kidneys) and pancreas are also associated with cigarette smoking (English et al. 1995).

Cigarette smoking is estimated to have directly caused 10,592 new cases of cancer (54.6 new cases per 100,000 population) and 7,820 deaths (40.3 per 100,000 population) in 2001. Between 1991 and 2001, the male incidence rate for cancers attributable to smoking fell by an average of 1.4% per year, while the rate for females rose by 0.7% per year. Over the same period, mortality rates fell by 1.9% per annum for males and rose by less than 0.1% per annum for females (Figure 10).

The following illustrates the improvements in the male mortality rate for cancers from the decline in smoking among men. If the 1991 age-specific rates attributable to smoking were applied to the 2001 male population there would be an additional 1,253 male deaths due to smoking in 2001. In contrast, the female mortality rate for cancers attributable to smoking has increased slightly since 1991 because of the lag effect on cancer incidence of rising rates of smoking among women in the 1960s and 1970s. There would be 33 fewer female deaths in 2001 if the 1991 rates were applied to the 2001 female population.

Cancer rates in the states and territories, 1997–2001

Cancer incidence and mortality are reported here for the combined period 1997–2001 for all states and territories. Cancer registration is based on state and territory of residency of the patient at the time of diagnosis.

Melanoma rates

Cancer incidence is generally similar among states and territories. However, variation in the incidence of melanoma among states creates some differences in the overall incidence rates.

An analysis of all cancers combined (excluding non-melanoma skin cancers) showed that Queensland had the highest incidence in both males (576.1 per 100,000 population in 1997–2001) and females (418.7 per 100,000 population), while the Northern Territory reported the lowest incidence with 489.6 cases per 100,000 for males and 365.2 per 100,000 for females (Table 36) because of lower incidence among Aboriginal and Torres Strait Islander people.

Melanoma risk is generally highest in the northern areas and lower in the more southerly areas, showing a correlation to exposure to ultraviolet radiation (Jelfs et al. 1994). Age-standardised mortality ranges from 3.6 deaths per 100,000 population for the Australian Capital Territory to 6.5 deaths per 100,000 population for Queensland (Table 41).

Incidence rates excluding skin cancers

When the impact of melanoma and non-melanoma skin cancers are removed from the comparison, the order of states and territories with the highest and lowest cancer incidence rate for males changed with South Australia reporting the highest incidence rate for all cancers combined (excluding melanoma and non-melanoma skin cancers) among males (509.3 per 100,000 population in 1997–2001), closely followed by Victoria (500.5 per 100,000 population). The Northern Territory reported the lowest, with 452.4 cases per 100,000 population. The remaining states and territories reported the following rates for males: Queensland 498.2, the Australian Capital Territory 496.0, Tasmania 480.8, New South Wales 482.0 and Western Australia 456.0. For females the Australian Capital Territory reported the highest rate (382.1 per 100,000 population), closely followed by New South Wales (381.6 per 100,000 population). Western Australia reported the lowest (330.2 per 100,000 population). The remaining states and territories reported the following rates for females: Queensland 365.6, Victoria 359.1, South Australia 358.2, Tasmania 354.3 and the Northern Territory 330.2 per 100,000 population.

Mortality rates by state of usual residence

The 1997–2001 cancer mortality rates reported for males across the states and territories range from 219.6 per 100,000 population in the Australian Capital Territory to 262.7 per 100,000 population in Tasmania. For females, the mortality rates vary from 146.7 per 100,000 population in New South Wales to 187.9 in the Northern Territory (Table 36).

These rates are in respect of deaths for which cancer was the underlying cause of death as coded by the Australian Bureau of Statistics (ABS) from death certificates. Some, but not all of the state and territory cancer registries undertake their own detailed analysis of cancer mortality and there may be differences between the figures published by the cancer registries and the ABS figures published in this report.

These differences are minimised where state privacy legislation permits the cancer registry to provide details of specific cancer type to the ABS. For states such as New South Wales, where privacy legislation prohibits such data exchange, if death data are required for the purposes of planning services they should be requested from the NSW Cancer Registry.

Mortality by state of registration and state of usual residence

State and territory mortality rates in this publication refer to the state and territory **of usual residence**. However, it is not uncommon for persons diagnosed with cancer to travel interstate for treatment and end of life care, so state of usual residence at diagnosis may differ from the state of usual residence at time of death, which may affect the comparison of incidence and mortality rates in this report, especially for the Australian Capital Territory.

Even larger differences occur between the state of registration and the state of usual residence at death, especially for the Australian Capital Territory and the Northern Territory.

Of cancer deaths registered in the Australian Capital Territory during the period 1997–2001, 16.3% usually resided in another state or territory, the majority (15.1%) coming from New South Wales (Table 3).

During the same period, 6.9% of cancer deaths of usual residents of the Northern Territory were registered outside the Territory, the majority in South Australia (3.7%).

Table 3: Cancer deaths by state of usual residence and state of registration, 1997–2001

State of registration	State of usual residence									
	NSW	**Vic**	**Qld**	**WA**	**SA**	**Tas**	**ACT**	**NT**	**Other**	**Total**
NSW	59,735	197	263	11	23	8	34	9	1	*60,281*
VIC	323	45,499	57	10	33	21	7	6	0	*45,956*
QLD	573	65	30,862	9	15	10	7	8	0	*31,549*
WA	19	14	15	15,382	6	3	1	4	5	*15,449*
SA	58	45	8	5	15,685	0	0	31	0	*15,832*
TAS	4	11	2	2	2	5,079	1	0	0	*5,101*
ACT	350	10	9	3	5	1	1,938	0	0	*2,316*
NT	5	2	6	4	8	1	0	782	0	*808*
Total	*61,067*	*45,843*	*31,222*	*15,426*	*15,777*	*5,123*	*1,988*	*840*	*6*	*177,292*
	Per cent of deaths registered in each state by state of usual residence									
NSW	99.1	0.3	0.4	0.0	0.0	0.0	0.1	0.0	0.0	*100.0*
VIC	0.7	99.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	*100.0*
QLD	1.8	0.2	97.8	0.0	0.0	0.0	0.0	0.0	0.0	*100.0*
WA	0.1	0.1	0.1	99.6	0.0	0.0	0.0	0.0	0.0	*100.0*
SA	0.4	0.3	0.1	0.0	99.1	0.0	0.0	0.2	0.0	*100.0*
TAS	0.1	0.2	0.0	0.0	0.0	99.6	0.0	0.0	0.0	*100.0*
ACT	15.1	0.4	0.4	0.1	0.2	0.0	83.7	0.0	0.0	*100.0*
NT	0.6	0.2	0.7	0.5	1.0	0.1	0.0	96.8	0.0	*100.0*
Total	*34.4*	*25.9*	*17.6*	*8.7*	*8.9*	*2.9*	*1.1*	*0.5*	*0.0*	*100.0*
	Per cent of deaths in state of usual residence by state of registration									
NSW	97.8	0.4	0.8	0.1	0.1	0.2	1.7	1.1	16.7	34.0
VIC	0.5	99.2	0.2	0.1	0.2	0.4	0.4	0.7	0.0	25.9
QLD	0.9	0.1	98.8	0.1	0.1	0.2	0.4	1.0	0.0	17.8
WA	0.0	0.0	0.0	99.7	0.0	0.1	0.1	0.5	83.3	8.7
SA	0.1	0.1	0.0	0.0	99.4	0.0	0.0	3.7	0.0	8.9
TAS	0.0	0.0	0.0	0.0	0.0	99.1	0.1	0.0	0.0	2.9
ACT	0.6	0.0	0.0	0.0	0.0	0.0	97.5	0.0	0.0	1.3
NT	0.0	0.0	0.0	0.0	0.1	0.0	0.0	93.1	0.0	0.5
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Note: All deaths during the 5-year period with year of death 1997 to 2001.

Source: AIHW mortality database.

Cancers attributed to smoking

Lung cancer incidence rates (including the trachea and bronchus) are highest in the Northern Territory (for males 77.9 cases per 100,000 population, for females 40.3) (Table 40). The lowest lung cancer incidence rates are reported for males in the Australian Capital Territory (69.7 per 100,000 population) and for females in South Australia (26.7).

State and territory variations in cancers attributed to smoking generally reflect those observed for lung cancer (Table 55). The Northern Territory reported the highest incidence rates for males and females (116.5 and 41.2 per 100,000 population respectively). The Australian Capital Territory reported the lowest smoking-related cancer incidence rates for males and females (69.7 and 26.7 per 100,000 population respectively). Death rates from cancers attributed to smoking were highest in the Northern Territory for both males and females (89.7 and 32.1 per 100,000 population respectively).

These patterns of incidence probably reflect smoking behaviour approximately 10–25 years ago, due to the time lag between exposure to carcinogens in the tobacco smoke and the diagnosis of cancer. Differentials in smoking rates between the states and territories reported in the 2001 National Health Survey (ABS 2002) are likely to affect smoking-related cancer incidence rates in the future. Queensland (52.9%) reported the highest proportion of current and ex-smokers, and the Australian Capital Territory the lowest at 49.3%, with the national average 51.5%.

Breast cancer and prostate cancer

The Australian Capital Territory reported the highest incidence rates for female breast cancer (122.1 per 100,000), followed by South Australia (117.4 per 100,000), Queensland (117.2 per 100,000), Victoria (114.9 per 100,000), Western Australia (112.9 per 100,000), New South Wales (112.3 per 100,000) and Tasmania (104.1 per 100,000). The Northern Territory reported the lowest incidence rate (97.9 cases per 100,000 population) (Table 42).

The Australian Capital Territory reported high incidence rates of prostate cancer (162.4 per 100,000 population), while considerably lower rates were reported in the Northern Territory (103.5 per 100,000 population) (Table 46), a rate influenced by the low Indigenous population incidence rates (d'Espaignet et al. 1996). These interstate variations in prostate cancer incidence might also be explained by differences in the time and rate of uptake of prostate-specific antigen (PSA) testing in the states and territories (Smith et al. 1998; Threlfall et al. 1998).

Cervical cancer

The Northern Territory reported the highest incidence rates for cervical cancer (14.6 per 100,000 population). A major contributor to this incidence rate is the high rate of cervical cancer among the Indigenous population, which d'Espaignet et al. (1996) indicated was up to three times the rate of the non-Indigenous population. This situation is also reflected in a high mortality rate (6.7 deaths per 100,000 population). This high mortality rate may be an indicator of late-stage detection of these cancers.

The remaining states and territories reported the following incidence rates: 6.5 for the Australian Capital Territory, 6.9 for South Australia, 7.2 for Victoria, 8.5 for New South Wales, 8.6 for both Western Australia and Tasmania and 9.3 for Queensland per 100,000

population. Mortality rates for the states and territories, with the exception of the Nothern Territory, ranged from 2.0–3.2 deaths per 100,000 population.

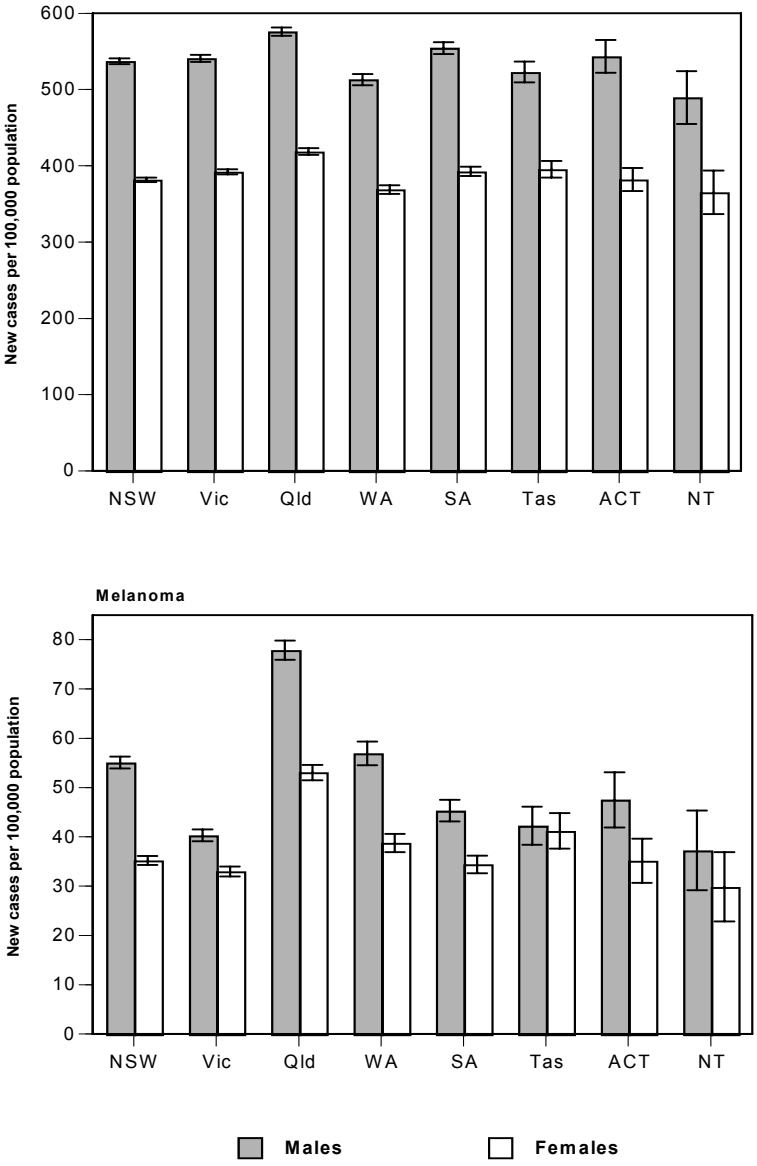
Explanations for variations

Differences in state and territory cancer incidence rates may be explained by variations in underlying cancer risk, the availability and utilisation of diagnostic procedures, reporting and coding inconsistencies, and normal incidence rate fluctuations. A case in point is bladder cancer (Table 48), where state and territory comparisons vary by more than 100%. In the Northern Territory the incidence rate is 7.3 new cases per 100,000 population compared to 20.3 in Queensland and 19.8 in Victoria. This is largely due to differences in local coding practices, particularly in regard to the inclusion or exclusion of tumours of uncertain behaviour. One of the main functions of the AACR is to identify such differences in coding practice and agree on strategies to standardise coding and produce comparable state and territory data that are also comparable to published international statistics.

Incidence rates for several types of cancer published in this report are considerably lower for the Northern Territory than for other states. These differences are predominantly due to low incidence of these cancers in Indigenous Australians, who comprise 29% of the Northern Territory population (Condon et al. 2001).

Care should be taken when interpreting incidence rates, especially for less common cancers and for states and territories with small populations. To reduce the problems of statistical variation due to a small number of cases, the numbers and rates presented for the states and territories in Tables 36 to 55 in this publication are annual averages of the 5-year period 1997–2001. For annual sex- and cancer-specific data, or data cross-classified by other variables (for example, age, geographic area), the state and territory cancer registries should be contacted directly.

All cancers and melanoma incidence rates by sex, states and territories



Source: Cancer in Australia 2001 (AIHW & AACR 2003).

Figure 7: Age-standardised incidence rates (95% confidence intervals) for all cancers (excluding non-melanoma skin cancers) and for melanoma, states and territories, 1997–2001

Mesothelioma data in the National Cancer Statistics Clearing House

Introduction

Mesothelioma is a usually fatal cancer that is characterized by the extremely long time between exposure to the known carcinogen, asbestos, and the eventual diagnosis of the disease. The latent interval between exposure and the development of mesothelioma is often about 30 years (Underwood 1996). It has a poor survival record, with people not usually surviving more than 2 years following diagnosis.

The Australian Mesothelioma Register was set up in 1986 by the National Occupational Health and Safety Commission (NOHSC) which has been publishing annual monitoring reports ever since (www.nohsc.gov.au). The Register includes occupational, industry and household exposure to asbestos. In 2004 NOHSC was abolished and its functions absorbed within the Department of Employment and Workplace Relations (DEWR). Negotiations are being held between NOHSC and AIHW to transfer the Register to the Institute in 2005.

Incidence and mortality

The National Cancer Statistics Clearing House at AIHW includes complete incidence and mortality data for mesothelioma because it is a cancer and therefore notifiable to all state and territory cancer registries.

While national incidence data are available back to the commencement of records in the NCSCH in 1982, mesothelioma mortality data are only available from 1997 from the commencement of ICD-10 coding of mortality by the Australian Bureau of Statistics. It was not included as a separate cancer in ICD-9.

Incidence and mortality trends

Because of the high fatality rate and relatively short survival after diagnosis, incidence and mortality numbers of cases and rates are similar. Trends are as follows:

- The age-standardised incidence per 100,000 population increased from 1.2 in 1982 to 2.9 in 2001.
- The numbers of new cases per year has increased from around 150 in the early 1980s to 567 in 2001, while the peak number of recorded deaths to date was 519 in 2001.
- Although female incidence is substantially lower than male incidence, the age-standardised rate for females has more than tripled since the early 1980s to 1.0 per 100,000 women, while the male rate has more than doubled during the same period to 5.3 per 100,000 males.

Other features of mesothelioma are:

- The median age at diagnosis for men is 70.0 years and median age at death is also 70.0 years.
- For women, the median age at diagnosis is 71.0 years and median age at death 72.0 years.

Table 4: New cases and deaths for mesothelioma ICD-10 C45, all ages (0–85+), Australia, 1982–2002

New cases				Deaths			
Year of diagnosis	Males	Females	Persons	Year of death	Males	Females	Persons
1982	134	22	156	1982	n.a	n.a	n.a
1983	130	14	144	1983	n.a	n.a	n.a
1984	149	18	167	1984	n.a	n.a	n.a
1985	177	24	201	1985	n.a	n.a	n.a
1986	196	30	226	1986	n.a	n.a	n.a
1987	176	29	205	1987	n.a	n.a	n.a
1988	243	32	275	1988	n.a	n.a	n.a
1989	229	38	267	1989	n.a	n.a	n.a
1990	258	35	293	1990	n.a	n.a	n.a
1991	260	46	306	1991	n.a	n.a	n.a
1992	287	38	325	1992	n.a	n.a	n.a
1993	318	51	369	1993	n.a	n.a	n.a
1994	372	47	419	1994	n.a	n.a	n.a
1995	332	58	390	1995	n.a	n.a	n.a
1996	361	53	414	1996	n.a	n.a	n.a
1997	391	75	466	1997	353	63	416
1998	412	59	471	1998	360	43	403
1999	397	76	473	1999	333	57	390
2000	399	78	477	2000	375	61	436
2001	460	107	567	2001	434	85	519
				2002*	400	80	480

* Refers to year of registration.

n.a. refers to not available.

Sources: National Cancer Statistics Clearing House and AIHW National Mortality Database.

Table 5: Age-standardised incidence and mortality rates for mesothelioma ICD-10 C45, all ages (0–85+), Australia, 1982–2002

	Age-standardised rates for all ages (0-85+)						
Year of diagnosis	Males	Females	Persons	Year of death	Males	Females	Persons
1982	2.3	0.3	1.2	1982	n.a	n.a	n.a
1983	2.1	0.2	1.1	1983	n.a	n.a	n.a
1984	2.4	0.3	1.2	1984	n.a	n.a	n.a
1985	3.0	0.3	1.5	1985	n.a	n.a	n.a
1986	3.1	0.4	1.6	1986	n.a	n.a	n.a
1987	2.6	0.4	1.4	1987	n.a	n.a	n.a
1988	3.8	0.4	1.9	1988	n.a	n.a	n.a
1989	3.5	0.5	1.8	1989	n.a	n.a	n.a
1990	3.9	0.4	1.9	1990	n.a	n.a	n.a
1991	3.7	0.6	2.0	1991	n.a	n.a	n.a
1992	4.0	0.4	2.1	1992	n.a	n.a	n.a
1993	4.4	0.6	2.3	1993	n.a	n.a	n.a
1994	5.0	0.5	2.6	1994	n.a	n.a	n.a
1995	4.4	0.7	2.3	1995	n.a	n.a	n.a
1996	4.7	0.6	2.4	1996	n.a	n.a	n.a
1997	4.9	0.8	2.7	1997	4.5	0.7	2.4
1998	5.1	0.6	2.6	1998	4.5	0.5	2.2
1999	4.8	0.8	2.6	1999	4.1	0.6	2.1
2000	4.7	0.8	2.5	2000	4.4	0.6	2.3
2001	5.3	1.0	2.9	2001	5.0	0.8	2.7
				2002*	4.4	0.7	2.4

Note: Rates are age-standardised to the 2001 Australian Population Standard.

* Refers to year of registration.

n.a. refers to not available.

Sources: National Cancer Statistics Clearing House and National Mortality Database, AIHW 2004.

Table 6: New cases and deaths for mesothelioma ICD10 C45 by age group and sex, Australia, 2001

	New cases			Deaths		
Age group	Males	Females	Persons	Males	Females	Persons
Less than 55 years	36	13	49	21	3	24
55–59	38	15	53	35	3	38
60–64	57	8	65	46	4	50
65–69	76	11	87	60	3	63
70–74	84	23	107	72	16	88
75–79	78	18	96	64	15	79
80–84	59	12	71	41	6	47
85+	32	7	39	28	6	34
Total	460	107	567	375	61	436
Mean age at diagnosis/death:	70.0	68.7	69.8	69.9	70.2	70.0
Median age at diagnosis/death:	70.0	71.0	71.0	70.0	72.0	71.0

Sources: National Cancer Statistics Clearing House and AIHW National Mortality Database.