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Abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
AIHW	Australian Institute of Health and Welfare
ARIA	Accessibility/Remoteness Index for Australia
ASGC	Australian Standard Geographic Classification
ASR	age-standardised rate
CD	Census Collection District
CI	confidence interval
DoHA	Australian Government Department of Health and Ageing
DCIS	ductal carcinoma in situ
ICD	International Classification of Diseases
NAS	National Accreditation Standards
NSW	New South Wales
NT	Northern Territory
Qld	Queensland
SA	South Australia
Tas	Tasmania
Vic	Victoria
WA	Western Australia

Symbols

. .	not applicable
≤	less than or equal to
<	less than
>	more than

Summary

BreastScreen Australia is a joint program of the Australian Government and state and territory governments that aims to reduce morbidity and mortality from breast cancer. This is achieved through organised breast cancer screening to detect cases of unsuspected breast cancer in asymptomatic women, enabling intervention at an early stage. The target age group is women aged 50–69 years.

Participation and rescreening

In 2007–2008, 1,641,316 women participated in BreastScreen Australia, of whom 1,273,403 (77.6%) were aged 50–69 years. Although the number of women increased, participation of women aged 50–69 years decreased from 56.9% in 2005–2006 to 54.9% in 2007–2008.

BreastScreen Australia achieved equitable access to women across geographic regions, but participation of Aboriginal and Torres Strait Islander women remained lower at 36.0%.

The proportion of women aged 50–69 years rescreened within 27 months ranged from 59.3% after the first screen to 66.8% after the second screen and to 78.4% after subsequent screens.

Invasive cancer detection

Between 1996 and 2008, the national rate at which women are recalled to assessment to investigate mammograms suspicious for breast cancer increased from 5.8% to 9.5% of women screened for the first screening round, while for subsequent screening rounds this rate remained at around 4%. An increase in the recall to assessment rate may have contributed to the increase in the rate of detection of invasive breast cancer between 1996 and 2008. The rate increased from 56.5 to 71.7 per 10,000 women screened for the first screening round, and from 35.3 to 47.5 per 10,000 women screened for subsequent screening rounds.

Nearly two-thirds of all invasive breast cancers detected by BreastScreen Australia were small. This is an important result, since detection of breast cancers when they are small leads to more options for treatment and improved survival.

While screen-detected cancer detection rates were high, interval cancer rates were low. For the 0–12 months after a negative screening episode, these rates were 6.3 and 6.5 interval cancers per 10,000 women-years for the first and subsequent screening rounds respectively.

Incidence and mortality

Incidence and mortality rates for breast cancer for Australian women have changed between 1991, when BreastScreen Australia commenced, and the most recent year for which these data are available.

Incidence for women aged 50–69 years increased from 230.1 new cases per 100,000 women in 1991 to 287.7 in 2006, with a peak of 304.8 in 2001. Conversely, mortality from breast cancer for women aged 50–69 years has decreased steadily, from 68.2 deaths per 100,000 women in 1991 to 47.0 deaths per 100,000 women in 2007.

While Aboriginal and Torres Strait Islander women experienced lower incidence of invasive breast cancer than non-Indigenous women, mortality was found not to differ.

National comparison table

The following table provides a comparison of national data for BreastScreen Australia for key performance indicators for women in the target age group, 50–69 years. Summary statistics for the latest reporting period are compared with those from the previous reporting period and those from the reporting period 5 years before the latest reporting period. National Accreditation Standard performance objectives for BreastScreen Australia (BreastScreen Australia 2004) provide benchmark standards to help in the interpretation of data presented.

One-year and 5-year comparison table for national BreastScreen Australia data for key performance indicators for women aged 50–69 years

		Latest reporting period		Previous non-overlapping period		Period 5 years ago	
Indicator	**Objective(a)**	**Year**	**Rate**	**Year**	**Rate**	**Year**	**Rate**
Participation in 24-month period (%)	70.0(b)	2007–2008	54.9	2005–2006	56.9	2002–2003	56.2
		2006–2007	56.1	2004–2005	56.1	2001–2002	57.1
Rescreening(c)							
First screening round	≥75	Index year 2005	59.3	Index year 2004	62.7	Index year 2000	66.3
Second screening round	≥90	Index year 2005	66.8	Index year 2004	70.5	Index year 2000	75.7
Third and subsequent screening rounds	≥90	Index year 2005	78.4	Index year 2004	81.0	Index year 2000	84.3
Recall to assessment(d)							
First screening round	<10	2008	9.5	2007	9.8	2003	9.3
		2007	9.8	2006	9.9	2002	8.8
Subsequent screening rounds	<5	2008	4.1	2007	4.0	2003	4.0
		2007	4.0	2006	4.0	2002	4.1
Detection rate of small invasive cancers (≤15 mm)(e)							
First screening round	≥25	2008	39.8	2007	41.1	2003	41.2
		2007	41.1	2006	39.5	2002	42.8
Subsequent screening rounds	≥25	2008	29.8	2007	26.7	2003	28.1
		2007	26.7	2006	28.1	2002	28.9
Detection of ductal carcinoma in situ (DCIS)							
First screening round	≥12	2008	14.4	2007	20.6	2003	16.8
		2007	20.6	2006	19.4	2002	21.8
Subsequent screening rounds	≥7	2008	11.5	2007	11.1	2003	10.4
		2007	11.1	2006	9.7	2002	9.3

(continued)

One-year and 5-year comparison table for national BreastScreen Australia data for key performance indicators for women aged 50-69 years (continued)

		Latest reporting period		Previous non-overlapping period		Period 5 years ago	
Indicator	**Objective[a]**	**Year**	**Rate**	**Year**	**Rate**	**Year**	**Rate**
Interval cancer rate							
First screening round 0–12 months following a negative screening episode	<7.5	Index years 2003–2005	6.3	Index years 2000–2002	6.8	Index years 1998–2000	7.2
Subsequent screening rounds 0–12 months following a negative screening episode	<7.5	Index years 2003–2005	6.5	Index years 2000–2002	7.9	Index years 1998–2000	8.0
Program sensitivity (screen detected cancers)							
First screening round 0–12 months following a negative screening episode	. .	Index years 2003–2005	91.8	Index years 2000–2002	90.2	Index years 1998–2000	89.4
Subsequent screening rounds 0–12 months following a negative screening episode	. .	Index years 2003–2005	86.8	Index years 2000–2002	84.4	Index years 1998–2000	83.2
Incidence of breast cancer[f]		2006	287.7	2005	279.7	2001	304.8
Incidence of ductal carcinoma in situ (DCIS)[g]		2006	43.4	2005	43.9	2001	46.0
Mortality from breast cancer[h]		2007	47.0	2006	47.4	2001	52.3

(a) Performance objective of BreastScreen Australia as set out in the National Accreditation Standards (BreastScreen Australia 2004) Although these objectives were developed for individual screening services rather than for the national program as a whole, they do provide an indication of the national program's performance.

(b) Target formally agreed by the former BreastScreen National Advisory Committee.

(c) Although the BreastScreen Australia target age group is 50–69 years, only women aged 50–67 years are reported for the rescreen indicator. This is because women aged 68–69 years in the index year are outside the target age group 27 months after their index screen and, therefore, are not expected to return for screening.

(d) Rates are the number of women recalled for assessment as a percentage of women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

(e) Rates are the number of women with small invasive cancer detected per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

(f) Rates are the number of new cases of invasive breast cancer per 100,000 women and age standardised to the Australian population at 30 June 2001.

(g) Rates are the number of new cases of DCIS per 100,000 women and age standardised to the Australian population at 30 June 2001.

(h) Rates are the number of deaths from breast cancer per 100,000 women and age standardised to the Australian population at 30 June 2001.

Introduction

Cancer

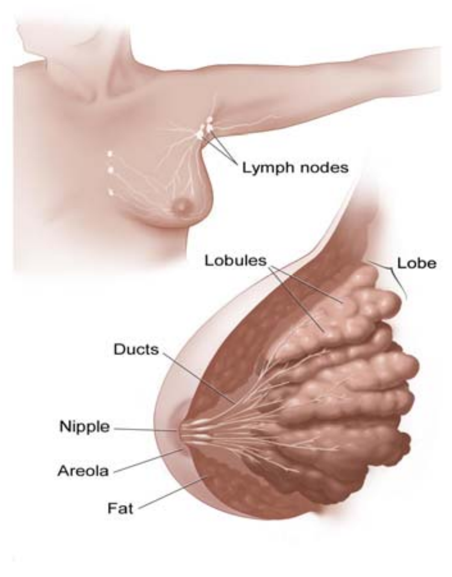
Cancer is a group of several hundred diseases in which abnormal cells are not destroyed by normal cell processes but instead proliferate and spread out of control. Cancers are distinguished from each other by the specific type of cell involved and the place in the body in which the disease begins.

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

Although various risk factors for cancer have been identified, for most cancers the causes are not fully known. Although some of the causes are modifiable through lifestyle changes, some others are inherited and cannot be avoided through personal action. However, the risk of death due to particular cancers may be reduced through intensive monitoring of individuals at high risk, reducing external risk factors, detecting and treating cancers early in their development, and treating them in accordance with the best available evidence.

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

Breast cancer



Source: National Cancer Institute 2009.

Breast cancer occurs when abnormal cells grow and multiply out of control. Breast cancer originates in the ducts of the breast (which carry milk from the lobules to the nipple) or in the lobules (small lobes of the breast that produce milk), and can be classified as either non-invasive or invasive.

Breast cancer that remains confined within the lobules or ducts is called non-invasive breast cancer, or carcinoma in situ. There are two types of non-invasive breast cancer: ductal carcinoma in situ (DCIS)—the most common type of non-invasive breast cancer—is confined to the ducts of the breast, while lobular carcinoma in situ is confined to the lobules.

Invasive breast cancer is where the cancer cells spread beyond the lobules or ducts and invade surrounding breast tissue. Most invasive breast cancers originate in the ducts of the breast.

Many risk factors, both established and probable, have been identified for breast cancer in women. The greatest risk factor is age, with most breast cancers occurring in women over the age of 50. A family history of breast cancer can also increase a woman's risk of developing breast cancer, although most women who develop breast cancer do not have a family history of the disease. Women are considered to have about twice the risk of breast cancer if they have a first-degree relative (mother, sister or daughter) diagnosed with breast cancer before the age of 50 (McPherson et al. 2000). The risk increases with a greater number of relatives with breast cancer, and younger age of breast cancer in affected relatives, and other factors such as family history of bilateral breast cancer, breast cancer before the age of 40 and male breast cancer (NBCC 2006). Genetic predisposition accounts for up to 10% of breast cancers in Western countries (McPherson et al. 2000). Inherited alterations in two identified breast cancer genes called BRCA1 and BRCA2 are involved in many cases of hereditary breast cancer, and a woman's risk of developing breast cancer is greatly increased if she inherits either of these altered genes (McPherson et al. 2000).

Other factors that may increase a woman's risk of breast cancer include not having carried or given birth to any children, late age at birth of first child, early menstruation and late menopause. Oral contraception use can cause a small increase in the risk of breast cancer, as can hormone replacement therapy, the use of which causes an increase in the risk of breast cancer consistent with late menopause (McPherson et al. 2000).

Incidence and mortality

Excluding non-melanoma skin cancer, breast cancer is the most common cancer affecting Australian women, with an age-standardised incidence of 112.4 new cases per 100,000 women in 2006, and is the second most common cause of cancer mortality in Australian women behind lung cancer, with an age-standardised mortality of 22.1 deaths per 100,000 women in 2007.

Screening

Population-based screening involves the systematic use of a test to identify individuals who have a previously unrecognised disease in an asymptomatic population (that is, in people not showing any symptoms of the disease). The aim of population-based screening is to reduce the burden of disease, which may include a reduction in the incidence, morbidity and mortality of the disease, through detection at an early stage in individuals who would not otherwise know they were affected (Screening Subcommittee 2008; Strong et al. 2005; Wald 2001).

The screening test used in a population-based screening program is not intended to be diagnostic; rather it aims to distinguish between individuals who test positive (and therefore may have, or may develop, the disease) and require further specific testing to ascertain whether they have the disease, and those who test negative (show no early indications of the disease) and require no further testing (Screening Subcommittee 2008; Strong et al. 2005). The screening test should both minimise false positives (a positive screening result that further diagnostic testing showed was actually negative) and maximise true positives. Balanced information as to the benefits and potential harms of the screening should be made available to the target population to ensure they can make an informed decision regarding their participation (Screening Subcommittee 2008).

In 1968, the World Health Organization endorsed 10 principles to be used when determining if a new population-based screening program should be introduced for a disease or condition (Wilson & Jungner 1968). These principles were designed to ensure that the disease in question was well understood and the correct test, treatment and resources were in place to allow screening to be of benefit to the target population. In 2006 in Australia there were eight National Health Priority Area cancers: lung cancer, bowel cancer, melanoma, non-melanoma skin cancer, prostate cancer, breast cancer, cervical cancer and non-Hodgkin lymphoma (NHPAC 2006). Of these, bowel, breast and cervical cancer have met the criteria for approved population-based screening programs. This report focuses on the screening program for breast cancer, BreastScreen Australia.

Breast cancer screening

Mammography (x-ray of the breast) is the screening test used in breast cancer screening. In screening mammography, two views are performed on each breast, and the films are reviewed by two independent radiologists to look for suspicious characteristics that would require follow-up. Screening mammography is different from diagnostic mammography, which is appropriate for women with breast symptoms, since diagnostic mammography is able to target a symptomatic area of the breast using multiple views.

The aim of organised breast cancer screening is to detect cases of unsuspected breast cancer in asymptomatic women, which enables intervention when the cancer is at an early stage. Finding breast cancer early often means that the cancer is small. Small breast cancers are associated with increased treatment options (NBOCC 2009a) and improved survival (AIHW & NBCC 2007).

Breast cancer screening using mammography has been demonstrated to reduce mortality from breast cancer. Recent estimates of 8.8 and 5.7 breast cancer deaths prevented per 1,000 women screened use data from the Swedish Two-County Trial and England’s breast cancer screening program, respectively (Duffy et al. 2010). Australia’s breast cancer screening program has also recently been estimated to have reduced breast cancer mortality by 21–28% (BreastScreen Australia EAC 2009a).

Australia's national breast cancer screening program was established in 1991 as the then-named 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 Government and state and territory governments. Like many population-based cancer screening programs, the main objective of BreastScreen Australia is to reduce mortality and morbidity from breast cancer.

BreastScreen Australia provides free breast cancer screening to women through screening and assessment services, which are made up of one assessment centre and one or more screening units. Women have their screening mammogram performed at a screening unit (which may be fixed, relocatable or mobile). If any films are found to be suspicious for breast cancer, these women will be 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.

BreastScreen Australia targets women aged 50–69 years but also screens women aged 40–49 years and 70 years or over. Women aged 50–69 years are targeted because these women have a relatively high incidence of breast cancer, and screening mammography is known to be effective in reducing mortality in this age group (BreastScreen Australia 2004). Screening mammography is less effective in women aged less than 50 years. Biological differences in the breast tissue of pre-menopausal women result in more investigations and false negative results (missed breast cancers) due to the lower sensitivity of screening mammography in this age group (Irwig et al. 1997).

The aims and objectives of BreastScreen Australia (BreastScreen Australia 2004) are listed opposite.

Aims of BreastScreen Australia

- To ensure that the program is implemented in such a way that statistically significant reductions can be achieved in morbidity and mortality attributable to breast cancer.
- To maximise the early detection of breast cancer in the target population.
- To ensure that screening for breast cancer in Australia is provided in dedicated and accredited screening and assessment services as part of the BreastScreen Australia Program.
- To ensure equitable access for women aged 50−69 years to the program.
- To ensure that services are acceptable and appropriate to the needs of the eligible population.
- To achieve high standards of program management, service delivery, monitoring and evaluation, and accountability.

Objectives of BreastScreen Australia

- To achieve a 70 per cent participation rate in the BreastScreen Australia Program by women in the target group (50–69) and access to the program for women aged 40–49 years and 70–79 years.
- To rescreen all women in the program at two-yearly intervals.
- To achieve agreed performance outcomes which minimise recall rates, retake films, invasive procedures, 'false negatives' and 'false positives', and maximise the number of cancers detected, particularly the number of small cancers.
- To refer to appropriate treatment services and collect information about the outcome of treatment.
- To fund, through state coordination units, screening and assessment services which are accredited according to agreed National Accreditation Standards and to ensure that those standards are monitored and reviewed by appropriate national and state and territory accreditation committees.
- To recognise the real costs to women of participation in the program and to minimise those costs. This includes the provision of services at minimal or no charge, and free to eligible women who would not attend if there was a charge.
- To make information about mammographic screening and the BreastScreen Australia Program available in a variety of easily comprehensible and appropriate forms, to women and health-care providers in particular.
- To achieve patterns of participation in the program which are representative of the socioeconomic, ethnic and cultural profiles of the target population.
- To provide services in accessible, non-threatening and comfortable environments by staff with appropriate expertise, experience and training.
- To provide appropriate service in that: the provision of counselling, education and information is an integral part of the program; sensitive procedures for notification of recall are in place; and the time between the initial screen and assessment is minimised.
- To achieve high levels of participation in the development and management of the program by members of significant professional and client groups.
- To collect and analyse data sufficient to monitor the implementation of the program, to evaluate its effectiveness and efficiency and to provide the basis for future policy and program development decisions.

Monitoring BreastScreen Australia

For a population-based cancer screening program such as BreastScreen Australia, there is a need to assess whether the program is achieving its aims. The overarching aim of BreastScreen Australia is to reduce mortality (deaths) and morbidity (illness) from breast cancer. The Australian Institute of Health and Welfare (AIHW) has measured BreastScreen Australia's performance in reaching these and other aims since the first reporting period of 1996–1997 in the annual *BreastScreen Australia monitoring report*.

Performance indicators and objectives

To address the need to monitor performance of BreastScreen Australia in the shorter-term, performance indicators have been developed that allow progress towards reductions in mortality and morbidity to be assessed. Performance indicators for BreastScreen Australia cover the areas of participation, cancer detection, sensitivity, DCIS detection, recall to assessment and rescreening within BreastScreen Australia, as well as incidence of breast cancer and DCIS and mortality from breast cancer in Australia. Performance indicators are needed because, despite its reduction being the primary goal, measuring mortality alone is an inadequate measure of performance in the short term due to the inevitable time lag between any interventions or alterations to BreastScreen Australia and the deaths that ensue.

Performance indicators for BreastScreen Australia were developed and endorsed by the former National Screening Information Advisory Group and by state and territory BreastScreen programs, and represent key measures of BreastScreen Australia's progress towards achieving reductions in morbidity and mortality from breast cancer.

BreastScreen Australia also has National Accreditation Standards (NAS) performance objectives, some of which overlap with the performance indicators. These NAS performance objectives represent minimum standards that have been set to represent a service's ability to meet the aims and objectives of BreastScreen Australia (BreastScreen Australia 2004). In this report, these objectives provide benchmark standards to help in the interpretation of data presented at the national level for performance indicators 1 to 6, inclusive.

To inform BreastScreen Australia's programs and policies, the most recent data available for each performance indicator have been sourced for inclusion in this report from state and territory BreastScreen programs, state and territory cancer registries, and national cancer incidence and mortality databases held at the AIHW. This creates a lack of congruency between some indicators, but the ability to access the most recent data on all indicators should eclipse any potential deficits in this approach.

Statistical significance

Statistical analyses are useful tools that aid in the interpretation of data. In this report, 95% confidence intervals have been used to determine if a statistically significant difference exists between compared values. Although the approximate comparisons presented might understate the statistical significance of some differences, they are sufficiently accurate for the purposes of this report. For more information on 95% confidence intervals, see Appendix D.

Interpretation

The confidence intervals presented in this report 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 overlapping confidence intervals does not imply that the difference between two rates is definitely due to chance. Instead, overlapping confidence intervals represent 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.

As with all statistical comparisons, care should be exercised in interpreting the results of the comparison. If two 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.

Terminology

Whenever statistical significance is reported, the term ‘significant’ is often used instead of the term ‘statistically significant’. Importantly, this is the only context in which the term ‘significant’ or any of its derivatives are used; any use of the terms ‘significant’, ‘significantly’ or ‘significance’ should therefore be interpreted as a statistically significant result, as determined by the presence of non-overlapping confidence intervals, as described above.

Indicator 1 Participation

BreastScreen Australia aims to maximise the proportion of women aged 50–69 years who are screened every 2 years, as high participation is required to achieve reductions in mortality from breast cancer.

Key findings

- Participation in BreastScreen Australia decreased in 2007–2008 to 54.9% from the previously steady rate of around 56% seen between 2002–2003 and 2006–2007.
- BreastScreen Australia provided equitable access to women across geographic regions and socioeconomic status of location of residence. Participation in *Remote* locations was greater than the national rate, and participation in *Very remote* locations was less than five percentage points below the national rate, while all five socioeconomic status groups were within two percentage points of the national rate.
- Participation of Aboriginal and Torres Strait Islander women remained lower than that of non-Indigenous women—36.0% compared with 54.8% in 2007–2008.

Participation

Participation is a measure of the proportion of women in the population aged 50–69 years screened though BreastScreen Australia in a 24-month period. High attendance for screening by women aged 50–69 years is needed to maximise reductions in mortality from breast cancer (BreastScreen Australia 2004). This is reflected by the National Accreditation Standards (NAS) performance objective for participation, which is that at least 70% of women aged 50–69 years participate in screening in the most recent 24–month period (NAS 1.1.1) (BreastScreen Australia 2004).

State and territory BreastScreen programs report the number of women who had a screening mammogram performed in each 2-year reporting period, beginning 1 January of the first year and ending 31 December of the following year. This aligns with the recommended screening interval of 2 years, and so most women should only have one screening mammogram through BreastScreen Australia over this period. Participation is based on the number of women screened, and not the number of screening mammograms, so women are only counted once in any 2-year period regardless of the number of screening mammograms each woman received. Although the states and territories have different policies on screening women with symptoms, women with and without breast symptoms (such as a lump or clear or bloody discharge) are counted.

Participation is calculated as the number of participants as a proportion of the target population. The target population is the number of women aged 50–69 years, averaged over the 2 reporting years, sourced from the Australian Bureau of Statistics' (ABS) estimated resident population. No attempt has been made to adjust the population for women who have previously had breast cancer and are therefore not eligible for breast cancer screening through BreastScreen Australia, although again it should be noted that states and territories have different policies on screening women who have previously been diagnosed with breast cancer.

The most recent participation data are for the 2006–2007 and 2007–2008 reporting periods.

Participation trends

Table 1.1 shows the trend in participation in BreastScreen Australia nationally from 1996–1997, when reporting began, to 2007–2008, the most recent national data available.

Table 1.1: Age-standardised participation for women aged 50–69 years, 1996–1997 to 2007–2008

Year of screening	Target population	Participants	Objective[a]	Rate (per cent)	95% CI
1996–1997	1,645,331	845,102	70.0	51.5	51.4–51.6
1997–1998	1,700,951	927,699		54.6	54.5–54.7
1998–1999	1,754,254	976,149		55.7	55.6–55.8
1999–2000	1,809,735	1,012,150		55.9	55.8–56.1
2000–2001	1,868,832	1,064,224		57.0	56.8–57.1
2001–2002	1,928,878	1,102,621		57.1	57.0–57.2
2002–2003	1,989,802	1,118,798		56.2	56.1–56.3
2003–2004	2,051,480	1,144,998		55.7	55.6–55.8
2004–2005	2,114,036	1,188,984		56.1	56.0–56.2
2005–2006	2,177,660	1,242,245		56.9	56.8–57.0
2006–2007	2,242,133	1,262,377		56.1	56.0–56.2
2007–2008	2,307,802	1,273,403		54.9	54.8–55.0

(a) Performance objective of BreastScreen Australia as set out in the National Accreditation Standards (BreastScreen Australia 2004).

Note: Rates are the number of women screened as a percentage of the eligible female population calculated as the average of the ABS's estimated resident population and age standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of BreastScreen Australia data.

In 2006–2007 BreastScreen Australia screened 1,641,727 women, with 1,262,377 of these in the target age group 50–69 years. In 2007–2008, of the 1,641,316 women screened, 1,273,403 were in the target age group. There has been a steady increase in the number of women aged 50–69 years screened by BreastScreen Australia since the first reporting period of 1996–1997, but this does not always translate to an increase in participation since this measure is also dependent on changes in the target population (Table 1.1).

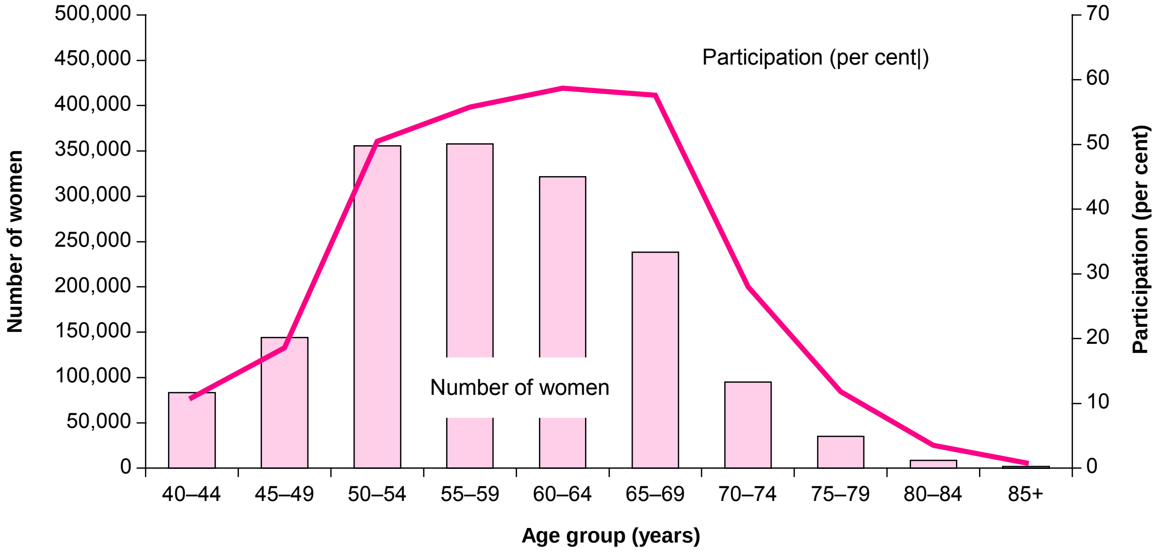
Since 1996–1997, participation has ranged between 51.5% and 57.1%. Participation in BreastScreen Australia was 51.5% in 1996–1997 when reporting began, increasing to a peak of 57.1% in 2001–2002 and thereafter remaining steady at around 56%. While participation in 2006–2007 followed this trend at 56.1%, the 2007–2008 reporting period saw a statistically significant decrease in participation down to 54.9% of women aged 50–69 years (Table 1.1). This drop does not reflect a decrease in attendance for screening. In fact, there was a 0.9% increase in the number of women aged 50–69 years screened between 2006–2007 and 2007–2008, but this was well below the population growth of 2.9% for women in this age group over this same period, resulting in the observed sharp decrease in participation rate.

Although the NAS performance objective of 70% has not been reached at the national level, the predicted reduction in breast cancer mortality of 16% that was originally expected to result from 70% participation has recently been shown to have been exceeded at 21–28%, with the average participation rate of 55% (BreastScreen Australia EAC 2009a).

Participation by age

Participation is measured in women aged 50–69 years since this is the target age group of BreastScreen Australia. However, women aged 40–49 years and 70 years and over are also eligible to attend for screening.

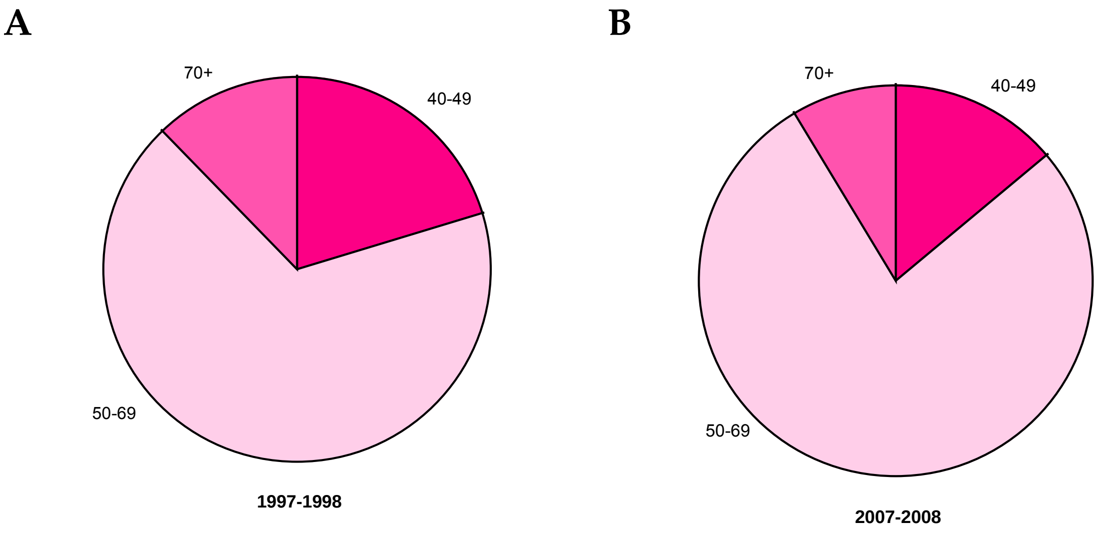
Figure 1.1 shows the number and proportion of women participating in BreastScreen Australian in 2007–2008 in each of the 5-year age groups from 40–44 years to 85 years and over. In line with BreastScreen Australia's aim to maximise the proportion of women aged 50–69 years who are screened every 2 years, the greatest number and proportion of women screened are in this target age group. This figure shows that, although the greatest number of women screened are those in the age groups 50–54 and 55–59 years, the greatest proportion of women screened are those aged 60–64 years at 58.7%.



Source: AIHW analysis of BreastScreen Australia data.

Figure 1.1: Participation in BreastScreen Australia, by age group, females, 2007–2008

Although women aged 50–69 years have always made up the greatest proportion of women screened by BreastScreen Australia, the breakdown into the target age group and other age groups has changed over time. The breakdown of women screened into the age groups 40–49 years, 50–69 years and 70 years and over is shown in Figure 1.2 for the reporting periods 1997–1998 and 2007–2008. Over this 10-year period, it is clear that women in the target age group have progressively made up a greater proportion of all women screened (Figure 1.2).



Source: AIHW analysis of BreastScreen Australia data.

Figure 1.2: Age distribution of women aged 40 years or over screened by BreastScreen Australia, 1997–1998 (A) and 2007–2008 (B)

In both 2006–2007 and 2007–2008, of all the women screened by BreastScreen Australia, most were in the target age group, with women aged 50–69 years making up 76.9% and 77.6% of all screened women, respectively. This has been increasing over time, from 67.4% in 1997–1998 to 69.1% in 2002–2003, and 77.6% in 2007–2008 (Table 1.2). Concurrent to this increase has been a decrease in the 40–49 and 70 and over age groups.

For women aged 40–49 years, this decrease was from 20.3% in 1997–1998 to 17.4% in 2002–2003, with women in this age group making up 13.9% of women screened in 2007–2008. For women aged 70 years and over, there was a small increase from 12.3% in 1997–1998 to 13.5% in 2002–2003, before a decrease leading to an apparent drop to 8.6% in 2007–2008 (Table 1.2).

Table 1.2: Age distribution of women aged 40 years or over screened by BreastScreen Australia, 1997–1998, 2002–2003, 2006–2007 and 2007–2008

	Age group (years)		
	40–49	**50–69**	**70+**
		(**per cent**)	
1997–1998	20.3	67.4	12.3
2002–2003	17.4	69.1	13.5
2006–2007	13.9	76.9	9.2
2007–2008	13.9	77.6	8.6

Notes

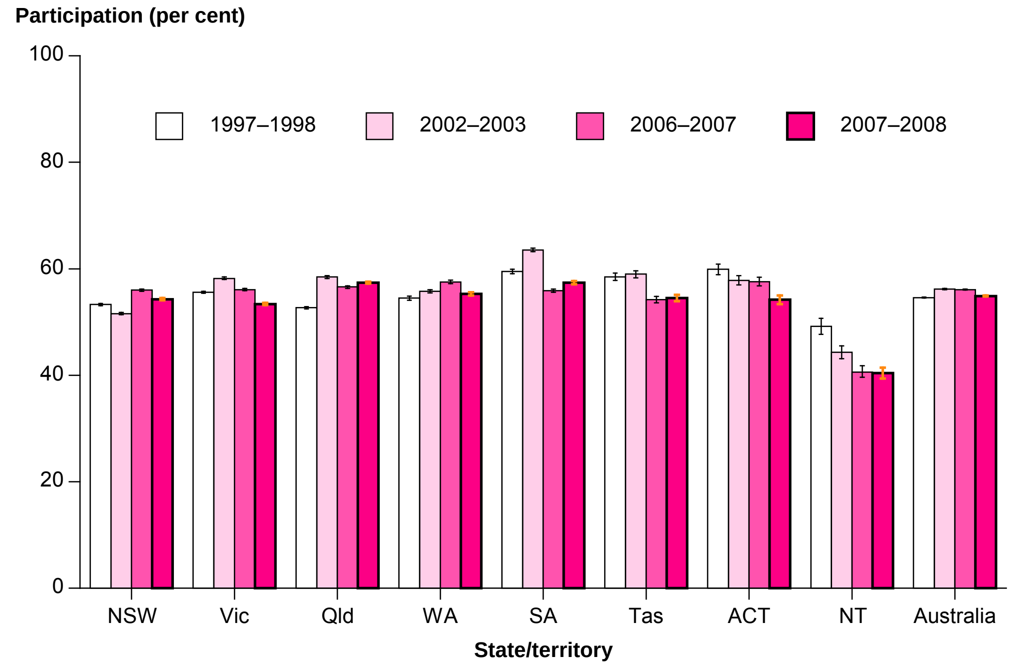
1. Rates are the number of women screened as a percentage of all women aged 40 years or over screened by BreastScreen Australia.
2. Periods cover 1 January 1997 to 31 December 1998, 1 January 2002 to 31 December 2003, 1 January 2006 to 31 December 2007 and 1 January 2007 to 31 December 2008.
3. Some states and territories have a policy of not screening outside the target age range.

Source: AIHW analysis of BreastScreen Australia data.

Participation by state and territory

While it is useful to measure participation in the eight states and territories of Australia, when making direct comparisons, it is important to consider the substantial differences that exist between the jurisdictions. Differences include population, area, geographic structure, policies and other factors.

Although there was a decrease in the overall participation for Australia, from 56.1% in 2006–2007 to 54.9% in 2007–2008, the age-standardised participation rates across states and territories was very similar in these two reporting periods, ranging from 40.6% to 57.6% in 2006–2007, and from 40.4% to 57.4% in 2007–2008 (Table 1.3).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 1.3: Participation of women aged 50–69 years in BreastScreen Australia, by state and territory, 1997–1998, 2002–2003, 2006–2007 and 2007–2008

From 2006–2007 to 2007–2008, participation increased in Queensland and South Australia, with all other states and territories showing either no change or a significant decrease over this period. Additionally, all jurisdictions except for New South Wales, which showed an increase, and Western Australia, which showed no change, demonstrated lower participation in 2007–2008 than they did 5 years earlier in 2002–2003, when national participation was 56.2% (Figure 1.3).

Nonetheless, when recent figures are compared with those 5 and even 10 years earlier, most jurisdictions have demonstrated relatively stable participation over this period, and trends in national participation are primarily mirrored across all states and territories.

Table 1.3: Participation of women aged 50–69 years in BreastScreen Australia, by state and territory, 1997–1998, 2002–2003, 2006–2007 and 2007–2008

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
					(per cent)				
1997–1998	53.3	55.6	52.7	54.5	59.5	58.5	59.9	49.2	54.6
95% CI	53.2–53.5	55.4–55.8	52.4–52.9	54.1–54.9	59.1–59.9	57.8–59.2	59.0–60.9	47.8–50.7	54.5–54.7
2002–2003	51.6	58.2	58.5	55.8	63.5	59.0	57.8	44.3	56.2
95% CI	51.4–51.8	58.0–58.5	58.2–58.7	55.5–56.1	63.2–63.9	58.3–59.6	57.0–58.7	43.1–45.5	56.1–56.3
2006–2007	56.0	56.1	56.6	57.5	55.9	54.2	57.6	40.6	56.1
95% CI	55.8–56.2	55.9–56.3	56.3–56.8	57.2–57.9	55.6–56.2	53.6–54.8	56.8–58.4	39.6–41.6	56.0–56.2
2007–2008	54.3	53.4	57.4	55.3	57.4	54.5	54.2	40.4	54.9
95% CI	54.1–54.5	53.2–53.6	57.2–57.6	55.0–55.6	57.1–57.8	53.9–55.1	53.4–55.0	39.4–41.4	54.8–55.0

Notes

1. Rates are the number of women screened as a percentage of the eligible female population calculated as the average of the ABS's estimated resident population and age standardised to the Australian population at 30 June 2001.
2. Periods cover 1 January 1997 to 31 December 1998, 1 January 2002 to 31 December 2003, 1 January 2006 to 31 December 2007 and 1 January 2007 to 31 December 2008.

Source: AIHW analysis of BreastScreen Australia data.

Participation by location of residence

Participation is assessed across geographic region of residence and socioeconomic status of location of residence, to assist in the identification of subgroups that participate to a lesser degree in BreastScreen Australia. Women are placed in geographic region of residence and socioeconomic status of location of residence based on the postcode they supply at the time of screening. It should be noted that before 2006–2007 women were allocated a geographic region and socioeconomic status based on 2001 ABS classifications, whereas in 2006–2007 and 2007–2008 women were allocated based on 2006 ABS classifications. These classifications contain differences reflecting changes in remoteness and socioeconomic status in areas of Australia over time, and data before 2006–2007 are therefore not comparable with data after 2006–2007.

Figure 1.4 illustrates that the trend in participation by geographic region seen in 2002–2003 was replicated in 2006–2007 and 2007–2008. In all three reporting periods, participation was highest in *Inner regional*, *Outer regional* and *Remote* locations, and lowest in *Major cities* and *Very remote* locations (Figure 1.4). The greatest change over the 5 years has been in *Very remote* locations, for which participation increased from 0.88 times that of *Major cities* in 2002–2003 to 0.92 and 0.93 times that of *Major cities* in 2006–2007 and 2007–2008, respectively (Table 1.4).

The ability of BreastScreen Australia to screen women in *Remote* and *Very remote* locations to the extent that it has in the 2007–2008 reporting period (the former greater than, and latter less than five percentage points below, the national rate) is of note.

Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 1.4: Participation of women aged 50–69 years in BreastScreen Australia, by geographic region, 2002–2003, 2006–2007, 2007–2008

Looking more recently, between 2006–2007 and 2007–2008, participation fell across all regions (Table 1.4). While this was on par with the decrease in the national participation rate over this time in *Outer regional*, *Remote* and *Very remote* locations, the decrease in *Major cities* and *Inner regional* locations surpassed this underlying trend, suggesting that participation may have dropped in these compared with other locations.

Table 1.4: Participation of women aged 50–69 years in BreastScreen Australia, by geographic region, 2002–2003, 2006–2007 and 2007–2008

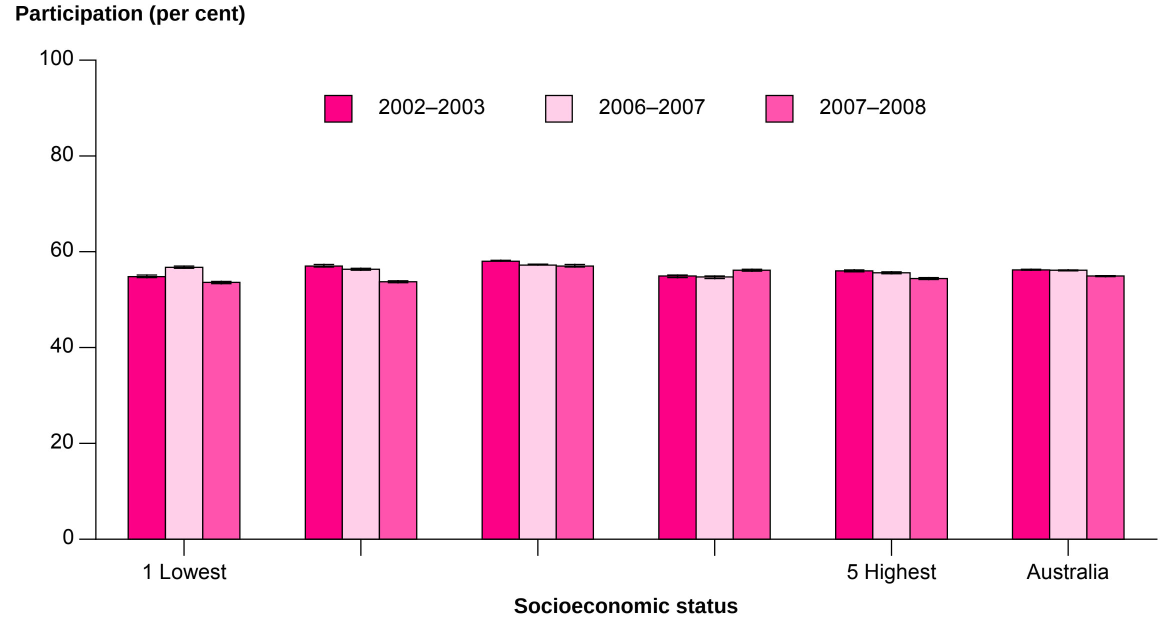
	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
			(per cent)			
2002–2003	54.3	59.0	60.7	60.0	47.8	56.2
95% CI	54.2–54.4	58.8–59.3	60.3–61.0	59.1–61.0	46.6–49.1	56.1–56.3
2006–2007	56.0	59.5	59.4	57.2	51.3	56.1
95% CI	55.9–56.1	59.3–59.7	59.1–59.7	56.4–58.1	50.0–52.6	56.0–56.2
2007–2008	53.8	56.7	58.3	56.3	50.2	54.9
95% CI	53.7–54.0	56.5–56.9	58.0–58.6	55.5–57.2	49.0–51.4	54.8–55.0

Notes

1. Rates are the number of women screened as a percentage of the eligible female population calculated as the average of the ABS's estimated resident population and age standardised to the Australian population at 30 June 2001.
2. Periods cover 1 January 2002 to 31 December 2003, 1 January 2006 to 31 December 2007 and 1 January 2007 to 31 December 2008.
3. Geographic regions were assigned using the woman's residential postcode according to the Australian Standard Geographic Classification for 2001 for the 2002–2003 reporting period, and to the Australian Standard Geographic Classification for 2006 for the 2006–2007 and 2007–2008 reporting periods.

Source: AIHW analysis of BreastScreen Australia data.

Participation does not vary greatly across socioeconomic status groups, all five groups being within 2 percentage points of the national rate for the two recent reporting periods, as well as the reporting period 5 years previous to these (Figure 1.5; Table 1.5).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 1.5: Participation of women aged 50–69 years in BreastScreen Australia, by socioeconomic status, 2002–2003, 2006–2007 and 2007–2008

Table 1.5: Participation of women aged 50–69 years in BreastScreen Australia, by socioeconomic status, 2002–2003, 2006–2007 and 2007–2008

	1 (lowest)	2	3	4	5 (highest)	Australia
			(per cent)			
2002–2003	54.8	57.0	58.0	54.9	56.0	56.2
95% CI	54.6–55.1	56.8–57.3	57.7–58.2	54.7–55.1	55.8–56.2	56.1–56.3
2006–2007	56.7	56.3	57.2	54.7	55.6	56.1
95% CI	56.5–57.0	56.1–56.5	57.0–57.4	54.5–54.9	55.4–55.8	56.0–56.2
2007–2008	53.6	53.7	57.0	56.1	54.4	54.9
95% CI	53.3–53.8	53.5–53.9	56.8–57.3	55.9–56.3	54.2–54.6	54.8–55.0

Notes

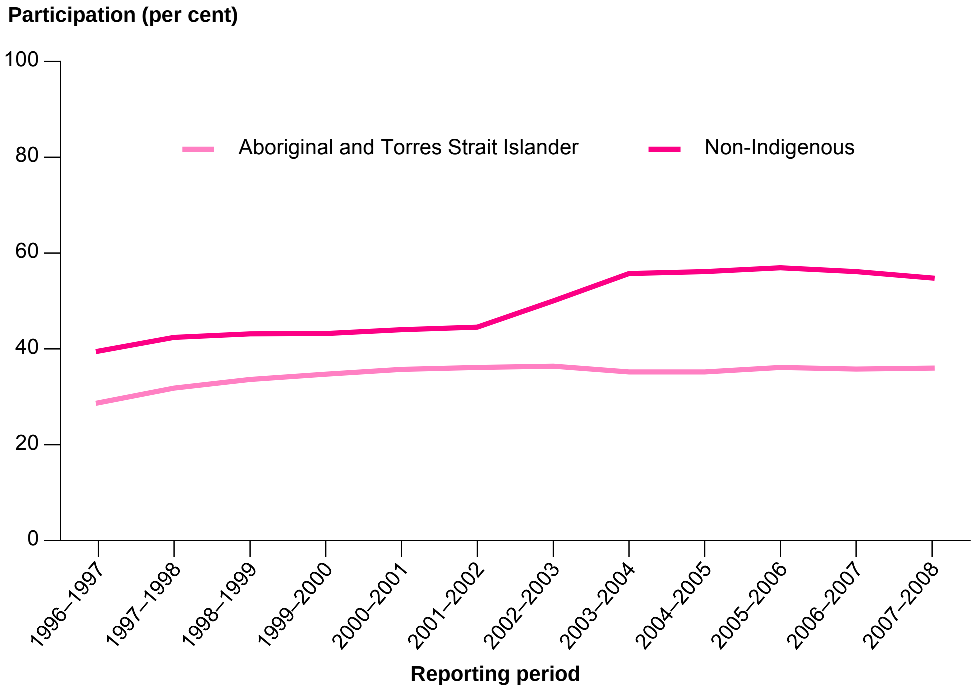
1. Rates are the number of women screened as a percentage of the eligible female population calculated as the average of the ABS's estimated resident population and age standardised to the Australian population at 30 June 2001.
2. Periods cover 1 January 2002 to 31 December 2003, 1 January 2006 to 31 December 2007 and 1 January 2007 to 31 December 2008.
3. Socioeconomic status was assigned using the woman's residential postcode according to the Socioeconomic Index for Areas (SEIFA) Index of Relative Socioeconomic Disadvantage for 2001 for the 2002–2003 reporting period, and to the SEIFA Index of Relative Socioeconomic Disadvantage for 2006 for the 2006–2007 and 2007–2008 reporting periods.
4. 1 (lowest socioeconomic group) corresponds to the most disadvantaged socioeconomic status and 5 (highest socioeconomic group) to the least disadvantaged socioeconomic status. This is different from socioeconomic status that has been presented in previous BreastScreen Australia monitoring reports.

Source: AIHW analysis of BreastScreen Australia data.

Participation by Aboriginal and Torres Strait Islander status

Women who attend for a screening mammogram at a BreastScreen Australia service are asked to complete a form that includes personal and demographic details, as well as personal and family history of breast cancer. The form also includes a question on Aboriginal and Torres Strait Islander status where women are able to identify as 'Aboriginal', 'Torres Strait Islander', 'both Aboriginal and Torres Strait Islander', or 'neither Aboriginal or Torres Strait Islander'. There is an additional 'not stated' category for women who choose not to answer this question. These responses are aggregated into the categories of 'Aboriginal and Torres Strait Islander', 'non-Indigenous' and 'not stated'.

While self-reported data are generally a robust source of data on Aboriginal and Torres Strait Islander status (AIHW 2010b), a significant cause of concern with the accuracy of these data is that some jurisdictions do not allow for the 'not stated' category. Further, some Aboriginal and Torres Strait Islander women may choose not to identify as such when presenting to a BreastScreen Australia service. Thus, some Aboriginal and Torres Strait Islander women may be incorrectly assigned non-Indigenous status.



Source: AIHW analysis of BreastScreen Australia data.

Figure 1.6: Participation of women aged 50–69 years in BreastScreen Australia, by Aboriginal and Torres Strait Islander status, 1996–1997 to 2007–2008

Aboriginal and Torres Strait Islander women participate in BreastScreen Australia at a lower rate than non-Indigenous women. This is true for all reporting periods between 1996–1997 and 2007–2008 (Figure 1.6). The age distribution of Aboriginal and Torres Strait Islander women also differs from that of all Australian women shown in Figure 1.2. While women aged 50–69 years still comprise the greatest proportion, at 69.2% in 2007–2008, this is lower than the corresponding proportion for all Australian women of 77.6%. Further, women aged

40–49 years make up a greater proportion of women screened, at 25.5% in 2007–2008, compared with 13.9% for all Australian women.

In the 5 years between 1997–1998 and 2002–2003, participation of Aboriginal and Torres Strait Islander women aged 50–69 years in BreastScreen Australia increased from 31.8% to 36.4% (a 47.8% increase in the number of Aboriginal and Torres Strait Islander women screened) while participation of non-Indigenous women increased from 42.4% to 50.0% (a 38.2% increase in the number of women screened) (Table 1.6).

In contrast, there was no change in the participation rate for Aboriginal and Torres Strait Islander women between 2002–2003 and 2007–2008, remaining steady at around 36%, despite a 28.6% increase in the number of Aboriginal and Torres Strait Islander women screened over these 5 years. Over this same period, the non-Indigenous rate increased significantly from 50.0% in 2002–2003 to 56.1% in 2006–2007, after which it declined to 54.8% in 2007–2008 (Table 1.6) (a 27.4% increase in the number of non-Indigenous women screened over these 5 years).

Table 1.6: Participation of women aged 50–69 years in BreastScreen Australia, by Aboriginal and Torres Strait Islander status, 1997–1998, 2002–2003, 2006–2007 and 2007–2008

	Aboriginal and Torres Strait Islander	Non-Indigenous	Australia[(a)]
		(per cent)	
1997–1998	31.8	42.4	54.6
95% CI	30.9–32.7	42.3–42.5	54.5–54.7
2002–2003	36.4	50.0	56.2
95% CI	35.6–37.3	49.9–50.1	56.1–56.3
2006–2007	35.8	56.1	56.1
95% CI	35.1–36.6	56.0–56.2	56.0–56.2
2007–2008	36.0	54.8	54.9
95% CI	35.3–36.7	54.7–54.9	54.8–55.0

(a) Includes women in the 'not stated' category for Aboriginal and Torres Strait Islander status.

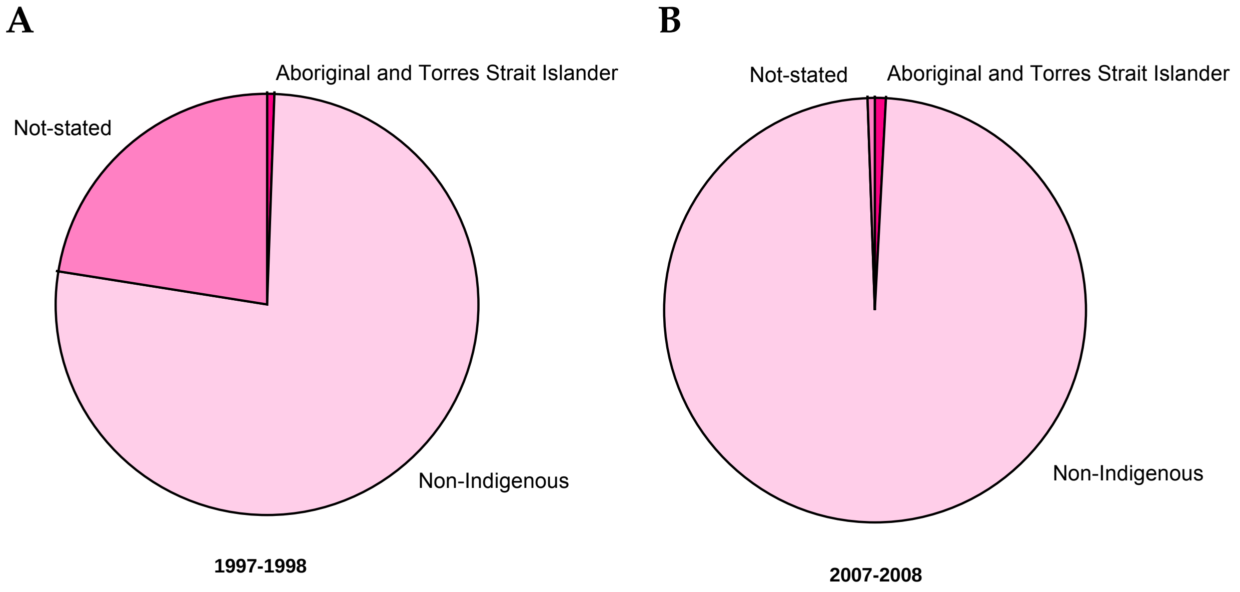
Notes

1. Some jurisdictions do not use the 'not stated' category. Therefore there are likely to be some Aboriginal and Torres Strait Islander women incorrectly assigned to non-Indigenous status. This means that the analysis based upon Aboriginal and Torres Strait Islander status should be interpreted with caution. Limitations of Aboriginal and Torres Strait Islander data are detailed in Appendix B.
2. Rates are the number of women screened as a percentage of the eligible female population calculated as the average of the ABS's estimated resident population and age standardised to the Australian population at 30 June 2001.
3. Periods cover 1 January 1997 to 31 December 1998, 1 January 2002 to 31 December 2003, 1 January 2006 to 31 December 2007 and 1 January 2007 to 31 December 2008.

Source: AIHW analysis of BreastScreen Australia data.

Aboriginal and Torres Strait Islander people make up about 2.5% of the Australian population, with 1.3% of the 2008 female population aged 50–69 years estimated to be Aboriginal or Torres Strait Islander, based on estimates in the Aboriginal and Torres Strait Islander population projections (ABS 2009). This is an increase from the estimated 1.0% of the 1998 population. In BreastScreen Australia, of the 1,273,403 women aged 50–69 years who participated in BreastScreen Australia in the 2007–2008 reporting period, 10,189 (0.8%) identified as Aboriginal or Torres Strait Islander. Again, this is an increase from the 1997–1998 reporting period, when 0.6% (5,362) of women screened self-identified as Aboriginal or Torres Strait Islander (Figure 1.7).

Because a greater proportion of Australian women identified as Aboriginal or Torres Strait Islander in the 2007–2008 reporting period compared with the 1997–1998 reporting period, there may be an effect of changing Aboriginal and Torres Strait Islander population estimates in the trends described (since this is the denominator for the calculation of Aboriginal and Torres Strait Islander participation; a greater denominator in later years would be associated with an apparent decrease in participation, all else being equal).



Source: AIHW analysis of BreastScreen Australia data.

Figure 1.7: Proportion of women aged 50–69 years screened by BreastScreen Australia, by Aboriginal and Torres Strait Islander status, 1997–1998 (A) and 2007–2008 (B)

Additionally, as shown in Figure 1.7, there has been a marked reduction in women being allocated to the 'not stated' category, which adds further complexity when interpreting trends in participation of Aboriginal and Torres Strait Islander women in BreastScreen Australia.

Many of the state and territory BreastScreen programs have developed, and continue to develop, strategies and initiatives to encourage greater participation by Aboriginal and Torres Strait Islander women. These are based on research to ensure that strategies and initiatives are sensitive and appropriate to the knowledge, attitudes and beliefs of Aboriginal and Torres Strait Islander women. Strategies and initiatives include dedicated and appropriate communication resources, and block and group bookings for breast cancer screening for Aboriginal and Torres Strait Islander women. BreastScreen programs also liaise closely with Aboriginal Health Workers and Aboriginal and Torres Strait Islander community groups to increase acceptance of breast cancer screening. To improve access for women in *Remote* and *Very remote* locations, states and territories use relocatable screening services, mobile screening vans and community buses to overcome transport barriers. By mid 2010, a first of its kind 4WD digital mobile screening service will provide better access to BreastScreen Australia for women in isolated and hard-to-reach locations.

Participation by main language spoken at home

Main language spoken at home is also a self-reported category that is supplied at the time of screening. Women who are reported as 'non-English-speaking' have identified that they speak a language other than English at home, which can be interpreted as an indication of 'active ethnicity'. Since a different cultural and linguistic background may present a barrier to screening, this self-reported category is used to identify women who may have difficulties accessing services due to their cultural or language background.

Data limitations are similar to Aboriginal and Torres Strait Islander status in that some jurisdictions do not allow for the 'not stated' category, which means that some women who speak a language other than English at home will be incorrectly assigned to the 'English only' category.

Of the 1,273,403 women aged 50–69 who participated in BreastScreen Australia in 2007–2008, 170,600 (13.4%) reported that they speak a language other than English at home, a relatively small increase from 12.7% (118,074) in 1997–1998.

Participation by women who speak a language other than English at home, while lower than women who speak only English at home, has increased relative to this group over time. The difference in participation in 1997–1998 was around 16 percentage points (41.6% compared with 57.1%), and this had not changed 5 years later in 2002–2003. However, 5 years later again, in 2007–2008, this difference had decreased to around 12 percentage points, with 45.1% participation compared with 56.7% for women who speak only English at home.

Table 1.7: Participation of women aged 50–69 years in BreastScreen Australia, by main language spoken at home, 1997–1998, 2002–2003, 2006–2007 and 2007–2008

	English-speaking	Non-English-speaking	Australia[(a)]
		(per cent)	
1997–1998	57.1	41.6	54.6
95% CI	57.0–57.2	41.4–41.9	54.5–54.7
2002–2003	58.7	42.7	56.2
95% CI	58.6–58.9	42.5–42.9	56.1–56.3
2006–2007	57.9	46.3	56.1
95% CI	57.8–58.1	46.0–46.5	56.0–56.2
2007–2008	56.7	45.1	54.9
95% CI	56.6–56.8	44.8–45.3	54.8–55.0

(a) Includes women in the 'not stated' category for Main language other than English spoken at home.

Notes

1. Some jurisdictions do not use the 'not stated' category and there may be difference in how these data are collected. This means that the analysis based upon main language spoken at home should be interpreted with caution. Limitations are detailed in Appendix B.
2. Rates are the number of women screened as a percentage of the eligible female population calculated as the average of the ABS's estimated resident population and age standardised to the Australian population at 30 June 2001.
3. Periods cover 1 January 1997 to 31 December 1998, 1 January 2002 to 31 December 2003, 1 January 2006 to 31 December 2007 and 1 January 2007 to 31 December 2008.

Source: AIHW analysis of BreastScreen Australia data.

Indicator 2 Detection of invasive cancers

BreastScreen Australia aims to maximise the number of invasive breast cancers and small cancers detected to achieve its aim of reducing deaths from breast cancer through early detection.

Key findings

- Detection of invasive breast cancers through BreastScreen Australia has increased over time. In 2008, this increased to 71.7 women aged 50–69 years diagnosed with invasive breast cancer per 10,000 women screened for the first screening round and 47.5 per 10,000 women screened for subsequent screening rounds.
- Nearly two-thirds of all invasive breast cancers that are detected through BreastScreen Australia are small (≤15 mm). The proportion of women diagnosed with small invasive breast cancers was above 60% for all years between 1996 and 2008.
- Nationally, detection of invasive breast cancers has remained consistently above the NAS performance objectives for all years between 1996 and 2008. This is true for detection of all invasive breast cancers, as well as for the detection of small (≤15 mm) invasive breast cancers.

Detection of invasive cancers

The overarching aim of BreastScreen Australia is to reduce morbidity and mortality from breast cancer. This can be achieved by detecting cases of unsuspected breast cancer in women before they have symptoms, which enables intervention when the cancer is at an early stage. A higher proportion of breast cancers detected through BreastScreen Australia compared with breast cancers detected outside the program have been shown to be small in size (54% compared with 28%), and the treatment of breast cancers detected through BreastScreen Australia is more likely to be breast-conserving surgery (74% compared with 56%) (NBOCC 2009b), which is associated with decreased morbidity. Mortality has also been shown to be reduced by early detection, with a cohort of Australian women with smaller breast cancers found to have considerably higher survival (5-year relative survival of 98% for women with cancers ≤10 mm compared with women with larger breast cancers (AIHW & NBCC 2007)). Further, in a recent evaluation of BreastScreen Australia, this screening program was estimated to have reduced breast cancer mortality by 21–28% (BreastScreen Australia EAC 2009a). Internationally, it has been estimated that 8.8 and 5.7 breast cancer deaths were prevented per 1,000 women screened using data from the Swedish Two-County Trial and England’s breast cancer screening program, respectively (Duffy et al. 2010).

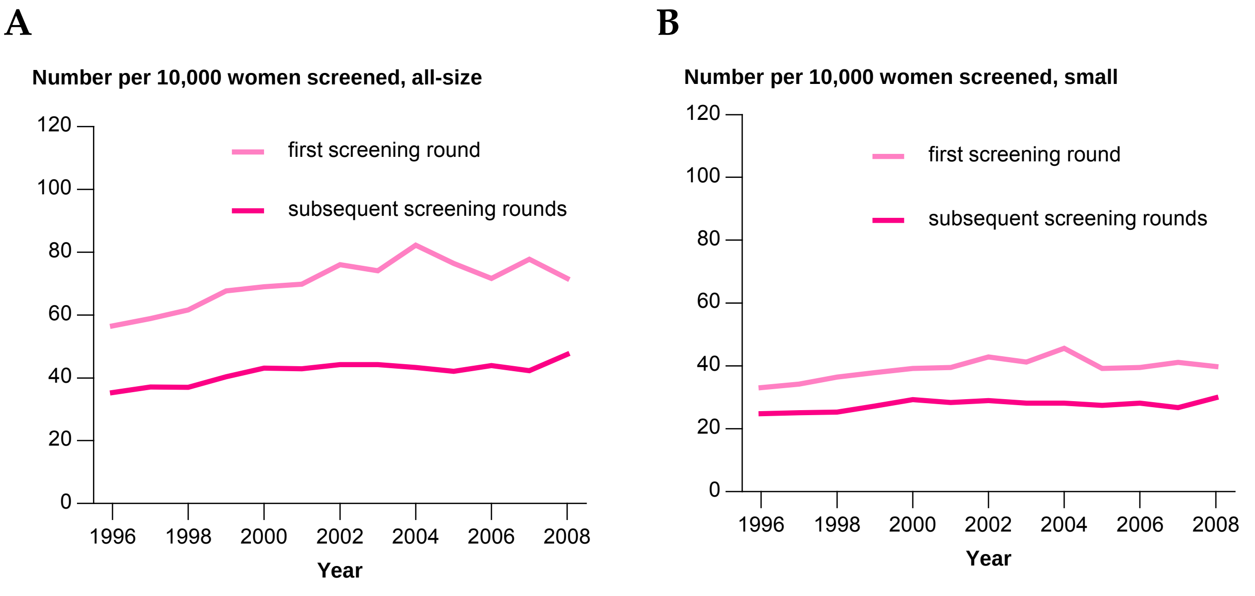
Detection of invasive cancers through BreastScreen Australia is reported as the number of women with invasive breast cancer detected per 10,000 women screened, presented for breast cancers of all sizes, as well as for a subset of breast cancers that are classified as small, having a diameter less than or equal to 15 mm. BreastScreen Australia aims to maximise the detection of invasive breast cancers and small cancers to achieve the desired reductions in morbidity and mortality from breast cancer through early detection. This is reflected in the NAS performance objectives for detection of invasive cancers that require that at least 50 women per 10,000 women screened aged 50–69 years who attend for their first screen are diagnosed with invasive breast cancer (NAS 2.1.1), at least 35 women per 10,000 women screened aged 50–69 years who attend for subsequent screens are diagnosed with invasive breast cancer (NAS 2.1.2), and that at least 25 women per 10,000 women screened aged 50–69 years who attend for screening are diagnosed with small (≤15 mm) invasive breast cancer (NAS 2.2.1) (BreastScreen Australia 2004).

Detection of invasive cancers is reported for a 12-month period (1 January to 31 December) and by screening round (first and subsequent). Detection of invasive cancers is disaggregated into first and subsequent screening rounds because a woman is more likely to have a breast cancer detected the first time she visits a BreastScreen service than in subsequent visits, since her first visit detects prevalent cancers that may have been present for some time rather than incident cancers that have grown between screens (Kavanagh et al. 1999).

The most recent all-size and small cancer detection data are for 2007 and 2008.

Detection of invasive cancer trends

Detection of invasive breast cancers has remained consistently above the NAS performance objectives for all years between 1996 and 2008. This is true for detection of all invasive breast cancers, as well as for the detection of small (≤15 mm) invasive breast cancers.



Source: AIHW analysis of BreastScreen Australia data.

Figure 2.1: All-size (A) and small (≤15 mm, B) invasive breast cancer detection in women aged 50–69 years, first and subsequent screening rounds, 1996–2008

Detection of invasive breast cancers through BreastScreen Australia has increased over time (Figure 2.1). Detection of invasive breast cancer in the first screening round increased steadily from 56.5 women diagnosed per 10,000 women screened in 1996 to 82.2 women diagnosed in 2004, thereafter remaining steady at between around 72 and 78 women diagnosed per 10,000 women screened (Table 2.1). Detection in subsequent screening rounds increased from 35.3 per 10,000 women screened in 1996, remaining steady at around 42 to 44 per 10,000 women screened between 2000 and 2007, with a small increase to 47.5 in 2008 (Table 2.1).

Table 2.1: All-size invasive breast cancer detection in women aged 50–69 years, first and subsequent screening rounds, 1996–2008

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
First screening round													
Rate	56.5	58.9	61.6	67.7	69.0	69.8	76.0	74.1	82.2	76.4	71.7	77.7	71.7
95% CI	52.7–60.4	54.3–63.7	56.6–66.9	61.4–74.4	62.1–76.2	63.1–76.9	68.3–84.2	66.0–82.9	73.3–91.8	68.1–85.1	63.7–80.3	69.8–86.0	65.4–78.5
Subsequent screening rounds													
Rate	35.3	37.1	37.0	40.4	43.1	42.9	44.2	44.2	43.3	42.1	43.9	42.3	47.5
95% CI	33.0–37.7	35.1–39.2	35.1–39.0	38.5–42.4	41.2–45.0	41.1–44.8	42.4–46.1	42.4–46.1	41.6–45.1	40.4–43.8	42.2–45.7	40.7–44.1	45.7–49.3

Note: Rates are the number of women with small invasive cancers detected per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

Detection of small cancers mirrored these trends, increasing from 33.1 per 10,000 women screened in 1996 to 45.6 in 2004, thereafter remaining at around 40 from 2005 to 2008 for the first screening round, and increasing from 24.8 in 1996 to remain at around 27 to 29 between 2000 and 2007, before increasing slightly to 29.8 in 2008 in subsequent screening rounds (Table 2.2).

Table 2.2: Small (≤15 mm) invasive breast cancer detection in women aged 50–69 years, first and subsequent screening rounds, 1996–2008

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
First screening round													
Rate	33.1	34.2	36.4	37.9	39.2	39.5	42.8	41.2	45.6	39.2	39.5	41.1	39.8
95% CI	30.2–36.1	30.8–38.0	32.6–40.6	33.3–43.0	34.1–44.8	34.6–44.9	37.1–49.1	35.2–47.9	39.0–52.8	33.4–45.5	33.5–46.0	35.4–47.3	35.1–44.9
Subsequent screening rounds													
Rate	24.8	25.1	25.3	27.2	29.2	28.3	28.9	28.1	28.1	27.4	28.1	26.7	29.8
95% CI	22.9–26.8	23.4–26.9	23.7–26.9	25.6–28.8	27.6–30.8	26.9–29.9	27.5–30.5	26.7–29.6	26.7–29.5	26.1–28.8	26.7–29.5	25.3–28.0	28.5–31.3

Note: Rates are the number of women with small invasive cancers detected per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

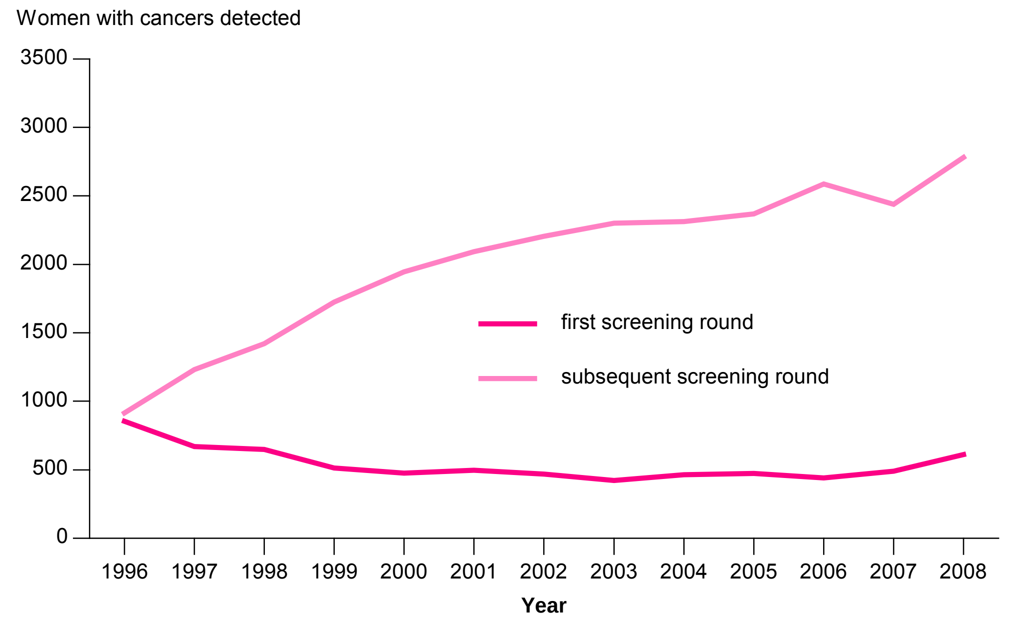
Source: AIHW analysis of BreastScreen Australia data.

The increases in the rate of women diagnosed with invasive breast cancer described above, while significant, are relatively modest in size. The increases in the number of women diagnosed are more striking, since these tend to be in proportion to the number of women screened in any given year. In 1996, the number of women diagnosed with invasive breast cancer through BreastScreen Australia was 2,515, with 1,769 (70.3%) of these women aged 50–69 years. In 2007, this had increased, in line with the increasing number of women screened, to 3,846 women, 2,928 (76.1%) aged 50–69 years. This increased again in 2008 to

4,289 women, 3,392 (79.1%) of whom were aged 50–69 years. This equates to a 91.7% increase in the number of women aged 50–69 years diagnosed with invasive breast cancer between 1996 and 2008.

The proportion of invasive breast cancers detected by screening round also reflects screening trends. In 1996, 5 years after the commencement of BreastScreen Australia, just over a third of women screened aged 50–69 years were attending a BreastScreen service for the first time. Thereafter, the proportion of women attending for rescreening increased annually, with the proportion of women aged 50–69 years screening for the first time falling to around 15% by 2000, becoming stable at around 11 to 12% from 2003 onwards (although this increased slightly to 14.1% in 2008).

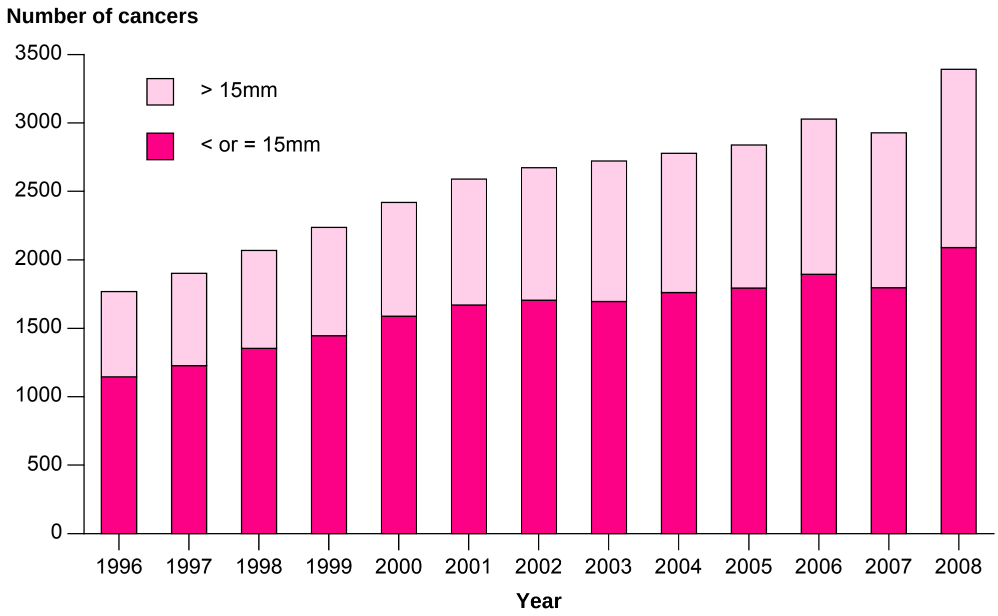
This trend is mirrored in the number of women aged 50–69 years diagnosed with invasive breast cancer by screening round. In 1996, around half (48.3%) of cancers were detected at a woman's first screening round. This had decreased to one-fifth (19.2%) by 2000, before becoming stable at between around 15–17% from 2003 onwards. As shown in Figure 2.2, this is associated with a decrease in the number of women with invasive breast cancers detected at their first screening round, from 854 in 1996 to 490 in 2007 with a small rise to 611 in 2008, and an increase in the number of women with cancer detected at subsequent screening rounds, from 915 in 1996 to 2,781 in 2008, reflecting the greater proportion of invasive breast cancers detected at subsequent screens in 2008 compared with 1996.



Source: AIHW analysis of BreastScreen Australia data.

Figure 2.2: Number of women aged 50–69 years with invasive breast cancers detected, first and subsequent screening rounds, 1996–2008

Nearly two-thirds of all invasive breast cancers that are detected through BreastScreen Australia are small (≤15 mm). The proportion of women diagnosed with small invasive breast cancers was above 60% for all years between 1996 and 2008 (Figure 2.3). From 1996 to 2001, the proportion of cancers detected that were small was consistently around 65%, and while this only dropped marginally in the following years, there is evidence that this gradual downward trend may be continuing, with the proportion of invasive breast cancers detected that were 15 mm in diameter or less being 61.4% in 2007 and 61.6% in 2008 (Table 2.3).



Source: AIHW analysis of BreastScreen Australia data.

Figure 2.3: Number of small (≤15 mm) invasive breast cancers to other size (>15 mm) invasive breast cancers detected in women aged 50–69 years, all screening rounds, 1996–2008

Table 2.3: Number and proportion of small (≤15 mm) invasive breast cancers to all size invasive breast cancers detected in women aged 50–69 years, all screening rounds, 1996–2008

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Small size (≤15mm)	1,146	1,227	1,353	1,446	1,589	1,670	1,706	1,695	1,762	1,794	1,895	1,797	2,089
All size	1,769	1,901	2,069	2,238	2,422	2,589	2,673	2,722	2,778	2,840	3,027	2,928	3,392
Proportion of small size cancers	64.8	64.5	65.4	64.6	65.6	64.5	63.8	62.3	63.4	63.2	62.6	61.4	61.6

Note: Rates are the number of women with small invasive cancers detected as a proportion of the number of women with invasive cancers detected.

Source: AIHW analysis of BreastScreen Australia data.

A woman is more likely to be diagnosed with a small cancer in her subsequent screening visits than in 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. This is reflected in the data in Table 2.4, which show that the proportion of small cancers is lower in the first screening round than in subsequent screening rounds (55.5% compared with 62.9% in 2008).

Table 2.4: Proportion of small (≤15 mm) invasive cancers detected in women aged 50–69 years, first and subsequent screening rounds, 1998, 2003, 2007 and 2008

	First screening round	Subsequent screening rounds
1998	58.6	68.5
2003	54.9	63.6
2007	52.9	63.1
2008	55.5	62.9

Note: Rates are the number of women with small invasive cancers detected as a proportion of the number of women with invasive cancers detected.

Source: AIHW analysis of BreastScreen Australia data.

Detection of invasive cancer by age

Detection of invasive breast cancers by BreastScreen Australia increased with age. This is in line with the increase in breast cancer incidence that occurs with age, as described in Indicator 7a. In 2008, the increase in invasive breast cancer detection was from 23.8 per 10,000 women screened for women aged 40–44 years to 82.0 for women aged 70 years or over (Table 2.5). Small invasive breast cancers increased in the same year, from 13.2 per 10,000 women screened in women aged 40–44 years to 49.6 for women aged 70 years or over (Table 2.6).

Table 2.5: All-size invasive breast cancer detection, by age, all screening rounds, 1998, 2003, 2007 and 2008

	Age group (years)						
	40–44	45–49	50–54	55–59	60–64	65–69	70+
1998 rate	13.6	23.8	33.5	38.7	45.3	54.7	72.3
95% CI	10.8–17.0	20.8–27.1	30.8–36.5	35.3–42.2	41.4–49.5	50.2–59.6	67.0–78.0
2003 rate	19.4	27.2	34.7	45.1	54.6	58.3	67.7
95% CI	15.8–23.5	23.9–30.8	32.0–37.6	41.9–48.4	50.7–58.7	53.8–63.0	63.0–72.6
2007 rate	22.9	31.2	34.5	41.2	54.3	56.8	77.9
95% CI	18.6–27.8	27.3–35.4	31.8–37.3	38.3–44.2	50.7–58.0	52.6–61.2	71.7–84.5
2008 rate	23.8	30.7	39.9	44.3	56.1	69.2	82.0
95% CI	19.4–28.9	26.9–34.9	37.1–42.9	41.3–47.4	52.6–59.8	64.7–74.0	75.3–89.0

Note: Rates are the number of women with invasive cancers detected per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

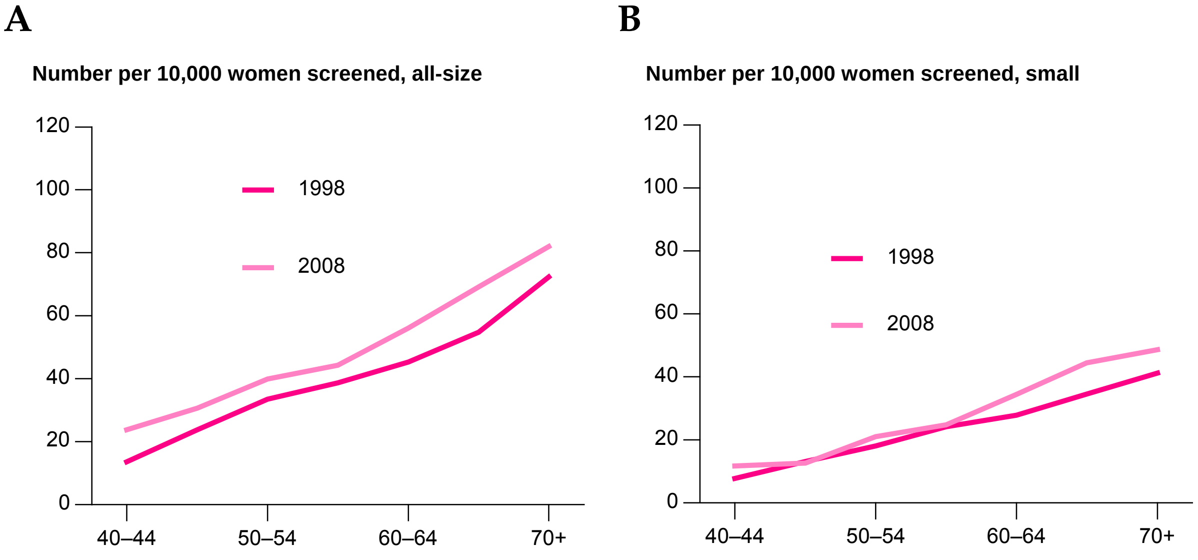
Table 2.6: Small invasive breast cancer detection, by age, all screening rounds, 1998, 2003, 2007 and 2008

	Age group (years)						
	40–44	45–49	50–54	55–59	60–64	65–69	70+
1998 rate	6.2	13.6	20.3	25.9	30.1	37.1	48.3
95% CI	4.4–8.6	11.3–16.1	18.1–22.6	23.2–28.9	27.0–33.6	33.3–41.1	43.9–53.0
2003 rate	10.0	16.2	19.6	28.2	35.9	37.0	45.0
95% CI	7.5–13.0	13.7–19.0	17.6–21.8	25.8–30.9	32.7–39.3	33.4–40.8	41.2–49.1
2007 rate	9.0	15.8	19.8	25.8	31.9	38.0	46.6
95% CI	6.4–12.3	13.1–19.0	17.8–22.0	23.5–28.2	29.2–34.8	34.6–41.6	41.8–51.7
2008 rate	13.2	15.3	23.7	26.0	35.3	44.9	49.6
95% CI	10.0–17.1	12.6–18.4	21.5–26.0	23.7–28.4	32.5–38.2	41.2–48.7	44.5–55.1

Note: Rates are the number of women with small invasive cancers detected per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

In the 10 years from 1998 to 2008, detection of invasive breast cancer increased significantly in all age groups except for 45–49 years and 55–59 years, for which the increases were not found to be statistically significant (Figure 2.4). In contrast, increases were only evident in the detection of small invasive breast cancers between 1998 and 2008 for women aged 60 years or over, with rates for other age groups unchanged (Figure 2.4).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 2.4: All-size (A) and small (≤15 mm, B) invasive breast cancer detection, by age, first and subsequent screening rounds, 1998 and 2008

The proportion of invasive breast cancers detected that were small was also higher in the older age groups, with a greater proportion of cancers being small (between 59% and 65% in

2008) in women aged 50–69 years, compared with women aged 40–49 years. This may be related to greater breast density in younger women, which makes small invasive breast cancers more difficult to visualise using screening mammography (Irwig et al. 1997).

Detection of invasive cancer by state and territory

Detection of invasive breast cancers across states and territories is influenced by the characteristics of the women screened in each state and territory. For instance, cancer detection is higher in women with breast symptoms (including a lump or clear or bloody discharge), which may affect cancer detection rates in states and territories with either a high or a low proportion of symptomatic women screened, since states and territories have different policies for women with symptoms. Likewise, Aboriginal and Torres Strait Islander women have a lower incidence of invasive breast cancer (as shown in Indicator 7a), which may affect cancer detection in states and territories with a large Indigenous population. 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. It should also be noted that, in some states and territories, the age-standardised rates vary considerably from the crude rates.

The number of women with invasive breast cancer diagnosed per 10,000 women screened showed considerable variation among states and territories, particularly for cancers detected in the first screening round due to smaller numbers.

Table 2.7: All-size invasive breast cancer detection in women aged 50–69 years, by state and territory, first and subsequent screening rounds, 1998, 2003, 2007 and 2008

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
1998 rate	63.5	77.1	50.7	62.2	69.2	70.0	102.1	67.2	61.6
95% CI	54.9–73.1	62.1–94.1	43.1–59.2	42.8–87.1	47.5–96.4	40.4–111.1	44.9–192.2	20.8–158.9	56.6–66.9
2003 rate	65.2	75.0	72.3	107.7	98.9	87.9	89.8	81.1	74.1
95% CI	54.0–78.0	53.6–100.1	56.1–91.3	73.4–149.3	53.3–157.6	41.5–159.7	16.4–234.8	3.5–312.0	66.0–82.9
2007 rate	66.6	102.2	96.3	77.5	59.6	112.3	30.1	203.4	77.7
95% CI	57.2–77.1	75.4–133.5	75.7–120.4	48.1–113.3	18.9–120.5	48.0–215.9	7.7–69.9	71.4–416.1	69.8–86.0
2008 rate	62.4	80.8	89.3	98.9	117.2	91.9	113.7	62.9	71.7
95% CI	55.0–70.5	59.8–105.1	71.0–110.3	65.0–140.6	64.3–184.9	41.8–169.2	36.3–235.6	0.7–213.4	65.4–78.5
Subsequent screening rounds									
1998 rate	34.9	37.7	34.3	40.2	43.1	36.8	36.3	29.5	37.0
95% CI	31.7–38.2	34.1–41.7	29.5–39.6	34.1–47.0	36.6–50.4	26.5–49.8	22.8–54.7	4.0–91.2	35.1–39.0
2003 rate	45.8	37.3	47.2	46.3	48.6	49.8	40.3	40.6	44.2
95% CI	42.5–49.2	34.1–40.8	43.0–51.6	40.6–52.5	42.6–55.1	39.0–62.7	27.5–56.9	20.8–71.2	42.4–46.1
2007 rate	40.2	42.8	45.4	41.2	44.6	37.2	43.8	33.3	42.3
95% CI	37.3–43.2	39.4–46.3	41.6–49.4	36.1–46.8	38.8–50.9	28.1–48.3	31.6–59.2	15.8–61.5	40.7–44.1
2008 rate	45.2	49.4	49.3	47.6	45.4	41.9	54.8	48.4	47.5
95% CI	42.1–48.5	45.8–53.3	45.5–53.3	42.3–53.4	39.8–51.5	32.7–52.8	40.1–73.2	26.1–81.8	45.7–49.3

Note: Rates are the number of women with invasive cancers detected per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

In 2007, invasive breast cancer detection rates for women aged 50–69 years were between 30.1 and 203.4 per 10,000 women screened for the first screening round, and between 33.3 and 45.4 for subsequent screening rounds across states and territories (Table 2.7).

In 2008, all states and territories achieved invasive breast cancer detection rates above the NAS for women aged 50–69 years. These ranged from 62.4 to 117.2 per 10,000 women screened for the first screening round, and from 41.9 to 54.8 for subsequent screening rounds (Table 2.7).

Table 2.8: Small (≤15 mm) invasive breast cancer detection in women aged 50–69 years, by state and territory, first and subsequent screening rounds, 1998, 2003, 2007 and 2008

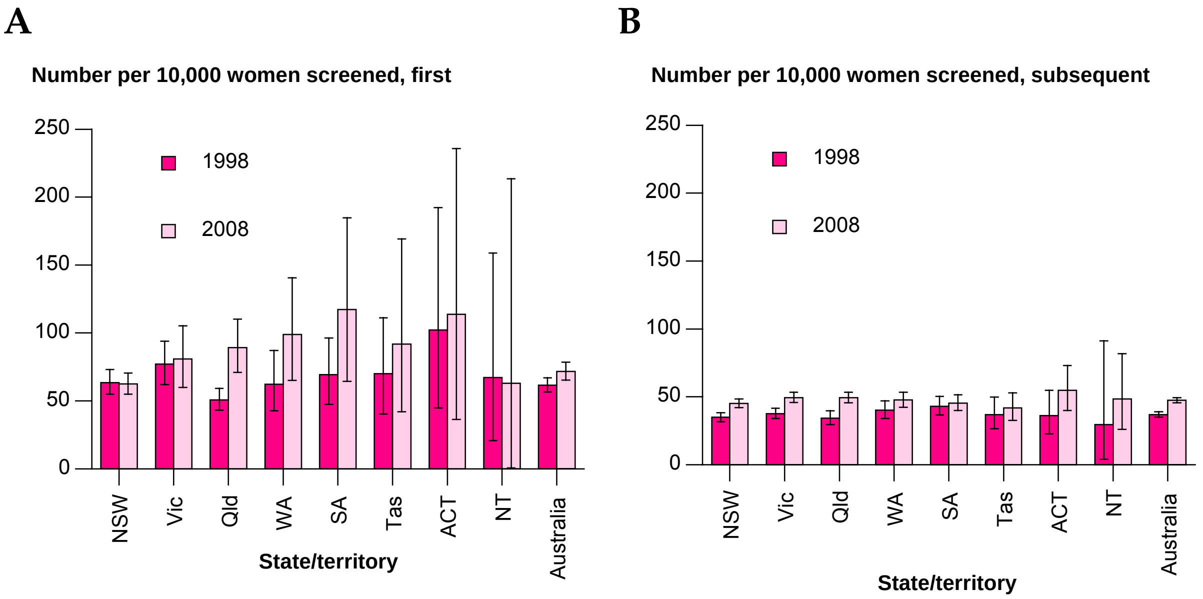
	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
1998 rate	38.0	40.7	30.0	39.3	43.9	52.7	45.9	42.3	36.4
95% CI	31.4–45.5	30.1–53.2	24.3–36.8	24.1–60.3	26.6–67.4	27.4–90.0	10.9–115.1	8.0–125.5	32.6–40.6
2003 rate	38.0	46.2	34.2	58.2	52.7	63.9	22.5	81.1	41.2
95% CI	29.4–48.2	29.8–66.4	23.5–47.6	33.4–90.7	21.2–97.5	26.0–126.7	0.1–89.0	3.5–312.0	35.2–47.9
2007 rate	37.7	49.2	43.0	46.3	30.8	73.2	15.1	79.0	41.1
95% CI	30.6–45.7	31.0–71.8	29.8–59.5	24.1–75.1	4.9–75.1	24.3–164.1	–0.4–61.2	7.8–219.6	35.4–47.3
2008 rate	38.6	36.8	46.8	42.5	60.1	21.6	35.5	6.8	39.8
95% CI	32.7–45.2	24.1–52.2	33.6–62.7	22.7–68.9	23.0–111.9	3.6–60.4	–2.0–115.9	0.2–37.8	35.1–44.9
Subsequent screening rounds									
1998 rate	23.0	26.7	22.5	27.9	29.1	27.2	27.9	29.5	25.3
95% CI	20.5–25.7	23.6–30.1	18.6–26.9	22.9–33.7	23.9–35.2	18.5–38.6	16.4–44.4	4.0–91.2	23.7–26.9
2003 rate	28.8	24.1	31.2	26.5	32.5	29.4	26.2	19.8	28.1
95% CI	26.2–31.5	21.5–26.9	27.8–34.8	22.3–31.4	27.7–38.0	21.3–39.6	16.1–40.1	7.2–43.2	26.7–29.6
2007 rate	25.6	26.8	27.0	25.6	30.9	24.4	31.7	13.1	26.7
95% CI	23.3–28.0	24.2–29.7	24.1–30.1	21.6–30.1	26.1–36.3	17.1–33.6	21.4–45.1	3.5–33.7	25.3–28.0
2008 rate	28.1	30.1	30.8	31.0	31.6	28.0	33.6	18.0	29.8
95% CI	25.7–30.8	27.3–33.1	27.8–34.0	26.7–35.7	27.0–36.7	20.7–37.0	22.1–48.8	5.6–42.4	28.5–31.3

Note: Rates are the number of women with small invasive cancers detected per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

In 2007 and 2008, small invasive breast cancer detection rates met the NAS for most states and territories. Those that did not were smaller states and territories with unstable rates. For instance, the difference between the Australia Capital Territory falling below the NAS in 2007 with 15.1 women diagnosed with small invasive breast cancer and meeting the NAS in 2008 with 35.5 women diagnosed is two women. Briefly, in 2007, small invasive cancer detection rates ranged from 15.1 to 79.0 for the first screening round, and from 13.1 to 31.7 for subsequent screening rounds; in 2008, these ranged from 6.8 to 60.1 for the first screening round, and from 18.0 to 33.6 women diagnosed with small invasive breast cancers per 10,000 women screened for subsequent screening rounds (Table 2.8).

The proportion of invasive breast cancers detected that were small was found to be relatively consistent across the states and territories. In 2008, the three largest states—New South Wales, Victoria and Queensland—had proportions of small cancers detected very similar to the national 61.6% for women aged 50–69 years, at 61.8%, 60.1% and 61.0% respectively. In the same year, Western Australia and South Australia detected small cancers in 62.6% and 67.6% of the women aged 50–69 years diagnosed with invasive breast cancer, respectively. The three smallest jurisdictions were not analysed since numerators and denominators were well below 100, which were considered too small to be able to generate meaningful rates.

Despite most states and territories demonstrating an increase in invasive breast cancer detection between 1998 and 2008 in line with the increase in the national rate from 61.6 in 1998 to 71.7 in 2008, most differences were not found to be significant. This is particularly true for cancers detected in the first screening round. Only Queensland achieved a sufficiently large increase in detection over the 10 years in the first screening round to be significant, from 50.7 women aged 50–69 years diagnosed with invasive breast cancer per 10,000 women in 1998 to 89.3 per 10,000 women in 2008 (Figure 2.5). In subsequent screening rounds, increases in cancer detection between 1998 and 2008 were found to be significant in only the larger states and territories in which cancer numbers were sufficiently large—from 34.9 to 45.2 in New South Wales, from 37.7 to 49.4 in Victoria and, in Queensland, an increase from 34.3 to 49.3 women aged 50–69 diagnosed with invasive breast cancer in subsequent screening rounds (Figure 2.5).

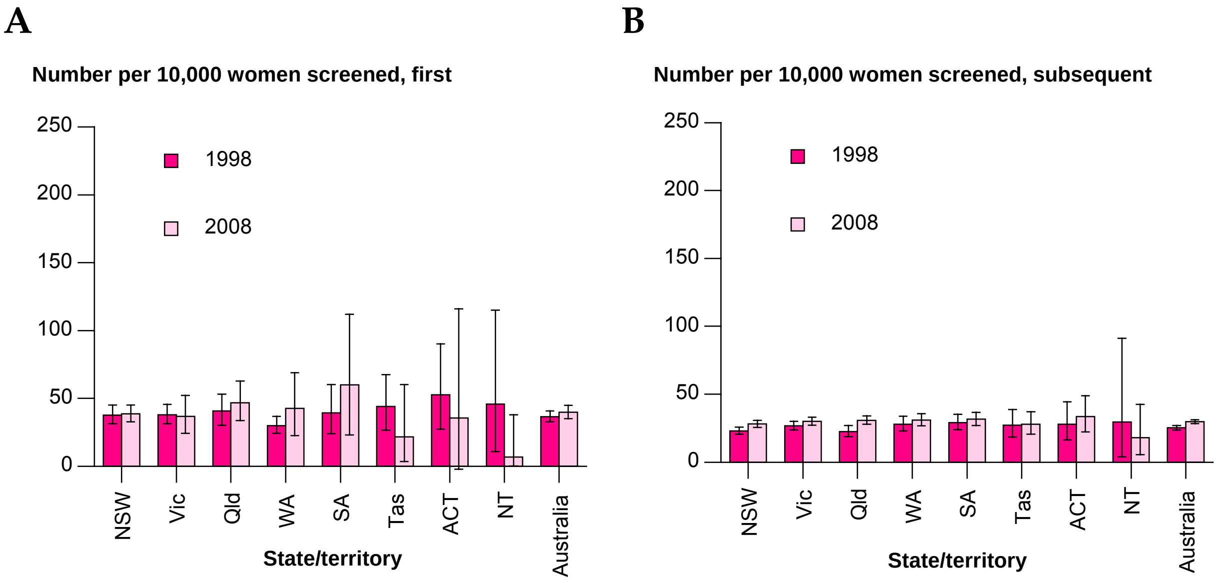


Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 2.5: All-size invasive breast cancer detection in women aged 50–69 years, by state and territory, first (A) and subsequent (B) screening rounds, 1998 and 2008

The only increase in small invasive breast cancer detection between 1998 and 2008 that was found to be significant was an increase in Queensland for small cancers detected per 10,000 women screened in subsequent screening rounds, from 22.5 in 1998 to 30.8 in 2008 (Figure 2.6).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 2.6: Small (≤15 mm) invasive breast cancer detection in women aged 50–69 years, by state and territory, first (A) and subsequent (B) screening rounds, 1998 and 2008

The cancer detection trends by state and territory presented above are for women aged 50–69 years. Of women diagnosed with invasive breast cancer through BreastScreen Australia, 79.1% were aged 50–69 years, with the remaining cancers being detected in women outside the target age group—7.7% aged 40–49 years and 13.2% aged 70 years or over. There are state and territory differences in the proportion of invasive cancers detected in women aged 40–49 years, with Queensland and Tasmania detecting a notably higher proportion of cancers in women aged 40–49 years, at 13.8% and 14.5%, compared with the national 7.7%. This is consistent with the greater proportion of women screened aged 40–49 years in these two states (23.9% and 21.6% respectively, compared with 13.9% nationally). Across states and territories, women aged 70 years or over do not display such differences in the proportion of cancers detected.

Indicator 3 Sensitivity

Interval cancer and program sensitivity rates give an indication of the ability of BreastScreen Australia to detect invasive breast cancers in women attending for screening.

Key findings

- Interval cancer rates were low for the index years 2003–2005, with 6.3 and 6.5 interval cancers diagnosed per 10,000 women-years for the 0–12 months following a negative screening episode for first and subsequent screening rounds, respectively.
- Program sensitivity was high for the index years 2003–2005, at 91.8% and 86.8% for 0–12 months follow-up for the first and subsequent screening rounds, respectively.

Interval cancers and program sensitivity

The ability of screening mammography to successfully detect invasive breast cancer in women screened in the target age group can be assessed by considering the relative number of invasive breast cancers detected at screening episodes, invasive breast cancers diagnosed 0–12 months after a screening episode detected no cancer, and invasive breast cancers diagnosed 13–24 months after a screening episode detected no cancer.

Invasive breast cancers that are diagnosed after a screening episode detected no cancer and before the next scheduled screening episode are known as ‘interval’ cancers (Kavanagh et al. 1999). An interval cancer may be an aggressive breast cancer that emerges and grows very rapidly in the period between scheduled screening episodes, a breast cancer that, due to the characteristics of the cancer or the breast tissue, is not visible on screening mammography and therefore not able to be detected, or a breast cancer that can be retrospectively detected on the previous screening mammogram (BreastScreen SA 2010). The first two are true interval cancers, and therefore do not represent any failure in detection, whereas the third type represents a failure of the screening process. State and territory BreastScreen programs are required to audit interval cancers, with reports that over 80% of interval cancers are found to be true interval cancers.

The rate of interval cancers measures how effective BreastScreen Australia is at detecting the presence of breast cancer in well women. The interval cancer rate is one measure of the effectiveness of the screening process, with low rates indicating good performance.

Program sensitivity is directly related to interval cancers. It is the proportion of invasive breast cancers that are 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. Program sensitivity measures the ability of the program to detect invasive breast cancers in women attending for screening. A high sensitivity indicates that few cancers in women screened are missed by BreastScreen Australia.

The goal of BreastScreen Australia is to have a high proportion of invasive breast cancers detected within screening episodes and a low proportion of invasive breast cancers diagnosed after a screening episode detected no cancer (interval cancers). This is reflected in the NAS for interval breast cancers that requires that less than 7.5 interval cancers per 10,000 women aged 50–69 years are diagnosed in women who attend for screening less than

12 months following a negative screening episode (NAS 2.4.2(a)) (BreastScreen Australia 2004). While there are no NAS for the sensitivity indicator, high sensitivity is desirable.

Interval cancers and program sensitivity are reported separately, as Indicator 3a and Indicator 3b.

Indicator 3a Interval cancer rate

The interval cancer rate is reported as the rate of invasive breast cancers detected during an interval between two screening rounds per 10,000 women-years. A low interval cancer rate is one measure of the effectiveness of the screening process.

Interval cancers are reported for 3 index years combined to improve the stability of rates. Further, in order to produce comparable rates from the relatively small number of cases, interval cancer rates are reported by 10-year age groups rather than 5-year age groups. Interval cancer rates are also disaggregated into time since screening (0–12 months, 13–24 months and 0–24 months) and screening round (first and subsequent).

The most recent interval cancer data are for women screened in the index years 2003, 2004 and 2005 combined.

Interval cancer trends

Interval cancer rates have decreased over time. For the 0–12 months following a negative screening episode, while there was no change apparent in the interval cancer rate after a woman's first screening round between the index years of 2000–2002 and 2003–2005, there was a significant decrease in the interval cancer rate after subsequent screening rounds, from 7.9 in 2000–2002 to 6.5 interval cancers per 10,000 women-years in 2003–2005.

Table 3.1: Interval cancer rate for women aged 50–69 years, screened in index years 2000–2002 and 2003–2005, 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									
Index years 2000–2002									
Rate	5.8	6.9	7.9	5.3	5.6	15.9	10.2	12.4	6.8
95% CI	4.1–7.8	5.0–9.3	5.4–11.0	2.1–10.2	2.0–11.1	4.9–36.5	-0.1–40.8	2.5–36.1	5.7–8.0
Index years 2003–2005									
Rate	6.7	6.8	7.2	3.7	1.6	11.1	2.4	0.0	6.3
95% CI	4.8–9.1	3.5–11.0	4.5–10.8	1.9–6.4	0.4–4.2	1.6–34.1	0.1–13.1	. .	5.1–7.8
Subsequent screening rounds									
Index years 2000–2002									
Rate	8.3	7.6	8.5	6.3	7.2	6.7	11.9	2.6	7.9
95% CI	7.5–9.2	6.7–8.5	7.4–9.6	5.1–7.8	5.9–8.8	4.4–9.7	7.8–17.4	0.1–14.4	7.4–8.3
Index years 2003–2005									
Rate	6.2	6.7	6.7	6.8	5.9	8.6	3.7	3.8	6.5
95% CI	5.5–6.9	5.9–7.6	5.8–7.6	5.6–8.2	4.7–7.2	6.1–11.9	1.7–7.1	0.7–11.4	6.1–6.9

Notes

1. Rates are the number of interval cancers detected per 10,000 women-years and age standardised to the population of women attending a BreastScreen Australia service in 2008.
2. The data include both symptomatic and asymptomatic women.

Source: AIHW analysis of BreastScreen Australia data.

No significant differences were apparent between 2000–2002 and 2003–2005 for 13–24 months following a negative screening episode for either the first or subsequent screening rounds. The same was true for overall interval cancer rates (0–24 months), with an apparent decrease from 10.1 to 9.5 interval cancers per 10,000 women-years for subsequent screening rounds not found to be significant (Table 3.3).

For women screened in the index years 2003–2005, fewer interval cancers were diagnosed in the 0–12 months following a negative screening episode than in the 13–24 months following a negative screening episode.

This was true for interval cancers diagnosed following a woman's first screening round, with 6.3 interval cancers diagnosed per 10,000 women-years in the 0–12 months' follow-up compared with 13.3 in the 13–24 months' follow-up, and for interval cancers diagnosed following subsequent screening rounds, at 6.5 in the 0–12 months' follow-up compared with 12.7 in the 13–24 months' follow-up (Tables 3.1 and 3.2).

Thus the national interval cancer rate for 2003–2005 was well within the NAS of less than 7.5 interval cancers per 10,000 women-years, which is only applicable to interval cancers diagnosed in the first 12 months after a negative screening episode.

There were no appreciable differences in the interval cancer rate between first and subsequent screening rounds for either 0–12 months' follow-up or 13–24 months' follow-up, indicating that, although women are more likely to have an invasive breast cancer detected in their first screening round compared with subsequent screening rounds, they are no more likely to have an interval cancer diagnosed after their first screen than after any other screen at a BreastScreen Australia service.

Table 3.2: Interval cancer rate for women aged 50–69 years, screened in index years 2000–2002 and 2003–2005, 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									
Index years 2000–2002									
Rate	9.9	10.9	18.6	11.4	7.8	18.2	13.4	12.8	12.4
95% CI	7.7–12.5	8.3–14.1	14.4–23.6	6.5–18.2	4.9–11.8	7.0–37.3	4.9–29.3	2.6–37.6	10.9–14.1
Index years 2003–2005									
Rate	11.6	19.1	11.5	21.6	8.9	4.9	4.9	0.0	13.3
95% CI	8.8–14.8	13.1–26.1	8.0–15.9	12.3–34.0	2.5–18.4	1.0–14.4	0.6–17.8	. .	11.3–15.4
Subsequent screening rounds									
Index years 2000–2002									
Rate	11.3	12.8	14.2	12.9	13.2	10.9	8.1	23.9	12.5
95% CI	10.3–12.3	11.6–14.0	12.8–15.8	10.9–15.2	11.2–15.3	7.8–14.7	4.7–13.1	10.2–46.5	11.9–13.2
Index years 2003–2005									
Rate	12.6	13.5	13.1	11.0	12.0	13.7	9.5	13.5	12.7
95% CI	11.5–13.6	12.4–14.7	11.8–14.4	9.3–13.0	10.2–14.0	10.3–17.8	5.9–14.6	6.0–25.9	12.2–13.3

Notes

1. Rates are the number of interval cancers detected per 10,000 women-years and age standardised to the population of women attending a BreastScreen Australia service in 2008.
2. The data include both symptomatic and asymptomatic women.

Source: AIHW analysis of BreastScreen Australia data.

Table 3.3: Interval cancer rate for women aged 50–69 years, screened in index years 2000–2002 and 2003–2005, first and subsequent screening rounds, 0–24 months' follow-up

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
Index years 2000–2002									
Rate	7.8	8.9	13.2	8.2	6.7	17.1	11.9	12.6	9.5
95% CI	6.4–9.4	7.2–10.8	10.7–16.0	5.2–12.0	4.2–9.8	8.6–29.8	3.7–25.7	4.6–27.4	8.6–10.6
Index years 2003–2005									
Rate	9.1	12.9	9.3	12.1	5.2	7.9	3.6	0.0	9.7
95% CI	7.4–11.0	9.5–16.9	7.1–12.0	7.5–17.8	1.9–9.8	2.2–18.5	0.7–10.6	. .	8.6–11.0
Subsequent screening round									
Index years 2000–2002									
Rate	9.7	10.2	11.3	9.3	10.1	8.7	10.1	11.2	10.1
95% CI	9.1–10.4	9.4–10.9	10.4–12.2	8.1–10.6	8.9–11.4	6.8–11.0	7.3–13.6	5.1–21.0	9.7–10.5
Index years 2003–2005									
Rate	9.2	10.1	9.9	8.7	8.8	11.1	6.5	8.4	9.5
95% CI	8.6–9.8	9.4–10.8	9.1–10.7	7.7–9.9	7.8–10.0	8.9–13.5	4.4–9.3	4.3–14.8	9.1–9.8

Notes

1. Rates are the number of interval cancers detected per 10,000 women-years and age standardised to the population of women attending a BreastScreen Australia service in 2008.
2. The data include both symptomatic and asymptomatic women.

Source: AIHW analysis of BreastScreen Australia data.

Interval cancer by age

Interval cancers in the first 0–12 months were more likely to be diagnosed in younger women. In 2003–2005, with all screening rounds combined, interval cancer rates in the 0–12 months following a negative screening interval decreased with age, from 7.4 per 10,000 women-years in women aged 40–49 years to 6.4 and 6.5 for women aged 50–59 and 60–69 years respectively, and 5.8 for women aged 70 years or over. This trend was not maintained in the 13–24 months following a negative screening episode, with interval cancer rates of 12.5, 12.6, 12.8 and 11.8 in the respective age groups.

Relatively high interval cancer rates for women aged 40–49 years in the 0–12 months, but not the 13–24 months, following a negative screening round may be due to younger women being more likely to have aggressive breast cancers that present with symptoms in the 12 months immediately following a previous screen (Erbas et al. 2004).

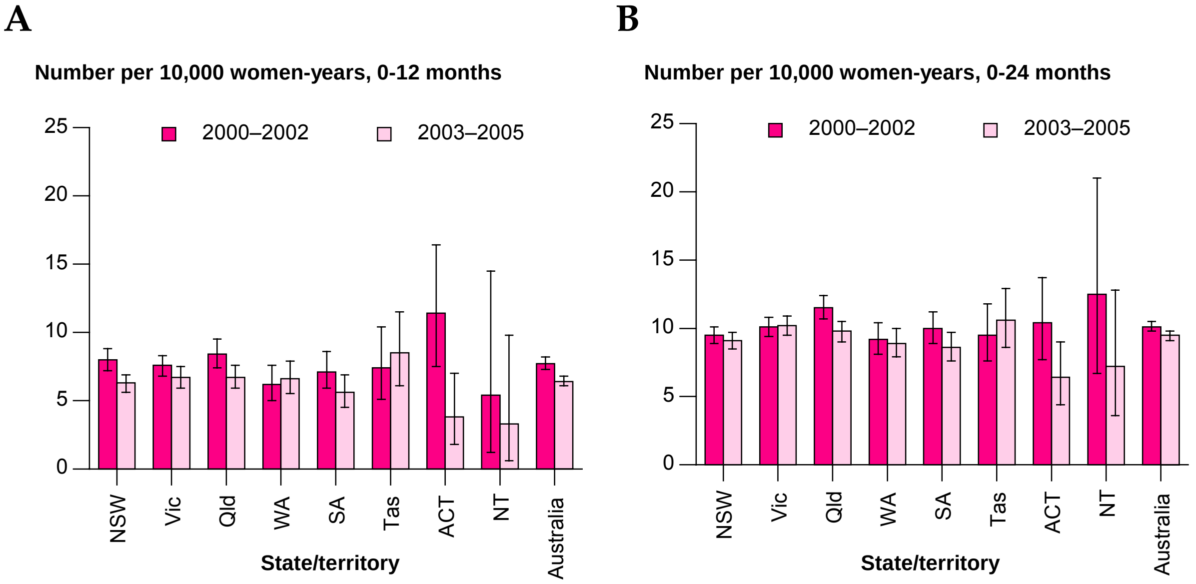
Interval cancer by state and territory

Because these data include both symptomatic and asymptomatic women, interval cancer rates in each state and territory are affected by the policy of management of symptomatic women in that jurisdiction. For example, in some jurisdictions women are not recalled to assessment on the basis of symptom status; those women with a negative screen but who have symptoms are referred for diagnostic follow-up outside BreastScreen Australia. Those referred women who subsequently have a cancer diagnosis will be counted as interval cancers, leading to a higher apparent interval cancer rate. Other states that do recall on the basis of symptoms may have lower apparent interval cancer rates. This affects the comparability of this indicator between jurisdictions.

Further, since interval cancer rates are higher in younger women, states and territories that screen a greater proportion of women aged 40–49 years may be expected to have slightly higher interval cancer rates.

Interval cancer rates were relatively similar across states and territories in 2003–2005, with variation only coming from smaller states and territories due to very small numbers and hence highly variable rates, even when combined across 3 years (Figure 3.1).

Between 2000–2002 and 2003–2005, interval cancer rates appeared to decrease across almost all states and territories in line with the national decrease. However, these differences were found to be significant only in New South Wales and the Australian Capital Territory in the 0–12 months following a negative screening episode (Figure 3.1). When all interval cancers were combined (all screening rounds and 0–24 months following a negative screening episode), only the decrease in Queensland's interval cancer rate was found to be statistically significant, with no other differences found between the two time periods (Figure 3.1).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 3.1: Interval cancer rate for women aged 50–69 years, screened in index years 2000–2002 and 2003–2005, by state and territory, all screening rounds, 0–12 months' follow-up (A) and 0–24 months' follow-up (B)

Indicator 3b Program sensitivity

Program sensitivity is reported as the percentage of women with invasive breast cancer among all program-screened women diagnosed with invasive breast cancer during the screening interval (screen-detected and interval cancers). High sensitivity indicates that few cancers in women screened are missed by BreastScreen Australia.

As for the interval cancer rate, program sensitivity is reported for 3 index years combined, and by 10-year age groups. Program sensitivity is disaggregated into time since screen (0–12 months and 0–24 months) and screening round (first and subsequent).

The most recent program sensitivity data are for the index years 2003, 2004 and 2005 combined.

Program sensitivity trends

Despite the interval cancer rate falling slightly, the subsequent increase in program sensitivity between 2000–2002 and 2003–2005 was not found to be statistically significant for either the first or subsequent screening intervals.

In 2003–2005, program sensitivity for 0–12 months was 91.8% for the first screening round and 86.8% for subsequent screening rounds (Table 3.4). Overall program sensitivity (0–24 months) was 81.7% for the first screening round and 73.2% for subsequent screening rounds (Table 3.5).

Table 3.4: Program sensitivity for women aged 50–69 years, screened in index years 2000–2002 and 2003–2005, 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									
Index years 2000–2002									
Rate	91.5	89.2	89.0	91.8	93.4	81.4	89.3	83.3	90.2
95% CI	83.1–100.0	80.0–99.2	79.1–99.8	75.0–100.0	77.7–100.0	53.5–100.0	52.5–100.0	26.9–100.0	85.5–95.1
Index years 2003–2005									
Rate	90.4	91.5	91.4	95.3	97.6	89.2	96.9	100.0	91.8
95% CI	81.9–99.6	79.5–100.0	80.7–100.0	77.9–100.0	73.7–100.0	61.7–100.0	58.0–100.0	45.5–100.0	86.6–97.2
Subsequent screening round									
Index years 2000–2002									
Rate	83.3	83.7	84.3	87.5	86.7	86.4	79.6	96.6	84.4
95% CI	79.6–87.2	79.4–88.1	79.6–89.1	80.6–94.7	80.2–93.6	74.0–100.0	65.0–96.4	63.0–100.0	82.3–86.5
Index years 2003–2005									
Rate	87.4	85.2	86.8	86.9	88.2	83.9	91.8	92.6	86.8
95% CI	83.7–91.2	81.0–89.6	82.4–91.5	80.7–93.5	81.5–95.2	72.6–96.5	74.3–100.0	64.9–100.0	84.7–88.9

Notes

1. Rates are the number of screen-detected cancers as a percentage of all cancers (screen-detected and interval cancers) and age standardised to the population of women attending a BreastScreen Australia service in 2008.
2. The data included both symptomatic and asymptomatic women.

Source: AIHW analysis of BreastScreen Australia data.

No significant difference was found in program sensitivity between the first screening round and subsequent screening rounds for 0–12 months, but program sensitivity was significantly lower for subsequent screening rounds than for the first screening round for overall program sensitivity (0–24 months).

This means that the ability of BreastScreen Australia to detect invasive breast cancers in screened women is highest immediately following a woman's first screen and decreases with length of time after the screen, and, to a lesser extent, number of screens (although no distinction is made between a woman's second or tenth screen as these are all considered subsequent).

Table 3.5: Program sensitivity for women aged 50–69 years, screened in index years 2000–2002 and 2003–2005, by state and territory, first screening round, 0–24 months' follow-up

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
First screening round									
Index years 2000–2002									
Rate	80.1	77.3	72.5	85.1	85.0	68.0	84.8	83.3	78.0
95% CI	72.8–88.0	69.2–86.1	64.5–81.4	69.3–100.0	70.2–100.0	44.8–98.9	46.0–100.0	26.9–100.0	73.9–82.3
Index years 2003–2005									
Rate	85.8	74.5	80.5	82.7	88.1	77.4	94.1	100.0	81.7
95% CI	77.7–94.5	64.7–85.2	71.1–90.7	68.5–98.7	66.1–100.0	52.9–100.0	55.9–100.0	45.5–100.0	77.1–86.6
Subsequent screening round									
Index years 2000–2002									
Rate	69.3	66.1	67.6	80.8	71.1	74.2	84.6	74.4	69.7
95% CI	66.2–72.4	62.7–69.6	63.9–71.5	74.5–87.6	65.8–76.8	63.6–86.0	69.1–100.0	48.6–100.0	67.9–71.4
Index years 2003–2005									
Rate	79.4	65.7	69.4	83.3	72.1	72.2	82.0	75.3	73.2
95% CI	76.0–82.8	62.4–69.0	65.8–73.1	77.3–89.6	66.7–77.8	62.5–83.0	66.5–100.0	52.9–100.0	71.5–75.0

Notes

1. Rates are the number of screen-detected cancers as a percentage of all cancers (screen-detected and interval cancers) and age standardised to the population of women attending a BreastScreen Australia service in 2008.
2. The data included both symptomatic and asymptomatic women.

Source: AIHW analysis of BreastScreen Australia data.

Program sensitivity by age

Consistent with the higher interval cancer rates in women aged 40–49 years noted earlier, program sensitivity was lowest in women aged 40–49 years, thereafter increasing with age.

In 2003–2005, with all screening rounds combined, program sensitivity for 0–12 months increased with age, from 77.4% in women aged 40–49 years to 86.1% and 89.6% for women aged 50–59 and 60–69 years respectively, and 92.6% for women aged 70 years or over. This trend was maintained overall (0–24 months), with overall program sensitivity for women aged 40–49 years being 60.9%. Lower sensitivity means that BreastScreen Australia is less able to detect invasive breast cancers in women aged 40–49 years who attend for screening.

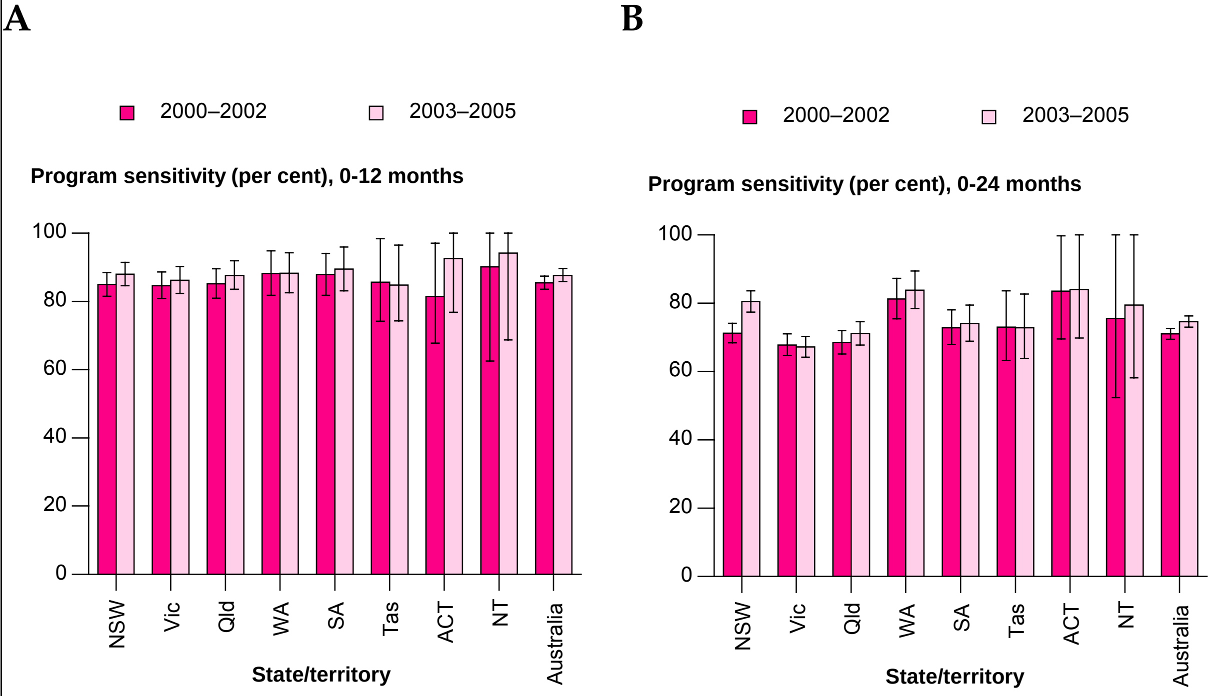
Program sensitivity by state and territory

As detailed for the interval cancer indicator, both interval cancers and sensitivity rates in each state and territory are affected by the policy of management of symptomatic women in that jurisdiction, which affects the comparability of this indicator between jurisdictions.

Further, since program sensitivity is lower in younger women, states and territories that screen a greater proportion of women aged 40–49 years may be expected to have slightly lower program sensitivity.

In 2003–2005, program sensitivity for 0–12 months was very similar across the states and territories, with some variation coming only from the smallest states and territories due to very small numbers. Overall program sensitivity (0–24 months, all screening rounds combined) also tended to be relatively similar across states and territories, although with notably lower program sensitivity in Victoria compared with the national rate (Figure 3.2).

Between 2000–2002 and 2003–2005, while overall program sensitivity appeared to increase in most states and territories in line with the increase in the national rate, this was statistically significant only for New South Wales (Figure 3.2).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 3.2: Program sensitivity for women aged 50–69 years, screened in index years 2000–2002 and 2003–2005, by state and territory, all screening rounds, 0–12 months' follow-up (A) and 0–24 months' follow-up (B)

Indicator 4 Detection of ductal carcinoma in situ

BreastScreen Australia aims to maximise the detection of DCIS.

Key findings

- Detection of DCIS within BreastScreen Australia increased from 9.2 women aged 50–69 years diagnosed with DCIS per 10,000 women screened in 1996 to 12.2 in 2008.

Detection of ductal carcinoma in situ

Ductal carcinoma in situ (DCIS) is a non-invasive tumour that arises from the lining of the ducts that carry milk from the milk-producing lobules to the nipple. Although the changes to the cells lining the milk ducts seen in DCIS are similar to those in invasive breast cancer, unlike breast cancer, DCIS does not invade the surrounding breast tissue, and is instead contained entirely within the milk duct.

DCIS is asymptomatic in most cases detected in the current environment of breast cancer screening, usually detected as a change on a mammogram or as a chance finding on a breast biopsy for another condition (BreastScreen Australia 2004). Rarely discovered before the introduction of screening mammography, the introduction and progressive expansion of national organised screening mammography from 1991 in the form of BreastScreen Australia has resulted in a substantial increase in the detection of DCIS (Luke et al. 2006; NBBC et al. 2000).

It has been recognised for some time that women with DCIS are at an increased risk of subsequent development of invasive breast cancer. Although much is still not yet understood about the natural history of DCIS, there is evidence that DCIS may progress to invasive breast cancer if left untreated (WHO & IARC 2002). Further, invasive breast cancer may also occur following treated cases of DCIS, either in the opposite breast or arising independently of the original DCIS in the same breast (Kerlikowske et al. 2010).

Recently, using data provided by the eight Australian state and territory cancer registries on DCIS cases diagnosed between 1995 and 2005 to the Australian Cancer Database, it was estimated that women who had previously been diagnosed with DCIS were around 4 times more likely to develop an invasive breast cancer than Australian women in general. Increased risk was quantified as a 5.3% and 10.9% risk of being diagnosed with invasive breast cancer within 5 and 10 years, respectively, with the risk being higher for women aged less than 40 years at 8.4% and 15.5% within 5 and 10 years, respectively (AIHW & NBOCC 2010).

Because of the recognised increased risk of invasive breast cancer following a diagnosis of DCIS, and because it is not currently possible to predict which DCIS cases might progress to invasive breast cancer, the aim is to identify and treat all cases of DCIS, since the detection and subsequent treatment of high-grade DCIS is likely to prevent deaths from invasive breast cancer (Eusebi et al. 1994).

Detection of DCIS through BreastScreen Australia is reported as the number of women with DCIS per 10,000 women screened. In line with the aim of BreastScreen to maximise the detection of DCIS, the NAS for detection of DCIS require that at least 12 women per 10,000 women screened aged 50–69 years who attend for their first screen are diagnosed with DCIS (NAS 2.3.1), and that at least 7 women per 10,000 women screened aged 50–69 years who attend for subsequent screens are diagnosed with DCIS (NAS 2.3.2) (BreastScreen Australia 2004). This is a change in focus from the previous National Accreditation Requirements that aimed to minimise DCIS detected to <20% of all cancers detected(BreastScreen WA 2008), and supports the premise that maximising DCIS detection is appropriate given the current understanding of DCIS and its relationship to invasive breast cancer.

Detection of DCIS is reported for a 12-month period (1 January to 31 December) and by screening round (first and subsequent). Similar to detection of invasive breast cancers, detection of DCIS is disaggregated into first and subsequent screening round because a woman is more likely to have DCIS diagnosed at her first screen than subsequent screens, since her first visit detects prevalent cases, not just incident cases. Further, in order to produce comparable rates from the relatively small number of DCIS cases, detection of DCIS is reported by 10-year age groups, rather than the 5-year age groups used for invasive breast cancer detection.

The most recent DCIS detection data are for 2007 and 2008.

Detection of DCIS trends

Detection of DCIS met the NAS for all years between 1996 and 2008, except for DCIS detection for subsequent screening rounds in 1997, which was slightly below the NAS at 6.9 women diagnosed with DCIS per 10,000 women screened (Table 4.1).

Source: AIHW analysis of BreastScreen Australia data.

Figure 4.1: Ductal carcinoma in situ detection in women aged 50–69 years, all screening rounds, 1998–2008

Detection of DCIS in the first screening round was variable with relatively broad confidence intervals. There appears to be a general trend of increasing detection rates, from 12.2 women diagnosed per 10,000 women screened in 1996 to around 20 for most years from 2001 onwards (Table 4.1). In 2007, DCIS detection was significantly higher than it had been in 1996, at 20.6 women aged 50–69 years diagnosed per 10,000 women screened. However, in 2008 the rate was no longer significantly different from the 1996 rate at 14.4 women diagnosed per 10,000 women screened (Table 4.1).

Detection in subsequent screening rounds increased from 7.3 per 10,000 women screened in 1996 to 10.4 in 2000, thereafter remaining steady at around 10 to 11 per 10,000 women screened for most years between 2000 and 2008. DCIS detection in subsequent screening rounds was 11.1 in 2007 and 11.5 women aged 50–69 years diagnosed per 10,000 women screened in 2008 (Table 4.1).

Table 4.1: Ductal carcinoma in situ detection in women aged 50–69 years, first and subsequent screening rounds, 1996–2008

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
First screening round													
Rate	12.2	12.0	13.0	15.6	13.8	19.3	21.8	16.8	20.7	14.6	19.4	20.6	14.4
95% CI	10.5–14.0	10.1–14.2	10.9–15.4	12.8–18.8	11.0–17.0	16.0–23.0	18.0–26.1	13.2–20.9	16.5–25.5	11.4–18.3	15.6–23.9	16.8–24.8	11.9–17.2
Subsequent screening rounds													
Rate	7.3	6.9	8.9	9.0	10.4	10.2	9.3	10.4	10.6	11.0	9.7	11.1	11.5
95% CI	6.3–8.5	6.1–7.9	8.0–9.9	8.1–9.9	9.5–11.4	9.3–11.2	8.5–10.2	9.5–11.3	9.8–11.5	10.2–11.9	9.0–10.6	10.2–12.0	10.7–12.4

Note: Rates are the number of cases of DCIS per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

While there was a 95% increase in the total number of women of all ages diagnosed with DCIS from 528 in 1996 to 1,030 in 2008, most of this increase occurred in the first few years, with a nearly 60% increase from 1996 to 2000. The number of women with DCIS diagnosed then levelled off at around 800 to 900 cases between 2000 and 2006. In 2007, the number of women diagnosed with DCIS was 1,023, with 776 (75.9%) of these women aged 50–69 years. This had changed little in 2008, with 1,030 women diagnosed, 812 (78.8%) of whom were aged 50–69 years.

Further, the greatest increases were in women aged 50–69 years. Looking at the number of cases in 2008 compared with 10 years earlier in 1998, the number of women aged 40–49 years and 70 years or over diagnosed with DCIS is almost identical (105 and 103 respectively in 1998, and 111 and 107 in 2008), whereas the number of women aged 50–69 years increased from 490 to 812 over this same period—a 66% increase.

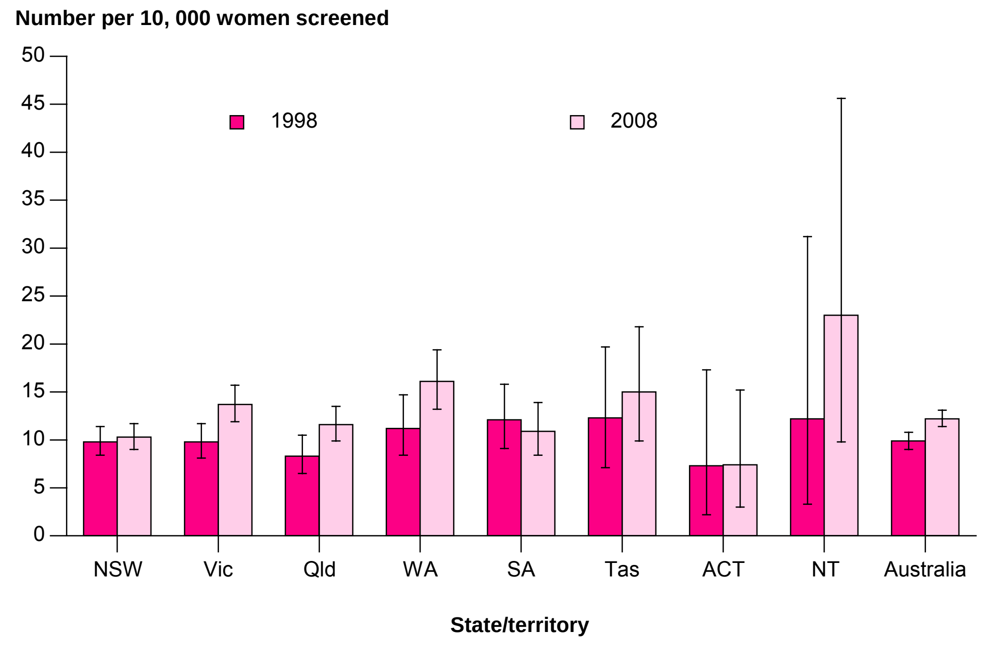
These numbers, while small compared with the invasive cancer detection numbers detailed in Indicator 2, are substantial when compared with the total number of DCIS cases registered each year. Indeed, a recent report estimated that more than half the DCIS cases diagnosed in Australia between 1996 and 2005 were detected through BreastScreen Australia, with the highest proportions in women aged 50–69 years—a reflection of the contribution made by screening mammography to the number of DCIS cases diagnosed in Australia (AIHW & NBOCC 2010).

Detection of DCIS by age

Similar to invasive breast cancer detection, DCIS detection increases with age, in line with the increase in DCIS incidence with age outlined in Indicator 7b. In 1998, this increase was from 6.8 women diagnosed with DCIS per 10,000 women screened for women aged 40–49 years, to 9.2 for women aged 50–59 years, to 10.8 for women aged 60–69 years, and finally 11.1 per 10,00 women screened for women aged 70 years and over. This trend was maintained in 2008, in which age-specific rates increased from 9.5 for women aged 40–49 years, to 10.9 for women aged 50–59 years, to 13.7 for women aged 60–69 years, to 15.5 women diagnosed with DCIS per 10,000 women screened for women aged 70 years and over.

The proportion of women diagnosed with DCIS in each age group was also analysed for 1998 and 2008. It was found that, from 1998 to 2008, the proportion of women aged 50–69 years diagnosed with DCIS increased from 70.2% to 78.8%, with concurrent decreases in the proportion of women diagnosed with DCIS aged 40–49 years (from 15.0% to 10.8%) and 70 years or over (from 14.8% to 10.4%). This trend is in line with the overall trend of an increasing proportion of women screened aged 50–69 years over women outside the target age group, discussed in Indicator 1.

Detection of DCIS by state and territory



Source: AIHW analysis of BreastScreen Australia data.

Figure 4.2: Ductal carcinoma in situ detection in women aged 50–69 years, by state and territory, all screening rounds, 1998 and 2008

As for detection of invasive breast cancers, 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 by state and territory. It should also be noted that, in some states and territories, the age-standardised rates vary considerably from the crude rates.

Broad confidence intervals, particularly in the smaller states and territories, make differences in DCIS detection among states and territories difficult to interpret, although most states and territories show a clear but insignificant increase in the detection of DCIS from 1998 to 2008 (Figure 4.2).

This is illustrated in Table 4.2, which shows the year-to-year variation in DCIS detection for the smaller states and territories, even with all screening rounds combined. This is due to the very small numbers of DCIS cases detected in these smaller states and territories. For instance, the increase in the age-standardised rate from 12.5 in 2007 to 23.0 in 2008 in the Northern Territory is based on an increase of three women. The larger states show more robust trends in DCIS detection. The small but significant increase in the national rate of DCIS detection from 9.9 in 1998 to 12.2 10 years later in 2008 appears to be mirrored in the larger states and territories, although this increase in only significant in Victoria (from 9.8 to 13.7 women diagnosed per 10,000 women screened).

Table 4.2: Ductal carcinoma in situ detection in women aged 50–69 years, by state and territory, all screening rounds, 1998, 2003, 2007 and 2008

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
1998 rate	9.8	9.8	8.3	11.2	12.1	12.3	7.3	12.2	9.9
95% CI	8.3–11.4	8.1–11.7	6.5–10.4	8.3–14.6	9.1–15.9	7.2–19.8	2.3–17.3	3.3–31.2	9.0–10.8
2003 rate	9.2	10.7	11.8	17.0	8.7	14.4	12.8	2.5	11.0
95% CI	7.9–10.7	9.1–12.5	9.9–14.0	13.8–20.7	6.4–11.6	9.1–21.6	6.3–22.9	0.1–14.1	10.2–11.9
2007 rate	10.9	12.5	12.3	17.3	11.1	6.1	8.1	12.5	12.1
95% CI	9.6–12.4	10.8–14.4	10.5–14.4	14.2–20.9	8.4–14.3	2.9–11.3	3.7–15.4	3.9–29.4	11.2–12.9
2008 rate	10.3	13.7	11.6	16.1	10.9	15.0	7.4	23.0	12.2
95% CI	9.0–11.8	11.9–15.7	9.9–13.6	13.2–19.4	8.4–13.9	9.9–21.9	3.0–15.2	9.7–45.5	11.3–13.0

Note: Rates are the number of cases of DCIS per 10,000 women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

Indicator 5 Recall to assessment

BreastScreen Australia aims to maximise the number of cancers detected, while minimising the number of unnecessary recalls and investigations.

Key findings

- Recall to assessment for a woman's first screening visit increased from 5.8% of women screened in 1996 to 9.5% of women screened in 2008.
- Recall to assessment for a woman's subsequent screens was around 4% of women screened for most years between 1996 and 2008.

Recall to assessment

The recall to assessment indicator measures the rate of women who are recalled for assessment following attendance for routine screening at a BreastScreen Australia service.

This indicator reports recall to assessment for mammographic reasons, which means that the recall is made because a woman's screening mammogram films are found to be suspicious for breast cancer. Assessment of women recalled involves further investigation by a multidisciplinary team at an assessment centre. Further investigation may include clinical examination, additional mammography, ultrasound and, if required, a biopsy. Most women recalled to assessment are found not to have breast cancer (BreastScreen SA 2010).

Recall to assessment by BreastScreen Australia is reported as the proportion of women screened in a 12-month period who were recalled for assessment for mammographic reasons. BreastScreen Australia aims to maximise the number of cancers detected while minimising the number of unnecessary investigations, since recall to assessment can cause anxiety and subjects women to additional procedures. This is reflected in the NAS for recall to assessment that require that less than 10% of women aged 50–69 years who attend for their first screen are recalled for assessment (NAS 2.6.1), and that less than 5% of women aged 50–69 years who attend for their second or subsequent screen are recalled for assessment (NAS 2.6.2) (BreastScreen Australia 2004).

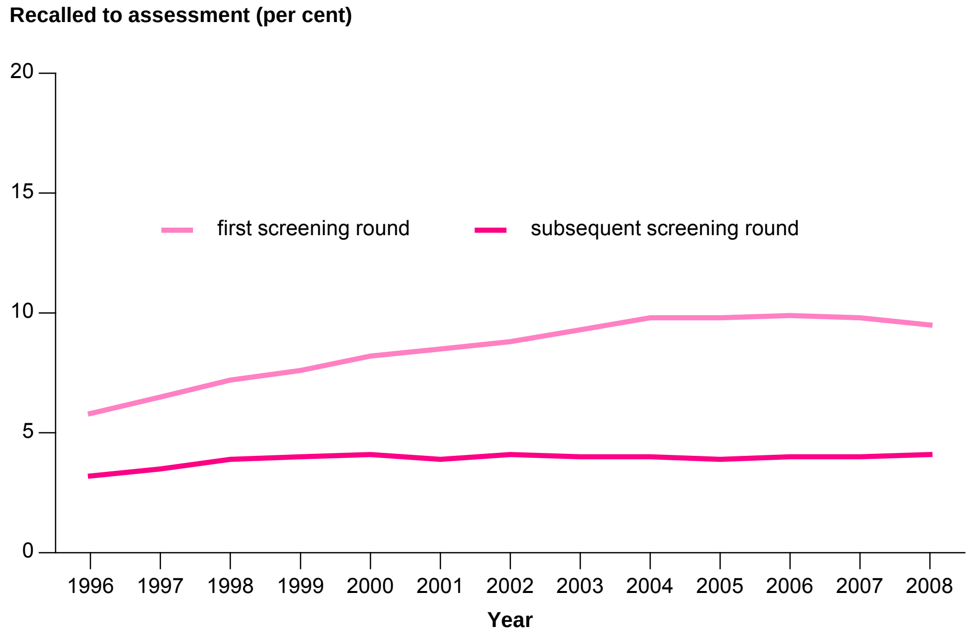
Recall to assessment is reported for a 12-month period (1 January to 31 December) and by screening round (first and subsequent). Recall to assessment is disaggregated into first and subsequent screening rounds because a woman is more likely to be recalled to assessment the first time she visits a BreastScreen service than subsequent visits. This is for several reasons. First, with no previous films with which to compare her first screening mammography films, it is more difficult to decipher between what might be normal and what might be suspicious and therefore require further investigation (BreastScreen WA 2008). Second, a woman is more likely to have an invasive breast cancer detected on her first visit, which necessitates that recall to assessment rates will be higher for the first screening round than subsequent screening rounds. Because of the relationship between recall to assessment and invasive cancer detection, changes to recall to assessment rates cannot be considered in the absence of corresponding invasive cancer detection rates.

The most recent recall to assessment data are for 2007 and 2008.

Recall to assessment trends

The number of women recalled to assessment by BreastScreen Australia increased from 26,122 in 1996, of whom 17,081 (65.4%) were aged 50–69 years, to 42,767 in 2007 with 30,419 (71.1%) aged 50–69 years, and finally to 45,278 in 2008, with 32,724 (72.3%) aged 50–69 years. This is a 73.3% increase in women aged 40 years and over, and a 91.6% increase in women aged 50–69 years, from 1996 to 2008.

Further, women aged 50–69 years comprised an increasing proportion of all women recalled to assessment over time. This was a steady increase from 65.4% in 1996 to 71.1% in 2007 and 72.3% in 2008.



Source: AIHW analysis of BreastScreen Australia data.

Figure 5.1: Recall to assessment rate for women aged 50–69 years, mammographic reasons, first and subsequent screening rounds, 1996–2008

Recall to assessment rates also increased over time. For women aged 50–69 years attending for the first time, recall to assessment increased from 5.8% of women screened in 1996 to 9.3% in 2003, thereafter remaining fairly steady at just under 10% of women screened, reaching 9.8% and 9.5% of women screened in 2007 and 2008 respectively. The highest rate reached was 9.9% in 2006 (Table 5.1). Although easily meeting the NAS of less than 10% in earlier years, recall to assessment rates between 2004 and 2008 are only just below 10% when reported to one decimal place.

Recall to assessment for women aged 50–69 years attending subsequent screening rounds, while initially increasing from 3.2% of women screened in 1996 to 3.9% in 1998, remained at around 4% of women screened for all years between 1998 and 2008. This was 4.0% in 2007 and 4.1% of women screened in 2008 (Table 5.1). These rates were well within the NAS performance objective of less than 5% of women screened for all years between 1996 and 2008.

Table 5.1: Recall to assessment rate for women aged 50–69 years, mammographic reasons, first and subsequent screening rounds, 1996–2008

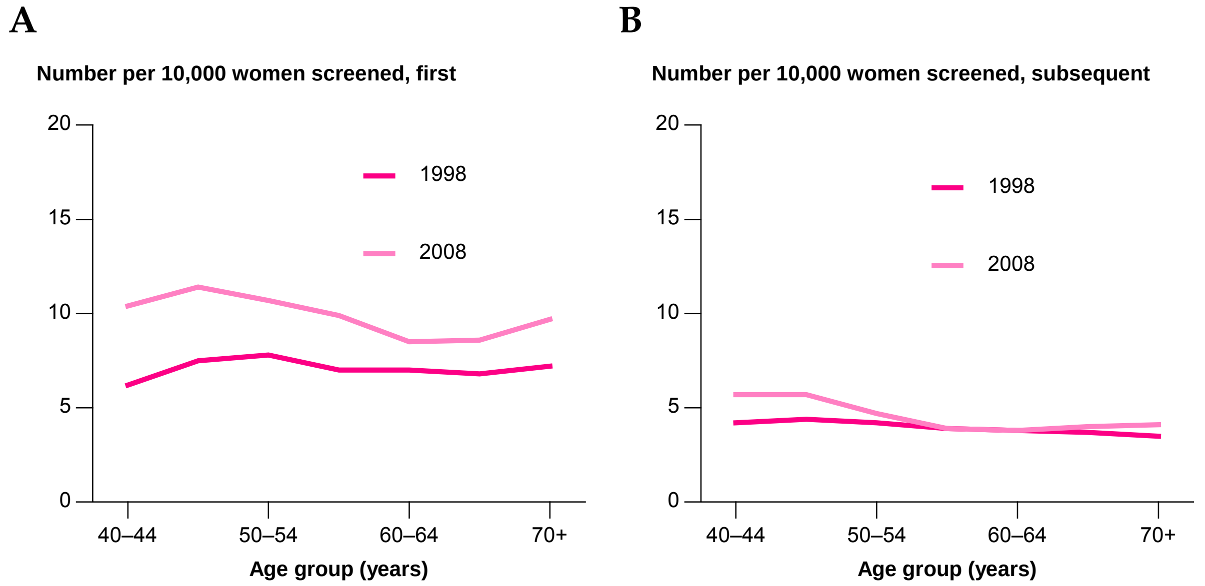
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
							(per cent)						
First screening round													
Rate	5.8	6.5	7.2	7.6	8.2	8.5	8.8	9.3	9.8	9.8	9.9	9.8	9.5
95% CI	5.7–5.9	6.4–6.7	7.0–7.4	7.4–7.8	8.0–8.5	8.2–8.7	8.5–9.0	9.1–9.6	9.5–10.1	9.5–10.1	9.6–10.2	9.6–10.1	9.3–9.7
Subsequent screening rounds													
Rate	3.2	3.5	3.9	4.0	4.1	3.9	4.1	4.0	4.0	3.9	4.0	4.0	4.1
95% CI	3.1–3.2	3.4–3.5	3.9–4.0	3.9–4.0	4.0–4.1	3.9–4.0	4.0–4.1	4.0–4.1	4.0–4.1	3.9–4.0	3.9–4.0	3.9–4.0	4.0–4.1

Note: Rates are the number of women recalled for assessment as a percentage of women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

Recall to assessment by age

In 1998, recall to assessment rates for the first screening round were lowest in women aged 40–44 years and highest in women aged 50–54 years, with little variation in the other age groups (Figure 5.2A). In 2008, however, recall to assessment tended to be higher in the younger age groups and lower in the older age groups, with recall to assessment decreasing from 11.4% for women aged 45–49 years to 8.6% of women screened for women aged 65–69 years – a broader range of values than in 1998. Further, recall to assessment rates were higher in 2008 compared with 1998 for all age groups, especially for women aged 40–44 and 45–49 years (Figure 5.2A).



Source: AIHW analysis of BreastScreen Australia data.

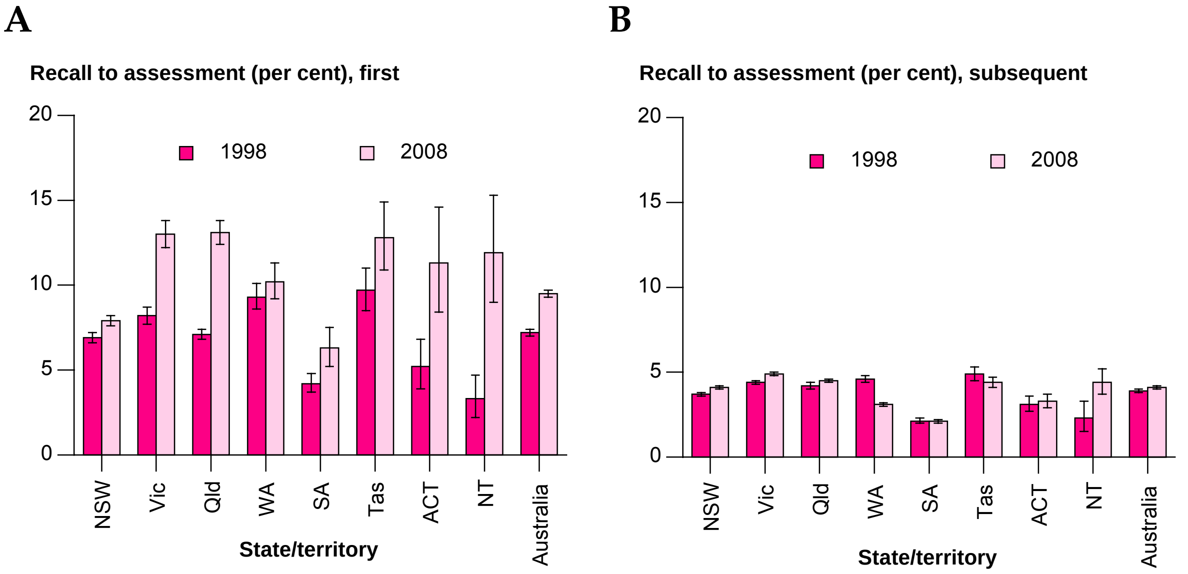
Figure 5.2: Recall to assessment rate, mammographic reasons, by age, first (A) and subsequent (B) screening rounds, 1998 and 2008

In subsequent screening rounds, while there was a clear trend of decreasing recall to assessment rate with increasing age, the distribution of recall to assessment rates in 2008 had changed from the essentially straight line in 1998, and also had a wider range of recall to assessment rates, as shown in Figure 5.2. While recall to assessment rates were identical in 1998 and 2008 for women aged 55–59 and 60–64 years, these were higher in 2008 compared with 1998 in all other age groups, particularly in women aged 40–44 and 45–49 years (Figure 5.2B).

It has been suggested that recall to assessment rates are highest in women age 40–49 years because younger women tend to have denser breasts that make screening mammography films more difficult to interpret (BreastScreen WA 2008). There may also be an effect of a higher rate of breast symptoms in younger women (BreastScreen WA 2008), a trend supported by a recent report of BreastScreen Australia data (BreastScreen Australia EAC 2009b).

Recall to assessment by state and territory

Recall to assessment for women aged 50–69 in the first screening round increased in all states and territories over the 10 years from 1998 to 2008, in line with the increase in the national rate from 7.2% to 9.5% of women screened over this period (largest in Victoria, Queensland, the Australian Capital Territory and the Northern Territory (Figure 5.2A)). This was statistically significant between these 2 years for all states and territories except Western Australia and Tasmania (Table 5.2).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 5.3: Recall to assessment rate for women aged 50–69 years, mammographic reasons, by state and territory, first (A) and subsequent (B) screening rounds, 1998 and 2008

While in 2007 only Victoria, Queensland, Tasmania and the Australian Capital Territory had recall to assessment rates for the first screening round greater than the NAS, by 2008 all states and territories has recall to assessment greater than 10% of women screened, except for

New South Wales and South Australia, both of which have very low recall to assessment rates (7.9% and 6.3% of women screened respectively) (Table 5.2).

Recall to assessment for women aged 50–69 years in subsequent screening rounds changed little overall, being 3.9% of women screened in 1998 and 4.1% of women screened in 2008. However, there was variation across the states and territories in recall to assessment rates between these 2 years. New South Wales, Victoria and the Northern Territory had significant increases, while Western Australia had a statistically significant decrease from 4.6% to 3.1% of women screened. Other states and territories showed no change, including South Australia, which had a notably low recall to assessment rate of 2.1% of women screened for both years (Table 5.2; Figure 5.3). Recall to assessment for subsequent screening rounds was well below the NAS of 5% of women screened for states and territories in 2007 and 2008 (Table 5.2).

Table 5.2: Recall to assessment rate for women aged 50–69 years, mammographic reasons, by state and territory, first screening round, 1998, 2003, 2007 and 2008

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
					(per cent)				
First screening round									
1998 rate	6.9	8.2	7.1	9.3	4.2	9.7	5.2	3.3	7.2
95% CI	6.6–7.2	7.7–8.7	6.8–7.3	8.6–10.1	3.6–4.7	8.4–11.0	3.9–6.8	2.2–4.7	7.0–7.4
2003 rate	9.2	9.7	9.9	9.6	5.7	12.3	8.5	5.7	9.3
95% CI	8.8–9.7	9.0–10.5	9.3–10.5	8.6–10.6	4.6–6.9	10.3–14.6	6.2–11.2	3.5–8.5	9.1–9.6
2007 rate	8.7	13.1	11.5	9.3	6.5	11.9	8.4	11.7	9.8
95% CI	8.4–9.0	12.2–14.0	10.8–12.2	8.3–10.4	5.3–7.9	9.9–14.1	6.1–11.0	8.8–15.1	9.6–10.1
2008 rate	7.9	13.0	13.1	10.2	6.3	12.8	11.3	11.9	9.5
95% CI	7.7–8.2	12.2–13.9	12.5–13.9	9.1–11.3	5.1–7.5	10.9–14.9	8.4–14.5	9.1–15.3	9.3–9.7
Subsequent screening rounds									
1998 rate	3.7	4.4	4.2	4.6	2.1	4.9	3.1	2.3	3.9
95% CI	3.6–3.8	4.3–4.5	4.0–4.4	4.4–4.8	2.0–2.3	4.5–5.3	2.7–3.6	1.5–3.3	3.9–4.0
2003 rate	4.2	4.1	4.5	3.2	2.4	5.4	5.1	3.1	4.0
95% CI	4.1–4.3	4.0–4.2	4.3–4.6	3.0–3.4	2.3–2.6	5.0–5.8	4.6–5.6	2.5–3.9	4.0–4.1
2007 rate	4.1	4.4	4.7	2.9	2.0	4.4	3.1	3.9	4.0
95% CI	4.0–4.2	4.3–4.5	4.6–4.8	2.7–3.0	1.9–2.2	4.1–4.8	2.8–3.5	3.2–4.7	3.9–4.0
2008 rate	4.1	4.9	4.5	3.1	2.1	4.4	3.3	4.4	4.1
95% CI	4.0–4.2	4.8–5.0	4.4–4.7	2.9–3.2	2.0–2.2	4.1–4.7	2.9–3.7	3.7–5.3	4.0–4.1

Note: Rates are the number of women recalled for assessment as a percentage of women screened and age standardised to the population of women attending a BreastScreen Australia service in 2008.

Source: AIHW analysis of BreastScreen Australia data.

The proportion of women recalled to assessment by age group also varied across states and territories. Queensland and Tasmania, which both screen a relatively large proportion of women aged 40–49 years compared with other states and territories, had a correspondingly high proportion of women aged 40–49 years recalled to assessment (32.1% and 34.1% of women recalled to assessment, respectively, compared with 21.0% nationally). Because women aged 40–49 years have higher recall to assessment rates, screening a greater proportion of younger women has probably contributed to the relatively high overall recall to assessment rates in these two states in 2008. As a corollary, Queensland and Tasmania also have the lowest proportion of women recalled to assessment aged 50–69 years (59.0% and 61.4% respectively in 2008, compared with 72.3% nationally).

Indicator 6 Rescreening

Maintaining high rescreening rates is important to both increase the likelihood of breast cancers being detected early in screened women and to maintain overall participation.

Key findings

- Rescreening decreased over time, with women screened in 2005 rescreening at lower rates than ever before.
- Rescreening increased with number of previous screens, with rescreen rates being lowest in women after their first screen and highest for women after their third or subsequent screen.

Rescreening

The rescreen indicator measures the proportion of women who return for screening at a BreastScreen Australia service within the recommended screening interval. The interval between screens is an important factor influencing the level of detection of cancers within BreastScreen Australia, since screening intervals that are too long may allow tumours to grow to the point where symptoms become evident, thus eliminating the advantage of screening. The screening interval recommended for most women who attend a BreastScreen Australia service is 2 years, since 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).

The rescreen rate is the proportion of all women screened in a given index year whose screening outcome was a recommendation to return for screening in 2 years and who returned for a screen within 27 months. A high rescreen rate is important to both increase the likelihood of breast cancers being detected early in screened women and to maintain overall participation. This is reflected in the NAS for rescreening that require that at least 75% of women aged 50–67 years who attend for their first screening round are rescreened within 27 months (NAS 1.2.1), and that at least 90% of women aged 50–67 years who attend for their second and subsequent screens are rescreened within 27 months of their previous screening episode (NAS 1.2.2) (BreastScreen Australia 2004).

The screening interval of 27 months is used instead of the recommended screening interval of 2 years to allow for potential delays in screening availability and data transfer. Further, although the BreastScreen Australia target age group is 50–69 years, only women aged 50–67 years are reported for the rescreen rate because women aged 68–69 years in the index year will be outside the target age group 27 months after their index screen. Note that the denominator has not been adjusted to remove women who died or developed an interval cancer after their screen in the index year.

Rescreening is reported for each index year and by first, second, and third and subsequent screening round.

The most recent rescreening data are for the index year 2005.

Rescreening trends

The rate of women aged 50–67 years rescreening within 27 months decreased over time. Of the women first screened in 2000, 66.3% returned for their second screen within 27 months. This decreased to 59.3% for women screened for the first time 5 years later in 2005. Similarly, women rescreening within 27 months of having their second screen decreased from 75.7% in 2000 to 66.8% in 2005. Of women who had their third or subsequent screen in 2000, 84.3% were rescreened within 27 months, falling to 78.4% of women screened in 2005 (Table 6.1).

While the rate of rescreening decreased with time, the rate of rescreening increased with the number of screens previously attended. The proportion of women who were screened in 2005 and returned within 27 months increased from 59.3% after the first screening round to 66.8% after the second screening round, and finally to 78.4% after the third and subsequent screening rounds for women aged 50–67 years (Table 6.1).

The NAS of at least 75% for the first screening round and at least 90% for second and subsequent screening rounds was not met for the index year of 2005, either nationally or for any state or territory, for the first, second, or third and subsequent screening rounds.

Table 6.1: Rescreen rate for women aged 50–67 years, screened during 2000, 2004 and 2005

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
					(per cent)				
First screening round									
2000 rate	62.7	67.5	71.4	60.6	66.3	68.4	56.1	49.0	66.3
95% CI	61.6–63.8	66.1–69.0	70.0–72.7	58.0–63.2	63.7–69.0	63.9–73.2	50.6–61.9	42.0–56.7	65.6–67.0
2004 rate	63.5	58.6	66.5	59.4	58.6	70.6	65.1	49.4	62.7
95% CI	62.3–64.7	56.8–60.4	64.9–68.1	57.0–61.9	54.4–62.9	65.7–75.8	60.7–69.7	40.8–58.8	62.0–63.5
2005 rate	58.5	57.4	63.4	62.5	47.1	52.0	63.6	52.8	59.3
95% CI	57.5–59.6	55.5–59.2	61.9–64.9	59.9–65.2	44.0–50.3	48.2–56.0	56.7–70.9	45.7–60.6	58.6–60.0
Second screening rounds									
2000 rate	72.2	75.1	80.4	69.6	77.7	76.6	62.0	64.1	75.7
95% CI	71.2–73.2	73.8–76.5	79.3–81.4	67.6–71.6	75.5–80.0	73.0–80.3	57.0–67.2	58.3–70.2	75.1–76.2
2004 rate	73.8	68.0	73.7	64.7	60.6	75.6	74.5	59.1	70.5
95% CI	72.6–75.0	66.5–69.4	72.2–75.3	62.6–66.8	57.7–63.6	70.3–81.2	69.5–79.7	50.1–69.1	69.8–71.2
2005 rate	67.2	63.5	71.3	71.6	54.3	58.0	70.8	55.6	66.8
95% CI	66.1–68.4	61.8–65.1	69.7–72.9	69.2–74.0	51.4–57.2	53.8–62.3	64.6–77.5	46.1–66.0	66.1–67.5
Third and subsequent screening rounds									
2000 rate	81.9	85.4	87.1	82.1	88.5	85.2	75.9	80.2	84.3
95% CI	81.4–82.5	84.7–86.1	86.3–88.0	81.1–83.0	87.4–89.6	83.5–87.0	73.5–78.2	74.2–86.5	84.0–84.6
2004 rate	82.6	77.0	85.3	79.2	76.7	84.3	82.6	75.7	81.0
95% CI	82.1–83.1	76.4–77.6	84.7–85.9	78.3–80.1	75.8–77.6	82.7–86.0	80.7–84.6	71.7–79.9	80.7–81.3
2005 rate	78.1	76.2	83.0	84.8	69.9	67.5	82.2	74.6	78.4
95% CI	77.6–78.5	75.7–76.8	82.4–83.6	83.9–85.7	69.1–70.7	66.1–69.0	80.2–84.2	71.0–78.4	78.1–78.6

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

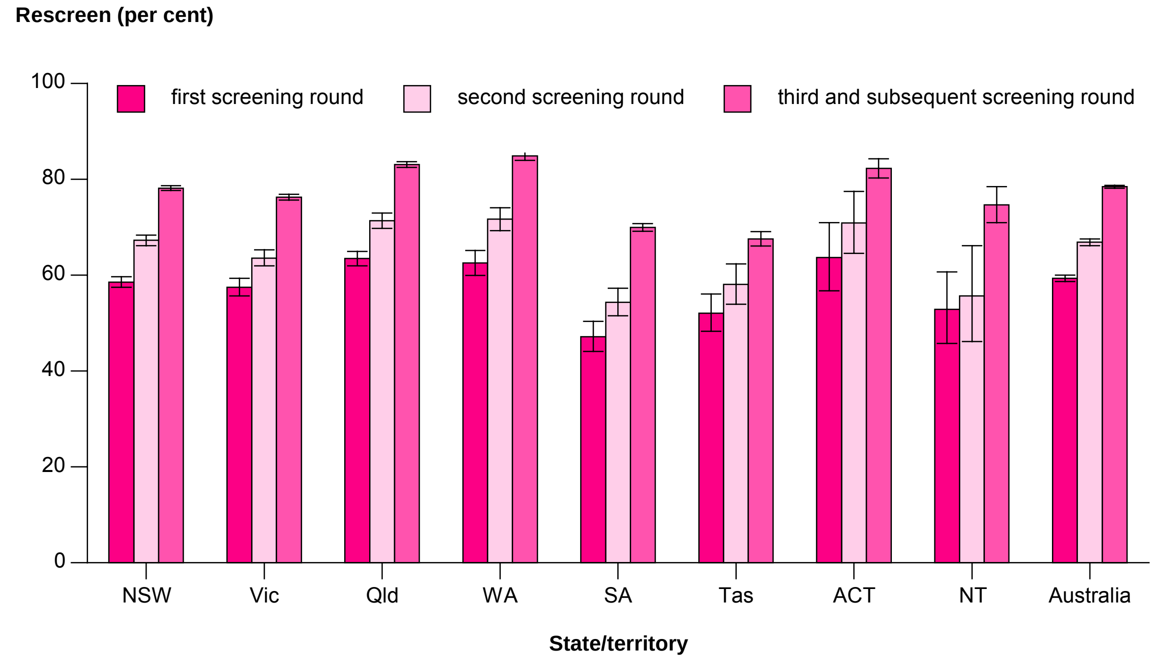
Source: AIHW analysis of BreastScreen Australia data.

Rescreening by age

For women screened in 2005, the highest rescreen rates were for women aged 50–67 years, followed by women aged 40–49 years. Women aged 70 years and over had far lower rescreen rates. For women screened for the first time in 2005, rescreen rates for women aged 40–49 years, 50–67 years, and 70 years and over were 46.5%, 59.3% and 28.0%, respectively. For women screened for the second time in 2005, these were 61.0%, 66.8% and 38.2%, respectively, with rescreen rates of 75.9% for women aged 40–49 years, 78.4% for women aged 50–67 years, and 47.4% for women aged 70 years and over who were screened for a third or subsequent time in 2005.

Further, of the women rescreening, the proportion of women aged 50–67 years increased with the number of screens previously attended. For women screened in 2005, of the 68,950 women rescreening after the first screening round, 42,147 (61.1%) were aged 50–67 years, whereas of the 66,142 women rescreening after the second screening round, 47,505 (71.8%) were aged 50–67 years, and of the 425,372 women rescreening after third and subsequent screening rounds, 346,926 (81.6%) were aged 50–67 years.

Rescreening by state and territory



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 6.1: Rescreen rate for women aged 50–67 years, screened during 2005, by state and territory, first, second, third and subsequent screening rounds

Although there was some variation among the states and territories, all jurisdictions mirrored the national trend of increasing rescreen rates with number of screens previously attended (Figure 6.1). Further, while most states and territories also mirrored the national trend of decreasing rescreen rates over time, between the index years of 2000 and 2005 rescreen rates increased for Western Australia and the Australian Capital Territory (and for the Northern Territory after the first screening round) (Table 6.1).

In a recent evaluation of BreastScreen Australia, rescreening was analysed further to better appreciate the decreasing rate of women rescreening within 27 months. In addition to calculating the proportion of women rescreening within 27 months, screening intervals of 28–36 months, 37–48 months and >48 months, and not yet returned were also considered (BreastScreen Australia EAC 2009b). It was found that, while the majority of women were rescreened within 27 months of their index screen, irrespective of age or screening round, the proportion of women rescreened within 27 months decreased over time, with a concurrent increase in the proportion of women being rescreened within 28–36 months. This means that the decrease in rescreening rate may not be a true decline in women rescreening, but rather a redistribution of women rescreening from within 27 months to 28–36 months, since the increase in women rescreening after 27 months are not included in the rescreen rate.

Indicator 7 Incidence

Incidence rates are based on all Australian women, and include new cases of invasive breast cancer (for incidence of breast cancer) or new cases of DCIS (for incidence of DCIS) in women both within and outside BreastScreen Australia.

Key findings

- Incidence of invasive breast cancer increased from 174.0 new cases per 100,000 women in 1982, to 230.1 in 1991 when BreastScreen Australia commenced, to 287.7 new cases per 100,000 women in 2006 for women aged 50–69 years. Peak incidence was 304.8 new cases per 100,000 women in 2001.
- Incidence of ductal carcinoma in situ increased from 29.8 new cases per 100,000 women in 1996 to 43.4 new cases per 100,000 women in 2006 for women aged 50–69 years. Peak incidence was 46.0 new cases per 100,000 women in 2001.

Incidence of invasive breast cancer and ductal carcinoma in situ

Registration of cancer cases is required by law in each of the states and territories. Data are collected by state and territory cancer registries and compiled in a national database, the Australian Cancer Database (formerly the National Cancer Statistics Clearing House), which is held by the AIHW. The data include clinical and demographic information about people with newly diagnosed cancer.

Incidence of invasive breast cancer measures the number of new cases of invasive breast cancer diagnosed each year, sourced from the Australian Cancer Database. Only primary invasive breast cancers are included—secondary breast cancers and breast cancers that are a reoccurrence of a primary breast cancer are not counted. Note that incidence data refer to the number of new cases diagnosed and not number of women diagnosed (although it is rare for a woman to be diagnosed with more than one primary invasive breast cancer in the same year). These data include both screen-detected invasive breast cancers (through BreastScreen Australia) and invasive breast cancers detected by other methods.

Incidence of ductal carcinoma in situ (DCIS) measures the number of new cases of DCIS diagnosed each year. Because DCIS is an in situ carcinoma and not invasive, it is not included in the Australian Cancer Database. However, state and territory cancer registries have been collecting data on DCIS routinely for more than 10 years, and are the source of DCIS incidence data reported here. Similar to invasive breast cancer incidence data, DCIS data refer to number of new cases diagnosed and not number of women diagnosed. Further, if a woman is diagnosed with DCIS and invasive breast cancer, only the more serious diagnosis of invasive breast cancer will be counted, not that of DCIS.

Incidence of invasive breast cancer and incidence of DCIS are reported separately, as Indicator 7a and Indicator 7b respectively.

Indicator 7a Incidence of invasive breast cancer

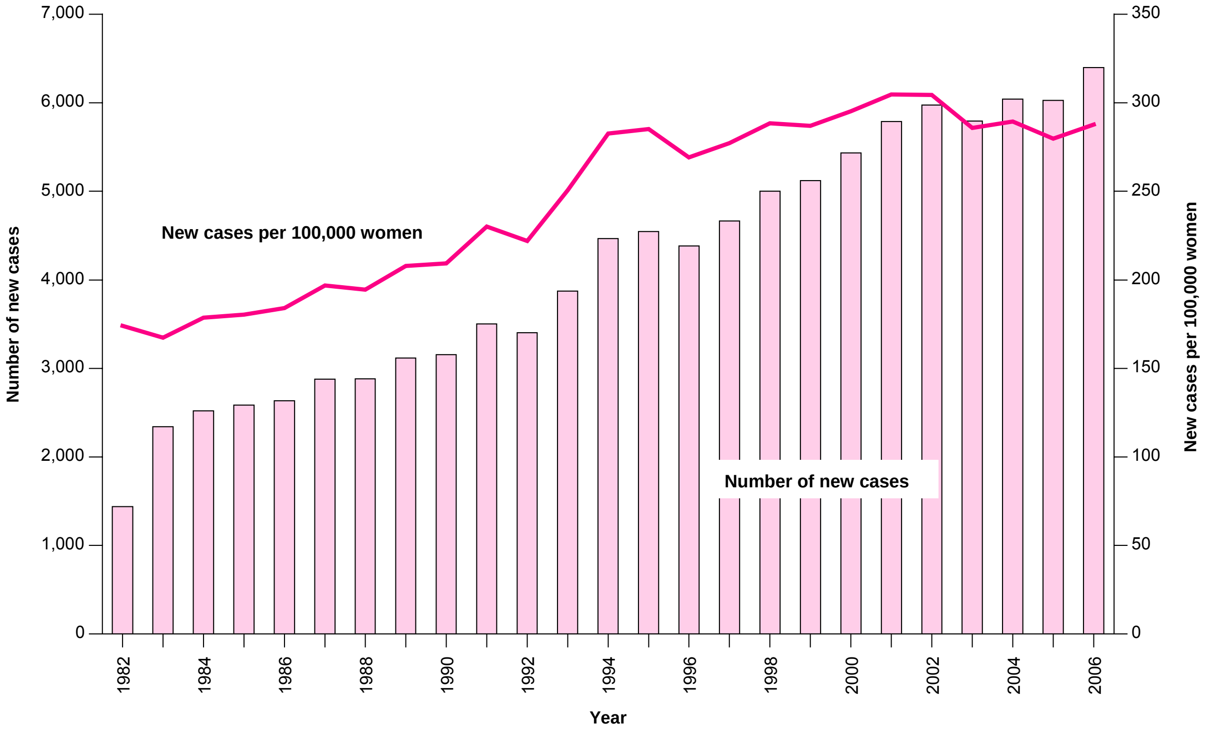
Incidence of invasive breast cancer is reported as the number of new cases of invasive breast cancer diagnosed per 100,000 women.

Incidence of invasive breast cancer by age is reported for a 12-month period (1 January to 31 December). Incidence of invasive breast cancer by state and territory, geographic region and Aboriginal and Torres Strait Islander status is reported over a 5-year period to improve the stability and comparability of rates.

The most recent incidence of invasive breast cancer data are for 2006.

Incidence of invasive breast cancer trends

The incidence of invasive breast cancer increased over time. For women aged 50–69 years, while incidence had been increasing steadily before breast cancer screening, from 174.0 new cases per 100,000 women in 1982 (the first year for which data are available) to 209.3 in 1990, incidence increased more sharply in this age group from 230.1 in 1991 when BreastScreen Australia commenced to 285.2 new cases per 100,000 women in 1995 (Figure 7.1). Incidence of invasive breast cancers in women aged 50–69 years reached a peak of 304.8 new cases per 100,000 women in 2001, thereafter levelling off at around 290 new cases per 100,000 women (Figure 7.1). In 2006, the latest year for which data are available, incidence of invasive breast cancers was 287.7 new cases per 100,000 women for women aged 50–69 years (Table 7.1).

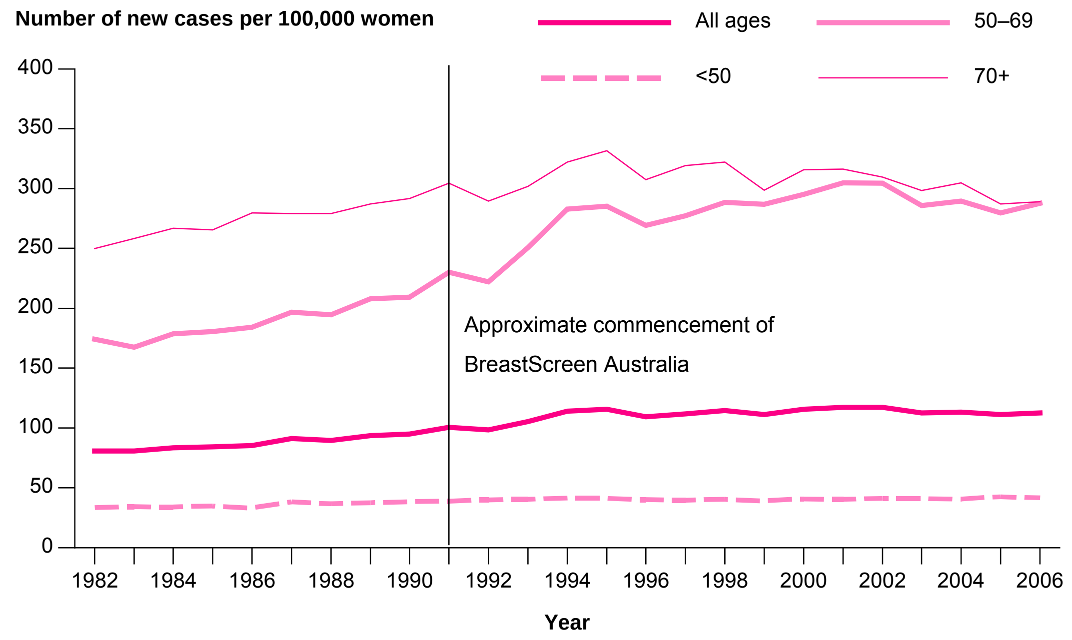


Source: AIHW analysis of BreastScreen Australia data.

Figure 7.1: Incidence of breast cancer in women aged 50–69 years, 1982–2006

The increase in rate between 1982 and 1990 was accompanied by a similar trend in new cases diagnosed, from 2,437 new cases in 1982 to 3,154 in 1990 (a 29.4% increase). This increase was exceeded over the 4 years from 1991 to 1995, over which time there was a 30% increase in the number of new cases, from 3,501 to 4,546. At its peak rate in 2001, the number of new cases was 5,790. However, despite a stable rate from 2003 to 2006 of around 290 new cases per 100,000 women, the actual number of new cases continued to rise from 5,794 to 6,398 over this period—a 10.4% increase.

For women outside the target age group for BreastScreen Australia, the pattern of incidence appears to be mirrored in women aged 70 years and over, except that incidence—historically highest in this age group—was indistinguishable from incidence in women aged 50–69 years in 2006 (Figure 7.2). This was not true for women aged less than 50 years, which includes but is not limited to women aged 40–49 years, for which incidence remained steady at between around 39 and 42 new cases per 100,000 women between 1991 and 2006 (Figure 7.2).



Source: AIHW Australian Cancer Database.

Figure 7.2: Incidence of breast cancer per 100,000 women, by age, 1982–2006

For all age groups combined, incidence was influenced by women aged 50–69 years, increasing from 80.7 new cases per 100,000 women in 1982 to 112.4 in 2006, where it has been since 2003 after a peak incidence of 117.3 in 2001 (Figure 7.2). The overall increase in number of new cases of invasive breast cancer was from 5,289 in 1982 to 12,614 in 2006, more than a doubling of new cases, and a 138.5% increase overall. Excluding non-melanoma skin cancer, this makes breast cancer the most commonly diagnosed cancer for women in 2006, with 28% of all new cancer cases diagnosed in 2006 being invasive breast cancer (AIHW & NBOCC 2009).

Table 7.1: Incidence of breast cancer per 100,000 women, 1982–2006

		Age group (years)		
Year of diagnosis	**All ages**	**<50**	**50–69**	**70+**
1982	80.7	33.6	174.0	249.8
1983	80.6	34.2	167.3	258.3
1984	83.4	34.0	178.6	266.7
1985	84.2	34.7	180.4	265.4
1986	85.1	33.1	184.1	279.6
1987	91.2	38.3	196.8	279.0
1988	89.6	36.7	194.5	279.0
1989	93.4	37.4	207.9	287.0
1990	94.7	38.2	209.3	291.7
1991	100.4	38.8	230.1	304.5
1992	98.3	40.0	222.0	289.4
1993	105.3	40.4	250.6	301.7
1994	114.1	41.4	282.7	322.1
1995	115.6	41.6	285.2	331.5
1996	109.3	40.1	269.1	307.5
1997	111.5	39.5	277.2	319.2
1998	114.5	40.3	288.4	322.0
1999	111.2	39.0	286.9	298.6
2000	115.6	40.8	295.2	315.6
2001	117.3	40.5	304.8	316.1
2002	117.2	41.3	304.5	309.4
2003	112.4	41.1	285.8	298.4
2004	113.3	40.6	289.4	304.7
2005	111.2	42.5	279.7	287.2
2006	112.4	41.7	287.7	288.9

Note: Rates are the number of breast cancers detected per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

Incidence of invasive breast cancer by age

In 2006, the highest incidence of invasive breast cancer was for women aged 60–64 years and 65–69 years, for which it was 349.2 and 345.6 new cases per 100,000 women respectively (Table 7.2).

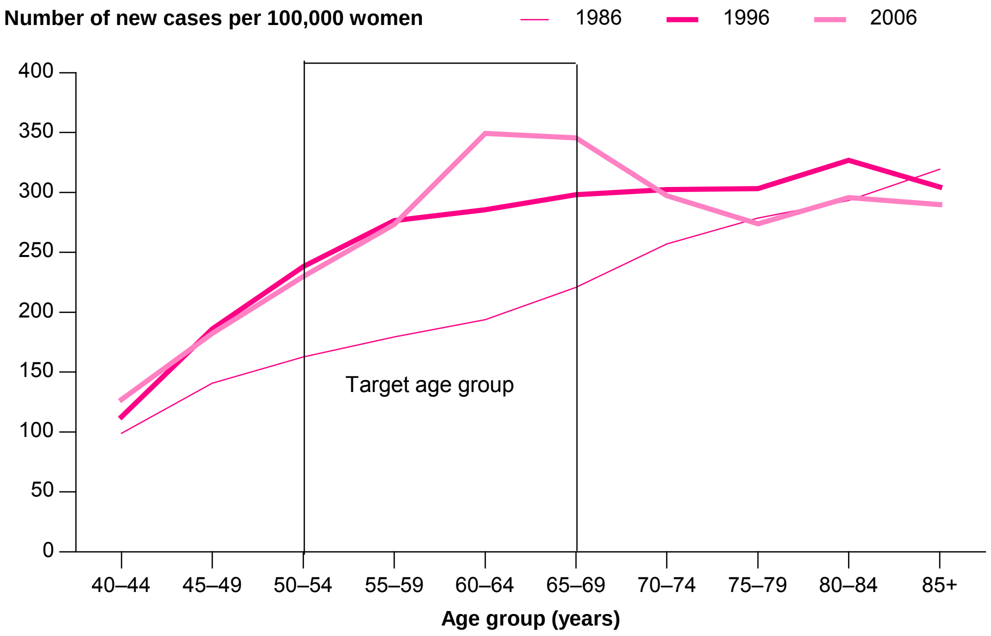
Table 7.2: Age-specific incidence rates for breast cancer in women, by age, 1996, 2001, 2005 and 2006

	Age group (years)									
	40–44	**45–49**	**50–54**	**55–59**	**60–64**	**65–69**	**70–74**	**75–79**	**80–84**	**85+**
1996 rate	112.8	186.0	238.0	276.3	285.4	298.0	302.4	303.1	326.7	304.4
2001 rate	123.9	178.8	255.2	308.1	353.9	335.5	329.1	309.2	306.2	310.4
2005 rate	123.2	193.8	236.4	266.8	312.7	341.7	279.5	292.1	286.2	297.6
2006 rate	127.1	182.3	229.7	273.2	349.2	345.6	297.3	273.8	295.5	289.8

Note: Rates are the number of breast cancers per 100,000 women.

Source: AIHW Australian Cancer Database.

While these two age groups also had the highest incidence 5 years previous to this in 2001, the trend was notably different 10 years previous to this in 1996, with the highest incidence in women aged 80–84 years (Table 7.2). Going back another 10 years to 1986, prior to the commencement of BreastScreen Australia, incidence was lower in 1986 than in 2006 for all age groups from 40–44 years to 70–74 years, after which time incidence was either equal to or greater than the age groups from 75–79 years to 85 years and over (Figure 7.3).



Source: AIHW Australian Cancer Database.

Figure 7.3: Age-specific incidence rates for breast cancer in women, by age, 1986, 1996 and 2006

In 2006, new cases of invasive breast cancer diagnosed in women aged 50–69 years comprised 50.7% of all invasive breast cancers. This is an increase from 45.0% in 1996, and 43.3% of all invasive breast cancers in 1986.

Incidence of invasive breast cancer by state and territory

In 2002–2006, the incidence of invasive breast cancers for women of all ages among the states and territories was relatively stable, with most states and territories having an incidence around the national rate of 113.2 new cases per 100,000 women. Only the Australian Capital Territory and the Northern Territory deviated from this, the former having a notably higher incidence of 129.2 and the latter recording a notably lower incidence of 83.3 new cases per 100,000 women.

For women aged 50–69 years, the trend was similar, with most states and territories recording an incidence of around the national rate of 289.1 new cases per 100,000 women. Again, the standouts were the Australian Capital Territory at 339.6 new cases and the Northern Territory at 204.3 new cases per 100,000 women. It should be noted, however, that these two smallest jurisdictions are open to variation due to smaller numbers, even with 5 years of data combined.

Table 7.3: Incidence of breast cancer in women aged 50–69 years, by state and territory, 1997–2001 and 2002–2006

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Rate 1997–2001	284.6	287.8	298.6	294.6	309.8	269.5	324.0	249.4	290.9
95% CI	278.6–290.6	280.9–294.9	290.2–307.2	283.0–306.5	297.4–322.7	248.8–291.4	293.9–356.3	207.2–297.4	287.3–294.4
Rate 2002–2006	290.0	276.4	291.2	298.2	304.5	292.3	339.6	204.3	289.1
95% CI	284.3–295.7	270.0–282.9	283.8–298.8	287.6–309.1	292.9–316.4	272.4–313.3	311.6–369.5	171.6–241.4	285.8–292.4

Note: Rates are the number of breast cancers per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW Australian Cancer Database.

Incidence rates were very similar between 1997–2001 and 2002–2006, both nationally and across states and territories. The only notably difference was a small increase in incidence in Tasmania and the Australian Capital Territory, and a fall in incidence in the Northern Territory, none of which were statistically significant (Table 7.3).

While there was little change from 1997–2001 and 2002–2006, Figure 7.4 illustrates that incidence in most states and territories was lower in the earlier 5-year period of 1992–1996 compared with 2002–2006, although not statistically significantly so in the smaller states and territories.

Note: Bars on columns represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

Figure 7.4: Incidence of breast cancer in women aged 50–69 years, by state and territory, 1992–1996, 1997–2001 and 2002–2006

Incidence of invasive breast cancer by geographic region

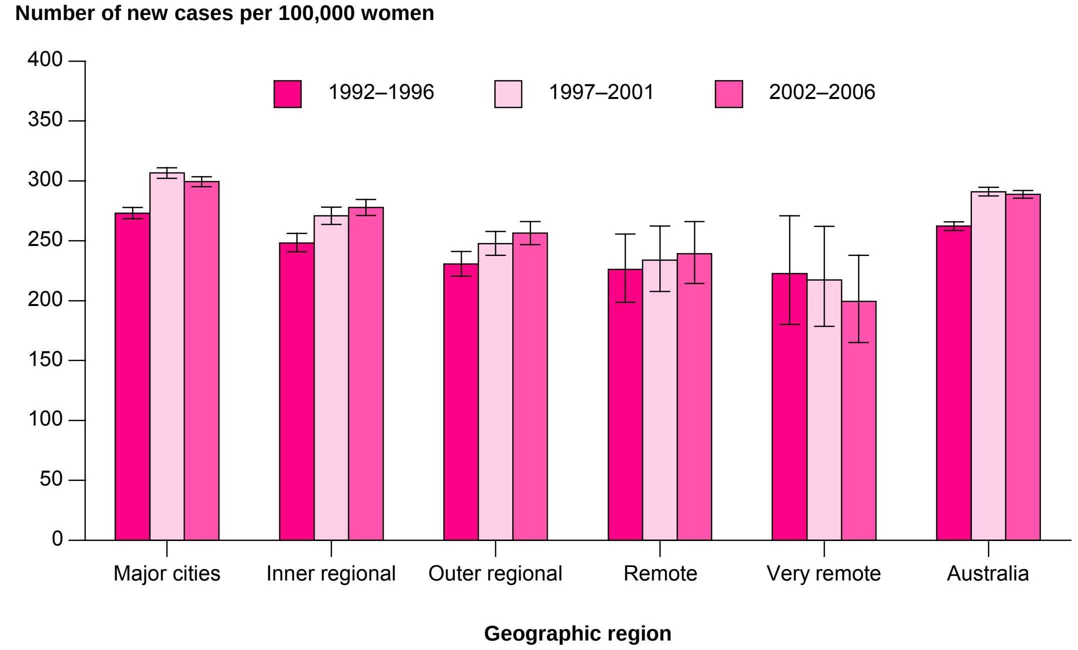
The incidence of invasive breast cancer in women aged 50–69 years decreased with increasing level of remoteness. In 2002–2006, incidence fell from 299.3 new cases per 100,000 women in *Major cities* to 199.4 new cases per 100,000 women in *Very remote* locations (Table 7.4), a trend that is unchanged from both the previous (1997–2001) and earlier (1992–1996) 5-year periods (Figure 7.5).

Table 7.4: Incidence of breast cancer in women aged 50–69 years, by geographic region, 1997–2001 and 2002–2006

	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
Rate 1997–2001	306.5	270.8	247.6	233.8	217.4	290.9
95% CI	302.0–311.0	263.6–278.2	237.7–257.8	207.6–262.3	178.5–262.1	287.3–294.4
Rate 2002–2006	299.3	277.8	256.4	239.1	199.4	289.1
95% CI	295.2–303.4	271.1–284.6	247.0–266.1	214.3–266.0	164.8–237.8	285.8–292.4

Note: Rates are the number of breast cancers detected per 100,000 women and age standardised to the Australian population at 30 June 2001.

Figure 7.5 also shows that the national increase in the incidence rate from 1992–1996 to 2002–2006 was also evident in *Major cities* and *Inner regional* locations, and probably also *Outer regional* locations. These data do not, however, allow us to attribute a similar trend to *Remote* and *Very remote* locations due to small numbers and broad confidence intervals. Note that, although the mean incidence in *Very remote* locations appears to have decreased over this time, these data should not be interpreted as having changed due to the broad and overlapping confidence intervals across the three 5-year periods (Figure 7.5).



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW Australian Cancer Database.

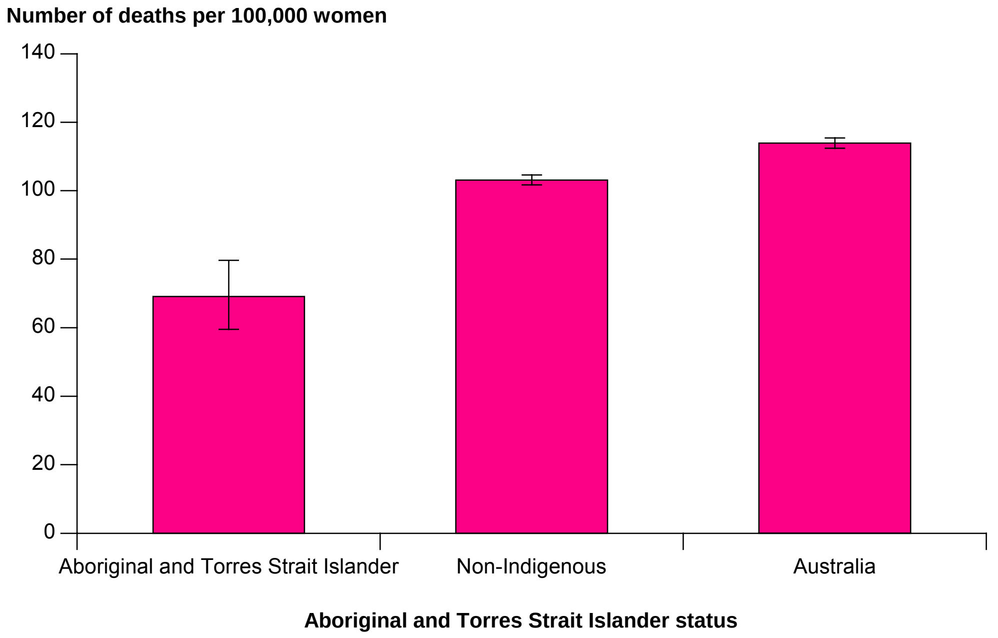
Figure 7.5: Incidence of breast cancer in women aged 50–69 years, by geographic region, 1992–1996, 1997–2001 and 2002–2006

Incidence of invasive breast cancer by Aboriginal and Torres Strait Islander status

The collection of reliable information by the state and territory cancer registries on the Aboriginal and Torres Strait Islander status of individuals diagnosed with cancer is problematic, since primary cancer diagnosis information is sourced from pathology forms that do not have the capacity to record this information (although work is currently underway to include Aboriginal and Torres Strait Islander status on pathology forms). The registries collect this information from additional sources such as hospitals records and death records, which affects the completeness and correctness of these data.

Because of these limitations, incidence of invasive breast cancer by Aboriginal and Torres Strait Islander status has been considered of insufficient quality, and thus has never previously been reported in this publication. Certainly this insufficiency is true at the national level, but a recent AIHW report (AIHW & NBOCC 2009) investigated the validity in reporting breast cancer incidence by Aboriginal and Torres Strait Islander status, and determined that relatively robust data of this kind could be reported for four states and territories: Queensland, Western Australia, South Australia and the Northern Territory. Note that, even for these four states and territories, the level of missing data on Aboriginal and Torres Strait Islander status is about 10% (AIHW & NBOCC 2009). Nevertheless, it is considered that the benefits of reporting these incidence data outweigh the risk of including imperfect and incomplete data.

The incidence of invasive breast cancer by Aboriginal and Torres Strait Islander status has been taken directly from the report *Breast cancer in Australia: an overview, 2009* (AIHW & NBOCC 2009). Note that in this report incidence is for women of all ages, and is not limited to women aged 50–69 years.



Notes

1. Bars on columns represent 95% confidence intervals.
2. 'Aboriginal and Torres Strait Islander' and 'non-Indigenous' are for Qld, WA, SA and NT only. 'Australia' includes all states and territories.

Source: Aboriginal and Torres Strait Islander and non-Indigenous data: AIHW & NBOCC 2009.

Figure 7.6: Incidence of breast cancer in women of all ages, by Aboriginal and Torres Strait Islander status, Queensland, Western Australia, South Australia and the Northern Territory, and all Australian women, 2002–2006

It was shown that, over the 5-year period 2002–2006, Aboriginal and Torres Strait Islander women in Queensland, Western Australia, South Australia and the Northern Territory had a significantly lower incidence of invasive breast cancer compared with non-Indigenous women from these states and territories at 69.1 new cases per 100,000 women compared with the non-Indigenous rate of 103.1 new cases per 100,000 women (Figure 7.6). This finding supports previous reports of lower breast cancer incidence in Aboriginal and Torres Strait Islander women (ABS & AIHW 2008; Roder 2005).

Despite a lower rate, breast cancer is the most commonly diagnosed cancer for Aboriginal and Torres Strait Islander women in Queensland, Western Australia, South Australia and the Northern Territory (AIHW & NBOCC 2009).

Indicator 7b Incidence of ductal carcinoma in situ

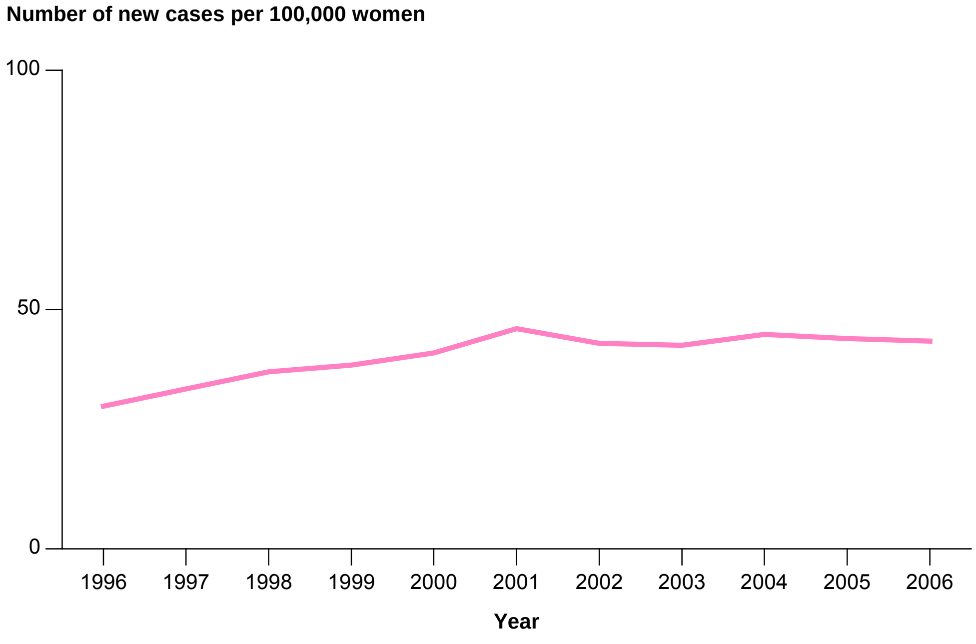
Incidence of ductal carcinoma in situ (DCIS) is reported as the number of new cases of DCIS diagnosed per 100,000 women.

The incidence of DCIS by age is reported for a 12-month period (1 January to 31 December), whereas incidence of DCIS by state and territory is reported over a 5-year period to improve the stability and comparability of rates. Further, in order to produce comparable rates from the relatively small number of DCIS cases, incidence of DCIS is reported by 10-year age groups, rather than the 5-year age groups used for incidence of invasive breast cancer.

The most recent incidence of DCIS data are for 2006.

Incidence of ductal carcinoma in situ trends

Incidence of DCIS increased over time. For women aged 50–69 years, incidence of DCIS increased steadily from 29.8 new cases per 100,000 women in 1996 to a peak of 46.0 new cases in 2001, thereafter remaining steady at around 43 to 45 new cases per 100,000 women (Figure 7.7). In 2006 the incidence of DCIS in women aged 50–69 years was 43.4 new cases per 100,000 women (Table 7.5).



Source: AIHW analysis of state and territory cancer registry data.

Figure 7.7: Incidence in ductal carcinoma in situ in women aged 50–69 years, 1996–2006

Over this same period, the number of new cases of DCIS in women aged 50–69 years increased from 483 in 1996 to 874 in 2001, when the incidence rate was at its highest—an 81.0% increase. In contrast, the number of new cases over the following 5 years only increased from 841 in 2002 to 961 in 2006—a much smaller increase at 14.3%.

Incidence of DCIS in women of all ages showed a similar trend, increasing from 10.1 new cases per 100,000 women in 1996 to 14.3 in 2001, thereafter remaining steady at around 14 new cases per 100,000 women. In 2006, incidence of DCIS for all women was 43.4 new cases per 100,000 women, with 1,508 new cases overall that year.

Table 7.5: Incidence of ductal carcinoma in situ in women aged 50–69 years, 1996–2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Rate	29.8	33.4	37.0	38.4	40.9	46.0	42.9	42.5	44.8	43.9	43.4
95% CI	27.2–32.6	30.7–36.3	34.2–39.9	35.6–41.4	38.0–43.9	43.0–49.2	40.1–45.9	39.7–45.4	42.0–47.8	41.2–46.8	40.7–46.3

Note: Rates are the number of DCISs detected per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cancer registry data.

Incidence of ductal carcinoma in situ by age

In 2006, the highest incidence of DCIS was for women aged 60–69 years, for which it was 49.6 new cases per 100,000 women. The next highest incidence was for women aged 50–59 years at 39.4 new cases per 100,000 women.

In 2006, new cases of DCIS diagnosed in women aged 50–69 years comprised 65.6% of all DCIS cases in women aged 40 years and over. This is an increase from 57.3% of all DCIS cases in women aged 40 years and over in 1996.

Incidence of ductal carcinoma in situ by state and territory

In 2002–2006, the incidence of DCIS for women of all ages in the states and territories was relatively stable, with most states and territories being close to the national rate of 13.8 new cases per 100,000 women. This rate was notably higher in Western Australia at 18.3 new cases per 100,000 women and notably lower in the Northern Territory at 7.1 new cases per 100,000 women, although caution should be used when interpreting rates from small numbers such as these.

Table 7.6: Incidence of ductal carcinoma in situ in women aged 50–69 years, by state and territory, 1997–2001 and 2002–2006

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Rate 1997–2001	36.5	42.7	35.4	51.4	36.8	38.5	44.3	20.3	39.3
95% CI	34.4–38.7	40.0–45.5	32.6–38.4	46.6–56.5	32.5–41.4	31.0–47.4	33.6–57.2	9.8–36.8	38.0–40.6
Rate 2002–2006	40.1	42.9	46.0	60.2	36.1	40.5	49.3	25.2	43.5
95% CI	38.0–42.2	40.4–45.5	43.1–49.1	55.5–65.2	32.2–40.3	33.3–48.8	39.0–61.6	14.7–40.2	42.3–44.8

Note: Rates are the number of DCIS detected per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW analysis of state and territory cancer registry data.

For women aged 50–69 years, the trend was similar, with most states and territories recording an incidence of around the national rate of 43.5 new cases per 100,000 women. Again, Western Australia and the Northern Territory deviated from this trend, at 60.2 and

25.2 new cases per 100,000 women respectively (Table 7.6) although, again, these rates are based on relatively small numbers, even with 5 years of data combined.

Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of state and territory cancer registry data.

Figure 7.8: Incidence of ductal carcinoma in situ in women aged 50–69 years, by state and territory, 1997–2001 and 2002–2006

The only statistically significant changes in DCIS incidence rates between 1997–2001 and 2002–2006 were nationally (from 39.3 to 43.5 new cases per 100,000 women) and for Queensland (from 35.4 to 46.0 new cases per 100,000 women) (Figure 7.8).

Indicator 8 Mortality

BreastScreen Australia aims to reduce mortality from breast cancer. Mortality rates are based on all Australian women, including deaths from breast cancer in women both within and outside BreastScreen Australia.

Key findings

- Mortality from invasive breast cancer, after remaining stable between 1982 and 1994 at between 66 and 69 deaths per 100,000 women, decreased from 66.4 deaths per 100,000 women in 1995 to 47.0 in 2007, for women aged 50–69 years.
- Despite Aboriginal and Torres Strait Islander women experiencing a significantly lower incidence of invasive breast cancer, mortality from invasive breast cancer was not found to be significantly different between Aboriginal and Torres Strait Islander women and non-Indigenous women.

Mortality

Mortality statistics are one of the most comprehensively collected national data sets. Registration of death is a legal requirement in Australia and, as a result, compliance is virtually complete. Registration of deaths is the responsibility of the Registrar of Births, Deaths and Marriages in each state and territory. The registrars provide the mortality data to the ABS for coding the cause of death and compilation into national statistics. The AIHW also holds these data in the AIHW National Mortality Database, from which the data presented here are sourced.

Mortality from invasive breast cancer measures the number of deaths each year for which breast cancer was the underlying cause of death. Analyses are based on the year of death, except for 2007 (the latest year for which mortality data are available), which is based on year of registration of death. Note that about 5% of deaths are not registered until the year following the death (ABS 2007). These data include mortality from all invasive breast cancers, screen-detected (through BreastScreen Australia) or otherwise.

Mortality from invasive breast cancer is reported as the number of deaths for which breast cancer was the underlying cause of death per 100,000 women.

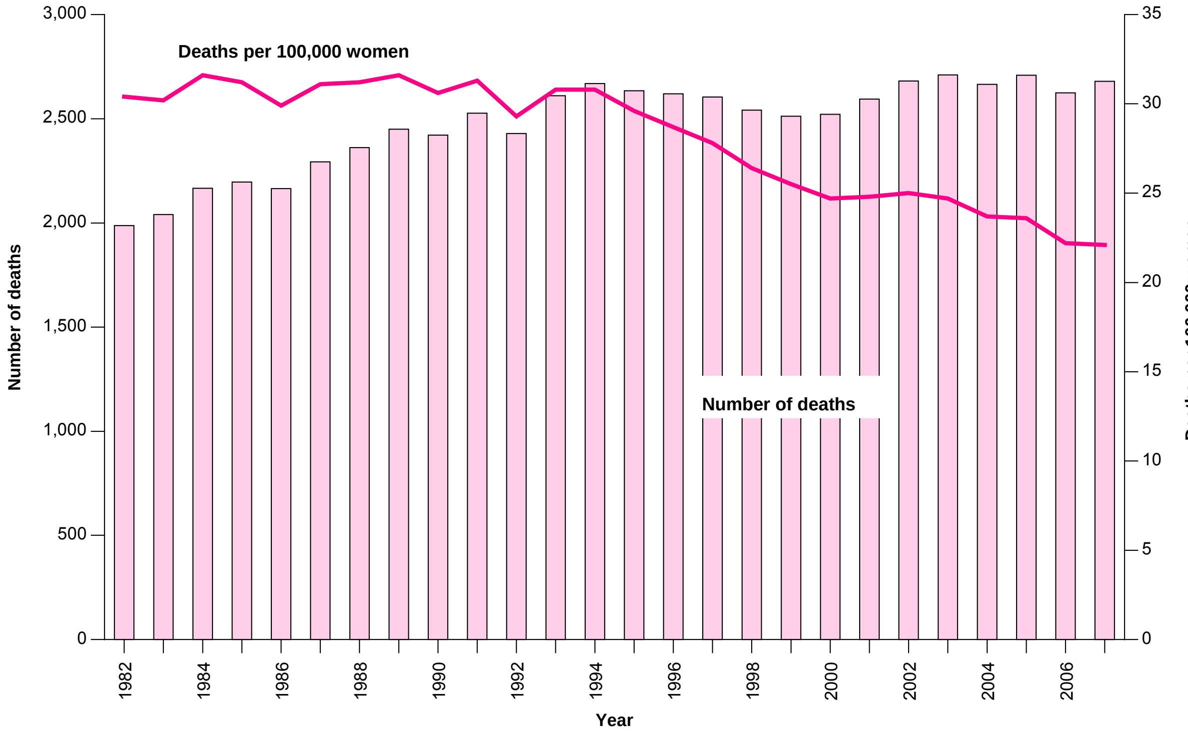
Mortality from invasive breast cancer by age is reported for a 12-month period (1 January to 31 December). Mortality from invasive breast cancer by state and territory, geographic region and Aboriginal and Torres Strait Islander status is reported over a 5-year period to improve the stability and comparability of rates.

The most recent data for mortality from invasive breast cancer are for 2007.

Mortality from invasive breast cancer trends

Mortality from invasive breast cancer decreased over time. For women aged 50–69 years, mortality was relatively stable between 1982 and 1994 at between around 66 and 69 deaths per 100,000 women (this was true for all years except for 1992, during which mortality briefly dropped to around 61 deaths per 100,000 women), but began to fall steadily from 1995 onwards (Figure 8.1). This fall was from 66.4 deaths per 100,000 women in 1995 to 47.0 deaths per 100,000 women in 2007 (the latest year for which data are available) (Table 8.1).

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

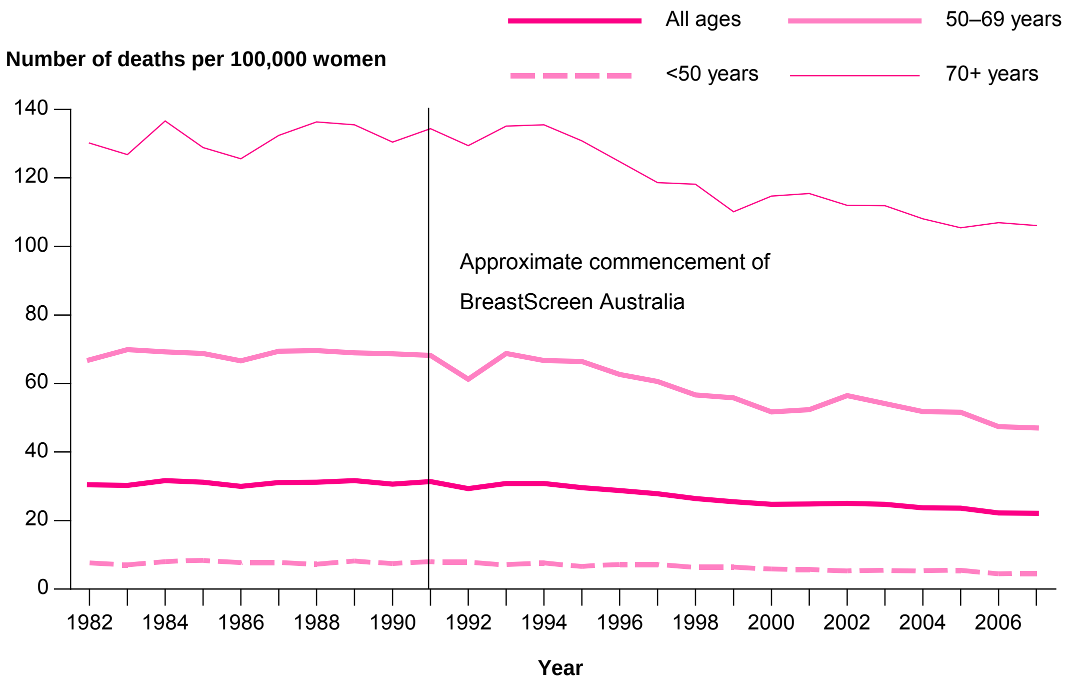


Source: AIHW analysis of BreastScreen Australia data.

Figure 8.1: Number of deaths from breast cancer and number of deaths per 100,000 women, 1982–2007

The corresponding number of deaths varied over time, as shown in Figure 8.1. Between 1982 and 1994 when the mortality rate was steady, the actual number of deaths for women aged 50–69 years increased from 933 in 1982 to 1,059 in 1994—a 13.5% increase. The initial fall in the mortality rate from 1995 onwards was accompanied by a decrease in the number of deaths from invasive breast cancer for the first time. This decrease was from 1,083 deaths in 1995 to 953 deaths in 2000, in the realm of the number of deaths seen in the 1980s. Thereafter, despite a mortality rate that continued to fall, the number of deaths remained relatively steady at around 1,100 deaths each year. In 2007, the number of deaths from invasive breast cancer in women aged 50–69 years was 1,085.

For women outside the BreastScreen Australia target age group, mortality trends appear to be mirrored in women aged 70 years and over, although for all years mortality in women aged 70 years or over was around 60 deaths per 100,000 women higher than it was for women aged 50–69 years (Figure 8.2). Further (although difficult to see in Figure 8.2), the general trend described for women aged 50–69 years was also true for women aged less than 50 years (which includes but is not limited to women aged 40–49 years). For these younger women, mortality was steady at between around 7 and 8 deaths per 100,000 women until 1995, during which mortality fell below 7 deaths for the first time, thereafter falling to 4.6 deaths per 100,000 women in 2007 (Table 8.1).



Source: AIHW National Mortality Database.

Figure 8.2: Number of deaths from breast cancer per 100,000 women, by age, 1982–2007

For all age groups combined, similar to the trends described above, mortality from invasive breast cancer was steady at around 30 deaths per 100,000 women, before falling from 29.6 in 1995 to 22.1 deaths per 100,000 women in 2007 (Table 8.1)—a total of 2,680 deaths in this latest year. This makes breast cancer the second most common cause of cancer mortality of Australian women in 2007.

Table 8.1: Number of deaths from breast cancer per 100,000 women, 1982–2007

	Age group (years)			
	All ages	**<50**	**50–69**	**70+**
1982	30.4	7.6	66.9	130.2
1983	30.2	7.1	69.9	126.8
1984	31.6	8.0	69.2	136.6
1985	31.2	8.4	68.8	128.9
1986	29.9	7.7	66.6	125.6
1987	31.1	7.8	69.4	132.4
1988	31.2	7.3	69.6	136.3
1989	31.6	8.2	69.0	135.5
1990	30.6	7.5	68.7	130.5
1991	31.3	8.0	68.2	134.4
1992	29.3	7.9	61.2	129.4
1993	30.8	7.1	68.8	135.1
1994	30.8	7.6	66.7	135.5
1995	29.6	6.6	66.4	130.8
1996	28.7	7.2	62.6	124.8
1997	27.8	7.2	60.6	118.6
1998	26.4	6.4	56.6	118.1
1999	25.5	6.4	55.8	110.1
2000	24.7	5.9	51.7	114.7
2001	24.8	5.8	52.3	115.4
2002	25.0	5.3	56.5	112.0
2003	24.7	5.5	54.1	111.9
2004	23.7	5.3	51.8	108.1
2005	23.6	5.5	51.6	105.5
2006	22.2	4.5	47.4	106.9
2007	22.1	4.6	47.0	106.1

Note: Rates are the number of deaths from breast cancer per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.

Mortality from invasive breast cancer by age

In 2007, the mortality increased with age, from 12.8 deaths per 100,000 women for women aged 40–44 years to 179.8 deaths per 100,000 women for women aged 85 years and over (Table 8.2).

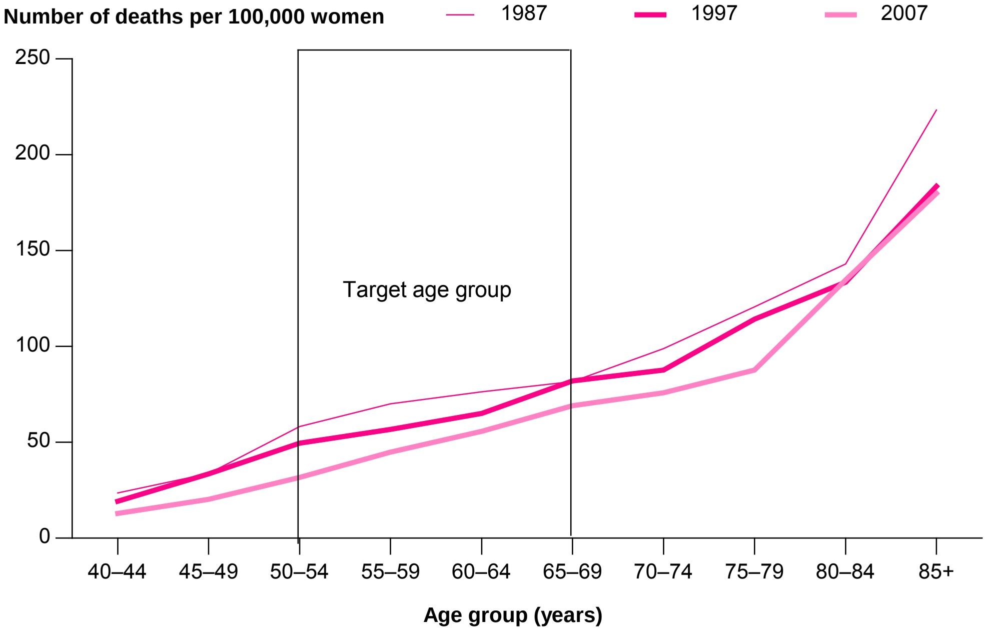
Table 8.2: Age-specific mortality rates for breast cancer, 1997, 2002, 2006 and 2007

	Age group (years)									
	40–44	**45–49**	**50–54**	**55–59**	**60–64**	**65–69**	**70–74**	**75–79**	**80–84**	**85+**
1997	19.2	33.5	49.5	56.7	64.9	82.0	87.6	114.2	133.4	183.5
2002	14.5	24.3	45.3	54.1	64.4	71.6	72.5	104.4	133.8	194.7
2006	14.0	19.9	34.5	47.0	58.4	59.5	77.3	89.0	134.0	179.6
2007	12.8	20.1	31.6	44.8	55.7	68.9	75.8	87.7	134.7	179.8

Note: Rates are the number of deaths from breast cancer per 100,000 women.

Source: AIHW National Mortality Database.

The trend of increasing mortality with increasing age described in 2007 was also true 10 years previous to this in 1997, and also 10 years earlier again in 1987 (Figure 8.3).



Source: AIHW National Mortality Database.

Figure 8.3: Age-specific mortality rates for breast cancer, 1987, 1997 and 2007

In 2007, deaths from invasive breast cancer in women aged 50–69 years comprised 40.4% of all breast cancer deaths. This is unchanged from the 39.6% of breast cancer deaths in 1997, but a fall from the 44.0% of all breast cancer deaths in 1987.

Mortality from invasive breast cancer by state and territory

In 2003–2007, mortality from invasive breast cancers for women of all ages across states and territories was relatively stable around the national rate of 23.2 deaths per 100,000 women. Mortality rates for women aged 50–69 years also varied little around the national rate of 50.3 deaths per 100,000 women (Table 8.3).

Note: Bars on columns represent 95% confidence intervals.

Source: AIHW National Mortality Database.

Figure 8.4: Number of deaths from breast cancer per 100,000 women in women aged 50–69 years, by state and territory, 1993–1997, 1998–2002 and 2003–2007

Apparent decreases in mortality between 1998–2002 and 2003–2007 across the states and territories were not found to be statistically significant for women aged 50–69 years, although decreases in mortality from the earlier period of 1993–1997 were statistically significant in the larger states and territories (Figure 8.4).

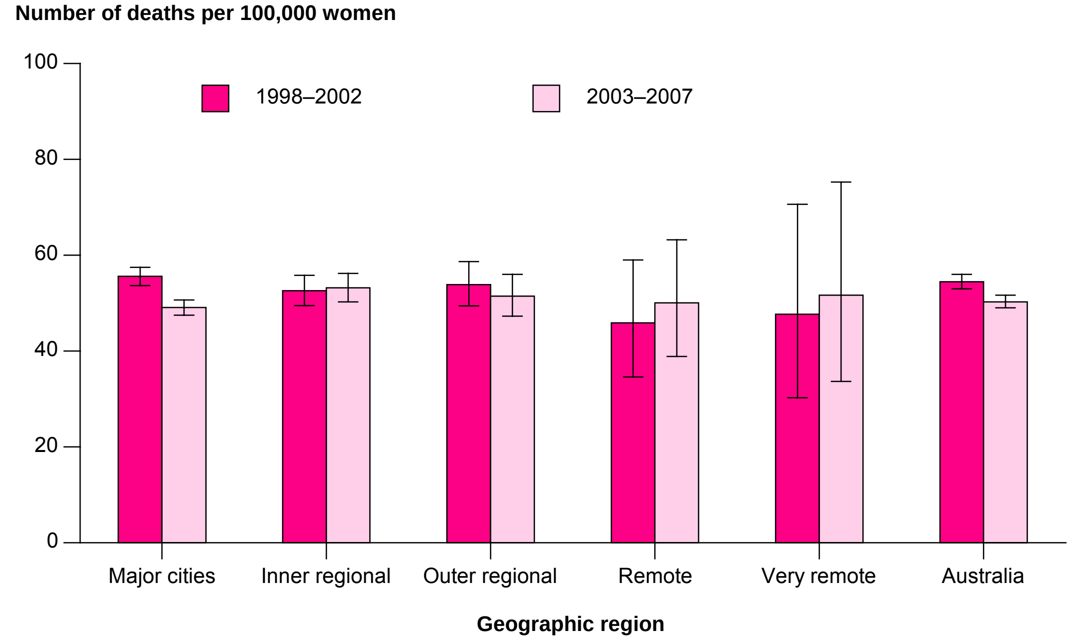
Table 8.3: Number of deaths from breast cancer per 100,000 women in women aged 50–69 years and women of all ages, by state and territory, 1998–2002 and 2003–2007

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
50–69 years									
Rate 1998–2002	54.5	56.3	51.1	49.7	59.3	60.2	59.2	60.8	54.5
95% CI	52.0–57.1	53.3–59.4	47.8–54.7	45.1–54.7	54.0–65.0	50.8–70.8	46.8–73.9	40.8–86.9	53.0–56.1
Rate 2003–2007	50.1	51.5	49.8	48.1	53.5	46.6	45.9	46.8	50.3
95% CI	47.8–52.5	48.8–54.3	46.8–52.9	44.0–52.5	48.8–58.5	39.0–55.3	36.1–57.5	32.3–65.3	48.9–51.6
All ages									
Rate 1998–2002	24.3	26.8	24.2	24.4	26.9	27.8	26.9	26.1	25.3
95% CI	23.6–25.0	25.9–27.7	23.2–25.3	23.0–25.9	25.4–28.5	25.0–30.8	23.1–31.2	19.2–34.4	24.8–25.7
Rate 2003–2007	23.4	23.8	22.2	22.2	24.4	22.6	23.3	19.0	23.2
95% CI	22.8–24.1	23.0–24.7	21.3–23.1	21.0–23.6	23.0–25.8	20.2–25.1	20.0–27.0	13.7–25.5	22.8–23.6

Note: Rates are the number of deaths from breast cancer per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.

Mortality from invasive breast cancer by geographic region



Note: Bars on columns represent 95% confidence intervals.

Source: AIHW analysis of BreastScreen Australia data.

Figure 8.5: Number of deaths from breast cancer per 100,000 women, by geographic region, for women aged 50–69 years, 1993–1997 and 2003–2007

In 2003–2007, mortality from invasive breast cancers for women of all ages and women aged 50–69 years across geographic regions was relatively stable around the respective national rates (Table 8.4). Mortality in major cities decreased significantly between 1998–2002 and 2003–2007, along with the national rate (Figure 8.5).

Table 8.4: Number of deaths from breast cancer per 100,000 women, by geographic region, for women aged 50–69 years and women of all ages, 1998–2002 and 2003–2007

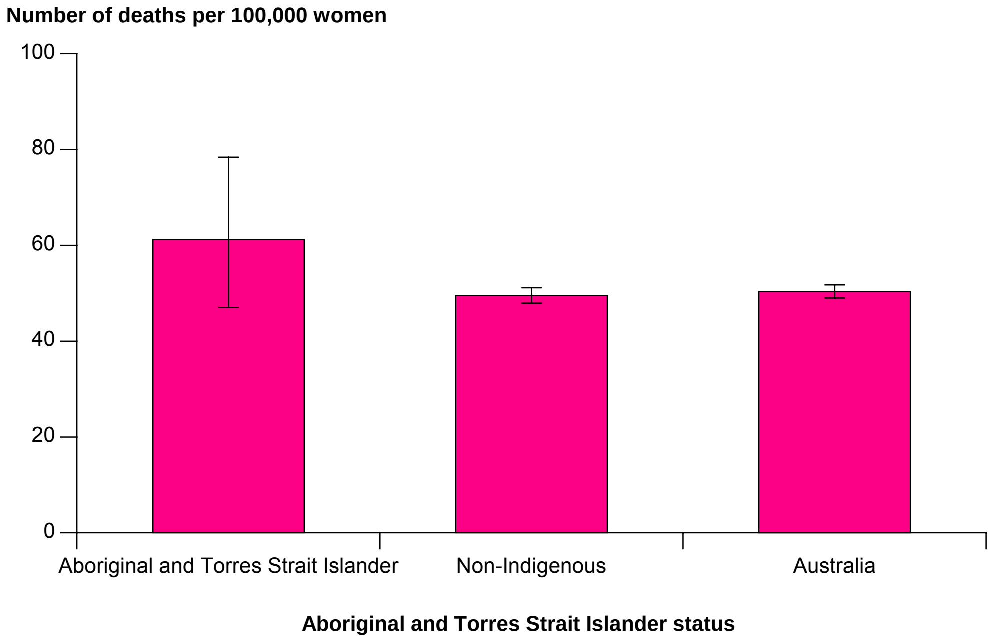
	Major cities	Inner regional	Outer regional	Remote	Very remote	Australia
50–69 years						
Rate 1998–2002	55.6	52.6	53.9	45.9	47.7	54.5
95% CI	53.8–57.6	49.4–55.8	49.4–58.7	34.6–59.0	30.2–70.6	53.0–56.1
Rate 2003–2007	49.1	53.2	51.5	50.1	51.7	50.3
95% CI	47.5–50.8	50.3–56.3	47.3–56.0	39.0–63.3	33.7–75.3	48.9–51.6
All ages						
Rate 1998–2002	25.3	25.3	25.3	22.7	22.6	25.3
95% CI	24.8–25.9	24.3–26.2	23.9–26.7	19.1–26.9	16.9–29.6	24.8–25.7
Rate 2003–2007	22.6	24.8	24.7	22.5	23.8	23.2
95% CI	22.1–23.1	23.9–25.7	23.4–26.1	18.9–26.5	17.6–31.3	22.8–23.6

Note: Rates are the number of deaths from breast cancer per 100,000 women and age standardised to the Australian population at 30 June 2001.

Source: AIHW National Mortality Database.

Mortality from breast cancer by Aboriginal and Torres Strait Islander status

Information on Aboriginal and Torres Strait Islander status on the AIHW National Mortality Database is considered of sufficient quality for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory. Note that this is different from previous reports that only included data for Queensland, Western Australia, South Australia and the Northern Territory. The addition of New South Wales data from 2001 means that comparisons with previously reported rates are not valid, nor is comparison with the previous 5-year period possible.



Notes

1. Bars on columns represent 95% confidence intervals.
2. 'Aboriginal and Torres Strait Islander' and 'non-Indigenous' are for NSW, Qld, WA, SA and NT only. 'Australia' includes all states and territories.

Source: AIHW National Mortality Database.

Figure 8.6: Number of deaths from breast cancer per 100,000 women, by Aboriginal and Torres Strait Islander status, for women aged 50–69 years, New South Wales, Queensland, Western Australia, South Australia and the Northern Territory, 2003–2007

These data show that, despite significantly lower incidence of invasive breast cancer (as shown in Indicator 7a), mortality where invasive breast cancer was the underlying cause was not found to be significantly different between Aboriginal and Torres Strait Islander women and non-Indigenous women in 2003–2007 for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory (Figure 8.6).

This was true for women aged 50–69 years and women of all ages (Table 8.5).

Table 8.5: Number of deaths from breast cancer per 100,000 women, by Aboriginal and Torres Strait Islander status, for women aged 50–69 years and women of all ages, New South Wales, Queensland, Western Australia, South Australia and the Northern Territory, 2003–2007

	NSW, Qld, WA, SA and NT[(a)]		
	Aboriginal and Torres Strait Islander	Non-Indigenous	Australia[(b)]
50–69 years			
Rate 2003–2007	61.2	49.5	50.3
95% CI	46.9–78.3	48.0–51.1	48.9–51.6
All ages			
Rate 2003–2007	23.4	23.1	23.5
95% CI	18.8–28.7	22.6–23.6	23.1–23.9

(a) ‘Aboriginal and Torres Strait Islander’ and ‘non-Indigenous’ are for New South Wales, Queensland, Western Australia, South Australia and the Northern Territory only. Data from these jurisdictions are considered to have adequate levels of Indigenous identification in death registration data at the time this report was prepared.

(b) All women in Australia, which includes Aboriginal and Torres Strait Islander, non-Indigenous and women in the ‘not stated’ category for Aboriginal and Torres Strait Islander status.

Notes

1. Age-standardised rates are the number of deaths from breast cancer per 100,000 women, age standardised to the Australian population at 30 June 2001.
2. Deaths between 2003 and 2006 were derived by year of death and state of usual residence; deaths in 2007 were derived by year of registration of death and state of usual residence.

Source: AIHW National Mortality Database.

Appendix A Additional data tables

Additional data tables that provide more detail on the data presented in this report can be found in the accompanying publication: *BreastScreen Australia monitoring report 2006–2007 and 2007–2008: supplementary data tables* (AIHW 2010a).

Figure A1: Number of women aged 50–69 years in each stage of the BreastScreen Australia screening process over the 12 month period 1 January to 31 December 2008

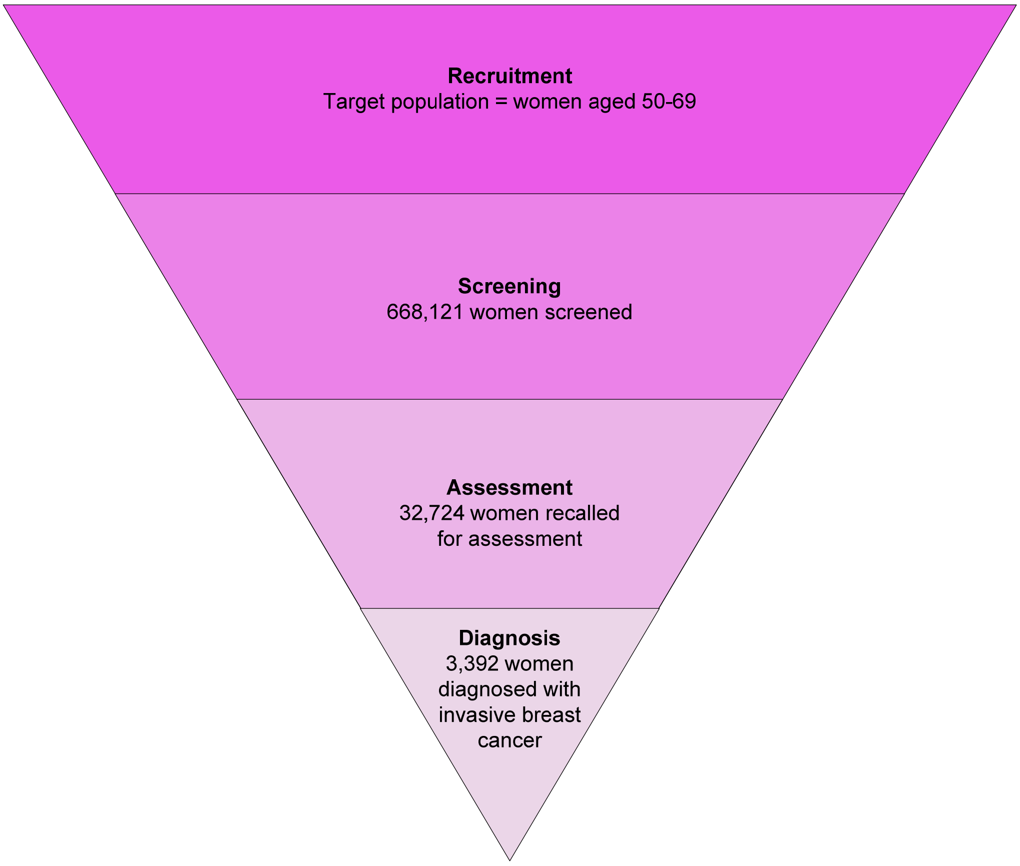


Table A1: BreastScreen Australia participation, by selected population groups, women 50–69 years, 2007–2008

	Number	ASR	95% CI
		50–69 years	
State and territory			
NSW	412,336	54.3	54.1–54.5
Vic	305,368	53.4	53.2–53.6
Qld	262,354	57.4	57.2–57.6
WA	125,611	55.3	55.0–55.6
SA	107,925	57.4	57.1–57.8
Tas	33,161	54.5	53.9–55.1
ACT	19,574	54.2	53.4–55.0
NT(a)	7,074	40.4	39.4–41.4
Australia	**1,273,403**	**54.9**	**54.8–55.0**
Remoteness area			
Major cities	827,202	53.8	53.7–54.0
Inner regional	288,243	56.7	56.5–56.9
Outer regional	134,677	58.3	58.0–58.6
Remote	16,924	56.3	55.5–57.2
Very remote	6,357	50.2	49.0–51.4
Australia	**1,273,403**	**54.9**	**54.8–55.0**
Socioeconomic status			
1 (lowest)	252,785	53.6	53.3–53.8
2	261,211	53.7	53.5–53.9
3	255,699	57.0	56.8–57.3
4	244,705	56.1	55.9–56.3
5 (highest)	259,004	54.4	54.2–54.6
Australia	**1,273,403**	**54.9**	**54.8–55.0**
Aboriginal and Torres Strait Islander status			
Aboriginal and Torres Strait Islander	10,189	36.0	35.3–36.7
Non-Indigenous	1,255,154	54.8	54.7–54.9
Not stated	8,060	. .	. .
Australia	**1,273,403**	**54.9**	**54.8–55.0**
Main language spoken at home			
English	1,099,997	56.7	56.6–56.8
Non-English	170,600	45.1	44.8–45.3
Not stated	2,806	. .	. .
Australia	**1,273,403**	**54.9**	**54.8–55.0**

(a) BreastScreen Australia services are not provided in some remote areas of the Northern Territory; this may have affected the rate for the Northern Territory.

Source: AIHW analysis of BreastScreen Australia data.

Table A2: Number and proportion of women participating in BreastScreen Australia, by age, state and territory, 2007–2008

Age group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number									
40–44	15,421	10,239	38,619	8,615	5,820	3,810	469	328	83,321
45–49	29,294	19,591	57,974	16,780	11,850	6,468	1,217	990	144,164
50–69	**412,336**	**305,368**	**262,354**	**125,611**	**107,925**	**33,161**	**19,574**	**7,074**	**1,273,403**
70–74	15,694	29,052	32,750	6,219	7,312	3,073	799	107	95,006
75+	9,560	12,453	12,933	3,936	4,944	1,161	381	54	45,422
Per cent									
40–44	3.2	2.7	9.5	5.3	4.2	8.0	2.1	3.8	5.1
45–49	6.1	5.2	14.3	10.4	8.6	13.6	5.4	11.6	8.8
50–69	**85.5**	**81.1**	**64.8**	**77.9**	**78.3**	**69.6**	**87.2**	**82.7**	**77.6**
70–74	3.3	7.7	8.1	3.9	5.3	6.4	3.6	1.3	5.8
75+	2.0	3.3	3.2	2.4	3.6	2.4	1.7	0.6	2.8

Source: AIHW analysis of BreastScreen Australia data.

Table A3: Number of women rescreening in BreastScreen Australia, by age, state and territory, index year 2005

Age group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number									
40–44	1,490	1,222	14,461	3,285	1,873	1,248	58	148	23,785
45–49	5,311	4,974	21,123	6,644	3,769	2,083	658	412	44,974
50–67	**140,677**	**102,031**	**93,460**	**46,451**	**33,777**	**10,198**	**7,854**	**2,130**	**436,578**
70–74	2,112	11,505	10,858	1,502	1,711	1,043	151	18	28,900
75+	1,345	1,254	1,999	796	994	212	64	11	6,675
Per cent									
40–44	1.0	1.0	10.2	5.6	4.4	8.4	0.7	5.4	4.4
45–49	3.5	4.1	14.9	11.3	8.9	14.1	7.5	15.2	8.3
50–67	**93.2**	**84.3**	**65.9**	**79.2**	**80.2**	**69.0**	**89.4**	**78.3**	**80.7**
70–74	1.4	9.5	7.7	2.6	4.1	7.1	1.7	0.7	5.3
75+	0.9	1.0	1.4	1.4	2.4	1.4	0.7	0.4	1.2

Source: AIHW analysis of BreastScreen Australia data.

Table A4: Number and proportion of women recalled to assessment by BreastScreen Australia, by age, state and territory, 2008

Age group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number									
40–44	675	504	1,844	333	112	223	29	13	3,733
45–49	1,244	971	2,338	624	184	289	58	55	5,763
50–69	**10,700**	**8,677**	**7,689**	**2,662**	**1,445**	**921**	**408**	**222**	**32,724**
70–74	395	548	801	135	100	37	15	7	2,038
75+	257	224	350	84	66	30	8	1	1,020
Per cent									
40–44	5.1	4.6	14.2	8.7	5.9	14.9	5.6	4.4	8.2
45–49	9.4	8.9	18.0	16.3	9.6	19.3	11.2	18.5	12.7
50–69	**80.6**	**79.4**	**59.0**	**69.4**	**75.8**	**61.4**	**78.8**	**74.5**	**72.3**
70–74	3.0	5.0	6.2	3.5	5.2	2.5	2.9	2.3	4.5
75+	1.9	2.1	2.7	2.2	3.5	2.0	1.5	0.3	2.3

Source: AIHW analysis of BreastScreen Australia data.

Table A5: Number and proportion of women with invasive breast cancer detected by BreastScreen Australia, by age, state and territory, 2008

Age group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
Number									
40–44	16	8	54	10	7	5	0	1	101
45–49	41	31	91	34	18	11	3	0	229
50–69	**1,060**	**790**	**751**	**348**	**284**	**84**	**58**	**17**	**3,392**
70–74	84	81	99	41	37	5	2	1	350
75+	57	44	55	29	25	5	1	1	217
Per cent									
40–44	1.3	0.8	5.1	2.2	1.9	4.5	0.0	5.0	2.4
45–49	3.3	3.2	8.7	7.4	4.9	10.0	4.7	0.0	5.3
50–69	**84.3**	**82.8**	**71.5**	**75.3**	**76.5**	**76.4**	**90.6**	**85.0**	**79.1**
70–74	6.7	8.5	9.4	8.9	10.0	4.5	3.1	5.0	8.2
75+	4.5	4.6	5.2	6.3	6.7	4.5	1.6	5.0	5.1

Source: AIHW analysis of BreastScreen Australia data.

Table A6: Number and proportion of women with ductal carcinoma in situ detected by BreastScreen Australia, by age, state and territory, 2008

Age group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
					Number				
40–49	19	22	43	17	4	5	1	0	111
50–69	**223**	**209**	**165**	**109**	**64**	**27**	**7**	**8**	**812**
70+	15	28	46	11	6	1	0	0	107
					Per cent				
40–49	7.4	8.5	16.9	12.4	5.4	15.2	12.5	0.0	10.8
50–69	**86.8**	**80.7**	**65.0**	**79.6**	**86.5**	**81.8**	**87.5**	**100.0**	**78.8**
70+	5.8	10.8	18.1	8.0	8.1	3.0	0.0	0.0	10.4

Source: AIHW analysis of BreastScreen Australia data.

Table A7: Number of screen-detected invasive breast cancers and interval cancers diagnosed, by age, state and territory, index years 2003–2005, 0–12 months following negative screening episode

Age group	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Australia
					Number of screen-detected cancers				
40–49	286	115	370	102	66	35	13	9	996
50–69	**2,634**	**1,876**	**1,705**	**890**	**772**	**237**	**123**	**47**	**8,284**
70+	755	538	478	129	139	53	14	2	2,108
					Number of interval cancers				
40–49	82	52	95	28	22	10	0	0	289
50–69	**352**	**298**	**237**	**119**	**91**	**41**	**10**	**3**	**1,151**
70+	62	40	37	14	8	6	1	0	168

Source: AIHW analysis of BreastScreen Australia data.

Table A8: Incidence of invasive breast cancer, by selected population groups, women 50–69 years and all ages, 2002–2006

	Number	ASR	95% CI
	50–69 years		
State and territory			
NSW	10,116	290	284.3–295.7
Vic	7,163	276.4	270.0–282.9
Qld	5,843	291.2	283.8–298.8
WA	2,992	298.2	287.6–309.1
SA	2,624	304.5	292.9–316.4
Tas	803	292.3	272.4–313.3
ACT	548	339.6	311.6–369.5
NT	147	204.3	171.6–241.4
Australia	**30,236**	**289.1**	**285.8–292.4**
Remoteness area			
Major cities	20,417	299.3	295.2–303.4
Inner regional	6,556	277.8	271.1–284.6
Outer regional	2,803	256.4	247.0–266.1
Remote	339	239.1	214.3–266.0
Very remote	122	199.4	164.8–237.8
Australia	**30,236**	**289.1**	**285.8–292.4**
	All ages		
Aboriginal and Torres Strait Islander status			
Aboriginal and Torres Strait Islander	234	69.1	59.5–79.7
Non-Indigenous	20,231	103.1	101.7–104.6
Not stated	2,299	. .	. .
Australia	**30,236**	**289.1**	**285.8–292.4**

Source: AIHW analysis of BreastScreen Australia data.

Table A9: Mortality from invasive breast cancer, by selected population groups, women 50–69 years, 2003–2007

	Number	ASR	95% CI
		50–69 years	
State and territory			
NSW	1,799	50.1	47.8–52.5
Vic	1,377	51.5	48.8–54.3
Qld	1,045	49.8	46.8–52.9
WA	502	48.1	44.0–52.5
SA	475	53.5	48.8–58.5
Tas	132	46.6	39.0–55.3
ACT	76	45.9	36.1–57.5
NT	36	46.8	32.3–65.3
Australia	**5,442**	**50.3**	**48.9–51.6**
Remoteness area			
Major cities	3,535	49.1	47.5–50.8
Inner regional	1,256	53.2	50.3–56.3
Outer regional	554	51.5	47.3–56.0
Remote	70	50.1	39.0–63.3
Very remote	27	51.7	33.7–75.3
Australia	**5,442**	**50.3**	**48.9–51.6**
Aboriginal and Torres Strait Islander status			
Aboriginal and Torres Strait Islander	64	61.2	46.9–78.3
Non-Indigenous	3,760	49.5	48.0–51.1
Not stated	33	. .	. .
Australia	**5,442**	**50.3**	**48.9–51.6**

Source: AIHW analysis of BreastScreen Australia data.

Appendix B BreastScreen Australia information

BreastScreen Australia definitions

Target population

BreastScreen Australia selects women on the basis of age alone. BreastScreen Australia actively targets women aged 50–69 years through recruitment strategies and reminder letters. Although women aged 40–49 years and 70 years or over can also attend, these women are not actively recruited.

Eligible population

Because BreastScreen Australia selects women on the basis of age alone, the eligible population, used as the denominator for the calculation of participation, is defined as 'women aged 50–69 years'.

Aboriginal and Torres Strait Islander status

The *BreastScreen Australia data dictionary* (AIHW & DoHA 2005) specifies that 'Aboriginal and Torres Strait Islander status' (currently 'Indigenous status' in the dictionary) should be coded as:

- Aboriginal
- Torres Strait Islander
- both Aboriginal and Torres Strait Islander
- not Indigenous or
- not stated.

For the purposes of this report, these categories were amalgamated and the data stratified into three categories:

- Aboriginal and Torres Strait Islander
- not Indigenous or
- not stated.

In addition, some jurisdictions do not use the 'not stated' category. If Aboriginal and Torres Strait Islander status is not given, it is set to a default value. The default used is not the same for all jurisdictions. Therefore there are likely to be some Aboriginal and Torres Strait Islander women who are being incorrectly assigned non-Indigenous status. This means that the analysis based upon Aboriginal and Torres Strait Islander status should be interpreted with caution.

Aboriginal and Torres Strait Islander women comprise a small proportion of women both in the population and within BreastScreen Australia. Aboriginal and Torres Strait Islanders make up about 2.5% of the Australian population, with 1.3% of the 2008 female population aged 50–69 years estimated to be Aboriginal or Torres Strait Islander, based on estimates in Aboriginal and Torres Strait Islander population projections (ABS cat. no. 3238.0) (ABS 2009).

Main language spoken at home

The *BreastScreen Australia data dictionary* (AIHW & DoHA 2005) recommends that 'main language spoken at home' be coded according to the four-digit ABS Australian Standard Classification of Languages, 1997 (ABS cat. no. 1267.0). This report has collapsed the classification into the simple dichotomy of 'English' and 'other language'.

Although this stratification is reported as 'main language spoken at home', practice varies between the jurisdictions as to how this information is collected. In some jurisdictions, there may thus be some lack of comparability with the *BreastScreen Australia data dictionary* definition of 'main language'.

In addition, some jurisdictions do not use the 'not stated' category. If the main language spoken at home is not given, it is set to a default value. The default used is not the same for all jurisdictions. This means that the analysis based upon the main language spoken at home should be interpreted with caution.

Tumour size

Tumour size is the size in millimetres of the malignant lesion, and applies to invasive cancers only. For more details about this stratification, see the definition given in the *BreastScreen Australia data dictionary* (AIHW & DoHA 2005).

Screening round

The *BreastScreen Australia data dictionary* (AIHW & DoHA 2005) distinguishes between a woman's screening round in the national program and her round in the state or territory program. The screening round in the national program is used for this stratification in this report. However, it is not always possible to determine the round in the national program, so, for some women, this stratification has been collected as the round number in the state or territory program.

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Appendix C Data sources and classifications

Data sources

Data used in this report are derived from multiple sources and are summarised below. All data are based on calendar years.

Indicator	Description	Data source
1	Participation	BreastScreen Australia state and territory services
2	Cancer detection	BreastScreen Australia state and territory services
3	Sensitivity	BreastScreen Australia state and territory services
4	DCIS detection	BreastScreen Australia state and territory services
5	Recall to assessment	BreastScreen Australia state and territory services
6	Rescreening	BreastScreen Australia state and territory services
7a	Incidence (ICD-10 C50)	Australian Cancer Database, AIHW
7b	Incidence of DCIS	State and territory cancer registries
8	Mortality (ICD-9 174, ICD-10 C50)	National Mortality Database, AIHW

BreastScreen Australia data

BreastScreen Australia has both national and state and territory components. Although policy is usually decided at a national level, coordination of screening activity is the responsibility of the individual state or territory. Data for participation, cancer detection, sensitivity, DCIS detection, recall to assessment and rescreening are provided by each state and territory BreastScreen program, and then compiled into national figures to allow national monitoring of BreastScreen Australia.

Population data

The ABS estimated resident female population was used to calculate participation, incidence and mortality rates in this report.

Participation was calculated using the average of the 2006 and 2007, and 2007 and 2008, estimated resident female populations. The only exception to this was participation by socioeconomic status, by language spoken at home and by Aboriginal and Torres Strait Islander status.

Because the ABS does not calculate the estimated resident population by socioeconomic status or language spoken at home, alternative methods were used to calculate the denominators for these rates. In the case of language spoken at home, the denominator was calculated by applying the age-specific distribution from the language question in the 2006 national population Census to the relevant age-specific estimated resident population counts. The denominator for rates based on socioeconomic status was calculated by applying an ABS concordance between statistical local area and socioeconomic status to the relevant estimated resident population by statistical local area counts.

The average of the ABS projected populations (ABS cat. no. 3238.0) (ABS 2009)for 2006 and 2007, and 2007 and 2008, was used as the denominator for Aboriginal and Torres Strait Islander women's participation.

The age-standardised rates in this publication were calculated using the total estimated resident Australian population at June 2001.

Incidence data

Incidence data in this report come from the Australian Cancer Database (formerly the National Cancer Statistics Clearing House)—a national collection of cancer statistics held and operated by the AIHW. The Australian Cancer Database receives data from individual state and territory cancer registries on cancers diagnosed in residents of Australia and produces reports on national incidence.

Mortality data

Mortality data in this report come from the AIHW's National Mortality Database, which is a national collection of de-identified information for all deaths in Australia maintained by the AIHW. Information on the characteristics and causes of death of the deceased is provided by the Registrars of Births, Deaths and Marriages and coded nationally by the ABS. Information on the cause of death is supplied by the medical practitioner certifying the death, or by a coroner. The data are updated each calendar year.

Mortality data in this report are given for 1992–2007. During this time, changes have been made to the coding and processing of mortality data that affect comparability of the data. Data for holdings for 1987–1996 were manually coded using the ninth revision of the International Classification of Diseases (ICD-9). Data holdings for 1997 onwards were coded using ICD-10, using an automated system with slightly different coding rules. The change to the coding and processing of mortality data introduced a break in the data time series.

Data have been analysed using the year of occurrence of death for the period 1992–2006 and year of registration of death for 2007. This is because mortality data by year of occurrence of death is a more accurate reflection of mortality during a particular year than year of registration data; however, owing to late registrations, year of occurrence data for 2007 are still incomplete.

All states and territories have provision for the identification of Aboriginal and Torres Strait Islander deaths on their death registration forms. However, the coverage of deaths identified as Aboriginal and Torres Strait Islander varies across states and territories and over time. Although the identification of Aboriginal and Torres Strait Islander deaths is incomplete in all state and territory registration systems, five jurisdictions (New South Wales, Queensland, Western Australia, South Australia and the Northern Territory) have been assessed by the ABS and the AIHW as having adequate identification.

Some mortality figures are based on a reporting period of 5 years rather than 12 months. This longer period allows for a greater aggregation of information on issues that are subject to wide fluctuations, and for a more confident and meaningful estimate of the outcomes.

Classifications

Age

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

This means that it is possible for a woman to be double-counted in the screening data. If she was screened in one jurisdiction and then screened again less than 2 years later in another jurisdiction, both screens may be included in participation. This should, however, have a negligible effect on the reported participation.

Geographic region

Geographic regions are classified according to the ABS's Australian Standard Geographic Classification (ASGC) Remoteness Structure (ABS 2006), which groups geographic areas into six categories. These categories, called Remoteness Areas (RAs), are based on Census Collection Districts (CDs) and defined using the Accessibility/Remoteness Index for Australia (ARIA). ARIA is a measure of the remoteness of a location from the services provided by large towns or cities. Accessibility is judged purely on distance to one of the metropolitan centres. A higher ARIA score denotes a more remote location. The six RAs of the ASGC Remoteness Structure are listed in the table below; the sixth 'migratory' area is not used in this report.

Remoteness areas for the ASGC

Geographic region	Collection districts within region
Major cities of Australia	CDs with an average ARIA index value of 0 to 0.2
Inner regional Australia	CDs with an average ARIA index value greater than 0.2 and less than or equal to 2.4
Outer regional Australia	CDs with an average ARIA index value greater than 2.4 and less than or equal to 5.92
Remote Australia	CDs with an average ARIA index value greater than 5.92 and less than or equal to 10.53
Very remote Australia	CDs with an average ARIA index value greater than 10.53
Migratory	Areas composed of off-shore, shipping and migratory CDs

Residential address postcodes of participants were mapped to CDs and then classified to the five main RAs, ranging from *Major cities* to *Very remote* areas. As some postcodes can span different RAs, a weighting for each RA is attributed to the postcode. This can result in non-integer counts for remoteness classifications. For example, the Northern Territory postal area 0822 is classified as 70.54% *Very remote*, 6.64% *Remote* and 22.82% *Outer regional*. Participants with postcode 0822 have their counts apportioned accordingly.

Tables in this report based on geographic location are rounded to integer values. Where figures are rounded, discrepancies may occur between totals and sums of the component items.

Socioeconomic status

Socioeconomic status classifications are based on the ABS Index of Relative Socioeconomic Disadvantage (ABS 2008). Geographic areas are assigned a score based on attributes such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations. The score does not refer to the socioeconomic situation of a particular individual but instead refers to the area in which a person lives. A low score means an area has many low-income families, people with little training and high unemployment, and may be considered disadvantaged relative to other areas. Areas with high index scores may be considered less disadvantaged relative to other areas.

Socioeconomic status groups based on the level of the index are used for analysis where 1 (lowest) represents the most disadvantaged and 5 (highest) the least disadvantaged.

BreastScreen Australia classifications

See Appendix B for classifications specific to BreastScreen Australia.

Appendix D 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 is expressed as a percentage.

Age-specific rates

Age-specific rates are calculated by dividing the number of cases occurring in each specified age group by the corresponding population in the same age group expressed as a percentage or a number per 1,000 or 100,000 population. This rate may be calculated for particular age and sex groupings. For example:

Age-specific breast cancer incidence rate in females aged 50–54 years

$$= \frac{\text{New cases aged 50 – 54 years}}{\text{Female population aged 50 – 54 years}} \times 100{,}000$$

$$= \frac{1{,}585}{673{,}077} \times 100{,}000$$

= 235.5 per 100,000

Age-standardised rates (ASR)

Rates are adjusted for age to facilitate comparisons between populations that have different age structures, for example, between youthful and ageing communities. There are two different methods commonly used to adjust for age. This publication uses direct standardisation, in which the age-specific rates are multiplied by a constant population. This effectively removes the influence of the age structure on the summary rate.

It important to be aware that for some data presented in this report, indirect age standardisation would be more appropriate due to small numbers (most commonly for the Australian Capital Territory and the Northern Territory), but direct age standardisation has been used for consistency. This can result in relatively large differences between crude and age-standardised rates. In these cases, crude rates should also be considered when interpreting data.

As the *National health data dictionary* recommends the use of the 2001 Australian total estimated resident population as the standard population for health statistics, this population has been used for age standardising mortality, incidence and participation.

For statistics based on the population of women screened—that is, cancer detection rates, interval cancer rates and program sensitivity—rates are standardised to the 2008 population of women screened by BreastScreen Australia. Note that previous reports are age-standardised to the 1998 population of women screened by BreastScreen Australia. This means that historical rates will be different from those previously published.

The method used for this calculation comprises three steps:

1. Calculate the age-specific rate (as shown above) for each age group.
2. Calculate the expected number of cases in each 5-year age group by multiplying the age-specific rates by the corresponding standard population and dividing by the appropriate factor (that is, 100,000 for mortality and incidence rates, and 100 for participation).
3. To give the age-standardised rate, sum the expected number of cases in each group, divide by the total of the standard population and multiply by the appropriate factor (that is, 100,000 for mortality and incidence rate, and 100 for participation).

Confidence intervals

Population numbers for incidence, 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 the 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 two standard errors.

The 95% confidence intervals in this report were calculated using a method developed by Dobson and colleagues (Dobson et al. 1991). This method calculates approximate confidence intervals for a weighted sum of Poisson parameters.

Where indicators include a comparison (such as between states and territories), a 95% confidence interval is 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 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 overlapping confidence intervals does not imply that the difference between two 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 two 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

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

Age-standardised rate: weighted average of age-specific rates according to a standard distribution of the population by age to eliminate the effect of different age distributions and thus facilitate valid comparisons of groups with differing age compositions.

Assessment: further investigation of a mammographic abnormality or symptom reported at screening. This includes women who choose assessment outside BreastScreen Australia.

Benign: not cancerous.

Cancer (malignant neoplasm): a term used to describe one of several diseases that result when the process of cell division, by which tissues normally grow and renew themselves, becomes uncontrolled and leads to the development of malignant cells. These cancer cells multiply in an uncoordinated way, independently of normal growth control mechanisms, to form a tumour. The tumour can expand locally by invasion or systemically by metastasis through the lymphatic or vascular systems. If left untreated, most malignant tumours eventually result in death.

Cancer death: a death where the underlying cause is indicated as cancer. People with cancer who died of other causes are not counted in the death 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 (for example, relative risk) lies.

Data: refers to the building blocks of health information, including observations from administrative databases and health survey data sets.

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

False negative: means that the test has incorrectly observed that the disease is not present.

False positive: means that the test has incorrectly observed that the disease is present.

First screening round: see *Screening round.*

Incidence: see *New cancer case.*

Index screening year: the year for which the interval cancer rate and the program sensitivity rate are determined.

Index screens: all screening examinations performed within the index screening year.

Indicators: observations about data that have been analysed to provide a means of comparing measures of health within and between population groups.

International Classification of Diseases: the World Health Organization's internationally accepted classification of death and disease. The 10th revision (ICD-10) is currently in use.

Interval cancer—invasive (as defined for national reporting purposes by (Kavanagh et al. 1999), with minor changes endorsed by the 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 blood-stained 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 invaded healthy or normal tissue.

Mammogram: a radiographic depiction of the breast.

Mortality: see *Cancer death.*

New cancer case: a person who has a new cancer diagnosed for the first time. One person can have more than one cancer and therefore may be counted twice in incidence statistics if it is decided that the two 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).

Population estimates: official population numbers compiled by the ABS at both state and territory and statistical local area levels, by age and sex, as at 30 June each year. These estimates allow comparisons to be made between geographic areas of differing population sizes and age structures.

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. Because a screening test is not intended to be diagnostic, a person with a positive or suspicious result must be referred for diagnosis and treatment.

Screening episode: a screening episode includes 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. If she attends for the fourth screening round, she has been screened three times before.

Screening round (first): a woman's first visit to a BreastScreen Australia mammography screening service.

Screening round (subsequent): a woman's visit to a BreastScreen Australia mammography screening service when she has attended such a service before.

Sensitivity: the proportion of people with a disease that has a positive test result for the disease.

Significant difference: where rates are referred to as significantly different, or one rate is deemed significantly higher or lower than another, and these differences are statistically significant. Rates are deemed statistically significantly different when their confidence intervals do not overlap, because their difference is greater than what could be explained by chance. See 'confidence intervals' in Appendix D 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 blood-stained or watery nipple discharge.

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.

Women-years 'at risk' of interval or screen-detected breast cancer are:

- all women screened aged 50–69 years who are resident in the service catchment area in which they are screened at the time of screening who have not reported a personal history of invasive cancer or DCIS
- women who are recommended for annual rescreening are only at risk of interval cancer up until 12 months after the screening examination
- women who are recommended for routine rescreening are only at risk of an interval cancer up until 24 months after the screening examination.

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