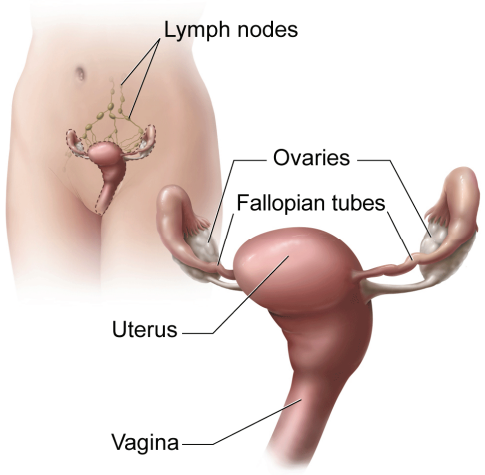
1 Introduction

Ovarian cancer is often referred to as a 'challenging cancer'. Unlike breast and cervical cancer, no effective tests are currently available for population-based screening for ovarian cancer (NBOCC 2009). Further, the symptoms of ovarian cancer (such as abdominal swelling, abdominal or back pain, and intestinal and urinary symptoms) tend to be similar to the symptoms of many other common conditions. Thus, ovarian cancer is often diagnosed at an advanced stage.

What is ovarian cancer?

The ovaries are a pair of solid, oval-shaped organs that are part of the female reproductive system, with one ovary on each side of the uterus (Figure 1.1). Each ovary is around 3 centimetres long and 1 centimetre thick.

Ovarian cancer is a disease in which abnormal cells in the ovaries multiply and form an invasive (i.e. malignant) tumour. Such tumours can spread to other parts of the body and, if the spread is not controlled, can result in death. Benign tumours can also form in the ovaries; such tumours do not spread and, with very rare exceptions, are not life-threatening.



Source: National Cancer Institute 2009.

Figure 1.1: The ovaries and nearby organs

There are three main types of ovarian cancers, each of which begin in a different type of cell in the ovary. Epithelial cells form an outer covering over the ovary. Most ovarian cancers begin in this layer of cells and are called *epithelial ovarian cancers*. Germ cells are found inside the ovary and these cells eventually mature into the eggs (ova) that are released into the fallopian tubes. Cancers which develop in these cells are called *germ cell ovarian cancers*. Stromal cells release the hormones oestrogen and progesterone. Ovarian cancers which begin in these cells are called *sex cord-stromal ovarian cancers*.

Similar to invasive epithelial ovarian cancers, borderline tumours (also known as tumours of low malignant potential) develop in the epithelium of the ovaries but these tumours are not as aggressive as other epithelial ovarian tumours and there is less risk that they will spread or recur. As discussed in more detail later in this chapter, borderline tumours are not regarded as malignant tumours in the current version of the international coding standards for cancers and thus these tumours are not considered in this report.

While the cause of ovarian cancer is unknown, two of the main risk factors are advancing age and a family history of ovarian cancer, while important protective factors are increased parity and use of the contraceptive pill (ACN & NBCC 2004).

Purpose and structure of this report

The purpose of this report is to provide a comprehensive snapshot of national statistics on ovarian cancer in Australia. The aim is to increase the level of understanding about this disease and to inform decision-making, resource allocation and the evaluation of programs and policies. The report is aimed at a wide audience—including health professionals, policy makers, health planners, educators, researchers, consumers and the general public.

This report brings together the latest available statistics and trend data on the following topics:

- the number of cases of ovarian cancer diagnosed each year (Chapter 2)
- the number of women who die from this disease each year (Chapter 3)
- survival prospects for those diagnosed with ovarian cancer (Chapter 4)
- the number of women alive who have been diagnosed with ovarian cancer (Chapter 5)
- the burden of disease due to ovarian cancer (Chapter 6)
- the number of hospitalisations for ovarian cancer (Chapter 7)
- the extent of health care spending on ovarian cancer (Chapter 8).

Compared with the previous edition of this report (AIHW & NBCC 2006), this edition includes, for the first time, information on how incidence differs within Australia according to country of birth. It also provides additional information on how Australian ovarian cancer data compare globally and by Aboriginal and Torres Strait Islander status.

Data interpretation

In this report, the term 'ovarian cancer' is used to refer to primary ovarian tumours which are invasive (i.e. malignant). It does not encompass secondary ovarian cancers, nor does it include benign or non-invasive ovarian tumours. Furthermore, borderline tumours are not included. In the second edition of the International Classification of Diseases for Oncology (ICD-O-2), ovarian tumours of borderline malignancy were considered malignant. However, in the third edition of ICD-O (i.e. ICD-O-3), borderline tumours are considered to be of uncertain behaviour and are no longer considered malignant. For the 2006 version of this report (AIHW & NBCC 2006), tumours were classified according to ICD-O-2 and thus the results presented in that report are not strictly comparable to the results shown in this report, which are based on ICD-O-3. As shown in the earlier report, 6% of ovarian cancer cases diagnosed in 2002 were borderline tumours (AIHW & NBCC 2006).

In this report, ovarian cancer is defined, when possible, as those cancers classified as 'C56' in the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (i.e. ICD-10). However, in some data sets used in this report (namely the burden of disease data, the expenditure data and the international GLOBOCAN data), data were not available for the ICD-10 code of 'C56' but instead were available for the ICD-10 codes of 'C56 and C57.0–C57.4' grouped together (see Appendix Table B.2). This grouping of cancers is referred to as 'ovarian and related cancers' in this report.

Information about the classifications referred to in this report, including ICD and ICD-O, is provided in Appendix A.

Information on tumour stage (i.e. extent of spread) at time of diagnosis is important in relation to both prognosis and determining the most appropriate type of treatment. Information on change over time in stage at diagnosis also assists in the monitoring of ovarian cancer control policies and programs. While some of the Australian states and

territories collect information on stage at diagnosis for ovarian cancer, not all do so and there are no nationally agreed standards for the collection of these data. While national data on these items are not available, some state-level and overseas data on incidence and survival are presented by stage at diagnosis in this report.

Information on the actual number of ovarian cancer cases and deaths is presented in this report, together with age-standardised rates. The use of age-standardised rates is important when making comparisons between groups and within groups over time in order to take into account differences in the age structure and size of the population. This is especially important in regard to ovarian cancer since the risk of this disease increases with age. Rates have been standardised to the Australian population at 30 June 2001 and are generally expressed per 100,000 females. In addition, for some of the key statistics and the international comparisons, age-standardised rates based on a World Standard Population are shown. The use of a world standard allows for the comparison of Australian data with those of other countries. Further information on age standardisation and other technical matters can be found in Appendix B. Note that all discussion of age-standardised rates in the text of this report pertains to rates that were standardised to the Australian population, with the exception of the discussion on international comparisons, which pertains to rates standardised to the world standard.

Confidence intervals (at the 95% level) are shown in graphs (as error bars) and tables in this report. 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 may be 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/territory-based data in order to help put the Australian situation into a broader context, and to give some indication as to whether the observed findings have been found in other studies as well. However, caution must be taken when making such comparisons since observed differences may be influenced not only by the underlying number of ovarian cancer cases (or the number of deaths when considering mortality data), but also by differences between Australia and individual jurisdictions or other countries in the following:

- cancer detection
- types of treatment provided and access to treatment services
- characteristics of the cancer such as stage at diagnosis and histological type
- coding practices and cancer registration methods, as well as the accuracy and level of cancer coverage of the data.

The last point is of particular relevance in regard to ovarian cancer since different jurisdictions and countries include different types of cancers within the definition of 'ovarian cancer'. In addition, ovarian borderline tumours are included in some data but excluded from others (see Appendix B for further details). Finally, difficulties in distinguishing between ovarian cancers and borderline tumours (Kricker 2002), as well as between ovarian cancers and other types of cancers (such as peritoneum cancers or cancers of an unknown primary site) also contribute to observed variations in ovarian cancer rates between jurisdictions and countries, as well as over time.

Data sources

A key data source for this report was the Australian Cancer Database (ACD), which was previously known as the National Cancer Statistics Clearing House. The ACD is a database that holds information on 1.8 million Australian cancer cases diagnosed between 1982 and 2006. 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 (other than two types of non-melanoma skin cancers (NMSC)) mandatory. Note that compared with past reports prepared by the AIHW, a different approach to the exclusion of non-melanoma skin cancers from the data was used when preparing this report. Additional information about this change, as well as about the ACD itself, can be found in Appendix C.

Another key data source was the National Mortality Database (NMD). This database contains information on the date and cause of death for all registered deaths in Australia from 1964 onwards. Depending on the coding version used (ICD-7 in 1964 through to ICD-10 at present), some diseases may not have had a unique code that identifies the disease separately from other closely-related diseases for some of the years. Ovarian cancer is an example of this, with data on mortality due specifically to ovarian cancer (rather than from ovarian and related cancers) available from 1968 onwards. Additional information about the NMD is provided in Appendix C.

In addition, several other data sources—including the National Death Index, the National Hospital Morbidity Database, the Disease Expenditure Database and the 2002 GLOBOCAN database—have been used to present a broad picture of ovarian cancer in Australia in this report. Information about each of these data sources can also be found in Appendix C.

Throughout this report:

- The term 'ovarian cancer' refers to primary, invasive ovarian cancers, with cancers classified as 'C56' in ICD-10 included (unless otherwise indicated). Borderline tumours are excluded.
- Differences that are described as 'significant' refer to a statistically significant difference. Such differences may or may not be significant from a practical or clinical perspective.

2 Incidence of ovarian cancer

Incidence data indicate the number of new cases of ovarian cancer diagnosed during a specified time period, usually one year. While these data refer to the number of *cases* diagnosed and not the number of *women* diagnosed with ovarian cancer, it is rare (although possible) that any one woman would be diagnosed with two or more primary ovarian cancers during a 1-year period. Thus, the annual number of new ovarian cancer cases is practically the same as the annual number of women newly diagnosed with ovarian cancer.

Details on the incidence of ovarian cancer over time are provided in this chapter, as is information on the projected number of new cases to 2015, the risk of a woman being diagnosed with ovarian cancer by the age of 75 and 85 years, and disparities in incidence among women according to age, geographical area, socioeconomic status, Aboriginal and Torres Strait Islander status and country of birth. Information on how Australia's ovarian cancer rates compare internationally is also shown.

As mentioned in Chapter 1, only those cases in which ovarian cancer was a primary, invasive cancer are considered. Additionally, to be counted, the case must be a 'new' primary cancer and not a reoccurrence of a previous primary cancer (IARC 2004).

The main data source for this chapter was the Australian Cancer Database.

Incidence in 2006

The ten most commonly diagnosed cancers among females in 2006 are shown in Table 2.1. Since two types of skin cancer—namely, basal cell carcinoma and squamous cell carcinoma—are not reported to cancer registries, data on these two types of cancer are not included in either the ACD or Table 2.1. Past research shows that these skin cancers are by far the most frequently diagnosed cancers in Australia in both females and males (AIHW & CA 2008).

In 2006, a total of 1,226 cases of ovarian cancer were diagnosed in Australia; this equates to an average of 3 women being diagnosed with this disease every day. Ovarian cancer was the ninth most commonly diagnosed cancer among females (excluding basal and squamous cell carcinomas of the skin) and the second most commonly diagnosed gynaecological cancer, after cancer of the uterus (1,860 cases). Ovarian cancer accounted for 3% of all reported cancer cases in women in 2006 and 29% of all gynaecological cancers.

The age-standardised rate of ovarian cancer incidence stood at 10.7 cases per 100,000 females in 2006. This compares with a rate of 112.4 cases per 100,000 females for breast cancer and 16.3 cases per 100,000 females for cancer of the uterus.

Table 2.1: Incidence of the 10 most commonly diagnosed cancers[a], females, 2006

Cancer type (ICD-10 codes)	Number of cases	Per cent of all gynaecological cancer cases	Per cent of all cancer cases[a]	Age-standardised rate[b]	95% confidence interval
Breast (C50)	12,614	. .	27.7	112.4	110.4–114.4
Bowel (C18–C20)	6,159	. .	13.5	52.1	50.8–53.4
Melanoma of skin (C43)	4,275	. .	9.4	38.2	37.1–39.4
Lung (C33–C34)	3,533	. .	7.8	30.3	29.3–31.3
Lymphoma (C81–C85, C96)	1,961	. .	4.3	17.2	16.4–18.0
Uterus (C54, C55)	1,860	43.8	4.1	16.3	15.6–17.1
Unknown primary site (C26, C39, C76, C80)	1,592	. .	3.5	12.6	12.0–13.3
Thyroid (C73)	1,270	. .	2.8	11.8	11.2–12.5
Ovary (C56)	1,226	28.9	2.7	10.7	10.1–11.4
All leukaemias (C91–C95)	1,111	. .	2.4	9.7	9.1–10.3
All cancers[c]	**45,534**	**. .**	**100.0**	**396.3**	**392.6–400.0**

(a) Excluding basal and squamous cell carcinomas of the skin.

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

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

Source: Australian Cancer Database, AIHW.

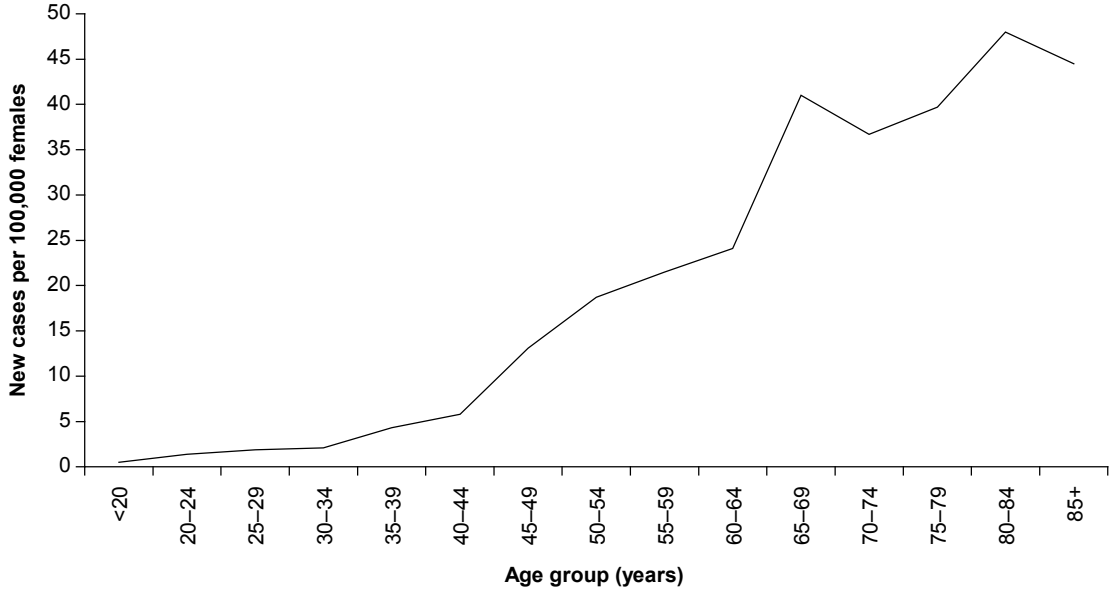
Differences by age at diagnosis

In 2006, the majority of cases of ovarian cancer were diagnosed among women aged 60 years and over (60%). In addition, one in fourteen cases (7%) were diagnosed in women under the age of 40 years, and one-third (33%) were diagnosed in those aged 40 to 59 years (Appendix Table D2.1). The mean age at first diagnosis was 63 years.

Figure 2.1 shows differences in the incidence rate of ovarian cancer by age group in 2006. The likelihood of being diagnosed with ovarian cancer increased with age. The rates were relatively low for those aged less than 40 years (i.e. less than 5 cases per 100,000 females for each of those age groups). In contrast, there was an observable increase between most age groups from the age of 40 to 44 years onwards, but these increases were not always statistically significant. The highest rate was observed for women aged 80 to 84 years (48.0 per 100,000), followed by those aged 85 years and over (44.5 per 100,000).

Trends

The number of new ovarian cancer cases diagnosed each year increased over the 25-year period from 1982 (the year in which national cancer incidence data were first available) to 2006 (Figure 2.2). In 1982, 833 new cases of ovarian cancer were diagnosed among Australian women compared with 1,226 in 2006, indicating an overall increase of 47% cases over this period. Furthermore, the number of ovarian cancer cases diagnosed in 2006 was slightly higher than the number diagnosed in the previous year (1,219 cases) but lower than the number diagnosed in 2004 (1,267 cases) when the largest number of ovarian cancer cases diagnosed to date was reported.

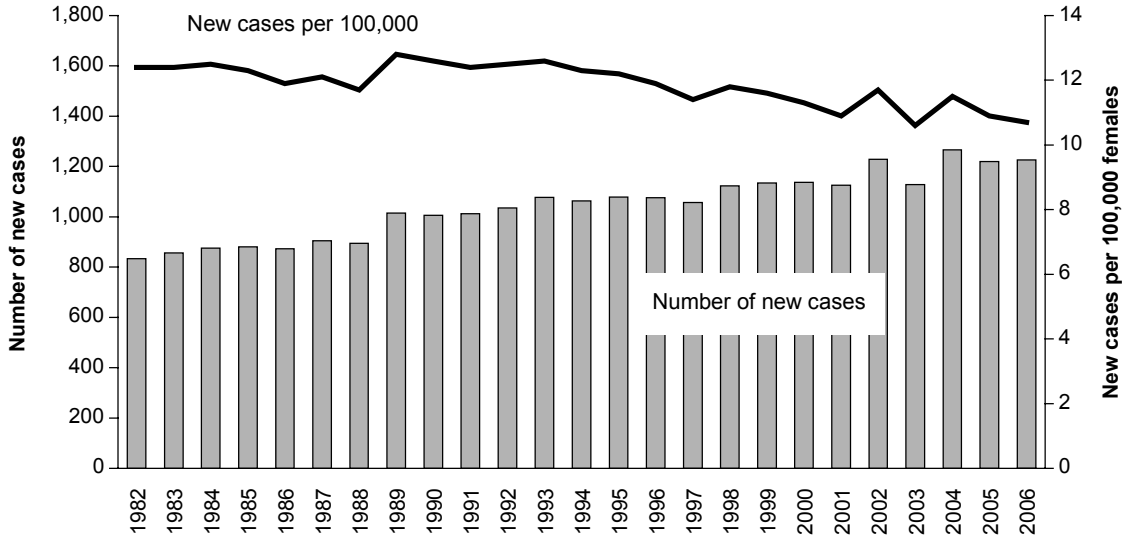


Notes

1. The rates shown are age-specific rates.
2. The data for this figure are shown in Appendix Table D2.1.

Source: Australian Cancer Database, AIHW.

Figure 2.1: Incidence of ovarian cancer by age at diagnosis, 2006



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001.
2. The data for this figure are shown in Appendix Table D2.2.

Source: Australian Cancer Database, AIHW.

Figure 2.2: Incidence of ovarian cancer, 1982 to 2006

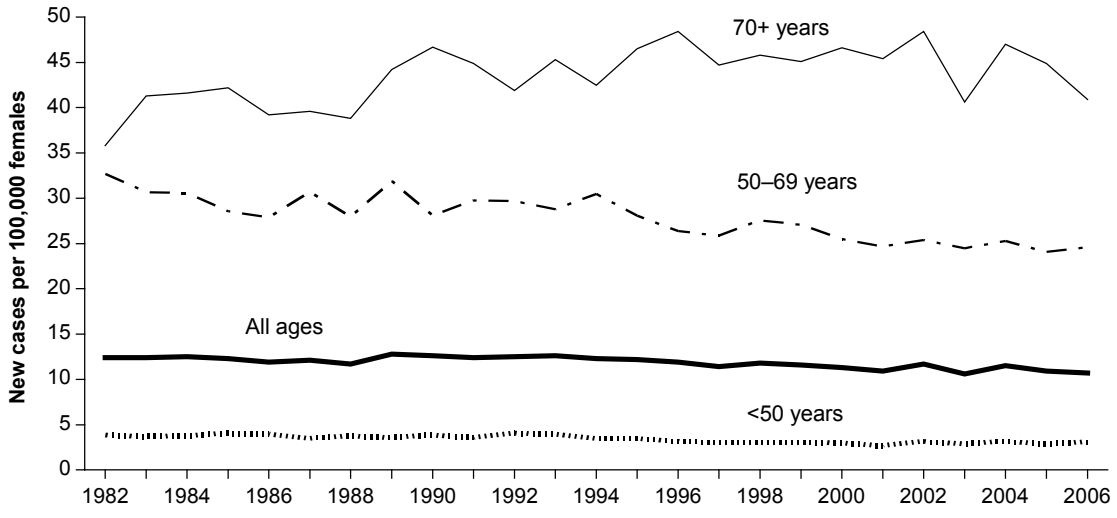
In contrast, there was a statistically significant decrease in the age-standardised incidence rate of ovarian cancer. In 1982, the incidence rate stood at 12.4 (per 100,000 females), while it was 10.7 (per 100,000 females) in 2006, indicating an overall decrease of 14%. This indicates that the increase in the absolute number of ovarian cancer cases over the years can be explained by the ageing and increasing size of the population.

The reason for the decline in the age-standardised rate is unclear, with possible reasons being change over time in the proportion of women with various ovarian cancer risk and protective factors (e.g. use of the contraceptive pill), changes in the classification systems and approaches used to diagnose borderline versus invasive tumours and, in some cases, the removal of precancerous lesions which prevented ovarian cancer from developing (Skirnisdottir et al. 2008).

The share of all reportable cancers diagnosed in females that were ovarian cancer decreased between 1982 and 2006, from 3.8% to 2.7% respectively (Appendix Table D2.2). Meanwhile, the proportion of all gynaecological cancers diagnosed in females that were ovarian cancer ranged over the years from 27.2% (1986) to 31.2% (2002).

Trends by age at diagnosis

While overall there was a slight decrease in the rate of ovarian cancer over the years considered, this did not apply equally to all of the age groups (Figure 2.3). Instead, the observed decrease in incidence rates over the years was centred on those aged 50 to 69 years, with rates decreasing significantly from 32.7 cases per 100,000 females in 1982 to 24.6 cases per 100,000 females in 2006; this equates to a decrease of 25%. The incidence rate of ovarian cancer for women aged less than 50 years also decreased somewhat from 1982 (3.9 cases per 100,000 females) to 2006 (3.1 per 100,000), but this decrease was not statistically significant. For women aged 70 years and over, incidence rates fluctuated considerably over the period, with no statistically significant difference found between the 1982 rate (35.8 per 100,000) and the 2006 rate (40.9 per 100,000).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001.
2. The data for this figure are shown in Appendix Table D2.3.

Source: Australian Cancer Database, AIHW.

Figure 2.3: Incidence of ovarian cancer by age at diagnosis, 1982 to 2006

Risk of ovarian cancer and average age at diagnosis

Table 2.2 shows the risk of a woman being diagnosed with ovarian cancer by the age of 75 years and 85 years (see Appendix B for an explanation of how these risks were calculated). While the risk of being diagnosed with ovarian cancer fluctuated somewhat between 1982 and 2006, an overall decline in the risk is evident. The risk of being diagnosed with ovarian cancer by the age of 75 years was 1 in 94 in 1982, compared with 1 in 116 in 2006. The corresponding values in the risk of being diagnosed by the age of 85 years was 1 in 71 (in 1982) to 1 in 77 (in 2006).

Table 2.2 also indicates change over time in the mean and median age at first diagnosis of ovarian cancer. Both the mean and median ages at diagnosis have been tending upwards over time, with the mean age increasing from 60 years in 1982 to 63 years in 2006.

Table 2.2: Risk and average age at diagnosis of ovarian cancer, 1982 to 2006

Year	Risk to age 75 years	Risk to age 85 years	Mean age at first diagnosis	Median age at first diagnosis
1982	1 in 94	1 in 71	59.6	60.0
1983	1 in 98	1 in 70	59.8	61.0
1984	1 in 95	1 in 69	60.5	62.0
1985	1 in 101	1 in 67	60.7	62.0
1986	1 in 104	1 in 74	60.5	62.0
1987	1 in 98	1 in 72	60.6	62.0
1988	1 in 104	1 in 74	60.4	62.0
1989	1 in 93	1 in 66	61.2	63.0
1990	1 in 96	1 in 67	61.7	64.0
1991	1 in 100	1 in 68	62.1	64.0
1992	1 in 97	1 in 69	60.7	62.0
1993	1 in 97	1 in 66	61.3	64.0
1994	1 in 99	1 in 69	61.5	63.0
1995	1 in 105	1 in 67	62.1	64.0
1996	1 in 108	1 in 70	63.2	65.0
1997	1 in 113	1 in 74	62.9	64.0
1998	1 in 106	1 in 69	62.9	65.0
1999	1 in 109	1 in 74	62.8	64.0
2000	1 in 114	1 in 74	63.7	65.0
2001	1 in 120	1 in 76	64.3	65.0
2002	1 in 112	1 in 69	63.9	65.0
2003	1 in 118	1 in 77	63.3	64.0
2004	1 in 109	1 in 72	63.9	65.0
2005	1 in 120	1 in 75	64.1	65.0
2006	1 in 116	1 in 77	63.3	64.5

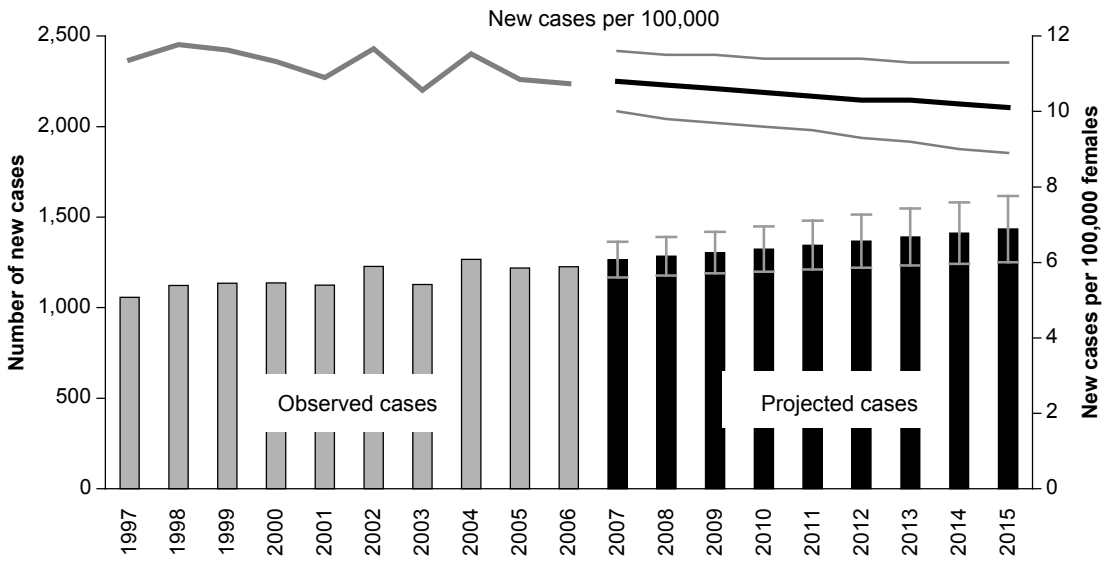
Source: Australian Cancer Database, AIHW.

Projections

To estimate the incidence of ovarian cancer from 2007 to 2015, data on the number of new cases of ovarian cancer diagnosed over the 10-year period from 1997 to 2006 were extrapolated (see Appendix B for further details on the methodology used). This estimation approach assumes that the trends in the incidence of ovarian cancer during that 10-year period will continue to 2015. Since it is impossible to anticipate and quantify future developments that might cause a change in the number of women diagnosed with ovarian cancer, these projections should be interpreted as only indicative of future trends. Note also that there is greater margin of error surrounding the projections for the later years than the earlier years.

The number of women diagnosed with ovarian cancer is expected to continue to increase in the future due to continued ageing and growth of the population (Figure 2.4). The projections suggest that 1,324 new cases of ovarian cancer will be diagnosed in 2010. By 2015, the number of new ovarian cancer cases diagnosed is estimated to be 1,434, which would be 17% higher than in 2006 (1,226 cases). If these projections are accurate, an average of 4 women would be diagnosed with ovarian cancer each day in 2015.

Figure 2.4 also indicates the projected age-standardised incidence rate for ovarian cancer from 2007 to 2015. When expected changes in the age structure and size of the population are taken into account, the results suggest that the rate at which new ovarian cancer cases are diagnosed will continue to decrease slightly through to 2015, reaching 10.1 new cases per 100,000 females in that year. However, due to the wide confidence interval around this estimate, the projected incidence rate for 2015 is not statistically different from the 2006 rate of 10.7 cases per 100,000 females.



Notes

1. The projections were based on ovarian cancer incidence data for 1997 to 2006.
2. The rates were age-standardised to the Australian population as at 30 June 2001.
3. For the years 2007 to 2015, grey lines around the age-standardised rates indicate the 95% prediction intervals.
4. The data for this figure are shown in Appendix Tables D2.2 and D2.4.

Source: Australian Cancer Database, AIHW.

Figure 2.4: Incidence of ovarian cancer, observed for 1997 to 2006 and projected for 2007 to 2015

Types of ovarian cancer

Ovarian cancer consists of a heterogeneous set of invasive tumours that arise from the different cell types in the ovary (as discussed in Chapter 1). Pathologists classify ovarian cancers into histological types, with each of the types associated with different genetic risk factors, patterns of transformation and responses to chemotherapy (Kobel et al. 2008). Due to the large number of histological types of ovarian cancer and the relative infrequency of many of these types in the Australian Cancer Database, similar types of tumours have been grouped into broader categories for the purposes of this report. As shown in Table 2.3, the three main categories are: 'group 1: *carcinoma'* (which is also referred to as epithelial tumours)'; 'group 2: *sex cord-stromal tumours'*; and 'group 3: g*erm cell tumours*'. Two additional categories capture other specified types of ovarian cancers (group '4') and ovarian cancers that were unspecified (group '5'). One of the groups—namely 'group 1: c*arcinoma'*—is further divided into seven subgroups. The histology types included in each group and sub-group are listed in Appendix Table D2.5. This system of grouping ovarian cancers was based primarily on documentation from the International Agency for Research on Cancer (Curado et al. 2007), with additional input from National Breast and Ovarian Cancer Centre.

In 2006, 84% of the ovarian cancers were classified as *carcinoma* (group 1) with the most common type within this group being *serous carcinoma* (group 1.1) (52% of *carcinomas*), followed by *adenocarcinoma not otherwise specified* (group 1.5) (15% of *carcinomas*). Meanwhile, 4% of ovarian cancers were classified as *germ cell tumours* (group 3), 3% were coded as *other specified malignant neoplasm* (group 4) and 1% were coded as *sex cord-stromal tumours* (group 2). The histological type was *unspecified* (group 5) in 1 in 13 (8%) ovarian cancer cases.

Table 2.3: Incidence of ovarian cancer and average age at diagnosis by type of ovarian cancer, 2006

Type of ovarian cancer[(a)]	Number of cases	Per cent of all ovarian cancers	Per cent of carcinomas	Mean age at first diagnosis	Median age at first diagnosis
1: Carcinoma (epithelial tumours)	1,026	83.7	100.0	63.5	64.0
1.1: Serous carcinoma	530	43.2	51.7	63.1	64.0
1.2: Mucinous carcinoma	85	6.9	8.3	62.2	62.0
1.3: Endometrioid carcinoma	103	8.4	10.0	56.8	53.0
1.4: Clear cell carcinoma	63	5.1	6.1	59.6	59.0
1.5: Adenocarcinoma NOS	152	12.4	14.8	69.4	73.0
1.6: Other specified carcinoma	30	2.4	2.9	56.8	57.0
1.7: Unspecified carcinoma	63	5.1	6.1	72.2	78.0
2: Sex cord-stromal tumours	16	1.3	. .	51.9	50.0
3: Germ cell tumours	48	3.9	. .	33.7	29.0
4: Other specified malignant neoplasm	39	3.2	. .	64.2	65.0
5: Unspecified malignant neoplasm	97	7.9	. .	77.1	82.0
Total	**1,226**	**100.0**	**. .**	**63.3**	**64.5**

(a) All cases were coded as primary site, invasive ovarian cancers. Appendix Table D2.5 provides a list of the histology types included in each group.

Source: Australian Cancer Database, AIHW.

The average age at the first diagnosis of ovarian cancer differed by histology type (Table 2.3). The mean age of occurrence was highest for those cases in which the type of ovarian cancer was *unspecified* (group 5) (77 years). In contrast, the mean age at diagnosis was lowest for women diagnosed with *germ cell tumours* (group 3) (34 years) and *sex cord-stromal tumours* (group 2) (52 years). The mean age for women diagnosed with *carcinoma* (group 1) was 64 years, but considerable variation is seen across the various types of carcinomas. Those with an *unspecified type of carcinoma* (group 1.7) had a relatively high mean age at diagnosis (72 years), while those in 'group 1.6: *other specified carcinoma*' and 'group 1.3: *endometrioid carcinoma*' had a relatively low mean age (57 years).

Further information about the relationship between age and histological type of ovarian cancer in 2006 is provided in Table 2.4. For each of the three age groups, *carcinoma* (group 1) was the most commonly diagnosed type of ovarian cancer, although differences in the proportion of all ovarian cancers coded to this group of ovarian cancers are evident. Specifically, among those aged less than 50 years, three in four (75%) ovarian cancer cases were *carcinoma*, compared with 91% of those who were aged 50 to 69 years and 80% of those aged 70 years and over at diagnosis. Relative to the other age groups, the younger women were more likely to have been diagnosed with a *germ cell tumour* (group 3) (17% of those with ovarian cancer who were aged less than 50 years compared with less than 2% of those in the other age groups). One in 6 cases (16%) of ovarian cancer among those aged 70 years and over was coded as an *unspecified ovarian cancer* (group 5); this compares with 3% of those in the two other age groups.

Trends in types of ovarian cancer

Trends in the proportion of the various types of ovarian cancers are shown in Table 2.5, 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 the observed trends.

There was minimal change in the proportion of ovarian cancers that were classified as *carcinoma* (group 1), with values ranging from 86% (in 2000 to 2006) to 89% (in 1988 to 1993). However, within the group of *carcinomas*, there was change over time in the proportion of a number of the subgroups. In particular, three out of ten (30%) ovarian cancers were classified as *serous carcinoma* (group 1.1) in 1982 to 1987; this proportion had increased to 43% by 2000 to 2006. Over the same period, the proportion of ovarian cancers that were coded as *adenocarcinoma not otherwise specified* (group 1.5) fell from 25% to 14% of ovarian cancers.

For each of the time periods, the proportion of ovarian cancers that were classified as *germ cell tumours* (group 3) remained at around 3%, while the proportion of *sex cord-stromal tumours* (group 2) fell from 2% in 1982 to 1987 to 1% in 2000 to 2006, and the proportion that were coded as *other specified ovarian cancer* (group 4) increased from 2% to 4%. The proportion that was classified as *unspecified ovarian cancer* (group 5) fluctuated over the four time periods, with no clear pattern evident.

Further information on the histological types of ovarian cancers by age group is provided in Appendix Tables D2.6 to D2.8, with those tables showing trends from 1982–1987 to 2000–2006 for the three age groups of those less than 50 years, those 50 to 69 years, and those 70 years and over at diagnosis.

Table 2.4: Incidence by type of ovarian cancer and age at diagnosis, 2006

	Number of cases				Per cent			
Type of ovarian cancer[(a)]	**<50 years**	**50–59 years**	**70+ years**	**Total**	**<50 years**	**50–69 years**	**70+ years**	**Total**
1: Carcinoma (epithelial tumours)	171	495	360	1,026	74.7	90.7	79.8	83.7
1.1: Serous carcinoma	76	283	171	530	33.2	51.8	37.9	43.2
1.2: Mucinous carcinoma	15	42	28	85	6.6	7.7	6.2	6.9
1.3: Endometrioid carcinoma	34	50	19	103	14.8	9.2	4.2	8.4
1.4: Clear cell carcinoma	16	34	13	63	7.0	6.2	2.9	5.1
1.5: Adenocarcinoma NOS	15	53	84	152	6.6	9.7	18.6	12.4
1.6: Other specified carcinoma	8	18	4	30	3.5	3.3	0.9	2.4
1.7: Unspecified carcinoma	7	15	41	63	3.1	2.7	9.1	5.1
2: Sex cord-stromal tumours	8	7	1	16	3.5	1.3	0.2	1.3
3: Germ cell tumours	38	9	1	48	16.6	1.6	0.2	3.9
4: Other specified malignant neoplasm	5	18	16	39	2.2	3.3	3.5	3.2
5: Unspecified malignant neoplasm	7	17	73	97	3.1	3.1	16.2	7.9
Total	**229**	**546**	**451**	**1,226**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, invasive ovarian cancers. Appendix Table D2.5 provides a list of the histology types included in each group.

Source: Australian Cancer Database, AIHW.

Table 2.5: Incidence by type of ovarian cancer, 1982–1987 to 2000–2006

	Number of cases				Per cent			
Type of ovarian cancer[(a)]	**1982–1987**	**1988–1993**	**1994–1999**	**2000–2006**	**1982–1987**	**1988–1993**	**1994–1999**	**2000–2006**
1: Carcinoma (epithelial tumours)	4,587	5,355	5,766	7,140	87.8	88.6	88.2	85.7
1.1: Serous carcinoma	1,539	2,195	2,728	3,555	29.5	36.3	41.8	42.7
1.2: Mucinous carcinoma	597	673	627	586	11.4	11.1	9.6	7.0
1.3: Endometrioid carcinoma	522	559	557	679	10.0	9.3	8.5	8.2
1.4: Clear cell carcinoma	217	307	329	437	4.2	5.1	5.0	5.2
1.5: Adenocarcinoma NOS	1,309	1,161	1,067	1,170	25.1	19.2	16.3	14.0
1.6: Other specified carcinoma	45	68	64	178	0.9	1.1	1.0	2.1
1.7: Unspecified carcinoma	358	392	394	535	6.9	6.5	6.0	6.4
2: Sex cord-stromal tumours	98	88	87	77	1.9	1.5	1.3	0.9
3: Germ cell tumours	155	188	180	270	3.0	3.1	2.8	3.2
4: Other specified malignant neoplasm	119	190	203	293	2.3	3.1	3.1	3.5
5: Unspecified malignant neoplasm	265	221	298	550	5.1	3.7	4.6	6.6
Total	**5,224**	**6,042**	**6,534**	**8,330**	**100.0**	**100.0**	**100.0**	**100.0**

(a) All cases were coded as primary site, invasive ovarian cancers. Appendix Table D2.5 provides a list of the histology types included in each group.

Source: Australian Cancer Database, AIHW.

Incidence by stage at diagnosis

Stage at diagnosis refers to the 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 (Odicino et al. 2008; Pecorelli et al. 2000). The fact that ovarian cancer is often diagnosed at an advanced stage is noted repeatedly in the literature and is considered to be one of the major contributors to the high mortality rate for this type of cancer (e.g. Laurvick et al. 2003; Menon & Jacobs 2001; Tracey et al. 2009).

A number of different staging systems are used to classify ovarian cancers, including the International Federation of Gynecology and Obstetrics (FIGO) system, the International Union Against Cancer (UICC) TNM system, and the Surveillance Epidemiology End Results (SEER) Summary Staging system (or 'summary staging system' for short). In both the FIGO and the TNM systems, ovarian tumours are given a value from I (indicating early disease with the tumours confined to the ovaries and of relatively small size) to IV (indicating clearly distant metastatic disease, with metastasis found beyond the peritoneal cavity such as inside the liver, the lungs or other organs). In the summary staging system, which is a simpler system, tumours are allocated to one of three categories: local (the tumour is confined to one or both ovaries); regional (the tumour has spread to surrounding tissue or nearby lymph nodes); and distant (the tumour has spread to distant organs or other parts of the body and has begun to grow at the new location) (Young et al. 2001). Further details about these staging systems are provided in Appendix E.

There is currently no national requirement in Australia for the collection of data on stage at diagnosis and not all states and territories collect this information. In addition, in the data that does exist, varying definitions of ovarian cancer are often used, with some including borderline ovarian tumours (which skew the results towards the less advanced stages) and others including only the staged cases (rather than all cases including those with an unknown stage), thus making comparison difficult with data that considered all cases.

To give an indication of the proportion of ovarian cancers diagnosed at various stages, Table 2.6 presents data from New South Wales (NSW) for 1980 to 2003 (Tracey et al. 2009) and for the United States of America (USA) for 1999 to 2005 (Horner et al. 2009). Although the time periods to which the data apply differ markedly from each other, the advantage of presenting data from both NSW and the USA is that ovarian cancer was defined in these studies in the same way in which it was defined for the purposes of this report (i.e. those cancers coded as 'C56' in ICD-10, with borderline tumours excluded).

Based on NSW data for 1980 to 2003, one-quarter (25%) of staged ovarian cancer cases were diagnosed when the tumour was localised, about two in nine (22%) were diagnosed when the tumour was at the regional stage, while over half (53%) were diagnosed when the tumour was at a distant stage. The 1999 to 2005 data from the USA also show that the majority of staged cases were at the distant stage when diagnosed, although the proportion is considerably higher (67%) than suggested by the NSW data. In addition, in 7% of the USA ovarian cancer cases, the stage at diagnosis was unknown.

Change over time in the proportion of ovarian and other female genital organ cancers (i.e. ICD-10 codes of C56 and C57.0 to C57.7) that are diagnosed at different stages in NSW are shown in Table 2.7 (Tracey et al. 2007). The proportion of cases that had an unknown stage at diagnosis was similar over the two time periods considered (13% and 12% respectively).

Table 2.6: Incidence of ovarian cancer by stage at diagnosis, New South Wales and United States of America

Stage at diagnosis[a]	New South Wales (1980–2003)[b]		United States of America (1999–2005)[b,c]		
	No. of cases	% of staged cases	No. of cases	% of all cases	% of staged cases[d]
Localised	1,763	25.4	n.a.	15	16
Regional	1,522	21.9	n.a.	17	18
Distant	3,649	52.6	n.a.	62	67
Unknown	n.a.	. .	n.a.	7	. .
Total	**6,934**	**100.0**	**29,168**	**100**	**100**

(a) Based on the SEER summary staging system. 'Localised' tumours were defined as those that were confined to one or both ovaries, 'regional' tumours had spread to surrounding tissue or nearby lymph nodes and 'distant' tumours had spread to distant organs or other parts of the body and had begun to grow at the new location (see Appendix E).

(b) Includes ovarian cancers coded in ICD-10 as C56; borderline ovarian tumours are excluded.

(c) Data were from the SEER 17 areas which cover approximately a quarter of the USA (see Table 21.7 in Horner et al. 2009).

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

Source: Tracey et al. 2009; Horner et al. 2009.

Meanwhile, the proportion that was at the distant stage at diagnosis increased over time from 50% of staged cases in 1980–1998 to 60% of staged cases in 1999–2003. Tracey and associates (2009) suggest that this increase may reflect improvements in testing sensitivity due to advances in imaging and other diagnostic testing.

Studies on ovarian cancer based on Californian data (Morris et al. 2008) and Florida data (FDH 2009) also found an increase over time in the proportion of ovarian cancer cases diagnosed with distant metastases. In contrast, other studies have not found such an increase, with one example being a study using Danish data (Kjaerbye-Thygesen et al. 2005). In that study, the proportion of cases with distant metastases at diagnosis decreased significantly between 1978–1982 and 1998–2002. The authors of the Danish study suggest that the different trends observed internationally may be due to the use of different staging systems and practices for classifying stage at diagnosis in different countries.

Table 2.7: Incidence of ovarian and other female genital organ cancers[a] by stage at diagnosis, New South Wales, 1980–1998 and 1999–2003

Stage at diagnosis[b]	1980–1998			1999–2003		
	No. of cases[a]	% of all cases	% of staged cases	No. of cases[a,c]	% of all cases	% of staged cases
Localised	1,422	23.1	26.5	368	19.0	21.7
Regional	1,266	20.5	23.6	302	15.6	17.8
Distant	2,685	43.5	50.0	1,023	52.9	60.4
Unknown	796	12.9	. .	240	12.4	. .
Total	**6,169**	**100.0**	**100.0**	**1,933**	**100.0**	**100.0**

(a) Includes ovarian and other female genital organ cancers coded in ICD-10 as C56 and C57.0–C57.7 (see Appendix Table B.2); excludes borderline ovarian tumours.

(b) Based on the SEER summary staging system. 'Localised' tumours were defined as those that were confined to one or both ovaries, 'regional' tumours had spread to surrounding tissue or nearby lymph nodes and 'distant' tumours had spread to distant organs or other parts of the body and had begun to grow at the new location (see Appendix E).

(c) The number of cases for 1999 to 2003 were derived from Table 25 in Tracey et al. 2007.

Source: Tracey et al. 2007.

Table 2.8 presents information on the stage of ovarian cancer according to age at diagnosis, using data from the USA for 1999 to 2005. Older women were more likely to be diagnosed with advanced stage ovarian cancer (69% of women aged 65 years and over) than other women (55% of those aged less than 65 years). This difference by age has also been observed in other research (e.g. Grossi et al 2002; Kosary 2007; WHC & NCRI 2006). In addition, the USA data indicate that an unknown stage at diagnosis was also more likely among older women than others (10% and 4% of cases, respectively).

Table 2.8: Incidence of ovarian cancer[(a)] by stage and age at diagnosis, United States of America, 1999–2005

	<65 years			65+			All ages		
Stage at diagnosis[(b)]	No. of cases	% of all cases	% of staged cases[(c)]	No. of cases	% of all cases	% of staged cases[(c)]	No. of cases	% of all cases	% of staged cases[(c)]
Localised	n.a.	21	22	n.a.	7	8	n.a.	15	16
Regional	n.a.	20	21	n.a.	13	14	n.a.	17	18
Distant	n.a.	55	58	n.a.	69	77	n.a.	62	67
Unknown	n.a.	4	. .	n.a.	10	. .	n.a.	7	. .
Total	**16,000**	**100**	**100**	**13,168**	**100**	**100**	**29,168**	**100**	**100**

(a) Includes ovarian cancers coded in ICD-10 as C56; borderline ovarian tumours were excluded. Data were from the SEER 17 areas which cover approximately a quarter of the USA (see Table 21.7 in Horner et al. 2009).

(b) Based on the SEER summary staging system. 'Localised' tumours were defined as those that were confined to one or both ovaries, 'regional' tumours had spread to surrounding tissue or nearby lymph nodes and 'distant' tumours had spread to distant organs or other parts of the body and had begun to grow at the new location (see Appendix E).

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

Source: Horner et al. 2009.

Differences across groups

In this section, data on the incidence of ovarian cancer are provided according to geographical area, socioeconomic status, Aboriginal and Torres Strait Islander status and country of birth. In order to take into account differences in the age structures and the size of the groups being compared, age-standardised rates are provided for each of the comparisons. The data are presented for the 5-year period of 2002 to 2006 rather than for just 1 year since presenting the data for multiple years reduces random variation in the data. This is especially important for comparisons of small sub-groups (e.g. Indigenous women or women in smaller states and territories).

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

- population characteristics (e.g. a relatively greater proportion of Indigenous women in remote areas)
- the prevalence of risk and/or protective factors (e.g. reproductive patterns, use of the contraceptive pill)
- the availability of diagnostic services.

Differences by geographical area

In the 2002 to 2006 period, the largest average number of ovarian cancer cases diagnosed each year was in New South Wales (408 cases annually) and the smallest number in the Northern Territory (7 cases annually) (Table 2.9). When the age structure and size of the population in each state and territory was taken into account, the results indicate that the Northern Territory had the lowest incidence rate (9.1 cases per 100,000 females), followed by South Australia (9.4 per 100,000) and Tasmania (9.5 per 100,000). While the rates for the Northern Territory and Tasmania did not differ significantly from that of the other states and territories, the rate for South Australia was significantly lower than the rates for New South Wales (11.0 per 100,000), Victoria (11.8 per 100,000) and Western Australia (12.2 per 100,000). The highest incidence rates were observed for Western Australia and the Australian Capital Territory, with 12.2 cases of ovarian cancer diagnosed per 100,000 females in each of those jurisdictions. While the rate for the Australian Capital Territory was not significantly different from that of other states and territories, the rate for Western Australia was significantly higher than the rates for Queensland and South Australia (10.5 and 9.4 cases per 100,000 females).

Table 2.9: Incidence of ovarian cancer by state and territory, 2002–2006

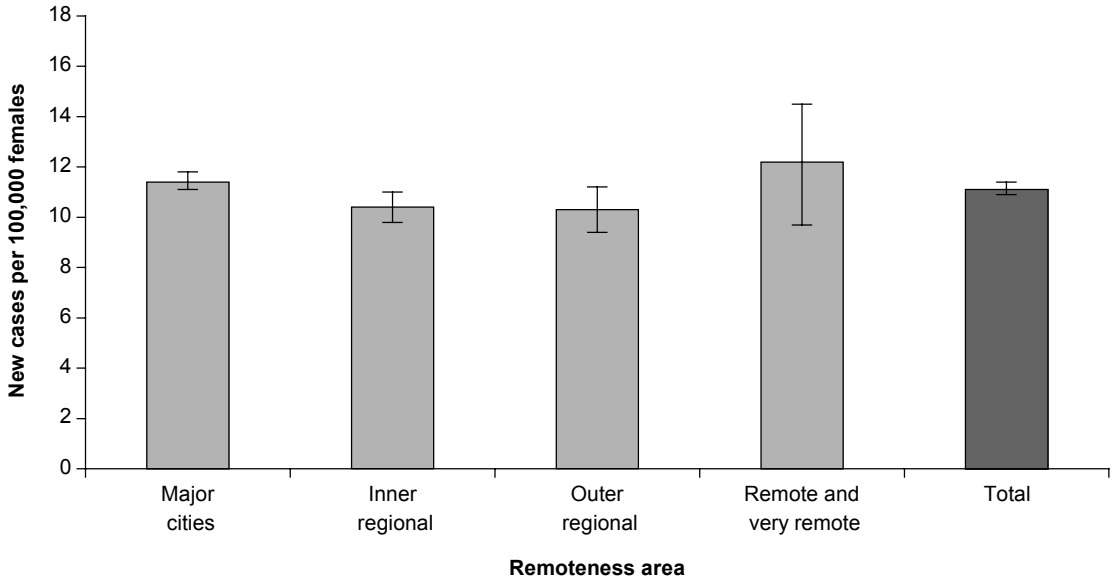
State or territory	Average annual number of cases[(a)]	Total number of cases	Age-standardised rate[(b)]	95% confidence interval
New South Wales	408	2,042	11.0	10.5–11.5
Victoria	327	1,633	11.8	11.2–12.4
Queensland	213	1,066	10.5	9.9–11.2
Western Australia	123	617	12.2	11.3–13.2
South Australia	89	446	9.4	8.6–10.4
Tasmania	28	138	9.5	8.0–11.3
Australian Capital Territory	19	93	12.2	9.8–15.0
Northern Territory	7	33	9.1	5.8–13.3
Total	**1,214**	**6,068**	**11.1**	**10.8–11.3**

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

(b) The age-standardised rates were 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-year period from 2002–2006.

Source: Australian Cancer Database, AIHW.

Age-standardised incidence rates according to level of remoteness of the area in which the women lived at diagnosis are shown in Figure 2.5. The Australian Standard Geographical Classification (ASGC) Remoteness Areas was used to categorise areas of Australia. Information about this classification is provided in Appendix A. While the incidence rate for women who lived in *Remote and very remote* areas at diagnosis (12.2 cases per 100,000 females) was higher than those for other women, the difference was not statistically significant.



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 based on the total number of cases over the 5-year period from 2002–2006.
3. The 'Total' column includes cases for which information on remoteness area was not available.
4. The data for this figure are shown in Appendix Table D2.9.

Source: Australian Cancer Database, AIHW.

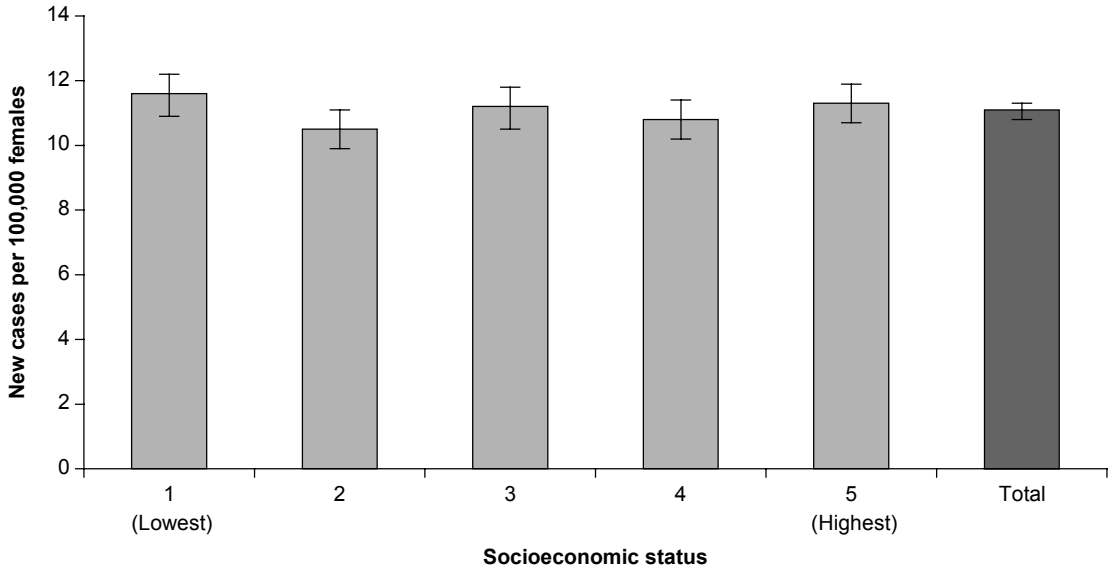
Figure 2.5: Incidence of ovarian cancer by remoteness area, 2002–2006

Differences by socioeconomic status

The findings from studies that have addressed the associations between socioeconomic status and the risk of ovarian cancer have been inconsistent. For example, there was no significant association found using South Australian data for 1977 to 2001 (Cancer Council SA 2009) and Irish data for 2000 to 2004 (Donnelly et al. 2009), while disadvantaged women in Queensland were significantly more likely than more advantaged women to be diagnosed with ovarian cancer between 1996 and 2002 (Baade et al. 2005).

In this report, the Index of Relative Socio-economic Disadvantage (IRSD) is used to indicate socioeconomic status (ABS 2008a), with the first group (which is labelled '1') corresponding to geographical areas containing the 20% of the population with the lowest socioeconomic status according to the IRSD and the fifth group corresponding to the 20% of the population with the highest status. Appendix A provides further information about the IRSD.

As shown in Figure 2.6, there was no statistically significant association between the incidence of ovarian cancer and socioeconomic status in Australia in 2002 to 2006.



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 based on the total number of cases over the 5-year period from 2002–2006.
3. The 'Total' column includes cases for which information on socioeconomic status was not available.
4. The data for this figure are shown in Appendix Table D2.10.

Source: Australian Cancer Database, AIHW.

Figure 2.6: Incidence of ovarian cancer by socioeconomic status, 2002–2006

Differences by Aboriginal and Torres Strait Islander status

Across a range of health-related and socioeconomic indicators, Aboriginal and Torres Strait Islander people are disadvantaged relative to other Australians. They 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 (ABS & AIHW 2008). 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 2009g,h).

Reliable national data on the incidence of cancer for Indigenous women 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 ovarian cancer by Indigenous status. While the majority (60%) of Australian Indigenous women live in these four jurisdictions (ABS 2009f), the degree to which data for these jurisdictions are representative of data for all Indigenous women is unknown. Furthermore, due to the small number of Indigenous women who had been diagnosed with ovarian cancer in the four jurisdictions between 2002 and 2006—namely, an average of 8 women per year—caution should be taken when making use of the data on ovarian cancer rates by Indigenous status.

For the four jurisdictions, the level of missing data on Indigenous status for ovarian cancer cases diagnosed between 2002 and 2006 was 3% (Table 2.10).

Although the age-standardised incidence rate for Indigenous women was slightly higher than that for non-Indigenous women (12.4 and 11.2 cases per 100,000 females, respectively), the difference was not statistically significant.

Table 2.10: Incidence of ovarian cancer by Indigenous status, Queensland, Western Australia, South Australia and the Northern Territory, 2002–2006

Indigenous status	Annual average number of cases[(a)]	Total number of cases	Age-standardised rate[(b,c)]
Indigenous	8	38	12.4
Non-Indigenous	410	2,050	11.2
Not stated	15	74	. .
Total	**432**	**2,162**	**11.6**

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

(b) Indirectly age-standardised to the 2002–2006 non-Indigenous population for the four jurisdictions (see Appendix B) and based on the total number of cases over the 5-year period from 2002–2006.

(c) The 95% confidence interval around the age-standardised rate for Indigenous women is 8.8–17.0.

Source: Australian Cancer Database, AIHW.

A study using Northern Territory data for the years from 1991 to 2001 also found no significant difference in ovarian cancer incidence by Indigenous status (Condon 2004), as did a study using Queensland data for 1982 to 1996 (Coory et al. 2000). A study using New Zealand data for 2005 (NZ Ministry of Health 2009a, 2009b) also showed no significant difference by Indigenous status, whereas data from the USA indicated that American Indians and Alaska native women had a significantly lower incidence rate of ovarian cancer than their white counterparts (USCSWG 2009; Wiggins et al. 2008).

Differences by country of birth

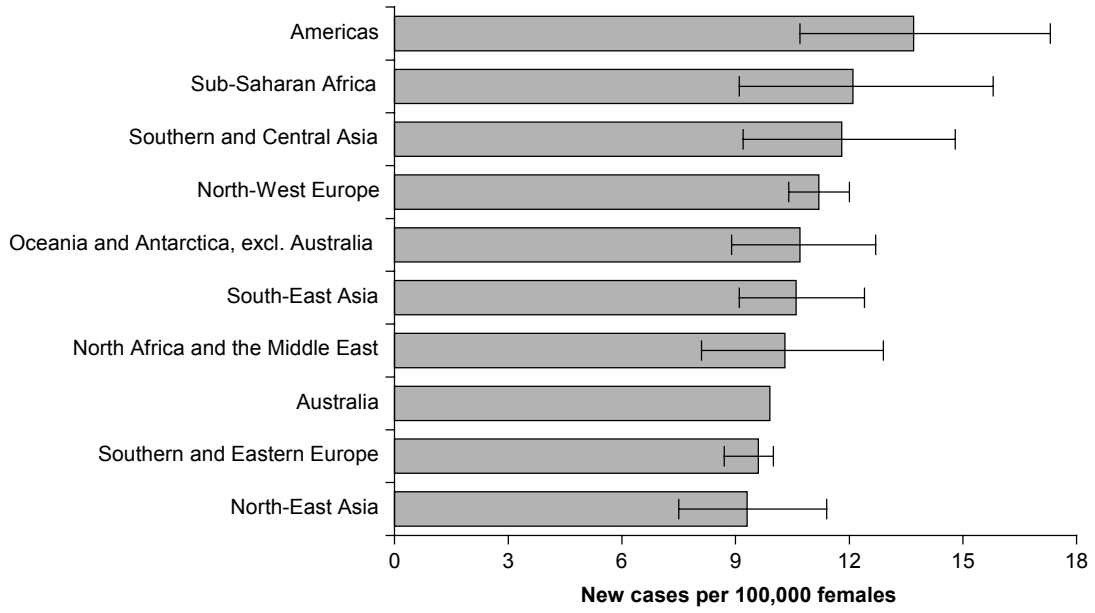
Australia has one of the largest proportions of immigrant populations in the world. In 2006, it was home to 4.4 million overseas-born people and one in four (25%) residents was born outside of the country (ABS 2009a). Research has found that most migrants are at least as healthy, if not more so, as the 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 2008a). However, research suggests that this migrant health advantage decreases over time. In regard to ovarian cancer, it is thought that incidence rates for migrants also tend to converge with that of the host country over time, particularly so for any offspring (Kliewer & Smith 1995; Parkin & Iscovich 1997).

Immigrants are more likely than Australian-born people to live in urban areas (ABS 2009a); 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 the earlier edition of this report (AIHW & NBCC 2006), data on ovarian cancer incidence by country of birth were only available for New South Wales, whereas in this edition, national data 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 periods of time (ABS 2009a).

In this report, country of birth data were classified using the Standard Australian Classification of Countries (SACC), second edition. Further information about this classification can be found in Appendix A. Information on the woman's country of birth was not available for 5% of the ovarian cancer cases diagnosed in Australia between 2002 and 2006.

Figure 2.7 shows that women living in Australia who were born in the Americas had the highest rate of ovarian cancer (13.7 cases per 100,000 females), with this rate significantly higher than the rates for women born in Australia (9.9 per 100,000). The lowest age-standardised incidence rate was seen among women who were born in North-East Asia (9.3 per 100,000). This rate was not significantly different from that of those who were born in Australia.



Notes

1. Country of birth was classified according to the Standard Australian Classification of Countries, second edition (see Appendix A).
2. The rates were indirectly age-standardised to the 2002–2006 Australian-born population and are based on the total number of cases over the 5-year period from 2002–2006 (see Appendix B).
3. The data for this figure are shown in Appendix Table D2.11.

Source: Australian Cancer Database, AIHW.

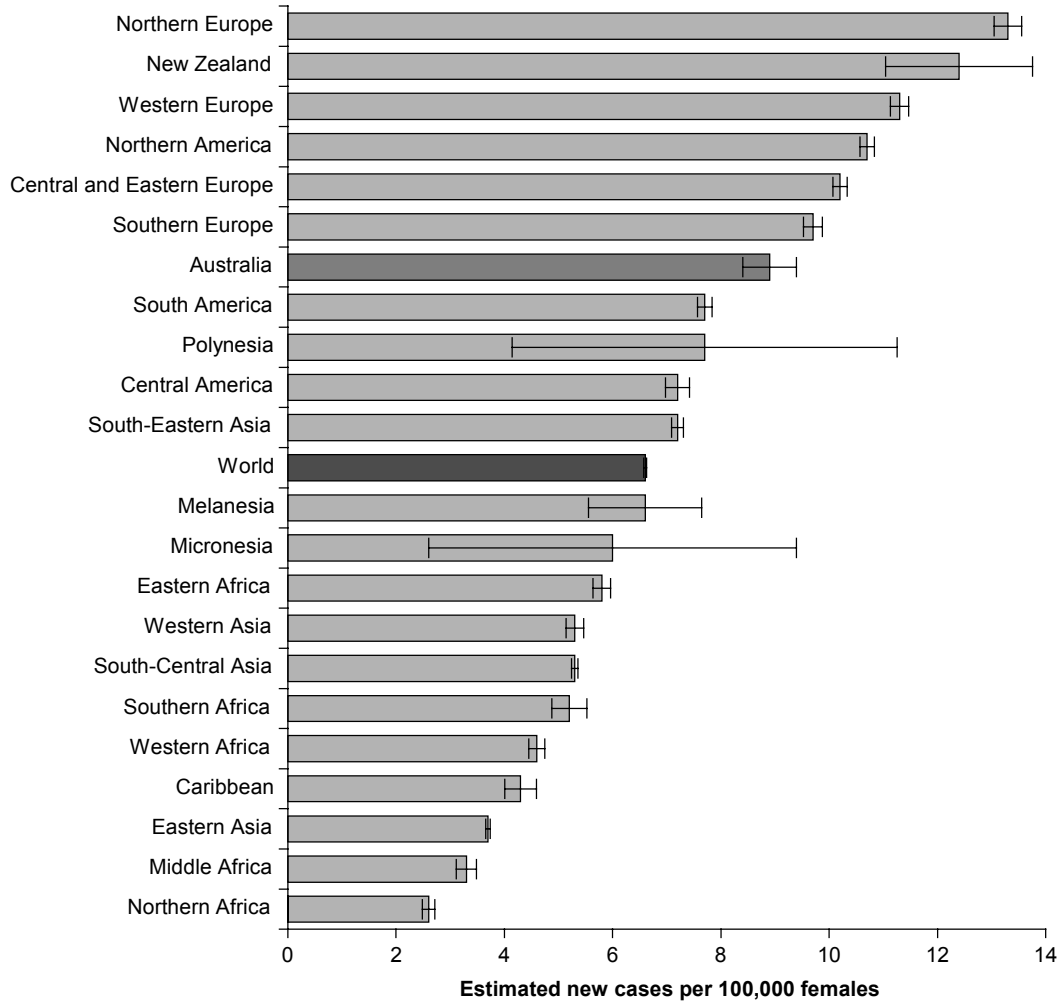
Figure 2.7: Incidence of ovarian cancer by country/region of birth, 2002–2006

International comparisons

In this section of the report, the incidence rate of ovarian cancer in Australia is compared with the rate for other countries using data from the GLOBOCAN database—a database which is prepared by the International Agency for Research on Cancer (IARC) (Ferlay et al. 2004). The most recent GLOBOCAN estimates are for 2002, with these estimates based on cancer incidence rates from approximately two to five years earlier. The GLOBOCAN data for ovarian cancer pertain to 'ovarian and related cancers' (that is, the ICD-10 codes of C56 and C57.0–C57.4) and thus encompass a broader range of cancers than is generally considered in this report. However, in line with the definition of ovarian cancer used in this report, borderline ovarian tumours were not included in the 2002 GLOBOCAN data. 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.

The estimated number of new cases of ovarian and related cancers around the world in 2002 was approximately 204,500 (Appendix Table D2.12). Figure 2.8 shows the estimated incidence rates of these cancers by country (for Australia and New Zealand) and by region. The estimated age-standardised rate for Australia was 8.9 new cases per 100,000 females. Thus, Australia was estimated to have a significantly higher incidence rate than the average world rate (6.6 cases per 100,000 females) and than of all the African and Asian regions.



Notes

1. The data were estimated for 2002 by the International Agency for Research on Cancer (IARC) and are based on data from approximately 3 to 5 years earlier.
2. The data pertain to cancers coded in ICD-10 as C56 and C57.0–C57.4.
3. 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).
4. The data for this figure are shown in Appendix Table D2.12.

Source: Ferlay et al. 2004.

Figure 2.8: International comparison of estimated incidence of ovarian and related cancers, 2002

However, Australia's rate was significantly lower than the rates of all other Westernised countries and regions, including New Zealand (12.4 per 100,000), Northern America (10.7 per 100,000) and all of the European regions (which ranged from 9.7 to 13.3 cases per 100,000 females).

The differences by region and country in the incidence rates for ovarian and related cancers may be due to a number of factors, including differences in diagnostic and classification practices, completeness of cancer registration, the proportion of women with various risk and protective factors (e.g. parity and use of oral contraceptives) and genetic susceptibility (Bray et al. 2005; Colombo et al 2006; Kliewer & Smith 1995; Kricker 2002).

3 Mortality from ovarian cancer

The number of deaths from ovarian cancer in a given time period is a result of the incidence of ovarian cancer, as well as factors that affect the likelihood of fatality such as the characteristics of the ovarian cancers diagnosed (e.g. stage at diagnosis and histological type of ovarian 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 primary site ovarian cancer. The ovarian cancer that led to the death may have been diagnosed many years previously, in the same year in which the person died or, in some cases, after death (e.g. 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. This database contains information about deaths due specifically to ovarian cancer from 1968 onwards (see Appendix C for further information).

In this chapter, information is presented on the number of deaths attributed to ovarian cancer in 2006, as well as in previous years. In addition, differences in mortality rates according to age, geographical area, socioeconomic status, Indigenous status and country of birth are provided. Lastly, mortality rates for Australia and other countries are compared.

Mortality in 2006

A total of 795 women died from ovarian cancer in 2006 (Table 3.1); thus, across Australia, an average of 2 women died every day from this disease. Ovarian cancer was the sixth most

Table 3.1: The 10 most common types of cancer deaths, females, 2006

Cancer type (ICD-10 codes)	No. of deaths	% of all gynaecological cancer deaths	% of all cancer deaths	% of all deaths	ASR[(a)]	95% confidence interval
Lung (C33–C34)	2,683	. .	15.7	4.1	22.7	21.8–23.6
Breast (C50)	2,618	. .	15.3	4.0	22.1	21.3–23.0
Unknown primary site (C26, C39, C76–C80)	1,917	. .	11.2	2.9	15.1	14.5–15.8
Bowel (C18–C20)	1,675	. .	9.8	2.6	13.6	12.9–14.2
Pancreas (C25)	1,029	. .	6.0	1.6	8.4	7.9–8.9
Ovary (C56)	795	54.7	4.6	1.2	6.7	6.2–7.2
All lymphomas (C81–C85,C96)	669	. .	3.9	1.0	5.4	5.0–5.8
All leukaemias (C91–C95)	609	. .	3.6	0.9	5.0	4.6–5.4
Melanoma (C43)	452	. .	2.6	0.7	3.8	3.5–4.2
Stomach (C16)	448	. .	2.6	0.7	3.6	3.3–4.0
All cancers[(b)]	**17,123**	**. .**	**100.0**	**26.3**	**141.0**	**138.9–143.2**

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

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

Source: National Mortality Database, AIHW.

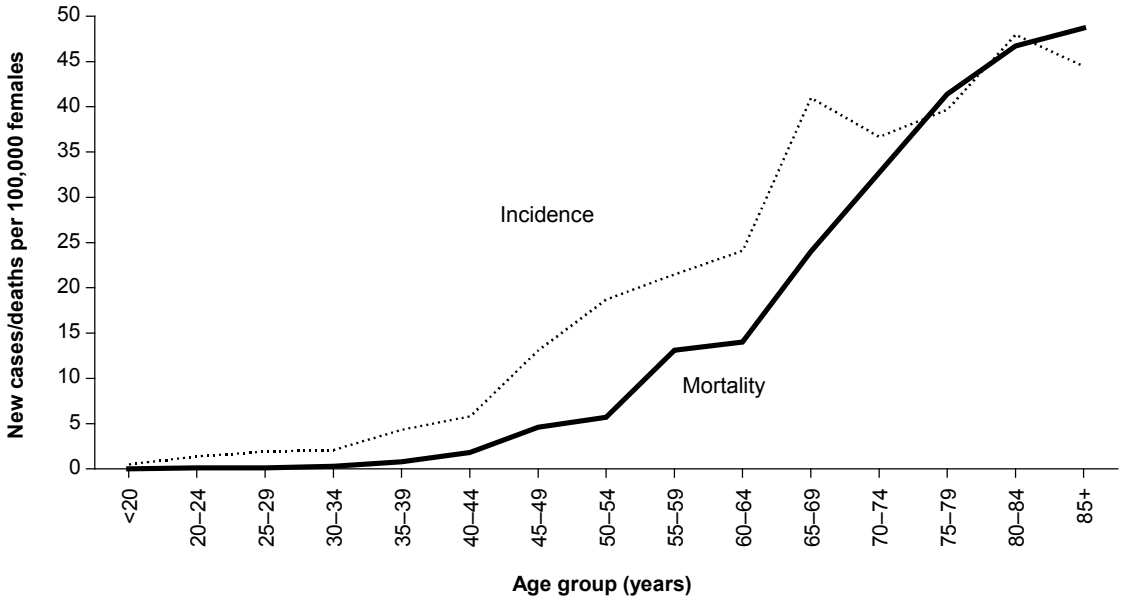
common cause of cancer death among women. Mortality from ovarian cancer accounted for 5% of all female cancer deaths and 1% of all female deaths. Furthermore, ovarian cancer was the most common cause of gynaecological cancer death in 2006, representing over half (55%) of such deaths. This means that more women died from ovarian cancer than from all of the other gynaecological cancers combined.

The age-standardised mortality rate of ovarian cancer in 2006 was 6.7 deaths per 100,000 females. The corresponding rates for lung cancer and breast cancer were 22.7 and 22.1 (deaths per 100,000 females), respectively.

Differences by age at death

In 2006, 1% of deaths due to ovarian cancer occurred among women aged under 40 years, just over one-fifth (22%) occurred among those aged 40 to 59 years, while the over three in four deaths (77%) occurred among women aged 60 years and over (Appendix Table D3.1).

Figure 3.1 presents mortality rates of ovarian cancer according to age at death for 2006. As a point of comparison, incidence rates by age at diagnosis are also shown. Similar to the incidence rates, the likelihood of women dying from ovarian cancer increased with age. The mortality rates were less than 2 deaths per 100,000 females for those aged up to and including 40 to 44 years. From that age group onwards, there was an increase in the mortality rates between most age groups (although in most cases the difference from one age group to the next was not statistically significant). The highest mortality rate of 48.7 deaths per 100,000 females was observed for the oldest age group (i.e. those aged 85 years and over), with this rate significantly higher than the rates for all age groups up to and including 70 to 74 years.



Notes

1. The rates shown are age-specific rates.
2. The data for this figure are shown in Appendix Tables D2.1 and D3.1.

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

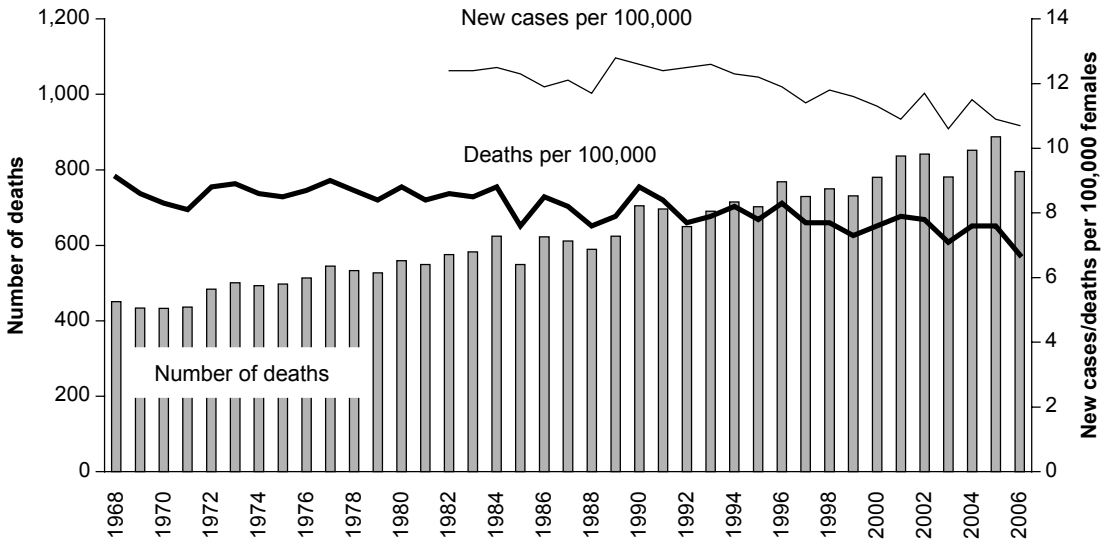
Figure 3.1: Ovarian cancer incidence and mortality by age group, 2006

Trends

The first year for which national mortality data for ovarian cancer are available is 1968. In Figure 3.2, the number of deaths due to ovarian cancer and the corresponding age-standardised mortality rates are shown for 1968 to 2006. For comparison purposes, age-standardised incidence rates are also shown.

Despite some year-to-year fluctuations, the number of deaths from ovarian cancer increased over time. In 1968, 451 women died from ovarian cancer; in 1990, this number had risen to 705 women, while 795 women had died from ovarian cancer in 2006. Between 1968 and 2006, the number of deaths from ovarian cancer increased by 76%.

When the age-standardised rates are considered, some year-to-year fluctuations are again seen. However, overall, the mortality rate decreased significantly by 26% between 1968 (9.1 deaths per 100,000 females) and 2006 (6.7 per 100,000). In addition, the age-standardised mortality rate for 2006 was the lowest rate for any year to date (although it was not significantly lower than the rates observed for three of the preceding years).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001. The 1968 to 1996 mortality data were adjusted from earlier ICD standards to ICD-10 standards using a factor of 0.98.
2. The data for this figure are shown in Appendix Tables D2.2 and D3.2. Incidence data are available from 1982 onwards.

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

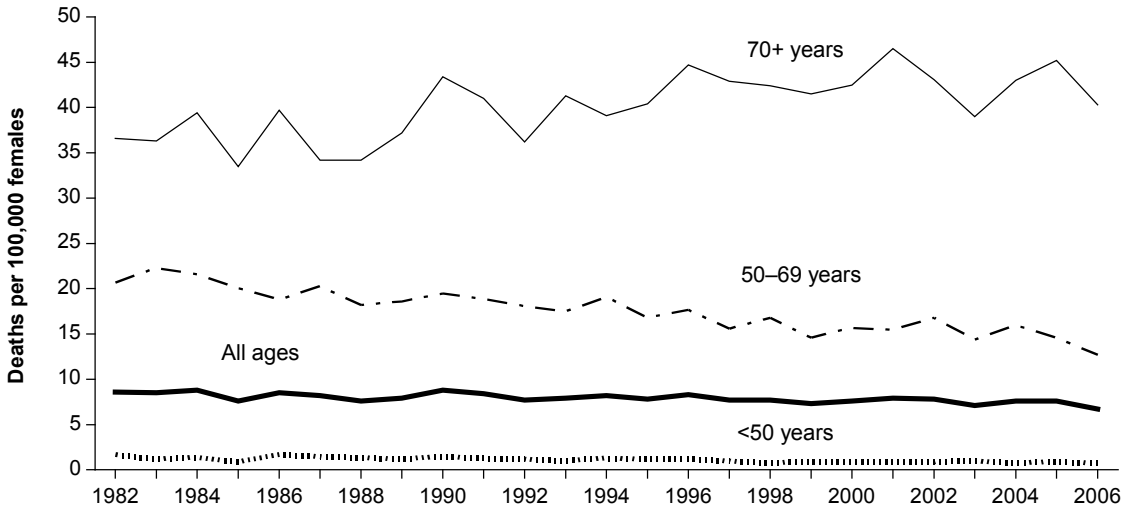
Figure 3.2: Ovarian cancer incidence and mortality, 1968 to 2006

Possible explanations for the decline in the mortality rate from ovarian cancer over time include the following:

- a decrease in the incidence rate of ovarian cancer (as discussed in Chapter 2)
- improvements in access to and quality of treatments, including greater sub-specialisation in gynaecological oncology, more aggressive surgery, the availability of more effective types of chemotherapy, and better multidisciplinary care (Kjaerbye-Thygesen et al. 2005; Oriel et al. 1999; Tracey et al. 2008)
- change over time in the histological types of ovarian cancers occurring among women (as discussed in Chapter 4, the prognosis is better for some types of ovarian cancers than others).

Trends by age at death

Trends in ovarian cancer morality rates by age for the 25-year period from 1982 to 2006 are shown in Figure 3.3. Between 1982 and 2006, the mortality rate due to ovarian cancer decreased slightly but significantly for those aged less than 50 years at death, from 1.7 per 100,000 females in 1982 to 0.8 per 100,000 females in 2006. The rate also fell significantly for women aged 50 to 69 years at death, with a decline of 39% (20.7 deaths per 100,000 females in 1982 to 12.7 per 100,000 in 2006). In contrast, for women aged 70 years and over at death, numerous year-to-year fluctuations in the mortality rate are observed, with an overall statistically significant increase in the ovarian cancer mortality rate of 9% from 1982 to 2006 (36.6 and 40.3 deaths per 100,000 females, respectively). Thus, the trend in the mortality rates for women aged 70 years and over was in the opposite direction to the trend for those aged less than 70 years.



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001. The 1982 to 1996 rates were adjusted from ICD-9 to ICD-10 standards using a factor of 0.98.
2. The data for this figure are shown in Appendix Table D3.3.

Source: National Mortality Database, AIHW.

Figure 3.3: Mortality from ovarian cancer by age at death, 1982 to 2006

While the trend of increasing ovarian cancer mortality rates for older women has also been observed elsewhere (e.g. in data from the USA reported by Oriel et al. 1999), the reasons for this increase are not clear. Part of the explanation may be that, unlike those aged 50 to 69 years, the ovarian cancer incidence rate did not fall for those aged 70 years and over (see Chapter 2). Second, it is possible that the benefits of improvements in treatment (such as the improved treatment of germ cell cancers) have been relatively smaller for older women than younger women (Bray et al. 2005; Cancer Council Victoria 2007; Oriel et al. 1999). Third, change over time in the relative proportion of older women (compared with other women) who are diagnosed with types of ovarian cancer that have a poorer prognosis may also help explain this trend.

Note that while it is well established that older women tend to be diagnosed at a later stage than younger women (see Chapter 2) and that older women are, in general, given less aggressive treatment than their younger counterparts (Maas et al. 2005; Petignat et al. 2004; WHC & NCRI 2006), these differences by age do not help explain the rise in mortality rates

among older women unless those trends have worsened over time (Oriel et al. 1999). In conclusion, the reasons for increasing ovarian cancer mortality rates for older women are not clearly understood and further investigation on this topic could be warranted.

Risk of death from ovarian cancer and average age at death

Based on 2006 data, the risk of a woman in the general population dying from ovarian cancer before the age of 75 years was 1 in 206; the corresponding risk for the age of 85 was 1 in 108 (Table 3.2). Although these risk levels have fluctuated over the years, the general pattern has been one of a decrease in the risk of a woman dying from ovarian cancer. For example, based on 1982 data, the risk of dying from ovarian cancer by the age of 85 years was 1 in 89 compared with the risk of 1 in 108 calculated from the 2006 data.

The average age at death due to ovarian cancer has increased over time. The mean age of death of women who died from ovarian cancer increased from 65 years in 1982 to 70 years in 2006, while the median age increased from 65 years to 72 years over the same period.

Table 3.2: Risk of death from ovarian cancer and average age at death, 1982 to 2006

Year	Risk to age 75 years	Risk to age 85 years	Mean age at death	Median age at death
1982	1 in 145	1 in 89	64.9	65.0
1983	1 in 146	1 in 95	64.6	64.0
1984	1 in 140	1 in 90	65.0	66.0
1985	1 in 155	1 in 101	65.9	66.0
1986	1 in 144	1 in 94	65.1	66.0
1987	1 in 156	1 in 99	65.3	65.0
1988	1 in 166	1 in 100	65.4	66.0
1989	1 in 156	1 in 100	66.3	67.0
1990	1 in 142	1 in 88	66.5	68.0
1991	1 in 148	1 in 92	67.0	68.0
1992	1 in 161	1 in 101	66.6	68.0
1993	1 in 155	1 in 94	68.1	69.0
1994	1 in 159	1 in 92	66.2	68.0
1995	1 in 169	1 in 97	67.7	69.0
1996	1 in 162	1 in 90	67.8	70.0
1997	1 in 178	1 in 95	68.8	71.0
1998	1 in 176	1 in 95	69.0	71.0
1999	1 in 194	1 in 102	69.4	72.0
2000	1 in 178	1 in 100	69.2	71.0
2001	1 in 179	1 in 94	70.0	72.0
2002	1 in 173	1 in 93	69.2	71.0
2003	1 in 199	1 in 104	69.0	71.0
2004	1 in 173	1 in 94	69.6	71.0
2005	1 in 193	1 in 97	70.6	73.0
2006	1 in 206	1 in 108	70.3	72.0

Note: The 1982 to 1996 data were adjusted from ICD-9 to ICD-10 standards using a factor of 0.98.

Source: National Mortality Database, AIHW.

Differences across groups

In this section of the report, differences in mortality of women from ovarian cancer are presented according to geographical area, socioeconomic status, Indigenous 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 ovarian cancer, the characteristics of the ovarian cancers diagnosed (e.g. stage at diagnosis and type of tumour), and access to and quality of treatment. Similar to what was done to examine differences in incidence across groups, age-standardised rates for the 5-year period from 2002 to 2006 are compared.

Differences by geographical area

The average number of ovarian cancer deaths per year over the period from 2002 to 2006 ranged from 283 in New South Wales to 2 in the Northern Territory (Table 3.3). When the age-standardised rates are considered, the Northern Territory had the lowest rate (3.2 deaths per 100,000 females), with this rate significantly lower than the rates for Victoria (8.1 per 100,000 females), Western Australia (7.6 per 100,000) and New South Wales (7.3 per 100,000). The highest age-standardised rates were observed for the Australian Capital Territory (8.3 per 100,000) and Victoria (8.1 per 100,000). While the rate for the Australian Capital Territory did not differ significantly from that of other states and territories, the rate for Victoria was significantly higher than that observed for Queensland (6.8 per 100,000), South Australia (6.5 per 100,000) and the Northern Territory (3.2 per 100,000).

Table 3.3: Mortality from ovarian cancer by state and territory, 2002–2006

State or territory[(a)]	Average annual number of deaths	Total number of cases	Age-standardised rate[(b)]	95% confidence interval
New South Wales	283	1,414	7.3	6.9–7.7
Victoria	234	1,168	8.1	7.7–8.6
Queensland	139	693	6.8	6.3–7.3
Western Australia	77	385	7.6	6.8–8.4
South Australia	64	322	6.5	5.8–7.3
Tasmania	21	106	7.2	5.9–8.7
Australian Capital Territory	12	60	8.3	6.3–10.8
Northern Territory	2	10	3.2	1.2–6.3
Total	**832**	**4,158**	**7.3**	**7.1–7.6**

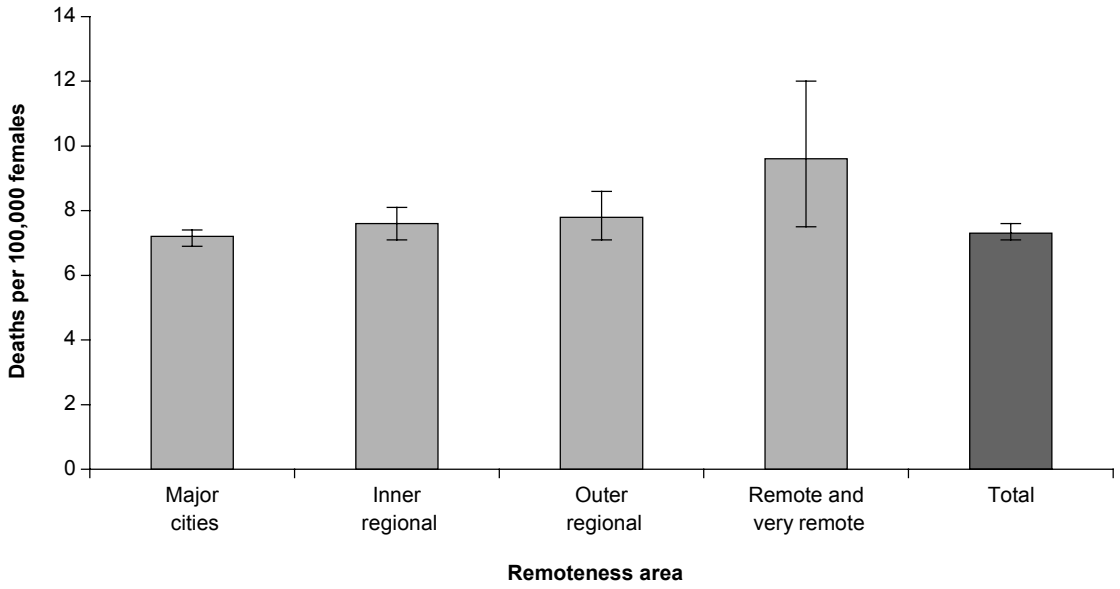
(a) These data may not be comparable with data published in state and territory cancer reports since the data shown in this report relate to the place of residence at the time of *death*, not the place of residence at the time of *diagnosis* as is often shown in state and territory reports. Furthermore, the states and territory cancer registries tend to use a different methodology from that used by the AIHW to determine the cause of death (see Appendix B).

(b) The age-standardised rates were 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-year period from 2002–2006.

Source: National Mortality Database, AIHW.

In Figure 3.4, the ovarian cancer mortality rates for women living in different remoteness areas are presented. The mortality data are based on the remoteness of the usual place of residence of the women at time of death. During the 2002 to 2006 period, women living in *Remote and very remote* areas had the highest mortality rate (9.6 deaths per 100,000 females),

with this rate being significantly higher than the rate for those living in *Major cities* (7.2 per 100,000). This difference may be related to a number of factors including access to diagnostic and other health services in remote areas.



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 based on the total number of cases over the 5-year period from 2002–2006.
3. The 'Total' column includes cases for which information on remoteness area was not available.
4. The data for this figure are shown in Appendix Table D3.4.

Source: National Mortality Database, AIHW.

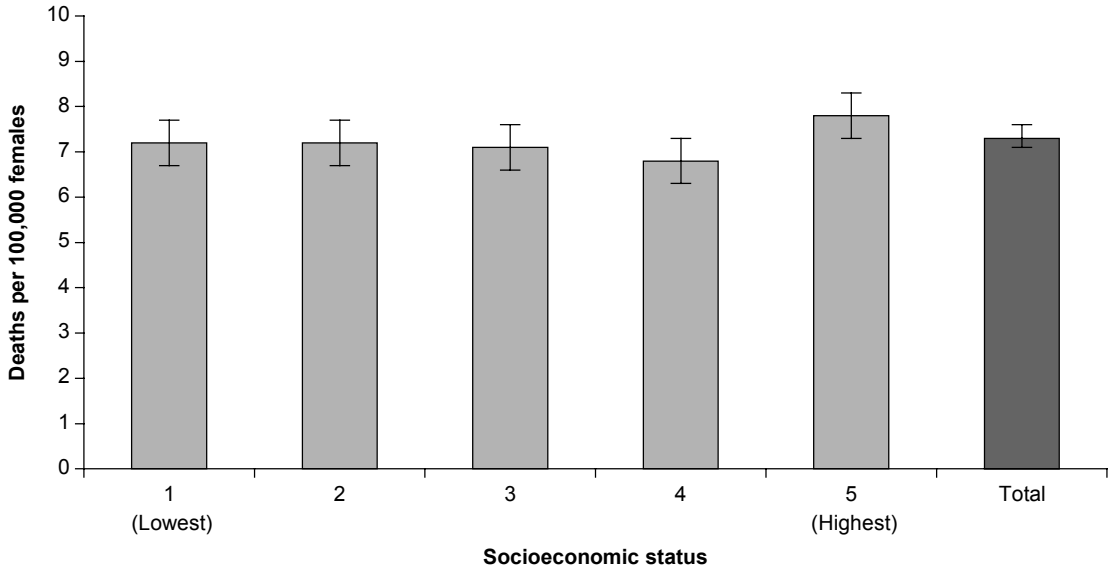
Figure 3.4: Mortality from ovarian cancer by remoteness area, 2002–2006

Differences by socioeconomic status

The socioeconomic status measure used in this report pertains to the characteristics of people in the area in which the women lived, rather than to the characteristics of the individual (see Appendix A). From 2002 to 2006, women living in areas with the highest socioeconomic status had the highest ovarian cancer mortality rate (7.8 deaths per 100,000 females) but this rate was not significantly higher than the rates for women living in other areas (Figure 3.5).

Differences by Aboriginal and Torres Strait Islander status

Information in the National Mortality Database (NMD) on Indigenous status for 2002 to 2006 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 nine in ten (89%) Indigenous women live in these five jurisdictions (ABS 2009f). In the NMD, the Indigenous status of 1% of the women who had died from ovarian cancer was not known (Table 3.4). Between 2002 and 2006, there was an annual average of 6 ovarian cancer deaths recorded for Indigenous women in the five jurisdictions. Due to the relatively small number of Indigenous women who died from ovarian cancer, caution should be taken when considering differences in mortality rates by Indigenous status.



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 based on the total number of cases over the 5-year period from 2002–2006.
3. The 'Total' column includes cases for which information on socioeconomic status was not available.
4. The data for this figure are shown in Appendix Table D3.5.

Source: National Mortality Database, AIHW.

Figure 3.5: Mortality from ovarian cancer by socioeconomic status, 2002–2006

There was no statistically significant difference in the age-standardised mortality rates from ovarian cancer for Indigenous women compared with non-Indigenous women (8.4 deaths per 100,000 females among Indigenous women and 7.9 per 100,000 among non-Indigenous women). This finding of a lack of significant difference by Indigenous status mirrors those of a number of other studies, including research using data from the Northern Territory (Condon 2004; Zhang et al. 2008), New South Wales (Supramaniam et al. 2006) and New Zealand (NZ Ministry of Health 2009a,b). In contrast, data from the United States of America indicated that American Indian and Alaska native women had a significantly lower age-standardised mortality rate from ovarian cancer than white American women (5 and 9 deaths per 100,000 females, respectively) (USCSWG 2009).

Table 3.4: Mortality from ovarian cancer by Indigenous status, New South Wales, Queensland, Western Australia, South Australia and the Northern Territory, 2002–2006

Indigenous status	Average annual number of deaths[(a)]	Total number of cases	Age-standardised rate[(b,c)]
Indigenous	6	30	8.4
Non-Indigenous	553	2,764	7.9
Not stated	6	30	. .
Total	**565**	**2,824**	**8.0**

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

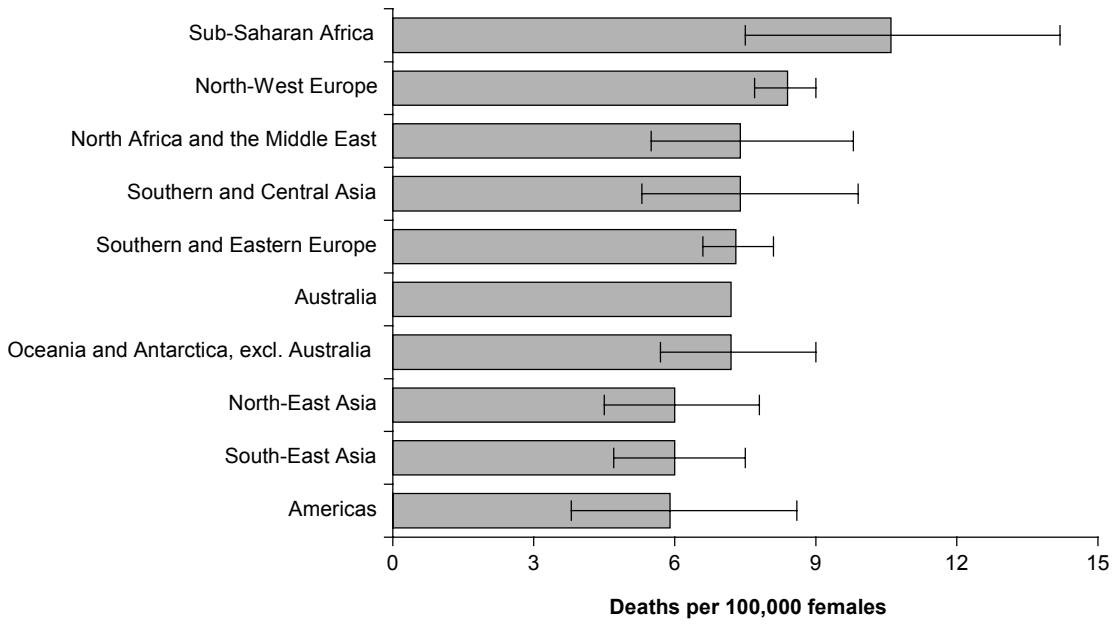
(b) Indirectly age-standardised to the 2002–2006 non-Indigenous population for the five jurisdictions (see Appendix B) and are based on the total number of cases over the 5-year period from 2002–2006.

(c) The 95% confidence interval around the age-standardised rate for Indigenous women is 5.7–12.0.

Source: National Mortality Database, AIHW.

Differences by country of birth

From 2002 to 2006, women living in Australia who were born in Sub-Saharan Africa had the highest age-standardised mortality rate (10.6 deaths per 100,000 females), with this rate significantly higher than the rate for women born in Australia (7.2 per 100,000) (Figure 3.6). The lowest mortality rates were observed for women born in the Americas (5.9 per 100,000), South-East Asia (6.0 per 100,000) and North-East Asia (6.0 per 100,000); these rates were not significantly higher than the rate for those born in Australia.



Notes

1. Country of birth was classified according to the Standard Australian Classification of Countries, second edition (see Appendix A).
2. The rates were indirectly age-standardised to the 2002–2006 Australian-born population and are based on the total number of cases over the 5-year period from 2002–2006 (see Appendix B).
3. The data for this figure are shown in Appendix Table D3.6.

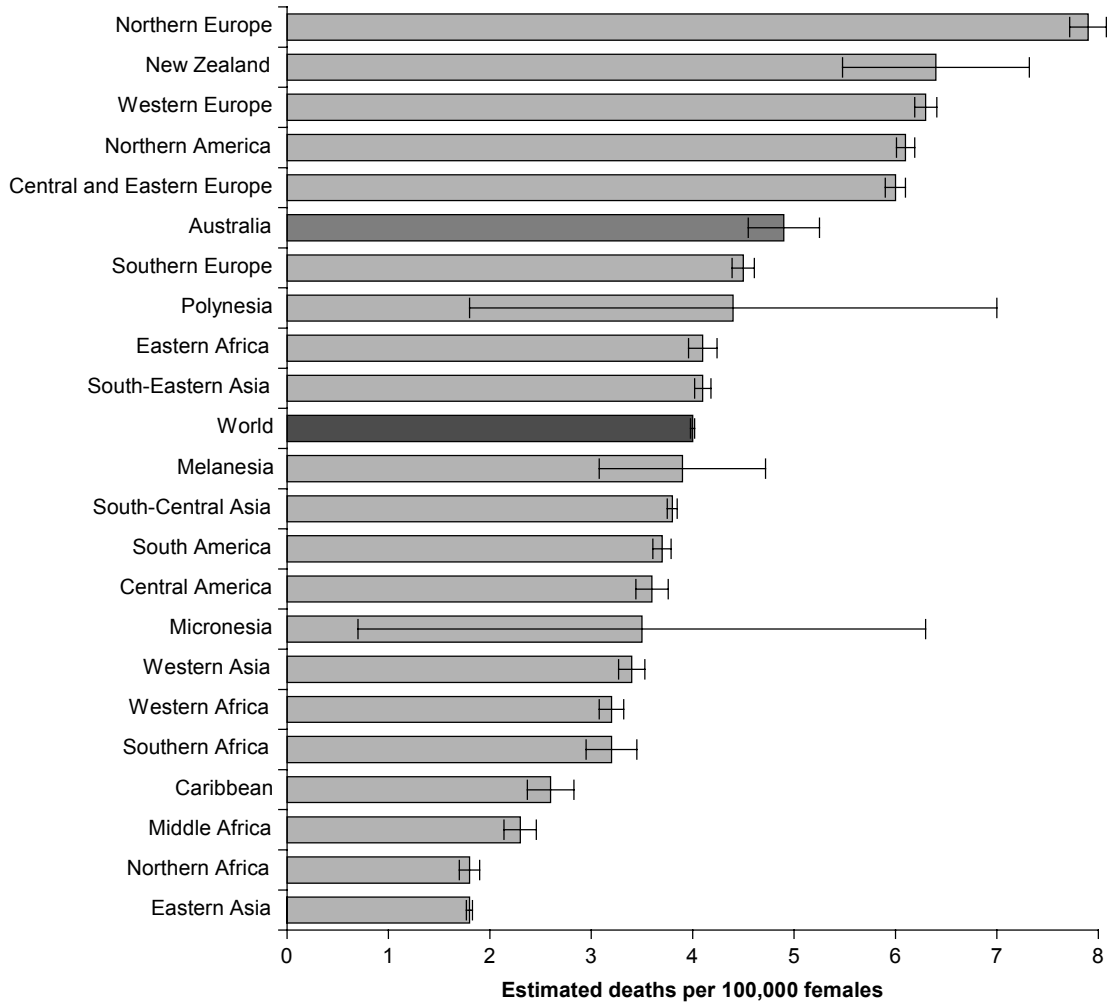
Source: National Mortality Database, AIHW.

Figure 3.6: Mortality from ovarian cancer by country/region of birth, 2002–2006

International comparisons

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 ovarian cancer deaths from the GLOBOCAN database (Ferlay et al. 2004) are shown in Figure 3.7. The confidence intervals indicate the variation that would be expected by chance, assuming that the estimated mortality rates are accurate. Note that the GLOBOCAN data pertain to both 'ovarian and related cancers' (specifically, the ICD-10 codes of C56 and C57.0–C57.4) rather than to just 'ovarian cancer'. In addition, the data are estimates for 2002 and are based on information from around 3 to 5 years earlier. Further information about these data is provided in Appendix C.

The age-standardised mortality rate from ovarian and related cancers for Australia (4.9 deaths per 100,000 females) was significantly lower than that for a number of other



Notes

1. The data were estimated by IARC for 2002 and are based on data from approximately 3 to 5 years earlier.
2. The data pertain to cancers coded in ICD-10 as C56 and C57.0–C57.4.
3. 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).
4. The data for this figure are shown in Appendix Table D3.7.

Source: Ferlay et al. 2004.

Figure 3.7: International comparison of estimated mortality from ovarian and related cancers, 2002

Westernised countries and regions including Northern Europe (7.9 per 100,000), New Zealand (6.4 per 100,000), Western Europe (6.3 per 100,000) and Northern America (6.1 per 100,000). Meanwhile, Australia's mortality rate from ovarian and related cancers was estimated to be significantly higher than the rate for each of the African and Asian regions (which ranged from 1.8 to 4.1 deaths per 100,000 females).

Ovarian cancer as an associated cause of death

The data presented thus far in this chapter apply to deaths of women for which the *underlying* cause of death was ovarian cancer. In addition to an underlying cause of death, *associated* causes of death can be listed on a death certificate. An associated cause of death is

any other condition or event that was not the underlying cause of death, but was considered to contribute to the individual's death. In this section, data are presented on deaths of women for which ovarian cancer was the associated (but not underlying) cause of death.

An annual average of 59 women who died between 2002 and 2006 had ovarian cancer recorded as an associated cause of death (Table 3.5). For most of these deaths (23 deaths or 38% of the relevant deaths), a circulatory system disease was the underlying cause of death. The second most common underlying cause of death for those deaths for which ovarian cancer was an associated cause of death was a cancer other than ovarian cancer (average of 15 deaths per year and 25% of the relevant deaths). The most common type of these 'other' cancers was 'cancer of independent (primary) multiple sites' (ICD-10 code of C97), followed by breast cancer (ICD-10 code of C50), with the corresponding average number of deaths being 4 and 2 per year, respectively.

Table 3.5: Underlying cause of death where ovarian cancer was an associated cause, annual average for 2002–2006

Underlying cause of death	ICD-10 codes	Average annual number of deaths[(a)]	% of deaths
Circulatory system disease	I00–I99	23	38.4
Cancer (other than ovarian cancer)	C00–C55, C57–C97, D45–D46, D47.1, D47.3	15	24.9
Respiratory system disease	J00–J99	4	7.1
Nervous system disease	G00–G99	1	2.4
Endocrine, nutritional and metabolic disease	E00–E89	3	4.4
Digestive system disease	K00–K93	7	12.1
Mental and behavioural disorder	F00–F99	1	1.3
Other	all other ICD-10 codes (except for C56)	6	9.4
Total		**59**	**100.0**

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

Source: National Mortality Database, AIHW

During 2002 to 2006, the majority (75%) of women who died with ovarian cancer as an associated cause of death were aged 70 years or older at death, while 24% were 50 to 69 years and 2% were less than 50 years (Table 3.6).

Table 3.6: Women who died with ovarian cancer as an associated cause by age at death, annual average for 2002–2006

Age at death	Average annual number of deaths[(a)]	Per cent of deaths
<50 years	1	1.7
50–69 years	14	23.7
70+ years	44	74.6
Total	**59**	**100.0**

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

Source: National Mortality Database, AIHW.

4 Survival after a diagnosis of ovarian cancer

Information on the survival of those who are diagnosed with ovarian cancer provides an indication of the effect of cancer and the success of cancer control programs and treatments. Survival estimates provide information on the probability that a person will still be alive at a specified point in time (such as 1 or 5 years) after the diagnosis of cancer. Survival is influenced by a range of factors including the characteristics of those diagnosed with cancer (e.g. age, sex, additional illnesses and lifestyle), the nature of the tumours (e.g. stage at diagnosis and histology type), and the health-care system (e.g. screening, diagnostic and treatment facilities, and follow-up services) (Black et al. 1998; WCRF & AICR 2007).

Two different measures of survival from cancer can be presented, namely, *crude survival* and *relative survival*. Crude survival indicates the proportion of people alive at a specified point in time subsequent to diagnosis of cancer; it does not take into account the fact that some people diagnosed with cancer—for example, older persons—may have a relatively shorter lifespan than the rest of the population (regardless of their diagnosis of cancer) due to other illnesses. Relative survival takes this issue into account and it is thus a more meaningful measure of outcomes from cancer. Relative survival involves the comparison of the survival of people diagnosed with cancer (i.e. observed survival) with that experienced by a population of equivalent age, sex and calendar year in the general population (i.e. expected survival). The ratio of observed to expected survival is used to estimate the proportion of people who would have survived their cancer. As detailed more fully in Appendix B, relative survival can be calculated in a number of different ways; the 'cohort method' was used for this report.

Relative survival is generally presented as a proportion, with a value less than 100% suggesting that those with ovarian cancer had a lower chance of survival than the general population. For example, 5-year relative survival of 40% for females diagnosed with ovarian cancer means that these females had a 40% chance of surviving 5 years after diagnosis relative to comparable women in the general population.

Since relative survival estimates are based on the outcomes of a group of people with a diverse mix of ovarian cancer and other characteristics, they provide an indication of the *average* survival experience. They do not reflect an *individual's* chance of surviving since this is affected by specific characteristics of the individual and the cancer they have.

In this chapter, 1-year survival is shown, along with longer-term survival proportions such as 5- and 10-year survival, following a diagnosis of invasive ovarian cancer. One-year survival proportions might indicate the net short-term effectiveness of treatment and the stage at which the cancer was detected. In contrast, longer-term survival estimates might indicate:

- the effectiveness of treatment
- whether long-term side effects of cancer treatment are associated with additional mortality
- the number of people needing ongoing monitoring rather than cancer treatment
- milestones when there has been an arrest in the disease process or a slower progression.

In this chapter, change over time in relative survival estimates for those diagnosed with ovarian cancer are described, as are differences by age at diagnosis and by histological type

of ovarian 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 and country of birth due to data limitations and the lack of necessary life tables. However, *crude* survival estimates can be calculated according to Indigenous status for women in four jurisdictions and the results from these calculations are shown in this chapter. In addition, international data on survival are provided.

The survival estimates shown in this chapter are based on the analysis of records of ovarian cancer cases diagnosed between 1982 and 2006 as held in the Australian Cancer Database. Data from the National Death Index on deaths (from any cause) that occurred up to 31 December 2008 were used to determine which women with ovarian cancer had died and when this occurred.

Survival of those diagnosed between 2000 and 2006

For women who were diagnosed with ovarian cancer between 2000 and 2006, 1-year relative survival was 74% (Table 4.1). The corresponding 5-year relative survival estimate was considerably lower at 40%. In other words, those women who were diagnosed with ovarian cancer between 2000 and 2006 were 40% as likely as comparable women in the general population to live 5 years after diagnosis.

Table 4.1: Relative survival, ovarian and breast cancer, females, 2000–2006

	1-year relative survival		5-year relative survival	
	RS (%)	95% CI	RS (%)	95% CI
Ovarian cancer	73.7	72.7–74.7	40.0	38.8–41.2
Breast cancer	97.4	97.2–97.5	88.3	88.0–88.6

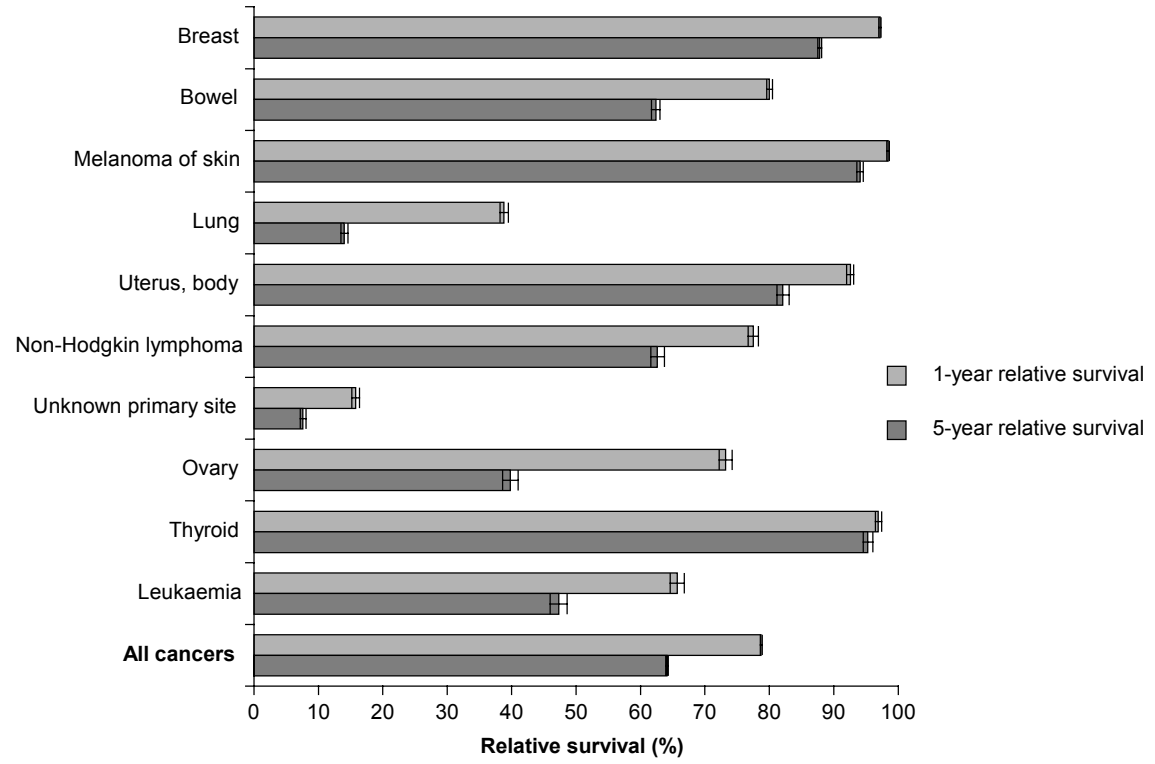
Source: Australian Cancer Database, AIHW; AIHW & NBOCC 2009.

Survival from ovarian cancer compared with other cancers

To put the survival estimates for ovarian cancer into context, it is useful to compare these estimates with those of other cancers. Survival estimates for the period of 2000 to 2006 are currently available for one other type of cancer—breast cancer. As shown in Table 4.1, the prognosis for women diagnosed with breast cancer was better than that for those diagnosed with ovarian cancer for both the 1-year and the 5-year survival estimates. Specifically, the 1-year relative survival estimates were 74% for ovarian cancer and 97% for breast cancer (AIHW & NBOCC 2009). For the 5-year relative survival estimates, the estimate for breast cancer (88%) was more than double the estimate for ovarian cancer (40%).

In order to compare survival from ovarian cancer with a broader range of cancers, Figure 4.1 presents 1- and 5-year relative survival estimates (as sourced from a 2008 report by AIHW, CA and AACR) for the 10 most frequently diagnosed cancers among women (excluding non-melanoma skin cancer). The data pertain to women diagnosed with cancer between 1998 and 2004. For the 1-year relative survival estimates, the estimate for ovarian cancer (73%) is significantly lower than the estimate for all cancers combined (79%), and it ranked seventh lowest of the ten relative survival estimates shown. In regard to the 5-year relative survival estimates, the difference between the estimate for ovarian cancer (40%) and the estimate for all cancers combined is much more stark (64%), and ovarian cancer ranked eighth lowest of the ten cancers shown. These data indicate that the prognosis prospects for women

diagnosed with ovarian cancer are often poorer than those for women diagnosed with other frequently diagnosed cancers. The reasons for the poor survival outcomes for ovarian cancer include the relatively high proportion of diagnoses at an advanced stage (see Chapter 2) which may be affected by the non-specific nature of the symptoms of this type of cancer.



Notes

1. The most commonly diagnosed cancers, excluding non-melanoma skin cancer (C44), were determined using data for 2004; the cancers have been listed in order of how common they were.
2. 'All cancers' includes cancers coded in ICD-10 as C00–C97 (except for C44), D45, D46, D47.1 and D47.3.
3. The data for this figure are shown in Appendix Table D4.1.

Source: AIHW, CA & AACR 2008; Australian Cancer Database, AIHW.

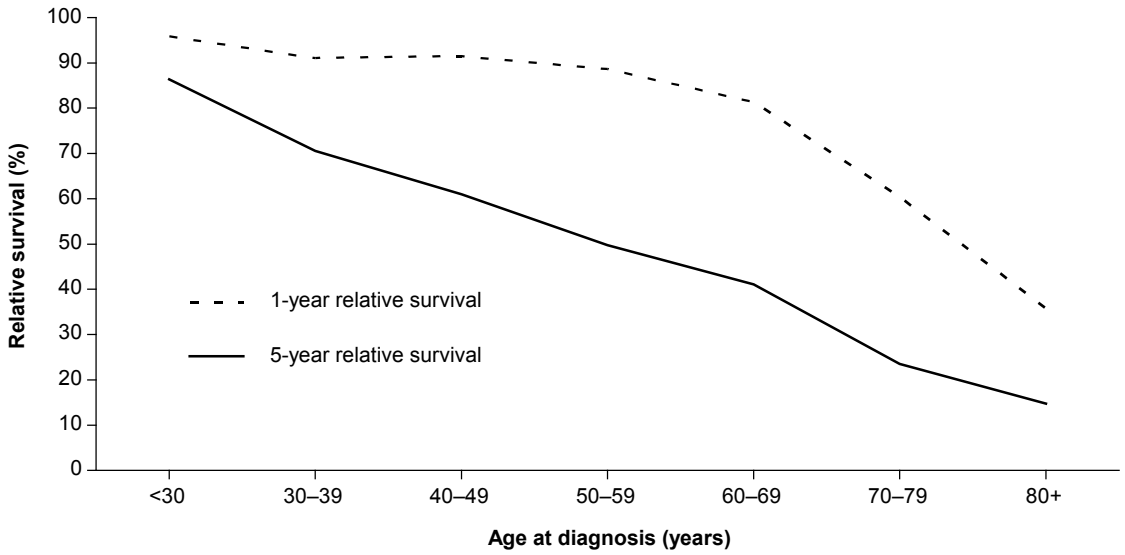
Figure 4.1: Relative survival, 10 most commonly diagnosed cancers, females, 1998–2004

Differences by age at diagnosis

Figure 4.2 presents 1- and 5-year relative survival estimates by age at diagnosis for women diagnosed with ovarian cancer during 2000 to 2006. For 1-year relative survival, those in the youngest age group (those less than 30 years) had the highest survival estimate (96%). However, this estimate is not significantly higher than the estimates for women aged 30 to 39 years (91%) and those aged 40 to 49 years (92%). In contrast, for all of the age groups from 50 to 59 years onwards, there is a statistically significantly decrease in the relative survival estimates from one group to the next, with those aged 80 years and over having the lowest 1-year relative survival estimate (36%).

The 5-year relative survival estimates decreased steadily by age at diagnosis, with statistically significant differences observed between all of the age groups. The estimates ranged from 86% for those aged less than 30 years to 15% for those aged 80 years and over.

A large body of other research has also found that survival of women diagnosed with ovarian cancer at an older age is much poorer than it is for those diagnosed at a younger age; examples include studies using data from the USA (Horner et al. 2009), the United Kingdom (Cancer Research UK 2006) and Ireland (WHC & NCRI 2006). This difference by age in survival may be due to a number of different reasons, including differences in the histological type and stage at diagnosis of the tumours, a greater likelihood of co-morbidities and frailty among those diagnosed at an older age, and differences by age in treatments received and the inclusion in clinical trials (Chan et al. 2006; Maas et al. 2005; McMurdo et al. 2005; Petignat et al. 2004; South Australia Cancer Registry 2000; Tracey et al. 2009; Uyar et al. 2005; WHC & NCRI 2006).



Note: The data for this figure are shown in Appendix Table D4.2.

Source: Australian Cancer Database, AIHW.

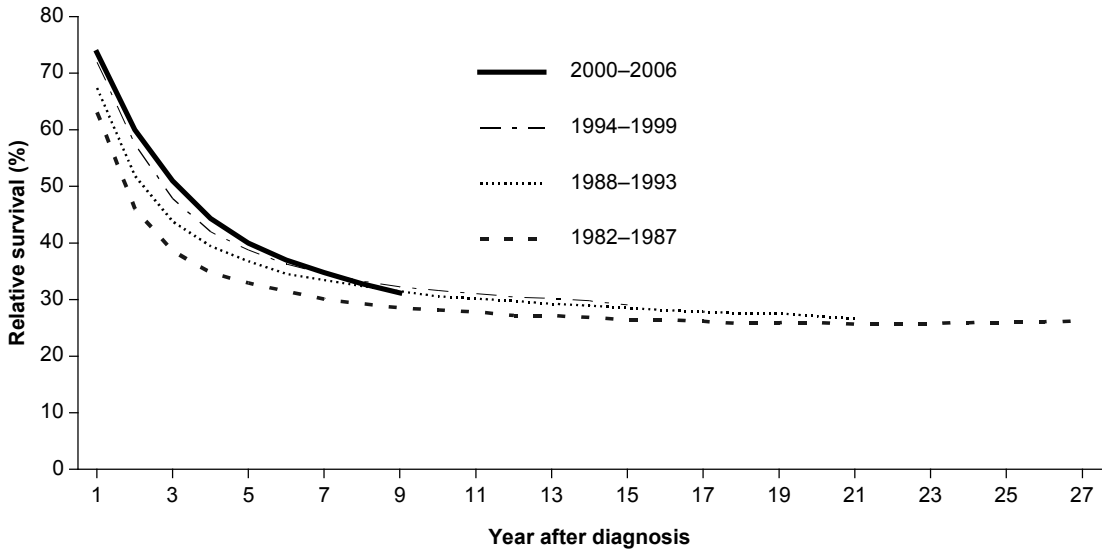
Figure 4.2: Relative survival by age at diagnosis, ovarian cancer, 2000–2006

Trends

Survival curves for ovarian cancer are presented in Figure 4.3 for four time periods from 1982–1987 to 2000–2006. For each of the four time periods, the relative survival estimates fell most sharply during the first five to six years following diagnosis, indicating that the relative risk of dying from ovarian cancer was highest during the initial years following diagnosis. In contrast, from about nine years following diagnosis onwards, the relative survival estimates were virtually stable. This suggests that the relative risk of dying from ovarian cancer was small for those women who survived for nine years or more following their ovarian cancer diagnosis.

A question of key interest is whether or not survival has improved over the years. The data indicate that improvement is evident when the entire time period from 1982–1987 to 2000–2006 is considered. For instance, between the first and the last of the four time periods considered, 1-year relative survival increased significantly from 63% to 74%, while 5-year relative survival increased significantly from 33% to 40% (Figure 4.3 and Appendix Table D4.3). However, much of the improvement in survival occurred during the earlier of the four time periods, rather than in the most recent ones. Specifically, no significant change in the 1-

year relative survival estimates was seen between 1994–1999 and 2000–2006 (72% and 74%, respectively); likewise, there was also no significant change in the 5-year estimates between the most recent two periods (39% and 40%, respectively).



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

Source: Australian Cancer Database, AIHW.

Figure 4.3: Relative survival by period of diagnosis, ovarian cancer, 1982–1987 to 2000–2006

Note that the method used to calculate the relative survival estimates shown in this chapter does not take into account differing age structures in the population over time. Since the average age of those diagnosed with ovarian cancer has increased somewhat over the years considered (see Table 2.2), 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.

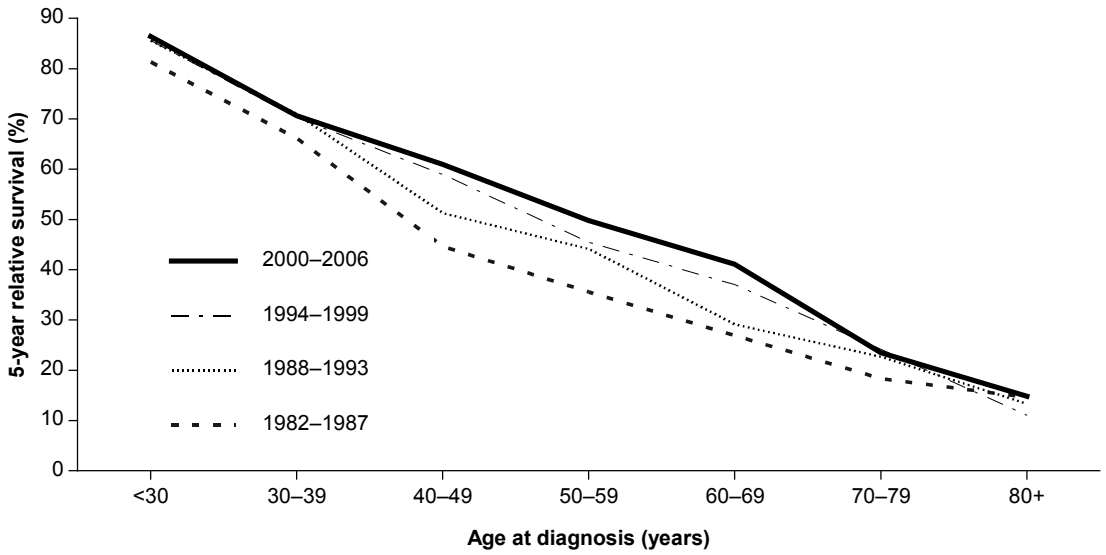
Possible reasons for the overall improvement in survival from ovarian cancer over time include the following (AIHW, CA & AACR 2008; ACN & NBCC 2004; Tracey et al. 2009):

- more accurate and effective investigation, diagnosis and staging of disease
- improvements in the speed and appropriateness of referral
- increasing subspecialisation in gynaecological oncology and the establishment of multidisciplinary teams
- advances in the effectiveness of treatment, including surgery and chemotherapy
- more widespread availability of treatment
- availability of evidence-based guidelines for the management of ovarian cancer.

Trends by age at diagnosis

Figure 4.4 illustrates 5-year relative survival curves by age at diagnosis for 1982–1987 to 2000–2006. These data indicate that the improvements in survival over time in Australia were centred on a subset of women—those in the middle age groups. While there was some improvement over the four time periods in the relative survival estimates for the two youngest age groups (i.e. from 81% to 86% for those under 30 years of age and 66% to 71%

for those 30 to 39 years at diagnosis), the difference was not statistically significant. Likewise, for the oldest age group, namely those aged 80 years and over, there was no statistically significant change between any of the four time periods, with estimates of 15% in both 1982–1987 and 2000–2006. In contrast, there was a significant increase in the 5-year relative survival estimates for women in the 'middle' age groups—women aged 40 to 79 years—over the periods considered. That is, the 5-year relative survival for those aged 40 to 49 years increased significantly from 45% in 1982–1987 to 61% in 2000–2006. The corresponding improvement for those aged 50 to 59 years was 36% to 50%, and for those aged 60 to 69 years, 27% to 41%. Meanwhile, although statistically significant, the improvement was not as marked for those aged 70 to 79 years, with the relative survival estimates increasing from 18% to 24% over the four time periods.



Note: The data for this figure are shown in Appendix Table D4.4.

Source: Australian Cancer Database, AIHW.

Figure 4.4: Five-year relative survival by age at diagnosis, ovarian cancer, 1982–1987 to 2000–2006

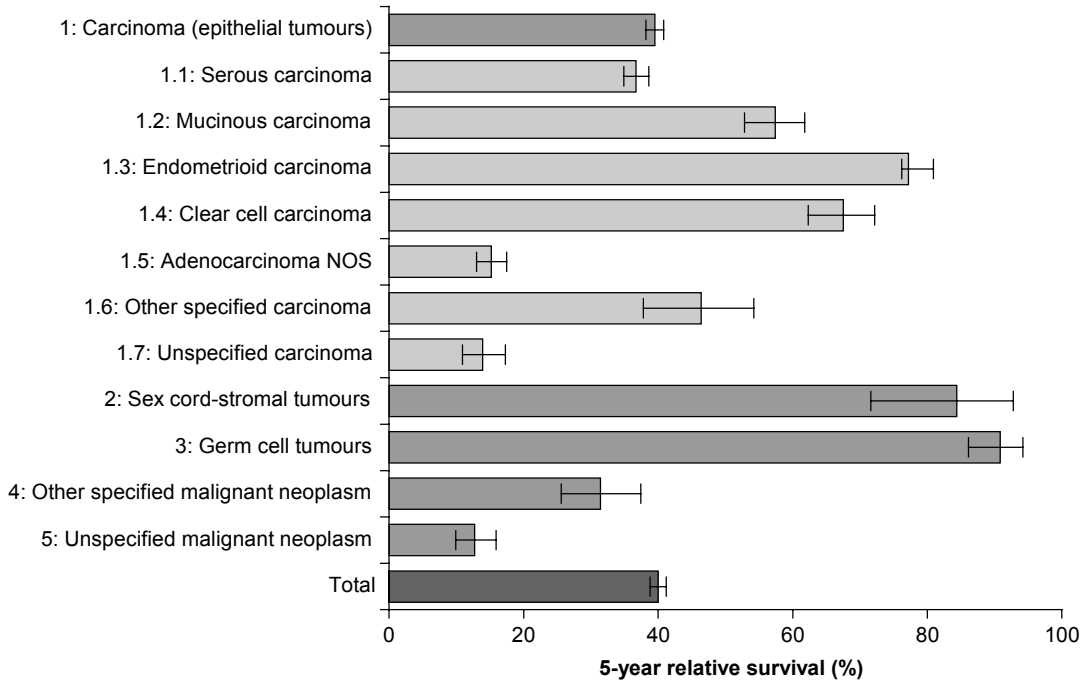
Survival by type of ovarian cancer

Five-year relative survival by histology types are shown for the period 2000 to 2006 in Figure 4.5 and Table 4.2. These data illustrate that ovarian cancer is a heterogeneous disease with widely varying clinical outcomes, depending on the type of ovarian cancer.

Women diagnosed with *germ cell tumours* (group 3) had the highest 5-year relative survival (91%), followed by those diagnosed with *sex cord-stromal tumours* (group 2) (84%). As shown in Chapter 2, younger women are more likely than older women to be diagnosed with these two types of ovarian cancers, especially *germ cell tumours*. (Also see Appendix Table D4.5 where 5-year relative survival is shown by age group for each of the histology groups for 1982 to 2006).

Women diagnosed with an *unspecified malignant neoplasm* (group 5) had the lowest 5-year relative survival (13%), with this estimate significantly lower than those calculated for each of the other major histology groupings. It has been suggested that women diagnosed with

this 'type' of ovarian cancer have poor survival prospects because they usually present with advanced disease or other factors that make them unsuitable for surgical treatment (Cancer Council Victoria 2007).



Notes

1. All cases were coded as primary site, invasive ovarian cancers.
2. Appendix Table D2.5 provides a list of the histology types included in each group.
3. The data for this figure are shown in Table 4.2.

Source: Australian Cancer Database, AIHW.

Figure 4.5: Five-year relative survival by type of ovarian cancer, 2000–2006

The 5-year relative survival for women diagnosed with *carcinoma* (group 1) was estimated to be 40%. However, this overall estimate masks the variation in relative survival estimates for the different subtypes of carcinomas, with the 5-year relative survival ranging from 77% for those diagnosed with *endometrioid carcinoma* (group 1.3) to 14% for those diagnosed with *unspecified carcinoma* (group 1.7). Five-year relative survival was also very low (15%) for those diagnosed with *adenocarcinoma not otherwise specified* (group 1.5).

A significant improvement in 5-year relative survival between 1982–1987 and 2000–2006 was found for some of the histology groups but not others (Table 4.2). Furthermore, the timing of the improvement varied. For women diagnosed with *sex cord-stromal tumours* (group 2), the 5-year relative survival estimates increased significantly from 62% in 1982–1987 to 84% in 1988–1993, with the estimates for the following two periods remaining in the low 80s. There was a significant increase over the four time periods in survival for those diagnosed with *germ cell tumours* (group 3) (80% to 91%, respectively), with the majority of change occurring between 1982–1987 and 1988–1993. Although less marked, there was also a significant increase in survival for those diagnosed with *carcinoma* (group 1), with these estimates increasing from 32% in the first period to 40% in the last period.

Table 4.2: Incidence and 5-year relative survival by type of ovarian cancer, 1982–1987 to 2000–2006

Type of ovarian cancer[(a)]	1982–1987			1988–1993			1994–1999			2000–2006		
	No. of cases	RS (%)	95% CI	No. of cases	RS (%)	95% CI	No. of cases	RS (%)	95% CI	No. of cases	RS (%)	95% CI
1: Carcinoma (epithelial tumours)	4,537	31.6	30.2–33.0	5,305	35.2	33.8–36.5	5,733	38.1	36.8–39.4	7,108	39.5	38.2–40.8
1.1: Serous carcinoma	1,533	30.4	28.0–32.8	2,195	32.7	30.7–34.8	2,728	35.6	33.7–37.4	3,555	36.7	34.9–38.6
1.2: Mucinous carcinoma	597	52.2	47.9–56.4	673	53.3	49.2–57.2	627	60.2	56.0–64.1	586	57.4	52.8–61.8
1.3: Endometrioid carcinoma	522	46.4	41.8–50.9	559	59.2	54.7–63.5	557	70.1	65.8–74.1	679	77.2	73.2–80.9
1.4: Clear cell carcinoma	217	44.8	37.9–51.6	307	51.4	45.4–57.2	329	62.2	56.3–67.5	437	67.5	62.3–72.2
1.5: Adenocarcinoma NOS	1,306	17.4	15.3–19.6	1,156	17.6	15.4–19.9	1,067	13.1	11.2–15.3	1,167	15.2	13.0–17.5
1.6: Other specified carcinoma	45	31.0	17.9–45.6	68	26.4	16.4–37.8	64	45.9	32.6–58.5	178	46.4	37.8–54.6
1.7: Unspecified carcinoma	317	24.2	19.6–29.2	347	20.4	16.4–24.8	361	16.7	13.1–20.7	506	13.9	10.9–17.3
2: Sex cord-stromal tumours	98	61.5	50.5–71.1	88	83.5	72.7–91.3	87	82.0	71.0–90.0	77	84.4	71.6–92.8
3: Germ cell tumours	155	79.6	72.2–85.3	188	89.1	83.6–93.0	180	87.4	81.4–91.6	270	90.8	86.1–94.2
4: Other specified malignant neoplasm	119	19.2	12.8–26.8	190	27.2	20.6–34.2	203	26.4	20.3–33.0	293	31.4	25.6–37.4
5: Unspecified malignant neoplasm	205	19.8	14.8–25.4	193	14.5	10.3–19.5	262	10.5	7.6–14.0	467	12.7	9.9–15.9
Total	**5,114**	**33.0**	**31.6–34.3**	**5,964**	**36.8**	**35.5–38.1**	**6,465**	**38.8**	**37.5–40.0**	**8,215**	**40.0**	**38.8–41.2**

(a) All cases were coded as primary site, invasive ovarian cancers. Appendix Table D2.5 provides a list of the histology types included in each group.

Note: The number of cases equals the total number of diagnosed cases in the period considered.

Source: Australian Cancer Database, AIHW.

However, improvements over time within this group of carcinomas did not apply evenly. The most sizeable change was found for those diagnosed with *endometrioid carcinoma* (group 1.3), with 5-year relative survival estimates increasing from 46% in 1982–1987 to 77% in 2000–2006. The increase in the 5-year relative survival estimates for *clear cell carcinoma* (group 1.4) was also relatively large, with the estimates increasing from 45% to 68% between the first and the last of the four periods. In contrast, there was no significant improvement in survival for those diagnosed with some of the other types of carcinomas, such as *mucinous carcinoma* (group 1.2) and *adenocarcinoma not otherwise specified* (group 1.5).

Survival by stage at diagnosis

Existing research has consistently shown that stage at diagnosis of ovarian cancer is closely related to survival prospects, with advanced stage associated with poorer survival (e.g. Averette et al. 1995; Chan et al. 2006; Heintz et al. 2006; Laurvick et al. 2003; South Australia Cancer Registry 2000; Yang et al. 2008). Since no national data are available on stage at diagnosis in Australia, national relative survival estimates for ovarian cancer by stage at diagnosis cannot be calculated. However, to illustrate the trends, data from NSW and from the USA in which ovarian cancer was defined in the same way as in this report (i.e. ICD-10 code of C56) are shown. For information on the various staging systems used to classify ovarian cancers, see Appendix E.

As noted in Chapter 2, data on stage at diagnosis for ovarian cancer, based on the SEER summary stage system, are available for NSW (Tracey et al. 2009). According to those data, 5-year relative survival estimates for tumours that were diagnosed at the localised stage between 1980 and 2003 was 78% (Table 4.3). In contrast, the corresponding estimates for regional and distant tumours were significantly lower, at 34% and 18% respectively.

Table 4.3: Five-year relative survival by stage at diagnosis, ovarian cancer, New South Wales, 1980–2003

Stage at diagnosis[(a)]	Number of cases[(b)]	Per cent of staged cases	Relative survival (%)[(c)]	95% confidence interval
Localised	1,763	25.4	78.0	76.0–80.0
Regional	1,522	21.9	34.3	31.8–36.8
Distant	3,649	52.6	17.5	16.1–18.9
Unknown	n.a.	. .	n.a.	n.a.
Total	**6,934**	**100.0**	**36.7**	**35.7–37.7**

(a) Based on the SEER summary stage system. 'Localised' tumours were confined to one or both ovaries, 'regional' tumours had spread to surrounding tissue or nearby lymph nodes and 'distant' tumours had spread to distant organs or other parts of the body and had begun to grow at the new location (see Appendix E).

(b) Includes ovarian cancers coded in ICD-10 as C56; borderline ovarian tumours are not included.

(c) The cause-specific method of calculating survival was used.

Source: Tracey et al. 2009.

Data for 1999 to 2005 from the USA are shown in Table 4.4. As was seen 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 94% for those diagnosed with localised tumours and an estimate of 28% for those diagnosed with distant tumours (Table 4.4). In addition, the USA data provide an estimate of survival for those with an unknown tumour stage at diagnosis; according to these data, the 5-year relative survival for this group was 27%, which is similar to the estimate for those who were diagnosed with a distant tumour.

Table 4.4: Five-year relative survival by stage at diagnosis and age group, ovarian cancer, United States of America, 1999–2005

Stage at diagnosis[a]	<65 years		65+ years		All ages	
	% of cases[b]	RS (%)[c]	% of cases[b]	RS (%)[c]	% of cases[b]	RS (%)[c]
Localised	21	93.9	7	93.5	15	93.8
Regional	20	79.7	13	56.7	17	72.8
Distant	55	34.9	69	20.0	62	28.2
Unknown	4	48.9	10	13.0	7	27.3
Total	**100**	**56.5**	**100**	**29.8**	**100**	**45.9**

(a) Based on the SEER summary stage system. 'Localised' tumours were confined to one or both ovaries, 'regional' tumours had spread to surrounding tissue or nearby lymph nodes and 'distant' tumours had spread to distant organs or other parts of the body and had begun to grow at the new location (see Appendix E).

(b) The numbers of cases were as follows: 16,000 cases of women less than 65 years old; 13,168 cases of women 65 years and over; and a total of 29,168 cases.

(c) The cohort method of calculating relative survival was used.

Note: Data are from the SEER 17 areas which cover approximately a quarter of the USA (see Table 21.7 in Horner et al. 2009).

Source: Horner et al. 2009.

The USA data also provide information on differences by age group in survival by stage at diagnosis. Overall, the survival prospects of women aged less than 65 years were much better than for older women (those aged 65 years and over), with 5-year relative survival estimates of 57% and 30%, respectively. This differential by age applied for all of the stages at diagnosis, with one exception. This exception pertains to women diagnosed with localised tumour—for women diagnosed with these 'early-stage' tumours, regardless of the age group, 5-year relative survival was 94%. In contrast, for example, for distant tumours, 5-year relative survival was 35% for those aged less than 65 years at diagnosis, while it was 20% for those aged 65 years and over at diagnosis. The differential by age was particularly marked for those diagnosed with an unknown stage at diagnosis—the 5-year relative survival estimate for those aged less than 65 years was 49% compared with 13% for those aged 65 years and over.

Differences by Aboriginal and Torres Strait Islander status

Relative survival estimates cannot be calculated for Indigenous women 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 women is shorter than that of non-Indigenous women (ABS 2004, 2009e). At the same time, the mean age at which women were diagnosed with ovarian cancer differs by Indigenous status, with the Indigenous women being younger at diagnosis (mean of 53 years) than the non-Indigenous women (63 years) (Table 4.5). It is not known how these underlying differences may have affected the crude survival estimates presented.

Given the small number of ovarian cancer cases reported among Indigenous women, a 10-year time period from 1997 to 2006 is considered in these analyses. Despite this, the

number of cases of ovarian cancer among Indigenous women was still relatively small (68 cases) and this should be considered when making use of these data.

The crude 5-year survival estimate for ovarian cancer for Indigenous women was somewhat lower than for non-Indigenous women—35% and 38%, respectively—in the four jurisdictions; however, this difference was not statistically significant.

Table 4.5: Five-year crude survival by Indigenous status, ovarian cancer, Queensland, Western Australia, South Australia & Northern Territory, 1997–2006

	Indigenous	Non-Indigenous
Number of cases[(a)]	68	3,891
Crude survival (%)	35.1	38.1
95% confidence interval	23.1–47.4	36.5–39.8
Mean age at diagnosis	53.2	63.2

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

Source: Australian Cancer Database, AIHW.

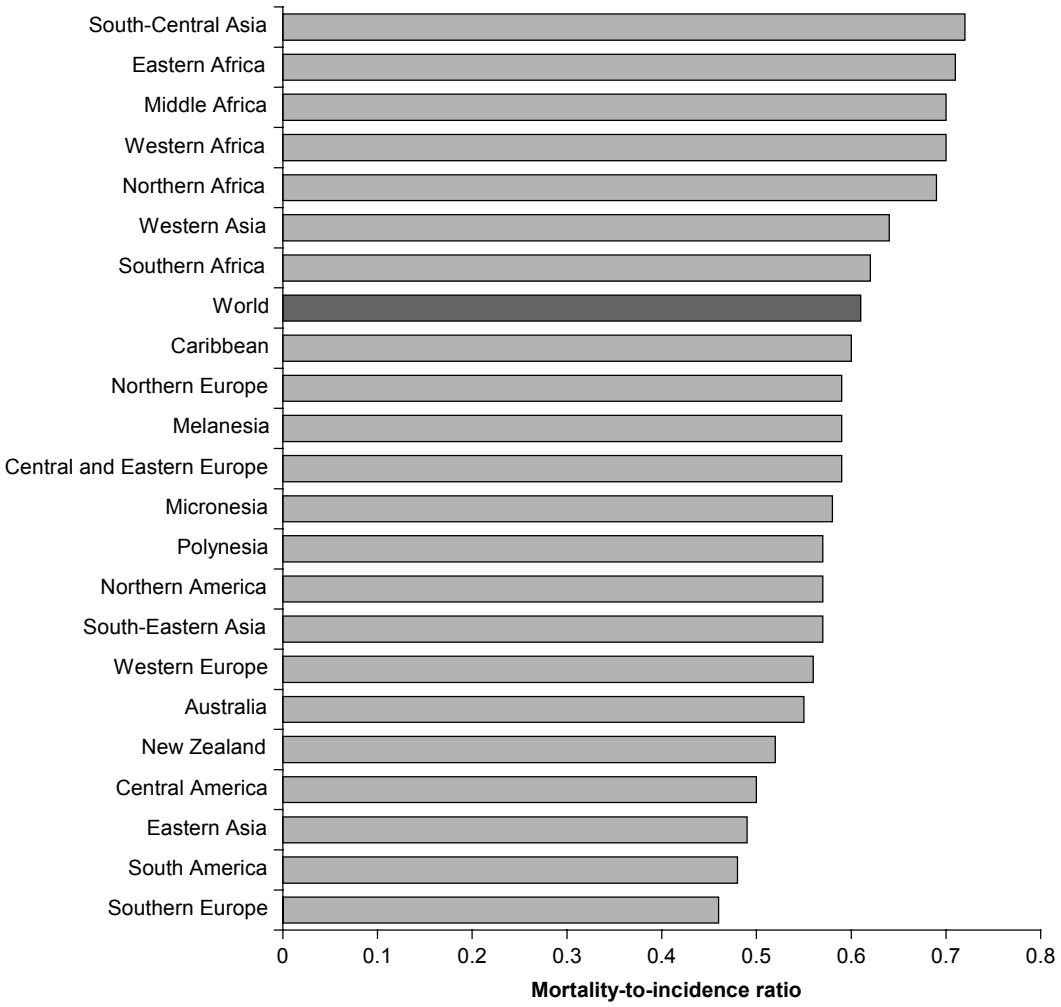
International comparisons

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: the years to which the relative survival estimates apply; the length of the follow-up period considered (e.g. 1-, 5-, 10-year and so forth); and the 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 0.60 for ovarian cancer would indicate that there were 60 deaths for every 100 new cases of ovarian cancer 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 (i.e. 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 ovarian cancer ratios were calculated using data from GLOBOCAN (Ferlay et al. 2004). The fact that the GLOBOCAN data were estimates for 2002 should be taken into account when interpreting the results shown in Figure 4.6. Note also that these data pertain to 'ovarian and related cancers' (i.e. the ICD-10 codes of C56 and C57.0–C57.4) rather than just 'ovarian cancer' (ICD-10 code of C56).

The GLOBOCAN data suggest that the MIRs for ovarian and related cancers varied markedly between different countries and regions, with survival from ovarian and related cancers poorest among women in South-Central Asia (MIR of 0.72), and best for women in Southern Europe (MIR of 0.46). The MIR for women in Australia was relatively low (0.55). This suggests that, in 2002, Australian women who were diagnosed with ovarian and related cancers had better survival prospects than their counterparts in many other countries and regions.



Notes

1. The ratios are based on estimated incidence and mortality data for 2002; those estimates were based on data from approximately 3 to 5 years earlier.
2. The mortality-to-incidence ratio equals the age-standardised mortality rate divided by the age-standardised incidence rate.
3. The data pertain to cancers coded in ICD-10 as C56 and C57.0–C57.4 (see Appendix B for further details).
4. The data for this figure are shown in Appendix Table D4.6.

Source: Ferlay et al. 2004.

Figure 4.6: International comparison of mortality-to-incidence ratios for ovarian and related cancers, 2002

5 Prevalence of ovarian cancer

Prevalence, or complete prevalence as it is sometimes called, is the number of people alive at a specified point in time who have ever been diagnosed with ovarian cancer regardless of how long ago. These people may or may not be undergoing treatment or be considered 'cured'. In contrast, 'limited-duration prevalence' provides information on the number of people alive who were diagnosed with ovarian cancer within a specified time period, such as the previous 1 or 5 years. One-year prevalence data, for example, would indicate the number of people alive on 31 December of a particular year who were diagnosed with ovarian cancer during that same year, while 5-year prevalence data would indicate the number of people alive on 31 December of a specified year who were diagnosed with ovarian cancer within the previous five years.

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 (i.e. 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 ovarian cancer in our society both at the personal/familial level and societal level, particularly in terms of health care services. While the exact nature of health care needs can vary widely from one person to the next over the years following diagnosis, overall, different types and intensities of health care services may be required by those who were diagnosed with ovarian cancer recently (e.g. in the past year) compared with those diagnosed many years previously.

In Australia, as elsewhere, complete prevalence data are not available through cancer registry data collections since these collections do not hold data for a long-enough period. The only source of complete prevalence data in Australia is surveys, such as the National Health Survey, where prevalence estimates are based on self-reported information of a sample of Australians (ABS 2009c). However, since the National Health Survey excludes people in hospitals, hospices, and nursing and convalescent homes, those data are incomplete. An additional deficiency of those data may be the erroneous self reporting of benign or borderline ovarian tumours as invasive ovarian cancer.

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. Since national incidence data on ovarian cancer are available from 1982 onwards, limited-duration prevalence data can be presented for a maximum of 25 years (from 1 January 1982 to 31 December 2006). In addition, information is provided in this chapter on differences in prevalence by age, geographical area 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 (e.g. 5, 10, 25 years) and the analytical methods employed to calculate prevalence.

Unlike the incidence data, which pertain to the number of *cases* of ovarian cancer, the prevalence data presented in this report pertain to the number of *females* who have been diagnosed with ovarian cancer and are still alive. However, as mentioned in Chapter 2, since it is rare that any one woman would be diagnosed with more than one primary ovarian cancer during a 1-year period, the number of new *cases* of ovarian cancer in a particular year would be very similar to the number of *females* diagnosed with ovarian cancer in that year.

Prevalence in 2006

Of all females alive at the end of 2006, over 8,200 had been diagnosed with ovarian cancer in the previous 25 years (Table 5.1). This equates to 8 out of 10,000 females. At the same time, the 20-year prevalence for ovarian cancer was 7,500 women, the 10-year prevalence was 5,179 women and the 1-year prevalence was 1,016 women. The 1-year prevalence compares with an *incidence* of 1,226 cases for 2006 (Table 2.1). Note that those women who were both diagnosed with ovarian cancer and died in 2006 (approximately 210 women) may or may not have died as a result of ovarian cancer.

Table 5.1: Limited-duration prevalence of ovarian cancer, end of 2006

Time period	Number[(a)]	Per 10,000 population[(b)]
1-year prevalence	1,016	1.0
5-year prevalence	3,445	3.3
10-year prevalence	5,179	4.9
15-year prevalence	6,506	6.2
20-year prevalence	7,500	7.1
25-year prevalence	8,216	7.8

(a) Refers to the number of females, not cases.

(b) Based on the number of females in the Australian population at 31 December 2006.

Source: Australian Cancer Database, AIHW.

In order to compare prevalence across commonly diagnosed cancers in females, Table 5.2 presents data from the AIHW's 2008 publication on cancer survival and prevalence (AIHW, CA & AACR 2008). Those data pertain to the prevalence at the end of 2004 and thus 23 years of cancer incidence data were available.

Table 5.2: Limited-duration prevalence of the 10 most commonly diagnosed cancers[(a)], females, end of 2004

Cancer type (ICD-10 codes)	1-year prevalence	5-year prevalence	10-year prevalence	23-year prevalence
Breast (C50)	11,764	53,051	89,777	129,438
Bowel (C18–C20)	4,969	18,940	29,929	43,286
Melanoma of skin (C43)	4,151	18,697	33,303	56,235
Lung (C33–C34)	1,978	4,413	5,657	6,817
Uterus, body (C54)	1,630	6,665	11,244	17,720
Non-Hodgkin lymphoma (C82–C85, C96)	1,423	5,632	8,837	11,845
Unknown primary site (C26, C39, C76, C80)	632	1,511	1,943	2,690
Ovary (C56)	1,024	3,288	4,997	7,637
Thyroid (C73)	1,092	4,502	7,529	11,248
Leukaemia (C91–C95)	777	3,007	4,663	6,513
All cancers[(b)]	**36,331**	**141,553**	**230,245**	**338,692**

(a) Determined by the most commonly diagnosed cancers in 2004 and ordered accordingly; excludes non-melanoma skin cancer (C44).

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

Note: Data refer to the number of females, not cases.

Source: AIHW, CA & AACR 2008.

When 23-year prevalence is considered, ovarian cancer was the seventh most prevalent type of cancer in women (excluding non-melanoma skin cancer) among the ten most commonly reported cancers. It was also the second most prevalent type of gynaecological cancer (after 'uterus, body' cancer). Of all females alive at the end of 2004, over 7,600 females had been diagnosed with ovarian cancer in the previous 23 years. In comparison, the 23-year prevalence for breast cancer was 129,438 women and for 'uterus, body' cancer, it was 17,720 women. For each of the other three prevalence durations considered, ovarian cancer was the eighth most prevalent type of cancer among women (excluding non-melanoma skin cancer).

Differences by age

Table 5.3 presents 25-year prevalence of ovarian cancer by age group. At the end of 2006, there were 2,051 women in the 60 to 69 year age group still alive who had been diagnosed with ovarian cancer in the previous 25 years, while there were a further 1,841 women aged 50 to 59 years who had been diagnosed with this type of cancer.

When the number of females diagnosed with ovarian cancer is compared with the number in the respective age group, the data indicate that the highest proportion exists among those aged 70 to 79 years, with a prevalence of 26 per 10,000 females.

Table 5.3: Twenty-five-year prevalence of ovarian cancer by age group, end of 2006

Age group (years)	Number[(a)]	Per 10,000 population[(b)]
0–19	56	0.2
20–29	172	1.2
30–39	474	3.1
40–49	937	6.1
50–59	1,841	13.9
60–69	2,051	22.4
70–79	1,634	25.9
80+	1,051	22.6
Total	**8,216**	**7.8**

(a) Refers to the number of females, not cases.

(b) Based on the number of females in the Australian population at 31 December 2006.

Source: Australian Cancer Database, AIHW.

Differences across groups

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

Differences by geographical area

Table 5.4 presents prevalence data for the end of 2006 according to the state and territory in which the woman lived at the time of diagnosis. Since it is unknown whether the women lived in the same state and territory in 2006 as they did at the time of diagnosis, these data should be used with caution. During 1982 to 2006, just over 2,700 women had been diagnosed with ovarian cancer in New South Wales and were still alive at the end of 2006.

This compares with 25-year prevalence for ovarian cancer of 2,127 women for Victoria and 1,638 women for Queensland.

Table 5.4: Limited-duration prevalence of ovarian cancer by state and territory of diagnosis, end of 2006

State or territory	1-year prevalence	5-year prevalence	10-year prevalence	25-year prevalence
New South Wales	315	1,154	1,731	2,707
Victoria	276	881	1,330	2,127
Queensland	196	636	1,009	1,638
Western Australia	114	382	507	759
South Australia	69	238	366	603
Tasmania	26	69	119	203
Australian Capital Territory	16	59	85	132
Northern Territory	4	26	32	47
Total	**1,016**	**3,445**	**5,179**	**8,216**

Note: Data refer to the number of females, not cases.

Source: Australian Cancer Database, AIHW.

Differences by country of birth

The prevalence of ovarian cancer according to country or region of birth is shown in Table 5.5. The 25-year prevalence, as a proportion of the respective female population, was highest among women born in the European regions (13 per 10,000 females for both North-West Europe, and Southern and Eastern Europe). This compares with a figure of 6 per 10,000 for those born in Australia. The data also indicate that there was a relatively low proportion of females alive who had been diagnosed with ovarian cancer in the 25-year period among women born in North-East Asia and Sub-Sahara Africa (both 5 per 10,000 females).

Table 5.5: Limited-duration prevalence of ovarian cancer by country/region of birth, end of 2006

	1-year		5-year		10-year		25-year	
Country/region of birth[a]	**Number[b]**	**Per 10,000 population[c]**	**Number[b]**	**Per 10,000 population[c]**	**Number[b]**	**Per 10,000 population[c]**	**Number[b]**	**Per 10,000 population[c]**
North-West Europe	99	1.3	418	5.6	624	8.4	998	13.4
Southern and Eastern Europe	69	1.6	225	5.3	345	8.1	566	13.4
Americas	18	1.7	50	4.7	68	6.3	102	9.5
North Africa and the Middle East	14	1.0	52	3.7	67	4.8	98	7.1
Oceania and Antarctica, excl. Australia	24	0.9	89	3.2	128	4.5	194	6.9
South-East Asia	38	1.1	114	3.2	170	4.7	240	6.7
Australia	603	0.8	2,102	2.7	3,155	4.0	5,029	6.4
Southern and Central Asia	18	1.3	43	3.0	65	4.5	91	6.3
Sub-Saharan Africa	6	0.5	32	2.9	47	4.3	57	5.2
North-East Asia	21	0.8	61	2.4	96	3.7	128	5.0
Not stated	106	. .	259	. .	414	. .	713	. .
Total[b]	**1,016**	**1.0**	**3,445**	**3.3**	**5,179**	**4.9**	**8,216**	**7.8**

(a) Classified according to the Standard Australian Classification of Countries, second edition (see Appendix A). Countries/regions of birth are ordered in descending order according to the 25-year prevalence proportions.

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

(c) Based on the number of females in the Australian population born in each country/region as at 30 June 2006, except for the 'Total' which is based on the number of females in the Australian population at 31 December 2006.

Source: Australian Cancer Database, AIHW.

6 Burden of disease due to ovarian cancer

The effect of ovarian cancer on the health of the population can be summarised by using a number 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 diseases
- comparing the effect of a particular disease 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 and
- non-fatal health outcomes—which is 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 can be found in the AIHW report on the burden of disease and injury (Begg et al. 2007a).

In the report by Begg and associates, ovarian cancer was defined to include the ICD-10 codes of 'C56 and C57.0–C57.4', which we refer to as 'ovarian and related cancers' in this report. In this chapter, the burden of disease in Australia due to ovarian and related cancers is presented along with comparisons with other diseases that are also major contributors to the overall burden. The most recent burden of disease estimates for Australia are for 2003. These estimates, and the method by which they were derived, are detailed in an AIHW report by Begg and associates (2007a,b).

Burden of disease in 2003

The total burden of disease for females in Australia in 2003 was estimated to be more than 1.2 million DALYs and the burden due to cancer was 235,034 DALYs, which is 19% of the total burden. Table 6.1 presents the leading causes of disease burden for females, along with the five leading causes of cancer burden. Ovarian and related cancers ranked 25th in terms of the leading causes of burden of disease for women, and accounted for 1% of all female burden of disease. In terms of leading causes of burden due to cancer, ovarian and related cancers ranked fourth, with nearly 12,000 DALYs attributed to this disease. Ovarian and related cancers accounted for 5% of the female burden of disease due to all cancers and was the leading cause of burden from all gynaecological cancers.

Table 6.1: Leading causes of burden of disease, including leading cancers, females, 2003

Cause	ICD-10 codes	Disability-adjusted life years (DALYs)	Per cent of total DALYs	Rank
Anxiety and depression	F30, 32–39, 40.0, 40.1, 41.0–41.2, 42, 43.1, 93.0	126,464	10.0	1
Ischaemic heart disease	I20–25	112,390	8.9	2
Stroke	G45; I60–69	65,166	5.1	3
Type 2 diabetes	E11–13	61,763	4.9	4
Dementia	F00–01, 02.0–02.1, 02.3, 03; G30, 31.0–31.1, 31.8–31.9	60,747	4.8	5
Cancer	*C00–96*	*235,034*	*18.5*	. .
Breast cancer	C50	60,520	4.8	6
Lung cancer	C33–34	33,876	2.7	8
Bowel cancer	C18–21	28,962	2.3	10
Ovarian and related cancers	C56, 57.0–57.4	11,994	0.9	25
Pancreas cancer	C25	11,246	0.9	27
Other cancers	All other 'C' codes	88,436	7.0	. .
Chronic obstructive pulmonary disease	I27.0, 27.8–27.9; J40–44	37,550	3.0	7
Asthma	J45–46	33,828	2.7	9
Total for all causes		**1,268,156**	**100.0**	. .

Source: Begg et al. 2007a.

Table 6.2 and Figure 6.1 show the extent of the cancer burden associated with the leading causes of cancer burden for females which were due to both premature death (YLL) and disease, disability or injury (YLD). For cancer, causes of years of healthy life lost to disability include side effects during and after treatment (e.g. during and after radiotherapy or chemotherapy) and the psychosocial affects of having gone through treatment.

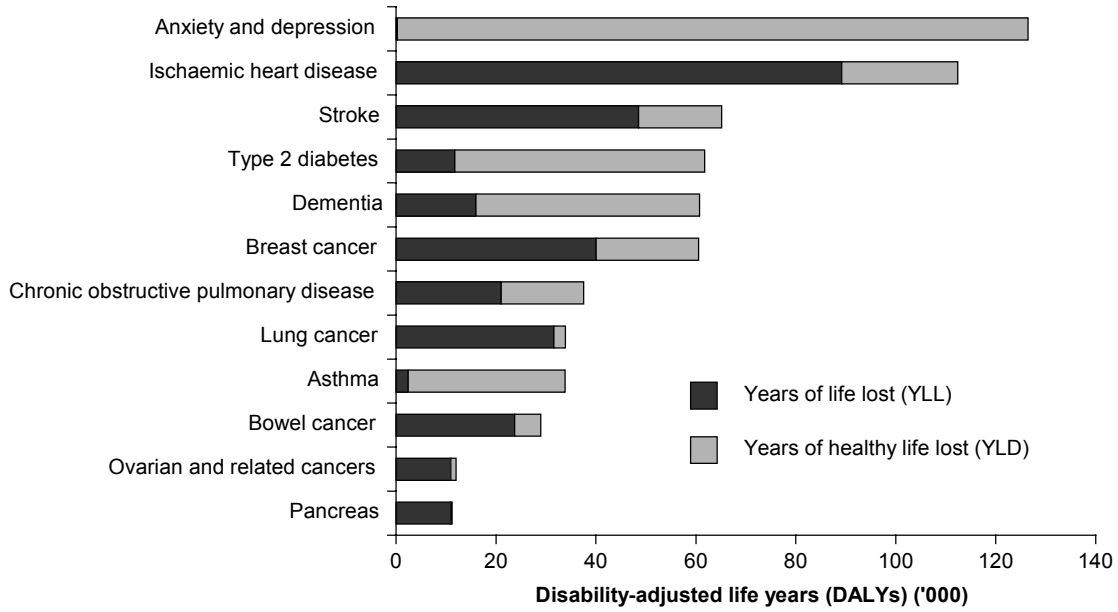
Due to the relatively poor prognosis from many cancers compared with the majority of other diseases, most cancers contribute more years of life lost (YLL) than years of healthy life lost to disability (YLD). This is the case for ovarian and related cancers. In 2003, this disease resulted in 10,946 years of life lost due to premature mortality, which equates to 91% of the total estimated DALYs for this disease. This compares with an average of 82% for all cancers combined.

While ovarian and related cancers ranked 25th in terms of the causes of burden of disease for females when DALYs were considered, it ranked 11th in terms of the leading causes of mortality burden, and 75th in terms of causes of disability burden. Considering just the burden due to cancers, ovarian and related cancers accounted for 6% of all years of life lost from cancer and 2% of years lost due to disability.

Table 6.2: Leading causes of burden of disease, including leading cancers, by fatal (YLL) and non-fatal (YLD) components, females, 2003

	Fatal component			Non-fatal component			Total		
Cause	**Years of life lost (YLL)**	**Per cent of total YLL**	**Rank**	**Years of healthy life lost (YLD)**	**Per cent of total YLD**	**Rank**	**Disability-adjusted life years (DALYs)**	**% of DALYs due to YLL**	**% of DALYs due to YLD**
Anxiety and depression	221	0.0	98	126,244	18.1	1	126,464	0.2	99.8
Ischaemic heart disease	89,152	15.7	1	23,238	3.3	5	112,390	79.3	20.7
Stroke	48,548	8.5	2	16,619	2.4	9	65,166	74.5	25.5
Type 2 diabetes	11,751	2.1	9	50,012	7.2	2	61,763	19.0	81.0
Dementia	16,009	2.8	7	44,738	6.4	3	60,747	26.4	73.6
Cancer	*191,794*	*33.7*	. .	*43,240*	*6.2*	. .	*235,034*	81.6	18.4
Breast cancer	40,080	7.0	3	20,440	2.9	7	60,520	66.2	33.8
Lung cancer	31,551	5.5	4	2,325	0.3	51	33,876	93.1	6.9
Bowel cancer	23,735	4.2	5	5,227	0.7	31	28,962	82.0	18.0
Ovarian and related cancers	10,946	1.9	11	1,048	0.1	75	11,994	91.3	8.7
Pancreas cancer	10,984	1.9	10	262	0.0	120	11,246	97.7	2.3
Other cancers	74,498	13.1	. .	13,938	2.0	. .	88,436	84.2	15.8
Chronic obstructive pulmonary disease	21,025	3.7	6	16,525	2.4	10	37,550	56.0	44.0
Asthma	2,423	0.4	44	31,405	4.5	4	33,828	7.2	92.8
Total for all causes	**569,181**	**100.0**	**. .**	**698,975**	**100.0**	**. .**	**1,268,156**	**44.9**	**55.1**

Source: Begg et al. 2007a.



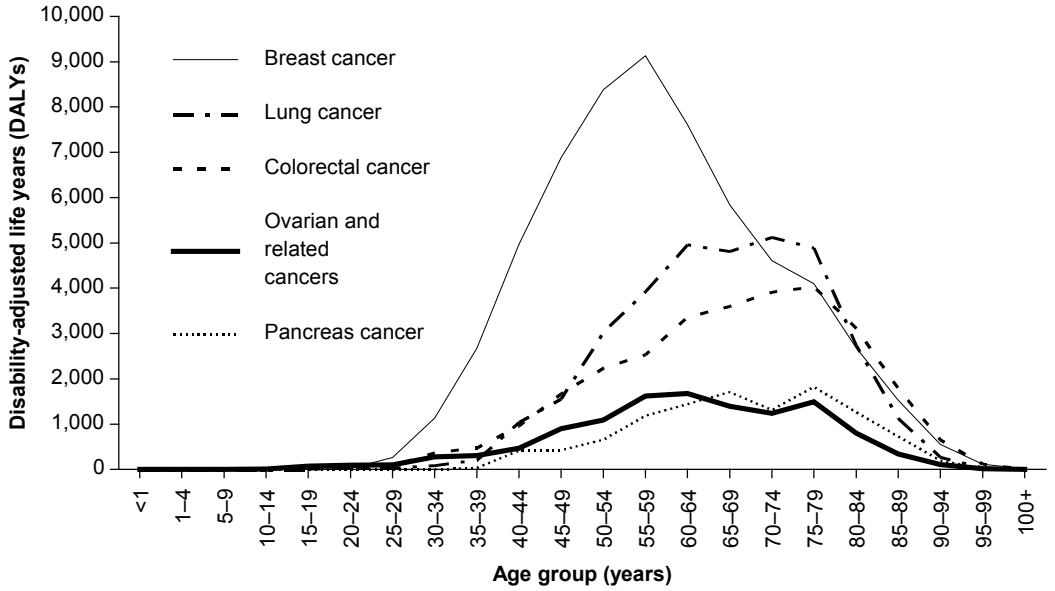
Note: The data for this figure are shown in Table 6.2.

Source: Begg et al. 2007a.

Figure 6.1: Leading causes of burden of disease, including leading cancers, by fatal and non-fatal components, females, 2003

Differences by age

The leading causes of cancer burden for women by age are shown in Figure 6.2. In 2003, the distribution of the burden of ovarian and related cancers was flatter than that of a number of the other types of cancer shown, such as breast cancer and lung cancer.



Note: The data for this figure are shown in Appendix Table D6.1.

Source: Begg et al. 2007b.

Figure 6.2: Leading cancer causes of burden of disease by age group, females, 2003

The proportion of all DALYs from cancer that were due to ovarian and related cancers varied according to the age group considered, with the highest proportion found for those aged 15 to 19 years and those aged 20 to 24 years (9% and 8% of DALYs from cancer were due to ovarian and related cancers, respectively) (Appendix Table D6.1).

Trends and projections

Table 6.3 presents information on the burden of disease from ovarian and related cancers for 1993 and 2003, as well as the projected burden for 2013 and 2023. In 1993, the age-standardised burden of ovarian and related cancers was 123 DALYs per 100,000 females; it had decreased to 120 DALYs per 100,000 females by 2003. Projected trends to the year 2023 suggest that the age-standardised burden of ovarian and related cancers will decrease somewhat over time to 116 DALYs per 100,000 females in 2023. This indicates an overall estimated decrease of 3% from 2003 to 2023. In contrast, the total number of DALYs due to ovarian and related cancers is expected to continue to increase over the years from 11,994 in 2003 to 14,225 in 2023. This projected increase in the number of DALYs is due to a population that is both ageing and growing in size.

Table 6.3: Trends and projected burden of ovarian and related cancers, 1993 to 2023

Year	Disability adjusted life years (DALYs)	Age-standardised rate
1993	10,918	123.1
2003	11,994	119.8
2013[(a)]	13,331	119.2
2023[(a)]	14,225	115.6

(a) See Begg et al. 2007a for information on how the projections were derived.

Source: AIHW unpublished data.

7 Hospitalisations for ovarian cancer

Women with ovarian cancer may require hospitalisation as an admitted patient for a variety of reasons including diagnostic procedures and treatments (e.g. surgery, chemotherapy and the management of associated conditions). The number of such hospitalisations for ovarian cancer in any one year is related to a range of factors, including the number of women with ovarian cancer and the number of these requiring health services as an admitted patient in a hospital. Other factors include the availability of alternative health-care services, relative accessibility of hospital care, admission criteria and administrative policies.

In this chapter, details are provided on the number and characteristics of admitted patient hospitalisations that are related to the care and/or treatment of persons with invasive ovarian cancer, with the term 'hospitalisations' used interchangeably with 'separations'.

Due to the method in which the principal diagnosis for hospitalisations of cancer patients is coded (particularly in relation to same-day chemotherapy treatments), identifying those hospitalisations that are due specifically to ovarian cancer is not straightforward. As discussed in more detail in Appendix F, 'ovarian cancer–related hospitalisations' are defined in this report as those admitted patient hospitalisations in which:

- the principal diagnosis was ovarian cancer (i.e. ICD-10-AM code of C56) or
- ovarian cancer (i.e. ICD-10-AM code of C56) was recorded as an *additional* diagnosis and the principal diagnosis code related specifically to the treatment or care of a cancer patient.

The data source for this chapter was the National Hospital Morbidity Database (NHMD) which contains data on admitted patient separations. The most recent data available pertain to the 2007–08 financial year. Note that the data from the NHMD refer to hospitalisations and not individuals. Any one 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 this data source can be found in Appendix C.

Over the course of the past decade, a number of hospitals (mainly in the public sector) in New South Wales, South Australia and the Australian Capital Territory changed their admissions practices so that not all patients who receive same-day chemotherapy services are admitted to hospital. Instead, these hospitals provide chemotherapy treatment on an outpatient (i.e. non-admitted patient) basis. This change in process, which is discussed in more detail in Appendix F, must be taken into account when examining change over time in the number of hospitalisations due to ovarian cancer. Because the change applies largely to same-day hospitalisations (and not to overnight ones), separate information is provided in this chapter on the number and rate of same-day and overnight hospitalisations. Ideally, data on the number of chemotherapy services provided to ovarian cancer patients on an outpatient basis would be included in this chapter, but such data are not available.

In this chapter, rates of hospitalisations are presented per 1,000 females.

Hospitalisations in 2007–08

In the 2007–08 financial year, there were 14,277 hospitalisations due to ovarian cancer (Table 7.1); these accounted for 0.3% of all hospitalisations of women. The age-standardised rate of ovarian cancer–related hospitalisations was 1.2 (per 1,000 females).

Table 7.1: Hospitalisations for ovarian cancer and all reasons, females, 2007–08

	Number	Per cent of all hospitalisations	Age-standardised rate[(a)]	95% confidence interval
Ovarian cancer	14,277	0.3	1.2	1.20–1.24
All hospitalisations	4,149,381	100.0	370.0	369.60–370.31

(a) The age-standardised rates were standardised to the Australian population as at 30 June 2001 and are expressed per 1,000 females.

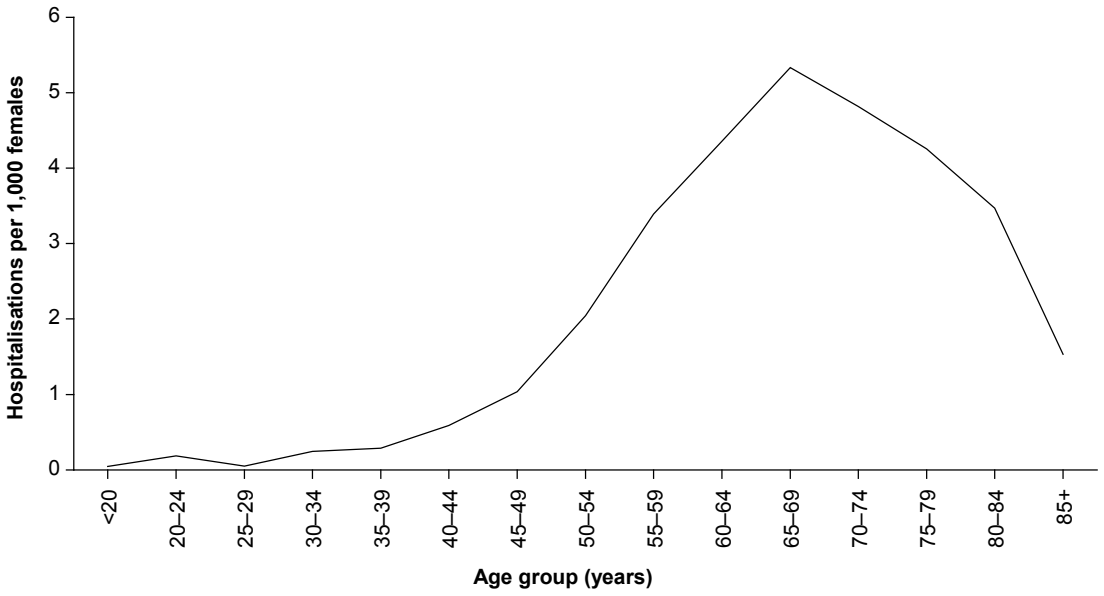
Source: National Hospital Morbidity Database, AIHW.

Of the total number of hospitalisations for ovarian cancer, nearly eight out of ten (79%) were same-day hospitalisations (11,296), while the remainder (21%) were overnight hospitalisations (2,981).

Differences by age

Of all hospitalisations for ovarian cancer-related care in 2007–08, over half (61%) were of women aged 60 years and over, 34% were for those aged 40 to 59 years, while 5% were for those under the age of 40 years (Appendix Table D7.1).

Differences in the hospitalisation rate for ovarian cancer–related care according to age are shown in Figure 7.1. The rate of hospitalisation was less than 1 (per 1,000 females) for those under the age of 45 years, but rose to a high of 5 (per 1,000 females) for those aged 65 to 69 years and for those aged 70 to 74 years.



Note: The rates shown are age-specific rates. The data for this figure are shown in Appendix Table D7.1.

Source: National Hospital Morbidity Database, AIHW.

Figure 7.1: Hospitalisations for ovarian cancer by age group, 2007–08

Average length of stay

Data on the total number of days that patients stayed in hospital are collected in the NHMD, with a length of stay of 1 day allocated to all same-day hospitalisations. By using those data, as well as information on the *number* of hospitalisations, the average length of stay (ALOS)

can be derived. In 2007–08, the average length of stay for ovarian cancer–related hospitalisations was 2.4 days (Table 7.2). When only those hospitalisations that included an overnight stay are considered, the average length of stay was 7.6 days.

Considering only those hospitalisations that involved an overnight stay, the average length of stay increased by age. For those aged less than 30 years, the average length of an overnight stay was 5.3 days, compared with 11.7 days for those aged 80 years and over.

Table 7.2: Average length of stay (ALOS) for ovarian cancer–related hospitalisations by age group, 2007–08

Age group (years)	ALOS of overnight hospitalisations (days)	Total ALOS (days)[(a)]
<30	5.3	2.3
30–39	6.8	2.3
40–49	6.6	2.3
50–59	6.3	2.0
60–69	7.3	2.1
70–79	8.3	2.6
80+	11.7	4.1
Total	**7.6**	**2.4**

(a) Includes both overnight and same-day hospitalisations (with the latter, by definition, equal to1 day per hospitalisation).

Source: National Hospital Morbidity Database, AIHW.

Trends

The total number of hospitalisations for ovarian cancer increased by 35% between 1999–00 (10,604 hospitalisations) and 2007–08 (14,277 hospitalisations) (Table 7.3). While there was an overall decrease of 6% in the number of overnight hospitalisations over the period considered, the majority of change pertained to the number of same-day hospitalisations which increased by 52%. This is despite the fact that, as noted earlier, changes occurred in hospital admission procedures during the period considered such that by 2007–08, some

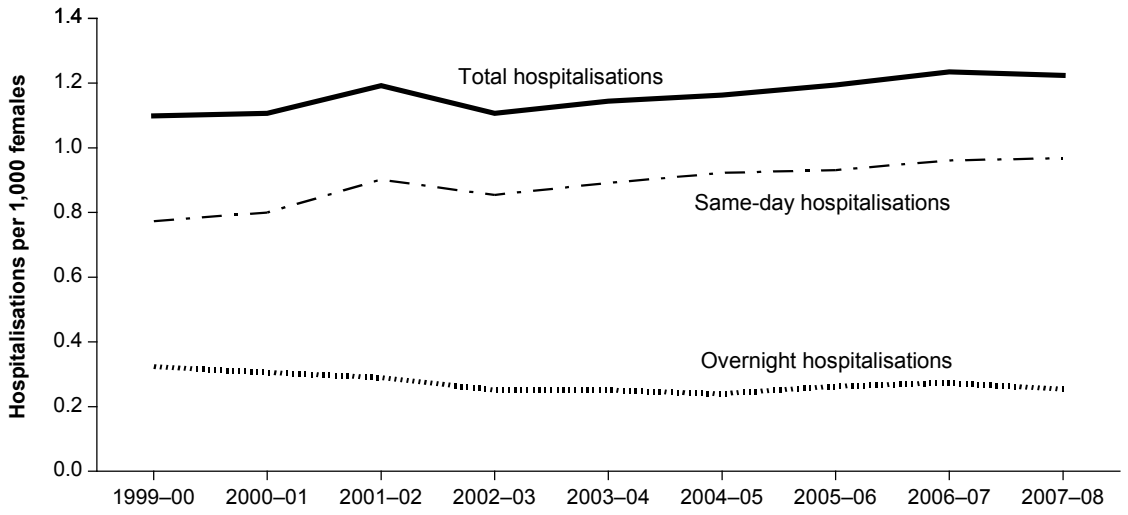
Table 7.3: Hospitalisations for ovarian cancer by same-day and overnight status, 1999–00 to 2007–08

Year	Number of same-day hospitalisations	Number of overnight hospitalisations	Total number of hospitalisations
1999–00	7,434	3,170	10,604
2000–01	7,913	3,063	10,976
2001–02	9,095	2,978	12,073
2002–03	8,794	2,646	11,440
2003–04	9,407	2,710	12,117
2004–05	9,955	2,631	12,586
2005–06	10,317	2,942	13,259
2006–07	10,940	3,132	14,072
2007–08	11,296	2,981	14,277

Source: National Hospital Morbidity Database, AIHW.

Cancer patients in three jurisdictions 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).

In Figure 7.2, trends in the age-standardised rate of ovarian cancer–related hospitalisations are shown. For all ovarian cancer–related hospitalisations, the rate increased slightly, but significantly, from 1.1 hospitalisations per 1,000 females in 1999–00 to 1.2 hospitalisations per 1,000 females in 2007–08. As shown, the overall increase over time was driven by changes in the number of same-day hospitalisations, while the rate of overnight hospitalisations decreased slightly but significantly between 1999–00 and 2007–08 (from 0.32 to 0.25 hospitalisations per 1,000 females, respectively).



Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 1,000 females.
2. The data for this figure are shown in Appendix Table D7.2.

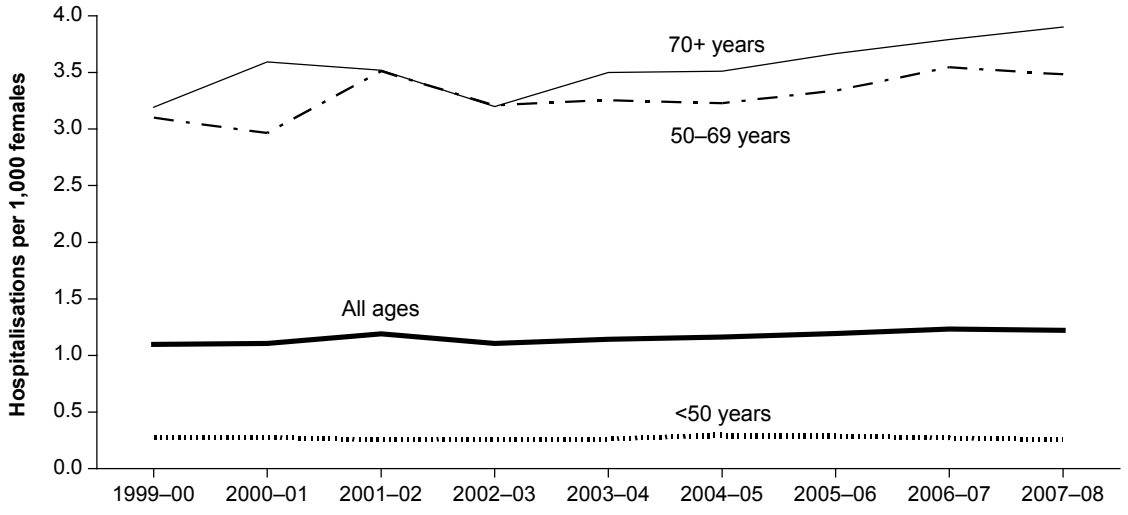
Source: National Hospital Morbidity Database, AIHW.

Figure 7.2: Hospitalisations for ovarian cancer by same-day and overnight status, 1999–00 to 2007–08

Trends in the rate of hospitalisations for ovarian cancer by age group are shown in Figure 7.3. For the age group of those less than 50 years, the rates remained unchanged at 0.3 per 1,000 females over the period considered. For the other two age groups, the rates fluctuated somewhat over the years, but the general direction was one of an increase. Specifically, between 1999–00 and 2007–08, there was a 13% increase in the number of hospitalisations for ovarian cancer for those aged 50 to 69 years, and a corresponding increase of 22% increase for those aged 70 years and over.

Trends in average length of stay

Trends in the average length of stay of women who were hospitalised for ovarian cancer in 2007–08 are shown in Figure 7.4. For those hospitalisations that involved an overnight stay, the average length of stay for ovarian cancer–related hospitalisations was 7.3 days in 1999–00; it increased to 8.8 days in 2004–05 and then decreased to 7.6 days in 2007–08.

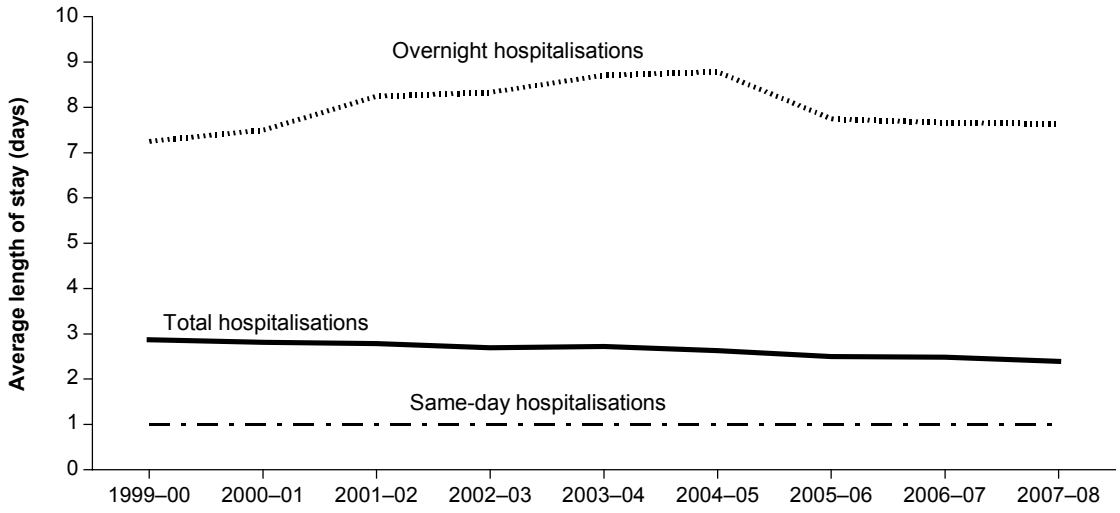


Notes

1. The rates were age-standardised to the Australian population as at 30 June 2001 and are expressed per 1,000 females.
2. The data for this figure are shown in Appendix Table D7.3.

Source: National Hospital Morbidity Database, AIHW.

Figure 7.3: Hospitalisations for ovarian cancer by age group, 1999–00 to 2007–08



Note: The data for this figure are shown in Appendix Table D7.4.

Source: National Hospital Morbidity Database, AIHW.

Figure 7.4: Average length of stay for ovarian cancer–related hospitalisations by same-day and overnight status, 1999–00 to 2007–08

In contrast, the average length of stay for all ovarian cancer-related hospitalisations in 2007–08 was shorter than that in 1999–00 (2.4 and 2.9 days, respectively). The reduction of the overall average length of stay can be attributed to the increase of the number of same-day hospitalisations which, by definition, are shorter than those hospitalisations that involved an overnight stay.

Procedures undertaken during hospitalisations

Procedures undertaken in hospitals include surgical procedures, non-surgical procedures for investigative and therapeutic purposes (such as chemotherapy) and client support interventions (e.g. anaesthesia). One or more procedures can be reported for each hospitalisation, but procedures are not undertaken during all hospitalisations; thus, only some hospitalisations include data on procedures. The classification system that was used to code the 2007–08 data on procedures was the fifth edition of the Australian Classification of Health Interventions (ACHI) (see Appendix A).

Table 7.4 indicates the number of hospitalisations in which the indicated procedure was undertaken at least once during 2007–08. The majority of these hospitalisations included the 'administration of pharmacotherapy' (i.e. chemotherapy); this procedure was undertaken in almost two-thirds (62%) of ovarian cancer–related hospitalisations. In addition, 12% of the hospitalisations involved 'generalised allied health professions' and a further 11% included the 'loading of a drug delivery device'.

Table 7.4: Hospitalisations for ovarian cancer by most common procedures, 2007–08

Procedure description (ACHI[(a)] block number)	Count of hospitalisations[(b,c)]	Per cent[(c)]
Administration of pharmacotherapy (1920)	8,793	61.6
Generalised allied health professions (1916)	1,691	11.8
Loading of drug delivery device (1921)	1,631	11.4
Transfusion of blood and gamma globulin (1893)	1,274	8.9
Cerebral anaesthesia (1910)	1,269	8.9
Vascular infusion device and pump (766)	839	5.9
Abdominal hysterectomy (1268)	551	3.9
Other procedures on female genital organs (1299)	423	3.0
Therapeutic interventions on cardiovascular system (1890)	422	3.0
Postprocedural analgesia (1912)	414	2.9
Immunisation (1884)	390	2.7
Division of abdomen adhesions (986)	330	2.3
Other excision procedures on abdomen, peritoneum or omentum (989)	269	1.9
Application, insertion or removal procedures on abdomen (983)	253	1.8
Salpingo-oophorectomy (1252)	251	1.8
Conduction anaesthesia (1909)	235	1.6
Appendicectomy (926)	191	1.3
Computerised tomography of abdomen and pelvis (1963)	183	1.3
Venous catheterisation (738)	180	1.3
Laparoscopy (985)	170	1.2
Total ovarian cancer-related hospitalisations	**14,277**	**. .**

(a) Classified according to the Australian Classification of Health Interventions, fifth edition (see Appendix A).

(b) Indicates the number of hospitalisations in which the indicated procedure was undertaken.

(c) The sum of the count of hospitalisations does not equal the total number of hospitalisations since no procedure, or multiple procedures, may be undertaken during each hospitalisation. For the same reason, the sum of the percentages does not equal 100.

Source: National Hospital Morbidity Database, AIHW.

8 Expenditure on ovarian cancer

Another measure of the impact of ovarian cancer is the health care costs incurred. Generally, when expenditure for various types of cancers is considered, estimates are provided on recurrent, direct health care costs—that is, expenditure on health goods and services spent by all levels of government, private health insurers, companies, households and individuals to diagnose and treat that type of cancer. This was the approach used in the recent report on breast cancer (AIHW and NBOCC 2009).

For ovarian cancer, however, only one component of such expenditure was considered to be of sufficient quality for publication—namely, hospital admitted patient services expenditure. This type of expenditure pertains to services provided to admitted patients, including private admitted patients, in hospitals. In contrast, estimates of out-of-hospital medical expenses and prescription pharmaceuticals for ovarian cancer patients were considered to be of insufficient quality to report due to insufficient numbers in the surveys on which the expenditure estimates are based.

The latest expenditure estimates that are available on hospital admitted patient services for ovarian cancer are for the 2004–05 financial year, with comparable data available for 2000–01. The data were sourced from the Disease Expenditure Database which is maintained by the AIHW. In this database, ovarian cancer was defined to include the ICD-10 codes of 'C56 and C57.0–C57.4', which we refer to as 'ovarian and related cancers'. This definition of ovarian cancer differs from the definition used in the majority of other chapters in this report (i.e. the ICD-10 code of 'C56').

In the Disease Expenditure Database (and unlike the approach taken in Chapter 7 of this report), the data on hospital expenditure for ovarian and related cancers pertain only to those hospitalisations for which the principal diagnosis was 'ovarian and related cancers'. Thus, expenditure related to same-day hospitalisations for the administration of chemotherapy, with ovarian and related cancer patients 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 ovarian and related 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, 2008b).

Expenditure in 2004–05

Expenditure on hospital admitted patient services for ovarian and related cancers was estimated to be $25 million in the 2004–05 financial year (Table 8.1). The corresponding value for expenditure for all cancers for females was $884 million and, for all diseases, it was $12,688 million. Overall, ovarian and related cancers comprised 3% of all cancer-related hospital admitted patient services expenditure for females and 0.2% of such expenditure for all diseases.

Table 8.1: Hospital admitted patient services expenditure[a] by disease, females, 2004–05

	$ (million)	Per cent of expenditure on all cancers[b]	Per cent of expenditure on all diseases
Ovarian and related cancers[c]	25	2.9	0.2
All cancers[b]	884	100.0	7.0
All diseases	12,688	. .	100.0

(a) Pertains to those hospitalisations for which the principal diagnosis was ovarian and related cancers. Does not pertain to hospitalisations for which ovarian and related cancers was an additional diagnosis, with the principal diagnosis relating specifically to the type of cancer treatment or care received.

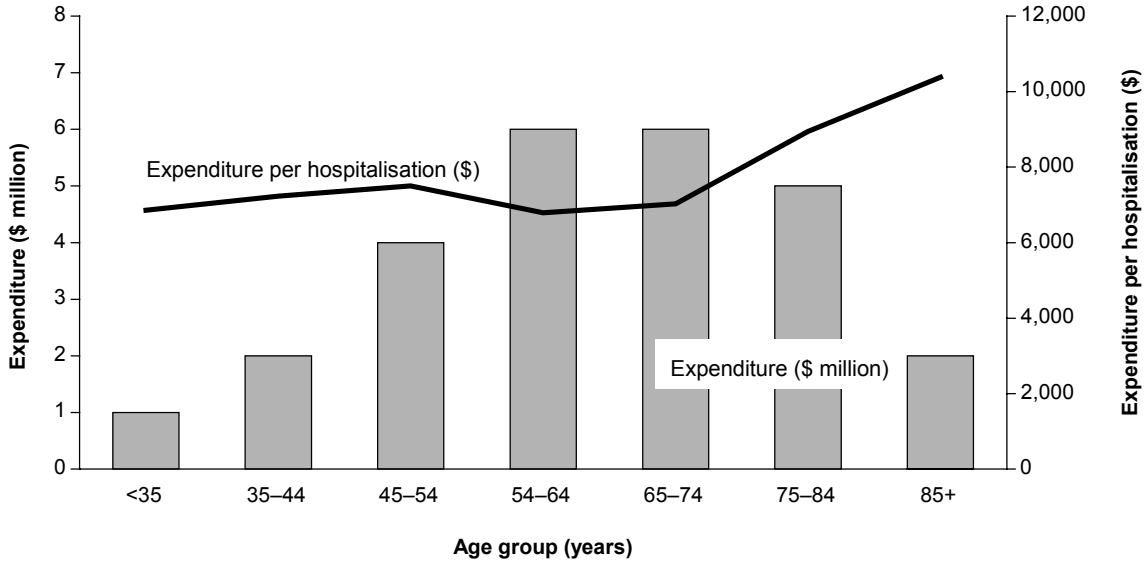
(b) Includes cancers coded in ICD-10 as C00–C97. Does not include cancers coded as D45, D46, D47.1 and D47.3.

(c) Includes cancers coded in ICD-10 as C56 and C57.0–C57.4.

Source: Disease Expenditure Database, AIHW.

Differences by age

Differences by age in ovarian and related cancers expenditure for hospital admitted patient services is shown in Figure 8.1. Almost one quarter (23%) of the $25 million was spent on women aged 54 to 64 years ($6 million). As well, 23% was spent on women aged 65 to 74 years ($6 million), while 21% ($5 million) was spent on women aged 75 to 84 years and 16% (4 million) on those aged 45 to 54 years.



Notes

1. Pertains to those hospitalisations for which the principal diagnosis was ovarian and related cancers (i.e. codes of C56 and C57.0–C57.4 in ICD-10). Does not pertain to hospitalisations for which ovarian and related cancers was an additional diagnosis, with the principal diagnosis relating specifically to the type of cancer treatment or care received.
2. The data for this figure are shown in Appendix Table D8.1.

Source: Disease Expenditure Database, AIHW.

Figure 8.1: Hospital admitted patient services expenditure on ovarian and related cancers by age group, 2004–05

Average expenditure per hospitalisation for ovarian and related cancers was highest for women in the older age groups. In particular, average expenditure for those aged 85 years and over was $10,379 per hospitalisation and, for those aged 75 to 84 years, it was $8,945 per hospitalisation. In contrast, the lowest average expenditure per hospitalisation of $6,790 was for those aged 54 to 65 years, followed by expenditure of $6,860 for those aged less than 35 years.

Trends

Change over time in admitted patient expenditure on ovarian and related cancers is shown in Table 8.2. After prices were adjusted for inflation (with all prices shown in 2004–05 dollars), the data indicate that admitted patient expenditure on ovarian and related cancers grew by 15% from $22 million in 2000–01 to $25 million in 2004–05. Further investigation of the data indicated that this increase was largely due to increased expenditure on specialists. Table 8.2 also indicates that the overall increase in estimated expenditure on ovarian and related cancers (15%) is somewhat lower than the estimated increase of 19% for all cancers and 18% for all diseases.

Table 8.2: Hospital admitted patient services expenditure[(a)] by disease, constant prices[(b)], females, 2000–01 and 2004–05

Sector	2000–01 $ (million)[(b)]	2004–05 $ (million)	Change (%)[(c)]
Ovarian and related cancers[(d)]	22	25	15.0
All cancers[(e)]	745	884	18.6
All diseases	10,739	12,688	18.1

(a) Pertains to those hospitalisations for which the principal diagnosis was ovarian and related cancers (i.e. codes of C56 and C57.0–C57.4 in ICD-10). Does not pertain to hospitalisations for which ovarian and related cancers was an additional diagnosis, with the principal diagnosis relating specifically to the type of cancer treatment or care received.

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

(c) These calculations were based on exact dollars.

(d) Includes cancers coded in the ICD-10 as C56 and C57.0–C57.4.

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

Source: Disease Expenditure Database, AIHW.