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Health and Welfare**

BreastScreen Australia monitoring report 2012–2013

BreastScreen
AUSTRALIA

A joint Commonwealth/State and Territory Program

CANCER SERIES NO. 95



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*Authoritative information and statistics
to promote better health and wellbeing*

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Abbreviations

ABS	Australian Bureau of Statistics
ACD	Australian Cancer Database
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
CI	confidence interval
DCIS	ductal carcinoma in situ
IRSD	Index of Relative Socio-economic Disadvantage
NAS	National Accreditation Standards
NMD	National Mortality Database
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
RA	remoteness area
SA	South Australia
SEIFA	Socio-Economic Indexes for Areas
Tas	Tasmania
Vic	Victoria
WA	Western Australia

Summary

BreastScreen Australia is the national breast cancer screening program. It aims to reduce illness and death from breast cancer through an organised approach to the early detection of breast cancer, using screening mammography to detect unsuspected breast cancer in women. Detection at an early stage provides an opportunity for early treatment, which can reduce illness and death. Women aged 40 and over are eligible for free mammograms every 2 years.

This report is the latest in the *BreastScreen Australia monitoring report* series, which is published annually to provide regular monitoring of national participation and performance of BreastScreen Australia. The report presents preliminary participation data for 2013–2014 and final data for 2012–2013, as well as the latest available data on incidence and mortality.

As part of the 2013–14 Federal Budget, the Australian Government committed \$55.7 million over 4 years to expand BreastScreen Australia's target age range from 50–69 to 50–74 from 1 July 2013. However, most data in 2012–2013 were collected when only women aged 50–69 were actively targeted, which makes it the appropriate target age group for this report.

The following statistics refer to the latest data available for women aged 50–69.

Breast cancer is the most common cancer diagnosed in Australian women

In 2011, there were 7,499 new cases of invasive breast cancer diagnosed in Australian women aged 50–69. This is equivalent to just under 300 new cases per 100,000 women, and makes breast cancer the most common cancer affecting Australian women.

Incidence has remained steady at around 300 per 100,000 women for over a decade.

In 2012, 1,126 women aged 50–69 died from breast cancer, which is equivalent to 44 deaths per 100,000 women. This makes breast cancer the second-most common cause of cancer-related death for Australian women.

Breast cancer mortality fell from 68 deaths per 100,000 women in the target age range in 1991 (when BreastScreen Australia began) to 42 per 100,000 women in 2012 (age-standardised).

Incidence of breast cancer was lower for Indigenous women than for non-Indigenous women at 203 compared with 271 new cases per 100,000 women, but mortality from breast cancer was higher at 48 compared with 44 deaths per 100,000 women (all rates age-standardised).

More than half of targeted women participate in BreastScreen Australia

In both 2012–2013 and 2013–2014, more than 1.4 million women aged 50–69 had a screening mammogram through BreastScreen Australia, which is around 55% participation.

Participation of Aboriginal and Torres Strait Islander women was lower at 36% in 2012–2013.

Participation has been 54% or 55% for all years between 2010–2011 and 2013–2014.








Some women are recalled for further investigation

In 2013, 12% of women screening for the first time and 4% of women attending subsequent screens were recalled for further investigation. These rates are slightly higher than for 2012.




More than half the cancers detected by BreastScreen Australia are small

Small breast cancers (≤ 15 mm in diameter) tend to be associated with more treatment options and improved survival. In 2013, a high proportion of invasive breast cancers detected were small: 46% of invasive breast cancers detected in those attending their first screen, and 61% in those attending subsequent screens. These are similar to the figures for 2012.

Report card

	Latest data	Previous data	Recent trend (last 3–5 years)	
Participation	53.7% in 2013–2014 <i>(preliminary)</i>	54.6%	Continuing trend with slight fall from 55% to 54%	
	54.4% in 2012–2013 <i>(final)</i>	54.8%		
Rescreening				
After first screening round	59.6%	58.3%	Steady at just under 60%	
After second screening round	67.8%	67.8%	Steady at around 68%	
After subsequent screening rounds	81.6%	82.8%	Steady at around 82%	
Women recalled for further investigation				
First screening round	11.6%	10.8%	Continuing trend with slight rise from 11% to 12%	
Subsequent screening rounds	3.9%	3.4%	Steady at around 4%	
Detection of invasive breast cancer				
First screening round	107.9	103.6	Rising from 80 to 108	
Subsequent screening rounds	47.6	43.9	Rising from 44 to 48	
Small breast cancer detection	30.4	28.2	Steady at around 30	
Detection of DCIS				
First screening round	29.2	22.8	Rising from 20 to 29	
Subsequent screening rounds	12.8	11.0	Rising from 12 to 13	
Incidence in 2011	292.8	301.2	Steady at around 300	
Mortality in 2012	42.4	44.0	Falling from 47 to 42	

Report card uses age-standardised rates where available to aid in comparison of trends. All data shown are for women aged 50–69. 'Previous data' refers to the previous calendar year except for participation which is measured over 2 calendar years, and for which 'previous data' refers to the previous non-overlapping 2-year period (for instance, if 'latest data' refers to 2013–2014, then 'previous data' refers to 2011–2012). Data for detection of invasive breast cancer and ductal carcinoma in situ (DCIS) are 'per 10,000 women screened'; data for incidence and mortality are 'per 100,000 women in the population'.

 Green light: positive trend – all is well.  Amber light: trend slipping in an unfavourable direction – keep an eye on this.  Red light: unfavourable trend – may be cause for concern/require further investigation or monitoring.

Navigating changes in this report

Regular users of this annual monitoring report will notice that the *BreastScreen Australia monitoring report 2012–2013* looks a little different to the previous report *BreastScreen Australia monitoring report 2011–2012*. The same data are presented, along with much of the same supporting information, but the structure and format have changed. Therefore this ‘map’ has been provided to aid regular users in the navigation of this report to ensure they are still able to find the data and information they require.

Where are all the data tables?

All the data tables that were previously interspersed amongst the text of each performance indicator chapter now appear together in Appendix A. These tables appear in the same order, and are numbered according to the performance indicator (for example, participation data tables, being indicator 1, are numbered from A1.1 to A1.8, and rescreening tables are numbered from A2.1 to A2.3), so that regular users can still access the detailed data as usual.

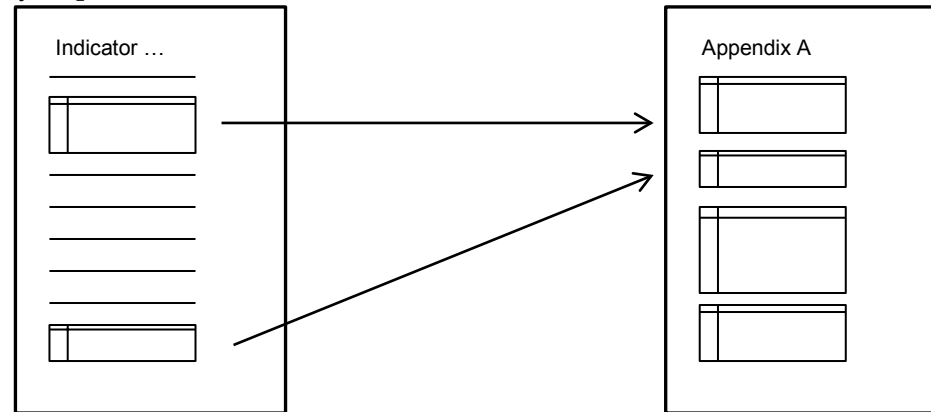
Why are fewer data being reported?

Regular users will also notice that the sections that report on data are shorter and described differently. Whereas there used to be a chapter for each performance indicator, with every result for every disaggregation reported, only selected results appear in this report, with a focus on the most important findings – the ‘story’ of what occurred in BreastScreen Australia in 2012–2013. Further, data from different performance indicators have been incorporated into a single chapter so that data can be discussed in context, rather than isolation. This means that participation and rescreening data are reported together in a chapter called *Screening behaviour*, interval cancer and program sensitivity data are reported together in a section called *Sensitivity of the screening test*, and recall to assessment, breast cancer detection and DCIS detection data are reported in a section called *Detection of breast cancer and ductal carcinoma in situ (DCIS)*. The overall aim of these changes is to have key information easy to find while removing any repetition or redundancy in the text that might mask key findings.

Note that the fact that some data are not reported does not imply these are not important to monitor; all data are analysed and monitored.

Where has the information from the introduction gone?

The introductory section is now much shorter, but key information has been retained and, rather than appearing at the beginning of the report, is now dispersed within the relevant sections of the text, glossary and appendixes.

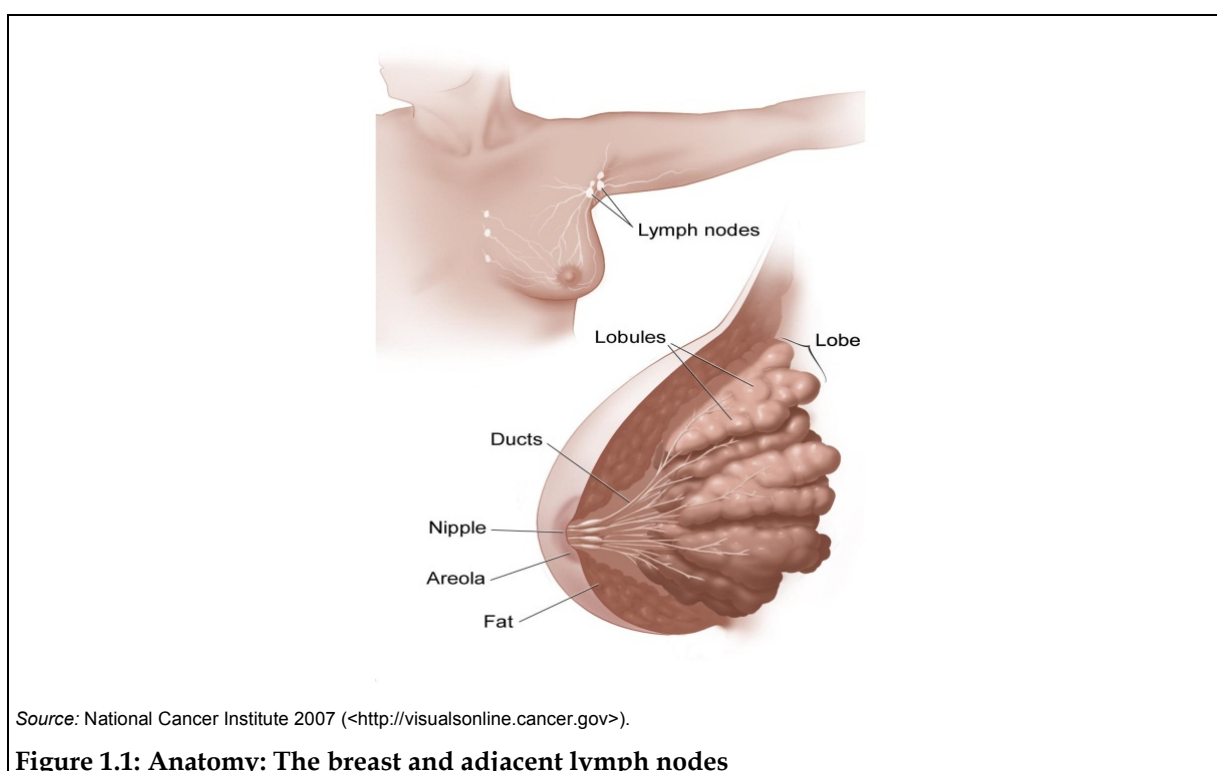


1 Introduction

1.1 Breast cancer

Cancer is a group of several hundred diseases in which abnormal cells are not destroyed naturally by the body but instead multiply and spread out of control. Cancers are distinguished from each other by the specific type of cell involved and the place in the body in which the disease began.

Breast cancer most commonly originates in the ducts of the breast (which carry milk from the lobules to the nipple) but can also originate in the lobules (small lobes of the breast that produce milk). More rarely, breast cancer can originate in the connective tissue of the breast. The arrangement of breast tissue is illustrated in Figure 1.1.



Worldwide, breast cancer is the most common cancer affecting women, representing one in four of all cancers in women. The incidence of breast cancer differs worldwide, with this disease being far more common in more developed countries compared with developing countries (although as less developed countries become more developed, a shift towards the lifestyles of developed countries brings an increase in cancers that have reproductive, dietary and hormonal risk factors, of which breast cancer is one) (UICC 2014).

Breast cancer is the most commonly diagnosed cancer in Australian women (excluding basal and squamous cell carcinoma of the skin), comprising 27% of all female cancers, and with an incidence rate of around 115 new cases per 100,000 women (AIHW 2014). It is second only to lung cancer in cancer deaths in Australian women (AIHW 2014).

For more information on breast cancer, see the Cancer Australia website, <www.canceraustralia.gov.au>.

1.2 Age is the greatest risk factor for breast cancer

It is not known what causes breast cancer; however, several risk factors have been identified that may increase the chance of a woman developing breast cancer. Having a risk factor does not mean that a woman will get breast cancer – many women who have risk factors never develop breast cancer.

The greatest risk factor for breast cancer is **age**, with most breast cancers occurring in women over the age of 50. Indeed, 77% of all breast cancers diagnosed in 2011 in Australia were in women aged 50 years and over.

Certain reproductive or hormonal factors may also increase a woman's risk of developing breast cancer, including not having carried or given birth to any children (or to fewer children), older age at birth of first child, younger age at menarche and older age at menopause. Oral contraception use can cause a small increase in the risk of breast cancer, as can hormone replacement therapy, which causes an increase in risk consistent with late menopause (De et al. 2010; McPherson et al. 2000).

A **family history** of breast cancer can also increase a woman's risk, although most women who develop breast cancer do not have a family history of the disease – 8 out of 9 women who develop breast cancer do not have a mother, sister, or daughter with breast cancer (Breast Cancer Network Australia 2013).

Family history can be split into three categories (Cancer Australia 2015a):

- 'At or slightly above average risk' which covers more than 95% of the female population, and includes women with no family history as well as women with a weak family history (such as one first degree relative diagnosed with breast cancer at age 50 or older). Nine out of ten women in this group will not develop breast cancer.
- 'Moderately increased risk' which covers less than 4% of the female population, and includes women with a strong family history (for instance, one first degree relative diagnosed with breast cancer under the age of 50).
- 'Potentially high risk' which covers less than 1% of the female population, and includes women with a very strong family history (for instance, two first or second degree relatives on one side of the family diagnosed with breast or ovarian cancer plus one of a range of additional factors on the same side of the family, such as an additional breast cancer diagnosed before the age of 40, or breast cancer in a male relative).

See *Advice about familial aspects of breast cancer and epithelial ovarian cancer: a guide for health professionals* (Cancer Australia 2015a) for more information about assessing individual risk and advice.

Women with a **BRCA1 or BRCA2 mutation** have a higher risk of developing breast cancer compared with the general population in all age groups. Women who carry a fault in BRCA1 or BRCA2 have a high lifetime risk of breast cancer, estimated to be in the range of 30–60%, and a lifetime ovarian cancer risk of about 20% (Cancer Australia 2015b).

Women with **dense breasts** are also at an increased risk of developing breast cancer – around 3–5 times higher for women with the most dense breasts compared with women with the least dense breasts. Other risk factors associated with breast cancer include a higher body mass index (BMI), exposure to X radiation and gamma radiation, and consumption of alcoholic beverages (Cancer Research UK 2014).

The only factor protective against breast cancer is breastfeeding (WCRF/AICR 2007).

1.3 Screening can detect breast cancer early

In Australia, population-based breast cancer screening is available through BreastScreen Australia, which targets women aged 50–74 for 2-yearly screening mammograms (women aged 40–49 and 75 years and over are also eligible to attend, but are not actively targeted).

As with all population-based breast cancer screening programs, BreastScreen Australia aims to reduce morbidity and mortality from breast cancer by using screening mammograms to detect unsuspected breast cancers in women who have no symptoms and therefore would not otherwise know they had the disease. Detection of breast cancers at an early stage allows access to diagnostic and treatment services early, so that the woman can benefit the most from available treatments for breast cancer. Treatment options and survival are both increased when breast cancer is detected when it is small.

Mammography is the only means of population-based screening shown to reduce breast cancer mortality, and is recommended as a population-based screening tool by Cancer Australia (Cancer Australia 2009).

In screening mammography, two views are taken of each breast, and the images are reviewed by radiologists to look for suspicious characteristics that require further investigation. Screening mammography, like the screening tests used in other programs such as bowel and cervical screening, is not intended to be diagnostic; rather, it aims to identify people who are more likely to have breast cancer, and therefore require further investigation from diagnostic tests.

Screening mammograms work well in older women because breasts become less dense as women get older, particularly after menopause, which is why mammograms become more effective as women get closer to age 50. Incidence of breast cancer is also much higher, with more than 75% of breast cancers occurring in women aged 50 and over.

Mammographic screening is not recommended for women younger than 40. This is because breast tissue in premenopausal women tends to be dense, which can make it difficult to correctly identify the presence of breast cancer with mammography. The reduced accuracy of mammography in younger women produces a high risk of false positive and false negative results, which would result in a high number of unnecessary investigations and missed breast cancers (Irwig et al. 1997).

Box 1.1: Women aged 40 and over are the focus of this report, but it is important for people of all ages to be breast-aware

As women aged 40 and over are eligible for breast cancer screening through BreastScreen Australia, these women are the focus of this report. However, even though screening mammography is not recommended for women under the age of 40, young women can and do develop breast cancer. More rarely, men of any age can also develop breast cancer.

Therefore, **it is important for people of all ages to be aware of how their breasts normally look and feel and promptly report any new or unusual changes** to their general practitioner. More information about breast cancer diagnosed in women aged under the age of 40 can be found in *Breast cancer in young women: key facts about breast cancer in women in their 20s and 30s* (AIHW 2015a).

More information about breast cancer in men can be found at <http://breastcancerinmen.canceraustralia.gov.au>.

Screening mammography decreases mortality from breast cancer

Lower morbidity from breast cancer is achieved by detecting cancers when they are small, as small breast cancers tend to be associated with increased treatment options (NBOCC 2009). Consistent with this, it has been shown that 58% of breast cancers detected by BreastScreen Australia are small, compared with just 28% of breast cancers detected outside BreastScreen Australia (NBOCC 2009). Further, treatment of breast cancers detected by BreastScreen Australia is more likely to be breast-conserving surgery (74% compared with 56% outside the program) (NBOCC 2009), which is associated with decreased morbidity.

Mortality benefits from breast cancer screening are also due to the detection of breast cancers when they are small, as it has been shown that finding breast cancers when they are small leads to improved survival (AIHW & NBCC 2007). In 2009, in a comprehensive evaluation of BreastScreen Australia, it was estimated that breast cancer mortality had been reduced by 21–28% as a result of breast cancer screening (BreastScreen Australia EAC 2009), and in 2010, it was estimated that 8.8 and 5.7 breast cancer deaths were prevented per 1,000 women screened using data from the Swedish Two-Country Trial and England's breast cancer screening program, respectively (Duffy et al. 2010).

In 2015, the International Agency for Research on Cancer (IARC) conducted a full review of available high-quality observational studies, to ensure that the evidence that showed a sufficient reduction in mortality from screening mammography compiled in 2002 (IARC 2002) was still relevant today. The study determined that women aged 50–69 who attended breast cancer screening using screening mammography had about a 40% reduction in the risk of death from breast cancer, with a substantial reduction in the risk of death also observed in women aged 70–74 (IARC 2015). These mortality benefits align with the women targeted by BreastScreen Australia (that is, those aged 50–74).

Box 1.2: 'Overdiagnosis' of breast cancer by BreastScreen Australia

It is likely that some breast cancers detected through BreastScreen Australia may never have progressed to a stage where they would have been diagnosed during a woman's lifetime. Detection of these cancers is sometimes referred to as 'overdiagnosis'.

It is estimated that *for every 1000 women in Australia who are screened every two years from age 50 to age 74, around 8 (between 2 and 21) breast cancers may be found and treated that would not have been found in a woman's lifetime* (Cancer Australia 2014). However, it is currently not possible to predict precisely which breast cancers would have progressed and which would not have progressed during a woman's lifetime.

Given these facts, the possibility of 'overdiagnosis' should not dissuade women from participating in breast cancer screening through BreastScreen Australia.

For further information, please refer to the position statement endorsed by the Australian Health Ministers' Advisory Council Standing Committee on Screening, Cancer Council Australia and the Royal Australian and New Zealand College of Radiologists, and supported by the Cancer Australia Advisory Council, which can be found at <http://canceraustralia.gov.au/publications-and-resources/position-statements/overdiagnosis-mammographic-screening> (Cancer Australia 2014).

2 Recent change to the target age range of BreastScreen Australia

2.1 Women aged 50–74 now targeted

As part of the 2013–14 Federal Budget, the Australian Government committed \$55.7 million over 4 years to expand BreastScreen Australia’s target age range from 50–69 to 50–74, resulting in a change to the age group actively targeted for 2-yearly screening mammograms.

This means that, from 1 July 2013, women aged 70–74 began being actively targeted by BreastScreen Australia, along with women aged 50–69.

Both the funding and the targeting activities associated with increasing the target age range by 5 years are being phased in over several years, with full implementation expected by 2016–17. This means that participation of women aged 70–74 is likely to increase until 2016–17, and thereafter be relatively stable (as illustrated in Figure 2.1 below).

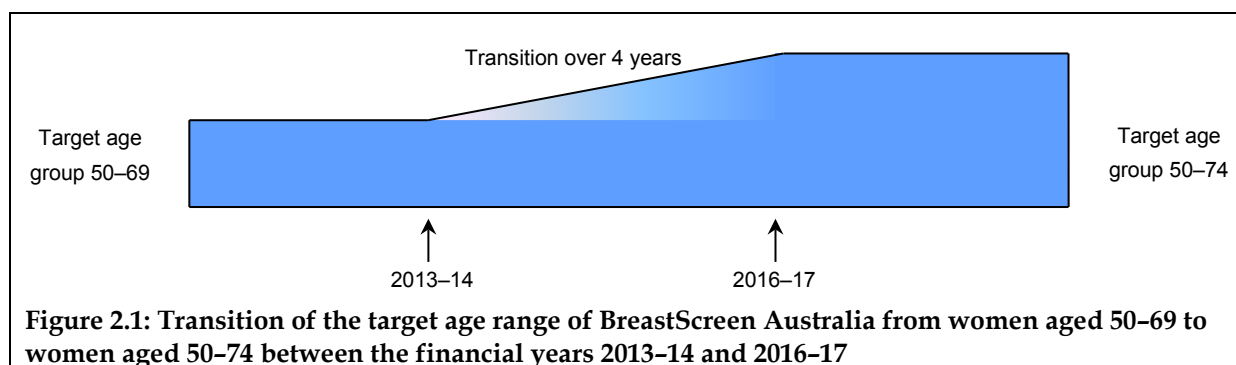


Figure 2.1: Transition of the target age range of BreastScreen Australia from women aged 50–69 to women aged 50–74 between the financial years 2013–14 and 2016–17

2.2 Changes to reporting

In order to report participation in a way that incorporates the new target age range yet is also comparable with previous years (and is thus a useful measure of performance), participation will be reported for both target age groups, women aged 50–69 and women aged 50–74, for several years, until the change has been fully implemented.

The timing of commencement of this co-reporting has been considered carefully, as there is a discord between the implementation of the change in target age range (based on financial years to align with funding) and the reporting of participation data which are measured over two calendar years (from 1 January of the first year to 31 December of the second year).

The plan for reporting the new target age group of BreastScreen Australia is detailed in Box 2.1. This report, which covers the two calendar years 2012–2013, uses the target age group of 50–69 as the target age range of BreastScreen Australia because the majority of the data that appear in this report were collected when only women aged 50–69 were actively targeted.

Box 2.1: Reporting BreastScreen Australia's new target age group

The following is a brief summation of the plan for reporting from 2012–2013 onward:

- Participation for 2012–2013 (1 January 2012 to 31 December 2013) will be reported for women aged 50–69 only, as there will be at most 6 months (from 1 July 2013 to 31 December 2013) in which women aged 70–74 were also actively targeted.
- Participation for 2013–2014 (1 January 2013 to 31 December 2014) will be reported for women aged 50–69 only, as there will be at most 18 months (from 1 July 2013 to 31 December 2014) in which women aged 70–74 were also actively targeted.
- Participation for 2014–2015 (1 January 2014 to 31 December 2015) onwards will be reported for both women aged 50–69 and women aged 50–74, as these reporting periods overlap completely with the implementation of the new target age range.

3 Monitoring BreastScreen Australia using program data

3.1 Screening behaviour

Screening behaviour in this report refers to participation in BreastScreen Australia (screening) and whether or not women return at 2-yearly intervals (rescreening).

Note that these data do not include any screening mammography performed outside BreastScreen Australia (screening mammography is available through Medicare for women at higher risk of breast cancer, and mammograms are also undertaken in private clinics).

Screening

Participation is a major indicator of the performance of BreastScreen Australia, as high attendance for screening by women in the target age group maximises the reductions in mortality from breast cancer. Participation is measured as the percentage of women in the population aged 50–69 screened by BreastScreen Australia over 2 calendar years (Box 3.1).

Box 3.1: Participation is measured over 2 calendar years

Participation is measured over 2 years to align with the 2-year recommended screening interval, as most women will only screen once within a 2-year period. A consequence of measuring participation over 2 years on an annual basis is that there are 'rolling' participation rates, in which there is an overlap of 1 calendar year between any 2 consecutive rates. Because of this, the participation rate for a 2-year reporting period is often compared with the previous non-overlapping rate.

Preliminary participation data are released in July each year, with final comprehensive participation data published in this report. The latest preliminary participation data are for the two-year period 2013–2014, and the latest final participation data are for 2012–2013.

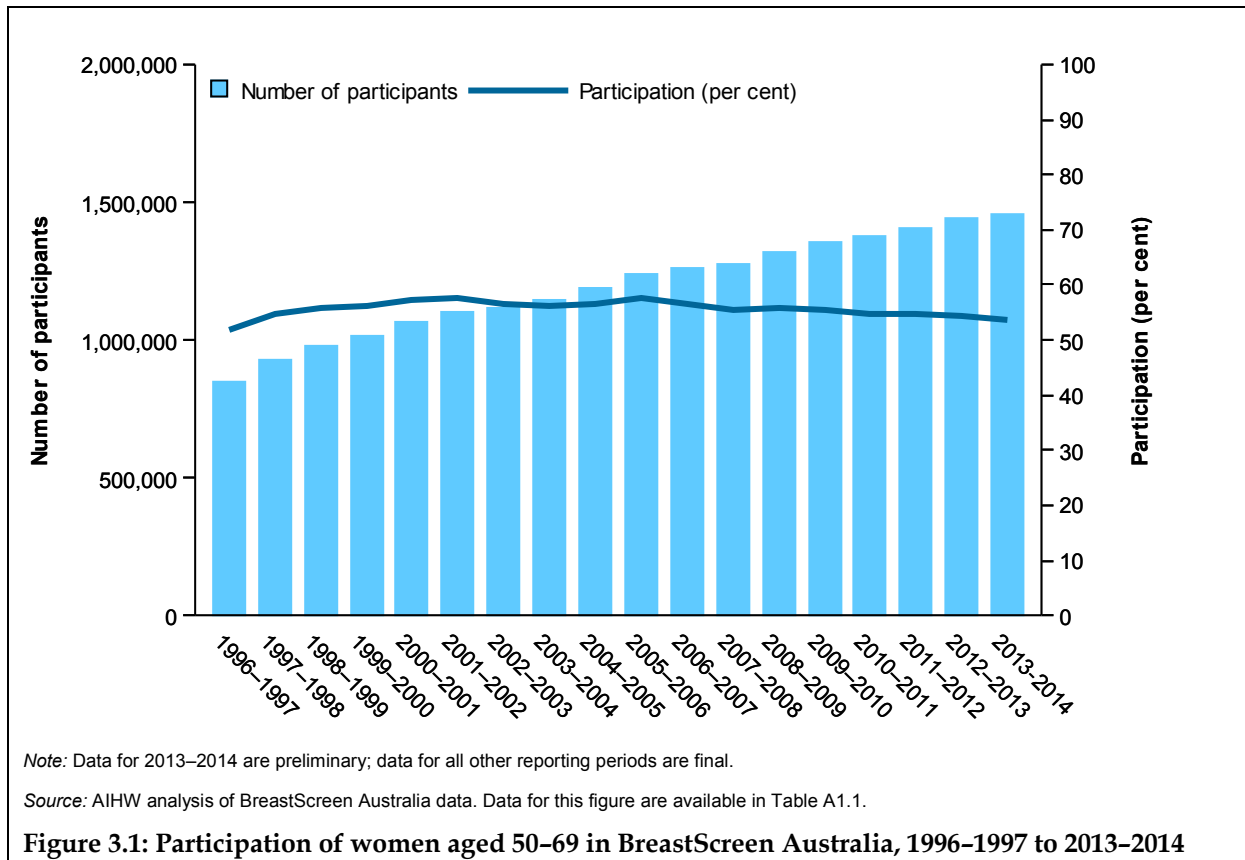
In 2012–2013 and 2013–2014, the number of women aged 50–69 who participated in BreastScreen Australia was 1,439,748 and 1,456,830 respectively, which is 54.9% and 54.2% of the population, respectively.

Participation rates for 2012–2013 and 2013–2014 have also been age-standardised to 54.4% and 53.7%, respectively, which are the rates used when comparing participation (and other measures of performance) over time or across population subgroups, such as states and territories, remoteness areas and socioeconomic status groups (see Box 3.2).

Box 3.2: Crude versus age-standardised rates

This report presents crude and age-standardised rates. Crude is the 'true' proportion or rate, and is appropriate when a single year or reporting period is reported (for example, crude participation in 2012–2013 was 54.9%). However, comparisons over time or across states/territories or population subgroups require that crude rates are age-standardised to remove underlying differences in age-structure over time or between groups. These allow analysis of trends and differentials, and are therefore preferentially reported in these situations (for example, the age-standardised participation rate in 2012–2013 was 54.4%).

Using the age-standardised rates allows us to see that participation in these latest years is similar to the participation in previous 2-year periods, as indicated by the dark blue line in Figure 3.1. This figure also shows that the number of women screened in each 2-year period (as indicated by the light blue columns) increases steadily from year to year.



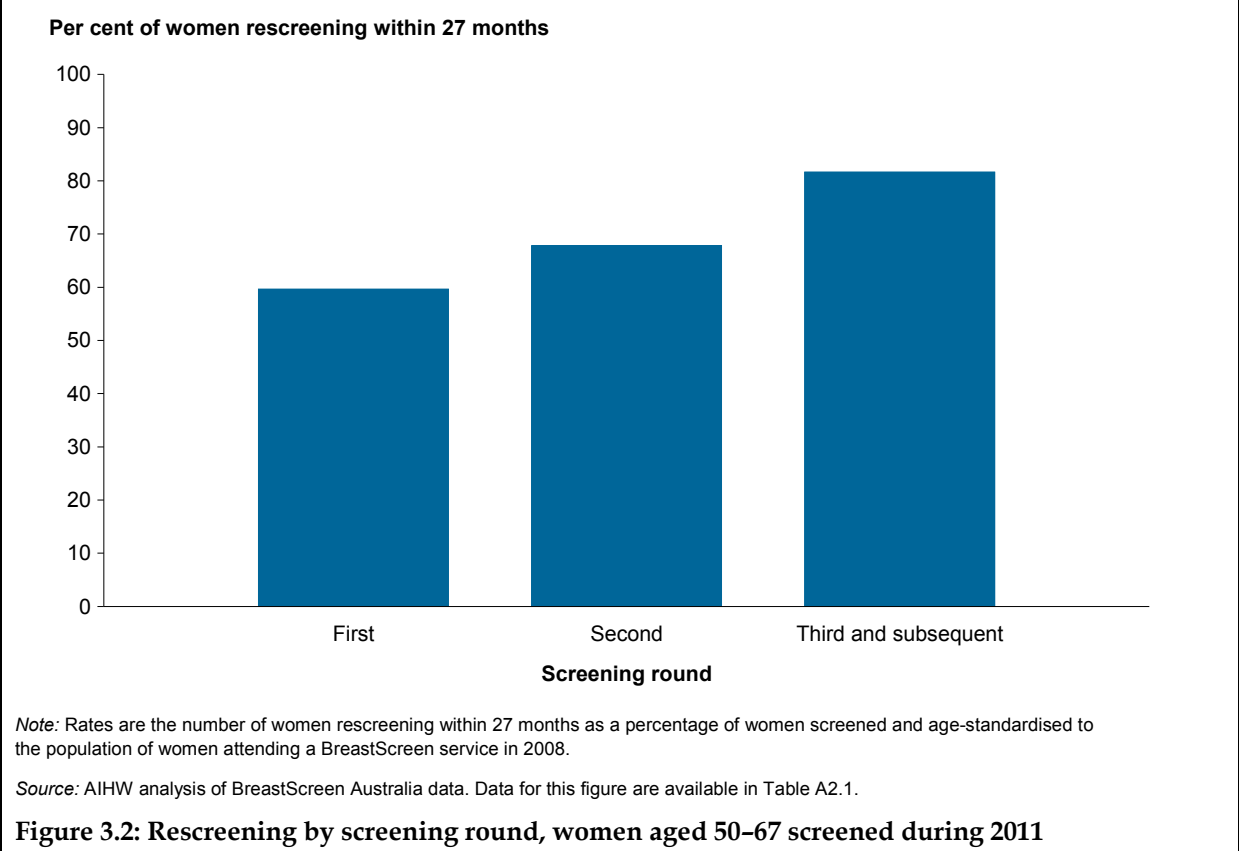
Rescreening

As well as the proportion of women who screen in each 2-year period, the proportion of women who return for a rescreen is also monitored. It is important that women rescreen according to BreastScreen Australia’s recommended screening interval of 2 years, as it has been shown that screening intervals longer than 2 years reduce mortality benefits from screening and result in an increase in interval cancers (BreastScreen Australia 2004). This is because increased time between screening may allow a tumour to grow to the point where symptoms become evident, thus eliminating the advantage of screening.

Although the recommended screening interval is 2 years (24 months), 27 months is used to allow a reasonable time frame for women to respond to invitations. The target age group used for rescreening is 50–67 rather 50–69, because women aged 68–69 at the age of their screen will be outside the target age group when they are due for their rescreen, and therefore will no longer be actively targeted by BreastScreen Australia.

The latest rescreening data are for women screened in 2011; these show that for women screened for the first time in 2011, 59.6% of women aged 50–67 rescreened within 27 months. This increased to 67.8% of women who screened for the second time in 2011, and to 81.6% of women who screened for the third or subsequent time in 2011 (Figure 3.2). This indicates that the proportion of women aged 50–67 who return for a rescreen within 27 months increases with the number of screens previously attended.

It has been shown that women with false positive screening mammograms (that is, those recalled to assessment for further investigation and found not to have breast cancer) are less likely to participate in subsequent screening rounds (Sim et al. 2012). Since women are more likely to be recalled to assessment at their first screening visit (see Section 3.3), this may deter women from rescreening within the desired 27 months, which may contribute to the lower rescreening rates for women after their first screening visit.



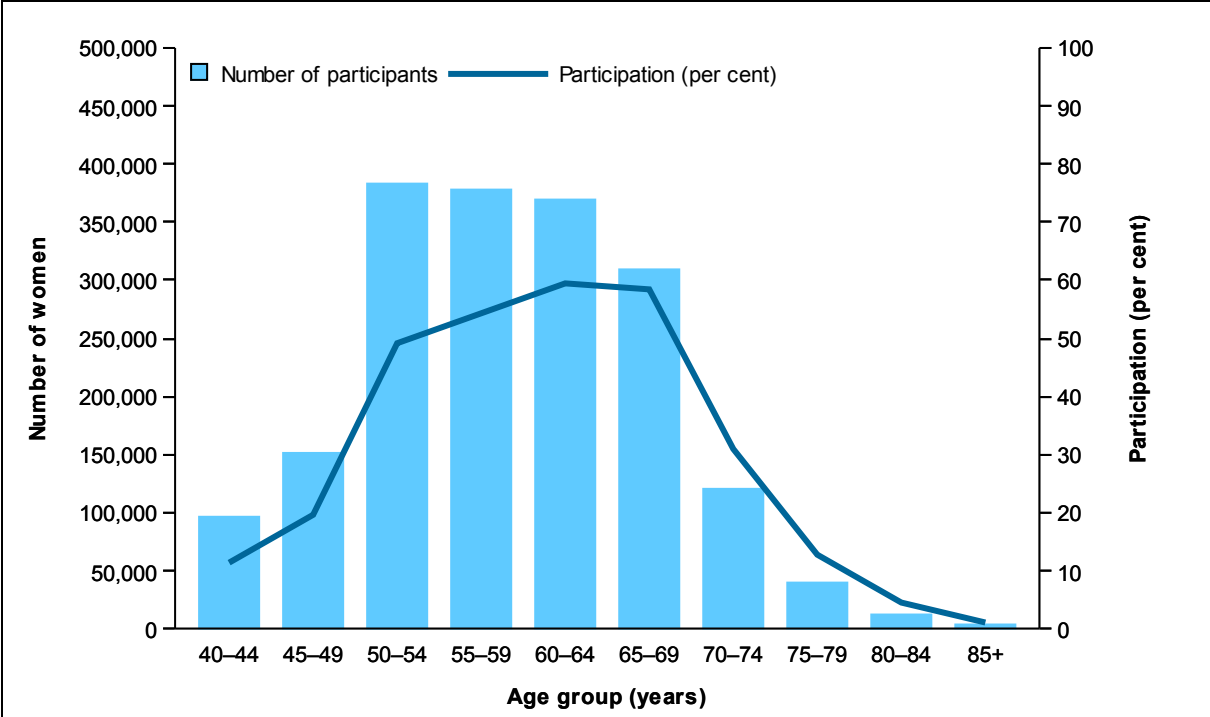
Screening and rescreening behaviour across ages

In both 2012–2013 and 2013–2014, the proportion of women screened was highest for those aged 50–69, in line with the BreastScreen Australia’s aim to maximise the proportion of women in the target age group screened every 2 years. Further, the proportion of women participating was around 49% or above for all 5-year age groups within the target age range, with participation highest for women aged 60–64, this being 59.5% in 2012–2013 (Figure 3.3) and 58.7% in 2013–2014.

The proportion of women screened who were outside the target age group was lower, with around 15% of women aged 40–49 and around 14% of women aged 70 and over screened in 2012–2013. In 2013–2014, the proportion of women screened aged 70 and over was higher at 18%, which is likely due to women aged 70–74 being actively targeted by BreastScreen Australia from mid-2013. A similar trend was noted for women rescreening, with the highest rescreen rates for women aged 50–67, followed by women aged 40–49 in all three screening rounds. Women aged 70 and over had far lower rescreening rates regardless of the screening round (Figure 3.4).

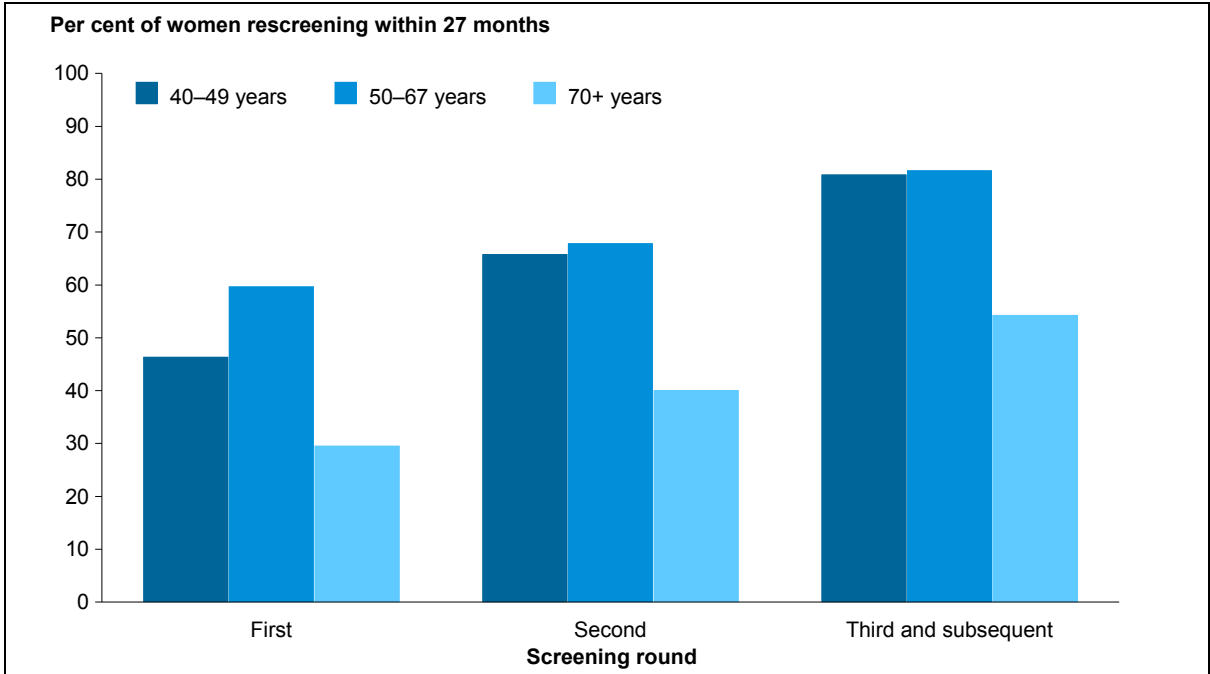
Women aged 50–67 comprise a greater proportion of women rescreening with increasing number of previous screens attended – 59.6% of those rescreening after their first screen were

aged 50–67, whereas 67.8% of those rescreening after their second screen and 81.6% of all women rescreening after their third or subsequent screen were aged 50–67.



Source: AIHW analysis of BreastScreen Australia data. Data for this figure are available in Table A1.2.

Figure 3.3: Participation in BreastScreen Australia by age, 2012–2013



Note: Rates are the number of women rescreening within 27 months as a percentage of women screened, age-standardised to the population of women attending a BreastScreen Australia service in 2008.

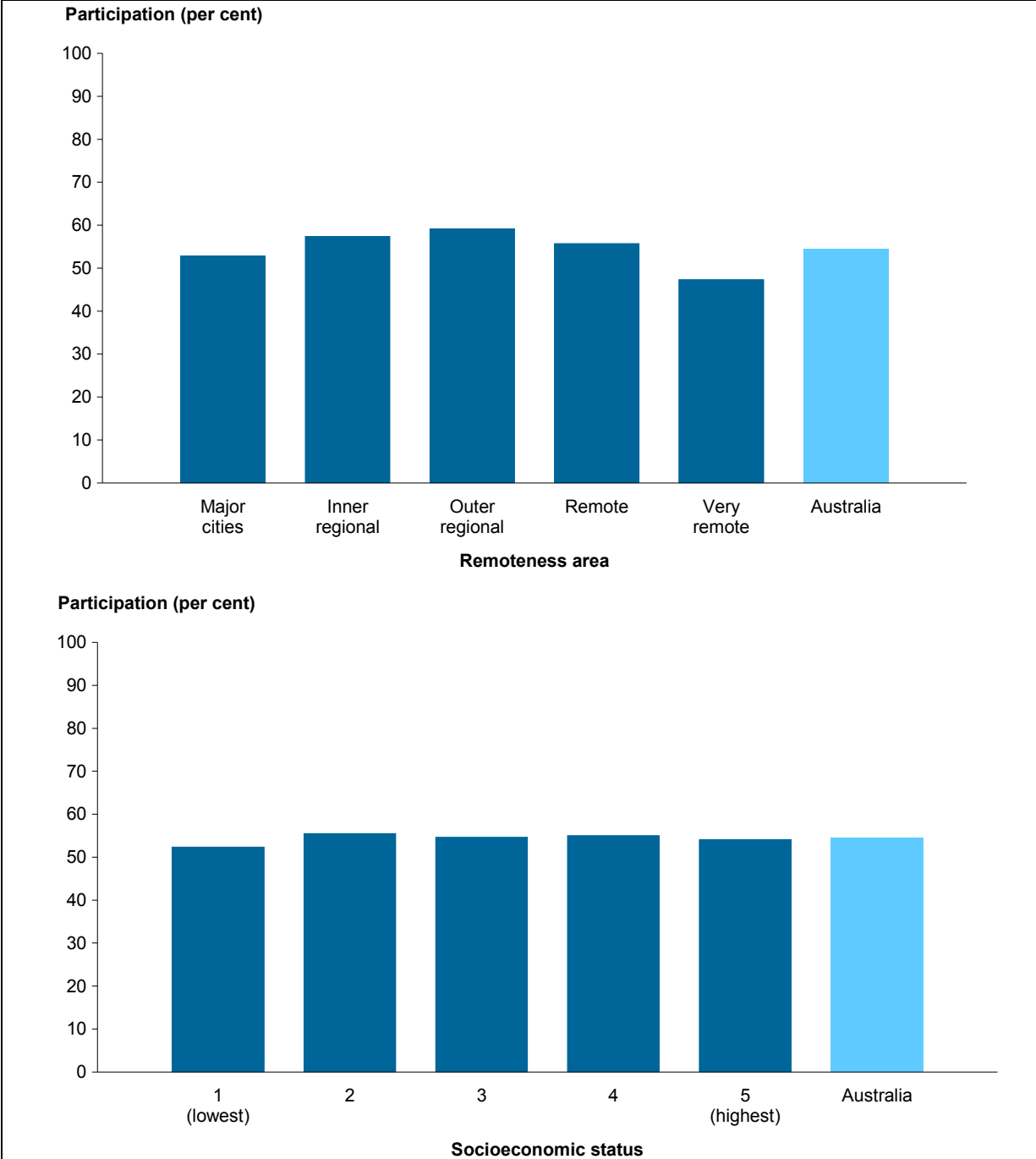
Source: AIHW analysis of BreastScreen Australia data. Data for this figure are available in Table A2.2.

Figure 3.4: Rescreening by age and screening round, women screened during 2011

Screening behaviour across groups

Participation was highest in *Outer regional* areas at 59.2%, compared with 52.8% in *Major cities* and 47.3% in *Very remote* areas (Figure 3.5).

There was little variation in participation across socioeconomic groups, with all groups having participation rates between 52.3% and 55.5% (Figure 3.5).



Source: AIHW analysis of BreastScreen Australia data. Data for this figure are available in tables A1.4 and A1.5.

Figure 3.5: Participation of women aged 50–69 in BreastScreen Australia, by remoteness area, and by socioeconomic status, 2012–2013

Aboriginal and Torres Strait Islander women participate in BreastScreen Australia at a lower rate than non-Indigenous women, with a difference of around 20 percentage points. This is also true to a lesser extent for women from culturally and linguistically diverse backgrounds, with participation for women who report that they speak a language other than English at home around 6 percentage points lower than for women who report that they only speak English and home.

In 2012–2013, participation of Aboriginal and Torres Strait Islander women in BreastScreen Australia was 35.5% compared with the non-Indigenous rate of 54.5% (age-standardised), whereas participation of women who report that they speak a language other than English at home was 55.0% compared with the English-speaking rate of 48.8%.

Participation trends for Aboriginal and Torres Strait Islander women and non-Indigenous women are shown in Figure 3.6. Historical Indigenous participation rates have been recalculated using new Indigenous population estimates so that meaningful comparisons between reporting periods can be made (see Box 3.3).

Box 3.3: Indigenous populations

New Indigenous population estimates were released by the Australian Bureau of Statistics (ABS) in 2014 based on the 2011 Census. These estimates included backcasts of the Indigenous population as well as population projections to 2026. The new backcast estimates of the Indigenous population were considerably larger than those previously published based on the 2006 Census. This is in part due to improvements in Census coverage and enumeration of Indigenous Australians in the 2011 Census, and an increased likelihood that individuals identified themselves and their children as Indigenous. Historical Indigenous participation rates have been recalculated using these new Indigenous population estimates so that meaningful comparisons between reporting periods can be made over time. Rates presented in this report should not be compared with previously published rates that used population estimates based on the 2006 Census.

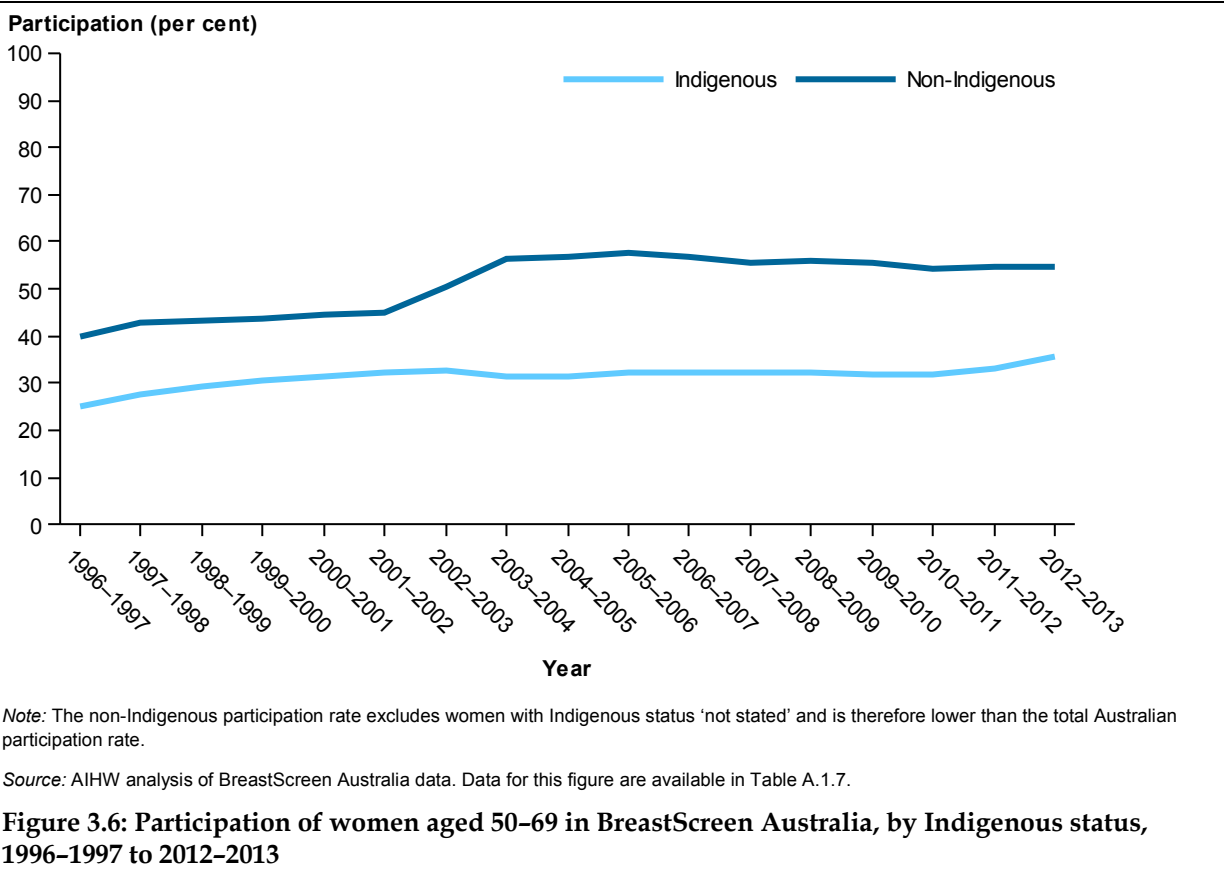
Trend data show that Indigenous women have always had lower participation rates than non-Indigenous women – at around 32–33% for all reporting periods between 2001–2002 and 2011–2012, although increasing a little to 36% in 2012–2013 (Figure 3.6). Lower participation of Indigenous women may reflect a decreased opportunity to screen compared with non-Indigenous women and/or different screening behaviour of Indigenous women (that is, being less likely to screen even with the same opportunity to do so).

Results of a recent project, 'Closing the Gap in Breast Cancer Screening' (in Queensland), suggest that different screening behaviour of Indigenous women may play a significant role in their lower participation rates. This project aimed to address barriers to screening for Indigenous women through culturally appropriate messages, art shows and partnerships with local Indigenous groups, in order to build trust, educate and support Indigenous women to attend BreastScreen Australia. The project reported an increase in Indigenous participation from 49% to 56% in 2 years.

Initiatives such as these are common to state and territory BreastScreen programs, many of which have adopted strategies and initiatives to encourage greater participation in breast cancer screening by Aboriginal and Torres Strait Islander women. These strategies and initiatives are designed to be culturally sensitive and appropriate to the knowledge, attitudes and beliefs of Aboriginal and Torres Strait Islander women. They include dedicated and appropriate communication resources, group bookings for Indigenous women who would

prefer to attend as a group, and the use of Indigenous artwork. BreastScreen workers liaise closely with Aboriginal Health Workers and Aboriginal and Torres Strait Islander community groups to increase acceptance of screening.

In the last quarter of 2014–15, the Australian Government ran the National BreastScreen Australia Campaign to support the expansion of the program for women aged 50–74 years. The campaign included communication activities for Aboriginal and Torres Strait Islander consumers with materials developed in consultation with Aboriginal and Torres Strait Islander women.



Access to BreastScreen services, especially for women from Indigenous, culturally and linguistically diverse, rural/remote, and lower socioeconomic backgrounds is a national policy feature of BreastScreen Australia, which has developed National Accreditation Standard (NAS) Measures to ensure that this policy feature is met by services accredited through BreastScreen Australia (see Box 3.4 for more information on NAS Measures and accreditation).

These NAS Measures, along with other NAS Measures related to access and participation in BreastScreen Australia underpin BreastScreen Australia’s aim to maximise the proportion of women in the target population who are screened every two years.

Table 3.1 shows the NAS Measures related to participation and rescreening.

Table 3.1: NAS Measures for participation and rescreening calculated using BreastScreen Australia data supplied for the *BreastScreen Australia monitoring report 2012–2013*

NAS Measure		Calculated value
NAS Measure 1.1.1 (b)	≥70% of women aged 50–69 years participate in screening in the most recent 24-month period.	54.4%
NAS Measure 1.1.2 (b)	≥75% of women aged 50–67 years who attend for their first screening episode within the Program are rescreened within 27 months.	59.6%
NAS Measure 1.1.3 (b)	≥90% of women aged 50–67 years who attend for their second and subsequent screens within the Program are rescreened within 27 months of their previous screening episode.	67.8% second 81.6% subsequent
NAS Measure 1.2.1 (b)	The Service and/or SCU monitors and reports participation of women aged 50–69 years from special groups and where rates are below that of the overall population, implements specific strategies to encourage their participation in screening. Consideration of equitable participation rates of at least the following groups is made: women from Indigenous, culturally and linguistically diverse, rural/remote and lower socio-economic backgrounds.	
	Indigenous	35.5%
	Non-English-speaking	48.8%
	Remote/Very remote	55.6%/47.3%
	SES group (lowest)	52.3%
NAS Measure 1.2.2	The Service and/or SCU monitors the proportion of all women in the Service who are screened and recalled for assessment, aged 40–49 years and 75 years and over.	
	(a) women who are screened	
	40–49	15.4%
	75+	14.2%
	(b) women who are recalled for assessment	
	40–49	10.7%/5.3%
	75+	11.2%/4.2%

Source: AIHW analysis of BreastScreen Australia data.

Box 3.4: BreastScreen Australia and National Accreditation Standards

Provision of a high-quality service to women is of great importance to BreastScreen Australia. For this reason, services accredited under BreastScreen Australia are expected to operate according to the National Accreditation Standards (NAS) of BreastScreen Australia, along with national policy features and protocols. The accreditation system, of which the NAS are an integral part, intends to drive continuous quality improvement in the delivery of breast screening services to ensure women receive safe, effective and high-quality care.

The BreastScreen Australia NAS Measures have been developed to ensure that all women receive breast screening services that are of a consistently high quality, regardless of where they attend for screening or assessment.

A number of NAS Measures are consistent with the performance indicators in this report. For this reason, where appropriate, the data in this report are benchmarked against these Measures. These benchmarks are useful in helping to interpret the data presented, although in considering how these national data compare with the NAS Measures, it should be noted that the NAS Measures were not designed to be used as standards for the BreastScreen Australia performance indicators.

3.2 Sensitivity of the screening test

Mammography (X-ray of the breast) is the test used in breast cancer screening. Screening mammography, like the screening tests used in other programs such as bowel and cervical screening, is not intended to be diagnostic; rather, it aims to identify people who are more likely to have breast cancer, and therefore require further investigation from diagnostic tests.

Sensitivity of a screening test is the ability of that test to accurately identify the disease in people who have that disease. This is referred to as a 'true positive' screening result. A 'false negative' screening result occurs when women have screening mammography that incorrectly indicates that they do not have breast cancer.

The estimation of false negative results requires that we know if a woman had breast cancer present at the time of her screen. Because this cannot be truly known at the time of the test, we use interval cancers – breast cancers that arise between routine screening mammograms – as a way of assessing breast cancers that may have been present at the time of screen but missed by the screening process (although many interval cancers are not able to be detected because they were either not yet present or not visible – this is described in more detail in Box 3.5 and in the paragraphs that follow).

Box 3.5: Interval cancers

An interval cancer is defined as an invasive breast cancer that is diagnosed after a screening episode that detected no cancer and before the next scheduled screening episode (Kavanagh et al. 1999). This means that a woman attends BreastScreen for a screening mammogram, is advised that her mammogram is not suspicious for breast cancer, and given a recommendation to rescreen in 2 years (or in 1 year if she screens annually). Within those 2 years (or 1 year in the case of the latter), she experiences signs or symptoms suggestive of breast cancer (such as a lump or clear or bloody nipple discharge), and either returns to BreastScreen or – more commonly – visits her general practitioner for further investigation, at which time it is discovered that she has invasive breast cancer.

There are two categories of interval cancers; into which category an interval cancer falls can only be determined when previous screening mammograms are reviewed after the discovery of an interval cancer (for interval cancers diagnosed outside BreastScreen Australia, this discovery is made through linkage with the cancer registry in the relevant state or territory). All interval cancers in all state and territory BreastScreen programs undergo clinical review.

The first category comprises 'true' interval cancers. These are invasive breast cancers diagnosed between routine screening mammograms that, upon review, could not be detected in the previous routine screening mammogram. This may be due to either the interval cancer being an aggressive breast cancer that emerged and grew very rapidly in the period between routine screening mammograms, or due to the breast cancer not being visible due to the characteristics of the cancer or the breast tissue (for example, dense breast tissue can make breast cancers very difficult to see). True interval cancers do not represent any failure in detection.

The second category comprises breast cancers that, upon review, were visible in the previous routine screening mammogram. These are false negative screening results and are considered a failure of the screening process.

However, even though only missed cancers and not 'true' interval cancers are false negative screening results, all interval cancers are included in this measure of sensitivity.

'Program sensitivity' is measured as the proportion of invasive breast cancers detected by BreastScreen Australia (screen-detected cancers) out of all invasive breast cancers (interval cancers plus screen-detected cancers) diagnosed in program-screened women in the screening interval. This program sensitivity is a measure of the sensitivity of screening mammography; that is, the proportion of breast cancers detected by BreastScreen Australia of all the breast cancers that may be present in screening women.

How time since screen affects sensitivity

The latest data for interval cancers and program sensitivity are for women screened in 2008, 2009 and 2010 (referred to as index years 2008–2010). These are the latest data available because, by its very definition, at least 2 years need to have passed since a woman's last routine screening mammogram to know whether she was diagnosed with an interval cancer in that time – often longer due to time required for cancer registries to be notified of the cancer, and for linkage between the BreastScreen registers and cancer registers.

There are fewer interval cancers, and thus higher program sensitivity, in the first year following a woman's negative screen than in the second year. For the index years 2008–2010, in the first year after a negative screening episode, there were 6 interval cancers per 10,000 women-years after a woman's first visit and subsequent visits. In comparison, in the second year after a negative screening episode, there were 10 and 12 interval cancers per 10,000 women-years after a woman's first visit and subsequent visits, respectively (Table 3.2).

In these data, there were no appreciable differences in the interval cancer rate between first and subsequent screening rounds for either the first or second year after a negative screening episode (while in the second year after a negative screening round the interval cancer rate after a woman's first screening round is slightly lower than after subsequent screening rounds at 10 compared with 12, the confidence intervals overlap which suggests that these two numbers do not differ in any significant way). This indicates that women are no more likely to have an interval cancer diagnosed after their first screen than after any other screen at BreastScreen Australia. This is different to invasive cancer detection through BreastScreen Australia, which is more likely at a woman's first screen compared with subsequent screens (see Section 3.3).

Program sensitivity differs by time since screen, being higher in the first year after a negative screening episode than when the entire 2 years are considered together (93.2% and 88.1% after a woman's first visit and subsequent visits, respectively, compared with 85.6% and 74.5% after a woman's first visit and subsequent visits, respectively) (Table 3.2).

Table 3.2: Interval cancer rate and program sensitivity, by time since screen, women aged 50–69 screened 2008–2010

Time since screen	First year after screen	Second year after screen	First and second years
Interval cancers			
First screening round			
Number	134	210	344
Crude rate	6.1	10.0	8.0
AS rate	5.9	9.8	7.8
95% CI	4.7–7.2	8.2–11.6	6.8–8.9
Subsequent screening rounds			
Number	1,097	2,081	3,178
Crude rate	6.1	12.2	9.1
AS rate	6.1	12.1	9.0
95% CI	5.8–6.5	11.6–12.6	8.7–9.4
Program sensitivity			
First screening round			
Crude rate	92.4	..	83.9
AS rate	93.2	..	85.6
95% CI	88.3–98.2	..	81.1–90.3
Subsequent screening rounds			
Crude rate	88.8	..	75.5
AS rate	88.1	..	74.5
95% CI	86.2–90.1	..	72.9–76.2

.. not applicable: program sensitivity is not calculated for the second year after a negative screening episode.

Note: Crude rate is the number of interval cancers detected per 10,000 women-years; age-standardised (AS) rate is the number of interval cancers detected per 10,000 women-years, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Unlike the interval cancer measures, program sensitivity measures differ by screening round, being higher after a woman's first visit compared with her subsequent visits. This may be because women at their first screening visit are more likely to be recalled to assessment for further investigation, and thus more likely to have a breast cancer that is present detected.

How age affects sensitivity

In 2008–2010, for the first year after a negative screening round, the interval cancer rate was lowest for women aged 50–59 and 60–69, and was highest for women aged 40–49. The trend was not as clear in the second year after a negative screening round, with the interval cancer rate lowest for women aged 40–49 and 50–59, increasing with increasing age (Table 3.3).

Program sensitivity mirrored the trend seen in the first year after a negative screening round, being lowest for women aged 40–49, increasing with each 10-year age group to be highest for women aged 70 and over (Table 3.3).

These results, when combined, point to lower sensitivity of screening mammography for women aged 40–49, meaning that BreastScreen Australia is less able to detect invasive breast

cancers in women aged 40–49 who attend for screening. This is likely due to features of young breasts, such as high density, which can make breast cancers difficult to visualise with mammography.

Table 3.3: Interval cancer rate and program sensitivity, by age, women screened in 2008–2010

Time since screen		Age group (years)			
		40–49	50–59	60–69	70+
Interval cancers					
First year	Number	284	670	561	142
	Crude rate	8.2	6.0	6.2	7.4
Second year	Number	388	1,173	1,118	287
	Crude rate	11.9	11.0	13.1	15.8
Program sensitivity					
First year	Crude rate	79.0	87.3	91.1	92.9
First and second years	Crude rate	67.0	73.9	79.0	83.1

Note: Crude rates are the number of interval cancers detected per 10,000 women-years.

Source: AIHW analysis of BreastScreen Australia data.

Specificity

While sensitivity is the ability of a screening test to accurately identify the disease in people who have that disease, specificity refers to the ability of a screening test to accurately identify people who do not have the disease. This is referred to as a ‘true negative’ screening result. The vast majority of women who are given a negative screening result after their screening mammography through BreastScreen Australia do not have breast cancer, and thus receive a true negative screening result.

Women who are not given a negative screening result are recalled to assessment for further investigation. A ‘true positive’ screening result is when they are found to have breast cancer at assessment. A ‘false positive’ screening result is when women are recalled to assessment for further investigation when they do not have breast cancer. Most women who are recalled to assessment through BreastScreen Australia do not have breast cancer.

The proportion of women who are recalled to assessment will be examined in the following section (Section 3.3). BreastScreen Australia aims to achieve a balance in breast cancer screening that minimises the number of cancers that are missed (false negatives) while also minimising the number of women who are recalled when they do not have breast cancer (false positives). This underpins many of the objectives and NAS Measures of BreastScreen Australia. The NAS Measures related to interval cancers are shown in Table 3.4.

Table 3.4: NAS Measures for interval cancers calculated using BreastScreen Australia data supplied for the *BreastScreen Australia monitoring report 2012–2013*

NAS Measure	Calculated value
NAS Measure 2.3.1 (b) <7.5 per 10,000 women aged 50–69 years who attend for screening are diagnosed with an interval invasive breast cancer in the first calendar year following a negative screening episode.	5.9/6.1
NAS Measure 2.3.2 (b) ≤15 per 10,000 women aged 50–69 years who attend for screening are diagnosed with an interval invasive breast cancer in the second calendar year following a negative screening episode.	9.8/12.1

Source: AIHW analysis of BreastScreen Australia data.

3.3 Detection of invasive breast cancer and ductal carcinoma in situ (DCIS)

At the completion of the screening episode, each woman screened through BreastScreen Australia receives what is called a 'recommendation of screening'. For some women, this recommendation will be that she is recalled to an assessment centre to undergo further investigation because her mammogram was suspicious.

The majority of women who participate in BreastScreen Australia experience only the screening test, while a subset – those who the screening test identify as being more likely to have breast cancer and therefore require further investigation from diagnostic tests – is recalled for more rigorous and sometimes invasive testing. Testing at assessment can include palpation, diagnostic mammography, ultrasound and, if required, a percutaneous biopsy (a fine needle or core biopsy of breast tissue upon which histology can be performed).

In 2013, of the 86,038 women screened for the first time, 10,214 (11.9%) were recalled for further assessment, while of the 663,373 women attending subsequent screens, 25,681 (3.9%) were recalled. Of the women recalled to assessment, most were found not to have an invasive breast cancer or ductal carcinoma in situ (DCIS) detected – 922 women attending their first visit, and 4,155 attending a subsequent screen had an invasive breast cancer or DCIS detected (Table 3.5).

Table 3.5: Number of women aged 50–69 in who invasive breast cancer or DCIS was detected, 2013

Number of women aged 50–69	First screening round	Subsequent screening rounds
Screened	86,038	663,373
Recalled to assessment	10,214	25,681
Invasive breast cancer or DCIS detected	922	4,155

Source: AIHW analysis of BreastScreen Australia data.

This means that, for women attending their first screen, 1.0% of women screened and 9.0% of women recalled to assessment will have an invasive breast cancer or DCIS detected, and for women attending subsequent screens, 0.6% of women screened and 16.2% of women recalled to assessment have an invasive breast cancer or DCIS detected.

From this, it can be seen that screening mammography is less accurate for women attending for the first time, in so far as more women are recalled to assessment when there is no breast cancer or DCIS present (that is, have more false positives). This is likely due, in part, to not having any previous images with which to compare a woman's first screening mammography images. Without any previous images for comparison, it is more difficult to distinguish between what is normal and what might be suspicious (BreastScreen WA 2008), with additional testing less likely when prior mammograms are available for comparison.

Detection is usually expressed as the number of cancers diagnosed per 10,000 women screened. In 2013, for women aged 50–69, for every 10,000 women screened for the first time, 83 had an invasive breast cancer detected, while for every 10,000 women attending subsequent screens, 49 had a cancer detected (Table 3.6). Detection of DCIS was rarer, at 24 per 10,000 women attending their first screen, and 13 per 10,000 women attending subsequent screens in 2013 (Table 3.6).

A higher proportion of women attending their first screen have an invasive breast cancer or DCIS detected because a woman's first visit detects prevalent cancers that may have been

present for some time rather than incident cancers that have grown between screens, which tend to be the breast cancers detected at subsequent screening visits (Kavanagh et al. 1999).

Table 3.6: Invasive breast cancer and DCIS detection in women aged 50–69, 2013

	Number	Crude rate	AS rate	95% CI
Invasive breast cancer				
First screening round	715	83.1	107.9	97.9–118.5
Subsequent screening rounds	3,279	49.4	47.6	45.9–49.2
DCIS				
First screening round	207	24.1	29.2	24.2–34.7
Subsequent screening rounds	876	13.2	12.8	12.0–13.7

Note: Crude rate is the number of women with invasive breast cancer detected per 10,000 women screened; age-standardised (AS) rate is the number of women with invasive breast cancer detected per 10,000 women screened, age-standardised to the population of women attending a BreastScreen Australia service in 2008. AS rates are shown to aid in comparisons over time; 95%CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Detection of small breast cancers

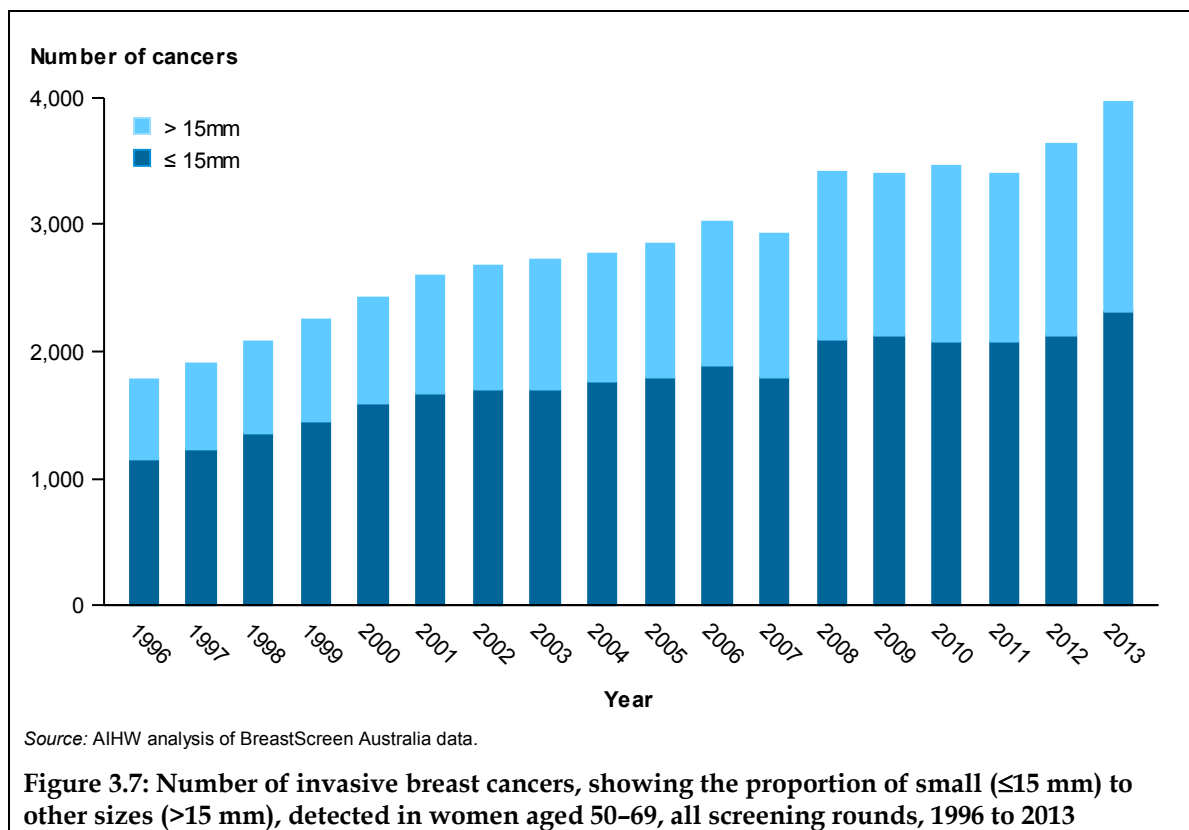
BreastScreen Australia strives to maximise the detection of invasive breast cancers, particularly small cancers, to achieve the desired reductions in morbidity and mortality.

In 2013, for every 10,000 women screened through BreastScreen Australia aged 50–69, 31 had a small (≤ 15 mm) invasive breast cancer detected. As a proportion of all invasive breast cancers detected, this was 46.3% for first screens, and 60.6% for subsequent screens. For all screening rounds combined, it was 58.0%.

A woman is more likely to be diagnosed with a small cancer in subsequent screening visits than her first visit, since her first screening mammogram detects prevalent cancers that may have been present for some time, whereas subsequent screens detect incident cancers that have grown between screens (Kavanagh et al. 1999). Because they have had less time to grow, incident cancers are more likely to be small.

Although the proportion of breast cancers detected that are small has fallen over time, from around 65% of all invasive breast cancers between 1996 and 2001 to 58% in 2013 (Figure 3.7), it is still of note that more than half of all invasive breast cancers detected through BreastScreen Australia are small at ≤ 15 mm. The high proportion of small breast cancers is a positive outcome, as small breast cancers tend to be associated with increased treatment options (NBOCC 2009) and improved survival (AIHW & NBCC 2007). Invasive breast cancers detected outside BreastScreen Australia are less likely to be small, with only 28% measuring ≤ 15 mm (NBOCC 2009).

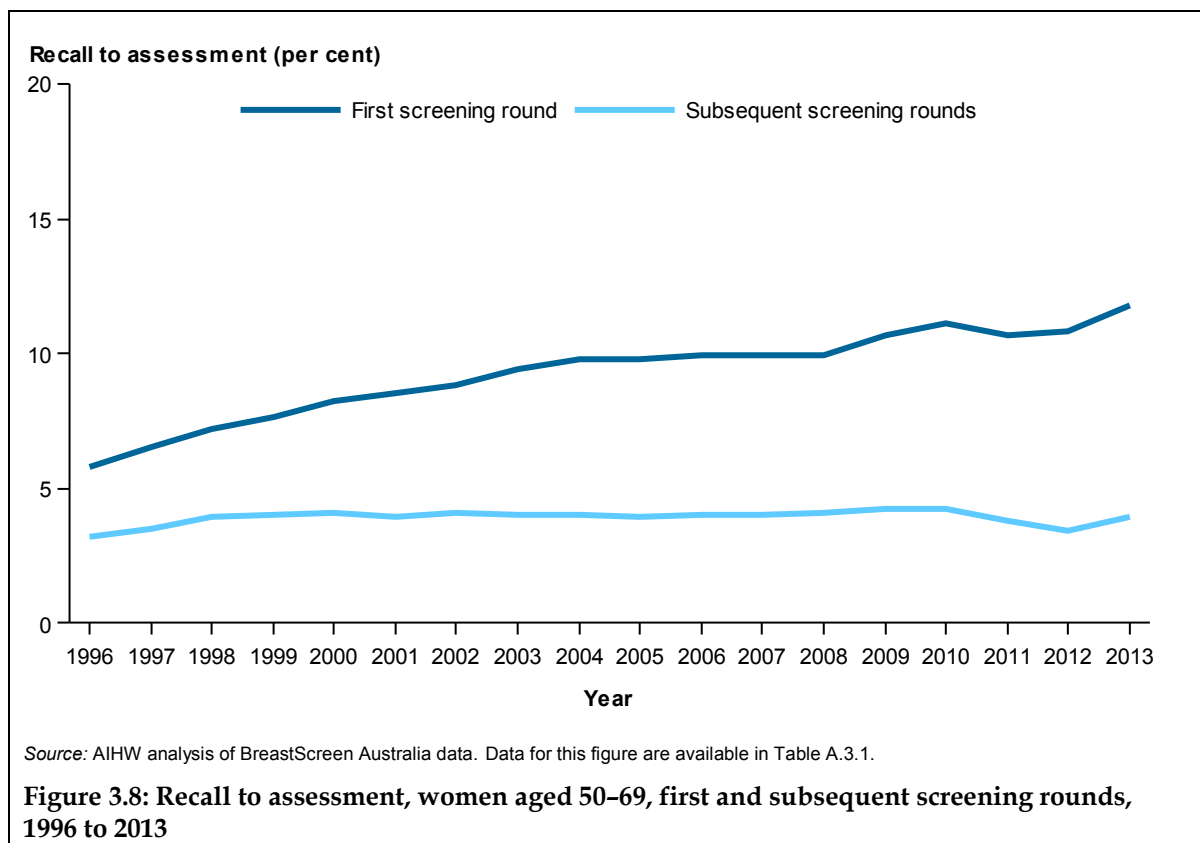
The proportion of cancers that are small is lower in younger age groups – 46.7% for women aged 40–49 compared with 58.0% for women aged 50–69 and 59.2% for women aged 70 and over. The lower proportion of small invasive cancers in young age groups may be related to greater breast density in younger women, which makes small invasive breast cancers more difficult to detect using screening mammography (Irwig et al. 1997).



Detection over time

Over time, while the recall to assessment rate for subsequent screening rounds has remained steady at 4%, the proportion of women attending BreastScreen Australia for the first time who were recalled to assessment has increased. After remaining steady at 10% from 2004 to 2008, it increased to 11% in 2009–2012, before reaching a high of 11.6% in 2013 (Figure 3.8).

Changes to recall to assessment rates should be considered alongside corresponding invasive cancer detection rates, as a higher recall to assessment rate may be considered acceptable (within reasonable limits) if it leads to higher breast cancer detection rates.

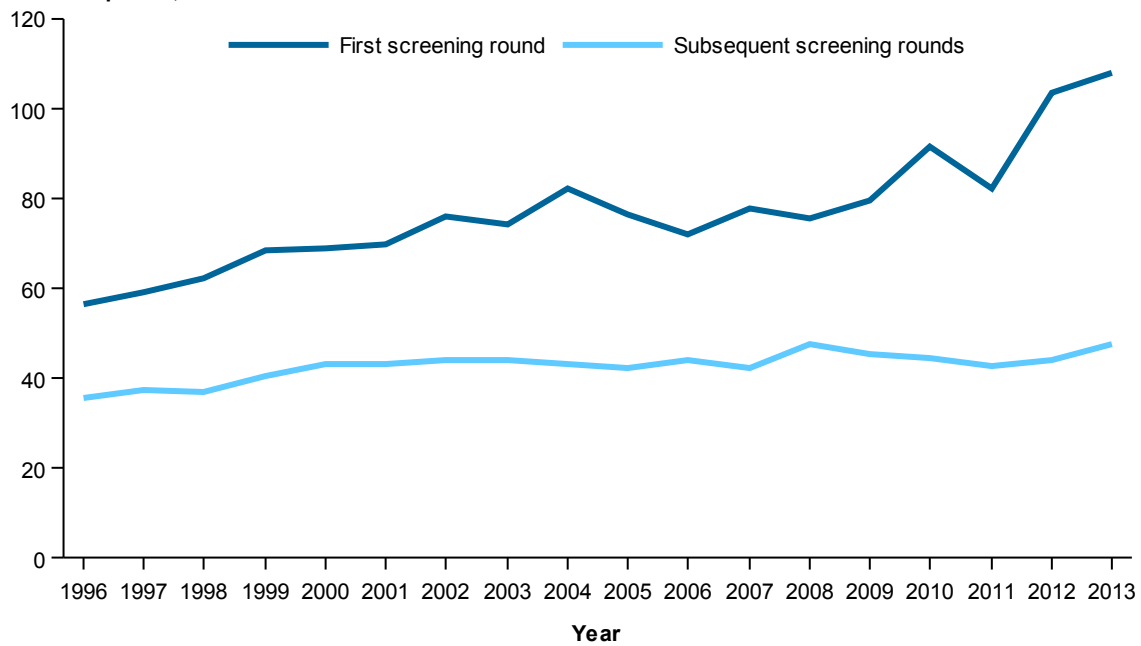


Invasive breast cancer detection trends are shown in Figure 3.9. For the past decade, the rate of invasive breast cancer detection for subsequent screening rounds has remained steady, ranging between 42 and 48 per 10,000 women screened. In contrast, after ranging between 72 and 82 early in the past decade, invasive breast cancer detection increased to 92 in 2010, before falling back to 82 in 2011, and then increasing to 104 and 108 women diagnosed with invasive breast cancer per 10,000 women screened in 2012 and 2013, respectively (Figure 3.9).

Detection of DCIS in women screening for the first time was also high in 2012 and 2013, reaching a high of 29 women diagnosed with DCIS per 10,000 women screened in 2013 (Figure 3.10).

Considering recall to assessment and invasive breast cancer detection rates together, it appears that the increase in the proportion of women who were recalled for further investigation in the last few years has led to an increase in the detection of breast cancer and DCIS for women screening for the first time. In this respect, the increase in the recall to assessment rate to above 10% for the first screening round may be considered acceptable.

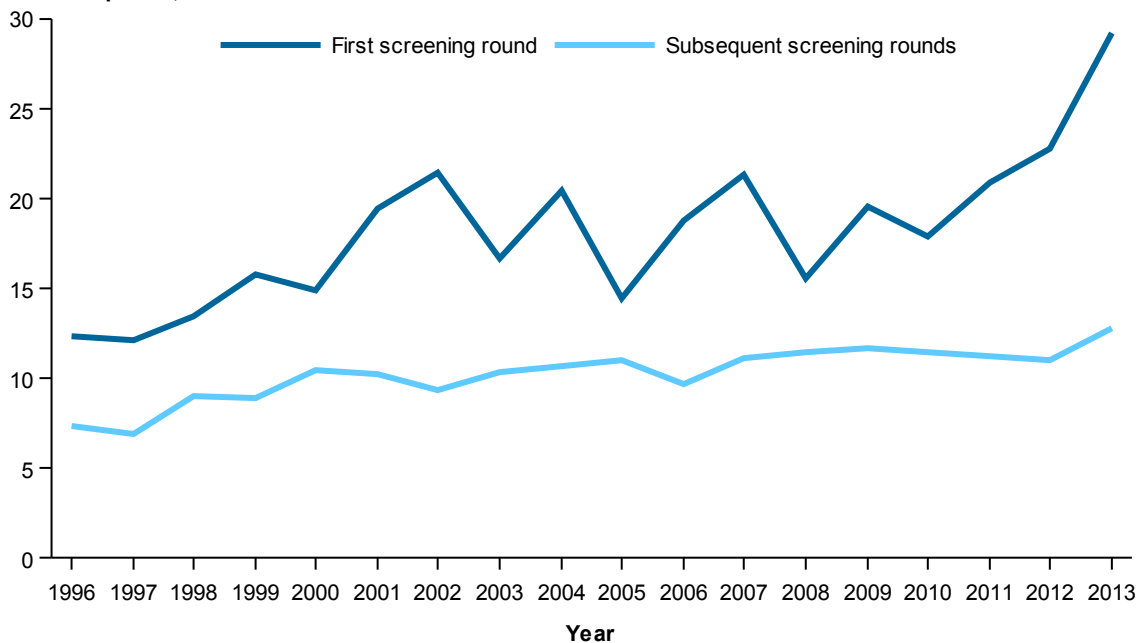
Number per 10,000 women screened



Source: AIHW analysis of BreastScreen Australia data. Data for this figure are available in Table A.4.1

Figure 3.9: Invasive breast cancer detection (all sizes), women aged 50–69, first and subsequent screening rounds, 1996 to 2013

Number per 10,000 women screened



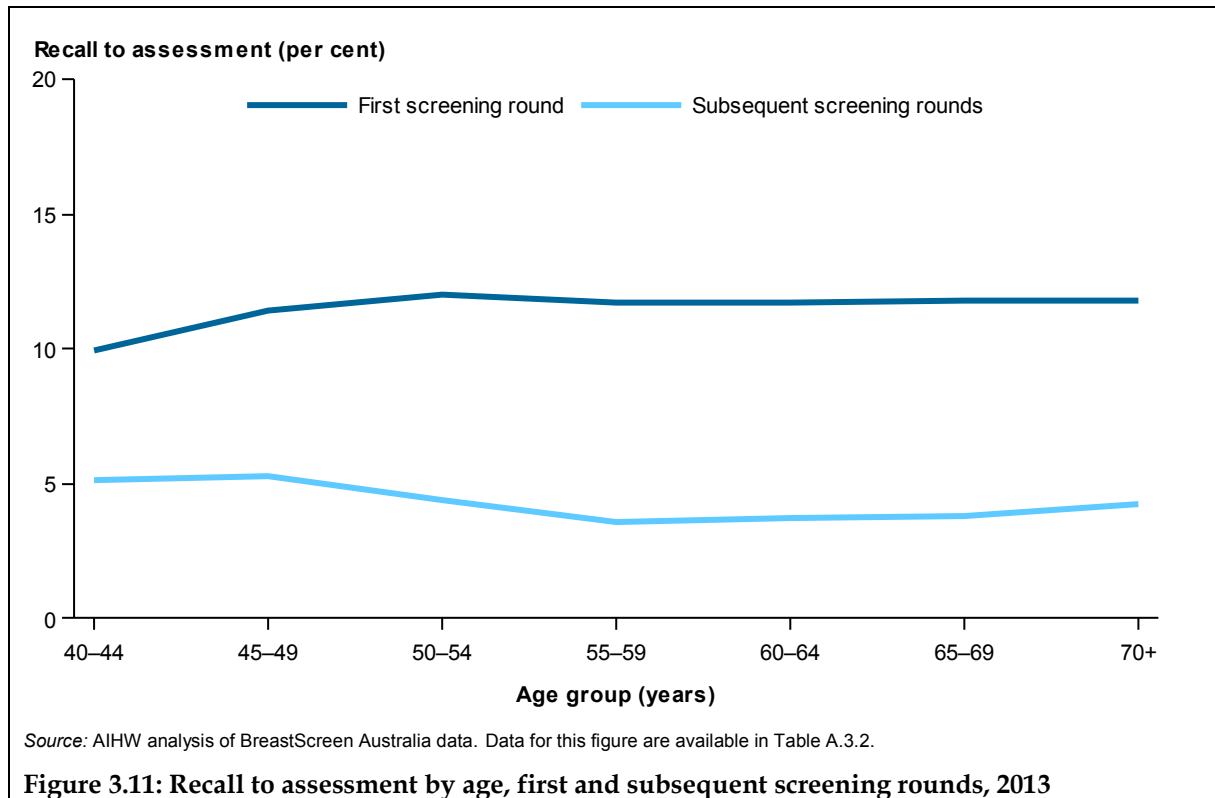
Source: AIHW analysis of BreastScreen Australia data. Data for this figure are available in Table A.5.1.

Figure 3.10: DCIS detection, women aged 50–69, first and subsequent screening rounds, 1996 to 2013

Detection across ages

In 2013, the proportion of women attending their first screen that were recalled to assessment for further investigation was between 11% and 12% for all age groups aged 50 and over, with women aged 40–44 having a lower recall rate of 10% (Figure 3.11).

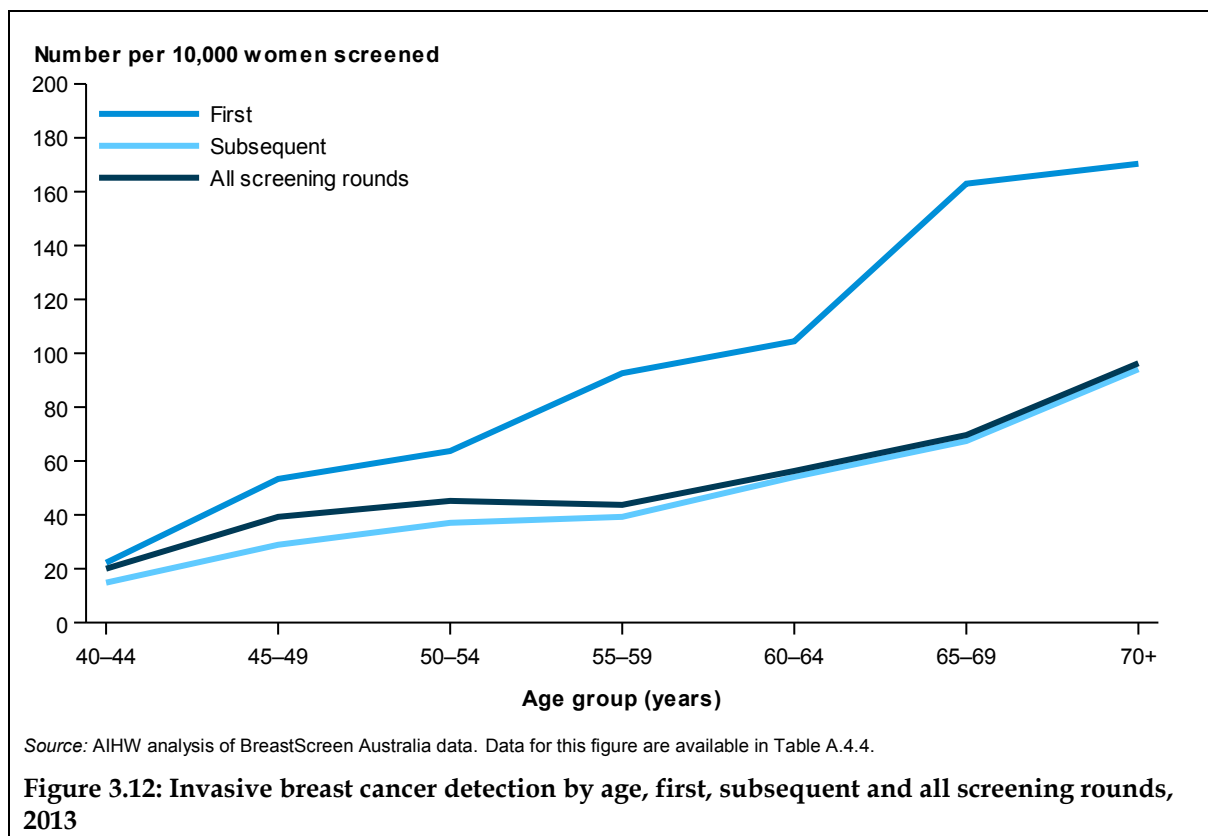
This differed for women attending subsequent screens, for whom the proportion recalled to assessment was highest for women aged 40–44 and 45–49 at 5.2% and 5.3%, respectively. Women aged 55–69 were least likely to be recalled after a subsequent screen, having recall rates ranging between 3.6% and 3.8% of women screened in 2013 (Figure 3.11).



Breast cancer detection increased with age in 2013, from 20 and 39 per 100,000 women screened for women aged 40–44 and 45–49, respectively, to 45 and 44 for women aged 50–54 and 55–59, respectively, increasing to 57 and 70 for women aged 60–64 and 65–69, respectively. Breast cancer detection was highest for women aged 70 and over, with 96 women diagnosed with invasive breast cancer for every 10,000 women screened (Figure 3.12).

This trend of increasing invasive breast cancer detection with increasing age was true for both women attending their first screen and women attending subsequent screens (Figure 3.12).

DCIS detection also increased with age. In 2013, DCIS detection was 12 per 10,000 women screened for women aged 40–49, 13 for women aged 50–59, 16 for women aged 60–69, and 19 women diagnosed with DCIS per 10,000 women screened for ages 70 and over.



BreastScreen Australia aims to maximise the number of invasive breast cancers and DCIS detected, while also minimising the number of women who are recalled when they do not have breast cancer (false positives). The NAS Measures related to invasive breast cancer detection, DCIS detection and recall to assessment are shown in Table 3.7.

Table 3.7: NAS measures for the detection of invasive breast cancers, the detection of DCIS and recall to assessment calculated using BreastScreen Australia data supplied for the *BreastScreen Australia monitoring report 2012–2013*

NAS Measure	Calculated value
NAS Measure 2.1.1 (b) ≥50 per 10,000 women aged 50–69 years who attend for their first screening episode are diagnosed with invasive breast cancer.	107.9
NAS Measure 2.1.2 (b) ≥35 per 10,000 women aged 50–69 years who attend for their second or subsequent screening episode are diagnosed with invasive breast cancer.	47.6
NAS Measure 2.1.3 (c) ≥25 per 10,000 women aged 50–69 years who attend for screening are diagnosed with small (≤15mm) invasive breast cancer.	30.4
NAS Measure 2.2.1 (b) ≥12 per 10,000 women aged 50–69 years who attend for their first screening episode are diagnosed with DCIS.	29.2
NAS Measure 2.2.2 (b) ≥7 per 10,000 women aged 50–69 years who attend for their second or subsequent screening episode are diagnosed with DCIS.	12.8
NAS Measure 2.6.3 (b) <10% of women aged 50–69 years who attend for their first screening episode are recalled for assessment.	11.6%
NAS Measure 2.6.4 (b) <5% of women aged 50–69 years who attend for their second or subsequent screening episode are recalled for assessment.	3.9%

Source: AIHW analysis of BreastScreen Australia data.

4 Monitoring BreastScreen Australia using AIHW data

4.1 Incidence of breast cancer

Australia has high-quality and virtually complete cancer incidence data. Collected by state and territory cancer registries, clinical and demographic data for all cancer cases are provided to the Australian Institute of Health and Welfare (AIHW) and compiled into the Australian Cancer Database. The latest national data are for new cases diagnosed in 2011.

In 2011, there were 14,465 new cases of breast cancer in Australian women. This is equivalent to 129 new cases for every 100,000 women in the population. Of the 14,465 new cases, 7,499 were in women aged 50–69, the target population of BreastScreen Australia. These 7,499 new cases are equivalent to 297 new cases for every 100,000 women in the population.

These rates have also been age-standardised for use in analyses of trends and differentials to 116 new cases per 100,000 women for women of all ages, and 293 new cases per 100,000 women for those aged 50–69.

Box 4.1: Invasive breast cancer cases detected through BreastScreen Australia

Of all invasive breast cancer cases diagnosed in 2011 in women aged 50–69, approximately 45% were detected through BreastScreen Australia (32% for women aged 40 and over).

Breast cancer types

Invasive breast cancers by type are shown in Table 4.1 (2009 data are used instead of 2011, as 2010 and 2011 data are estimates for New South Wales and the Australian Capital Territory).

The most common breast cancer type for women aged 50–69 was invasive ductal carcinoma at 80.2% of all breast cancers; invasive lobular cancer was the second-most common at 11.0%.

Table 4.1: Incidence of breast cancer in women aged 50–69, by type, 2009

Type of breast cancer	New cases	Crude rate	% of breast cancers
Invasive ductal carcinoma	5,635	236.5	80.2
Invasive lobular carcinoma	772	32.4	11.0
Medullar carcinoma and atypical medullary carcinoma	28	1.2	0.4
Tubular carcinoma and invasive cribriform carcinoma	146	6.1	2.1
Mucinous carcinoma	95	4.0	1.4
Invasive papillary carcinoma	72	3.0	1.0
Inflammatory carcinoma	11	0.5	0.2
Mesenchymal	7	0.3	0.1
Other—specified	95	4.0	1.4
Unspecified	165	6.9	2.4

Note: Crude rate is the number of new cases per 100,000 women. Histology codes that comprise each breast cancer group appear in Appendix E

Source: AIHW Australian Cancer Database 2011.

Other breast cancer types were rarer – ranging between less than 1 to 6 new cases per 100,000 women aged 50–69 in the population. These accounted for 0.1% and 2.1% of all invasive breast cancers, respectively; unspecified breast cancers accounted for 2.4% (Table 4.1).

Breast cancer over time

The incidence rate for women aged 50–69, after increasing following the introduction of BreastScreen Australia in 1991, has been relatively steady at around 300 new cases per 100,000 women (Figure 4.1).

This is despite an increase in the number of new cases from 2,446 in 1982 to 7,499 in 2011 (from 5,307 to 14,465 for women of all ages).

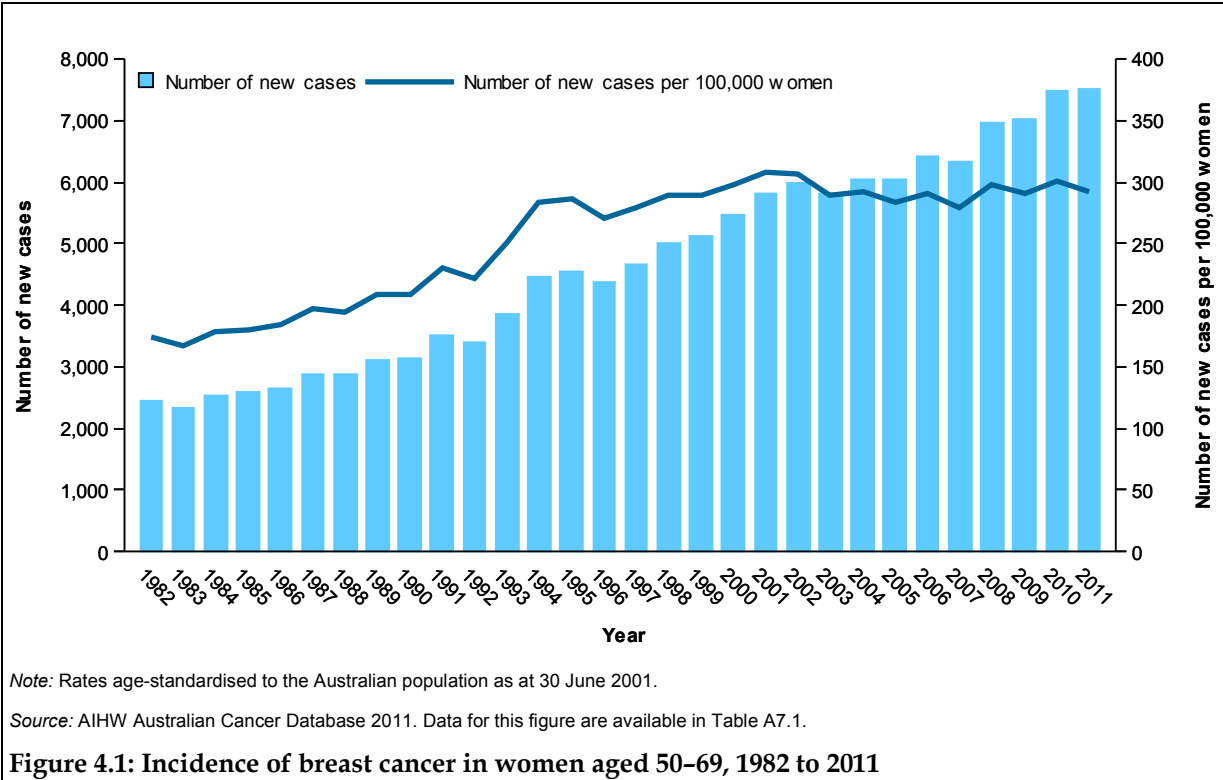
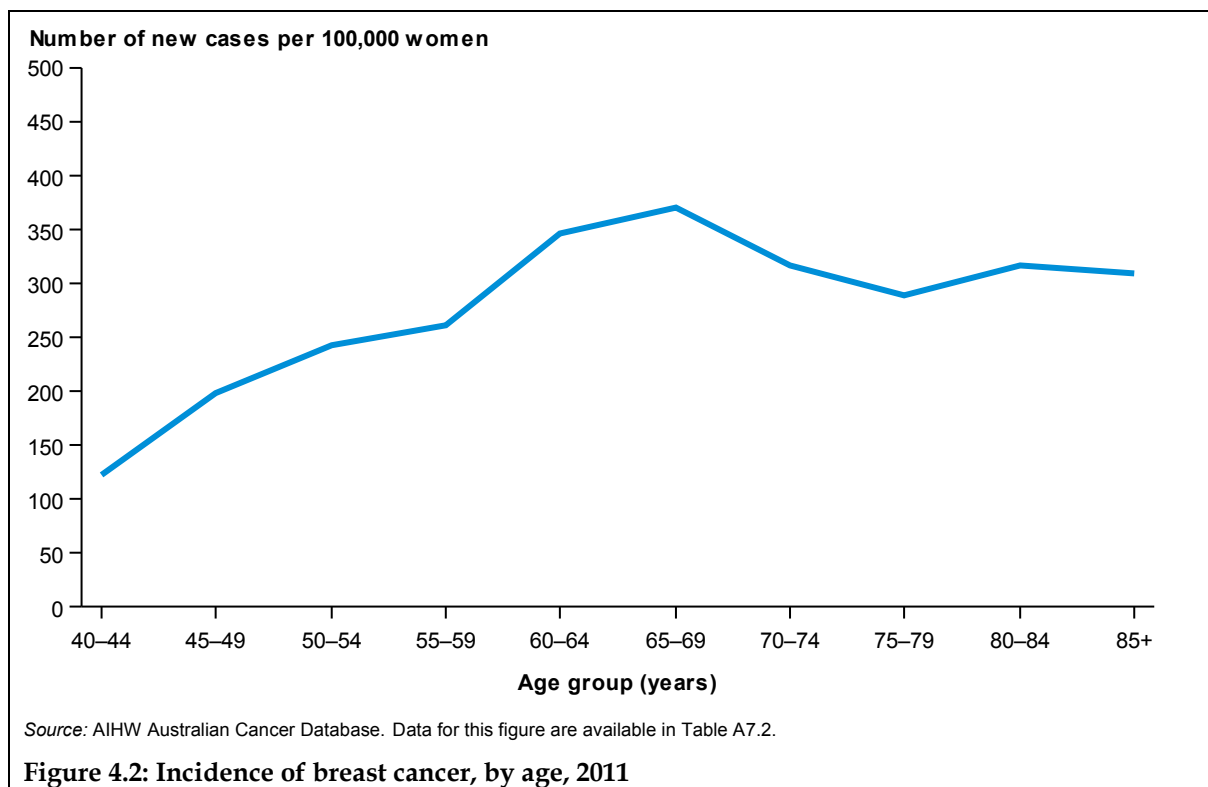


Figure 4.1: Incidence of breast cancer in women aged 50–69, 1982 to 2011

Breast cancer across ages

Incidence of breast cancer usually increases with increasing age, but the impact of BreastScreen Australia on the age at which breast cancers are diagnosed results in peak incidence occurring for women aged 60–64 and 65–69 at 346 and 370 new cases per 100,000 women in 2011, respectively – both of which are higher than the incidence rates of the older age groups (Figure 4.2).

In 2011, breast cancers in women aged 50–69 comprised half (51.8%) of all breast cancers diagnosed in that year.



Breast cancer across groups

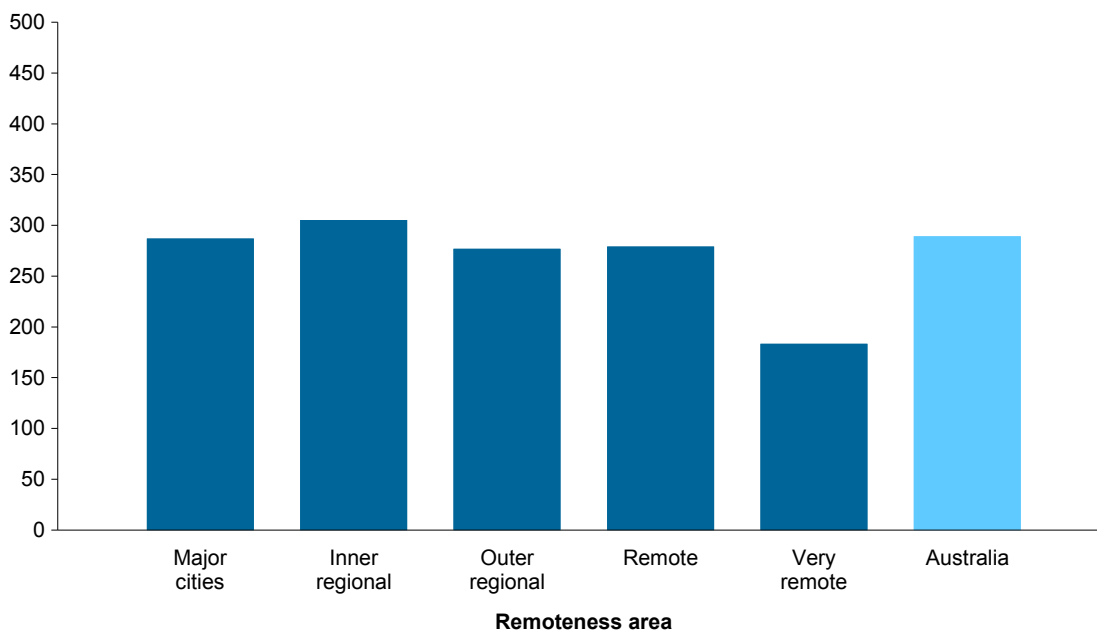
Incidence for population groups is presented for 2005–2009 (or 2006–2009 in the case of socioeconomic status) rather than for 2007–2011, as the actual data for 2010 and 2011 were not provided for New South Wales and the Australian Capital Territory to compile the 2011 Australian Cancer Database (ACD) (see Appendix C).

Although highest in *Inner regional* areas at 305 new cases per 100,000 women, incidence of breast cancer in 2005–2009 was relatively similar across all remoteness areas except for *Very remote* areas, which had a far lower incidence of 183 new cases per 100,000 women (Figure 4.3).

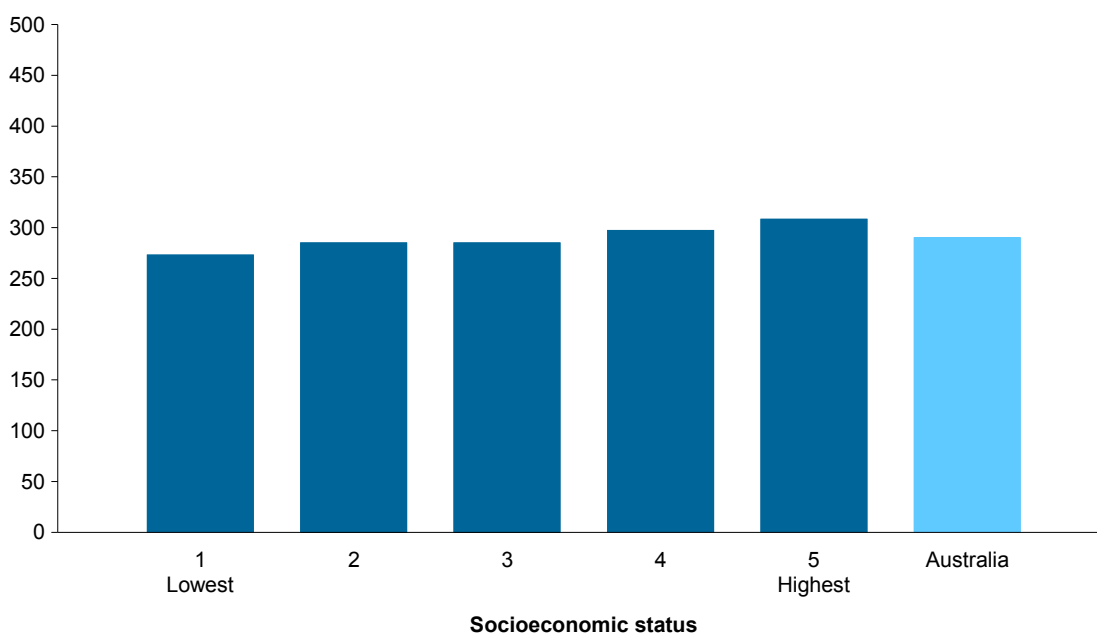
Lower incidence in *Very remote* areas may be related to the proportionately high number of Aboriginal and Torres Strait Islander women living in these areas, since Indigenous women have lower incidence of breast cancer (see Figure 4.4).

In 2006–2009, while incidence was relatively similar across socioeconomic status groups, there was a small trend of increasing incidence with increasing socioeconomic status (Figure 4.3).

Number of new cases per 100,000 women



Number of new cases per 100,000 women



Note: Rates age-standardised to the Australian population as at 30 June 2001.

Source: AIHW Australian Cancer Database 2011. Data for this figure, including 95% confidence intervals, are available in tables A7.5 and A7.6.

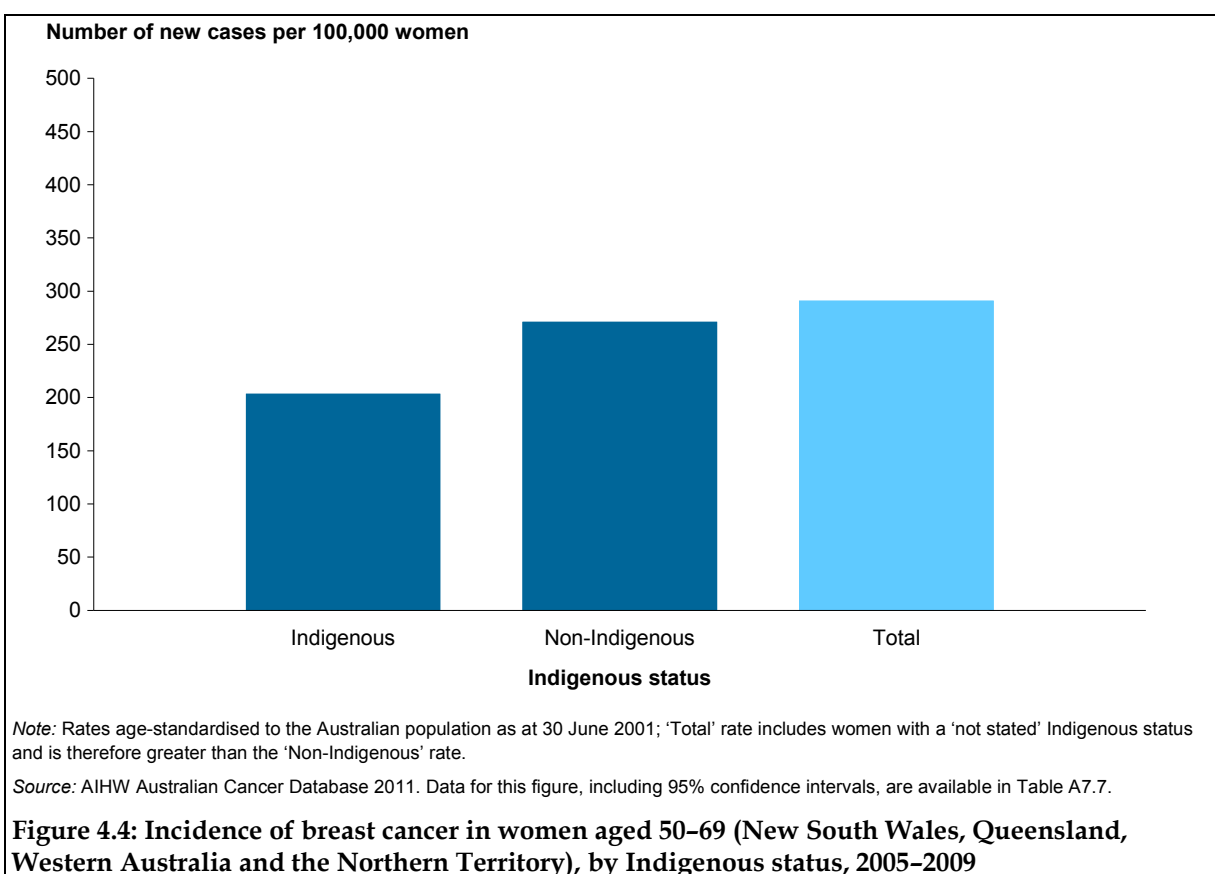
Figure 4.3: Incidence of breast cancer in women aged 50–69, by remoteness area, 2005–2009, and by socioeconomic status, 2006–2009

Box 4.2: Indigenous identification on the Australia Cancer Database

The collection of reliable information by the state and territory cancer registries on the Indigenous status of individuals diagnosed with cancer is problematic. This is because primary cancer diagnosis information is sourced from pathology forms which currently do not record information on Indigenous status in most states and territories. The registries collect information on the Indigenous status of individuals from additional sources such as hospital records and death records, which affects the completeness (and quality) of data.

This means that reliable national data on the incidence of cancer for Aboriginal and Torres Strait Islander Australians are not available, because in some jurisdictions the level of identification of Indigenous status is not considered sufficient to enable analysis. In this report, data for 4 states and territories – New South Wales, Queensland, Western Australia and the Northern Territory – are considered of sufficient quality, and were used to examine the incidence of breast cancer by Indigenous status. While the majority (around 85%) of Australian Aboriginal and Torres Strait Islander people reside in these 4 jurisdictions, both the level of completeness of Indigenous status recorded in these jurisdictions, and the degree to which data for these jurisdictions are representative of all Aboriginal and Torres Strait Islander people, is unknown.

It was found that, over the 5-year period 2005–2009, breast cancer incidence in Aboriginal and Torres Strait Islander women aged 50–69 in New South Wales, Queensland, Western Australia and the Northern Territory was significantly lower than that of non-Indigenous women. This was 203 new cases per 100,000 Indigenous women compared with 271 new cases per 100,000 non-Indigenous women (Figure 4.4).



4.2 Incidence of ductal carcinoma in situ (DCIS)

DCIS is a non-invasive tumour arising from the lining of the ducts that carry milk from the milk-producing lobules to the nipple. Cell changes seen in DCIS are similar to those in invasive breast cancer. However, unlike invasive breast cancer, DCIS does not invade surrounding breast tissue, and is instead contained entirely within the milk duct.

State and territory cancer registries have been collecting data on DCIS since 1996. Recently, these data have been included in data provided to the AIHW for the formation of the ACD; this means that for the first time, DCIS data have been sourced and analysed nationally through the ACD (see Appendix E for classification of DCIS). As actual data were not provided, data for New South Wales and the Australian Capital Territory had to be projected for 2010 and 2011 in the 2011 ACD, and as this does not include DCIS cases, there are no DCIS cases for New South Wales or the Australian Capital Territory for 2010 or 2011. Therefore, the latest national data for DCIS incidence are for 2009.

In 2009, there were 1,803 new cases of DCIS in Australian women. This is equivalent to 17 new cases for every 100,000 women in the population. Of the 1,803 new cases, 1,152 were in women aged 50–69, the target population of BreastScreen Australia. These 1,152 new cases are equivalent to 48 new cases for every 100,000 women in the population.

These rates have also been age-standardised for use in analyses of trends and differentials to 15 new cases per 100,000 women for women of all ages, and 48 new cases per 100,000 women for those aged 50–69.

Box 4.3: DCIS cases detected through BreastScreen Australia

Of all DCIS cases diagnosed in 2009 in women aged 50–69, approximately 76% were detected through BreastScreen Australia (65% for women aged 40 and over).

DCIS over time

Both the incidence rate and the number of new cases of DCIS in women aged 50–69 have increased over time; the former from 31 new cases per 100,000 women in 1996 to 48 in 2009, and the latter from 501 new cases in 1996 to 1,152 new cases in 2009.

DCIS across ages

Similar to invasive breast cancer, the incidence of DCIS increases with increasing age. Also similar to invasive breast cancer, there is a clear impact of BreastScreen Australia in determining the peak incidence of DCIS in women age 60–69. While DCIS incidence in 2009 increased from 21 in women aged 40–49 to 44 in women aged 50–59 and finally to 55 for women aged 60–69, incidence of DCIS thereafter drops off to be 24 new cases per 100,000 women for women aged 70 and over.

In 2009, DCIS in women aged 50–69 comprised 64% of all cases diagnosed in that year.

It is clear from these data, and the data shown in Box 4.3, that DCIS is deserving of its name as a ‘disease of screening’. Indeed, DCIS was rarely detected before breast screening was introduced, and its incidence has increased since the introduction of screening mammography, including that performed through BreastScreen Australia.

4.3 Mortality from breast cancer

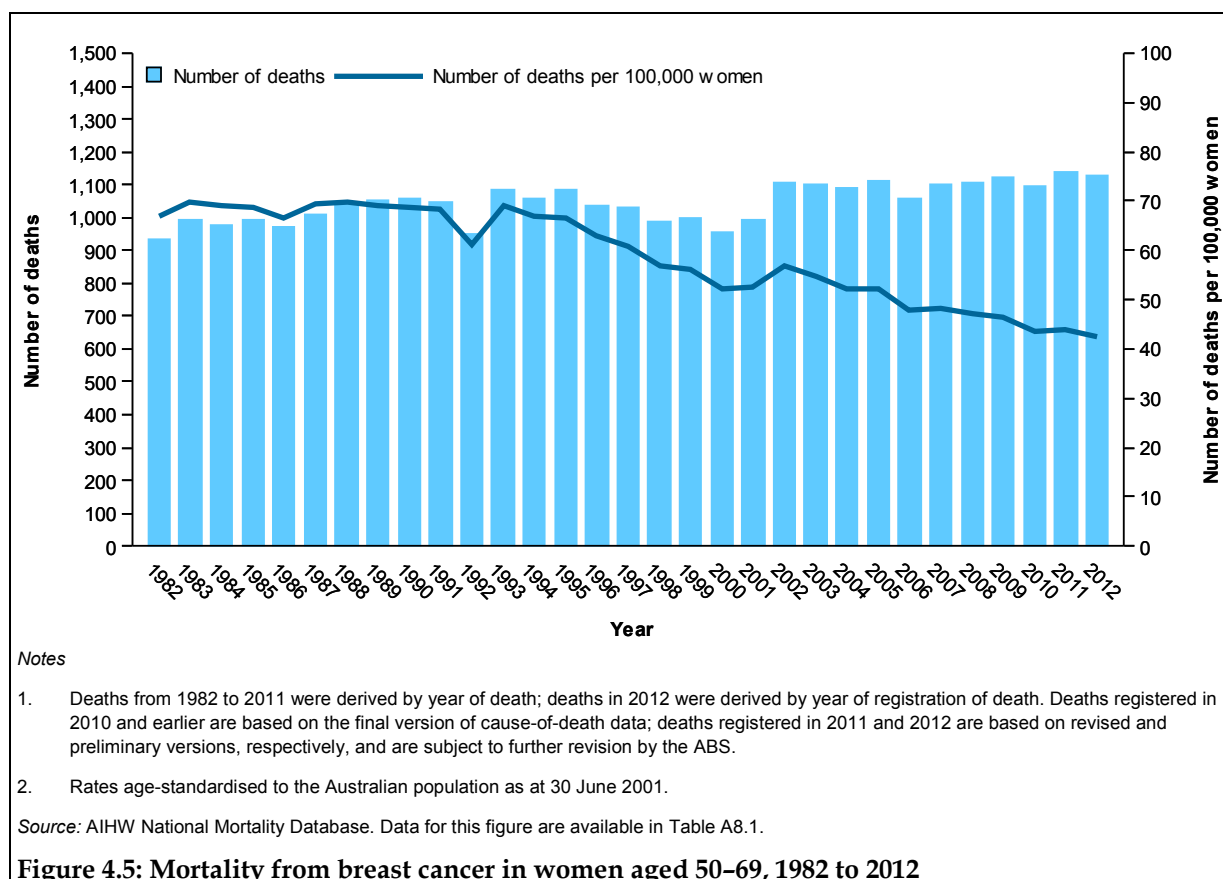
Similar to incidence data, Australia has high-quality and virtually complete mortality data. The mortality data used here were provided by the Registries of Births, Deaths and Marriages and the National Coronial Information System (managed by the Victorian Department of Justice) and include cause of death coded by the Australian Bureau of Statistics (ABS). These data are maintained at the AIHW in the National Mortality Database. The latest national data available are for deaths in 2012.

In 2012, there were 2,795 deaths from breast cancer in Australian women. This is equivalent to 25 deaths for every 100,000 women in the population. Of the 2,795 deaths, 1,126 were in women aged 50–69, the target population of BreastScreen Australia. These 1,126 deaths are equivalent to 44 deaths for every 100,000 women in the population.

These rates have also been age-standardised for use in analyses of trends and differentials to 21 deaths per 100,000 women for women of all ages, and 42 deaths per 100,000 women for those aged 50–69.

Breast cancer deaths over time

Mortality from breast cancer has decreased over time, with this decrease evident after the introduction of BreastScreen Australia in 1991 when it was 68 deaths per 100,000 women to the rate in 2012 of 42 deaths per 100,000 women for women aged 50–69 (Figure 4.5).

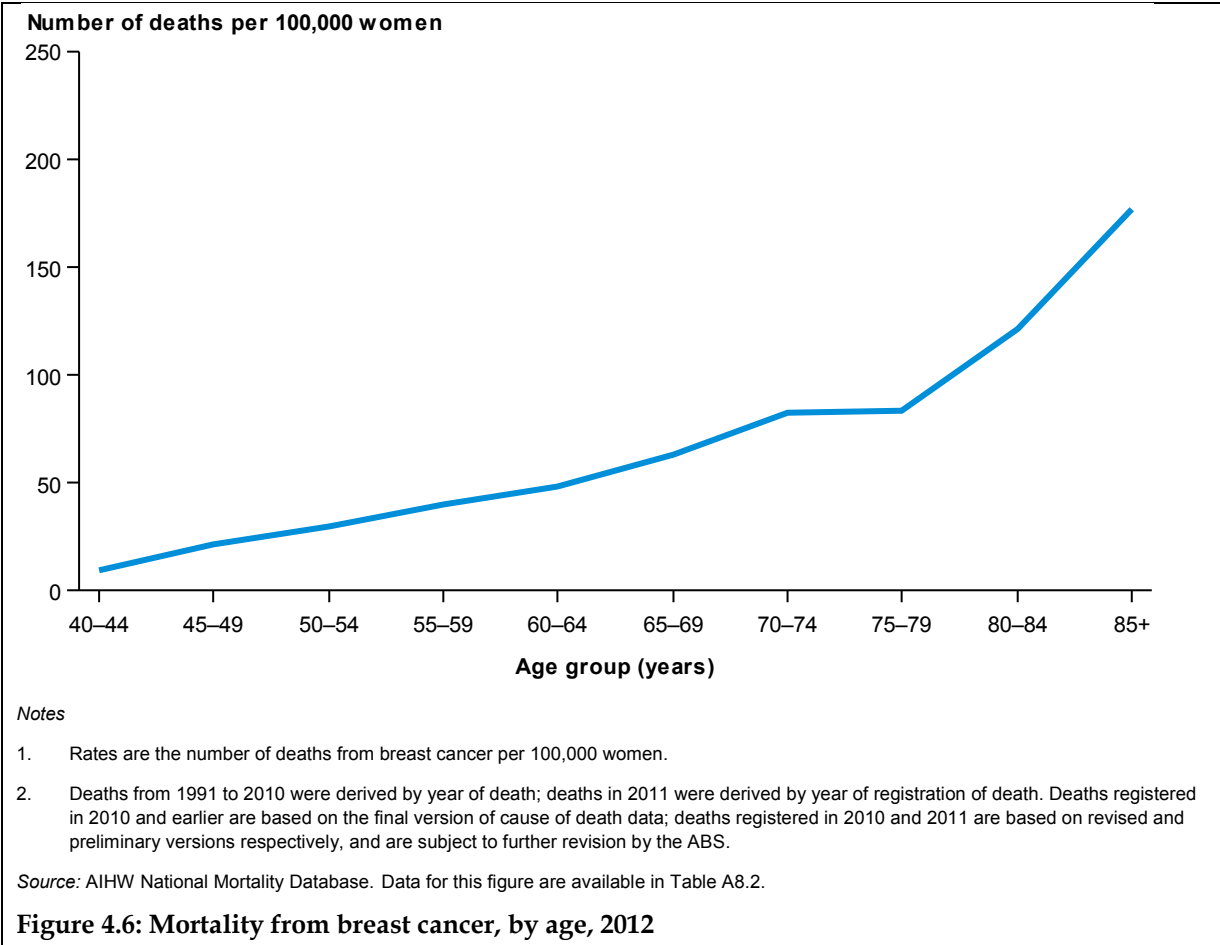


The fall in breast cancer mortality in women aged 50–69 has been attributed in part to the early detection of breast cancer through BreastScreen Australia, along with advances in the management and treatment of breast cancer (BreastScreen Australia EAC 2009).

Breast cancer deaths across ages

Mortality from breast cancer increases with increasing age. In 2012, this ranged from 9 deaths per 100,000 women for women aged 40–44, to 177 deaths per 100,000 women for women aged 85 and over (Figure 4.6).

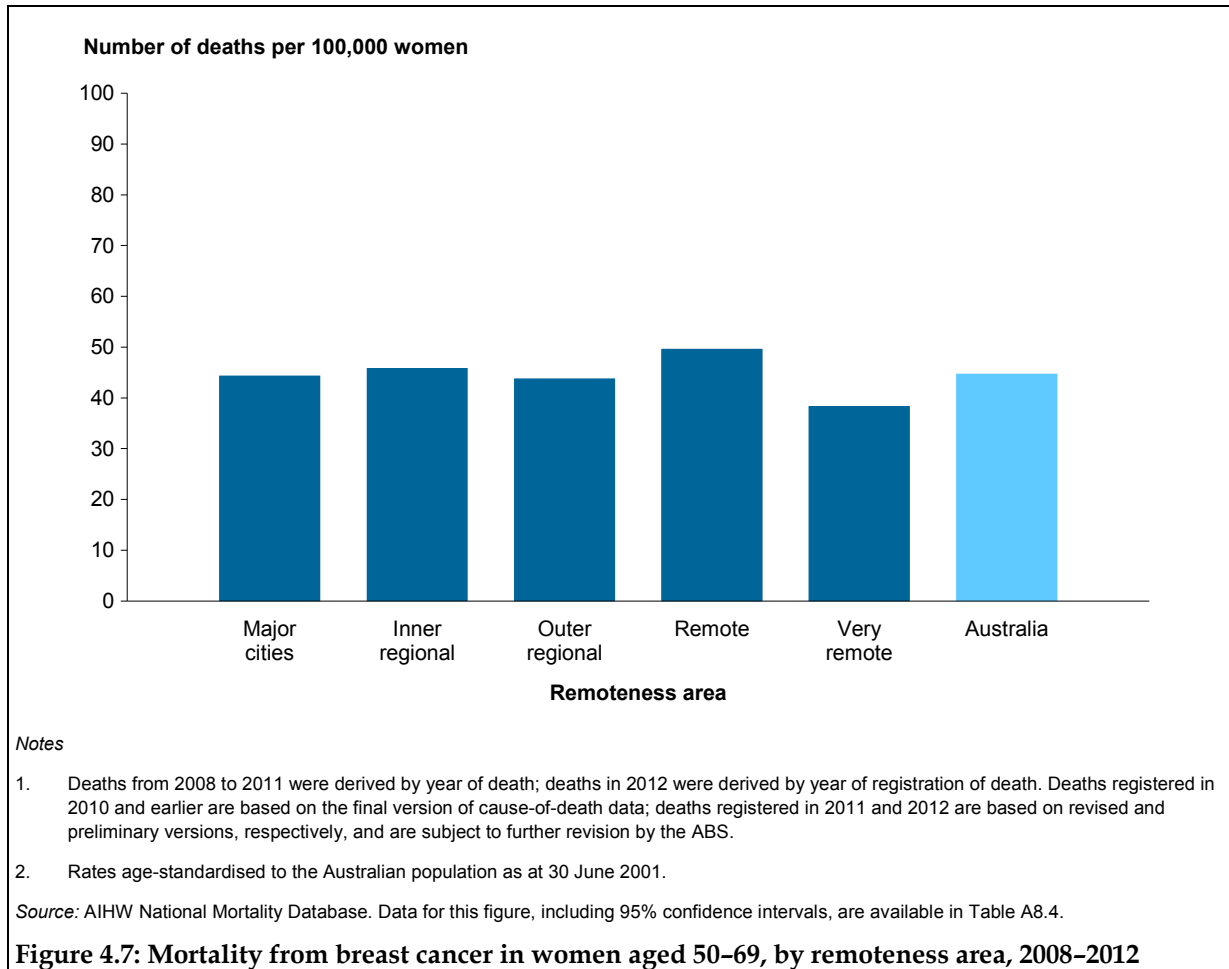
In 2012, deaths due to breast cancer in women aged 50–69 comprised 40.3% of all breast cancer deaths in that year.



Breast cancer deaths across population groups

Mortality in 2008–2012 for women aged 50–69 was relatively similar across *Major cities*, *Inner regional* and *Outer regional* areas, at around 44–46 deaths per 100,000 women. However, mortality was higher in *Remote* areas at 50 deaths per 100,000 women and lower in *Very remote* areas at 38 deaths per 100,000 women (Figure 4.7).

The reason for higher mortality in *Remote* areas and lower mortality in *Very remote* areas in women age 50–69 years is not clear, but small numbers of deaths in *Remote* and *Very remote* areas (76 and 28, respectively) may affect the robustness of these rates.

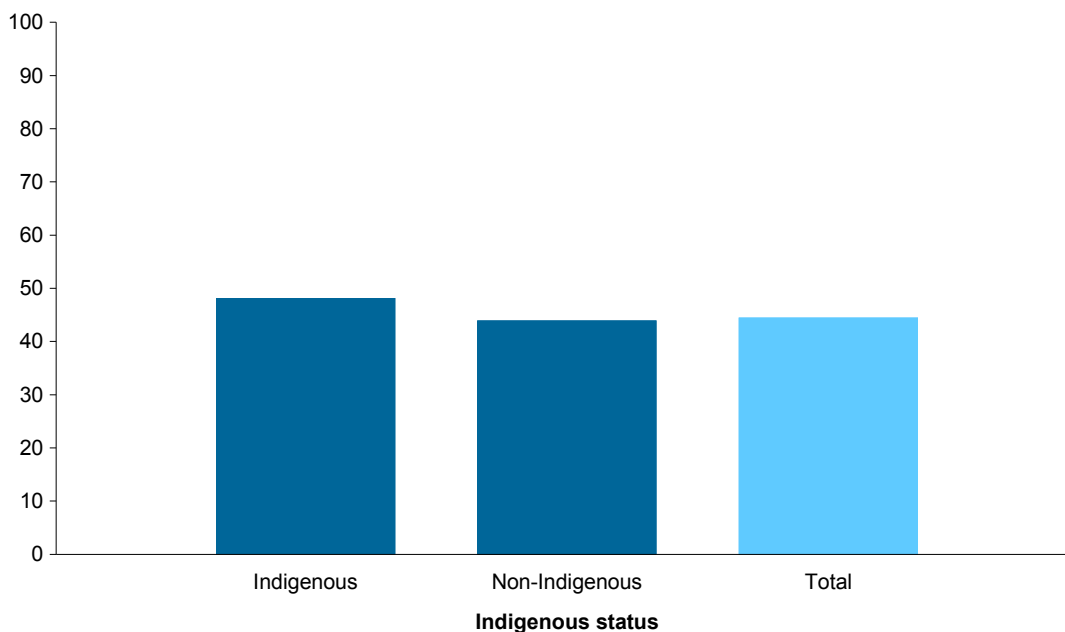


Information on Indigenous status in the AIHW National Mortality Database is considered to be adequate for reporting for 5 jurisdictions – New South Wales, Queensland, Western Australia, South Australia and the Northern Territory. The majority (around 90%) of Aboriginal and Torres Strait Islander people reside in these 5 jurisdictions.

In 2008–2012, mortality from breast cancer in Aboriginal and Torres Strait Islander women aged 50–69 in New South Wales, Queensland, Western Australia, South Australia and the Northern Territory was significantly higher than that of non-Indigenous women. The mortality rate was 48 deaths per 100,000 Indigenous women compared with 44 deaths per 100,000 non-Indigenous women (Figure 4.8).

This higher mortality from breast cancer in Indigenous women is despite their having a lower incidence of breast cancer compared with non-Indigenous women. Higher mortality from breast cancer is associated with a larger size of breast cancer at diagnosis and spread of the cancer to lymph nodes (AIHW & NBCC 2007), and it has previously been shown that Aboriginal and Torres Strait Islander women have, on average, larger breast cancers, and a higher proportion of breast cancers that are node positive (Roder et al. 2012).

Number of deaths per 100,000 women



Notes

1. Deaths from 2008 to 2011 are derived from year of death; deaths in 2012 are derived from year of registration. Deaths registered in 2010 and earlier are based on the final version of cause-of-death data; deaths registered in 2011 and 2012 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Rates age-standardised to the Australian population as at 30 June 2001.
3. 'Total' includes women for whom Indigenous status was 'not stated'.

Source: AIHW National Mortality Database. Data for this figure, including 95% confidence intervals, are available in Table A8.5.

Figure 4.8: Mortality from breast cancer in women aged 50–69 (New South Wales, Queensland, Western Australia, South Australia and Northern Territory), by Indigenous status, 2008–2012

5 Monitoring other aspects of BreastScreen Australia

5.1 Expenditure on BreastScreen Australia

In Australia, there are three cancers for which screening is recommended – breast, cervical and bowel. Each cancer has a national screening program, with both Australian Government and state and territory government components.

The Australian Government provides funding to the states and territories for public health services through National Health Reform Payments (known as National Specific Purpose Payments before 1 July 2012) and National Partnership Payments. State and territory governments have full discretion over the application of National Health Reform Payments for public health funding, including the amount expended on BreastScreen Australia and the National Cervical Screening Program. The funding for the National Bowel Cancer Screening Program is through a specific National Partnership Payment.

In addition to the funding provided by the Australian Government, state and territory governments also contribute funding towards these programs.

Table 5.1 shows expenditure for the three national cancer screening programs (expenditure by Australian and state and territory governments combined), as well as total expenditure on cancer screening for the 2012–13 financial year.

In 2012–13, an estimated \$204.9 million was spent on BreastScreen Australia.

Table 5.1: Government funding for cancer screening programs, 2012–13

Screening program	Expenditure 2012–13 (\$ million)
BreastScreen Australia ^(a)	204.9
National Cervical Screening Program ^(b)	89.3
National Bowel Cancer Screening Program ^(c)	32.9
Total	327.1

(a) Excludes mammography for breast cancer screening that occurs outside BreastScreen Australia.

(b) Excludes the proportion of the costs associated with general practitioner, specialist and nurse attendances that would have been for Pap smears.

(c) Excludes Medicare Benefits Schedule (MBS) flow-on costs as well as bowel screening that occurs outside the National Bowel Cancer Screening Program.

Note: These expenditure data only include recurrent expenditure; health infrastructure payments for cancer have been excluded as well as any health workforce expenditure.

Sources: AIHW Health expenditure database; Medicare Australia Statistics.

Appendix A: Supporting data tables

A1 Participation

Table A1.1: Participation of women aged 50–69 in BreastScreen Australia, 1996–1997 to 2013–2014

Reporting period	Participants ^(a)	Population ^(b)	Crude rate ^(c)	AS rate ^(d)
1996–1997	845,143	1,637,010	51.6	51.7
1997–1998	927,735	1,691,811	54.8	54.9
1998–1999	976,182	1,744,201	56.0	56.0
1999–2000	1,012,184	1,798,652	56.3	56.3
2000–2001	1,064,246	1,856,598	57.3	57.3
2001–2002	1,102,642	1,915,145	57.6	57.6
2002–2003	1,118,823	1,974,192	56.7	56.6
2003–2004	1,145,008	2,033,831	56.3	56.2
2004–2005	1,188,955	2,094,183	56.8	56.7
2005–2006	1,242,210	2,155,430	57.6	57.5
2006–2007	1,262,334	2,217,714	56.9	56.7
2007–2008	1,273,317	2,282,672	55.8	55.5
2008–2009	1,319,771	2,349,050	56.2	55.9
2009–2010	1,352,112	2,416,676	55.9	55.6
2010–2011	1,373,731	2,487,062	55.2	54.8
2011–2012	1,407,065	2,557,284	55.0	54.6
2012–2013	1,439,748	2,624,718	54.9	54.4
2013–2014	1,456,830	2,688,350	54.2	53.7

(a) Participants are the number of women aged 50–69 screened through BreastScreen Australia in each 2-year reporting period. The screening periods cover 1 January of the initial year to 31 December of the latter year indicated.

(b) Population is the average of the Australian Bureau of Statistics (ABS) estimated resident population for women aged 50–69 for the 2 reporting years.

(c) Crude rate is the number of women aged 50–69 screened in each 2-year reporting period as a percentage of the ABS estimated resident population.

(d) Age-standardised (AS) rate is the number of women aged 50–69 screened in each 2-year reporting period as a percentage of the ABS estimated resident population age-standardised to the Australian population at 30 June 2001.

Note: Data for 2013–2014 are preliminary; data for all other reporting periods are final.

Source: AIHW analysis of BreastScreen Australia data.

Table A1.2: BreastScreen Australia participation by age, 2012–2013 and 2013–2014

	40–44	45–49	50–54	55–59	60–64	65–69	70+
2012–2013							
Number	95,962	151,224	382,542	378,326	369,518	309,362	174,968
Crude rate	11.5	19.6	49.3	54.2	59.5	58.4	14.2
2013–2014							
Number	100,882	149,480	380,921	378,684	372,144	325,081	224,352
Crude rate	12.0	19.3	48.5	53.0	58.7	58.6	17.7

Notes

1. For 2012–2013 data, Crude rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population.
2. Data for 2013–2014 are preliminary.

Source: AIHW analysis of BreastScreen Australia data.

Table A1.3: BreastScreen Australia participation by state and territory, women aged 50–69, 2012–2013 and 2013–2014

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
2012–2013									
Number	445,023	356,963	302,281	154,170	110,419	39,768	22,441	8,683	1,439,748
Crude rate	52.1	55.3	58.0	57.3	53.6	58.7	55.5	41.4	54.9
AS rate	51.6	54.9	57.6	57.1	53.1	57.9	54.9	41.6	54.4
2013–2014									
Number	448,290	362,644	307,941	150,466	116,900	39,410	22,621	8,558	1,456,830
Crude rate	51.3	54.8	57.6	54.4	55.7	57.2	54.8	39.7	54.2
AS rate	50.7	54.5	57.2	54.1	54.9	56.4	54.2	39.7	53.7

Notes

1. For 2012–2013 data, Crude rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population; age-standardised (AS) rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population age-standardised to the Australian population at 30 June 2001.
2. Direct comparisons between the states and territories of Australia are not advised due to the substantial differences that exist between the jurisdictions including for population, geographical size and structure, policies and other factors.
3. Data for 2013–2014 are preliminary.

Source: AIHW analysis of BreastScreen Australia data.

Table A1.4: BreastScreen Australia participation by remoteness area, women aged 50–69, 2012–2013

	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
Number	944,408	316,699	151,739	18,111	7,950	1,439,748
Crude rate	53.2	58.1	59.7	55.7	47.2	54.9
AS rate	52.8	57.4	59.2	55.6	47.3	54.4

Notes

1. Crude rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population; age-standardised (AS) rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population age-standardised to the Australian population at 30 June 2001.
2. Remoteness areas were assigned using the woman's residential postcode according to the Australian Statistical Geography Standard (ASGS) for 2011. Not all postcodes can be assigned to a remoteness area therefore, categories do not add exactly to the total for Australia.

Source: AIHW analysis of BreastScreen Australia data.

Table A1.5: BreastScreen Australia participation by socioeconomic status, women aged 50–69, 2012–2013

	1 (lowest)	2	3	4	5 (highest)	Australia
Number	281,752	297,827	286,160	283,285	287,291	1,439,748
Crude rate	52.9	56.1	55.0	55.3	54.3	54.9
AS rate	52.3	55.5	54.6	55.0	54.0	54.4

Notes

1. Crude rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population; age-standardised (AS) rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population age-standardised to the Australian population at 30 June 2001.
2. Socioeconomic status was assigned using the woman's residential postcode according to the Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-economic Disadvantage for 2011; 1 (lowest socioeconomic group) corresponds to the most disadvantaged socioeconomic status and 5 (highest socioeconomic group) to the least disadvantaged socioeconomic status. Not all postcodes could be assigned to a socioeconomic category; therefore, categories do not add exactly to the total for Australia.

Source: AIHW analysis of BreastScreen Australia data.

Table A1.6: BreastScreen Australia participation by Indigenous status, women aged 50–69, 2012–2013

	Indigenous	Non-Indigenous	Australia ^(a)
Number	14,786	1,418,450	1,439,748
Crude rate	35.1	54.9	54.9
AS rate	35.5	54.5	54.4

(a) Includes women in the 'not stated' category for Indigenous status. Therefore, columns may not sum to the Australia column.

Notes

1. Indigenous status is self-reported; therefore, accuracy of Indigenous participation rates will be affected if women choose not to identify as Indigenous at the time of screening.
2. Crude rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population; age-standardised (AS) rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of BreastScreen Australia data.

Table A1.7: Number and age-standardised rate of women aged 50–69 participating in BreastScreen Australia, by Indigenous status, 1996–1997 to 2012–2013

Reporting period	Indigenous participants	Indigenous crude rate	Indigenous AS rate	Non-Indigenous participants	Non-Indigenous crude rate	Non-Indigenous AS rate
1996–1997	4,660	25.0	25.0	643,182	39.7	39.8
1997–1998	5,398	27.8	27.8	713,175	42.6	42.7
1998–1999	5,965	29.3	29.4	748,367	43.4	43.4
1999–2000	6,479	30.4	30.5	773,574	43.5	43.5
2000–2001	7,011	31.4	31.5	813,461	44.3	44.4
2001–2002	7,504	31.9	32.1	849,334	44.9	44.9
2002–2003	7,985	32.3	32.6	985,439	50.5	50.5
2003–2004	8,132	31.2	31.5	1,131,173	56.3	56.3
2004–2005	8,595	31.2	31.6	1,175,197	56.9	56.8
2005–2006	9,284	32.0	32.4	1,226,306	57.7	57.5
2006–2007	9,720	31.7	32.1	1,246,513	57.0	56.8
2007–2008	10,294	31.9	32.3	1,256,472	55.8	55.6
2008–2009	10,902	31.9	32.3	1,302,050	56.2	55.9
2009–2010	11,374	31.5	32.0	1,332,597	56.0	55.6
2010–2011	11,971	31.5	31.9	1,341,869	54.8	54.4
2011–2012	13,164	32.9	33.3	1,384,064	55.0	54.5
2012–2013	14,786	35.1	35.5	1,418,450	54.9	54.5

Notes

1. Indigenous status is self-reported; therefore, accuracy of Indigenous participation rates will be affected if women choose not to identify as Indigenous at the time of screening.
2. Crude rate is the number of women screened as a percentage of the ABS estimated resident population; age-standardised (AS) rate is the number of women screened as a percentage of the ABS estimated resident population age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of BreastScreen Australia data.

Table A1.8: BreastScreen Australia participation by main language spoken at home, women aged 50–69, 2012–2013

	English-speaking	Non-English-speaking	Australia ^(a)
Number	1,209,575	218,476	1,439,748
Crude rate	55.5	49.1	54.9
AS rate	55.0	48.8	54.4

- (a) Includes women in the 'not stated' category for main language other than English spoken at home. Therefore, columns may not sum to the Australia column.

Notes

1. Some jurisdictions do not use the 'not stated' category, and there may also be differences in how these data are collected. This means that the analysis based on main language spoken at home should be interpreted with caution.
2. Crude rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population; age-standardised (AS) rate is the number of women screened in 2012–2013 as a percentage of the ABS estimated resident population age-standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of BreastScreen Australia data.

A2 Rescreening

Table A2.1: Rescreening by screening round, women aged 50–67, 2001 to 2011

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
First screening round											
AS rate	62.8	61.5	60.4	62.7	59.3	49.9	55.9	59.9	59.4	58.3	59.6
Second screening round											
AS rate	71.9	70.2	69.3	70.5	66.8	58.5	62.6	71.2	69.8	67.8	67.8
Third and subsequent screening rounds											
AS rate	81.9	80.8	80.2	81.0	78.4	73.5	76.1	81.6	82.3	82.8	81.6

Note: Age-standardised (AS) rate is the number of women rescreened within 27 months as a percentage of women screened age-standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

Table A2.2: Rescreening by age and screening round, women screened during 2011

	Age group (years)		
	40–49	50–67	70+
First screening round			
Crude rate	45.8	60.1	28.7
Second screening round			
Crude rate	65.7	68.9	39.6
Third and subsequent screening rounds			
Crude rate	80.0	81.7	54.1

Note: Crude rate is the number of women rescreened within 27 months as a percentage of women screened.

Source: AIHW analysis of BreastScreen Australia data.

Table A2.3: Rescreening by state and territory and screening round, women aged 50–67 screened during 2011

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
Crude rate	65.1	58.2	62.9	61.1	44.4	69.9	50.2	41.4	60.1
AS rate	64.9	53.9	63.2	56.6	43.8	70.6	45.1	38.9	59.6
Second screening round									
Crude rate	73.5	67.4	71.7	71.8	50.2	76.7	61.4	51.1	68.9
AS rate	72.2	63.8	71.8	68.8	49.3	77.2	56.6	49.0	67.8
Third and subsequent screening rounds									
Crude rate	85.5	79.7	85.9	82.9	64.1	86.0	70.9	68.1	81.7
AS rate	85.2	79.5	85.7	82.9	64.0	85.8	70.5	68.3	81.6

Note: Crude rate is the number of women rescreened within 27 months as a percentage of women screened; age-standardised (AS) rate is the number of women rescreened within 27 months as a percentage of women screened age-standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

A3 Recall to assessment

Table A3.1: Recall to assessment, women aged 50–69, first and subsequent screening rounds, 2003 to 2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
First screening round											
Number	6,320	7,061	7,503	7,743	7,948	9,213	9,454	9,110	8,420	8,395	10,214
Crude rate	9.5	10.0	10.2	10.2	10.3	10.3	11.2	11.4	11.1	10.8	11.9
AS rate	9.4	9.8	9.8	9.9	9.9	9.9	10.7	11.1	10.7	10.8	11.6
Subsequent screening rounds											
Number	20,845	21,292	21,851	23,078	22,472	23,604	25,164	25,880	24,022	22,406	25,681
Crude rate	4.0	4.0	3.9	4.0	4.0	4.1	4.1	4.1	3.7	3.4	3.9
AS rate	4.0	4.0	3.9	4.0	4.0	4.1	4.2	4.2	3.8	3.4	3.9

Note: Crude rate is the number of women recalled for assessment as a percentage of women screened; age-standardised (AS) rate is the number of women recalled for assessment as a percentage of women screened age-standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

Table A3.2: Recall to assessment by age, first and subsequent screening rounds, 2013

	Age group (years)						
	40–44	45–49	50–54	55–59	60–64	65–69	70+
First screening round							
Number	3,897	3,669	6,901	1,762	985	566	256
Crude rate	10.0	11.5	12.1	11.6	11.4	11.3	11.2
Subsequent screening rounds							
Number	769	2,569	6,328	6,542	6,703	6,108	4,167
Crude rate	5.2	5.3	4.5	3.6	3.7	3.8	4.2

Note: Crude rate is the number of women recalled for assessment as a percentage of women screened.

Source: AIHW analysis of BreastScreen Australia data.

Table A3.3: Recall to assessment by state and territory, women aged 50–69, first and subsequent screening rounds, 2013

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
Number	3,641	3,021	1,664	750	720	157	133	128	10,214
Crude rate	12.7	11.9	13.1	8.2	14.1	9.4	6.4	10.4	11.9
AS rate	12.4	11.9	13.3	7.7	14.6	8.7	6.5	9.2	11.6
Subsequent screening rounds									
Number	8,467	6,125	6,105	1,629	2,334	572	327	122	25,681
Crude rate	4.1	3.8	4.1	2.3	5.0	3.0	3.2	3.4	3.9
AS rate	4.2	3.9	4.2	2.3	5.0	3.0	3.2	3.4	3.9

Note: Crude rate is the number of women recalled for assessment as a percentage of women screened; age-standardised (AS) rate is the number of women recalled for assessment as a percentage of women screened age-standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

A4 Invasive breast cancer detection

Table A4.1: All-size invasive breast cancer detection in women aged 50–69, first and subsequent screening rounds, 2003 to 2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
First screening round											
Number	421	465	475	442	489	585	549	581	537	631	715
Crude rate	63.5	66.1	64.5	58.4	63.6	67.2	65.2	72.7	70.7	80.8	83.1
AS rate	74.2	82.2	76.6	71.8	77.6	75.5	79.5	91.6	82.1	103.6	107.9
95% CI	66.0– 82.9	73.3– 91.8	68.4– 85.4	63.8– 80.4	69.8– 86.0	68.5– 82.9	71.7– 87.7	82.6– 101.2	73.5– 91.3	93.2– 114.6	97.9– 118.5
Subsequent screening rounds											
Number	2,302	2,313	2,371	2,589	2,437	2,834	2,859	2,879	2,862	3,011	3,279
Crude rate	44.4	43.5	42.5	44.4	43.0	48.7	46.8	45.9	44.4	45.4	49.4
AS rate	44.2	43.3	42.1	44.0	42.3	47.8	45.4	44.4	42.9	43.9	47.6
95% CI	42.4– 46.1	41.5– 45.1	40.5– 43.9	42.3– 45.7	40.7– 44.0	46.0– 49.6	43.8– 47.1	42.8– 46.1	41.3– 44.5	42.4– 45.5	45.9– 49.2

Note: Crude rate is the number of women with invasive breast cancer detected per 10,000 women screened; age-standardised (AS) rate is the number of women with invasive breast cancer detected per 10,000 women screened, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Table A4.2: Small (≤ 15 mm) invasive breast cancer detection in women aged 50–69, all screening rounds, 2003 to 2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number	1,695	1,763	1,797	1,898	1,798	2,103	2,132	2,082	2,077	2,122	2,317
Crude rate	29.0	29.3	28.4	28.8	27.9	31.4	30.7	29.4	28.8	28.6	30.9
AS rate	29.4	29.6	28.7	29.2	28.0	31.4	30.5	29.2	28.4	28.2	30.4
95% CI	28.0– 30.9	28.3– 31.0	27.4– 30.1	27.9– 30.5	26.7– 29.3	30.1– 32.8	29.2– 31.8	27.9– 30.4	27.2– 29.7	27.1– 29.5	29.1– 31.6

Note: Crude rate is the number of women with invasive breast cancer detected per 10,000 women screened; age-standardised (AS) rate is the number of women with invasive breast cancer detected per 10,000 women screened, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Table A4.3: Proportion of small (≤ 15 mm) invasive breast cancers detected in women aged 50–69, all screening rounds, 2003 to 2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Proportion (%)	62.2	63.5	63.1	62.6	61.4	61.5	62.6	60.2	61.1	58.3	58.0

Note: Figures are the number of women with small invasive breast cancer detected as a proportion of the number of women with invasive breast cancer detected.

Source: AIHW analysis of BreastScreen Australia data.

Table A4.4: All-size and small (≤ 15 mm) invasive breast cancer detection by age, all screening rounds, 2013

	Age group (years)						
	40–44	45–49	50–54	55–59	60–64	65–69	70+
All-size							
Number	110	316	903	860	1,083	1,148	968
Crude rate	20.3	39.3	45.3	44.1	56.7	70.1	96.2
Small							
Number	51	148	488	484	646	699	573
Crude rate	9.4	18.4	24.5	24.8	33.8	42.7	57.0

Note: Crude rate is the number of women with small invasive breast cancer detected per 10,000 women screened.

Source: AIHW analysis of BreastScreen Australia data.

Table A4.5: All-size and small (≤ 15 mm) invasive breast cancer detection by state and territory, women aged 50–69, 2013

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
All-size, first screening round									
Number	231	183	112	78	37	14	52	8	715
Crude rate	80.3	72.2	88.3	85.0	72.6	83.6	250.1	64.8	83.1
AS rate	108.6	91.8	102.1	100.9	100.6	91.9	251.1	80.5	107.9
95% CI	91.0–128.0	73.5–112.3	81.0–126.5	72.1–135.0	59.2–153.6	43.6–164.2	186.2–330.9	18.0–187.3	97.9–118.5
All-size, subsequent screening rounds									
Number	966	834	730	343	266	98	22	20	3,279
Crude rate	47.0	52.0	49.6	48.4	56.8	51.7	21.6	56.3	49.4
AS rate	44.9	49.9	48.5	46.7	53.8	50.6	21.0	53.8	47.6
95% CI	42.0–47.9	46.5–53.4	45.0–52.1	41.8–52.0	47.4–60.8	40.9–61.9	13.1–31.8	32.8–83.2	45.9–49.2
Small, all screening rounds									
Number	701	559	491	242	194	84	30	16	2,317
Crude rate	29.9	30.1	30.7	30.2	37.4	40.7	24.4	33.4	30.9
AS rate	29.2	29.6	30.4	30.1	36.1	39.9	24.4	36.7	30.4
95% CI	27.1–31.5	27.2–32.1	27.7–33.2	26.4–34.1	31.2–41.6	31.8–49.5	16.4–35.0	20.8–60.0	29.1–31.6

Notes

1. Crude rate is the number of women with invasive breast cancer detected per 10,000 women screened; age-standardised (AS) rate is the number of women with invasive breast cancer detected per 10,000 women screened, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.
2. State and territory differences, along with the size of the 95% confidence intervals (particularly in the smaller states and territories), need to be taken into consideration when interpreting cancer detection results.
3. A small number of women may be screened in one jurisdiction but have their cancer detected in another.

Source: AIHW analysis of BreastScreen Australia data.

A5 Ductal carcinoma in situ (DCIS) detection

Table A5.1: DCIS detection by year, women aged 50–69, first and subsequent screening rounds, 2003 to 2013

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
First screening round											
Number	105	123	104	130	144	142	152	142	141	153	207
Crude rate	15.8	17.5	14.1	17.2	18.7	15.9	18.0	17.8	18.6	19.6	24.1
AS rate	16.7	20.4	14.5	18.8	21.3	15.6	19.6	17.9	20.9	22.8	29.2
95% CI	13.0– 21.0	16.1– 25.4	11.2– 18.4	14.9– 23.3	17.3– 25.7	12.7– 18.8	16.0– 23.6	14.1– 22.1	16.7– 25.7	18.1– 28.0	24.2– 34.7
Subsequent screening rounds											
Number	537	565	618	571	633	678	723	734	740	750	876
Crude rate	10.4	10.6	11.1	9.8	11.2	11.7	11.8	11.7	11.5	11.3	13.2
AS rate	10.3	10.7	11.0	9.7	11.1	11.5	11.7	11.5	11.2	11.0	12.8
95% CI	9.4– 11.2	9.8– 11.6	10.2– 11.9	8.9– 10.6	10.3– 12.0	10.7– 12.4	10.9– 12.6	10.7– 12.4	10.4– 12.1	10.3– 11.9	12.0– 13.7

Note: Crude rate is the number of women with DCIS detected per 10,000 women screened; age-standardised (AS) rate is the number of women with DCIS detected per 10,000 women screened, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Table A5.2: DCIS detection by age, all screening rounds, 2013

	Age group (years)			
	40–49	50–59	60–69	70+
Number	155	527	556	192
Crude rate	11.5	13.4	15.7	19.1

Note: Crude rate is the number of women with DCIS detected per 10,000 women screened.

Source: AIHW analysis of BreastScreen Australia data.

Table A5.3: DCIS detection by state and territory, women aged 50–69, all screening rounds, 2013

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number	337	272	208	129	79	31	18	9	1,083
Crude rate	14.4	14.6	13.0	16.1	15.2	15.0	14.7	18.8	14.5
AS rate	14.3	14.6	12.9	16.1	15.0	14.4	14.4	19.4	14.3
95% CI	12.8–16.0	12.9–16.4	11.2–14.7	13.4–19.1	11.8–18.7	9.7–20.5	8.5–22.8	8.7–37.1	13.5–15.2

Notes

1. Crude rate is the number of women with DCIS detected per 10,000 women screened; age-standardised (AS) rate is the number of women with DCIS detected per 10,000 women screened and age-standardised to the population of women attending a BreastScreen Australia service in 2008; rates based on numbers less than 20 should be interpreted with caution; 95% CI are 95% confidence intervals.
2. State and territory differences, along with the size of the 95% confidence intervals (particularly in the smaller states and territories), need to be taken into consideration when interpreting DCIS detection results.
3. In some states and territories, the age-standardised rates vary considerably from the crude rates.
4. A small number of women may be screened in one jurisdiction but have their DCIS detected in another.

Source: AIHW analysis of BreastScreen Australia data.

A6a Interval cancers

Box A1: Different policies across state and territory BreastScreen programs affects interval cancer detection rates

Please note that differences in state and territory policies for managing women with symptoms may affect interval cancer rates.

For example, in some jurisdictions, women with a negative screening mammogram but who have symptoms are referred for diagnostic follow-up outside BreastScreen Australia, rather than being recalled for assessment within BreastScreen Australia; any cancers found in these women will be counted as interval cancers, leading to a higher apparent interval cancer rate. Conversely, states and territories that do recall women to assessment if they have symptoms (even in the face of a negative screening mammogram) may have lower apparent interval cancer rates. This affects the comparability of this indicator between jurisdictions.

Table A6.1: Interval cancer rate for women aged 50–69, screened in index years 2008, 2009 and 2010, by state and territory, first and subsequent screening rounds, 0–12 months follow-up

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
AS rate	7.0	3.9	6.8	3.3	6.6	4.6	1.7	3.0	5.9
95% CI	5.0–9.5	2.7–5.5	4.0–10.5	0.7–7.8	1.2–15.1	0.9–13.4	0.0–9.2	0.1–16.6	4.7–7.2
Subsequent screening rounds									
AS rate	7.0	5.0	6.0	6.0	5.9	5.9	7.2	6.7	6.1
95% CI	6.4–7.8	4.4–5.8	5.3–6.9	4.9–7.2	4.7–7.2	4.0–8.5	4.4–11.1	2.5–14.6	5.8–6.5

Note: Age-standardised (AS) rate is the number of interval cancers detected per 10,000 women-years, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Table A6.2: Interval cancer rate for women aged 50–69, screened in index years 2008, 2009 and 2010, by state and territory, first and subsequent screening rounds, 13–24 months follow-up

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
AS rate	9.8	10.1	9.0	9.0	4.7	13.2	33.4	3.0	9.8
95% CI	7.3–12.9	6.8–14.2	5.7–13.2	4.5–15.1	2.5–8.0	3.5–31.2	4.5–87.2	0.1–16.9	8.2–11.6
Subsequent screening rounds									
AS rate	10.8	13.5	12.0	10.3	13.9	14.2	15.6	13.5	12.1
95% CI	9.9–11.7	12.4–14.7	11.0–13.2	8.8–11.9	12.0–16.0	10.9–18.2	10.9–21.6	7.0–23.6	11.6–12.6

Note: Age-standardised (AS) rate is the number of interval cancers detected per 10,000 women-years, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Table A6.3: Interval cancer rate for women screened in index years 2008, 2009 and 2010, by age, all screening rounds, 0–12 months and 13–24 months follow-up

Time since screen (months)		Age group (years)			
		40–49	50–59	60–69	70+
0–12	Number	284	670	561	142
	Crude rate	8.2	6.0	6.2	7.4
13–24	Number	388	1,173	1,118	287
	Crude rate	11.9	11.0	13.1	15.8

Note: Crude rate is the number of interval cancers detected per 10,000 women-years.

Source: AIHW analysis of BreastScreen Australia data.

Table A6.4: Interval cancer rate for women aged 50–69, screened in index years 2008, 2009 and 2010, by state and territory, first and subsequent screening rounds, 0–24 months follow-up

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
AS rate	8.3	7.0	7.9	6.1	5.7	8.6	16.4	3.0	7.8
95% CI	6.7–10.2	5.2–9.1	5.7–10.6	3.4–9.6	2.5–10.0	3.4–17.2	2.6–40.7	0.4–10.8	6.8–8.9
Subsequent screening rounds									
AS rate	8.9	9.3	9.0	8.0	9.7	9.7	11.1	10.1	9.0
95% CI	8.3–9.4	8.6–9.9	8.4–9.7	7.1–9.0	8.6–10.9	7.8–11.9	8.3–14.4	6.0–15.9	8.7–9.4

Note: Age-standardised (AS) rate is the number of interval cancers detected per 10,000 women-years, age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

A6b Program sensitivity

Table A6.5: Program sensitivity for women aged 50–69, screened in index years 2008, 2009 and 2010, by state and territory, first and subsequent screening rounds, 0–12 months follow-up

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
AS rate	92.3	93.9	92.9	96.2	91.4	94.8	98.5	96.5	93.2
95% CI	84.7– 100.0	82.0– 100.0	82.5– 100.0	79.8– 100.0	71.4– 100.0	68.4– 100.0	70.6– 100.0	51.5– 100.0	88.3– 98.2
Subsequent screening rounds									
AS rates	86.2	89.8	89.0	87.7	87.9	86.4	92.0	89.2	88.1
95% CI	82.8– 89.8	85.7– 94.0	85.1– 93.2	81.7– 93.9	81.1– 95.0	74.9– 99.1	79.7– 100.0	65.8– 100.0	86.2– 90.1

Note: Age-standardised (AS) rate is the number of screen-detected cancers as a percentage of all cancers (screen-detected and interval cancers), age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Table A6.6: Program sensitivity for women aged 50–69, screened in index years 2008, 2009 and 2010, by state and territory, first and subsequent screening rounds, 0–24 months follow-up

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
AS rates	84.0	83.1	91.0	90.6	84.7	85.4	87.1	93.4	85.6
95%CI	77.0– 91.5	72.2– 94.8	80.9– 100.0	74.9– 100.0	65.6– 100.0	61.4– 100.0	62.6– 100.0	49.2– 100.0	81.1– 90.3
Subsequent screening rounds									
AS rates	72.0	70.7	80.8	82.7	69.9	69.5	79.4	73.9	74.5
95%CI	69.2– 75.0	67.5– 74.0	77.2– 84.5	77.1– 88.6	64.6– 75.5	60.3– 79.5	69.0– 90.9	54.4– 98.1	72.9– 76.2

Note: Age-standardised (AS) rate is the number of screen-detected cancers as a percentage of all cancers (screen-detected and interval cancers), age-standardised to the population of women attending a BreastScreen Australia service in 2008; 95% CI are 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Table A6.7: Program sensitivity for women screened in index years 2008, 2009 and 2010, all screening rounds, by age, 0–12 months and 0–24 months follow-up

Time since screen (months)		Age group (years)			
		40–49	50–59	60–69	70+
0–12	Crude rate	79.0	87.3	91.1	92.9
0–24	Crude rate	67.0	73.9	79.0	83.1

Note: Crude rate is the number of interval cancers detected per 10,000 women-years.

Source: AIHW analysis of BreastScreen Australia data.

A7a Invasive breast cancer incidence

Table A7.1: Incidence of invasive breast cancer, 1982 to 2011

Year of diagnosis	Women aged 50–69		Women of all ages	
	Number of new cases of invasive breast cancer	AS rate	Number of new cases of invasive breast cancer	AS rate
1982	2,446	174.7	5,307	81.0
1983	2,344	167.4	5,370	80.7
1984	2,529	179.2	5,712	83.6
1985	2,588	180.6	5,916	84.3
1986	2,639	184.5	6,087	85.2
1987	2,887	197.2	6,695	91.2
1988	2,882	194.4	6,726	89.5
1989	3,122	208.1	7,172	93.5
1990	3,153	209.2	7,424	94.9
1991	3,500	230.0	8,036	100.3
1992	3,394	221.9	8,004	98.0
1993	3,868	250.7	8,774	105.3
1994	4,470	283.8	9,748	114.5
1995	4,546	286.3	10,058	116.1
1996	4,381	270.2	9,744	109.8
1997	4,673	279.0	10,202	112.1
1998	5,000	289.9	10,736	115.3
1999	5,121	288.6	10,661	111.9
2000	5,457	298.4	11,394	116.8
2001	5,801	307.5	11,835	118.4
2002	5,982	307.1	12,081	118.2
2003	5,806	288.6	11,874	113.6
2004	6,047	292.0	12,213	114.5
2005	6,043	283.3	12,261	112.7
2006	6,412	291.4	12,694	114.2
2007	6,322	278.5	12,643	111.0
2008	6,961	298.1	13,615	117.0
2009	7,027	291.3	13,756	115.3
2010	7,478	301.2	14,256	117.0
2011	7,499	292.8	14,465	116.0

Note: Age-standardised (AS) rate is the number of new cases of breast cancer per 100,000 women, age-standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database 2011.

Table A7.2: Incidence of invasive breast cancer, by age, 2011

	Age group (years)									
	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
New cases	984	1,547	1,833	1,766	2,125	1,776	1,176	868	804	820
Crude rate	122.9	198.9	242.9	262.0	345.6	370.0	317.5	289.4	317.1	310.0

Note: Crude rate is the number of new cases of breast cancer per 100,000 women.

Source: AIHW Australian Cancer Database 2011.

Table A7.3: Incidence of invasive breast cancer, by age and histology group, 2009

Type of breast cancer	40–49	50–59	60–69	70+
Invasive ductal carcinoma	2,002	2,766	2,869	2,539
Invasive lobular carcinoma	214	335	437	403
Medullar carcinoma and atypical medullary carcinoma	21	13	15	7
Tubular carcinoma and invasive cribriform carcinoma	33	72	74	35
Mucinous carcinoma	27	35	60	148
Invasive papillary carcinoma	24	30	42	49
Inflammatory carcinoma	7	4	7	3
Mesenchymal	1	4	3	5
Other - specified	35	41	54	77
Unspecified	55	75	90	303

Note: One woman was unable to be allocated to a group and so does not appear in this table.

Source: AIHW Australian Cancer Database 2011.

Table A7.4: Incidence of invasive breast cancer by state and territory, women aged 50–69, 2005–2009

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
New cases	10,934	7,857	6,602	3,059	2,703	840	592	178	32,765
AS rate	292.4	281.1	298.4	274.1	292.4	279.2	334.9	213.3	288.7
95% CI	291.3– 293.4	279.8– 282.3	296.9– 299.8	272.2– 276.0	290.2– 294.6	275.5– 283.1	329.7– 340.4	207.2– 220.1	288.1– 289.3

Note: Age-standardised (AS) rate is the number of new cases of breast cancers per 100,000 women age-standardised to the Australian population at 30 June 2001. 95% CI are 95% confidence intervals.

Source: AIHW Australian Cancer Database 2011.

Table A7.5: Incidence of invasive breast cancer by remoteness area, women aged 50–69, 2005–2009

	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
New cases	21,942	7,190	3,095	396	123	32,765
AS rate	286.4	304.9	276.3	278.7	182.7	288.7
95% CI	285.7–287.1	303.5–306.3	274.4–278.3	273.4–284.4	176.5–189.6	288.1–289.3

Notes

1. Age-standardised (AS) rate is the number of new cases of breast cancers per 100,000 women age-standardised to the Australian population at 30 June 2001. 95% CI are 95% confidence intervals.
2. Remoteness areas were assigned using the woman's residential postcode according to the Australian Standard Geographical Classification for 2006. Not all postcodes can be assigned to a remoteness area, therefore categories do not add exactly to the total for Australia.

Source: AIHW Australian Cancer Database 2011.

Table A7.6: Incidence of invasive breast cancer by socioeconomic status, women aged 50–69, 2006–2009

	1(lowest)	2	3	4	5 (highest)	Australia
New cases	5,113	5,531	5,054	5,166	5,835	26,722
AS rate	273.1	285.0	284.8	297.4	308.1	289.9
95% CI	271.6–274.6	283.5–286.5	283.3–286.4	295.8–299.0	306.6–309.7	289.2–290.6

Notes

1. Age-standardised (AS) rate is the number of new cases of breast cancers per 100,000 women age-standardised to the Australian population at 30 June 2001. 95% CI are 95% confidence intervals.
2. Socioeconomic status was assigned using the woman's residential postcode according to the Socioeconomic Index for Areas (SEIFA) Index of Relative Socioeconomic Disadvantage for 2006; 1 (lowest socioeconomic group) corresponds to the most disadvantaged socioeconomic status and 5 (highest socioeconomic group) to the least disadvantaged socioeconomic status. Not all postcodes could be assigned to a socioeconomic category, therefore, categories do not add exactly to the total for Australia.

Source: AIHW Australian Cancer Database 2011.

Table A7.7: Incidence of breast cancer (New South Wales, Queensland, Western Australia and the Northern Territory) by Indigenous status, women aged 50–69, 2005–2009

	Indigenous ^(a)	Non-Indigenous ^(a)	Total ^(a)
New cases	255	19,002	20,773
Crude rate	195.2	272.8	292.7
AS rate	202.9	270.6	290.5
95% CI	198.1–208.2	269.8–270.6	289.7–290.5

- (a) Indigenous, Non-Indigenous and Total are for New South Wales, Queensland, Western Australia and the Northern Territory only. Data from these jurisdictions were considered to have adequate levels of Indigenous identification in cancer registration data at the time this report was prepared. Total includes women in the 'not stated' category.

Notes

1. Some states and territories use an imputation method for determining Indigenous cancers that may lead to differences between these data and those shown in jurisdictional cancer incidence reports.
2. Crude rate is the number of new cases of breast cancer per 100,000 women; age-standardised (AS) rates are the number of breast cancers detected per 100,000 women directly age-standardised to the Australian population at 30 June 2001. 95% CI are 95% confidence intervals.

Source: AIHW Australian Cancer Database 2011.

A7b Ductal carcinoma in situ (DCIS) incidence

Table A7.8: Incidence of DCIS, 1996 to 2009

Year of diagnosis	Women aged 50–69		Women of all ages	
	Number of new cases of DCIS	AS rate	Number of new cases of DCIS	AS rate
1996	501	30.9	912	10.4
1997	584	34.8	1,041	11.6
1998	660	38.1	1,163	12.6
1999	701	39.3	1,179	12.5
2000	783	42.6	1,317	13.6
2001	891	46.9	1,435	14.5
2002	835	42.6	1,379	13.6
2003	869	43.0	1,436	13.7
2004	928	44.6	1,533	14.4
2005	971	45.2	1,562	14.3
2006	963	43.5	1,513	13.6
2007	998	43.7	1,613	14.1
2008	1,109	47.0	1,732	14.8
2009	1,152	48.0	1,803	15.2

Note: Age-standardised (AS) rate is the number of new cases of DCIS per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database 2011.

Table A7.9: Incidence of DCIS, by age, 2009

	Age group (years)			
	40–49	50–59	60–69	70+
New cases	320	597	555	268
Crude rate	20.7	43.6	54.8	23.6

Note: Crude rate is the number of new cases of DCIS per 100,000 women.

Source: AIHW Australian Cancer Database 2011.

A8 Mortality

Table A8.1: Mortality from breast cancer, 1982 to 2012

Year of death	Women aged 50–69		Women of all ages	
	Number of deaths	AS rate	Number of deaths	AS rate
1982	933	66.9	1,987	30.4
1983	992	69.9	2,040	30.2
1984	978	69.2	2,166	31.6
1985	991	68.8	2,196	31.2
1986	970	66.6	2,165	29.9
1987	1,010	69.4	2,293	31.1
1988	1,043	69.6	2,361	31.2
1989	1,050	69.0	2,449	31.6
1990	1,056	68.7	2,422	30.6
1991	1,049	68.2	2,526	31.3
1992	949	61.2	2,429	29.4
1993	1,083	69.0	2,611	30.8
1994	1,059	66.9	2,669	30.9
1995	1,083	66.7	2,635	29.7
1996	1,035	62.9	2,620	28.8
1997	1,030	60.9	2,604	27.9
1998	986	56.9	2,541	26.5
1999	997	56.2	2,512	25.6
2000	953	52.0	2,521	24.9
2001	994	52.6	2,594	25.0
2002	1,108	56.9	2,681	25.2
2003	1,099	54.6	2,710	24.9
2004	1,088	52.3	2,665	24.0
2005	1,114	52.1	2,710	23.8
2006	1,058	47.9	2,624	22.4
2007	1,099	48.1	2,722	22.6
2008	1,106	47.0	2,746	22.3
2009	1,125	46.5	2,785	22.2
2010	1,093	43.6	2,837	21.7
2011	1,139	44.0	2,900	21.8
2012	1,126	42.4	2,795	20.6

Notes

1. Deaths from 1982 to 2011 were derived by year of death; deaths in 2012 were derived by year of registration of death. Deaths registered in 2010 and earlier are based on the final version of cause-of-death data; deaths registered in 2011 and 2012 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Age-standardised (AS) rate is number of deaths from breast cancer per 100,000 women age-standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.

Table A8.2: Mortality from breast cancer, by age, 2012

	Age group (years)									
	40–44	45–49	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85+
Deaths	77	169	228	275	296	327	316	256	307	484
Crude rate	9.3	21.9	29.6	39.8	48.1	63.4	82.2	83.8	121.3	177.0

Notes

1. Deaths in 2012 were derived using year of registration. Deaths registered in 2012 are based on the preliminary version of cause-of-death data and are subject to further revision by the ABS.
2. Crude rate is the number of deaths from breast cancer per 100,000 women.

Source: AIHW National Mortality Database.

Table A8.3: Mortality from breast cancer by state and territory, 2008–2012

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
50–69 years									
Deaths	1,832	1,388	1,083	515	497	163	78	33	5,589
AS rate	44.6	45.1	43.7	41.4	49.6	49.7	40.3	37.1	44.6
95% CI	44.2–45.0	44.7–45.6	43.2–44.2	40.7–42.1	48.7–50.5	48.3–51.3	38.7–42.3	34.8–40.1	44.4–44.9
All ages									
Deaths	4,734	3,666	2,533	1,278	1,206	390	191	65	14,063
AS rate	21.8	22.4	20.8	20.7	22.2	23.3	21.4	20.5	21.7
95% CI	21.1–22.6	21.5–23.2	19.9–21.7	19.5–22.0	20.6–24.0	20.4–26.5	18.6–24.6	17.7–23.7	21.3–22.1

Notes

1. Deaths from 2008 to 2011 were derived by year of death; deaths in 2012 were derived by year of registration of death. Deaths registered in 2010 and earlier are based on the final version of cause-of-death data; deaths registered in 2011 and 2012 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
2. Age-standardised (AS) rate is the number of deaths from breast cancer per 100,000 women, age-standardised to the Australian population at 30 June 2001; 95% CI are 95% confidence intervals.

Source: AIHW National Mortality Database.

Table A8.4: Mortality from breast cancer, by remoteness area, 2008–2012

	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
50–69 years						
Deaths	3,735	1,198	538	76	28	5,589
AS rate	44.3	45.7	43.7	49.6	38.3	44.6
95% CI	44.0–44.6	45.2–46.3	43.0–44.4	47.5–52.0	35.7–41.6	44.4–44.9
All ages						
Deaths	9,519	3,017	1,299	140	56	14,063
AS rate	21.5	22.5	21.7	20.4	18.1	21.7
95% CI	21.0–21.9	21.4–23.6	20.2–23.1	17.3–23.8	15.0–21.8	21.3–22.1

Notes

1. Women were allocated to a remoteness area using residential statistical local area (SLA) according to the Australian Standard Geographic Classification for 2008–2010 and using residential statistical area level 2 (SA2) according to the Australian Statistical Geography Standard for 2011–2012.
2. Deaths from 2008 to 2011 were derived by year of death; deaths in 2012 were derived by year of registration of death. Deaths registered in 2010 and earlier are based on the final version of cause-of-death data; deaths registered in 2011 and 2012 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.
3. Age-standardised (AS) rate is the number of deaths from breast cancer per 100,000 women age-standardised to the Australian population at 30 June 2001; 95% CI are 95% confidence intervals.

Source: AIHW National Mortality Database.

Table A8.5: Mortality from breast cancer (New South Wales, Queensland, Western Australia, South Australia and the Northern Territory) by Indigenous status, women aged 50–69 and women of all ages, 2008–2012

	Indigenous ^(a)	Non-Indigenous ^(a)	Total ^(a)
50–69 years			
Deaths	75	3,847	3,960
Crude rate	45.7	44.9	45.3
AS rate	48.1	43.9	44.4
95% CI	46.0–50.5	43.6–43.9	44.1–44.4
All ages			
Deaths	149	9,582	9,816
Crude rate	10.2	25.3	25.0
AS rate	24.1	21.7	21.9
95% CI	22.5–25.9	21.2–22.2	21.4–22.4

(a) Indigenous, Non-Indigenous and Total are for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only; data from these jurisdictions were considered to have adequate levels of Indigenous identification in cancer mortality data at the time this report was prepared. Total includes women in the 'not stated' category.

Notes

1. Crude rate is the number of deaths from breast cancer per 100,000 women; age-standardised (AS) rate is the number of deaths from breast cancer per 100,000 women directly age-standardised to the Australian population at 30 June 2001; 95% CI are 95% confidence intervals.
2. Deaths from 2008 to 2011 were derived by year of death; deaths in 2012 were derived by year of registration of death. Deaths registered in 2010 and earlier are based on the final version of cause-of-death data; deaths registered in 2011 and 2012 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.

Source: AIHW National Mortality Database.

Appendix B: BreastScreen Australia information

Australia's national breast cancer screening program was established in 1991 as the National Program for the Early Detection of Breast Cancer. This program is now known as BreastScreen Australia, and is a joint program of the Australian and state and territory governments. BreastScreen Australia aims to reduce mortality and morbidity from breast cancer.

BreastScreen Australia provides free biennial breast cancer screening to women through dedicated screening and assessment services. Women have a screening mammogram performed at a screening unit (which may be fixed, relocatable or mobile). Women whose images are suspicious for breast cancer are recalled for further investigation by a multidisciplinary team at an assessment centre. Further investigation may include clinical examination, mammography, ultrasound and biopsy procedures. Most women who are recalled for assessment are found not to have breast cancer.

Box B1: Objectives of BreastScreen Australia

The objectives of the BreastScreen Australia program are to:

1. Reduce the mortality and morbidity attributable to breast cancer.
2. Maximise early detection of breast cancer in the target population.
3. Maximise the proportion of women in the target population who are screened every two years.
4. Provide high quality services that are equitable, acceptable and appropriate to the needs of the population and equally accessible to all women in the target age group.
5. Provide screening and assessment services in accredited Screening and Assessment Services as part of the BreastScreen Australia program.
6. Provide high standards of program management, service delivery, monitoring, evaluation and accountability.

Source: BreastScreen Australia 2014.

Box B2: All BreastScreen services now use digital mammography

Digital mammography is a technique for recording breast x-ray images in computer code instead of on x-ray film, as with conventional film mammography. Digital mammography is as accurate as film mammography in screening asymptomatic women for breast cancer.

Advantages of digital mammography include increased efficiencies, improved working environment for radiographers, less physical storage requirements, and reduced need for radiologists to be on site to read mammograms.

In 2009, it was announced that \$120 million would be provided over 4 years to ensure BreastScreen Australia would be fully digital by June 2013.

All BreastScreen services now use digital mammography.

Box B3: National policy features of BreastScreen Australia

Services accredited under BreastScreen Australia are expected to operate according to the national accreditation standards of BreastScreen Australia along with the national policy features and protocols detailed below.

1: Access and participation

- 1) Appropriate levels of access and participation in the target and eligible populations:
 - a) women are selected for screening on the basis of age alone. That is, women 40 years of age and above are eligible to participate and recruitment strategies are targeted at women aged 50–74 years
 - b) the screening interval is every two years
 - c) screening is provided at minimal or no cost to the women, and free of charge to eligible women who would not attend if there were a charge
 - d) patterns of participation are representative of the socioeconomic, ethnic and cultural profiles of the target population.

2: Cancer detection

- 2) Breast cancer detection is maximised in the target population and harm is minimised:
 - a) screening employs mammography as the primary screening method
 - b) all women are screened with two view mammography. Reasons for any variation from this policy are documented
 - c) all mammograms are taken by a mammographic technologist or radiographer appropriately trained in screening mammography
 - d) all mammographic images are read and reported independently, in a blind relationship, by two or more readers, at least one of whom shall be a radiologist
 - e) all mammography results are combined into a single recommendation, which indicates whether or not further assessment for the presence of breast cancer is required.

3: Assessment

- 3) Assessment and diagnosis of breast cancer is appropriate, safe and effective:
 - a) a comprehensive approach is employed in the assessment of breast abnormalities
 - b) a multidisciplinary team is involved in the assessment of women recalled from screening
 - c) the pre-operative diagnosis of breast cancer is maximised, and recommendations for surgery for benign lesions are minimised
 - d) the outcomes for all women recommended for surgery are collected, reviewed and utilised in continuing professional education for members of the multidisciplinary team
 - e) women's general practitioners are kept informed of the results of screening and assessment, unless a woman directs otherwise.

4: Timeliness

- 4) Screening and assessment services are provided to women in a timely and efficient manner:
 - a) women have timely access to screening
 - b) the time from screening to assessment is minimised
 - c) the results of screening and assessment are provided promptly and directly to the woman concerned in ways which are sensitive to her possible anxiety.

(continued)

Box B3 (continued): National policy features of BreastScreen Australia

5: Data management and information systems

5) Effective data and information management systems:

- a) data are collected, stored and managed using secure, quality, contemporary data management and communication systems that comply with relevant state and national standards, and that enable valid, reliable system and service performance analysis and evaluation
- b) data are used for strategic purposes, quality improvement of services and for clinical and service management
- c) data are collected in line with the requirements of the BreastScreen Australia Data Dictionary
- d) data are to be submitted annually to the Australian Institute of Health and Welfare, for use in a national program monitoring report, and annual performance data reports for review by the National Quality Management Committee.

6: Client focus

6) Services are of high quality and client focused:

- a) high quality information is provided to inform women, and women feel appropriately engaged and supported
- b) screening services are provided in a manner which is acceptable to women in accessible, non-threatening and comfortable environments
- c) women and health care providers are given comprehensive and easily understood information about the Program, from screening up to and including diagnosis of breast cancer
- d) counselling and information are an integral part of the Program
- e) women are advised of the benefits and risks of mammography
- f) women are provided with written information and actively involved in decisions about their management, particularly in relation to further assessment and treatment.

7: Governance and management

7) Effective structures and processes are in place to ensure high quality governance and management:

- a) screening and assessment are carried out at BreastScreen Australia accredited services
- b) key stakeholders and stakeholder groups participate in the monitoring and management of the Program.

Performance indicators

The performance of a population-based cancer screening program such as BreastScreen Australia needs to be assessed as it relates to the underlying aims of the program. At the national level, this is achieved by reporting data against a series of performance indicators to allow screening outcomes to be monitored, and positive and negative trends identified early.

BreastScreen Australia has been monitored since 1996–1997 using performance indicators developed and endorsed by the former National Screening Information Advisory Group and by jurisdictional BreastScreen programs. These national performance indicators represent key measures of the progress BreastScreen Australia is making towards reducing morbidity and mortality from breast cancer; they are listed in Table B1.

Table B1: Performance indicators for BreastScreen Australia

Performance indicators	
1 Participation	The percentage of women aged 50–69 who have a screening mammogram through BreastScreen Australia in a 2-year period
2 Rescreening	The proportion of women screened who return for a rescreen within 27 months
3 Recall to assessment	The proportion of women screened who are recalled for further investigation
4 Invasive breast cancer detection	The number of women with invasive breast cancer detected through BreastScreen Australia
5 Ductal carcinoma in situ detection	The number of women with DCIS detected through BreastScreen Australia
6 Sensitivity	The ability of screening mammography to successfully detect cancers
6a Interval cancers	
6b Program sensitivity	
7 Incidence	The number of new cases of invasive breast cancer or DCIS
7a Invasive breast cancer incidence	
7b Ductal carcinoma in situ incidence	
8 Mortality	The number of deaths from invasive breast cancer

Note: Further details and definitions of performance indicators are available in previous *BreastScreen Australia monitoring reports* and in the *BreastScreen Australia data dictionary: version 1.1* (AIHW 2015b).

Source: *BreastScreen Australia data dictionary: version 1.1* (AIHW 2015b).

National Accreditation Standards (NAS) Measures

Provision of a high-quality service to women is of great importance to BreastScreen Australia. For this reason, services accredited under BreastScreen Australia are expected to operate according to the National Accreditation Standards (NAS) of BreastScreen Australia, along with national policy features and protocols. The accreditation system, of which the NAS are an integral part, intends to drive continuous quality improvement in the delivery of breast screening services to ensure women receive safe, effective and high-quality care.

The BreastScreen Australia NAS have been developed to ensure that all women receive breast screening services which are of a consistently high quality, regardless of where they attend for screening or assessment.

A number of NAS are consistent with the performance indicators in this report. For this reason, where appropriate, the data in this report are benchmarked against the NAS. These benchmarks are useful in helping to interpret the data presented, although in considering how these national data compare with the NAS, it should be noted that the NAS were not designed to be used as standards for the BreastScreen Australia performance indicators.

NAS Measures that relate to these data, along with data analysed by the AIHW, appear in tables 3.1, 3.4 and 3.7 in this report.

Contact details and online resources for BreastScreen Australia components are provided in Table B2.

Table B2: Contacts and links for the state, territory and Australian government components of BreastScreen Australia

BreastScreen New South Wales	
Tel: (02) 8374 5777	<www.bsnsw.org.au>
Fax: (02) 8374 5699	
Email: information@cancerinstitute.org.au	
BreastScreen Victoria	
Tel: (03) 9660 6888	<www.BreastScreen.org.au>
Fax: (03) 9662 3881	
Email: info@BreastScreen.org.au	
BreastScreen Queensland	
Tel: (07) 3328 9467	<www.health.qld.gov.au/breastscreen>
Fax: (07) 3328 9487	
Email: cssb@health.gov.au	
BreastScreen Western Australia	
Tel: (08) 9323 6700	<www.BreastScreen.health.wa.gov.au>
Fax: (08) 9323 6799	
Email: BreastScreenwa@health.wa.gov.au	
BreastScreen South Australia	
Tel: (08) 8274 7100	<www.breastscreen.sa.gov.au>
Fax: (08) 8373 4395	
Email: HealthBSSAEnquiries@sa.gov.au	
BreastScreen Tasmania	
Tel: (03) 6216 4300	<www.dhhs.tas.gov.au/cancerscreening/information_about_breast_screening>
Fax: (03) 6216 4326	
Email: canscreen@dhhs.tas.gov.au	
BreastScreen ACT	
Tel: (02) 6205 4444	<www.health.act.gov.au/our-services/women-youth-and-children/breastscreen>
Fax: (02) 6205 1394	
Email: BreastScreen@act.gov.au	
BreastScreen NT	
Tel: (08) 8922 6449	<www.health.nt.gov.au/Womens_Health/Breast_Screen_NT/index.aspx>
Fax: (08) 8922 6440	
Email: wcpp.ths@nt.gov.au	
Australian Government Department of Health	
Email: cancerscreening@health.gov.au	<http://www.cancerscreening.gov.au/internet/screening/publications.nsf/Content/breast-screening-1>
AIHW	
Email: screening@aihw.gov.au	<http://www.aihw.gov.au/cancer/screening/breast>

Appendix C: Data sources

Data used in this report are derived from multiple sources and are summarised in Table C1.

Table C1: Data sources for BreastScreen Australia monitoring report 2012–2013

Data used to monitor BreastScreen Australia	Data source
Monitoring BreastScreen Australia using BreastScreen data	
Performance Indicator 1 Participation	State and territory BreastScreen registers, ABS population data
Performance Indicator 2 Rescreening	State and territory BreastScreen registers
Performance Indicator 3 Recall to assessment	State and territory BreastScreen registers
Performance Indicator 4 Invasive breast cancer detection	State and territory BreastScreen registers
Performance Indicator 5 DCIS detection	State and territory BreastScreen registers
Performance Indicator 6 Sensitivity	State and territory BreastScreen registers
Monitoring BreastScreen Australia using AIHW data	
Performance Indicator 7 Incidence	AIHW Australian Cancer Database 2011; ABS population data
Performance Indicator 8 Mortality	AIHW National Mortality Database; ABS population data
Monitoring other aspects of BreastScreen Australia	
Expenditure on BreastScreen Australia	AIHW Health Expenditure Database

State and territory BreastScreen registers

Data for the performance indicators participation, rescreening, recall to assessment, invasive breast cancer detection, ductal carcinoma in situ (DCIS) detection, and sensitivity are sourced from the BreastScreen register in each state and territory according to definitions and data specifications in the *BreastScreen Australia data dictionary version 1.1* (AIHW 2015b). These data are compiled into national figures by the Australian Institute of Health and Welfare (AIHW) to allow national monitoring of BreastScreen Australia.

The Data Quality Statement for BreastScreen Australia data appears in Appendix D, and can also be found on the AIHW website at <http://meteor.aihw.gov.au/content/index.phtml/itemId/569662>.

AIHW Australian Cancer Database

All forms of cancer, except basal and squamous cell carcinomas of the skin, are notifiable diseases in each Australian state and territory. This means there is legislation in each jurisdiction that requires hospitals, pathology laboratories and various other institutions to report all cases of cancer to their central cancer registry. An agreed subset of the data collected by these cancer registries is supplied annually to the AIHW, where they are compiled into the Australian Cancer Database (ACD). The ACD currently contains data on all cases of cancer diagnosed from 1982 to 2009 for all states and territories, and for 2010 and 2011 for all except New South Wales and the Australian Capital Territory.

The 2010 and 2011 incidence data for New South Wales and the Australian Capital Territory were not available for inclusion in the 2011 version of the ACD. The development of the new NSW Cancer Registries system has resulted in a delay in processing incidence data for 2010

onwards and therefore the most recent NSW data available for inclusion in the ACD are for 2009. Full details about this situation are given at:

<<http://www.cancerinstitute.org.au/data-and-statistics/accessing-our-data/availability-of-nsw-central-cancer-registry-data>>. As the coding of Australian Capital Territory cancer notifications is contracted to the NSW Cancer Registry, the most recent data available for the Australian Capital Territory are also for 2009.

The 2010 and 2011 incidence data for New South Wales and the Australian Capital Territory were estimated by the AIHW. These estimates were combined with the actual data supplied by the other 6 state and territory cancer registries to form the 2011 ACD. The detailed methodology by which data for New South Wales and the Australian Capital Territory were estimated for 2010 and 2011 is available in Appendix F of *Cancer in Australia: an overview 2014* (AIHW 2014).

Cancer reporting and registration is a dynamic process, and records in the state and territory cancer registries may be modified if new information is received. As a result, the number of cancer cases reported by the AIHW for any particular year may change slightly over time and may not always align with state and territory reporting for that same year.

Data have been analysed using the year of diagnosis of cancer. This is a more accurate reflection of incidence during a particular year than the year of registration of cancer.

The Data Quality Statement for the ACD 2011 can be found on the AIHW website at <<http://meteor.aihw.gov.au/content/index.phtml/itemId/586979>>.

AIHW National Mortality Database

The AIHW National Mortality Database (NMD) contains information provided by the Registries of Births, Deaths and Marriages and the National Coronial Information System (managed by the Victorian Department of Justice), and includes cause of death coded by the Australian Bureau of Statistics (ABS), for deaths from 1964 to 2012. Registration of deaths is the responsibility of the state and territory registrars of births, deaths and marriages. These data are then collated and coded by the ABS and are maintained at the AIHW in the NMD.

In the NMD, the year of occurrence of the death, and the year in which the death was registered, are both provided. For the purposes of this report, actual mortality data are shown based on the year of occurrence of the death, except for the most recent year (2012) where the number of people whose death was registered is used. Previous investigation has shown that the year of death and its registration coincide for the most part. However, in some instances, deaths at the end of each calendar year may not be registered until the following year. Thus, year-of-death information for the latest available year is generally an underestimate of the actual number of deaths that occurred in that year.

In this report, deaths registered in 2010 and earlier are based on the final version of cause-of-death data; deaths registered in 2011 and 2012 are based on revised and preliminary versions, respectively, and are subject to further revision by the ABS.

A statement on data quality relating to the AIHW NMD is available at the following ABS website: Quality declaration summary, *Causes of death, 2012* (ABS cat. no. 3303.0) <<http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/3303.0Quality+Declaration02012>>.

ABS population data

Throughout this report, population data were used to derive rates of participation in breast cancer screening, breast cancer incidence and breast cancer mortality. The population data were sourced from the ABS using the most up-to-date estimates available at the time of analysis.

To derive its estimates of the resident populations, the ABS uses the 5-yearly Census of Population and Housing data and adjusts it as follows:

- All respondents in the Census are placed in their state or territory, Statistical Local Area (SLA) and postcode of usual residence; overseas visitors are excluded.
- An adjustment is made for persons missed in the Census.
- Australians temporarily overseas on Census night are added to the usual residence Census count.

Estimated resident populations are then updated each year from the Census data, using indicators of population change, such as births, deaths and net migration. More information is available from the ABS website at <www.abs.gov.au>.

For the Indigenous comparisons in this report, the most recently released Indigenous experimental estimated resident populations as released by the ABS were used. Those estimates were based on the 2011 Census of Population and Housing.

ABS population data for participation calculations

Participation rates were calculated using the average of the estimated resident female population for the 2-year reporting period.

Note that there is the potential for variation in published participation rates between the AIHW and state and territory reports because of different sources of estimated resident population data.

ABS population data for incidence and mortality calculations

Incidence and mortality rates were calculated using the estimated resident population for single-year calculations, and the aggregate of the estimated resident populations for the 5 relevant years for 5-year calculations (or 4 years in the case of incidence for different groups of socioeconomic status).

AIHW Disease Expenditure Database

The AIHW Disease Expenditure Database contains estimates of expenditure by disease category, age group and sex for each of the following areas of expenditure: admitted patient hospital services, out-of-hospital medical services, prescription pharmaceuticals, optometrical and dental services, community mental health services and public health cancer screening.

For more information on the AIHW Disease Expenditure Database, see *Health system expenditure on cancer and other neoplasms in Australia: 2008–09* (AIHW 2013).

The Data Quality Statement for the Disease Expenditure Database can be found on the AIHW website at <<http://meteor.aihw.gov.au/content/index.phtml/itemId/512599>>.

Appendix D: BreastScreen Australia 2012–2013 Data Quality Statement

Summary of key data quality issues

- All states and territories maintain a population-based BreastScreen register which records the data collected during a woman's contact with a BreastScreen service.
- The Australian Institute of Health and Welfare (AIHW) compiles BreastScreen Australia data supplied from state and territory BreastScreen registers in order to monitor BreastScreen Australia annually at a national level.
- State and territory BreastScreen registers change every day, adding new records and improving the quality of existing records as new information becomes available. BreastScreen Australia data may therefore change.

Description

BreastScreen Australia is Australia's national, population-based breast cancer screening program and is a joint program of the Australian and state and territory governments.

BreastScreen registers in each state and territory record data collected during a woman's contact with a BreastScreen service.

Each BreastScreen program supplies BreastScreen data annually to the AIHW. These data are compiled into the BreastScreen Australia database, held at the AIHW to enable national monitoring of BreastScreen Australia.

Some BreastScreen data are supplied as aggregate data and therefore cannot be interrogated in more detail.

The majority of screening mammography performed in Australia is through BreastScreen Australia. However, a relatively small amount of screening mammography occurs through services other than BreastScreen Australia, which are not within the scope of these data.

Institutional environment

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* (Cwlth) to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent corporate Commonwealth entity established in 1987, governed by a management Board, and accountable to the Australian Parliament through the Health portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The Institute also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government

organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national data sets based on data from each jurisdiction, to analyse these data sets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance to the *Privacy Act 1988* (Cwlth), ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information, see the AIHW website <www.aihw.gov.au>.

The AIHW has been receiving BreastScreen data since 1996.

Timeliness

BreastScreen data are available within about 6–12 months of activity (it can take up to 12 months for final pathology results on all breast tissue samples to be received by BreastScreen registers.) The BreastScreen Australia database cannot be fully compiled until the final jurisdiction supplies its data.

Participation data for the previous calendar year are supplied in July each year; rescreening and invasive breast cancer and ductal carcinoma in situ (DCIS) detection data for the previous calendar year are supplied July–December each year. (Rescreening and sensitivity data lag behind, as the specifications for these require a specified period of time to pass before they can be accurately calculated.)

The current BreastScreen Australia database contains data on women who participated in BreastScreen Australia between 1996 and 2013.

Accessibility

BreastScreen Australia data are published annually in the *BreastScreen Australia monitoring report* available on the AIHW website <<http://www.aihw.gov.au/breast-cancer-screening>> where they can be downloaded without charge. Supplementary data tables presenting more detailed data accompany each report and these, too, are available on the AIHW website where they can be downloaded without charge.

General enquiries about AIHW publications can be made to the Digital and Media Communications Unit on (02) 6244 1032 or via email to <info@aihw.gov.au>.

Interpretability

While many concepts in the *BreastScreen Australia monitoring report* are easy to interpret, other concepts and statistical calculations are more complex. All concepts are explained within the body of the report presenting these data, along with footnotes to provide further details and caveats. The appendixes provide additional detail on the data sources and classifications, and on the statistical methods used.

Relevance

Breast cancer screening data are highly relevant for monitoring trends in breast screening participation and the detection of invasive breast cancer and DCIS, as well as other measures of program performance, such as recall rates and sensitivity measures. The data are used for many purposes by policy makers and researchers, but are supplied and analysed specifically to monitor and inform BreastScreen Australia.

Accuracy

All data provided by state and territory BreastScreen programs, once analysed, are supplied back to the jurisdictional BreastScreen programs for verification.

Women attending a BreastScreen service are able to self-report Indigenous status; this database field is therefore considered to be of high quality. However, use of the 'not stated' category has changed substantially over time, which makes trend data difficult to interpret.

State and territory BreastScreen databases change every day, and not just because new records are added; existing records are changed if new, more precise information becomes available or if typographical errors are discovered by routine data checking procedures. As a result, the number of women participating, as well as DCIS and invasive breast cancer cases reported by the AIHW for any particular year, may change slightly over time. Further, data published by a jurisdictional BreastScreen program at a certain point in time may differ slightly from what is published by the AIHW at a different time.

Coherence

BreastScreen data are reported and published annually by the AIHW.

Appendix E: Classifications

Age

The data in this report are stratified by the age of the woman at the time of the specified test (for screening data), at the time of diagnosis (for cancer incidence data) or at the time of death (for cancer mortality data).

State or territory

The state or territory reported is the one where screening took place (for the screening data), where the diagnosis was made (for the cancer incidence data) or the place of usual residence (for the cancer mortality data).

Remoteness area

The remoteness areas (RAs) divide Australia into broad geographical regions that share common characteristics of remoteness for statistical purposes. The remoteness structure divides each state and territory into several regions on the basis of their relative access to services. There are 6 classes of RA in the remoteness structure: *Major cities*, *Inner regional*, *Outer regional*, *Remote Australia*, *Very remote* and *Migratory*. The category *Major cities* includes Australia's capital cities, except for Hobart and Darwin, which are classified as *Inner regional*. RAs are based on the Accessibility and Remoteness Index of Australia produced by the Australian Population and Migration Research Centre at the University of Adelaide.

Remoteness area for participation calculations

For participation calculations, women were allocated to a remoteness area using their residential postcode supplied at the time of screening. Caution is required when examining differences across remoteness areas. First, postcodes used to allocate women may not represent their location of residence. Second, because these are based on the 2011 Census, the accuracy of remoteness area classifications diminishes due to subsequent changes in demographics. Third, some postcodes (and hence some individual women) are unable to be allocated to a remoteness area.

Remoteness area for incidence and mortality calculations

Each unit record in the Australian Cancer Database (ACD) contains the 2006 Statistical Local Area (SLA) and 2011 Statistical Area Level 2 (SA2) but not the remoteness area. In order to calculate the cancer incidence rates by remoteness area, a correspondence was used to map the 2006 SLA to the 2006 RA. Similarly, the cancer mortality rates by remoteness area were calculated by applying a correspondence from the 2011 SA2 to the 2011 RA.

Socioeconomic status

The Index of Relative Socio-economic Disadvantage (IRSD) is one of four Socio-Economic Indexes for Areas (SEIFAs) developed by the Australian Bureau of Statistics (ABS). This index is based on factors such as average household income, education levels and

unemployment rates. The IRSD is not a person-based measure; rather, it is an area-based measure of socioeconomic disadvantage 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 disadvantage of people living in those areas and may not be correct for each person in that area.

In this report, the first socioeconomic status group (quintile 1) corresponds to geographical areas containing the 20% of the population with the greatest socioeconomic disadvantage according to the IRSD (that is, the lowest socioeconomic group), and the fifth group (quintile 5) corresponds to the 20% of the population with the least socioeconomic disadvantage (that is, the highest socioeconomic group).

Socioeconomic status for participation calculations

For participation, women were allocated to a socioeconomic status using their residential postcode supplied at the time of screening. Caution is required when examining differences across socioeconomic status for several reasons. First, postcodes used to allocate women may not represent their location of residence. Second, because these are based on the 2011 Census, the accuracy of socioeconomic status classifications diminishes due to subsequent changes in demographics. Third, many postcodes (and hence women) are unable to be allocated to a socioeconomic status group.

Socioeconomics status for incidence and mortality calculations

Socioeconomic status quintiles were assigned to cancer cases according to the IRSD of the Statistical Local Area (SLA) of residence at the time of diagnosis, and to deaths according to the Statistical Area Level 2 (SA2) of residence at the time of death.

Classification of invasive breast cancer and ductal carcinoma in situ

Histology

Invasive breast cancer

Histology codes to classify invasive breast cancer into the groups that appear in Table 4.1 in this report were developed with the assistance of the State and Territory Cancer Registries. Groupings for invasive breast cancers are listed in Table E1.

Table E1: Breast cancer by histology group

Breast cancer group	Type of breast cancer (ICD-O-3 codes)
Invasive ductal carcinoma	Pleomorphic carcinoma (8022)
	Carcinoma with osteoclast-like giant cells (8035)
	Basaloid carcinoma (8123)
	Scirrhous adenocarcinoma (8141)
	Carcinoma simplex (8231)
	Infiltrating duct carcinoma, not otherwise specified (8500)

(continued)

Table E1 (continued): Breast cancer by histology group

Breast cancer group	Type of breast cancer (ICD-O-3 codes)
	Duct carcinoma, desmoplastic type (8514)
	Infiltrating ductular carcinoma (8521)
	Infiltrating duct and lobular carcinoma (8522)
	Infiltrating duct mixed with other types of carcinoma (8523)
	Paget disease and infiltrating duct carcinoma of breast (8541)
	Paget disease and intraductal carcinoma of breast (8543)
Invasive lobular carcinoma	Pleomorphic lobular carcinoma, NOS (8519)
	Lobular carcinoma, not otherwise specified (8520)
	Infiltrating lobular mixed with other types of carcinoma (8524)
Medullary carcinoma and atypical medullary carcinoma	Medullary carcinoma, not otherwise specified (8510)
	Atypical medullary carcinoma (8513)
	Medullary carcinoma with lymphoid stroma (8512)
Tubular carcinoma and invasive cribriform carcinoma	Tubular adenocarcinoma (8211)
	Cribriform carcinoma, not otherwise specified (8201)
Mucinous carcinoma	Mucinous adenocarcinoma (8480)
	Mucin-producing adenocarcinoma (8481)
	Signet ring cell carcinoma (8490)
Invasive papillary carcinoma	Intraductal papillary adenocarcinoma with invasion (8503)
	Papillary adenocarcinoma, not otherwise specified (8260)
	Intracystic (papillary) adenocarcinoma (8504)
	Papillary carcinoma, not otherwise specified (8050)
	Solid papillary carcinoma (8509)
	Invasive micropapillary carcinoma (8507)
Inflammatory carcinoma	Inflammatory carcinoma (8530)
Mesenchymal	Sarcoma, NOS (8800)
	Spindle cell sarcoma (8801)
	Giant cell sarcoma (8802)
	Epithelioid sarcoma (8804)
	Undifferentiated sarcoma (8805)
	Fibrosarcoma (8810)
	Fibromyxosarcoma (8811)
	Low grade myofibroblastic sarcoma (8825)
	Malignant fibrous histiocytoma (8830)
	Liposarcoma, NOS (8850)
	Well differentiated liposarcoma, NOS (excluding superficial soft tissue) (8851)
	Myxoid liposarcoma (8852)
	Pleomorphic lipo sarcoma (8854)
	Leiomyo sarcoma (8890)
	Angiomyosarcoma (8894)

(continued)

Table E1 (continued): Breast cancer by histology group

Breast cancer group	Type of breast cancer (ICD-O-3 codes)
	Myosarcoma (8895)
	Rhabdomyo sarcoma (8900)
	Alveolar rhabdomyo sarcoma (8920)
	Stromal sarcoma, NOS (8935)
	Haemangio sarcoma (9120)
	Haemangio endothelioma, malignant (9130)
	Haemangiopericytoma, malignant (9150)
	Lymphangio sarcoma (9170)
	Osteosarcoma, NOS (9180)
	Chondrosarcoma, NOS (9220)
Other—specified	Metaplastic carcinoma, NOS(8575)
	Adenocarcinoma with squamous differentiation(8570)
	Adenocarcinoma with spindle cell metaplasia(8572)
	Squamous cell carcinoma, NOS(8070)
	Squamous cell carcinoma, keratinising, NOS(8071)
	Squamous cell carcinoma, large cell nonkeratinising, NOS(8072)
	Squamous cell carcinoma, spindle cell(8074)
	Spindle cell carcinoma, NOS(8032)
	Carcinosarcoma, NOS(8980)
	Adenocarcinoma with cartilaginous and osseous metaplasia(8571)
	Pseudosarcomatous carcinoma(8033)
	Malignant myoepithelioma(8982)
	Adenocarcinoma, NOS(8140)
	Phyllodes tumour, malignant(9020)
Other—specified (continued)	Paget disease, mammary(8540)
	Adenocarcinoma with apocrine metaplasia(8573)
	Apocrine adenocarcinoma(8401)
	Neuroendocrine carcinoma, NOS(8246)
	Small cell carcinoma, NOS(8041)
	Carcinoma with neuroendocrine differentiation(8574)
	Large cell neuroendocrine carcinoma(8013)
	Carcinoid , NOS(8240)
	Atypical carcinoid tumour(8249)
	Adenocarcinoma with mixed subtypes(8255)
	Mixed cell adenocarcinoma(8323)
	Secretory carcinoma of breast (C50._)(8502)
	Acinar cell carcinoma(8550)
	Mucoepidermoid carcinoma(8430)
	Lipid-rich carcinoma (C50._)(8314)

(continued)

Table E1 (continued): Breast cancer by histology group

Breast cancer group	Type of breast cancer (ICD-O-3 codes)
	Glycogen-rich carcinoma(8315)
	Clear cell adenocarcinoma, NOS(8310)
	Sebaceous carcinoma(8410)
	Mixed tumour, malignant(8940)
	Lymphoepithelial carcinoma(8082)
	Basal cell adenocarcinoma(8147)
	Trabecular carcinoma(8190 A)
	Solid carcinoma, NOS(8230)
	Adenomyoepithelioma, malignant(8983)
	Adenoid cystic carcinoma(8200)
	Epithelial-myoepithelial carcinoma(8562)
	Peripheral neuroectodermal tumour, NOS(9364)
	Granular cell tumour, malignant(9580)
	Adenosquamous carcinoma(8560)
	Comedocarcinoma, NOS (C50._)(8501)
Unspecified	Neoplasm, malignant(8000)
	Tumour cells, malignant(8001)
	Malignant tumour, spindle cell type(8004)
	Carcinoma, NOS(8010)
	Large cell carcinoma, NOS(8012)
	Carcinoma, undifferentiated(8020)
	Carcinoma, anaplastic(8021)
	Giant cell and spindle cell carcinoma(8030)
	Giant cell carcinoma(8031)

Non-invasive

Histology codes to classify non-invasive breast tumours were also developed with the assistance of the State and Territory Cancer Registries. Groupings for non-invasive breast tumours are listed in Table E2. Only the histology codes for DCIS are relevant to this report, as other non-invasive breast tumours have not been reported here.

In interpreting incidence of non-invasive breast tumours, it should be noted that non-invasive tumours that are diagnosed within four-months of an invasive breast cancer are excluded. This is referred to as the 'four month rule' and is based on the consensus view that in such a situation the invasive breast cancer was almost certainly present at the time of the DCIS diagnosis, but was not detected.

The effect of applying this rule was the removal any non-invasive records in which an invasive breast cancer was diagnosed in less than or equal to 121 days of a non-invasive tumour.

Table E2: Non-invasive breast tumours by histology group

Breast cancer group	Type of breast cancer (ICD-O-3 codes)
Ductal carcinoma in situ (DCIS)	Papillary carcinoma in situ, NOS (8050)
	Cribriform carcinoma in situ (8201)
	Ductal carcinoma in situ, solid type (8230)
	Papillary adenocarcinoma, NOS, in situ (8260)
	Apocrine adenocarcinoma in situ (8401)
	Intraductal carcinoma, noninfiltrating, NOS (8500)
	Comedocarcinoma, non-infiltrating (8501)
	Secretory carcinoma of breast in situ (8502)
	Noninfiltrating intraductal papillary adenocarcinoma (8503)
	Noninfiltrating intracystic carcinoma (8504)
	Intraductal micropapillary carcinoma (8507)
	Cystic hypersecretory carcinoma in situ (8508)
	Solid papillary carcinoma in situ (8509)
	Noninfiltrating ductular carcinoma (8521)
	Intraductal carcinoma and lobular carcinoma in situ (8522)
	Ductal carcinoma in situ mixed with other types of carcinoma in situ (8523)
Paget disease, in situ, and intraductal carcinoma of breast (8543)	
Lobular carcinoma in situ (LCIS)	Pleomorphic lobular carcinoma in situ (8519)
	Lobular carcinoma in situ, NOS (8520)
Other specified carcinoma in situ	Squamous cell carcinoma in situ, NOS (8070)
	Adenocarcinoma in situ (8140)
	Mucinous adenocarcinoma in situ, NOS (8480)
	Paget disease, in situ, mammary (8540)
	Adenocarcinoma in situ with squamous metaplasia (8570)
Unspecified	Carcinoma in situ, NOS (8010)

Appendix F: Statistical methods

Comparisons and tests of statistical significance

This report includes statistical tests of the significance of comparisons of rates between population groups. Any statistical comparison applied to one variable must take account of any other potentially relevant variables. For example, any comparison of participation by state must also take account of differences in the distribution of age and sex between the states. These other variables are known as 'confounding' variables.

Crude rates

A 'crude rate' is defined as the number of events over a specified period of time (for example, a year) divided by the total population. For example, a crude cancer incidence rate is similarly defined as the number of new cases of cancer in a specified period of time divided by the population at risk. Crude mortality rates and cancer incidence rates are expressed in this report as number of deaths or new cases per 100,000 population. Crude participation rate is expressed as a percentage.

Age-specific rates

Age-specific rates provide information on the incidence of a particular event in an age group relative to the total number of people at risk of that event in the same age group. It is calculated by dividing the number of events occurring in each specified age group by the corresponding 'at-risk' population in the same age group and then multiplying the result by a constant (for example, 100,000) to derive the rate. Age-specific rates are often expressed per 100,000 population.

Age-standardised rates

A crude rate provides information on the number of, for example, new cases of cancer or deaths from cancer in the population at risk in a specified period. No age adjustments are made when calculating a crude rate. Since the risk of cancer is heavily dependent on age, crude rates are not suitable for looking at trends or making comparisons across groups in cancer incidence and mortality.

More meaningful comparisons can be made by the use of age-standardised rates, with such rates adjusted for age in order to facilitate comparisons between populations that have different age structures – for example, between Indigenous people and other Australians. This standardisation process effectively removes the influence of age structure on the summary rate.

There are 2 methods commonly used to adjust for age: direct and indirect standardisation. In this report, the direct standardisation approach presented by Jensen and colleagues (1991) is used. To age-standardise using the direct method, the first step is to obtain population numbers and numbers of cases (or deaths) in age ranges, typically 5-year age ranges. The next step is to multiply the age-specific population numbers for the standard population (in this case, the Australian population as at 30 June 2001) by the age-specific incidence rates (or death rates) for the population of interest (such as those in a certain socioeconomic status

group or those who lived in *Major cities*). The next step is to sum across the age groups and divide this sum by the total of the standard population to give an age-standardised rate for the population of interest. Finally, this is expressed per 1,000 or 100,000 as appropriate.

Confidence intervals

Population numbers for incidence and mortality and screening have a natural level of variability for a single year above and below what might be expected in the mean over many years. The percentage variability is small for large population numbers but high for small numbers such as mortality in a young age group. One measure of the likely difference is that of standard error, which indicates the extent to which a population number might have varied by chance in only 1 year of data. In the 95% confidence interval, there are about 19 chances in 20 that the difference will be less than 2 standard errors.

There are several methods for calculating confidence intervals. The 95% confidence intervals (CIs) in this report were calculated using a method developed by Dobson and others (1991). This method calculates approximate confidence intervals for a weighted sum of Poisson parameters.

Interpretation of confidence intervals

Some indicators have a 95% confidence interval presented along with the rates. This is because the observed value of a rate may vary due to chance, even where there is no variation in the underlying value of the rate. The 95% confidence interval represents a range (interval) over which variation in the observed rate is consistent with this chance variation. In other words, there is a 95% confidence that the true value of the rate is somewhere within this range.

These confidence intervals can be used as a guide to whether differences in a particular rate are consistent with chance variation. Where the confidence intervals do not overlap, the difference between rates is greater than that which could be explained by chance, and is regarded as statistically significant.

It is important to note that the overlapping of confidence intervals does not imply that the difference between 2 rates is definitely due to chance. Instead, an overlapping confidence interval represents a difference in rates that is too small to allow differentiation between a real difference and one that is due to chance variation. It can therefore only be stated that no statistically significant differences were found, and not that no differences exist.

The approximate comparisons presented might understate the statistical significance of some differences, but they are sufficiently accurate for the purposes of this report.

As with all statistical comparisons, care should be exercised in interpreting the results of the comparison. If 2 rates are statistically significantly different from each other, this means that the difference is unlikely to have arisen by chance. Judgment should, however, be exercised in deciding whether or not the difference is of any clinical significance.

Glossary

Aboriginal or Torres Strait Islander: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Indigenous**.

age-specific rate: A rate for a specific age group. The numerator and denominator relate to the same age group.

age-standardised rate: A method of removing the influence of age when comparing populations with different age structures. This is usually necessary because the rates of many diseases vary strongly (usually increase) with age. The age structures of the different populations are converted to the same 'standard' structure, which allows comparison of disease rates.

Australian Statistical Geography Standard (ASGS): Common framework defined by the Australian Bureau of Statistics for collection and dissemination of geographically classified statistics. The ASGS replaced the Australian Standard Geographical Classification (ASGC) in July 2011.

assessment: Further investigation of a mammographic abnormality or symptom reported at screening.

benign: Not **malignant**.

biopsy: Small sample of tissue that is taken to obtain a definitive diagnosis of an abnormality.

cancer (malignant neoplasm): A large range of diseases in which some of the body's cells become defective, and begin to multiply out of control. These cells can invade and damage the area around them, and can also spread to other parts of the body to cause further damage.

cancer death: A death where the **underlying cause of death** is indicated as cancer. People with cancer who die of other causes are not counted in the **mortality** statistics in this publication.

confidence interval: A range determined by variability in data, within which there is a specified (usually 95%) chance that the true value of a calculated parameter lies.

ductal carcinoma in situ: A non-invasive tumour of the mammary gland (breast) arising from cells lining the ducts.

false negative: A test that has incorrectly observed that the disease is not present.

false positive: A test that has incorrectly observed that the disease is present.

first screening round: See **screening round**.

Indigenous: A person of Aboriginal and/or Torres Strait Islander descent who identifies as an Aboriginal and/or Torres Strait Islander. See also **Aboriginal or Torres Strait Islander**.

in situ: A Latin term meaning in place or position; undisturbed.

incidence: The number of new cases (for example, of an illness or event) occurring during a given period, usually 1 year.

index screening year: The year for which an **interval cancer** rate and program sensitivity rate are determined.

index screens: All screening examinations performed within the index screening year.

interval cancer (invasive) (as defined for national reporting purposes by Kavanagh et al. 1999, with minor changes endorsed by the then-named National Advisory Committee):

- an invasive breast cancer diagnosed after completion of a negative screening episode and before the next screening examination (within 24 months from the date of the previous screen)
- a case of invasive breast cancer that is diagnosed at early review or in the interval between assessment and early review, where the recommendation for early review is 6 months or more from the screening date
- breast cancer diagnosed in a woman by BreastScreen Australia within 24 months of a negative screen (early rescreen) if the woman presents with a breast lump and/or clear or bloodstained nipple discharge in the breast in which the breast cancer was diagnosed
- an invasive breast cancer diagnosed between 6 and 24 months after a recommendation for assessment is made and a woman fails to attend assessment.

invasive cancer: A **tumour** whose cells have the potential to spread to nearby healthy or normal tissue or to more distant parts of the body.

malignant: Abnormalities in cells or tissues consistent with **cancer**.

mammogram: A radiographic depiction of the breast.

metastasis: The process by which cancerous cells are transferred from one part of the body to another; for example, via the lymphatic system or the bloodstream.

morbidity: Illness.

mortality: The number of deaths occurring during a given period.

new cancer case: A person who has a new cancer diagnosed for the first time. One person may have more than once cancer and therefore may be counted twice in **incidence** statistics if it is decided that the 2 cancers are not of the same origin. This decision is based on a series of principles set out in more detail in a publication by Jensen et al. (1991).

rescreening: The next screening examination after the screening episode in the index screening year.

risk factor: An attribute or exposure that is associated with an increased probability of a specified outcome, such as the occurrence of a disease. Risk factors are not necessarily the causes of disease.

screening: The performance of tests on apparently well people in order to detect a medical condition at an earlier stage than would otherwise be the case.

screening episode: All attendances for screening and assessment within 6 months relating to a particular round of screening. It starts at the date of attendance for screening. It is completed when:

- a recommendation is made to return the woman to routine rescreening
- a recommendation is made for early review at 6 months or more from the screening date
- a diagnosis of cancer is made

- the woman fails to attend for technical recall or assessment within 6 months
- the woman dies.

screening round: The first screening round is a woman's first visit to a mammography screening service; a subsequent screening round means that she has been screened before. For example, if she attends for a fourth screening round, she has been screened three times before.

significant difference: Where rates are referred to as significantly different, or one rate is deemed significantly higher or lower than another, these differences are statistically significant. Rates are deemed statistically significantly different when their **confidence intervals** do not overlap, since their difference is greater than what could be explained by chance. See 'confidence intervals' in Appendix F for more information.

symptom: Any evidence of disease apparent to the patient. For the purposes of this report, symptoms refer to a self-reported breast lump and/or bloodstained or watery nipple discharge.

target population: Women aged 50–69.

tumour: An abnormal growth of tissue. Can be **benign** (not a cancer) or **malignant** (cancer).

the Institute: The Australian Institute of Health and Welfare.

ultrasound: Diagnostic method based on the reflection of ultrasonic sound waves generated through scanning of, in this case, the breast. The reflections are viewed on a computer screen or photograph, and checked for variations in images.

underlying cause of death: The condition, disease or injury initiating the sequence of events leading directly to death; that is, the primary, chief or principal cause.

women-years: The denominator for the interval cancer rate, it is the 'number of years at risk' of being diagnosed with an interval cancer, and takes into account women who screen annually rather than every 2 years (who would be at risk for the first year after their screen but not the second).

Note: Terms in **bold** are defined elsewhere in the glossary.

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Related publications

The *BreastScreen Australia monitoring report* is an annual report.

This and previous *BreastScreen Australia monitoring reports* and their supplementary data tables are available at <<http://www.aihw.gov.au/publications/breast-cancer>>.

You may also be interested in the following related publications:

- AIHW (Australian Institute of Health and Welfare) 2015. BreastScreen Australia data dictionary: version 1.1. Cancer series no. 92. Cat. no. CAN 90. Canberra: AIHW.
- AIHW 2015. Breast cancer in young women: key facts about breast cancer in women in their 20s and 30s. Cancer series no. 96. Cat. no. CAN 94. Canberra: AIHW.
- AIHW 2015. Cervical screening in Australia 2012–2013. Cancer series no. 93. Cat. no. CAN 91. Canberra: AIHW.
- AIHW 2015. National Bowel Cancer Screening Program: monitoring report 2013–14. Cancer series 94. Cat. no. CAN 92. Canberra: AIHW.
- AIHW 2014. Analysis of bowel cancer outcomes for the National Bowel Cancer Screening Program. Cat. no. CAN 87. Canberra: AIHW.
- AIHW 2014. Cancer in Australia: an overview 2014. Cancer series no. 90. Cat. no. CAN 88. Canberra: AIHW.
- AIHW 2014. Australian Cancer Incidence and Mortality (ACIM) books: breast cancer. Canberra: AIHW. <<http://www.aihw.gov.au/acim-books>>.

Supplementary online data tables

Additional tables are available as online Excel tables at <www.aihw.gov.au>, under the 'Additional material' tab for this report. These tables contain detailed statistics for many of the tables and figures presented in summary form in both the body of the report and in Appendix A. Supplementary data tables have the prefix 'S' (for example, 'Table S1.1').

There are 7 Excel files, one for each performance indicator:

- Indicator 1 Participation
- Indicator 2 Rescreening
- Indicator 3 Recall to assessment
- Indicator 4 Invasive breast cancer detection
- Indicator 5 DCIS detection
- Indicator 6 Sensitivity
- Indicator 7 Incidence
- Indicator 8 Mortality

The *BreastScreen Australia monitoring report 2012–2013* presents the latest national statistics in the monitoring of BreastScreen Australia, which aims to reduce illness and death resulting from breast cancer through organised screening to detect cases of unsuspected breast cancer in women, thus enabling early intervention. Around 55% of women in the target age group 50–69 took part in the program, with more than 1.4 million women screening in 2012–2013.

Breast cancer mortality in 2012 was 44 deaths per 100,000 women.