



**BC Cancer Agency**

CARE + RESEARCH

*An agency of the Provincial Health Services Authority*

**Screening Mammography Program**

# 2007/2008 Annual Report

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## MESSAGE FROM THE PROVINCIAL CHIEF RADIOLOGIST

July 18th 2008 heralded the 20th Anniversary of the Screening Mammography Program of BC. Our celebration held at the BC Cancer Agency Research Centre was well attended. Guests of honor included Mary Pollack, Minister of Healthy Living and Sport; Dr. Vivian Basco, Co-founder; Barbara Kaminsky, CEO, Canadian Cancer Society BC/Yukon, and Mrs. Jean Orr our first screenee. The entire steering committee was honored and all but 3 of the original 13 members were able to attend. We reported detection of more than 10,000 cancers and over 4 million examinations. We have documented reduction in mortality of 25% for women attending for screening. This success has been realized only because of the collaborative efforts of not only the health professionals but the entire community.

In 2007 we performed 279,260 examinations and detected 1,123 cancers. We are planning to perform over 292,000 examinations this year.

### Government Support

The 10 year goal for our program involves achieving 70% participation in the 50-69 year age group by 2017. We are grateful to the Ministry of Health for its support with operating funds for this program.

### Professional and Academic Activities

The annual Scientific Forum was held on October 13th of 2007 with a record of 257 registrants. Our involved lectures included Dr. Tibor Tot, Head of Department of Pathology and Clinical Cytology, Central Hospital, Falun, Sweden; Dr. Per Skaane, Professor, Department of Radiology, Ullevaal University Hospital, Oslo Norway; Dr. Edward Sickles, Professor Emeritus of Radiology, University of California San Francisco School of Medicine and External Reviewer, SMPBC; Dr. Martin Yaffee, PhD, Senior Scientist, Imaging Research, Sunnybrook Health Sciences Centre and University of Toronto. Our local speakers included Dr. Andy Coldman, PhD, Vice President, Population Oncology, BC Cancer Agency; Dr. Paula Gordon, Clinical Professor, Department of Radiology University of British Columbia and Chair, Academic Committee, SMPBC. The themes of the Forum included breast cancer risk and its relationship to histology, the natural history of low grade DCIS an overview of the controlled trials comparing screen film and full field digital mammography and the digital mammography imaging screening trial. As well, breast density and breast cancer risk were discussed together

with the future potential for digital mammography. The impact on screening on mortality on breast cancer in British Columbia were discussed together with our own work on interval cancer classification.

Our SMPBC scientist and representatives published 25 papers in the medical literature and gave 12 lectures. Our publications included the awaited report on "facilitated" Fast Track referral published in the Canadian Journal of Public Health.

### Administrative Activities

We are actively planning for transition to digital mammography based on the consultants report presented last year. This is a feature of the 10 year plan. We have established digital equipment standards for the SMP program and began work on implementation of the technologist workforce report which was completed last year. These activities include active communication with technologists for recruitment and retention, encouragement of community involvement as well as establishing educational and financial incentives. BCIT is an important partner in these activities.

Our administrative staff maintain stability and create important technical innovation as our program plans for broader and more efficient communication with the various health regions. However, it is the personal dedication, ingenuity and exemplary work ethics of our staff not only at head office but at all of the screening centres and of the health professionals at all of our centres to whom we owe our success.

Our 20th anniversary is the end of an era in many ways and it is with mixed feelings of regret and respect that we say goodbye to Dr. Greg Hislop, our devoted and beloved senior scientist. Greg helped to spearhead the preparation of our original and relatively modest proposal in 1987 and has guided our scientific research all the way. Greg and his wife Marion are full of energy and enthusiasm for their future projects which include volunteer work in setting up schools in rural India. We wish Greg and Marion a very bright future.

Finally, we can continue to take pride in maintaining the lowest mortality and incidence from breast cancer in Canada at the same time as we roll up our sleeves to confront our future challenges.

With the support and encouragement of all British Columbians, we can continue to make a difference in Breast Cancer Screening.



Dr. Linda Warren, Provincial Chief Radiologist



## PROGRAM OVERVIEW

The SMPBC provides standard two-view bilateral mammography to British Columbian women between ages 40 to 79 without doctor's referral. Women outside of this age group may be referred to the SMPBC by their family physicians, if they are at high risk.

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

### The Screening Process

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

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

### Screening Promotion

The SMPBC launched the newly developed promotional/educational materials in Fall 2007. The renewed material incorporated a "call to action" to encourage women to take an active role in their breast health, and to promote SMPBC with friends and loved ones. As breast cancer risk increases with age, images of older women have greater prominence in the new materials.

Our core promotional materials (e.g. information brochures, posters, appointment pads) in a number of languages are distributed through doctors' offices, health units, libraries, community centres and other interested organizations. Our website ([www.smpbc.ca](http://www.smpbc.ca)) has enhanced content, including a short presentation on what happens when you have a mammogram in English, Punjabi and Chinese.

There are ongoing dialogues and projects with First Nations and ethnic community leaders to identify culturally sensitive ways to encourage participation.

Volunteers are a key to the SMPBC. A network of more than 300 volunteers assist with community promotion, and create a warm and welcoming

setting for women using our mobile screening services.

With addresses provided by the Ministry of Health's Client Registry, SMPBC sends screening invitations to women turning age 50 each year. The SMPBC also sends recall reminders to women when they are due to return for another screening mammogram.

### Quality Assurance and Quality Control

Quality standards and systems in the SMPBC 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 Department and the scientific literature.

CAR Mammography Accreditation is mandatory for all SMPBC Centres. The SMPBC has a team of Medical Physicists, a Provincial Professional Practice Leader for Mammography Technologists and a Quality Management Coordinator. This team supports imaging quality assurance and to 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.

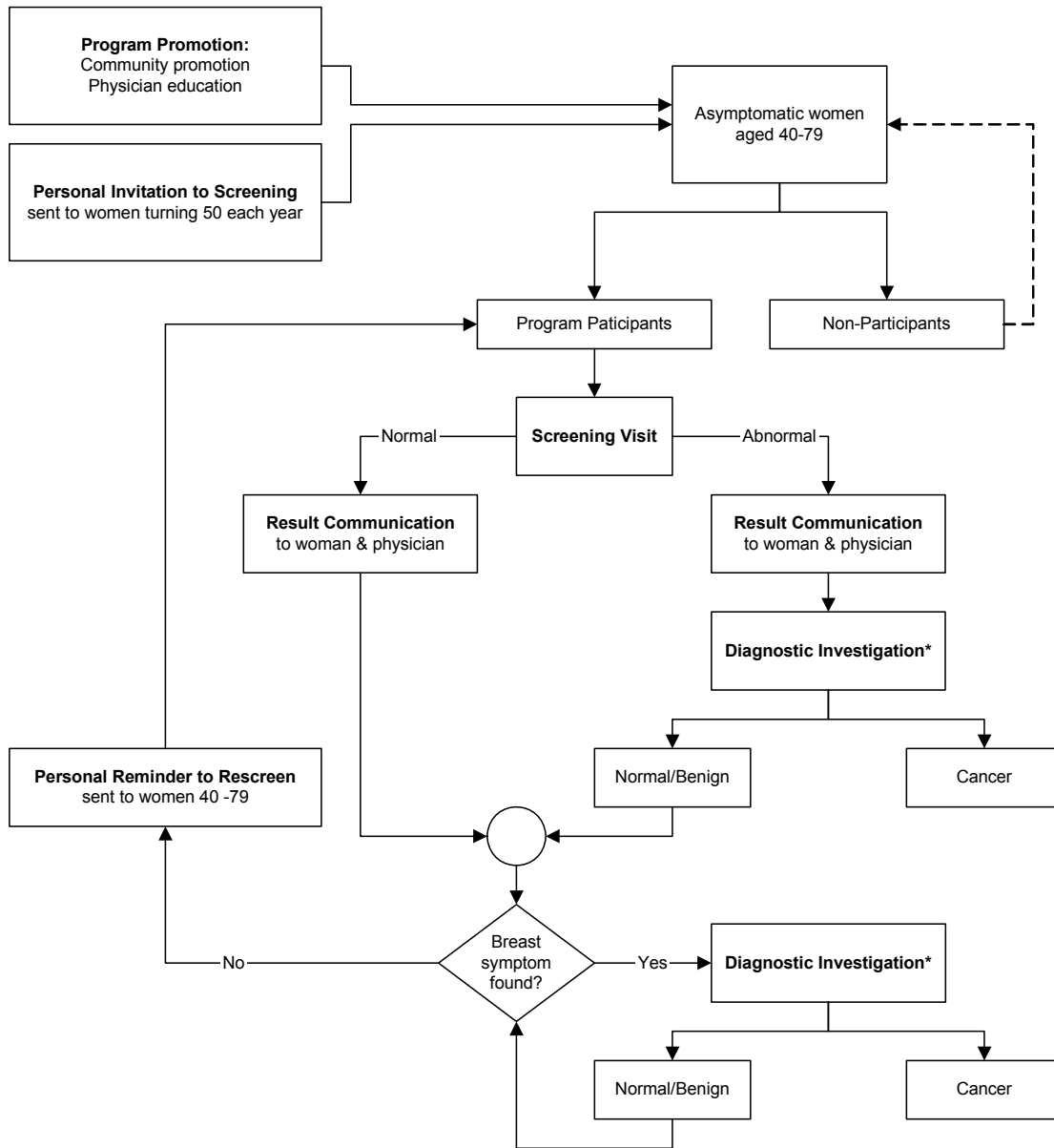
### FAST TRACK - Facilitated Referral to Diagnostic Imaging

The SMPBC initiated in 1999 a voluntary facilitated referral to diagnostic imaging ("Fast Track") for patients with abnormal screening mammograms. Currently, 55% of general practitioners are enrolled in the Fast Track referral process. Analysis of data from January 2003 to June 2005 showed that the median time between abnormal screening report and the first assessment procedure is 1.5 weeks less for patients on Fast Track referral.

### Evaluation

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

# SMPBC 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.

# PROGRAM RESULTS

## Recruitment and Rescreening

The SMPBC provided 279,260 examinations to 279,141 women in 2007. During this period, 40,484 (14%) examinations were performed for women attending the SMPBC for the first time and the remaining 238776 (86%) examinations were performed on returning participants.

Figure 1 shows that the number of exams provided by SMPBC in 2007 increased by 5%, where the number of first time attendees in 2007 decreased by 6% and the number of those women returning for an examination in 2007 increased by 7% over the previous year.

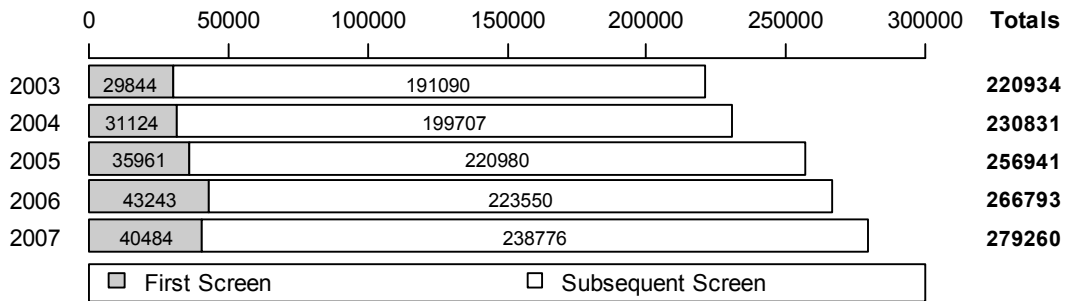
The age distribution of all exams and first exams performed in 2007 by Health Services Delivery Areas (HSDA) are displayed in Table 1. In all HSDA's, majority of exams are performed for

women age 50-69, while most women who had their initial examinations are of age less than 50.

In the 24-month period of 2006 and 2007, 457,991 women age 40 and over participated in the SMPBC. Age specific participation rates by HSDA are shown in Table II. In each and every HSDA, the highest participation rates were seen in the 50-59 and 60-69 age groups. The overall participation rate for women aged 50-69 was 49%. In the Northern Health Authority, participation rates for women aged 50-69 increased by 1% in the Northwest and Northern Interior, and decreased 1% in the Northeast. Overall, the Northern Health Authority participation rates for women aged 50-69 are maintained at 46%. The participation rate in the East Kootenay remains the lowest in the province at 29%, while Okanagan and Richmond have the highest participation rate at 54%.

**FIGURE 1**

**SMPBC Annual Screening Volume  
Years: 2003-2007**



**TABLE I**  
**SMPBC Volume by Health Service Delivery Area (HSDA) Year 2007**

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	3,085	34%	54%	12%	426	14%	58%	39%	4%
Kootenay Boundary	4,573	28%	57%	15%	651	14%	54%	43%	3%
Okanagan	26,424	29%	55%	16%	3,416	13%	62%	34%	3%
Thompson Cariboo	16,129	30%	58%	12%	1,816	11%	66%	31%	2%
Fraser East	15,083	33%	53%	14%	2,290	15%	63%	34%	3%
Fraser North	35,527	40%	50%	10%	5,610	16%	74%	24%	2%
Fraser South	39,276	38%	52%	11%	6,061	15%	71%	27%	2%
Richmond	13,673	37%	54%	9%	1,715	13%	73%	25%	2%
Vancouver	37,586	38%	52%	10%	5,760	15%	71%	27%	3%
North Shore / Coast Garibaldi	17,531	36%	53%	12%	2,579	15%	70%	27%	3%
South Vancouver Island	26,855	30%	57%	13%	3,505	13%	63%	34%	3%
Central Vancouver Island	19,098	26%	59%	14%	2,456	13%	56%	41%	4%
North Vancouver Island	8,307	29%	59%	12%	1,155	14%	59%	38%	3%
Northwest	4,123	37%	56%	8%	1,111	27%	54%	43%	3%
Northern Interior	8,388	37%	55%	8%	1,174	14%	70%	29%	2%
Northeast	2,499	38%	52%	10%	470	19%	66%	33%	2%
<b>Program</b>	<b>279,260</b>	<b>34%</b>	<b>54%</b>	<b>12%</b>	<b>40,484</b>	<b>14%</b>	<b>67%</b>	<b>30%</b>	<b>3%</b>

**Note:**

SMPBC data extraction date August 5, 2008.



**TABLE II**  
**Regional Participation Rates by 10-Year Age Groups**  
**between 2006 and 2007 Inclusive**

Health Service Delivery Area	10-Year Age Groups					Ages 50-69
	40-49	50-59	60-69	70-79	80-89	
East Kootenay	25%	28%	31%	25%	1%	29%
Kootenay Boundary	31%	40%	46%	38%	2%	42%
Okanagan	42%	51%	57%	46%	3%	54%
Thompson Cariboo Shuswap	40%	50%	54%	43%	2%	52%
Fraser East	36%	46%	49%	43%	2%	47%
Fraser North	42%	49%	50%	41%	3%	49%
Fraser South	40%	46%	48%	39%	2%	47%
Richmond	46%	54%	54%	42%	3%	54%
Vancouver	42%	50%	51%	38%	2%	50%
North Shore/Coast Garibaldi	38%	45%	48%	40%	2%	46%
South Vancouver Island	40%	51%	56%	47%	3%	53%
Central Vancouver Island	37%	48%	55%	46%	3%	51%
North Vancouver Island	37%	48%	52%	44%	2%	50%
Northwest	33%	42%	43%	34%	2%	42%
Northern Interior	40%	50%	51%	40%	2%	50%
Northeast	28%	40%	40%	36%	2%	40%
<b>British Columbia</b>	<b>40%</b>	<b>48%</b>	<b>51%</b>	<b>42%</b>	<b>2%</b>	<b>49%</b>

**NOTES:**

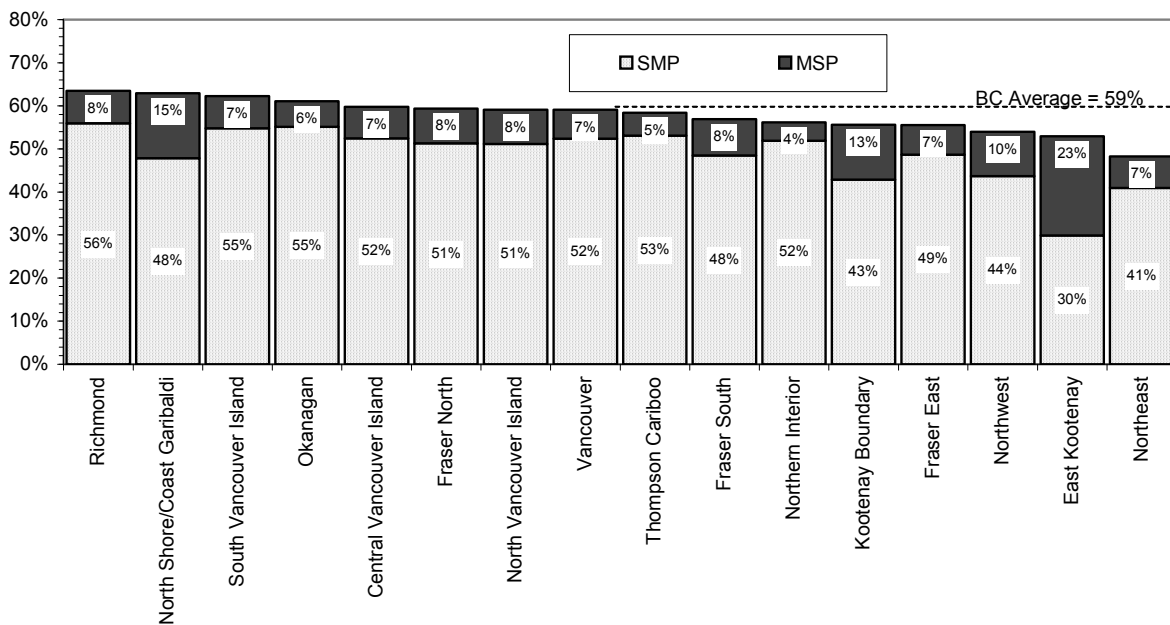
1. Based on the average of 2006 and 2007 female population estimates
2. Population data source: P.E.O.P.L.E. 32 population estimates (Nov 2007), BC STATS, BC Ministry of Labour and Citizens' Services
3. Postal code translation file: TMF0108 (Jan 2008).
4. Population and postal code data acquired through the Health Data Warehouse, BC Ministry of Health
5. SMP data extraction date: August 5, 2008

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) was directly related to screening. Data on bilateral mammography utilization were obtained from MSP.

stabilized to 5%-8%. Over the two-year period, some women may have had services through SMPBC, as well as MSP. The proportions presented may be slightly higher than the actual figures because of possible duplication. During the two years of 2006 and 2007, 59% of BC women age 50-69 received bilateral mammography services. The percent of women age 50-69 receiving bilateral mammography ranged from 48% to 64% across the province, with East Kootenay and Northeast with the lowest percentages. Overall, the SMPBC provided 86% of the bilateral mammography services for this age group.

Figure 2 shows the proportion of women receiving bilateral mammography service through SMPBC and MSP. In Health Service Delivery Areas with long standing SMPBC service, the proportion of women using MSP bilateral mammography has

**FIGURE 2**  
**Bilateral Mammography Utilization by Women Aged 50-69 in BC**  
**between 2006 and 2007 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, 2008 for services provided within years 2006 and 2007.
3. SMP data includes single screen per woman provided in calendar years 2006 and 2007.
4. 2006 and 2007 Estimated Population Data Source: P.E.O.P.L.E. 32, BC Ministry of Health Planning
5. SMP data extraction date: August 5, 2008

The regional representation of selected ethnic groups both in the SMPBC and in British Columbia is shown in *Table III*.

of population in each ethnic group and HSDA were computed based on Statistics Canada's 2001 Census.

Ethnic origin data was collected at the time of SMPBC registration (25% of 2006-2007 attendees age 50-69 did not specify their ethnicity and were excluded from the analysis) and the percentages

Ethnic population estimates, especially East/South East Asian population, may be under-represented in the Simon Fraser, Richmond and Vancouver Health Service Delivery Areas.

**TABLE III**  
**Regional Ethnic Representation of Women Aged 50-69**  
**between 2006 and 2007 Inclusive**

Health Service Delivery Area	First Nations		East/South-East Asians		South Asians	
	Population Percentage	Participation Rate	Population Percentage	Participation Rate	Population Percentage	Participation Rate
11 East Kootenay	1.1%	48.2%	1.2%	36.0%	0.7%	27.3%
12 Kootenay Boundary	0.6%	46.7%	1.0%	44.5%	0.2%	100.0%
13 Okanagan	0.7%	55.4%	1.4%	42.1%	1.0%	40.7%
14 Thompson Cariboo Shuswap	3.6%	38.5%	1.3%	64.6%	1.3%	37.7%
21 Fraser Valley	1.4%	42.5%	1.8%	65.2%	6.9%	43.8%
22 Simon Fraser	0.6%	27.2%	19.4%	53.9%	4.8%	40.9%
23 South Fraser	0.4%	48.9%	6.3%	55.2%	10.6%	42.7%
31 Richmond	0.2%	62.4%	38.8%	62.7%	6.1%	50.9%
32 Vancouver	0.9%	38.1%	37.2%	48.7%	4.4%	51.5%
33 North Shore/Coast Garibaldi	1.5%	40.8%	5.9%	52.7%	2.2%	52.1%
41 South Vancouver Island	0.8%	47.0%	4.0%	41.6%	1.3%	51.1%
42 Central Vancouver Island	2.0%	34.2%	1.2%	58.2%	1.2%	46.5%
43 North Vancouver Island	2.2%	45.5%	1.2%	43.8%	0.3%	50.9%
51 Northwest	14.1%	45.8%	2.0%	34.0%	2.0%	42.1%
52 Northern Interior	3.5%	52.5%	1.5%	39.9%	2.4%	39.0%
53 Northeast	5.0%	36.1%	1.2%	7.0%	0.0%	0.0%
<b>British Columbia</b>	<b>1.4%</b>	<b>42.5%</b>	<b>11.1%</b>	<b>51.7%</b>	<b>3.9%</b>	<b>45.4%</b>

**Participation Rate:**

1. Population data sources: P.E.O.P.L.E. 32 population estimates (Nov 2007), BC STATS, BC Ministry of Labour and Citizens' Services and 2001 Census, Statistics Canada (original data source).
2. Women attended the SMPBC at least once in 2006-2007 inclusive
3. *East/South-East Asians* include Chinese, Japanese, Korean, Filipino, Thai, Vietnamese, Indonesian, Malay, Mongolian, and Tibetan.
4. *South Asians* include Punjabi, Singhalese, Tamil, Bangladeshi, East Indian, Pakistani, and Sri Lankan.
5. Data extraction date: August 5, 2008.

**Population Percentage:**

1. Original data source - 2001 Census, Statistics Canada
2. *East/South-East Asians* include Chinese, Filipino, Burmese, Cambodian, Laotian, Thai, Vietnamese, Indonesian, Japanese, Korean,
3. *South Asians* include Bangladeshi, Bengali, East Indian, Hindu, Goan, Gujarati, Pakistani, Ismaili, Muslim, Punjabi, Sikh, Sinhalese, Sri Lankan, Tamil, and South Asian n.i.e.

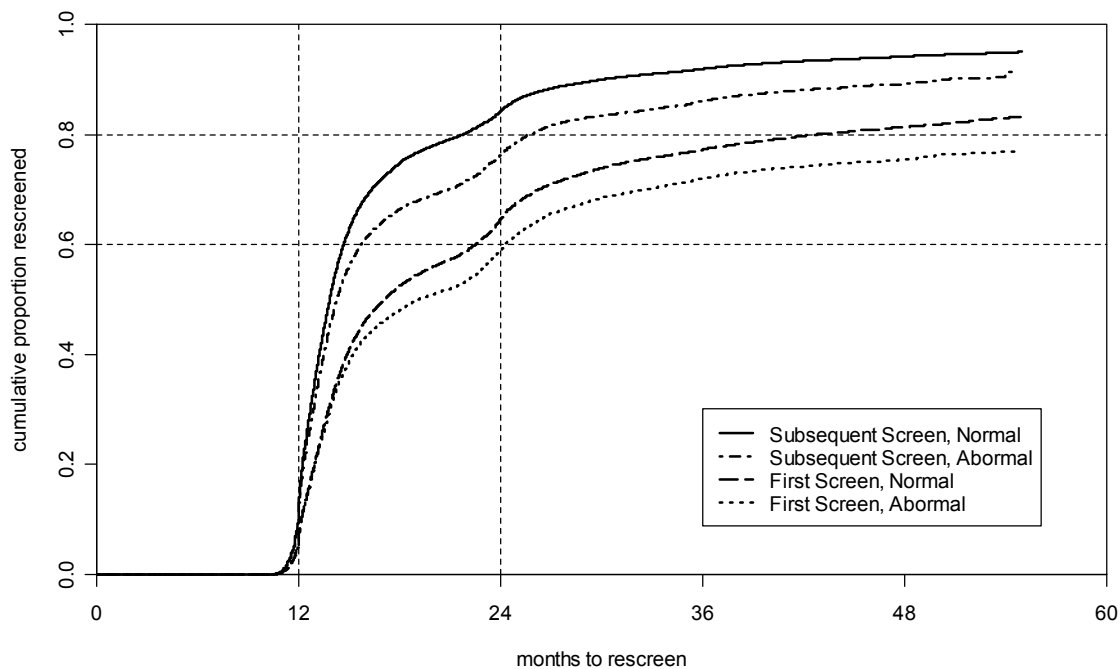
The effectiveness of regular screening mammography is universally recognized for women age 50-69. The BCCA Breast Tumour Group recommends screening at least every two years for women age 40-79. However, research evidence indicates that the sojourn time (i.e. the duration that the disease remains in the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

The SMPBC sends recall reminders to women in accordance with the interval recommendation. A second letter is sent if there is no appointment scheduled within 4-6 weeks after the first letter. This two-letter reminder system is repeated again for another year if there is no response.

Figure 3 and Figure 4 show the return rates by initial / subsequent re-screen and screen result for women age 40-49 and 50-69 respectively, between 2004 and 2006 inclusive, as of August 1, 2008. Women who had breast cancer or implants or died after the screen examination were not included in the calculation.

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

**FIGURE 3**  
**Return Rates for Women Aged 40-49**  
**by First/Subsequent Screens: 2004-2006**



**FIGURE 4**  
**Return Rates for Women Aged 50-56**  
**by First/Subsequent Screens: 2004-2006**

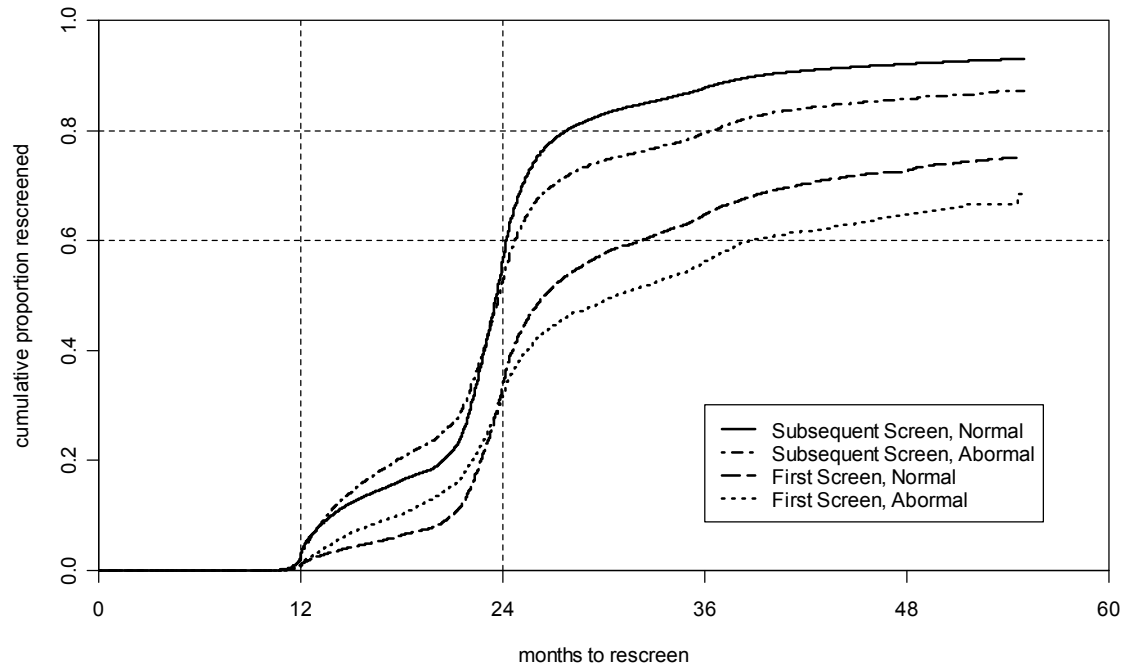


Table IV summarizes the compliance rate by first and subsequent rescreens and screen result for women age 50-69 screened between 2004 and 2006 inclusive in 6-month intervals. The compliance rate for subsequent screens is higher

than first screens at all time. In the long run, the compliance rate for women who had normal screen result is higher than for those who had abnormal result.

**TABLE IV**  
**Cumulative Numbers and Return Rate**  
**for Women Aged 50-69: 2004-2006**

	First Screen				Subsequent Screen			
	Normal		Abnormal		Normal		Abnormal	
<b>Total Number to be Re-screened</b>	26457		4727		345,255		19,308	
<b>Returned by</b>								
<b>18 months</b>	1694	6%	484	10%	56,461	16%	3,981	21%
<b>24 months</b>	6607	34%	944	32%	126,694	57%	5,705	53%
<b>30 months</b>	4995	58%	663	49%	75,678	83%	3,440	75%
<b>36 months</b>	988	65%	180	56%	9,642	88%	566	80%

**Note:**

SMPBC data extraction date: August 5, 2008.

**2006 Screening Results**

Table V summarizes the outcome indicators for screening provided in the calendar year 2007 by 10-year age groups. Of the 279,260 screening mammograms performed, 19,681 (7.0%) had an abnormal result and 1,123 breast cancers were reported as of August 1, 2008 (4.0 per 1,000 exams), including 266 in-situ cancers. For every age group, the abnormal call rate is lower on

subsequent screens than on first screens. The overall abnormal call rate decreased with age between 40-49 and 70-79 from 8.7% to 5.2%. Cancer detection rates and positive predictive value, increase with age, while benign core biopsy rate and benign open biopsy rate decrease with age.

**TABLE V**  
**SMPBC Outcome Indicators by 10-Year Age Group**  
**Year: 2007**

Outcome Indicators	Age at Exam						All
	<40	40-49	50-59	60-69	70-79	80+	
<b>Number of Exams</b>	296 0.1%	95,719 34.3%	89,487 32.0%	61,155 21.9%	31,167 11.2%	1,436 0.5%	279,260
<b>Number of First Screens with complete follow-up</b>	261 0.6%	26,787 66.3%	9,068 22.5%	3,176 7.9%	995 2.5%	96 0.2%	40,383
<b>Number of Cancers</b>	0 0.0%	185 16.5%	358 31.9%	328 29.2%	227 20.2%	25 2.2%	1,123
<b>Abnormal Call Rate</b>	10.5%	8.7%	6.9%	5.5%	5.2%	5.7%	7.0%
▪ on first screens	11.1%	14.3%	16.3%	14.5%	13.2%	14.6%	14.7%
▪ on subsequent screens	5.9%	6.5%	5.9%	5.1%	5.0%	5.1%	5.7%
<b>Overall Cancer Detection Rate (per 1,000)</b>	0.0	1.9	4.0	5.4	7.3	17.4	4.0
▪ on first screens	0.0	2.8	6.5	12.9	17.1	20.8	4.8
▪ on subsequent screens	0.0	1.6	3.7	5.0	7.0	17.2	3.9
<b>DCIS Detection Rate (per 1,000)</b>	0.0	0.8	0.9	1.0	1.4	2.8	1.0
<b>Positive Predictive Value of Screening Mammography</b>	0.0%	2.2%	5.8%	9.8%	14.0%	31.3%	5.8%
▪ on first screens	0.0%	2.0%	4.0%	9.1%	13.0%	14.3%	3.3%
▪ on subsequent screens	0.0%	2.5%	6.4%	9.9%	14.1%	34.8%	6.8%
<b>Benign Core Biopsy Rate (per 1000)</b>	3.4	5.5	4.0	3.2	2.4	1.4	4.2
▪ on first screens	3.8	11.9	13.8	11.0	12.1	10.4	12.2
▪ on subsequent screens	0.0	3.1	2.9	2.8	2.1	0.7	2.8
<b>Benign to Malignant Core Biopsy Ratio</b>	---	4.6 : 1	1.5 : 1	0.9 : 1	0.5 : 1	0.1 : 1	1.6 : 1
▪ on first screens	---	6.6 : 1	2.8 : 1	1.4 : 1	1.2 : 1	1.0 : 1	3.8 : 1
▪ on subsequent screens	---	3.1 : 1	1.3 : 1	0.8 : 1	0.5 : 1	0.1 : 1	1.1 : 1
<b>Benign Open Biopsy Rate (per 1000)</b>	---	0.2	0.1	0.1	0.1	0.0	0.2
▪ on first screens	---	0.3	0.4	0.3	---	---	0.3
▪ on subsequent screens	---	0.2	0.1	0.1	0.1	0.0	0.1
<b>Benign to Malignant Open Surgical Biopsy Ratio</b>	---	2.3 : 1	1.3 : 1	0.7 : 1	2.0 : 1	0.0 : 1	1.3 : 1
▪ on first screens	---	2.7 : 1	2.0 : 1	1.0 : 1	---	---	2.2 : 1
▪ on subsequent screens	---	2.2 : 1	1.1 : 1	0.7 : 1	2.0 : 1	0.0 : 1	1.1 : 1

**Notes:**

1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. An additional 238 abnormal screens had incomplete or lost followup. Information from these screens is excluded from all entries in the table other than exam counts and abnormal call rates.
4. Out of 19443 "abnormal" screens with complete follow-up, there were 16 lobular carcinoma in-situ cases. The final number of cancers is still to be determined.
5. SMPBC data extraction data: August 5, 2008.

Diagnostic procedure information is available on 19,432 (98.7%) of the abnormal screening mammograms to date. *Table VI* shows the proportion of women receiving specific diagnostic procedures as part of the work-up on their screen detected abnormalities. Overall, 10% and 6% of

women with abnormal screening mammograms and complete follow-up had core and/or open biopsy, respectively.

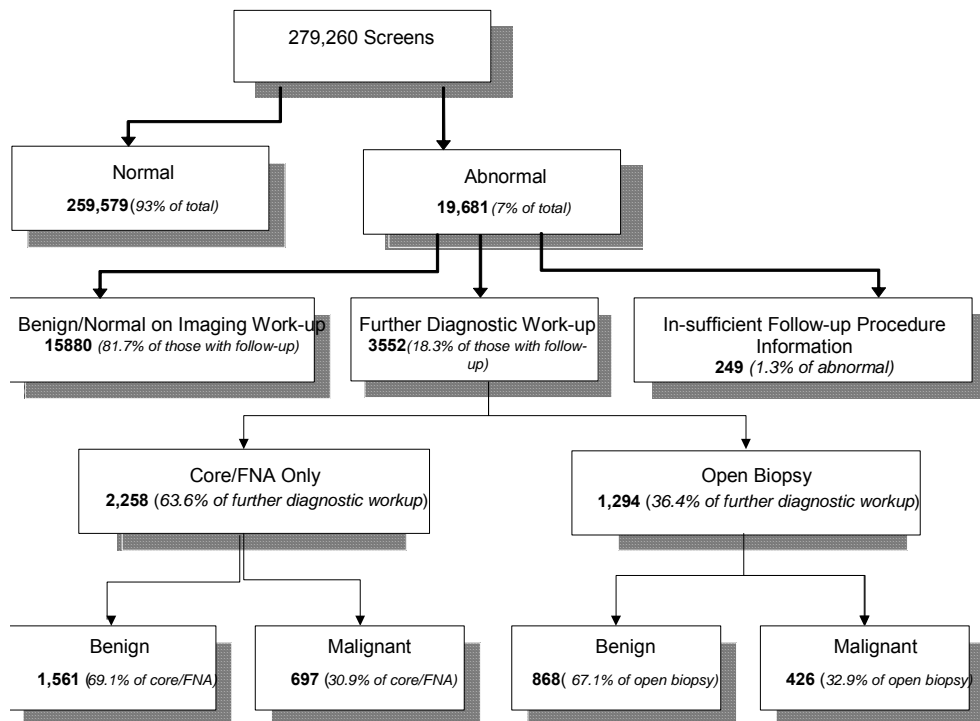
**TABLE VI**  
**Diagnostic Procedures Received by SMPBC Participants**  
**with “Abnormal” Screening Mammograms**  
**Year: 2007**

Procedure	Age at Exam						All
	<40	40-49	50-59	60-69	70-79	80+	
Diagnostic Mammogram	87%	90%	91%	93%	92%	95%	91%
Ultrasound	67%	66%	63%	62%	62%	63%	64%
Fine Needle Aspiration	3%	5%	5%	4%	5%	10%	5%
Core Biopsy	3%	8%	10%	12%	14%	20%	10%
Surgical Biopsy	0%	5%	6%	8%	8%	16%	6%
▪ with Localization	0%	5%	6%	8%	8%	14%	6%
Number of cases with diagnostic assessment information available	30	8,219	6,142	3,346	1,615	80	19,432

**Note:**

SMPBC data extraction date: August 5, 2008.

**FIGURE 5**  
**Screening Outcome Summary 2007**





## 2006 Cancer Detection

Histologic features of breast cancers detected by SMPBC in 2006 are summarized by 10-years age groups in *Table VII*. Histologic features of breast cancer cases were obtained from the pathology reviews if available, otherwise from the original diagnostic reports. Invasive tumour size was determined from the best available source: (1) pathological, (2) radiological, (3) clinical. The TNM cancer staging was determined by assuming no regional lymph node involvement (N0) whenever axillary lymph nodes were not

assessed and no distant metastases (M0) unless otherwise informed.

Overall, 72% of cancers detected were in situ or stage I. Of the invasive cancers detected, 64% were  $\leq 15$  mm, 76% have not had invasion of the regional lymph nodes and 23% were grade 3 (i.e. poorly differentiated) tumours. Of the grade 3 tumours, 44% were smaller than 15mm. These overall outcome indicators met the international targets<sup>1</sup> recommended for screening programs.

**TABLE VII**  
**Histologic Features of Breast Cancers Detected by SMPBC**  
**Year: 2006**

Histological Features	Age at Exam					Age 40+
	40-49	50-59	60-69	70-79	80+	
<b>Number of Cancers</b>	200	306	321	230	11	1,068
▪ in situ	63 32%	87 28%	66 21%	31 13%	1 9%	248 23%
▪ invasive	137 69%	219 72%	255 79%	199 87%	10 91%	820 77%
<b>TNM Staging</b>						
▪ I	81 60%	142 66%	158 63%	137 70%	7 70%	525 65%
▪ II	52 38%	73 34%	85 34%	51 26%	3 30%	264 33%
▪ III+	3 2%	1 0%	7 3%	8 4%	0 0%	19 2%
▪ unknown stage	(1)	(3)	(5)	(3)	(0)	(12)
<b>Invasive Tumour Size</b>						
▪ $\leq 5$ mm	14 10%	18 8%	19 8%	11 6%	2 20%	64 8%
▪ 6-10 mm	35 26%	49 23%	70 28%	64 33%	0 0%	218 27%
▪ 11-15 mm	32 24%	76 35%	73 29%	53 27%	3 30%	237 29%
▪ 16-20 mm	17 13%	32 15%	32 13%	30 15%	2 20%	113 14%
▪ $>20$ mm	38 28%	41 19%	56 22%	38 19%	3 30%	176 22%
▪ unknown size	(1)	(3)	(5)	(3)	(0)	(12)
<b>Invasive with tumour <math>\leq 15</math> mm</b>	81 60%	143 66%	162 65%	128 65%	5 50%	519 64%
<b>Node Involvement in Invasive</b>						
▪ no	91 71%	156 74%	183 74%	155 85%	4 57%	589 76%
▪ yes	38 29%	54 26%	63 26%	28 15%	3 43%	186 24%
▪ no nodes sampled	(8)	(9)	(9)	(16)	(3)	(45)
<b>Histologic Grade of Invasive</b>						
▪ 1 - <i>well differentiated</i>	44 33%	70 34%	74 31%	64 34%	4 40%	256 33%
▪ 2 - <i>moderately differentiated</i>	56 41%	91 45%	103 43%	87 46%	4 40%	341 44%
▪ 3 - <i>poorly differentiated</i>	35 26%	43 21%	62 26%	37 20%	2 20%	179 23%
▪ unknown grade	(2)	(15)	(16)	(11)	(0)	(44)
<b>Grade 3 tumour <math>\leq 15</math> mm</b>	9 26%	16 37%	34 55%	19 51%	0 0%	78 44%

### Notes:

1. TNM staging was determined by using mammographic measurement whenever pathologic measurement of the tumour was unavailable, by assuming N0 whenever nodes were not assessed and M0 unless otherwise informed.
2. Targets<sup>1</sup>:  $>50\%$  invasive tumours  $\leq 15$ mm,  $>70\%$  with negative nodes,  $>30\%$  grade 3 tumours  $\leq 15$ mm.
3. SMPBC data extraction date: August 5, 2008.

### Reference

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

## Outcome Indicators by Calendar Year: 2003-2007

The overall abnormal call rate in 2007 of 7.0% is slightly less than the previous year (7.4%) and the 5 year cumulative rate (7.2%). The overall cancer detection rate for 2007, as well as the corresponding rate for subsequent screens are slightly lower than the respective 5 year cumulative rate, while the 2007 cancer detection rate for first screens seems slightly higher (0.1) than the respective 5 year averages. The benign core biopsy rate is higher than the 5-year cumulative rate, and the benign open biopsy rate is lower than the 5-year cumulative rate.

Regular record linkage with the British Columbia Cancer Registry enables the SMPBC to determine the number of non-screen detected (interval) cancers in SMPBC participants for each year. 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 SMPBC conducts formal reviews, both

blinded and retrospective, of all interval cancers in SMPBC 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 SMPBC, prevalent screens have been restricted to those women with no previous outside mammogram within 24 months of their first SMPBC encounter. Swedish two-county study showed a prevalence to expected incidence ratio of 3.09 for age 50-59 and 4.59 for age 60-69<sup>1</sup> and had recommended the target of >3.0 for organized screening programs<sup>2</sup>. The annual prevalence to expected incidence ratios for age 50-79 have consistently been above 3 from 1995 onwards.

### References

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**  
**SMPBC Outcome Indicators by Calendar Year**  
**between 2003 and 2007 Inclusive**

Outcome Indicators	Calendar Year					5-Year Cumulative
	2003	2004	2005	2006	2007	
<b>Number of Exams</b>	220,934	230,831	256,941	266,793	279,260	1,254,759
<b>% first screens</b>	13.5%	13.5%	14.0%	16.2%	14.5%	14.4%
<b>Number of Cancers</b>	908	926	1,115	1,068	1,123	5,140
<b>% on first screens</b>	15.3%	16.2%	13.4%	19.5%	17.4%	16.4%
<b>Abnormal Call Rate</b>	7.1%	7.1%	7.2%	7.4%	7.0%	7.2%
▪ on first screens	14.3%	14.7%	15.1%	14.9%	14.7%	14.8%
▪ on subsequent screens	6.0%	5.9%	5.9%	5.9%	5.7%	5.9%
<b>Overall Cancer Detection Rate (per 1,000)</b>	4.1	4.0	4.3	4.0	4.0	4.1
▪ on first screens	4.7	4.9	4.2	4.8	4.8	4.7
▪ on subsequent screens	4.0	3.9	4.4	3.9	3.9	4.0
<b>DCIS Detection Rate (per 1,000)</b>	1.0	1.0	1.0	0.9	1.0	1.0
<b>Positive Predictive Value of Screening Mammography</b>	6.0%	5.8%	6.2%	5.6%	5.8%	5.9%
▪ on first screens	3.4%	3.5%	2.9%	3.3%	3.3%	3.3%
▪ on subsequent screens	6.9%	6.7%	7.5%	6.6%	6.8%	6.9%
<b>Benign Core Biopsy Rate (per 1000)</b>	2.6	2.8	3.1	4.2	4.2	3.4
▪ on first screens	7.5	7.9	9.8	11.6	12.2	10.1
▪ on subsequent screens	1.8	2.0	2.0	2.8	2.8	2.3
<b>Benign to Malignant Core Biopsy Ratio</b>	1.5 : 1	1.5 : 1	1.4 : 1	1.8 : 1	1.6 : 1	1.6 : 1
▪ on first screens	3.8 : 1	3.5 : 1	4.3 : 1	3.8 : 1	3.8 : 1	3.9 : 1
▪ on subsequent screens	1.1 : 1	1.1 : 1	0.9 : 1	1.3 : 1	1.1 : 1	1.1 : 1
<b>Benign Open Biopsy Rate (per 1000)</b>	0.4	0.3	0.2	0.2	0.2	0.3
▪ on first screens	1.2	0.8	0.7	0.5	0.3	0.7
▪ on subsequent screens	0.3	0.2	0.2	0.2	0.1	0.2
<b>Benign to Malignant Open Surgical Biopsy Ratio</b>	1.8 : 1	1.1 : 1	1.4 : 1	1.6 : 1	1.3 : 1	1.4 : 1
▪ on first screens	4.4 : 1	1.7 : 1	2.4 : 1	2.3 : 1	2.2 : 1	2.4 : 1
▪ on subsequent screens	1.3 : 1	1.0 : 1	1.1 : 1	1.3 : 1	1.1 : 1	1.1 : 1
<b>Interval Cancer Rate (per 1,000)</b>						
▪ 0-12 months	0.65	0.63	0.64	0.53	---	---
after first screens	0.51	0.39	0.70	0.44	---	---
after subsequent screens	0.67	0.66	0.63	0.55	---	---
▪ 13-24 months	0.73	0.77	0.66	---	---	---
<b>Sensitivity (i.e. 1 - false negative rate)</b>	86.4%	86.5%	87.1%	---	---	---
<b>Specificity (i.e. 1 - false positive rate)</b>	93.5%	93.5%	93.4%	93.2%	---	---
<b>Prevalence to Expected Incidence Ratio for Age 50-79 (target<sup>2</sup>: &gt;3.0)</b>	3.00	3.20	3.00	3.20	3.80	3.20

**Notes:**

1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. The final number of cancers in 2007 is still to be determined.
4. Number of cancers and related rates do not include data for women whose follow-up is incomplete.
5. SMPBC data extraction data: August 5, 2008.

## Outcome Indicators by Age: 2003-2007 Cumulative

In the 5-year period from 2003 to 2007, the SMPBC provided 1,254,759 screening mammography examinations to 573,325 women. Outcome indicators for this 5-year period are summarized by 10-year age groups in *Table IX*. The abnormal call rate is generally lower for older ages. Additionally, the risk of breast cancer

increases with age, which is reflected by higher cancer detection rates for older women. An increasing trend with age is observed in the positive predictive value of screening mammography, benign core biopsy rate, benign open biopsy rate and specificity.

**TABLE IX**  
**SMPBC Outcome Indicators by 10-Year Age Groups**  
**between 2003 and 2007 Inclusive**

Outcome Indicators	Age at Exam					All
	40-49	50-59	60-69	70-79	80+	
<b>Number of Exams</b>	426,708	405,707	263,613	151,073	6,261	1,254,759
<b>% first screens</b>	28.2%	9.6%	5.6%	3.3%	8.3%	14.4%
<b>Number of Cancers</b>	880	1,575	1,531	1,080	73	5,140
<b>% on first screens</b>	40.7%	15.2%	10.6%	6.9%	9.6%	16.4%
<b>Abnormal Call Rate</b>	8.9%	7.0%	5.9%	5.3%	6.3%	7.2%
▪ on first screens	14.5%	16.1%	14.6%	13.0%	15.4%	14.8%
▪ on subsequent screens	6.7%	6.0%	5.3%	5.0%	5.5%	5.9%
<b>Overall Cancer Detection Rate (per 1,000)</b>	2.1	3.9	5.8	7.2	11.7	4.1
▪ on first screens	3.0	6.2	11.1	15.1	13.6	4.7
▪ on subsequent screens	1.7	3.6	5.5	6.9	11.5	4.0
<b>DCIS Detection Rate (per 1,000)</b>	0.7	1.0	1.2	1.3	1.1	1.0
<b>Positive Predictive Value of Screening Mammography</b>	2.4%	5.7%	10.2%	13.9%	19.2%	5.9%
▪ on first screens	2.1%	4.0%	7.9%	12.1%	9.3%	3.3%
▪ on subsequent screens	2.6%	6.2%	10.5%	14.0%	21.6%	6.9%
<b>Benign Core Biopsy Rate (per 1000)</b>	4.7	3.3	2.5	2.0	1.9	3.4
▪ on first screens	10.2	11.0	8.4	7.2	5.8	10.1
▪ on subsequent screens	2.5	2.5	2.2	1.8	1.6	2.3
<b>Benign to Malignant Core Biopsy Ratio</b>	4.1 : 1	1.5 : 1	0.8 : 1	0.6 : 1	0.3 : 1	1.6 : 1
▪ on first screens	6.1 : 1	3.1 : 1	1.4 : 1	0.9 : 1	0.8 : 1	3.9 : 1
▪ on subsequent screens	2.7 : 1	1.2 : 1	0.7 : 1	0.5 : 1	0.2 : 1	1.1 : 1
<b>Benign Open Biopsy Rate (per 1000)</b>	0.4	0.2	0.2	0.1	0.3	0.3
▪ on first screens	0.8	0.6	0.2	0.2	0.0	0.7
▪ on subsequent screens	0.3	0.2	0.2	0.1	0.3	0.2
<b>Benign to Malignant Open Surgical Biopsy Ratio</b>	4.1 : 1	1.3 : 1	0.7 : 1	0.3 : 1	0.3 : 1	1.4 : 1
▪ on first screens	6.0 : 1	1.4 : 1	0.3 : 1	0.1 : 1	0.0 : 1	2.4 : 1
▪ on subsequent screens	3.1 : 1	1.2 : 1	0.8 : 1	0.3 : 1	0.4 : 1	1.1 : 1
<b>Interval Cancer Rate (per 1,000)</b>						
▪ 0-12 months	0.56	0.47	0.52	0.66	0.48	0.54
after first screens	0.45	0.42	0.48	0.40	0.00	0.44
after subsequent screens	0.61	0.48	0.52	0.67	0.52	0.55
▪ 13-24 months	0.01	0.66	0.76	0.84	1.76	0.49
<b>Sensitivity (i.e. 1 - false negative rate)</b>	78.6%	89.1%	91.8%	91.5%	96.1%	88.5%
<b>Specificity (i.e. 1 - false positive rate)</b>	91.5%	93.6%	94.8%	95.5%	95.0%	93.4%

**Notes:**

1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS)
3. The final number of cancers in 2007 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. SMPBC data extraction data: August 5, 2008.

## Outcome Indicators by HSDA: 2003-2007 Cumulative

Outcome indicators for 2003 to 2007 are summarized by HSDA in Table X. HSDA's in the Interior and Vancouver Island have the lowest abnormal call rate (5%), while Fraser East has the highest (11%). Central Vancouver Island has the

highest cancer detection rate, positive predictive value and percentage of invasive cancer  $\leq 15$ mm. All HSDA meet the national target of having more than 50% of invasive cancers with tumour size  $\leq 15$ mm.

**Table X**  
**SMPBC Outcome Indicators by Health Service Delivery Area (HSDA)**  
**between 2003 and 2007 Inclusive**

HSDA	% Called Abnormal	Cancer Detection Rate (per 1000)	PPV	In-Situ : Invasive (number)	% Invasive $\leq 15$ mm	% Invasive with -ve nodes
East Kootenay	5%	3.6	7%	6:50	54%	66%
Kootenay Boundary	5%	3.8	8%	18:66	68%	65%
Okanagan	5%	4.2	8%	118:382	67%	73%
Thompson Cariboo	5%	3.9	8%	57:228	65%	72%
Fraser East	11%	4.6	4%	68:240	57%	71%
Fraser North	8%	4.1	5%	179:480	68%	71%
Fraser South	9%	4.4	5%	205:558	62%	70%
Richmond	8%	3.6	5%	68:167	64%	66%
Vancouver	8%	4.1	5%	196:493	68%	67%
North Shore / Coast Garibaldi	6%	4.3	8%	88:254	69%	69%
South Vancouver Island	5%	3.4	7%	61:341	62%	66%
Central Vancouver Island	5%	4.8	9%	74:336	73%	72%
North Vancouver Island	5%	3.8	8%	27:112	66%	77%
Northwest	6%	3.3	5%	11:39	59%	49%
Northern Interior	7%	4.2	6%	44:117	67%	70%
Northeast	7%	3.1	4%	4:30	63%	60%
<b>Program</b>	7%	4.1	6%	1226:3914	65%	70%

**Notes:**

1. See glossary in the Appendix for definitions of terms.
2. SMPBC data extraction date: August 5, 2008.

## Cancer Characteristics by Age Year: Cumulative up to and including 2006

From the start of the program in July 1988 to December 2006, 11,848 women have been found to have breast cancer through screen-initiated work-up. Histologic features of breast cancers detected by SMPBC cumulative to and including 2006 are summarized by 10-year age groups in *Table XI*. The data for women younger than 40

are included in the totals but not listed in a separate column. Internationally recommended targets have been achieved. However, invasive cancers found in women age 40-49 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 SMPBC**  
**Cumulative up to and including 2006**

Histological Features	Age at Exam					All
	40-49	50-59	60-69	70-79	80+	
<b>Number of Cancers</b>	1,998	3,373	3,593	2,669	207	11,848
▪ in situ	619 31%	891 26%	759 21%	478 18%	20 10%	2,770 23%
▪ invasive	1,379 69%	2,482 74%	2,834 79%	2,191 82%	187 90%	9,078 77%
<b>TNM Staging</b>						
▪ I	807 59%	1,573 64%	1,947 69%	1,586 73%	138 74%	6,055 67%
▪ II	513 38%	815 33%	799 28%	516 24%	43 23%	2,687 30%
▪ III+	42 3%	64 3%	71 3%	71 3%	5 3%	253 3%
▪ unknown stage	(17)	(30)	(17)	(18)	(1)	(83)
<b>Invasive Tumour Size</b>						
▪ ≤5 mm	139 10%	233 10%	243 9%	155 7%	19 10%	789 9%
▪ 6-10 mm	276 20%	591 24%	779 28%	686 32%	50 27%	2,383 27%
▪ 11-15 mm	382 28%	697 28%	902 32%	663 31%	54 29%	2,699 30%
▪ 16-20 mm	203 15%	423 17%	402 14%	329 15%	35 19%	1,394 16%
▪ >20 mm	359 26%	505 21%	488 17%	338 16%	28 15%	1,719 19%
▪ unknown size	(20)	(33)	(20)	(20)	(1)	(94)
<b>Invasive with tumour ≤ 15 mm</b>	797 59%	1521 62%	1924 68%	1504 69%	123 66%	5871 65%
<b>Node Involvement in Invasive</b>						
▪ no	873 70%	1,685 74%	2,008 78%	1,513 81%	95 79%	6,179 76%
▪ yes	378 30%	589 26%	577 22%	345 19%	25 21%	1,914 24%
▪ no nodes sampled	(128)	(208)	(249)	(333)	(67)	(985)
<b>Histologic Grade of Invasive</b>						
▪ 1 - <i>well differentiated</i>	353 28%	754 34%	867 34%	755 39%	65 39%	2,794 35%
▪ 2 - <i>moderately differentiated</i>	537 43%	894 41%	1,121 44%	851 44%	71 43%	3,476 43%
▪ 3 - <i>poorly differentiated</i>	356 29%	548 25%	554 22%	319 17%	29 18%	1,808 22%
▪ unknown grade	(133)	(286)	(292)	(266)	(22)	(1000)
<b>Grade 3 tumour ≤ 15 mm</b>	152 43%	256 47%	310 56%	160 50%	13 45%	891 49%

**Notes:**

1. TNM staging was determined by using mammographic measurement whenever pathologic measurement of the tumour was unavailable, by assuming N0 whenever nodes were not assessed and M0 unless otherwise informed.
2. Targets<sup>1</sup>: >50% invasive tumours ≤15mm, >70% with negative nodes, >30% grade 3 tumours ≤15mm.
3. The 'All' column includes women less than 40 years of age.
2. SMPBC data extraction date: August 5, 2008.

## Comparison with Canadian Standards

The necessity to standardize evaluation of Canadian breast cancer screening programs was first recognized in 1990. In December 1992, the Canadian Breast Cancer Screening Initiative (CBCSI) was launched. Under the Canadian Breast Cancer Screening component of this initiative, Health 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. Currently all provincial programs contribute 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.

In this section, SMPBC performance measures are presented against the targets set for Canadian breast cancer screening programs. These targets are presented in the report: Guidelines for Monitoring Breast Screening Program Performance Second Edition, published in 2007<sup>1</sup>. 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. These national guidelines have recently been reviewed and it is anticipated that an update will be available in the very near future.

**TABLE XII**  
**Comparison of SMPBC Performance with**  
**Canadian Breast Screening Standards for 50-69 Year olds**

Performance Measure	National Target	SMPBC
<b>Participation Rate (1)</b>	≥70% of the eligible population	49% (plus 8% MSP)
<b>Retention Rate (2)</b>		
. Initial Rescreen	≥75% initial re-screen within 30 months	54%
. Subsequent Rescreen	≥90% initial re-screen within 30 months	81%
<b>Abnormal Call Rate (3)</b>		
. First Screens	<10% first screens	15.8%
. Subsequent Screens	<5% re-screens	5.5%
<b>Invasive Cancer Detection Rate (3)</b>		
. First Screens	>5 per 1,000 first screens	3.35 per 1,000
. Subsequent Screens	>3 per 1,000 re-screens	6.86 per 1,000
<b>In Situ Cancer Detection Rate (3)</b>	Surveillance and Monitoring only, 04-1.0 per 1,000 in UK standards	0.09 per 1,000
<b>Positive Predictive Value (3)</b>		
. First Screens	≥5% first screen	5.2%
. Subsequent Screens	≥6% re-screens	7.7%
<b>Benign to Malignant Core Biopsy Ratio (4)</b>		
. First Screens	Surveillance and Monitoring Purposes only	2.3 : 1
. Subsequent Screens	Surveillance and Monitoring Purposes only	1.0 : 1
<b>Benign to Malignant Open Biopsy Ratio (4)</b>		
. First Screens	≤1:1	1.7 : 1
. Subsequent Screens	≤1:1	0.9 : 1
<b>Invasive Tumour size ≤10 mm (4)</b>	>25%	27%
<b>Invasive Tumour size ≤15 mm (4)</b>	>50%	51%
<b>Node Negative Rate in Cases of Invasive Cancer (4)</b>	>70%	68%

**Notes:**

1. Screen years: (1) = 2006 & 2007, (2) = 2004-2006, (3) = 2007, (4) = 2006
2. Population data source: P.E.O.P.L.E. 32 population estimates (Nov 2007), BC STATS, BC Ministry of Labour and Citizens' Services
3. Data extraction date: August 5, 2008.

**Reference:**

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



## Cost Analysis

The SMPBC is funded by the provincial Ministry of Health through the Provincial Health Services Authority (PHSA). It contracts with both public and private facilities to operate screening centres, including mobile services, throughout the province. The SMPBC Central Office provides overall program administration and coordination, including a provincial toll-free call centre, result mail-out, invitation and recall reminder system,

follow-up tracking, quality management, promotion, program evaluation and research support.

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

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

**TABLE XIII**  
**Cost Comparison by Fiscal Year**

Indicator	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Total Cost	\$13,005,919	\$13,401,773	\$15,759,715	\$16,732,061	\$18,219,310
Total cost per screen	\$58.44	\$57.11	\$60.08	\$62.18	\$65.54
▪ Central Services	\$8.85	\$8.16	\$8.24	\$8.74	\$10.46
▪ Other operating costs	\$34.26	\$33.75	\$36.67	\$37.99	\$39.38
▪ Professional Reading Fees	\$13.39	\$13.39	\$13.39	\$13.39	\$13.80
▪ Capital Allocation	\$1.93	\$1.81	\$1.78	\$2.06	\$1.91
Cost per cancer detected	\$13,941.00	\$14,002.71	\$14,243.78	\$15,024.04	Not Available

**Notes:**

1. Number of cancers detected in 2007-08 is not available yet, and thus the cost per cancer detected is not computed.
2. The cost per screen is consistent with PHSA Finance. The per screen payments to Screening Centres were increased in fiscal year 2007-08 to address expenses incurred by Centres to provide screens. reports includes under and overpayments to screen provid
3. Other operating costs include the cost of tube replacement.
4. Capital allocation includes 1) capital differential allocated to privately administered centres in their annual operating budget and 2) amortization of equipment purchased through BCCA/PHSA. Capital allocation does not include capital expenditures cap
5. The professional reading fee is \$13.80 per screen was effective April 2007.
6. Cost per cancer detected is based upon screens with consent and complete follow-up.

# APPENDIX 1

## Cancer Screening Program Overview

### Definition of Screening

Screening is a prevention strategy. The Primary cancer prevention strategy involves changes of behavior or habits that reduce a risk e.g., stop smoking, low fat diet, etc.

Screening for cancer is a secondary prevention strategy. Secondary cancer prevention strategy targets disease in process<sup>1</sup>.

A secondary prevention can reduce cancer morbidity and mortality by diagnosing invasive disease at an earlier, more favorable prognostic stage and detecting precursor lesions associated with some cancers that once eliminated, prevent progression to invasive disease.

Screening is “the application of various tests to apparently healthy individuals to sort out those who probably have risk factors or are in the early stages of specified conditions.”<sup>2</sup>

### Limitations of Screening

The decision to screen an at-risk population for pre-clinical signs of cancer is based on well-established criteria related to cancer and the screening tests that we used to identify individuals who may have occult disease.<sup>3,4,5</sup>

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

A person with an abnormal screening test does not have a definitive diagnosis until additional, more sophisticated diagnostic tests are completed. The emphasis on likelihood also is important because screening tests are inherently limited in their accuracy, which varies by test, cancer site and individual characteristics. Although most of screening interpretations are accurate, it is inevitable that some individuals are identified as possibly having cancer when they do

not and screening tests fail to identify some individuals who do not have the disease.

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

### Organized Population Screening Program

To reduce morbidity and mortality from cancer in a population by screening, there must be coordinated and 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 who work together to develop goals, set standards, monitor progress and continue improvement in each of the six components.

<sup>1</sup> US Preventive Services Task Force: Guide to Clinical Preventive Services, Ed 2. Baltimore, Williams & Wilkins, 1996

<sup>2</sup> Morrison A: Screening in Chronic Disease. New York, Oxford Press, 1992

<sup>3</sup> Cole P, Morrison AS: Basic issues in cancer screening. In Miller AB (ed); Screening in Cancer. Geneva, International Union Against Cancer, 1978, p7

<sup>4</sup> Miller AB; Fundamentals of Screening. In Screening for Cancer. Orlando, Academic Press, 1985, p3

<sup>5</sup> Wilson JMG, Junger G; Principles and Practice of Screening for Disease. Geneva, World Health Organization, 196

## APPENDIX 2

### SMPBC Screening Recommendations

The SMPBC offers screening mammography to eligible women aged 40 to 79 without doctor referral.

Age	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.

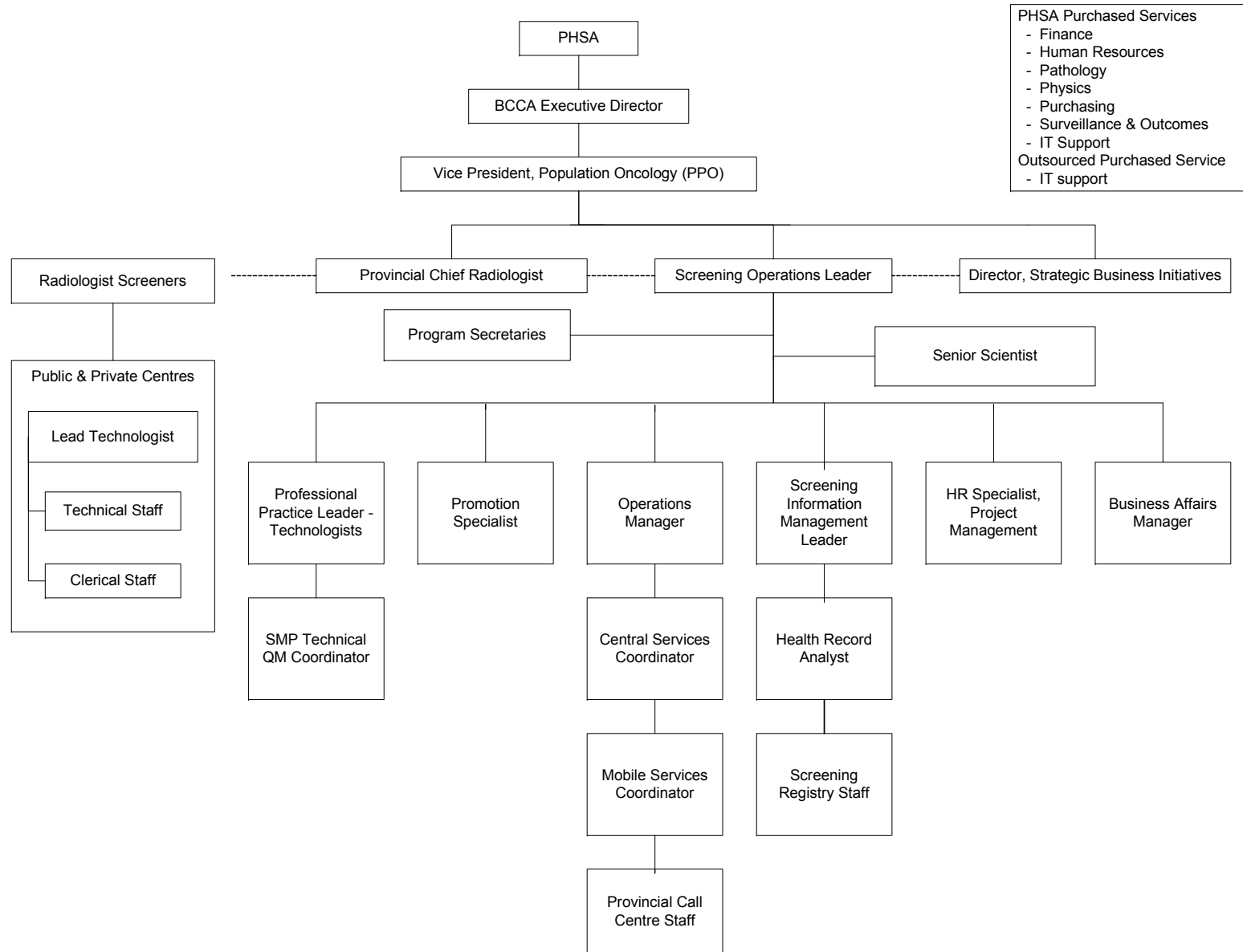
#### Age <40 – physician referral required

Primary health care providers may wish to refer women age <40 with a strong family history of breast cancer (ie. 2 or more 1st degree family members), for screening at the SMPBC. These women may also benefit from discussion of breast cancer risks including genetic counseling and testing. Screening mammography is only one component of care for these higher risk families. The SMPBC asks that each screening exam for women age <40 be arranged by primary health care providers after consultation with a radiologist at the SMPBC centre of choice. The primary health care provider should provide the woman with a referral slip citing the approving radiologist screener's name.

#### Age 80+ - physician referral required

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

## APPENDIX 3 SMPBC/BCCA Organization Chart



- PHSA Purchased Services
- Finance
  - Human Resources
  - Pathology
  - Physics
  - Purchasing
  - Surveillance & Outcomes
  - IT Support
- Outsourced Purchased Service
- IT support

## APPENDIX 4 Map of Screening Centres



## APPENDIX 5

### Screening Centre Contact Information

Abbotsford	604-851-4750	Penticton	250-770-7573
Burnaby	604-436-0691	Port Alberni	1-800-663-9203
Campbell River	1-800-663-9203	Powell River	1-800-663-9203
Chilliwack	1-800-663-9203	Prince George	250-565-6816
Comox	250-890-3020	Prince Rupert	1-800-663-9203
Coquitlam	604-927-2130	Quesnel	1-800-663-9203
Cranbrook	250-417-3585	Richmond	604-244-5505
Dawson Creek	1-800-663-9203	Sechelt	1-800-663-9203
Delta	604-660-3639	Smithers	1-800-663-9203
Duncan	1-800-663-9203	Surrey	604-586-2772
Fort St. John	1-800-663-9203	Terrace	1-800-663-9203
Kamloops	250-828-4916	Vernon	250-549-5451
Kelowna	250-861-7560	White Rock	604-535-4512
Kitimat	1-800-663-9203	Williams Lake	1-800-663-9203
Langley	604-514-6044		
Nanaimo	250-716-5904		
North Vancouver	604-903-3860		

#### Vancouver

BC Women's Health Centre	604-775-0022
Mount St. Joseph Hospital	604-877-8388
5752 Victoria Drive	604-321-6770
#505-750 West Broadway	604-879-8700

#### Victoria

#230 - 1900 Richmond Ave	250-952-4232
Victoria General Hospital	250-727-4338

### Mobile Screening Service Delivery Areas

<b>Interior/Kootenay Mobile</b>	Ashcroft Balfour Barriere Beaver Valley Castlegar Chase Christina Lake Clearwater Clinton Cranbrook Crawford Bay	Creston Elkford Enderby Fernie Fountain Golden Grand Forks Greenwood Hope Invermere Kaslo	Keremeos Kimberley Ktunaxa/Kinbasket Lillooet Logan Lake Lytton Meadow Creek Merritt Midway Nakusp Nelson	New Denver Oliver Osoyoos Princeton Radium Hot Springs Revelstoke Rock Creek Rossland Salmo Salmon Arm	Scotch Creek Sicamous Slocan Sorrento Sparwood Summerland Trail Windermere 100 Mile House
<b>Islands &amp; Coastal Mobile</b>	Alert Bay Bella Bella Bella Coola Chemainus Fort Rupert Gabriola Gold River	Ladysmith Lake Cowichan Masset Mill Bay Mount Currie Parksville	Pauquachin Pemberton Pender Island Port Alice Port Hardy Port McNeill	Qualicum Beach Queen Charlotte City Saanichton Saltspring Island Sayward	Skidegate Sooke Squamish Tofino Ucluelet Whistler
<b>Northern/Okanagan Mobile</b>	Burns Lake Chetwynd Dease Lake	Fort St. James Fort Nelson Fraser Lake	Hazelton Houston Lumby Mackenzie	McBride Peachland Penticton Southside Stewart	Tumbler Ridge Valemount Vanderhoof Winfield
<b>Lower Mainland Mobile</b>	Locations will change from time to time. Latest visits include: Agassiz, Bowen Island, Chilliwack, Delta, Gibsons, Hope, Langley, Maple Ridge, New Westminster, Port Coquitlam, Port Moody, Richmond, Sechelt, Surrey, Vancouver - Chinatown, Downtown Eastside, Pacific Centre, PriceWaterhouse Building.				

## APPENDIX 6 Educational Materials Order Form

Educational materials are free of charge and delivered in bundles of 25 and 50.

Number Requested

Item

### Screening Mammography Program

Pass It On: Your Breast Health Has Support (Brochure)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

English  
Chinese  
Punjabi

Lower Mainland Appointment Pad

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

English  
Chinese  
Punjabi

1-800# Appointment Pad

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

English  
Chinese  
Punjabi

### Cervical Cancer Screening Program

Cervical cancer: protect yourself with regular Pap tests (Brochure)  
HPV & cervical cancer: what you should know, and do (Brochure)

\_\_\_\_\_  
\_\_\_\_\_

Preventing cervical cancer (booklet)  
Abnormal pap smear: causes and proper followup (Booklet)

\_\_\_\_\_  
\_\_\_\_\_

Technique for Obtaining Cervical Smears (Laminated Instruction Card)  
Speculum Exam & Pap smear (DVD or Video - English)

\_\_\_\_\_  
\_\_\_\_\_

Hereditary Cancer: Is My Family at Risk? (Brochure - English)

\_\_\_\_\_

**Name:**

\_\_\_\_\_

**Address:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**MSC#**

\_\_\_\_\_

**Fax this form to 604-660-3645**



## APPENDIX 7 Glossary

### Abnormal Call Rate

Proportion of screening mammography examinations determined to require further diagnostic assessment (*ie. called "abnormal"*).

$$\text{Abnormal call rate} = \frac{\text{number of exams called abnormal}}{\text{total number of exams}}$$

### Benign Core Biopsy Rate

Proportion of cases with complete follow-up that resulted in a benign core biopsy.

### Benign Open Biopsy Rate

Proportion of cases with complete follow-up that resulted in a benign open biopsy.

### Benign : Malignant Biopsy Ratio

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

$B_b$  number of cases with without breast cancer on screen-initiated biopsy

$M_b$  number of women found to have breast cancer on screen-initiated biopsy

### Cancer Detection Rate

Proportion of screened cases found to have breast cancer upon further investigation of an "abnormal" screening result.

**Prevalent Cancer Detection Rate** is the cancer detection rate on first screening examinations

**Incident Cancer Detection Rate** is the cancer detection rate on subsequent screening examinations

### Interval Cancer Rate

Proportion of women being diagnosed with breast cancer by within 12 months of having a "normal" screening result.

### False Negative Rate

Probability of interpreting screening mammograms of breast cancer cases as "normal".

$$\text{False Negative Rate} = \frac{FN}{TP + FN}$$

TP number of breast cancer cases found at screening

FN number of breast cancer cases diagnosed within 12 months of screening

### False Positive Rate

Probability of interpreting screening mammograms of cases with no evidence of breast cancer as "abnormal".

$$\text{False Positive Rate} = \frac{FP}{TN + FP}$$

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"

### Positive Predictive Value (PPV) of Screening Mammography

Proportion of "abnormal" cases found to have breast cancer after diagnostic workup.

$$PPV = \frac{\text{number of 'screen - detected' cancers}}{\text{number of abnormal} - \text{number of unknowns}}$$

### Prevalence to Expected Incidence Ratio





Comparison between rate 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 5-year age group obtained from the BC Cancer Registry were chosen as the comparison reference.

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

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

#### Retention Rate

Percentage of women returned for rescreen within 30 months of their previous visit.

$$\text{Retention Rate} = \frac{\text{Number of Women Returned for Rescreen}}{\text{Number of Women Eligible for Rescreen}}$$

Return (compliance) rate is the percentage of women returned for rescreen within a certain period of time.

#### Sensitivity

#### Participation Rate

The percentage of women who have a screening mammogram (calculated biennially) as a proportion of the eligible population. The eligible population is estimated by the average of the 2-year population from forecast.

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 breast cancer cases called "abnormal"

FN number of breast cancer cases called "normal"

#### 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

### Acknowledgement & Contributors

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 process and read 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:

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

#### **Contributors** (*alphabetical*)

- Margaret Bangen, Director, Strategic Business Initiatives, Population Oncology
- Christina Chu, Biostatistician, Surveillance & Outcomes, Population Oncology
- Dr. Andrew Coldman, Vice President, Population Oncology
- Lisa Kan, Screening Operations Leader
- Jennifer Sentell, Program Secretary
- Dr. Linda Warren, Provincial Chief Radiologist

## APPENDIX 9 Committees

### Screener's Advisory Committee

Dr. Ken Bentley  
Dr. Larry Breckon  
Dr. Ron Campbell  
Dr. Michael Clare  
Dr. Don Coish  
Dr. Joanne Coppola  
Dr. Henry Huey  
Dr. Lynn Jacobsen  
Dr. Rob Johnson  
Ms. Lisa Kan  
Dr. Brent Lee  
Dr. Richard Lee  
Dr. Patrick Llewellyn  
Dr. Heather MacNaughton  
Dr. Peter McNicholas  
Dr. David O'Keeffe  
Dr. Rasika Rajapakshe  
Dr. Stuart Silver  
Dr. Kelly Silverthorn  
Dr. Catherine Staples  
Dr. Phil Switzer  
Dr. Lynette Thurber  
Dr. Linda Warren - Chair  
Dr. Jose Zanbilowicz

### Quality Management Committee

Ms. Margaret Bangen  
Ms. Christina Chu  
Dr. Andy Coldman  
Dr. Malcolm Hayes  
Ms. Lisa Kan  
Ms. Ann MacDonald  
Ms. Sheila MacMahon  
Ms. Janette Sam  
Ms. Elaine Simpson  
Mr. Larry St. Germain  
Dr. Linda Warren - Acting Chair

### Academic Committee

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



## APPENDIX 10 Radiologist Screeners

### Abbotsford

Dr. Lynn Jacobsen  
Dr. John Kreml  
Dr. Caroline Pon  
Dr. Tyrone Soodeen

### Burnaby & Richmond

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

### Comox

Dr. Jose Zambilowicz  
Dr. Anthony Chilton  
Dr. Dave McKeown

### Coquitlam

Dr. Heather MacNaughton  
Dr. Jenny Dolden  
Dr. Maria Kidney  
Dr. Carol Miller  
Dr. Philip Uhrich  
Dr. Anita McEachern  
Dr. Nancy Dolden

### Cranbrook

Dr. Daryl Maisonneuve  
Dr. Julie Nicol

### Interior/Kootenay Mobile

Dr. Kelly Silverthorn

### Kamloops

Dr. Michael Clare  
Dr. Donal Downey

### Kelowna

Dr. Catherine Staples  
Dr. Wayne Middelkamp

Dr. Timothy Wall

### Langley

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

### Nanaimo/

### Islands & Coastal Mobile

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

### Northern/Okanagan/Lower Mainland Mobile

Dr. Kelly Silverthorn

### North Vancouver

Dr. Patrick Llewellyn  
Dr. Sven Aippersbach  
Dr. Alistair Martin  
Dr. Barry Irish  
Dr. Catherine Phillips

### Penticton

Dr. Peter McNicholas  
Dr. Blake Terriff  
Dr. Stacey Piche

### Prince George

Dr. Larry Breckon  
Dr. Alasdair Leighton  
Dr. Greg Shand  
Dr. Charles Coffey

### Sechelt

Dr. Dan Dolden

### Surrey

Dr. Don Coish  
Dr. Guy Eriksen  
Dr. Dennis Janzen  
Dr. Amir Neyestani  
Dr. John Sisler

Dr. Earl Tregobov

### Vancouver BC Women's Health Centre

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

### Vancouver Mount St. Joseph Hospital

Dr. Richard Lee

### Vancouver Victoria Drive

Dr. Phil Switzer  
Dr. Lorna Fulton  
Dr. Connie Siu

### Vancouver #505 - 750 West Broadway

Dr. Nicola Lapinsky  
Dr. Linda Warren

### Vernon

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

### Victoria General Hospital/ Victoria Richmond Ave

Dr. Stuart Silver  
Dr. Brent Lee  
Dr. Colin Lee  
Dr. Delmer Pengelly  
Dr. John Wrinch  
Dr. Richard Eddy  
Dr. Frederick Smith  
Dr. George Hodgins  
Dr. Robert Koopmans

### Victoria Richmond Avenue

See Victoria General Hospital

### White Rock

Dr. Susan Hacking  
Dr. Eleanor Clark  
Dr. Joanne Coppola



## APPENDIX 11

### Publications & Presentations

#### *Alphabetical listing*

#### **Dr. Marilyn Borugian – publications**

1. **Borugian MJ**, Kan L. The effect of socioeconomic status on first visits to mammography screening. Network News, Canadian Breast Cancer Network; 2008.
2. Poole B, Gelmon K, **Borugian MJ**, Kan L, Stilwell M. Breast cancer screening and diagnosis in BC. British Columbia Medical Journal 2008; 50(4):198-205.
3. **Borugian MJ**, Kan L, Chu C, Ceballos K, Gelmon KA, Gordon PB, Poole B, Tyldesley S, Olivotto IA. Facilitated “Fast Track” referral reduces time from abnormal screening mammogram to diagnosis. Canadian Journal of Public Health 2008; 99(4):252-56.
4. Gordon P, **Borugian MJ**, Warren Burhenne L. A true screening environment for review of interval breast cancers: Pilot study to reduce bias. 2007 Radiology; 245: 411-15.
5. Canadian Cancer Biomarker Comparison Cohort. Realizing the promise: National EDI Stakeholders Symposium, Stanford University (Palo Alto, California), May 22-24, 2007.
6. Maines-Bandiera S, Woo M, Molday L, Koebel M, **Borugian MJ**, Leung P, Gilks B, Molday R, Auerperg N. Oviduct-specific glycoprotein (OVGP1), a new serum biomarker for the detection of ovarian cancer. American Association for Cancer Research Annual Meeting, San Diego CA, April 12-16, 2008.
7. **Borugian MJ**, Kan L, Xu Chen Lydia, Abanto Zenaida. Screening mammography participation and socioeconomic status (poster). Canadian Breast Cancer Research Alliance Reasons for Hope 2008 Conference April 25-27, 2008.
8. **Borugian MJ**, Kan L, Chu CY, Ceballos K, Gelmon KA, Gordon PG, Poole B, Tydesley S, Olivotto IA. Facilitated “Fast Track” referral reduces time from abnormal screening mammogram to diagnosis (poster). Canadian Breast Cancer Research Alliance Reasons for Hope 2008 Conference April 25-27, 2008.
9. **Borugian MJ**, Gordon PB, Hislop TG, Pollak MP, Spinelli JJ, Switzer T, Warren Burhenne L, McIntosh C, Gallagher RP. Mammographic density, insulin resistance and breast cancer prevention (Breast Density Study): Lessons learned (poster). Canadian Breast Cancer Research Alliance Reasons for Hope 2008 Conference April 25-27, 2008.
10. **Borugian MJ**, Kan L, Xu Chen Lydia, Abanto Zenaida. Screening mammography participation and socioeconomic status (poster). Statistics Canada Soco-economic Conference May 5-6, 2008.
11. **Borugian MJ**. Banking normal specimens for biomarker validation: The I-HELP project. Canadian Cancer Biomarker Comparison Cohort. Canary Foundation National EDI Stakeholders Symposium, Stanford University (Palo Alto, California), May 20-22, 2008.
12. **Borugian MJ**. Breast density as a possible phenotype to identify those at high risk of ovarian cancer. Canary Foundation National EDI Stakeholders Symposium, Stanford University (Palo Alto, California), May 20-22, 2008.

### **Dr. Andrew Coldman - publications**

1. Phillips N, **Coldman A**. Comparison of nonbreast cancer incidence, survival and mortality between breast screening program participants and nonparticipants. *Int J Cancer*. 2008 Jan 1;122(1):197-201. In process

### **Dr. Paula Gordon – publications**

1. Paula B. Gordon, Marilyn J. Borugian, and Linda J. Warren Burhenne. A True Screening Environment for Review of Interval Breast Cancers: Pilot Study to Reduce Bias. *Radiology* 2007;245:411-415

### **Dr. Paula Gordon - lectures**

1. Understanding Interval Breast Cancers. Practical Radiology, Whistler, BC, Feb 6, 2008.
2. A True Screening Environment For Review Of Interval Breast Cancers: A Pilot Study To Reduce Bias. Annual Forum of the Screening Mammography Program of BC, Oct 13, 2007, Vancouver, BC.
3. Ultrasound Diagnosis and Intervention. Society of Breast Imaging, 8th Postgraduate Course. Hollywood, Florida. April 14, 2007.
4. Breast Ultrasound: Equipment and Technique, Radiological Society of North America Annual Meeting, Chicago, IL, Nov 25, 2007.
5. Ultrasound-guided Interventional Breast Procedures (Hands-on Workshop), Radiological Society of North America Annual Meeting, Chicago, IL, Nov 26, 2007.
6. Small Parts Interventional Ultrasound (Hands-on Workshop), Radiological Society of North America Annual Meeting, Chicago, IL, Nov 29, 2007.
7. Guest Speaker. Canadian Society for Women in Science and Technology. July 3, 2007.

### **Dr. Greg Hislop - presentations**

1. Boyd N, Martin LJ, Guo H, Chiarelli A, **Hislop G**, Yaffe M, Minkin S. Reproductive factors, mammographic density and risk of breast cancer. Making
2. Connections: A Canadian Cancer Research Conference Celebrating NCIC's 60th Anniversary, Toronto, Ontario, November 15-17, 2007, Book of Abstracts #P-04, p. 59.
3. Boyd N, Martin LJ, Guo H, Chiarelli, **Hislop G**, Yaffe M, Minkin S. Factors associated with interval cancers in mammographic screening programmes. Making Connections: A Canadian Cancer Research Conference Celebrating NCIC's 60th Anniversary, Toronto, Ontario, November 15-17, 2007, Book of Abstracts #ED-50, p. 102
4. Tam C, **Hislop G**, Martin LJ, Minkin S, Boyd NF. Diet and breast cancer incidence in postmenopausal Caucasian and Chinese women. Making Connections: A Canadian Cancer Research Conference Celebrating NCIC's 60th Anniversary, Toronto, Ontario, November 15-17, 2007, Book of Abstracts #P-18, p. 69.

### **Dr. Greg Hislop - publications**

1. Boyd NF, Guo H, Martin LJ, Sun L, Stone J, Fishell E, Jong RA, **Hislop G**, Chiarelli A, Minkin S, Yaffe M. Mammographic density and the risk and detection of breast cancer. *New England Journal of Medicine* 2007; 356: 227-236.
2. Bottonff JL, Ratner PA, Johnson JL, **Hislop TG**, Buxton JA, Zeisser C, Chen W, Reime B. Women's responses to individualized information about mammographic breast density. *Canadian Journal of Nursing Research* 2007; 39: 38-57.

3. **Hislop TG**, Bajdik CD, Saroa SR, Yeole BB, Barroetavena MC. Cancer Incidence in Indians from three areas: Delhi and Mumbai, India and British Columbia, Canada. *Journal of Immigrant and Minority Health* 2007; 9: 221-227.
4. **Hislop TG**, Bajdik CD, Regier MD, Barroetavena MC. Ethnic differences in survival for female cancers of the breast, cervix and colorectum in British Columbia, Canada. *Asian Pacific Journal of Cancer Prevention* 2007; 8: 209-214.

***Lisa Kan - publications***

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

***Dr. Rasika Rajapakshe - publications***

1. **R. Rajapakshe**, L. Watts, A. Bergman, S. MacMahon and M. Schmuland, “ Changes in image quality parameters within the Screening mammography Program of British Columbia (SMPBC)”, *Radiotherapy & Oncology* 84 Supplement 2 pp S32 (2007).
2. **R. Rajapakshe**, “Retrospective Analysis of Quality Control Data from the Screening mammography Program of British Columbia (SMPBC)”, In *Radiological Society of North America Scientific Assembly and annual meeting program. RSNA, Oakbrook Ill. SSK14-07 pp 500 (2007).*

***Dr. Linda Warren - publications***

1. Gordon P, Borugian MJ, **Warren Burhenne L**. A true screening environment for review of interval breast cancers: Pilot study to reduce bias. *2007 Radiology*; 245: 411-15.
2. Borugian MJ, Gordon PB, Hislop TG, Pollak MP, Spinelli JJ, Switzer T, **Warren Burhenne L**, McIntosh C, Gallagher RP. Mammographic density, insulin resistance and breast cancer prevention (Breast Density Study): Lessons learned (poster). *Canadian Breast Cancer Research Alliance Reasons for Hope 2008 Conference April 25-27, 2008.*
3. Coldman A, Phillips N, **Warren L** et al (British Columbia Cancer Agency, Vancouver, Canada Breast cancer mortality after screening mammography in British Columbia Women Breast Diseases: A year book Quarterly Vol. 18 No. 4 2008 pg 351-353
4. **Warren Burhenne L.J**. Review Factors Associated with Image and Procedural Events Used to detect Breast Cancer After Screening Mammography Breast Disease: A Year Book Quarterly Vol 18 No 4 2008 Pg 358

***Dr. Linda Warren - presentations***

1. CAD: Current Status, Society of Breast Imaging, Hollywood, Fl. April 15, 2007
2. Looking Twice makes a Difference, American Roentgen Ray Society Orlando, Florida May 7, 2007

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