BC CANCER BREAST SCREENING
Provincial Health Services Authority

BC Cancer Breast Screening
2021 Program Results

March 2024

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Appendix

1 – MESSAGE

Message from the Medical Director

2021 was a busy year for the screening program as we continued to build upon our return of screening services after the 2020 screening suspension due to the COVID-19 pandemic. Despite ongoing enhanced infection prevention practices the centres were able to provide screening volumes similar to 2019. Breast screening participation however reached a 10 year low, due in part to the long waits to obtain a screen caused by the screening suspension. It is anticipated that participation will begin to improve as centres continue to catch up on their screening backlogs.

Our screening radiologists across the province continued the important work of optimizing reporting time and accuracy. A key quality goal remains stabilizing the national trend of rising abnormal call rate, with eventual reversal. The group has made progress in this effort with the ACR remaining stable at 8.7%, down from 9.2% in 2018. The 2021 overall cancer detection rate increased compared with 2020, from 5.7 to 6.1 cancers detected per 1000 individuals screened.

The program engaged in quality assurance activities including a Post Screen Cancer Review. Post-Screen Cancer Reviews are conducted under Section 51 of the BC Evidence Act, for the purpose of quality improvement and continuing medical education. Each Breast Screening Program reading centre performs case reviews of diagnostic work-up on all moderate and high suspicion screen detected abnormalities as well as 100% of all cancer cases, including interval and contradiction cases, at least quarterly. A minimum of 50% of Interval cancers diagnosed within 18 months of the last BC Cancer Breast Screening program (the “program”) exam are subject to an Independent Blind Review for any given calendar year. A working group reviewed the current program policy and practice, performed an environmental review of other jurisdictions, and made recommendations to the Screener’s Advisory Committee. We are excited for a practice revision which will allow all screeners to participate, and thus spread its recognized value in individual practice development across the province.

It has been both a challenging and unique year. Thank you all for your continued program commitment as we navigated through it together.

Dr. Colin Mar

Message from the Screening Operations Director

We are pleased to provide our annual report which includes both program results as well as initiatives the program undertook in order to improve and promote the services we provide.

2021 continued to be a year of recovery from the 10 week Covid related screen suspension in 2020. The program created a series of videos for social media outlining the various measures in place to keep participants and staff safe from COVID-19, added COVID-19 safety resources to its website, and provided promotional resources to screening centres that supported the safe return to screening.

The Program completed the development of its new “Cascade” screening information system in 2021. Cascade includes a new patient appointment booking website and by August 2021 screening recall notices sent to participants included a booking code which could be used to access the appointment booking website 24/7. By September 2021 ~20% of all appointments were being booked through the website. The program continues to build upon this success by looking for ways to make the website more user friendly and to promote its use.

We are encouraged by the leadership and dedication of all screening staff during 2021, and their enduring commitment to support breast health.

Janette Sam

2 – EXECUTIVE SUMMARY

BC Cancer is proud of the achievements of the Breast Screening Program. The population based breast cancer screening program was the first of its kind in Canada and is in its 33rd year of operation. Since the inception of the program in 1988 to the end of 2021, the program has provided over 6,837,648 screening mammograms and detected 32,423 (breast) cancers.

The Breast Screening Program has a participation target of 70% of eligible 50-69 year old people to have a screen every two years. The number of people 50-69 eligible for a screening mammogram grows each year as the population ages and this cohort increases in size. Participation remained low in 2021 at 46%, due in part to the COVID-19 10 week screening suspension.

3 – SCREENING RECOMMENDATIONS FOR PEOPLE IN BRITISH COLUMBIA

BC's provincial breast screening recommendations are consistent with current evidence-based research findings, effective Feb 4, 2014. Recommendations encompass the use of mammography, MRI, breast self-examination, and clinical breast examination to screen for breast cancer. Information about the BC breast screening recommendations may be found in appendix 2, 2021 Breast Screening Program Screening Recommendations, and online at www.bccancer.bc.ca/screening/breast.

4 – ABOUT THE BREAST SCREENING PROGRAM

Regular breast cancer screening is an important part of an individual's health routine. Here in BC we have some of the best survival outcomes in Canada for those individuals who do get breast cancer. This success is largely due to improved cancer treatments and participation in breast cancer screening.

Obtaining a regular mammogram is a key component of early detection – regular breast cancer screening can find cancer when it is small, which means:

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

An individual's risk of breast cancer increases with ages; over 80% of breast cancers in BC are found in individuals 50 years and older. BC Cancer is committed to finding breast cancers early through breast cancer screening by its population based program. The Breast Screening Program utilizes standard two-view bilateral mammography (x-ray of the breast) for breast cancer screening. Individuals ages 40-74 may self-refer to the program; however it is recommended that by age 50 average risk individuals have a screening mammogram every two years. Individuals are not eligible for a screening mammogram in BC if they have had breast cancer or breast implants, or if they currently have breast symptoms requiring a diagnostic investigation. These individuals must speak with their primary care provider and may be referred for a diagnostic mammogram.

4.1 Centres and Mobile Services

There are 36 fixed centres across the province, and three mobile vans that visit over 170 smaller BC communities, including many First Nations communities. Mobile schedules are posted on the Breast Screening Program website (www.bccancer.bc.ca/screening/breast) and are sent to local health professionals.

4.2 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 the screening examination.
3. Investigate any abnormalities identified on screening.
4. Issue a screening reminder at the appropriate interval.

4.3 FAST TRACK – Facilitated Referral to Diagnostic Imaging

On average approximately 9% of participants who attend for screening will require additional diagnostic testing. Recognizing the importance of timely follow up, the Fast Track Referral System was established in 1999. The Fast Track system facilitates referral for participants who require further testing.

4.4 Fast Track Overview

- At the time of screening, participants are informed that if further tests are required, they will be called directly by a diagnostic facility to book their appointment.
- If further testing is required i.e. additional mammographic views or breast ultrasound, the particiant is booked at the Fast Track diagnostic clinic closest to the screening site, usually at the same location.
- The Breast Screening Program images and results are transferred to the diagnostic office prior to the appointment.
- Breast Screening Program notifies the particiant's health care provider where their patient has been referred for additional testing.
- The diagnostic facility makes every effort to provide an appointment within one week of receiving the referral.
- Standardization of the Fast Track referral system ensures that all participants benefit from the shortened time between an initial abnormal screening result and the first appointment for diagnostic assessment.

4.5 Program Evaluation

Data is collected and analyzed on an ongoing basis to monitor the program's effectiveness and to identify areas for improvement. Breast Screening Program evaluation indicators, quality standards and systems are based on national and international guidelines and recommendations, including the 3rd edition of the *Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance,* published in February 2013[1].

Results of this analysis are presented in the "PROGRAM RESULTS" section of this report (Section 5). Age-specific breast cancer incidence and mortality rates are provided by the BC Cancer Registry.

[1] Canadian Partnership against Cancer. Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Cancer Screening Program Performance (3rd edition). Toronto: Canadian Partnership Against Cancer; February, 2013

4.6 Quality Assurance

A team of Medical Physicists, a Provincial Practice Leader for Mammography Technologists, and a Quality Management Coordinator are dedicated to quality assurance at all Breast Screening Program centres. This team supports imaging quality assurance and provides professional direction in equipment selection, acceptance testing, troubleshooting, quality control testing and accreditation at screening centres around the province. The Program also supports continuing education for radiologists and technologists.

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

- Certificate in Breast Imaging scholarship program;
- Educational Webinars throughout the year;
- A Quarterly Technologist Newsletter;
- An educational event at the biennial Breast Screening Program Forum with continuing medical education (CME) credits that is also open to BCIT students comprised of up-to-date topics and speakers that are relevant to the profession;
- Breast Screening Program Mammography Teaching Sets for Technologists for CME credits;
- Mammography positioning and Patient Care In-Service presentations (CME credits) at the centres;
- A comprehensive Breast Screening Program Technologist Manual with information to support a technologist's day-to-day duties.

Quality assurance and monitoring is a critical component of an organized screening program. Standards and systems in the Breast Screening Program 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 Breast Screening Program Quality Assurance 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 Breast Screening Program Centres. Centres participate in accreditation renewals every three years and are required to have an annual update. The team provides support and guidance for centres as they pursue accreditation. Accredited sites display a CAR certificate for all participants attending the service to view.

Image Quality Assurance: The Breast Screening Program Quality Assurance Support Group provides leadership and technical support to centres for their quality control practices which are standardized and monitored regularly. All centres undergo regular annual equipment testing by a Program Medical Physicist and are also supported through site visits, training, and comprehensive manuals. The team also provides support for centres during equipment replacement.

4.6 Quality Assurance (continued)

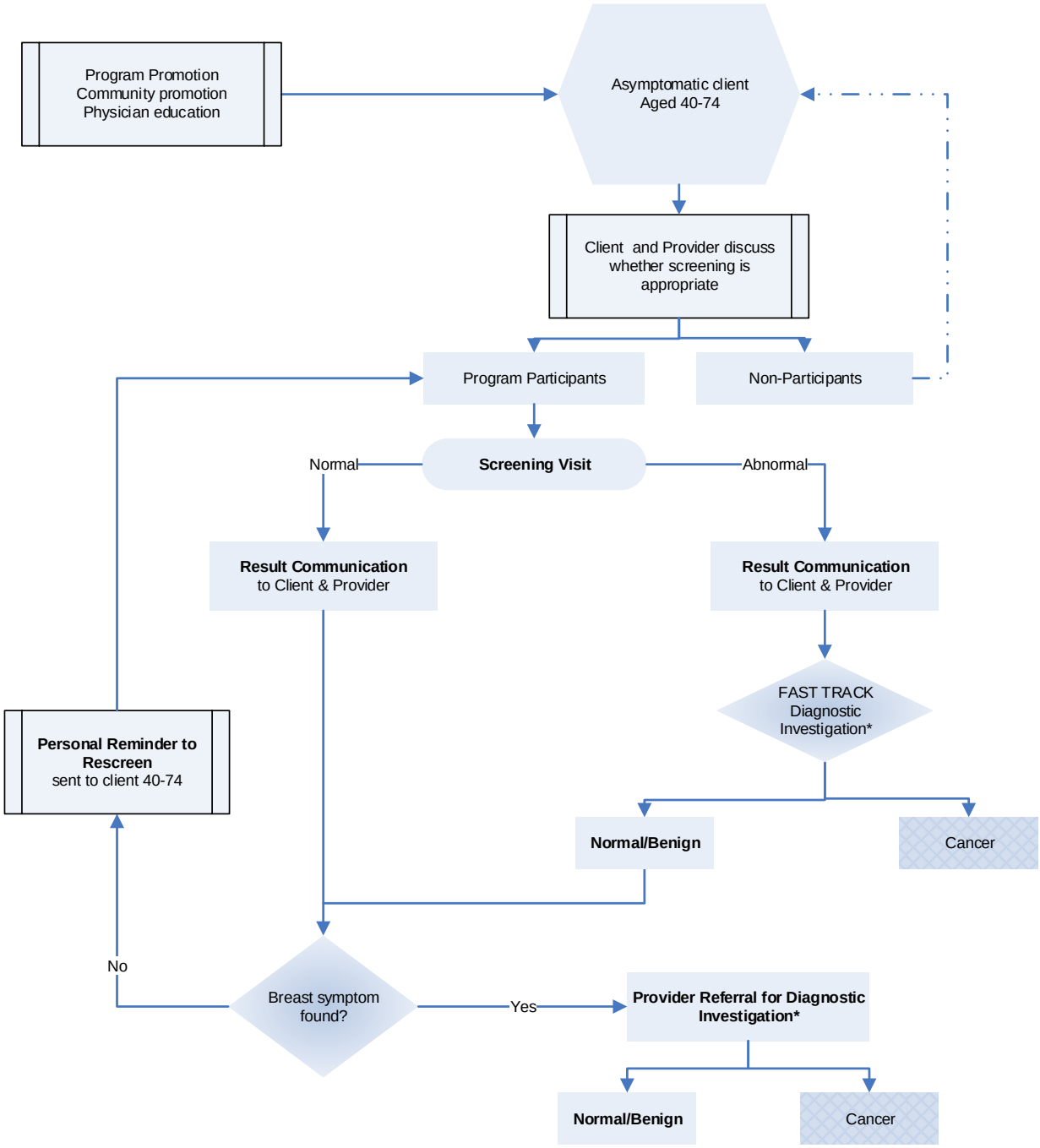
Based upon best practices, the program has developed and implemented a comprehensive, harmonized quality control program specific for digital mammography equipment, as well as digital mammography-specific phantoms and a web based 'mQc' program. Technologists are trained to perform these quality control tests through site visit demonstrations. Access to the QC website allows technologists and physicists to review test results on site or remotely. The Breast Screening Program continues to work with other provinces to champion standardization of quality control programs for digital mammography.

4.7 Regular Promotion and Education Activities

Ongoing promotion activities include:

- Production of new promotional tools, such as brochures, posters, marketing giveaways, bookmarks and postcards that effectively communicate the benefits of mammography.
- Working with ethnic and First Nations groups to develop customized materials and culturally-sensitive approaches to increase understanding and interest in screening.
- Regular media advertisements to promote the mobile mammography service.
- A "@BCCancer" Twitter account that promotes relevant information about cancer screening including upcoming mobile visits in communities around the province.
- A Facebook page (@BCCancerScreening) that promotes relevant information about breast screening including upcoming mobile visits, an open platform for information sharing and video promotions.
- A website (www.bccancer.bc.ca/screening/breast) to support informed decision making about screening.
- Regular presence at health fairs and events throughout the province by the BC Cancer Prevention group.

FIGURE 1: SCREENING PROCESS OVERVIEW



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

5.0 — 2021 PROGRAM RESULTS

The program results section provides outcomes for various indicators including coverage, participation, follow-up, quality of screening, detection, and disease extent at diagnosis. The indicators used are adapted from the Canadian Partnership Against Cancer Guidelines for Monitoring Breast Cancer Screening Program Performance[2].

The program results include outcomes where applicable for participants who have indicated they have a family history (higher than average risk individuals). In section 5.8, the Breast Screening Program performance measures are presented against the national targets set for Canadian breast cancer screening programs.

[2] http://www.cancerview.ca/idc/groups/public/documents/webcontent/guideline_monitoring_breast.pdf

5.1 – RECRUITMENT AND RE-SCREENING

Screening Volume

The Breast Screening Program provided 261,671 examinations in 2021. During this period 28,156 (10.8%) of those examinations were provided to first time attendees. First time attendees are categorized as those who have not had a screening mammogram in the previous 10 year period.

Figure 2 shows that the total number of exams provided by Breast Screening Program increased significantly in 2021 compared to 2020 as the program began to recover from the 10 week COVID 19 screening suspension in 2020.

FIGURE 2: ANNUAL SCREENING VOLUME YEARS: 2017-2021

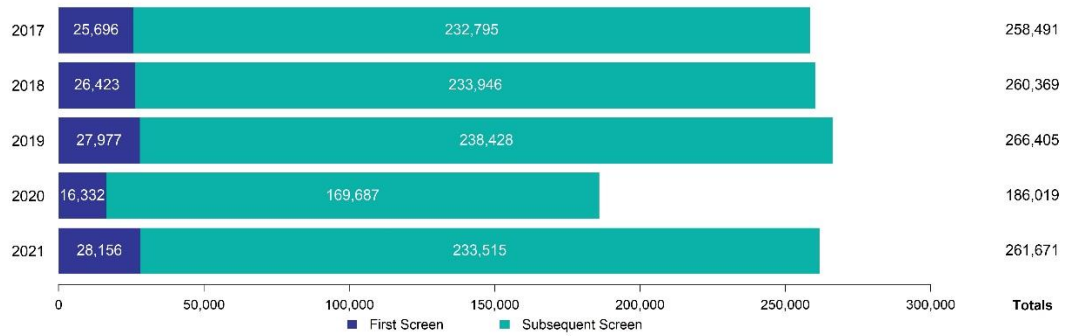
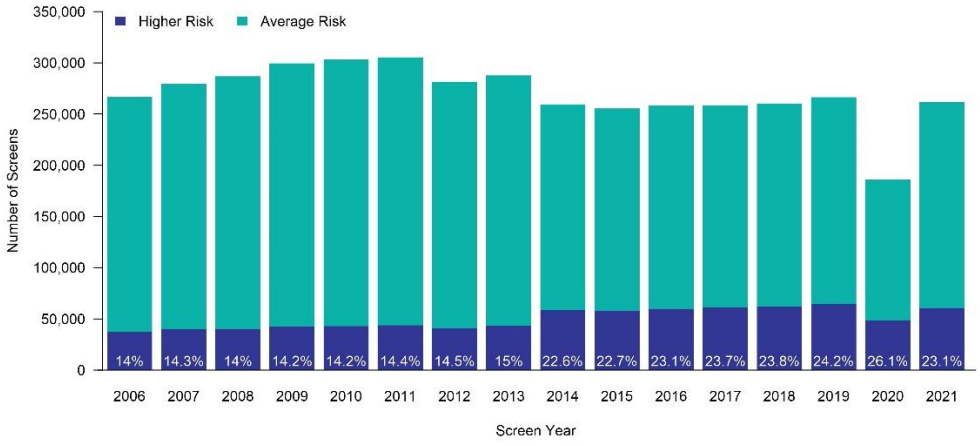


Figure 3 shows the percentage of participants screened who are at higher risk decreased to 23.1% of the total number of individuals screened in 2021.

FIGURE 3: ANNUAL SCREENING VOLUME BY RISK AND SCREEN YEARS: 2006-2021



Notes

1. Breast Screening Program data extraction date: January 31, 2023.

Volume by Health Service Delivery Area: 2021

The age distribution of all exams and first exams performed in 2021 by Health Services Delivery Areas (HSDA) are displayed in Table 1.

- The majority of exams (67%) are performed for individuals between ages 50 to 69 in all HSDAs. This is similar to 2020.
- A screening mammogram is considered as the baseline screen (first exam) if the participant has not been screened in the last 10 years.
- The majority of first time attendees were under 50 years of age; however, there are regional variations ranging from 34% in Kootenay Boundary to 63% of first time attendees being under 50 years of age in Fraser South.

TABLE 1: VOLUME BY HEALTH SERVICE DELIVERY AREA YEAR: 2021

		Age Distribution of All Exams			First Exams		Age Distribution of First Exams		
HSDA	Total Exams	<50	50-69	70+	n	% Total	<50	50-69	70+
East Kootenay	4,403	11%	69%	20%	534	12%	38%	56%	6%
Kootenay Boundary	3,364	10%	71%	19%	378	11%	34%	61%	5%
Okanagan	23,264	11%	69%	20%	2310	10%	42%	52%	6%
Thompson Cariboo Shuswap	12,184	13%	69%	19%	1046	9%	49%	45%	6%
Interior	43,215	11%	69%	20%	4268	10%	42%	52%	6%
Fraser East	14,328	18%	66%	16%	1401	10%	58%	38%	4%
Fraser North	37,074	20%	67%	13%	4065	11%	62%	35%	3%
Fraser South	40,130	21%	65%	14%	4436	11%	63%	34%	3%
Fraser	91,532	20%	66%	14%	9902	11%	62%	35%	3%
Richmond	11,908	18%	67%	15%	1269	11%	60%	38%	2%
Vancouver	34,753	21%	65%	14%	4128	12%	62%	35%	3%
North Shore / Coast Garibaldi	17,474	18%	66%	17%	1934	11%	58%	38%	4%
Vancouver Coastal	64,135	19%	66%	15%	7331	11%	61%	36%	3%
South Vancouver Island	24,609	14%	67%	19%	2804	11%	46%	49%	5%
Central Vancouver Island	17,527	10%	67%	23%	1702	10%	40%	53%	6%
North Vancouver Island	8,078	11%	69%	20%	796	10%	38%	56%	6%
Vancouver Island	50,214	12%	67%	21%	5302	11%	43%	51%	6%
Northwest	3,389	16%	69%	15%	362	11%	51%	44%	6%
Northern Interior	6,929	14%	71%	15%	618	9%	51%	47%	2%
Northeast	2,123	17%	71%	12%	328	15%	45%	52%	3%
Northern	12,441	15%	71%	14%	1308	11%	49%	47%	3%
Unknown	134	21%	66%	13%	45	34%	40%	53%	7%
British Columbia	**261,671**	**17%**	**67%**	**16%**	**28,156**	**11%**	**55%**	**41%**	**4%**

Notes

1. Breast Screening Program data extraction date: January 31, 2024.
2. A new row named 'Unknown' is added to this table because of clients who have unknown geographic information.

Volume by Health Service Delivery Area: 2021 (continued)

The age and volume distribution of all screens performed for participants who self-identified as having a family history (higher risk) or other high risk factor are displayed in table 2.

- The majority of higher risk exams (81%) are performed for individuals between ages 50 to 74 across all HSDAs.

TABLE 2: AGE AND VOLUME DISTRIBUTION FOR HIGHER RISK IDIVIDUALS BY HEALTH SERVICE DELIVERY AREA: 2021

			Age Distribution of Higher Risk Exams			
HSDA	**Number of Higher Risk Exams**	**% Higher Risk Exams**	**<40**	**40-49**	**50-74**	**75+**
East Kootenay	1086	25%	1%	10%	84%	6%
Kootenay Boundary	924	27%	0%	9%	86%	5%
Okanagan	6062	26%	0%	9%	84%	6%
Thompson Cariboo Shuswap	3180	26%	0%	9%	85%	6%
Interior	11252	26%	0%	9%	85%	6%
Fraser East	3239	23%	1%	13%	82%	4%
Fraser North	7337	20%	1%	16%	79%	5%
Fraser South	8255	21%	0%	16%	80%	4%
Fraser	18831	21%	0%	15%	80%	4%
Richmond	2434	20%	1%	12%	82%	5%
Vancouver	7044	20%	1%	17%	78%	4%
North Shore / Coast Garibaldi	3976	23%	1%	14%	80%	5%
Vancouver Coastal	13454	21%	1%	15%	79%	5%
South Vancouver Island	6560	27%	0%	12%	82%	5%
Central Vancouver Island	4853	28%	0%	9%	83%	7%
North Vancouver Island	2236	28%	0%	9%	86%	4%
Vancouver Island	13649	27%	0%	11%	83%	6%
Northwest	889	26%	0%	14%	81%	4%
Northern Interior	1840	27%	0%	13%	84%	3%
Northeast	522	25%	1%	13%	83%	2%
Northern	3251	26%	0%	13%	83%	3%
Unknown	37	28%	0%	14%	84%	3%
British Columbia	**60,474**	**23%**	**< 1%**	**13%**	**81%**	**4.98%**

Notes

1. Breast Screening Program data extraction date: January 31, 2024.
2. A new row named 'Unknown' is added to this table because of clients who have unknown geographic information.

Screening Participation

The percentage of BC individuals who have completed a Breast Screening Program screening mammogram at least once within 30 months as a proportion of the prevalence adjusted population.

The biennial screening participation rates are shown by HSDA for each age group in Table 3.

- In the 30-month period between July 1, 2019 and December 31, 2021, 316,684 individuals ages 50-69 participated in the Breast Screening Program.
- The Vancouver and South Vancouver Island HSDAs had the highest participation rates at 47%.

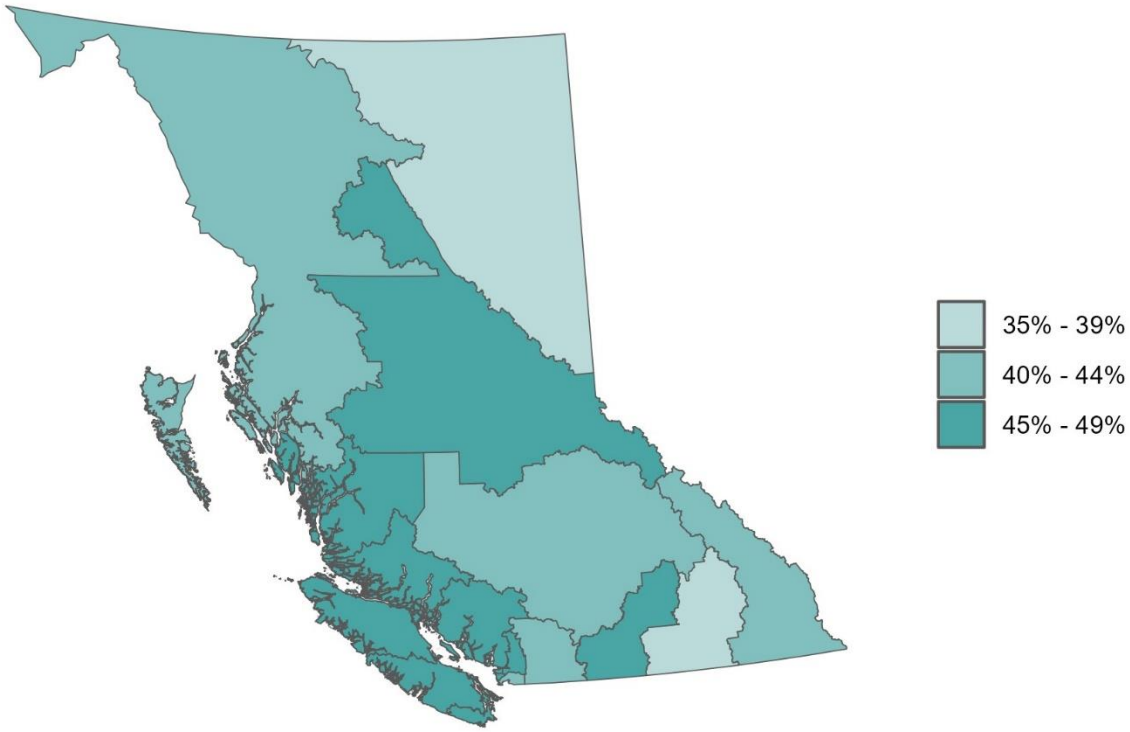
TABLE 3: REGIONAL 30-MONTH PARTICIPATION RATES BY 10-YEAR AGE GROUPS ENDING DECEMBER 31, 2021 INCLUSIVE

	10-Year Age Groups					
HSDA	**40-49**	**50-59**	**60-69**	**70-74**	**Ages 50-69**	**Ages 50-74**
East Kootenay	15%	36%	46%	49%	**42%**	**43%**
Kootenay Boundary	12%	29%	40%	41%	**35%**	**36%**
Okanagan	19%	40%	51%	54%	**46%**	**48%**
Thompson Cariboo Shuswap	20%	39%	48%	48%	**43%**	**44%**
Interior	18%	38%	49%	50%	**44%**	**45%**
Fraser East	21%	37%	45%	46%	**41%**	**42%**
Fraser North	23%	43%	51%	48%	**46%**	**46%**
Fraser South	23%	41%	45%	43%	**43%**	**43%**
Fraser	23%	41%	47%	45%	**44%**	**44%**
Richmond	23%	42%	51%	57%	**46%**	**48%**
Vancouver	22%	45%	48%	53%	**47%**	**48%**
North Shore/Coast Garibaldi	22%	42%	51%	48%	**46%**	**47%**
Vancouver Coastal	22%	44%	50%	52%	**47%**	**47%**
South Vancouver Island	19%	43%	51%	52%	**47%**	**48%**
Central Vancouver Island	18%	38%	52%	54%	**46%**	**47%**
North Vancouver Island	17%	38%	52%	52%	**46%**	**47%**
Vancouver Island	19%	41%	52%	53%	**46%**	**48%**
Northwest	19%	39%	43%	45%	**41%**	**42%**
Northern Interior	17%	41%	49%	50%	**45%**	**45%**
Northeast	13%	35%	42%	41%	**38%**	**38%**
Northern	17%	39%	46%	47%	**42%**	**43%**
Unknown	NA	NA	NA	NA	**NA**	**NA**
British Columbia	**21%**	**41%**	**49%**	**50%**	**45%**	**46%**

Notes

1. Population data source: P.E.O.P.L.E. 2021 population projections (Oct 2021), BC Stats, Ministry of Technology, Innovation and Citizens' Services, Government of the Province of British Columbia.
2. A new row named 'Unknown' is added to this table because of clients who have unknown geographic information.
3. A new column named 'Ages 50-74' is added to this table.
4. Cascade data extraction date: January 31, 2024

FIGURE 4: BIENNIAL SCREENING PARTICIPATION BY INDIVIDUALS AGES 50-69 OVER 30-MONTH PERIOD BETWEEN JULY 1, 2019 AND DECEMBER 31, 2021



Notes

1. Population data source: P.E.O.P.L.E. 2020 population projections (Oct 2020), BC Stats, Ministry of Technology, Innovation and Citizens' Services, Government of the Province of British Columbia.
2. Postal code translation file: TMF202106 (Jun 2021), BC Stats, Ministry of Technology, Innovation and Citizens' Services, Government of the Province of British Columbia.
3. Breast Screening Program data extraction date: January 31, 2024.

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

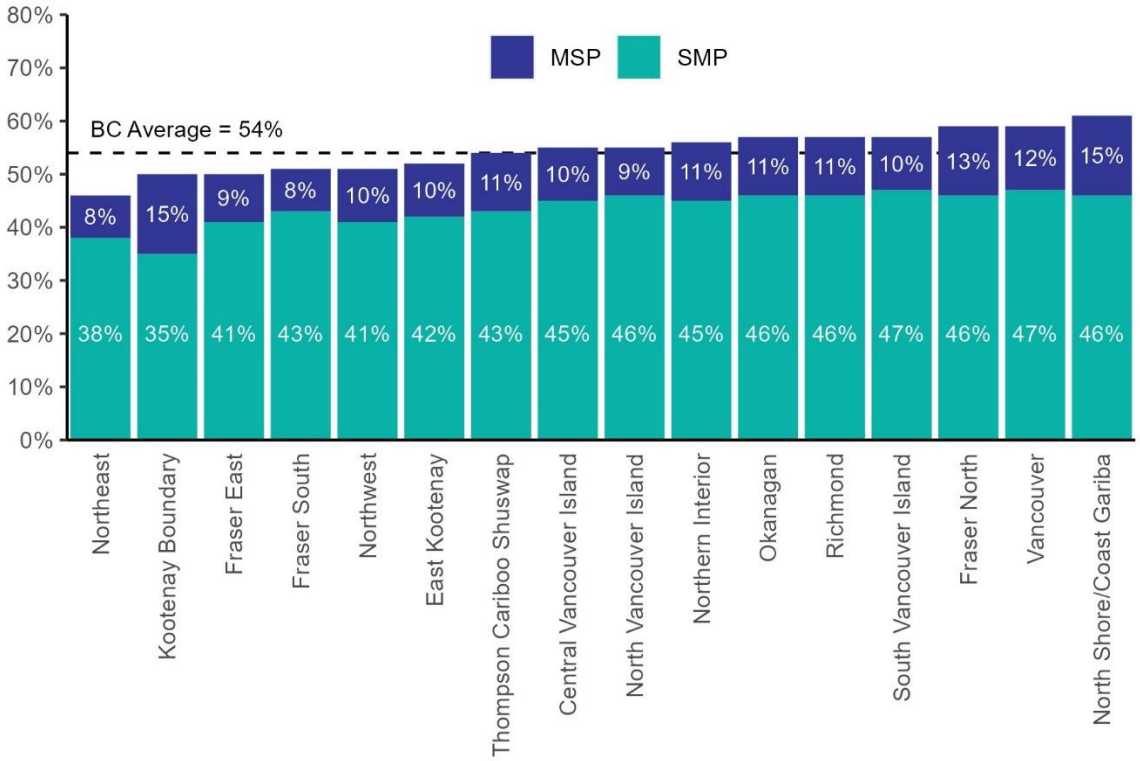
Figure 5 shows the proportion of individuals receiving bilateral mammography services through either the Breast Screening Program or MSP over a 30 month period. Some individuals may have had bilateral mammograms through both the Breast Screening Program and MSP. Thus, the proportions presented here may be slightly higher than the actual figures due to this possible duplication.

Screening Participation (continued)

- During the 30-month reporting period, 54% of BC individuals ages 50 to 69 received bilateral mammography services through either the screening program or MSP.

- The percentage of individuals ages 50 to 69 receiving bilateral mammography ranged from 46% to 61% across the province.
- Overall, the Breast Screening Program provided 80% of the bilateral mammography services for this age group.

FIGURE 5: BILATERAL MAMMOGRAPHY UTILIZATION BY INDIVIDUALS AGES 50-69 IN BC BETWEEN JULY 1, 2019 AND DECEMBER 31, 2021 INCLUSIVE



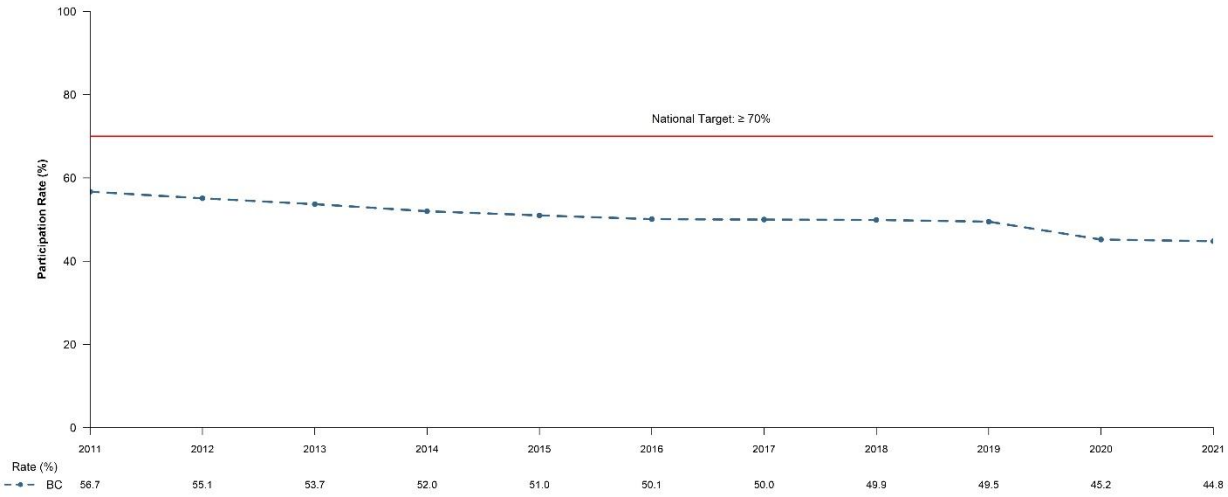
Notes

1. MSP data includes only MSP Fee-For-Service item 8611 on female patients; all out of province claims are excluded.
2. MSP data contains payment date to June 30, 2020 for services provided between July 1, 2019 and December 31, 2021.
3. Breast Screening Program data includes single and multiple screens per individual provided between July 1, 2019 and December 31, 2021.
4. Population data source: P.E.O.P.L.E. 2020 (Oct 2020), BC Stats, Ministry of Technology, Innovation and Citizens' Services, Government of the Province of British Columbia.
5. Breast Screening Program data extraction date: January 31, 2024.

Trends in Screening Participation

There are 36 fixed and 3 mobile mammography centres enabling all BC individuals to have reasonable access to screening services. Participation has been ranging between ~50-56% between 2011 to 2019. In 2020 there was a drop in participation due in part to the COVID-19 10 week screening suspension. As the program begins to recover from the COVID 19 suspension, the participation rate stabilized in 2021 at 44.5%.

FIGURE 6: BREAST SCREENING PROGRAM PARTICIPATION RATES (%) FOR INDIVIDUALS AGES 50-69 BY CALENDAR YEAR: 1988 – 2021



Notes

1. Breast Screening Program data extraction date: January 31, 2024.

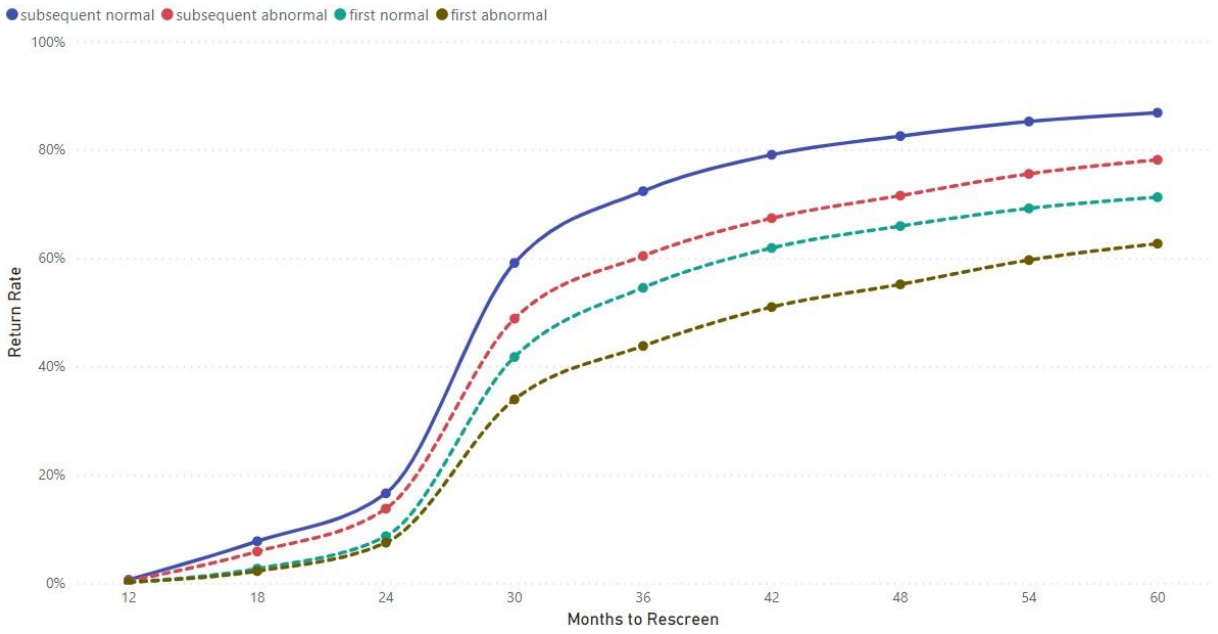
Screening Return Rates

Retention rate is the percentage of screen eligible individuals that had a subsequent Breast Screening Program screening mammogram within 30 months of their previous program mammogram.

Regular attendance for screening is important in order to benefit from a reduction in breast cancer mortality. The program sends recall reminders to participants 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. A third letter is sent the following year if there is no response.

Figure 7-9 and Table 5-7 show return rates for participants ages 40 to 49, 50 to 69 and 40-74 respectively, who attended for breast screening between 2018 and 2020. By 24 months, when program recall mailing is active, participants with normal results are more likely to respond to the recall letters than participants who previously had an abnormal result. First time attendees have a lower rate of return than those who have had two or more visits already. By 30 months, 53% of average risk participants with a previous normal result and 41% of participants with a previous abnormal result had returned to screening (Table 7). The Program has developed support material for the technologists to share with participants at their first appointment to encourage them to return when they are recalled for future screening.

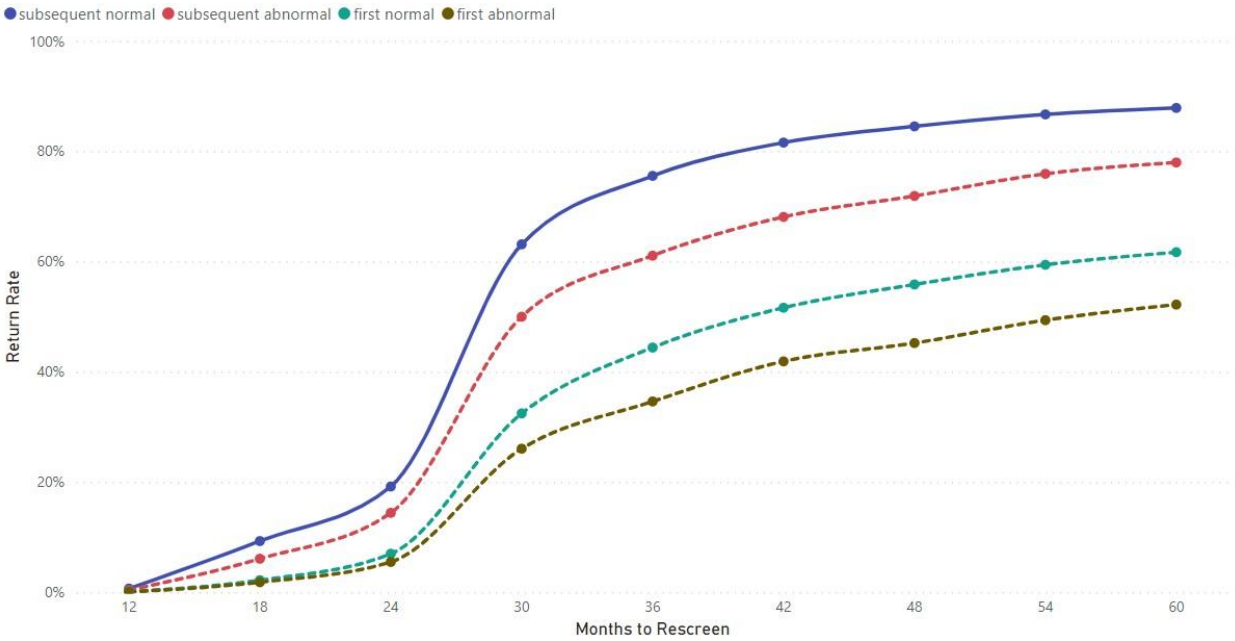
FIGURE 7: SCREENING RETURN RATES FOR WOMEN AGES 40-49: 2018 – 2020



Notes

1. Breast Screening Program data extraction date: January 31, 2024.

FIGURE 8: SCREENING RETURN RATES FOR WOMEN AGES 50-69: 2018 – 2020



Notes

1. Breast Screening Program data extraction date: January 31, 2024.

TABLE 5: SCREENING RETURN RATES FOR PARTICIPANTS AGES 40-49: 2018 – 2020

	First Screen		Subsequent Screen		Overall	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Total Number to be Re-screened	29,862	7,786	57,775	6,936	**87,637**	**14,722**
Returned by 12 months	0%	0%	1%	0%	**0%**	**0%**
18 months	3%	2%	8%	6%	**6%**	**4%**
24 months	9%	7%	17%	14%	**14%**	**10%**
30 months	42%	34%	59%	49%	**53%**	**41%**
36 months	55%	44%	72%	60%	**66%**	**52%**

Notes

1. Breast Screening Program data extraction date: Janaruy 31, 2024.
2. The last screen of each client in the time range was used to calculate the retention rates.

TABLE 6: SCREENING RETURN RATES FOR PARTICIPANTS AGES 50-69: 2018 – 2020

	First Screen		Subsequent Screen		Overall	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Total Number to be Re-screened	26,193	7,318	304,924	26,215	**331,117**	**33,533**
Returned by 12 months	0%	0%	1%	0%	**1%**	**0%**
18 months	2%	2%	9%	6%	**9%**	**5%**
24 months	7%	6%	19%	14%	**18%**	**12%**
30 months	32%	26%	63%	50%	**61%**	**45%**
36 months	44%	35%	76%	61%	**73%**	**55%**

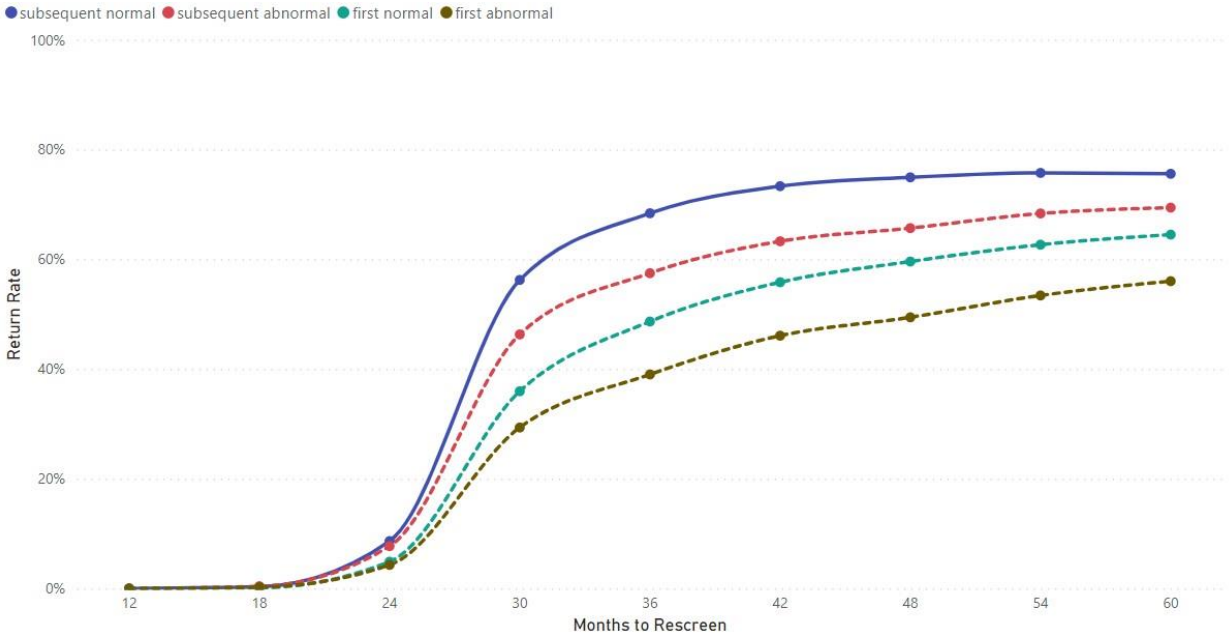
Notes

1. Breast Screening Program data extraction date: January 31, 2024.
2. The last screen of each client in the time range was used to calculate the retention rates.

Screening Return Rates by Risk Group

Figure 10 shows a graph of return rates for participants ages 40 to 74 who self-identified as having a family history of breast cancer (higher risk) and attended for breast screening between 2018 and 2020. Participants in this cohort are recommended to screen annually rather than every two years. By 18 months, 47% of participants with a previous normal result and 29% of participants with a previous abnormal result had returned to screening (Table 8). By 30 months, 67% of higher risk participants who had a normal screen have returned for screening compared with 53% of average risk participants.

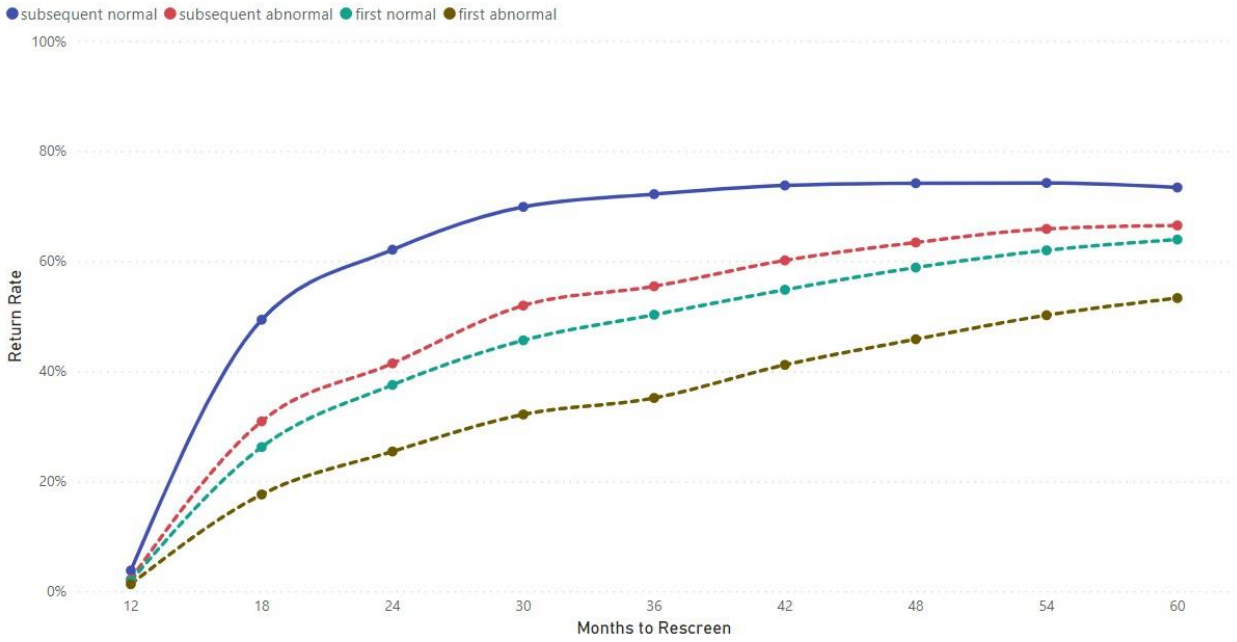
FIGURE 9: RETURN RATES FOR AVERAGE RISK PARTICIPANTS AGES 40-74 BY FIRST/SUBSEQUENT SCREEN AND SCREEN RESULT: 2018 – 2020



Notes

1. Breast Screening Program data extraction date: January 31, 2024.

FIGURE 10: RETURN RATES FOR HIGHER RISK PARTICIPANTS AGES 40-74 BY FIRST/SUBSEQUENT SCREEN AND SCREEN RESULT: 2018 – 2020



Notes

1. Breast Screening Program data extraction date: January 31, 2024.

TABLE 7: SCREENING RETURN RATES FOR AVERAGE RISK PARTICIPANTS AGES 40-74: 2018 – 2020

	First Screen		Subsequent Screen		Overall	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Total Number to be Re-screened	52,958	14,032	349,978	30,717	**402,936**	**44,749**
Returned by 12 months	0%	0%	0%	0%	**0%**	**0%**
18 months	0%	0%	0%	0%	**0%**	**0%**
24 months	5%	4%	9%	8%	**8%**	**7%**
30 months	36%	29%	56%	46%	**53%**	**41%**
36 months	49%	39%	68%	57%	**66%**	**51%**

Notes

1. Breast Screening Program data extraction date: January 31, 2024.
2. The last screen of each client in the time range was used to calculate the retention rates.

TABLE 8: RETURN RATES FOR HIGHER RISK PARTICIPANTS AGES 40-74: 2018 – 2020

	First Screen		Subsequent Screen		Overall	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
Total Number to be Re-screened	5,233	1,674	76,398	7,434	**81,631**	**9,108**
Returned by 12 months	2%	1%	4%	2%	**4%**	**2%**
18 months	26%	18%	49%	31%	**47%**	**28%**
24 months	37%	25%	61%	41%	**60%**	**38%**
30 months	46%	32%	69%	51%	**67%**	**48%**
36 months	50%	35%	71%	55%	**70%**	**51%**

Notes

1. Breast Screening Program data extraction date: January 31, 2024.
2. The last screen of each client in the time range was used to calculate the retention rates.

5.2 – 2021 SCREENING RESULTS

Table 9 summarizes the outcome indicators for screening exams provided in 2021 by 10-year age groups:

- Of the 261,671 screening mammograms performed, 22,751 (8.7%) had an abnormal result.
- There were 1,597 breast cancers reported in 2021 as of January 31, 2024 (6.1 per 1,000 exams).
- The 2021 overall cancer detection rate increased compared with 2020, from 5.7 to 6.1 cancers detected per 1000 individuals screened.
- The overall cancer detection rate is highest on first screens for participants who reported a family history (mother, sister, daughter).
- The proportion of cancers detected per 1000 individuals screened increases with age.

Abnormal Call Rate

Abnormal Call Rate is the percentage of individuals who were referred for further testing because of an abnormal screening mammogram result.

- The overall screen abnormal call rate (first and subsequent screens) remained the same as 2020 at 8.7%
- The abnormal call rate is higher on first screens than on subsequent screens.
- The overall abnormal call rate decreases with age, from 13.3% for ages 40 to 49 to 6.9% for ages 70 to 74.

Cancer Detection Rate

Cancer Detection Rate is the number of individuals with a screen detected cancer per 1,000 individuals who had a screening mammogram. Cancer detection rates may be presented as invasive cancer detection rates, in-situ cancer detection rates and overall cancer detection rates.

- The 2021 overall cancer detection rate increased compared with 2020, from 5.7 to 6.1 cancers detected per 1000 individuals screened.
- The cancer detection rate for higher risk individuals was greater than that for average risk individuals for first screens.
- The overall DCIS detection rate increased in 2021 compared to 2020, from 1.1 to 1.5 per 1000 individuals screened.

Positive Predictive Value

Positive Predictive Value (PPV) is the percentage of individuals with an abnormal mammogram result who were diagnosed with breast cancer (DCIS or invasive) after completion of diagnostic work-up.

- The overall positive predictive value increased in 2021 compared to 2020, from 6.6% to 7.0%.

TABLE 9: BREAST SCREENING PROGRAM OUTCOME INDICATORS BY 10-YEAR AGE GROUPS: 2021

		Age at Exam					
		40-49	50-59	60-69	70-74	75+	All
Number of Exams		43,358	81,863	92,975	35,042	8,062	261,671
on first screens		34.8%	9.1%	4.5%	2.5%	3.2%	10.8%
on higher risk screens		18.2%	20.2%	24.6%	28.2%	37.3%	23.1%
Number of Cancers		133	408	614	335	106	1,597
on first screens		45.1%	15.2%	8.8%	4.8%	8.5%	12.6%
on higher risk screens		18.8%	23.5%	26.7%	28.4%	48.1%	27.1%
Abnormal Call Rate		13.3%	8.7%	7.2%	6.9%	8.2%	8.7%
on first screens	Overall	18.9%	21.1%	18.7%	17.0%	25.0%	19.4%
	Higher Risk	19.3%	22.7%	17.3%	17.3%	20.9%	19.4%
	Average Risk	18.8%	20.9%	19.0%	16.9%	25.8%	19.4%
on subsequent screens	Overall	10.2%	7.5%	6.7%	6.6%	7.6%	7.4%
	Higher Risk	9.7%	7.0%	6.3%	6.1%	8.4%	6.9%
	Average Risk	10.4%	7.7%	6.8%	6.8%	7.2%	7.5%
Overall Cancer Detection Rate (per 1,000)		3.1	5.0	6.6	9.6	13.2	6.1
on first screens	Overall	4.0	8.3	12.8	18.2	34.7	7.2
	Higher Risk	4.3	14.6	18.2	29.8	0.0	10.2
	Average Risk	3.9	7.6	11.8	15.5	41.7	6.7
on subsequent screens	Overall	2.6	4.7	6.3	9.3	12.4	6.0
	Higher Risk	2.8	5.3	6.8	9.3	17.2	6.9
	Average Risk	2.5	4.5	6.1	9.4	9.5	5.7
DCIS Detection Rate (per 1,000)		1.2	1.4	1.5	1.9	2.2	1.5
on first screens	Overall	1.3	2.2	1.4	4.6	7.7	1.7
	Higher Risk	3.2	6.1	1.5	0.0	0.0	3.2
	Average Risk	1.1	1.7	1.4	5.6	9.3	1.5
on subsequent screens	Overall	1.1	1.4	1.5	1.9	2.1	1.5
	Higher Risk	1.3	2.0	1.6	1.5	3.0	1.7
	Average Risk	1.0	1.2	1.4	2.0	1.4	1.4
Positive Predictive Value		2.3%	5.7%	9.2%	13.9%	16.2%	7.0%
on first screens	Overall	2.1%	4.0%	6.9%	10.7%	14.1%	3.7%
	Higher Risk	2.2%	6.5%	10.5%	17.2%	0.0%	5.2%
	Average Risk	2.1%	3.6%	6.3%	9.2%	16.4%	3.5%
on subsequent screens	Overall	2.5%	6.2%	9.5%	14.1%	16.4%	8.1%
	Higher Risk	2.9%	7.7%	10.9%	15.2%	20.4%	10.0%
	Average Risk	2.4%	5.9%	9.0%	13.8%	13.5%	7.5%
Core Biopsy Yield Ratio		18.0%	38.0%	53.6%	62.4%	58.0%	43.6%
on first screens		15.0%	23.7%	42.5%	45.5%	60.0%	24.4%
on subsequent screens		21.3%	42.7%	55.1%	63.5%	57.9%	49.2%
Open Biopsy Yield Ratio		18.3%	19.3%	25.6%	44.1%	23.5%	24.2%
on first screens		24.1%	10.5%	0.0%	100.0%	0.0%	17.5%
on subsequent screens		12.9%	21.7%	27.4%	42.4%	28.6%	25.9%

Notes

1. See glossary in the Appendix for definitions of terms.
2. Overall Cancer Rate includes ductal carcinoma in situ (DCIS).
3. An additional 108 abnormal screens had incomplete or lost to follow-up. Information from these screens is excluded from all entries in the table other than exam counts and abnormal call rates.
4. The final number of cancers is still to be determined.
5. 371 exams were performed for women <40 years old and 1 cancer was detected for this age group.

March 2024

6. The "All" column includes women less than 40 years of age.
7. Cascade data extraction date: January 31, 2024.

Diagnostic procedure information is available to date on 22,658 (99.6%) of the screening mammograms with abnormal findings. Table 10 shows the proportion of participants receiving specific diagnostic procedures as part of the work-up on their screen-detected abnormalities.

Overall, 18% and 6% of participants with abnormal screening mammograms had core biopsy and open biopsy, respectively.

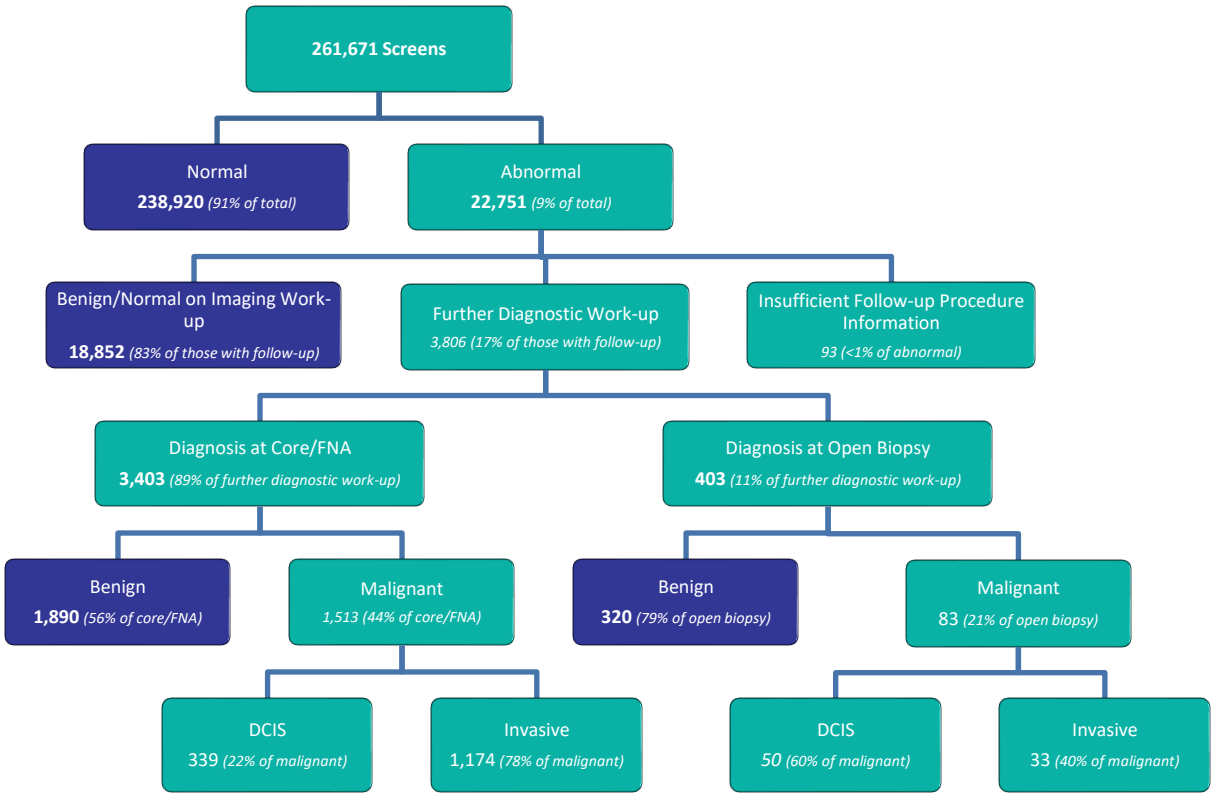
TABLE 10: DIAGNOSTIC PROCEDURES RECEIVED BY BREAST SCREENING PROGRAM PARTICIPANTS WITH "ABNORMAL" SCREENING MAMMOGRAMS: 2021

	Age at Exam						
Procedure	**<40**	**40-49**	**50-59**	**60-69**	**70-79**	**80+**	**All**
Diagnostic Mammogram	95%	94%	95%	95%	94%	94%	**95%**
Ultrasound	74%	75%	74%	71%	70%	69%	**73%**
Fine Needle Aspiration		0%	0%	0%	1%		**< 1%**
Core Biopsy	9%	15%	17%	19%	24%	32%	**18%**
Surgical Biopsy	2%	3%	5%	7%	8%	8%	**6%**
with Localization	2%	3%	4%	6%	6%	1%	**5%**
Number of cases with diagnostic assessment information available	58	5,728	7,121	6,690	2,924	137	**22,658**

Notes

1. Breast Screening Program data extraction date: January 31, 2024.

FIGURE 11: SCREENING OUTCOME SUMMARY: 2021



5.3 – 2021 CANCER DETECTION

Histologic features of breast cancers detected by the Breast Screening Program in 2021 are summarized by 10-year age groups in Table 11. 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, 24% of cancers detected were in situ.
- Of the invasive cancers detected, 61% were ≤15 mm, 78% did not have invasion of the regional lymph nodes, and 38% were grade 3 (i.e. poorly differentiated) tumours, ≤ 15mm.

These overall outcome indicators met the international targets[3] recommended for screening programs.

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

TABLE 11: HISTOLOGIC FEATURES OF BREAST CANCERS DETECTED BY BREAST SCREENING PROGRAM: 2021

	Age at Exam									
Histological Features	**40-49**		**50-59**		**60-69**		**70-79**		**Age 40-79**	
Number of Cancers	134		408		615		419		1,576	
in situ	50	37%	118	29%	136	22%	81	19%	385	24%
invasive	84	63%	290	71%	479	78%	338	81%	1,191	76%
Invasive Cancers Tumour Size										
≤ 5 mm	11	14%	23	8%	45	10%	28	8%	107	9%
6-10 mm	13	17%	53	19%	124	28%	86	26%	276	24%
11-15 mm	15	19%	74	27%	127	28%	86	26%	302	27%
16-20 mm	13	17%	47	17%	69	15%	47	14%	176	16%
> 20 mm	25	32%	79	29%	81	18%	84	25%	269	24%
unknown size	7		14		33		7		61	
Invasive Cancers with tumour ≤ 15 mm	39	51%	150	54%	296	66%	200	60%	685	61%
Node Involvement in Invasive Cancers										
no	49	69%	187	71%	351	80%	256	82%	843	78%
yes	22	31%	76	29%	86	20%	55	18%	239	22%
no nodes sampled / unknown	13		27		42		27		109	
Histologic Grade of Invasive Cancers										
1 - well differentiated	20	27%	76	28%	153	34%	93	28%	342	30%
2 - moderately differentiated	34	46%	129	47%	225	50%	183	55%	571	51%
3 - poorly differentiated	20	27%	69	25%	71	16%	55	17%	215	19%
unknown grade	10		16		28		6		60	
Grade 3 tumour ≤ 15 mm	6	30%	26	38%	35	49%	15	27%	82	38%

Notes

1. Targets: >50% invasive tumours ≤15mm, >70% with negative nodes, >30% grade 3 tumours ≤15mm.
2. Cascade data extraction date: January 31, 2024

5.4 – OUTCOME INDICATORS BY CALENDAR YEAR: 2017 – 2021

Table 12 shows the outcome indicators for screening exams provided over five years.

- Cancer detection rates have been stable for the last five years.
- Abnormal call rates have been trending lower over last five years.
- Sensitivity, specificity and interval cancer rate calculations are currently not available

Regular record linkage with the British Columbia Cancer Registry enables the Breast Screening Program to determine the number of non-screen detected (interval) cancers occurring in Breast Screening Program participants. Sensitivity (i.e. probability of finding individuals with breast cancer) and specificity (i.e. probability of a negative mammogram in individuals without breast cancer) by calendar year are shown in Table 12. The Breast Screening Program conducts formal reviews, both blinded and retrospective, of ~ 50% of interval cancers in Breast Screening Program participants as a quality assurance process.

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 Breast Screening Program, the definition of prevalent screens has been restricted to those individuals with no previous outside mammogram within 24 months of their first screening encounter.

TABLE 12: BREAST SCREENING PROGRAM OUTCOME INDICATORS BY CALENDAR YEAR BETWEEN 2017 AND 2021 INCLUSIVE

Outcome Indicators	Calendar Year					5-Year Cumulative
	2017	2018	2019	2020	2021	
Number of Exams	258,491	260,369	266,405	186,019	261,671	1,232,955
on first screens	9.9%	10.1%	10.5%	8.8%	10.8%	10.1%
Number of Cancers	1,429	1,504	1,574	1,062	1,597	7,166
on first screens	14.6%	13.9%	13.1%	12.1%	12.6%	13.3%
Abnormal Call Rate	9.0%	9.2%	8.9%	8.7%	8.7%	8.9%
on first screens	19.7%	20.7%	20.2%	19.7%	19.4%	20.0%
on subsequent screens	7.8%	7.9%	7.5%	7.6%	7.4%	7.7%
Overall Cancer Detection Rate (per 1,000)	5.5	5.8	5.9	5.7	6.1	5.8
on first screens	8.1	7.9	7.4	7.9	7.2	7.7
on subsequent screens	5.2	5.5	5.7	5.5	6.0	5.6
DCIS Detection Rate (per 1,000)	1.2	1.3	1.1	1.1	1.5	1.2
on first screens	1.9	1.7	1.7	1.4	1.7	1.7
on subsequent screens	1.1	1.2	1.1	1.1	1.5	1.2
Positive Predictive Value	6.2%	6.3%	6.7%	6.6%	7.0%	6.6%
on first screens	4.2%	3.9%	3.7%	4.0%	3.7%	3.9%
on subsequent screens	6.8%	7.0%	7.7%	7.3%	8.1%	7.4%
Core Biopsy Yield Ratio	38.0%	39.0%	43.9%	43.5%	43.6%	41.4%
on first screens	20.4%	15.5%	12.9%	22.4%	17.5%	17.6%
on subsequent screens	43.0%	43.7%	51.0%	49.1%	49.2%	47.0%
Open Biopsy Yield Ratio	28.3%	27.4%	30.7%	25.7%	24.2%	27.7%
on first screens	20.4%	15.5%	12.9%	22.4%	17.5%	17.6%
on subsequent screens	30.9%	30.9%	36.3%	26.5%	25.9%	30.7%
Interval Cancer Rate (per 1,000 normal screens)						
0-12 months	0.6	0.6	0.8	-	-	-
after first screens	0.5	0.8	1.0	-	-	-
after subsequent screens	0.6	0.6	0.8	-	-	-
13-24 months	0.9	0.9	-	-	-	-
Sensitivity (1 - false negative rate)	91.3%	91.0%	88.6%	-	-	-
Specificity (1 - false positive rate)	91.6%	91.3%	91.7%	-	-	-

Notes

2. See glossary in the Appendix for definitions of terms.
3. Overall Cancer Detection Rate includes ductal carcinoma in situ (DCIS).
4. The final number of cancers in 2021 is still to be determined.
5. Number of cancers and related rates do not include data for women whose follow-up is incomplete.
6. Interval Cancer Rate, Sensitivity, and Specificity results are not complete because the data is not available yet.
7. Cascade data extraction date: January 31, 2024

5.5 – OUTCOME INDICATORS BY 10-YEAR AGE GROUPS: 2017 – 2021 CUMULATIVE

Table 13 shows the outcome indicators for exams provided in a five-year period by 10-year age groups.

- From 2017 to 2021, the Breast Screening Program provided 1,232,955 breast screening examinations, and detected 7,166 breast cancers.
- Approximately 89% of the cancers detected during this five-year period were in individuals 50 years of age or older. The screen-to-cancer ratio ranges from 111:1 for individuals in their 70's to 284:1 for individuals in their 40's.
- Although the risk of breast cancer increases with age, the abnormal call rates were higher in the younger age groups
- The abnormal-to-cancer ratio ranges from 8:1 for individuals in their 70's to 37:1 for individuals in their 40's.
- The cancer detection rate and positive predictive value increases for individuals as they get older.
- Interval Cancer Rate, Sensitivity and Specificity results are not complete because the data is not available yet.

TABLE 13: BREAST SCREENING PROGRAM OUTCOME INDICATORS BY 10-YEAR AGE GROUPS BETWEEN 2017 AND 2021 INCLUSIVE

	Age at Exam					
	Age at Exam					
Outcome Indicators	**40-49**	**50-59**	**60-69**	**70-79**	**80+**	**All**
Number of Exams	213,935	398,197	429,425	182,687	7,241	**1,232,955**
on first screens	33.2%	8.0%	3.8%	2.1%	2.9%	**10.1%**
Number of Cancers	758	1,887	2,752	1,652	114	**7,166**
on first screens	46.0%	15.1%	8.2%	5.1%	6.1%	**13.3%**
Abnormal Call Rate	13.2%	8.8%	7.5%	7.3%	8.9%	**8.9%**
on first screens	19.5%	21.1%	19.7%	20.6%	24.8%	**20.0%**
on subsequent screens	10.1%	7.8%	7.0%	7.0%	8.4%	**7.7%**
Overall Cancer Detection Rate (per 1,00(	3.5	4.7	6.4	9.0	15.8	**5.8**
on first screens	4.9	8.9	13.9	21.7	33.8	**7.7**
on subsequent screens	2.9	4.4	6.1	8.8	15.2	**5.6**
DCIS Detection Rate (per 1,000)	1.1	1.1	1.3	1.6	2.4	**1.2**
on first screens	1.6	1.8	1.8	3.9	9.7	**1.7**
on subsequent screens	0.9	1.1	1.3	1.5	2.1	**1.2**
Positive Predictive Value	2.7%	5.4%	8.6%	12.5%	18.0%	**6.6%**
on first screens	2.5%	4.3%	7.1%	10.6%	14.3%	**3.9%**
on subsequent screens	2.9%	5.7%	8.8%	12.6%	18.3%	**7.4%**
Core Biopsy Yield Ratio	20.1%	36.1%	50.9%	59.5%	69.6%	**41.4%**
on first screens	16.5%	23.7%	38.7%	45.3%	46.2%	**23.3%**
on subsequent screens	24.6%	39.9%	52.4%	60.6%	71.7%	**47.0%**
Open Biopsy Yield Ratio	16.4%	24.7%	34.1%	41.8%	26.7%	**27.7%**
on first screens	17.7%	16.0%	16.1%	30.0%	33.3%	**17.6%**
on subsequent screens	15.0%	26.9%	36.1%	42.8%	25.0%	**30.7%**
Interval Cancer Rate (per 1,000 normal screens)						
0-12 months	0.8	0.6	0.6	0.9	1.0	**0.7**
after first screens	0.8	0.6	0.9	0.6	0.0	**0.8**
after subsequent screens	0.8	0.6	0.6	0.9	1.0	**0.7**
13-24 months	0.9	0.9	0.8	1.3	1.5	**0.9**
Sensitivity (1 - false negative rate)	84.5%	89.6%	91.7%	91.3%	94.7%	**90.2%**
Specificity (1 - false positive rate)	87.1%	91.5%	93.0%	93.4%	92.5%	**91.5%**

Notes

1. See glossary in the Appendix for definitions of terms.
2. Overall cancer detection rate includes ductal carcinoma in situ (DCIS).
3. Number of cancers and related rates do not include data for women whose follow-up is incomplete.
4. The final number of cancers in 2021 is still to be determined.
5. The total for all ages includes women less than 40 years of age.
6. Interval Cancer Rate, Sensitivity, and Specificity results are not complete because the data is not available yet.
7. Cascade data extraction date: January 31, 2024

5.6 – OUTCOME INDICATORS BY HSDA: 2017 – 2021 CUMULATIVE

Outcome indicators for 2017 to 2021 are summarized by HSDA in Table 14.

- South Vancouver Island region has the lowest abnormal call rate (6%), Northeast has the highest (12%).
- Northeast has the lowest cancer detection rate (4.5 per 1,000), while East Kootenay has the highest (7.1 per 1,000).
- Northeast has the lowest positive predictive value (4%) and South Vancouver Island has the highest (10%).
- All but one of the HSDAs meet the national targets[4] recommended for screening programs for invasive tumour detection size (target > 50%); twelve out of the sixteen HSDAs meet the national target recommended for percentage of cases with negative nodes (target > 70%).

[4] Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Screening Program Performance third Edition. Health Canada 2013

TABLE 14: BREAST SCREENING PROGRAM OUTCOME INDICATORS BY HEALTH SERVICE DELIVERY AREA (HSDA) BETWEEN 2017 AND 2021 INCLUSIVE

HSDA	% Called Abnormal	Cancer Detection Rate (per 1,000)	PPV	In-Situ : Invasive (number)	% Invasive ≤ 15 mm	% Invasive with -ve nodes
East Kootenay	10%	7.1	7%	29 : 111	59%	78%
Kootenay Boundary	9%	5.1	6%	17 : 72	65%	69%
Okanagan	8%	6.2	8%	133 : 522	63%	75%
Thompson Cariboo Shuswap	10%	5.7	6%	65 : 271	59%	72%
Interior	9%	6.0	7%	244 : 976	61%	74%
Fraser East	10%	6.3	6%	93 : 351	60%	72%
Fraser North	10%	5.8	6%	226 : 753	56%	69%
Fraser South	9%	5.6	6%	258 : 832	58%	70%
Fraser	9%	5.8	6%	577 : 1936	58%	70%
Richmond	9%	5.3	6%	80 : 237	50%	68%
Vancouver	9%	5.7	6%	253 : 671	58%	71%
North Shore / Coast Garibaldi	11%	5.5	5%	96 : 350	64%	75%
Vancouver Coastal	10%	5.6	6%	429 : 1258	58%	72%
South Vancouver Island	6%	5.6	10%	98 : 513	51%	71%
Central Vancouver Island	7%	6.2	9%	99 : 414	60%	80%
North Vancouver Island	8%	6.3	8%	27 : 204	58%	70%
Vancouver Island	6%	5.9	9%	224 : 1131	56%	74%
Northwest	11%	6.9	6%	17 : 99	60%	60%
Northern Interior	11%	6.0	6%	38 : 169	65%	75%
Northeast	12%	4.5	4%	3 : 43	49%	70%
Northern	11%	6.0	5%	58 : 311	61%	69%
Unknown	8%	4.0	5%	1 : 5	80%	60%
British Columbia	**9%**	5.8	7%	1533 : 5617	58%	72%

Notes

1. See glossary in the Appendix for definitions of terms.
2. Targets: >50% invasive tumours ≤15mm, >70% with negative nodes.
3. Breast Screening Program data extraction date: January 31, 2024.

5.7 – CANCER CHARACTERISTICS BY AGE: CUMULATIVE UP TO AND INCLUDING 2021

From the start of the program in July 1988 to December 2021, 32,467 participants were found to have breast cancer through screening-initiated work-up. Histologic features of breast cancers detected by the Breast Screening Program, cumulative up to and including 2021, are summarized by 10-year age groups in Table 15. Internationally recommended targets have been achieved.

Overall, invasive cancers found in participants ages 40 to 49 tend to be larger and more likely to have node involvement than cancers found in older participants.

TABLE 15: HISTOLOGIC FEATURES OF BREAST CANCERS DETECTED BY BREAST SCREENING PROGRAM CUMULATIVE UP TO AND INCLUDING 2021

	Age at Exam											
Histological Features	**40-49**		**50-59**		**60-69**		**70-79**		**80+**		**Age 40+**	
Number of Cancers	4,659		8,996		11,079		7,222		511		**32,467**	
in situ	1,446	31%	2,197	24%	2,236	20%	1,262	17%	63	12%	**7,204**	**22%**
invasive	3,213	69%	6,799	76%	8,843	80%	5,960	83%	448	88%	**25,263**	**78%**
Invasive Cancers Tumour Size												
≤ 5 mm	314	10%	627	9%	804	9%	445	8%	36	8%	**2,226**	**9%**
6-10 mm	591	19%	1,482	22%	2,327	27%	1,730	29%	116	26%	**6,246**	**25%**
11-15 mm	821	26%	1,873	28%	2,524	29%	1,731	29%	122	28%	**7,071**	**28%**
16-20 mm	493	16%	1,110	17%	1,331	15%	874	15%	73	17%	**3,881**	**16%**
> 20 mm	908	29%	1,584	24%	1,737	20%	1,110	19%	95	21%	**5,434**	**22%**
unknown size	(86)		(123)		(120)		(70)		(6)		**(405)**	
Invasive Cancers with tumour size ≤ 15 mm	1,726	55%	3,982	60%	5,655	65%	3,906	66%	274	62%	**15,543**	**63%**
Node Involvement in Invasive Cancers												
no	1,987	69%	4,606	73%	6,405	78%	4,332	81%	267	81%	**17,597**	**76%**
yes	890	31%	1,669	27%	1,798	22%	1,012	19%	61	19%	**5,430**	**24%**
no nodes sampled / unkno	(333)		(520)		(637)		(613)		(120)		**(2,223)**	
Histologic Grade of Invasive Cancers												
1 - well differentiated	744	25%	1,928	30%	2,736	33%	1,977	35%	159	38%	**7,544**	**32%**
2 - moderately differentiate	1,330	45%	2,731	43%	3,843	46%	2,601	47%	181	44%	**10,686**	**45%**
3 - poorly differentiated	877	30%	1,664	26%	1,744	21%	1,012	18%	75	18%	**5,372**	**23%**
unknown grade	(259)		(472)		(515)		(366)		(33)		**(1,645)**	
Grade 3 tumour ≤ 15 mm	353	40%	726	44%	844	48%	472	47%	30	40%	**2,425**	**45%**

Notes

1. Targets1: >50% invasive tumours ≤15mm, >70% with negative nodes, >30% grade 3 tumours ≤15mm.
2. Breast Screening Program data extraction date: January 31, 2024.

5.8 – 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. In 2012 the CBCSI component transferred to the Canadian Partnership Against Cancer (CPAC).

The Canadian Breast Cancer Screening Database (CBCSD) was first established in 1993. All provincial and territorial programs in Canada 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. Biennial evaluation reports are now produced regularly from the CBCSD by CPAC.

In this section, the Breast Screening Program performance measures are presented against the targets set for Canadian breast cancer screening programs[5]. 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.

The Breast Screening Program 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.

- There was a decrease in the first screen retention rate (31.1% compared with 41.1% in 2020). This is due to the longer than normal wait time for screen appointments due to COVID 19 recovery, resulting in inability of participants to get screened within the 30 month period.
- There was a decrease in the diagnostic interval for tissue biopsies performed (63% completed within 7 weeks compared with 70.9% in 2020).

Comparison of Breast Screening Program Performance with Canadian Breast Screening Standards for Ages 50 to 69 is summarized in Table 16.

5 Report from the Evaluation Indicators Working Group: Guidelines for Monitoring Breast Screening Program Performance third Edition. Health Canada 2013

TABLE 16: COMPARISON OF BREAST SCREENING PROGRAM PERFORMANCE WITH CANADIAN BREAST SCREENING STANDARDS FOR INDIVIDUALS AGES 50-69 YEARS

Performance Measure	National Target	Breast Screening Program
Participation Rate (1)	≥ 70% of the eligible population	44.8% + 10.9% MSP
Retention Rate (2)		
Initial Re-screen	≥ 75% initial re-screen within 30 months	31.1%
Subsequent Re-screen	≥ 90% subsequent re-screen within 30 months	62.2%
Abnormal Call Rate (3)		
First Screens	< 10% first screens	20.2%
Subsequent Screens	< 5% re-screens	7.1%
Invasive Cancer Detection Rate (3)		
First Screens	> 5.0 per 1,000 first screens	8.1 per 1,000
Subsequent Screens	> 3.0 per 1,000 re-screens	4.1 per 1,000
DCIS Detection Rate (3)		
First Screens	Surveillance and monitoring only	1.9 per 1,000
Subsequent Screens	Surveillance and monitoring only	1.4 per 1,000
Diagnostic Interval (3)		
no tissue biopsy performed	90% within 5 weeks if no tissue biopsy performe	80.4%
tissue biopsy performed	≥ 90% within 7 weeks if tissue biopsy performed	60.0%
Positive Predictive Value (3)		
First Screens	≥ 5% first screens	5.0%
Subsequent Screens	≥ 6% re-screens	7.9%
Benign Core Biopsy Rate (3)		
First Screens	Surveillance and monitoring only	22.7 per 1,000
Subsequent Screens	Surveillance and monitoring only	5.4 per 1,000
Benign to Malignant Core Biopsy Ratio (3)		
First Screens	Surveillance and monitoring only	2.3 : 1
Subsequent Screens	Surveillance and monitoring only	1.0 : 1
Benign Open Biopsy Rate (3)		
First Screens	Surveillance and monitoring only	1.9 per 1,000
Subsequent Screens	Surveillance and monitoring only	0.7 per 1,000
Benign to Malignant Open Biopsy Ratio (3)		
First Screens	≤ 1 : 1	11.0 : 1
Subsequent Screens	≤ 1 : 1	3.1 : 1
Invasive Cancers Tumour Size ≤ 10 mm (3)	> 25%	31.9%
Invasive Cancers Tumour Size ≤ 15 mm (3)	> 50%	58.0%
Node Negative Rate in Cases of Invasive Cancer (3)	> 70%	70.0%

Notes

1. Screen years: (1) = July 1, 2019 - December 31, 2021, (2) = 2018 - 2020, (3) = 2021.
2. Population data source: P.E.O.P.L.E. 2021 population projection (Oct 2021), BC Stats, Ministry of Technology, Innovation and Citizens' Services, Government of the Province of British Columbia.
3. Cascade data extraction date: January 31, 2024 .

5.9 – COST ANALYSIS

The BC Cancer Breast Screening Program is funded by the provincial Ministry of Health through the Provincial Health Services Authority (PHSA). The Breast Screening Program 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 Breast Screening Program Central Office, including: promotion, a provincial toll-free call centre, mobile service coordination and staff travel, result mail-out to participants 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 17.

Financial reports for PHSA and BCCA are available at the PHSA website: www.phsa.ca/AboutPHSA/PHSA_Budget_Financials/default.htm

TABLE 17: COST COMPARISON BY FISCAL YEAR

Indicator	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Total Cost	**$21,127,930**	**$21,452,284**	**$21,242,674**	**$18,812,835**	**$21,748,666**
Total Cost per Screen	$82.46	$81.76	$82.40	$95.39	$83.39
Central Services	$18.02	$16.80	$17.18	$24.79	$20.99
Screen Provision Costs	$49.46	$49.90	$50.08	$55.38	$47.10
Professional Reading Fees	$14.99	$15.06	$15.14	$15.22	$15.30
Cost per Cancer Detected	**$14,621.40**	**$13,840.18**	**$14,539.82**	**$15,677.36**	**$13,773.70**

Notes

1. Program Expenses are audited through PHSA Finance annually.
2. Screen Provision Costs includes, but are not limited to, staffing costs, equipment related costs, and mobile operation costs.
3. The professional reading fee was $15.30 per screen effective April 1, 2021.
4. Cost per cancer detected is based upon screens with complete follow-up. 2020-2021 includes 10 week closure due to COVID
5. The cost per screen is exclusive of salary and benefit increases to public screening centers which, commencing in fiscal 2006, have gone directly to the Health Authority.
6. Cascade data extraction date: January 31, 2024

APPENDIX 1 – CANCER SCREENING PROGRAM OVERVIEW

Definition of Screening

Screening is one part of a prevention strategy, with the goal of identifying cancer before symptoms or signs develop. Primary cancer prevention strategy involves changes of behaviour or habits that reduce a risk, for example, stopping smoking, fat reduction in the diet, etc. Screening for cancer is a secondary prevention strategy. Secondary cancer prevention strategy targets disease in process[6]. 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."[7]

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 may use to identify individuals who may have occult disease.[8],[9],[10]

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 (false-positive screen), and screening tests may fail to identify some individuals who do have the disease (false-negative screen).

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

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6 US Preventive Services Task Force: Guide to Clinical Preventive Services, Ed 2. Baltimore, Williams & Wilkins, 1996

7 Morrison A: Screening in Chronic Disease. New York, Oxford Press, 1992

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

9 Miller AB; Fundamentals of Screening. In Screening for Cancer. Orlando, Academic Press, 1985, P3

10 Wilson JMG, Junger G; Principles and Practice of Screening for Disease. Geneva, World Health Organization, 196

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 individuals, 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

APPENDIX 2 – 2021 BREAST SCREENING PROGRAM SCREENING SERVICES

In 2021 the Program provided screening mammography to individuals ages 40 and over. The recall frequency shown below was used to calculate the program results for the period of January 1, 2021 – December 31, 2021.

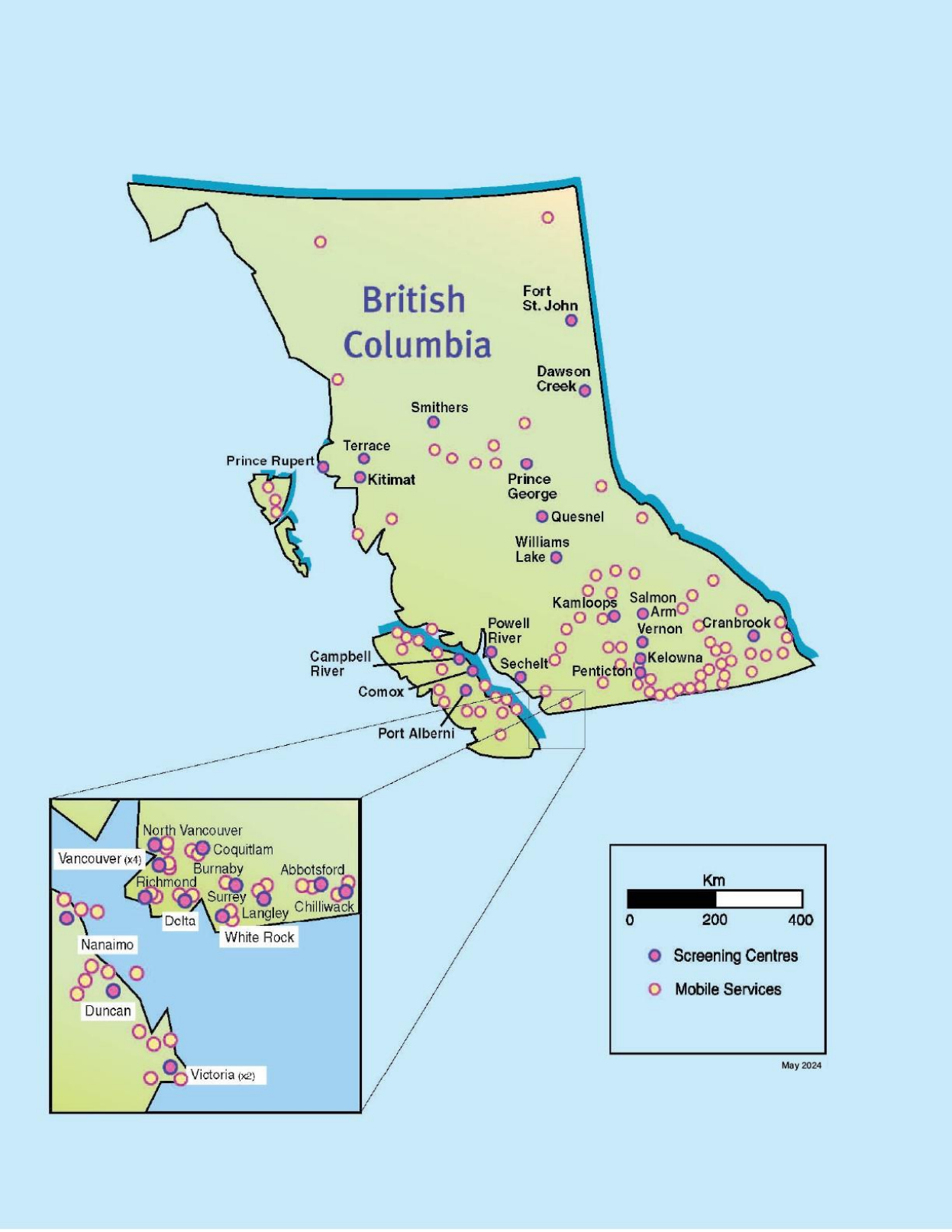
Age	Recall Frequency
<40	Will accept with primary health care provider referral, no recall provided
40-74 Average risk	Reminders for 24-month and 36-month anniversary to age 74.
40-74 Higher Risk	Reminders* for 12-month and 24-month anniversary to age 74
75+	Will accept, no recall provided

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 primary care provider to receive the results.

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

APPENDIX 3 – MAP OF SCREENING CENTRES



APPENDIX 4 – SCREENING CENTRES CONTACT INFORMATION

Abbotsford	604-851-4750
Burnaby	604-436-0691
Campbell River	250-286-7100 x67477
Chilliwack	604-795-4122
Comox	250-331-5949
Coquitlam	604-927-2130
Cranbrook	250-417-3585
Dawson Creek	250-784-7320
Delta	604-946-1121 x783511
Duncan	250-737-2030 x44027
Fort St John	250-261-7424
Kamloops	250-828-4916
Kelowna	250-861-7560
Langley	604-514-6044
Nanaimo	250-716-5904
IK and NLM Mobile	604-877-6232
North Vancouver	604-903-3860
Penticton	250-770-7573
Port Alberni	250-724-8811
Powell River	604-485-3282
Prince George	250-645-6654
Prince Rupert	250-622-6172
Quesnel	250-985-5680
Richmond	604-244-5505
Salmon Arm	250-833-3607 x6
Sechelt	604-885-2224 x4213
Smithers	250-847-6214
Surrey – JPOCSC	604-582-4592
Terrace	250-638-4046
Vernon	250-549-5451
White Rock	604-535-4512 x757479
Williams Lake	250-302-3220 x4
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	
Victoria General Hospital	250-727-4338
305-1990 Fort St	250-952-4232

Mobile Screening Service Delivery Areas

Mobile Screening Communities:			
100 Mile House	Grandforks	Old Massett	Sparwood
Agassiz	Hope	Oliver	Squamish
Armstrong	Houston	Osoyoos	Stewart
Ashcroft	Hudson's Hope	Parksville	Summerland
Barriere	Invermere	Pemberton	Trail
Bella Bella	Kamloops	Pender Island	Tumbler Ridge
Bella Coola	Kelowna	Penticton	Ucluelet
Bowen Island	Kimberley	Pitt Meadows	Valemount
Burns Lake	Kitimat	Port Alberni	Vanderhoof
Castlegar	Ladysmith	Port Alice	Vernon
Chemainus	Lake Cowichan	Port Clements	Westbank
Chetwynd	Lillooet	Port Hardy	Whistler
Clearwater	Lumby	Port McNeil	Winifield
Clinton	Mackenzie	Princeton	
Creston	Maple Ridge	Qualicum Beach	
Dease Lake	Massett	Queen Charlotte	
Elkford	McBride	Radium	
Fernie	Merritt	Revelstoke	
Fort Nelson	Mill Bay	Saanichton	
Fort St. James	Mission	Salmon Arm	
Fraser Lake	Mount Currie	Salt Spring Island	
Gabriola Island	Nakusp	Sayward	
Galiano	Nelson	Skidegate	
Gold River	New Hazelton	Sointula	
Golden	New Westminster	Sooke	

Lower Mainland locations change from time to time. Latest visits include: Agassiz, Hope, Maple Ridge, Mission, New Westminster, Pitt Meadows

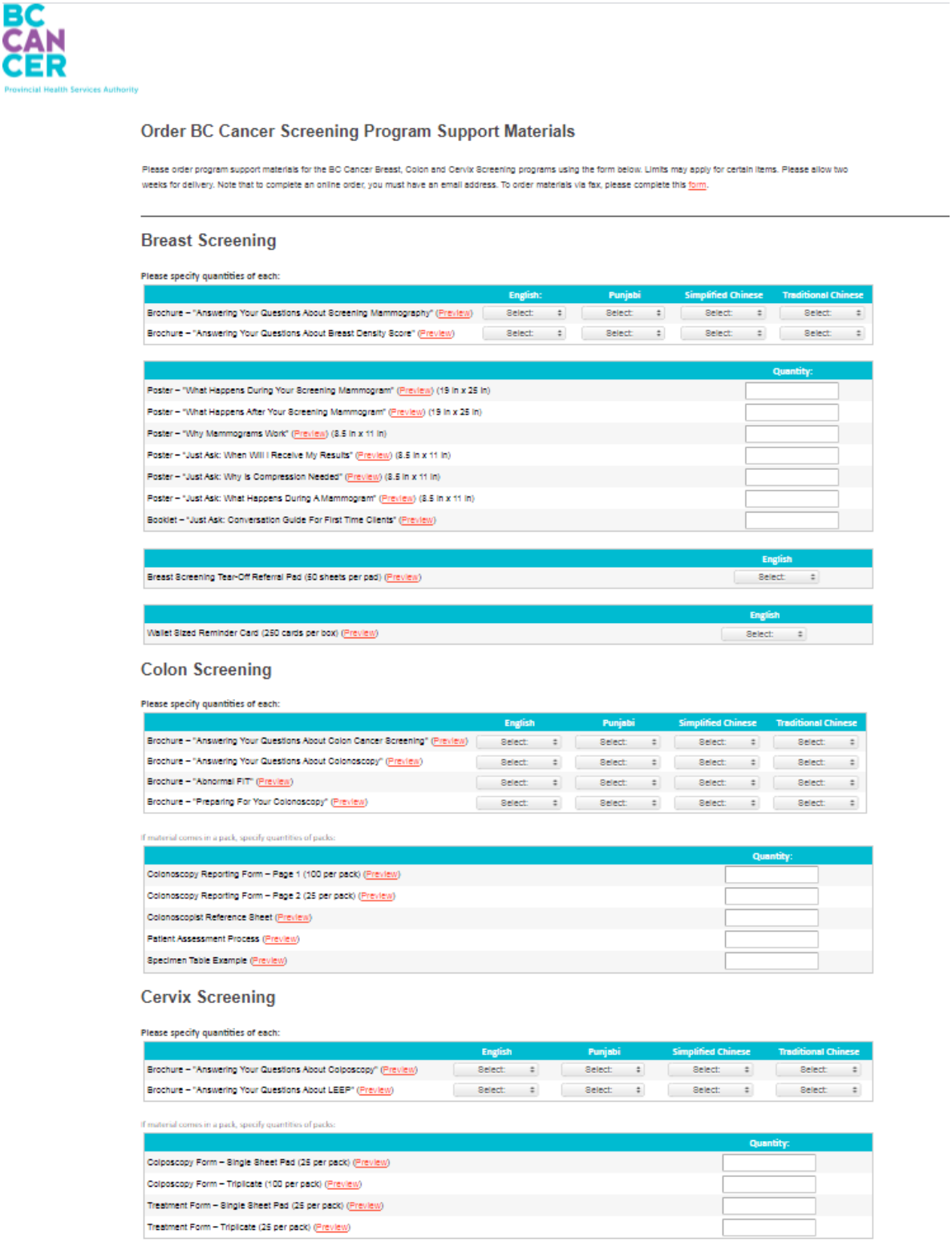
March 2024

First Nations Communities

Community	Area
Alexis Creek (Anaham)	Alexis Creek
Anahim Lake	Anahim Lake
Burns Lake-Southside	Southside
Canim Lake Band	Canim Lake
Fountain	Lillooet
Fort Nelson First Nation	Fort Nelson
Gingolx	Kincolith
Gitlaxt'aamiks (New Aiyansh)	New Aiyansh
Gitwinksihlk	Gitwinksihlk
Haisla First Nation	Kitimat
Kispox	Hazelton
Laxgatls'ap (Greenvile)	Greenville
Lower Kootenay Band	Creston
Lower Nicola	Merritt
McLeod Lake	McLeod Lake
Musqueam Indian Band	Vancouver
Nak'Azdli	Fort St. James
Okanagan Indian Band	Vernon
Qwemtsin	Kamloops
Saik'uz	Vanderhoof
Saulteau First Nation	Chetwynd
Seabird	Agassiz
Simpcw First Nation	Barriere
Skeetchestn	Savona
Spences Bridge	Spences Bridge
Splatsin	Enderby
Stellat'En	Fraser Lake
Sto:lo Nation	Chilliwack
Stone-Yunesit'in	Hanceville
Sts'ailes	Agassiz
Tachie-TI'azt'en Nation	Fort St. James
Tatla Lake	Tatla Lake
Tiget-T'It'Q'Et First Nation	Lillooet
Tobacco Plains	Grasmere
Toosey-TI'Esqox	Riske Creek
Tsleil-Waututh	North Vancouver
Upper Nicola	Merritt
Urban Native Health Clinic	Kamloops
Westbank First Nation	Westbank
Witset-Moricetown	Moricetown
Penelakut	Chemainus
Songhees	Victoria
Stz'uminus	Ladysmith

APPENDIX 5 – EDUCATIONAL MATERIALS ORDER FORM

The online materials order form can be found online at http://www.bccancer.bc.ca/screening/breast.



BC CANCER
Provincial Health Services Authority

Order BC Cancer Screening Program Support Materials

Please order program support materials for the BC Cancer Breast, Colon and Cervix Screening programs using the form below. Limits may apply for certain items. Please allow two weeks for delivery. Note that to complete an online order, you must have an email address. To order materials via fax, please complete this form.

Breast Screening

Please specify quantities of each:

	English:	Punjabi	Simplified Chinese	Traditional Chinese
Brochure – "Answering Your Questions About Screening Mammography" (Preview)	Select:	Select:	Select:	Select:
Brochure – "Answering Your Questions About Breast Density Score" (Preview)	Select:	Select:	Select:	Select:

	Quantity:
Poster – "What Happens During Your Screening Mammogram" (Preview) (19 in x 25 in)	
Poster – "What Happens After Your Screening Mammogram" (Preview) (19 in x 25 in)	
Poster – "Why Mammograms Work" (Preview) (8.5 in x 11 in)	
Poster – "Just Ask: When Will I Receive My Results" (Preview) (8.5 in x 11 in)	
Poster – "Just Ask: Why Is Compression Needed" (Preview) (8.5 in x 11 in)	
Poster – "Just Ask: What Happens During A Mammogram" (Preview) (8.5 in x 11 in)	
Booklet – "Just Ask: Conversation Guide For First Time Clients" (Preview)	

	English
Breast Screening Tear-Off Referral Pad (50 sheets per pad) (Preview)	Select:

	English
Wallet Sized Reminder Card (250 cards per box) (Preview)	Select:

Colon Screening

Please specify quantities of each:

	English	Punjabi	Simplified Chinese	Traditional Chinese
Brochure – "Answering Your Questions About Colon Cancer Screening" (Preview)	Select:	Select:	Select:	Select:
Brochure – "Answering Your Questions About Colonoscopy" (Preview)	Select:	Select:	Select:	Select:
Brochure – "Abnormal FIT" (Preview)	Select:	Select:	Select:	Select:
Brochure – "Preparing For Your Colonoscopy" (Preview)	Select:	Select:	Select:	Select:

If material comes in a pack, specify quantities of packs:

	Quantity:
Colonoscopy Reporting Form – Page 1 (100 per pack) (Preview)	
Colonoscopy Reporting Form – Page 2 (25 per pack) (Preview)	
Colonoscopist Reference Sheet (Preview)	
Patient Assessment Process (Preview)	
Specimen Table Example (Preview)	

Cervix Screening

Please specify quantities of each:

	English	Punjabi	Simplified Chinese	Traditional Chinese
Brochure – "Answering Your Questions About Colposcopy" (Preview)	Select:	Select:	Select:	Select:
Brochure – "Answering Your Questions About LEEP" (Preview)	Select:	Select:	Select:	Select:

If material comes in a pack, specify quantities of packs:

	Quantity:
Colposcopy Form – Single Sheet Pad (25 per pack) (Preview)	
Colposcopy Form – Triplicate (100 per pack) (Preview)	
Treatment Form – Single Sheet Pad (25 per pack) (Preview)	
Treatment Form – Triplicate (25 per pack) (Preview)	

APPENDIX 6 – 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.

Diagnostic Interval: Percentage of individuals with an abnormal screening mammogram result who were diagnosed (benign or cancer) within the recommended time interval from the abnormal screen date.

- ≤ 5 weeks without a tissue biopsy
- ≤ 7 weeks with a tissue biopsy

Invasive Cancer Detection Rate: Number of invasive cancer cases detected per 1,000 screens with complete follow-up.

Interval Cancer Rate: Number of individuals 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 individuals who have a screening mammogram within 30 months as a proportion of the prevalence adjusted population.

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 individuals with no previous outside mammogram within 24 months of their first program screens. The 1982 incidence rates by five-year age group obtained from the BC Cancer Registry were chosen as the comparison reference.

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

Where Ni is the number of prevalent screens for age group i, Cai is the number of cancers detected in prevalent screens for age group i and Ri is the expected incidence rate for age group i. Prevalence to expected incidence ratio for ages 50 to 79 would be calculated by summing over age groups 50 to 54,

55 to 59, 60 to 64, 65 to 69, 70 to 74, and 75 to 79 in the numerator and denominator.

Retention Rate (Return Rate): The estimated percentage of individuals without history of breast cancer diagnosis returned for rescreen within a certain period of time from their previous screen. This rate is estimated using Fine & Grey competing risk survival analysis 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.

SMP: Breast Screening Program

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 7 – ACKNOWLEDGEMENTS

The Breast Screening 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.
- Primary care providers 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 Radiological Society
Canadian Cancer Society
Canadian Partnership Against Cancer
College of Physicians and Surgeons of BC
Doctors of BC
Divisions of Family Practice
Society of General Practitioners
University of British Columbia

APPENDIX 8 – COMMITTEES (effective March 2024)

Alphabetical Listing – By Surname

Quality Management Committee (QMC)	Quality Management Support Group
Ms. Rachel Berns	Ms. Amanda Hunter
Dr. Stephen Chia	Ms. Shelley Pietraroia
Dr. Zuzana Kos	Ms. Sheila MacMahon
Dr. Fabio Feldman	Ms. Moira Pearson
Mr. Javis Lui	Dr. Rasika Rajapakshe
Ms. Amanda Hunter	Dr. Derek Wells
Ms. Sheila MacMahon	
Ms. Rableen Nagra	
Ms. Mary Nagy	
Dr. Linda Warren	
Dr. Charlotte Yong-Hing – Chair	

Screener's Advisory Committee (SAC)	
Dr. Eleanor Clark	Dr. Darryn Maisonneuve
Dr. Marie-Josee Cloutier	Dr. Peter McNicholas
Dr. Jennifer Dolden	Ms. Rableen Nagra
Dr. Brenda Farnquist	Dr. David O'Keeffe
Dr. Fabio Feldman	Dr. Amie Padilla-Thornton
Dr. Dellano Fernandes	Dr. Catherine Phillips
Ms. Amanda Hunter	Dr. Rasika Rajapakshe
Dr. Kevin Irish	Dr. Karen Seland
Dr. Dennis Janzen	Dr. Stuart Silver
Dr. Rob Johnson	Dr. Phil Switzer
Dr. Tahir Khalid	Dr. Beth Tanton
Dr. John Lai	Dr. Claire Thugur
Dr. Grant Larsen	Dr. Linda Warren
Dr. Brent Lee	Dr. Peggy Yen
Dr. Colin Mar	Dr. Charlotte Yong-Hing– Chair

APPENDIX 9 – RADIOLOGISTS SCREENERS (effective March 2024)

*Alphabetical listing, *** Indicates Chief Screener***

Abbotsford & Chilliwack	**Kelowna**	Dr. Dennis Janzen*
Dr. Amarjit Bajwa	Dr. Brenda Farnquist*	Dr. Dennis Lee
Dr. Joseph Chooi	Dr. Trent Orton	Dr. Amir Neyestani
Dr. Tahir Khalid*	Dr. Michael Partrick	**Vancouver BC Women's Health Centre**
Dr. Chung Ko	Dr. Cathy Staples	Dr. Marie-Josee Cloutier*
Burnaby & Richmond	**Langley**	Dr. Rashin Rastegar
Dr. Theodore Blake	Dr. Joseph Chooi	**Vancouver – Mount St. Joseph Hospital**
Dr. Andy Chan	Dr. Tahir Khalid	Dr. Roberta Dionello
Dr. Tracey Chandler	Dr. Chung Ko	Dr. Jessica Farrell
Dr. Bill Collins	Dr. John Lai*	Dr. Amie Padilla-Thornton*
Dr. Vanindar (Vee) Lail	Dr. Jerome Wong	**Vancouver – Victoria Drive**
Dr. Kelly MacLean	Dr. Xing Wong	Dr. Jennifer Jessup
Dr. Beth Tanton*	**Nanaimo/Islands & Coastal Mobile**	Dr. Connie Siu
Dr. Betty Tuong	Dr. David Coupland	Dr. Phil Switzer*
Comox	Dr. Robert Johnson*	**Vancouver – #505 – 750 West Broadway**
Dr. Grant Larson*	Dr. Zenobia Kotwall	Dr. Nicola Lapinsky
Dr. Jennifer Waterhouse	Dr. David O'Keefe	Dr. Nicholas Murray
Dr. Peggy Yen	Dr. Paul Trepanier	Dr. Linda Warren*
Coquitlam	Dr. Peggy Yen* (Mobile Chief Screener)	Dr. Charlotte Yong-Hing
Dr. Vishal Anand	**North Vancouver & Sechelt**	**Vernon/Salmon Arm**
Dr. Debra Chang	Dr. Sven Aippersbach	Dr. Glenn Scheske
Dr. Rita Chiu	Dr. Simon Bicknell	Dr. Claire Thurgur*
Dr. Jennifer Dolden*	Dr. Bobbi-Jo Coldwell	Dr. Adam Weathermon
Dr. Jian Li	Dr. Patrick Llewellyn	Dr. Chad Wherry
Dr. Anita McEachern	Dr. Catherine Phillips*	**Victoria General Hospital / Victoria Ft. St.**
Dr. Robert van Wiltenburg	Dr. David Spouge	Dr. Richard Eddy
Cranbrook	**Penticton**	Dr. Nicola Finn
Dr. Daryn Maisonneuve*	Dr. Peter McNicholas*	Dr. Chris King
Interior / Northern &	Dr. Meghan Van Vliet	Dr. Jonathan Hickle
Lower Mainland Mobile	**Prince George (UHNBC)**	Dr. Brent Lee*
Dr. Kevin Ibach	Dr. Shyr Chui	Dr. Stuart Silver*
Dr. Colin Mar*	Dr. Sarah Harvie	Dr. Frederick Smither
Dr. Tetyana Martin	Dr. Gurpreet Narang	Dr. Paul Sobkin
Dr. Charlotte Yong-Hing	Dr. Karen Seland*	**White Rock & Delta**
Kamloops	**Surrey – JPOC**	Dr. Eleanor Clark*
Dr. Dellano Fernandes*	Dr. Sanjiv (Sonny) Bhalla	Dr. Jeff Hagel
Dr. Vipal Vedd	Dr. Guy Eriksen	Dr. Tarek Helou

APPENDIX 10 – PUBLICATIONS AND PRESENTATIONS

Publications

Colin Mar

Cressman, S; Mar, C; Sam, J; Kan, L; Lohrisch, C; Spinelli, J; The cost-effectiveness of adding tomosynthesis to mammography-based breast cancer screening: an economic analysis. CMAJOpen 2021;9(2):E443-E450

Bentley, H; Woods, R; Mar, C; et al. Hindsight is 2020: Understanding the Impact of the COVID-19 Pandemic on a Provincial Population-Based Breast Screening Program. [Research Letter] Canadian Association of Radiologists' Journal 2021; DOI: 10.1177/08465371211036902

Janette Sam

Cressman, S; Mar, C; Sam, J; Kan, L; Lohrisch, C; Spinelli, J; The cost-effectiveness of adding tomosynthesis to mammography-based breast cancer screening: an economic analysis. CMAJOpen 2021;9(2):E443-E450

Presentations, Interviews and Lectures, Research Grants

Colin Mar

Breast Cancer Screening, Family Practice Oncology Network's GPO Training Program; Vancouver; March 8, 2021

Cancer Screening: When to stop. CME on the Run! Geriatrics. Vancouver, May 7, 2021

Sunvalley News – interview; May 20, 2021

Breast Cancer Screening, Family Practice Oncology Network's GPO Training Program; Vancouver; October 4, 2021

CKPG, Prince George – interview; October 4, 2021

CHNL, Kamloops – interview; October 4, 2021

Fairchild TV – interview; October 4, 2021

Vista Radio North Island – interview; October 4, 2021

The Eagle FM – interview; October 4, 2021

Sing Tao Daily– interview; October 4, 2021

Red FM, Harjinder Thind Show – interview; October 6, 2021

Rasika Rajapakshe

BC Approach to Quality in Mammography Screening; Canadian Organization of Medical Physicists Mammography Workshop (Virtual); April 16, 2021

Artificial Intelligence on Medical Imaging – Application to mammography; Annual Conference of the Association of Physicists and Biomedical Engineers of Quebec; (Virtual); October 28-29, 2021

Impact of Local and Federated Learning on the Accuracy of an AI Algorithm for Predicting Breast Cancer Using a Retrospective Cohort of Digital Mammograms; Kheiron Medical Technologies, Inc.; $235,242 November 2021

Nancy Aldoff

BC Approach to Quality in Mammography Screening; Canadian Organization of Medical Physicists Mammography Workshop (Virtual); April 16, 2021

Artificial Intelligence - How Will It Benefit Technologists; Provincial Webinar; October 13, 2021

The Importance of Breast Cancer Screening; Taking Care of Our Women Event; Tla'amin Nation; Powell River; October 21, 2021

APPENDIX 11 – BREAST SCREENING PROGRAM / BC CANCER CONTACT INFORMATION (ALPHABETICAL LISTING BY SURRNAME)

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