

BreastScreen Aotearoa
(INTERNAL) MONITORING REPORT 3

Women screened between 1 July and 31 December 2003

December 2004

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Foreword: BSA Monitoring Process

This brief foreword describes the process used to produce these reports, and has a concluding comment that is relevant to this report in particular.

Data are sent monthly from the six BreastScreen Aotearoa lead providers to the New Zealand Health Information Service of the Ministry of Health (NZHIS). The data are checked at NZHIS, amalgamated into a single file, and sent to the National Screening Unit (NSU). The NSU runs further checks and encrypts the National Health Index (NHI) numbers. The data and tabulations of performance indicators for this report were produced within NSU according to their specifications. The tables were sent to an independent epidemiologist at the University of Auckland to add explanatory text and commentary to the report, with some opportunity to also request additional tabulations where it was felt appropriate. The draft report was then sent to members of the BSA Advisory group (formed in June 2004) prior to a collective meeting where it was presented and discussed. The draft report was then circulated to lead providers (LPs) for comment, and these comments were discussed at an NSU meeting. The report was finalised after this meeting.

The procedure for producing this report has recently changed, and this is the second report that will have been through this new process. Treatment indicators, which have been included in one report previously, have not been provided by the NSU at this stage. The Treatment Provider monitoring indicators have been the subject of an internal review (MoH TPDIR document, 2002) and may be included in reports for 2004 onwards.

Executive Summary

This six-month report relates to women screened between 1 July and 31 December 2003, and includes data on assessment carried out for these women following their screening mammograms. Cumulative data are presented for the two-year period (representing a full screening round with two-yearly screening) from 1 January 2002 until 31 December 2003. Treatment data for women diagnosed with breast cancer at screening between 1 December 1998 and 31 March 2003 are also included in this report. Information on treatment is less recent because of the time it takes for treatment to be completed, and for the data to be collected.

In the six months from 1 July to 31 December 2003, 51,143 women were screened in BreastScreen Aotearoa. This represents 16.1% of eligible women, according to the population projections from the 2001 Census. To meet the performance indicator for coverage of 70% of all eligible women in each two-year screening round, an average of 17.5% of all eligible women need to be screened every six months. The absolute number of women screened in this particular six month period was greater than in the previous six month period, but the percentage of the eligible population covered remained the same, reflecting the growing number of women who fall into the screening age range.

Overall coverage rates remain below 70% for BSA, and within all age groups and Lead Providers, except for two (BSS and BSHC). BSAN, which has the greatest number of eligible women in its region, has the lowest coverage. Further, there is a trend over the last two-year period (2002-2003) at BSAN towards the lowest coverage occurring in the youngest women (50-54 year old age group). This, in particular, will hinder the progress of coverage towards the greater than 70% target - which has been estimated to be required to achieve a significant reduction in longer term mortality from breast cancer.

Of continuing major concern is the poor coverage among Maori and Pacific women in BSA, given the burden of breast cancer in these groups and the disparities that are becoming evident in ethnic outcome data (Curtis, 2004). Coverage is recognised internationally as one of the most important determinants of a screening programme's effectiveness in reducing the burden of breast cancer, and with coverage rates below 50% for Maori and Pacific women, the impact will be less than desirable in these groups, where breast cancer mortality is higher than in other NZ groups.

The majority of women (>70%) screened in BreastScreen Aotearoa are now undergoing incidence screening, having already been screened at least once previously since the start of the BreastScreen Aotearoa programme. The use of the terms prevalent (or prevalence) and incident (or incidence) may be a misclassification of women screened by BSA, as some women have had mammograms taken outside the programme prior to their entry to BSA. It may be more useful to refer to screens within the programme as 'initial' and 'subsequent'. In general, referral to assessment and false positive rates are lower for women who have had previous mammograms, either within or outside the programme. If the proportion of women who have had mammography prior to entering BSA is high, this may artificially reduce the assessment and false positive rates, making them falsely reassuring against the targets for prevalence screening. Some estimation of the numbers of women who are

effectively currently misclassified as prevalent screens, when they have had mammograms previously, may be required to determine how important this effect is likely to be.

A Positive Predictive Value has been added as an adjunct to the false positive rate, in this as well as the last report, to reflect the impact that screening has on asymptomatic women who receive a positive test from mammography but who, after further investigations, are subsequently found not to have breast cancer. This measure uses a denominator of *all women referred to assessment* rather than *all women screened*. There is a general issue throughout routine monitoring reports that the measures have largely focussed on outcomes that are relevant to workload and capacity (which are clearly important for the effective running of the programme) by using a denominator of 'all women screened', without including sufficient measures based on 'all women referred for assessment', that allow an evaluation of potential benefit to harm for women enrolled in BSA. A report which captures a better balance of these two aspects might be more appropriate, as both are pertinent to monitoring quality and outcome.

The indicators of timeliness reported in Section 5 continue to show marked variation in the number of women who move swiftly between each stage in the assessment and treatment process overall and in some cases between Lead Providers for each particular indicator. While it is acknowledged that there are many barriers to providing expedient services, some geographical and some labour-force related, it is of utmost importance to the overall success of the screening programme that appropriate treatment is provided in a timely manner. It is also of utmost importance for individual women in reducing their anxiety in the waiting periods.

The quality of the BreastScreen Aotearoa programme is high overall (Chamberlain, 2002). However, it is essential that the quality is consistently high across Lead Providers, so that benefits for women are consistently maximised, and harm minimised. Coverage rates need to surpass the 70% level recommended, especially in Maori and Pacific women, and treatment delays need to be reduced if the programme is to achieve its long-term goal of reducing mortality from breast cancer in New Zealand. These issues are of critical importance and must not be subsumed by the inevitable issues that will arise as the programme is extended to women aged 45 and 69 years.

Recommendations

- To continue to strive for coverage rates of greater than 70% of the eligible population of women in BSA.
- In particular, to strive for increased coverage among Maori and Pacific women, in order to address the inequalities that are occurring in the uptake of the programme. This may require attention to access to screening as well as to the provision of culturally appropriate services.
- To continue to strive for coverage of 70% in the current age group (50 – 64 year olds) and across ethnic groups in the face of the age-extension.
- To rename the *Incident* and *Prevalent* screens – *Initial* and *Subsequent* screens (or similar terminology) to account for women who may have undergone mammographic assessment prior to entry to BSA.
- That the measure of Positive Predictive Value be calculated and reported in all monitoring documents to act as an adjunct to measures already regularly reported. That this measure be stratified by age group and ethnicity.
- That indicators of screening effectiveness overall should be routinely stratified by age group, and where possible by ethnicity, so that any differences in harm to benefit ratios by age and/or ethnicity might be identified.
- To inform women fully, when they enter the screening programme, of the likelihood and implications of a false positive test, given that the target for PPV is currently set at >9%.
- That consideration be given to the appropriate denominator for measures to assess the quality of the screening programme. At present, most use “all screened women”, but in some cases it may be more appropriate to also use “all women referred to assessment” (i.e.all positive mammograms).
- Many of the proxy outcome indicators use targets based on those currently used in the European Guidelines. It would be extremely beneficial for New Zealand to determine its own underlying breast cancer incidence, including DCIS incidence, to ensure that targets are appropriate for the New Zealand population.
- Measures of timeliness indicate that there may be an ongoing need to consider the shortfall in the availability of treatment for women identified by the screening programme as requiring surgical intervention. This will become more acute as BSA is extended to cover women aged 45-69 years of age in July 2004.
- That ongoing follow up of women enrolled in the screening programme - with determination of interval cancers and longer term measures of morbidity and

mortality - should be a priority for BSA, so that the effectiveness of the screening programme might be monitored in the longer term.

Data Abbreviations

The key to the tables which appear in this document is:

BSAN = BreastScreen Auckland and North

BSM = BreastScreen Midland

BSCtoC= BreastScreen Coast to Coast

BSC= BreastScreen Central

BSS = BreastScreen South

BSHC = BreastScreen HealthCare

1. Coverage

1.3 Coverage – overall

Definition

The number and percentage of women 50-64 years who have had a screening mammogram in the programme, based on the estimated eligible population.

Target > 70%

Table 1.3 Overall coverage of eligible women

Lead Provider	Eligible Population*	Last 6 Months		Last 2 Years	
		Jul 2003 to Dec 2003		Jan 2002 to Dec 2003	
		Number of Women Screened	Coverage %	Number of Women Screened	Coverage %
BSAN	110410	15748	14.3%	58919	53.4%
BSM	49890	7627	15.3%	30414	61.0%
BSCtoC	43025	7259	16.9%	25211	58.6%
BSC	34830	5722	16.4%	20487	58.8%
BSS	57070	10727	18.8%	46448	81.4%
BSHC	23400	4060	17.4%	16945	72.4%
BSA Total	318625	51143	16.1%	198424	62.3%

* Eligible population is based on the 2003 estimated projected population

In the six months from 1 July to 31 December 2003 51,143 women were screened by BSA. This was 16.1% of the estimated eligible* women. This represented an increase in the absolute number of women screened, but the same percentage of the eligible population as for the previous six month period (50,612 (16.1%)). To meet the performance indicator for coverage of 70% of women in each two year screening round, 17.5% of all eligible women should be screened on average every six months. While BSCtoC and BSC were under the target of 70% coverage for the two year period, they achieved an improved coverage for the six month period. However, only BSS and BSHC were consistently above the 70% target for two yearly screening coverage.

Comments:

- *The eligible population numbers in each region are based on the projected population for the 2003 screening round, using projections from the 2001 Census data supplied by Statistics New Zealand (refer Appendix A). It is inevitable that there will be some error in these estimates, which therefore leads to imprecision in the calculation of the percentage of women covered. The changes in the estimations between successive reports, with an unknown degree of measurement error, also makes comparisons between six-monthly and two year periods problematic.
- Given the changing demographics of the New Zealand population, with increasing numbers of eligible women in the screening age-group, ever increasing numbers of women need to be screened in each six month period to achieve the same percentage coverage. This is most significant in regions with the most rapid population growth.

Table 1.3a The number and percentage of screens that are Prevalent and Incident screens

Lead Provider	Jan 2002 to Dec 2003				Total Screens
	Prevalent Screens		Incident Screens		
	Number of Women Screened	Prevalent %	Number of Women Screened	Incident %	
BSAN	17355	29%	41564	71%	58919
BSM	7186	24%	23228	76%	30414
BSCtoC	6745	27%	18466	73%	25211
BSC	5884	29%	14603	71%	20487
BSS	11479	25%	34969	75%	46448
BSHC	3665	22%	13280	78%	16945
BSA Total	52314	26%	146110	74%	198424

An important determinant of the outcome of screening is whether the screen is a prevalence or incidence screen, hence the proportions of each type of screen are detailed according to Lead Provider in Table 1.3a. Women who are being screened for the first time (called prevalent screens above), whether because of age and/or new entry to the programme, are likely to have a higher rate of abnormal screening results, and a different distribution of true disease, than those who have been screened previously and who are returning for repeat screens (called incident screens above).

The proportion of prevalent screens varied from 22% to 29% between Lead Providers in the two year period. BSAN and BSC continue to have the highest proportion of prevalent screens.

Comments:

- The terms *prevalent* and *incident* suggest that these are indeed either first and subsequent screens, when they may only be the first screen *in this programme* (i.e. women may have chosen to have a mammogram, in the absence of symptoms, prior to entry to BSA). The proportion of women with previous mammograms may well vary according to region, with the availability of private screening, but might be expected to lead to problems in the interpretation of diagnostic outcomes if the classification continues as before.
- The number of women returning for subsequent screens is an important measure of the acceptability of BSA. It is important that women not only enter the screening programme, but for the programme to achieve its aim of overall reduction of mortality from breast cancer, they need to be screened repeatedly in a timely manner (i.e. two-yearly in the screening age group).

Table 1.3b The percentage of Women Screened by Type of Screening Unit

Lead Provider	Jan 2002 to Dec 2003				Total Screens
	Fixed Site		Mobile Site		
	Number of Women Screened	Fixed %	Number of Women Screened	Mobile %	
BSAN	51873	88%	7046	12%	58919
BSM	22119	73%	8295	27%	30414
BSCtoC	19455	77%	5756	23%	25211
BSC	13372	65%	7115	35%	20487
BSS	39971	86%	6477	14%	46448
BSHC	11663	69%	5282	31%	16945
BSA Total	158453	80%	39971	20%	198424

The distribution of screens by type of screening unit varies greatly between Lead Providers. BSAN and BSS have the lowest proportions of screens performed on mobile units - both less than 15% of the total screens - as compared to approximately a third of all screens in BSHC and BSC. However, this should not affect the outcome of screening, assuming the technical ability of each type of unit is similar, although it may create differences in accessibility and timeliness of screening where regions are highly dependent on mobile units.

Figure 1.3c Overall Number of Screens by Month, and Cumulative 24 Month Total

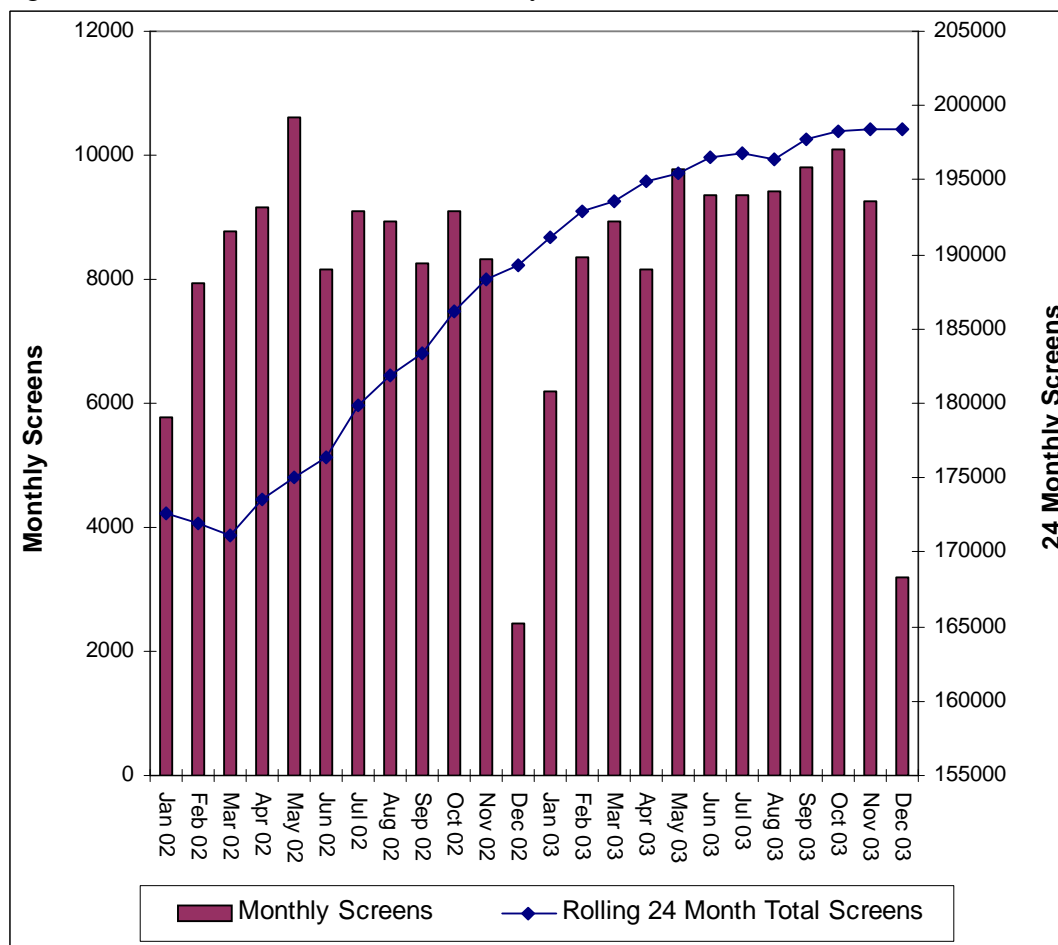


Figure 1.3c illustrates the distribution of the number of screens undertaken each month in the 24 month period from January 2002 until December 2003, with the cumulative (rolling) total superimposed.

The distribution is not uniform across the 24 month period, with rates tending to fall-off between December and February, largely reflecting planned closures for routine maintenance which take place at times of decreased demand during the summer holiday period. Of note is the decreased variation seen in numbers of monthly screens over the last 12 months of this two year period, and the increasing average number of screens per month overall. The introduction of the age extension from 1 July 2004 has further increased the demand for screening, and the way this is managed, including how the summer down-time is managed, may need to be reviewed.

1.4 Coverage by Age Group

The number and percentage of eligible* women screened according to 5 year age-groups are shown in Tables 1.4a through c below.

Target: >70% (as for all ages)

Table 1.4a Coverage of 50-54 year old eligible women

Lead Provider	Eligible Population*	Last 6 Months		Last 2 Years	
		Jul 2003 to Dec 2003		Jan 2002 to Dec 2003	
		Number of Women Screened	Coverage %	Number of Women Screened	Coverage %
BSAN	43810	5665	12.9%	22980	52.5%
BSM	18900	2772	14.7%	10943	57.9%
BSCtoC	16525	2345	14.2%	9378	56.8%
BSC	13690	1980	14.5%	7828	57.2%
BSS	22240	4345	19.5%	18998	85.4%
BSHC	8950	1701	19.0%	6672	74.5%
BSA Total	124115	18808	15.2%	76799	61.9%

* Eligible population is based on the 2003 estimated projected population

Table 1.4b Coverage of 55-59 year old eligible women

Lead Provider	Eligible Population*	Last 6 Months		Last 2 Years	
		Jul 2003 to Dec 2003		Jan 2002 to Dec 2003	
		Number of Women Screened	Coverage %	Number of Women Screened	Coverage %
BSAN	37640	5615	14.9%	19921	52.9%
BSM	16800	2381	14.2%	10072	60.0%
BSCtoC	14365	2649	18.4%	8480	59.0%
BSC	11820	2074	17.5%	6973	59.0%
BSS	19300	3592	18.6%	15096	78.2%
BSHC	7850	1363	17.4%	5410	68.9%
BSA Total	107775	17674	16.4%	65952	61.2%

Table 1.4c Coverage of 60-64 year old eligible women

Lead Provider	Eligible Population*	Last 6 Months		Last 2 Years	
		Jul 2003 to Dec 2003		Jan 2002 to Dec 2003	
		Number of Women Screened	Coverage %	Number of Women Screened	Coverage %
BSAN	28960	4468	15.4%	16018	55.3%
BSM	14190	2474	17.4%	9399	66.2%
BSCtoC	12135	2265	18.7%	7353	60.6%
BSC	9320	1668	17.9%	5686	61.0%
BSS	15530	2790	18.0%	12354	79.5%
BSHC	6600	996	15.1%	4863	73.7%
BSA Total	86735	14661	16.9%	55673	64.2%

The coverage by five-year age group follows the same general trends as for overall coverage (1.3). Only BSS and BSHC approximate or achieve the 70% coverage target for their eligible populations for each age group. In comparison to the last six month report, coverage in the youngest age group (50-54 years) has shown a marginal improvement overall, and in BSAN in particular, which is the region with the largest number of eligible women in this age group. This is in contrast to the falling coverage reported for this youngest age-group in Report 2. Of note is the high coverage of the youngest group of women in BSS (85.4%) over the last two years.

Comments:

- The comment made regarding overall coverage is also relevant here; that the proportion of women screened relies on an estimation of the total eligible population, which may lead to error in the calculation, particularly in areas where there is high population growth and substantial migration.
- It is acknowledged that there is also substantial variation in the use of private screening facilities between regions, which may well contribute to different coverage rates. However, it is not possible at present to estimate how extensive this private usage is.
- The extension of the programme to women age 45-69 in July 2004 has brought further challenges in terms of coverage and retention of women both new to, and currently enrolled in, the BSA programme.

1.5 Coverage by Ethnicity

The number and percentage of women screened according to ethnicity is shown in Table 1.5

Target: 70% (as for overall coverage)

Table 1.5 Coverage by Ethnicity, Summary for last 2 years

Lead Provider	Jan 2002 to Dec 2003						
	Maori		Pacific		Other		Not Stated
	Number of Women Screened	Coverage %	Number of Women Screened	Coverage %	Number of Women Screened	Coverage %	Number of Women Screened
BSAN	4553	48.6%	3441	42.3%	50387	54.2%	538
BSM	2868	39.3%	240	45.3%	27294	64.8%	12
BSCtoC	2043	35.7%	145	35.8%	22835	61.9%	188
BSC	1077	43.2%	547	32.8%	18822	61.4%	41
BSS	1325	65.9%	246	64.7%	44556	81.5%	321
BSHC	436	49.5%	48	41.7%	16255	72.6%	206
BSA Total	12302	44.3%	4667	41.5%	180149	64.4%	1306

Table 1.5a Coverage of Maori women

Lead Provider	Eligible Population*	Last 6 Months		Last 2 Years	
		Jul 2003 to Dec 2003		Jan 2002 to Dec 2003	
		Number of Women Screened	Coverage %	Number of Women Screened	Coverage %
BSAN	9370	1297	13.8%	4553	48.6%
BSM	7300	933	12.8%	2868	39.3%
BSCtoC	5725	602	10.5%	2043	35.7%
BSC	2495	332	13.3%	1077	43.2%
BSS	2010	315	15.7%	1325	65.9%
BSHC	880	101	11.5%	436	49.5%
BSA Total	27780	3580	12.9%	12302	44.3%

Table 1.5b Coverage of Pacific women

Lead Provider	Eligible Population*	Last 6 Months		Last 2 Years	
		Jul 2003 to Dec 2003		Jan 2002 to Dec 2003	
		Number of Women Screened	Coverage %	Number of Women Screened	Coverage %
BSAN	8140	962	11.8%	3441	42.3%
BSM	530	116	21.9%	240	45.3%
BSCtoC	405	43	10.6%	145	35.8%
BSC	1670	230	13.8%	547	32.8%
BSS	380	50	13.2%	246	64.7%
BSHC	115	6	5.2%	48	41.7%
BSA Total	11240	1407	12.5%	4667	41.5%

Table 1.5c Coverage of Other women

Lead Provider	Eligible Population*	Last 6 Months		Last 2 Years	
		Jul 2003 to Dec 2003		Jan 2002 to Dec 2003	
		Number of Women Screened	Coverage %	Number of Women Screened	Coverage %
BSAN	92890	13335	14.4%	50387	54.2%
BSM	42090	6573	15.6%	27294	64.8%
BSCtoC	36900	6540	17.7%	22835	61.9%
BSC	30630	5154	16.8%	18822	61.4%
BSS	54680	10296	18.8%	44556	81.5%
BSHC	22390	3912	17.5%	16255	72.6%
BSA Total	279580	45810	16.4%	180149	64.4%

Screening coverage of Maori and Pacific women remains substantially lower than coverage of Other women, and substantially lower than the coverage rate for all women, for both the six month period and the two year period. For Maori and Pacific women, coverage is below 50% for all lead providers over the two year period with the exception of BSS, whose rates are considerably higher, although the absolute number of eligible women in this region is relatively small. However, the *coverage rates for Maori women have shown a slight increase over the last six month period, which has contributed to a marginal increase in coverage over the last two years.

Comment:

- The variation in the number of women recorded as “unstated” continues to complicate comparisons of ethnic coverage. If this figure were expressed as a proportion of all screens, it would be of some assistance for interpretation, but a higher completion rate should be the goal overall.
- It would be useful for lead providers to highlight any measures they have implemented that have led to an improvement in their coverage rates by ethnicity when they comment on the monitoring report, as these might be applicable in, or adaptable to, other regions.
- It might be informative to stratify coverage rates by age-group within the different ethnic groups to consider whether there are any groups who are over- or under-represented in comparison to the group as a whole, although numbers are likely to be small in some areas.

2. Provision of high quality screening and assessment

2.1 Screened women who have no more than four films taken

Definition: The percentage of women who have no more than four films taken, expressed as a percentage of women screened

Target: >80% of women screened have four or less films taken

Table 2.1a Percentage of women having no more than 4 films taken by type of screening unit, last 6 months

Lead Provider	Jul 2003 to Dec 2003					
	Fixed			Mobile		
	Women having 4 films or less	Number of Women Screened	% of Women Screened	Women having 4 films or less	Number of Women Screened	% of Women Screened
BSAN	11624	13940	83.4%	1347	1808	74.5%
BSM	5145	5751	89.5%	1444	1876	77.0%
BSCtoC	4933	5720	86.2%	1259	1539	81.8%
BSC	2951	3864	76.4%	1421	1858	76.5%
BSS	7767	9114	85.2%	1377	1613	85.4%
BSHC	2214	2581	85.8%	1388	1479	93.8%
BSA Total	34634	40970	84.5%	8236	10173	81.0%

Table 2.1b Percentage of women having no more than 4 films taken by type of screening unit, last 2 years

Lead Provider	Jan 2002 to Dec 2003					
	Fixed			Mobile		
	Women having 4 films or less	Number of Women Screened	% of Women Screened	Women having 4 films or less	Number of Women Screened	% of Women Screened
BSAN	43536	51873	83.9%	5877	7046	83.4%
BSM	19650	22119	88.8%	6736	8295	81.2%
BSCtoC	16900	19455	86.9%	4580	5756	79.6%
BSC	10108	13372	75.6%	5508	7115	77.4%
BSS	33489	39971	83.8%	5415	6477	83.6%
BSHC	9596	11663	82.3%	4763	5282	90.2%
BSA Total	133279	158453	84.1%	32879	39971	82.3%

At fixed sites, all Lead Providers apart from BSC are meeting this target. However there has been a slight fall-off in the number of Lead Providers who are meeting this target at mobile units, although overall in BSA, the target is still being attained. BSHC perform better at mobile sites than at fixed sites in this regard, which is in contrast to most other Lead Providers.

Comment:

- This is an important indicator, not only for quality assurance, but also as a proxy safety indicator, as the extent of radiation exposure per screen contributes to the balance of harm to benefit for well women undergoing a screening test.

2.2 Technical Recall Rate

Definition: The number of women who are recalled to a screening unit (either fixed or mobile) for further films to complete their screening episode, expressed as a percentage of all women screened.

Target: Mobile <3%
Fixed <0.5%

Table 2.2a Women having technical recall as a percentage of Women screened, last 6 Months

Lead Provider	Jul 2003 to Dec 2003					
	Fixed			Mobile		
	Women having Technical Recall	Number of Women Screened	% of Women Screened	Women having Technical Recall	Number of Women Screened	% of Women Screened
BSAN	36	13940	0.3%	90	1808	5.0%
BSM	8	5751	0.1%	61	1876	3.3%
BSCtoC	9	5720	0.2%	107	1539	7.0%
BSC	28	3864	0.7%	45	1858	2.4%
BSS	37	9114	0.4%	53	1613	3.3%
BSHC	6	2581	0.2%	16	1479	1.1%
BSA Total	124	40970	0.3%	372	10173	3.7%

Table 2.2b Women having technical recall as a percentage of Women screened, last 2 years

Lead Provider	Jan 2002 to Dec 2003					
	Fixed			Mobile		
	Women having Technical Recall	Number of Women Screened	% of Women Screened	Women having Technical Recall	Number of Women Screened	% of Women Screened
BSAN	138	51873	0.3%	255	7046	3.6%
BSM	30	22119	0.1%	295	8295	3.6%
BSCtoC	29	19455	0.1%	356	5756	6.2%
BSC	117	13372	0.9%	337	7115	4.7%
BSS	181	39971	0.5%	153	6477	2.4%
BSHC	42	11663	0.4%	71	5282	1.3%
BSA Total	537	158453	0.3%	1467	39971	3.7%

Fixed Screens: Overall, the percentage of women recalled for technical reasons to complete a screening episode at a fixed site did not exceed the target of less than 0.5%, but there was some variation in this figure between Lead Provider regions over both the six month and two year period. At the extreme, BSC had a technical recall rate that approached 1% of women screened, which is almost double the target for this indicator.

Mobile screens: Overall, the percentage of women recalled for technical reasons from a mobile screening unit failed to reach the target of less than 3% for this indicator. However, there was again considerable variation between the rates amongst Lead Providers, with BSC and BSHC achieving the target during the last six months and

BSS and BSHC over the two year period. Of concern are the high technical recall rates in BSCtoC during both the six month and the two year periods.

Comment:

- As absolute numbers of women recalled tend to be small, some of the differences between Lead Providers may be due to random variation. Considering the rates overall may be most informative for this indicator, especially over a two year rather than a six month period.
- The different targets for fixed and mobile screening units in terms of technical recall rate reflect the different technical capacity of these units. The difference in targets for technical recall acknowledges the fact that MRTs in the mobile units are not able to assess the technical adequacy of films before a women leaves (in contrast to a fixed unit) and therefore technical recall rates are inevitably higher. However it would seem appropriate to attempt to lower the technical recall rate for mobile screening units as much as possible, given the accessibility and availability issues for women who use these screening facilities.

2.3 Technical Reject Rate

Definition: The number of films rejected as a percentage of the number of films taken, calculated separately for women who are screened in a fixed unit or a mobile site

Target: <3%

Table 2.3a Rejected films as a percentage of total films taken, last 6 Months

Lead Provider	Jul 2003 to Dec 2003					
	Fixed			Mobile		
	Total Films Rejected	Total Films Taken	% of Total Films	Total Films Rejected	Total Films Taken	% of Total Films
BSAN	619	59299	1.0%	53	7968	0.7%
BSM	144	24055	0.6%	65	8271	0.8%
BSCtoC	321	23969	1.3%	132	6617	2.0%
BSC	189	16907	1.1%	3	8143	0.0%
BSS	366	39349	0.9%	60	7064	0.8%
BSHC	133	10993	1.2%	5	6053	0.1%
BSA Total	1772	174572	1.0%	318	44116	0.7%

Table 2.3b Rejected films as a percentage of total films taken, last 2 Years

Lead Provider	Jan 2002 to Dec 2003					
	Fixed			Mobile		
	Total Films Rejected	Total Films Taken	% of Total Films	Total Films Rejected	Total Films Taken	% of Total Films
BSAN	2580	219729	1.2%	146	30001	0.5%
BSM	571	92922	0.6%	191	35952	0.5%
BSCtoC	935	81520	1.1%	469	25085	1.9%
BSC	718	58673	1.2%	25	31028	0.1%
BSS	1807	171249	1.1%	196	28029	0.7%
BSHC	736	50172	1.5%	17	21986	0.1%
BSA Total	7347	674265	1.1%	1044	172081	0.6%

All Lead Providers met this target over the last two year period and the latter six months. However it is notable that BSCtoC had a reject rate at mobile sites that was considerably higher than any other Lead Provider, despite meeting the target.

Comment:

- The low rate of rejected films overall, with only a slight increase in rates for mobile as compared to fixed units, is in contrast to the differences seen in technical *recall* rates between the fixed and mobile units, and the failure to meet the targets for some Lead Providers. These apparent inconsistencies have been seen for several years of the screening programme and require further explanation. It is anticipated that unidisciplinary groups will address these technical issues.

2.4 Assessment Rate

Definition: Number of women referred to assessment as a percentage of the number screened

Target:

Prevalence screen: <10% with an expected value of <7%

Incidence screen: <5% with an expected value of <4%

Table 2.4a Referral to Assessment as a percentage of Women screened, last 6 Months

Lead Provider	Jul 2003 to Dec 2003					
	Prevalence			Incidence		
	Referral to Assessment	Number of Women Screened	% of Women Screened	Referral to Assessment	Number of Women Screened	% of Women Screened
BSAN	410	4243	9.7%	417	11505	3.6%
BSM	150	1753	8.6%	210	5874	3.6%
BSCtoC	113	1613	7.0%	149	5646	2.6%
BSC	180	1491	12.1%	185	4231	4.4%
BSS	247	2419	10.2%	350	8308	4.2%
BSHC	64	999	6.4%	55	3061	1.8%
BSA Total	1164	12518	9.3%	1366	38625	3.5%

Table 2.4b Referral to Assessment as a percentage of Women screened, last 2 Years

Lead Provider	Jan 2002 to Dec 2003					
	Prevalence			Incidence		
	Referral to Assessment	Number of Women Screened	% of Women Screened	Referral to Assessment	Number of Women Screened	% of Women Screened
BSAN	1496	17355	8.6%	1622	41564	3.9%
BSM	537	7186	7.5%	824	23228	3.5%
BSCtoC	469	6745	7.0%	530	18466	2.9%
BSC	679	5884	11.5%	572	14603	3.9%
BSS	1082	11479	9.4%	1400	34969	4.0%
BSHC	262	3665	7.1%	234	13280	1.8%
BSA Total	4525	52314	8.6%	5182	146110	3.5%

It is expected that the number of referrals from prevalent screens will be higher than from incident screens, given that the former women are theoretically attending screening for the first time, whereas the incident screens represent repeat screening episodes.

Prevalent screens: For 4 of the 6 Lead Providers, referral to assessment occurred in less than 10% of all women screened over the last 6 months and 5 of the 6 Lead Providers met the target for the last 2 years. BSC prevalent assessment rates were above 10% during both time periods.

Incident screens: Referral to assessment was markedly lower in women having repeat screening episodes with all Lead Providers, and overall rates were less than the target values both in the six month period and the two year period. In the two year period,

the expected value was reached by all LPs, but BSS and BSC were over the expected value in the last six month period.

Comments:

- Some of the variability in rates may be due to random fluctuations in the occurrence of breast cancer, which may lead to higher assessment rates in some six month periods, but should be less obvious over a two year period, particularly in regions which have a relatively small absolute number of eligible women. While the rates in each Lead Providers region will have inevitable effects on follow-up services for referred women, it may be more important to consider rates over a longer period for a more accurate assessment of this indicator. Probably of most importance is the collective rate (BSA total).
- This indicator is more useful for planning further follow up services that may result from the screening programme, than as an indicator of the success of the screening programme in detecting breast cancer, and subsequently reducing mortality overall. It is, however, useful as an adjunct to measures of the cancer detection rate.
- It is worthwhile considering this measure in conjunction with the false positive rate (Section 2.5), and it is salient to note that the higher rates of assessment in BSS and BSC were associated with a higher false positive rate - which suggests this is not due to a random fluctuation (increase) in breast cancer in those areas.

2.5 False Positive Rate

Definition: The number of false positive screening results as a percentage of the number of women screened

Target:

Prevalence round: <9% and expected value is <6%

Incidence round: <4% and expected value is <3%

Table 2.5 False positives as a percentage of Women screened

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	Prevalence	Incidence	Total	Prevalence	Incidence	Total
BSAN	7.8%	2.8%	4.2%	7.1%	3.2%	4.3%
BSM	7.7%	3.1%	4.1%	6.7%	3.0%	3.9%
BSCtoC	6.0%	2.2%	3.0%	5.9%	2.3%	3.3%
BSC	10.9%	3.5%	5.4%	10.6%	3.4%	5.4%
BSS	9.3%	3.6%	4.9%	8.5%	3.4%	4.7%
BSHC	6.0%	1.2%	2.4%	6.5%	1.3%	2.4%
BSA Total	8.1%	2.9%	4.1%	7.6%	2.9%	4.2%

Prevalence round: The target was reached by 4 of the 6 Lead Providers for the six month period. BSC and BSS exceeded the target. Only BSC exceeded the target for the two year period. It remains difficult to comment on the reasons for possible fluctuations in false positive rates without absolute numbers of cases or denominators provided. However, it is pertinent to note that the referral to assessment rates at BSC and BSS were the highest for prevalence screens for both the time periods, suggesting that the assessment rate may not have been a result of a true increase in disease, but rather represented a higher rate of false positive results (Section 2.4).

Incidence round: Overall, the target of less than 4% false positive screening results was met by all Lead Providers for both the six month and two year periods. However, there was variation between Lead Providers in meeting the expected value, with BSS and BSC again at the higher end of the false positive rate, whilst BSHC had consistently lower rates than other providers throughout the time period. As with the prevalent round data, it is not possible to comment further on the variation given the lack of absolute numbers of women and numbers used as denominators for these calculations.

Comment:

- There is some ambiguity between the *description* of false positive and the *monitoring definition* of false positive in the Data Management Manual (DMM). The DMM *description* states that the false positive rate “measures the proportion of women who are recalled to assessment, but after assessment, are found not to have cancer”. The measure DMM might be describing is ‘1 minus the Positive Predictive Value’, which may be a more appropriate measure of the screening tools effectiveness in a given population (in this case women screened in the BSA programme in NZ). Some clarification needs to be made so that the denominator for the false positive indicator is ‘all

screened women'. The PPV measure has been added to this report, as well as the last, and appears in section 2.6.

- The current false positive rate uses *all screened women* as the denominator. This is useful for evaluating the screening programme. However, because it does not directly compare the false positive rate to the true positive rate, it is not very useful for assessing the harm caused to women who are referred to assessment (i.e. have a suspicious mammogram, but who are subsequently found not to have breast cancer). This needs to be balanced against the benefit that is gained in morbidity/mortality for women who are referred to assessment and subsequently found to have breast cancer.
- The false positive rate, while a useful measure, and one used throughout screening programmes elsewhere, tends to underestimate the potential harm to benefit ratio of a positive result from a screening test if PPV is not considered as an adjunct measure.
- A lesser concern, but one which has potentially complicated interpretation of this table, is the lack of any absolute numbers of women, so that the denominator that has been used in Table 2.5 above is not explicit.

2.6 Positive Predictive Value

Definition: The number of women who are ultimately diagnosed with breast cancer, expressed as a percentage of women referred to assessment

Target: => 9%

Table 2.6a Breast Cancers as a percentage of Referrals to Assessment, Last 6 Months

Lead Provider	Jul 2003 to Dec 2003					
	Prevalence			Incidence		
	Number of Cancers	Number of Referrals	% Cancer*	Number of Cancers	Number of Referrals	% Cancer*
BSAN	39	410	9.5%	57	417	13.7%
BSM	9	150	6.0%	20	210	9.5%
BSCtoC	10	113	8.8%	23	149	15.4%
BSC	12	180	6.7%	33	185	17.8%
BSS	17	247	6.9%	47	350	13.4%
BSHC	1	64	1.6%	17	55	30.9%
BSA Total	88	1164	7.6%	197	1366	14.4%

Table 2.6b Breast Cancers as a percentage of Referrals to Assessment, Last 2 Years

Lead Provider	Jan 2002 to Dec 2003					
	Prevalence			Incidence		
	Number of Cancers	Number of Referrals	% Cancer*	Number of Cancers	Number of Referrals	% Cancer*
BSAN	174	1496	11.6%	233	1622	14.4%
BSM	45	537	8.4%	110	824	13.3%
BSCtoC	58	469	12.4%	98	530	18.5%
BSC	46	679	6.8%	76	572	13.3%
BSS	93	1082	8.6%	194	1400	13.9%
BSHC	18	262	6.9%	61	234	26.1%
BSA Total	434	4525	9.6%	772	5182	14.9%

* % Cancer column gives the percentage of all referrals that are subsequently determined to be breast cancer cases

Overall in BSA, the positive predictive value reaches the required target for both the six month and two year periods for incident screens but does not reach the target for prevalent screens over the last six months. However there is considerable variation in the positive predictive values, with BSM, BSCtoC, BSC, BSS and BSHC, who tended to have the fewest number of confirmed cancers, having PPVs for prevalent screens of less than 9% for the last six months, compared with 9.5% for the largest Lead Provider, BSAN. This is of particular concern in the case of BSC, who also exceeded the target for assessment rate. All lead providers achieved the target for incident screens, but again there was marked variation.

Comments:

- The positive predictive value (PPV) relates the proportion of true positives to the total of true and false positives for the screening tool in the particular

population in which it is being used. Unlike other measures, the denominator is based on actual numbers of positive tests, rather than a population estimate obtained from a Census extrapolation.

- The PPV determines the proportion of true positives among women referred for assessment, so that 1-PPV estimates the proportion of false positives in the same group. It is worthwhile considering that this figure (1-PPV) estimates the proportion of well women who are referred to further investigation after screening, believing they may have cancer, only to be “cleared” later. While this is an inevitable part of screening, women who are well at screening do not always understand that this is ‘normal’.
- The current target of >9% implies that it is acceptable that more than 9 out of 10 women with positive tests will be found to be false positives after further investigation. 1-PPV is a measure of the harm that this screening tool inflicts on women with an abnormal mammogram.
- It may be pertinent to discuss whether it should be acceptable for a lower rate of PPV in prevalent screens, since screening is acknowledged to be less precise in “first-time” screens.
- This indicator provides important information for health professionals and for individual women about the nature of the screening programme and the crudeness of the population screening tool.
- Since PPV varies with the prevalence of breast cancer in the population, and the prevalence of breast cancer increases with age, this measure may vary with age. Therefore, in this report, PPV is stratified by 5 year age groups (Section 2.61). It will be extremely important to consider this measure in 45-49 year old women following the age extension.

2.6.1 Positive Predictive Value – stratified by age

Definition: The proportion of true positives of all women who were test positive at screening (total referred for assessment) stratified by 5 year age group. In this case the proportion of all women who were found to have breast cancer (after further investigation) after being referred to assessment following a screening mammogram in each 5 year age group.

Target: >9% (taken from all ages)

Table 2.6.1a Breast Cancers as a percentage of Referrals to Assessment for Prevalent screens, by age group, July to December 2003

Prevalent Screens	Number of Cancers			Number of Referrals			% Cancer* (PPV)		
	Age group			Age group			Age group		
	50-54	55-59	60-64	50-54	55-59	60-64	50-54	55-59	60-64
BSAN	24	9	6	282	77	51	8.5%	11.7%	11.8%
BSM	6	2	1	118	21	11	5.1%	9.5%	9.1%
BSCtoC	3	3	4	77	20	16	3.9%	15.0%	25.0%
BSC	6	3	3	120	37	23	5.0%	8.1%	13.0%
BSS	10	4	3	201	30	16	5.0%	13.3%	18.8%
BSHC	1	0	0	57	7	0	1.8%	0.0%	
BSA Total	50	21	17	855	192	117	5.8%	10.9%	14.5%

Table 2.6.1b Breast Cancers as a percentage of Referrals to Assessment for Incident screens, by age group, July to December 2003

Incident Screens	Number of Cancers			Number of Referrals			% Cancer* (PPV)		
	Age group			Age group			Age group		
	50-54	55-59	60-64	50-54	55-59	60-64	50-54	55-59	60-64
BSAN	14	20	23	102	174	141	13.7%	11.5%	16.3%
BSM	3	4	13	55	71	84	5.5%	5.6%	15.5%
BSCtoC	5	10	8	32	63	54	15.6%	15.9%	14.8%
BSC	4	13	16	47	72	66	8.5%	18.1%	24.2%
BSS	11	17	19	102	135	113	10.8%	12.6%	16.8%
BSHC	3	8	6	16	23	16	18.8%	34.8%	37.5%
BSA Total	40	72	85	354	538	474	11.3%	13.4%	17.9%

Table 2.6.1c Breast Cancers as a percentage of Referrals to Assessment for Prevalent screens, by age group, January 2002 to December 2003

Prevalent Screens	Number of Cancers			Number of Referrals			% Cancer* (PPV)		
	Age group			Age group			Age group		
	50-54	55-59	60-64	50-54	55-59	60-64	50-54	55-59	60-64
BSAN	102	41	31	956	309	231	10.7%	13.3%	13.4%
BSM	30	9	6	391	93	53	7.7%	9.7%	11.3%
BSCtoC	21	16	21	300	90	79	7.0%	17.8%	26.6%
BSC	23	10	13	423	160	96	5.4%	6.3%	13.5%
BSS	65	16	12	848	139	95	7.7%	11.5%	12.6%
BSHC	13	4	1	226	31	5	5.8%	12.9%	20.0%
BSA Total	254	96	84	3144	822	559	8.1%	11.7%	15.0%

Table 2.6.1d Breast Cancers as a percentage of Referrals to Assessment for Incident screens, by age group, January 2002 to December 2003

Incident Screens	Number of Cancers			Number of Referrals			% Cancer* (PPV)		
	Age group			Age group			Age group		
	50-54	55-59	60-64	50-54	55-59	60-64	50-54	55-59	60-64
BSAN	47	90	96	430	656	536	10.9%	13.7%	17.9%
BSM	21	40	49	183	324	317	11.5%	12.3%	15.5%
BSCtoC	17	36	45	132	198	200	12.9%	18.2%	22.5%
BSC	8	30	38	146	228	198	5.5%	13.2%	19.2%
BSS	30	74	90	367	547	486	8.2%	13.5%	18.5%
BSHC	5	26	30	58	95	81	8.6%	27.4%	37.0%
BSA Total	128	296	348	1316	2048	1818	9.7%	14.5%	19.1%

* % Cancer column gives the percentage of all referrals that are subsequently determined to be breast cancer cases

Comments:

- In the prevalent screening round the greatest number of breast cancers detected is in the youngest age group (50-54 years), with a decline over the next two age groups. Conversely, in the incident screening round, the number of breast cancers detected increases with increasing age (greatest in 60-64 year old age group).
- In general, the greatest proportion of false positives is seen in the youngest age group in the prevalent screening round. In that group (50-54 years) most Lead Providers did not meet the PPV target of $\geq 9\%$; only BSAN achieved $>10\%$ over the two year period.
- The PPV was greater overall in the incident rounds, although there was considerable variation between Lead Providers. Some of this variation could be explicable in terms of random variation in breast cancer occurrence and small numbers of cases in some regions in the latest six-month period, but over the two-year period this variation was still apparent. In particular BSC, BSS and BSHC had PPVs of $<9\%$ in the 50-54 year old age group.
- The accuracy of the screening process in determining true breast cancer improves with age, as evidenced by the increased PPV (% Cancer columns) across the age groups. The reasons for this may be complex and might include changing breast density and increasing breast cancer prevalence with age, as well as aspects of film interpretation.
- The lower PPV in the youngest age group of women (50-54 years) at both prevalent and incident screens suggests that this outcome should be looked at very carefully in the 45-49 year old group from July 2004.

2.7 Open Surgical Biopsy Rate

Definition: The number of women having an open biopsy expressed as a percentage of all women screened

Target: <1%

Table 2.7 Open Surgical Biopsy as a percent of Women screened

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	Open Biopsy	Number of Women Screened	% of Women Screened	Open Biopsy	Number of Women Screened	% of Women Screened
BSAN	33	15748	0.2%	118	58919	0.2%
BSM	8	7627	0.1%	41	30414	0.1%
BSCtoC	1	7259	0.0%	24	25211	0.1%
BSC	13	5722	0.2%	54	20487	0.3%
BSS	12	10727	0.1%	58	46448	0.1%
BSHC	11	4060	0.3%	42	16945	0.2%
BSA Total	78	51143	0.2%	337	198424	0.2%

All Lead Providers achieved this target during both time periods.

Comment:

2.8 Benign Biopsy Weight

Definition - The number of benign open biopsies where the weight of the benign lesion is less than 20 grams, expressed as a percentage of the number with benign open biopsies

Indicator - 80% or more of open biopsies (benign result) should weigh < 20g.

Table 2.8. Number and percentage of benign open biopsies which weigh <20g, by lead provider.

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	Benign Open Biopsies < 20g	Total Benign Open Biopsies	% of Benign Open Biopsies	Benign Open Biopsies < 20g	Total Benign Open Biopsies	% of Benign Open Biopsies
BSAN	18	26	69.2%	62	89	69.7%
BSM	5	6	83.3%	21	32	65.6%
BSCtoC	*	*	*	*	*	*
BSC	4	6	66.7%	29	36	80.6%
BSS	6	11	54.5%	26	47	55.3%
BSHC	4	5	80.0%	13	21	61.9%
BSA Total	37	54	68.5%	151	225	67.1%

* 80% of the benign open biopsies had a default weight recorded within the national monitoring data set so results for BreastScreen Coast to Coast have not been reported.

Because of the small numbers of benign open biopsies performed there is a great deal of fluctuation.

Comment:

- It has been recommended (Monitoring Report no. 9) that this indicator no longer be reported. However, despite its limitations, it is the only indicator that is used internationally to measure the proportion of women who have a satisfactory cosmetic outcome in women who have a benign biopsy result.
- BSCtoC continues to provide default weights for over 20% of specimens for each of the reporting periods in the last two years.
- In the NP&QS the target has now changed to “90% or more of open surgical biopsies (benign result) should weigh <30g”, which is in line with the European Guidelines. This will be the standard used for future reports.

2.9 Needle Biopsy Rates

Definition – Number of women undergoing fine needle aspiration (FNA) or core biopsy as percentages of all women screened

Indicator - None set

Table 2.9a Number and percentage of Women having Needle Biopsy, last 6 months

Lead Provider	Jul 2003 to Dec 2003									
	FNA only		Core Needle only		Both*		Other		Total	
	Number of Women	% of Screens	Number of Women	% of Screens	Number of Women	% of Screens	Number of Women	% of Screens	Number of Women	% of Screens
BSAN	35	0.2%	156	1.0%	23	0.1%	150	1.0%	364	2.3%
BSM	16	0.2%	93	1.2%	2	0.0%	0	0.0%	111	1.5%
BSCtoC	7	0.1%	83	1.1%	0	0.0%	0	0.0%	90	1.2%
BSC	5	0.1%	98	1.7%	4	0.1%	0	0.0%	107	1.9%
BSS	51	0.5%	174	1.6%	13	0.1%	0	0.0%	238	2.2%
BSHC	7	0.2%	36	0.9%	2	0.0%	0	0.0%	45	1.1%
BSA Total	121	0.2%	640	1.3%	44	0.1%	150	0.3%	955	1.9%

* Women who have both FNA and core needle procedures.

Table 2.9b Number and percentage of Women having Needle Biopsy, last 2 Years

Lead Provider	Jan 2002 to Dec 2003									
	FNA only		Core Needle only		Both*		Other		Total	
	Number of Women	% of Screens	Number of Women	% of Screens	Number of Women	% of Screens	Number of Women	% of Screens	Number of Women	% of Screens
BSAN	124	0.2%	605	1.0%	76	0.1%	519	0.9%	1324	2.2%
BSM	55	0.2%	377	1.2%	15	0.0%	0	0.0%	447	1.5%
BSCtoC	31	0.1%	333	1.3%	1	0.0%	0	0.0%	365	1.4%
BSC	21	0.1%	349	1.7%	11	0.1%	0	0.0%	381	1.9%
BSS	254	0.5%	644	1.4%	40	0.1%	1	0.0%	939	2.0%
BSHC	37	0.2%	94	0.6%	21	0.1%	0	0.0%	152	0.9%
BSA Total	522	0.3%	2402	1.2%	164	0.1%	520	0.3%	3608	1.8%

* Women who have both FNA and core needle procedures.

Comment:

- Given that there is no set target, this outcome is difficult to assess as a measure of the quality of screening. It provides comparison between Lead Providers, which may be useful, but once again it may be more useful to understand the rate of needle biopsies as a proportion of referrals to assessment to ascertain the quality of the programme in detecting breast cancer, and for weighing up the risks and benefits.

2.10 Specificity

Definition (Actual) – The number of women with true negative screening results as a percentage of the number of women who do not have disease (true negatives and false positives from screening).

Indicator - > 93%

Specificity is defined as ‘the proportion of women without breast cancer at screening that have a negative screen result’. This is **estimated** by expressing the number of women who have a negative screen result as a proportion of all women screened, less the number with cancer detected at the time of screening. The estimated specificity for each lead provider is shown in Table 2.10.

Table 2.10 Estimated Specificity of BSA by Lead Provider

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	Prevalence	Incidence	Total	Prevalence	Incidence	Total
BSAN	92.1%	97.2%	95.8%	92.8%	96.8%	95.6%
BSM	92.2%	96.9%	95.8%	93.2%	97.0%	96.1%
BSCtoC	94.0%	97.8%	97.0%	94.0%	97.7%	96.7%
BSC	88.9%	96.5%	94.5%	89.3%	96.6%	94.5%
BSS	90.6%	96.4%	95.1%	91.4%	96.6%	95.3%
BSHC	94.0%	98.8%	97.6%	93.4%	98.7%	97.6%
BSA Total	91.8%	97.1%	95.8%	92.4%	97.0%	95.8%

All Lead Providers achieved the target for incident screens over the two year period and for the last six months of that period. However, there was some variation in specificity for prevalent screens, where previous films are not available for comparison. In particular, BSC was below 90% for both the six-month and two year period.

Comments:

- This indicator has previously included the caveat that “*Although false negative results are included in both the numerator and the denominator, the number of false negatives is so small in comparison to the number of true negatives that a reasonable estimate of specificity can be made. One minus the specificity is the proportion of women without breast cancer at screening who have a positive result. Positive results require further investigation to determine whether or not cancer is present.*” Specificity is an important measure of validity of a screening test in how accurate it is in labelling women as negative on screening tests if they do not actually have breast cancer. Unfortunately in all but randomised controlled trials (RCTs), which use measures which are more precise than a screening tool to determine the absence or presence of true disease in the whole eligible screening population, it is not possible to determine the extent of false negatives from the screening programme alone (certainly not at the time of screening). Hence calculating an estimate of specificity that assumes that false negative rates are low is a rather circular argument since in essence this is what is being ascertained by the true measure.

- European guidelines suggest that calculating an estimate of specificity is worthwhile, but that it should be interpreted with caution given this underlying assumption, which should not be assumed to be constant in screening situations different to those under which the European trials were carried out.
- Further to assume that '1 minus this estimate' represents the proportion of women with breast cancer at screening who have a positive result also relies on the assumption that the number of false negatives is extremely small
- There may be merit in reviewing whether the number of false negatives is indeed negligible in a New Zealand context, and gathering information on interval cancer rates will be a step towards doing this.
- The PPV may be a measure that is more relevant, either alone or as an adjunct to this measure, to assess the quality of screening in this population.

3. Early detection of DCIS or Invasive Breast Cancer

3.1 Detection of DCIS or Invasive Breast Cancer

Definition: Number of women diagnosed with DCIS or breast cancer per 1000 women screened.

Target: Prevalence round ≥ 6 per 1000 women screened
Incidence round ≥ 3 per 1000 women screened

Table 3.1 Detection rates of DCIS and invasive breast cancer per 1000 women screened

Lead Provider	Last 6 Months				Last 2 Years			
	Jul 2003 to Dec 2003				Jan 2002 to Dec 2003			
	Prevalence		Incidence		Prevalence		Incidence	
	Number	Rate per 1000	Number	Rate per 1000	Number	Rate per 1000	Number	Rate per 1000
BSAN	39	9.2	57	5.0	174	10.0	233	5.6
BSM	9	5.1	20	3.4	45	6.3	110	4.7
BSCtoC	10	6.2	23	4.1	58	8.6	98	5.3
BSC	12	8.0	33	7.8	46	7.8	76	5.2
BSS	17	7.0	47	5.7	93	8.1	194	5.5
BSHC	1	1.0	17	5.6	18	4.9	61	4.6
BSA Total	88	7.0	197	5.1	434	8.3	772	5.3

All Lead Providers met these targets with the exception of prevalence round screening at BSM in the last six months and BSHC during both periods. Absolute numbers of cases were small in these regions, but BSHC prevalence cancer detection rates will need close monitoring.

Comment:

- The effectiveness of the screening programme is measured against this indicator. However, the cancer detection rate is reliant on the background incidence of breast cancer in the population of eligible women, which is not well documented for the New Zealand population, particularly for Maori and Pacific women.
- The cancer detection rate targets for BSA are the same as the UK targets. These may or may not be relevant to the New Zealand eligible (or screened) population. However, the NSU has recently estimated the background incidence of breast cancer in NZ in the absence of screening, and these data have been used with the European guidelines to derive New Zealand specific targets, and will be introduced as part of the updated NPQS targets for women screened between 1 January and 30 June 2004.

3.1.1 Summary Table

The following table (Table 3.1.1a) provides a summary of the percentage of women referred to assessment, the estimated specificity, the estimated percentage of false positives and the cancer detection rate per 1000 women screened. Table 3.1a is for prevalence screening and Table 3.1.1b is for incident screening.

Table 3.1.1a Summary for prevalence screening by Lead Provider

Lead Provider	Last 6 Months				Last 2 Years			
	Jul 2003 to Dec 2003				Jan 2002 to Dec 2003			
	Referral to Assessment as % of Women screened	Specificity	False Positives as % of Women screened	Detection rate per 1000 women screened	Referral to Assessment as % of Women screened	Specificity	False Positives as % of Women screened	Detection rate per 1000 women screened
BSAN	9.7%	92.1%	7.8%	9.2	8.6%	92.8%	7.1%	10.0
BSM	8.6%	92.2%	7.7%	5.1	7.5%	93.2%	6.7%	6.3
BSCtoC	7.0%	94.0%	6.0%	6.2	7.0%	94.0%	5.9%	8.6
BSC	12.1%	88.9%	10.9%	8.0	11.5%	89.3%	10.6%	7.8
BSS	10.2%	90.6%	9.3%	7.0	9.4%	91.4%	8.5%	8.1
BSHC	6.4%	94.0%	6.0%	1.0	7.1%	93.4%	6.5%	4.9
BSA Total	9.3%	91.8%	8.1%	7.0	8.6%	92.4%	7.6%	8.3

Table 3.1.1b Summary for incidence screening by Lead Provider

Lead Provider	Last 6 Months				Last 2 Years			
	Jul 2003 to Dec 2003				Jan 2002 to Dec 2003			
	Referral to Assessment as % of Women screened	Specificity	False Positives as % of Women screened	Detection rate per 1000 women screened	Referral to Assessment as % of Women screened	Specificity	False Positives as % of Women screened	Detection rate per 1000 women screened
BSAN	3.6%	97.2%	2.8%	5.0	3.9%	96.8%	3.2%	5.6
BSM	3.6%	96.9%	3.1%	3.4	3.5%	97.0%	3.0%	4.7
BSCtoC	2.6%	97.8%	2.2%	4.1	2.9%	97.7%	2.3%	5.3
BSC	4.4%	96.5%	3.5%	7.8	3.9%	96.6%	3.4%	5.2
BSS	4.2%	96.4%	3.6%	5.7	4.0%	96.6%	3.4%	5.5
BSHC	1.8%	98.8%	1.2%	5.6	1.8%	98.7%	1.3%	4.6
BSA Total	3.5%	97.1%	2.9%	5.1	3.5%	97.0%	2.9%	5.3

These tables provide a summary of some of the key indicators reported elsewhere.

Comment:

- The comments made earlier in this report are also relevant when considering the estimates of specificity and false positive rates here.
- The detection rate per 1000 may be misleading in this table, since all other figures are reported per 100. Although the detection rate would be 10-fold less if reported per 100 women screened, it would be more comparable with the other figures.

3.2 DCIS and Invasive Cancer

There is an inevitable delay in the recording of details about DCIS or invasive breast cancer diagnosed as a result of screening, due to the time required to arrange treatment, and the subsequent recording of treatment data by lead providers. To make allowance for this delay, cancer details have been provided for women screened within the six-month monitoring period up to the end of March 2003 (three months prior to the start of this reporting period).

All lead providers achieved 90% completion of cancer detail records from the commencement of screening to the end of March 2003.

In previous reports, the cancer detection rates in tables 3.2 and 3.3 were calculated per 1000 women screened. Unfortunately, using “women screened” as the denominator for periods beyond 2 years (a screening round) instead of “number of screens” artificially elevates the cancer detection rates. The rates in 3.2 and 3.3 in previous reports could therefore not be used for comparison with international programmes. The correct and updated tables are presented here.

Table 3.2 Summary of Cancers Detected

Lead Provider	For Women Screened from December 1998 to March 2003						
	DCIS		Invasive		Total Cancers	Total Screens	Cancer Detection Rate per 1000 Screens
	Number	% of all Cancers	Number	% of all Cancers			
BSAN	235	29%	580	71%	815	106188	7.7
BSM	81	24%	262	76%	343	58496	5.9
BSCtoC	42	13%	271	87%	313	48077	6.5
BSC	38	15%	209	85%	247	37474	6.6
BSS	119	22%	419	78%	538	83877	6.4
BSHC	24	16%	122	84%	146	33317	4.4
BSA Total	539	22%	1863	78%	2402	367429	6.5

3.3 Invasive Cancer

Definition: Number of women screened who are diagnosed with invasive breast cancer per 1000 screens

Target: ≥ 4.8 per 1000 screens

Table 3.3 Invasive cancer detection rate per 1000 women screened

Lead Provider	For Women Screened from Dec 1998 to March 2003				
	Total Invasive Cancers	Total Screened Women	Invasive Rate per 1000 Screened Women	Total Screens	Invasive Rate per 1000 Screens
BSAN	580	66100	8.8	106188	5.5
BSM	262	37158	7.1	58496	4.5
BSCtoC	271	29628	9.1	48077	5.6
BSC	209	22851	9.1	37474	5.6
BSS	419	50523	8.3	83877	5.0
BSHC	122	19830	6.2	33317	3.7
BSA Total	1863	226090	8.2	367429	5.1

All Lead Providers, except BSHC and BSM, met the target for the number of women who were diagnosed with invasive breast cancer between December 1998 and September 2002.

Tables 3.3.1 and 3.3.2 stratify the numbers of invasive cancers by clinically recognised tumour classification systems.

Table 3.3.1 Number of Invasive cancers by Tumour Classification

Lead Provider	For Women Screened from December 1998 to March 2003								Total Invasive Cancers
	pT0	pT1a	pT1b	pT1c	pT2	pT3	pT4	pTX	
BSAN	1	74	158	219	105	12	9	2	580
BSM	0	17	64	124	54	1	2	0	262
BSCtoC	0	32	60	117	59	2	1	0	271
BSC	0	20	74	89	26	0	0	0	209
BSS	0	50	115	179	68	5	2	0	419
BSHC	0	11	44	48	15	3	1	0	122
BSA Total	1	204	515	776	327	23	15	2	1863

Table 3.3.2 Percentage of Invasive cancers by Tumour Classification

Lead Provider	For Women Screened from December 1998 to March 2003							
	pT0	pT1a	pT1b	pT1c	pT2	pT3	pT4	pTX
BSAN	0.2%	12.8%	27.2%	37.8%	18.1%	2.1%	1.6%	0.3%
BSM	0.0%	6.5%	24.4%	47.3%	20.6%	0.4%	0.8%	0.0%
BSCtoC	0.0%	11.8%	22.1%	43.2%	21.8%	0.7%	0.4%	0.0%
BSC	0.0%	9.6%	35.4%	42.6%	12.4%	0.0%	0.0%	0.0%
BSS	0.0%	11.9%	27.4%	42.7%	16.2%	1.2%	0.5%	0.0%
BSHC	0.0%	9.0%	36.1%	39.3%	12.3%	2.5%	0.8%	0.0%
BSA Total	0.1%	11.0%	27.6%	41.7%	17.6%	1.2%	0.8%	0.1%

Comment:

- We should see a downward shift in the distribution of tumours over time, if the screening programme is achieving its goal of identifying earlier stage disease.
- The distribution might be expected to change slowly at the beginning of the screening period, but gradually shift towards less aggressive disease as screening becomes established, and incident screening becomes the norm, for older women in particular.

Figure 3.3 Percentage of Invasive Cancers by classification , December 1998 to March 2003

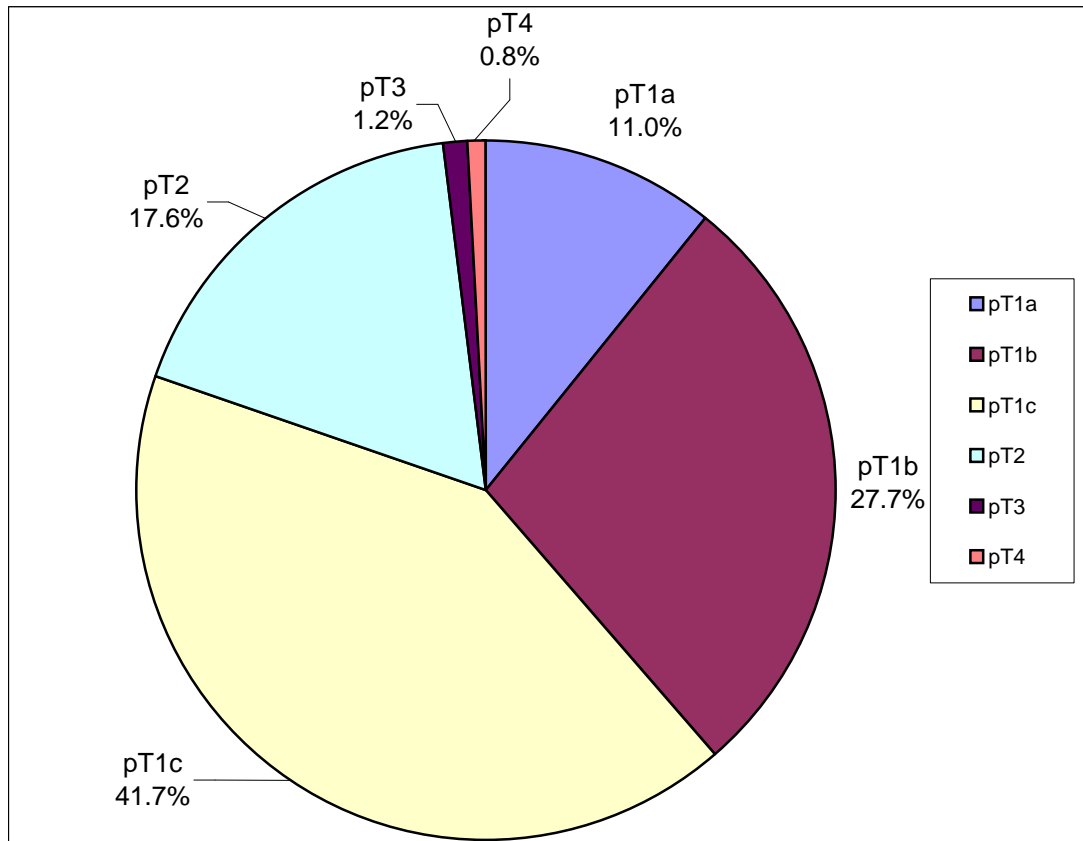


Figure 3.3 illustrates that the majority of primary tumours being detected by screening are classified as pT1a-c through pT2, which is in accordance with the aims of screening.

3.4 Nodal Involvement

Definition: Number of women with invasive cancer who do not have nodal involvement, expressed as a percentage of the number with invasive cancer.

Target: At least 70% of women with invasive breast cancer should be node negative.

Table 3.4a describes the distribution of the nodal involvement of cancers detected since the commencement of the screening programme, and Table 3.4b provides a dichotomous table, with nodal involvement classified either as nil or invasion, and with the exclusion of cancers classified as pNX.

Table 3.4a Summary of Nodal Status of Women with invasive Breast Cancer

Lead Provider	For Women Screened from December 1998 to March 2003								
	pN0	%	pN1	%	pN2	%	pNX	%	Total Invasive Cancers
BSAN	422	72.8%	140	24.1%	0	0.0%	18	3.1%	580
BSM	190	72.5%	65	24.8%	1	0.4%	6	2.3%	262
BSCtoC	199	73.4%	62	22.9%	4	1.5%	6	2.2%	271
BSC	156	74.6%	46	22.0%	0	0.0%	7	3.3%	209
BSS	312	74.5%	92	22.0%	3	0.7%	12	2.9%	419
BSHC	92	75.4%	26	21.3%	0	0.0%	4	3.3%	122
BSA Total	1371	73.6%	431	23.1%	8	0.4%	53	2.8%	1863

Table 3.4b Summary of Women with invasive Breast Cancer who have no nodal involvement

Lead Provider	December 1998 to March 2003		
	No Nodal Involvement (pN0)	Total Invasive Cancers (less pNX)	% of Invasive Cancers (less pNX) with no Nodal Involvement
BSAN	422	562	75.1%
BSM	190	256	74.2%
BSCtoC	199	265	75.1%
BSC	156	202	77.2%
BSS	312	407	76.7%
BSHC	92	118	78.0%
BSA Total	1371	1810	75.7%

All Lead Providers are achieving the target of at least 70% of invasive cancers detected having no nodal involvement, which suggests that cancers are being detected at an early stage.

Comment:

- This distribution also needs to be reviewed in the light of pre-screening figures to better determine the efficacy of the screening programme. See above

- These figures compare favourably with the results from the Swedish two-County (S2C trial) of screening, where nodal status was negative in over 75% of women with cancer detected.

3.5 Ductal Carcinoma In Situ (DCIS)

Definition: The number of women with DCIS as a percentage of all women diagnosed with cancer in the screening programme

Target: 10-25% of all cancers detected are DCIS

Table 3.5 Number of women with DCIS as a percentage of total cancer detected

Lead Provider	For Women Screened from December 1998 to March 2003		
	DCIS	Total Cancers	% of Total Cancers
BSAN	235	815	28.8%
BSM	81	343	23.6%
BSCtoC	42	313	13.4%
BSC	38	247	15.4%
BSS	119	538	22.1%
BSHC	24	146	16.4%
BSA Total	539	2402	22.4%

There is variation between Lead Providers in the proportion of cancers that are diagnosed as DCIS. At the extremes, 28.8% of total cancers detected by BSAN were classified as DCIS (an increasing proportion, and greater than the target upper limit of 25%) compared with 13.4% at BSCtoC.

Comment:

- There is some concern worldwide that breast-screening programmes may be over-diagnosing and over-treating DCIS in women who may never have presented in their lifetime with breast cancer had they not been screened.
- Figures from 1979-1988 in New Zealand suggest that DCIS represented less than 2% of all breast cancers during that pre-screening period (however this would need further investigation to check that direct comparisons were appropriate between the two time periods)
- It would be interesting to stratify this outcome by age-group, to see if the proportions of DCIS and invasive cancer differed as women aged. Given that the numbers are small, this may only be possible for all Lead Providers combined.

5. Provision of an appropriate and acceptable service

5.1 Time taken for provision of screening results

Definition: Days (working) between date of final screening visit and provision of screening results to women

Target: 95% notified within 10 working days

Table 5.1 Percentage of women notified of screening results within 10 working days

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	# notified within 10 working days	Number of Women Screened	% notified within 10 working days	# notified within 10 working days	Number of Women Screened	% notified within 10 working days
BSAN	15116	15748	96.0%	56645	58919	96.1%
BSM	7506	7627	98.4%	29942	30414	98.4%
BSCtoC	7241	7259	99.8%	25039	25211	99.3%
BSC	5416	5722	94.7%	19958	20487	97.4%
BSS	10655	10727	99.3%	46161	46448	99.4%
BSHC	3758	4060	92.6%	16284	16945	96.1%
BSA Total	49692	51143	97.2%	194029	198424	97.8%

BSHC and BSC failed to meet this target over the six month period. However, they did reach the target in the two-year period.

This target is the first in a series of indicators that evaluate the timeliness of the screening programme. Overall more than 97% of women receive their initial screening results within 10 days of their final screening visit. However, the overall rate has shown a slight fall-off in the last six month period, which is of concern given the increases required in the provision of screening with the age extension in July 2004.

5.2 Time taken from screening visit to first offer of an assessment appointment

Definition: Working days between the date of final screening visit and date of first available appointment offered for assessment

Target: At least 90% of women are offered an assessment appointment within 14 working days of their final screening mammogram.

Table 5.2 Number and percentage of Women offered 1st assessment appointment within 14 working days

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	# offered assessment within 14 working days	Number Referred to Assessed	% offered apptment within 14 working days	# offered assessment within 14 working days	Number Referred to Assessed	% offered apptment within 14 working days
BSAN	619	827	74.8%	2599	3118	83.4%
BSM	318	360	88.3%	1257	1361	92.4%
BSCtoC	224	262	85.5%	850	999	85.1%
BSC	286	365	78.4%	1111	1251	88.8%
BSS	561	597	94.0%	2317	2482	93.4%
BSHC	79	119	66.4%	368	496	74.2%
BSA Total	2087	2530	82.5%	8502	9707	87.6%

There is considerable variation in performance against this indicator between Lead Providers. Only BSS met the target in both the last six months and the two-year period. At BSAN, BSM, BSHC and BSC there has been a fall-off in the proportion of women offered their first assessment within 14 working days of their final screening mammography. For BSAN, this represents a regression to earlier rates, but represents a new trend for BSM. BSHC remains well below the target of 90% over both periods.

5.3 Time taken from assessment to final diagnostic biopsy

Definition: Either the time in working days between the date of first level assessment and date of needle biopsy or date of first offer of open surgical biopsy.

Target: At least 90% of women requiring needle biopsy have that procedure completed within 7 working days of their assessment, and at least 90% of women those who require open biopsy are offered that procedure within three weeks of their assessment.

Table 5.3.1 Number and percentage of women receiving Needle Biopsy within 7 days of assessment

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	Women having needle biopsy within 7 days of assessment	Women having Needle Biopsy	% receiving Needle Biopsy within 7 days	Women having needle biopsy within 7 days of assessment	Women having Needle Biopsy	% receiving Needle Biopsy within 7 days
BSAN	295	364	81.0%	1024	1324	77.3%
BSM	91	111	82.0%	358	447	80.1%
BSCtoC	76	90	84.4%	316	365	86.6%
BSC	102	107	95.3%	355	381	93.2%
BSS	198	238	83.2%	772	939	82.2%
BSHC	43	45	95.6%	140	152	92.1%
BSA Total	805	955	84.3%	2965	3608	82.2%

In general, there has been a continuing improvement in timeliness in the last six-month period, although only BSC and BSHC consistently have over 90% of the women in their region receiving a needle biopsy within the target time periods. However it is noteworthy that BSAN, and to a lesser extent BSM and BSS, have continued to reduce the delay in this measure, and are moving closer to the target of 90%.

Table 5.3.2 Number and percentage of women with Date Offered for Open Biopsy within 3 weeks of assessment

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	Women with Date Offered for Open Biopsy within 3 weeks of assessment	Women having Open Biopsy	% Date Offered for Open Biopsy within 3 weeks	Women with Date Offered for Open Biopsy within 3 weeks of assessment	Women having Open Biopsy	% Date Offered for Open Biopsy within 3 weeks
BSAN	17	33	51.5%	50	118	42.4%
BSM	3	8	37.5%	15	41	36.6%
BSCtoC	1	1	100.0%	7	24	29.2%
BSC	6	13	46.2%	27	54	50.0%
BSS	4	12	33.3%	26	58	44.8%
BSHC	3	11	27.3%	25	42	59.5%
BSA Total	34	78	43.6%	150	337	44.5%

Only BSCtoC achieved the target in the last six months, and this was on the strength of only one woman, and was against their trend for the two-year period. No other Lead Provider has reached the target of 90% for this timeliness indicator, and there have been some significant fluctuations in the six monthly intervals that make up the two-year period under consideration. In particular, BSAN offered open biopsies within three weeks to almost 82% of women in the previous six month period (January to June 2003) but only achieved this for just over half (51.5%) of women in the last six months (July to December 2003), with a rate of under 50% for the whole two year period. BSM offered open biopsies within the 3 week time period to fewer than 40% of women over the last six months, having achieved 54.5% in the previous six months. Other Lead Providers also remain well below the target, with some indication that the delay might have worsened over the last six months.

Comment:

- Overall, BSA is not meeting this timeliness target, and it appears to be moving further away from achieving it. This is of particular concern as the BSA programme is extended, and the need for these biopsies increases. This indicator relates to small numbers of women, and in future will be reported with confidence intervals to allow more valid interpretation of the achievement of the target.

5.4 Time taken from final diagnostic biopsy to reporting assessment results

Definition: Number of working days between date of final diagnostic biopsy and date of reporting final biopsy results.

Target: Results should be reported to at least 90% of women within 7 days of final diagnostic biopsy

Table 5.4 Number and percentage of Women receiving final diagnostic biopsy results within 7 days

Lead Provider	Last 6 Months			Last 2 Years		
	Jul 2003 to Dec 2003			Jan 2002 to Dec 2003		
	# with results reported within 7 days of final biopsy	# with final diagnostic biopsy	% receiving final biopsy results within 7 days	# with results reported within 7 days of final biopsy	# with final diagnostic biopsy	% receiving final biopsy results within 7 days
BSAN	319	370	86.2%	1152	1372	84.0%
BSM	93	112	83.0%	363	453	80.1%
BSCtoC	82	90	91.1%	328	369	88.9%
BSC	100	107	93.5%	346	383	90.3%
BSS	233	239	97.5%	925	943	98.1%
BSHC	42	47	89.4%	150	163	92.0%
BSA Total	869	965	90.1%	3264	3683	88.6%

Overall, Lead Providers have either maintained their performance on this indicator, or moved towards the target of 90% over the six months between July and December 2003. However, BSAN and BSM still failed to reach the 90% target in both time periods.

5.5 Time taken from reporting assessment results to first date offered for primary surgical treatment

Definition: Time in weeks between the date of reporting of final biopsy results and offer of primary surgical treatment.

Target: At least 90% of women are offered primary surgical treatment within three weeks of the final diagnosis being reported to the woman.

Table 5.5 Percentage of Women offered Surgical Treatment within 3 weeks of assessment

Lead Provider	For Women Screened from December 1998 to March 2003		
	Offered Surgical treatment within 3 weeks	Surgical treatment as first Treatment Procedure	% Offered Surgical treatment within 3 weeks
BSAN	402	785	51.2%
BSM	212	339	62.5%
BSCtoC	208	295	70.5%
BSC	187	240	77.9%
BSS	358	535	66.9%
BSHC	113	139	81.3%
BSA Total	1480	2333	63.4%

Note: Lead Providers have advised they are unable to collect the date first offered surgical treatment and that the date recorded is usually the date of first surgical treatment procedure.

As has been the case for the last several reporting periods, none of the Lead Providers met the target for this timeliness indicator for this six month or two year period.

Comment:

- This may be influenced in part by the date recorded for monitoring being the actual date of the procedure rather than the date of the offer. Nevertheless it is the date of the procedure that will ultimately impact on the attempt to reduce mortality in the longer term.

References

Chamberlain J. BreastScreen Aotearoa An Independent Review. May 2002

Curtis E. BSA Reducing Inequalities Policy Impact Paper (draft). National Screening Unit, Ministry of Health. June 2004.

Appendix A: Denominators

Population denominator data

The eligible populations in this report were calculated from the projected resident populations for each Lead Provider district, provided by Statistics New Zealand. The projections are based on the New Zealand Census 2001, assuming medium fertility, mortality, migration and inter-ethnic mobility. The populations are the mean of the projected populations for 2003.

Table 1. Population projections for BreastScreen Aotearoa, by age group (2003)

Lead Provider	Summary by Age Group			Total Eligible Population
	50-54	55-59	60-64	
BSAN	43810	37640	28960	110410
BSM	18900	16800	14190	49890
BSCtoC	16525	14365	12135	43025
BSC	13690	11820	9320	34830
BSS	22240	19300	15530	57070
BSHC	8950	7850	6600	23400
BSA Total	124115	107775	86735	318625

Ethnic group denominators

The denominators for each ethnic group are also taken from the 2001 census, and calculated from projected resident populations in each lead provider district, provided by Statistics New Zealand.

In the census it is possible to choose more than one ethnic group. Where more than one category has been chosen, priority is given to certain ethnic groups for the purposes of classification by the New Zealand Health Information Service (NZHIS). Thus, if a woman chooses more than one category and one of these is Maori, she is counted as Maori.

Table 2 below uses the prioritised definition of ethnicity.

Table 2. Population projections for BreastScreen Aotearoa, by ethnicity (2003)

Lead Provider	Summary by Ethnicity			Total
	Maori	Pacific	Other	
BSAN	9370	8140	92890	110410
BSM	7300	530	42090	49890
BSCtoC	5725	405	36900	43025
BSC	2495	1670	30630	34830
BSS	2010	380	54680	57070
BSHC	880	115	22390	23400
BSA Total	27780	11240	279580	318625

Appendix B: Key Parameters

These reports assess the data collected by BreastScreen Aotearoa from individual providers with respect to the National Monitoring Indicator Set (NMIS). An asterisk indicates those indicators included in the six-monthly report. Some results cannot be provided until the end of a screening round. The indicators in this report were decided on by the previous Independent Monitoring Group in collaboration with NSU, with limited consultation with the independent epidemiologist largely due to the timing of the consultation. The instigation of a new Advisory Group may represent a pertinent time to review the indicators included herein.

The parameters listed relate to the screening pathway, from registration of eligible women, screening, and assessment, to diagnosis and treatment. Within each stage of the screening pathway certain parameters are measured. These parameters have been chosen because they can be used as indicators of the acceptability, effectiveness, and efficiency of BSA.

The choice of the parameters to be examined, and the calculations of the tables, are currently undertaken internally within the NSU, but explanatory text and commentary are provided externally.

A2.1 IDENTIFICATION AND INVITATION

Invitation of eligible women (which requires them first to be identified) is an essential component of a national breast cancer screening programme. Currently processes for invitation tend to vary between Lead Providers and eligible population numbers are obtained from extrapolations of Census data.

A2.1.1 Registration rate

This rate will be measured by dividing the number of registered women (from provider records) as a percentage of the number of eligible women according to projected population numbers. The target registration rate is 85% by the end of the prevalence round, and the performance of BSA against this target will be reported after the end of the prevalence screening round.

A2.1.2 Coverage rate *

Coverage will be measured by dividing the number of women screened (from provider records) by the number of eligible women according to projected population numbers. Coverage rates will be calculated for each provider area, and for the whole country (if data is available from Health Benefits Ltd for private sector screening of women), by age group. Coverage rates for BSA and for the private sector will also be calculated separately. The target is >70% of women aged 50-64 years in BSA. The performance of BSA with respect to this target will be measured at the end of the prevalence screening round.

A2.2 SCREENING TEST

The validity of the screening test will be examined by calculating its sensitivity and specificity. The screening test is the point of entry for a woman with breast cancer. If her cancer is missed, she cannot benefit from early detection. Because the test is not perfect, some women will have false positive or false negative tests. These should be kept to a minimum in order to avoid unnecessary anxiety and investigations, or false reassurance.

A2.2.1 Radiation dose/Optical density

The mean absorbed dose to glandular tissue (MGD) for a test object (routinely collected as part of equipment calibration and maintenance) will be obtained from provider records and reported in each annual report. Optical density, a measure of film density and mammographic quality will be obtained from provider records and reported in each annual report.

A2.2.2 Number of films taken *

The number of films taken for each woman screened will be obtained from provider records. This will be compared against the target of a minimum of 80% of women having 4 or fewer films. Numbers of films per woman will be calculated by provider, and for mobile versus fixed screening centres.

A2.2.3 Technical recall rate *

The number of women recalled for extra films for technical reasons (from provider records) will be divided by the number of women screened (from provider records). Technical recall rates will be calculated according to screening round, by provider, and for mobile versus fixed screening centres. Targets are <3% for mobile units and <0.5% for fixed units.

A2.2.4 Technical reject rate (changed from technical repeat rate in this Report following advice from past Monitoring Group)*

The number of technical reject films will be divided by the total number of films taken (from provider records). Technical reject rates will be calculated according to screening round, by provider, and for mobile versus fixed screening centres. The target is <3%.

A2.2.5 Sensitivity (estimate)

Sensitivity will be estimated by dividing the number of women with screen-detected breast cancer by the sum of this number and the number of women with interval cancers in the year following a negative screen. The target is 90%. Sensitivity will be estimated for each screening round by age group and by region and provider.

A2.2.6 Specificity (actual)

Specificity will be calculated after a complete screening round, by dividing the number of women with true negative screening tests by the sum of this number and the number of women with false positive tests. In order to measure the number of women with true negative tests, it will be important to measure the number of women with false negative tests (interval cancers). This information will have to be obtained from provider records (negative tests) and also from the Cancer Registry of the NZHIS (women diagnosed with interval cancers following a negative test). Specificity will be calculated by age group and by region and provider. The target is >93%.

A2.2.7 Specificity (estimated)* - included as previously referred to (see comments in text re validity)

Specificity can be estimated before the second screening round by dividing all negative tests (including false negatives) by the sum of all negatives and false positives. This is an adequate estimate of specificity (although false negatives have been included in the numerator and the denominator) because the number of false negatives is very small in relation to the number of true negatives. This information will be obtained from provider records. Specificity will be estimated by age group and by provider. The target is >93%.

A2.2.8 Positive predictive value (PPV)*

The number of women with breast cancer diagnosed through the screening programme will be divided by the sum of this number and the number of women with false positive screening tests (i.e.: the number of women with screen-detected cancer as a percentage of all women referred for assessment). This information will be obtained from provider records. The positive predictive value will be calculated by screening round, by age group, and by region and provider, and will be reported in each annual report. The target PPV is $\geq 9\%$.

A2.3 ASSESSMENT

Women with positive screening tests will be referred for assessment. The number referred will be determined by the underlying prevalence of breast cancer in the population and by the sensitivity and specificity of the screening test. Ideally the assessment process will determine which women with positive screening tests actually have breast cancer and require treatment, while minimising unnecessary anxiety and investigations in the other women.

A2.3.1 Assessment rate *

The assessment rate will be calculated by dividing the number of women referred for assessment by the total number of women screened. Assessment rates will be calculated by screening round, by age group, and by provider. Targets for the prevalence screening round are <7% (expected) and <10% (minimum). Targets for the incidence screening rounds are <4% (expected) and <5% (minimum). These targets will not be measured until after the end of each screening round.

A2.3.2 False positive rate of mammograms *

The false positive rate will be calculated by dividing the number of women with false positive screening results (women referred for assessment but who do not have breast cancer diagnosed as a result) divided by the total number of women screened. This information will be obtained from provider records. The false positive rate will be calculated by age group, and by provider. Targets for the prevalence screening round are <6% (expected) and <9% (minimum). Targets for the incidence screening rounds are <3% (expected) and <4% (minimum). These targets will not be measured until after the end of each screening round

A2.3.3 Needle biopsy rate *

The needle biopsy rate will be calculated by dividing the number of women undergoing FNA divided by the number of women screened. This information will be obtained from provider records. The needle biopsy rate will be calculated by age group, and by provider. No target has been set for the needle biopsy rate.

A2.3.4 Benign biopsy weight*

The weight of benign biopsy is measured to ensure 80% weigh less than 20g. The rate is calculated by the number of benign biopsies, which weigh less than 20g as a percentage of the number of benign open biopsies.

A2.3.5 Open surgical biopsy rate *

The open surgical biopsy rate will be calculated by dividing the number of women undergoing open surgical biopsy divided by the number of women screened. This information will be obtained from provider records. The open surgical biopsy rate will be calculated by age group, and by provider. The target for the open surgical biopsy rate is 1% or less.

A2.3.6 Benign biopsy rate *

The benign biopsy rate will be calculated by dividing the number of women with benign open surgical biopsy divided by the number of women screened. This information will be obtained from provider records. The benign biopsy rate will be calculated by age group, and by provider. The targets are <10 per 1,000 women screened in the prevalence round and <5 per 1,000 women screened in the incidence rounds. The performance of BSA with respect to these targets will be summarised in the annual reports.

A2.4 DIAGNOSIS

The number of women diagnosed with breast cancer as a result of BSA will be partly determined by the underlying prevalence of breast cancer in the eligible population, but also by the quality of the screening and assessment procedures. After diagnosis, the size and node status of cancers detected can be used as an indicator of the effectiveness of BSA.

A2.4.1 Pre-operative diagnosis rate

This will be calculated by dividing the number of women whose breast cancers were diagnosed by needle biopsy by the total number of women with breast cancer diagnosed through the screening programme. This information will be obtained from provider records. The target is $\geq 70\%$. The pre-operative diagnosis rate will be calculated by age group, and by region and provider, and will be reported annually.

A2.4.2 Cancer detection rate

The cancer detection rate will be calculated by dividing the number of women with breast cancer diagnosed through the screening programme by the number of women screened. This information will be obtained from provider records. The cancer detection rate and 95% confidence interval will be calculated by age group, and by region and provider. The targets are ≥ 6 per 1,000 women screened in the prevalence round and ≥ 3 per 1,000 women screened in the incidence rounds. The performance of the programme with respect to these targets will be reported in the annual reports.

In the prevalent round the cancer detection rate is expected to be at least three times the expected breast cancer incidence rate in the absence of screening. In the incident round it is expected to be at least 1.5 times the expected breast cancer incidence rate in the absence of screening. The expected incidence rate in the absence of screening will be estimated based on historical data from the Cancer Registry, taking into account relevant demographic trends.

A2.4.3 Invasive cancer rate*

This will be calculated by dividing the number of women with invasive breast cancer detected through the screening programme by the number of women screened. This information will be obtained from provider records. The invasive cancer rate and 95% confidence interval will be calculated by age group, and by region and provider, and reported six-monthly. The target is 4.8 per 1,000 women screened.

A2.4.4 Small invasive cancer detection rate

As above, but for cancers $\leq 10\text{mm}$. The target is 1.2 per 1,000 women screened per incident round.

A2.4.5 Proportion of women diagnosed with nodal involvement*

The proportion of women with nodal involvement will be calculated by dividing the number of women with breast cancer involving axillary nodes diagnosed through the screening programme by the total number of women diagnosed with breast cancer diagnosed through the screening programme. This information will be obtained from provider records. The proportion will be calculated by age group, and by region and provider, and will be reported six-monthly. The target is that at least 70% of women with cancers detected by BSA should be node negative (i.e. less than 30% node positive).

A2.4.6 Proportion of DCIS*

As above, but for DCIS. The target is that 10-25% of all cancers detected by BSA should be DCIS.

A2.4.7 Interval cancer rate

The interval cancer rate will be calculated by dividing the number of women with breast cancer detected within 12 months of a negative screen by the total number of women with negative screening tests during that screening round. This information will be obtained from the providers and from the Cancer Registry. The interval cancer rate, and 95% confidence interval, will be calculated by screening round and by region, and reported annually. The targets are <0.6 per 1,000 women screened within 1 calendar year of a negative screen, and <1.2 per 1,000 women screened between the 1st and 2nd year of a negative screen.

A2.4.8 Proportion of women with cancers detected by the programme

The proportion of women with cancers detected by the programme will be calculated by dividing the number of women with breast cancer diagnosed through the programme by the total number of women in the eligible age-range diagnosed with breast cancer in a given period. This information will be obtained from the providers and from the Cancer Registry. The proportion will be calculated by screening round, by age, and by region, and reported annually.

A2.5 TIMELINESS

The following relate to the requirement for the programme to ensure prompt and appropriate treatment for women who take part in the National Breast Cancer Screening Programme. The information will be collected from the providers, and where appropriate, from NZHIS. The dates of screening, providing results of screening, assessment, providing assessment results, date of biopsy, providing biopsy result, date of final diagnostic biopsy, result of final biopsy, and date first offered for primary treatment will be collected. The time taken for the following indicators will be calculated according to screening round and by region. The indicators will be reported every six months.

A2.5.1 Time to recall after a negative screen

Eligible women should be offered mammograms at two-yearly intervals. The percentage of eligible women recalled within 24 months of their previous screen will be measured.

A2.5.2 Time taken to provide results of screening *

The target is for 95% of women to be notified within 10 working days of the screening examination.

A2.5.3 Time taken from screening visit to first assessment appointment *

The target is for 90% of women to be offered their assessment appointment within 14 working days of their final mammogram.

A2.5.4 Time taken from final assessment to final diagnostic biopsy *

The target is for 90% of women requiring needle biopsy to have that procedure completed within 7 days of their assessment, and for 90% of women requiring open surgical biopsy to be offered that procedure within 3 weeks of their assessment.

A2.5.5 Time taken from final diagnostic biopsy to reporting assessment results *

The target is that 90% of women should have received their results within 7 days of their final diagnostic biopsy.

A2.5.6 Time taken from reporting assessment results to first date offered for primary treatment*

The target is that 90% of women are offered primary treatment within 3 weeks of the final diagnosis being reported to them.