



**BC Cancer Agency**

CARE + RESEARCH

*An agency of the Provincial Health Services Authority*

# 25

Celebrating Twenty-Five Years of Breast Screening in BC

# Acknowledgements

The team responsible for the BC Cancer Agency Screening Mammography Program 25th Anniversary Report was led by Janette Sam, Operations Director and Dr. Christine Wilson, Medical Director. The analysis of the data for the program evaluation and trend analysis was provided by Anky Lai, BC Cancer Agency Biostatistician.

We would like to express our appreciation to the following individuals who assisted with the review and compilation of program information: Dr. Andrew Coldman, Lisa Kan, Nancy Aldoff, Rasika Rajapakshe, Ritinder Harry, Norm Phillips, Colleen McGahan, Karen Truong, Cathy Rayment, and Dr. Linda Warren. We would also like to acknowledge Jarvis Lui for the production and design of the report.

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*“I am convinced that the efforts of the original SMP pioneers, especially Drs. Basco, and Warren-Burhenne and Ms. Sheila King, and the thousands of staff and physicians who have been made the care of women through the SMPBC possible since 1988, was worthwhile. Breast cancer survival rates in BC have significantly improved since the mid-1980s. Outcome evaluation within BC has demonstrated that approximately 2/3rds of the improved survival that has occurred over the past 2-3 decades is attributable to earlier diagnosis (the rest has been due to improved treatment). The SMP, and the public educational efforts surrounding SMP implementation have improved the lives of thousands of women in BC. “*

**Dr. Ivo Olivotto, Past Program Medical Leader,  
BCCA Vice President Radiation Therapy and Functional Imaging**

*“Cancer screening and mammography has evolved over the last 25 years. Ongoing program data analysis and evidence from well-conducted observational studies provide information that can be used for continued program evaluation and improvement.”*

**Dr. Andrew Coldman, Past BCCA Vice President, Population Oncology**

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# SMP by the Numbers

300,000

Number of women screened by the Screening Mammography Program every year.

70%

SMP's target participation rate



15

minutes

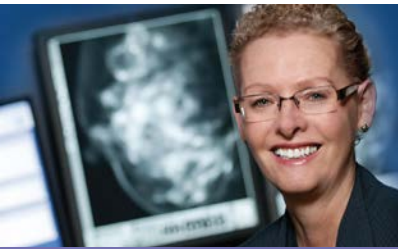
Average SMP appointment time



Number of screens provided by SMP over the last 25 years.



## Executive Summary



Dr. Christine Wilson, SMPBC

“Such a significant undertaking could not have occurred without the help and dedication of many individuals over the years.”

It has been 25 years since the BC Cancer Agency launched the Screening Mammography Program of BC (SMP) - the first population-based breast screening program in Canada.

Since its inception until the end of December, 2013, SMP has provided over 4.8 million exams and detected 20,992 breast cancers.

Such a significant undertaking could not have occurred without the support and dedication of many individuals over the years. In this report we will share how the program began and some of its significant milestones over the years.

A woman with long dark hair, wearing a white lab coat, is shown in profile from the waist up. She is standing in a clinical setting, looking at a large computer monitor that displays a grayscale mammogram image. Her right hand is resting on the control panel of the mammography machine. The machine is white and modern, with a large gantry arm visible in the background. The overall image has a blue tint.

## Screening Mammography Program Background

In December 1987 a sub-committee of the BC Cancer Agency Breast Tumour Group, led by radiation oncologist Dr. Vivian Basco, reported on the early diagnosis of breast cancer in British Columbia to the Ministry of Health. The report included recommendations for screening mammography, as the benefits of early diagnosis and reduction in mortality would reduce the impact of the disease on women, as well as reduce the costs associated with treating breast cancer.

The ministry accepted the recommendations and established a pilot program to assess operating costs over a one-year period. The pilot program performed its first screening mammogram on July 18, 1988.

# BC Cancer Agency Breast Screening Program

## A Timeline for Development

- 1985**
- Screening studies in Sweden, the Netherlands and New York State publish favourable breast cancer mortality results.
  - European and North American groups begin to discuss organized breast screening.
  - Canada launches the National Breast Screening Study, a national research project with Vancouver as one of its trial centres.
- 
- 1986**
- Vancouver-based radiologist, Dr. Linda Warren, visits screening programs in Sweden, England, the Netherlands and Germany while on sabbatical in Europe. She observed firsthand how the successful published results were achieved.
  - First reports on low cost screening were published in North America.
- 
- 1987**
- A sub-committee of the BC Cancer Agency's Breast Tumour Group, led by Dr. Basco, was formed to look at early diagnosis in BC. The committee included representation from the BCMA Cancer Committee and section of General Practice, the BC Radiological Society, the BC Surgical Society, the University of British Columbia and the Ministry of Health.
  - The subcommittee developed a brief for the Minister of Health outlining a proposal for the early detection of breast cancer in women over the age of 40.
- 
- 1988**
- In February the Medical Services Commission invited Dr. Vivien Basco (BCCA Breast Tumor Group) and Dr. Linda Warren (BC Radiological Society) to Victoria to make a presentation.
  - In March a national workgroup of experts developed the recommendation that women age 50-69 be invited to participate in an early detection program for breast cancer every two years.
  - Ministry of Health approved the proposed pilot project, provided the BC Cancer Agency a grant of \$400,000 to perform nine thousand examinations for women ages 40-79.
  - As the National Breast Screening Study was winding up in mid-1988, the facility in Vancouver was available and became the screening centre for the Pilot Project.
- 
- 1989**
- Ministry of Health provided ongoing budget to the BC Cancer Agency to expand the pilot project to a provincial Screening Mammography Program.

## The Pilot Program



Dr. Linda Warren and  
Dr. Vivien Basco

The goals of the pilot were to determine the unit cost per screen, to measure the acceptability of organized screening by the general population and to develop methodologies for data collection, analysis and quality control. The pilot program came in on budget at \$35 per examination.

Dr. Warren recalls how quickly the program began from there:

**“It was very encouraging when the provincial government began encouraging us to expand – even before we had a chance to analyze our data and make cost calculations. The Surrey Centre was established within a year, followed in quick succession by North Vancouver and the first mobile. Throughout the history of our Program, the Ministry of Health has been greatly supportive at all levels.”**

## Early Leadership

This vision succeeded with the collaboration and support of many leaders in the medical community and the Ministry of Health.

It is with the continued support of BC physicians and other health professionals, volunteers, partnerships with foundations and support groups, and women themselves that the Screening Mammography Program remains successful at reducing breast cancer mortality and morbidity.

- Dr. Vivien E. Basco – Chair, Breast Tumour Group, BCCA
- Dr. P. Band, Head, Division of Epidemiology and Occupational Oncology, BCCA
- Dr. J. Burhenne, Head, Division of Diagnostic Imaging, Vancouver General Hospital and UBC
- Dr. L. Warren Burhenne, Cancer Committee, BCMA
- Dr. M.G. Clay, Surgeon, Breast Tumour Group, BCCA
- Dr. T. G. Hislop, Division of Epidemiology and Occupational Oncology, BCCA
- Dr. R. Hutchinson, Senior Medical Consultant, Medical Consultation Division, Hospital Programs
- Dr. D. Klassen, Director, BCCA
- Dr. K. Kolotyluk, Section of General Practice, BCMA
- Dr. H. Mueller, Head, Division of Diagnostic Imaging, BCCA
- Dr. P. M. Rebbeck, Surgeon, Breast Tumour Group, BCCA
- Dr. J.T. Sandy, Surgeon, Breast Tumour Group, BCCA
- Mr. R. Smith, Deputy Director, BCCA
- Dr. L. Thurber, B.C. Radiological Society
- Dr. A. Worth, Pathologist, BCCA

## About the Program

### Breast Cancer in BC

Almost half of all Canadians (41% of females and 46% of males) will develop cancer in their lifetime and a quarter of all Canadians are expected to die of the disease<sup>1</sup>. Breast cancer is the most common cancer for women with 1 in 9 expected to develop breast cancer in their lifetime, and 1 in 29 expected to die from it. Breast cancer accounts for 26% of the new cancer cases each year in Canada.

#### Estimated Canadian breast cancer statistics (2013)<sup>2</sup>

| Category                                       | Males | Females |
|--|-------|---------|
| New cases                                      | 200   | 23,800  |
| Incidence rate (for every 100,000 people)*     | 1     | 99      |
| Deaths   | 60    | 5,000   |
| Death rate (for every 100,000 people)*         | 0.3   | 19      |
| 5-year relative survival (est. for 2006 -2008) | 80%   | 88%     |

*\*Age-standardized to the 1991 Canadian Standard Population. Age-standardization is a statistical method that removes the effect of age on the calculated rate. It allows rates to be compared over time or across provinces and territories.*

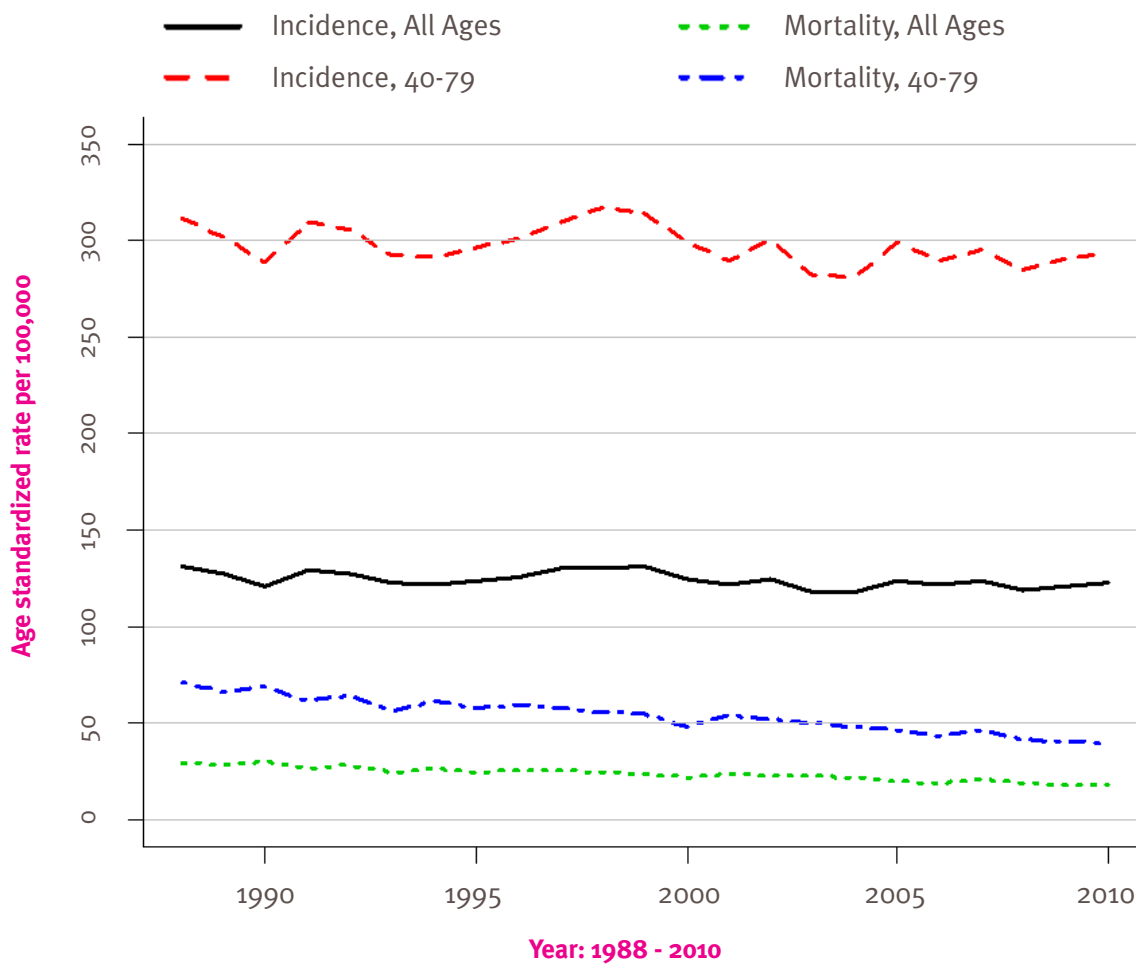
Breast cancer incidence rates remain fairly consistent across Canada. In BC, breast cancer is the most common cancer accounting for 3198 new cases in 2012. Over 80% of these cases occur in women aged 50 years or older.

### Evidence for Breast Screening in BC

The first randomized controlled trials conducted in the 1970's and 1980 demonstrated a breast cancer mortality reduction benefit of 20% among women allocated to screening. Analyses of women who actually participated in screening, whether in clinical trials or in population studies, indicate a greater benefit than for those who did not participate. Since the time of the original trials we have also seen advances in the medical and surgical treatment of breast cancer. The overall improvement in both screening and treatment has caused the mortality rate from breast cancer to steadily decline (Figure 1).

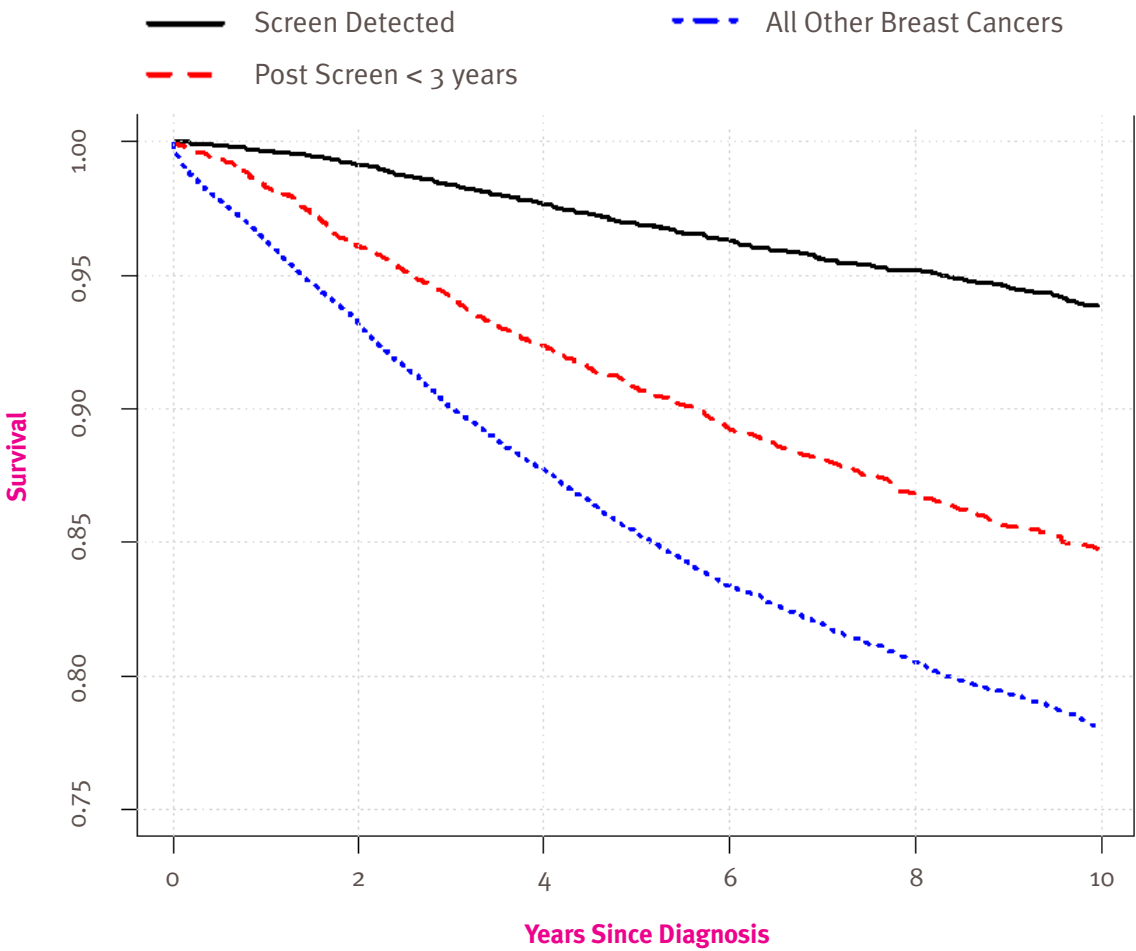
<sup>1</sup> Canadian Cancer Society's Advisory Committee on Cancer Statistics. Canadian Cancer Statistics 2013. Toronto, ON: Canadian Cancer Society; 2013

<sup>2</sup> Canadian Cancer Statistics 2013. <http://www.cancer.ca/en/cancer-information/cancer-type/breast/statistics/?region=bc#ixzz2bElMtCPb>

**FIGURE 1:****BREAST CANCER MORTALITY RATE IN BRITISH COLUMBIA****Mortality**

Consequently more women are surviving their breast cancer than ever before. These survival graphs (Figure 2) illustrate that survival is best for those women who have small cancers detected by screening mammography. Although survival is difficult to interpret when evaluating screening the picture they paint underpins the value of mammography first determined in the randomized trials.

**FIGURE 2:**  
**BREAST CANCER SURVIVAL RATE IN BRITISH COLUMBIA**



## Survival

In most Canadian Provinces, including British Columbia, we know from recent data assembled that there is a reduction in breast cancer mortality among screening participants<sup>3</sup>. The average reduction is approximately 40% with a range across the various provinces of 27% to 59%. As screening mammography technology changes and advances, for example, with the use of digital mammography and other potential technologies like tomosynthesis, we hope to see further reduction in the deaths from breast cancer.

<sup>3</sup> Coldman et al; Pan Canadian Study of Mammography Screening and Mortality from Breast Cancer; JNCI J Natl Cancer Inst (2014)

## Definition of Screening

Screening is a secondary prevention strategy. Primary cancer prevention strategies involve an intervention that reduces the risk of developing cancer. Examples of risk reduction strategies include stopping smoking, the HPV vaccine, fat reduction in the diet, and limiting the use of hormone replacement therapy.

Screening for cancer is a secondary prevention strategy. Secondary cancer prevention strategy targets disease in process<sup>4</sup>. A secondary prevention can reduce cancer morbidity and mortality by: diagnosing invasive disease at an earlier, more favourable prognostic stage; and, detecting precursor lesions associated with some cancers that once eliminated, prevent progression to invasive disease. Screening is “the application of various tests to apparently healthy individuals to sort out those who probably have risk factors or are in the early stages of specified conditions.”<sup>5</sup>

## Limitations of Screening

The decision to screen an at-risk population for pre-clinical signs of cancer is based on well-established criteria related to cancer and the screening tests that we used to identify individuals who may have occult (not readily apparent) disease<sup>6,7,8</sup>.

The overall objective of a screening program is to reduce morbidity and mortality from cancer. The goal of screening is to “apply a relatively simple, inexpensive test to a large number of persons in order to classify them as likely or unlikely to have the cancer”. The emphasis on likelihood underscores the limits of what should be expected from screening (i.e., screening tests are not diagnostic tests).

A person with an abnormal screening test does not have a definitive diagnosis until additional, more sophisticated diagnostic tests are completed. The emphasis on likelihood is also important because screening tests are inherently limited in their accuracy, which varies by test, cancer site, and individual characteristics. Although most screening interpretation are accurate, it is inevitable that some individuals are identified as possibly having cancer when they do not (false-positive screen), and screening tests may fail to identify some individuals who do have the disease (false-negative screen).

The comparative evaluation of accuracy versus misinterpretation cannot be considered in absolute terms, but rather should be evaluated in terms of the relative consequences of one or the other kind of error.

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<sup>4</sup> US Preventive Services Task Force: Guide to Clinical Preventive Services, Ed 2. Baltimore, Williams & Wilkins, 1996

<sup>5</sup> Morrison A: Screening in Chronic Disease. New York, Oxford Press, 1992

## Organized Population Screening Program

To reduce morbidity (the incidence of a disease) and mortality (the number of deaths from a disease) from cancer in a population by screening, there must be coordinated and effective strategies to ensure acceptance and utilization of the established screening test. Since screening is targeted at asymptomatic women (women with no signs or symptoms of cancer) the fine balance between maximizing benefits and minimizing undesirable effects must be maintained.

An organized approach to screening ensures that the target population has access to the screening service and that it accepts and uses the services offered. This is achieved by including the following six program components:

1. Health Promotion
2. Professional Development/Education
3. Recruitment & Retention
4. Screening Test & Reporting
5. Follow-up
6. Evaluation/Research Partnerships

## Screening Eligibility in British Columbia

SMP provides screening mammography to women ages 40-74. In order to be accepted for screening the following criteria must be met:

- Have no breast changes\*.
- Have not had a mammogram within 12 months.
- Have not had breast cancer.
- Do not have breast implants.
- Are not pregnant or breast feeding.
- Can provide the name of a health care provider to receive the results.

In 2005, the First Ministers set eight evidence-based national benchmarks including a participation target for screening mammography of 70% of eligible 50-69 year old women having a screening mammogram every two years. In 2007 BC established the target of March, 2017 to reach 70% participation.

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<sup>6</sup> Cole P, Morrison AS: Basic issues in cancer screening. In Miller AB (ed); Screening in Cancer. Geneva, International Union Against Cancer, 1978, P7

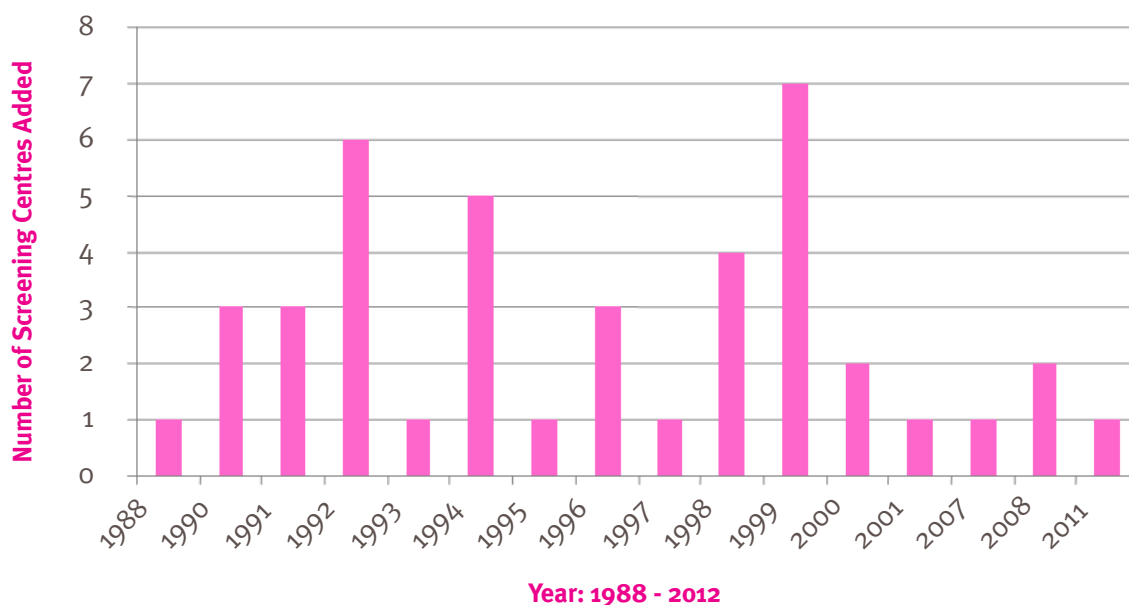
<sup>7</sup> Miller AB; Fundamentals of Screening. In Screening for Cancer. Orlando, Academic Press, 1985, P3

<sup>8</sup> Wilson JMG, Junger G; Principles and Practice of Screening for Disease. Geneva, World Health Organization, 1996

## 25 Years of Expansion

Early on, SMP developed a goal of ensuring every woman in BC has reasonable access to screening services, whether by attending their nearest local centre or the mobile mammography service when it visits their area. By the fifth year of operation, 1 mobile and 13 centres were serving the women of BC. Today there are 37 fixed centres and 3 mobiles providing screening services in BC. (Centre list - Appendix B)

**FIGURE 3:**  
**NEW SCREENING CENTRES, 1988-2012**

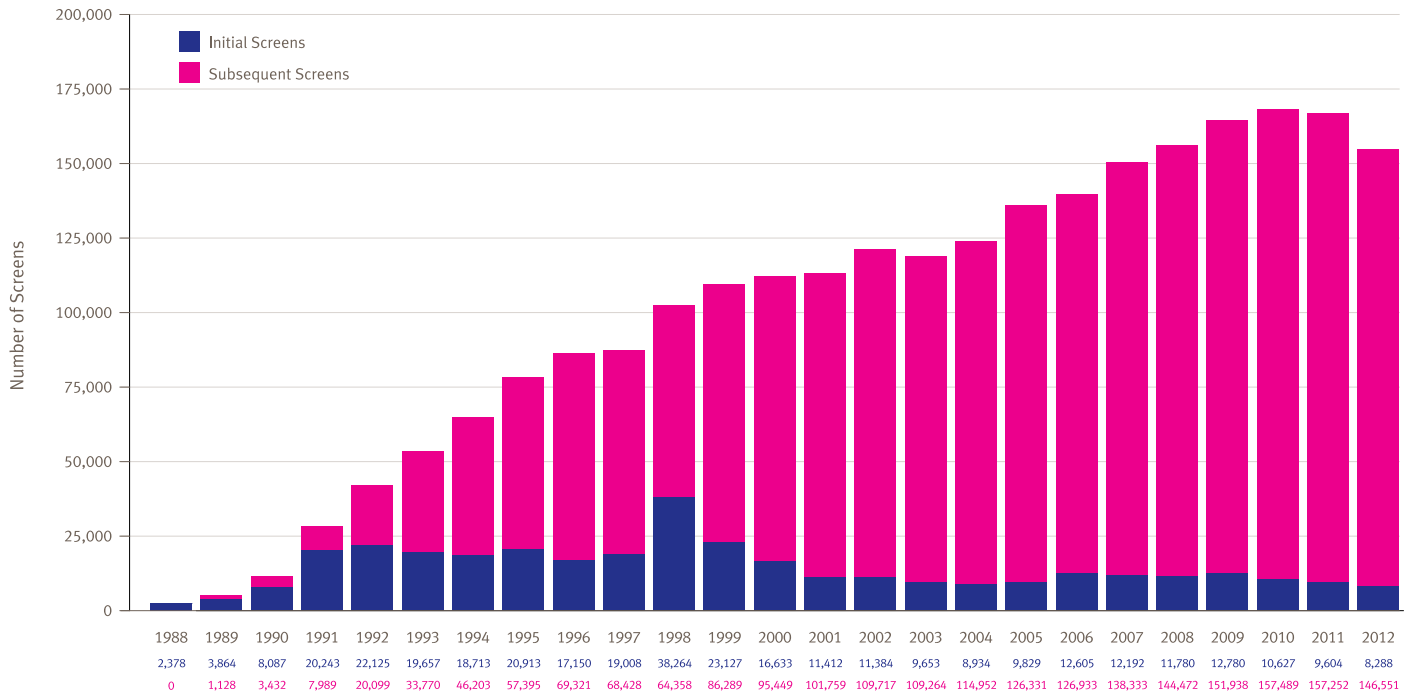


The BC Cancer Agency's Screening Mammography Program has the oversight responsibility for breast cancer screening in BC. The program works in partnership with the provincial health authorities to ensure that appropriate screening tests are available to eligible women. The program reminds women when they are due for breast screening, tracks participation, and monitors system performance and outcomes of breast screening activities. The centers are managed and operated directly by either the local health authority or by the community imaging clinic where the center resides.

The pilot project for SMP was funded in 1988 for 7,100 screens to be performed in one year. Recognizing the success of the pilot funding was continued by the Ministry and in 1989 the program officially began. In the first 5 years of operation more women were attending for a first initial screen, but by year six, in 1994, the percentages of women returning for a subsequent screen had increased. Today, on average, 10% of screens performed are by first time attendees to the program with the remainder of the screens being performed for women returning for subsequent screens.

Between 1988 and 2012 the program performed 4,543,907 exams.

**FIGURE 4:**  
**SMP SCREENING VOLUME: 1988 - 2012 (AGES 50-69), BY SCREEN TYPE AND CALENDAR YEAR**



## Fast Track Process

On average approximately 7% of women who attend for screening will require additional diagnostic testing.

In 1996, five pilot projects investigated the usefulness of different changes in the diagnostic system designed to reduce the time from an abnormal screen to diagnosis.

There was a significant reduction in the time to diagnosis in four of the five pilot projects, with the most dramatic effect in Nanaimo. In that community, family physicians agreed that the screening program could directly courier abnormal films and the accompanying radiologist's recommendations, to the diagnostic facility at the regional hospital. Women were informed at the time of screening, that if something abnormal was found, they would get a call from the hospital to arrange more tests like special mammographic views or a breast ultrasound. This process worked smoothly and was adopted in Vernon, Prince George and Comox.

The result of the SMP centre facilitating referral to the diagnostic service was a significant reduction in the time from abnormal screen result to diagnosis with improved access time by 1.5 weeks overall. Women and health care providers were satisfied with the care received. Based on these results, SMP has developed a process to make facilitated referrals for diagnostic imaging available to all women and physicians in BC.

The Fast Track Referral System was established in 1999 as a voluntary process for women and their health care providers. Initially 62% of health care providers in BC enrolled in the program, however due to the reductions in wait times achieved by Fast Track, it became the standard of care for all women who were recalled for further testing in January, 2010.

### Fast Track Overview

- At the time of screening, women are informed that if further tests are required, they will be called directly by a diagnostic facility to book their appointment.
- If further testing is required i.e. additional mammographic views or breast ultrasound, the woman is booked at the Fast Track diagnostic clinic closest to the screening site, usually at the same location.
- The SMP films and results are transferred to the diagnostic office prior to the appointment.
- SMP notifies the woman's doctor where their patient has been referred for additional testing.
- The diagnostic facility makes every effort to provide an appointment within one week of receiving the referral.

Standardization of the Fast Track referral system ensures that all women benefit from the shortened time between an initial abnormal screening result and the first appointment for diagnostic assessment.

## 25 Years of Quality Services

The first mammography technologist with the program, Jeannie Schmirler, recalls working with the film vendor to establish standards;

**“We didn’t have a quality control program yet – I just knew what would work. I worked with Kodak (the mammography film vendor), who was very helpful, and we set up a Quality Control program for mammography. They were new to this type of imaging too and were very happy to work together on this”.**

The desire to incorporate the philosophy of continuous quality improvement has shaped initiatives at SMP over the years.

From the very beginning, the leaders of SMP recognized the importance of standardization of processes so that women would be assured of receiving a quality examination, no matter where it occurred in BC.

When the program first started, modern mammography was fairly new and many quality control processes needed to be developed. Daily processor sensitometry documentation was developed and standardized for each new center that was added to the program.

In the 1970s the development of rare earth screens led to significant improvement of mammography film quality. Over time there were continued advances in the quality of the film, cassettes, and chemistry used to develop the film resulting in radiation dose reduction and improved cancer detection.

Some of the most significant advances for mammography film imaging occurred in 1990s including the development of new x-ray tube target and filtration materials, a new image quality testing phantom, and Min R 2000 mammography film.

In 2005 the Digital Mammography Imaging Screening Trial (DMIST) results were published. Digital mammography was confirmed to be at least as effective as film screen mammography in the general population, and possibly more effective in young women and women with dense breasts. In 2006 a pilot study at Victoria General was performed to evaluate the protocol for full field digital mammography in SMP. Today, digital mammography is the standard for new equipment acquisition in the program.

### Screening Program Quality Assurance Support Group

The Quality Assurance Support Group (QASG) was established for the purpose of providing physics support services in order to achieve and maintain maximum image quality and imaging performance at all SMP affiliated screening centres.

Membership includes BC Cancer Agency physicists, the Provincial Professional Practice Leader for screening technologists, and the SMP Quality Management Coordinator.

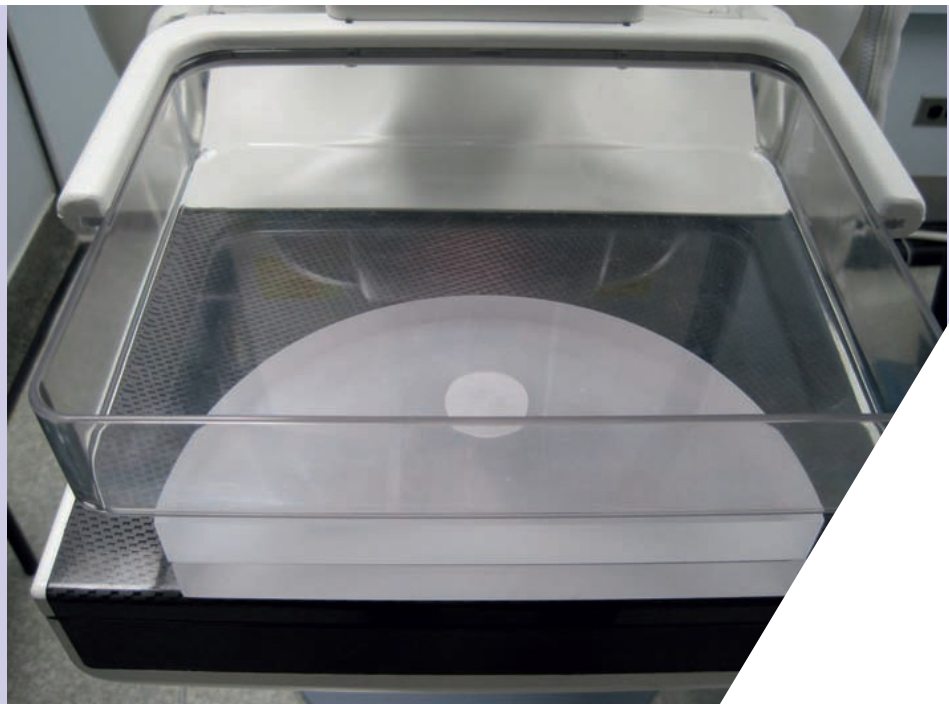
Services provided by the group include:

- Supporting the establishment and ongoing improvement of a quality control (QC) program at each screening centre.
- Monitoring screening centre QC data and communicate with the screening centres as required.
- Assisting the screening centres to meet accreditation requirements.
- Initiating and developing policies and procedures related to physics support and quality control for the SMP and making recommendations about revisions of existing policies and procedures and quality control manuals.
- Assisting and mediating, if necessary, to resolve technical problems with the equipment.
- Evaluating new equipment for the SMP affiliated screening centres.

The QASG has been involved in research projects as well as development of digital mammography innovations over the years.

### Double D Phantom

Dr. Rasika Rajapakshe, SMP Senior Physicist, has developed a patented Double D phantom for digital mammography quality control testing; the test is now included in the International Atomic Energy Agency Quality Assurance Program Manual.<sup>9</sup>

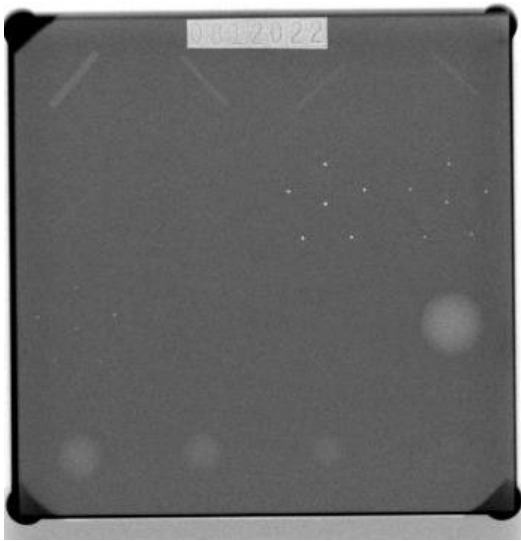


### Weekly QC Test Object

A web based “mQc” program has been developed by Dr. Rasika Rajapakshe and Stephen Smithbower, a computer science student from University of British Columbia, Okanagan. This software tool is used by digital SMP centres to send their QC test images for evaluation every week.

## Image Quality Over Time

Mammography Quality Assurance (QA) programs regularly monitor image quality and patient dose to ensure a safe and effective screening service. The goal in mammography imaging is to obtain the best possible image using the least amount of radiation possible. Mammography QA is standardized within the SMP and has been established, tracked and monitored since the beginning of the program.



### Mammographic Accreditation Phantom

One of the tools used to assess image quality is the Mammographic Accreditation Phantom. The phantom is a Lucite block used to simulate the x-ray attenuation of a compressed 4.2 cm human breast composed of 50% adipose tissue and 50% glandular tissue, containing details (masses, fibres and specks) ranging from visible to invisible on a mammographic image.

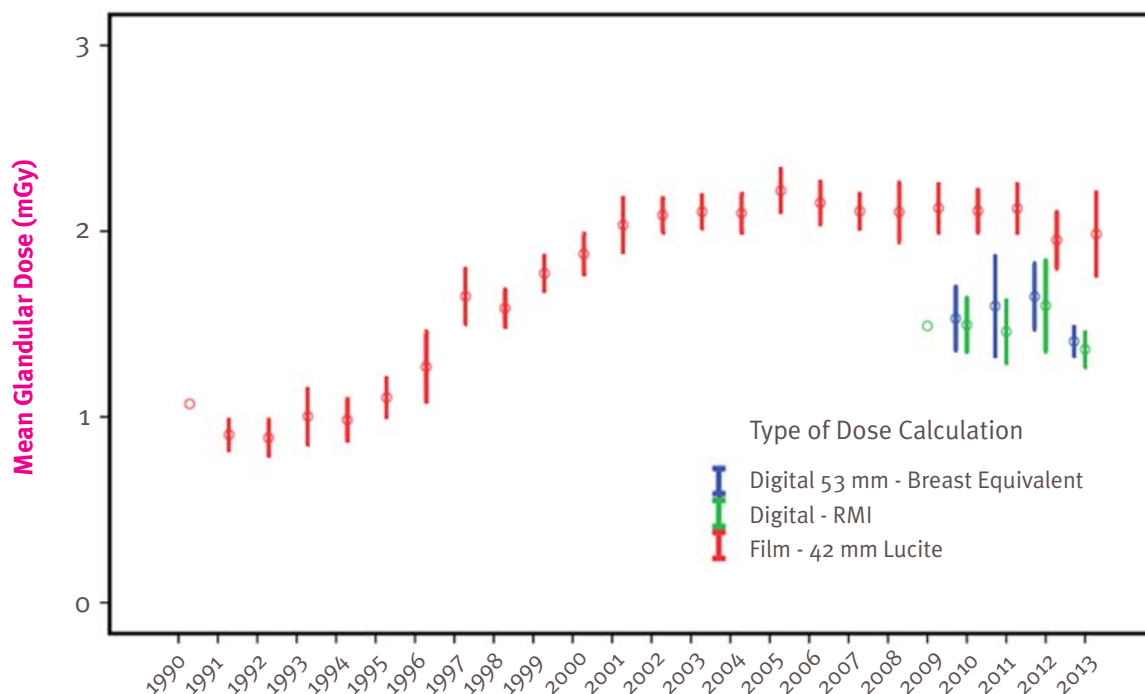
The minimum performance criterion to pass accreditation is visibility on a mammographic test image of four of the largest fibres, three of the largest speck groups and three of the largest masses.

The Mean Glandular Dose (MGD) is defined as the mean (average) dose to the glandular tissue. It is considered to be a reasonable quantity for comparing relative risk from different mammography procedures<sup>10</sup>. The acceptable limit for the dose for the phantom is 3 mGy.

The graph below displays the average mean glandular dose for the QC phantom image test for both film and digital mammography from 1990 – 2012. The mean glandular dose doubled between 1990 and 2000 to an average of 2 mGy due to optimization in the technical aspects of screen-film mammography. Although the dose doubled over this period of time, this is significantly less than the dose delivered in the early era of screening mammography when the MGD was estimated to be an average of 14 mGy in 1974.

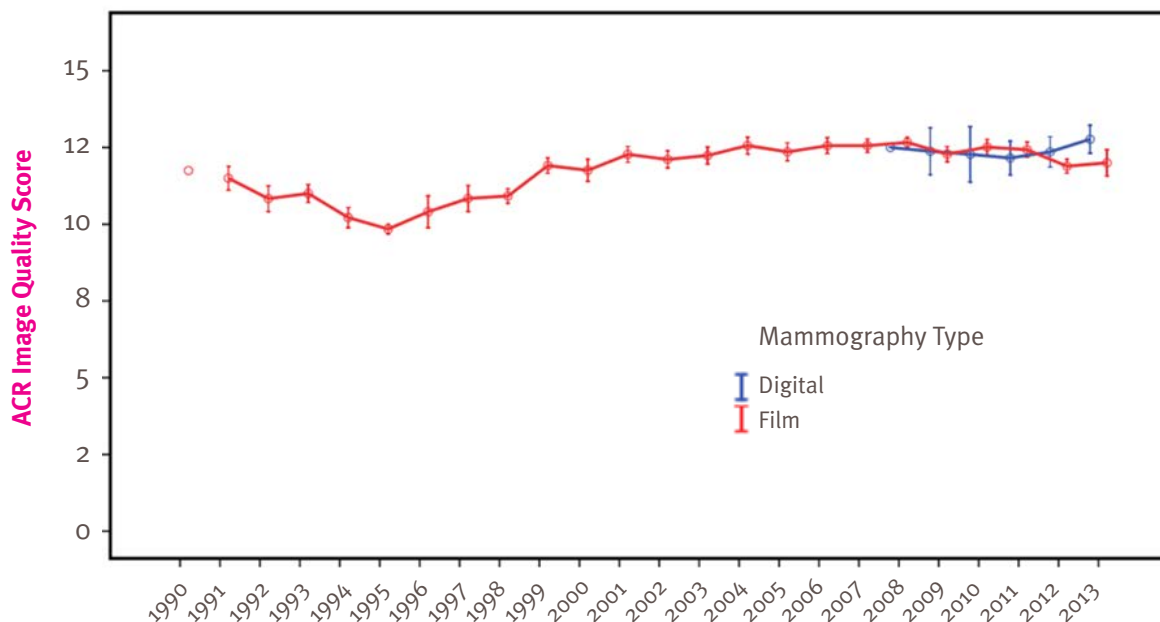
<sup>9</sup> [http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1482\\_web.pdf](http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1482_web.pdf)

<sup>10</sup> [https://rpop.iaea.org/rpop/rpop/content/informationfor/healthprofessionals/1\\_radiology/mammography/mammography-technique.htm#MFAQo8](https://rpop.iaea.org/rpop/rpop/content/informationfor/healthprofessionals/1_radiology/mammography/mammography-technique.htm#MFAQo8)

**FIGURE 5: AVERAGE MEAN GLANDULAR DOSE**

Technological advances in film screen mammography in the 1990's, including the development of Min R 2000 film and new x-ray tube target materials, contributed to a MGD radiation dose increase between 1995 and 2001. The dose increase corresponds with an increase in image quality (more specks, masses and fibers visible on the phantom image). A review of the ACR Phantom image quality control test results over time shows that phantom scores improved from 1995 – 2000 and then stabilized.

The SMP quality assurance program ensures that the programs' mammography units perform on par with national standards/recommendations and provide the highest image quality obtainable.

**FIGURE 6: IMAGE QUALITY CONTROL TEST RESULTS**

Dr. Linda Warren recalls the value of developing a quality control and monitoring program within SMP:

**“We developed a quality control program for classification and analysis of interval cancers. This illustrated the advantage of our population-based cancer registry, as well as the value of such analysis in improving radiologists’ experience and education.”**

## Canadian Association of Radiologists Mammography Accreditation Program

The Canadian Association of Radiologists (CAR) Mammography Accreditation Program (MAP) is an initiative instituted over fifteen years ago (1993) to ensure that the quality of mammography images meets the highest standards. This voluntary program offers radiologists the opportunity for peer review and evaluation of their facility’s staff qualifications, equipment performance, quality control and quality assurance programs, image quality, breast dose, and processor quality control .

By March 31, 1995, 8 of the 20 centres had completed the accreditation process. Recognizing the importance of accreditation, CAR Mammography Accreditation Program accreditation became mandatory for all Screening Mammography Program affiliated centers. Centres must either have current accreditation or be in the process of obtaining/updating their accreditation. By 2004 all centers were enrolled in the CARMAP accreditation process.

## Screening Mammography Program Scientific Forum

In October 1992 SMP held its first annual forum in Vancouver, offering continuing mammography related education for radiologists in BC. Topics covered included program results review and invited international mammography expert speakers. Over time the forum has grown to over 300 attendees, including radiologists, technologists, physicists, pathologists and surgeons. The forum is now held every two year and provides an opportunity for attendees to advance their knowledge of breast imaging and disease and to network with their peers.

## Professional Performance Standards and Management

The Screening Mammography Program has a robust performance management and review process for radiologist screeners. In addition to all screening radiologists maintaining CAR accreditation requirements, statistics on abnormal call rate, cancer detection rate, positive predictive value, sensitivity and specificity are compiled, reviewed and shared annually with each program radiologist screener. The program Medical Director reviews the statistics to ensure that the program’s established performance indicator benchmarks are met.

External reviews by a visiting world-renowned screening mammography expert radiologist are conducted annually for new screeners in their first two years with the program. In 2012 the process was expanded to provide one-on-one performance support consultation/tutorial session for any radiologist screener working on a particular aspect of their continuous performance improvement. SMP exceeds established national targets for cancer detection.

<sup>11</sup> <http://www.car.ca/en/accreditation/map.aspx>

## Provincial Breast Health Strategy

In May 2010, at the request of the Ministry of Health Services (MoHS), the Provincial Health Services Authority (PHSA) developed the Breast Health Action Plan (BHAP). The plan identifies areas for improvement and strategies to address these challenges. These include improving the clinical pathway, upgrading mammography equipment, addressing workforce issues and collaboration on a province-wide, evidence-based approach to prevention.

BC's breast imaging leaders, professional staff, health authority administrative and clinical leaders, and other key health partners responsible for breast diagnosis and prevention, collaborated together to develop and advance initiatives to improve BC's breast health system.

To date the project teams have advanced the following:

- **Clinical Pathway** – This team has developed a recommended breast diagnostic clinical pathway, including a hub and spoke model for imaging services. The pathway is designed to map out the woman's journey from receiving an abnormal screening mammogram result, or the finding of a physical breast abnormality, to the point where she receives a diagnosis. The goal is to provide consistent, timely care for women throughout BC.
- **Digital Mammography** – A provincial strategy for the replacement of film based analog with digital mammography equipment was developed. Competitive pricing was secured through a provincial digital mammography procurement process.
- **Prevention** – The prevention team focused on both primary and secondary breast cancer prevention. The secondary prevention work focused on updating BC's screening mammography policy.
- **Workforce** – This team focused on developing increased capacity in the system by addressing recruitment, retention and training of health professionals, including cross-training programs in breast ultrasound for mammography technologists and fellowship programs for breast-imaging radiologists.

## Partnership Support

### Canadian Cancer Society



**Canadian  
Cancer  
Society**

The Canadian Cancer Society (CCS) is a national, community-based organization of volunteers whose mission is the eradication of cancer and the enhancement of the quality of life of people living with cancer.

The CCS was supportive and involved early on with SMP and provided funding to purchase the first mobile mammography vehicle in 1990. The service was operated from Kamloops and provided screening mammograms to women in the region.



First SMP Mobile Mammography Vehicle, 1990

The mobile visits are successful due in large part to the extensive network of volunteers around the province that donate their time to provide support both in getting the word out locally prior to the mobile coming to town as well as providing a friendly welcoming presence when women check in for their appointment.

The Canadian Cancer Society was instrumental in the early days in establishing a volunteer network around the province to support the mobile visits locally. Dorothy Babcock was the longest serving volunteer for SMP. She rallied volunteers throughout the Interior and Kootenay regions to promote mobile visits in their communities and could often be found at health fairs encouraging women to go and get screened.

## SMP Grows Quality Assurance Process

SMP program implements revised screeners test, cancer review process, initiates customer satisfaction

# Through the Years: Screening Mammography Program of BC

The pilot program begins performing 9000 screens at a cost of \$35 per screen.

1988

## 1989

Pilot program expanded and Screening Mammography Program of BC is officially established.



Program performs  
102,160 screens

1993

1995

1997

## Screening Eligibility

Women 50-79 years old every two years. Invitation program to women 50-7

# 50

1990

1995

2000

2003

## 34%

Participation in SMP reaches 34 per cent.

## First mobile screening centre opens in Kamloops.

Mobile screening sites to eventually serve 10% of BC's population.



## SMP Fast Track Program Launches

## SMP Quality Assurance Support Group Expands

SMP Physics Support Group, first established in 1995, expands to include physicists, a professional practice leader and quality management coordinator in Vancouver, Victoria and Kelowna.

post screen  
tion survey.

to 79

y Review Complete

recommended to screen  
on letters sent from the  
4 years old.



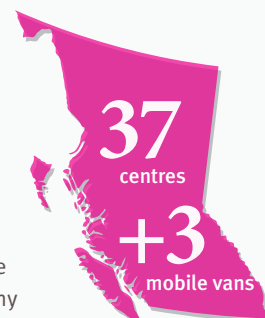
50 to 69

### Screening Mammography Benchmark Established

Canadian First Ministers establish evidence based screening mammography benchmark for women 50-69

### Proudly Serving British Columbia

Combination of fixed centres and mobile services provide access to mammography across the Province.



53%

53% of eligible 50-69 year women being screened

2013

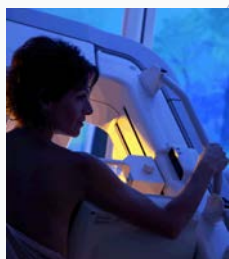
2005

2007

2006

2010

2011



### Digital Mammography

Digital mammography screening pilot project is started at Victoria General Hospital.

### SMP Fast Track Becomes Standard of Care for All Women

Fast Track is a province-wide initiative aimed at reducing the time between an abnormal result and further testing.

### SMP Continues to Grow

Canadian Breast Cancer Foundation Pink Tour travels BC to provide education around breast health and screening. By 2011, SMP is screening more than 300,000 BC women per year.



In 2012, the Canadian Cancer Society (CCS) launched a community-based screening campaign aimed at increasing awareness about early detection and screening for breast cancer in the South Asian community. The project goals are to increase breast cancer screening rates in the South Asian community in the Fraser Valley; and to empower the South Asian community to spread knowledge about breast cancer prevention and screening.

The Punjabi name of the initiative, Sirf Dus, translates to both Only Ten and Only Tell, and asks South Asian women to:

- Take 10 minutes to talk about the importance of the mammography exam and early detection.
- Take 10 minutes to go for mammography screening.
- Tell 10 friends about the importance of mammography screening.

SMP is a member of the project advisory committee, and supports CCS Sirf Dus events by providing mobile mammography services on site and a dedicated Punjabi voice message line at the call centre.

## Canadian Breast Cancer Foundation



The Canadian Breast Cancer Foundation (CBCF) is the leading community-driven organization in Canada dedicated to creating a future without breast cancer. The organization invests in innovative and relevant research that leads to progress in breast cancer prevention, diagnosis, treatment and care, and advocates for and supports the breast cancer community. Judy Caldwell, a breast cancer survivor, founded the BC/Yukon Region in 1992 and was also a member of the Screening Mammography Program Steering Committee from 1993/94 – 2000/01.

Over the years, many of CBCF's initiatives have concentrated on communicating with women regarding the value of regular breast screening. Some of the campaigns include the 2004 - 2008 Tour for the Cure that set up displays and toured the province, the 2005 – 2007 multi-media, GOHAVE1 advertising campaign, and the 2011 Pink Tour that saw a large pink bus, with interactive displays on board, travel across BC with breast health and cancer information. During this tour, numerous mammography technologists took part in tour stops, interacting with the public, answering questions and dispelling myths.

This year SMP will partner with CBCF on its 5th Ask an Expert series. The four week series will focus on sharing information with British Columbians about four areas of breast health including prevention, screening, treatment and research via newspaper and television, and provides a forum for the public to access experts to have their questions regarding breast health answered via live Facebook chats and a live event.

The generous support of CBCF donors and partners has enabled funding to be available for many SMP projects and initiatives over the years including regular support of the annual SMP Forum, scholarships for the training and professional development of mammography technologists in BC and most recently funding for a volunteer engagement and recognition initiative – all granted through CBCF’s Community Grants stream. In addition, grants for clinical and basic science research as well as support towards fellowships and studentships are critical investments made by CBCF on an annual basis for the benefit of the province’s talented research community as they strive to realize a future without breast cancer.

## Program Evaluation & Research Partnerships

### Program Evaluation

Evaluation and monitoring of program performance over time are critical to the ongoing desire to increase the benefits of screening while minimizing any harm.

The BC Cancer Agency is authorized through the BC Health Act (Section 9) and the BC Cancer Agency Research Information Regulation to operate the Cancer Registry for cancer surveillance and research.

Confidentiality and security of personal information is protected via the BC Freedom of Information and Personal Privacy Act (FOIPPA).

The BC Cancer Agency Cancer Surveillance & Outcomes Unit provides statistical support for SMP. Each year the program publishes its results in an annual report that includes information on program participation, retention, outcome indicators and comparison with established Canadian Standards.

### Breast Cancer Research

Research is an essential part of the mission of the BC Cancer Agency. Research improves our methods for detecting cancer, our understanding of why cancer occurs and our ability to control its development. If we learn about the causes and risk for breast cancer we can also improve our ability to predict who is at risk. Research also promotes the discovery of new, more effective treatments.

### Research Centre Info and Discoveries

SMP has an established Academic Committee whose purpose includes facilitating the investigation of clinical and operational questions using existing SMP administrative and clinical databases for operational purposes and to inform best practices. The Committee is a sub-committee of the Screening Mammography Program and is comprised of members with expertise in breast cancer and screening including radiologists, oncologists, pathologists, statisticians, physicists and program administration. The committee is co-chaired by the SMP Medical Director and the chair of the Breast Cancer Outcomes Unit (BCOU).

The disclosure and use of data for research and external project planning purposes complies with British Columbia's Health Act and Freedom of Information and Protection of Privacy Act. All research projects are reviewed by the ethics board.

Since the beginning of the program there have been 42 breast screening related publications. A list of Publications utilizing program data can be found in Appendix C.

## Program Evaluation & Trend Analysis

In 1999 the National Evaluation Indicators Working Group (EIWG) was formed under the guidance of the Canadian Breast Cancer Screening Initiative (CBCSI). The EIWG assesses and develops evaluation indicators and quality measures for monitoring breast cancer screening program performance in Canada. The 3rd edition of the Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance was published in February 2013<sup>12</sup>.

SMP reports program performance in their annual report and compares the program performance to the national evaluation indicators. Program performance is also evaluated and reported regularly in the *Canadian Partnership against Cancer Organized Breast Cancer Screening Programs in Canada - Report on Program Performance*<sup>13</sup>.

Results for women aged 50 to 69 are presented to allow for comparison with national indicators. From the time the program began in 1998, eligible women 40-79 have been able to self-refer for breast cancer screening, therefore a summary of the results for 40-79 year old women are available in Appendix A.

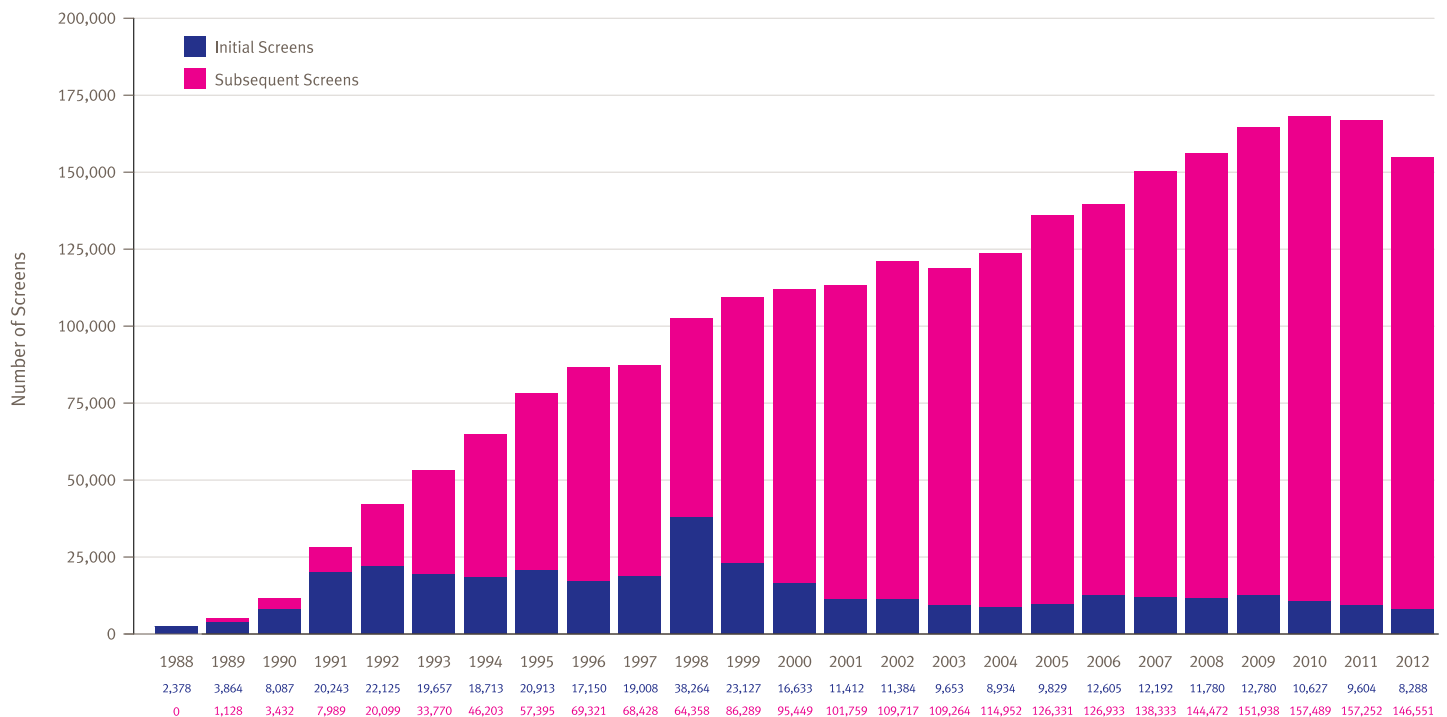
### Screening Program Attendance

Regular attendance for screening is important in order to benefit from a reduction in breast cancer mortality. Attendance has gradually risen in keeping with population growth. The number of examinations provided annually by the program increased as centers were added across the province and the mobile screening program expanded.

For the period of July 18, 1988 until December 31, 2012 the program performed a total of 4,543,907 exams. SMP tracks and monitors the number of women attending in the target population of 50-69 year olds; for the same period 2,498,102 exams were performed for 50-69 year old women.

<sup>12</sup> Canadian Partnership Against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

<sup>13</sup> [http://www.cancerview.ca/idc/groups/public/documents/webcontent/organized\\_breast\\_cancer.pdf](http://www.cancerview.ca/idc/groups/public/documents/webcontent/organized_breast_cancer.pdf)

**FIGURE 7:****SMP SCREENING VOLUME: 1988 - 2012, AGES 50 - 69, BY SCREEN TYPE AND CALENDAR YEAR**

The percentage of initial screens was significantly higher in the first 10 years of operation, as new centers were opened around the province. In 1998, 3 new centres opened on Vancouver Island resulting in a larger proportion of first time attendees that year. The slight drop in overall attendance in 2012 is seen as a reaction to the Canadian Task Force on Preventative Health's report in November 2011 which did not support screening for women in the 40 to 49 age group.

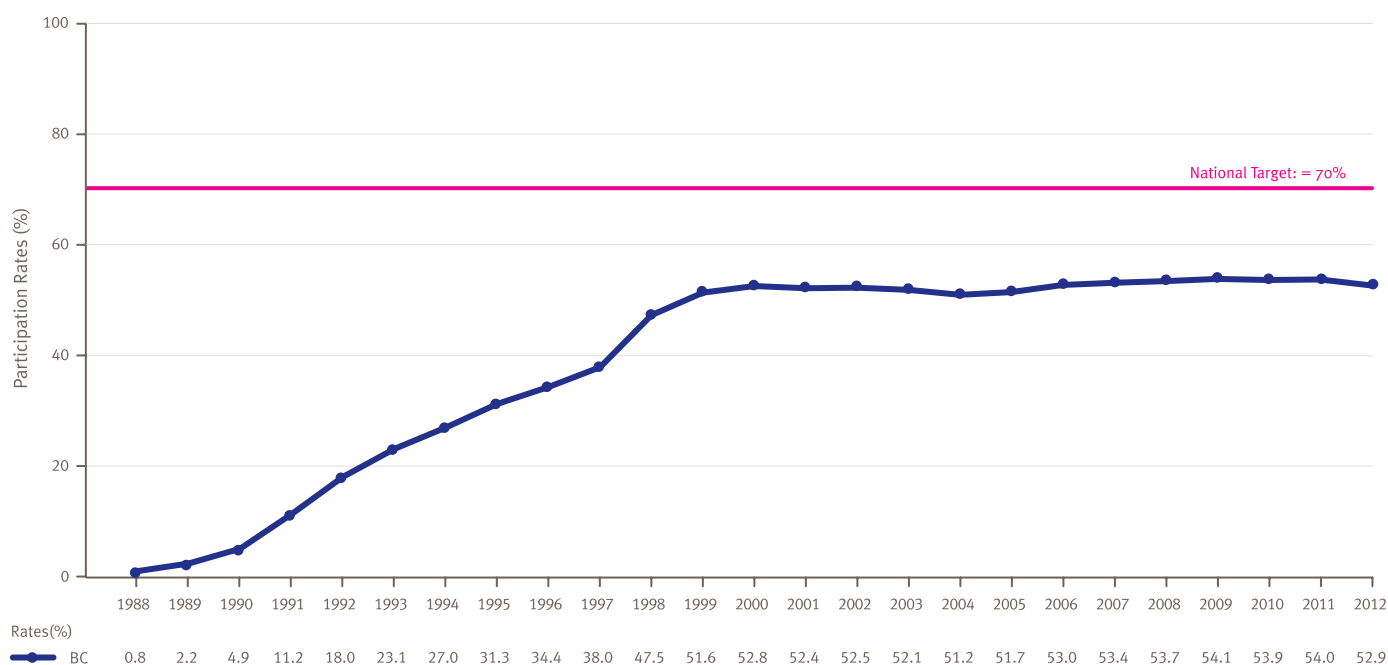
## Screening Program Participation

**Definition:** Percentage of women, 50-69 years old, who have a screening mammogram (within a 30 month period) as a proportion of the target population.

**Context<sup>14</sup>:** In order for a screening program to reduce mortality in a population, that population must participate in the program in sufficient numbers. Participation rate of 70% and over was achieved in trials reporting substantial mortality reductions. Many factors can influence the participation rate, such as acceptability, accessibility, promotion of screening and the capacity of a screening program. Although women are recommended to screen within 24 months, it may take up to 30-months for women to be screened in many programs.

**FIGURE 8:**

**SMP PARTICIPATION RATES (%) FOR WOMEN AGES 50 TO 69 BY CALENDAR YEAR: 1988-2012**



By 2000 there were 36 fixed and mobile mammography centers enabling all women of BC to have reasonable access to screening services. The percentage of women in the target population increased each year until 2000 and has remained steady since then, ranging between 51-54%.

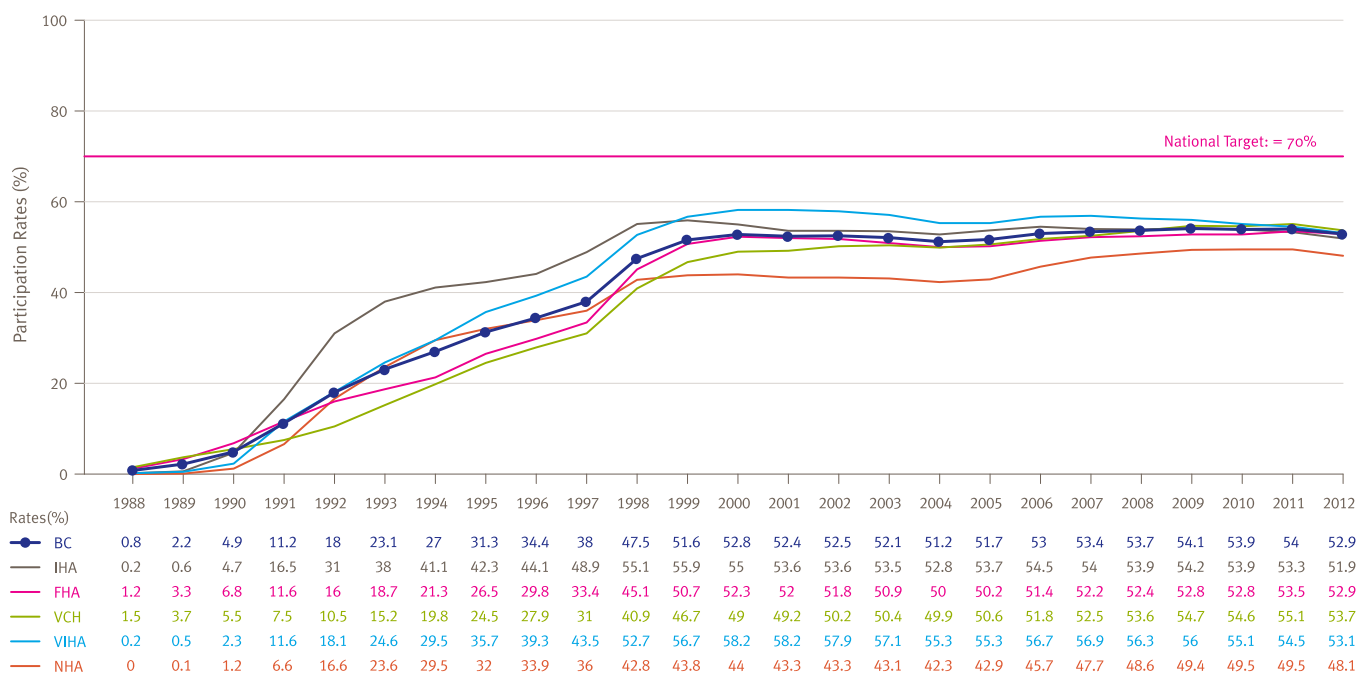
<sup>14</sup> Canadian Partnership Against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

This participation rate does not include women who are screened outside of the program. When bilateral mammography utilization through the Medical Services Plan is included the percentage rises to 62% on average, which is close to the national target of 70%. The participation rate in the target group in BC within the program is close to that seen in many other provinces in Canada as well as other international screening programs such as Australia.

Variations in participation by Health Authority are also noted, with the highest participation in 2012 in Vancouver Coastal Health Authority at 53.7% and the lowest in Northern Health Authority at 48.1%. Participation increased in Northern Health between 2005 and 2009, due in part to increased mobile mammography service in the North and the addition of year round service in Smithers in 2007.

These variations reflect the challenges of accessibility over a large geographical area which tends to be sparsely populated. Influencing this variation among HA's is the number of women who do not have a primary health care provider; SMP requires that women have a health care provider to enable consistent and timely follow up if required. There are various initiatives in place to address this ongoing problem including working with medical walk-in clinics locally to attach women to a physician so that they may self-refer for a screening examination. Attendance at SMP also has been shown to be heavily influenced by the recommendation or not of the primary health care provider. We have a research project underway currently which will attempt to quantify the influence of a family doctor's recommendation on women who have been away from the program for 30 to 48 months.

**FIGURE 9:**  
**SMP PARTICIPATION RATES (%) FOR WOMEN AGES 50 TO 69 BY CALENDAR YEAR: 1988-2012**

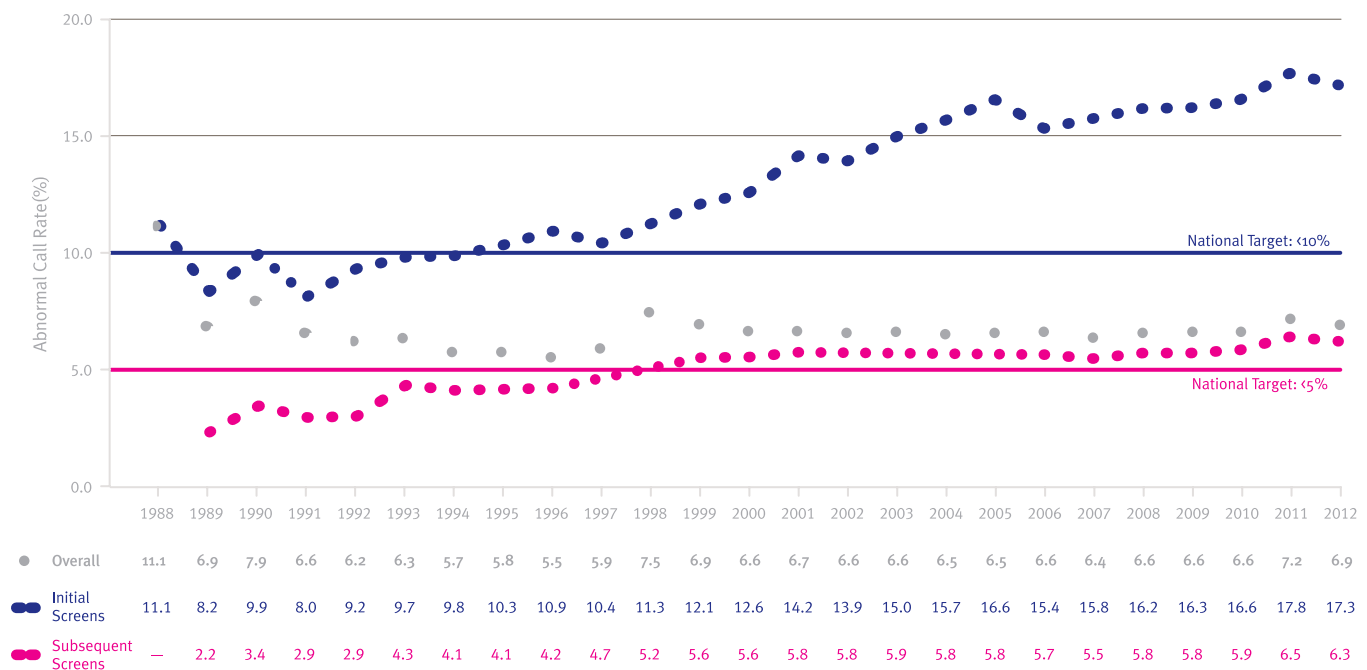


## Screening Program Abnormal Call Rate

**Definition:** Percentage of mammograms that are identified as abnormal (recalled for further testing) at time of program screen.

**Context<sup>15</sup>:** Abnormal call rate is an important indicator of the quality of the mammography image and interpretation. It is most meaningful when considered in the context of positive predictive value, cancer detection rate, post-screen cancer rate and the underlying breast cancer incidence rate. A high abnormal call rate can increase the false positive rate and result in unnecessary tests. Programs should strive to balance the number of abnormal calls with the number of cancers detected.

**FIGURE 10: SMP ABNORMAL CALL RATES (%) FOR WOMEN AGES 50 TO 69 BY CALENDAR YEAR: 1988-2012**



The abnormal call rate for women who have previous screening mammograms has risen slightly but remains stable at just over the national target of <5%. The abnormal call rate for women having initial screens has risen sharply starting in the late 1990's. This is most likely related to the change in technology i.e. more sensitive film/screen combinations in the late 1990's and then the advent of digital mammography after 2005. The abnormal call back rate in this group is now 17 to 18%. The overall abnormal call rates for women in the target group are just above the suggested national target of < 10% for initial screens and < 5% for subsequent screens.

To support achievement of national targets for abnormal call rates, the program has been addressing this by providing a one on one session with the program external expert reviewer for screeners identified as having high and/or rising abnormal call rates.

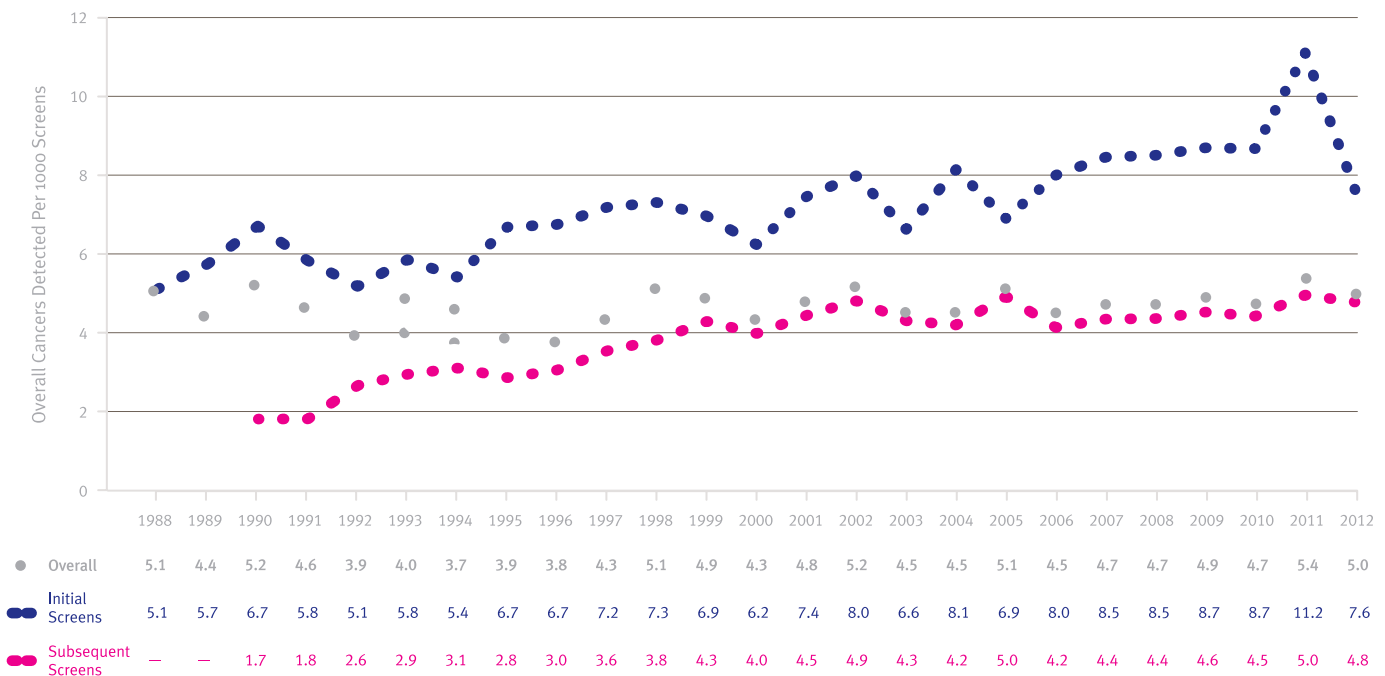
<sup>15</sup> Canadian Partnership Against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

## Screening Program Cancer Detection Rate

**Definition:** Number of invasive and ductal carcinoma in situ (DCIS) cancers detected per 1000 screens.

**Context<sup>16</sup>:** The cancer detection rate is important to evaluate how successful the program is at finding cancers. It is most meaningful when considered in relation to the abnormal call rate, post-screen cancer detection rate, and the underlying rate of breast cancer in the eligible population. Programs should strive to achieve the greatest number of cancers detected while limiting unnecessary tests and cancers missed at screen or assessment. Cancer detection rates will generally be higher for initial screens (which detect prevalent cancers) than for subsequent screens. However, women who received previous “opportunistic screening” outside the programs will contribute to a reduction in the cancer detection rate.

**FIGURE 11:**  
**SMP CANCER DETECTION RATES (%) FOR WOMEN AGES 50 TO 69 BY CALENDAR YEAR: 1988-2012**



Our overall cancer detection rates gradually increased at the beginning of the program and have been relatively stable since 2000, likely due in part to improved technology and the experience of the radiologist screeners. The additional cancers found in the women having an initial screen in recent years suggest we may be identifying pockets of under-served women throughout the province that have not had consistent access to the screening program.

<sup>16</sup> Canadian Partnership Against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

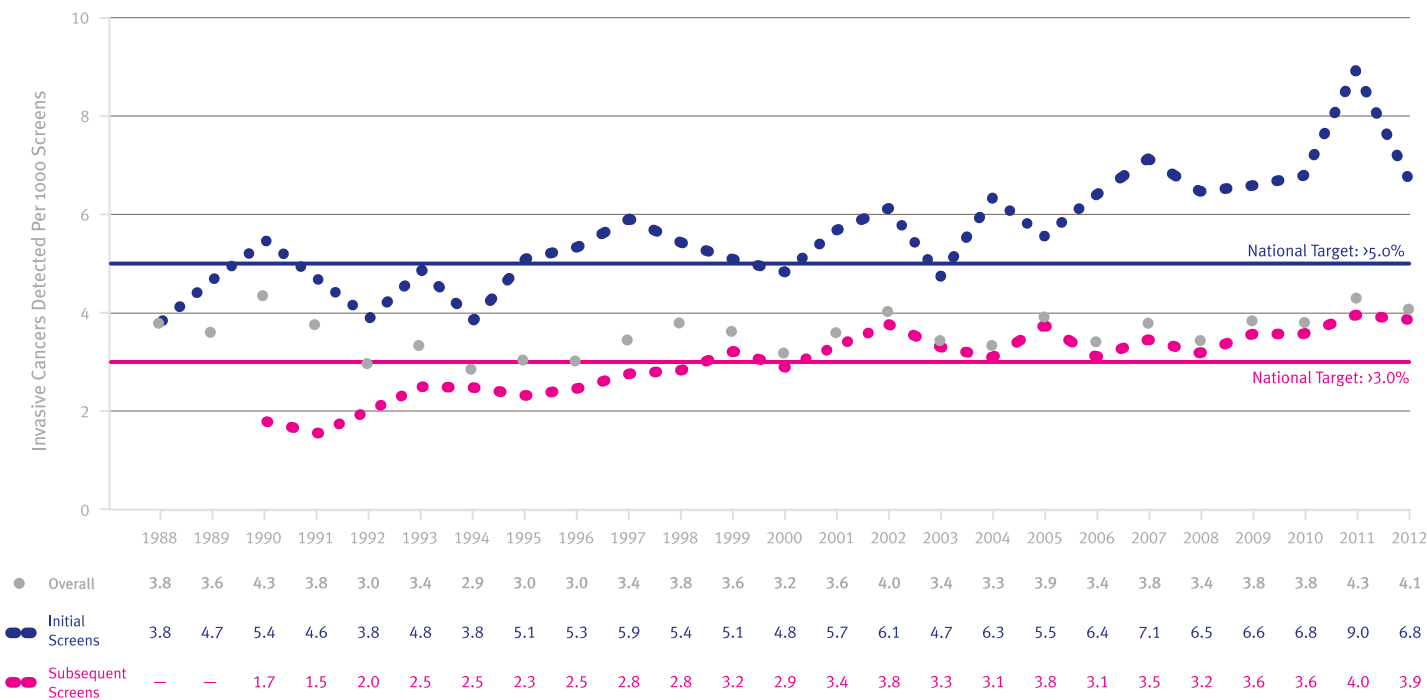
## Screening Program Invasive Cancer Detection Rate

**Definition:** Number of invasive cancers detected per 1,000 screens.

**Context<sup>17</sup>:** The invasive cancer detection rate is important to evaluate how successful the program is at finding invasive cancers. Invasive cancer is cancer that has spread beyond the layer of tissue in which it developed and is growing in to healthy tissue. The goal of breast screening is to find cancers early, before they have had a chance to spread.

Programs should strive to achieve the greatest number of cancers detected while limiting unnecessary tests and cancers missed at screen or assessment. Cancer detection rates will generally be higher for initial screens (which detect prevalent cancers) than for subsequent screens. However, women who received previous “opportunistic screening” outside the program will contribute to a reduction in the invasive cancer detection rate.

**FIGURE 12:**  
**SMP INVASIVE CANCER DETECTION RATES (%) FOR WOMEN AGES 50 TO 69 BY CALENDAR YEAR: 1988-2012**



Our invasive cancer detection rate is at or above national target of > 5 cancers detected per 1000 women screened for initial screens and > 3.0 per 1000 screened for subsequent screens for the target age group since 2000. The increase in cancer detection since 2008 correlates with improvements in technology over time.

<sup>17</sup> Canadian Partnership Against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

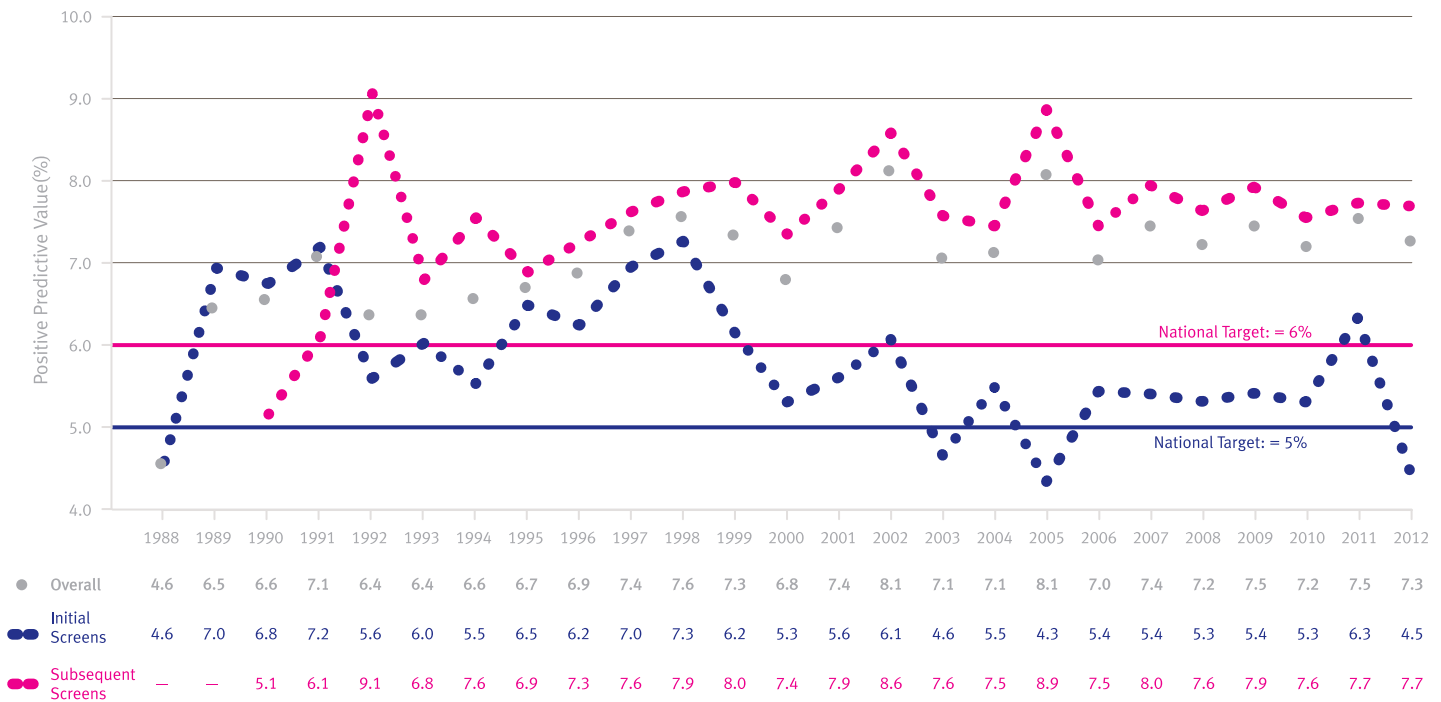
## Screening Program Positive Predictive Value

**Definition:** Proportion of abnormal cases diagnosed with breast cancer (invasive or ductal carcinoma in situ) after diagnostic work-up.

**Context<sup>18</sup>:** Positive predictive value (PPV) is an indicator of the predictive validity of a test. The factors that influence cancer detection rate and abnormal call rate must also be taken into consideration when evaluating a program's PPV. PPV tends to improve with subsequent screens because the initial screen establishes a normal baseline. Consequently, PPV tends to be lower among initial screens relative to subsequent screens. PPV is the ratio of the number of screen detected cancers divided by the number of abnormal screens.

**FIGURE 13:**

**SMP POSITIVE PREDICTIVE VALUE FOR WOMEN AGES 50 TO 69 BY CALENDAR YEAR: 1988-2012**



Our overall PPV remains consistently high in women having subsequent screens since the beginning of the program and is well above the national target.

<sup>18</sup> Canadian Partnership Against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

## Screening Program Sensitivity and Specificity

**Definition:** Sensitivity is the percentage of women diagnosed with breast cancer (invasive or DCIS) within a year of the mammogram date who had an abnormal SMP screening mammogram result followed by a breast cancer diagnosis as a result of a diagnostic assessment.

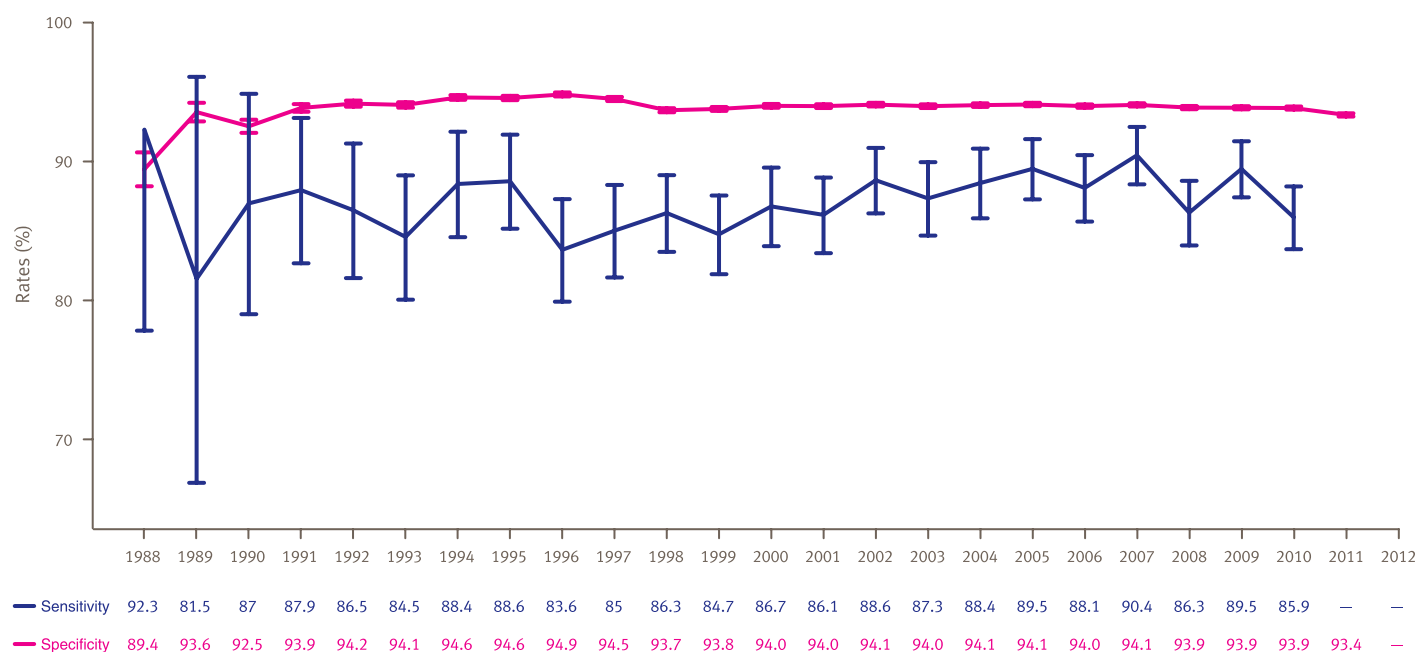
Specificity is the percentage of women without a cancer diagnosis (true negative) that were correctly identified as not having an abnormality at the time of screening.

**Context<sup>19</sup>:** Sensitivity is an indicator of how well the screening mammography program detects cancers. This rate is affected by underlying incidence rates, age, rate of disease progression, opportunistic screening, and screening interval recommendation. The accuracy of this indicator is dependent on the completeness of cancer registration.

Programs should strive to achieve the greatest number of cancers detected while limiting unnecessary tests and cancers missed at screen or assessment. Cancer detection rates will generally be higher for initial screens (which detect prevalent cancers) than for subsequent screens. However, women who received previous “opportunistic screening” outside the program will contribute to a reduction in the invasive cancer detection rate.

**FIGURE 14:**

**SMP SENSITIVITY & SPECIFICITY FOR WOMEN AGES 50 TO 69 BY CALENDAR YEAR: 1988-2012**



Sensitivity and specificity are affected by a number of factors including the experience of the reporting radiologist, the women's age and breast density, the quality of the image available for interpretation and the number of previous screens available for comparison.

The sensitivity has slowly risen and now shows much less fluctuation, reflecting the stability of the program. The specificity (the proportion of truly negative mammograms correctly identified) remains high, with little variation over the years. The overall specificity is 94%, therefore 6% of women screened without a diagnosis of breast cancer had an abnormal mammogram result (false-positive result or false alarm).

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<sup>19</sup> Canadian Partnership Against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

## Appendix A - Tables

**TABLE 1: OVERALL ABNORMAL CALL RATE**

|       | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 50-69 | 11.1 | 6.9  | 7.9  | 6.6  | 6.2  | 6.3  | 5.7  | 5.8  | 5.5  | 5.9  | 7.5  | 6.9  | 6.6  | 6.7  | 6.6  | 6.6  | 6.5  | 6.5  | 6.6  | 6.4  | 6.6  | 6.6  | 6.6  | 7.2  | 6.9  |
| 40-79 | 10.8 | 6.9  | 7.5  | 6.7  | 6.6  | 7.0  | 6.2  | 6.2  | 6.1  | 6.3  | 7.4  | 7.1  | 6.8  | 6.9  | 6.8  | 7.1  | 7.1  | 7.2  | 7.4  | 7.1  | 7.4  | 7.3  | 7.3  | 7.8  | 7.4  |

**TABLE 2: OVERALL CANCER DETECTION RATE**

|       | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 50-69 | 5.1  | 4.4  | 5.2  | 4.6  | 3.9  | 4.0  | 3.7  | 3.9  | 3.8  | 4.3  | 5.1  | 4.9  | 4.3  | 4.8  | 5.2  | 4.5  | 4.5  | 5.1  | 4.5  | 4.7  | 4.7  | 4.9  | 4.7  | 5.4  | 5.0  |
| 40-79 | 4.1  | 3.9  | 4.3  | 4.1  | 3.8  | 3.6  | 3.5  | 3.4  | 3.4  | 3.9  | 4.6  | 4.1  | 3.8  | 4.0  | 4.4  | 4.1  | 4.0  | 4.3  | 4.0  | 4.1  | 4.3  | 4.3  | 4.2  | 4.8  | 4.5  |

**TABLE 3: SENSITIVITY RATE**

|       | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 50-69 | 92.3 | 81.5 | 87.0 | 87.9 | 86.5 | 84.5 | 88.4 | 88.6 | 83.6 | 85.0 | 86.3 | 84.7 | 86.7 | 86.1 | 88.6 | 87.3 | 88.4 | 89.5 | 88.1 | 90.4 | 86.3 | 89.5 | 85.9 | –    | –    |
| 40-79 | 94.7 | 93.7 | 81.5 | 85.0 | 86.8 | 84.8 | 84.6 | 83.9 | 83.4 | 85.9 | 84.4 | 84.3 | 85.6 | 85.4 | 87.2 | 85.7 | 86.2 | 86.7 | 88.1 | 87.7 | 87.0 | 86.5 | 85.5 | –    | –    |

**TABLE 4: SPECIFICITY RATE**

|       | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 50-69 | 89.4 | 93.6 | 92.5 | 93.9 | 94.2 | 94.1 | 94.6 | 94.6 | 94.9 | 94.5 | 93.7 | 93.8 | 94.0 | 94.0 | 94.1 | 94.0 | 94.1 | 94.1 | 94.0 | 94.1 | 93.9 | 93.9 | 93.9 | 93.4 | –    |
| 40-79 | 89.7 | 93.5 | 92.9 | 93.7 | 93.8 | 93.4 | 94.2 | 94.2 | 94.3 | 94.1 | 93.6 | 93.6 | 93.8 | 93.7 | 93.8 | 93.5 | 93.5 | 93.4 | 93.2 | 93.4 | 93.1 | 93.2 | 93.2 | 92.7 | –    |

**TABLE 5: POSITIVE PREDICTIVE VALUE**

|       | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 50-69 | 4.6  | 6.5  | 6.6  | 7.1  | 6.4  | 6.4  | 6.6  | 6.7  | 6.9  | 7.4  | 7.6  | 7.3  | 6.8  | 7.4  | 8.1  | 7.1  | 7.1  | 8.1  | 7.0  | 7.4  | 7.2  | 7.5  | 7.2  | 7.5  | 7.3  |
| 40-79 | 3.8  | 5.6  | 5.7  | 6.1  | 5.8  | 5.2  | 5.8  | 5.6  | 5.6  | 6.2  | 6.7  | 6.0  | 5.9  | 6.1  | 6.7  | 5.9  | 5.8  | 6.2  | 5.6  | 5.9  | 5.9  | 5.9  | 5.8  | 6.2  | 6.0  |

## Appendix B - Centre Contact Information

|                   |                |                           |                |
|-------------------|----------------|---------------------------|----------------|
| Abbotsford        | 604-851-4750   | Prince Rupert             | 1-800-663-9203 |
| Burnaby           | 604-436-0691   | Quesnel                   | 1-800-663-9203 |
| Campbell River    | 1-800-663-9203 | Smithers                  | 1-800-663-9203 |
| Chilliwack        | 1-800-663-9203 | Sechelt                   | 1-800-663-9203 |
| Comox             | 250-890-3020   | Richmond                  | 604-244-5505   |
| Coquitlam         | 604-927-2130   | Surrey                    | 604-582-4592   |
| Cranbrook         | 250-417-3585   | Terrace                   | 1-800-663-9203 |
| Dawson Creek      | 1-800-663-9203 | Vernon                    | 250-549-5451   |
| Delta             | 604-946-1121   | White Rock                | 604-535-4512   |
| Duncan            | 1-800-663-9203 | Williams Lake             | 1-800-663-9203 |
| Fort St. John     | 1-800-663-9203 |                           |                |
| Kamloops          | 250-828-4916   | Vancouver                 |                |
| Kelowna           | 250-861-7560   | BC Women's Health Centre  | 604-775-0022   |
| Kitimat           | 1-800-663-9203 | Mount St. Joseph Hospital | 604-877-8388   |
| Langley           | 604-514-6044   | 5752 Victoria Drive       | 604-321-6770   |
| Nanaimo           | 250-716-5904   | #505-750 West Broadway    | 604-879-8700   |
| IK and NLM Mobile | 604-877-6232   |                           |                |
| North Vancouver   | 604-903-3860   | Victoria                  |                |
| Penticton         | 250-770-7573   | #230 - 1900 Richmond Ave  | 250-952-4232   |
| Port Alberni      | 1-800-663-9203 | Victoria General Hospital | 250-727-4338   |
| Powell River      | 1-800-663-9203 |                           |                |
| Prince George     | 250-565-6816   |                           |                |

## Appendix C - List of Publications

The Screening Mammography Program database has been a rich source of data over the years to help inform and influence decision making and allocation of resources to best provide evidence based breast cancer screening services.

A total of 42 studies were identified from 1988 – 2012 that used SMP data or recruited study participants from the Screening Mammography Program.

Thank you to Ms Cathy Rayment and the BC Cancer Agency Provincial Library for conducting a Medline search.

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## Notes

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*“The program’s commitment to providing continuing professional development and educational support through our Scientific Forum and funding to assist radiologists to attend other meetings has contributed to the high quality and performance of the program as evidenced by its published program results every year.”*

**Paula Gordon, OBC, MD, FRCPC**

**Clinical Professor, Department of Radiology, UBC**

**Medical Director, Sadie Diamond BC Breast Health Program, BC Women’s Hospital**

**Past Chair, Academic Committee of the Screening Mammography Program of BC.**

*“The Screening Mammography Program has made such an important contribution to breast cancer detection and diagnosis in British Columbia, contributing to one of the best survival rates in the world. With screening sites across the province and over 4.5 million mammograms performed over the past 25 years, this really is a time to celebrate the program’s many accomplishments and successes. On behalf of the Canadian Cancer Society, congratulations on the program’s 25th anniversary! We look forward to continuing our partnership and further reducing breast cancer deaths in BC.”*

**Barbara Kaminsky CEO, Canadian Cancer Society**

*“On behalf of the Canadian Breast Cancer Foundation Board of Directors, staff, volunteers and supporters, I want to extend sincere congratulations to the Screening Mammography Program (SMP) on its 25th anniversary. Since its inception in 1988, SMP has made a significant difference in the lives of women across this province, detecting over 18 thousand breast cancers – with 85 per cent of these in the early stage. Evidence shows that finding smaller tumours earlier saves lives, and we are proud to partner with SMP to ensure that we do just that by continuing to educate all British Columbians about the importance of early detection.”*

**Wendy Slavin, CEO, Canadian Breast Cancer Foundation – BC/Yukon Region**

