4 Survival after a diagnosis of breast cancer

Along with details on incidence and mortality, information on the survival of those who are diagnosed with breast 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 5 or 10 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. its 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 outcome 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 (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, with the 'cohort method' being used for this report.

Relative survival is generally presented as a proportion, with a value less than 100% suggesting that those with breast cancer had a lower chance of survival than the general population. For example, 5-year relative survival of 80% for women diagnosed with breast cancer means that these women had an 80% chance of surviving 5 years after diagnosis relative to the general population of Australian females.

Since relative survival estimates are based on the outcomes of a group of people with a diverse mix of breast cancer characteristics, they provide an indication of the *average* survival experience. They do not reflect an *individual's* chance of surviving since this may be affected by individual characteristics, such as the presence of other illnesses.

In this chapter, 1-, 5- and 10-year survival proportions are shown. One-year survival might indicate the net short-term effectiveness of treatment and the stage at which the cancer was detected.

Five- and 10-year survival estimates might indicate:

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

It should be noted, however, that these survival estimates may show early results only, since death from breast cancer can occur beyond 5- and 10-year time frames.

In this chapter, relative survival estimates are shown for females diagnosed with breast cancer, with comparisons made across time, by age group and by type of breast cancer. Where available from published reports, state-based findings on survival by stage at diagnosis are presented. In addition, international data on survival are provided (using mortality-to-incidence ratios as an indicator). Differences in relative survival for women with breast cancer were presented in an earlier report by socioeconomic status and remoteness of usual residence (AIHW, CA & AACR 2008). Key findings from those analyses are shown in this chapter. Data limitations and the lack of necessary life tables have precluded the calculation of relative survival proportions by Indigenous status and country of birth. However, *crude* survival estimates are shown by Indigenous status for women in four jurisdictions. The survival of males with breast cancer is also discussed in this chapter.

With the exception of the survival estimates obtained from the earlier AIHW report, the survival estimates shown in this chapter are based on the analysis of records of breast cancer cases diagnosed between 1982 and 2006 as held in the Australian Cancer Database (ACD). Data from the National Death Index on deaths (from any cause) that occurred up to 31 December 2008 were used to determine which persons with breast cancer had died and when this occurred.

Survival of females with breast cancer

Survival of females diagnosed in 2000 to 2006

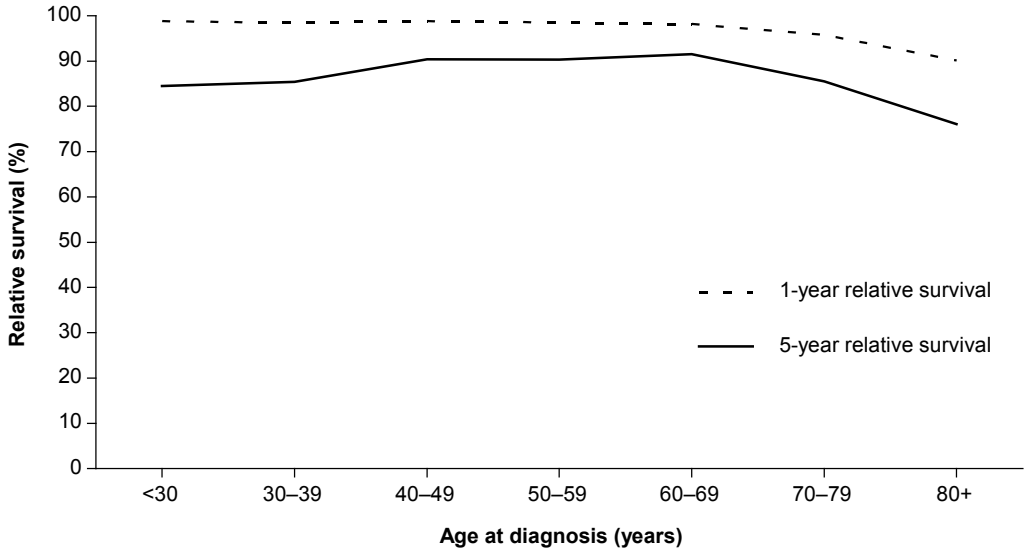
For women who were diagnosed with breast cancer in 2000 to 2006, 1-year relative survival was very high at 97%. The corresponding 5-year relative survival ratio was 88%. In other words, those women who were diagnosed with breast cancer between 2000 and 2006 were 88% as likely to live 5 years after diagnosis as were women of comparable age in the general population.

Differences by age at diagnosis

Differences in 1- and 5-year relative survival by age at diagnosis are shown in Figure 4.1 for women diagnosed with breast cancer during 2000 to 2006. While 1-year relative survival was consistently either 98% or 99% for those under the age of 70 years, it was significantly lower for the older women. That is, 1-year relative survival was 96% for those aged 70 to 79 years and 90% for those aged 80 years and over at diagnosis.

Those who were diagnosed between the ages of 60 to 69 years had the highest survival over a 5-year period (5-year relative survival of 92%) while the lowest survival was calculated for those aged 80 years and over (76%). Five-year relative survival for women below the age of 40 years at diagnosis (85%) and for those aged 70 to 79 years at diagnosis (86%) were also significantly lower than the figure for all ages combined.

Possible reasons for the poorer survival of women diagnosed at an older age include: less aggressive treatment; a smaller proportion of older people being entered into clinical trials; a greater likelihood of comorbidities with other diseases; and a lesser likelihood of being diagnosed with stage I tumours (as shown in Table 2.5).



Note: The data for this figure are shown in Appendix Table D4.1.

Source: Australian Cancer Database, AIHW.

Figure 4.1: Relative survival by age at diagnosis, females with breast cancer, 2000–2006

In contrast, lower survival of younger women is thought to be more closely aligned to the characteristics of the tumours. Past research suggests that breast cancer in younger women is a distinct disease where tumours are more likely than those diagnosed in older women to have characteristics associated with a poorer prognosis—for example, to show bilateral disease, be less well differentiated and be lymph-node positive (Bharat et al. 2009; Brennan et al. 2005). In addition, since routine mammography screening is thought to be less effective for women under the age of 40 years (see Chapter 7), it is more likely that tumours diagnosed in younger women would tend to be at a more advanced stage compared with those diagnosed in older women. This is supported by Queensland data on stage by age group as shown in Chapter 2 (Youlden et al. 2009).

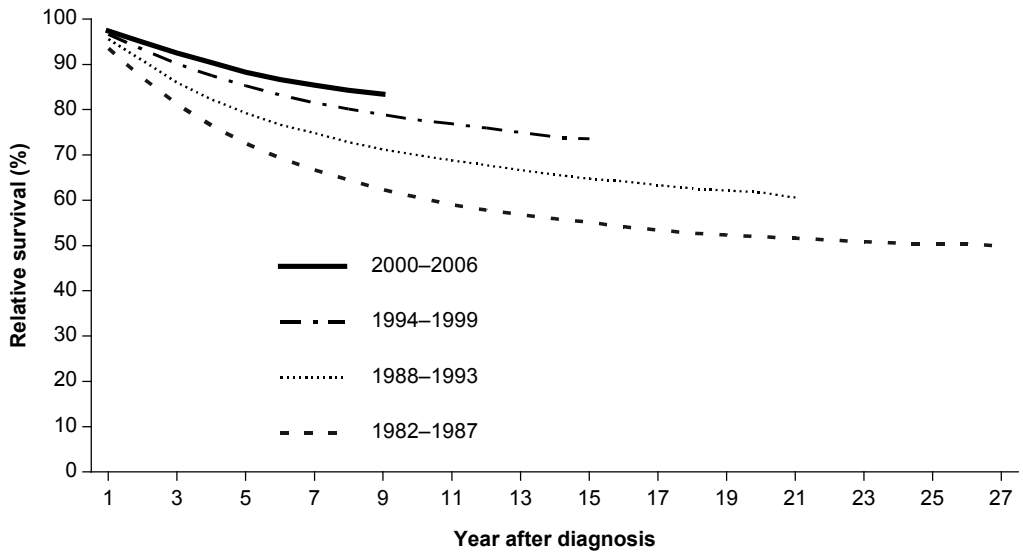
Trends

Relative survival for women with breast cancer is presented in Table 4.1 for four time periods spanning from 1982–1987 to 2000–2006. Note that the method used to calculate the relative survival proportions shown in this chapter does not take into account differing age structures in the population over time. However, given there was little difference in the age distribution of females diagnosed with breast cancer across the years considered (see Table 2.2), the lack of age adjustment is not expected to have any substantial effect on the trends observed.

Also note that since mammographic screening is able to detect small cancers in women that were not yet diagnosable clinically, increased participation in screening can lead to an increase in survival for two reasons: better treatment outcomes; and artificially increasing survival time by simply moving the date of diagnosis earlier (i.e. by increasing the 'lead time'). The available data here cannot be used to investigate causes of changes in survival over time. However, past research has indicated that mammographic screening programs

have resulted in improved survival over and above that attributable to lead time alone (Joensuu et al. 2004; Lawrence et al. 2009; Shen et al. 2005).

The relative survival proportions shown in Figure 4.2 (and the related data shown in Appendix Table D4.2) indicate that females survived significantly longer after a diagnosis of breast cancer in 2000 to 2006 than they did in the past. For example, between the first and the last of the four time periods considered, 1-year relative survival increased from 94% to 97%, while 5-year relative survival increased from 73% to 88%. In other words, females diagnosed with breast cancer in 1982 to 1987 were 73% as likely as other comparable women to be alive 5 years after their diagnosis, while the corresponding proportion for those diagnosed during 2000 to 2006 was 88%.



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

Source: Australian Cancer Database, AIHW.

Figure 4.2: Relative survival by period of diagnosis, females with breast cancer, for 1982–1987 to 2000–2006

While caution should be used when interpreting longer-term survival estimates since they reflect past detection and treatment practices rather than more recent ones, 10-year and 15-years relative survival estimates support the conclusion that more recent cohorts of females with breast cancer are surviving longer than their counterparts diagnosed in earlier years. While 61% of women diagnosed with breast cancer in the 1982 to 1987 period could expect to survive 10 years, relative to other women of comparable age, this proportion had increased to 78% for those women diagnosed during 1994 to 1999. The corresponding figures for 15-year survival are 55% in 1982 to 1987 and 74% in 1994 to 1999.

The improvements over time in survival of women following a diagnosis of breast cancer may be due to a number of factors including the following:

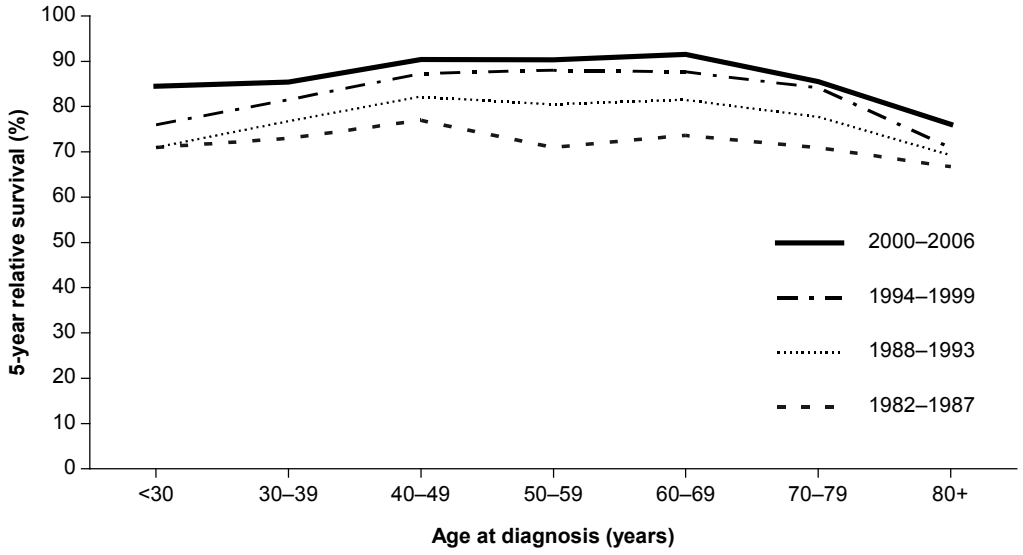
- earlier detection through screening mammogram programs, and public education about breast awareness and recognition of symptoms
- increased effectiveness of general practitioners in diagnosing and following up suspicious signs and symptoms

- improvements in appropriate referral
- more effective investigation and staging of disease
- the availability of up-to-date evidence-based guidelines for the management of breast cancer
- more widespread availability of treatment
- increasing subspecialisation of cancer treatment
- more effective treatment
- reduced levels of comorbidity among those with breast cancer (AIHW, CA & AACR 2008).

The finding of improved survival has also been observed in a number of other countries, including Canada (CCS & NCIC 2007), the United Kingdom (Cancer Research UK 2004) and the United States of America (Ries et al. 2008).

Trends by age at diagnosis

Although greater gains are seen for some age groups than others, the trend towards improved 5-year survival is evident at every age (Figure 4.3). Furthermore, the differences in the 5-year relative survival estimates between 1982–1987 and 2000–2006 are statistically significant for each age group (see Appendix Table D4.3). The largest gains between the first and the last time periods are observed in the age groups most affected by mammography screening, that is the 50 to 59 year age group (5-year relative survival increased from 71% to 90%) and the 60 to 69 year age group (74% to 92%). In contrast, although gains were made, a smaller improvement was observed for the oldest age group (those aged 80 years and over) where the 5-year relative survival increased from 67% in 1982–1987 to 76% in 2000–2006. These findings suggest that while women in all of the age groups have benefited from



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

Source: Australian Cancer Database, AIHW.

Figure 4.3: Five-year relative survival by age at diagnosis, females with breast cancer, 1982–1987 to 2000–2006

improvements in the management of breast cancer, women in the target age group for mammographic screening have had an additional benefit that may have been from the introduction of the screening program.

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 survival estimates. In particular, there tends to be wide variation across countries in the:

- years to which the relative survival estimates apply
- length of the follow-up period considered (e.g. 1-, 5-, 10-year and so forth)
- methods and age groups used to calculate the relative survival estimates (AIHW & AACR 2008:83–4).

For these reasons, relative survival estimates for different countries are not compared in this report.

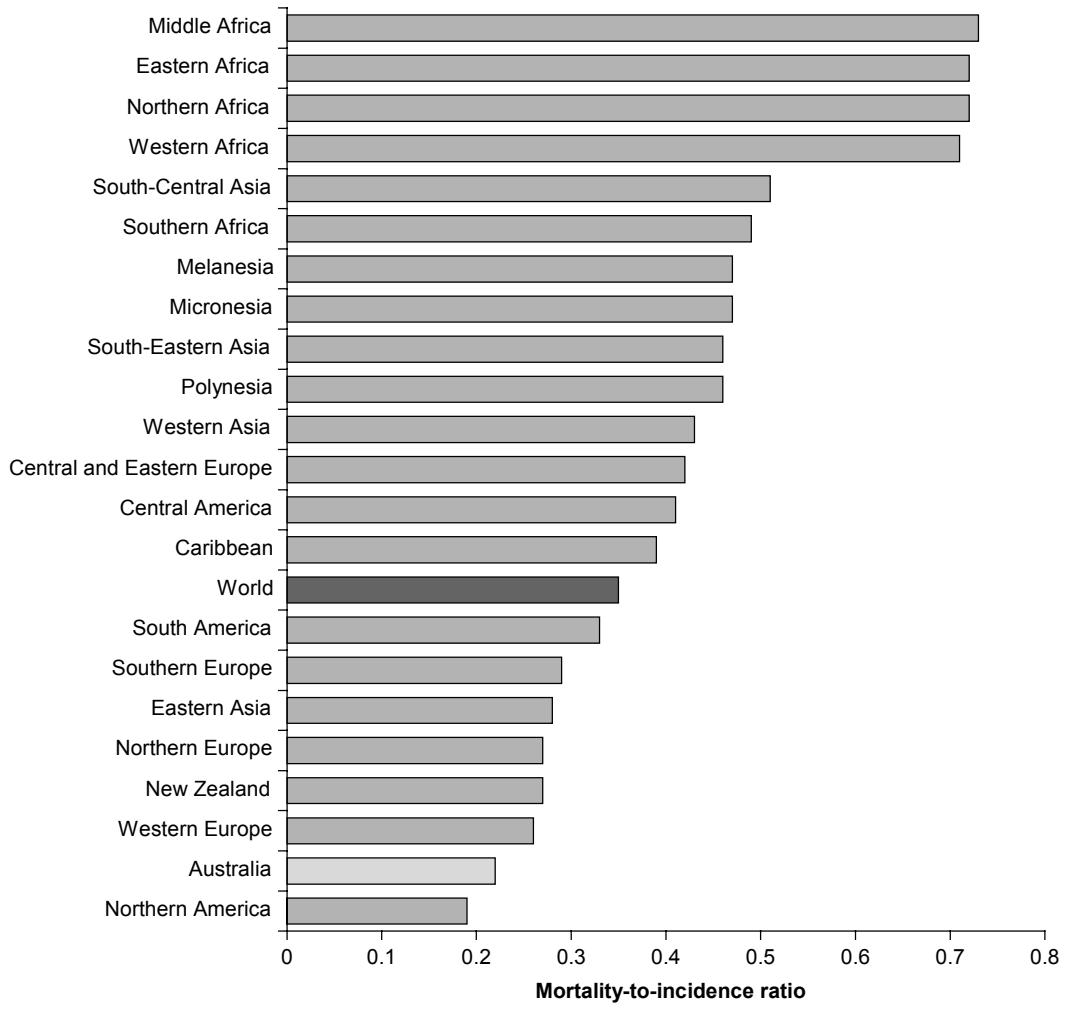
Although more rudimentary than relative survival estimates, a measure of cancer outcomes that is less fraught with difficulties when making international comparisons is the mortality-to-incidence ratio (MIR). This ratio describes how many deaths there were in a particular year due to a particular disease, relative to the number of new cases diagnosed that year (using age-standardised data). For example, a mortality-to-incidence ratio of 0.24 for breast cancer indicates that there were 24 deaths for every 100 new cases of breast 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 other countries, then the mortality-to-incidence ratio 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 lower (i.e. closer to zero). Appendix B provides further information on interpreting mortality-to-incidence ratios.

For this report, mortality-to-incidence ratios were calculated for women using data from GLOBOCAN (Ferlay et al. 2004). The fact that the GLOBOCAN data were estimates that pertain to 2002 should be taken into account when interpreting the results shown in Figure 4.4.

According to the 2002 GLOBOCAN data, the MIR for Australia was 0.22, suggesting that the survival of women in Australia who were diagnosed with breast cancer was very high relative to women in many other regions and countries. The MIR for women with breast cancer who lived in Northern American countries (i.e. the USA and Canada) was the lowest (0.19), indicating the best survival prospects. By comparison, the MIR for women with breast cancer in each of the African regions was 0.49 or higher, suggesting relatively poor survival. Overall, the MIR ratios suggest that there is a wide disparity around the globe in the survival of women with breast cancer, with Australia ranking favourably.

Survival by type of breast cancer

Five-year survival for 2000 to 2006 by histology group is shown in Figure 4.5. Survival is significantly lower than average for women where the type of breast cancer was 'Group 9: unspecified' (i.e. 5-year relative survival of 50%). At least part of this can be explained by



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 for this figure are shown in Appendix Table D4.4.

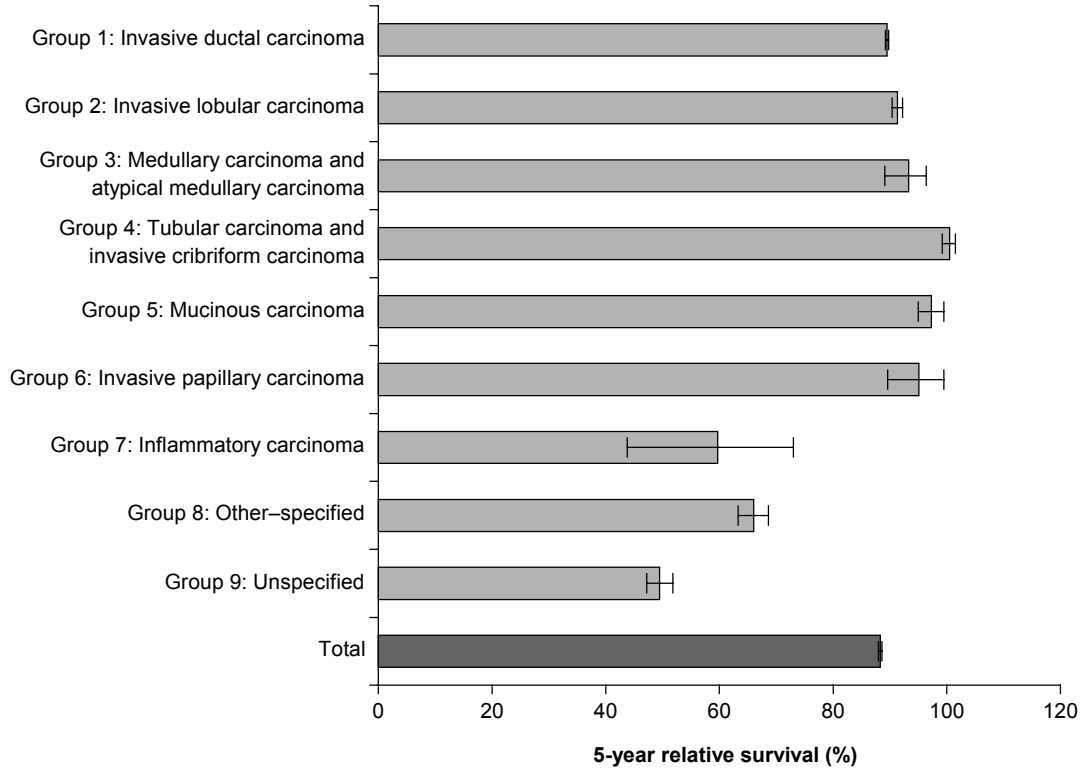
Source: Ferlay et al. 2004.

Figure 4.4: International comparison of mortality-to-incidence ratios for breast cancer, females, 2002

the fact that women with an 'unspecified' type of breast cancer tend to be older than average (as discussed in Chapter 2) and their prognosis tends to be poorer (as described previously in this chapter). This is examined further in Appendix Table D4.5 where 5-year relative survival is shown by age group for each of the nine histology groups.

Five-year relative survival was also significantly lower than average for women who were diagnosed with a breast cancer in 'Group 7: Inflammatory carcinoma' (60%) and in 'Group 8: Other specified types of breast cancer' (66%). Meanwhile, relative survival was estimated to be 101% for those with a breast cancer in 'Group 4: Tubular carcinoma and invasive cribriform carcinoma'. This suggests that the survival prospects of this group of women with breast cancer may be slightly better than for a comparable group of women in the general population. While this finding may be due to random variation, it may also be real, reflecting

different lifestyle choices (e.g. improved diet and increased physical activity), increased medical surveillance or other factors.



Notes

1. Appendix Table D2.6 provides a list of the histology types included in each group.
2. The data for this figure are shown in Table 4.1.

Source: Australian Cancer Database, AIHW.

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

Change over time in 5-year relative survival for each of the histology groups is shown in Table 4.1. A significant improvement is observed across each of the time periods in the relative survival estimates for women diagnosed with a breast cancer in 'Group 1: Invasive ductal carcinoma', with a 5-year survival estimate of 74% for the 1982 to 1987 period compared with a corresponding estimate of 90% for 2000 to 2006. Improvements over time in survival—and significant increases from the first to the last time period—were also observed for women diagnosed with breast cancers in the following groups:

- 'Group 2: Invasive lobular carcinoma' (from 79% to 91% 5-year relative survival)
- 'Group 5: Mucinous carcinoma' (from 85% to 97%)
- 'Group 3: Medullary carcinoma and atypical medullary carcinoma' (from 85% to 93%).

In contrast, the 5-year relative survival estimate for those with an 'unspecified' type of breast cancer (i.e. Group 9) decreased over the four time periods considered (from 59% to 50%). Substantial fluctuation in the 5-year relative survival estimates is seen over time for those cases diagnosed as 'Group 7: Inflammatory carcinoma'. Since there are few cases of this type of breast cancer in each of the periods, these survival estimates must be used with caution.

Table 4.1: Incidence and 5-year relative survival (RS) by type of breast cancer[(a)], females, 1982–1987 to 2000–2006

Type of breast 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
Group 1: Invasive ductal carcinoma	21,464	74.4	73.8–75.1	32,429	81.0	80.5–81.6	46,183	86.7	86.4–87.1	65,393	89.5	89.2–89.8
Group 2: Invasive lobular carcinoma	2,127	79.4	77.3–81.4	3,920	87.0	85.6–88.4	6,403	90.3	89.3–91.3	9,127	91.3	90.4–92.2
Group 3: Medullary carcinoma and atypical medullary carcinoma	660	84.5	81.0–87.6	618	85.8	82.4–88.8	449	92.4	88.9–95.2	389	93.3	89.1–96.4
Group 4: Tubular carcinoma and invasive cribriform carcinoma	268	98.8	94.2–102.1	965	98.6	96.5–100.3	1,653	99.0	97.6–100.2	1,789	100.5	99.2–101.5
Group 5: Mucinous carcinoma	646	85.1	80.5–89.3	834	94.4	91.0–97.5	1,168	96.8	94.1–99.2	1,642	97.3	95.0–99.5
Group 6: Invasive papillary carcinoma	186	94.2	86.5–100.3	216	88.8	81.2–95.1	236	96.8	90.4–101.8	379	95.1	89.6–99.5
Group 7: Inflammatory carcinoma	29	18.2	6.6–34.5	41	45.7	29.7–60.6	47	26.3	14.6–39.6	55	59.7	43.8–73.0
Group 8: Other—specified	5,176	67.5	66.0–69.0	3,498	68.1	66.3–69.9	1,901	63.8	61.3–66.2	1,853	66.0	63.3–68.6
Group 9: Unspecified	3,963	58.6	56.7–60.4	3,281	52.6	50.5–54.6	2,756	46.5	44.3–48.7	2,870	49.5	47.2–51.8
Total	**34,519**	**72.6**	**72.0–73.1**	**45,802**	**79.3**	**78.9–79.8**	**60,796**	**85.3**	**84.9–85.6**	**83,497**	**88.3**	**88.0–88.6**

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

Source: Australian Cancer Database, AIHW.

Survival by stage at diagnosis

Research in Australia (AIHW & NBCC 2007) and overseas (Michaelson et al. 2002) has uniformly shown that survival is considerably better for women diagnosed with small rather than large tumours. An Australian study examined the relative survival to 2006 of women who were diagnosed with breast cancer in 1997 and found that survival was significantly poorer for women with larger tumours at diagnosis (i.e. 30 mm or more) compared with those with smaller tumours. Specifically, 5-year relative survival was 98% for women with tumours of 10 mm in size or less and declined to 73% for women with cancers of 30 mm or more and to 49% for women with unknown tumour size at diagnosis (Table 4.2). In addition, the study found that survival was observed to be significantly higher for women whose lymph nodes were cancer-free (i.e. negative nodal status) compared with women whose cancer had spread to their lymph nodes (i.e. positive nodal status).

Table 4.2: Relative survival (RS) to 2006 by size of cancer and nodal status, females with breast cancer diagnosed in 1997

	1-year relative survival		5-year relative survival		9-year relative survival	
	RS (%)	95% CI	RS (%)	95% CI	RS (%)	95% CI
Size of cancer						
0–10 mm	99.6	99.0–100.0	98.2	96.9–99.4	96.0	94.2–97.7
11–15 mm	99.7	99.0–100.1	94.7	93.2–96.1	90.7	88.7–92.6
16–19 mm	99.6	98.6–100.3	93.0	90.6–95.1	87.7	84.6–90.7
20–29 mm	99.4	98.6–99.9	87.9	86.0–89.6	79.2	76.8–81.6
30+ mm	95.6	94.3–96.6	73.1	70.6–75.5	63.6	60.7–66.4
Unknown	74.0	71.1–76.6	49.1	45.7–52.5	39.0	35.5–42.5
Nodal status						
Nodes positive	97.7	96.9–98.3	80.2	78.5–81.7	69.7	67.7–71.6
Nodes negative	100.0	99.6–100.2	96.5	95.5–97.4	93.5	92.2–94.7
Unknown	87.2	85.6–88.6	70.7	68.4–72.9	63.4	60.8–66.0
Total	**96.3**	**95.8–96.7**	**85.6**	**84.7–86.4**	**79.3**	**78.2–80.4**

Source: AIHW & NBCC 2007.

While tumour size and nodal status are relevant to determining the stage of the tumour at diagnosis, they are insufficient for determining stage. Although no national data are available which allow one to calculate relative survival according to the stage of the breast cancer at diagnosis, other data—including state-based and overseas stage data—are available.

As mentioned in Chapter 2, the Queensland Cancer Registry holds sufficient data on stage to create a proxy measure of TNM stage (Youlden et al. 2009). These stage data indicate that in Queensland, survival is much higher for those women whose cancer was at a less advanced stage when diagnosed (Table 4.3). For the 2001 to 2006 period, 5-year relative survival for women in Queensland who were diagnosed with stage I breast cancer was 98%. This compares with 83% for those diagnosed at a more advanced stage (i.e. Stages II to IV) and 50% for those with an unknown stage at diagnosis.

Table 4.3: Five-year relative survival by stage at diagnosis[(a)], females, Queensland, 2001–2006

Stage at diagnosis[(a)]	Per cent of cases	Relative survival (%)[(b)]
Stage I	49	98
Stages II, III and IV	45	83
Unknown	6	50
Total	**100**	**89**

(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).

(b) The period method of calculating relative survival was used.

Source: Youlden et al. 2009.

Summary stage data available from New South Wales also allow for the examination of survival by stage. Since separate estimates for females were not published, the NSW relative survival estimates pertain to both males and females. However, the data for females will be virtually identical to the data shown, since 99% of those with breast cancer in NSW during the period considered were female.

The data from NSW present a similar picture to that observed with the Queensland data. That is, 5-year relative survival for people in NSW diagnosed with breast cancer between 1999 and 2003 was lowest for those with 'distant' breast cancer at diagnosis (41%) and highest for those with 'localised' tumour (97%) (Table 4.4). Note that, while still relatively low, 5-year relative survival for those in NSW with an 'unknown' stage at diagnosis (74%) was not as low as that observed for Queensland.

Table 4.4: Five-year relative survival by stage at diagnosis[(a)], people with breast cancer[(b)], New South Wales, 1999–2003

Stage at diagnosis[(a)]	Per cent of cases	Relative survival (%)[(c)]
Localised	53	97
Regional	33	86
Distant	5	41
Unknown	9	74
Total	**100**	**88**

(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).

(b) These data apply to males and females with the exception of the 'total' 5-year survival estimate which pertains to females only.

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

Source: Tracey et al. 2007.

Information from the United States of America (USA)—as shown in Table 4.5—provides further insights on survival by stage at diagnosis (Ries et al. 2008). These data again highlight the substantial difference in 5-year relative survival between those women who were diagnosed with a 'localised' breast cancer (98%) and those with a 'distant' tumour (27%). The data also suggest that those with an unknown tumour stage at diagnosis had a relatively poor 5-year survival (57%), although this seems more evident among those aged 50 years and over than those aged less than 50 years (53% and 71%, respectively). However there is a notable difference between the NSW and the USA 5-year survival estimates for distant stage

tumours, with a 41% survival estimate applying in NSW compared with 27% for the USA data.

Other countries which have published survival estimates by stage of breast cancer include the United Kingdom (Cancer Research UK 2003) and Canada (CCS & NCIC 2007). All of these data sources lead to the same well-recognised conclusion, that is, the stage at which breast cancer is diagnosed is an important determinant of survival, with the later the stage at diagnosis, the lower the survival estimate. Furthermore, the data show that survival is relatively poor for those with an 'unknown' stage at diagnosis.

Table 4.5: Five-year relative survival (RS) by stage at diagnosis[(a)] and age group, females with breast cancer, United States of America[(b)], 1996–2004

Stage at diagnosis[(a)]	<50 years		50+ years		All ages	
	% of cases	RS (%)[(c)]	% of cases	RS (%)[(c)]	% of cases	RS (%)[(c)]
Localised	54	95.5	63	98.9	61	98.1
Regional	39	83.1	28	84.2	31	83.8
Distant	5	33.9	6	24.8	6	27.1
Unknown	2	70.7	2	52.6	2	56.9
Total	**100**	**86.9**	**100**	**89.4**	**100**	**88.7**

(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 Ries et al. 2008:O-19).

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

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

Source: Ries et al. 2008.

Differences across groups

In this section of the report, differences in relative survival are discussed in relation to geographical area and socioeconomic status. The source for this information is a report prepared by the AIHW in 2008 (AIHW, CA & AACR 2008). The data for the analyses on geographical area pertain to women who were diagnosed with breast cancer between 1997 and 2004, while the analyses on socioeconomic status relate to diagnoses that occurred between 2000 and 2004. For both of these analyses, cases were followed to the end of 2006. Note that the method used to calculate the survival estimates does not include an adjustment for age; thus, differences in relative survival between groups may be affected by differing age structures. Further information about the approach used to calculate the relative survival estimates can be found in the 2008 report (AIHW, CA & AACR 2008).

Differences by geographical area

Cancer survival outcomes might vary according to the level of remoteness of where women live because of differences in:

- the age at which women are diagnosed with breast cancer
- the stage of the disease at diagnosis
- cancer histology type
- access to health services.

In addition, differences in relative survival across regions might be influenced by the population composition in these regions. For example, Aboriginal and Torres Strait Islander peoples are more likely than other Australians to live in *Remote* and *Very remote* areas. Given the higher proportion of Indigenous populations in more remote areas, relative survival from cancer is more strongly affected by the health status of Indigenous Australians in these areas than in more urban centres.

For the purposes of examining the effect on survival of level of remoteness of where women lived at diagnosis, the Australian Standard Geographical Classification Remoteness Area classification (ABS 2001) was used. As noted in Chapter 2, this classification divides all areas of Australia into five categories—namely, *Major cities*, *Inner regional*, *Outer regional*, *Remote* and *Very remote*. However, due to the relatively low population numbers in the *Remote* and *Very remote* areas, these two categories were combined for the present survival analyses.

The analyses indicated that there were no statistically significant differences by geographical area in the 1-year relative survival estimates (Table 4.6). However, there was such a difference in 5-year estimates—those Australian women diagnosed with breast cancer between 1997 and 2004 who lived in *Major cities* or *Inner regional* areas had a significantly higher 5-year relative survival proportion (both 88%) than did those who lived in *Outer regional* areas (85%). Note that 5-year survival estimates for remoteness areas by age group are shown in Appendix Table D4.6.

Table 4.6: Relative survival by remoteness area[(a)], females with breast cancer, 1997–2004

	1-year relative survival		5-year relative survival	
Remoteness area[(a)]	Relative survival (%)	95% confidence interval	Relative survival (%)	95% confidence interval
Major cities	97.2	97.0–97.3	87.7	87.3–88.1
Inner regional	97.1	96.8–97.4	87.6	86.9–88.2
Outer regional	96.8	96.4–97.3	85.3	84.3–86.4
Remote and Very remote	96.7	95.3–97.7	85.0	82.3–87.4

(a) Measured using the Australian Standard Geographical Classification Remoteness Area classification.

Source: AIHW, CA & AACR 2008.

Research findings on the relationship between survival estimates and remoteness tend to be inconsistent. Analyses of data from Victoria suggested no significant differences by remoteness (English et al. 2007). Analyses by the AIHW of national data for the 1992 to 1997 period indicated there were statistically significant differences by remoteness such that women with breast cancer who lived in 'Other remote areas' had a significantly lower age-adjusted relative survival proportion (80%) than those living in 'Capital cities' (83%) and 'Large rural centres' (84%) (AIHW & AACR 2003). Furthermore, analyses of Queensland data for 1997 to 2006 also indicated significant differences by remoteness area, with those living outside of a *Major city* having lower relative survival proportions (Youlden et al. 2009). The reasons for the different findings on the association between remoteness and survival from breast cancer are not clear. They could relate to differences in the approaches used to calculate the survival proportions (e.g. methods used, years covered, whether the data were age-adjusted and so forth) and/or actual differences over time and between different areas of Australia.

Differences by socioeconomic status

Areas with high socioeconomic status are predominantly located in cities, have good access to health services and have populations with generally above-average education and income. These factors are expected to be associated with earlier detection and treatment of cancer and, therefore, increased relative survival. In contrast, poor access to health services and lower levels of education and income in areas with low socioeconomic status might contribute to later cancer detection and less than adequate treatment, leading to lower cancer survival. In addition, cancer survival outcomes might vary across socioeconomic status levels because of differences in the age at diagnosis, extent of the disease at diagnosis and the cancer histology types associated with various socioeconomic status levels.

For breast cancers diagnosed between 2000 and 2004, the woman's area of residence was categorised according to the social and economic characteristics of those that lived in that area. As discussed in Chapter 2, this information was used as a proxy for the socioeconomic status of people living in those areas.

Significant differences by socioeconomic status are seen for both the 1- and 5-year relative survival proportions for women diagnosed with breast cancer between 2000 and 2004 (Table 4.7). Although the difference between the 1-year relative survival proportions for those living in areas with the lowest socioeconomic status (97%) and those living in areas with the highest socioeconomic status (98%) is small, the difference is statistically significant. Five-year relative survival was 90% for women with breast cancer living in areas with the highest socioeconomic status, while it was 86% for their counterparts who lived in areas with the lowest socioeconomic status. Appendix Table D4.7 provides 5-year survival estimates according to socioeconomic status and age group.

Table 4.7: Relative survival by socioeconomic status[(a)], females with breast cancer, 2000–2004

	1-year relative survival		5-year relative survival	
Socioeconomic status[(a)]	Relative survival (%)	95% confidence interval	Relative survival (%)	95% confidence interval
1 (lowest)	96.6	96.2–97.0	86.1	85.1–87.0
2	97.0	96.6–97.4	87.4	86.5–88.3
3	97.1	96.7–97.5	88.2	87.4–89.1
4	97.6	97.2–97.9	88.9	88.0–89.7
5 (highest)	97.7	97.3–98.0	90.0	89.2–90.7

(a) Measured using the ABS Socio-Economic Index for Areas (SEIFA) Index of Relative Socio-economic Disadvantage.

Source: AIHW, CA & AACR 2008.

Statistically significant differences according to socioeconomic status were also observed in the survival analyses by the AIHW with data for 1992 to 1997 (AIHW & AACR 2003). Those data led to the same conclusion—5-year survival was higher for those who lived in the areas of highest socioeconomic status (85%) compared with those who lived in the areas of lowest socioeconomic status (81%). Since neither the 2009 Queensland report (Youlden et al. 2009) nor the 2007 Victorian report (English et al. 2007) included survival analyses by socioeconomic status, comparisons cannot be made with findings for those states. However, an earlier report using Queensland data from 1996 to 2002 did look at this topic. In that report, a modified Index of Relative Socio-economic Disadvantage was used such that survival from breast cancer was compared for three groups of women: 'Affluent' (which included the 10% of people in the areas that had the highest socioeconomic status);

'Disadvantaged' (which included the 10% that had the lowest socioeconomic status); and 'Middle' (which included the remaining 80%). Although the expected direction of effect was found (i.e. 88% 5-year relative survival for those in the 'Affluent' group compared with 85% for those in the 'Disadvantaged' group), the differences by socioeconomic status were not statistically significant (Baade et al. 2005). As was noted in relation to remoteness levels, the disparate findings across studies may be due to differences in methodology (and in particular, in this case, the way in which the measure of socioeconomic status was categorised) or actual differences across time or geographical areas.

Differences by Aboriginal and Torres Strait Islander status

As noted earlier in this chapter, relative survival proportions cannot be calculated according to Indigenous status due to data issues and the lack of necessary life tables. However, 5-year *crude* survival estimates can be derived and these are shown in Table 4.8. Note that these estimates show survival from death from any cause (not from breast cancer death specifically). Past research has shown that the life expectancy of Indigenous women is shorter than that of non-Indigenous women (ABS 2004, 2009e) which would predispose them to lower crude survival estimates in this study. The data apply to women in four Australian states and territories (Queensland, Western Australia, South Australia and the Northern Territory) for the period 2002 to 2006. While data by age group are also shown, the relatively small number of Indigenous women in each age group (especially in the age group of women 70 years and over) should be considered when making use of these data.

Based on the crude survival estimates for breast cancer diagnosed between 2002 and 2006, the data suggest that in the four jurisdictions considered, 5-year crude survival was significantly lower for Indigenous women (65% survival) than non-Indigenous women (82% survival) who were diagnosed with breast cancer.

Table 4.8: Five-year crude survival (CS) by Indigenous status and age group, females, Queensland, Western Australia, South Australia and the Northern Territory, 2002–2006

Age group (years)	Indigenous			Non-Indigenous		
	No. of cases	CS (%)	95% CI	No. of cases	CS (%)	95% CI
<50	87	72.2	58.9–81.9	5,033	88.8	87.7–89.8
50–59	68	62.1	46.4–74.5	5,590	88.4	87.4–89.4
60–69	48	62.6	43.9–76.6	4,693	87.5	86.4–88.6
70+	31	51.2	26.4–71.5	4,848	62.1	60.5–63.6
All ages	**234**	**64.7**	**56.6–71.7**	**20,164**	**82.0**	**81.3–82.6**

Source: Australian Cancer Database, AIHW.

Survival of males with breast cancer

For males diagnosed with breast cancer during 2000 to 2006, 1-year relative survival was 96% (Table 4.9). This is not significantly different from the 97% observed for women (see Table D4.1). However, when 5-year survival estimates are considered, survival estimates were significantly lower for men than women diagnosed with breast cancer in 2000 to 2006 (82%

and 88%, respectively), indicating that the prognosis for males diagnosed with breast cancer is poorer than for their female counterparts.

It is difficult to compare these findings for males with other research results since most studies have only considered survival of females from breast cancer (e.g. English et al. 2007; Ries et al. 2008; Tracey et al. 2007; Youlden et al. 2009). However, an exception is a study using USA data from 1973 to 1998 which indicated that relative survival for men was worse than that for women largely because men were more likely to be diagnosed with breast cancer at a later stage, with larger tumours and with more frequent lymph node involvement (Giordano et al. 2004). Within individual stage categories, survival differences by sex were no longer evident. The lack of national data on stage at diagnosis in Australia means that it cannot be determined whether the same would hold true in Australia.

Table 4.9: Relative survival (RS) by period of diagnosis, males with breast cancer, 1982–1987 to 2000–2006

	1982–1987		1988–1993		1994–1999		2000–2006	
Years after diagnosis	RS (%)	95% CI	RS (%)	95% CI	RS (%)	95% CI	RS (%)	95% CI
1	91.4	87.2–94.6	92.9	89.2–95.7	94.4	91.2–96.7	96.1	93.8–97.9
5	78.9	72.0–85.1	79.7	73.4–85.4	81.6	76.2–86.5	82.3	77.4–86.7
10	65.3	56.7–73.7	65.9	57.9–73.7	73.0	66.1–79.6	. .	. .
15	56.2	46.4–66.4	62.9	53.4–72.5	56.5	41.2–72.3	. .	. .

Source: Australian Cancer Database, AIHW.

Change over time in relative survival for men is also presented in Table 4.9. Although some improvements are seen—for example, 5-year relative survival increased from 79% to 82% from the first to the last period considered—these differences were not statistically significant.