

2 Incidence of breast cancer

Incidence data indicate the number of new cases of breast cancer diagnosed during a specified time period, usually 1 year. The number of new cases is largely determined by the risk profile of the population – that is, the types of risk factors for breast cancer that people have. In addition, for females, the number of new cases of breast cancer diagnosed in any 1 year is affected by the extent of participation in screening mammography.

Details on the incidence of invasive breast cancer are provided in this chapter. Only cases in which the invasive breast cancer was the primary cancer are counted since a secondary breast cancer is not considered to be a new case. In addition, to be counted, the case must be a 'new' primary cancer and not a reoccurrence of a previous primary cancer (IARC 2004).

Note that data on breast cancer incidence refer to the number of *cases* newly diagnosed and not to the number of *people* newly diagnosed with breast cancer. Since it is rare (although possible) that any one person would be diagnosed with more than one primary breast cancer during a 1-year period, the annual number of new breast cancer cases is practically the same as the annual number of people newly diagnosed with breast cancer.

In this chapter, trends in the number and rate of breast cancer cases in women are presented. In addition, this chapter provides information on the projected number of new cases of breast cancer in women to 2015, the risk of being diagnosed with breast cancer by the age of 75 and 85 years, and disparities in the incidence of breast cancer among women according to age, geographical area, socioeconomic status, Aboriginal and Torres Strait Islander status and country of birth. Information on how Australian rates compare internationally is also presented, as are data on the incidence of ductal carcinoma in situ (DCIS) in women. For men, discussion is focused on incidence trends, differences by age, and the risk of being diagnosed with breast cancer.

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

Incidence of breast cancer in females

Incidence in 2006

The five most commonly diagnosed cancers among females in 2006 are shown in Table 2.1. Note that since two types of skin cancer – basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) – are not reported to cancer registries, data on these two types of cancer are not included in the ACD and thus not included in Table 2.1. Past research shows that these skin cancers are by far the most frequently diagnosed cancers in Australia in both males and females (AIHW & CA 2008).

Excluding basal and squamous cell carcinomas of the skin, breast cancer was the most commonly diagnosed cancer among females. A total of 12,614 females were diagnosed with this disease and this accounted for 28% of all new cancer cases diagnosed in 2006 (excluding basal and squamous cell carcinomas of the skin). This means that across Australia, on average, 35 females were diagnosed with breast cancer each day in 2006. Bowel cancer (or colorectal cancer as it is also called) was a distant second (6,159 cases and 14% of reported cancer cases), followed by melanoma of the skin (4,275 cases and 9% of reported cancers).

Table 2.1: The five most commonly diagnosed cancers^(a), females, 2006

Cancer type (ICD-10 codes ^(b))	Number of cases	Per cent of all cancer cases	Age-standardised rate ^(c)	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
All cancers^(d)	45,534	100.0	396.3	392.6–400.0

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

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

(c) Standardised to the Australian population as at 30 June 2001 and expressed per 100,000 females.

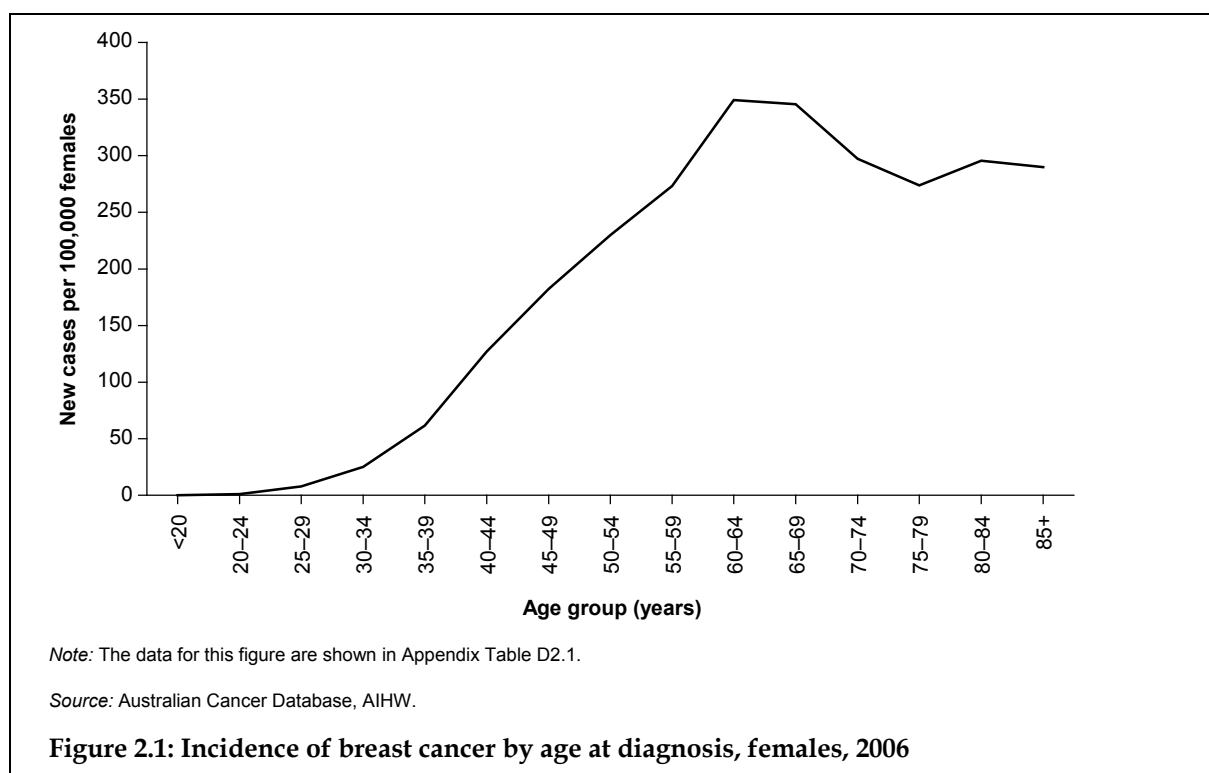
(d) Includes cancers coded in ICD-10 as C00–C97, D45, D46, D47.1 and D47.3 with the exception of those C44 codes which indicate a basal or squamous cell carcinoma of the skin.

Source: Australian Cancer Database, AIHW.

The age-standardised rate of breast cancer incidence stood at 112 (per 100,000 females) in 2006. The corresponding rate was 52 for bowel cancer and 38 for melanoma of the skin.

Differences by age

Differences by age in breast cancer incidence rates for women are shown in Figure 2.1. In 2006, the breast cancer incidence rate increased steadily and significantly for each female age group until the age of 60 to 64 years, where incidence was highest at 349 new cases per 100,000 women. While the incidence rate for women aged 65 to 69 years was not significantly



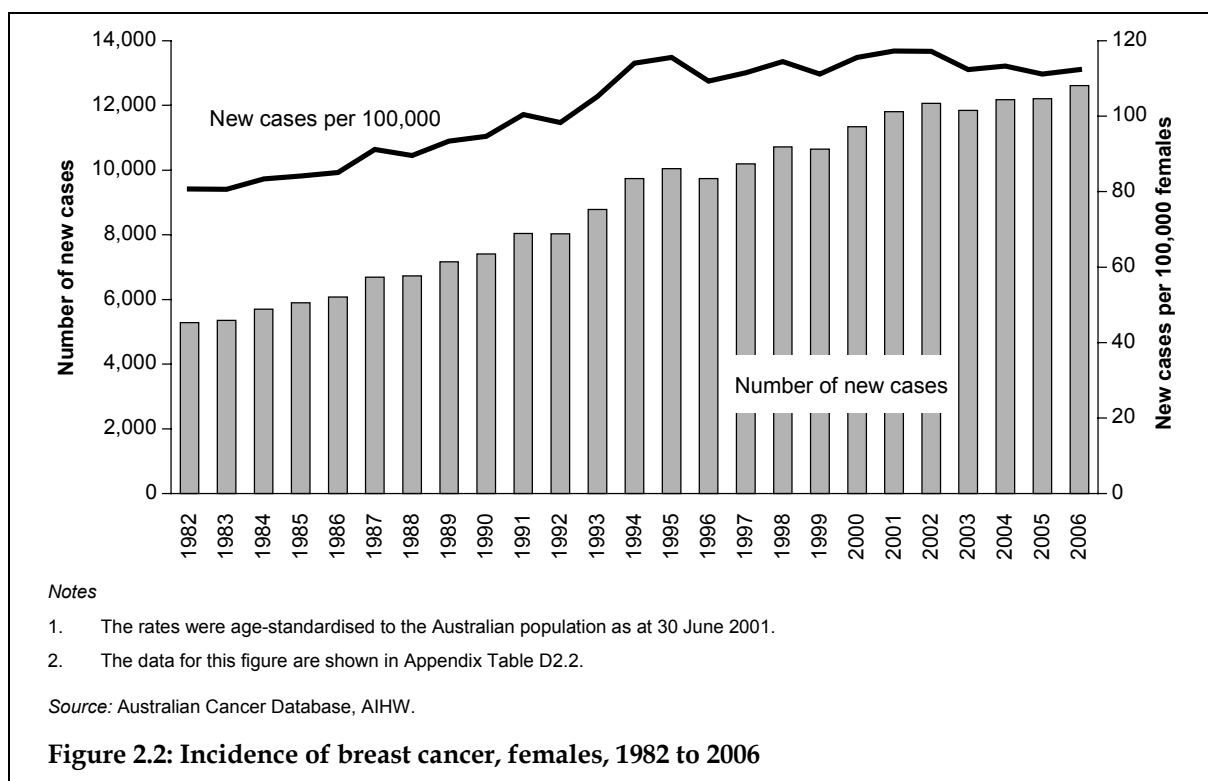
different from that of the 60 to 64 year olds, the rates for women aged 70 years and over were somewhat lower and significantly so. At least part of the reason for the lack of a further age-related increase in the detection of breast cancers among females aged 70 years and over would be the lower participation rate of these women in the BreastScreen Australia Program (see Chapter 7).

Overall, in 2006, more than two in three (69%) breast cancers in women were diagnosed in those aged 40 to 69 years, while one in four (25%) were diagnosed in those aged 70 and over.

Trends

The number of new breast cancer cases in women has more than doubled over the 25-year period from 1982 (the year in which national incidence data were first available) to 2006 (Figure 2.2). In 1982, 5,289 new cases of breast cancer were diagnosed among Australian women compared with 12,614 cases in 2006. In addition, the number of cases diagnosed in 2006 was 3% higher than the number diagnosed in the previous year (12,213 cases) and is the largest number of new breast cancer cases in women reported in any year to date.

The share of all cancers (excluding basal and squamous cell carcinomas of the skin) that were breast cancers also increased for women over the years – in 1982, 24% of reported cancers were breast cancers compared with 28% in 2006 (Appendix Table D2.2).



The age-standardised incidence rate of new breast cancer cases was 81 per 100,000 females in 1982. It increased in the following years and reached 116 per 100,000 females in 1995. Somewhat lower rates were seen in the remainder of the 1990s but, by 2001, the rate peaked at 117 new cases per 100,000 women with that same rate observed for 2002 as well. From 2003 to 2006, the rates levelled off at a somewhat lower level than seen in the previous 2

years (between 111 and 113 cases per 100,000 women) and no statistically significant differences in the rates for those 4 years were observed. These trend data indicate that while the absolute number of new cases of breast cancer is tending to increase from year to year, much of the increase over the last 10 years was due to changes in the age and size of the population.

Trends by age and possible screening effects

In Australia, women aged 40 years and over are eligible for free screening mammograms through the BreastScreen Australia Program, with those aged 50 to 69 years constituting the target age group (see Chapter 7). As mentioned earlier, the recorded incidence of breast cancer can be influenced by the extent of participation of women in population-based mammographic screening programs. In particular, the number of new cases of breast cancer found in females increases in the years directly following the start of screening. A major contributor to this would have been the increased diagnosis of small tumours that, without screening, would not have been found until they became larger. The number of these small tumours, in addition to the number of larger tumours that would have been found irrespective of screening, lead to an elevated number of diagnosed cancers. It is expected that this elevation would be temporary. In time, the incidence of diagnosed cancers would be expected to decrease towards the level that would have been expected had population-based screening not been undertaken.

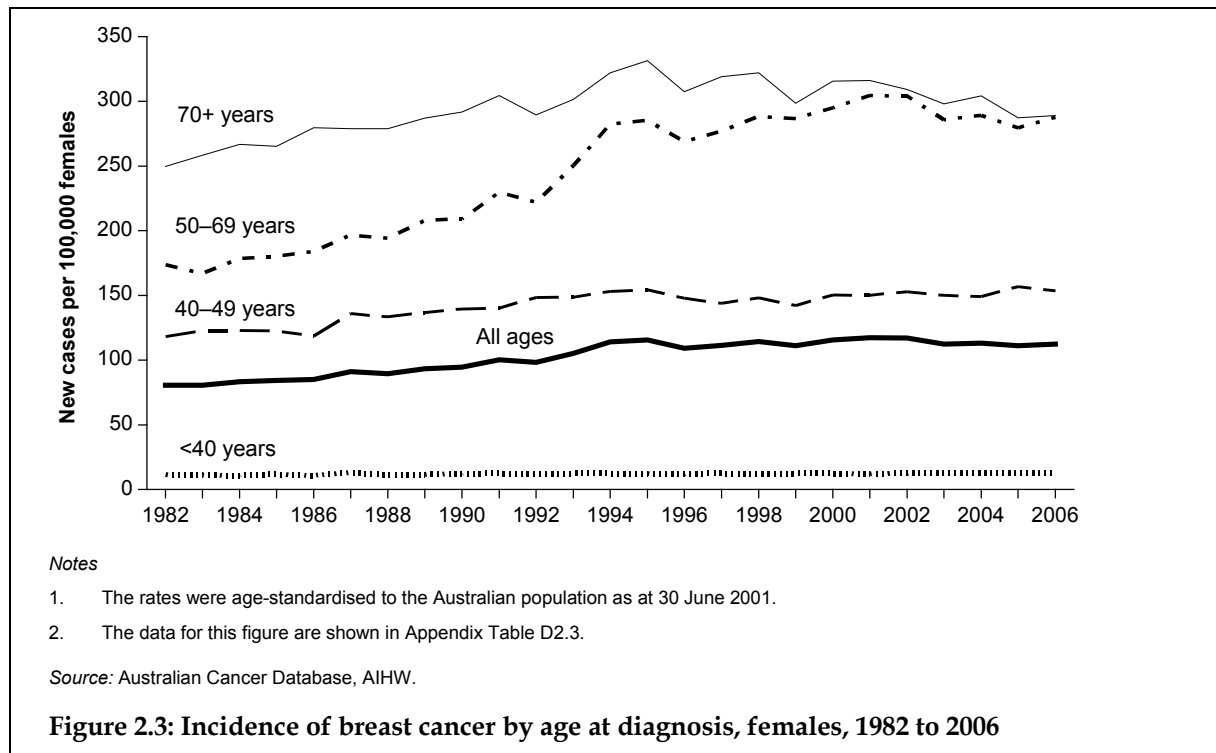
Pinpointing a specific year when the effect of mammographic screening might have first had a substantial influence on national breast cancer incidence rates is not straightforward. Although the provision of screening mammograms through BreastScreen Australia has been coordinated as a national program since 1991, the screening programs themselves commenced in each state and territory at a different date, ranging from 1989 (in Western Australia and South Australia) to 1994 (in the Northern Territory) (AIHW 1998). Also, the dates at which full geographical coverage was achieved in various jurisdictions differed; for example, state-wide coverage in New South Wales first occurred in 1995 (Chiu et al. 2006).

While it is difficult to specify a particular year when the effect of screening mammography might first be seen at the national level, one would expect the effect to have begun during the early 1990s. The data in Figure 2.3 correspond with this expectation. For women aged 50 to 69 years, a smaller rise in incidence rates during the 1980s was followed by a much steeper rise between 1992 and 1995. After that time, the increase in incidence rates for this age category was less steep and between 2002 and 2006, it declined from 304 to 288 per 100,000 women.

While a steep increase in incidence rates in the early- to mid-1990s was also observed for women aged 70 years and over, after that time the rates tended to level off and, in more recent years, to decrease. In addition, consistently from 2001 to 2006, the rate of new cases of breast cancer for women aged 70 years and over did not differ significantly from the rate for women aged 50 to 69 years. This contrasts with the situation in the 1980s and early 1990s when the incidence rate of breast cancers for older women was substantially higher than that for those aged 50 to 69 years.

Unlike that observed for other women, no decrease in the incidence rate is seen for women aged 40 to 49 years and for those aged less than 40 years. Instead, for those under the age of 40 years, the number of new cases of breast cancer remained between 11 and 13 per 100,000 women for the entire 25-year period considered. For those aged 40 to 49 years, the incidence

rate has increased moderately but fairly steadily over the years, from 118 per 100,000 women in 1982 to 154 per 100,000 in 2006.



Risk of breast cancer and average age at diagnosis

Table 2.2 shows the risk of an Australian woman being diagnosed with breast cancer by the age of 75 years and then by the age of 85 years (see Appendix B for an explanation of how these risks were calculated). Based on data for 2006, the risk that a woman would be diagnosed with breast cancer before the age of 75 years was calculated to be 1 in 11 and, before the age of 85 years, 1 in 9. This is higher than the risk of being diagnosed with breast cancer in the 1980s. For example, based on 1982 data, the risk of a woman being diagnosed with breast cancer was calculated to be 1 in 16 by the age of 75 years and 1 in 12 by the age of 85 years.

Table 2.2 also indicates the mean and median age at first diagnosis. Throughout the 25-year period for which national data are available, the mean age at first diagnosis has been stable at approximately 60 years.

Projections

To estimate the incidence of breast cancer in women during 2007 to 2015, data on the number of new cases of breast cancer diagnosed in females 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 breast cancer incidence 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 incidence, 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.

Table 2.2: Risk and average age at diagnosis of breast cancer, females, 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 16	1 in 12	59.7	60.0
1983	1 in 16	1 in 12	59.9	60.0
1984	1 in 16	1 in 11	60.1	60.0
1985	1 in 16	1 in 11	60.1	61.0
1986	1 in 15	1 in 11	60.6	61.0
1987	1 in 15	1 in 10	59.9	60.0
1988	1 in 15	1 in 11	60.0	61.0
1989	1 in 14	1 in 10	60.1	61.0
1990	1 in 14	1 in 10	60.0	60.0
1991	1 in 13	1 in 9	60.1	60.0
1992	1 in 13	1 in 10	59.9	59.0
1993	1 in 12	1 in 9	59.8	60.0
1994	1 in 11	1 in 8	60.1	60.0
1995	1 in 11	1 in 8	60.1	59.0
1996	1 in 12	1 in 9	60.0	59.0
1997	1 in 11	1 in 9	60.2	59.0
1998	1 in 11	1 in 8	60.1	59.0
1999	1 in 11	1 in 9	60.0	59.0
2000	1 in 11	1 in 8	60.1	59.0
2001	1 in 11	1 in 8	60.2	59.0
2002	1 in 11	1 in 8	60.1	59.0
2003	1 in 11	1 in 9	60.1	59.0
2004	1 in 11	1 in 9	60.2	59.0
2005	1 in 11	1 in 9	59.9	59.0
2006	1 in 11	1 in 9	60.1	59.0

Source: Australian Cancer Database, AIHW.

Due to ageing of the population, the number of women diagnosed with breast cancer is expected to increase in the future (Figure 2.4). By 2015, the number of new breast cancer cases among women is projected to be 22% higher than in 2006, with an estimated 15,409 women expected to be diagnosed with breast cancer. This equates to an estimated 42 women in Australia being diagnosed with breast cancer every day in 2015. The projected increase in the number of women diagnosed with breast cancer has important implications not only for women and the broader community, but also for the health system's capacity to provide the health services required.

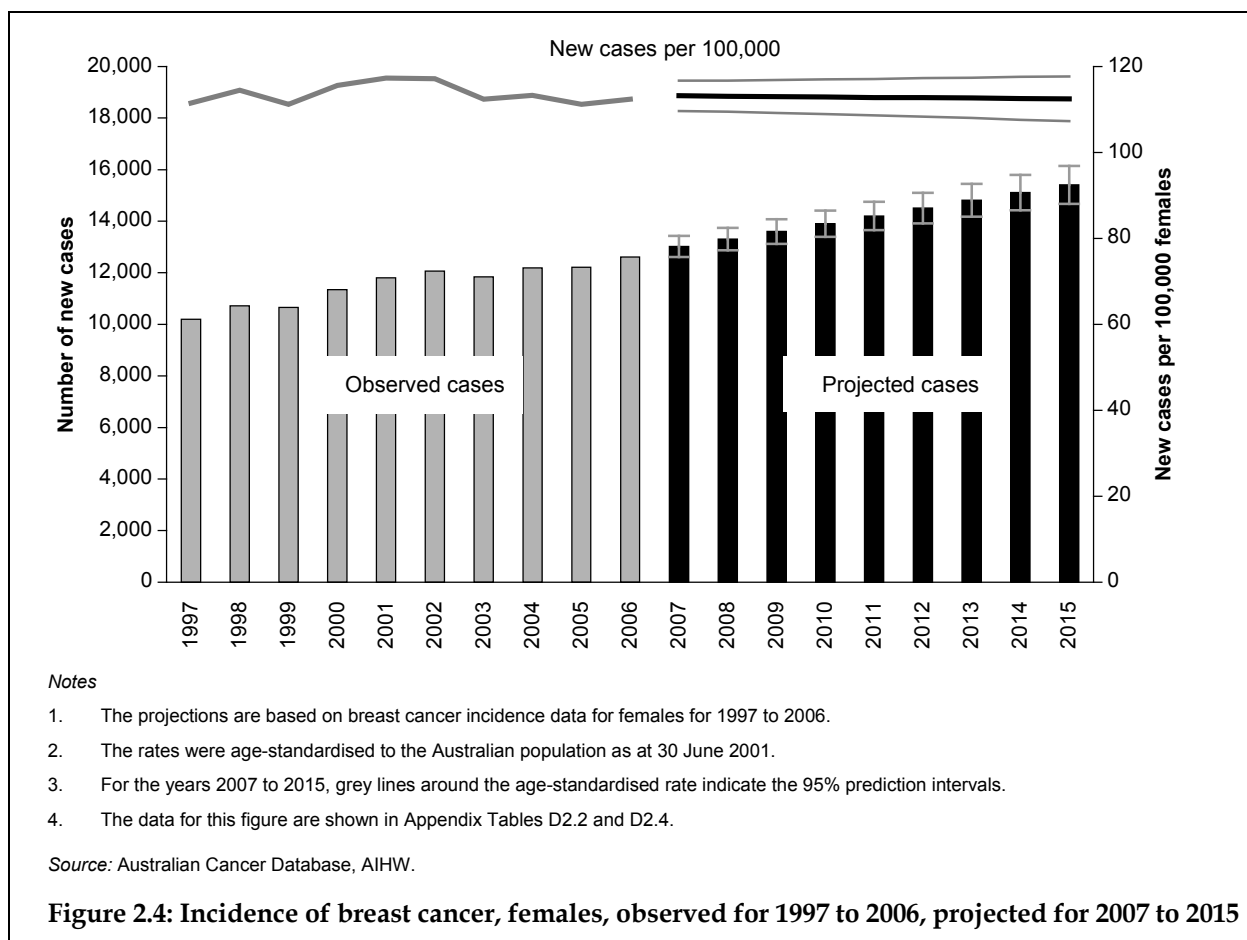


Figure 2.4 also indicates the projected age-standardised rate for new breast cancer cases in women from 2007 to 2015. When expected changes in the age structure and size of the population are taken into account, the results suggest that the rate at which new breast cancer cases are diagnosed will remain fairly stable through to 2015, at about 113 new cases per 100,000 women.

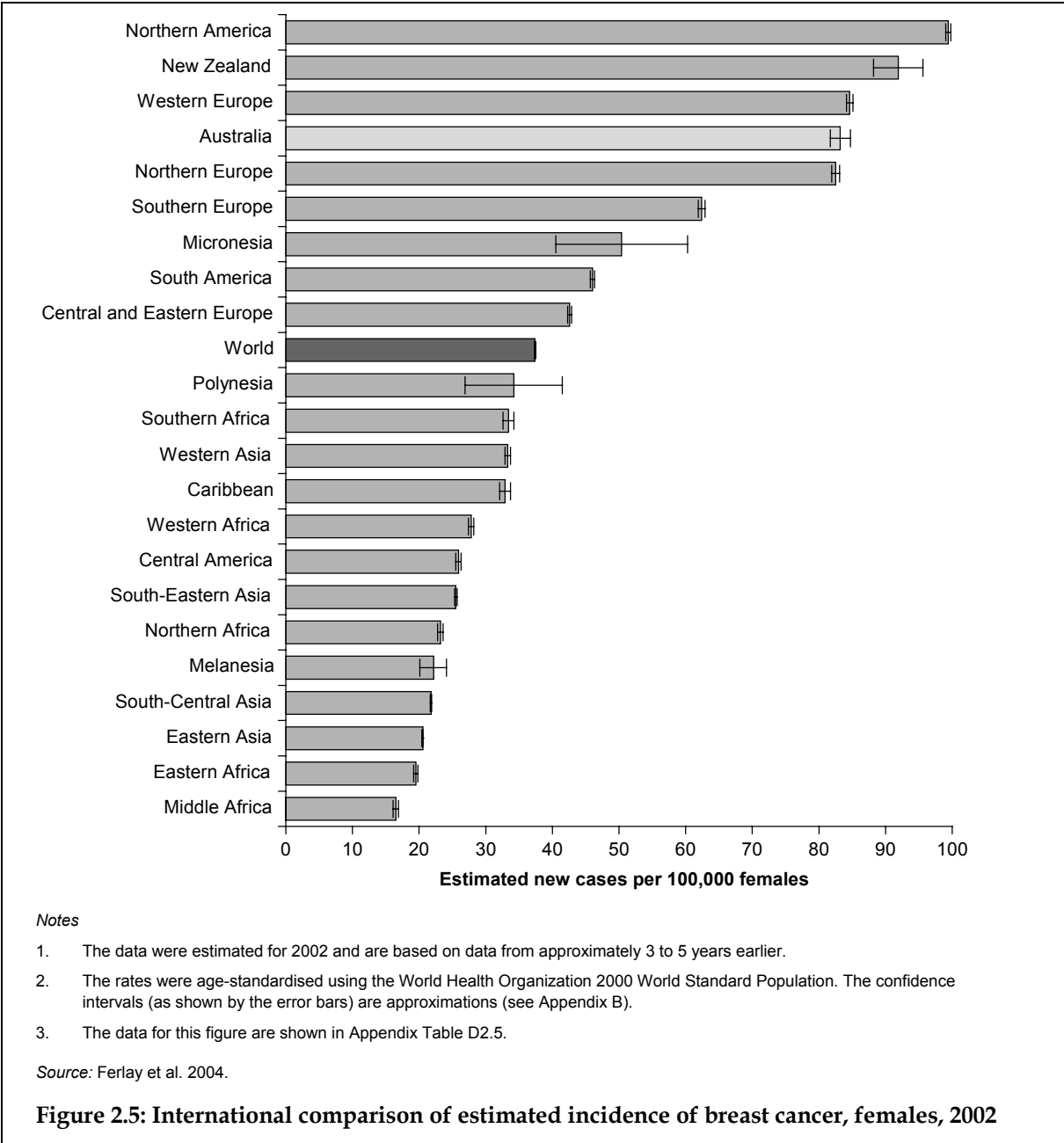
International comparisons

In this section, data on the incidence of breast cancer in women in Australia compared with corresponding data for women in other countries are shown. As discussed in Chapter 1, caution must be taken when comparing data from different countries since observed differences in incidence rates may be due to a range of methodological factors, not just differences in the underlying incidence rates. One of the main sources of internationally comparable data on cancer is the GLOBOCAN database which is prepared by the International Agency for Research on Cancer (IARC) (Ferlay et al. 2004). The IARC collates cancer incidence and mortality data from cancer registries around the world and uses those data to produce estimates for a 'common year'. The most recent GLOBOCAN estimates for which data could be obtained are for 2002, with these estimates based on data from approximately 3 to 5 years earlier.

Figure 2.5 shows the estimated incidence rates of breast cancer around the world by region, and for Australia and New Zealand. The estimated age-standardised rate of breast cancer for

Australian women (83 new cases per 100,000 women) was significantly lower than the rate estimated for Northern America women (99 per 100,000 women) and New Zealand women (92 per 100,000 women), but it was generally at the same level as that estimated for women in the Western European and Northern European regions (85 and 83 per 100,000 women, respectively). Australia's rate was significantly higher than that estimated for women in regions such as Southern Europe (62 per 100,000 women) and Central and Eastern Europe (43 per 100,000 women), as well as each of the African and Asian regions.

A number of factors could explain the international differences in breast cancer incidence rates including differences in genetic susceptibility, reproductive patterns, lifestyle (e.g. diet and physical activity), obesity levels, screening intensity and use of hormone replacement therapy (CCS & NCIC 2007; Hulka & Moorman 2008), as well as differences in diagnostic procedures and completeness of cancer registration.



Type of breast cancer

The type (or histology) of breast cancer refers to the kind of breast cancer a woman had when diagnosed. For the purposes of this report, histology types of breast cancer were categorised into nine groups (Table 2.3). The histology types included in each group were determined by National Breast and Ovarian Cancer Centre (NBOCC) and are listed in Appendix Table D2.6.

Table 2.3: Incidence of breast cancer and average age at diagnosis by type of breast cancer^(a), females, 2006

Type of breast cancer ^(a)	Number of cases	Per cent of total breast cancers	Mean age at diagnosis	Median age at diagnosis
Group 1: Invasive ductal carcinoma	9,933	78.7	59.0	58.0
Group 2: Invasive lobular carcinoma	1,354	10.7	62.2	62.0
Group 3: Medullary carcinoma and atypical medullary carcinoma	49	0.4	51.4	50.0
Group 4: Tubular carcinoma and invasive cribriform carcinoma	193	1.5	58.5	57.0
Group 5: Mucinous carcinoma	235	1.9	66.7	68.0
Group 6: Invasive papillary carcinoma	58	0.5	66.7	68.0
Group 7: Inflammatory carcinoma	9	0.1	58.1	55.0
Group 8: Other—specified	269	2.1	63.4	63.0
Group 9: Unspecified	514	4.1	71.6	76.0
Total	12,614	100.0	60.1	59.0

(a) Appendix Table D2.6 provides a list of the histology types included in each group.

Source: Australian Cancer Database, AIHW.

In 2006, over three-quarters (79% or 9,933 cases) of newly diagnosed breast cancers in women were in 'Group 1: Invasive ductal carcinoma'. Of these, most (9,414 cases) were *infiltrating duct carcinoma* (i.e. tumours originated in the ducts). For 1 in 10 cases (11% or 1,354 cases), the breast cancers were in 'Group 2: Invasive lobular carcinoma' (i.e. tumours originated in lobes). A further 4% of cases (514 cases) were diagnosed with an unspecified type of breast cancer (Group 9).

Table 2.3 also shows the mean and median age at diagnosis by histology type. Women with breast cancers classified as 'Group 3: Medullary carcinoma and atypical medullary carcinoma' had the lowest mean age (51 years compared with the overall average of 60 years). Meanwhile, the mean age for those with an unspecified type of breast cancer (i.e. Group 9) had the highest mean age of 72 years.

Anatomical location

In jurisdictions other than Victoria, South Australia and the Northern Territory, data are collected on anatomical location of the breast cancer. The level of missing information in these data is very high (34%) and caution should be exercised in data interpretation.

As shown in Table 2.4, in the five states and territories for which data were available, the most frequently recorded anatomical location of the breast cancer in 2006 was 'upper-outer quadrant of breast' (28%), followed by 'upper-inner quadrant of breast' (11%).

Table 2.4: Incidence of breast cancer by anatomical location, New South Wales, Queensland, Western Australia, Tasmania and Australian Capital Territory^(a), females, 2006

Anatomical location	Number of cases	Per cent
Upper-outer quadrant of breast	2,303	27.6
Upper-inner quadrant of breast	885	10.6
Overlapping lesion of breast	732	8.8
Lower-outer quadrant of breast	610	7.3
Central portion of breast	397	4.8
Lower-inner quadrant of breast	394	4.7
Nipple and areola	118	1.4
Axillary tail of breast	36	0.4
Unspecified	2,868	34.4
Total	8,343	100.0

(a) Data were not available for Victoria, South Australia and the Northern Territory.

Source: Australian Cancer Database, AIHW.

Incidence by stage at diagnosis

Stage refers to the extent or spread of the breast cancer at diagnosis. Staging information is essential in determining prognosis, the most appropriate treatment and the effectiveness of screening programs.

A number of different staging systems are used to classify breast cancer tumours. The TNM staging system is frequently used in clinical settings. This system makes use of information on the size of the primary tumour (T), lymph node involvement (N) and the absence or presence of distant metastases (M) to assign a value to invasive breast cancers ranging from stage I (early disease) to stage IV (advanced disease).

A simpler system for staging breast cancers is the Surveillance Epidemiology End Results (SEER) Summary Stage system (or 'summary stage' system for short). This system is used more commonly in reporting staging information to cancer registries. It has three categories that indicate the extent of spread of breast cancer at diagnosis, i.e. local (when the tumour is confined to the breast); regional (the tumour has spread to surrounding tissue or nearby lymph nodes); and distant (the tumour has spread to distant organs) (ACS 2007; Tracey et al. 2006).

There is currently no national requirement for the collection of data on stage and not all states and territories collect this information; thus, no national data on the staging of breast cancer are available. However, Queensland and New South Wales both collect staging information and data from these states are described below.

Queensland data on the incidence of female breast cancer by stage are presented in Table 2.5. These data are based on the TNM staging system of classifying the stage of tumours. Since the Queensland Cancer Registry does not collect complete information on stage (e.g. information on the presence of metastases was incomplete), the Queensland measure is a

proxy measure of TNM staging (Youlden et al. 2009). During 2002 to 2006, almost half (47%) of the breast cancer cases in women in Queensland were diagnosed at an early stage (stage I), while 45% were diagnosed at later stages (stages II to IV). The stage of diagnosis was unknown in 7% of Queensland cases.

Table 2.5: Incidence of breast cancer by stage^(a) and age at diagnosis, females, Queensland, 2002–2006

Stage at diagnosis ^(a)	Age group (%)					All ages	
	<40 years	40–49 years	50–69 years	70–79 years	80+ years	Per cent	Average annual number of cases
Stage I	34	43	53	53	29	47	1,101
Stages II, III and IV	61	53	43	39	42	45	1,053
Unknown	4	4	5	8	29	7	167
Total	100	100	100	100	100	100	2,321

(a) Based on an approximation of the TNM staging system. Stage I tumours are defined as 'tumours of not more than 20 mm diameter, with no evidence of lymph node involvement or distant metastases'; Stage II to IV tumours are defined as 'cancers larger than 20 mm diameter, and/or evidence of spread to lymph nodes; or distant metastases' (Youlden et al. 2009:53).

Source: Youlden et al. 2009 and personal communication from Queensland Cancer Registry.

Table 2.5 also shows that when breast cancer was diagnosed in women under the age of 40 years, the tumour was likely to be at a more advanced stage than for other women. Specifically, data for 2002 to 2006 indicate that in Queensland, 6 out of 10 (61%) breast cancers diagnosed among women aged less than 40 years were stages II to IV tumours compared with about 40% of breast cancers diagnosed among women aged 50 and above.

The Queensland data also indicate a clear difference by age in terms of the proportion of women for which the stage was unknown. While, overall, the stage at diagnosis was unknown for 7% of cases, stage was unknown for almost one in three (29%) cases of those aged 80 years or over. This difference may be due to a number of factors including advanced comorbidity at the time of diagnosis, frailty of the person due to age or other factors leading to a less comprehensive investigation of the tumour stage among those in the oldest age range.

Data for New South Wales, which is based on the summary stage system, are shown in Table 2.6. These data pertain to the 1995 to 2004 period and include all cases of breast cancer (i.e.

Table 2.6: Incidence of breast cancer by stage at diagnosis^(a), New South Wales, 1995–2004 and United States of America, 1996–2004^(b)

Stage at diagnosis ^(a)	New South Wales (%)	United States of America ^(c) (%)
Localised	53	61
Regional	32	31
Distant	4	6
Unknown	11	2
Total	100	100

(a) Based on the 'SEER Summary Stage' system of classifying the stage at diagnosis. Briefly, localised tumours are those that were confined to the breast; regional tumours are those that had spread to surrounding tissue or nearby lymph nodes; and distant tumours had spread to distant organs (see Tracey et al. 2006:128 & Ries et al. 2008:O-19).

(b) The NSW data pertain to both males and females since separate data for females were not available. The USA data pertain to females only.

(c) Data are from the 'SEER 17' areas which cover approximately a quarter of the USA (see Table IV-10 in Ries et al. 2008).

Source: Tracey et al. 2006; Ries et al. 2008.

for both males and females). However, it is expected that the findings for females would be very similar to the data shown due to the high proportion of all breast cancers found in females. Data from 17 cancer registries in the United States of America (USA) for 1996 to 2004 are also shown as a point of comparison; these data apply to females.

Both sets of data suggest that the majority of breast cancer cases were diagnosed when the cancer was still localised (53% in the NSW data and 61% in the USA data), while approximately a third were regional and about 1 in 20 were distant at the time of diagnosis. The stage of the breast cancer at diagnosis was unknown in 11% of NSW cases and 2% of USA cases. When only those cases for which the stage at diagnosis was known are considered, the proportion of breast cancer cases which were localised was 60% for NSW and 62% for the USA.

Differences across groups

Thus far in this chapter, the incidence of breast cancer in females has been examined for all women combined as well as by age. In this section, data 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 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 subgroups (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 live in remote areas)
- the prevalence of risk factors (e.g. obesity and reproductive patterns)
- participation rates in screening mammography programs
- the availability of diagnostic services.

Differences by geographical area

As expected, there is a clear relationship between the size of the jurisdiction and the average number of breast cancer cases diagnosed annually in 2002 to 2006, such that the largest number of cases were diagnosed in New South Wales (4,101 cases) and the smallest number in the Northern Territory (59 cases) (Table 2.7).

When the age-standardised incidence rates for 2002 to 2006 are considered, the two territories stand out. The incidence rate of breast cancer for women was significantly higher in the Australian Capital Territory (129 new cases per 100,000 women) than in the other states and territories. In contrast, the Northern Territory had a significantly lower rate (83 per 100,000 women), which may be due, at least in part, to the higher proportion of Aboriginal and Torres Strait Islander women residing in the Northern Territory.

Table 2.7: Incidence of breast cancer by state and territory, females, 2002–2006

State or territory	Average annual number of cases ^(a)	Age-standardised rate ^(b)	95% confidence interval
New South Wales	4,101	113.1	111.5–114.6
Victoria	3,009	111.4	109.6–113.2
Queensland	2,304	114.6	112.5–116.7
Western Australia	1,168	114.9	111.9–117.9
South Australia	1,022	113.5	110.4–116.7
Tasmania	317	114.8	109.2–120.6
Australian Capital Territory	204	129.2	121.3–137.4
Northern Territory	59	83.3	72.7–94.8
Total	12,185	113.2	112.3–114.2

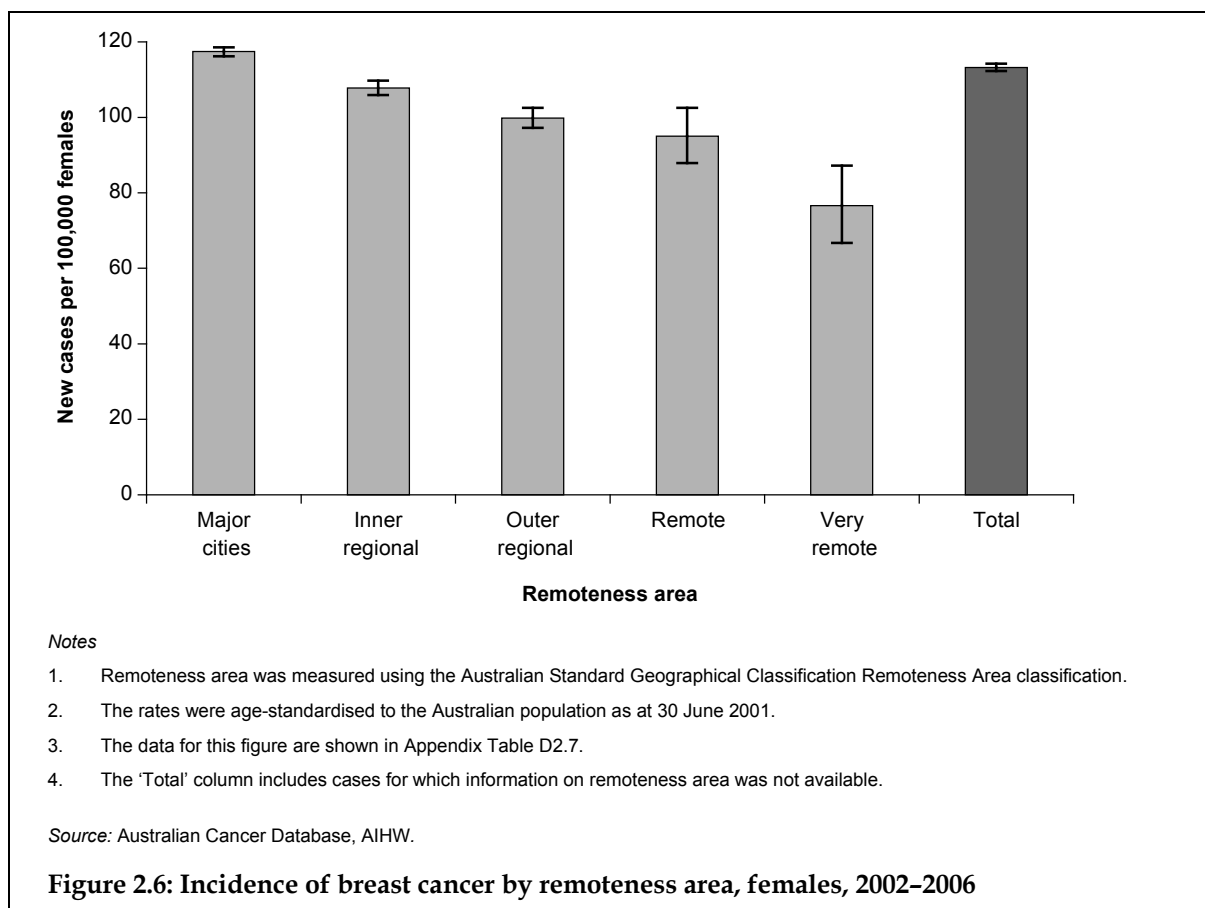
(a) Numbers may not sum to the total due to rounding.

(b) Standardised to the Australian population as at 30 June 2001 and expressed per 100,000 females.

Source: Australian Cancer Database, AIHW.

People living in more inaccessible regions of Australia are often disadvantaged regarding access to goods and services (including primary health-care services), income, educational and employment opportunities and, in some instances, access to basic amenities, such as clean water and fresh food (AIHW 2008a). To compare incidence rates according to level of remoteness of the area in which the women lived, the Australian Standard Geographical Classification Remoteness Area classification (ABS 2001) was used to assign areas across Australia to a remoteness category. This classification divides all areas of Australia into five categories – namely, *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote* (AIHW 2004).

As shown in Figure 2.6, women living in more urbanised areas at the time of diagnosis had higher age-standardised incidence rates of breast cancer, while those in more remote areas had lower rates. Specifically, during 2002 to 2006, the incidence rate of breast cancer for women was significantly higher in *Major cities* (117 new cases per 100,000 women) than in all other areas. The second highest incidence rate applied to those in *Inner regional* areas (108 per 100,000 women), with this rate being significantly higher than the rates for those living in each of the less urbanised areas. In contrast, the incidence rate was 77 (per 100,000 women) in *Very remote* areas, which was significantly lower than for other areas. This difference may be related to a number of factors including lower rates of mammographic screening in *Very remote* regions (see Chapter 7), the higher proportion of Indigenous women living in *Remote* and *Very remote* areas, and differential rates of access to diagnostic and other health services in remoter areas.



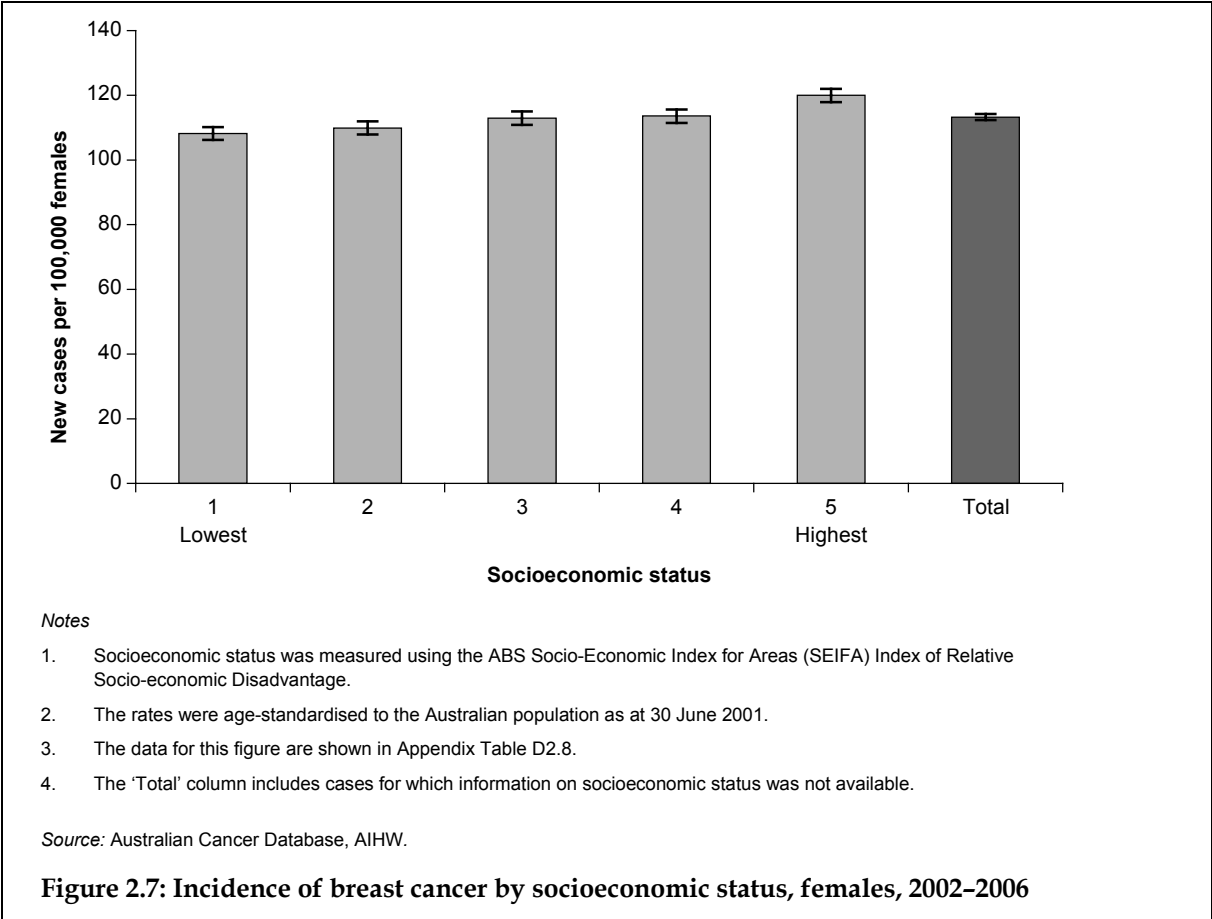
Differences by socioeconomic status

It is well established those of lower socioeconomic status have a higher overall risk of cancer. Socioeconomic status is associated with access to health services, material resources and educational opportunities. Furthermore, persons of lower socioeconomic status are more likely to have higher levels of cancer risk factors, including physical inactivity, tobacco use and poorer diet (ACS 2008). In regard to breast cancer, though, research suggests that a higher socioeconomic status is associated with higher breast cancer incidence (AIHW & NBCC 2006). This may be explained, at least to some degree, by differences in fertility and reproductive patterns by socioeconomic status.

In this report, the Index of Relative Socio-economic Disadvantage (IRSD) is used to indicate socioeconomic status. This index is one of four Socio-Economic Indexes for Areas (SEIFAs) developed by the Australian Bureau of Statistics (ABS 2008a). It is based on factors such as average household income, education levels and unemployment rates. Note that the IRSD is an area-based measure of socioeconomic status – rather than a person-based measure – in which small areas of Australia are classified on a continuum from disadvantaged to affluent. This information is used as a proxy for the socioeconomic status of people living in those areas and may not be correct for each person living in that area. In this report, the first socioeconomic status group (labelled '1') corresponds to geographical areas containing the 20% of the population with the lowest socioeconomic status according to the IRSD and the fifth group corresponds to the 20% of the population with the highest socioeconomic status.

In the 2002 to 2006 period, women living in areas with the highest socioeconomic status (i.e. group '5') had a significantly higher incidence rate of breast cancer (120 new cases per

100,000 women) than women living in other areas (Figure 2.7). Meanwhile, those living in areas with the lowest socioeconomic status had the lowest rate (108 per 100,000 women), although this rate was not significantly different from that observed for those in the second group. Incidence rates for the middle three socioeconomic status groups were not significantly different from each other. Overall, these data suggest that the largest contrast in breast cancer incidence is found between women living in areas with the highest socioeconomic status and the remainder, with the differences between those in the lowest and middle socioeconomic status groups being less obvious.



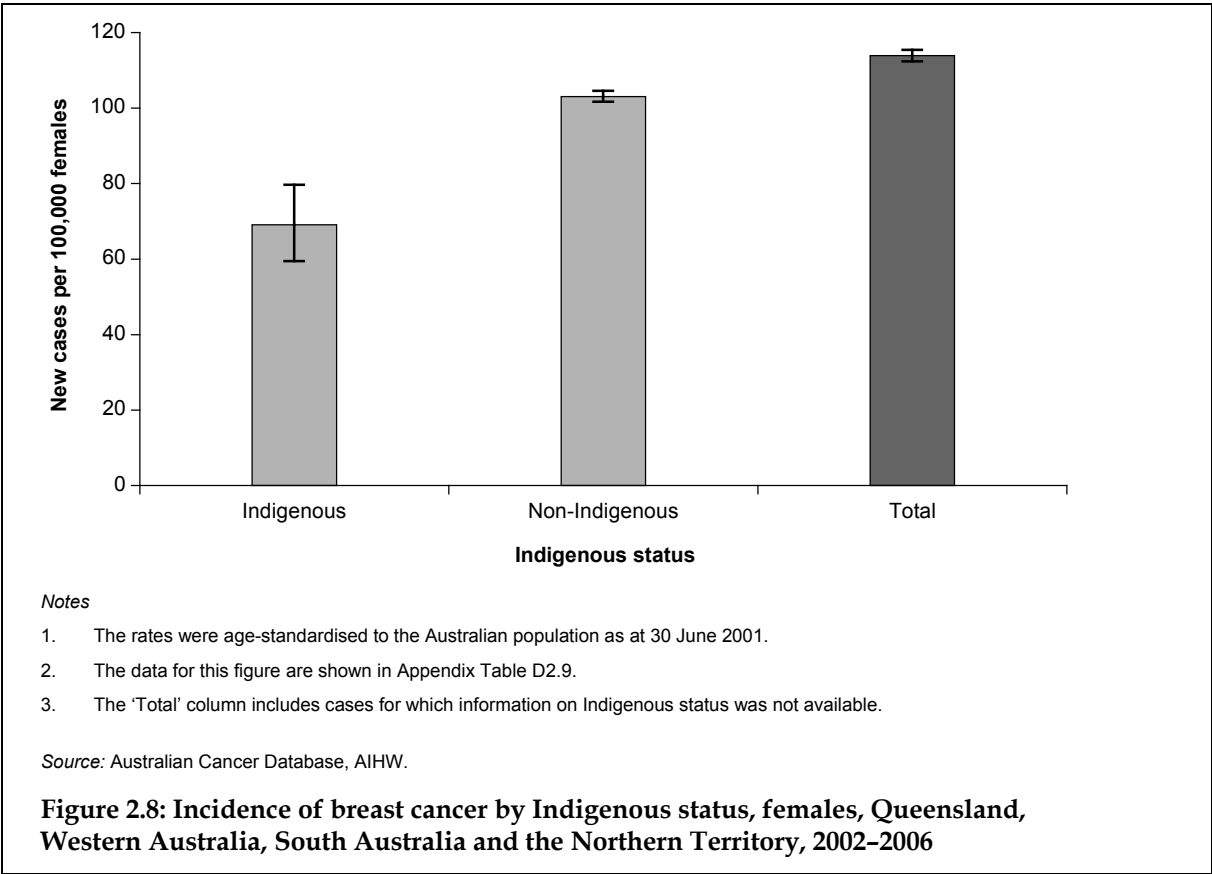
Differences by Aboriginal and Torres Strait Islander status

Across a range of health-related and socioeconomic indicators, Aboriginal and Torres Strait Islander peoples are disadvantaged relative to other Australians (ABS & AIHW 2008). They are also more likely to live in remote areas of Australia and to have a relatively young age structure, with a median age of 21 years compared with 37 years for the non-Indigenous population. This age difference is believed to be largely due to higher rates of fertility as well as deaths occurring at younger ages among the Indigenous population (ABS & AIHW 2008). Several studies at the state and territory level have found that Indigenous women are relatively less likely than non-Indigenous women to be diagnosed with breast cancer. For example, a study pertaining to women in the Northern Territory found that Indigenous women were half as likely as non-Indigenous women to be diagnosed with breast cancer (Cunningham et al. 2008); another study led to a similar conclusion with regard to Indigenous women in South Australia (Roder 2007).

Reliable data on the incidence of cancer for Indigenous women are not available. While all of the 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 compare breast cancer incidence by Indigenous status. Note that even for these jurisdictions, the level of missing data on Indigenous status is about 10%.

An average of 47 Indigenous women in Queensland, Western Australia, South Australia and the Northern Territory were diagnosed with breast cancer each year in the 2002 to 2006 period, making breast cancer the most common reportable cancer in Indigenous women in these four jurisdictions. The second most common reportable cancer was lung cancer (average of 27 cases per year), followed by bowel cancer (20 cases) and cervical cancer (17 cases).

When the age-standardised incidence rates in the four jurisdictions are compared, the results are similar to those of earlier state-based studies. That is, Indigenous women in Queensland, Western Australia, South Australia and the Northern Territory were significantly less likely to be diagnosed with breast cancer than their non-Indigenous counterparts (69 and 103 per 100,000, respectively) (Figure 2.8). This difference may be explained, at least in part, by the fact that Indigenous women are, on average, more likely than other Australian women to have children at a younger age and to have more pregnancies (ABS & AIHW 2008) which may help to protect Indigenous women against breast cancer (Roder 2005). Indigenous women are also significantly less likely than other women to have a screening mammogram (as discussed in Chapter 7).



A similar pattern by Indigenous status is observed in the United States of America; data for 2000 to 2004 indicate that American Indian and Alaskan native women had approximately half the incidence rate of breast cancer than their 'white' counterparts (ACS 2008). However, this same pattern is not observed in New Zealand Māori women who had a higher rate of breast cancer incidence than other New Zealand women – 102 and 91 per 100,000 women, respectively, in 2005 (NZ Ministry of Health 2009).

Differences by country of birth

Australia has one of the largest proportions of immigrant populations in the world; it was home to 4.4 million overseas-born people in 2006, and one in four (25%) residents were born outside of the country (ABS 2009a). Research has found that most migrants are at least as healthy, if not more so, than the Australian-born population. This '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). Research has shown that this migrant health advantage decreases over time, with the diminishing of the advantage in relation to breast cancer incidence emerging as soon as 10 years after migration in some migrant groups (Ziegler 1993).

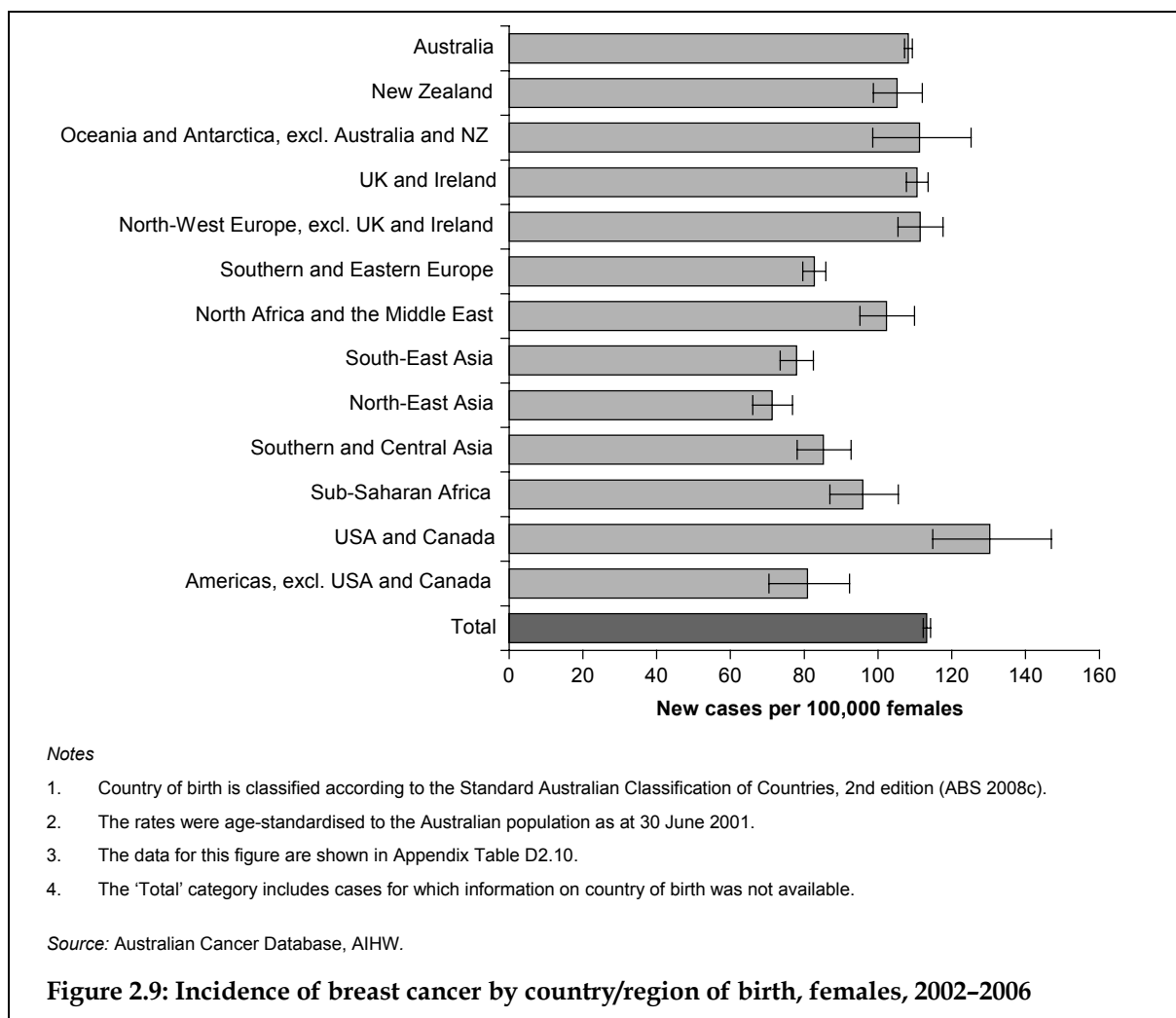
Furthermore, immigrants are more likely than Australian-born people to live in urban areas (ABS 2009a); this provides immigrants with relatively easier access to health-care services. At the same time, though, language and cultural barriers may mean that some immigrants are less likely or able to access available services. This is supported by the observation that women whose main language spoken at home was not English were significantly less likely than other women to participate in screening mammography programs (see Chapter 7). Thus cancer detection rates may be lower in these women.

In the earlier edition of this report (AIHW & NBCC 2006), data on breast 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 it is well known that some groups – for instance, people from Asia – tend to be more recent immigrants, while people from many European countries have been in Australia for a longer period of time (ABS 2009a). Note also that for 8% of cases, information on the woman's country of birth was not available.

The highest age-standardised rate was observed for cases in which the women were born in the United States of America and Canada (130 new cases per 100,000 females) and this rate was significantly higher than that observed for Australian-born women (108 per 100,000 females) (Figure 2.9). Women born in North-East Asia had a relatively low breast cancer incidence rate (71 per 100,000 females), as did those born in South-East Asia (78 per 100,000 females) and Southern and Eastern Europe (83 per 100,000 females); these rates were significantly lower than the rate for Australian-born women.

Incidence of ductal carcinoma in situ in females

Ductal carcinoma in situ (DCIS) is a non-invasive tumour of the breast contained within the cells lining the ducts. As noted in Chapter 1, it is thought that invasive breast cancer may start as DCIS. Monitoring how the number of DCIS cases changes over time is of particular interest in terms of assessing effects of interventions. One would expect to see a relatively larger number of in situ cases where there has been an increase in early detection, as well as

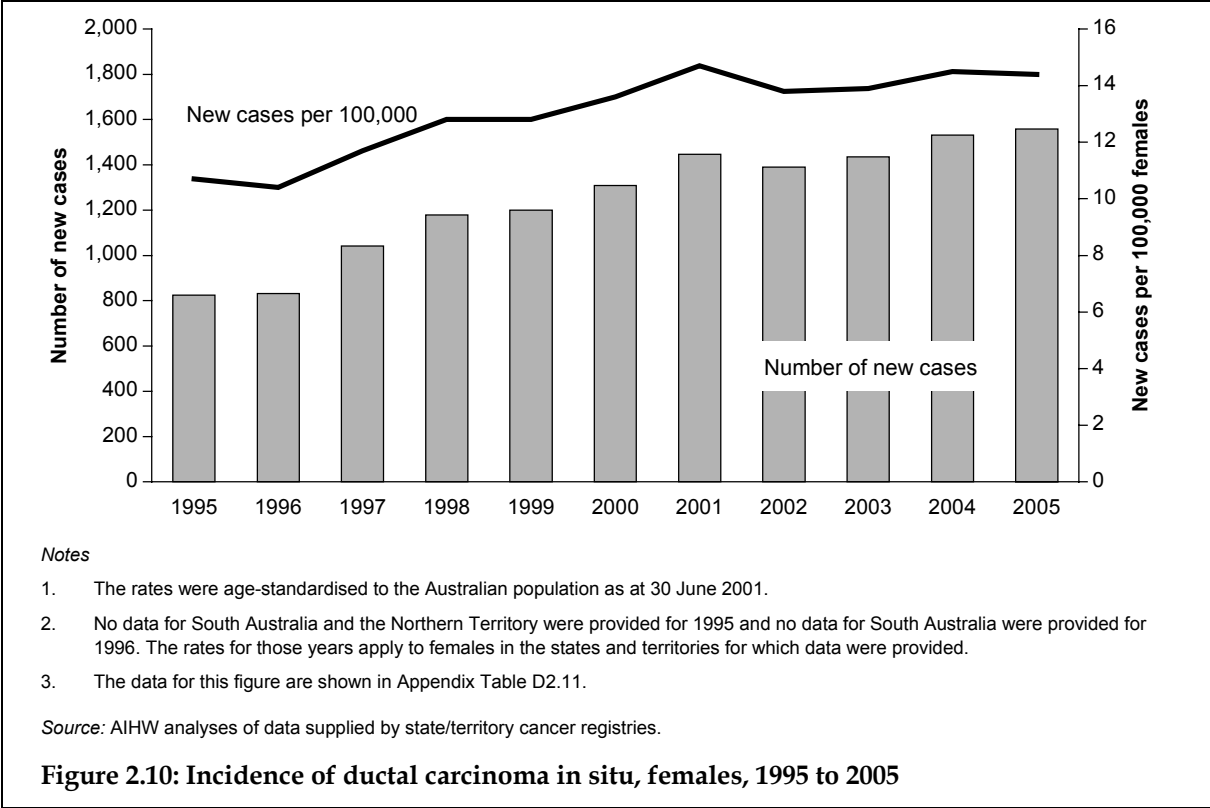


a decrease in the number of invasive cancers over time (Cancer Council Victoria 2008) and in the number of deaths from breast cancer.

Since DCIS is a condition that is usually not palpable, it is mostly diagnosed by a mammogram. Therefore, the number of diagnosed DCIS cases is widely believed to have increased substantially since the introduction of screening mammography programs in the early 1990s. While data from the USA (ACS 2007) and from individual Australian states such as Victoria (Cancer Council Victoria 2002) support this belief, no national data are available. This is because some state and territory cancer registries did not begin to record DCIS information until well after the introduction of widespread mammography screening, while others captured such data but it was regarded as incomplete. Queensland, for example, has collected DCIS data since 1982, but they do not consider their data to have acceptable coverage until 1995.

In 2008, each of the state and territory cancer registries were asked to provide the AIHW with data on the number of cases of DCIS diagnosed in females between 1995 and 2005. While most states and territories were able to provide such data, the completeness of recording of DCIS cases in South Australia was uncertain for 1995 and 1996, and in the Northern Territory for 1995. Thus, the first year in which data on the number of DCIS cases were provided for all states and territories was 1997 (see Appendix C for further details on these data).

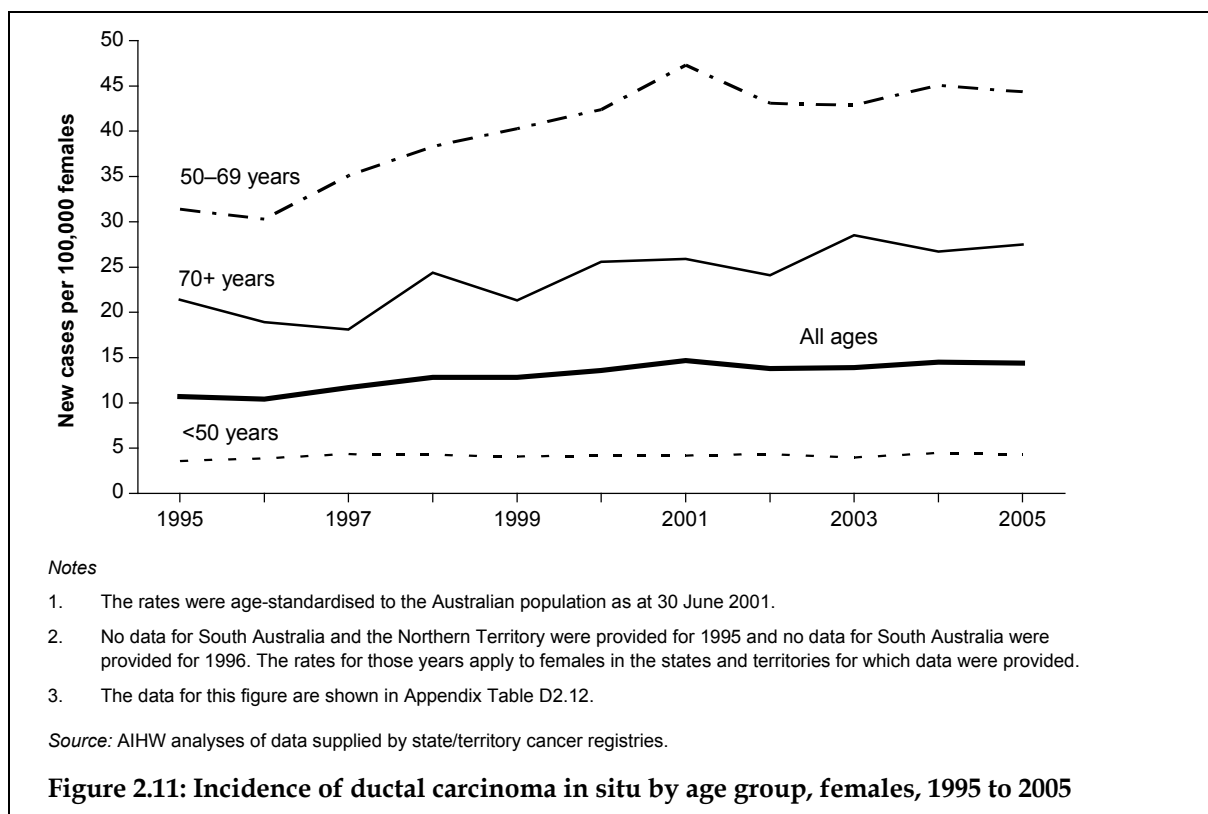
Between 1997 and 2005, the number of DCIS cases diagnosed in women increased by 50% – from 1,042 to 1,558 cases (Figure 2.10). Meanwhile, the age-standardised rate of women diagnosed with this disease increased from 12 cases per 100,000 women in 1997 to 14 cases per 100,000 women in 2005. This increase in the incidence rate indicates that the observed increase in the number of DCIS cases over this period is not simply due to the ageing and growth in size of the population.



The incidence rate for DCIS by age is shown in Figure 2.11. Since the target group for screening mammography is women aged 50 to 69 years, it was expected that the rate of DCIS for women in that age group would be much higher than that for women in other age groups. Over all of the years considered, this was the case. Furthermore, the data suggest a general increase in the incidence rate of DCIS cases for women in the 50 to 69 year age group between 1995 and 2005 (from 31 to 44 cases per 100,000 women). Meanwhile, over the years for which data were available, the rate of DCIS cases for women aged less than 50 years was fairly steady (at approximately 4 cases per 100,000 women), probably because these women are less likely than other women to have a screening mammography (see Chapter 7).

Incidence of breast cancer in males

Since males also have breast tissue, they can develop breast cancer. However, breast cancer is far less common in men than women because their breast duct cells are less developed and because their breast cells are not constantly exposed to the tumour-promoting effects of female hormones (ACS 2009b).



Even though the number of males diagnosed with breast cancer each year has increased somewhat over the years, breast cancer in men is still rare (Table 2.8). In the 1980s, approximately 50 to 60 new cases of breast cancer were diagnosed in men each year. In the 2000s, this number was about 80 to 110 cases each year. In 2006, 102 cases of breast cancer were diagnosed in men and this type of cancer represented 0.2% of all cancer cases among men (excluding basal and squamous cell carcinomas of the skin).

Considering breast cancer in both males and females, the total number of breast cancer cases in 2006 was 12,716, with men accounting for 0.8% of these cases. The female to male incidence ratio was 124 to 1.

The age-standardised rate of breast cancer cases for men has remained largely unchanged over the 25-year period for which national data are available at around 1 per 100,000 men. Since men are not eligible for mammograms through BreastScreen Australia's program, the number of breast cancer cases among males was not affected by the roll-out of screening mammography across Australia.

The risk of a man being diagnosed with breast cancer before the age of 75 years was low – 1 in 1,239 based on 2006 data (Table 2.9). The corresponding risk to the age of 85 was 1 in 767.

Table 2.10 presents data on the incidence of breast cancer by age for men in the 2002 to 2006 period. The lowest incidence rate was observed for those under the age of 50 years (0.1 per 100,000 males), while the highest rates were found for those aged 70 to 79 years (5 per 100,000 males) and 80 years and over (7 per 100,000 males).

The data also indicate that males tend to be diagnosed, on average, at an older age than females (Tables 2.2 and 2.9). In 2006, the mean age at first diagnosis of breast cancer for men was 68 years compared with 60 years for women.

Most breast cancer cases diagnosed in men during 2002 to 2006 were categorised as 'Group 1: Invasive ductal carcinoma' (average of 85 cases per year), with most of these being *infiltrating duct carcinoma* (80 cases) (see Appendix Table D2.13).

Table 2.8: Incidence of breast cancer, males, 1982 to 2006

Year	Number of cases	Per cent of all cancer cases ^(a)	Age-standardised rate (A) ^(b)	95% confidence interval	Age-standardised rate (W) ^(c)	95% confidence interval
1982	62	0.2	1.2	0.9–1.6	0.8	0.6–1.1
1983	45	0.2	0.9	0.6–1.2	0.6	0.4–0.8
1984	51	0.2	0.9	0.6–1.1	0.6	0.5–0.8
1985	59	0.2	1.0	0.7–1.3	0.7	0.6–0.9
1986	53	0.2	0.9	0.7–1.2	0.6	0.5–0.8
1987	55	0.2	0.9	0.6–1.1	0.6	0.5–0.8
1988	60	0.2	1.0	0.7–1.3	0.7	0.5–0.9
1989	67	0.2	1.0	0.8–1.3	0.7	0.6–0.9
1990	78	0.2	1.2	0.9–1.5	0.8	0.7–1.0
1991	64	0.2	1.0	0.7–1.3	0.7	0.5–0.8
1992	48	0.1	0.7	0.5–1.0	0.5	0.4–0.7
1993	63	0.2	0.9	0.7–1.1	0.6	0.5–0.8
1994	71	0.2	1.0	0.8–1.3	0.7	0.6–0.9
1995	57	0.1	0.8	0.6–1.0	0.6	0.4–0.7
1996	87	0.2	1.2	0.9–1.4	0.8	0.6–1.0
1997	71	0.2	0.9	0.7–1.1	0.6	0.5–0.8
1998	91	0.2	1.1	0.9–1.3	0.8	0.7–1.0
1999	73	0.2	0.9	0.7–1.1	0.6	0.5–0.8
2000	80	0.2	0.9	0.7–1.2	0.6	0.5–0.8
2001	91	0.2	1.1	0.9–1.3	0.7	0.6–0.9
2002	85	0.2	0.9	0.7–1.1	0.7	0.5–0.8
2003	100	0.2	1.1	0.9–1.3	0.8	0.6–0.9
2004	108	0.2	1.1	0.9–1.4	0.8	0.6–1.0
2005	97	0.2	1.0	0.8–1.2	0.7	0.6–0.9
2006	102	0.2	1.0	0.8–1.2	0.7	0.6–0.9

(a) Includes cancers coded in the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) as C00–C97, D45, D46, D47.1 and D47.3 with the exception of those C44 codes which indicate a basal or squamous cell carcinoma of the skin. Due to changes over time in which cancers were reportable, the data on cancers that begin with an ICD-10 code of 'D' may be incomplete before 2003 and data on C44 codes (other than basal or squamous cell carcinomas) may be incomplete before 2001.

(b) Standardised to the Australian population as at 30 June 2001 and expressed per 100,000 males.

(c) Standardised using the World Health Organization 2000 World Standard Population and expressed per 100,000 males.

Source: Australian Cancer Database, AIHW.

Table 2.9: Risk and average age at diagnosis of breast cancer, males, selected years from 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 1,249	1 in 619	65.8	67.5
1986	1 in 1,576	1 in 702	65.3	68.0
1991	1 in 1,453	1 in 641	68.9	70.0
1996	1 in 1,197	1 in 667	67.8	68.0
2001	1 in 1,397	1 in 678	69.5	72.0
2006	1 in 1,239	1 in 767	67.6	69.0

Source: Australian Cancer Database, AIHW.

Table 2.10: Incidence of breast cancer by age group, males, 2002–2006

Age group (years)	Average annual number of cases ^(a)	Age-specific rate ^(b)	95% confidence interval
<50	9	0.1	0.1–0.2
50–59	19	1.5	1.2–1.9
60–69	25	3.0	2.5–3.6
70–79	28	5.2	4.4–6.1
80+	17	6.8	5.5–8.5
Total^(c)	98	1.0	0.9–1.1

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

(b) Number of cases per 100,000 males.

(c) The rate shown in this row is age-standardised to the Australian population as at 30 June 2001; it is expressed per 100,000 males.

Source: Australian Cancer Database, AIHW.