



BC Cancer Agency

CARE + RESEARCH

An agency of the Provincial Health Services Authority

Screening Mammography Program

Screening Mammography Program 2011 Annual Report



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1.0 Message

Message from the BC Cancer Agency Chief Operating Officer

We are happy to provide this 2011 Screening Mammography Program annual report summarizing the new initiatives and ongoing activities of the program as well as the program results for 2010. It represents the efforts of the many dedicated radiologists, technologists, clerical and program staff across the province in service to the women of BC.

In this report we also recognize and appreciate Dr. Linda Warren for her valued leadership and contributions to the Screening Mammography Program since its inception.

The Screening Mammography Program continues to be actively involved in the Provincial Breast Health Strategy. You will find an update on the progress of the strategy to date as well as the next steps planned for the coming year.

We hope you find this report to be informative and helpful, and we appreciate your interest and continued support of the Screening Mammography Program of BC.

– *Karim Karmali*

Message from the Screening Operations Leader

This past year has been a very busy time for the Screening Mammography Program. I am pleased to share with you some of the research, developmental activities, and partnerships we have engaged in.

We continue to work towards improving and increasing access for the women of BC. This past year we opened a brand new centre in Surrey as well as reorganized the provincial mobile services. The quality of our services is important to us, and the Physics Support Group has continued to provide leadership around the development of digital mammography standards.

Looking forward, I am excited about our participation in the Provincial Breast Health Strategy and our role in contributing to improving BC's breast health system. Together we will make a difference.

– *Janette Sam*

Message from the Medical Director

I am excited to be joining the Screening Mammography Program during an important period of change that we anticipate will lead to an improvement in screening capacity through digital mammography, as well as optimal and timely care for all women as they journey through the pathway from screening through to diagnosis.

During my involvement with the Provincial Breast Health Strategy over the past year and a half, I have become aware of how valuable and important our well established Screening Mammography Program is for the women we serve. Each one of us plays a crucial role in the detection of breast cancer – from the receptionist at the front desk who greets the patients to the technologists who perform the exams and the screeners who interpret them, as well as the central office staff that keep the program running smoothly. This is a time for us to build on our past successes and look toward a future where the screening and diagnostic pathways are integrated to create a cohesive province-wide breast health system.

In BC, we have some of the best cancer outcomes in the world and SMP is a key element of this success. I look forward to working with all of you who have played such an important role in this achievement.

– Dr. Christine Wilson



About Dr. Christine Wilson

Dr. Wilson is a BC Cancer Agency (BCCA) radiologist who specializes in breast imaging. She is the Chief Screener for two of the program's mobile screening units and a member of the Breast Tumour Group. Dr. Wilson is well-known for her work to help advance the first MR-guided breast biopsies in BC.

She is a clinical associate professor at UBC and a member of BC's Diagnostic Accreditation Program Mammography Advisory Board, where she contributed to the development of the provincial diagnostic mammography standards.

An active member of the Provincial Breast Health Strategy, Dr. Wilson currently chairs the Provincial Breast Health Clinical Pathway project, and is a member of both the Provincial Breast Health Steering Committee and the Provincial Digital Mammography working group.

2.0 Executive Summary

The Screening Mammography Program (SMP) began in 1988, and July 2011 heralded the start of the 23rd year of the program. The goal of the SMP is to reduce breast cancer mortality by detecting breast cancer as early as possible. The Ministry of Health Services continues to provide additional funding towards meeting the goal of 70% participation in women ages 50 to 69.

In this past year of operation, we have:

- performed 303,157 examinations and detected 1,271 cancers,
- opened a new centre in Surrey,
- opened a Vancouver head office for our mobile services, and
- appointed Dr. Christine Wilson to the role of Medical Director. The Medical Director role is responsible for providing leadership and clinical expertise to the Screening Mammography Program.

Since the inception of the program in 1988 to the end of 2010, we completed over 4.3 million screening mammograms and detected breast cancers in over 16 thousand women. 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's Valued Leadership

The Screening Mammography Program has been fortunate to have Dr. Warren provide leadership and clinical oversight as the Provincial Chief Radiologist. Dr. Warren has been with the Screening Mammography Program (SMP) since its inception and has been an integral part of the program's success.

Dr. Warren has observed many changes in screening in BC over the last 25 years. Starting in the mid-1980's, favourable results of mortality reduction from screening programs in New York State, Sweden, and the Netherlands had been published, and the concept of screening had spread throughout Europe and North America. Dr. Warren had an opportunity in 1986 to visit Screening Programs in Sweden, England, the Netherlands, and Germany while on sabbatical in Europe, and had a chance to observe first hand how the successful published results were achieved.

At the same time, the first reports in North America on low cost screening were published. All of this momentum resulted in collaboration of the BCCA Breast Tumour Group under the Chairmanship of Dr. Basco and the BC Radiological Society, which Dr. Warren represented. Together they developed a 'made in British Columbia' proposal for early detection of breast cancer in late 1987. They presented their proposal to the Medical Services Commission in 1988. Their budget was approved and they received a grant of \$400,000 to complete nine thousand examinations. They welcomed their first patient on June 19, 2008 and to everyone's great relief, they came in on budget at \$35 per examination. This was considered a significant achievement for the time.

Dr. Warren's strong leadership led BC to be the first province in Canada to establish an organized screening program. Over the years SMP and Dr. Warren have been recognized both nationally and internationally by such societies as the American Cancer Society, the Society of Breast Imaging, and radiological societies throughout North America and Europe. Dr. Warren has had the privilege of being invited to speak internationally including North America, Europe, South America, Asia, Australia, New Zealand, and Saudi Arabia.

The Agency would like to thank Dr. Warren for her significant support and contributions to the SMP. Her commitment and dedication over the years has resulted in a world-class screening program. Dr. Linda Warren now has the opportunity to step into the role of Medical Imaging Consultant for SMP where she will continue to share her expertise and advice relating to breast cancer screening and quality assurance.

3.0 Program Overview

The Screening Mammography Program (SMP) is a province-wide, organized breast screening program that provides breast screening for women ages 40–79. Breast screening finds cancers when they are small and less likely to spread.

Through early detection most women will have:

- more treatment options,
- a reduced chance of cancer recurrence, and
- improved survival rates.

Mammography (x-ray of the breast) is the screening test used in breast cancer screening. SMP provides standard two-view bilateral mammography to BC 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 in BC if they have had breast cancer, breast implants, or if they currently have breast symptoms requiring a diagnostic investigation.

Centres and Mobile Services

There are 38 fixed centres in many city locations across the province. In addition, there are 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 abnormality identified on screening.
4. Screening reminder at the appropriate interval.

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 an abnormal screening report and the first assessment procedure is one and a half weeks¹ less for patients on Fast Track referral. In 2010 Fast Track became the standard process for all women.

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 (Section 9). Age-specific breast cancer incidence and mortality rates are tracked in conjunction with the BC Cancer Registry.

PATIENT FEEDBACK ►

I just wanted to say thank you very much from the bottom of my heart as my recent mammogram detected early stages of breast cancer. Yesterday I had a lumpectomy and if it wasn’t for that mammogram I wouldn’t have known that I had breast cancer, as I had no symptoms and didn’t feel that particular lump. I have been telling every woman I know how important having that mammogram is from my own experience! Your program has saved the lives of millions I’m sure, including my own, and there are no words to describe how truly thankful I am.

¹ Borugian MJ, Kan L, Chu C, Ceballos K, Gelmon KA, Gordon PB, Poole B, Tyldesley S, Olivetto IA. Facilitated “Fast Track” referral reduces time from abnormal screening mammogram to diagnosis. Canadian Journal of Public Health 2008; 99(4):252-56.

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.
- SMP Technologist Writing Contest.
- A Technologist Newsletter.
- An educational event at the Annual SMP Forum with continuing medical education (CME) credits. BCIT students are invited to attend.

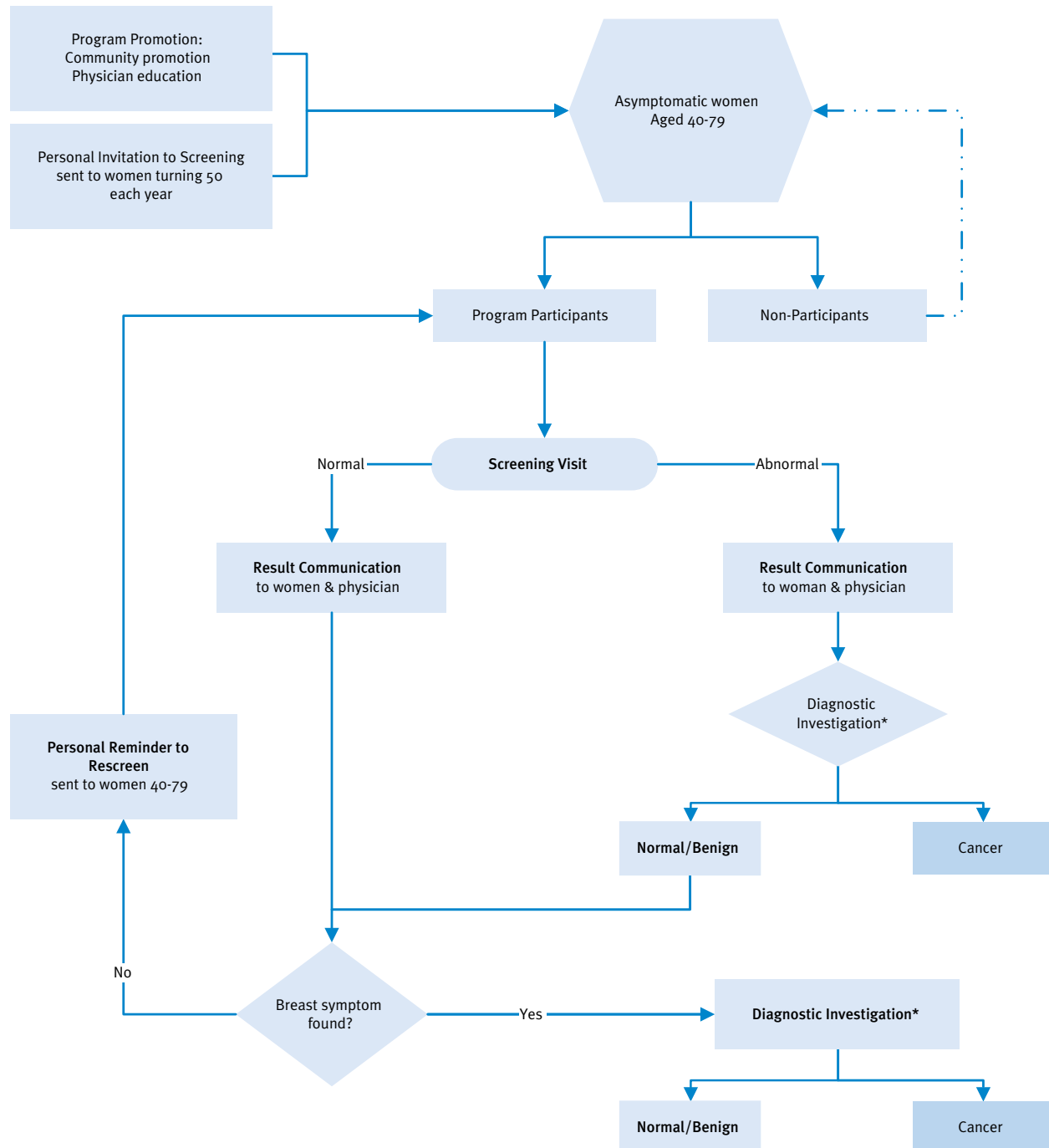
Quality standards and systems in the SMP are developed based on guidelines and recommendations from the Canadian Association of Radiologists (CAR), Public Health Agency of Canada (PHAC), the Canadian Association of Medical Radiation Technologists (CAMRT), the BCCA Physics Support Group, and the scientific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

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.

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

Regular Promotion and Education Activities

Ongoing promotion activities include:

- Regular presence at health fairs and events through the BC Cancer Agency's Prevention group.
- Partnering with local health advocates helping educate women in their communities about the importance of screening.
- 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 service.
- A "BreastCheck" Twitter account that promotes relevant information about screening and breast cancer.

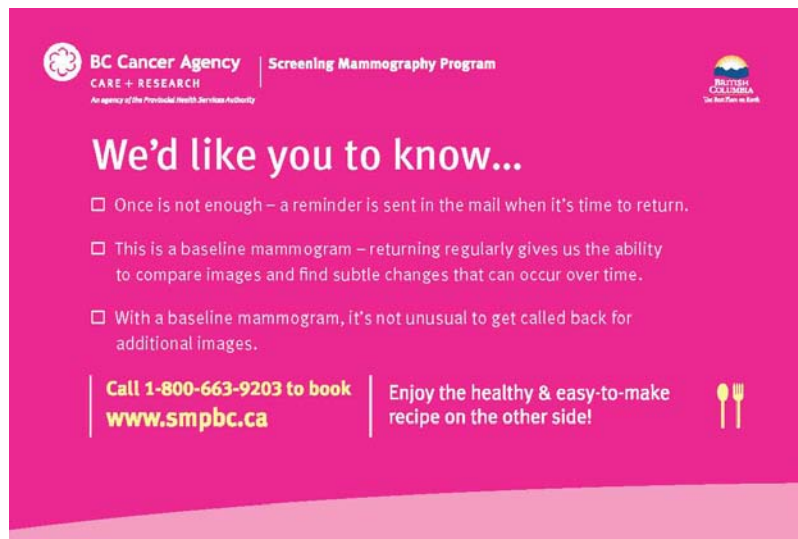
SMP has developed a number of promotional materials to help educate and raise awareness, which can be ordered through the website (www.smpbc.ca).

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:

First Time Screenee Retention

A review of the subsequent screen return patterns for first time screenees for SMP identified that approximately 20% of women who undergo a first screen never return. A working group of technologists and clerical staff was developed to investigate and make recommendations regarding actions and support materials that could be developed for women who attend for their first appointment. The materials developed include information on the importance of returning for regular screening. These materials were rolled out to the centres in June 2011. The effect of these new retention initiatives will not be measurable for at least two years.



MA Report Review

The MA report is the standardized report form that is used for the collection of patient information and standardized reporting of the examination. A working group of radiologists and technologists was convened to review the report to ensure that the structure and information on the report form met current standards required for patient care. Recommendations from the working group led to a streamlined new form. After testing and review the new form was rolled out to all of the centres in January, 2011.

Body World Campaign

During Breast Cancer Awareness month in October, BODY WORLDS offered the SMP free tickets to the new BODY WORLDS & The Brain exhibition at the TELUS World of Science. First-time users of the Screening Mammography Program were eligible to receive tickets when they booked their appointments.

Punjabi Phone Line

SMP supports the Canadian Cancer Society's South Asian initiative in the Fraser Valley by providing a Punjabi phone line. The phone line allows Punjabi speaking people to leave a call-back number to book an appointment. An SMP booking clerk who speaks Punjabi returns the call, usually within 48 hours.

Online Appointment Request Tool

The SMP website is one tool that can be used to motivate women to book an appointment. In the absence of online booking technology capability, SMP developed an online appointment request form located on the SMP website. Women can fill out the form and request that the call centre contact them to book an appointment. The call centre reviews the requests and responds within two business days. This new booking tool has generated significant activity, especially during the evening and weekend hours when the call centre is typically closed.

Targeted Phone Recall Campaign

SMP sends reminder letters to women when they are due for their next screening mammogram. A percentage of women may not respond to the letters within the appropriate screening interval. A targeted phone recall campaign has begun for women who are overdue for their next screening exam. Feedback from screening clients indicates that they appreciate being contacted directly to book their next exam.

The PINK Tour

The PINK Tour is a BC education initiative to encourage women 40–79 years of age to take advantage of the province's screening mammography program. The highlight of the four-month-long program organized by the Canadian Breast Cancer Foundation was a 45-foot branded bus that traveled through more than 50 BC communities. SMP staff and technologists met up with the bus in their local areas to greet visitors to the bus and help provide education around the importance of regular screening examinations.



5.0 Professional Development and Academic Activities

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.

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

Annual SMP Forum

The SMP annual scientific forum was held October 22-23, 2010. This year saw record participation with attendance of 306 participants, including 69 radiologists and 185 registered technologists. The 2010 program focused on digital mammography technology and transition, breast MRI, and centre quality assurance activities. In addition, a Friday evening event occurred for technologists that included recognition, awards, announcements, and a lecture about the clinical pathway after breast screening.

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. Constance Lehman, MD Professor and Vice Chair of Radiology and Section Head of Breast Imaging, University of Washington Medical Center; Director of Imaging, Seattle Cancer Care Alliance

Our local presenters included:

- Dr. Paula Gordon, Clinical Professor Department of Radiology, UBC and Chair of Academic Committee of BC
- Dr. Linda Warren, Provincial Chief Radiologist SMPBC, Clinical Professor Department of Radiology, UBC
- Dr. Urve Kuusk, Clinical Associate Professor, Department of Surgery
- University of British Columbia. Medical Director, Mount St. Joseph's Rapid Access Breast Clinic
- Dr. Stephen Chia, Medical Oncologist and Chair, Provincial Breast Tumour Group, British Columbia Cancer Agency
- Ms. Janette Sam, Screening Operations Leader, BC Cancer Agency Screening Mammography Program
- Dr. Rasika Rajapakshe, Senior Medical Physicist, BC Cancer Agency, Southern Interior

6.o 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 working groups:

- 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 2005 and 2006 Editorial Committee, Ms Christina Chu, Biostatistical Analyst, Cancer Surveillance & Outcomes, Population Oncology, BC Cancer Agency
- Underserved Population Working Group, Ms Ann MacDonald, Promotions Specialist, SMP

PATIENT FEEDBACK ►

I have to say that this was the easiest (and most comfortable – relatively speaking), mammogram (or other breast screening) I've experienced. The technician took the time to share some breathing and muscle relaxing tips to make the mammogram less painful, and had a terrific (and humorous) manner that immediately put me at ease.

7.0 The Provincial Breast Health Strategy

The Screening Mammography Program of BC (SMP) has been actively involved in BC's Provincial Breast Health Strategy (PBHS) since the PBHS launch in June 2010. SMP program leaders and radiologists are part of the Provincial Steering Committee and the project teams. Together, we are making some concrete steps toward improving BC's breast health system.

The purpose of the PBHS is to reduce deaths from breast cancer by providing women with timely, equitable access to high-quality breast cancer screening, diagnostic and prevention services. Over the next year, you will begin to see changes within the system to address some of the challenges that currently exist.

Background

In 2010, the Ministry of Health (MoH) asked the Provincial Health Services Authority (PHSA) to develop a Breast Health Action Plan (BHAP) for the province. The research that took place to develop the BHAP included interviews with breast health leaders and clinicians working in urban and rural communities across the province, as well as a review of documents, policies, brochures, reports, etc. related to breast cancer screening and diagnosis.

As a result, the BHAP shows aspects of the system that need to be improved and presents some solutions. For example, the BHAP highlights BC's ongoing need to attract more high-risk women into screening, especially women in the 50 to 69 age group. It also shows the need to make changes to some of our current practices to ensure that women get optimal and timely diagnostic care following an abnormal mammogram or the discovery of a physical breast problem.

Recognizing the importance of the BHAP, the MoH asked the PHSA to put the plan into motion. As a result, the PBHS was formed. For the first time this unites government, health authorities, and community partners toward the common goal of improving the breast health system. The PBHS is currently co-chaired by Brian Schmidt, Acting President, BC Cancer Agency, and Jan Christilaw, President, BC Women's Hospital and Health Centre. Community partners include the Canadian Breast Cancer Foundation, the Canadian Cancer Society, the BC Radiological Association, the University of BC, and the British Columbia Institute of Technology.

The purpose of the PBHS is to look at problems, identify potential solutions, develop specific action steps, and begin implementation. The changes that result will be integrated into ongoing operations across BC's breast health system.

Progress to Date: Significant progress has been made since the PBHS was launched. The Provincial Steering Committee and the project teams have been focusing on key areas of the current breast health system and developing strategies to improve services. Leaders from the partner organizations, as well as radiologists, surgeons, pathologists, primary care physicians, medical imaging technologists, and other professionals, have been an important part of this process.

In conjunction with the Annual SMP Forum in October 2010, the PBHS held a Provincial Breast Health Summit to engage a range of health care leaders, breast health clinicians, and breast cancer survivors to inform the planning and help to develop actions for the PBHS. This input helped to shape the ongoing work of the PBHS project teams. The teams' progress to date is outlined below:

Clinical Pathway Team: With input from radiologists, oncologists, surgeons, and health authority leaders, this team has developed a recommended clinical pathway, "hub and spoke" framework and standards aimed at providing women with optimal and timely care from an abnormal screening result or the discovery of a physical abnormality in the breast to the point of definitive diagnosis. Planning is now underway to pilot the pathway and framework in several urban and rural centres in the coming months.

Digital Mammography Team: The group working on this project includes members from the SMP, PHSA Information Management/Information Systems and breast imaging clinicians/administrators from urban and rural centres. Over the past year, this team developed provincial digital mammography equipment specifications, an inventory of equipment currently in use across BC, and a request for proposals (RFP) to provide province-wide pricing options. A business case for the replacement of aging equipment and related information systems infrastructure throughout the province has now been developed. This is based on the projected needs for both screening and diagnostic services across the province to 2017.

Prevention Team: This group is focusing on both primary and secondary (screening) prevention, including a review of BC's screening policy and the development of an evidence-based, collaborative, and consistent approach to primary prevention that can be integrated with existing healthy living programs.

Workforce Team: This team continues to examine the training, recruitment and retention requirements for breast health professionals (with a major focus on medical radiation technologists, radiologists and the potential role of coordinators/navigators) to ensure that BC has a sufficient number of qualified people to meet current and future needs of women requiring breast health services.

Community Engagement Team: This ad hoc team organized the Provincial Breast Health Summit.

Integration Team: Recognizing that the breast health system can function most efficiently as a whole, this team continues to identify and address overlapping issues between the PBHS project teams. This includes the potential for a shared governance and management model for screening mammography, and the establishment of performance indicators that can be tracked by health authority and local health area.

Next Steps: The PBHS has now progressed from the assessment and planning stage to the point where specific action steps can be finalized and implemented. Key actions for 2011/12 include:

- Working with health authorities to plan, implement, and evaluate the clinical pathway and “hub and spoke” model – this includes a strategy to help create family physician linkages to the hubs in order to help women without family physicians access screening.
- Developing digital screening and diagnostic mammography equipment replacement plans with each health authority, as well as plans for integrated information systems to support digital imaging.
- Finalizing the BC Breast Cancer Screening Policy and aligning SMP practice to policy.
- Developing and implementing mammography recruitment strategies for “hard to reach” women, including aboriginal women, rural women, and women from ethnic communities.
- Developing a collaborative social marketing strategy and website (that can be used by all PBHS partners) to provide evidence-based breast cancer screening and prevention messages to BC women and their health care providers.
- Creating a provincial cross-training program for mammography and ultrasound technologists.
- Increasing opportunities for radiology residents to receive breast imaging training (i.e. through fellowships, etc.).
- Establishing a provincial governance structure for breast cancer screening.

For more information: If you would like more information about the PBHS, please visit www.phsa.ca/HealthProfessionals/pbhs/default.htm or send an email to pbhs@phsa.ca

8.0 Biennial Participation Measurement in Screening Mammography

Screening mammography is a bilateral mammography exam given to apparently healthy individuals to identify those who may have signs of breast cancer. Biennial (every second year) screening mammography is recommended for healthy women ages 50–69 across Canada.

The Canadian Partnership against Cancer (CPAC) sponsored a review in 2009 to examine how biennial screening participation should be measured in Canada. The review reported that while provincial screening programs in Canada have been using a time frame of 24 months to measure the biennial participation rate, other international jurisdictions typically use a longer time frame, with 30 months being the most common measurement window used¹. Furthermore, retention rates in the Canadian programs have shown that only about 30% of women returned by 24 months². A cut-off at 30 months would be more reasonable, as this allows women some time to respond to reminders about re-screening. Thus, there is consensus in Canada to shift the measurement window for biennial screening participation from 24 months to 30 months.

SMP adopted this new measurement window for reporting participation April 1, 2011. In this report the measurement window has been shifted from 24 months to 30 months with the overall provincial participation report being reported as 54% for 2010 (refer to Figures 8.1 and 8.2).

¹ Gregory Doyle, Diane Major, Christina Chu, Agata Stankiewicz, Marion Harrison, Verna Mai, Jay Onysko, Lisa Pogany, **A Review of Screening Mammography Participation and Utilization in Canada**; Canadian Partnership Against Cancer. March 2010.

² Riaz Alvi, Judy Caines, Christina Chu, Theresa Comeau, Gregory Doyle, Song Gao, Eshwar Kumar, Andre Langlois, Vicky Majpruz, Rene Shumak, Bin Zhang; **Organized Breast Cancer Screening Programs in Canada Report on Program Performance in 2005 and 2006**; Public Health Agency of Canada. August 2011.

FIGURE 8.1: PARTICIPATION RATE BY HEALTH AUTHORITIES—24 MONTHS VS. 30 MONTHS

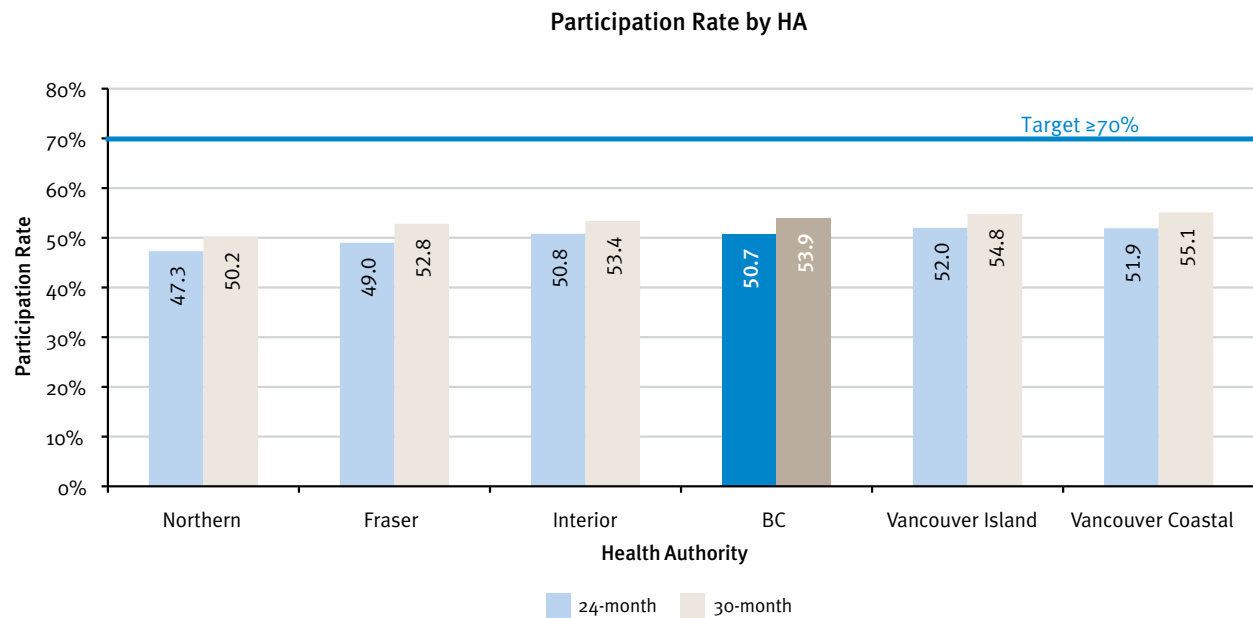
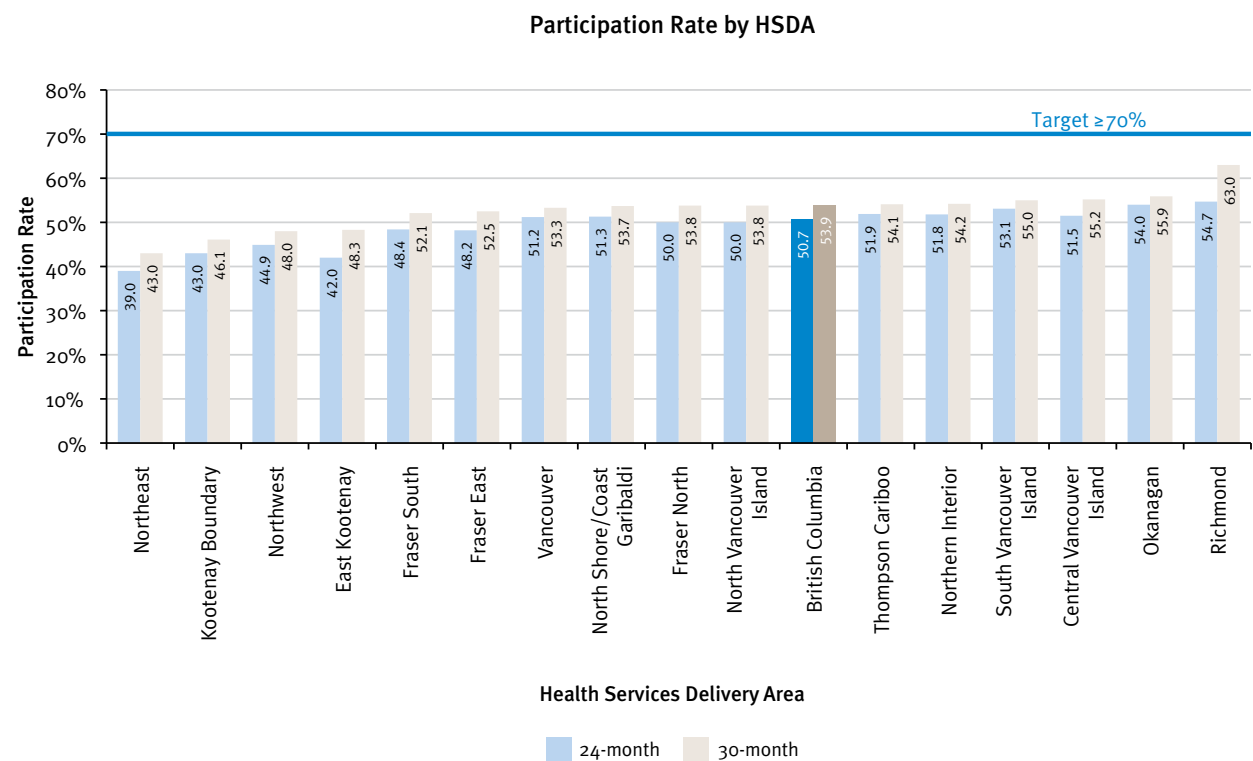


FIGURE 8.2: PARTICIPATION RATE BY HEALTH SERVICE DELIVERY AREA HSDA—24 MONTHS VS. 30 MONTHS

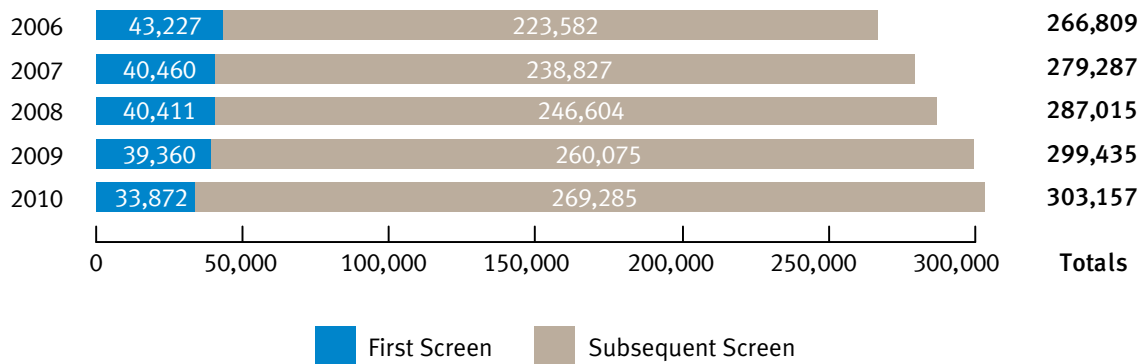


9.0 Program Results

9.1 Recruitment and Re-screening

The SMP provided 303,157 examinations to 302,957 women in 2010. During this period 33,872 (11%) of those examinations were provided to first time attendees. Figure 9.1 shows that the number of exams provided by SMP in 2010 increased by 1.2%. The number of first time attendees decreased by 14%, while the number of returning participants increased by 4% over the previous year.

FIGURE 9.1: SMP ANNUAL SCREENING VOLUME YEARS: 2006 – 2010



NOTE: SMP data extraction date: August 2, 2011

The age distribution of all exams and first exams performed in 2010 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% across most of the Lower Mainland.

TABLE I: SMP VOLUME BY HEALTH SERVICE DELIVERY AREA (HSDA): 2010

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	4,546	27%	61%	12%	841	18%	41%	53%	6%
Kootenay Boundary	4,544	26%	60%	14%	466	10%	53%	44%	3%
Okanagan	26,962	28%	57%	15%	2,560	9%	60%	36%	3%
Thompson Cariboo	16,181	28%	59%	13%	1,369	8%	68%	29%	2%
Fraser East	15,642	33%	54%	13%	1,868	12%	64%	34%	2%
Fraser North	41,812	38%	52%	9%	5,188	12%	73%	25%	2%
Fraser South	43,929	37%	54%	9%	4,991	11%	69%	29%	2%
Richmond	15,602	36%	55%	9%	1,815	12%	73%	26%	1%
Vancouver	40,483	38%	52%	10%	4,837	12%	75%	23%	2%
North Shore / Coast Garibaldi	21,050	32%	56%	12%	2,296	11%	62%	35%	3%
South Vancouver Island	26,554	28%	58%	14%	2,493	9%	62%	35%	2%
Central Vancouver Island	19,900	24%	61%	15%	1,977	10%	55%	41%	4%
North Vancouver Island	8,563	27%	61%	12%	991	12%	55%	42%	3%
Northwest	4,056	34%	58%	8%	544	13%	58%	38%	3%
Northern Interior	9,088	35%	56%	9%	930	10%	71%	28%	2%
Northeast	2,956	33%	57%	9%	438	15%	63%	34%	3%
Program	303,157	33%	55%	11%	33,872	11%	66%	31%	2%

NOTE: SMP data extraction date: August 2, 2011

The biennial screening participation rates are shown by HSDA for each age group in Table II. In the 30 month period between July 1, 2008 and December 31, 2010, 535,530 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 has the highest at 63%.

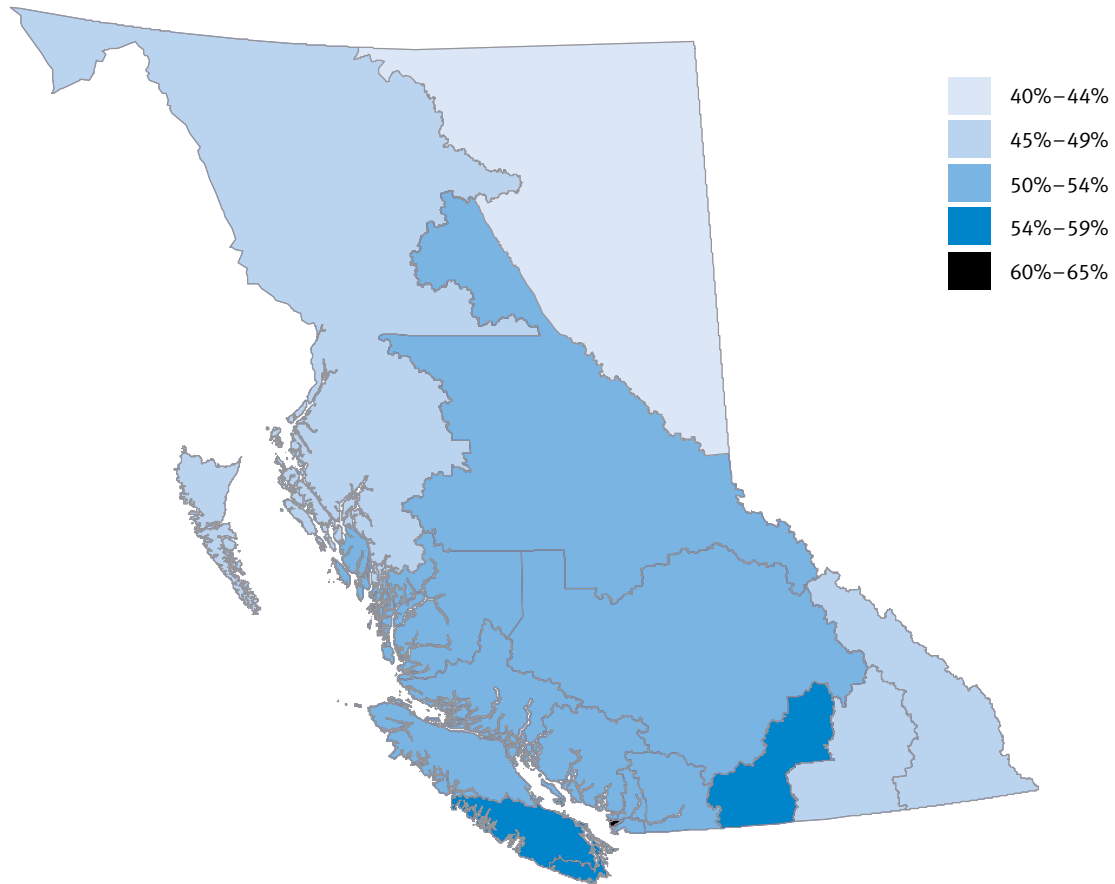
TABLE II: REGIONAL 30-MONTH PARTICIPATION RATES BY 10-YEAR AGE GROUPS ENDING DECEMBER 31, 2010 INCLUSIVE

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

NOTES:

1. Based on the average of 2008, 2009 and 2010 female population estimates
2. Population data source: P.E.O.P.L.E. 35 population estimates (Aug 2010), BC STATS, Service BC, BC Ministry of Citizens' Services
3. Postal code translation file: TMF 1106 (June 2011)
4. Population and postal code data acquired through the Health Data Warehouse, BC Ministry of Health
5. SMP data extraction date: August 2, 2011

**FIGURE 9.2: BIENNIAL SCREENING PARTICIPATION BY WOMEN AGES 50 TO 69 OVER 30 MONTH PERIOD
BETWEEN JULY 1, 2008 AND DECEMBER 31, 2010**



NOTES:

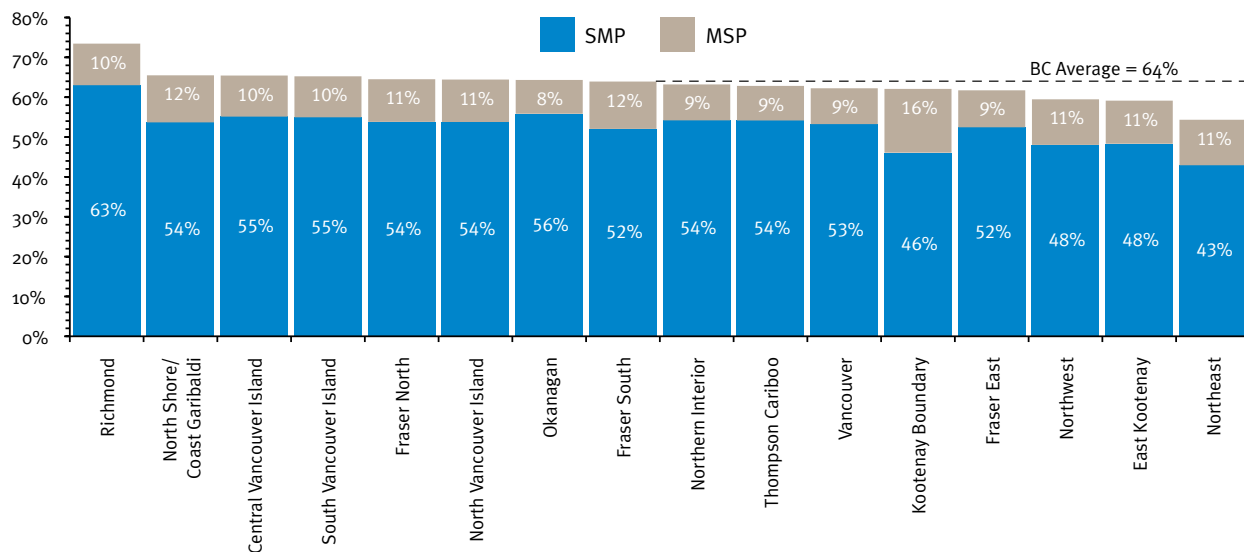
1. Based on the average of 2008, 2009 and 2010 female population estimates
2. Population data source: P.E.O.P.L.E. 35 population estimates (Aug 2010), BC STATS, Service BC, BC Ministry of Citizens' Services
3. Postal code translation file: TMF 1106 (June 2011)
4. Population and postal code data acquired through the Health Data Warehouse, BC Ministry of Health
5. SMP data extraction date: August 2, 2011

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 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 73% across the province, with Northeast (54%) and East Kootenay (59%) having the lowest percentages. Overall, the SMP provided 84% of the bilateral mammography services for this age group.

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 bilateral mammography has stabilized to 8%–11%.

**FIGURE 9.3: BILATERAL MAMMOGRAPHY UTILIZATION BY WOMEN AGES 50 TO 69 IN BC
BETWEEN JULY 1, 2008 AND DECEMBER 31, 2010 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, 2011 for services provided between July 1, 2008 and December 31, 2010.
3. SMP data includes single and multiple screens per woman provided between July 1, 2008 and December 31, 2010.
4. Population data source: P.E.O.P.L.E. 35 population estimates (Aug 2010), BC STATS, Service BC, BC Ministry of Citizens' Services
5. Postal code translation file: TMF 1106 (June 2011)
6. Population and postal code data acquired through the Health Data Warehouse, BC Ministry of Health
7. SMP data extraction date: August 2, 2011

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. 35 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 25% of attendees ages 50 to 69 screened between July 1, 2008 and December 31, 2010 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, 2008 AND DECEMBER 31, 2010 INCLUSIVE

HSDA	First Nations		East/South-East Asians		South Asians	
	Population %	Participation Rate	Population %	Participation Rate	Population %	Participation Rate
East Kootenay	0.8%	95.2%	0.9%	56.1%	0.4%	66.4%
Kootenay Boundary	0.5%	80.5%	1.0%	58.5%	0.2%	54.2%
Okanagan	0.9%	48.7%	1.4%	44.7%	1.1%	49.7%
Thompson Cariboo Shuswap	3.7%	46.3%	1.5%	61.6%	1.1%	48.5%
Fraser East	1.5%	47.4%	2.2%	67.0%	8.0%	51.1%
Fraser North	0.3%	63.4%	22.8%	54.0%	4.9%	49.3%
Fraser South	0.3%	82.9%	8.3%	52.6%	14.0%	44.3%
Richmond	0.1%	99.9%	45.6%	67.1%	6.5%	57.6%
Vancouver	0.8%	45.2%	39.5%	49.9%	4.2%	61.6%
North Shore/Coast Garibaldi	1.8%	41.9%	7.0%	51.8%	2.3%	55.0%
South Vancouver Island	0.8%	46.6%	4.2%	43.3%	1.2%	58.6%
Central Vancouver Island	2.1%	43.8%	1.6%	55.5%	1.5%	42.3%
North Vancouver Island	2.3%	46.6%	1.2%	50.7%	0.1%	99.9%
Northwest	17.3%	40.2%	2.5%	26.0%	2.2%	42.1%
Northern Interior	4.1%	52.9%	1.4%	42.3%	1.6%	60.8%
Northeast	5.1%	42.1%	1.4%	14.9%	0.4%	76.8%
British Columbia	1.5%	47.7%	12.4%	53.4%	4.5%	50.2%

PARTICIPATION RATE:

1. Population data sources: P.E.O.P.L.E. 35 population estimates (Aug 2010), BC STATS, 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, 2008 and December 31, 2010 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 2, 2011.

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 (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.

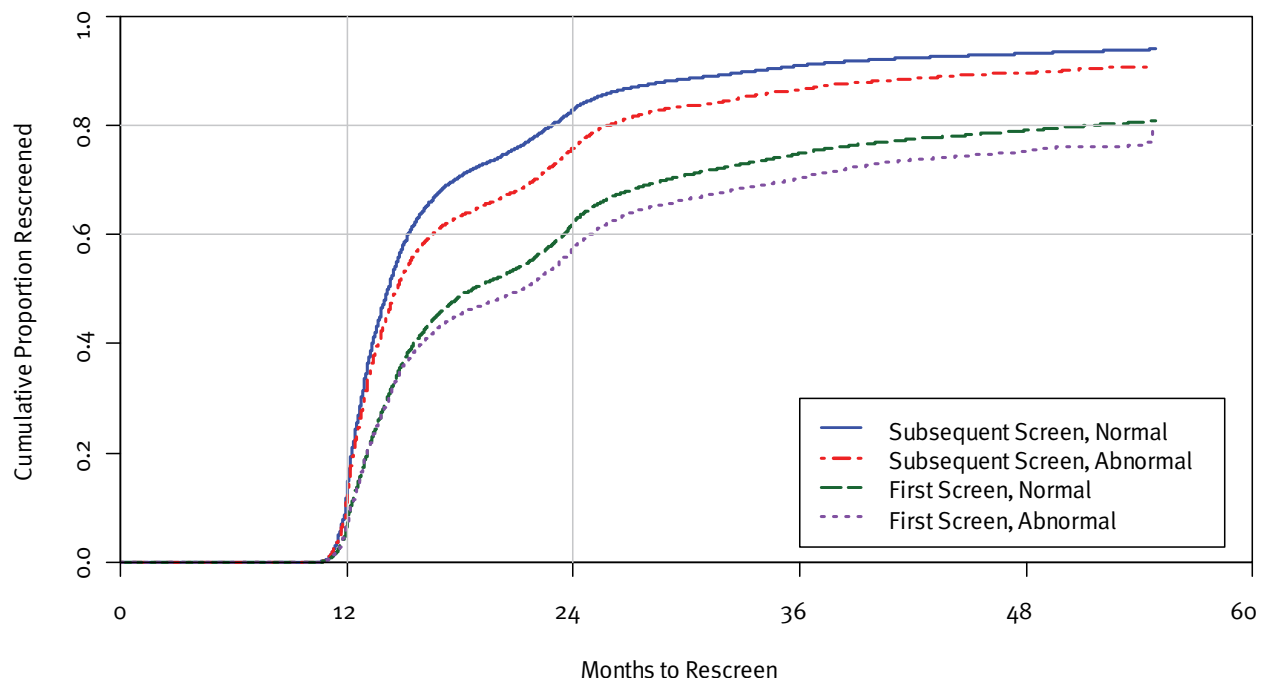
Participation in SMP by each selected ethnic group is lower than the overall population in general. There are regional variations. Participation by First Nations women was lowest in the Northwest (40.2%) and in North Shore/Coast Garibaldi (41.9%). Participation by East/South-East Asian women was lowest in the Northeast (14.9%) and in the Northwest (26.0%). Participation by South Asian women was lowest in the Northwest (42.1%) and Central Vancouver Island (42.3%).

Women ages 40-79 are eligible to screen in BC. The effectiveness of biennial screening mammography is universally recognized for women ages 50 to 69. 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 for another year if there is no response.

Figure 9.4 shows a graph of return rates for women ages 40 to 49 who attended SMP between 2007 and 2009 by first / subsequent screen results. Figure 9.5 shows a graph of return rates for women ages 50 to 69. Women who had breast cancer were not included in the calculations.

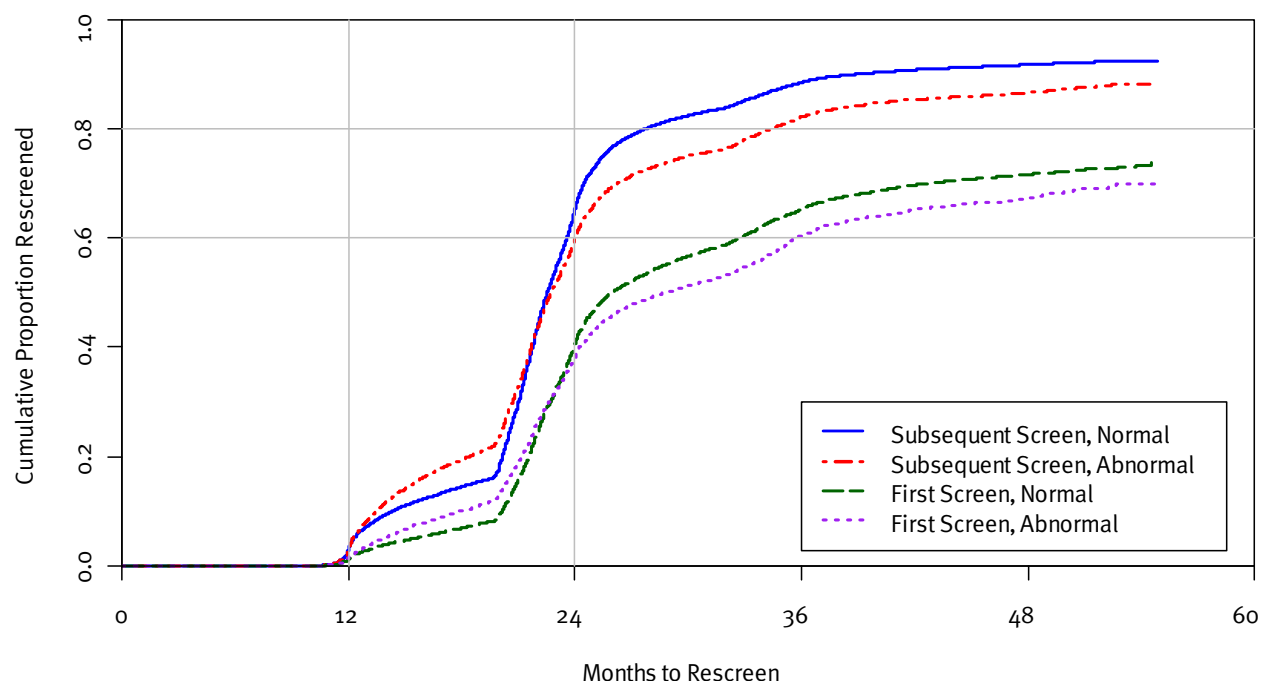
In general, women in both age groups who had a subsequent screen are observed to have a higher return (compliance) rate than those who had an initial screen. Women ages 40 to 49 who had normal screen results are more likely to return for screening than those who had abnormal screen results. However, 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 9.4: RETURN RATES FOR WOMEN AGE 40-49 BY FIRST/SUBSEQUENT SCREENS AND SCREEN RESULT: 2007–2009



NOTE: SMP data extraction date August 2, 2011

FIGURE 9.5: RETURN RATES FOR WOMEN AGE 50-69 BY FIRST/SUBSEQUENT SCREENS AND SCREEN RESULT: 2007 – 2009



NOTE: SMP data extraction date: August 2, 2011

Table IV summarizes the return rates for women ages 50 to 69 who attended SMP between 2007 and 2009 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 TO 69: 2007 – 2009

	First Screen		Subsequent Screen		Overall	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Total Number to be Re-screened	30,750	5,581	407,590	22,594	438,340	28,175
Returned by 18 months	7%	10%	14%	19%	14%	18%
24 months	41%	38%	65%	60%	64%	56%
30 months	57%	51%	82%	75%	81%	70%
36 months	65%	61%	89%	82%	87%	78%

NOTE: SMP data extraction date: August 2, 2011

9.2 2010 Screening Results

Table V summarizes the outcome indicators for screening exams provided in 2010 by 10-year age groups. Of the 303,157 screening mammograms performed, 22,032 (7.3%) had an abnormal result and 1,271 breast cancers were reported as of August 2, 2011 (4.2 per 1,000 exams), including 265 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 5.6% 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 and 79.

TABLE V: SMP OUTCOME INDICATORS BY 10-YEAR AGE GROUP: 2010

Outcome Indicators	Age at Exam						All
	<40	40-49	50-59	60-69	70-79	80+	
Number of Exams	286	99,922	94,480	73,714	33,434	1,321	303,157
% on first screens	89.2%	22.2%	8.0%	4.2%	2.2%	4.4%	11.2%
Number of Cancers	---	202	358	430	264	17	1,271
% on first screens	---	32.2%	15.6%	8.1%	4.9%	17.6%	13.5%
Abnormal Call Rate	12.6%	8.9%	6.9%	6.2%	5.6%	6.9%	7.3%
on first screens	12.5%	15.1%	16.6%	16.6%	14.2%	13.8%	15.6%
on subsequent screens	12.9%	7.1%	6.1%	5.8%	5.4%	6.6%	6.2%
Overall Cancer Detection Rate (per 1,000)	---	2.0	3.8	5.8	7.9	12.9	4.2
on first screens	---	2.9	7.5	11.3	17.4	51.7	5.1
on subsequent screens	---	1.8	3.5	5.6	7.7	11.1	4.1
DCIS Detection Rate (per 1,000)	---	0.7	0.7	1.2	1.3	1.5	0.9
on first screens	---	0.9	1.7	1.9	4.0	---	1.3
on subsequent screens	---	0.6	0.6	1.1	1.3	1.6	0.8
Positive Predictive Value of Screening Mammography	---	2.3%	5.5%	9.4%	14.2%	18.7%	5.8%
on first screens	---	2.0%	4.6%	6.9%	12.3%	37.5%	3.3%
on subsequent screens	---	2.5%	5.8%	9.7%	14.3%	16.9%	6.6%
Core Biopsy Yield Ratio	---	16.6%	33.7%	49.2%	54.7%	70.6%	35.0%
on first screens	---	11.2%	24.8%	32.9%	45.0%	50.0%	18.2%
on subsequent screens	---	21.6%	36.3%	51.4%	55.2%	73.3%	40.8%
Open Biopsy Yield Ratio	---	17.5%	27.0%	37.1%	44.4%	83.3%	29.1%
on first screens	---	15.5%	15.0%	35.0%	57.1%	100.0%	19.9%
on subsequent screens	---	18.9%	29.6%	37.3%	43.6%	75.0%	31.8%

Program Results

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 164 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 22,032 “abnormal” screens with complete follow-up, there were 20 lobular carcinoma in-situ cases. The final number of cancers is still to be determined.
5. SMP data extraction date: August 2, 2011.

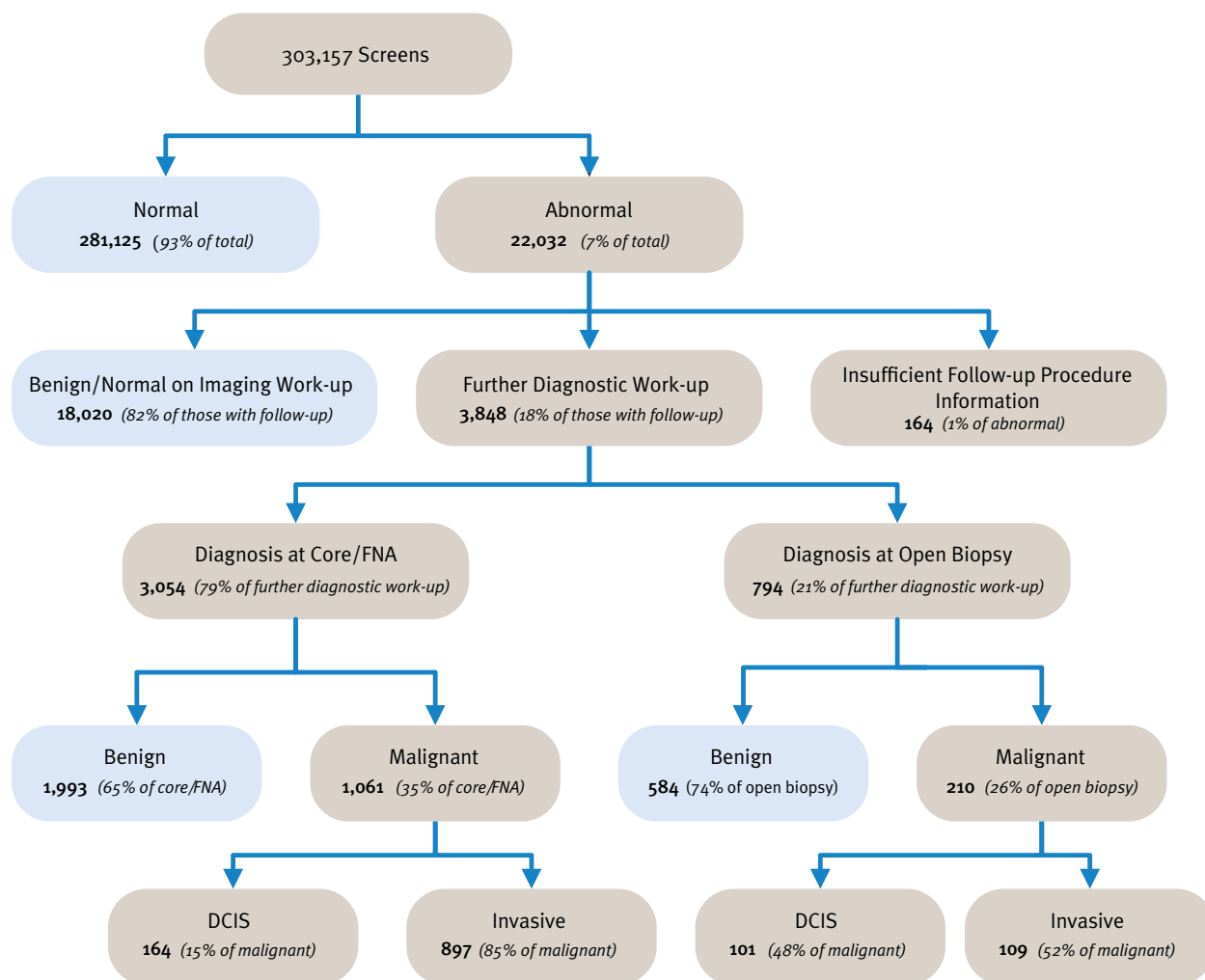
Diagnostic procedure information is available to date on 21,868 (99%) of the screening mammograms with abnormal findings. Table VI shows the proportion of women receiving specific diagnostic procedures as part of the work-up on their screen-detected abnormalities. Overall, 13% and 3% of women with abnormal screening mammograms had core biopsy and open biopsy, respectively.

TABLE VI: DIAGNOSTIC PROCEDURES RECEIVED BY SMP PARTICIPANTS WITH “ABNORMAL” SCREENING MAMMOGRAMS: 2010

Procedure	Age at Exam						All
	<40	40-49	50-59	60-69	70-79	80+	
Diagnostic Mammogram	86%	88%	90%	91%	92%	91%	90%
Ultrasound	58%	67%	66%	64%	64%	58%	66%
Fine Needle Aspiration	3%	3%	3%	3%	3%	1%	3%
Core Biopsy	14%	10%	14%	16%	21%	19%	13%
Surgical Biopsy	3%	3%	3%	4%	6%	4%	4%
with Localization	3%	2%	3%	4%	5%	4%	3%
Number of cases with diagnostic assessment information available	36	8,852	6,462	4,569	1,858	91	21,868

NOTE: SMP data extraction date: August 2, 2011

FIGURE 9.6: SCREENING OUTCOME SUMMARY (2010)



9.3 2009 Cancer Detection

Histologic features of breast cancers detected by the SMP in 2009 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, 23% of cancers detected were in situ. Of the invasive cancers detected, 62% were ≤ 15 mm, 74% have not had invasion of the regional lymph nodes, and 26% were grade 3 (i.e. poorly differentiated) tumours. Of the grade 3 tumours, 42% were smaller than 15 mm. These overall outcome indicators met the international targets¹ recommended for screening programs.

TABLE VII: HISTOLOGIC FEATURES OF BREAST CANCERS DETECTED BY SMP: 2009

Histological Features	Age at Exam								Age 40-79	
	40-49		50-59		60-69		70-79			
Number of Cancers	217		377		429		251		1,274	
in situ	67	31%	91	24%	84	20%	49	20%	291	23%
invasive	150	69%	286	76%	345	80%	202	80%	983	77%
Invasive Cancers Tumour Size										
≤5 mm	18	12%	32	11%	31	9%	14	7%	95	10%
6-10 mm	26	18%	65	23%	91	27%	57	29%	239	25%
11-15 mm	38	26%	71	25%	99	29%	63	32%	271	28%
16-20 mm	22	15%	43	15%	51	15%	31	16%	147	15%
>20 mm	43	29%	72	25%	70	20%	32	16%	217	22%
unknown size	(3)		(3)		(3)		(5)		(14)	
Invasive Cancers with tumour ≤ 15 mm										
	82	56%	168	59%	221	65%	134	68%	605	62%
Node Involvement in Invasive Cancers										
no	88	65%	190	72%	243	76%	146	80%	667	74%
yes	47	35%	74	28%	78	24%	37	20%	236	26%
no nodes sampled / unknown	(15)		(22)		(24)		(19)		(80)	
Histologic Grade of Invasive Cancers										
1 - well differentiated	37	25%	85	30%	118	35%	56	28%	296	31%
2 - moderately differentiated	56	38%	116	41%	149	44%	96	48%	417	43%
3 - poorly differentiated	53	36%	79	28%	73	21%	49	24%	254	26%
unknown grade	(4)		(6)		(5)		(1)		(16)	
Grade 3 tumour ≤ 15 mm	21	40%	29	37%	32	44%	24	49%	106	42%

NOTES:

1. Targets¹: $>50\%$ invasive tumours ≤ 15 mm, $>70\%$ with negative nodes, $>30\%$ grade 3 tumours ≤ 15 mm.
2. SMP data extraction date: August 2, 2011.

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

9.4 Outcome Indicators by Calendar Year: 2006–2010

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 2010, less than 30% of the open biopsy 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 69¹, and had recommended the target of >3.0 for organized screening programs². 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

TABLE VIII: SMP OUTCOME INDICATORS BY CALENDAR YEAR BETWEEN 2006 AND 2010 INCLUSIVE

Outcome Indicators	Calendar Year					5-Year Cumulative
	2006	2007	2008	2009	2010	
Number of Exams	266,809	279,287	287,015	299,435	303,157	1,435,703
% on first screens	16.2%	14.5%	14.1%	13.1%	11.2%	13.7%
Number of Cancers	1,074	1,168	1,244	1,293	1,271	6,050
% on first screens	19.7%	17.5%	17.2%	15.6%	13.5%	16.6%
Abnormal Call Rate	7.4%	7.0%	7.4%	7.3%	7.3%	7.3%
on first screens	14.9%	14.7%	15.4%	15.3%	15.6%	15.2%
on subsequent screens	5.9%	5.7%	6.1%	6.0%	6.2%	6.0%
Overall Cancer Detection Rate (per 1,000)	4.0	4.2	4.3	4.3	4.2	4.2
on first screens	4.9	5.0	5.3	5.1	5.1	5.1
on subsequent screens	3.9	4.0	4.2	4.2	4.1	4.1
DCIS Detection Rate (per 1,000)	0.9	1.0	1.1	1.0	0.9	1.0
on first screens	1.3	1.4	1.5	1.2	1.3	1.4
on subsequent screens	0.9	0.9	1.0	0.9	0.8	0.9
Positive Predictive Value of Screening Mammography	5.6%	6.0%	5.9%	6.0%	5.8%	5.9%
on first screens	3.4%	3.5%	3.5%	3.4%	3.3%	3.4%
on subsequent screens	6.7%	7.1%	6.9%	7.0%	6.6%	6.8%
Core Biopsy Yield Ratio	32.8%	34.9%	35.0%	36.0%	35.0%	34.9%
on first screens	19.3%	19.1%	18.7%	20.4%	18.2%	19.1%
on subsequent screens	40.5%	42.7%	42.3%	42.0%	40.8%	41.7%
Open Biopsy Yield Ratio	35.4%	32.8%	32.4%	30.3%	29.1%	32.3%
on first screens	23.1%	19.2%	22.3%	19.5%	19.9%	21.0%
on subsequent screens	40.0%	37.9%	36.1%	33.8%	31.8%	36.3%
Interval Cancer Rate (per 1,000)						
0-12 months	0.56	0.57	0.62	0.62	---	---
after first screens	0.44	0.40	0.72	0.43	---	---
after subsequent screens	0.58	0.59	0.60	0.65	---	---
13-24 months	0.66	0.71	0.83	---	---	---
Sensitivity (i.e. 1 – false negative rate)	87.8%	88.1%	87.5%	---	---	---
Specificity (i.e. 1 – false positive rate)	93.2%	93.4%	93.1%	93.2%	---	---
Prevalence to Expected Incidence Ratio for Age 50-79 (target¹: >3.0)	4.00	4.20	4.60	5.00	4.40	4.40

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 2010 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 2, 2011

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

9.5 Outcome Indicators by Age: 2006–2010 Cumulative

Table IX shows the outcome indicators for screening exams provided in a five-year period by 10-year age groups. From 2006 to 2010, the SMP provided 1,435,703 screening mammography examinations to 636,184 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.

PATIENT FEEDBACK ►

Just yesterday my wife and I visited our doctor together to review the results of her three tests: 1. preliminary screening mammogram, 2. follow up mammogram at the hospital, and 3. ultra-sound examination at the hospital. We were both relieved to learn that there was indeed no sign of breast cancer.

We often hear of complaints about our Canadian medical system – that it is too bureaucratic, that it is too slow; that it is insensitive to patients; and the like. But our recent experience with your “system” speaks volumes in favour of the system! Within one week my wife had three diagnostic tests and an appointment with her primary care physician to review the results. We were contacted at each step along the way by your office.

Thank you!

TABLE IX: SMP OUTCOME INDICATORS BY 10-YEAR AGE GROUPS BETWEEN 2006 AND 2010 INCLUSIVE

Outcome Indicators	Age at Exam					All
	40-49	50-59	60-69	70-79	80+	
Number of Exams	488,113	456,475	322,906	159,886	6,767	1,435,703
% on first screens	26.8%	9.6%	5.0%	3.0%	6.2%	13.7%
Number of Cancers	1,028	1,757	1,909	1,270	85	6,050
% on first screens	40.1%	16.8%	11.0%	6.1%	10.6%	16.6%
Abnormal Call Rate	9.0%	7.0%	5.9%	5.5%	5.9%	7.3%
on first screens	14.8%	16.3%	15.2%	13.7%	12.6%	15.2%
on subsequent screens	6.8%	6.0%	5.4%	5.3%	5.5%	6.0%
Overall Cancer Detection Rate (per 1,000)	2.1	3.9	5.9	7.9	12.6	4.2
on first screens	3.2	6.7	13.1	15.9	21.5	5.1
on subsequent screens	1.7	3.5	5.5	7.7	12.0	4.1
DCIS Detection Rate (per 1,000)	0.7	0.9	1.2	1.3	1.5	1.0
on first screens	1.2	1.4	2.7	2.5	2.4	1.4
on subsequent screens	0.6	0.9	1.2	1.3	1.4	0.9
Positive Predictive Value of Screening Mammography	2.4%	5.6%	10.1%	14.6%	21.4%	5.9%
on first screens	2.2%	4.2%	8.7%	11.8%	17.3%	3.4%
on subsequent screens	2.5%	5.9%	10.3%	14.8%	22.0%	6.8%
Core Biopsy Yield Ratio	16.6%	33.5%	49.9%	58.6%	73.4%	34.9%
on first screens	12.5%	22.6%	39.2%	51.4%	45.5%	19.1%
on subsequent screens	21.4%	37.2%	51.6%	59.2%	77.9%	41.7%
Open Biopsy Yield Ratio	19.9%	28.1%	43.2%	52.2%	73.0%	32.3%
on first screens	17.1%	18.5%	39.6%	42.6%	80.0%	21.0%
on subsequent screens	22.2%	31.1%	43.8%	52.8%	71.9%	36.3%
Interval Cancer Rate (per 1,000)						
0-12 months	0.51	0.49	0.61	0.60	1.18	0.54
after first screens	0.39	0.55	0.75	0.62	0.01	0.46
after subsequent screens	0.56	0.49	0.60	0.60	1.26	0.55
13-24 months	0.01	0.69	0.89	0.86	0.74	0.52
Sensitivity (i.e. 1 - false negative rate)	80.4%	88.7%	90.6%	93.0%	91.4%	88.6%
Specificity (i.e. 1 - false positive rate)	91.3%	93.4%	94.7%	95.3%	95.3%	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 2010 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 2, 2011.

9.6 Outcome Indicators by HSDA: 2006–2010 Cumulative

Outcome indicators for 2006 to 2010 are summarized by HSDA in Table X. The Kootenay Boundary has the lowest abnormal call rate (4%), while Fraser East has the highest (11%). North Vancouver Island has the lowest cancer detection rate (3.4 per 1,000), and Thomson Cariboo, Fraser East, North Shore / Coast Garibaldi and Central Vancouver Island have the highest (4.6 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 targets¹ recommended for screening programs.

TABLE X: SMP OUTCOME INDICATORS BY HEALTH SERVICE DELIVERY AREA (HSDA) BETWEEN 2006 AND 2010 INCLUSIVE

HSDA	% Called Abnormal	Cancer Detection Rate (per 1000)	PPV	In-Situ : Invasive (number)	% Invasive ≤15 mm	% Invasive with -ve nodes
East Kootenay	7%	3.6	5%	11 : 58	45%	76%
Kootenay Boundary	4%	4.2	10%	23 : 75	67%	69%
Okanagan	5%	4.1	8%	99 : 450	63%	76%
Thompson Cariboo	6%	4.6	8%	83 : 289	57%	70%
Fraser East	11%	4.6	4%	71 : 281	54%	71%
Fraser North	8%	4.0	5%	198 : 549	62%	68%
Fraser South	9%	4.4	5%	239 : 664	61%	70%
Richmond	7%	4.0	5%	90 : 193	63%	66%
Vancouver	9%	4.2	5%	212 : 584	66%	67%
North Shore / Coast Garibaldi	6%	4.6	7%	116 : 331	61%	68%
South Vancouver Island	5%	3.6	7%	75 : 407	57%	68%
Central Vancouver Island	6%	4.6	8%	75 : 369	70%	73%
North Vancouver Island	5%	3.4	8%	21 : 122	68%	79%
Northwest	6%	4.2	7%	21 : 60	60%	62%
Northern Interior	7%	4.3	6%	48 : 140	64%	69%
Northeast	7%	4.5	6%	7 : 52	63%	50%
Program	7%	4.2	6%	1395 : 4655	62%	70%

NOTES:

1. See glossary in Appendix 7 for definitions of terms.
2. Targets¹: >50% invasive tumours ≤15mm, >70% with negative nodes
3. SMP data extraction date: August 2, 2011

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

9.7 Cancer Characteristics by Age: Cumulative up to and Including 2009

From the start of the program in July 1988 to December 2009, 15,578 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 2009 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 2009

Histological Features	Age at Exam										Age 40+	
	40-49		50-59		60-69		70-79		80+			
Number of Cancers	2,637		4,469		4,753		3,452		267		15,578	
in situ	842	32%	1,158	26%	1,009	21%	619	18%	28	10%	3,656	23%
invasive	1,795	68%	3,311	74%	3,744	79%	2,833	82%	239	90%	11,922	77%
Invasive Cancers Tumour Size												
≤5 mm	182	10%	310	9%	321	9%	204	7%	23	10%	1,040	9%
6-10 mm	354	20%	798	24%	1,015	27%	867	31%	64	27%	3,098	26%
11-15 mm	499	28%	924	28%	1,154	31%	861	31%	67	28%	3,505	30%
16-20 mm	259	15%	552	17%	545	15%	420	15%	43	18%	1,819	15%
>20 mm	473	27%	683	21%	679	18%	447	16%	39	17%	2,321	20%
unknown size	(28)		(44)		(30)		(34)		(3)		(139)	
Invasive Cancers with tumour ≤ 15 mm												
	1,035	59%	2,032	62%	2,490	67%	1,932	69%	154	65%	7,643	65%
Node Involvement in Invasive Cancers												
no	1,138	70%	2,249	73%	2,657	77%	1,967	81%	126	80%	8,137	76%
yes	498	30%	812	27%	787	23%	469	19%	32	20%	2,598	24%
no nodes sampled / unknown	(159)		(250)		(300)		(397)		(81)		(1187)	
Histologic Grade of Invasive Cancers												
1 - well differentiated	451	27%	1,011	34%	1,152	34%	962	38%	80	38%	3,656	34%
2 - moderately differentiated	705	43%	1,237	41%	1,525	44%	1,143	45%	93	44%	4,703	43%
3 - poorly differentiated	493	30%	764	25%	755	22%	447	18%	39	18%	2,498	23%
unknown grade	(146)		(299)		(312)		(281)		(27)		(1065)	
Grade 3 tumour ≤ 15 mm	214	43%	362	47%	406	54%	231	52%	18	46%	1,231	49%

NOTES:

1. Targets¹: >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 2, 2011.

1 Tabår 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

9.8 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 programs¹. 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 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	56%
Subsequent Rescreen	≥90% subsequent re-screen within 30 months	82%
Abnormal Call Rate (3)		
First Screens	<10% first screens	16.6%
Subsequent Screens	<5% re-screens	5.9%
Invasive Cancer Detection Rate (per 1000) (3)		
First Screens	>5.0 per 1,000 first screens	6.8 per 1000
Subsequent Screens	>3.0 per 1,000 re-screens	3.6 per 1000
In Situ Cancer Detection Rate (3)		
First Screens	Surveillance and Monitoring only	1.8 per 1000
Subsequent Screens	Surveillance and Monitoring only	0.9 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	45.7%
Positive Predictive Value (3)		
First Screens	≥5% first screen	5.2%
Subsequent Screens	≥6% re-screens	7.5%
Benign Core Biopsy Rate (per 1000) (3)		
First Screens	Surveillance and Monitoring only	19.7 per 1000
Subsequent Screens	Surveillance and Monitoring only	4.7 per 1000
Benign to Malignant Core Biopsy Ratio (3)		
First Screens	Surveillance and Monitoring only	2.7 : 1
Subsequent Screens	Surveillance and Monitoring only	1.3 : 1
Benign Open Biopsy Rate (per 1000) (3)		
First Screens	Surveillance and Monitoring only	4.4 per 1000
Subsequent Screens	Surveillance and Monitoring only	1.5 per 1000
Benign to Malignant Open Biopsy Ratio (3)		
First Screens	≤1:1	3.6 : 1
Subsequent Screens	≤1:1	2.0 : 1
Invasive Tumour size ≤10 mm (4)	>25%	35%
Invasive Tumour size ≤15 mm (4)	>50%	62%
Node Negative Rate in Cases of Invasive Cancer (4)	>70%	74%

NOTES:

1. Screen years: (1) = July 1, 2008 - December 31, 2010, (2) = 2007-2009, (3) = 2010, (4) = 2009
2. Population data source: P.E.O.P.L.E. 35 population estimates (Aug 2010), BC STATS, BC Ministry of Labour and Citizens' Services.
3. SMP data extraction date: August 2, 2011.

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

9.9 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/AboutPHSA/PHSA_Budget_Financials/default.htm

TABLE XIII: COST COMPARISON BY FISCAL YEAR

Indicator	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011
Total Cost	\$16,732,061	\$18,219,310	\$20,311,839	\$21,450,188	\$21,716,688
Total cost per screen	\$62.18	\$65.54	\$69.79	\$70.56	\$72.34
Central Services	\$8.74	\$10.46	\$13.88	\$14.95	\$13.89
Other operating costs	\$37.99	\$39.38	\$39.84	\$39.85	\$42.40
Professional Reading Fees	\$13.39	\$13.80	\$14.08	\$14.50	\$14.57
Capital Allocation	\$2.06	\$1.91	\$1.99	\$1.25	\$1.48
Cost per cancer detected	\$14,943.25	\$15,460.36	\$15,823.09	\$16,619.23	Not Available

NOTES:

1. Number of cancers detected in 2010-11 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 \$14.57 per screen effective April 1, 2010.
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 2, 2011.

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 process¹. 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).

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 — 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.

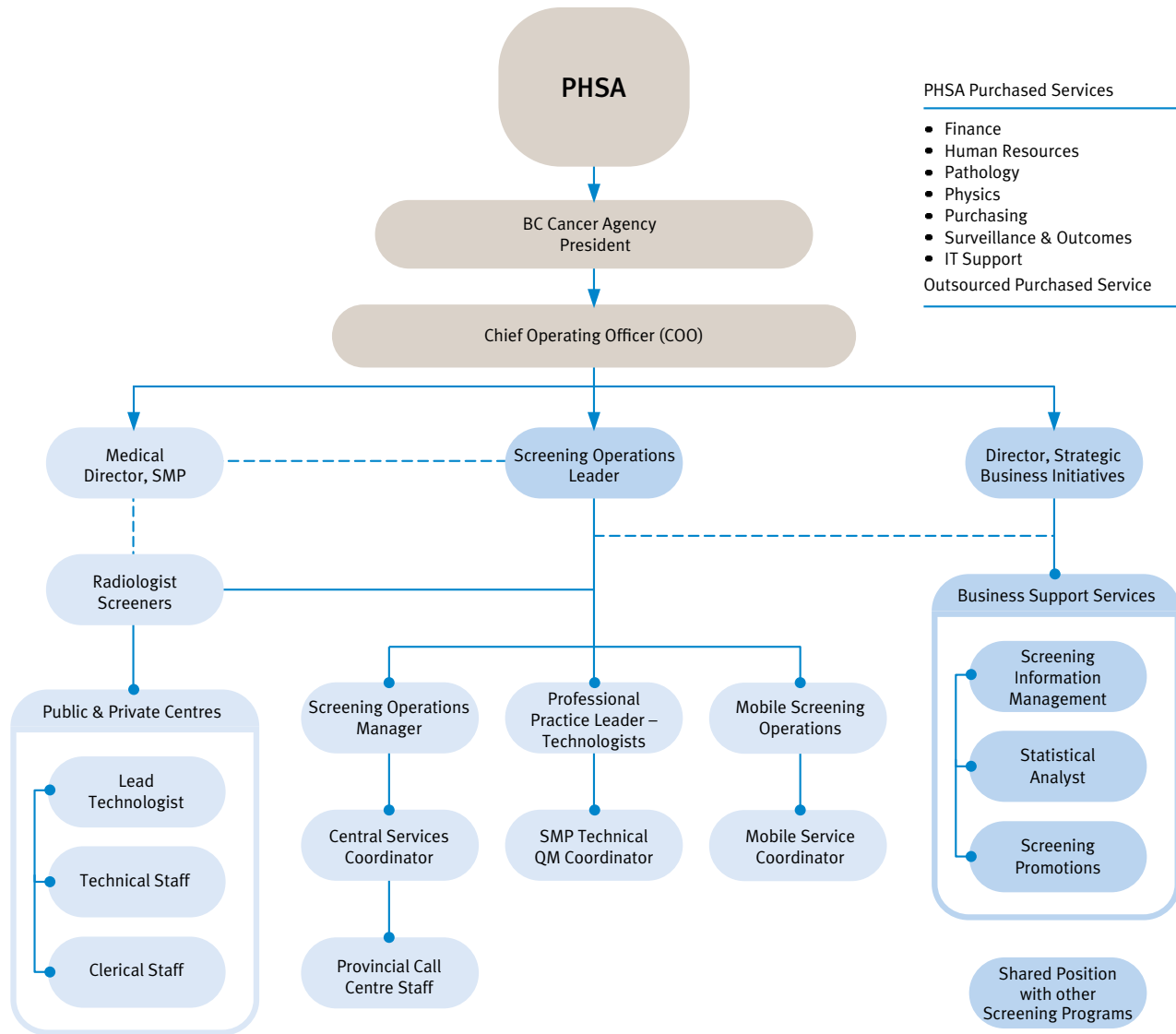
Ages <40 – Physician Referral Required

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.

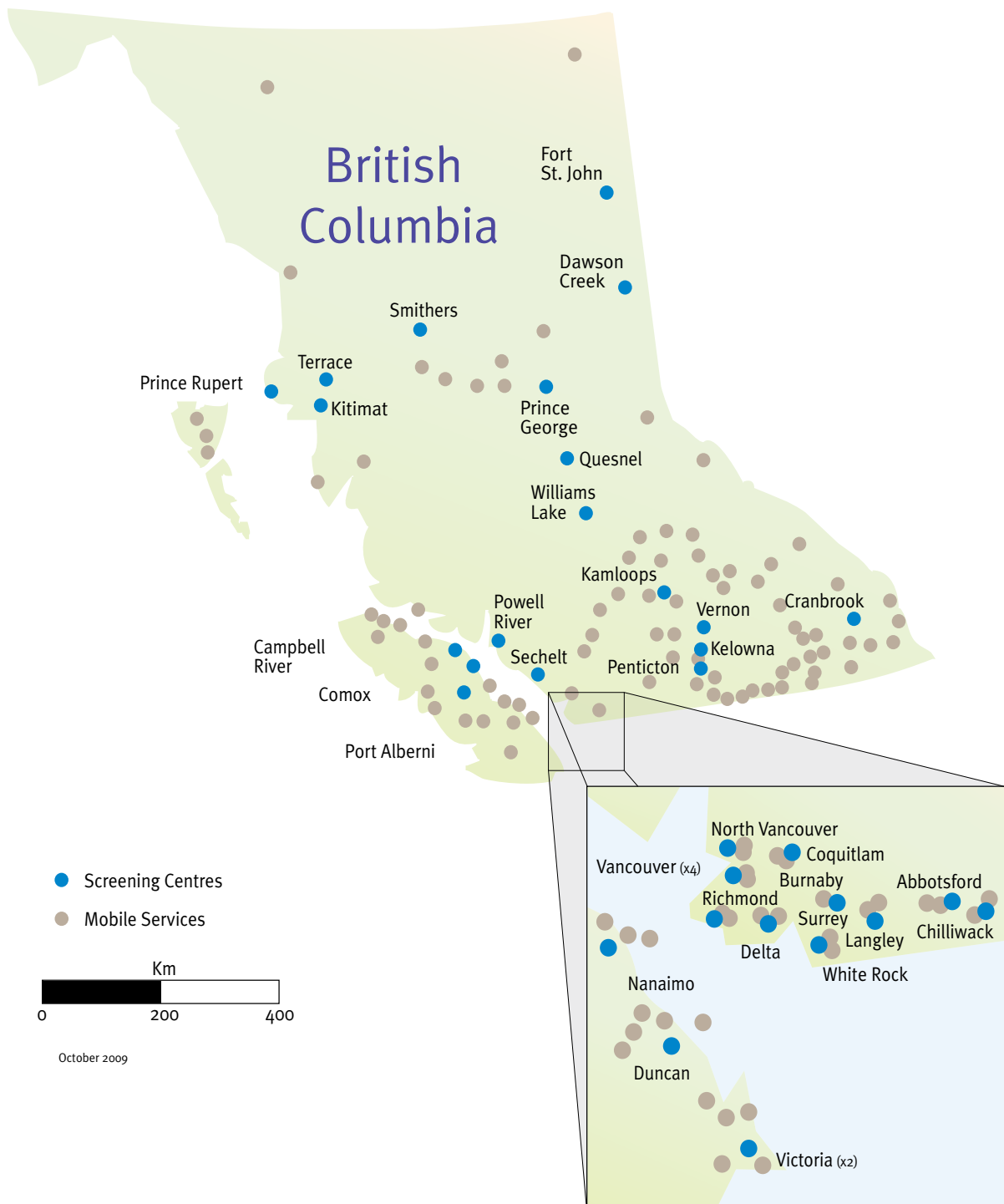
Ages 80+ – Physician Referral Required

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

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	Masset	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	Roseland	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, Stelat'en, Sto:Lo, Squamish (North Vancouver), Upper Nicola

Appendix 6 — Educational Materials Order Form



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	(max. 50)
- Bookmarks	
- Fridge magnets	(max. 50)
- Recipe Cards (max. 500)	
▪ Carrot Soup	
▪ Chili	
▪ Mango Salad	
▪ Salmon	
▪ Tomato Soup	
Health Check Card (Aboriginal)	(max. 50)
Posters	(max. 5)
- Pass it On	
- 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
 Ann MacDonald, Promotion & Education Specialist
 at 604-707-5927 or by email:
amacdonald4@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.

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

Where N_i is the number of prevalent screens for age group i , $C a_i$ 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”.

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

PATIENT FEEDBACK ►

The lady on the machine was amazing. She walked my 10-year-old through the equipment...what was going on...how it worked... she was fascinated.

She got home and called her friends talking about the experience she had. One of the mom's...jokingly got on my case saying... well...I have been putting this off for years...now my daughter wants me to go...so she can see this...so guess I have to go now.

Who knows...maybe this wonderful lady saved a life...by being so kind to my daughter...

Just thought you should know.

Appendix 9 — Committees

Academic Committee

Ms. Nancy Aldoff
Dr. Andy Coldman
Dr. Paula Gordon – Chair
Dr. Malcolm Hayes
Dr. Rasika Rajapakshe
Ms. Janette Sam
Dr. Linda Warren
Ms. Lisa Kan
Dr. Christine Wilson

Quality Management Committee

Ms. Nancy Aldoff
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
Dr. Christine Wilson – Chair

Screener's Advisory Committee

Dr. Ken Bentley
Dr. Larry Breckon
Dr. Michael Clare
Dr. Eleanor 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. Dave McKeown
Dr. Kathryn Miller
Dr. David O'Keeffe
Dr. Rasika Rajapakshe
Ms. Janette Sam
Dr. Stuart Silver
Dr. Connie Siu
Dr. Catherine Staples
Dr. Phil Switzer
Dr. Lynette Thurber
Dr. Tim Wall
Dr. Linda Warren
Dr. Christine Wilson – Chair

Appendix 10 — Radiologist Screeners

Abbotsford

Dr. Lynn Jacobsen*
Dr. Tahir Khalid
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*

Coquitlam

Dr. Jennifer Dolden
Dr. Brad Halkier
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 & NLM Mobile

Dr. Dorothy Harrison
Dr. Patricia Hassell
Dr. Colin Mar
Dr. Christine Wilson*

Kamloops

Dr. Michael Clare*
Dr. Donal Downey

Kelowna

Dr. Michael Partrick
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

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 & JPOSC

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

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Dr. Linda Warren*

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

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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

Appendix 11 — Publications & Presentations

Publications

1. Rasika Rajapakshe and J. Sam, **Development of Unified Quality Control Procedures for Digital Mammography Systems**, In Radiological Society of North America Scientific Assembly and annual meeting program. RSNA, Oakbrook IL SSJ23-01 (2010). <http://rsna2010.rsna.org/search/search.cfm?action=add&filter=Author&value=91465>
2. Christabelle N. Bitgood, Christina Weisstock, Elena Ostroumov, Steve McAvoy Paula B. Gordon, Andy Coldman, Chris Bajdik and Rasika Rajapakshe, **Estimation of breast cancer risk distribution in British Columbia - Preliminary Results**, BC Cancer Agency 2010 Annual Cancer Conference. Vancouver, BC November 25-27, 2A-pp9, (2010).
3. Elena Ostroumov, Steven McAvoy, Christina Weisstock, Christabelle N. Bitgood and Rasika Rajapakshe, **Participation Rates of Women in the Breast Cancer Risk Estimation Study**, BC Cancer Agency 2010 Annual Cancer Conference. Vancouver, BC November 25-27, 11D-pp27, (2010).
4. Rasika Rajapakshe, Larry Watts, Alanah Bergman, Sheila MacMahon, Moira Schmuland and Chang-Ying Joseph Yang, **Changes in image quality and radiation dose in the Screening Mammography Program of British Columbia**, BC Cancer Agency 2010 Annual Cancer Conference. Vancouver, BC November 25-27, 18D-pp42, (2010).
5. Rasika Rajapakshe, Chang-Ying Joseph Yang, **Radiation dose used in Screening Mammography Program of British Columbia**,

- BC Cancer Agency 2010 Annual Cancer Conference. Vancouver, BC November 25-27, 18C-pp42, (2010).
6. Steven M. McAvoy, Elena Ostroumov, Christabelle Bitgood, Christina Weisstock and Rasika Rajapakshe, **A Web-Based Survey Software Framework for Rapid Survey Deployment and Results Analysis for Breast Cancer Risk Assessment**, BC Cancer Agency 2010 Annual Cancer Conference. Vancouver, BC November 25-27, 26A-pp59, (2010).
 7. Rasika Rajapakshe, Stephen Smithbower, Janette Sam and Chang-Ying Joseph Yang, **Development of Unified Quality Control Process for Digital Mammography Systems**, BC Cancer Agency 2010 Annual Cancer Conference. Vancouver, BC November 25-27, 30B-pp66, (2010).
 8. Bülent Uyaniker, Steven M. McAvoy, Paula Gordon, Stuart Silver and Rasika Rajapakshe, **Imaging Biomarker for Breast Cancer Risk: Estimating Breast Density from Digital Mammograms**, BC Cancer Agency 2010 Annual Cancer Conference. Vancouver, BC November 25-27, 42A-pp82, (2010).
 9. Lee, C. H., Dershaw, D. D., Kopans, D., Evans, P., Monsees, B., Monticciolo, D, Warren Burhenne, Warren, L.J. **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
 10. Warren, L.J. **Variability in Interpretive Performance at Screening Mammography and Radiologists' Characteristics Associated with Accuracy**. Breast Diseases: A Year Book Quarterly – Review. January–March 2011; Vol. 21; No.4: 330-332
 11. Gregory Doyle, Diane Major, Christina Chu, Agata Stankiewicz, Marion Harrison, Verna Mai, Jay Onysko, Lisa Pogany, **A Review of Screening Mammography Participation and Utilization in Canada**; Canadian Partnership Against Cancer. March 2010.
 12. Riaz Alvi, Judy Caines, Christina Chu, Theresa Comeau, Gregory Doyle, Song Gao, Eshwar Kumar, Andre Langlois, Vicky Majpruz, Rene Shumak, Bin Zhang; **Organized Breast Cancer Screening Programs in Canada Report on Program Performance in 2005 and 2006**; Public Health Agency of Canada. August 2011.

Presentations and Lectures

Andy Coldman

1. False positive Screening Mammograms, *Canadian Breast Cancer Screening Initiative, Quality Determinants meeting, November 2010*

Paula Gordon

2. Breast Ultrasound. *St. Paul's Women's Health Update. May 1, 2010*
3. Interview, *CBC Radio One Afternoon Show, October 13, 2010*
4. Breast ultrasound: Basics, US Screening and BIRADS. *Ontario Association of Radiologists, October 16, 2010*
5. Problem Solving: Breast Ultrasound Lesion Localization & Triangulation. *Ontario Association of Radiologists, October 16, 2010*
6. After Mammography: What? *Screening Mammography Forum 2010, Vancouver, BC, October, 22 23, 2010*
7. Screening Mammography. *UBC School of Population and Public Health, November 1, 2010*
8. Moderator, Breast Poster Session, *Radiological Society of North America Annual Meeting, Chicago, IL, November 28, 2010*
9. Ultrasound Guided Breast Interventional Procedures ("Hands-on" Workshop), *Radiological Society of North America Annual Meeting, Chicago, IL, November 30, 2010*
10. Advanced Ultrasound Applications, *Radiological Society of North America Annual Meeting, Chicago, IL, December 3, 2010*
11. Small Parts Interventional Ultrasound (Hands-on Workshop), *Radiological Society of North America Annual Meeting, Chicago, IL, December 3, 2010*
12. Screening Mammography: Understanding the Issues and Controversies in the Media. *Women's Health: Practice and Policy Series. BC Women's Hospital and Health Care Centre. January 25, 2011*
13. Breast Ultrasound, Part 1. *Residents' Academic Half-Day, March 2, 2011*

Rasika Rajapakshe

14. “Digital Mammography: Practical Issues in Implementation and Operation”, *Screening Mammography Forum 2010, Vancouver, BC, October, 22-23, 2010*
15. “Breast Cancer Risks”, Leaders & Legacies-A New Decade of Discoveries, *BC Cancer Foundation Annual Donor Recognition Evening, Kelowna, BC, November 23, 2010*

Janette Sam

16. Utilizing Professional Development Initiatives and Continuing Education to Engage the Screening Mammography Workforce in British Columbia, *Gold Coast, Australia, September 11, 2010*
17. Implementing a Standardized Digital Mammography Quality Control Program in a Provincial Screening Program, *Gold Coast, Australia, September 12, 2010*
18. Digital Mammography: Practical Issues in Implementation and Operation – Janette Sam and Dr. Rasika Rajapakshe, *Screening Mammography Forum 2010, Vancouver, BC, October, 22-23, 2010*
19. Sreenee Complaints -What have we learned? Janette Sam and Dr. Linda Warren, *Screening Mammography Forum 2010, Vancouver, BC, October, 22-23, 2010*

Linda Warren

20. Welcoming Address, *Screening Mammography Program of British Columbia, Vancouver, BC, October, 22-23, 2010*
21. Sreenee Complaints – What Have We Learned, *Screening Mammography Program of British Columbia, Vancouver, BC, October, 22-23, 2010*
22. Refresher Course – Mammography Reporting – BI-RADS and Lexicon, *RSNA 96th Scientific Assembly and Annual Meeting, Chicago, IL, November 27 – December 3, 2010*
23. Panel – Hot Topics, *RSNA 96th Scientific Assembly and Annual Meeting, Chicago, IL, November 27 – December 3, 2010*
24. 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*

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