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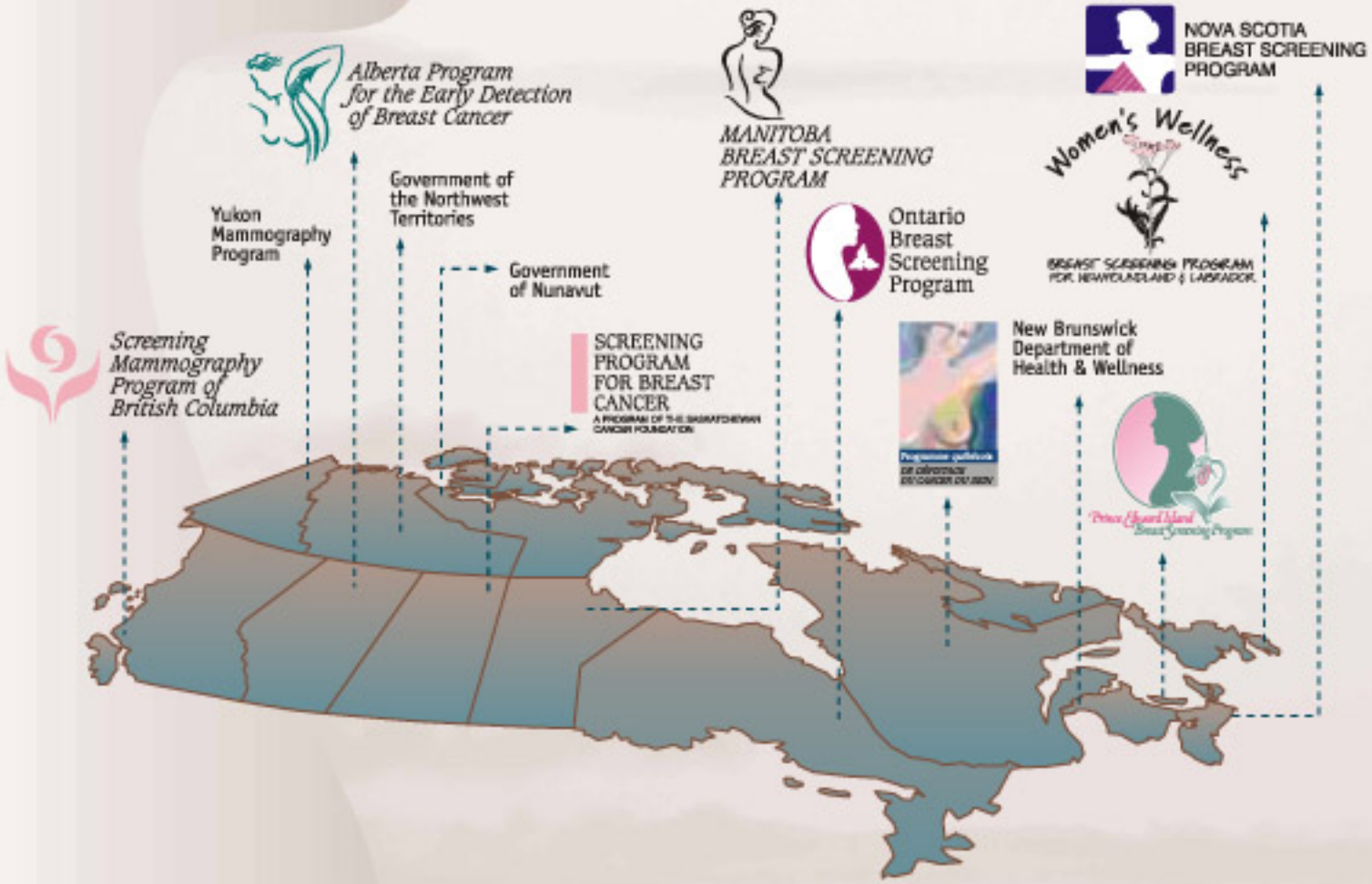
Organized Breast Cancer Screening Programs in Canada



1999 and 2000 Report

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EXECUTIVE SUMMARY

Breast cancer continues to be the most common cancer afflicting Canadian women, with 21,100 new cases estimated for 2003. According to 1998 estimates, breast cancer cost Canadians $1,062.8 million in terms of the value of years of life lost due to premature death. Nationally, nearly half of new cases of breast cancer occur among women aged 50 to 69. Early detection through organized breast cancer screening combined with effective treatment remains the best tool currently available to reduce breast cancer deaths among women in this age group.

The goal of monitoring and evaluating organized breast cancer screening programs in Canada is to promote high-quality screening, ultimately leading to reductions in breast cancer mortality and morbidity, and to the minimization of the unwanted effects of screening. This document presents an evaluation of the performance of organized breast cancer screening programs in Canada for the 1999 and 2000 calendar years using newly established Canadian performance measures and targets. Data for this evaluation were submitted to the Canadian Breast Cancer Screening Database by all 10 provinces. The quality of organized screening programs is enhanced through the ongoing monitoring efforts of the Canadian Breast Cancer Screening Initiative's National Committee.

The newly established Canadian performance measures and targets are used to monitor and evaluate organized breast cancer screening programs in Canada, ultimately leading to reductions in breast cancer mortality and morbidity.

Organized screening programs maximize the benefits to participants by detecting as many cancers as possible as early as possible. Rates of invasive cancer detection, the proportion of small invasive cancers, and the proportion of invasive cancers that have not spread to the lymph nodes reflect the extent to which programs are achieving this goal. Invasive cancer detection rates exceeded Canadian performance targets for women returning to screening, but just fell short for women at the initial screen. Performance measures indicate that screening programs were effective in finding breast cancers at an early stage, often before they could be felt or had spread to the lymph nodes.

Performance measures indicate that programs are minimizing many of the unwanted effects of screening. Although programs missed the

national targets of < 10% and < 5% for the percentage of women referred as a result of screening abnormalities, positive predictive values were within target, as were benign to malignant open biopsy ratios. Nationally, 73.3% of women not requiring surgical biopsy received a diagnosis within five weeks, and 45.6% of women requiring surgical biopsy were given a diagnosis within seven weeks. No individual program met the 90% target for timely diagnostic interval. Given that physicians outside the program setting most often coordinate follow-up, it is a challenge for programs to improve timeliness. However, remarkable progress was made in some programs, suggesting that evidence-based strategies to improve waiting times can be effective.

To transfer the benefits of screening to the entire target population, screening programs must attempt to maximize ongoing participation. This remains a challenge. Although most programs saw increased participation in 1999 and 2000, only 30.2% of eligible women accessed organized screening nationally. The stability of participation rates is of concern, as it suggests that programs are reaching the limits of their capacity. Additional capacity exists in most provincial health care systems external to organized programs in the fee-for-service sector, where a significant number of women receive opportunistic screening. However, the performance of screening in the fee-for-service sector is not monitored or evaluated.

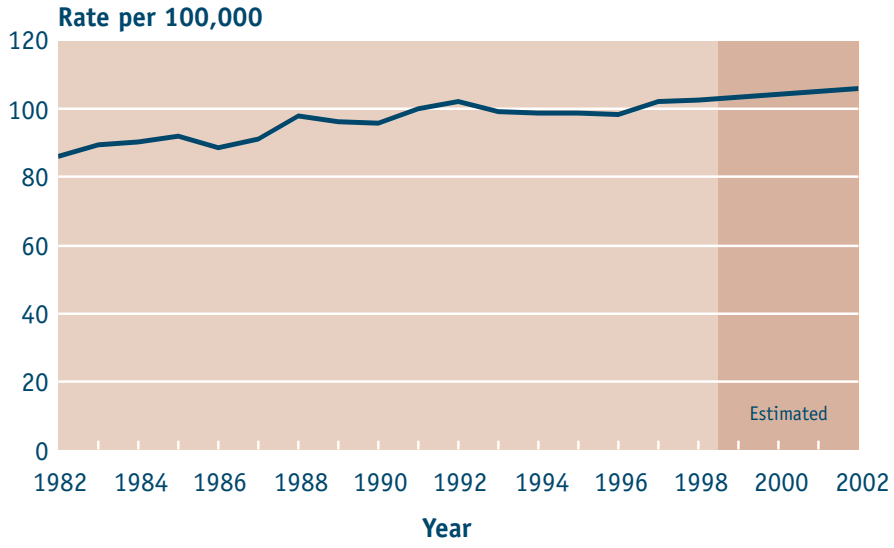
In the coming years, organized screening programs will continue to provide high-quality breast cancer screening. Programs aim to achieve reductions in breast cancer mortality in the target population by conducting research to enhance the quality and effectiveness of screening, and by adapting and updating their practices as new evidence and technologies become available. The results of monitoring and evaluation efforts, such as those reported here, are used to enhance the performance of screening across Canada.

BACKGROUND

With 21,100 new cases and 5,300 deaths estimated for 2003, breast cancer continues to be the most common cancer and the second highest cause of cancer death in Canadian women[1]. A rise in the incidence of breast cancer has been observed over several decades; this parallels an increase in mammographic screening. However, mortality rates have dropped, particularly since 1990, a decrease attributed, in part, to improved treatment and early detection resulting from mammography screening (see Figures 1a and 1b). The estimates for 2003 represent a projected increase of 9.9% in incident cases and a 3.6% decrease in deaths when compared with estimates for the year 2000[2]. The incidence of and mortality due to breast cancer place a significant cost on society. Hospital expenditures for breast cancer were estimated at $84.8 million in 1998. Mortality costs, which measure the value of life lost due to premature death, were much greater at an estimated $1,062.8 million

Figure 1a

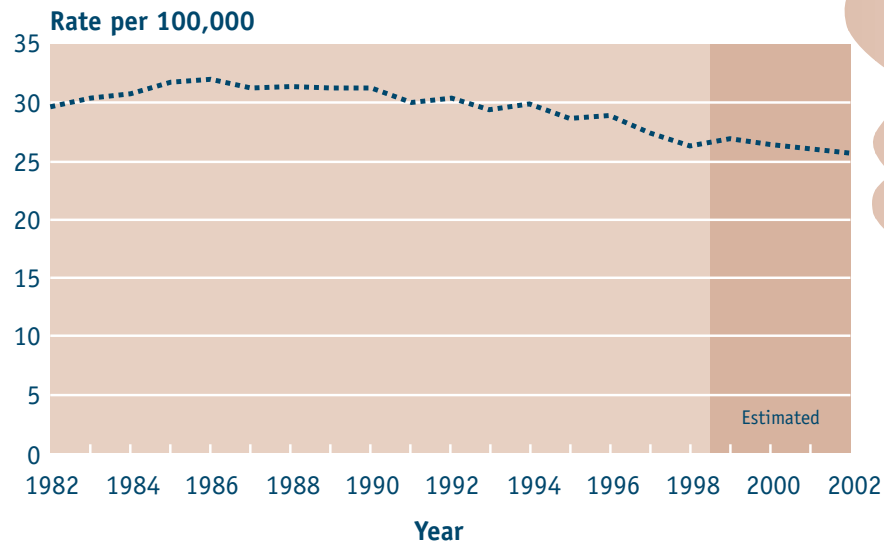
Age-standardized incidence rates per 100,000 for breast cancer in Canada, 1982-2002



Source: National Cancer Institute of Canada: Canadian Cancer Statistics 2002, Toronto, Canada, 2002.
Notes: Incidence rates for 1999-2002 are estimates. Rates are standardized to the age distribution of the 1991 population.

Nearly half of all breast cancer cases occur in women aged 50-69 and it has been demonstrated that these women benefit the most from breast cancer screening.

Figure 1b
Age-standardized mortality rates per 100,000 for breast cancer in Canada, 1982-2002



Source: National Cancer Institute of Canada: Canadian Cancer Statistics 2002, Toronto, Canada, 2002.
Notes: Mortality rates for 1999-2002 are estimates. Rates are standardized to the age distribution of the 1991 population.

and represented 10% of the mortality costs associated with all cancers combined[3].

While the body of knowledge surrounding the causes of breast cancer continues to grow, primary prevention strategies to reduce incidence in the population are currently limited. Most known risk factors are not modifiable; these include demographic factors (e.g. age, country of birth, socio-economic status), genetic factors (e.g. family history, BRCA1 and BRCA2 genetic mutations), hormonal factors (e.g. age at first pregnancy, age at menarche, age at menopause, parity) and biological factors (e.g. benign breast disease confirmed by biopsy). Of these, age has the strongest influence[4,5]. Both incidence and mortality rise sharply with age, the highest rates being found among women aged 60 and over[1]. Nearly half of all new cases occur among women aged 50 to 69[1]. Women in this age group benefit the most from breast screening, as has been demonstrated through randomized trials. For this reason, the delivery of regular, high-quality breast screening to this group has the potential to reduce breast cancer mortality rates by as much as one-third[6,7].

Breast Cancer Screening in Canada

In December 1992, the federal government launched the first phase of the Canadian Breast Cancer Initiative (CBCI) with stable, ongoing funding of $25 million over five years. In June 1998 the renewal of the CBCI with stable, ongoing funding was announced. This renewal resulted from extensive consultations with breast cancer partners and stakeholders. A key goal of the renewed CBCI has been to take the knowledge gained and the cooperative spirit developed during the initiative's first phase and use these to strengthen the CBCI's collaborative and multidisciplinary approach to breast cancer issues. As a result, Health Canada continues to support the activities of the National Committee for the Canadian Breast Cancer Screening Initiative.

Although the Canadian recommendation for breast cancer screening articulated in 1988 was that "…women aged 50 to 69 be offered, and encouraged to participate in, an early detection program consisting of mammography, physical examination of the breast by a health care professional, and teaching and monitoring of breast self-examination every 2 years"[8], organized breast cancer screening programs continue to adapt and enhance their practices as new evidence and technologies become available.

In 2001, the Canadian Task Force on Preventive Health Care reviewed the evidence surrounding breast self-examination (BSE). It concluded that, because there is fair evidence of no benefit and good evidence of harm, there is reasonable support to recommend that routine teaching of BSE be excluded from the periodic health examination of women aged 40 to 69[9]. While these recommendations have been controversial, organized breast cancer screening programs recognize the importance of evidence-based screening policy. Consequently, the practice of monthly BSE is no longer routinely taught as part of a screening examination. Instead, general breast health awareness is encouraged.

Organized Breast Screening Programs

Organized breast cancer screening programs began in British Columbia in 1988 and have since expanded to include all provinces, the Yukon and the Northwest Territories (Table 1). Breast cancer screening in

Table 1
Breast cancer screening programs in Canada[a] – usual practices, 1999 and 2000 screen years

Program	Program Start Date	Clinical Breast Exam on Site	Program Practices for Women Outside the 50 to 69-year Age Group		
			Age Group	Accept	Recall
British Columbia	1988	No	<40	Yes[b]	None
			40-49	Yes	Annual
			70-79	Yes	Biennial
			80+	Yes[b]	None
Yukon	1990	No	40-49	Yes	None
			70+	Yes	None
Northwest Territories	1994	No	40-49	Yes	Annual
			70+	Yes	Biennial
Alberta	1990	No	40-49	Yes	Annual[c]
			70-74	Yes	Biennial
			75+	Yes	None
Saskatchewan	1990	No	40-49	No	N/A
			70-75	Yes	Biennial
			> 75	Yes	None
Manitoba	1995	Nurse or technologist	40-49	No[d]	Biennial
			70+	No[d]	None
Ontario	1990	Nurse	40-49	No	N/A
			70-74	Yes	Biennial
			75+	Yes	None
Quebec	1998	No	40-49	Yes[e]	None
			70+	Yes[e]	None
New Brunswick	1995	No	40-49	Yes[b]	None
			70+	Yes[b]	None
Nova Scotia	1991	Technologist	40-49	Yes	Annual
			70+	Yes	Biennial
Prince Edward Island	1998	Technologist	40-49	Yes	Annual
			70-74	Yes	Biennial
Newfoundland	1996	Nurse	40-49	No	N/A
			70-74	Yes	Biennial

[a] Nunavut has not developed an organized breast cancer screening program.

[b] Accept with physician referral.

[c] Until April 1999 recall was biennial.

[d] As of July 1998, both age groups accepted to mobile unit with a doctor's referral.

[e] Accept with physician referral if done at a program screening centre, but is not officially considered within the program.

all organized programs includes a bilateral two-view screening mammogram.

For the purposes of the Canadian Breast Cancer Screening Database (CBCSD), the target population is defined as asymptomatic women between the ages of 50 and 69 years with no prior diagnosis of breast cancer. All programs screen some women outside the target age group (Table 1), although they are not actively recruited.

The Screening Process

The process that an organized breast cancer screening program undertakes to reach its target population for screening can be described in three stages:

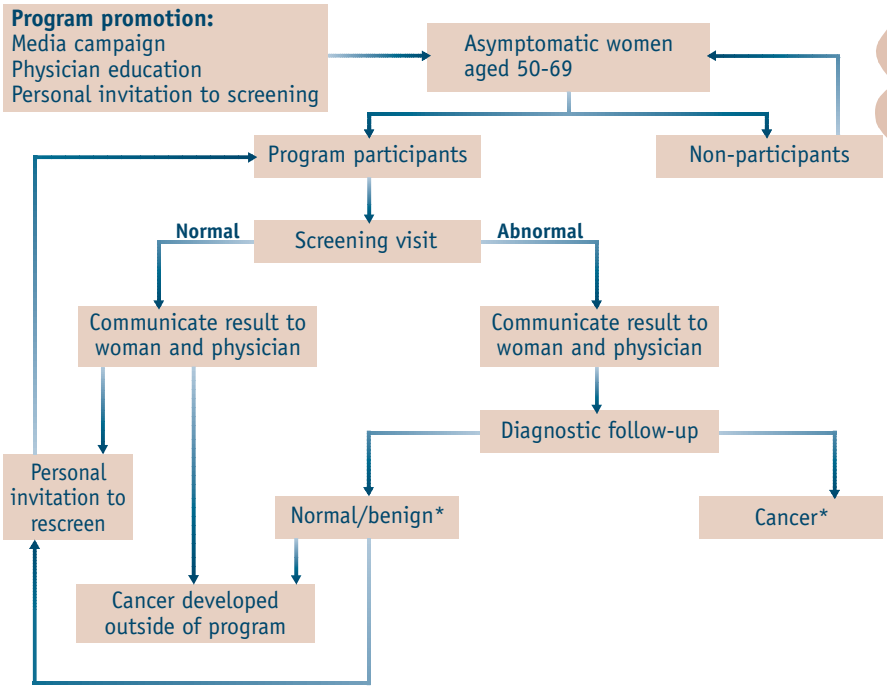
- Identification and invitation of the target population
- Provision of the screening examination
- If an abnormality is detected, further investigation

Women of the target age are recruited to the screening program through either a letter of invitation, a physician referral or self-referral. At the screening facility, which may be a mobile unit or a fixed site, women receive two-view mammography of each breast. In addition to mammographic screening, women attending programs in Ontario, Manitoba, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador receive a clinical breast examination (CBE) performed by a trained health professional; the remaining programs encourage women to obtain regular CBE outside the program from their family physicians (Table 1).

All programs provide screening results to both the woman and her physician. If the screening result is normal, women who are still eligible will be recalled by letter of invitation for another routine screen. This generally occurs after two years, although a minority of women are recalled annually on the basis of age, mammographic results, family history, or other factors that vary across programs. Women with an abnormal screening result are informed, along with their family physician, of the need for further assessment. Depending on the program, diagnostic follow-up is coordinated either by the woman's physician or through an integrated process directed by the screening program. Diagnosis is complete when a final diagnosis of either

cancer or normal/benign is reached. Figure 2 illustrates the pathway in more detail.

Figure 2
Pathway of a breast cancer screening program



* Breast screening programs obtain final diagnoses from sources such as physicians, pathology reports and cancer registries.

Program participants are advised that, although mammography is highly effective in the early detection of breast cancers, there is a possibility that some cancers are undetectable by mammography. A small number of women may develop symptoms in the interval before their next screening visit and are encouraged to consult their physician as soon as symptoms are found.

Monitoring and Evaluation

To achieve reductions in breast cancer mortality and morbidity, and to minimize the unwanted effects of screening, delivery of organized screening must be of high quality.

A standardized method of evaluation for all Canadian breast screening programs has been repeatedly identified as a necessity. With the CBCSD fully implemented, consistent program data are available for evaluation. In 1999, with this infrastructure in place, the CBCSI's Quality Assurance Working Group, Database Technical Subcommittee, and Database Management Subcommittee formed the Evaluation Indicators Working Group (EIWG) to formalize a set of performance measures and targets.

In February 2000, representatives of Health Canada and the breast screening evaluation community met at a national workshop as a first step towards developing a set of Canadian core indicators and targets for evaluating the performance and quality of organized breast screening programs. Ultimately, nine categories were selected:

- Recruitment and retention
- Client experience
- Technical aspects
- Mammography interpretation
- Diagnostic assessment and diagnosis
- Treatment
- Survival and mortality
- Data quality assurance
- Program management

Using the nine categories as a guide, performance and quality indicators were gathered through a review of national documents from various countries, published research literature, Canadian federal documents and Canadian provincial/territorial screening program annual reports. The review focused on indicators that were currently available for breast cancer screening programs in publicly funded health care systems. With this review, the participants of the 2000 workshop identified 30 core performance and quality indicators, target outcomes for some of the indicators and recommendations on practical means to gather and report these data[10]. The EIWG then selected key indicators on the basis of outcomes, pragmatic considerations and efficiency. Subsequent meetings of the EIWG resulted in the following guidelines for reporting

Standardized methods of evaluation will promote the delivery of high-quality organized screening programs

a key set of performance measures (Table 2)[11]. The 11 performance measures detailed here generally met the following criteria:

- Data for the measure were regularly available.
- Data available for the measure were of high quality.
- Meaningful targets could be defined on an evidentiary basis*.
- Measures and targets would be useful for national comparison.
- Monitoring on an annual basis would be valuable.
- Each measure was widely accepted for use in program evaluation.

Monitoring screening programs requires reliable, standardized information that is comparable across provinces/territories. Some follow-up data must be obtained from external sources, which thereby complicates the evaluation process. Many, but not all, programs are directly linked to their provincial/territorial cancer registries in order to obtain cancer outcome data. Further complicating the evaluation process, some programs experience delays in obtaining registry data.

Canadian Breast Cancer Screening Database

The CBCSD is a national breast screening surveillance system that furthers collaboration in monitoring and evaluating organized breast cancer screening across Canada. Established in 1993, it is operated and maintained by Health Canada's Centre for Chronic Disease Prevention and Control. Through the Canadian Breast Cancer Screening Initiative (CBCSI), the CBCSD is managed by the Database Management Committee (Appendix 1) and implemented by the Database Technical Subcommittee (Appendix 2).

Memoranda of Understanding (MOU) exist between the Centre for Chronic Disease Prevention and Control and 11 of the organized screening programs. The MOU clarify issues of ownership, access, accountability and confidentiality with respect to data collected by the CBCSD. These data can be used to generate national statistics, to compare data interprovincially and internationally, and to provide a larger database from which to conduct research activities. Research priorities using the CBCSD are identified on an ongoing basis.

The Canadian Breast Cancer Screening Database is a national breast screening surveillance system that furthers collaboration in monitoring and evaluating organized breast cancer screening across Canada.

* No targets were set for in situ cancer detection rate, given the controversy surrounding the natural history of the condition.

Table 2
Performance measures and targets for breast cancer screening programs in Canada

Indicator	Definition	Target
1. Participation Rate	Percentage of women who have a screening mammogram (calculated biennially) as a proportion of the eligible population.	≥ 70% of the eligible population (age 50-69)
2. Retention Rate	The estimated percentage of women who are re-screened within 30 months of their previous screen.	≥ 75% re-screened within 30 months (age 50-69)
3. Abnormal Call Rate	Percentage of women screened who are referred for further testing because of abnormalities found with a program screen.	< 10% (initial screen) (age 50-69) < 5% (re-screens) (age 50-69)
4. Invasive Cancer Detection Rate	Number of women detected with invasive cancer during a screening episode per 1,000 women screened.	> 5 per 1,000 (initial screen) (age 50-69) > 3 per 1,000 (re-screens) (age 50-69)
5. In Situ Cancer Detection Rate	Number of women detected with ductal carcinoma in situ (rather than invasive cancer) during a screening episode per 1,000 women screened.	Surveillance and Monitoring Purposes Only
6. Diagnostic Interval	Percentage of women who have completed the process from abnormal screen to resolution of abnormal screen, within 5 and 7 weeks of the screen date.	≥ 90% within 5 weeks if no open biopsy (age 50-69) ≥ 90% within 7 weeks if open biopsy (age 50-69)
7. Positive Predictive Value	Proportion of abnormal cases with completed follow-up found to have breast cancer (invasive or in situ) after diagnostic work-up.	≥ 5% (initial screen) (age 50-69) ≥ 6% (re-screen) (age 50-69)
8. Benign to Malignant Open Biopsy Ratio	Among open biopsies, the ratio of the number of benign cases to the number of malignant cancer cases.	≤ 2:1 open (initial & re-screen combined) (age 50-69)
9. Invasive Cancer Tumour Size	Percentage of invasive cancers with tumour size of ≤ 10 mm in greatest diameter as determined by the best available evidence: 1) pathological, 2) radiological, 3) clinical.	> 25% ≤ 10 mm (age 50-69)
10. Positive Lymph Nodes in Cases of Invasive Cancer	Proportion of invasive cancers in which the cancer has invaded the lymph nodes.	< 30% node positive (age 50-69)
11. Post-screen Detected Invasive Cancer Rate	Number of women with a diagnosis of invasive breast cancer after a negative screening episode per 10,000 person-years at risk, within 12 and 24 months of the screen date.	< 6 per 10,000 person-years (within 0-12 months, age 50-69) < 12 per 10,000 person-years (within 0-24 months, age 50-69)

Source: Health Canada. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance. Ottawa: Minister of Public Works and Government Services Canada, 2002.

Note: Table adapted from the Quality Determinants of Organized Breast Cancer Screening Programs Report.

The CBCSD currently contains screening information from program inception up to the end of 2000 for all 10 provinces: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland. Test data from the Northwest Territories are currently being analyzed. Because the Yukon does not have a computerized information system, its data are not available to the CBCSD. Nunavut does not have an organized program in place.

For more detailed information regarding the data collected, please refer to *Organized Breast Cancer Screening Programs in Canada 1996 Report* (http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/obcsp-podcs/index.html) and *Organized Breast Cancer Screening Programs in Canada 1997 and 1998 Report* (http://www.hc-sc.gc.ca/pphb-dgspsp/publicat/obcsp-podcs98/index.html).

1999 AND 2000 RESULTS

This report presents selected statistics for the 1999 and 2000 calendar years using data submitted to the CBCSD up to November 2002. Unless otherwise noted, the summary statistics for all programs include data from all 10 provinces.

Participation in Screening Programs

Participation in organized breast cancer screening programs continues to increase, although at a much lower rate than in previous years. From 1999 to 2000, Canada-wide annual screening volumes increased by only 6.7%, a much lower increase than that observed between 1998 and 1999, and the smallest recorded since the inception of organized screening in Canada (see Table 3). Participation rates in the eligible population also remained stable, with slight increases for all provinces

Table 3
Annual screening volume by program 1988 to 2000, all ages

Years	B.C.	Alta.	Sask.	Man.	Ont.	Que.[a]	N.B.[†]	N.S.	P.E.I.	Nfld.	Canada
1988	4,475	—	—	—	—	—	—	—	—	—	4,475
1989	9,371	—	—	—	—	—	—	—	—	—	9,371
1990	22,985	616	6,355	—	590	—	—	—	—	—	30,546
1991	55,884	5,873	14,305	—	15,380	—	—	1,877	—	—	93,319
1992	83,969	15,442	15,778	—	40,295	—	—	4,354	—	—	159,838
1993	104,380	16,146	26,057	—	45,541	—	—	4,891	—	—	197,015
1994	123,879	15,372	25,540	—	55,480	—	—	8,461	—	—	228,732
1995	150,248	14,170	29,603	2,671	58,287	—	5,853	12,491	—	—	273,323
1996	166,738	14,679	28,901	13,594	67,729	—	18,441	15,547	—	3,120	328,749
1997	173,908	23,336	33,915	19,163	80,132	—	18,247	19,477	—	4,694	372,872
1998	189,966	18,898	34,095	23,454	98,604	43,775	25,645	25,459	—	5,521	465,417
1999	217,547	22,423	35,028	28,203	114,061	145,039	30,104	29,284	5,585	6,087	633,519
2000	223,607	21,763	35,337	28,564	138,340	152,150	31,056	35,258	6,271	6,790	679,257
Total	1,526,957	168,718	284,914	115,649	714,439	340,964	129,346	157,099	11,856	26,212	3,476,433

[a] Although Quebec accepts women aged 40-49 and 70+ with physician referral if done at a program screening centre, data for these women are not captured.

† Data from New Brunswick are provisional.

Notes: Northwest Territories, Yukon and Nunavut programs are still in development. Data include all screens; figures have been updated and may vary slightly from previous reports.

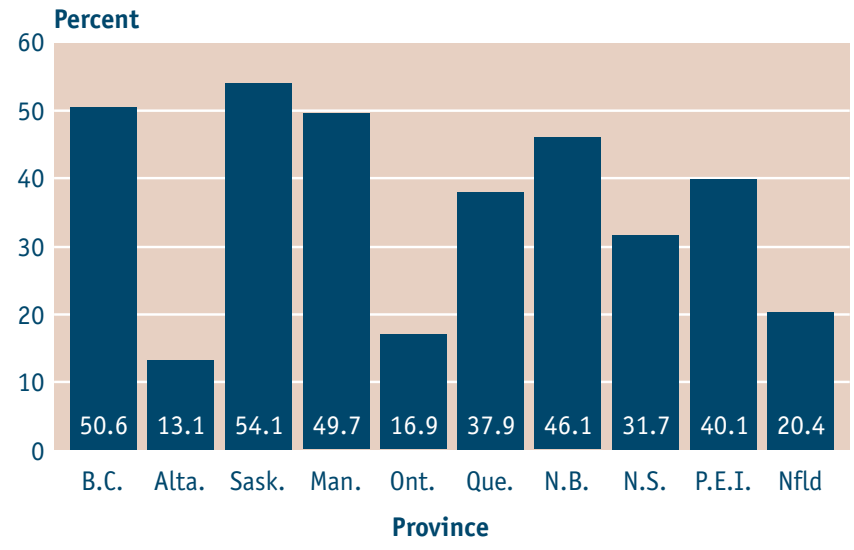
except Alberta (which saw a small decrease) and Saskatchewan (where participation remained virtually unchanged compared with 1997 and 1998). Currently, none of the programs meet the national performance target for participation. Self-report data from 2000-2001, which include screens occurring external to programs in the fee-for-service sector, estimate participation rates at 64.7%. Even with the overestimate inherent in self-reported data, this figure falls short of the 70% participation target for women aged 50 to 69 (Figure 4).

The stability of screening volume growth and participation rates suggests that programs are reaching the limits of their capacity to recruit additional women. Another impediment is the fact that not all programs have the resources to adequately reach all women in the target population. Expansion of organized breast cancer screening programs and shifting resources for the recruitment of target-aged women would reduce some of the barriers currently in place (e.g. such as waiting for appointments or lack of access to organized screening).

At the moment, additional capacity appears to exist in the provincial health care systems external to organized breast cancer screening programs. Comparison of Figure 4 and Figure 3 indicates the difference

Figure 3

Proportion of women aged 50-69 who participated in provincial breast cancer screening programs in 1999 and 2000

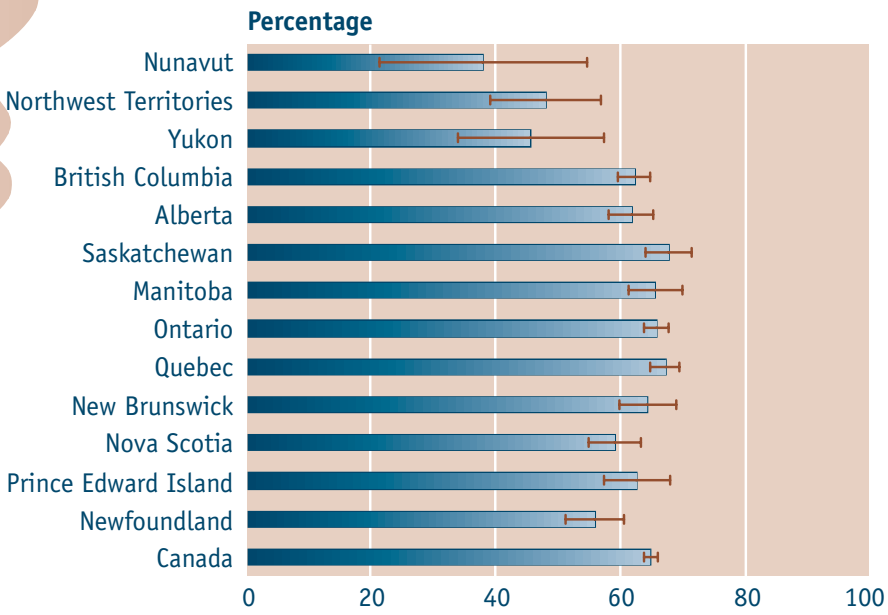


Source: Statistics Canada data are used for denominator values.
Notes: 1999 and 2000 population estimates were averaged.

Participation in organized breast cancer screening programs continues to increase, although at a much lower rate than in previous years. Currently, none of the programs meet the national performance target of at least 70% participation.

Figure 4

Proportion of women aged 50-69 with a self-reported mammogram* in the previous two years by province/territory, 2000-2001 Canadian Community Health Survey

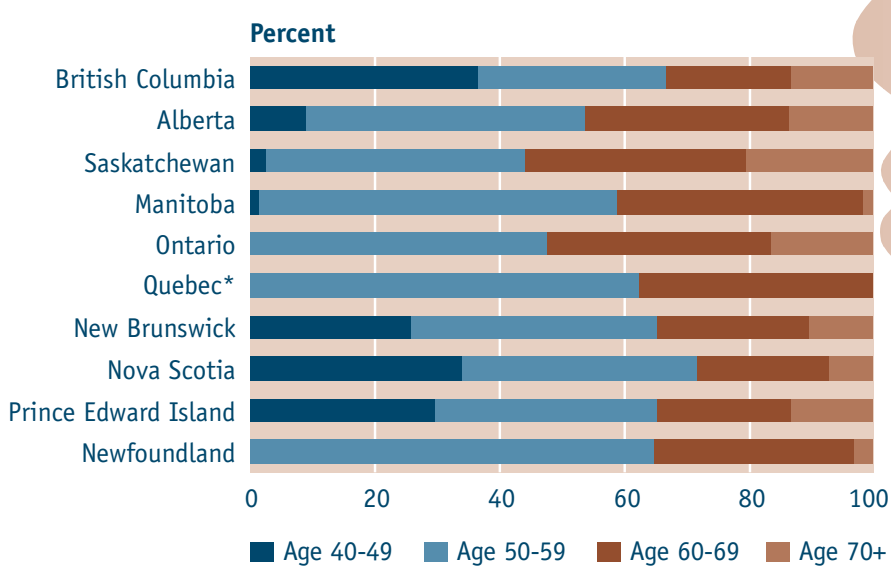


Source: 2000-2001 Canadian Community Health Survey Health Canada Share File.
* Diagnostic mammography excluded.

between the proportion of women obtaining screening through organized programs and that of women reporting mammography from any source. While some provinces are delivering the vast majority of their breast screening services through organized programs, Canada-wide data indicate that a considerable proportion of screening is delivered through the fee-for-service sector. This is a concern, because such screening mammography is delivered in an *ad hoc* fashion without targeting or recall of the women who are most likely to benefit from mammography screening. Organized screening programs can ensure that quality control elements of the screening process are in place and monitor interim indicators to determine whether the program is on track towards achieving a reduction of breast cancer mortality in the population.

In 1999 and 2000, the percentage of total screens that were delivered to women aged 50 to 69 ranged by province from 50.3% to 100% (Figure 5). Some programs also screen women aged 40 to 49 and 70

Figure 5
Age distribution of program screens by province, 1999 and 2000 screen years



* Although Quebec accepts women aged 40-49 and 70+ with physician referral if done at a program screening centre, data for these women are not captured.

years and over. The percentage of total screens in 1999 and 2000 delivered to women aged 40 to 49 was as high as 36.6%, and to women aged 70 and over as high as 20.4%. As a result of the mounting evidence questioning the value of screening women under age 50 and a general lack of capacity to meet recruitment targets for women aged 50 to 69, programs are revisiting their policies concerning active recruitment of women outside the target age range.

Recruitment and Retention

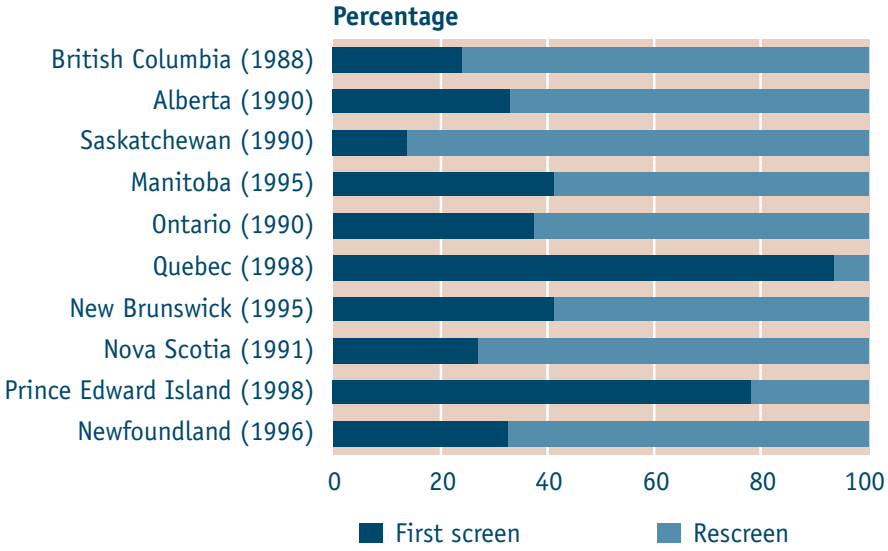
Organized breast cancer screening programs promote participation through a variety of recruitment methods. All use letters of invitation to reach at least part of their target population. However, not all programs have access to population-based lists, which may contribute to lower participation rates. Other means of recruitment include physician referrals, media campaigns and referrals from women themselves. Many programs have undertaken specialized recruitment efforts to reach underserved communities[12].

Maintaining ongoing participation of women in a program is not only important for screening success at a population level but is also an indicator of the acceptability of screening to women. In 1999-2000 76.5% of women were rescreened within 30 months, exceeding the Canadian performance target of 75%.

Over half the women screened in 1999 and 2000 were returning for screening (rescreens), this proportion ranging from 6.4% to 86.0% (Figure 6). Although program maturity appears to be the most influential factor determining the proportion of first screens versus rescreens, population age distribution, recruitment efforts and expansion strategies may influence the composition of women attending the programs as well.

Figure 6

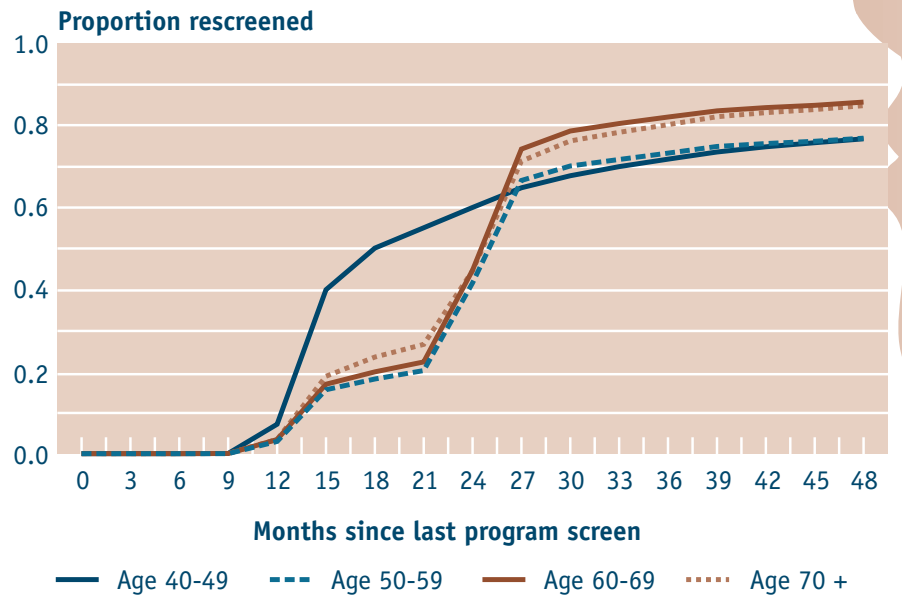
Distribution of first and subsequent program screens by province, women aged 40 and older, 1999 and 2000 screen years



Note: The number in the brackets indicates program start dates.

The likelihood that a woman will be rescreened within 30 months remained stable (Figure 7). The observed 76.5% retention rate for women aged 50 to 69 exceeds the national target of at least 75%. The relatively poor retention of women aged 40 to 49 might be explained by the greater proportion of first screens occurring in this group in combination with limited targeting through promotional material, mixed policies regarding screening eligibility and recall, weaker scientific evidence of the benefits of screening for women in this age group and the availability of opportunistic screening.

Figure 7
Cumulative probability of returning for a subsequent program screen by age group, 1996 and 1997 screen years



Notes: Based on data from British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, and Newfoundland.

Greater "slippage" – defined as the tendency to stretch out the interval between screening episodes[13] – was observed among women screened in 1996 and 1997 relative to women screened in 1994 and 1995. This might be explained by the growing maturity of the programs: with more and more women returning to programs operating near peak capacity, the chances for scheduling delays increase.

Results of Screening

Although recognizing that mammography and CBE are not perfect tests, organized programs aim to ensure that all breast cancers are identified in asymptomatic women while they minimize the number of healthy women who experience follow-up procedures.

Abnormal recall rates on first screen are normally high, reflecting prevalent cancers among previously unscreened women. Abnormal recall rates differed little among age groups, ranging from 9.9% to 11.9% of first screens obtained with mammography (Table 4). These

Table 4
Abnormal recall rates by mode of detection and age group, 1999 and 2000 screen years

Mode of Detection	40-49 %	50-59 %	60-69 %	70+ %	All Ages %
Abnormal by mammography[a]					
Initial screen	11.9	11.7	10.4	9.9	11.3
Rescreen	5.5	6.0	5.7	5.1	5.7
Abnormal CBE[bc]					
Initial screen	2.1	5.0	4.5	5.0	4.6
Rescreen	1.4	3.8	3.7	4.0	3.6
Abnormal by any modes of detection					
Initial screen	12.0	12.5	11.1	11.2	12.0
Rescreen	5.5	7.0	6.9	6.2	6.6

[a] Independent of CBE delivery or CBE findings.

[b] Independent of mammography delivery or mammography findings.

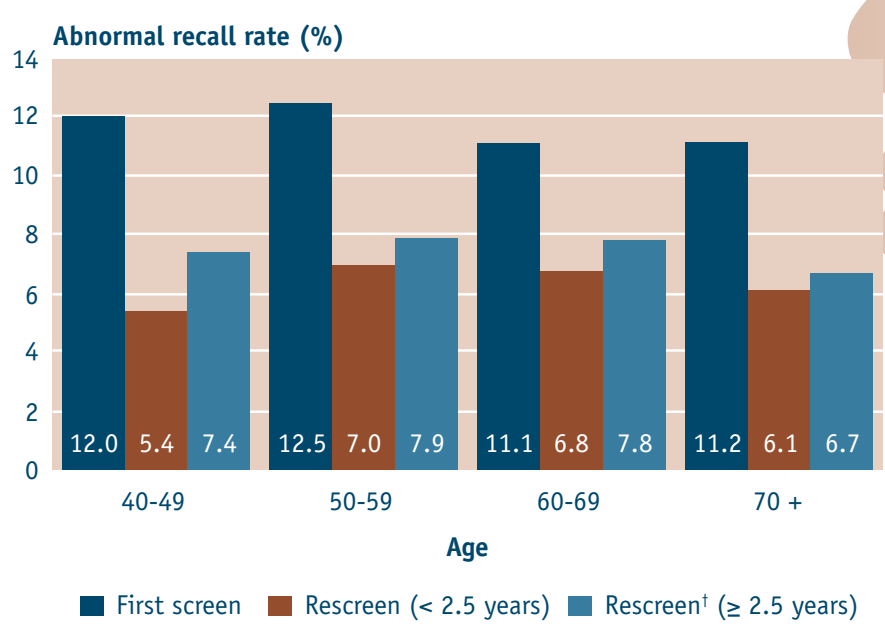
[c] All provinces provide mammography; Manitoba, Ontario, Nova Scotia, Prince Edward Island, and Newfoundland also provide clinical breast examinations (CBEs).

figures may, however, be influenced by the availability of mammography outside the programs. A proportion of the women receiving a "first" program screen will have had a mammogram before entering the program. For rescreens occurring less than 2.5 years after the previous screen, the abnormal recall rate (by any mode of detection) was substantially lower, between 5.5% and 7.0% (Table 4). The lower rate may reflect either the value of having previous comparison mammograms or the likelihood that fewer cancers would develop between screens, or both factors. The abnormal recall rates for rescreens occurring at least 2.5 years after the previous screen begin to take on the profile of first screens, which emphasizes the benefits of returning for a subsequent screen in a timely fashion. This pattern is consistent with the results presented in the 1997 and 1998 report[2].

For women in the target age range, the abnormal recall rates for first and subsequent screens are slightly higher than the national targets, which specify that less than 10% of first screens and less than 5% of rescreens should be abnormal (see Table 2). However, several Canadian programs also use CBE in combination with mammography. For women aged 50 to 69, inclusion of CBE as a screening modality has been shown

Programs strive to minimize the number of healthy women who experience follow-up procedures. In 1999-2000, however, for first and subsequent screens abnormal recall rates slightly exceeded the Canadian targets of less than 10% of first screens and less than 5% of rescreens.

Figure 8
Abnormal recall rate* by age group, 1999 and 2000 screen years



* Includes mammography and clinical breast examination as screening modalities.
† Half of the women who were rescreened 2.5 or more years from the previous screen returned for a screen by 3.0 years.

to increase abnormal recall rates by as much as 58% over the rates observed if mammography were the sole detection modality[14].

Diagnostic Investigations

When a lump or lesion is detected through CBE or mammography screening, additional assessment is normally required to establish or exclude the presence of cancer. The screening program notifies women with screen-detected abnormalities and their family physicians of the need for further assessment. For the most part, family physicians coordinate follow-up. Because mammography screening is offered to asymptomatic women and breast cancer is not present in the majority of women with screening abnormalities, the fear and anxiety associated with subsequent testing should be minimized by providing a timely, well-coordinated follow-up with only the appropriate number of interventions. For this reason, a number of programs have started to establish methods to streamline scheduling, track follow-up procedures

There is a growing trend towards using less invasive procedures before resorting to open surgical biopsy. Consequently the overall benign to malignant open biopsy ratio is well within the Canadian target of less than 2:1.

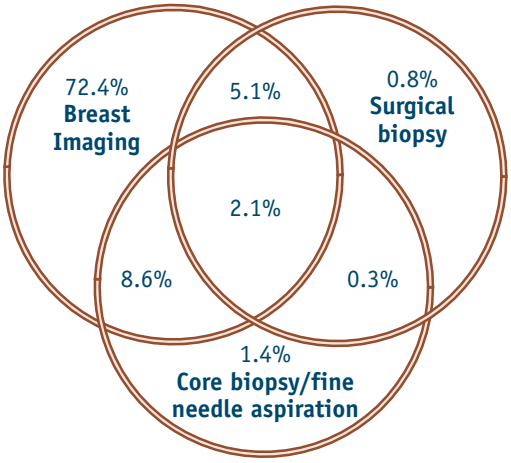
and results, and provide additional support to women during the process.

This process of further evaluating suspicious or uncertain findings following a breast screening examination is a normal part of the screening procedure. The success of screening programs in reducing breast cancer mortality in the population requires complete and timely follow-up in women with abnormal screens. In 1999 and 2000, complete follow-up information was available for over 90% of women with abnormal screening examinations. Among women screened, 10.4% were referred for additional assessment. For every 100 women with an abnormality found on screening, approximately six women subsequently received a diagnosis of cancer.

Diagnostic investigations may include a clinical evaluation, radiologic work-up including diagnostic mammography with additional views (spot compression or magnification views), a comparison with previous mammograms and/or ultrasonography. Imaging procedures, including either a diagnostic mammogram and/or ultrasound, were performed for the majority of women aged 50 to 69 (88.2%) who underwent follow-up. For 72.4% of women of this age no further assessment was required. Figure 9 shows the proportions of women who received each diagnostic procedure after an abnormal screen.

In order that a final diagnosis can be obtained, a small number of women may undergo a surgical consultation, fine-needle aspiration, core biopsy and/or surgical biopsy where appropriate[15]. There is a growing trend towards using the less invasive procedures before resorting to open surgical biopsy. Compared with 1997 and 1998 data, the number of fine-needle aspirations performed declined from 5.0% to 4.7% (Table 5). In 1999 and 2000, 90.7% of women aged 50 to 69 with a screen-detected abnormality did not require surgical biopsy to obtain a diagnosis. Of the women who did require a surgical biopsy, approximately 43 of every 100 were found to have cancer. This represents a benign to malignant open biopsy ratio of 1.3:1, which is well within the Canadian target of ≤ 2:1 (Table 2) and is also an improvement over the 1997 and 1998 open biopsy ratio of 1.6:1[2]. Keeping the recall rate and the ratio of benign to malignant biopsies appropriately low is necessary to avoid inducing needless morbidity in healthy women.

Figure 9
Combinations of diagnostic procedures after an abnormal screen, women aged 50-69, 1999 and 2000 screen years



9.3% of women had none of the above procedures.

Note: Only first screens, with one year of follow-up, are included for Quebec data.

Table 5
Diagnostic procedures after an abnormal screen in women aged 50-69, 1999 and 2000 screen years

	Modes of Referral			
	All Modes of Referral	Referred by mammography alone	Referred by CBE alone	Referred by both mammography and CBE
Diagnostic Procedure	Number[a] (%) Range[b]	Number[a] (%)	Number[a] (%)	Number[a] (%)
Diagnostic mammogram	62,149 (71.5) 47.2-89.7	59,754 (78.9)	551 (6.7)	1,844 (62.4)
Ultrasound	40,620 (46.7) 27.9-67.2	35,825 (47.3)	2,850 (34.7)	1,945 (65.8)
Fine-needle aspiration	4,105 (4.7) 0.1-10.7	3,285 (4.3)	523 (6.4)	297 (10.0)
Core biopsy	6,991 (8.0) 1.9-23.4	6,454 (8.5)	104 (1.3)	433 (14.6)
Open biopsy with or without fine wire localization	7,246 (8.3) 0.0-13.1	6,144 (8.1)	516 (6.3)	586 (19.8)

[a] All provinces combined.
[b] Range among provinces, reported as a percentage of women with abnormal findings.

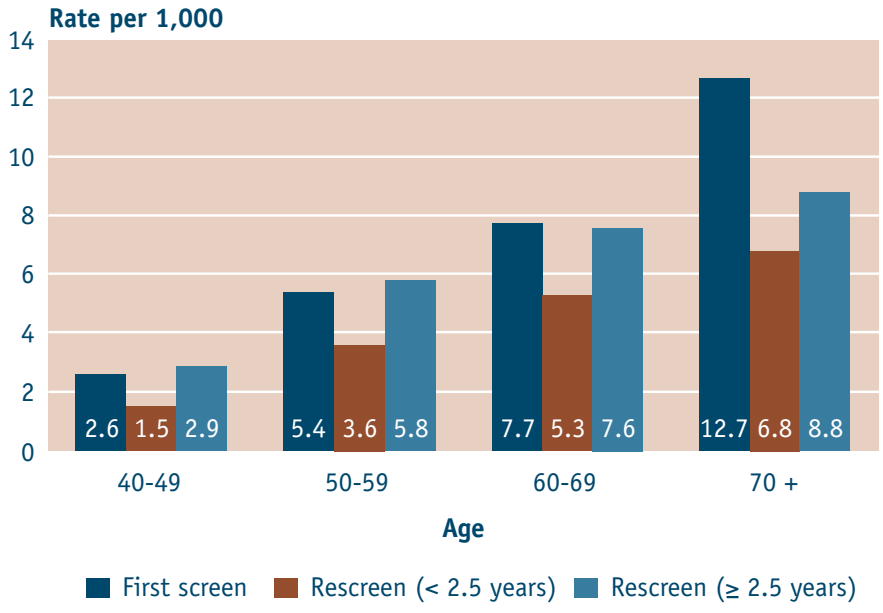
Note: Only first screens, with one year of follow-up, are included for Quebec data.

Cancer Detection

The cancer detection rate is a meaningful indicator for program evaluation when it is observed in relation to the abnormal recall rate, post-screen cancer detection rate and the underlying breast cancer incidence rate. The cancer detection rate in an organized screening program should generally exceed the cancer incidence rate that existed in the population before screening implementation, because screening detects asymptomatic cancers. Consequently, cancer detection rates will generally be higher for first screens (when prevalent cancers would be detected) than for rescreens (Figure 10). These rates also tend to be higher among women who do not return for screening within the recommended interval. Performance of CBE leads to small increases in cancer detection rates (Table 6). Gains are small, however, 4.6% and 5.9% of cancers detected on first versus subsequent screens being attributed to CBE alone[14].

Preventing breast cancer deaths through screening depends on detecting cancers early, before they are large enough to be felt or to have spread: in 1999 and 2000, 38.0% of invasive cancers detected were less than 10 mm in diameter and 75.7% had not spread to the lymph nodes.

Figure 10
Cancer detection rate per 1,000 screens by age group, 1999 and 2000 screen years



Note: Only first screens, with one year of follow-up, are included for Quebec data.

Table 6
Cancer detection rates[a] per 1,000 screens by mode of detection and age group, 1999 and 2000 screen years

Mode of Detection	40-49	50-59	60-69	70+	All Ages
Detected by mammography[b]					
Initial screen	2.6	5.3	7.7	12.6	6.0
Rescreen	1.6	3.6	5.3	6.8	4.2
Detected by CBE[cd]					
Initial screen	1.0	2.0	2.4	6.1	2.3
Rescreen	0.9	1.4	1.9	2.5	1.7
Detected by any mode of detection					
Initial screen	2.6	5.4	7.7	12.7	6.0
Rescreen	1.6	3.7	5.5	7.0	4.3

[a] Includes invasive, in situ, and unclassified cancers.

[b] Independent of CBE delivery or CBE findings.

[c] Independent of mammography delivery or mammography findings.

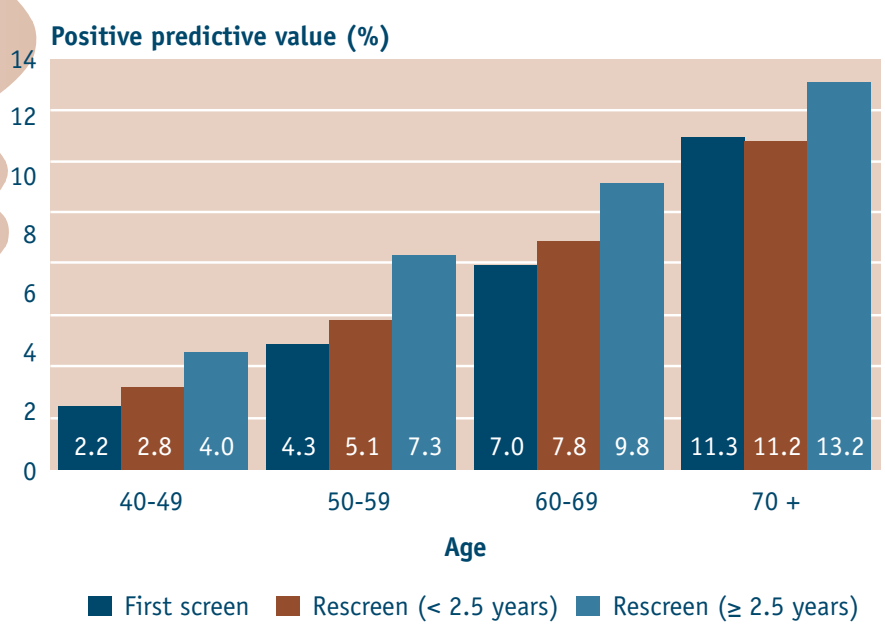
[d] All provinces provide mammography; Manitoba, Ontario, Nova Scotia, Prince Edward Island, and Newfoundland also provide clinical breast examinations (CBEs).

Note: Only first screens, with one year of follow-up, are included for Quebec data.

Positive predictive value (PPV) is determined by the proportion of women who had an abnormal screen and who subsequently received a diagnosis of cancer. A high PPV reflects the effectiveness of screening at minimizing unnecessary follow-up. The factors that influence cancer detection rate and abnormal recall rate must be taken into consideration when evaluating a program's PPV. The PPV tends to improve with rescreening because the initial screen establishes a normal baseline for comparison (Figure 11). A greater prevalence of cancers also tends to increase PPV. Delayed intervals (≥ 2.5 years) to rescreen tended to increase PPV for both these reasons (Figure 11). Even though abnormal recall rates did not differ substantially with age (Table 4), the PPV increased with age, reflecting the increased number of cancers with advancing age and the improved discriminating power of mammograms for less dense breasts.

In 1999 and 2000, screening programs detected a total of 6,463 cancers, of which 79.8% were invasive and 20.2% were ductal carcinoma in situ (DCIS) (Table 7). The proportion of screen-detected cancers that were invasive increased with age. A performance measure has not been established for DCIS cancer detection rates, given the lack of

Figure 11
Positive predictive value of abnormal screening by age group, 1999 and 2000 screen years



Note: Only first screens, with follow-up for only one year, are included for Quebec data.

scientific consensus surrounding the interpretation of these rates. They are included in this report for monitoring purposes only.

The prevention of breast cancer death through mammographic screening depends on detecting cancers at an early stage, before they are large enough to be felt or to have spread. Patients with cancer detected at an early stage have more treatment options, reduced cancer recurrence and improved survival[16]. Of women with stage I breast cancers, 93.2% survive for at least five years; this stage accounted for 50.7% of screen-detected cancers (with complete staging information) in women aged 50 to 69 (Table 7).

Survival decreases as the stage of the cancer increases, reflecting larger tumours, more lymph node involvement and increased probability of distant metastasis. During 1994 to 1997 five-year relative survival rates among women aged 50 to 69 in a Canadian setting were approximately 83.2% for stage II cancers, just over 41.2% for stage III and 15.3% for

Table 7
Characteristics of cancers detected by age group, 1999 and 2000 screen years

	40-49		50-59		60-69		70+		All Ages	
	n	%	n	%	n	%	n	%	n	%
Number of cancers[a]										
Invasive	290	69.5	2,023	78.1	1,964	82.1	881	82.8	5,158	79.8
DCIS	127	30.5	567	21.9	428	17.9	183	17.2	1,305	20.2
TNM staging[b]										
0 *(in situ)*	127	31.8	368	23.9	311	21.1	183	20.5	989	23.0
I	172	43.0	732	47.6	795	53.9	502	56.3	2,201	51.2
II	92	23.0	394	25.6	345	23.4	192	21.5	1,023	23.8
III+	9	2.2	43	2.8	24	1.6	14	1.6	90	2.1
invasive (TNM stage missing)	17		161		169		173		520	
Tumour size[b] (invasive only)										
≤ 5 mm	32	11.6	129	10.3	117	9.2	78	9.1	356	9.7
6-10 mm	56	20.3	321	25.7	392	30.7	252	29.4	1,021	27.9
11-15 mm	82	29.7	338	27.1	371	29.1	259	30.3	1,050	28.7
16-20 mm	41	14.9	207	16.6	181	14.2	125	14.6	554	15.2
21+ mm	65	23.6	253	20.3	215	16.8	142	16.6	675	18.5
# unknown	14		82		57		25		178	
Median tumour size (mm)	14		13		12		12		12	
Positive nodes[b] (invasive only)										
0	194	73.5	850	72.5	926	78.8	597	83.3	2,567	77.1
1-3	50	18.9	239	20.4	190	16.2	96	13.4	575	17.3
4+	20	7.6	83	7.1	59	5.0	24	3.3	186	5.6
# unknown[c]	26		158		158		164		506	

[a] Unclassified cancers are not included in this analysis.

[b] Quebec data are not included in this category.

[c] Includes missing values and cases in which dissection was not done.

Note: Only first screens, with one year of follow-up, are included for Quebec data.

stage IV cancers*. As a key component of cancer staging, tumour size is a good prognostic indicator (Table 2). Among women aged 50 to 69 in 1999 and 2000, 38.0% of invasive cancers detected by program screens were ≤ 10 mm in diameter (Table 8), and only 24.3% of cases were node positive. These results exceed the Canadian performance targets of 25% and 30% respectively.

* Gao R, Gaudette L. Chronic Disease Control and Management Division, Health Canada: personal communication, 2003

Table 8
Screening outcome summary by program, women aged 50-69 at screening, 1999 and 2000 screening years

Outcome	B.C.	Alta.	Sask.	Man.[a]	Ont.[a]	Que.	N.B.[b]	N.S.[c]	PEI[a]	Nfld[a]	Canada
Number of screens	221,518	34,306	54,228	55,216	210,681	297,160	38,344	38,060	6,754	12,505	968,772
Number of first screens	44,563	10,736	7,439	22,399	83,540	278,119	12,949	7,676	5,270	4,189	476,880
Number of cancers[de]	1,008	190	248	332	1,172	1,707	162	179	28	62	5,088
Participation rate (%)	50.6	13.1	54.1	49.7	16.9	37.9	46.1	31.7	40.1	20.4	30.2
Retention rate (%)[f]	78.4	68.9	77.8	73.6	79.1	N/A[f]	62.8	77.6	N/A[g]	73.6	76.5
Abnormal recall rate (%)											
Abnormal by mammography[h]											
Initial screen	11.8	7.7	16.3	9.8	11.1	11.5	11.7	9.4	6.2	11.0	11.3
Rescreen	5.5	4.1	6.6	6.3	6.0	6.7	7.2	5.0	4.2	6.4	5.8
Abnormal by any mode of dectection											
Initial screen	11.8	7.7	16.3	11.3	14.7	11.5	11.7	9.6	6.2	16.1	12.0
Rescreen	5.5	4.1	6.6	7.5	9.6	6.7	7.2	5.2	4.2	12.6	7.0
Invasive cancer detection rate per 1,000 screens[d]											
Detected by mammography[h]											
Initial screen	4.9	5.1	4.2	5.6	5.0	4.8	4.9	4.2	3.6	4.8	4.8
Rescreen	3.0	4.6	3.1	3.8	3.9	N/A	3.0	3.1	2.7	3.5	3.4
Detected by any mode of dectection											
Initial screen	4.9	5.1	4.2	5.7	5.2	4.8	4.9	4.2	3.6	5.0	4.9
Rescreen	3.0	4.6	3.1	4.0	4.3	N/A	3.0	3.1	2.7	3.6	3.5
In situ cancer detection rate per 1,000 screens[d]											
Initial screen	1.7	1.2	1.1	1.4	1.0	1.1	0.7	2.1	0.9	0.7	1.2
Rescreen	1.1	0.6	0.8	0.9	0.9	N/A	0.5	1.2	N/A	0.8	0.9
Completed diagnostic interval (%)											
With no open biopsy, within 5 weeks	77.0	60.1	69.3	67.8	75.7	N/A	68.3	82.8	80.8	65.2	73.3
With open biopsy, within 7 weeks	40.6	25.0	29.3	32.8	53.9	N/A	39.4	71.0	N/A	28.0	45.6

Table 8 *con't*
Screening outcome summary by program, women aged 50-69 at screening, 1999 and 2000 screening years

Outcome	B.C.	Alta.	Sask.	Man.[a]	Ont.[a]	Que.	N.B.[b]	N.S.[c]	PEI[a]	Nfld[a]	Canada
Positive predictive value (%)[de]											
Detected by mammography[h]											
Initial screen	5.6	8.2	3.5	7.1	5.4	5.4	4.8	6.7	7.4	5.0	5.5
Rescreen	7.3	12.5	6.6	7.8	8.0	N/A	5.0	8.6	6.4	6.9	7.6
Detected by any mode of dectection											
Initial screen	5.6	8.2	3.5	6.3	4.2	5.4	4.8	6.5	7.4	3.6	5.2
Rescreen	7.3	12.5	6.6	7.0	5.4	N/A	5.0	8.3	6.4	3.6	6.5
Benign to malignant open biopsy ratio	1.4 : 1	1.2 : 1	1.7 : 1	2.4 : 1	1.1 : 1	N/A	1.5 : 1	0.5 : 1	N/A	3.0 : 1	1.3 : 1
Benign to malignant core biopsy ratio	1.4 : 1	1.3 : 1	1.3 : 1	2.7 : 1	1.9 : 1	N/A	2.2 : 1	2.3 : 1	3.9 : 1	1.4 : 1	1.9 : 1
Invasive cancer tumour size (% ≤ 10 mm[i])	37.2	31.4	32.9	41.7	41.1	N/A	32.6	38.7	22.2	28.6	38.0
Positive lymph nodes in cases of invasive cancer (%)[i]	22.7	28.2	26.5	30.5	22.9	N/A	N/A	23.9	22.2	30.0	24.3
Post-screen detected invasive cancer rate (per 10,000 person-years)[f]											
Within 12 months	7.5	5.4	N/A[j]	4.5	5.1	N/A[g]	N/A[k]	N/A[k]	N/A[g]	4.1	6.0
Within 24 months	9.9	12.5	N/A[j]	7.8	9.4	N/A[g]	N/A[jk]	N/A[k]	N/A[g]	8.4	9.7

[a] Screening visit includes mammography and complete clinical breast examination.

[b] Data from New Brunswick are provisional.

[c] Screening visit includes mammography and modified clinical breast examination by technician.

[d] Only first screens, with one year of follow-up, are included for Quebec data.

[e] Includes invasive, in situ, and unclassified cancers.

[f] Data for 1996 and 1997 screen years are used.

[g] Program started after the period of analysis.

[h] Independent of CBE delivery or CBE findings.

[i] Missing values were exluded from calculation; expressed as a proportion of invasive cancers with complete data on tumour size or number of positive nodes.

[j] Data on out of program cancers were not available for analysis.

[k] Program does not collect out of program cancers.

Post-Screen Cancers

Organized screening aims to ensure that a high proportion of asymptomatic women with breast cancer are identified by the screening process. Although it is highly sensitive in detecting even small tumours, mammography screening will not detect all breast cancers present at the time of screening. Some cancers, termed "post-screen cancers", may be missed at screening or diagnosis, or may develop in the interval between screens (sometimes called "interval cancers"). Others may occur in women who do not return for subsequent screening (sometimes called "non-compliant cancers"). Post-screen cancers that are diagnosed in the interval between biennial screens need to be closely monitored because they are indicators of the sensitivity of screening and the appropriateness of the screening interval[17,18]. A high detection rate of post-screen cancers in the 24 months after a screen represents a negative outcome for a screening program.

Provincial screening programs that track post-screen cancers link with their provincial cancer registries at least every six months to identify cancers detected outside of the program in previously screened women. As an element of the quality control process, when post-screen cancers are detected, radiologists (and, in some cases, technologists) review the previous screening film to arrive at a final decision regarding whether the cancers were newly developed in the interval between screens, were missed at screening or were missed at diagnosis. In cases of disagreement, resolutions are made either through consensus or by a majority decision by readers.

Post-screen cancers that are diagnosed in the interval between biennial screens need to be closely monitored because they are indicators of the sensitivity of screening and the appropriateness of the screening interval.

According to the Canadian performance targets (Table 2), fewer than six post-screen detected invasive cancers per 10,000 person-years should be detected within 12 months from screening, and fewer than 12 per 10,000 person-years should be detected within 24 months from screening. While these targets were met or nearly met (Table 8), the figures must be interpreted cautiously for a number of reasons. Comparisons of post-screen cancer rates among programs require complete and up-to-date breast cancer registration and the assurance that post-screen cancers are counted in the same way. Better linkages with cancer registries will result in higher post-screen cancer rates because of higher levels of case ascertainment. In Canada, post-screen cancer rates may also be affected by the amount of screening delivered outside of screening programs, the performance of CBE and breast

self-examination between screening episodes, and differences in the classification of the end of a screening episode in the event of a screening abnormality.

Summary of Performance Measures

Organized screening programs are committed to maximizing the benefits of screening by detecting as many cancers as possible as early as possible, and by minimizing potential harms by eliminating as much as possible diagnostic follow-up among women who do not have cancer. To transfer these benefits to the entire target population, screening programs must attempt to reach as many eligible women as possible by maximizing ongoing participation.

The extent to which programs maximize benefits to participants is reflected by indicators for the rate of invasive cancer detection, the proportion of small invasive cancers and the proportion of invasive cancers that have not spread to the lymph nodes. Invasive cancer detection rates for mammography and combined screening (mammography and/or CBE) exceeded Canadian performance targets for rescreened women, but just fell short for women on initial screen. The proportions of small and of node negative invasive cancer were well within targets (Table 8). Post-screen cancer detection rates reflect the sensitivity of screening. Within 12 months of the screening examination, this rate bordered on the Canadian target; within 24 months it was well within target. Although not all cancers are detectable by screening, this measure monitors whether the number of cancers missed is being kept to a minimum.

Indicators for abnormal recall rate, positive predictive value, benign to malignant open biopsy ratio and the timeliness of the diagnostic interval measure the degree to which programs minimize the potential harms of screening among participants. Abnormal recall rates for mammography and for any modality exceeded the national targets of < 10% and < 5%. PPVs were within target, as were benign to malignant open biopsy ratios. Nationally, 73.3% of women not requiring surgical biopsy were given a diagnosis within five weeks and 45.6% of women requiring surgical biopsy received a diagnosis within seven weeks. No individual program met the 90% target for timely diagnostic interval.

Only 30.2% of eligible women accessed organized screening nationally. Greater participation in organized programs by the target population will bring the benefits of screening to more Canadian women.

Transferring the benefits of screening to the entire target population remains a challenge for screening programs. Although most programs saw increased participation in 1999 and 2000, only 30.2% of eligible women accessed organized screening nationally. Greater participation in organized programs by the target population will bring the benefits of screening to more Canadian women. The performance indicator for retention indicates that programs are successfully maintaining the participation of women who enter the screening program.

Table 8 further details the outcomes for women within the target population by province. The provincial results are presented for summary purposes only, as it is difficult to readily compare the performance of all programs. The volume of screens and the proportion that are first screens vary greatly among provinces, mainly reflecting the length of time each program has been in operation. Programs also differ in terms of screening methods; Manitoba, Ontario, Nova Scotia, Prince Edward Island and Newfoundland each offer CBE in addition to mammography. This has an impact on both abnormal recall rates and cancer detection. Variations among the provinces in risk factor profiles, socio-economic status and the age distribution of women may also have an impact on the performance of the screening programs.

While the performance of individual programs is not comparable, the results in Table 8 do illustrate some of the successes of program-specific approaches. For the most part, cancer detection rates compare favourably with the Canadian performance targets (Table 2). PPVs were highest in Alberta and Nova Scotia, where abnormal recall rates were the lowest. Benign to malignant biopsy ratios have improved in most programs and this, in turn, has improved the combined national ratios. Increased use of imaging-directed core biopsy has greatly decreased the need for surgery in the case of benign lesions and can lead to a more timely definitive diagnosis. Although no program currently meets the performance targets for timely diagnosis, Nova Scotia came closest to meeting the target. More frequent use of core biopsy to obtain a tissue diagnosis and the use of patient navigators are two reasons for the increased timeliness of diagnosis in this program. The recent adoption of facilitated referral practices, in which the screening program arranges the initial diagnostic imaging procedures

on behalf of a woman's family physician, has led to substantial improvements in timeliness in a number of programs[19,20].

Table 9 summarizes screening outcomes by age group. Most screens occurred within the target age group. As expected, the proportion of first screens was highest among women aged 50 to 59 (53.7%) and lowest in women aged 70 and over (20.2%). The abnormal recall rate differed little among age groups. The cancer detection rate increased with age, as did the PPV of abnormal screening. The benign to malignant biopsy ratios were higher in women aged 40 to 49 but improved with age. Older women tended to have more favourable prognostic indicators (i.e. small tumour size, node negative).

Table 10 summarizes screening outcomes for women aged 50 to 69 for the past five screen years (1996, 1997, 1998, 1999 and 2000). The number of screens and cancers detected increased from 1996 to 1999 as new programs began to operate at capacity. However, from 1999 to 2000 there was very little growth, suggesting that many programs have reached their capacity to recruit additional women. Consequently, program-based screening mammography is potentially available to only 1.3 million of the estimated 3 million Canadian women aged 50 to 69. Abnormal recall rates increased over time for both first and subsequent screens, leaving performance targets unmet, while cancer detection rates remained stable. This emphasizes that further efforts are required to ensure that the number of healthy women who experience follow-up procedures is minimized.

Table 9
Screening outcome summary by age group, 1999 and 2000 screen years

Outcome	40-49	50-59	60-69	70+	All Ages
Number of screens	208,881	581,760	387,012	132,623	1,310,276
Number of first screens	79,256	312,751	164,129	26,838	582,974
Number of cancers[ab]	417	2,646	2,442	1,076	6,581
Participation rate (%)	6.3	30.4	29.3	7.6	16.7
Retention rate (%)[c]	67.8	76.2	78.6	70.1	74.6
Abnormal recall rate (%)					
Abnormal by mammography[d]					
Initial screen	11.9	11.7	10.4	9.9	11.3
Rescreen	5.5	6.0	5.7	5.1	5.7
Abnormal by any mode of dectection					
Initial screen	12.0	12.5	11.1	11.2	12.0
Rescreen	5.5	7.0	6.9	6.2	6.6
Invasive cancer detection rate per 1,000 screens[a]					
Detected by mammography[d]					
Initial screen	1.9	4.1	6.3	11.0	4.7
Rescreen	1.1	2.7	4.2	5.4	3.3
Detected by any mode of dectection					
Initial screen	1.9	4.1	6.3	11.1	4.7
Rescreen	1.1	2.8	4.3	5.5	3.4
In situ cancer detection rate per 1,000 screens[a]					
Initial screen	0.8	1.1	1.3	1.6	1.1
Rescreen	0.5	0.9	1.0	1.3	0.9
Completed diagnostic interval (%)[e]					
With no open biopsy, within 5 weeks	75.0	72.9	74.0	74.9	73.7
With open biopsy, within 7 weeks	40.3	44.4	47.3	49.1	45.8
Positive predictive value (%)[ab]					
Detected by mammography[d]					
Initial screen	2.2	4.6	7.4	12.8	5.3
Rescreen	3.0	6.1	9.4	13.3	7.5
Detected by any mode of dectection					
Initial screen	2.2	4.3	7.0	11.3	5.0
Rescreen	2.9	5.3	7.9	11.3	6.6
Benign to malignant open biopsy ratio[e]	3.1 : 1	1.7 : 1	1.0 : 1	0.6 : 1	1.3 : 1
Benign to malignant core biopsy ratio[e]	5.3 : 1	2.4 : 1	1.4 : 1	0.9 : 1	1.9 : 1

Table 9 *con't*
Screening outcome summary by age group, 1999 and 2000 screen years

Outcome	40-49	50-59	60-69	70+	All Ages
Invasive cancer tumour size (% ≤ 10 mm)[ef]	31.9	36.1	39.9	38.6	37.7
Positive lymph nodes in cases of invasive cancer (%)[ef]	26.5	27.5	21.2	16.7	22.9
Post-screen detected invasive cancer rate (per 10,000 person-years)[g]					
Within 12 months	4.7	5.8	6.3	6.1	5.8
Within 24 months	6.3	9.3	10.1	9.5	9.1

[a] Only first screens, with one year of follow-up, are included for Quebec data.

[b] Includes invasive, in situ, and unclassified cancers.

[c] Retention rates are calculated on 1996 and 1997 data and include the following provinces: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, and Newfoundland.

[d] Independent of CBE delivery or CBE findings.

[e] Quebec data are not reported for this indicator.

[f] Missing values were exluded from calculations; expressed as a proportion of invasive cancers with complete data on tumour size or number of positive nodes.

[g] Post-screen detected cancer rates are calculated on 1996 and 1997 data and include the following provinces: British Columbia, Alberta, Manitoba, Ontario, and Newfoundland.

Table 10
Screening outcome summary by year, women aged 50-69 at screening

Outcome	Year of Screen				
	1996	1997	1998	1999	2000
Number of screens	215,415	246,429	328,126	466,682	502,090
Number of first screens	83,627	92,316	154,936	247,941	228,939
Number of cancers[ab]	1,059	1,319	1,437	2,568	2,520
Retention rate (%)[c]	78.3	80.3	86.3	N/A	N/A
Abnormal recall rate (%)					
Abnormal by mammography[d]					
Initial screen	8.8	9.1	10.2	11.2	11.4
Rescreen	4.6	5.0	5.4	5.8	5.8
Abnormal by any mode of dectection					
Initial screen	10.7	10.8	11.3	11.9	12.1
Rescreen	5.6	6.0	6.5	7.0	6.9
Invasive cancer detection rate per 1,000 screens[a]					
Detected by mammography[d]					
Initial screen	4.9	5.5	5.0	4.9	4.7
Rescreen	3.4	3.5	3.2	3.5	3.3
Detected by any mode of dectection					
Initial screen	5.0	5.6	5.1	5.0	4.7
Rescreen	3.4	3.7	3.3	3.6	3.4
In situ cancer detection rate per 1,000 screens[a]					
Initial screen	1.1	1.2	1.4	1.2	1.1
Rescreen	0.7	0.8	0.8	0.9	0.9
Completed diagnostic interval (%)[e]					
With no open biopsy, within 5 weeks	75.9	75.9	74.9	73.0	73.5
With open biopsy, within 7 weeks	56.0	52.8	51.2	45.2	46.1
Positive predictive value (%)[ab]					
Detected by mammography[d]					
Initial screen	6.8	7.4	6.2	5.6	5.3
Rescreen	8.9	8.7	7.4	7.7	7.5
Detected by any mode of dectection					
Initial screen	5.7	6.3	5.5	5.3	5.0
Rescreen	7.4	7.5	6.3	6.5	6.4
Benign to malignant open biopsy ratio[e]	1.5 : 1	1.5 : 1	1.6 : 1	1.4 : 1	1.2 : 1
Benign to malignant core biopsy ratio[e]	1.9 : 1	1.9 : 1	2.1 : 1	2.0 : 1	1.8 : 1

Table 10 *con't*
Screening outcome summary by year, women aged 50-69 at screening

Outcome	Year of Screen				
	1996	1997	1998	1999	2000
Invasive cancer tumour size (% ≤ 10 mm)[ef]	37.3	37.5	38.6	38.6	37.4
Positive lymph nodes in cases of invasive cancer (%)[ef]	22.7	22.6	20.6	24.6	24.1
Post-screen detected invasive cancer rate (per 10,000 person-years)[g]					
Within 12 months	6.4	5.6	N/A	N/A	N/A
Within 24 months	9.4	9.9	N/A	N/A	N/A

[a] Only first screens, with one year of follow-up, are included for Quebec data.

[b] Includes invasive, in situ, and unclassified cancers.

[c] Retention rate calculations include the following provinces: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, and Newfoundland.

[d] Independent of CBE delivery or CBE findings.

[e] Quebec data are not reported for this indicator.

[f] Missing values were exluded from calculations; expressed as a proportion of invasive cancers with complete data on tumour size or number of positive nodes.

[g] Post-screen detected cancer rates are calculated on 1996 and 1997 data and include the following provinces: British Columbia, Alberta, Manitoba, Ontario, and Newfoundland.

SPECIAL TOPIC: RETENTION OF SCREENED WOMEN

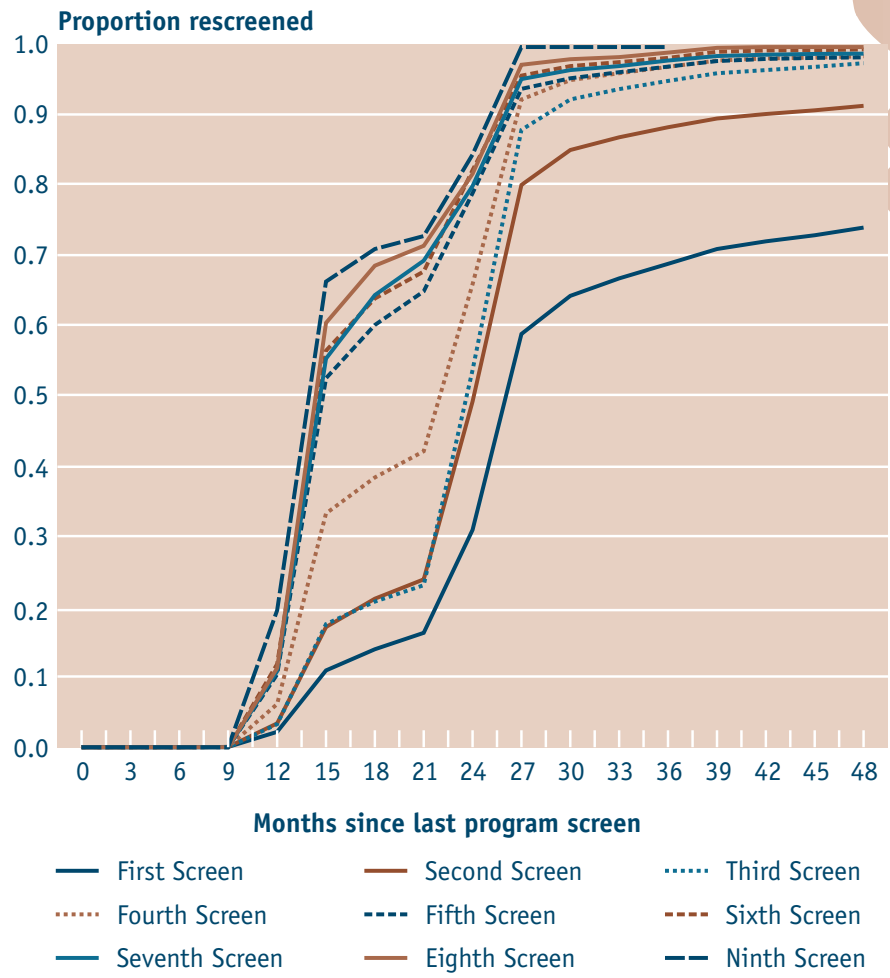
Reductions in breast cancer mortality require a high level of ongoing and timely participation in screening among target-aged women, as evidenced in randomized controlled trials. The benefit of a single screen is time limited, as cancers may develop even after several normal screens have been achieved. Maintaining ongoing participation of women in a program is not only important for screening success at a population level but is also an indicator of the acceptability of screening to women. Performance targets for retention in Canadian programs aim to screen at least 75% of women screened in the previous round.

Although programs consistently meet or exceed performance targets for overall retention, Figure 12 indicates that in Canadian organized breast cancer screening programs, women are most likely to discontinue screening after their initial screen: 64% retention at 30 months between first and second screen as compared with 85% to 99% at later rounds. This pattern holds across all programs and suggests that efforts to encourage women to return should focus on those first entering the program. Here, the contribution of four factors to a woman's likelihood of returning for a second screen by 30 months was evaluated in women aged 50 to 69 screened in 1996 and 1997. The four factors were family history of breast cancer, false positive mammography at first screen, recommendation for one-year follow-up and age.

Women with a family history of breast cancer were generally more likely to return for a second screen. Depending on the program, the probability of returning by 30 months was 2% to 48% higher among women with a family history than among women without such a history. Other research has found that family history of breast cancer is a commonly cited factor associated with an increased likelihood of reattendance and long-term compliance with a program[21-24].

Women who were referred for follow-up after their first screen but who did not have a diagnosis of breast cancer (false positives) were 8% to 56% less likely to return for a second screen by 30 months,

Figure 12
Cumulative probability of returning for a subsequent program screen by screen sequence, 1996 and 1997 screen years



Notes: Based on data from British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, and Newfoundland.

depending on the program. This is contrary to the results of most studies, which show that women are either equally or more likely to return or intend to return for screening if they experienced previous false-positive mammography results[23,25-32]. However, two studies have noted a decreased likelihood of returning to screening among women with false-positive findings[33,34]. It is uncertain whether the decision not to return to the program is a result of a negative experience with screening, continued clinical follow-up, or absorption of clients into

the fee-for-service sector. This finding underlines the need for a well-coordinated follow-up to minimize anxiety and unnecessary referral. A recent study from the Ontario Breast Screening Program indicated that screening program facilities with an integrated assessment service improved reattendance by women with false-positive screen results[35].

No consistent pattern of retention by 30 months was seen across programs for women who were given a recommendation to return within one year rather than two years. In Saskatchewan and Alberta, women with a one-year recommendation were less likely to return; in Newfoundland and Ontario they were more likely to return; in Manitoba, there was no difference. Similarly, the impact of age differed by program. Older women (aged 65+) were most likely to return for a second screen by 30 months in Newfoundland, Nova Scotia, New Brunswick, Ontario, Manitoba and Alberta, and younger women (aged 50 to 54) were most likely to return in Saskatchewan. In British Columbia, women aged 55 to 64 were most likely to return.

Although the factors examined give some indication of where efforts can be directed to improve retention, more in-depth study at the program level is needed. Furthermore, retention differed widely across programs. This emphasizes the need to consider the different environments in which screening programs operate. For example, the three most long-standing screening programs had the lowest retention rates by 30 months between first and second screen (54.0%-60.0%), whereas the two newest programs had the highest retention rates (72.8%-74.1%). This suggests that issues of capacity may be contributing to reduced retention in mature programs. Alternatively, efforts to promote screening may be greater in settings where screening programs have been recently initiated. Some programs also face the ongoing challenge of competition from the fee-for-service sector.

SUMMARY AND FUTURE DIRECTIONS

The availability of performance measures and targets has allowed monitoring efforts to identify ways of continuously improving the quality of organized screening programs. Although most performance targets for organized programs were met, the current evaluation indicates three areas on which to concentrate future efforts for improvement: capacity, referral practices, and timeliness of diagnostic follow-up.

None of the programs met the performance target of screening at least 70% of the target population. This suggests that the provinces are reaching the limits of their capacity to recruit additional women. Increased commitment to the screening of women through organized breast cancer screening programs and allocation of additional resources to recruit target-aged women could reduce barriers, such as waiting for appointments or lack of access. Revisiting the policies on screening women outside the target age range may provide a means to increase capacity for the women most likely to benefit from screening.

Although the performance indicator for retention indicates that programs are successfully maintaining the participation of women currently in the screening program, more detailed analysis suggests that retention is significantly poorer among women new to the program. It is critical to increase retention among these women because the benefits of a single screen are small.

For the period covered in this report, abnormal recall rates did not meet targets set for performance. One project currently under way (the Pan-Canadian Study of Radiologist Reading Volumes) is attempting to address this issue by investigating the number of readings a radiologist should conduct annually to maximize cancer detection while maintaining conservative abnormal recall rates. However, other factors that contribute to high abnormal recall rates also merit consideration. Increases in the proportion of women waiting in excess of 30 months to return to screening will increase

The availability of performance measures and targets has allowed monitoring efforts to identify ways of continuously improving the quality of organized screening programs. The current evaluation indicates three areas on which to concentrate future efforts for improvement: capacity, referral practices, and timeliness of diagnostic follow-up.

abnormal recall rates, tying this once again to the issue of capacity. The inclusion of CBE also increases abnormal recall rates but contributes only a small amount to the early detection of breast cancer.

Although timeliness of diagnostic follow-up appears to have diminished between 1996 and 2000, several individual programs have made remarkable strides in expediting the diagnostic work-up after an abnormal screening examination. In order to achieve performance targets set for diagnostic follow-up, further evaluation and exchange of the various strategies that have been effective may allow other programs to enhance their own processes.

The goal of monitoring and evaluating organized breast cancer screening programs in Canada is to promote high-quality screening, ultimately leading to reductions in breast cancer mortality and morbidity and to the minimization of the unwanted effects of screening. With recent questioning of the value of screening mammography, the importance of such monitoring efforts is even more critical in order to provide women with an accurate picture of the benefits and harms of participation in screening programs. Ongoing monitoring and evaluation is a necessary mechanism that provides direction for programs in their continuous efforts to provide high-quality screening and to reduce the burden of breast cancer mortality among Canadian women and their families.

REFERENCES

1. National Cancer Institute of Canada. *Canadian Cancer Statistics 2002*. Toronto, Canada, 2002.

2. Health Canada. *Organized Breast Screening Programs in Canada 1997 and 1998 Report*. Ottawa: Minister of Public Works and Government Services Canada, 2001.

3. Health Canada. *Economic Burden of Illness in Canada, 1998*. Ottawa: Minister of Public Works and Government Services Canada, 2002. Cat. No. H21-136/1998E.

4. Kelsey JL, Bernstein L. *Epidemiology and prevention of breast cancer*. Annu Rev Public Health 1996;17:47-67.

5. Health Canada. *Summary Report: Review of Lifestyle and Environmental Risk Factors for Breast Cancer*. Ottawa: Minister of Public Works and Government Services Canada, 2001. Cat. No. H39-586/2001E.

6. Kerlikowske K, Grady D, Rubin SM, Sandrock C, Ernster VL. *Efficacy of screening mammography. A meta-analysis*. JAMA 1995;273:149-54.

7. WHO: International Agency for Research on Cancer. *Handbook for Cancer Prevention Vol. 7, Breast Cancer Screening*. IARC Press, 2002.

8. The Workshop Group. *Reducing deaths from breast cancer in Canada*. Can Med Assoc J 1989; 141:199-201.

9. *Preventive Health Care, 2001 Update: Should Women be Routinely Taught Breast Self-examination to Screen for Breast Cancer?* Prepared by N. Baxter, MD, PhD, FRCS(C), with the Canadian Task Force on Preventive Health Care, October 2000.

10. Horne T, Evaluation Indicators Working Group. *Proposed indicators for performance and quality of breast screening programs in Canada*. Ottawa: Health Canada, April 2000.

11. Health Canada. *Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance*. Ottawa: Minister of Public Works and Government Services Canada, 2002.

12. Simces Z. *Community Development Pilot Projects*. BC Cancer Agency Care and Research, 2002.

13. Faux AM, Lawrence GM, Wheaton ME, Wallis MG, Jeffery CL, Griffiths RK. *Slippage in the NHS breast screening programme: an assessment of whether a three year screening round is being achieved*. J Med Screen 1998;5:88-91.

14. Bancej C, Decker K, Chiarelli A, Harrison M, Turner D, Brisson J. *Contribution of clinical breast examination to mammography screening in the early detection of breast cancer*. J Med Screen (in press).

15. The Steering Committee on Clinical Practice Guidelines for the Care and Treatment of Breast Cancer. *The palpable breast lump: information and recommendations to assist decision-making when a breast lump is detected*. Can Med Assoc J 1998;158 (Suppl 3):S3-S8.

16. Olivotto IA, Mates D, Kan L, Fung J, Samant R, Warren Burhenne LJ. *Prognosis, treatment, and recurrence of breast cancer for women attending or not attending the Screening Mammography Program of British Columbia*. Breast Cancer Res Treat 1999;54:73-81.

17. Woodman CB, Threlfall AG, Boggis CR, Prior P. *Is the three year breast screening interval too long? Occurrence of interval cancers in NHS breast screening programme's north western region*. Brit Med J 1995;310:224-26.

18. Decker KM, Harrison M, Chateau D. *Influence of direct referrals on time to diagnosis after an abnormal breast screening result*. 2003 (unpublished manuscript).

19. Olivotto IA, Borugian MJ, Kan L, Harris SR, Rousseau EJ, Thorne SE, Vestrup JA, Wright CJ, Coldman AJ, Hislop TG. *Improving the time to diagnosis after an abnormal screening mammogram*. Can J Public Health. 2001:92(5):366-71.

20. Rickard MT, Taylor RJ, Fazli MA, El Hassan N. *Interval breast cancers in an Australian mammographic screening program*. Med J Aust 1998;169:184-87.

21. Cockburn J, Schofield P, White V, Hill D, Russel I. *Predictors of returning for second round screening at a population based mammographic screening programme in Melbourne, Australia*. J Epidemiol Community Health 1997;51(1):62-66.

22. Lerman C, Rimer B, Trock B, Balshem A, Engstrom PF. *Factors associated with repeat adherence to breast screening*. Prev Med 1990;19(3):279-90.

23. Orton M, Fitzpatrick R, Fuller A, Mant D, Mlynek C, Thorogood M. *Factors affecting women's response to an invitation to attend for a second breast cancer screening examination*. Br J Gen Pract 1991;41:321-3.

24. Weinberg AD, Lane M, Cooper HP, Kripalani S. *Screening behaviours and long-term compliance with mammography guidelines in a breast cancer screening program*. Am J Prev Med 1997;13(1):29-35.

25. Bastani R, Kaplan CP, Maxwell AE, Nisenbaum R, Pearce J, Marcus AC. *Initial and repeat mammgoraphy screening in a low income multi-ethnic population in Los Angeles*. Cancer Epidemiol Biomarkers Prev 1995;4:161-7.

26. Benedict S, Williams RD, Baron PL. *The effect of benign breast biopsy on subsequent breast cancer detection practices*. Oncol Nurs Forum 1994;21(9):1467-75.

27. Pisano ED, Earp J, Schell M, Vokaty K, Denham A. *Screening behavior of women after a false-positive mammogram*. Radiology 1998;208(1):245-9.

28. Cockburn J, Schofield P, White V, Hill D, Russel I. *Predictors of returning for second round screening at a population based mammographic screening programme in Melbourne, Australia*. J Epidemiol Community Health 1997;51(1):62-66.

29. Gram IT, Lund E, Slenker SE. *Quality of life following a false positive mammogram*. Br J Cancer 1990;62:1018-22.

30. Lerman C, Trock B, Rimer BK et al. *Psychological and behavioral implications of abnormal mammograms*. Ann Intern Med 1991;114:657-61.

31. Marshall G. *A comparative study of re-attenders and non-re-attenders for second triennial National Breast Screening Program appointments*. J Public Health Med 1994;16(1):79-86.

32. Meldrum P, Turnbull D, Dobson HM, Colquhoun C, Harper Gilmour W, McIlwaine GM. *Tailored written invitations for second round breast cancer screening: a randomised controlled trial*. J Med Screen 1994;1:245-8.

33. Scaf-Klomp W, van Sonderen FLP, Stewart R, van Dijck JAAM, van den Heuvel WJA. *Compliance after 17 years of breast cancer screening*. J Med Screen 1995;2:195-9.

34. Johnson MM, Hislop TG, Kan L, Coldman AJ, Lai A. *Compliance with the screening mammography program of Bristish Columbia: Will she return?* Can J Public Health 1996;87:176-9.

35. Chiarelli A, Moravan V, Halapy E, Majpruz V, Mai V, Tatla RK. *False positive result and reattendance in the Ontario Breast Screening Program*. Journal of Medical Screening (in press).

APPENDIX 1

Database Management Committee

This committee advises on the content, management process, and use of the Canadian Breast Cancer Screening Database. It is responsible to the National Committee for the Canadian Breast Cancer Screening Initiative, and is advisory to the Centre for Chronic Disease Prevention and Control, Health Canada.

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APPENDIX 2

Database Technical Subcommittee

This committee develops and implements the strategies for the uniform collection and sharing of data in the Canadian Breast Cancer Screening Database. It is responsible to the Database Management Committee, and is advisory to the Centre for Chronic Disease Prevention and Control, Health Canada.

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APPENDIX 3

Glossary

Asymptomatic
A woman who does not report symptoms and appears without signs of disease at screening.

Cancer
Includes malignant and ductal carcinoma in situ (DCIS) of the breast.

Diagnosis
The first pathologic or cytologic diagnosis of cancer, last known biopsy for benign cases, or last intervention before a recommendation to return to screening or return for early recall[1].

Ductal carcinoma in situ (DCIS)
A non-invasive tumour of the breast, arising from cells that involve only the lining of a breast duct. The cells have not spread outside the duct to other tissues in the breast.

Fine-needle aspiration biopsy
A technique used to differentiate cystic from solid lesions in the breast. A needle is inserted into the lesion and material drawn out using a syringe. If the material is solid, it can be stained and the cells examined in a laboratory to determine whether or not they are benign or malignant.

Incident cancer
Cancer detected by a program screen after the initial screen.

In situ
Refers specifically to ductal carcinoma in situ (DCIS): a non-invasive tumour of the breast, arising from cells that involve only the lining of a breast duct. The cells have not spread outside the duct to other tissues in the breast.

Initial screen
The first Canadian screening program screen provided to a woman.

Interval cancer
Any invasive breast cancer diagnosed in the interval after a "normal" screening result and before the next scheduled screening examination.

Invasive cancer
Cancer cells invading beyond the basement membrane of the milk duct or lobule. A ductal carcinoma in situ component may also be present in cases of invasive cancer.

Negative screening episode
A screening episode that concludes with normal findings, including program-initiated work-up that did not reveal any cancer.

Open biopsy
Surgical removal of a breast mass under local anesthesia for subsequent microscopic examination by a pathologist.

Post-screen cancer
A cancer detected outside the program within 24 months of a negative screening episode.

Prevalent cancer
The proportion of the population with cancer at a given point in time.

Screen
Can comprise mammography, or both clinical breast examination and mammography, delivered by a program.

Screening episode (completed)
Defined for normal screens as the date of the last screen; for abnormal screens, the date of tissue diagnosis if biopsy is performed, the date of the last test before a return to screening or before the recommendation for repeat diagnostic imaging. A "negative screening episode" can include all follow-up, provided that the end result is negative.

Rescreening

Subsequent screening, according to policy, after initial screening under the program. This includes women who miss a scheduled round of screening.

Screen-detected cancer

Cancer detected as a result of a positive test with histologic confirmation attributed to the screening findings of the program.

Total person-years at risk

Within a 12 or 24-month period after a negative screening episode, women are considered at risk for post-screen detected cancer. Women contribute a count in the denominator for each year or fraction of a year within the period of interest before a post-screen detected cancer or the next regular program screen.