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

Screening Mammography Program

Screening Mammography Program 2012 Annual Report

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1.0 Message

Message from the Medical Director

Once again, we have had an interesting year at the Screening Mammography Program (SMP) of BC.

The spring brought the Screening Guideline Review, which was conducted by a committee co-chaired by Dr. Stephen Chia, Chair of the Breast Tumour Group, and Brian Schmidt, Acting President of the BCCA. Also on the committee were clinicians and experts committed to the diagnosis and treatment of breast cancer, and ultimately improving breast health for the women of British Columbia. This was a very robust review with great discussion of current literature and emphasis on the BC experience.

We have also spent considerable time and energy working on a new digital screening test that some of you may have had a chance to view and/or contribute to. When complete, this test will provide an opportunity for new screeners to be tested in a digital environment – which we hope is in the near future for the whole province.

It has been my great pleasure to meet and talk with so many of you over the past year. I am always impressed by the dedication of our team - all of you are critical to the ongoing success of this program.

As you will see in this report, our outcome indicators continue to reflect the positive force of early detection in breast cancer. This feat would not have been possible without the dedication and hard work of our team – from screening sites across the province, to mobile operations and the call centre to the program administration office. Well done!

– Christine Wilson MD

Message from the Operations Director

Our annual report provides an opportune time to highlight the many activities that we have undertaken over this past year. We are especially excited about the significant progress made by the Provincial Breast Health Strategy and hope you enjoy the update on page 15 of this report.

The women we serve are of utmost importance to us. This past year we focused on retention activities and initiated a number of projects focused on getting women to return at the appropriate interval. Projects included redesigning our reminder notice and hosting a customer service training session for center staff from across the province. We also began sending reminders to "re-invite" women who have not returned for a screening mammogram in 4 or more years.

Our mobile service also complemented our retention activities by continuing to improve and increase access for the women of BC – our provincial mobile service added 23 new First Nations and rural communities in northern BC to our mobile schedule.

The activities we perform are both important and rewarding – together we will make a difference.

– Janette Sam

Message from the BC Cancer Agency Chief Operating Officer

We are pleased to share the 2012 Screening Mammography Program (SMP) annual report.

Early detection is a critical component of the BC Cancer Agency's evidence-based, cancer control strategy and this report represents the dedicated efforts of the many radiologists, technologists, clerical and program staff that are committed to reducing breast cancer deaths by finding cancer at an early stage through routine screening.

This report summarizes both the program results and ongoing activities that assist us in meeting our program and agency goals and objectives. We hope you find it to be informative and helpful.

We appreciate your interest and continued support of the SMP of BC.

– Karim Karmali

2.0 Executive Summary

The Screening Mammography Program (SMP) is a population-based screening program operated by the BC Cancer Agency and funded by the Ministry of Health (MoH). SMP began in 1988, and has been in operation for over 24 years. The program operates 38 fixed screening mammography clinics across the province, and three mobile screening units that serve communities in rural British Columbia.

The goal of the Screening Mammography Program is to reduce breast cancer mortality by detecting breast cancer as early as possible. Over the past year, SMP has performed 305,421 examinations and detected 1,464 cancers. Since the program's inception, over 17 thousand breast cancers have been detected through screening mammograms. Almost 85% of these cancers were found in early stage, and about 83% of the total cancers detected were found in women aged 50 years or older.

Participation in SMP by select ethnic groups has increased over the last two consecutive years: Participation by First Nations women has increased by 2.4 % overall, East/South East Asians has increased by 1.4 % overall and South Asians has increased by 1.8 % overall - closing the gap with the general population.

In addition to conducting mammograms, SMP also focused on the development and deployment of initiatives related to quality assurance, promotion and retention, and program expansion. Projects included:

- Hosting a *Customer Service* session for clerical staff from across BC
- Developing a recall program for significantly overdue women
- Measuring satisfaction with our reminder system via an online marketing survey
- Developing software specific to digital mammography quality assurance monitoring.

Early detection through organized breast cancer screening combined with effective treatment has enabled British Columbia to have the lowest breast cancer mortality rates in Canada. Together with the continued support and encouragement of all British Columbians, we are making a difference.

3.0 Program Overview

Breast cancer screening saves lives. Studies of screening programs around the world have demonstrated a 30 to 40 percent reduction in deaths from breast cancer among women who are screened. Here in British Columbia, we see these benefits directly. Our province has the best survival outcomes for those women who do get breast cancer. This success is largely due to improved cancer treatments and increased participation in breast cancer screening.

Going for a regular mammogram is a woman's best line of defense – regular breast cancer screening can find cancer when it is small, which means:

- There is a better chance of treating the cancer successfully.
- It is less likely to spread.
- There may be more treatment options.

The BC Cancer Agency is committed to finding breast cancers early through SMP – its population-based screening program. SMP utilizes standard two-view bilateral mammography (x-ray of the breast) for breast cancer screening. Women ages 40-79 may self-refer to the screening program. Women outside of this age group may be referred to the SMP by their family physicians.

Women are not eligible for a screening mammogram in BC if they have breast cancer, breast implants, or if they currently have breast symptoms requiring a diagnostic investigation. These women must speak with their primary care provider and be referred for a diagnostic mammogram.

Centres and Mobile Services

There are 38 fixed centres across the province, and three mobile vans that visit over 120 smaller BC communities, including many First Nations communities. Mobile schedules are posted on the SMP website (www.smpbc.ca) and are sent to local health professionals.

The Screening Process

The Screening Process is illustrated in Figure 3.1 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 any abnormalities identified on screening.
4. Issue a screening reminder at the appropriate interval.

FAST TRACK – Facilitated Referral to Diagnostic Imaging

SMP has set up the "Fast Track" program which is a standard facilitated referral process to diagnostic imaging for patients with abnormal screening mammograms. This process was developed to decrease the wait time from abnormal screen to first assessment. Since this process was first implemented, it has demonstrated that the median time between an abnormal screening report and the first assessment procedure is less for patients on Fast Track referral.

Program Evaluation

Data is collected and analyzed on an ongoing basis to monitor the program's effectiveness and to identify areas for improvement. SMP evaluation indicators, quality standards and systems are based on national and international guidelines and recommendations.

Results of this analysis are presented in the "PROGRAM RESULTS" section of this report (Section 9). Age-specific breast cancer incidence and mortality rates are tracked in conjunction with the BC Cancer Registry.

Commitment to Quality

The SMP has a team dedicated to quality assurance comprised 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 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;
- A Technologist Newsletter;
- An educational event at the Annual SMP Forum with continuing medical education (CME) credits that is open to BCIT students.

Quality assurance and monitoring are a critical component of an organized screening program. 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.

Accreditation: Accreditation is the certification of competence in an area of expertise. CAR Mammography Accreditation is mandatory for all SMP Centres. Centres participate in accreditation renewals every three years and are required to have an annual update. Accredited sites display a certificate for all women attending the service to see.

Quality Assurance: The SMP Physics Support Group provides leadership and technical support to centres for their quality control practices. All centres undergo regular annual equipment surveys. Quality control practices are standardized and monitored regularly.

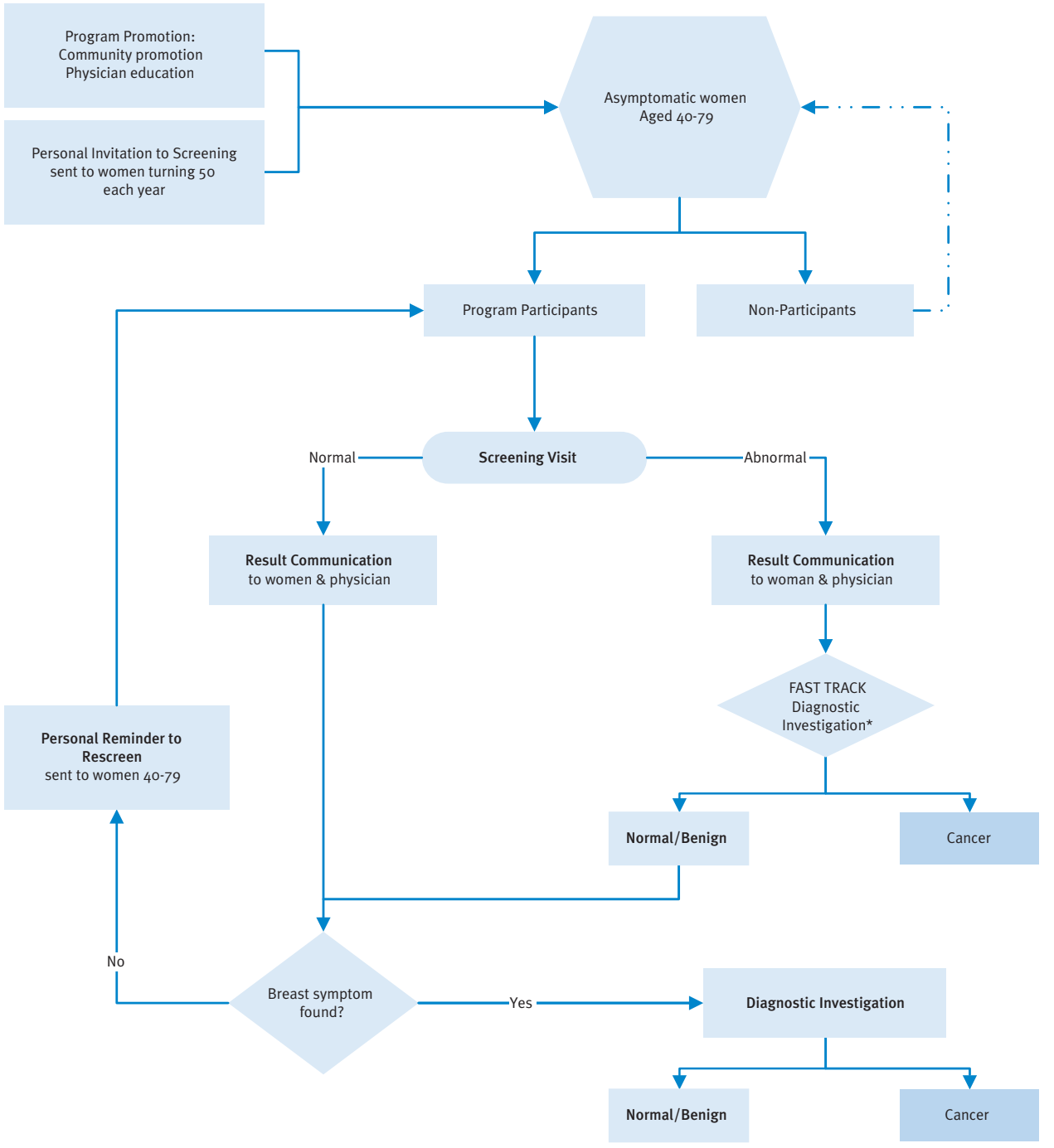
Based upon best practices, SMP has developed and implemented a comprehensive, harmonized quality control program specific for digital mammography equipment, as well as digital mammography-specific phantoms. SMP continues to work with other provinces to champion standardization of quality control programs for digital mammography.

Regular Promotion and Education Activities

Ongoing promotion activities include:

- Regular presence at health fairs and events through the BC Cancer Agency's Prevention group.
- Production of new promotional tools such as brochures, posters, marketing giveaways, bookmarks and postcards that effectively communicate the benefits of mammography.
- Working with ethnic and First Nations groups to develop customized materials and culturally-sensitive approaches to increase understanding and interest in screening.
- Regular media advertisements to promote the mobile mammography service.
- A "BreastCheck" Twitter account (www.twitter.com/breastcheck) that promotes relevant information about screening and breast cancer.
- A website (www.smpbc.ca) to support informed decision making about screening.

Figure 3.1: 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.

4.0 Program Initiatives and Activities

Program Initiatives

SMP regularly develops initiatives related to quality assurance, promotion and retention, and program expansion. This past year some of the initiatives and activities included:

Customer Service Session

The Screening Mammography Program has a target participation rate of 70% for women age 50-69. SMP works to ensure that these women return for their regular screening mammogram every two years, as per BC's breast screening policy. To reach this goal, SMP is continuously finding ways to increase client satisfaction during the mammography visit.

In support of this, SMP held day long training sessions for SMP clerical staff from around the province. These sessions included information on SMP goals/objectives, as well as a "WorldHost Service in Healthcare" session. WorldHost shares our vision of raising the bar of service excellence and provided an interactive fun day to help session participants gain the skills and confidence they need to improve our client-focused service.

Call Centre Operational Review

It is important to SMP that women are able to book their appointment easily. Mammogram appointments for any SMP clinic can be booked through a fixed centre or the provincial SMP call centre. The provincial call centre books approximately half (150,000) of all SMP appointments annually. Growing demand for screening services and the inherent variability in call volume during the day, and throughout the week, add complexity to the operations of the call centre. SMP management identified a need to review current operations for the call centre, in particular staffing levels throughout the day and across days of the week to better match the call demands.

SMP engaged the Operations Research for Improved Cancer Care Team to research and apply data-driven, operations research methodologies to address the objectives of the project. The data collected provided the Call Centre with a detailed summary of operations over a 12-month period. From this data, the Call Centre made the following changes:

- Re-scheduled staff to provide better telephone coverage during peak "call in" periods.
- Spread out weekly mailing of reminder notices (approx. 9,500) to smooth the volume of calls received by the Call Centre over the week.
- Improve telephone prompts to encourage clients to *'stay on the line for the next available agent'*.

To date, these changes have resulted in a 40% reduction in abandoned and rejected calls over the same period last year, and a 71% reduction in the number of calls going to voicemail. SMP will continue to monitor and adjust to any incoming call pattern changes to ensure that booking a mammogram is as quick and easy as possible.

Overdue recall program

SMP continues to focus on retention activities in 2012. In April we began a new initiative to invite women who are significantly overdue to return to SMP. Approximately 900 additional reminder letters are being sent weekly to this group (example below). The reminder is being sent to women on their significant birthday (50, 55, 60, 65, and 69) if they have not returned for a screen in at least four years.

Some of the women who are responding and booking appointments have not been back to the program in as many as **20 years**.

Overdue recall example

Focus Groups and Survey

Focus Groups and Survey

SMP performed a series of focus groups to acquire feedback on the program's promotional materials from eligible populations, including First Nations. The focus groups concentrated on the usage of language, images and tone of writing employed within SMP promotional materials.

The program also commissioned an online survey of British Columbia women aged 40 to 79, who are active (currently attending screenings at the recommended intervals) or lapsed (are 30 months or more overdue for a return screening) clients. The objective of this survey was to evaluate the efficacy of the current reminder system, and identify how SMP can influence the women's decision to return for screening. The valuable information received will help inform future development of program materials, and SMP's reminder system.

Radiologist Ongoing Performance Review and Management

The Screening Mammography Program has a robust performance management and review process for radiologist screeners. 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.

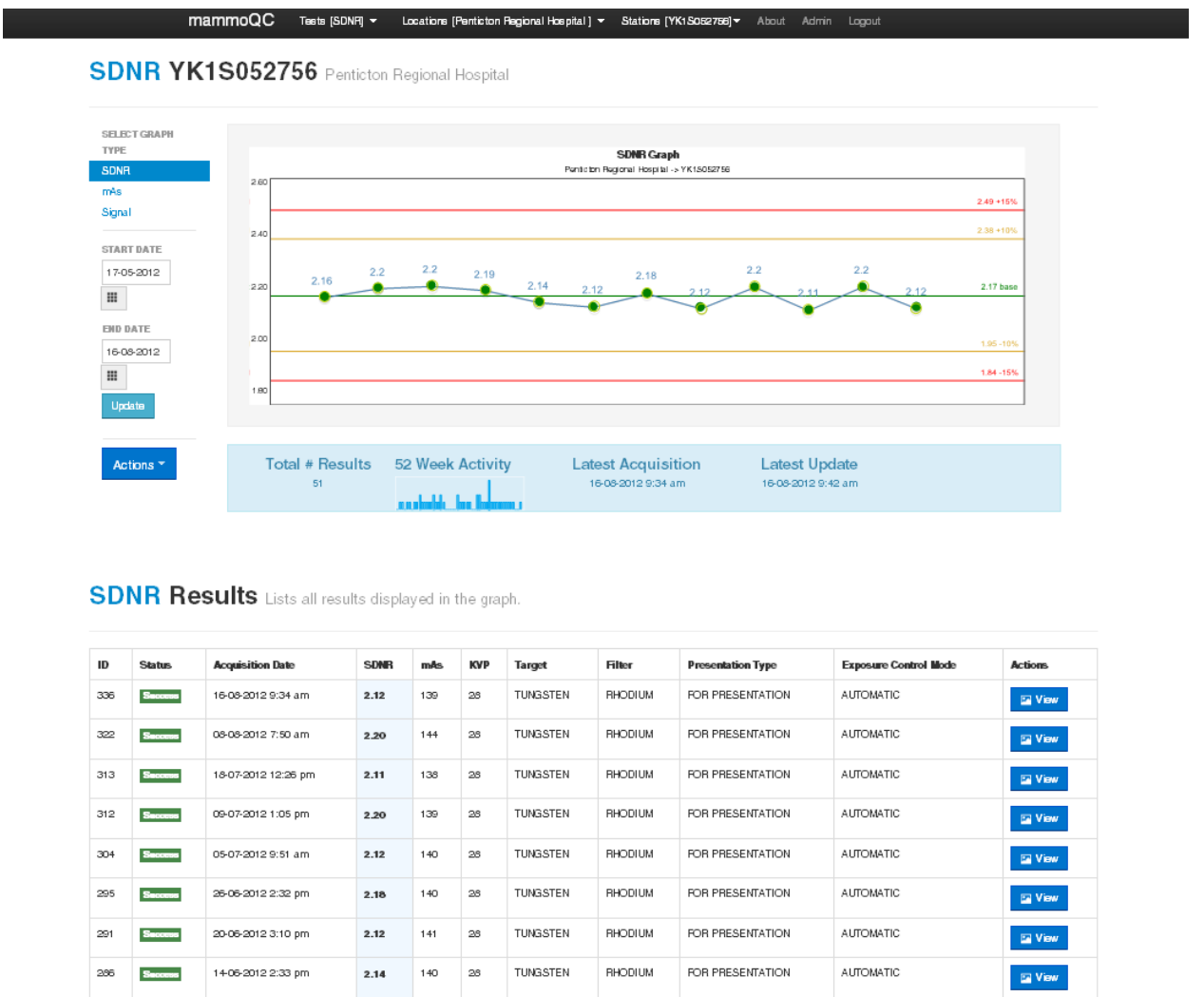
The program Medical Director reviews the statistics to ensure that the program's established performance indicator benchmarks are met.

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 this 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 Digital Quality Assurance Software Tool

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

Test images are instantly evaluated by the software that was developed, with results being charted on the website for the centres to review. Equipment performance and image quality are consistently monitored by the physicists and centres, and results are stored in a database for future reference. Plans are under way for expansion of this website for data storage of additional quality control tests and electronic QC manuals. These unique tools and continual advancements position our program as leaders in digital quality control.



mQc Software tool developed by the Screening Mammography Program

5.0 Professional Development and Academic Activities

Screening program representatives and scientists authored six publications in radiologic literature, and delivered 30 lectures and presentations to mammography screening peers. Additional research projects are ongoing.

The SMP plans and participates in professional and academic activities throughout the year including a scientific forum hosted by the program.

Screening Mammography Program Scientific Forum

The SMP scientific forum was held October 21-22, 2011. The 2011 program included updates on the Provincial Breast Health Strategy activities, a tribute to Dr. Linda Warren, an image case study review, and a mammography technologist positioning workshop. In addition, a Friday evening event occurred for technologists that included recognition, awards, announcements, and lectures about *Digital Mammography and Tomosynthesis and SMP Provincial Breast Dose Survey.*

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
- Diane Rinella, RT(R)(M)(BD)RDMS(BR)CDT Breast Imaging Specialist/Consultant

Our local presenters included:

- Dr. Christine Wilson, Medical Director, BC Cancer Agency Screening Mammography Program
- Dr. Jan Christilaw, President, BC Women's Hospital & Health Centre and Vice President, PHSA
- Ms. Lynn Pelletier, Project Director, Provincial Breast Health Strategy
- Dr. Andy Coldman, Vice President, Population Oncology, BC Cancer Agency
- Ms. Janette Sam, Operations Director, BC Cancer Agency Screening Mammography Program
- Dr. Jason K. Rivers, MD. Clinical Professor of Dermatology at the University of British Columbia
- Ms. Trish Hunt, Director, Risk Management, BC Cancer Agency

6.0 Partnerships and Collaborations

PHAC/Canadian Breast Cancer Screening Initiative

SMP participates as a member of the Public Health Agency of Canada, Canadian Breast Cancer Screening Initiative. This national committee's purpose is to review, discuss and take action on inter-provincial matters of mutual interest or concern that are related to breast cancer screening.

National activities include representation by BCCA staff on the following committees and working groups:

- Canadian Breast Cancer Screening Initiative,
  - Dr. Christine Wilson, Medical Director, Screening Mammography Program
  - Ms. Janette Sam, Operations Director, Screening Mammography Program
- Evaluation Indicators Working Group,
  - Dr. Andrew Coldman, Vice President, Population Oncology, BC Cancer Agency
  - Ms. Christina Chu, Biostatistical Analyst, Cancer Surveillance & Outcomes, Population Oncology, BC Cancer Agency
- Participation Rate Working Group,
  - Ms. Christina Chu, Biostatistical Analyst, Cancer Surveillance & Outcomes, Population Oncology, BC Cancer Agency
- Organized Breast Cancer Screening Programs in Canada – Report on Program Performance in 2007 and 2008 Editorial Committee
  - Ms. Christina Chu, Biostatistical Analyst, Cancer Surveillance & Outcomes, Population Oncology, BC Cancer Agency

7.0 The Provincial Breast Health Strategy

In 2010, BC's Minister of Health asked the Provincial Health Services Authority to develop an action plan to improve breast cancer prevention, screening and diagnostic services across the province. This action plan was completed in April 2010, and was the catalyst for the Provincial Breast Health Strategy which outlined BC's approach to increase breast cancer survival rates and fight the most common form of cancer diagnosed in Canadian women. Over the past two years, multi-disciplinary teams have been working collaboratively to improve breast health outcomes in BC.

The Screening Mammography Program (SMP) of BC has been actively involved in BC's Provincial Breast Health Strategy, and will continue to support its implementation. SMP program leaders and radiologists will continue to work with stakeholders and partners across the province to implement the screening policy, communicate consistent messages regarding prevention and screening, update aging equipment, integrate and streamline services, improve access for all women and report on outcomes.

Provincial Breast Health Strategy *At-a-Glance*

Improve Prevention and Screening

- Conduct evidence reviews and develop key prevention messages
- Develop the "FivePlus" website to communicate evidence-based messages on ways that women can reduce their risk for breast cancer
- Review BC's breast screening policy
- Ensure that screening mammograms are accessible by all women in BC
- Develop decision-aid and risk assessment tools to support informed screening decisions

Improve the Quality of Diagnostic Services

- Develop the Provincial Clinical Pathway and Standards to ensure that the path from screening, to diagnosis, to treatment – is streamlined and efficient
- Identify the Health Authority Hub and Spoke model to map out roles and responsibilities
- Recommend shift from surgical to image-guided biopsies
- Recommend implementation of synoptic reporting
- Develop virtual navigation for patients

Upgrade to Digital Mammography

- Develop a provincial equipment inventory and establish an RFP for new equipment to reduce costs
- Develop a provincial business case to address equipment requirements and connectivity
- Initiate partnerships between public sector and foundations to fund equipment
- Develop a screening equipment priority replacement plan

Increase Workforce Capacity

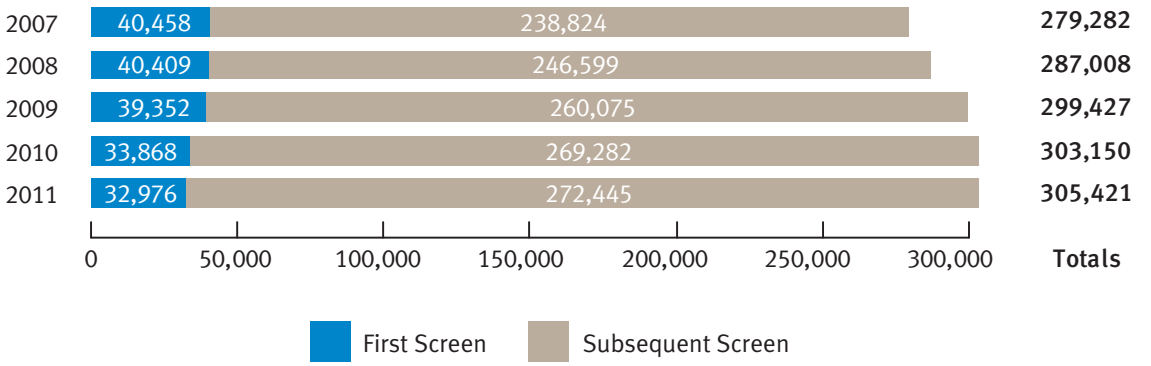
- Establish radiology breast imaging fellowships (BCW, BCCA, X-ray 505)
- Add Medical Radiation Technology and Sonography training spaces to BC colleges
- Implement cross-training of mammography and ultrasound technologists
- Plan UBC Breast Imaging Chair
- Integration and Shared Accountability
- Develop provincial performance indicators and Health Authority reports
- Integrate breast health performance expectations into PHSA Service Plan
- Propose incentive funding to reinforce provincial performance targets
- Review shared governance, management and delivery of screening services

8.0 Program Results

8.1 Recruitment and Re-screening

The SMP provided 305,421 examinations in 2011. During this period 32,976 (11%) of those examinations were provided to first-time attendees. Figure 9.1 shows that the number of exams provided by SMP in 2011 increased by 1.0%. The number of first-time attendees decreased by 3%, while the number of returning participants increased by 1% over the previous year.

FIGURE 9.1: SMP ANNUAL SCREENING VOLUME YEARS: 2007 – 2011



NOTE: SMP data extraction date: July 24, 2012

The age distribution of all exams and first exams performed in 2011 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 41% in East Kootenay to over 70% of first-time attendees being under 50 years of age across most of the Lower Mainland.

Table I: SMP Volume by Health Service Delivery Area (HSDA): 2011

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	4,809	26%	61%	13%	720	15%	45%	48%	6%
Kootenay Boundary	4,302	22%	62%	16%	379	9%	56%	41%	3%
Okanagan	26,211	26%	56%	18%	2,148	8%	58%	39%	3%
Thompson Cariboo	15,382	27%	58%	14%	1,261	8%	67%	31%	2%
Fraser East	17,004	31%	55%	14%	1,846	11%	67%	30%	3%
Fraser North	41,289	39%	51%	10%	4,958	12%	76%	22%	2%
Fraser South	47,834	37%	52%	11%	5,846	12%	70%	28%	2%
Richmond	15,450	37%	53%	9%	1,748	11%	76%	22%	2%
Vancouver	40,983	39%	51%	10%	5,026	12%	75%	23%	2%
North Shore / Coast Garibaldi	21,075	34%	54%	13%	2,395	11%	67%	31%	3%
South Vancouver Island	25,663	28%	58%	14%	2,229	9%	65%	34%	2%
Central Vancouver Island	19,857	23%	61%	16%	1,725	9%	57%	40%	3%
North Vancouver Island	8,764	24%	61%	14%	762	9%	56%	41%	3%
Northwest	4,030	32%	58%	9%	488	12%	63%	35%	2%
Northern Interior	8,966	33%	58%	10%	851	9%	73%	26%	2%
Northeast	2,354	34%	56%	10%	268	11%	65%	34%	1%
Program	**305,421**	**33%**	**55%**	**12%**	**32,976**	**11%**	**69%**	**29%**	**2%**

NOTE: SMP data extraction date: July 24, 2012

The biennial (30-month) screening participation rates are shown by HSDA for each age group in Table ll. In the 30-month period between July 1, 2009 and December 31, 2011, 535,246 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 54%. Northeast had the lowest participation rate at 43%, while Richmond had the highest at 63%.

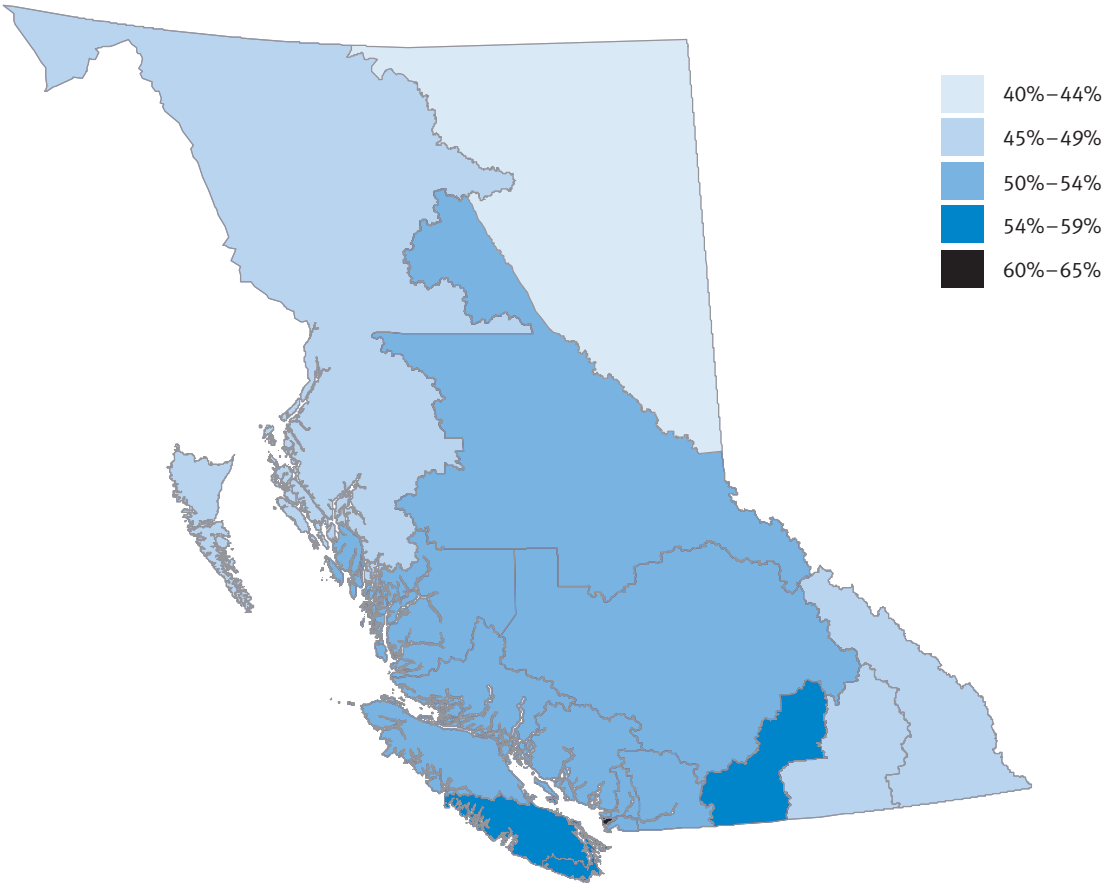
Table II: Regional 30-Month Participation Rates by 10-Year Age Groups Ending December 31, 2011 Inclusive

HSDA	10-Year Age Groups					Ages
	40-49	50-59	60-69	70-79	80-89	50-69
East Kootenay	37%	48%	49%	39%	3%	49%
Kootenay Boundary	35%	45%	48%	43%	4%	46%
Okanagan	46%	55%	59%	51%	4%	56%
Thompson Cariboo Shuswap	44%	53%	56%	47%	3%	54%
Fraser East	42%	51%	56%	46%	2%	53%
Fraser North	48%	53%	55%	46%	3%	54%
Fraser South	49%	54%	50%	36%	2%	52%
Richmond	51%	64%	63%	45%	3%	63%
Vancouver	47%	52%	55%	42%	3%	53%
North Shore/Coast Garibaldi	45%	51%	56%	49%	3%	53%
South Vancouver Island	45%	53%	58%	51%	3%	55%
Central Vancouver Island	41%	53%	59%	49%	4%	55%
North Vancouver Island	40%	52%	57%	48%	3%	54%
Northwest	40%	47%	48%	37%	3%	48%
Northern Interior	46%	54%	54%	42%	3%	54%
Northeast	33%	42%	43%	38%	1%	43%
British Columbia	**46%**	**53%**	**55%**	**45%**	**3%**	**54%**

NOTES:

1. Based on the weighted average of 2009, 2010 and 2011 female population estimates
2. Population data source: P.E.O.P.L.E. 36 population estimates (Jul 2011), BC STATS, Service BC, BC Ministry of Citizens' Services.
3. Postal code translation file: TMF1112 (June 2012)
4. Population and postal code data acquired through the Health Data Warehouse, BC Ministry of Health
5. SMP data extraction date: July 24, 2012

Figure 9.2: Biennial Screening Participation by Women Ages 50 to 69 over 30 month period between July 1, 2009 and December 31, 2011



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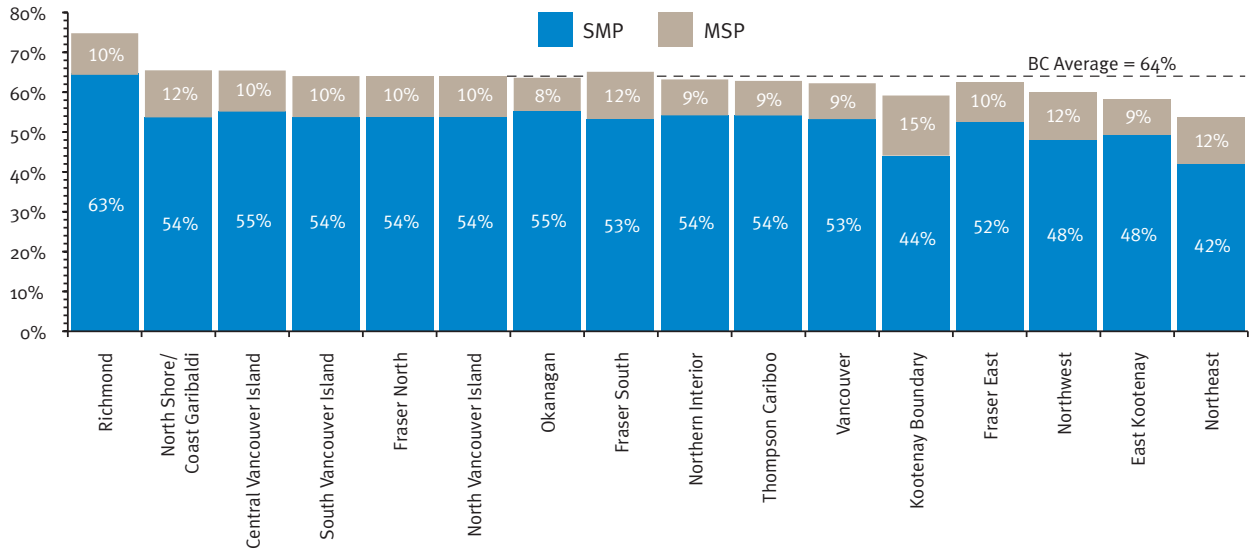
4. Population and postal code data acquired through the Health Data Warehouse, BC Ministry of Health
5. SMP data extraction date: July 24, 2012

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

Figure 9.3 shows the proportion of women receiving bilateral mammography services through the SMP or MSP over a 30-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 funded bilateral mammography has stabilized to 8% –10%.

During the 30-month reporting period, 64% of BC women ages 50 to 69 received bilateral mammography services. The percentage of women ages 50 to 69 receiving bilateral mammography ranged from 54% to 75% across the province, with Northeast (54%) and East Kootenay (58%) having the lowest percentages. Overall, the SMP provided 85% of the bilateral mammography services for this age group.

Figure 9.3: Bilateral Mammography Utilization by Women Ages 50 to 69 in BC between July 1, 2009 and December 31, 2011 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 July 15, 2012 for services provided between July 1, 2009 and December 31, 2011.
3. SMP data includes single and mulitiple screens per woman provided between July 1, 2009 and December 31, 2011.
4. 2009 to 2011 Estimated Population Data Source: P.E.O.P.L.E. 36, BC Ministry of Health Planning
5. SMP data extraction date: July 24, 2012

Participation rates of women ages 50 to 69 by selected ethnic groups are shown in Table lll. 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. 36 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 Fraser North, Richmond, and Vancouver HSDAs. The SMP data on ethnic origin was collected at the time of SMP registration on approximately 75% of attendees' ages 50 to 69 screened between July 1, 2009 and December 31, 2011. 25% of attendees 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 July 1, 2009 and December 31, 2011 Inclusive

HSDA	First Nations		East/South-East Asians		South Asians	
	Population %	Participation Rate	Population %	Participation Rate	Population %	Participation Rate
East Kootenay	1%	100%	1%	54%	0%	71%
Kootenay Boundary	1%	96%	1%	53%	0%	74%
Okanagan	1%	57%	1%	44%	1%	52%
Thompson Cariboo Shuswap	4%	49%	1%	60%	1%	48%
Fraser East	2%	51%	2%	69%	8%	54%
Fraser North	0%	70%	23%	55%	5%	51%
Fraser South	0%	91%	8%	60%	14%	47%
Richmond	0%	100%	46%	70%	7%	59%
Vancouver	1%	49%	39%	50%	4%	62%
North Shore/Coast Garibaldi	2%	43%	7%	53%	2%	53%
South Vancouver Island	1%	45%	4%	44%	1%	60%
Central Vancouver Island	2%	42%	2%	54%	1%	42%
North Vancouver Island	2%	45%	1%	52%	0%	100%
Northwest	17%	43%	2%	26%	2%	41%
Northern Interior	4%	55%	1%	41%	2%	59%
Northeast	5%	42%	1%	13%	0%	73%
British Columbia	**1.5%**	**50%**	**12%**	**55%**	**4.5%**	**52%**

PARTICIPATION RATE:

1. Population data sources: P.E.O.P.L.E. 36 population estimates (August 2010), BC STATS, Service BC, BC Ministry of Citizens' Services and 2006 Census, Statistics Canada (original data source).
2. Postal code translation file: TMF1106 (June 2011).
3. Women attended the SMP at least once between July 1, 2009 and December 31, 2011 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, Tamil.
6. SMP data extraction date: July 24, 2012

POPULATION PERCENTAGE:

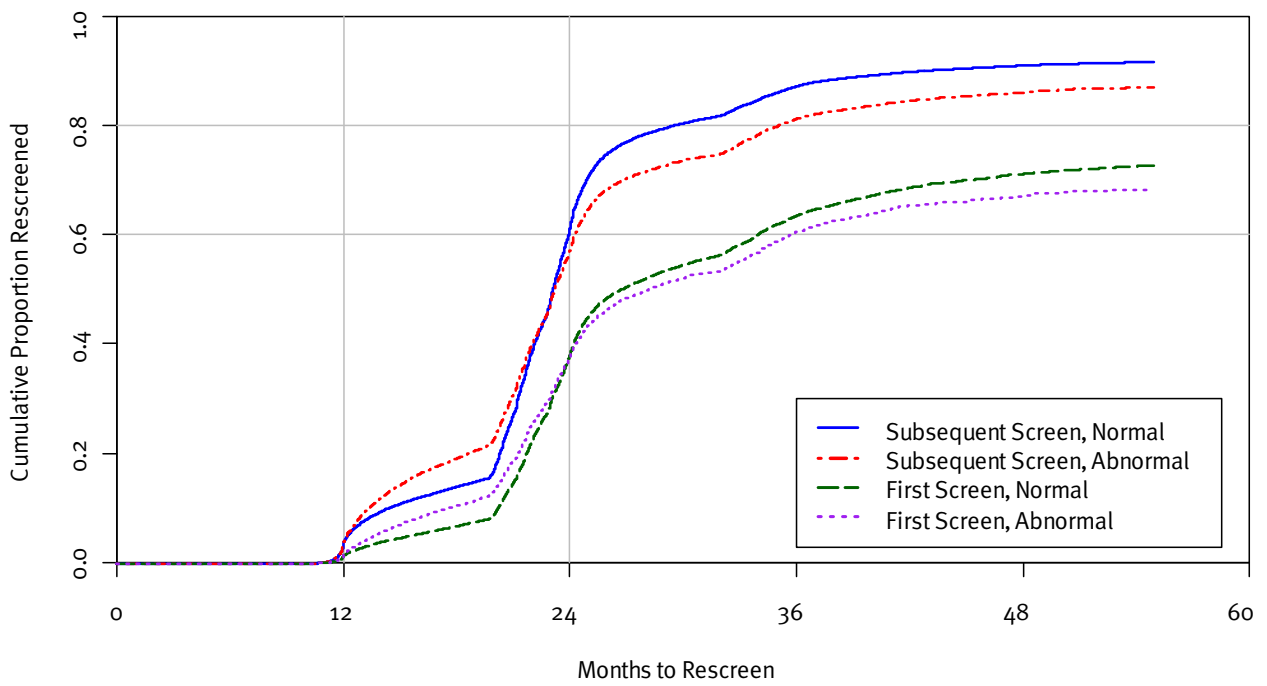
1. Original data source - 2006 Census, Statistics Canada
2. East/South-East Asians include Chinese, Filipino, Burmese, Cambodian, Hmong, Khmer, Laotian, Thai, Vietnamese, Indonesian, Japanese, Korean, Malaysian, Singaporian, Mongolian, Taiwanese, Tibetan, Asian n.o.s. and East/Southeast Asian n.i.e
3. South Asians include Bangladeshi, Bengali, East Indian, Goan, Gujarati, Kashmiri, Nepali, Pakistani, Punjabi, Sinhalese, Sri Lankan, Tamil, and South Asian n.i.e.

Participation in SMP by each selected ethnic group has increased over the last two consecutive years, closing the gap with the general population. Participation by First Nations women has increased by 2.4 % overall, East/South East Asians has increased by 1.4 % overall and South Asians has increased by 1.8 % overall. Table III indicates that there are regional variations. This information will help inform the promotional activities.

Women ages 40-79 are eligible to screen in BC. The SMP sends recall reminders to women when they are due for their next screening interval. 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 the following year if there is no response.

Figure 9.4 and Table IV show return rates for women ages 50 to 69 who attended SMP between 2008 and 2010. About 3-5% more women with abnormal results at the last visit self-selected to return earlier (by 18 months) than those with normal results. But by 24 months, when SMP recall mailing is active, women with normal results are more likely to respond to the recall letters. However, the most striking feature of this figure shows that first-time women have a much lower rate of return than those who had two or more visits already. A working group of SMP technologists and clerical staff have recommended a number of initiatives to better engage first-time attendees in general. Further analysis of SMP data showed a single factor that seemed to be associated with poor return rate in first time attendees: women who did not indicate what factor(s) persuaded them to attend screening (in the first place) were less likely to return for a subsequent screen. This information helps SMP technologists quickly identify women who may require further support.

Figure 9.4: Return Rates for Women Age 50-69 by First/Subsequent Screens and Screen Result: 2008-2010



NOTE: SMP data extraction date July 24, 2012

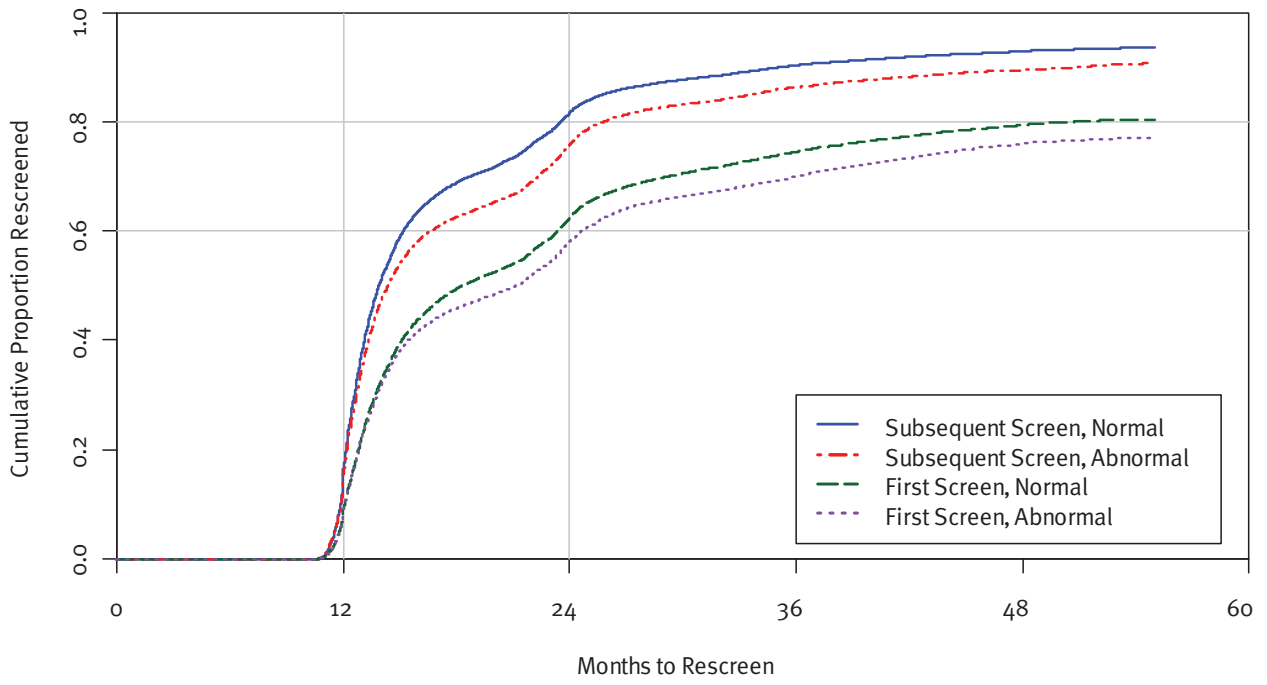
Table IV: Return Rates for Women Age 50 to 69: 2008 – 2010

	First Screen		Subsequent Screen		Overall	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Total Number to be Re-screened	29,310	5,415	424,946	24,119	454,256	29,534
Returned by 18 months	7%	10%	14%	19%	14%	18%
24 months	38%	38%	62%	58%	60%	54%
30 months	55%	52%	81%	74%	79%	70%
36 months	64%	61%	87%	81%	86%	77%

NOTE: SMP data extraction date: August 14, 2012

Figure 9.5 shows a graph of return rates for women ages 40 to 49 who attended SMP between 2008 and 2010. Women with normal screen results at the last visit were more likely to return than those who had abnormal screen results. Just as observed for women ages 50-69, first time women ages 40-49 also have a much lower rate of return than those who had two or more visits already.

Figure 9.5: Return Rates for Women Age 40-49 by First/Subsequent Screens and Screen Result: 2008-2010



8.2 Screening Results

Table V summarizes the outcome indicators for screening exams provided in 2011 by 10-year age groups. Of the 305,421 screening mammograms performed, 23,859 (7.8%) had an abnormal result and 1,464 breast cancers were reported as of July 24, 2012 (4.8 per 1,000 exams), including 299 in-situ cancers. The abnormal call rate is lower on subsequent screens than on first screens. The overall abnormal call rate decreased from 9.4% for ages 40 to 49 to 5.6% 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 40-49 and 70-79. The overall cancer detection rate increased from 4.2 per 1000 in 2010 to 4.8 per 1000 in 2011. The increased detection was observed in all age groups from 40-49 to 70-79.

Table V: SMP Outcome Indicators by 10-Year Age Group: 2011

Outcome Indicators	Age at Exam						All
	<40	40-49	50-59	60-69	70-79	80+	
Number of Exams	317	100,363	93,431	73,442	36,580	1,288	305,421
% on first screens	90.5%	22.2%	7.2%	3.9%	2.0%	3.4%	10.8%
Number of Cancers	---	231	392	500	328	13	1,464
% on first screens	---	33.8%	15.8%	9.0%	4.9%	7.7%	13.8%
Abnormal Call Rate	17.0%	9.4%	7.5%	6.7%	6.5%	5.6%	7.8%
on first screens	18.1%	16.3%	18.0%	17.2%	16.7%	6.8%	16.8%
on subsequent screens	6.7%	7.4%	6.7%	6.3%	6.3%	5.5%	6.7%
Overall Cancer Detection Rate (per 1,000)	---	2.3	4.2	6.8	9.0	10.1	4.8
on first screens	---	3.5	9.2	15.7	22.3	23.3	6.1
on subsequent screens	---	2.0	3.8	6.4	8.7	9.6	4.6
DCIS Detection Rate (per 1,000)	---	0.7	0.9	1.2	1.3	1.6	1.0
on first screens	---	1.3	1.9	2.8	2.8	---	1.5
on subsequent screens	---	0.5	0.9	1.2	1.3	1.6	0.9
Positive Predictive Value of Screening Mammography	---	2.5%	5.6%	10.2%	14.0%	18.3%	6.2%
on first screens	---	2.2%	5.2%	9.3%	13.8%	50.0%	3.7%
on subsequent screens	---	2.7%	5.7%	10.3%	14.0%	17.4%	6.9%
Core Biopsy Yield Ratio	---	17.4%	31.2%	48.1%	59.3%	80.0%	34.9%
on first screens	---	11.5%	19.8%	38.2%	53.8%	100.0%	17.9%
on subsequent screens	---	22.8%	34.6%	49.4%	59.7%	78.6%	40.8%
Open Biopsy Yield Ratio	---	12.5%	24.5%	34.2%	45.1%	33.3%	25.7%
on first screens	---	13.2%	22.7%	28.6%	28.6%	---	17.7%
on subsequent screens	---	11.9%	25.0%	34.8%	46.1%	33.3%	28.3%

NOTES:

1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. An additional 141 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. The final number of cancers is still to be determined.
5. SMP data extraction date: July 24, 2012

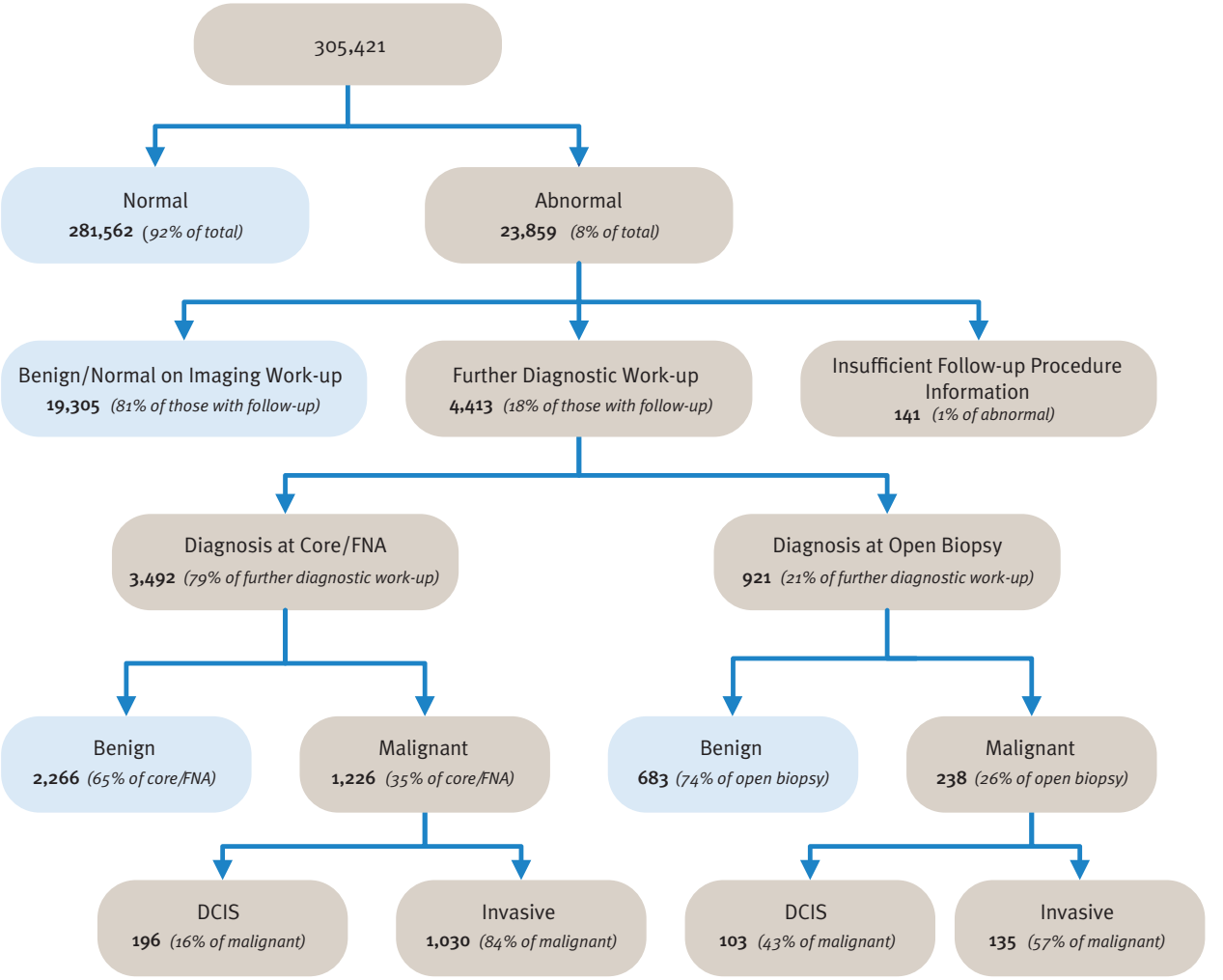
Diagnostic procedure information is available to date on 23,718 (99%) of the screening mammograms with abnormal findings. Table VI shows the proportion of women receiving specific diagnostic procedures as part of the work-up on their screen-detected abnormalities. Overall, 15% and 4% of women with abnormal screening mammograms had core biopsy and open biopsy, respectively. Core biopsies increased by 2% over the same period last year.

Table VI: Diagnostic Procedures Received by SMP Participants with "Abnormal" Screening Mammograms: 2011

Procedure	Age at Exam						All
	<40	40-49	50-59	60-69	70-79	80+	
Diagnostic Mammogram	91%	90%	90%	92%	91%	90%	90%
Ultrasound	69%	69%	66%	66%	66%	61%	67%
Fine Needle Aspiration	0%	3%	3%	3%	3%	1%	3%
Core Biopsy	11%	12%	15%	18%	20%	21%	15%
Surgical Biopsy	6%	3%	4%	4%	5%	4%	4%
with Localization	6%	3%	3%	4%	4%	4%	3%
Number of cases with diagnostic assessment information available	54	9,353	6,972	4,919	2,349	71	23,718

NOTE: SMP data extraction date: July 24, 2012

Figure 9.6: Screening Outcome Summary (2011)



8.3 2010 Cancer Detection

Histologic features of breast cancers detected by the SMP in 2010 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, they were obtained from the original diagnostic reports. Invasive tumour size was determined from the best available source: (1) pathological, (2) radiological, or (3) clinical.

Overall, 19 % of cancers detected were in situ. Of the invasive cancers detected, 62% were ≤15 mm, 76% have not had invasion of the regional lymph nodes, and 28% were grade 3 (i.e. poorly differentiated) tumours. Of the grade 3 tumours, 46% 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: 2010

NOTES:

Histological Features	Age at Exam 40-49		50-59		60-69		70-79		Age 40-79	
Number of Cancers	208		359		435		266		1,268	
in situ	67	32%	70	19%	85	20%	46	17%	268	21%
invasive	141	68%	289	81%	350	80%	220	83%	1,000	79%
Invasive Cancers Tumour Size										
≤5 mm	14	10%	28	10%	30	9%	18	8%	90	9%
6-10 mm	27	19%	73	26%	86	25%	68	31%	254	26%
11-15 mm	33	24%	64	22%	94	27%	64	29%	255	26%
16-20 mm	27	19%	48	17%	57	17%	34	16%	166	17%
›20 mm	38	27%	73	26%	77	22%	33	15%	221	22%
unknown size	(2)		(3)		(6)		(3)		(14)	
Invasive Cancers with tumour ≤ 15 mm	**74**	**53%**	**165**	**58%**	**210**	**61%**	**150**	**69%**	**599**	**61%**
Node Involvement in Invasive Cancers										
no	88	69%	196	71%	259	80%	164	82%	707	76%
yes	39	31%	82	29%	65	20%	37	18%	223	24%
no nodes sampled / unknown	(14)		(11)		(26)		(19)		(70)	
Histologic Grade of Invasive Cancers										
1 - well differentiated	34	25%	77	27%	102	30%	80	37%	293	30%
2 - moderately differentiated	56	41%	130	45%	155	46%	87	40%	428	44%
3 - poorly differentiated	48	35%	79	28%	83	24%	48	22%	258	26%
unknown grade	(3)		(3)		(10)		(5)		(21)	
Grade 3 tumour ≤ 15 mm	**18**	**38%**	**31**	**39%**	**33**	**40%**	**22**	**46%**	**104**	**40%**

1. Targets[1] : ›50% invasive tumours ≤15mm, ›70% with negative nodes, ›30% grade 3 tumours ≤15mm.
2. SMP data extraction date: July 24, 2012.

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

8.4 Outcome Indicators by Calendar Year: 2007 – 2011

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 35% in the last four years. Open biopsy yield ratios, on the other hand, have been declining steadily. In 2011, 30% of the open biopsies performed found breast cancer.

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 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 Tabàr L, Fagerberg G, Duffy, SW, Day NE, Gad A, Gröntoft 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

Table VIII: SMP Outcome Indicators by Calendar Year between 2007 and 2011 Inclusive

Outcome Indicators	Calendar Year					5-Year
	2007	2008	2009	2010	2011	Cumulative
Number of Exams	279,282	287,008	299,427	303,150	305,421	1,474,288
% on first screens	14.5%	14.1%	13.1%	11.2%	10.8%	12.7%
Number of Cancers	1,168	1,248	1,293	1,285	1,464	6,458
% on first screens	17.5%	17.2%	15.6%	13.6%	13.8%	15.5%
Abnormal Call Rate	7.0%	7.4%	7.3%	7.3%	7.8%	7.4%
on first screens	14.7%	15.4%	15.3%	15.6%	16.8%	15.5%
on subsequent screens	5.7%	6.1%	6.0%	6.2%	6.7%	6.2%
Overall Cancer Detection Rate (per 1,000)	4.2	4.4	4.3	4.2	4.8	4.4
on first screens	5.0	5.3	5.1	5.2	6.1	5.3
on subsequent screens	4.0	4.2	4.2	4.1	4.6	4.2
DCIS Detection Rate (per 1,000)	1.0	1.1	1.0	0.9	1.0	1.0
on first screens	1.4	1.6	1.2	1.3	1.5	1.4
on subsequent screens	0.9	1.0	0.9	0.8	0.9	0.9
Positive Predictive Value of Screening Mammography	6.0%	5.9%	6.0%	5.9%	6.2%	6.0%
on first screens	3.5%	3.5%	3.4%	3.4%	3.7%	3.5%
on subsequent screens	7.1%	6.9%	7.0%	6.7%	6.9%	6.9%
Core Biopsy Yield Ratio	34.9%	35.1%	36.0%	35.0%	34.9%	35.2%
on first screens	19.1%	18.7%	20.3%	18.3%	17.9%	18.8%
on subsequent screens	42.7%	42.5%	42.1%	40.8%	40.8%	41.6%
Open Biopsy Yield Ratio	32.8%	32.4%	30.3%	29.2%	25.7%	30.4%
on first screens	19.2%	22.6%	19.4%	19.6%	17.7%	19.9%
on subsequent screens	37.9%	36.0%	33.9%	31.9%	28.3%	34.1%
Interval Cancer Rate (per 1,000)						
0-12 months	0.00	0.00	0.65	0.70	---	---
after first screens	0.00	0.00	0.46	0.56	---	---
after subsequent screens	0.00	0.00	0.68	0.71	---	---
13-24 months	0.00	0.00	0.63	---	---	---
Sensitivity (i.e. 1 – false negative rate)	100.0%	100.0%	86.8%	---	---	---
Specificity (i.e. 1 – false positive rate)	93.4%	93.1%	93.2%	93.2%	---	---
Prevalence to Expected Incidence Ratio for Age 50-79 (target[1]: >3.0)	4.20	4.60	5.00	4.40	6.20	4.80

NOTES:

1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. The final number of cancers in 2011 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: July 24, 2012.

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

8.5 Outcome Indicators by Age: 2007 – 2011 Cumulative

Table IX shows the outcome indicators for screening exams provided in a five-year period by ten-year age groups. From 2007 to 2011, the SMP provided 1,474,288 screening mammography examinations, and detected 6,258 breast cancers. About 84% of the cancers detected during this five-year period were in women 50 years of age or older. The screen-to-cancer ratio ranges from 121:1 for women in their 70's to 464:1 for women in their 40's. Although the risk of breast cancer increases with age, the abnormal call rates were higher in the younger age groups. The abnormal-to-cancer ratio ranges from 7:1 for women in their 70's to 42:1 for women in their 40's. A similar detection pattern was also observed in core biopsy yield ratio and open biopsy yield ratio.

Table IX: SMP Outcome Indicators by 10-Year Age Groups between 2007 and 2011 Inclusive

Outcome Indicators	Age at Exam					All
	40-49	50-59	60-69	70-79	80+	
Number of Exams	493,752	464,282	342,295	165,646	6,737	1,474,288
% on first screens	25.1%	8.9%	4.6%	2.8%	5.5%	12.7%
Number of Cancers	1,063	1,845	2,093	1,369	87	6,458
% on first screens	37.3%	16.4%	10.0%	5.6%	11.5%	15.5%
Abnormal Call Rate	9.0%	7.1%	6.1%	5.8%	5.8%	7.4%
on first screens	15.1%	16.8%	15.7%	14.0%	11.4%	15.5%
on subsequent screens	7.0%	6.2%	5.6%	5.5%	5.5%	6.2%
Overall Cancer Detection Rate (per 1,000)	2.2	4.0	6.1	8.3	12.9	4.4
on first screens	3.2	7.4	13.3	17.0	27.1	5.3
on subsequent screens	1.8	3.6	5.8	8.0	12.1	4.2
DCIS Detection Rate (per 1,000)	0.7	0.9	1.2	1.4	1.6	1.0
on first screens	1.2	1.6	2.7	2.9	2.7	1.4
on subsequent screens	0.6	0.8	1.2	1.4	1.6	0.9
Positive Predictive Value of Screening Mammography	2.4%	5.6%	10.1%	14.4%	22.4%	6.0%
on first screens	2.1%	4.4%	8.6%	12.3%	24.4%	3.5%
on subsequent screens	2.6%	5.9%	10.3%	14.6%	22.1%	6.9%
Core Biopsy Yield Ratio	16.8%	33.1%	49.4%	59.0%	76.2%	35.2%
on first screens	12.2%	22.3%	37.8%	50.0%	54.5%	18.8%
on subsequent screens	21.7%	36.6%	51.1%	59.7%	79.5%	41.6%
Open Biopsy Yield Ratio	18.1%	27.0%	41.0%	50.0%	69.7%	30.4%
on first screens	15.8%	18.5%	36.4%	43.2%	80.0%	19.9%
on subsequent screens	20.0%	29.7%	41.6%	50.5%	67.9%	34.1%
Interval Cancer Rate (per 1,000)						
0-12 months	0.52	0.47	0.69	0.61	1.04	0.56
after first screens	0.39	0.54	0.88	0.66	‹0.01	0.47
after subsequent screens	0.57	0.46	0.68	0.61	1.10	0.57
13-24 months	‹0.01	0.65	0.90	0.91	1.04	0.52
Sensitivity (i.e. 1 - false negative rate)	80.4%	89.4%	89.9%	93.1%	92.6%	88.7%
Specificity (i.e. 1 - false positive rate)	91.2%	93.3%	94.5%	95.1%	95.5%	93.1%

NOTES:

1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. The final number of cancers in 2011 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: July 24, 2012.

8.6 Outcome Indicators by HSDA: 2007–2011 Cumulative

Outcome indicators for 2007 to 2011 are summarized by HSDA in Table X. The Kootenay Boundary, Okanagan, North and South Vancouver Island regions have the lowest abnormal call rate (5%), while Fraser East has the highest (11%). North Vancouver Island has the lowest cancer detection rate (3.5 per 1,000), and Thomson Cariboo has the highest (5.0 per 1,000). Fraser East has the lowest positive predictive value (4%), and Kootenay Boundary has the highest (10%). Six out of sixteen HSDAs meet the international targets[1] recommended for screening programs.

Table X: SMP Outcome Indicators by Health Service Delivery Area (HSDA) between 2007 and 2011 Inclusive

HSDA	% Called Abnormal	Cancer Detection Rate (per 1000)	PPV	In-Situ : Invasive (number)	% Invasive ≤15 mm	% Invasive with -ve nodes
East Kootenay	8%	4.4	5%	13 : 79	57%	77%
Kootenay Boundary	5%	4.5	10%	25 : 79	62%	68%
Okanagan	5%	4.3	8%	91 : 484	62%	75%
Thompson Cariboo	6%	5.0	8%	90 : 307	58%	72%
Fraser East	11%	4.7	4%	79 : 294	52%	68%
Fraser North	8%	4.1	5%	205 : 594	62%	69%
Fraser South	9%	4.6	5%	247 : 746	62%	71%
Richmond	7%	4.0	6%	86 : 204	63%	68%
Vancouver	9%	4.2	5%	225 : 595	65%	66%
North Shore / Coast Garibaldi	7%	4.8	7%	119 : 359	63%	69%
South Vancouver Island	5%	4.1	8%	88 : 458	56%	67%
Central Vancouver Island	6%	4.7	8%	77 : 388	66%	74%
North Vancouver Island	5%	3.5	7%	26 : 122	71%	75%
Northwest	7%	4.3	6%	23 : 63	57%	63%
Northern Interior	7%	4.4	6%	41 : 152	63%	64%
Northeast	7%	4.6	6%	7 : 52	65%	52%
Program	**7%**	**4.4**	**6%**	**1450 : 5008**	**62%**	**70%**

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: July 24, 2012.

1 Tabàr L, Fagerberg G, Duffy, SW, Day NE, Gad A, Gröntoft O. Update of the Swedish Two-country Program of Mammographic Screening for Breast Cancer. Radiol Clin North Am 1992; 30(1): 187-210

8.7 Cancer Characteristics by Age: Cumulative up to and including 2010

From the start of the program in July 1988 to December 2010, 16,867 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 2010 are summarized by ten-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 2010

Histological Features	Age at Exam 40-49		50-59		60-69		70-79		80+		Age 40+	
Number of Cancers	2,847		4,831		5,188		3,718		283		16,867	
in situ	907	32%	1,226	25%	1,089	21%	658	18%	30	11%	3,910	23%
invasive	1,940	68%	3,605	75%	4,099	79%	3,060	82%	253	89%	12,957	77%
Invasive Cancers Tumour Size												
≤5 mm	197	10%	340	10%	353	9%	223	7%	25	10%	1,138	9%
6-10 mm	382	20%	872	25%	1,103	27%	939	31%	68	27%	3,364	26%
11-15 mm	532	28%	990	28%	1,250	31%	926	31%	69	27%	3,767	29%
16-20 mm	287	15%	600	17%	601	15%	455	15%	46	18%	1,989	16%
>20 mm	511	27%	757	21%	756	19%	480	16%	43	17%	2,547	20%
unknown size	(31)		(46)		(36)		(37)		(2)		(152)	
Invasive Cancers with tumour ≤ 15 mm	1,111	58%	2,202	62%	2,706	67%	2,088	69%	162	65%	8,269	65%
Node Involvement in Invasive Cancers												
no	1,229	70%	2,451	73%	2,917	77%	2,133	81%	136	80%	8,866	76%
yes	538	30%	894	27%	853	23%	507	19%	35	20%	2,827	24%
no nodes sampled / unknown	(173)		(260)		(329)		(420)		(82)		(1264)	
Histologic Grade of Invasive Cancers												
1 - well differentiated	487	27%	1,090	33%	1,256	33%	1,045	38%	85	37%	3,963	33%
2 - moderately differentiated	762	43%	1,369	41%	1,682	45%	1,230	44%	99	44%	5,142	43%
3 - poorly differentiated	542	30%	845	26%	840	22%	496	18%	43	19%	2,766	23%
unknown grade	(149)		(301)		(321)		(289)		(26)		(1086)	
Grade 3 tumour ≤ 15 mm	234	43%	398	47%	442	53%	254	51%	19	44%	1,347	49%

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: July 24, 2012.

8.8 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 to 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 Years

Performance Measure	National Target[1]	SMP
Participation Rate (1)	≥70% of the eligible population	54% (plus 10% MSP)
Retention Rate (2)		
Initial Rescreen	≥75% initial re-screen within 30 months	54%
Subsequent Rescreen	≥90% subsequent re-screen within 30 months	80%
Abnormal Call Rate (3)		
First Screens	<10% first screens	17.8%
Subsequent Screens	<5% re-screens	6.5%
Invasive Cancer Detection Rate (per 1000) (3)		
First Screens	>5.0 per 1,000 first screens	9.0 per 1000
Subsequent Screens	>3.0 per 1,000 re-screens	4.0 per 1000
In Situ Cancer Detection Rate (3)		
First Screens	Surveillance and Monitoring only	2.2 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	79.6%
tissue biopsy performed	≥90% within 7 weeks if tissue biopsy performed	55.6%
Positive Predictive Value (3)		
First Screens	≥5% first screen	6.3%
Subsequent Screens	≥6% re-screens	7.7%
Benign Core Biopsy Rate (per 1000) (3)		
First Screens	Surveillance and Monitoring only	26.4 per 1000
Subsequent Screens	Surveillance and Monitoring only	5.8 per 1000
Benign to Malignant Core Biopsy Ratio (3)		
First Screens	Surveillance and Monitoring only	2.9 : 1
Subsequent Screens	Surveillance and Monitoring only	1.4 : 1
Benign Open Biopsy Rate (per 1000) (3)		
First Screens	Surveillance and Monitoring only	6.9 per 1000
Subsequent Screens	Surveillance and Monitoring only	1.9 per 1000
Benign to Malignant Open Biopsy Ratio (3)		
First Screens	≤1:1	3.1 : 1
Subsequent Screens	≤1:1	2.4 : 1
Invasive Tumour size ≤10 mm (4)	>25%	35%
Invasive Tumour size ≤15 mm (4)	>50%	63%
Node Negative Rate in Cases of Invasive Cancer (4)	>70%	76%

NOTES:

1. Screen years: (1) = July 1, 2009 - December 31, 2011, (2) = 2008-2010, (3) = 2011, (4) = 2010
2. Population data source: P.E.O.P.L.E. 36 population estimates (Aug 2010), BC STATS, BC Ministry of Labour and Citizens' Services.
3. SMP data extraction date: July 24, 2012.

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

8.9 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, results 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/AboutPHSA/PHSA_Budget_Financials/default.htm

Table XIII: Cost Comparison by Fiscal Year

Indicator	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
Total Cost	$18,219,310	$20,311,839	$21,450,188	$21,716,688	$22,304,886
Total cost per screen	$65.54	$69.79	$70.56	$72.34	$74.76
Central Services	$10.46	$13.88	$14.95	$13.89	$16.83
Other operating costs	$39.38	$39.84	$39.85	$42.40	$41.67
Professional Reading Fees	$13.80	$14.08	$14.50	$14.57	$14.64
Capital Allocation	$1.91	$1.99	$1.25	$1.48	$1.62
Cost per cancer detected	$15,434.15	$15,798.52	$16,606.31	$16,853.82	Not Available

NOTES:

1. Number of cancers detected in 2011-12 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 includes the cost of tube replacement.
4. Capital allocation includes 1) capital differential allocated to privately 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 $14.64 per screen effective April 1, 2011.
6. Cost per cancer detected is based upon screens with complete follow-up.
7. The cost per screen is exclusive of salary and benefit increases to public screening centers which, commencing in fiscal 2006, have gone directly to the Health Authority.
8. SMP data extraction date: July 24, 2012.

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 by 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).

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

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 (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 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 effective 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.

Appendix 2 — 2011 SMP Screening Services

In 2011 SMP provided screening mammography to women ages 40 to 79. The recall frequency shown below was used to calculate the program results for the period of January 1, 2011 – December 31, 2011.

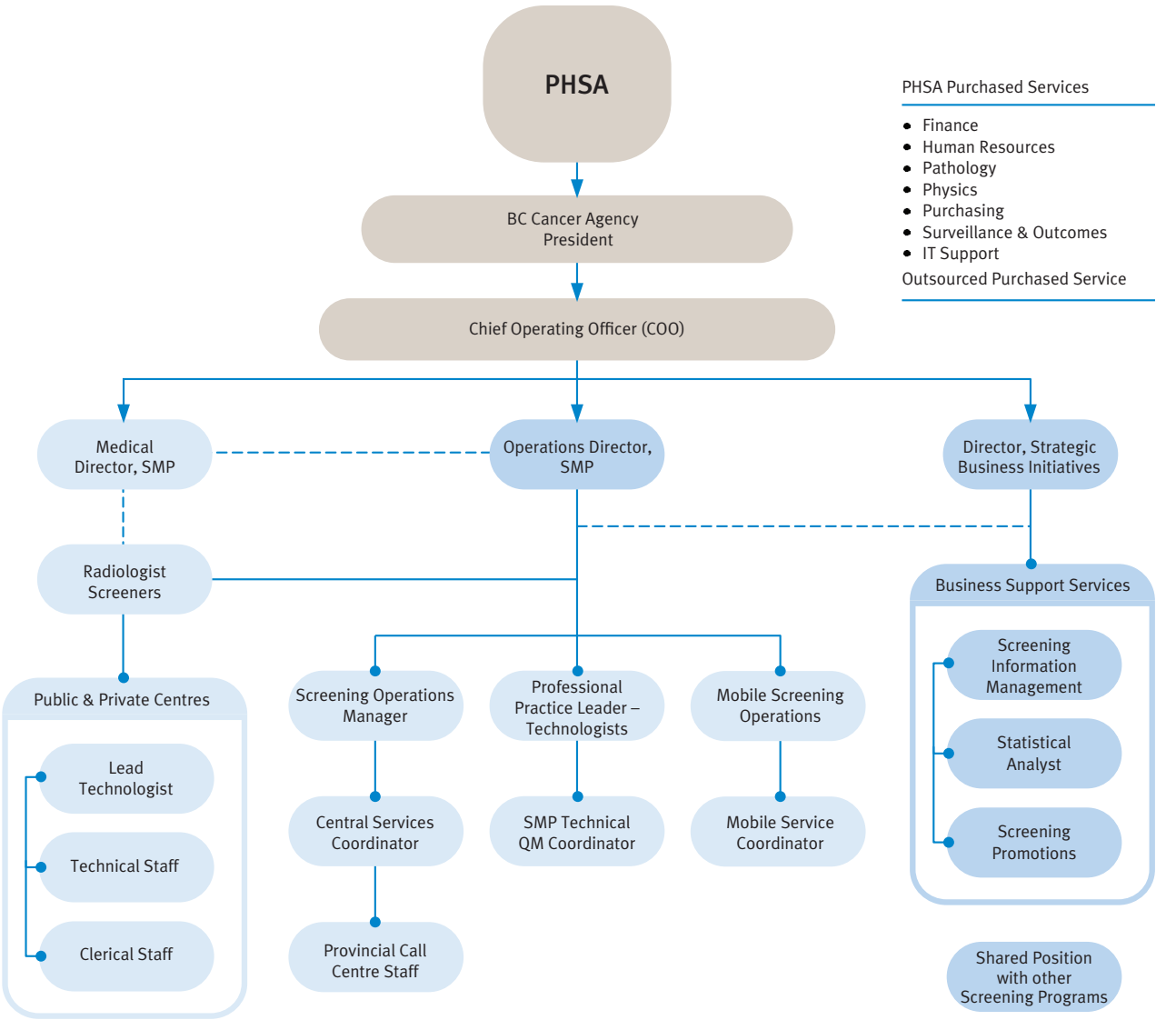
Age	Recall Frequency
<40	Will accept with primary health care provider referral
40-49	Reminders* for 12-month and 24-month anniversary
50-79	Reminders* for 24-month and 36-month anniversary to age 79
80+	Will accept with primary health care provider referral

Eligibility Criteria

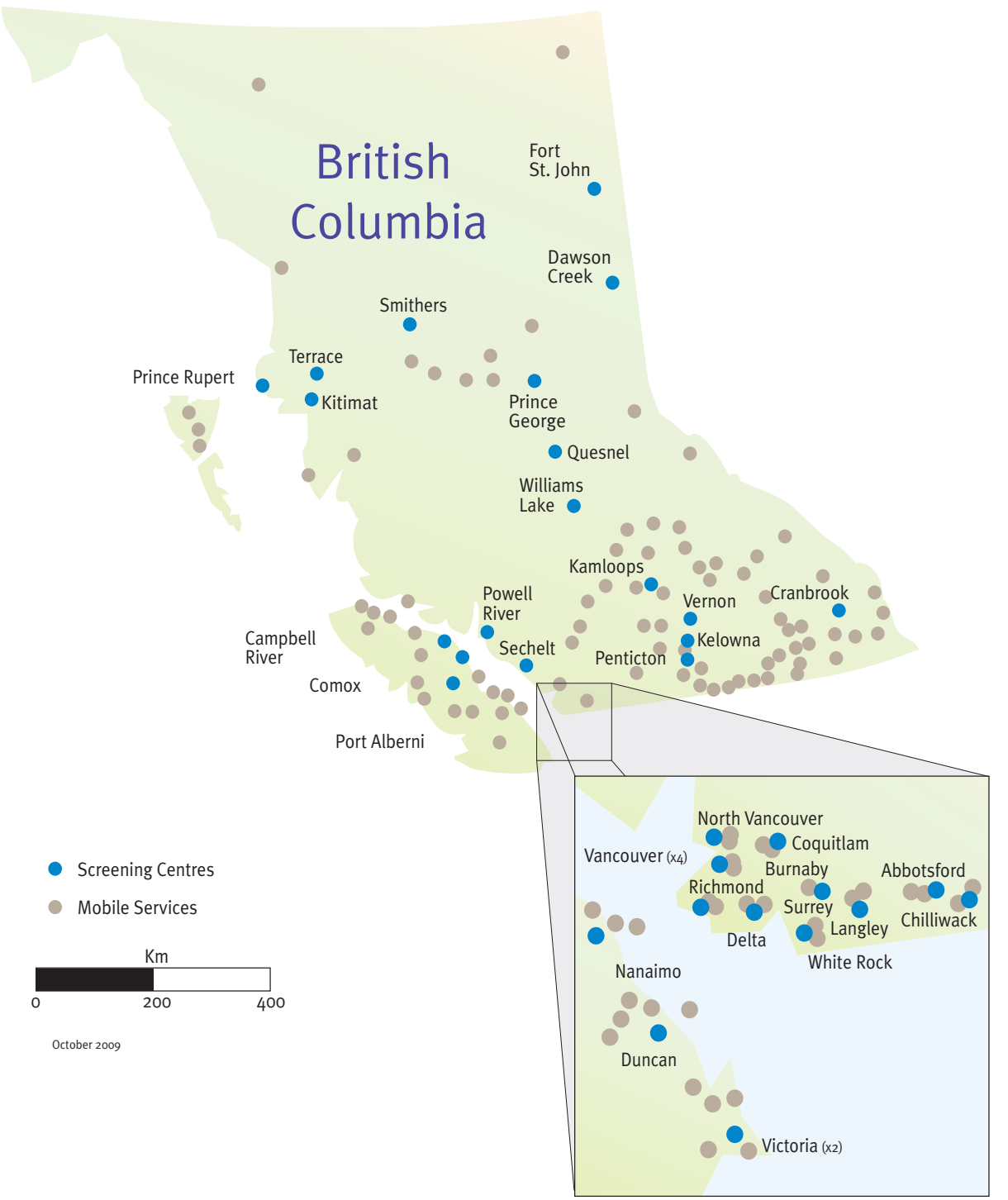
- Have no breast changes*.
- Have not had a mammogram within 12 months.
- Have not had breast cancer.
- Do not have breast implants.
- Are not pregnant or breast feeding.
- Can provide the name of a doctor to receive the results.

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

Appendix 3 — SMP/BCCA Organization Chart



Appendix 4 — Map of Screening Centres



Appendix 5 — Screening Centre Contact Information

Abbotsford	604-851-4750
Burnaby	604-436-0691
Campbell River	1-800-663-9203
Chilliwack	1-800-663-9203
Comox	250-890-3020
Coquitlam	604-927-2130
Cranbrook	250-417-3585
Dawson Creek	1-800-663-9203
Delta	604-946-1121
Duncan	1-800-663-9203
Fort St. John	1-800-663-9203
Kamloops	250-828-4916
Kelowna	250-861-7560
Kitimat	1-800-663-9203
Langley	604-514-6044
Nanaimo	250-716-5904
IK and NLM Mobile	604-877-6232
North Vancouver	604-903-3860
Penticton	250-770-7573
Port Alberni	1-800-663-9203
Powell River	1-800-663-9203
Prince George	250-565-6816
Prince Rupert	1-800-663-9203
Quesnel	1-800-663-9203
Smithers	1-800-663-9203
Sechelt	1-800-663-9203
Richmond	604-244-5505
Surrey – Guildford	604-586-2772
Surrey – JPOCSC	604-582-4592
Terrace	1-800-663-9203
Vernon	250-549-5451
White Rock	604-535-4512
Williams Lake	1-800-663-9203
Vancouver	
BC Women's Health Centre	604-775-0022
Mount St. Joseph Hospital	604-877-8388
5752 Victoria Drive	604-321-6770
#505-750 West Broadway	604-879-8700
Victoria	
#230 - 1900 Richmond Ave	250-952-4232
Victoria General Hospital	250-727-4338

Mobile Screening Service Delivery Areas

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

Lower Mainland locations change from time to time. Latest visits include: Alouette Correctional Centre, BC Biomedical Lab, BCIT Campus, Chilliwack City Hall, Coast Mountain Bus Company, Downtown Eastside Women's Health Centre, Fraser Mental Health, ICBC Head Office, Maple Ridge City Hall, New Vista Society, North Vancouver City Hall, Pacific Blue Cross (Head office, Burnaby) Richmond City Hall SFU Campus, Surrey Tax Centre, Telus, Translink, UBC Campus, Vancouver Primary Care Centre/Native Health, Work Safe BC (Richmond)

First Nations: Alexis Creek, Chehalis/Agassiz, Cultus Lake/Soowhalie, Chawathil, Doig River, Esketemc Nation (Alkali Lake), Fountain, Half Way River, Katzie, Ktunaxa, Mount Currie, New Aiyansh, Port Clements, Saik'uz, Seabird Island, Stellat'en, Sto:Lo, Squamish (North Vancouver), Upper Nicola

Appendix 6 — Educational Materials Order Form

BC Cancer Agency | Screening Mammography Program
CARE + RESEARCH
An agency of the Provincial Health Services Authority

SMP EDUCATION AND PROMOTION ORDER FORM

To order free materials, fax this form to 604-877-6113 or email SMP-BC@bccancer.bc.ca

Item	Languages	Quantity
Appointment Pads		
- Lower Mainland	English	(max. 20)
	Traditional Chinese	(max. 20)
	Punjabi	(max. 20)
- 1-800 number	English	(max. 20)
	Traditional Chinese	(max. 20)
	Punjabi	(max. 20)
Brochure - Pass it On	English	(max. 50)
	Traditional Chinese	(max. 50)
	Punjabi	(max. 50)
CD – PowerPoint (no audio) How a Screening Mammogram is Given	English	(max. 5)
	Traditional Chinese	(max. 5)
	Punjabi	(max. 5)
	English/Punjabi	(max. 5)
	English/Chinese	(max. 5)

ENGLISH ONLY ITEMS

Item	Quantity
DVD – Video (with audio) Having a Screening Mammogram	(max. 5)
Give-away Items for events - Bookmarks	(max. 50)
- Fridge magnets	(max. 50)
- Recipe Cards (max. 500)	
▪ Carrot Soup	
▪ Chili	
▪ Mango Salad	
▪ Salmon	
▪ Tomato Soup	
Health Check Card (Aboriginal)	(max. 50)
Posters - Pass it On	(max. 5)
- Why Mammograms are Important	(max. 5)
- Balancing Health Needs (Aboriginal)	(max. 5)

FAX 604-877-6113 OR
EMAIL: SMP-BC@bccancer.bc.ca
Please provide your address and phone number

Name: _____

Address: _____

_____

Postal Code: _____

Phone: _____

To give feedback on these resources contact Javis Lui, Screening Promotions Coordinator at 604-707-5927 or by email: javis.lui@bccancer.bc.ca

Copies of this order form are available at: www.smpbc.ca

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

Appendix 7 — Glossary

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

$$\text{Abnormal Call Rate} = \frac{\text{Number of exams called abnormal}}{\text{Total number of exams}} \times 100\%$$

- **Benign Core Biopsy Rate:** Proportion of cases with complete follow-up that resulted in a benign core biopsy for diagnostic purposes, 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 for diagnostic purposes, 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.

- **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.
- **Node Negative Rate in Cases of Invasive Cancer:** Proportion of invasive cancers in which the cancer has not invaded the lymph nodes.
- **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.
- **Participation Rate:** The percentage of women who have a screening mammogram within 30 months as a proportion of the eligible population. The eligible population is estimated by the weighted average of the three-year population from forecast.
- **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 Ni is the number of prevalent screens for age group i, Cai is the number of cancers detected in prevalent screens for age group i and Ri 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”.

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

Appendix 9 — Committees

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Dr. Kathy Ceballos
Dr. Stephen Chia
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Dr. Greg Shand
Dr. Stuart Silver
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Dr. Lynette Thurber
Dr. Tim Wall
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Appendix 10 — Radiologist Screeners

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Dr. Tahir Khalid
Dr. Marion J. Kreml*
Dr. Caroline Pon

Burnaby & Richmond
Dr. Bill Collins
Dr. Nancy Graham*
Dr. Henry Huey
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Dr. Robert Van Wiltenburg

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Dr. Julie Nicol

Interior/Kootenay
Dr. Dorothy Harrison
Dr. Colin Mar
Dr. Christine Wilson*
Dr. Charlotte Yong-Hing

Kamloops
Dr. Michael Clare*
Dr. Donal Downey

Alphabetical Listing

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Dr. Catherine Staples*
Dr. Timothy Wall*

Langley
Dr. Ron Campbell
Dr. John Matheson*

Nanaimo/Islands & Coastal Mobile
Dr. David Coupland
Dr. Rob Johnson*
Dr. Zenobia Kotwall
Dr. David O'Keeffe*
Dr. Paul Trepanier

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

Penticton
Dr. Peter McNicholas*
Dr. Stacey Piche

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Dr. Alasdair Leighton
Dr. Greg Shand*

Sechelt
Dr. Patrick Llewellyn*
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Dr. Fin Hodge
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Dr. Stuart Silver*
Dr. Paul Sobkin
Dr. John Wrinch

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

* Indicates Chief Screener

Appendix 11 — Publications & Presentations

Publications

Andy Coldman

Coldman A, Phillips N. Population studies of the effectiveness of mammographic screening. Prev Med. 2011 Sep; 53(3):115-7. Epub 2011 Jul 21

Olson RA, Nichol A, Caron NR, Olivotto IA, Speers C, Chia S, Davidson A, Coldman A, Bajdik C, 4Tyldesley S. Effect of community population size on breast cancer screening, stage distribution, treatment use and outcomes. Can J Public Health. 2012 Jan-Feb;103 (1):46-52.

Christine Wilson

"Flat Ductal Intraepithelial Neoplasia (DIN1A) Diagnosed at Stereotactic Core Needle Biopsy: Is Excisional Biopsy Indicated?" A. Becker, P. Gordon, D. Harrison. P. Hassell, M. Hayes, D. Van Niekerk, C. Wilson. AJR

Paula Gordon

The Intelligent Patient Guide to Breast Cancer. All you need to know to take an active part in your treatment. Contributing author, multiple chapters. By Olivotto I, Gelmon K, Kuusk U. 5th Edition 2011 Published by Intelligent Patient Guide, Vancouver, BC,

Rasika Rajapakshe

"Quality Assurance Programme for Digital Mammography", International Atomic Energy Agency Human Health Series No 17 (www-pub.iaea.org/MTCD/Publications/PDF/Pub1482_web.pdf), (2011)

R Rajapakshe, S McAvoy, C Bitgood, E Ostroumov, "A Web-based Survey Software Framework for Rapid Survey Deployment and Results Analysis for Breast Cancer Risk Assessment" In Radiological Society of North America Scientific Assembly and annual meeting program. RSNA, Oakbrook Ill. LL-INS-TH9A (2011). http://rsna2011.rsna.org/search/event_display.cfm?printmode=n&em_id=11010228

Presentations and Lectures

Nancy Aldoff

Screening Mammography Can Save Lives, Canadian Breast Cancer Foundation Pink Tour, Kelowna, BC, September 1, 2011

Andy Coldman

Population Studies of the Effectiveness of Mammographic Screening, Canadian Partnership Against Cancer (CPAC): Cancer Risk Management Breast Cancer Model Working, October 2012

Applied Cancer Research: Population Health Screening: Canadian Centre in Applied Research in Cancer Control (ARCC), May 2012

Cancer Screening Issues & Trends: BC Cancer Agency Research Seminar Series, March 2012

Breast Cancer Model: Canadian Partnership Against Cancer (CPAC): Cancer Risk Management

Committee, February 2012

Pan-Canadian Mortality Analysis: Canadian Breast Cancer Screening Initiative (CBCSI/CPAC), January 2012

False Positive Analysis in BC: SMP Annual Forum 2011, October 2011

Paula Gordon

Breast Ultrasound, part 2. Aug 3, 2011 UBC Residents' Academic Half-Day

Image-Guided Breast Biopsy. Sep 14, 2011 UBC Residents' Academic Half-Day

Digital Mammography and Applications, Sep 14, 2011, UBC Radiology Grand Round

Screening Mammography, Sep 26, 2011, UBC School of Population and Public Health

Challenging Cases. 10th Postgraduate Course, Society of Breast Imaging, San Antonio, Texas, May 18-21, 2011

Small Parts Interventional Ultrasound (Hands-on Workshop), Radiological Society of North America Annual Meeting, Chicago, IL, Dec 1, 2011.

Ultrasound Guided Breast Interventional Procedures ("Hands-on" Workshop), Radiological

Society of North America Annual Meeting, Chicago, IL, Nov 29, 2011.

Breast Ultrasound Scientific Session – Moderator, Radiological Society of North America Annual Meeting, Chicago, IL, Nov 27, 2011.

Zhang C, Lewis D, Nasute P, Warren L, Gordon P. The Negative Predictive Value of US-Guided 14-Gauge Core Needle Biopsy of Breast Masses: a validation study of 339 cases. UBC Medicine Undergraduate Research Forum, Mar 15, 2012.

Zhang C, Lewis D, Nasute P, Warren L, Gordon P. The Negative Predictive Value of US-Guided 14-Gauge Core Needle Biopsy of Breast Masses: a validation study of 339 cases. UBC Multidisciplinary Undergraduate Research Forum (MURC), Mar 24, 2012

Janette Sam

Provincial Breast Health Strategy – A Social Marketing Plan – Janette Sam, Screening Mammography Forum 2011, Vancouver, BC, October, 29, 2011

BC Cancer Conference – Poster - Characteristics of Women Who Did Not Return for Screening Mammography Regularly. Christina C.Y. Chu, Lisa Kan, Janette Sam, Vancouver, Dec 1-3, 2012

Digital Mammography in the Screening Mammography Program – Janette Sam and Dr. Christine Wilson, Provincial SMP Webinar – July 17, 2012

Christine Wilson

Speaker, BCAMRT Annual Meeting and Conference, MRI Guided Breast Biopsies, tips and techniques, April 8th, 2011.

Speaker, BCAMRT Annual Meeting and Conference, Provincial Breast Health Strategy, Vancouver, BC, April 8th, 2011.

Moderator and Speaker, Screening Mammography Forum, Provincial Breast Health Strategy Overview and Percutaneous Stereo Core Breast Biopsies – When, How and Often. Vancouver, BC, Oct 29th, 2011.

Speaker, Tour of all the Health Authorities in the province November and December, 2011 – Provincial Breast Health Strategy.

Speaker, St Paul's CME for Family Physicians; Controversies in Breast Imaging; Vancouver, BC, Nov 17th, 2011.

Paget's Disease: Imaging Review of a Clinically Diagnosed Breast Cancer; Paola Nasute Fauerbach, Kathy Ceballos, Christine Wilson; BCCA Annual Cancer Conference 2011, Vancouver, BC.

Guest Lecturer, Multidisciplinary Breast Rounds and Tumour Board; SMPBC – Challenges and Successes; Queen's Health Centre, Honolulu, HI. Jan 12th, 2012.

Visiting Professor, Royal Prince Alfred Health Centre, University of Sydney, Sydney Australia and the New South Wales Breast Screen Program Jan 20th – 23rd, 2012. Two lectures: SMPBC – Challenges and Successes and Breast MRI Utilization: a Regional Cancer Centre Perspective; a teaching session on Breast MRI as well as visiting the multidisciplinary Breast Clinic.

Linda Warren

Welcoming Address, Screening Mammography Program of British Columbia, Vancouver, BC, October, 22-23, 2010

Screenee Complaints – What Have We Learned, Screening Mammography Program of British Columbia, Vancouver, BC, October, 22-23, 2010

Refresher Course - Mammography Reporting – BI-RADS and Lexicon, RSNA 96th Scientific Assembly and Annual Meeting, Chicago, IL, November 27 – December 3, 2010

Panel – Hot Topics, RSNA 96th Scientific Assembly and Annual Meeting, Chicago, IL, November 27 – December 3, 2010

Refresher Course – Round Table Question and Answer With the Experts, Running an Efficient Practice – Society of Breast Imaging 10th Postgraduate Course San Antonio, Texas May 19, 2011

Appendix 12 — SMP/BCCA Contact Information

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An agency of the Provincial Health Services Authority

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Centre for the North
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Prince George, BC V2N 7E9
250.645. 7300 or toll-free 1.855.775.7300

Fraser Valley Centre
13750 96th Avenue
Surrey, BC V3V 1Z2
604.930.2098 or toll-free 1.800.523.2885

Sindi Ahluwalia Hawkins Centre for the Southern Interior
399 Royal Avenue
Kelowna, BC V1Y 5L3
250.712.3900 or toll-free 1.888.563.7773

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Vancouver, BC V5Z 4E6
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Vancouver Island Centre
2410 Lee Avenue
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