BC Cancer Agency
CARE + RESEARCH
*An agency of the Provincial Health Services Authority*

**Screening Mammography Program**

# 2010 Annual Report

Published by:

**Screening Mammography Program**

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October 2010

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# 1.0 MESSAGE FROM THE PROVINCIAL CHIEF SCREENER

July 2010, heralded the start of the 22nd year of our program. With 37 fixed centres and three mobile units, we serve over 120 communities in British Columbia.

In this past year of operation, we conducted 299,436 examinations and detected 1,283 cancers. Since the inception of the program in 1988 to the end of 2008, we completed over 3.5 million screening mammograms and detected breast cancers in over 14,000 women.

For the last three years, the Ministry of Health Services has provided additional funding towards meeting the goal of 70% participation in women ages 50 to 69.

**Professional and Academic Activities**

The Screening Mammography Program plans and participates in professional and academic activities throughout the year including an annual scientific forum hosted by the program.

Screening program representatives and scientists authored 10 publications in radiologic literature, as well as delivered 12 lectures and presentations to mammography screening peers. Additional research projects are ongoing.

**Administrative Activities**

Earlier this year, the Ministry of Health Services asked PHSA to develop a Breast Health Action Plan. The resulting Provincial Breast Health Strategy, which includes representatives from the provincial government, health authorities and community partners, is looking at breast cancer screening, diagnosis and prevention in BC. Working teams have convened to look at a number of different areas. These include the clinical pathway between abnormal screening and diagnosis; the implementation of digital mammography; the breast imaging/diagnostic service provider workforce needs; and prevention. The prevention team's work includes a screening mammography policy review group. The work of this group will enable the SMPBC to provide women and their primary caregivers with well-informed advice about screening recommendations in response to some of the conflicting research reports that have been widely publicized in the media over the past year. More information is expected over the next few months.

Ultimately the success of our program continues to depend on the enthusiasm, determination, knowledge, and personal attention of our staff at all of the screening offices and head office, as well as the loyal contributions of healthcare professionals throughout the province.

British Columbia continues to have the lowest breast cancer mortality rates in Canada. Together with the continued support of the entire public and the encouragement of all British Columbians, we are making a difference.

*Dr. Linda Warren, Provincial Chief Screener*

# 2.0 PROGRAM OVERVIEW

The Screening Mammography Program of BC (SMP) provides standard two-view bilateral mammography to British Columbian women between the ages of 40 to 79, without a doctor's referral. Women outside of this age group may be referred to the SMP by their family physicians.

Women are not eligible for screening if they have had breast cancer, breast implants, or if they currently have breast symptoms requiring a diagnostic investigation.

### The Screening Process

The Screening Process is illustrated in a diagram at the end of this section. The process consists of four stages:

1. Identify and invite the target population for screening.
2. Conduct screening examination.
3. Investigate abnormality identified on screening.
4. Screening reminder at the appropriate interval.

### Screening Promotion

In 2009, we developed a new campaign with the theme "Women are Doing It" to complement the previous message of "Your Breast Health Has Support". The campaign included recipe cards, advertisements for newspapers, transit ads, and a Shaw television listings banner ad and 15-second TV ad. Through CanPages SMP now has a year-long presence on the Internet. The SMP can also be followed on Twitter under "BreastCheck". Fridge magnets, bookmarks and the new recipe cards continue to be favourite take-aways at the health promotion events.


An order form for any of the core promotion and education materials is available on the SMP website (**www.smpbc.ca**), under "Publications".


The SMP mobile services visited 120 communities in 2009. Mobile schedules are posted on the SMP website and sent to health professionals and other community services available in the scheduled areas. The mobile service relies on the SMP network of volunteers to assist with community-based promotion and to greet women when they arrive for their appointments. The program uses local advertisements in newspapers and on radio to inform communities of the mobile visits.

The SMP also supports local promotion initiatives around screening with the help of the BC Cancer Agency's Prevention Coordinators. The SMP is working with ethnic and First Nations groups and leaders to develop customized education/ promotion materials that reflect their unique cultures. In 2009, SMP conducted an evaluation of its marketing activities over the past three years and we have used this information to develop new strategies to extend our reach and increase participation in the program.

Lastly, the SMP sends screening invitations to women turning age 50 each year using addresses provided by the Ministry of Health's Client Registry. Recall reminders are sent to women when they are due to return for another screening mammogram.

**Physician Engagement**

With the help of UBC Division of Continuing Professional Development (UBC CPD), SMP conducted a province-wide needs assessment study into the perceptions and practice patterns of BC primary care physicians with regards to five specific cancers: breast, cervical, colorectal, prostate, and hereditary predisposition to cancer. This project has been well supported by the Medical Association of BC, BC College of Family Physicians, the Society of General Practitioners of BC, the UBC Department of Family Practice, as well as the Family Practice Oncology Network, British Columbia. Nearly 900 physicians in BC participated in this study either by completing the survey questionnaire and/or participating in the focus group discussions. Physician feedback in this initiative is instrumental in the design of further educational programming, clinical support strategies, promotional materials, and other engagement strategies to improve cancer screening practices and increase patient uptake in recommended cancer screening.

**Quality Assurance and Quality Control**

Quality standards and systems in the SMP are developed based on guidelines and recommendations from the Canadian Association of Radiologists (CAR), Public Health Agency of Canada (PHAC), the Canadian Association of Medical Radiation Technologists (CAMRT), the BCCA Physics Support Group, and the scientific literature.

CAR Mammography Accreditation is mandatory for all SMP Centres. The SMP has a team of Medical Physicists, a Provincial Professional Practice Leader for Mammography Technologists and a Quality Management Coordinator. This team supports imaging quality assurance and provides professional direction in equipment selection, acceptance testing, and troubleshooting at screening centres around the province. The Program also supports continuing education for radiologists and technologists.

The SMP Physics Support Group provides leadership and technical support to centres for their quality control practices. Based upon best practices, SMP has developed and implemented a comprehensive, harmonized quality control program specific for digital mammography equipment, as well as digital mammography specific phantoms. SMP continues to work with other provinces to champion standardization of quality control programs for digital mammography.

**Radiologist and Technologist Professional Development**

The annual scientific forum was held on the 24$^{th}$ of October 2009. This was attended by 63 radiologists, 160 registered technologists, and 23 physicians. The 2009 program focused on new technologies, including: Computer-Aided Detection and Nuclear Medicine techniques, screening skills performance benchmarks, and current concepts in histopathology. Out-of-town faculty included:

- Dr. Edward Sickles, MD. Professor Emeritus, Department of Radiology, University of California at San Francisco School of Medicine; Former Chief, Breast Imaging Section, University of California at San Francisco Medical Center, San Francisco, CA, USA
- Dr. Susan Swiggum, MD Physician Risk Manager, Canadian Medical Protective Association, Ottawa, Canada
- Dr. Rachel Brem, MD Director, Breast Imaging and Interventional Centre, Professor of Radiology, Chair of Research and Faculty Development, Washington University Medical Centre, Washington DC, USA

Our local presenters included:

- Dr. Paula Gordon, Clinical Professor Department of Radiology, UBC and Chair of Academic Committee of BC
- Darren Kopetsky, Regional Director Clinic Relations and Risk Management, Patient Care Quality Office, Vancouver Coastal Health Authority, Vancouver
- Dr. Linda Warren, Provincial Chief Radiologist SMPBC, Clinical Professor Department of Radiology, UBC
- Dr. Malcolm Hayes, BCCA Pathologist, Clinical Professor of Pathology and Laboratory Medicine.

The screening mammography workforce is comprised of technologists from across BC who are trained and experienced in breast imaging. The Provincial Professional Practice Leader for Mammography Technologists has developed various initiatives to support the professional development of our technologists, including:

- Certificate in Breast Imaging scholarship program, in partnership with the Canadian Breast Cancer Foundation.
- SMP Technologist Writing Contest.
- A Technologist Newsletter.
- An educational event at the Annual SMP Forum with continuing medical education (CME) credits.

An SMP survey of the technologists determined that the professional development initiatives have increased their satisfaction in working with the screening program.

**FAST TRACK - Facilitated Referral to Diagnostic Imaging**

In 1999, the SMP initiated a voluntary facilitated referral to diagnostic imaging ("Fast Track") for patients with abnormal screening mammograms, which has demonstrated that the median time between abnormal screening report and the first assessment procedure is one and a half weeks less for patients on Fast Track referral. In 2010 Fast Track became the standard process for all women, including those that do not have a pre-selected fast track clinic.

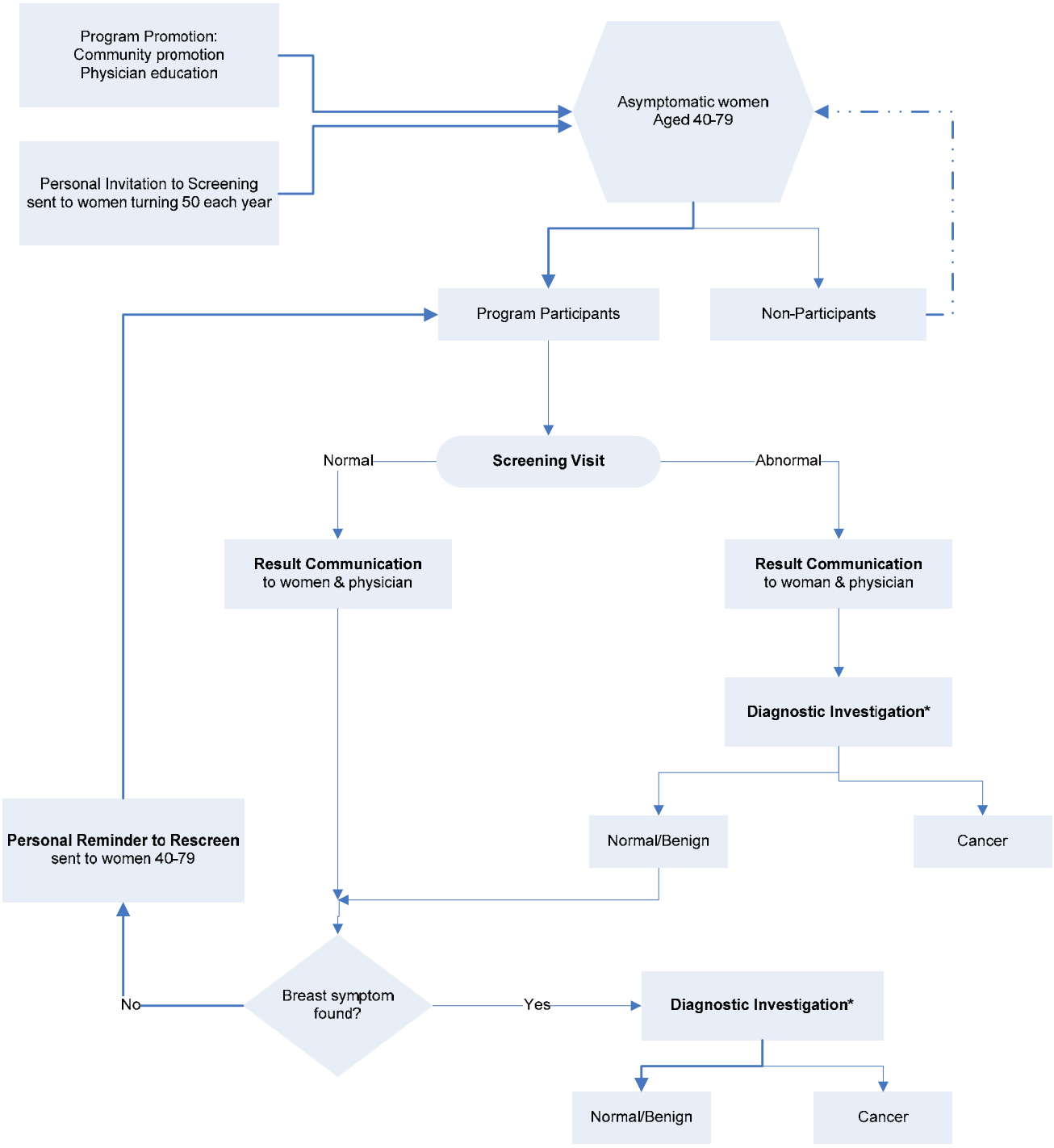
**Targeted Booking**

An appointment system was instituted in 2010 to support reaching our participation rate of 70% of women aged 50 to 69 by 2017. The Ministry of Health provided extra funding, specifically directed to provide the maximum number of appointments available to this target group.

**Evaluation**

Data are collected and analyzed on an ongoing basis to monitor the program's effectiveness and to identify areas for improvement. Results of this analysis are presented in the "PROGRAM RESULTS" section of this report. Age specific breast cancer incidence and mortality rates are tracked in conjunction with the BC Cancer Registry.

## SMP Screening Process Overview



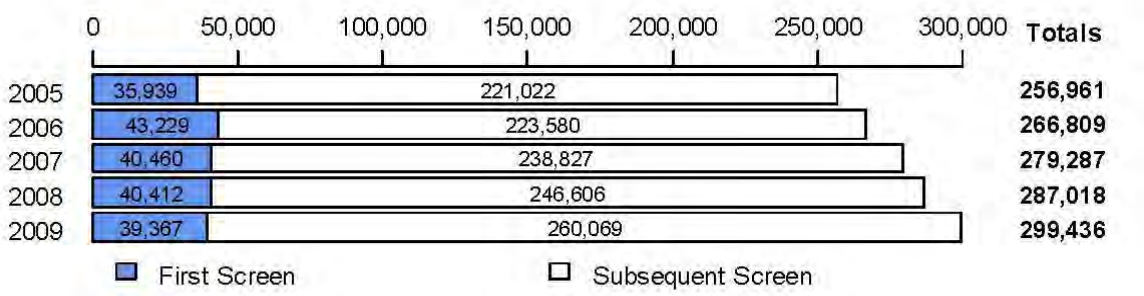

* SMPBC obtains diagnostic investigation information from sources such as Medical Services Plan, surgeons, hospitals and BC Cancer Registry on women who consent to follow up.

# 3.0 PROGRAM RESULTS

## 3.1. Recruitment and Re-screening

The SMP provided 299,436 examinations to 299,273 women in 2009. During this period 39,367 (13%) of those examinations were provided to first time attendees. *Figure 1* shows that the number of exams provided by SMP in 2009 increased by 4%. The number of first time attendees decreased by 3%, while the number of returning participants increased by 5% over the previous year.

**FIGURE 1: SMP Annual Screening Volume Years: 2005-2009**




**NOTE:** SMP data extraction date: August 12, 2010

The age distribution of all exams and first exams performed in 2009 by Health Services Delivery Areas (HSDA) are displayed in *Table I*. Majority of the exams are performed for women between ages 50 to 69 in all HSDAs. Most of the first time attendees were under 50 years of age. However, there are regional variations ranging from 36% in East Kootenay to over 70% across most of the Lower Mainland.

**TABLE I: SMP Volume by Health Service Delivery Area (HSDA): 2009**

| HSDA | Total Exams | Age Distribution of All Exams | | | First Exams | | Age Distribution of First Exams | | |
|---|---|---|---|---|---|---|---|---|---|
| | | <50 | 50-69 | 70+ | n | % Total | <50 | 50-69 | 70+ |
| East Kootenay | 4,781 | 29% | 60% | 11% | 1,431 | 30% | 36% | 56% | 8% |
| Kootenay Boundary | 4,988 | 25% | 60% | 15% | 626 | 13% | 54% | 43% | 3% |
| Okanagan | 27,581 | 28% | 56% | 16% | 3,027 | 11% | 60% | 37% | 3% |
| Thompson Cariboo | 16,159 | 29% | 59% | 12% | 1,615 | 10% | 64% | 35% | 2% |
| Fraser East | 17,483 | 31% | 55% | 13% | 2,320 | 13% | 64% | 34% | 2% |
| Fraser North | 38,144 | 39% | 51% | 10% | 5,429 | 14% | 74% | 24% | 2% |
| Fraser South | 42,306 | 37% | 53% | 10% | 5,629 | 13% | 70% | 28% | 2% |
| Richmond | 14,365 | 36% | 54% | 9% | 1,872 | 13% | 73% | 25% | 2% |
| Vancouver | 40,068 | 39% | 51% | 10% | 5,383 | 13% | 72% | 26% | 2% |
| North Shore / Coast Garibaldi | 20,089 | 34% | 54% | 12% | 3,121 | 16% | 56% | 39% | 5% |
| South Vancouver Island | 27,525 | 29% | 58% | 13% | 2,969 | 11% | 62% | 35% | 3% |
| Central Vancouver Island | 19,867 | 24% | 61% | 15% | 2,183 | 11% | 55% | 42% | 3% |
| North Vancouver Island | 8,872 | 26% | 61% | 13% | 1,097 | 12% | 56% | 41% | 4% |
| Northwest | 4,087 | 36% | 56% | 8% | 717 | 18% | 57% | 40% | 3% |
| Northern Interior | 9,345 | 36% | 57% | 8% | 1,191 | 13% | 69% | 30% | 1% |
| Northeast | 2,419 | 37% | 54% | 9% | 435 | 18% | 67% | 30% | 3% |
| **Program** | **299,436** | **33%** | **55%** | **12%** | **39,367** | **13%** | **65%** | **33%** | **3%** |

**NOTE:** SMP data extraction date: August 12, 2010

The biennial screening participation rates are shown by HSDA for each age group in *Table II.* In the 24-month period of 2008 and 2009, 491,869 women ages 40 and over participated in the SMP. In each and every HSDA, the highest participation rates were seen in the 50 to 59, and 60 to 69 age groups, with a combined participation rate of 51%. Northeast had the lowest participation rate at 39%, while Richmond has the highest at 55% (*Figure 2*). In comparison with last year's report, the participation has increased by: 8% in the East Kootenay; and 2% in Fraser East, North Shore/Coast Garibaldi, and North Vancouver Island. Service levels have increased in these regions.

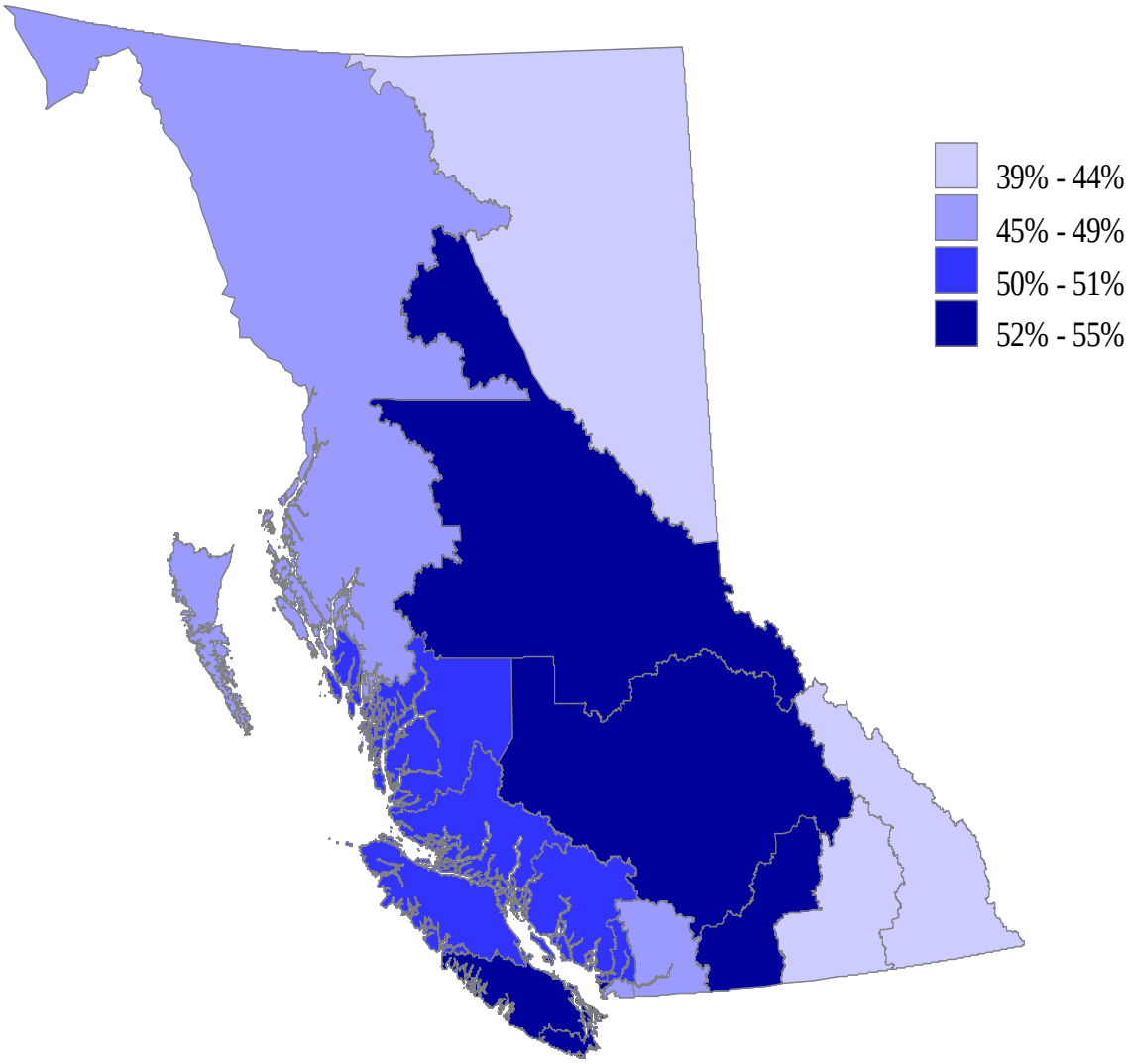
### TABLE II: Biennial Screening Participation Rates by 10-Year Age Groups over 24-month period between 2008 and 2009

| HSDA | 10-Year Age Groups | | | | | Ages |
|---|---|---|---|---|---|---|
| | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 50-69 |
| East Kootenay | 32% | 41% | 43% | 32% | 2% | 42% |
| Kootenay Boundary | 32% | 41% | 45% | 39% | 3% | 43% |
| Okanagan | 43% | 52% | 57% | 48% | 3% | 54% |
| Thompson Cariboo Shuswap | 41% | 50% | 54% | 43% | 2% | 52% |
| Fraser East | 37% | 46% | 51% | 43% | 2% | 48% |
| Fraser North | 44% | 49% | 51% | 39% | 2% | 50% |
| Fraser South | 43% | 48% | 49% | 39% | 2% | 48% |
| Richmond | 47% | 55% | 55% | 39% | 2% | 55% |
| Vancouver | 44% | 50% | 53% | 38% | 2% | 51% |
| North Shore/Coast Garibaldi | 43% | 50% | 54% | 45% | 2% | 51% |
| South Vancouver Island | 41% | 51% | 56% | 48% | 2% | 53% |
| Central Vancouver Island | 37% | 49% | 55% | 46% | 3% | 52% |
| North Vancouver Island | 37% | 48% | 53% | 44% | 2% | 50% |
| Northwest | 38% | 44% | 46% | 34% | 2% | 45% |
| Northern Interior | 42% | 51% | 53% | 40% | 2% | 52% |
| Northeast | 30% | 39% | 39% | 34% | 1% | 39% |
| **British Columbia** | **42%** | **49%** | **52%** | **42%** | **2%** | **51%** |

**NOTES:**

1. Based on the average of 2008 and 2009 female population estimates
2. Population data source: P.E.O.P.L.E. 34 population estimates (July 2009), BC STATS, Service BC, BC Ministry of Citizens' Services
3. Postal code translation file: TMF 1006 (June 2010)
4. Population and postal code data acquired through the Health Data Warehouse, BC Ministry of Health
5. SMP data extraction date: August 12, 2010

**FIGURE 2: Biennial Screening Participation by Women Ages 50 to 69 over 24-month period between 2008 and 2009**



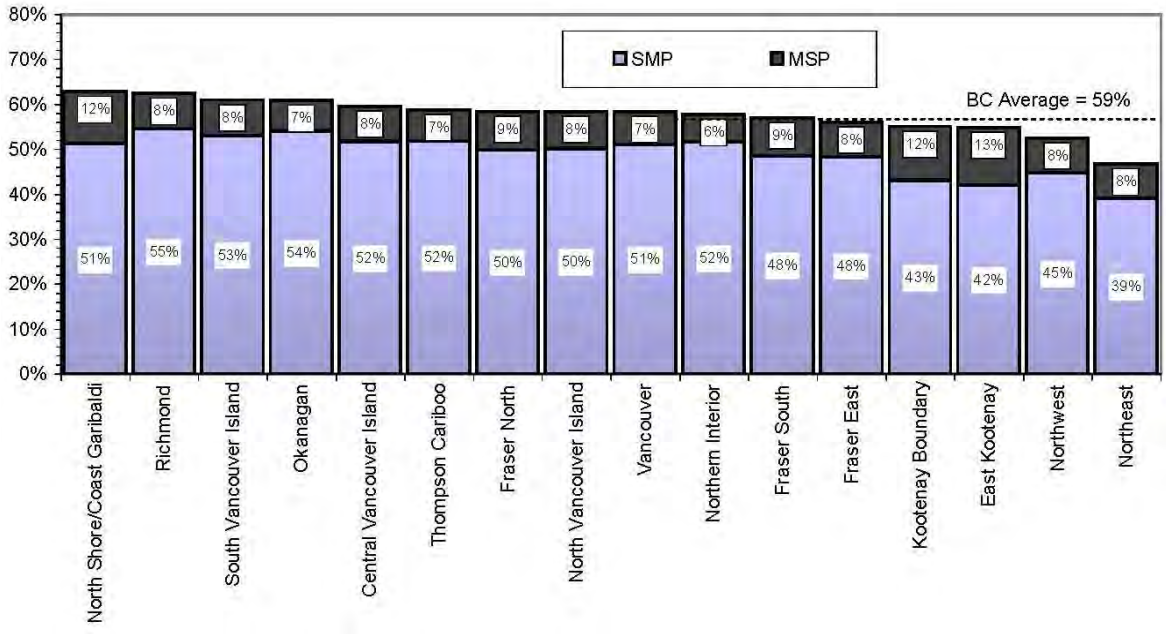
Bilateral mammography may be used for both screening and diagnostic purposes. Historically, a significant proportion of the bilateral mammography services paid through the Medical Services Plan (MSP) were directly related to screening. Data on bilateral mammography utilization were obtained from the MSP.

During the 24-month reporting period, 59% of BC women ages 50 to 69 received bilateral mammography services. The percentage of women ages 50 to 69 receiving bilateral mammography ranged from 47% to 63% across the province, with Northeast and Northwest having the lowest percentages. Overall, the SMP provided 86% of the bilateral mammography services for this age group.

*Figure 3* shows the proportion of women receiving bilateral mammography services through the SMP or MSP over a 24-month period. Some women may have had bilateral mammograms through both SMP and MSP. Thus, the proportions presented here may be slightly higher than the actual figures due to this possible duplication.

In HSDA with long established SMP services, the proportion of women using the MSP bilateral mammography has stabilized to 6% - 9%. The MSP bilateral mammography utilization in the North Shore/Coast Garibaldi HSDA (12%) and the East Kootenay HSDA (13%) have diminished over the last reporting period, respectively, by 3% and 9%, reflecting new SMP centres established in Sechelt in 2008 and Cranbrook in 2009.

### FIGURE 3: Bilateral Mammography Utilization by Women Ages 50 to 69 in BC between 2008 and 2009 Inclusive




**NOTES:**

1. MSP data includes only MSP FFS item 8611 on female patients only; all out of province claims are excluded.
2. MSP data contains payment data to June 15, 2010 for services provided within years 2008 and 2009.
3. SMP data includes single and multiple screens per woman provided in calendar years 2008 and 2009.
4. Population data source: P.E.O.P.L.E. 34 population estimates (July 2009), BC STATS, Service BC, BC Ministry of Citizens' Services
5. SMP data extraction date: August 12, 2010

Participation rates of women ages 50 to 69 by selected ethnic groups are shown in *Table III.* The percentage of each ethnic group in the population was computed based on Statistics Canada's 2006 Census 20% sample-based single response data. The ethnic population size for each HSDA was estimated based on this ethnic population percentage and the P.E.O.P.L.E. 34 population estimates. The use of single ethnic response data may represent an under-estimation of the ethnic population size, especially the East/South East Asian population in the Simon Fraser, Richmond, and Vancouver HSDAs. The SMP data on ethnic origin was collected at the time of SMP registration, where 27% of 2008-2009 attendees ages 50 to 69 did not specify their ethnicity and were excluded from this analysis.

### TABLE III: Regional Participation Rates of Women Ages 50 to 69 by Selected Ethnic Groups between 2008 and 2009 Inclusive

| HSDA | First Nations | | East/South-East Asians | | South Asians | |
|---|---|---|---|---|---|---|
| | Population % | Participation Rate | Population % | Participation Rate | Population % | Participation Rate |
| East Kootenay | 0.8% | 74.0% | 0.9% | 52.8% | 0.4% | 58.3% |
| Kootenay Boundary | 0.5% | 70.1% | 1.0% | 53.3% | 0.2% | 47.7% |
| Okanagan | 0.9% | 46.0% | 1.4% | 43.1% | 1.1% | 46.0% |
| Thompson Cariboo Shuswap | 3.7% | 41.0% | 1.5% | 60.7% | 1.1% | 47.3% |
| Fraser East | 1.5% | 41.9% | 2.2% | 62.4% | 8.0% | 44.4% |
| Fraser North | 0.3% | 52.2% | 22.8% | 48.6% | 4.9% | 43.3% |
| Fraser South | 0.3% | 71.1% | 8.3% | 46.4% | 14.0% | 37.7% |
| Richmond | 0.1% | 99.9% | 45.6% | 56.4% | 6.5% | 49.9% |
| Vancouver | 0.8% | 41.4% | 39.5% | 47.3% | 4.2% | 57.1% |
| North Shore/Coast Garibaldi | 1.8% | 34.0% | 7.0% | 50.0% | 2.3% | 50.5% |
| South Vancouver Island | 0.8% | 41.1% | 4.2% | 41.8% | 1.2% | 57.1% |
| Central Vancouver Island | 2.1% | 37.6% | 1.6% | 50.7% | 1.5% | 41.2% |
| North Vancouver Island | 2.3% | 42.3% | 1.2% | 47.7% | 0.1% | 99.9% |
| Northwest | 17.3% | 35.6% | 2.5% | 26.4% | 2.2% | 42.5% |
| Northern Interior | 4.1% | 44.3% | 1.4% | 40.1% | 1.6% | 58.7% |
| Northeast | 5.1% | 31.7% | 1.4% | 12.0% | 0.4% | 52.5% |
| **British Columbia** | **1.5%** | **41.3%** | **12.4%** | **49.2%** | **4.5%** | **44.5%** |

**PARTICIPATION RATE:**

1. Population data sources: P.E.O.P.L.E. 34 population estimates (July 2009), BC STATS, BC Ministry of Citizens' Services, and 2006 Census, Statistics Canada (original data source).
2. Postal code translation file: TMF1006 (June 2010).
3. Women attended the SMP at least once in 2008-2009 inclusive.
4. East/South-East Asians include Chinese, Japanese, Korean, Filipino, Burmese, Cambodian, Laotian, Thai, Vietnamese, Indonesian, Malay, and other Asians.
5. South Asians include Bangladeshi, Bengali, East Indian, Gujarati, Pakistani, Punjabi, Sinhalese, Sri Lankan, and Tamil.
6. SMP data extraction date: August 12, 2010.

**POPULATION PERCENTAGE:**

1. Original data source - 2006 Census, Statistics Canada
2. East/South-East Asians include Chinese, Filipino, Burmese, Cambodian, Hmong, Khmer, Laotian, Thai, Vietnamese, Indonesian, Japanese, Korean, Malaysian, Singaporean, Mongolian, Taiwanese, Tibetan, Asian n.o.s. and East/Southeast Asian not included elsewhere.
3. South Asians include Bangladeshi, Bengali, East Indian, Goan, Gujarati, Kashmiri, Nepali, Pakistani, Punjabi, Sinhalese, Sri Lankan, Tamil, and South Asian not included elsewhere.

Participation in SMP by each selected ethnic group is lower than the overall population in general. There are regional variations. Participation by First Nations women was lowest in the Northeast (31.7%) and in North Shore/Coast Garibaldi (34.0%). Participation by East/South-East Asian women was lowest in the Northeast (12.0%) and in the Northwest (26.4%). Participation by South Asian women was lowest in the Fraser South (37.7%) and Central Vancouver Island (41.2%).

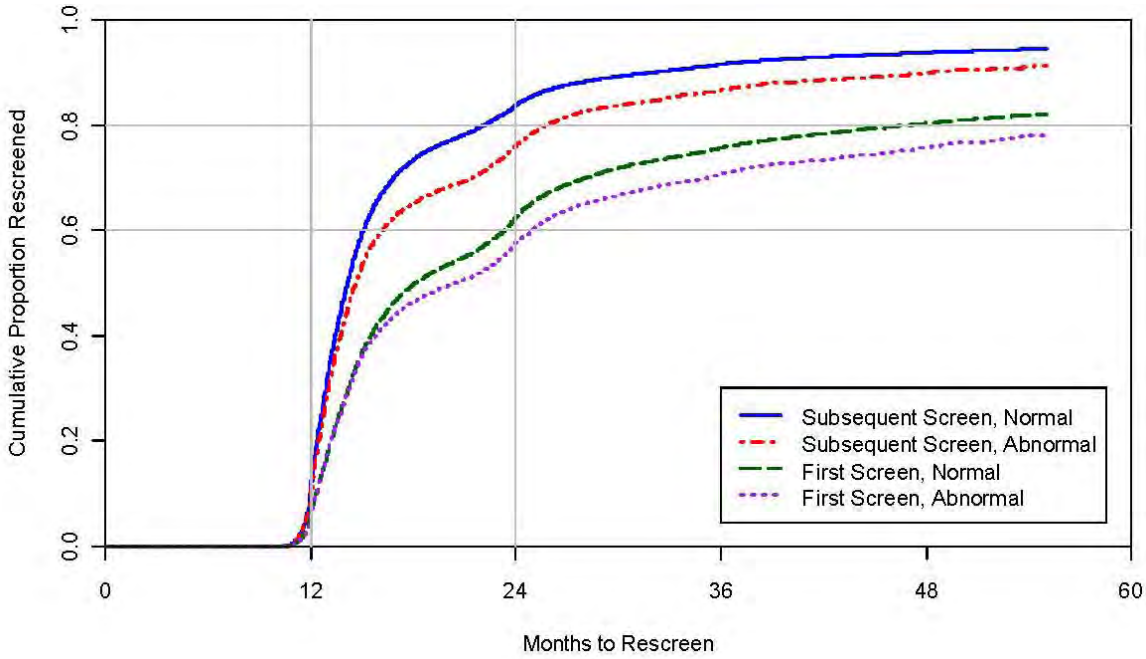
The effectiveness of regular screening mammography is universally recognized for women ages 50 to 69. The BCCA Breast Tumour Group recommends screening at least every two years for women ages 40 to 79. However, research evidence indicates that the sojourn time (i.e. the duration that the disease remains in the pre-clinical, screen-detectable phase) is shorter for women ages 40 to 49 than for older women. Consequently, the SMP reminds women ages 40 to 49 to return annually.

The SMP sends recall reminders to women in accordance with the interval recommendation. A second letter is sent if there is no appointment scheduled within four to six weeks of the first letter. This two-letter reminder system is repeated again for another year if there is no response.

*Figure 4* shows a graph of return rates for women ages 40 to 49 who attended SMP between 2006 and 2008 by first / subsequent screen results. *Figure 5* shows a graph of return rates for women ages 50 to 69. Women who had breast cancer were not included in the calculations.

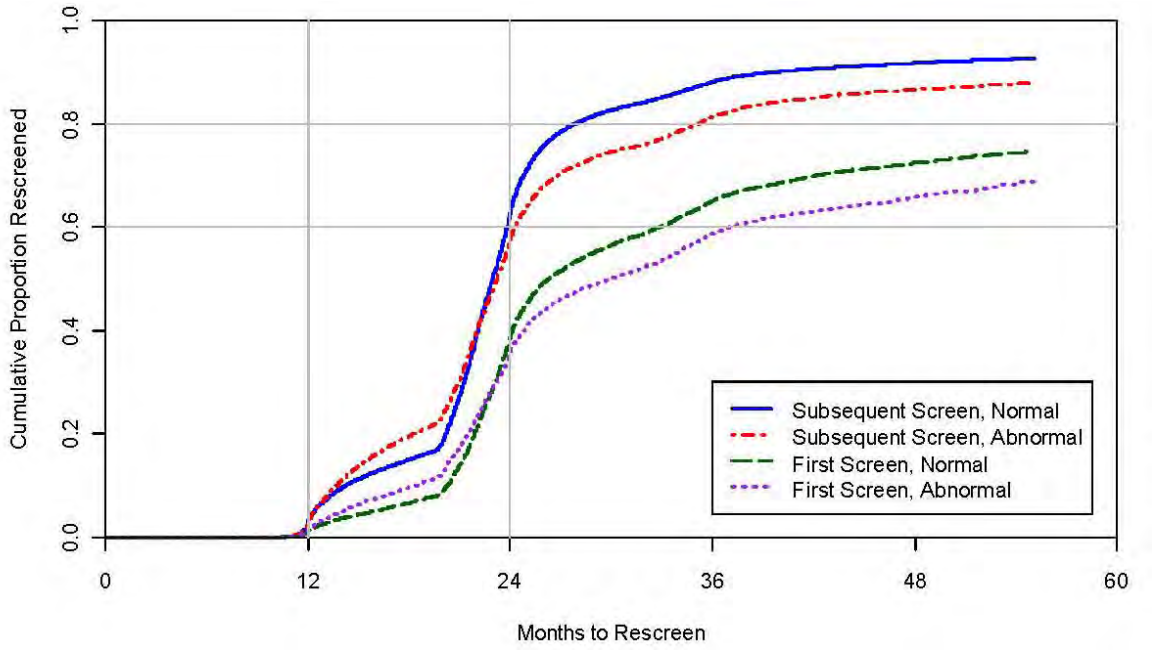
In general, women in both age groups who had a subsequent screen are observed to have a higher return (compliance) rate than those who had an initial screen. Women ages 40 to 49 who had normal screen results are more likely to return for screening than those who had abnormal screen results. However, women ages 50 to 69 who had abnormal screens are more likely to return within 24 months and less likely to return after 24 months for screening than those who had normal screens.

**FIGURE 4: Return Rates for Women Age 40-49 by First/Subsequent Screens and Screen Result: 2006-2008**




**NOTE:** SMP data extraction date August 12, 2010

## FIGURE 5: Return Rates for Women Age 50-69 by First/Subsequent Screens and Screen Result: 2006-2008




**NOTE:** SMP data extraction date: August 12, 2010

*Table IV* summarizes the return rates for women ages 50 to 69 who attended SMP between 2006 and 2008 by initial / subsequent screen results. The return rate for subsequent screens is higher than first screens at all time reference points. In the long run, the return rate for women who had normal screen results is higher than for those who had abnormal results.

## TABLE IV: Return Rates for Women Age 50-69: 2006-2008

| | First Screen | | Subsequent Screen | | Overall | |
|---|---|---|---|---|---|---|
| | Normal | Abnormal | Normal | Abnormal | Normal | Abnormal |
| **Total Number to be Re-screened** | 30,759 | 5,440 | 384,198 | 21,210 | 414,957 | 26,650 |
| **Returned by** | | | | | | |
| 18 months | 7% | 10% | 15% | 19% | 14% | 17% |
| 24 months | 39% | 36% | 63% | 58% | 61% | 53% |
| 30 months | 56% | 50% | 83% | 75% | 81% | 69% |
| 36 months | 65% | 59% | 88% | 81% | 86% | 77% |

**NOTE:** SMP DATA extraction DATE: AUGUST 12, 2010

## 3.2. 2009 Screening Results

*Table V* summarizes the outcome indicators for screening exams provided in 2009 by 10-year age groups. Of the 299,436 screening mammograms performed, 21,737 (7.3%) had an abnormal result and 1,283 breast cancers were reported as of August 6, 2010 (4.3 per 1,000 exams), including 291 in-situ cancers. The abnormal call rate is lower on subsequent screens than on first screens, except for those screens performed in women under age 40. The overall abnormal call rate decreased from 8.9% for ages 40 to 49 to 5.7% for ages 70 to 79. Cancer detection rates, ductal carcinoma in-situ (DCIS) detection rates, positive predictive values, core biopsy yield ratios, and open biopsy yield ratios increase with age between 40 and 79.

### TABLE V: SMP Outcome Indicators by 10-Year Age Group (2009)

| Outcome Indicators | Age at Exam | | | | | | All |
|---|---|---|---|---|---|---|---|
| | <40 | 40-49 | 50-59 | 60-69 | 70-79 | 80+ | |
| **Number of Exams** | 328 | 99,245 | 95,409 | 69,394 | 33,697 | 1,363 | 299,436 |
| ▪ % on first screens | 89.3% | 25.4% | 10.0% | 4.8% | 2.9% | 6.9% | 13.1% |
| **Number of Cancers** | --- | 215 | 373 | 426 | 250 | 19 | 1,283 |
| ▪ % on first screens | --- | 34.9% | 17.7% | 10.3% | 5.6% | 10.5% | 15.7% |
| **Abnormal Call Rate** | 11.0% | 8.9% | 7.2% | 5.8% | 5.7% | 5.9% | 7.3% |
| ▪ on first screens | 10.9% | 14.9% | 16.7% | 15.2% | 13.7% | 11.7% | 15.3% |
| ▪ on subsequent screens | 11.4% | 6.8% | 6.1% | 5.3% | 5.4% | 5.5% | 6.0% |
| **Overall Cancer Detection Rate (per 1,000)** | --- | 2.2 | 3.9 | 6.1 | 7.4 | 13.9 | 4.3 |
| ▪ on first screens | --- | 3.0 | 7.0 | 13.3 | 14.4 | 21.3 | 5.1 |
| ▪ on subsequent screens | --- | 1.9 | 3.6 | 5.8 | 7.2 | 13.4 | 4.2 |
| **DCIS Detection Rate (per 1,000)** | --- | 0.7 | 1.0 | 1.2 | 1.4 | 1.5 | 1.0 |
| ▪ on first screens | --- | 0.6 | 1.4 | 4.2 | 5.1 | --- | 1.2 |
| ▪ on subsequent screens | --- | 0.7 | 0.9 | 1.1 | 1.3 | 1.6 | 0.9 |
| **Positive Predictive Value of Screening Mammography** | --- | 2.5% | 5.5% | 10.6% | 13.3% | 23.5% | 5.9% |
| ▪ on first screens | --- | 2.0% | 4.2% | 8.9% | 10.8% | 18.2% | 3.4% |
| ▪ on subsequent screens | --- | 2.8% | 5.8% | 10.8% | 13.4% | 24.3% | 6.9% |
| **Core Biopsy Yield Ratio** | --- | 18.5% | 33.9% | 51.1% | 58.1% | 75.0% | 36.4% |
| ▪ on first screens | --- | 14.3% | 23.4% | 38.0% | 55.0% | 50.0% | 20.7% |
| ▪ on subsequent screens | --- | 22.9% | 37.3% | 53.1% | 58.3% | 80.0% | 42.4% |
| **Open Biopsy Yield Ratio** | --- | 18.6% | 23.0% | 45.5% | 49.2% | 33.3% | 30.0% |
| ▪ on first screens | --- | 11.3% | 19.6% | 46.9% | 42.9% | --- | 19.2% |
| ▪ on subsequent screens | --- | 23.4% | 24.2% | 45.3% | 49.6% | 33.3% | 33.5% |

**NOTES:**

1. See glossary in Appendix 7 for definitions of terms.
2. Overall Cancer Detection Rate includes ductal carcinoma in situ (DCIS).
3. An additional 144 abnormal screens had incomplete or lost to follow-up. Information from these screens is excluded from all entries in the table other than exam counts and abnormal call rates.
4. Out of 21,593 "abnormal" screens with complete follow-up, there were 21 lobular carcinoma in-situ cases. The final number of cancers is still to be determined.
5. SMP data extraction date: August 12, 2010.

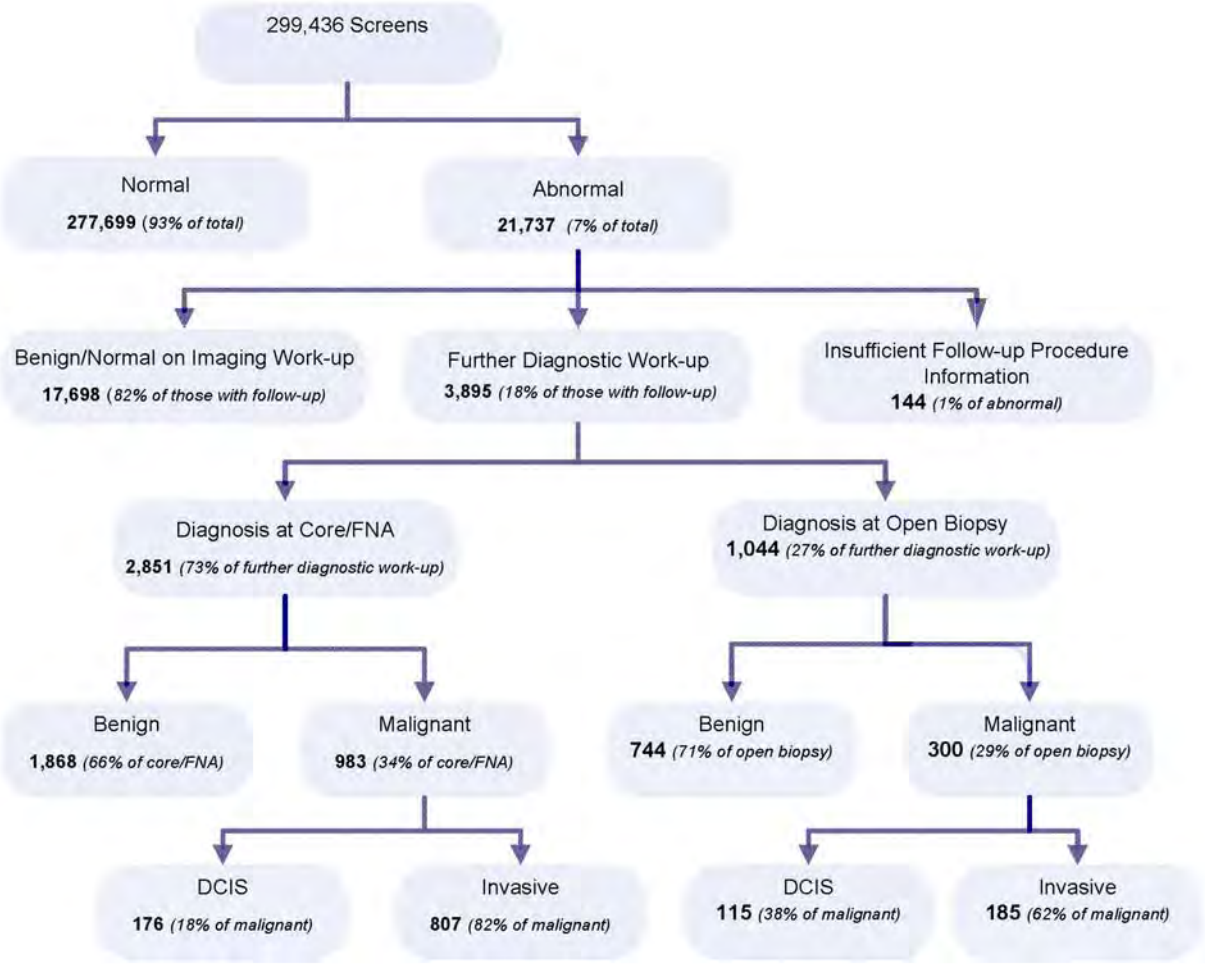
Diagnostic procedure information is available to date on 21,593 (99%) of the screening mammograms with abnormal findings. *Table VI* shows the proportion of women receiving specific diagnostic procedures as part of the work-up on their screen-detected abnormalities. Overall, 12% and 6% of women with abnormal screening mammograms had core biopsy and open biopsy, respectively.

### TABLE VI: Diagnostic Procedures Received by SMP Participants with "Abnormal" Screening Mammograms (2009)

| Procedure | Age at Exam | | | | | | All |
|---|---|---|---|---|---|---|---|
| | <40 | 40-49 | 50-59 | 60-69 | 70-79 | 80+ | |
| Diagnostic Mammogram | 89% | 89% | 90% | 92% | 91% | 89% | **90%** |
| Ultrasound | 58% | 67% | 64% | 63% | 64% | 64% | **65%** |
| Fine Needle Aspiration | 0% | 4% | 4% | 4% | 4% | 6% | **4%** |
| Core Biopsy | 14% | 9% | 13% | 16% | 17% | 30% | **12%** |
| Open Biopsy | 6% | 4% | 7% | 9% | 10% | 14% | **6%** |
| ▪ with Localization | 3% | 4% | 6% | 8% | 9% | 12% | **6%** |
| **Number of cases with diagnostic assessment information available** | **36** | **8,754** | **6,817** | **4,019** | **1,886** | **81** | **21,593** |

**NOTE:** SMP data extraction date: August 12, 2010

### FIGURE 6: Screening Outcome Summary 2009



## 3.3. 2008 Cancer Detection

Histologic features of breast cancers detected by the SMP in 2008 are summarized by 10-year age groups in *Table VII*. Histologic features of breast cancer cases were obtained from the pathology reviews, if available, otherwise from the original diagnostic reports. Invasive tumour size was determined from the best available source: (1) pathological, (2) radiological, or (3) clinical.

Overall, 26% of cancers detected were in situ. Of the invasive cancers detected, 63% were ≤15 mm, 75% have not had invasion of the regional lymph nodes, and 23% were grade 3 (i.e. poorly differentiated) tumours. Of the grade 3 tumours, 49% were smaller than 15 mm. These overall outcome indicators met the international targets[1] recommended for screening programs.

### TABLE VII: Histologic Features of Breast Cancers Detected by SMP (2008)

| Histological Features | Age at Exam | | | | | | | | Age 40-79 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40-49 | | 50-59 | | 60-69 | | 70-79 | | | |
| **Number of Cancers** | **209** | | **344** | | **388** | | **286** | | **1,227** | |
| ▪ in situ | 71 | 34% | 95 | 28% | 107 | 28% | 46 | 16% | 319 | 26% |
| ▪ invasive | 138 | 66% | 249 | 72% | 281 | 72% | 240 | 84% | 908 | 74% |
| **Invasive Tumour Size** | | | | | | | | | | |
| ▪ ≤5 mm | 10 | 8% | 11 | 4% | 20 | 7% | 17 | 7% | 58 | 7% |
| ▪ 6-10 mm | 26 | 20% | 67 | 27% | 74 | 26% | 56 | 24% | 223 | 25% |
| ▪ 11-15 mm | 40 | 30% | 72 | 29% | 82 | 29% | 90 | 39% | 284 | 32% |
| ▪ 16-20 mm | 22 | 17% | 41 | 17% | 43 | 15% | 34 | 15% | 140 | 16% |
| ▪ >20 mm | 35 | 26% | 54 | 22% | 61 | 22% | 35 | 15% | 185 | 21% |
| ▪ unknown size | (5) | | (4) | | (1) | | (8) | | (18) | |
| **Invasive with tumour ≤ 15 mm** | **76** | **57%** | **150** | **61%** | **176** | **63%** | **163** | **70%** | **565** | **63%** |
| **Node Involvement in Invasive** | | | | | | | | | | |
| ▪ no | 91 | 72% | 168 | 71% | 205 | 76% | 169 | 80% | 633 | 75% |
| ▪ yes | 36 | 28% | 69 | 29% | 65 | 24% | 43 | 20% | 213 | 25% |
| ▪ no nodes sampled / unknown | (11) | | (12) | | (11) | | (28) | | (62) | |
| **Histologic Grade of Invasive** | | | | | | | | | | |
| ▪ 1 - well differentiated | 38 | 29% | 70 | 29% | 82 | 30% | 86 | 37% | 276 | 31% |
| ▪ 2 - moderately differentiated | 55 | 41% | 108 | 44% | 137 | 50% | 104 | 45% | 404 | 46% |
| ▪ 3 - poorly differentiated | 40 | 30% | 65 | 27% | 55 | 20% | 40 | 17% | 200 | 23% |
| ▪ unknown grade | (5) | | (6) | | (7) | | (10) | | (28) | |
| **Grade 3 tumour ≤ 15 mm** | **18** | **45%** | **36** | **55%** | **26** | **47%** | **18** | **45%** | **98** | **49%** |

**NOTES:**

1. Targets[1]: >50% invasive tumours ≤15mm, >70% with negative nodes, >30% grade 3 tumours ≤15mm.
2. SMP data extraction date: August 12, 2010.

1 Tabàr L, Fagerberg G, Duffy SW, Day NE, Gad A, Gröntoft O. Update of the Swedish two-county program of mammographic screening for breast cancer. Radiol Clin North Am. 1992 Jan;30(1):187-21

## 3.4. Outcome Indicators by Calendar Year: 2005-2009

*Table VIII* shows the outcome indicators for screening exams provided over five years. Abnormal call rates, cancer detection rates, and positive predictive values have not changed much over the five years. Core biopsy yield ratios have settled around 36% in the last three years. Open biopsy yield ratios, on the other hand, have been declining steadily. In 2009, less than one third of SMP participants referred to open biopsy were found to have breast cancer.

### TABLE VIII: SMP Outcome Indicators by Calendar Year between 2005 and 2009 Inclusive

| Outcome Indicators | Calendar Year | | | | | 5-Year Cumulative |
|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | |
| **Number of Exams** | 256,961 | 266,809 | 279,287 | 287,018 | 299,436 | 1,389,511 |
| ▪ % on first screens | 14.0% | 16.2% | 14.5% | 14.1% | 13.1% | 14.4% |
| **Number of Cancers** | 1,115 | 1,071 | 1,162 | 1,240 | 1,283 | 5,871 |
| ▪ % on first screens | 13.4% | 19.6% | 17.4% | 17.2% | 15.7% | 16.6% |
| **Abnormal Call Rate** | 7.2% | 7.4% | 7.0% | 7.4% | 7.3% | 7.3% |
| ▪ on first screens | 15.1% | 14.9% | 14.7% | 15.4% | 15.3% | 15.1% |
| ▪ on subsequent screens | 5.9% | 5.9% | 5.7% | 6.1% | 6.0% | 6.0% |
| **Overall Cancer Detection Rate (per 1,000)** | 4.3 | 4.0 | 4.2 | 4.3 | 4.3 | 4.2 |
| ▪ on first screens | 4.2 | 4.9 | 5.0 | 5.3 | 5.1 | 4.9 |
| ▪ on subsequent screens | 4.4 | 3.9 | 4.0 | 4.2 | 4.2 | 4.1 |
| **DCIS Detection Rate (per 1,000)** | 1.0 | 0.9 | 1.0 | 1.1 | 1.0 | 1.0 |
| ▪ on first screens | 0.8 | 1.3 | 1.4 | 1.6 | 1.2 | 1.3 |
| ▪ on subsequent screens | 1.1 | 0.9 | 0.9 | 1.0 | 0.9 | 1.0 |
| **Positive Predictive Value of Screening Mammography** | 6.2% | 5.6% | 5.9% | 5.9% | 5.9% | 5.9% |
| ▪ on first screens | 2.9% | 3.4% | 3.4% | 3.5% | 3.4% | 3.3% |
| ▪ on subsequent screens | 7.5% | 6.6% | 7.0% | 6.9% | 6.9% | 7.0% |
| **Core Biopsy Yield Ratio** | 40.7% | 33.5% | 35.6% | 35.8% | 36.4% | 36.2% |
| ▪ on first screens | 18.5% | 19.4% | 19.7% | 19.2% | 20.7% | 19.6% |
| ▪ on subsequent screens | 50.8% | 41.5% | 43.4% | 43.2% | 42.4% | 43.8% |
| **Open Biopsy Yield Ratio** | 37.2% | 35.4% | 32.6% | 32.4% | 30.0% | 33.7% |
| ▪ on first screens | 18.3% | 23.1% | 19.0% | 22.3% | 19.2% | 20.4% |
| ▪ on subsequent screens | 43.5% | 40.0% | 37.7% | 36.1% | 33.5% | 38.5% |
| **Interval Cancer Rate (per 1,000)** | | | | | | |
| ▪ 0-12 months | 0.66 | 0.56 | 0.59 | 0.63 | --- | --- |
| after first screens | 0.73 | 0.47 | 0.40 | 0.74 | --- | --- |
| after subsequent screens | 0.64 | 0.58 | 0.63 | 0.61 | --- | --- |
| ▪ 13-24 months | 0.68 | 0.66 | 0.69 | --- | --- | --- |
| **Sensitivity (i.e. 1 - false negative rate)** | 86.9% | 87.7% | 87.5% | --- | --- | --- |
| **Specificity (i.e. 1 - false positive rate)** | 93.4% | 93.2% | 93.4% | 93.1% | --- | --- |
| **Prevalence to Expected Incidence Ratio for Age 50-79 (target[1]: >3.0)** | 3.60 | 4.00 | 4.20 | 4.60 | 5.00 | 4.20 |

**NOTES:**

1. See glossary in Appendix 7 for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. The final number of cancers in 2009 is still to be determined.
4. Number of cancers and related rates do not include data for women whose follow-up is incomplete.
5. SMP Data extraction date: August 12, 2010

1 Day NE, Williams DRR, Khaw KT. Breast cancer screening programmes: the development of a monitoring and evaluation system. Br J Cancer 1989;59:954-958

Regular record linkage with the British Columbia Cancer Registry enables the SMP to determine the number of non-screen detected (interval) cancers in the SMP participants. Sensitivity (i.e. probability of finding women with breast cancer) and specificity (i.e. probability of a negative mammography in women without breast cancer) by calendar year are shown in *Table VIII*. The SMP conducts formal reviews, both blinded and retrospective, of all interval cancers in the SMP participants.

Comparison of prevalence rate at first screen with the historical incidence rate prior to the onset of screening practice provides another measure of program performance. The expected age-specific incidence rates in the absence of screening were derived from the 1982 breast cancer incidence data reported for British Columbia. Since screening may be obtained outside of the SMP, prevalent screens have been restricted to those women with no previous outside mammogram within 24-months of their first SMP encounter.

A Swedish two-county study showed a prevalence to expected incidence ratio of 3.09 for ages 50 to 59, and 4.59 for ages 60 to 69[1], and had recommended the target of >3.0 for organized screening programs[2]. The annual prevalence to expected incidence ratios for ages 50 to 79 has consistently been above 3.0 from 1995 onwards.

1 Tabar L, Fagerberg G, Duffy, SW, Day NE, Gad A, Grontoft O. Update of The Swedish Two-Country Program of Mammographic Screening for Breast Cancer. Radiol Clin North Am 1992;30:187-209

2 Day NE, Williams DRR, Khaw KT. Breast cancer screening programmes: the development of a monitoring and evaluation system. Br J Cancer 1989;59:954-958

## 3.5. Outcome Indicators by Age: 2005-2009 Cumulative

*Table IX* shows the outcome indicators for screening exams provided in a five-year period by 10-year age groups. From 2005 to 2009, the SMP provided 1,389,511 screening mammography examinations to 621,866 women. About one-third of the exams were provided to women ages 40 to 49, and 17% of cancers were found in women of this age group. Although the risk of breast cancer increases with age, the abnormal call rates were higher in the younger age groups. Consequently, the positive predictive values of screening mammography increases with age ranging from 2.4% for ages 40 to 49, to 14.6% for ages 70 to 79. A similar performance pattern was also observed in core biopsy yield ratio, open biopsy yield ratio, sensitivity, and specificity.

### TABLE IX: SMP Outcome Indicators by 10-Year Age Groups between 2005 and 2009 Inclusive

| Outcome Indicators | Age at Exam | | | | | All |
|---|---|---|---|---|---|---|
| | 40-49 | 50-59 | 60-69 | 70-79 | 80+ | |
| **Number of Exams** | 476,097 | 444,810 | 302,693 | 157,672 | 6,704 | 1,389,511 |
| % first screens | 28.0% | 9.8% | 5.2% | 3.2% | 6.9% | 14.4% |
| **Number of Cancers** | 995 | 1,713 | 1,847 | 1,234 | 81 | 5,871 |
| % on first screens | 40.8% | 16.5% | 10.6% | 6.7% | 8.6% | 16.6% |
| **Abnormal Call Rate** | 9.0% | 7.0% | 5.8% | 5.4% | 5.8% | 7.3% |
| ▪ on first screens | 14.7% | 16.4% | 14.9% | 13.8% | 13.0% | 15.1% |
| ▪ on subsequent screens | 6.8% | 6.0% | 5.3% | 5.2% | 5.3% | 6.0% |
| **Overall Cancer Detection Rate (per 1,000)** | 2.1 | 3.9 | 6.1 | 7.8 | 12.1 | 4.2 |
| ▪ on first screens | 3.1 | 6.5 | 12.4 | 16.4 | 15.3 | 4.9 |
| ▪ on subsequent screens | 1.7 | 3.6 | 5.8 | 7.5 | 11.9 | 4.1 |
| **DCIS Detection Rate (per 1,000)** | 0.7 | 1.0 | 1.3 | 1.4 | 1.3 | 1.0 |
| ▪ on first screens | 1.1 | 1.4 | 2.7 | 2.0 | 2.2 | 1.3 |
| ▪ on subsequent screens | 0.6 | 0.9 | 1.2 | 1.4 | 1.3 | 1.0 |
| **Positive Predictive Value of Screening Mammography** | 2.4% | 5.6% | 10.6% | 14.6% | 21.2% | 5.9% |
| ▪ on first screens | 2.1% | 4.1% | 8.5% | 12.2% | 12.1% | 3.3% |
| ▪ on subsequent screens | 2.6% | 6.0% | 10.9% | 14.8% | 22.8% | 7.0% |
| **Core Biopsy Yield Ratio** | 17.1% | 34.8% | 52.3% | 61.6% | 74.3% | 36.2% |
| ▪ on first screens | 12.8% | 23.0% | 40.7% | 51.8% | 50.0% | 19.6% |
| ▪ on subsequent screens | 22.6% | 39.1% | 54.2% | 62.5% | 78.1% | 43.8% |
| **Open Biopsy Yield Ratio** | 20.0% | 29.2% | 45.7% | 55.3% | 61.9% | 33.7% |
| ▪ on first screens | 16.4% | 18.2% | 39.4% | 45.6% | 40.0% | 20.4% |
| ▪ on subsequent screens | 23.3% | 32.6% | 46.6% | 56.0% | 64.9% | 38.5% |
| **Interval Cancer Rate (per 1,000)** | | | | | | |
| ▪ 0-12 months | 0.56 | 0.51 | 0.59 | 0.63 | 1.34 | 0.56 |
| after first screens | 0.47 | 0.58 | 0.82 | 0.59 | <0.01 | 0.52 |
| after subsequent screens | 0.60 | 0.50 | 0.57 | 0.63 | 1.44 | 0.57 |
| ▪ 13-24 months | <0.01 | 0.72 | 0.87 | 0.86 | 0.90 | 0.52 |
| **Sensitivity (i.e. 1 - false negative rate)** | 78.9% | 88.3% | 91.3% | 92.6% | 90.0% | 88.3% |
| **Specificity (i.e. 1 - false positive rate)** | 91.3% | 93.4% | 94.8% | 95.4% | 95.4% | 93.2% |

**NOTES:**

1. See glossary in Appendix 7 for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS).
3. The final number of cancers in 2009 is still to be determined.
4. Number of cancers and related rates do not include data for women whose follow-up is incomplete.
5. The "All" column includes women less than 40 years-of-age.
6. SMP data extraction date: August 12, 2010.

## 3.6. Outcome Indicators by HSDA: 2005-2009 Cumulative

Outcome indicators for 2005 to 2009 are summarized by HSDA in *Table X*. The Kootenay Boundary has the lowest abnormal call rate (4%), while Fraser East has the highest (10%). North Vancouver Island has the lowest cancer detection rate (3.2 per 1,000), and the North Shore / Coast Garibaldi has the highest (4.7 per 1,000). Fraser East has the lowest positive predictive value (4%), and Kootenay Boundary has the highest (10%).

**Table X: SMP Outcome Indicators by Health Service Delivery Area (HSDA) between 2005 and 2009 Inclusive**

| HSDA | % Called Abnormal | Cancer Detection Rate (per 1000) | PPV | In-Situ : Invasive (number) | % Invasive ≤15 mm | % Invasive with -ve nodes |
|---|---|---|---|---|---|---|
| East Kootenay | 6% | 3.6 | 6% | 7 : 58 | 47% | 69% |
| Kootenay Boundary | 4% | 4.5 | 10% | 24 : 81 | 70% | 70% |
| Okanagan | 5% | 4.2 | 8% | 110 : 435 | 64% | 75% |
| Thompson Cariboo | 6% | 4.6 | 8% | 77 : 288 | 59% | 70% |
| Fraser East | 10% | 4.4 | 4% | 76 : 255 | 56% | 67% |
| Fraser North | 8% | 4.0 | 5% | 196 : 513 | 66% | 69% |
| Fraser South | 9% | 4.6 | 5% | 242 : 648 | 60% | 69% |
| Richmond | 8% | 4.0 | 5% | 88 : 186 | 63% | 68% |
| Vancouver | 9% | 4.3 | 5% | 220 : 572 | 68% | 66% |
| North Shore / Coast Garibaldi | 6% | 4.7 | 8% | 107 : 317 | 64% | 70% |
| South Vancouver Island | 5% | 3.4 | 7% | 73 : 377 | 60% | 67% |
| Central Vancouver Island | 6% | 4.5 | 8% | 78 : 349 | 68% | 71% |
| North Vancouver Island | 5% | 3.2 | 7% | 19 : 112 | 63% | 79% |
| Northwest | 6% | 4.3 | 7% | 20 : 58 | 60% | 53% |
| Northern Interior | 8% | 4.5 | 6% | 51 : 143 | 64% | 71% |
| Northeast | 7% | 4.6 | 6% | 7 : 50 | 58% | 50% |
| **Program** | **7%** | **4.2** | **6%** | **1400 : 4471** | **63%** | **69%** |

**NOTES:**

1. See glossary in Appendix 7 for definitions of terms.
2. Targets[1]: >50% invasive tumours ≤15mm, >70% with negative nodes
3. SMP data extraction date: August 12, 2010

1 Tabàr L, Fagerberg G, Duffy SW, Day NE, Gad A, Gröntoft O. Update of the Swedish two-county program of mammographic screening for breast cancer. Radiol Clin North Am. 1992 Jan;30(1):187-210

## 3.7. Cancer Characteristics by Age: Cumulative up to and Including 2008

From the start of the program in July 1988 to December 2008, 14,249 women were found to have breast cancer through screening-initiated work-up. Histologic features of breast cancers detected by the SMP cumulative up to and including 2008 are summarized by 10-year age groups in *Table XI*. Internationally recommended targets have been achieved. However, invasive cancers found in women ages 40 to 49 tend to be larger and more likely to involve nodes than cancers found in the older women.

### TABLE XI: Histologic Features of Breast Cancers Detected by SMP Cumulative Up To and Including 2008

| Histological Features | Age at Exam | | | | | | | | | | Age 40+ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40-49 | | 50-59 | | 60-69 | | 70-79 | | 80+ | | | |
| **Number of Cancers** | 2,413 | | 4,082 | | 4,314 | | 3,196 | | 244 | | 14,249 | |
| ▪ in situ | 777 | 32% | 1,070 | 26% | 927 | 21% | 569 | 18% | 26 | 11% | 3,369 | 24% |
| ▪ invasive | 1,636 | 68% | 3,012 | 74% | 3,387 | 79% | 2,627 | 82% | 218 | 89% | 10,880 | 76% |
| **Invasive Tumour Size** | | | | | | | | | | | | |
| ▪ ≤5 mm | 162 | 10% | 273 | 9% | 287 | 9% | 190 | 7% | 22 | 10% | 934 | 9% |
| ▪ 6-10 mm | 327 | 20% | 732 | 25% | 923 | 27% | 808 | 31% | 61 | 28% | 2,851 | 26% |
| ▪ 11-15 mm | 458 | 28% | 853 | 29% | 1,052 | 31% | 798 | 31% | 58 | 27% | 3,219 | 30% |
| ▪ 16-20 mm | 237 | 15% | 507 | 17% | 492 | 15% | 387 | 15% | 41 | 19% | 1,664 | 15% |
| ▪ >20 mm | 429 | 27% | 608 | 20% | 607 | 18% | 414 | 16% | 34 | 16% | 2,092 | 19% |
| ▪ unknown size | (23) | | (39) | | (26) | | (30) | | (2) | | (120) | |
| Invasive with tumour ≤ 15 mm | 947 | 59% | 1,858 | 62% | 2,262 | 67% | 1,796 | 69% | 141 | 65% | 7,004 | 65% |
| **Node Involvement in Invasive** | | | | | | | | | | | | |
| ▪ no | 1,044 | 70% | 2,052 | 74% | 2,405 | 77% | 1,817 | 81% | 113 | 80% | 7,431 | 76% |
| ▪ yes | 450 | 30% | 731 | 26% | 707 | 23% | 432 | 19% | 28 | 20% | 2,348 | 24% |
| ▪ no nodes sampled / unknown | (142) | | (229) | | (275) | | (378) | | (77) | | (1101) | |
| **Histologic Grade of Invasive** | | | | | | | | | | | | |
| ▪ 1 - well differentiated | 412 | 28% | 922 | 34% | 1,028 | 33% | 904 | 39% | 74 | 39% | 3,340 | 34% |
| ▪ 2 - moderately differentiated | 648 | 43% | 1,116 | 41% | 1,370 | 44% | 1,046 | 45% | 82 | 43% | 4,262 | 43% |
| ▪ 3 - poorly differentiated | 436 | 29% | 680 | 25% | 681 | 22% | 397 | 17% | 36 | 19% | 2,230 | 23% |
| ▪ unknown grade | (140) | | (294) | | (308) | | (280) | | (26) | | (1048) | |
| **Grade 3 tumour ≤ 15 mm** | 188 | 43% | 327 | 48% | 373 | 55% | 202 | 51% | 17 | 47% | 1,107 | 50% |

**NOTES:**

1. Targets[1]: >50% invasive tumours ≤15mm, >70% with negative nodes, >30% grade 3 tumours ≤15mm.
2. The 'All' column includes women less than 40 years of age.
3. SMP data extraction date: August 12, 2010.

1 Tabàr L, Fagerberg G, Duffy SW, Day NE, Gad A, Gröntoft O. Update of the Swedish two-county program of mammographic screening for breast cancer. Radiol Clin North Am. 1992 Jan;30(1):187-210

## 3.8. Comparison with Canadian Standards

The Canadian Breast Cancer Screening Initiative (CBCSI) was launched in 1992. Under this initiative, Health Canada (now Public Health Agency of Canada) facilitated a federal/provincial/territorial network that enabled collaboration in the implementation and evaluation of breast cancer screening programs in Canada.

The Canadian Breast Cancer Screening Database (CBCSD) was first established in 1993. All provincial and territorial programs in Canada are now contributing data to the CBCSD. The first evaluation report on Organized Breast Cancer Screening Programs in Canada was published in 1999, and prompted the creation of the Evaluation Indicators Working Group to begin the task of defining performance measures for Canadian breast cancer screening programs. Biennial evaluation reports are now produced regularly from the CBCSD by PHAC.

In this section, the SMP performance measures are presented against the targets set for Canadian breast cancer screening programs[1]. This document defined a set of performance measures that were developed on the basis of recognized population screening principles, evidence from randomized controlled trials, demonstration projects, and observational studies.

SMP achieves national targets in invasive cancer detection rates, positive predictive values, invasive tumour sizes, and node negative rates. Improvements are needed to: increase participation and retention rates; and, reduce abnormal call rates, diagnostic intervals, and benign to malignant open biopsy ratio.

Comparison of SMP Performance with Canadian Breast Screening Standards for Ages 50 to 69 is summarized in *Table XII.*

1 Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Screening Program Performance Second Edition. Health Canada 2007

## TABLE XII: Comparison of SMP Performance with Canadian Breast Screening Standards for Ages 50 to 69

| Performance Measure | National Target[1] | SMP |
|---|---|---|
| **Participation Rate (1)** | ≥70% of the eligible population | 51% (plus 8% MSP) |
| **Retention Rate (2)** | | |
| ▪ Initial Rescreen | ≥75% initial re-screen within 30 months | 56% |
| ▪ Subsequent Rescreen | ≥90% initial re-screen within 30 months | 82% |
| **Abnormal Call Rate (3)** | | |
| ▪ First Screens | <10% first screens | 16.3% |
| ▪ Subsequent Screens | <5% re-screens | 5.8% |
| **Invasive Cancer Detection Rate (per 1000) (3)** | | |
| ▪ First Screens | >5 per 1,000 first screens | 6.5 per 1000 |
| ▪ Subsequent Screens | >3 per 1,000 re-screens | 3.6 per 1000 |
| **In Situ Cancer Detection Rate (3)** | | |
| ▪ First Screens | Surveillance and Monitoring only | 2.1 per 1000 |
| ▪ Subsequent Screens | Surveillance and Monitoring only | 1.0 per 1000 |
| **Diagnostic Interval (3)** | | |
| ▪ no tissue biopsy performed | ≥90% within 5 weeks if no tissue biopsy performed | 74.6% |
| ▪ tissue biopsy performed | ≥90% within 7 weeks if tissue biopsy performed | 46.0% |
| **Positive Predictive Value (3)** | | |
| ▪ First Screens | ≥5% first screen | 5.3% |
| ▪ Subsequent Screens | ≥6% re-screens | 7.9% |
| **Benign Core Biopsy Rate (per 1000) (3)** | | |
| ▪ First Screens | Surveillance and Monitoring only | 16.3 per 1000 |
| ▪ Subsequent Screens | Surveillance and Monitoring only | 4.3 per 1000 |
| **Benign to Malignant Core Biopsy Ratio (3)** | | |
| ▪ First Screens | Surveillance and Monitoring only | 2.6 : 1 |
| ▪ Subsequent Screens | Surveillance and Monitoring only | 1.3 : 1 |
| **Benign Open Biopsy Rate (per 1000) (3)** | | |
| ▪ First Screens | Surveillance and Monitoring only | 7.1 per 1000 |
| ▪ Subsequent Screens | Surveillance and Monitoring only | 2.1 per 1000 |
| **Benign to Malignant Open Biopsy Ratio (3)** | | |
| ▪ First Screens | ≤1:1 | 2.8 : 1 |
| ▪ Subsequent Screens | ≤1:1 | 2.0 : 1 |
| **Invasive Tumour size ≤10 mm (4)** | >25% | 33% |
| **Invasive Tumour size ≤15 mm (4)** | >50% | 62% |
| **Node Negative Rate in Cases of Invasive Cancer (4)** | >70% | 74% |

**NOTES:**

1. Screen years: (1) = 2008 & 2009, (2) = 2006-2008, (3) = 2009, (4) = 2008.
2. Population data source: P.E.O.P.L.E. 34 population estimates (July 2009), BC STATS, BC Ministry of Labour and Citizens' Services.
3. SMP data extraction date: August 12, 2010.

1 Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Screening Program Performance Second Edition. Health Canada 2007

## 3.9. Cost Analysis

The SMP is funded by the provincial Ministry of Health through the Provincial Health Services Authority (PHSA). The SMP contracts with regional Health Authorities and private Community Imaging Clinics to provide screening mammography services, including mobile services, throughout the province. Overall program administration and coordination is provided by the SMP Central Office, including: promotion, a provincial toll-free call centre, mobile service coordination and staff travel, result mail-out to women and physicians, invitation and recall reminder system, follow-up tracking, quality management, program evaluation, and research support.

Costing analysis by fiscal year is summarized in *Table XIII*.

Financial reports for PHSA and BCCA are available at the PHSA website:
www.phsa.ca/whoweare/budget+accountability

### TABLE XIII: Cost Comparison by Fiscal Year

| Indicator | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 | 2009-2010 |
|---|---|---|---|---|---|
| **Total Cost** | $15,759,715 | $16,732,061 | $18,219,310 | $20,311,839 | $21,450,188 |
| **Total cost per screen** | $60.08 | $62.18 | $65.54 | $69.79 | $70.56 |
| ▪ Central Services | $8.24 | $8.74 | $10.46 | $13.88 | $14.95 |
| ▪ Other operating costs | $36.67 | $37.99 | $39.38 | $39.84 | $39.85 |
| ▪ Professional Reading Fees | $13.39 | $13.39 | $13.80 | $14.08 | $14.50 |
| ▪ Capital Allocation | $1.78 | $2.06 | $1.91 | $1.99 | $1.25 |
| **Cost per cancer detected** | **$14,216.83** | **$14,997.02** | **$15,512.98** | **$15,885.32** | **Not Available** |

**NOTES:**

1. Number of cancers detected in 2009-10 is not available yet, and thus the cost per cancer detected is not computed
2. Program Expenses are audited through PHSA Finance annually.
3. Other operating costs include the cost of tube replacement.
4. Capital allocation includes: 1) capital differential allocated to private administered centres in their annual operating budget; and, 2) amortization of equipment purchased through BCCA/PHSA. Capital allocation does not include capital expenditures capitalized and amortized through host hospitals.
5. The professional reading fee was $14.50 per screen effective April 1, 2009.
6. Cost per cancer detected is based on screens with complete follow-up.
7. The cost per screen is exclusive of salary and benefit increases to public screening centres which, commencing in fiscal 2006, have gone directly to the Health Authority.
8. SMP data extraction date: August 12, 2010.

# APPENDIX 1:
## Cancer Screening Program Overview

### Definition of Screening

Screening is a prevention strategy. Primary cancer prevention strategy involves changes of behaviour or habits that reduce a risk, for example, stopping smoking, fat reduction in the diet, etc. Screening for cancer is a secondary prevention strategy. Secondary cancer prevention strategy targets disease in process[1]. 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.*"[2]

### 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 disease.[3][4][5]

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 also is important because screening tests are inherently limited in their accuracy, which varies by test, cancer site, and individual characteristics. Although most of screening interpretations are accurate, it is inevitable that some individuals are identified as possibly having cancer when they do not, and screening tests fail to identify some individuals who do not have the disease.

The comparative evaluation of accuracy versus error 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.

### Organized Population Screening Program

To reduce morbidity and mortality from cancer in a population by screening, there must be coordinated and effect**i**ve strategies to ensure acceptance and utilization of the established screening test. Since screening is targeted at asymptomatic women, 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

The success of screening is a shared responsibility of the team of individuals working together to develop goals, set standards, monitor progress, and continue improvement in each of the six components.

---

1 US Preventive Services Task Force: Guide to Clinical Preventive Services, Ed 2. Baltimore, Williams & Wilkins, 1996
2 Morrison A: Screening in Chronic Disease. New York, Oxford Press, 1992
3 Cole P, Morrison AS: Basic issues in cancer screening. In Miller AB (ed); Screening in Cancer. Geneva, International Union Against Cancer, 1978, p7
4 Miller AB; Fundamentals of Screening. In Screening for Cancer. Orlando, Academic Press, 1985, p3
5 Wilson JMG, Junger G; Principles and Practice of Screening for Disease. Geneva, World Health Organization, 196

# APPENDIX 2:
## SMP Screening Recommendations

The SMP offers screening mammography to eligible women ages 40 to 79 without doctor referral.

| Age | Doctor Referral | Recall Frequency |
|---|---|---|
| <40 | Yes | Will accept with primary health care provider referral |
| 40-49 | No | Reminders* for 12-month and 24-month anniversary |
| 50-79 | No | Reminders* for 24-month and 36-month anniversary to age 79. |
| 80+ | Yes | Will accept with primary health care provider referral |

**Eligibility Criteria:**

- 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 doctor to receive the results.

*If there is a new lump, thickening or discharge, we recommend seeing a doctor immediately, even if the last mammogram was normal.

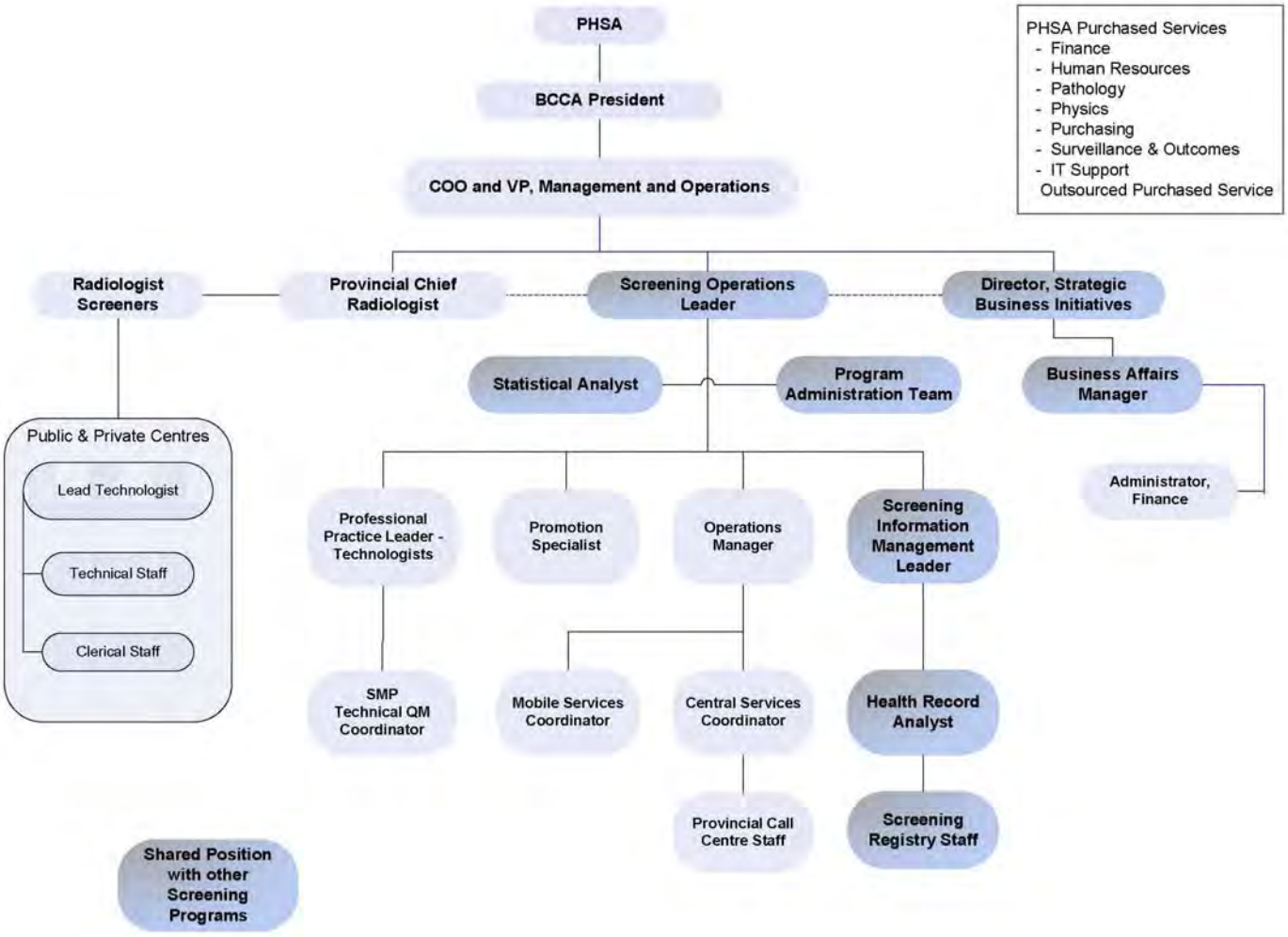
**Ages <40 – Physician Referral Required**

Primary health care providers may wish to refer women ages <40 with a strong family history of breast cancer (i.e. two or more first degree family members), for screening at the SMP. These women may also benefit from discussion of breast cancer risks including genetic counselling and testing. Screening mammography is only one component of care for these higher risk families. The SMP asks that each screening exam for women ages <40 be arranged by primary health care providers after consultation with a radiologist at the SMP centre of choice. The primary health care provider should provide the woman with a requisition to bring to the appointment citing the approving radiologist screener's name.

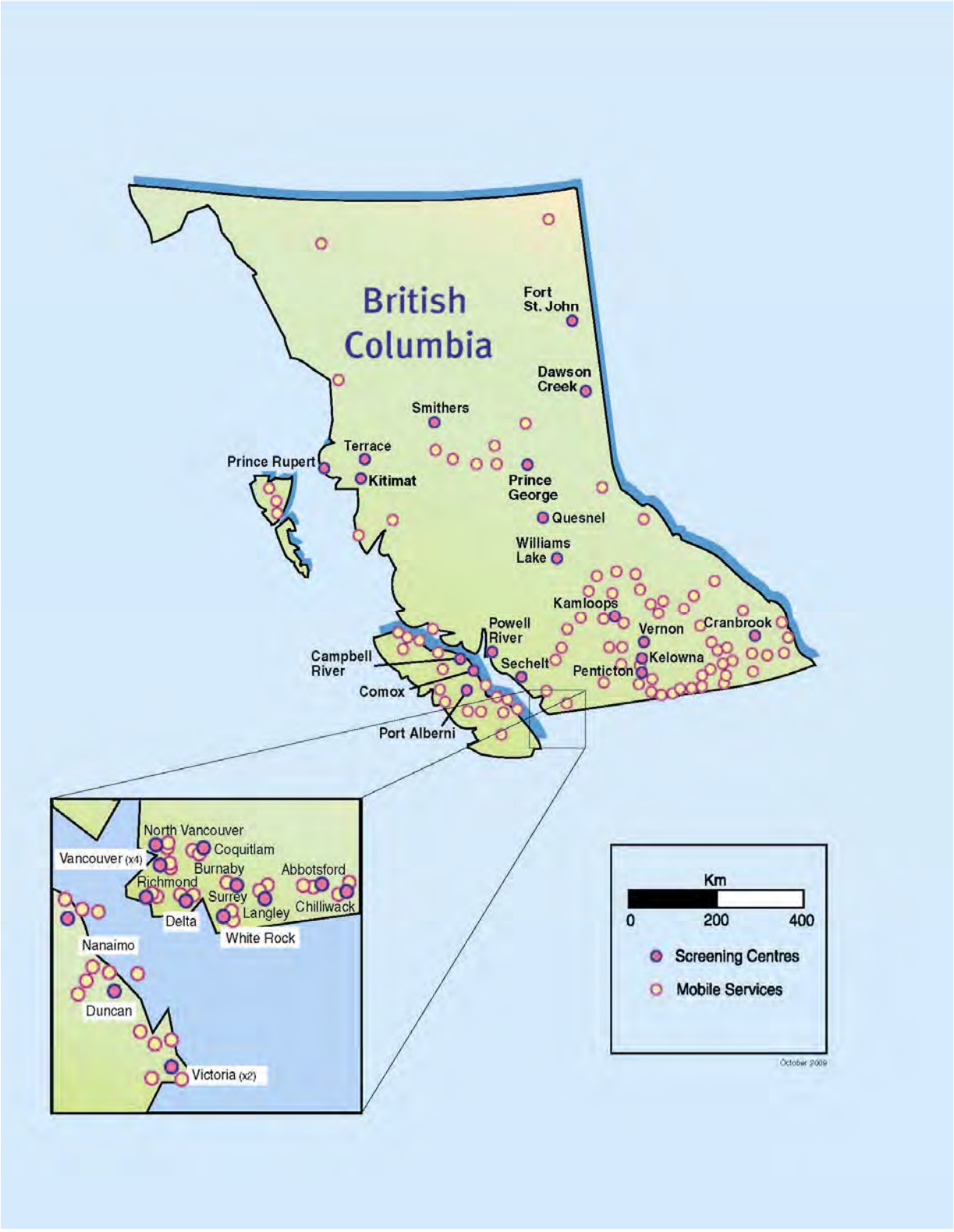
**Ages 80+ – Physician Referral Required**

Primary health care providers may wish to refer women ages 80+ in good general health (life expectancy of 10 or more years), for screening at the SMP. The possible benefits of screening mammography in light of other potential health concerns should be discussed with the patient. Therefore, the SMP asks that each screening exam for women ages 80+ be referred by primary health care providers to the SMP centre of choice. A requisition should be given to the woman to bring to the appointment.

# APPENDIX 3:
## SMP/BCCA Organization Chart



# APPENDIX 4:
## Map of Screening Centres



# APPENDIX 5:
## Screening Centre Contact Information

| | | | |
|---|---|---|---|
| Abbotsford | 604-851-4750 | Nelson | 250-354-6721 |
| Burnaby | 604-436-0691 | North Vancouver | 604-903-3860 |
| Campbell River | 1-800-663-9203 | Penticton | 250-770-7573 |
| Chilliwack | 1-800-663-9203 | Port Alberni | 1-800-663-9203 |
| Comox | 250-890-3020 | Powell river | 1-800-663-9203 |
| Coquitlam | 604-927-2130 | Prince George | 250-565-6816 |
| Cranbrook | 250-417-3585 | Prince Rupert | 1-800-663-9203 |
| Dawson Creek | 1-800-663-9203 | Quesnel | 1-800-663-9203 |
| Delta | 604-946-1121 | Smithers | 604-244-5505 |
| Duncan | 1-800-663-9203 | Sechelt | 1-800-663-9203 |
| Fort St. John | 1-800-663-9203 | Richmond | 1-800-663-9203 |
| Kamloops | 250-828-4916 | Surrey | 604-586-2772 |
| Kelowna | 250-861-7560 | Terrace | 1-800-663-9203 |
| Kitimat | 1-800-663-9203 | Vernon | 250-549-5451 |
| Langley | 604-514-6044 | White Rock | 604-535-4512 |
| Nanaimo | 250-716-5904 | Williams Lake | 1-800-663-9203 |
| **Vancouver** | | **Victoria** | |
| BC Women's Health Centre | 604-775-0022 | #230 - 1900 Richmond Ave | 250-952-4232 |
| Mount St. Joseph Hospital | 604-877-8388 | Victoria General Hospital | 250-727-4338 |
| 5752 Victoria Drive | 604-321-6770 | | |
| #505-750 West Broadway | 604-879-8700 | | |

## Mobile Screening Service Delivery Areas

| | | | | |
|---|---|---|---|---|
| Agassiz | Dawson Creek | Ladysmith | Pemberton | Slocan |
| Alert Bay | Dease Lake | Lake Cowichan | Pender Island | Sooke |
| Alexis Creek | Delta | Lillooet | Pitt Meadows | Sorrento |
| Anaheim Lake | Elkford | Logan Lake | Port Alice | Southside |
| Armstrong | Enderby | Lumby | Port Coquitlam | Sparwood |
| Ashcroft | Fernie | Lytton | Port Hardy | Squamish |
| Balfour | Fort Nelson | Mackenzie | Port McNeill | Stewart |
| Barriere | Fort Rupert | Maple Ridge | Port Moody | Summerland |
| Beaver Valley | Fort St. James | Massett | Princeton | Surrey |
| Bella Bella | Fort St. John | McBride | Qualicum Beach | Tatla Lake |
| Bella Coola | Fountain | Meadow Creek | Queen Charlotte City | Tofino |
| Bowen Island | Fraser Lake | Merritt | Queensborough | Trail |
| Burnaby | Gabriola | Midway | Radium Hot Springs | Tumbler Ridge |
| Burns Lake | Golden | Mill Bay | Revelstoke | Ucluelet |
| Castlegar | Gold River | Mission | Richmond | Valemount |
| Chase | Grand Forks | Mount Currie | Rock Creek | Vancouver |
| Chemainus | Granisle | Nakusp | Rossland | Vanderhoof |
| Chetwynd | Greenwood | Naramata | Saanichton | West Vancouver |
| Chilliwack | Hazelton | Nelson | Salmo | Westbank |
| Christina Lake | Hope | New Denver | Salmon Arm | Whistler |
| Clearwater | Houston | New Westminster | Saltspring Island | Williams Lake |
| Clinton | Hudson Hope | North Vancouver | Sayward | Windermere |
| Coquitlam | Invermere | Oliver | Scotch Creek | Winfield |
| Crawford Bay | Kaslo | Osoyoos | Seabird Island | 100 Mile House |
| Creston | Keremeos | Parksville | Sicamous | |
| | Kimberley | Peachland | Skidegate | |

Lower Mainland locations change from time to time**. Latest visits include**: Alouette Correctional Centre, BC Biomedical Lab, BCIT Campus, Chehalis Indian Band/Agassiz, Chilliwack City Hall, Cultus Lake/Soowahlie First Nations, Doig River First Nation, Downtown Eastside Women's Health Centre, Esketemc Nation (Alkali Lake), Half Way River First, ICBC Head Office, Maple Ridge City Hall, New Vista Society, SFU Campus, Sto:Lo First Nation, Surrey Tax Centre, Telus, UBC Campus, Vancouver Primary Care Centre/Native Health

# APPENDIX 6:
## Educational Materials Order Form

BC Cancer Agency | Screening Mammography Program
CARE + RESEARCH

# ORDER FORM
# Fax or Mail

**SMP PAMPHLETS, TEAR PADS, POSTERS, BOOKMARKS & CDs/DVDs**

**PAMPHLETS**

| | Quantities | |
|---|---|---|
| 1 Pass it On (order code SMP 028) | | |
| ☐ English | ☐ 25 | ☐ 50 |
| ☐ Chinese | ☐ 25 | ☐ 50 |
| ☐ Punjabi | ☐ 25 | ☐ 50 |

**APPOINTMENT PADS (TEAR PADS)**

| | Quantities | |
|---|---|---|
| 1) Lower Mainland | | |
| ☐ English | ☐ 5 | ☐ 10 |
| ☐ Punjabi | ☐ 5 | ☐ 10 |
| ☐ Traditional Chinese | ☐ 5 | ☐ 10 |
| 2) All other locations | | |
| ☐ English | ☐ 5 | ☐ 10 |
| ☐ Punjabi | ☐ 5 | ☐ 10 |
| ☐ Traditional Chinese | ☐ 5 | ☐ 10 |

**PLEASE PROVIDE YOUR ADDRESS & PHONE**

Name:_____

_____

Address:_____

_____

_____

_____

Postal Code:_____

**PHONE NUMBER**:

_____

**POSTERS (LIMIT OF 10 POSTERS)-ENGLISH ONLY**

| | Quantities |
|---|---|
| ☐ Pass it On | _____ |
| ☐ Why Regular Mammograms are Important | _____ |

**BOOKMARKS**

**Quantities:**

_____

**RECIPE CARDS (Quantities):** ___ TOMATO SOUP ___CARROT SOUP ___SALMON

___ MANGO SALAD ___CHILI

**CD**— How a Screening Mammogram is Given (no audio-PowerPoint)

☐ English Only ☐ English/Punjabi

☐ Chinese Only ☐ English/Chinese

☐ Punjabi Only ☐ English/Punjabi/Chinese

**DVD**—Having a Screening Mammogram (with audio)

☐ English only

**Aboriginal MATERIALS**

| | Quantities | |
|---|---|---|
| ☐ Health Check Cards | ☐ 25 | ☐ 50 |
| ☐ Balancing Your Health Needs Posters _____ (maximum 10) | | |

**Please fax this form to 604-877-6113** or mail to: SMPBC Central Office
711-750 W Broadway, Vancouver, BC V5Z 1H6

**ORDER FORMS are also available on SMP website:** www.smpbc.ca

**Please Note:** Order forms for the **Hereditary Cancer Program** are available at:
www.bccancer.bc.ca/PPI/Prevention/Hereditary

Revised August 2010

BRITISH COLUMBIA

# APPENDIX 7:
# Glossary

- **Abnormal Call Rate:** Proportion of screening mammography examinations determined to require further diagnostic assessment *(i.e. called "abnormal").*

$$\text{Abnormal Call Rate} = \frac{\text{Number of exams called abnormal}}{\text{Total number of exams}}$$

- **Benign Core Biopsy Rate:** Proportion of cases with complete follow-up that resulted in a benign core biopsy, where each core biopsy represents a case.
- **Benign Open Biopsy Rate:** Proportion of cases with complete follow-up that resulted in a benign open biopsy, where each open biopsy represents a case.
- **Benign to Malignant Core Biopsy Ratio**

$$\text{Benign to Malignant Core Biopsy Ratio} = \frac{B_b}{M_b} : 1$$

$B_b$ Number of benign cases detected by core biopsy, where each core biopsy performed represents a case.

$M_b$ Number of malignant cancers cases detected by core biopsy, where each core biopsy represents a case.

- **Benign to Malignant Open Biopsy Ratio**

$$\text{Benign to Malignant Open Biopsy Ratio} = \frac{B_b}{M_b} : 1$$

$B_b$ Number of benign cases detected by core biopsy, where each open biopsy performed represents a case.

$M_b$ Number of malignant cancers cases detected by core biopsy, where each open biopsy represents a case.

- **Core Biopsy Yield Ratio**: Proportion of cases with core biopsy that resulted in a diagnosis of breast cancer, where each core biopsy performed represents a case.

$$\text{Core Biopsy Yield Ratio} = \frac{M_b}{B_b + M_b} \times 100\ \%$$

$B_b$ Number of diagnostic core biopsies without breast cancer diagnosis.

$M_b$ Number of diagnostic core biopsies with breast cancer diagnosis.

- **Open Biopsy Yield Ratio**: Proportion of cases with open biopsy that resulted in a diagnosis of breast cancer, where each open biopsy performed represents a case.

$$\text{Open Biopsy Yield Ratio} = \frac{M_b}{B_b + M_b} \times 100\ \%$$

$B_b$ Number of diagnostic open biopsies without breast cancer diagnosis.

$M_b$ Number of diagnostic open biopsies with breast cancer diagnosis.

- **Overall Cancer Detection Rate:** Number of cancer cases detected per 1,000 screens with complete follow-up.
- **DCIS (or In Situ Cancer) Detection Rate:** Number of ductal carcinoma in situ (DCIS) cases detected per 1,000 screens with complete follow-up.
- **Invasive Cancer Detection Rate:** Number of invasive cancer cases detected per 1,000 screens with complete follow-up.

- **Interval Cancer Rate:** Number of women being diagnosed with post-screen breast cancer at a breast location which was called normal at previous screen within the specified period of time per 1,000 screens.
- **Positive Predictive Value (PPV) of Screening Mammography:** Proportion of "abnormal" cases found to have breast cancer after diagnostic workup.

$$\text{PPV} = \frac{\text{Number of screen-detected cancers}}{\text{Number of "abnormal" cases with complete follow-up}}$$

- **Prevalence to Expected Incidence Ratio:** Comparison between incidence rates at first (prevalent) screen with historical incidence rate prior to onset of screening practice. Prevalent screens have been restricted to those women with no previous outside mammogram within 24 months of their first program screens. The 1982 incidence rates by five-year age group obtained from the BC Cancer Registry were chosen as the comparison reference.

$$\text{P : I Ratio} = \frac{\sum_i Ca_i}{\sum_i N_i R_i}$$

Where $N_i$ is the number of prevalent screens for age group i, $Ca_i$ is the number of cancers detected in prevalent screens for age group i and $R_i$ is the expected incidence rate for age group i. Prevalence to expected incidence ratio for ages 50 to 79 would be calculated by summing over age groups 50 to 54, 55 to 59, 60 to 64, 65 to 69, 70 to 74, and 75 to 79 in the numerator and denominator.

- **Retention Rate:** The estimated percentage of women returned for rescreen within 30 months of their previous screen. This rate is estimated using Kaplan-Meier method.
- **Return (Compliance) Rate:** The estimated percentage of women without history of breast cancer diagnosis returned for rescreen within a certain period of time. This rate is estimated using Kaplan-Meier method.
- **Sensitivity:** Probability of interpreting screening mammograms of breast cancer cases as “abnormal”. It measures how well screening mammography determines the presence of breast cancer.

$$\text{Sensitivity} = \frac{TP}{TP + FN}$$

TP Number of screen-detected breast cancer cases.

FN Number of breast cancer cases called “normal” and diagnosed within 12 months post screen.

- **Specificity:** Probability of interpreting screening mammograms of cases with no evidence of breast cancer as "normal". It measures how well screening mammography determines the absence of breast cancer.

$$\text{Specificity} = \frac{TN}{TN + FP}$$

TN Number of cases with "normal" screening mammograms that remained without evidence of breast cancer before the next screening visit, or within 12 months after the last screening visit.

FP Number of cases with no evidence of breast cancer but whose screening mammograms were called "abnormal".

- **Participation Rate:** The percentage of women who have a screening mammogram (calculated biennially) as a proportion of the eligible population. The eligible population is estimated by the average of the two-year population from forecast.
- **Node Negative Rate in Cases of Invasive Cancer:** Proportion of invasive cancers in which the cancer has not invaded the lymph nodes.

# APPENDIX 8:
# Acknowledgements

The Screening Mammography Program would like to thank its partners who have supported and contributed to the Program over the years. The success of the Program depends on an integrated system of:

- Community health professionals promoting the benefits of screening
- Dedicated and highly trained staff to perform and interpret the screening mammograms
- Family doctors and medical specialists to provide diagnostic follow-up and treatment
- Community facilities providing space and personnel to support mammography

We would like to thank the following organizations for their ongoing support *(alphabetical)*:

- BC Cancer Foundation
- BC Medical Association
- BC Women's Health Centre
- BC/Yukon Women's Cancer Alliance
- Canadian Breast Cancer Foundation
- Canadian Cancer Society
- College of Physicians and Surgeons
- Women's Health Bureau

SMP has been fortunate to have a strong central administrative team. This year three long-serving members retired. We wish Elaine Simpson, Leslie Donaldson, and Margaret Bangen all the best in their retirement years, and we thank them for their considerable contributions to the program. Between them they have provided 50 years of service to the BC Cancer Agency and the Screening program. Their combined knowledge, leadership, and dedication have played a crucial role in building the program and they will be missed.

Organization changes within the BC Cancer Agency see SMP move to the BCCA Clinical Services portfolio. We would like to thank Dr. Andy Coldman, Vice President of Population Oncology, for his leadership the last 14 years. Dr. Coldman will continue to contribute his considerable expertise and experience to the SMP Academic Committee.

# APPENDIX 9:
# Committees

***Alphabetical Listing***

**Academic Committee**

Dr. Andy Coldman
Dr. Paula Gordon - Chair
Dr. Malcolm Hayes
Dr. Rasika Rajapakshe
Ms. Janette Sam
Dr. Linda Warren
Ms. Lisa Kan
Dr. Joseph Yang

**Quality Management Committee**

Ms. Carla Brown-John
Dr. Stephen Chia
Ms. Christina Chu
Dr. Malcolm Hayes
Ms. Lisa Kan
Ms. Ann MacDonald
Ms. Sheila MacMahon
Ms. Janette Sam
Mr. Larry St. Germain
Dr. Linda Warren - Chair

**Screener's Advisory Committee**

Dr. Ken Bentley
Dr. Larry Breckon
Dr. Michael Clare
Dr. Eleanore Clark
Dr. Don Coish
Dr. Dan Dolden
Dr. Nancy Graham
Dr. Lynn Jacobsen
Dr. Rob Johnson
Ms. Lisa Kan
Mr. Karim Karmali
Dr. Nicola Lapinsky
Dr. Brent Lee
Dr. Richard Lee
Dr. Patrick Llewellyn
Dr. Heather MacNaughton
Dr. Daryn Maisonneuve
Dr. Peter McNicholas
Dr. Kathryn Miller
Dr. David O'Keeffe
Dr. Rasika Rajapakshe
Ms. Janette Sam
Dr. Stuart Silver
Dr. Kelly Silverthorn
Dr. Connie Siu
Dr. Catherine Staples
Dr. Phil Switzer
Dr. Lynette Thurber
Dr. Tim Wall
Dr. Linda Warren - Chair
Dr. Jose Zanbilowicz

# APPENDIX 10:
# Radiologist Screeners

***Alphabetical Listing***

***Abbotsford***

Dr. Lynn Jacobsen*
Dr. Marion J. Kreml
Dr. Caroline Pon

***Burnaby & Richmond***

Dr. Bill Collins
Dr. Nancy Graham*
Dr. Henry Huey
Dr. Marty Jenkins
Dr. Vee Lail
Dr. Elizabeth Tanton
Dr. Lynette Thurber*

***Comox***

Dr. Dave McKeown
Dr. Jose Zanbilowicz*

***Coquitlam***

Dr. Jennifer Dolden
Dr. Maria Kidney
Dr. Heather MacNaughton*
Dr. Carol Miller
Dr. Anita McEachern
Dr. Robert Van Wiltenburg

***Cranbrook***

Dr. Daryn Maisonneuve*
Dr. Julie Nicol

***Interior/Kootenay Mobile***

Dr. Kelly Silverthorn

***Kamloops***

Dr. Michael Clare*
Dr. Donal Downey

***Kelowna***

Dr. Wayne Middelkamp
Dr. Catherine Staples*
Dr. Timothy Wall*

***Langley***

Dr. Ron Campbell
Dr. John Matheson
Dr. Kathryn Miller *

***Nanaimo/Islands & Coastal Mobile***

Dr. David Coupland
Dr. Rob Johnson*
Dr. Zenobia Kotwall
Dr. David O'Keeffe*
Dr. Paul Trepanier

***Northern/Lower Mainland Mobile***

Dr. Kelly Silverthorn*

***North Vancouver***

Dr. Sven Aippersbach
Dr. Barry Irish
Dr. Patrick Llewellyn*
Dr. Catherine Phillips

***Penticton***

Dr. Peter McNicholas*
Dr. Stacey Piche

***Prince George***

Dr. Larry Breckon*
Dr. Alasdair Leighton
Dr. Greg Shand

***Sechelt***

Dr. Daniel Dolden*

***Surrey***

Dr. Don Coish*
Dr. Guy Eriksen
Dr. Dennis Janzen
Dr. Amir Neyestani
Dr. John Sisler
Dr. L. Earl Tregobov

***Vancouver BC Women's Health Centre***

Dr. Paula Gordon
Dr. Patricia Hassell
*Dr. Linda Warren*

***Vancouver Mount St. Joseph Hospital***

Dr. Richard Lee*

***Vancouver Victoria Drive***

Dr. Connie Siu*
Dr. Phil Switzer*

***Vancouver #505 - 750 West Broadway***

Dr. Nicola Lapinsky*
Dr. Linda Warren*

***Vernon***

Dr. Ken Bentley*
Dr. Ian Marsh
Dr. Glenn Scheske

***Victoria General Hospital/ Victoria Richmond Ave***

Dr. Richard Eddy
Dr. Nicola Finn
Dr. George Hodgins
Dr. Robert Koopmans
Dr. Brent Lee*
Dr. Colin Lee
Dr. Delmer Pengelly
Dr. Stuart Silver*
Dr. Rick Smith
Dr. John Wrinch

***White Rock***

Dr. Eleanor Clark*
Dr. Joanne Coppola
Dr. Jeffrey Hagel

* Indicates Chief Screener/Member of Screeners Advisory Committee

# APPENDIX 11:
# Publications & Presentations

***Publications***

1. Warren, L., Burhenne, L.J., Coldman, A.J., Kan L., Organized Breast Cancer Screening in British Columbia: The Screening Mammography Program of British Columbia. Semim Breast Dis. 10:83-88.

2. Warren, L., Burhenne, L.J., Lee, C. H., Dershaw, D.D., Kopans, D., Evans, P., Monsees, B., Monticciolo, D., Breast Cancer Screening With Imaging: Recommendations from the Society of Breast Imaging and the ACR on the Use of Mammography, Breast Ultrasound, and Other Technologies for the Detection of Clinically Occult Breast Cancer, Journal of the American College of Radiology, 7(1), (2010): 18-27

3. R. Rajapakshe, Estimation of Patient Dose in a Provincial Screening Mammography Program" Med Phys Med. Phys. 36, pp. 4321 (2009).

4. B. Uyaniker, R. Rajapakshe, P. Gordon, S. Silver, A fully automatic method for estimating breast density in digital mammograms, Med. Phys. 36, pp. 4321 (2009).

5. R. Rajapakshe, Effectiveness RMI-156 Mammography Accreditation Phantom in Evaluating Digital Mammography Systems, Med. Phys. 36, pp. 4305 (2009).

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10. R. Rajapakshe, B. Uyaniker, P. Gordon, S. Silver A Fully Automatic Method for Estimating Breast Density in Digital Mammograms, Radiological Society of North America Scientific Assembly and annual meeting program. RSNA, Oakbrook Ill. SSM01-03 pp 574 (2009).

***Presentations and Lectures***

*Alphabetical Listing*

- ***Dr. Paula Gordon***

1. Ultrasound-Guided Breast Intervention. Society of Breast Imaging. *Colorado Springs, CO, April 28, 2009*
2. Ultrasound Guided Breast Interventional Procedures ("Hands-on" Workshop), *Radiological Society of North America Annual Meeting, Chicago, IL, November 30, 2009*
3. Small Parts Interventional Ultrasound (Hands-on Workshop), *Radiological Society of North America Annual Meeting, Chicago, IL, December 3, 2009*
4. Breast Ultrasound: Equipment and Technique, *Radiological Society of North America Annual Meeting, Chicago, IL, December 3, 2009*
5. Screening Update. *Practical Radiology, Whistler, BC, February 2, 2010*
6. Image-Guided Breast Biopsy. *Practical Radiology, Whistler, BC, February 3 and 24, 2010*
7. Breast Cancer Screening Update. *Western Urologic Forum. Scottsdale, AZ, March 26, 2010*
8. Breast Ultrasound: What's Important. St. Paul's Continuing Education Seminar. *Ultrasound: What's New and Practical in Women's Health, May 1, 2010*
9. Guest Speaker, *Canadian Breast Cancer Foundation Awareness Day. May 6, 2010*
10. Breast ultrasound: Basics, US Screening and BIRADS*. Ontario Association of Radiologists, October 16, 2010*
11. Problem Solving: Breast Ultrasound Lesion Localization & Triangulation*. Ontario Association of Radiologists, October 16, 2010*

- ***Dr. Linda Warren***

1. SMPBC – *Screening Mammography Forum 2009 – Moderator, October 24, 2009*

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