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

Cervical Cancer Screening Program

Cervical Cancer Screening Program 2012 Annual Report

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1.0 Message

Message from the Medical Director

The BC Cancer Agency's Cervical Cancer Screening Program (CCSP) is pleased to share its 2012 Annual Report summarizing the program's activities and results.

This report highlights the efforts of our dedicated pathologists, technologists, and laboratory and program staff. We are particularly proud that cervical cancer incidence and mortality rates remain low in British Columbia (Figure 1).

In 2011, a total of 501,245 women received Pap tests and 2,791 cases of significant cervical abnormalities were detected and treated. The results also emphasize the importance of regular screening – 42 percent of the 174 patients diagnosed with invasive cervical cancer in 2010 were screened more than 5 years ago, or did not have a screening history.

It was a busy year for the Human Papillomavirus testing for cervical cancer screening trial (HPV FOCAL Trial) with more than 25,000 Metro Vancouver and Victoria women consenting to participate in the study through 150 collaborating family physician clinics. The study is evaluating primary HPV testing vs. Cytology testing as a cervical cancer screening method. When complete, the final results of HPV FOCAL trial will have significant relevance, not only in British Columbia, but globally as a model for future cervical cancer screening guidelines in organized screening programs.

During the year, the Pan-Canadian Cervical Cancer Screening Initiative published Cervical Cancer Screening in Canada, Monitoring Program Performance 2006-2008. The report found that British Columbia's performance in 2006-2008 was strong in comparison with the other provinces, particularly in the areas of cytology turnaround time, colposcopy follow-up rate, biopsy rate, and cytology-histology agreement.

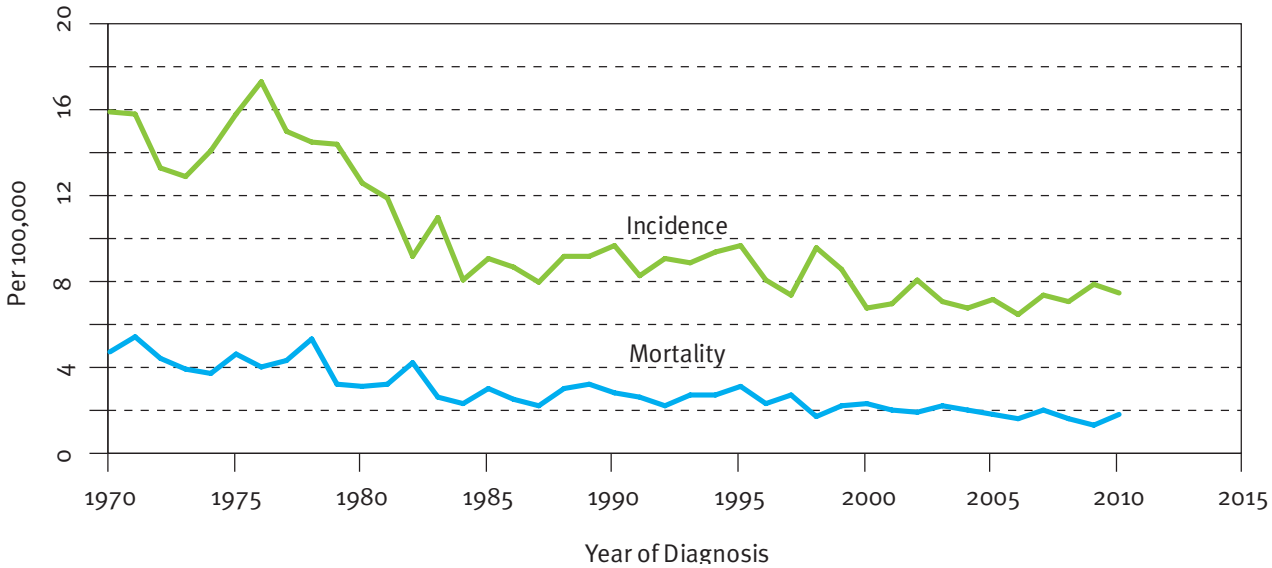
Continual evaluation of cervical cancer screening processes remains a priority of our program. This supports our efforts to maintain quality standards, and identify trends and areas for improvement.

CCSP plays an integral role in this province's cancer control strategy and results found in this annual report demonstrate the continued value of an organized population-based screening program.

We look forward to continuing to work with our all partners and stakeholders together to provide screening to eligible women and facilitate the prevention and early detection of cervical cancer in BC.

– Dr. Dirk van Niekerk
Medical Leader, Cervical Cancer Screening Program

Figure 1: Age Standardized Incidence & Mortality Rate of Invasive Cervical Cancer in BC



Notes:

1. Rates are standardized to the 1991 Canadian Population

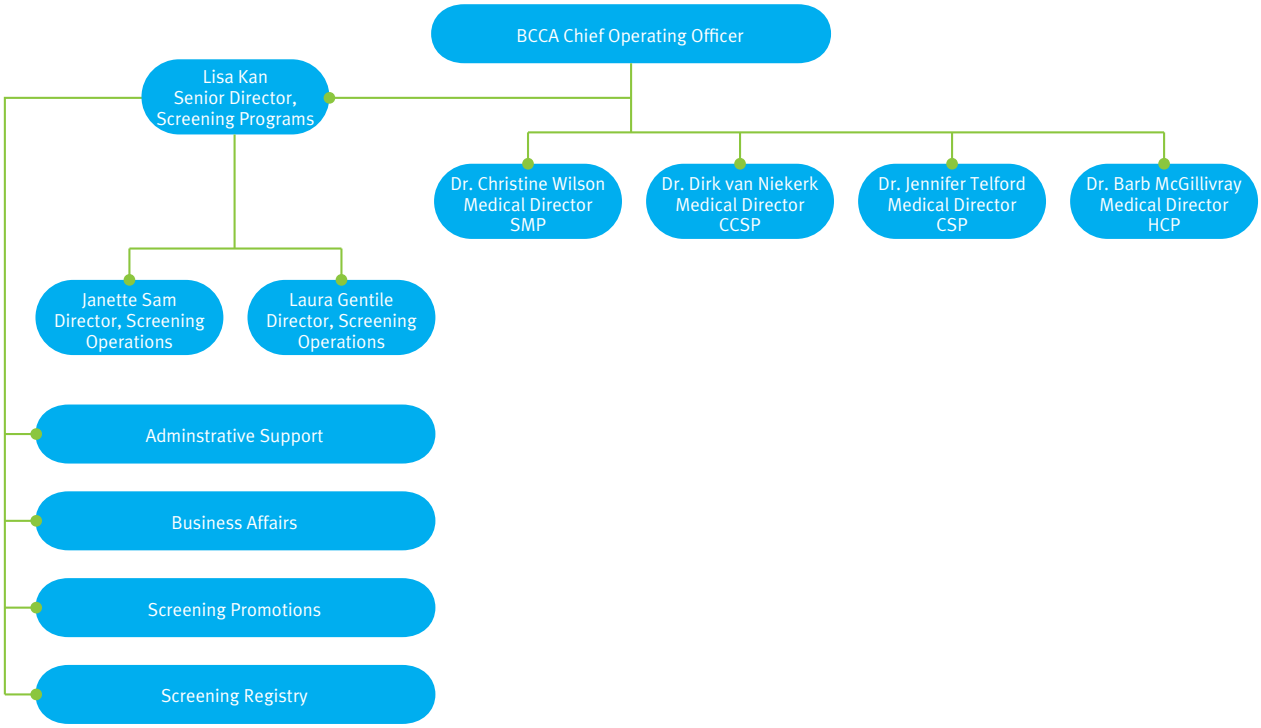
Message from Senior Director of Cancer Screening Programs

The organizational structure of Cancer Screening has been confirmed in the past year. In addition to the Cervical Cancer Screening Program (CCSP), the Cancer Screening portfolio includes the Screening Mammography Program (SMP), the Colon Screening Program, and the Hereditary Cancer Program (HCP). The organizational structure (Figure 2) provides operational efficiencies and optimizes knowledge-sharing across these programs where they have common requirements. Discipline specific operational requirements are managed within each program.

I am pleased to introduce Laura Gentile as the Operations Director responsible for the CCSP. Laura plans, directs and leads the operations and administration of the CCSP. Together, Laura and Dr. van Niekerk will continue to ensure that standards of care and quality are maintained and that the program is integrated across all of British Columbia's health authorities.

Lisa Kan
Senior Director, Cancer Screening Programs

Figure 2: Organizational Structure



Message from Director, Screening Operations

I look forward to my new role as Operations Director for the Cervical Cancer Screening Program (CCSP). The program plays a critical role in BC's cancer control strategy, working to decrease cervical cancer incidence and mortality rates in the province.

CCSP remains committed to implementing innovative ways to promote regular screening, including outreach activities such as the LACE (Live Aware, Create Empowerment) Campaign. The campaign promotes conversation, awareness, education and action around Pap tests for BC. Its activities around Pap Awareness Week (October 2012) remain among the most extensive in the country.

CCSP continues to benefit from the efforts of our many dedicated cytotechnologists, pathologists, and laboratory and program staff. The support of our community partners and stakeholders has been critical in helping to bring this life-saving service to BC women and for providing follow-up care.

We hope you find this report informative and helpful, and we thank you for your continued support of the BC's Cervical Cancer Screening Program.

Laura Gentile
Operations Director, Cancer Screening

2.0 Program Overview

The BC Cancer Agency's Cervical Cancer Screening Program (CCSP) has the oversight responsibility for cervical cancer screening in BC. The program works in partnership with the Cervical Cancer Screening Laboratory (CCS Lab) of the Provincial Health Services Authority (PHSA) to ensure that appropriate screening tests are available to eligible women. The program reminds healthcare providers when their patients are due for cervical screening, tracks adherence to screening recommendations, and monitors system performance and outcomes of cervical screening activities.

The Screening Process

The Screening Process is illustrated in Figure 3 (Page 10). The process consists of four stages:

1. Identify and invite the target population for screening
2. Conduct screening examinations
3. Investigate abnormalities identified during screening
4. Send screening reminders at the appropriate interval

Evaluation

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

Promotion and Education

In 2012, CCSP maintained a proactive approach to promoting the importance of Pap tests among eligible women in British Columbia.

CCSP's LACE Campaign (Live Aware, Create Empowerment) continued to be an important tool to promote conversation, awareness, education and action around Pap tests for women in the province.

With Pap Awareness Week 2012 (October 22-28) acting as a focal point of activities, LACE encouraged women, particularly those who may not have a regular doctor or are overdue for cervical cancer screening, to take advantage of dedicated Pap test hours offered by participating medical offices/clinics in their communities. A comprehensive campaign was deployed to encourage participation, including grassroots community events, social media (Facebook and Twitter), traditional media and advertising. Interest in the LACE Campaign remains strong with an increase in the number of participating clinics in BC – 175 in 2012 compared with 143 in 2011.

CCSP also worked to build internal capability in delivering a province-wide campaign such as LACE, by moving LACE Campaign coordination internally and importing web assets for the campaign onto internal servers.

The Program also completed and delivered two brochures for primary care providers – Pap Tests Saves Lives and Abnormal Pap Test. These brochures were developed to provide clear messages about the importance of Pap tests and to bring CCSP materials up to BC Cancer Agency's graphic standards. Both brochures were focus tested to ensure that key messages resonated with the intended audience.

An order form for these brochures and a wide variety of other promotion and education materials is available on CCSP's website: www.screeningbc.ca.

Commitment to Quality

Accreditation: As part of the program's ongoing commitment to quality improvement, the CCS Lab is accredited by the College of American Pathologists (CAP). CAP is internationally recognized as a leader in laboratory quality assurance, and its accreditation program ensures that accredited labs achieve the highest standards of excellence for patient care.

The CCS Lab continues to monitor and evaluate quality standards and implement quality improvement initiatives. Clinician feedback is encouraged and valued as part of the laboratory quality improvement process.

In 2012, the laboratory conducted an online Pap Test Clinician Survey. This survey was intended to provide an opportunity for clinicians to share their feedback on Pap testing in BC, and was conducted over four months – January 15 to May 15, 2012. 48 clinicians participated in this survey and provided valuable feedback. The survey found that:

- a 20-working day turnaround time for Pap tests is within acceptable limits
- the Pap test reports are clear and concise, containing all the relevant information required
- clinician concerns are addressed in a timely fashion once communicated
- the lab provides adequate communication on impending changes; and
- clinicians prefer communicating in printed hard copy format

Professional Development: Continuing education is encouraged and expected for all CCS Lab staff. In addition to participating in CAP and American Society for Clinical Pathology (ASCP) educational programs, CCS Lab staff participate in organized internal education forums and cyto-morphological group discussions. Appropriate on-site resources such as cytology text books and the *Acta Cytologica* journal are available as educational references.

Pathologists associated with the program participate in the Royal College of Physicians and Surgeons certification or equivalent programs.

Professional and Academic Activities: Professional staff members of the Cervical Cancer Screening Program (CCSP) are involved in research, professional development, and teaching related to cervical cancer screening.

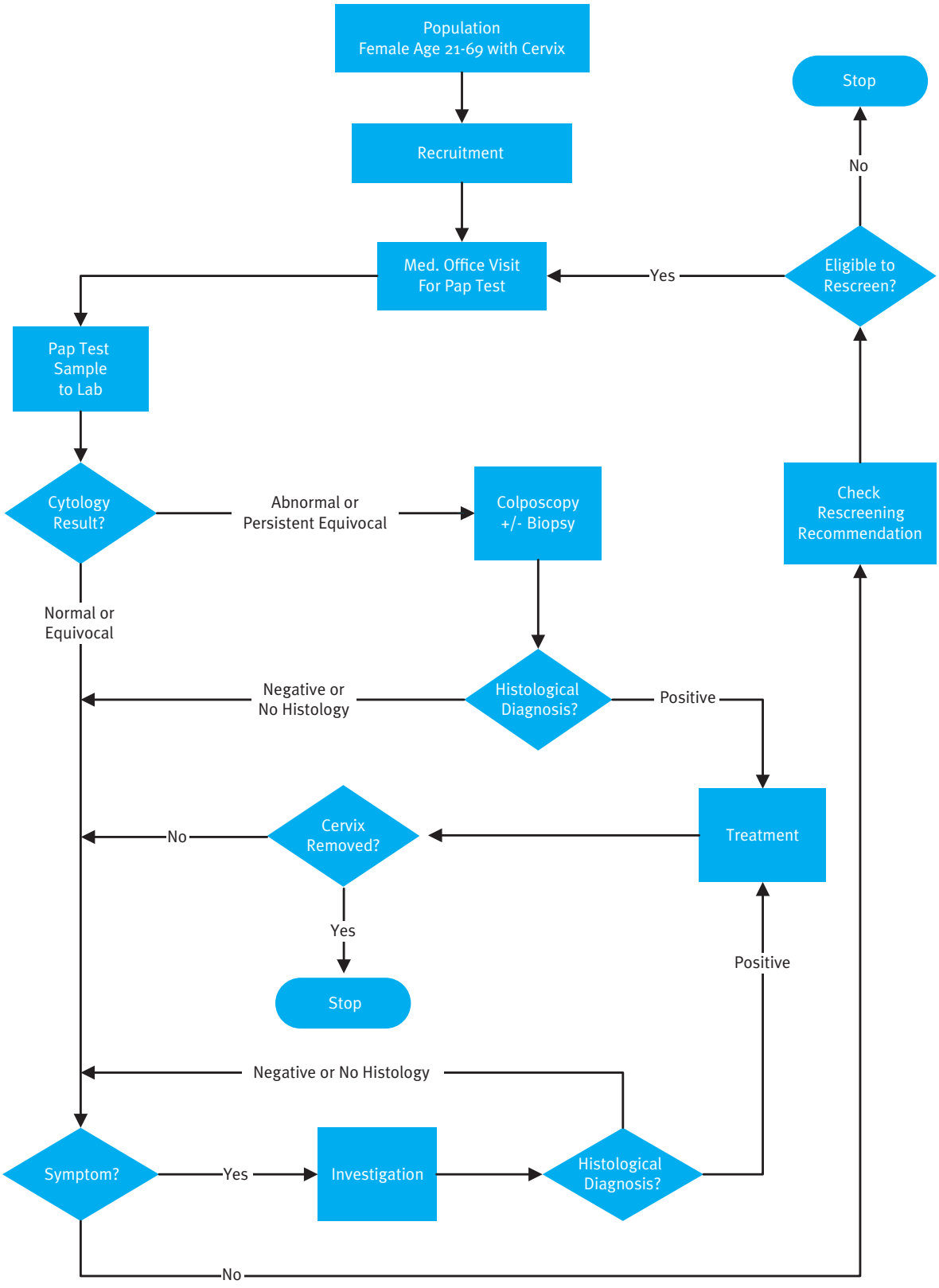
The HPV FOCAL Study, funded by the Canadian Institutes of Health Research, is the first randomized controlled trial to be conducted in a North American organized screening program. This study is evaluating primary HPV Testing (with cytology triage for HPV positive women) vs. Cytology testing alone, for cervical cancer screening. More than 25,000 Metro Vancouver and Victoria women consented to participate in the study through over 150 collaborating family physician clinics. Over 6,000 women have already completed the trial, and those who remain active in the study will be followed through 2016.

Preliminary results of the trial were published in the British Journal of Cancer in November 2012 (Ogilvie et al, BJC. 2012, 107: 1917-1924). The final results of the HPV FOCAL Trial will have significant relevance, not only in British Columbia, but globally as a model for future cervical cancer screening guidelines in organized programs.

Dr. Dirk van Niekirk, Medical Director for CCSP, participated on the Canadian Partnership Against Cancer's expert panel for HPV Testing for Cervical Cancer Screening. The panel subsequently published a summary document exploring the potential impacts of HPV testing as a primary screening tool. The summary also highlights the key trials that have published results or are currently underway in Canada.

CCSP also participated in the Cervical Cancer Screening in Canada: Monitoring Program Performance report that provided a pan-Canadian overview of cervical cancer screening performance. The report monitors key metrics including but not limited to: participation rate, retention rate, screening test results, cytology turnaround time, pre-cancer detection rate and cancer incidence.

Figure 3: CCSP Screening Process Overview



3.0 Program Results

3.1 Utilization

BC healthcare providers submitted a total of 541,125 gynecological Pap test samples to the CCS Lab in 2011. An additional 4,685 samples were submitted from the Yukon Territory. The program results in this report include samples from BC only.

Table 1 shows the number of gynecological Pap test samples received by 10-year age groups. The samples received include those from clinically asymptomatic women (routine screening), women with previously detected abnormalities, and a small percentage of symptomatic women. Unlabeled or improperly labeled samples were not processed. 97.9% were cervical/endocervical samples.

Table 1: Gynecological Cytology Samples Received / Processed, 2011

	<20	20-29	30-39	40-49	50-59	60-69	70+	All Ages
Number of Samples	19,121	115,612	118,229	118,407	104,504	60,461	4,763	541,125
Number of Samples Processed	18,949	114,639	117,307	117,601	103,797	60,066	4,698	537,081
(%)	99.1	99.2	99.2	99.3	99.3	99.3	98.6	99.3
Samples from Cervix Endocervix	18,941	114,543	116,748	115,495	100,020	56,381	3,696	525,848
(%)	100	99.9	99.5	98.2	96.4	93.9	78.7	97.9
Samples from Other Sites	8	96	559	2,106	3,777	3,685	1,002	11,233
(%)	0	0.1	0.5	1.8	3.6	6.1	21.3	2.1

NOTES:

1. CCSP data extraction date: October 25, 2012
2. Age is computed based on sample date

Table 2 shows the number and percentage of women having one, two, and three or more cervical/endocervical Pap tests in the 2012 year. Also shown in Table 2 are the number of women being screened for the first time, and the percentage first time screeners represent of all women with at least one cervical/endocervical sample.

Table 2: Number of Patients with Cervical/Endocervical Pap Test

	<20	20-29	30-39	40-49	50-59	60-69	70+	All Ages
Number of Patients	17,629	106,802	110,011	111,145	97,017	55,031	3,608	501,245
With 1 Sample	16,656	99,454	103,190	106,840	94,017	53,628	3,516	477,302
(%)	94.5	93.1	93.8	96.1	96.9	97.5	97.5	95.2
With 2 Samples	933	7,145	6,675	4,206	2,919	1,362	84	23,324
(%)	5.3	6.7	6.1	3.8	3	2.5	2.3	4.7
With 3+ Samples	40	203	146	99	81	41	8	619
(%)	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1
New Patients	7,846	17,508	7,885	4,320	2,111	1,140	167	40,977
(%)	44.5	16.4	7.2	3.9	2.2	2.1	4.6	8.2

Notes:

1. CCSP data extraction date: October 25, 2012
2. Age is computed on patient's last Pap test

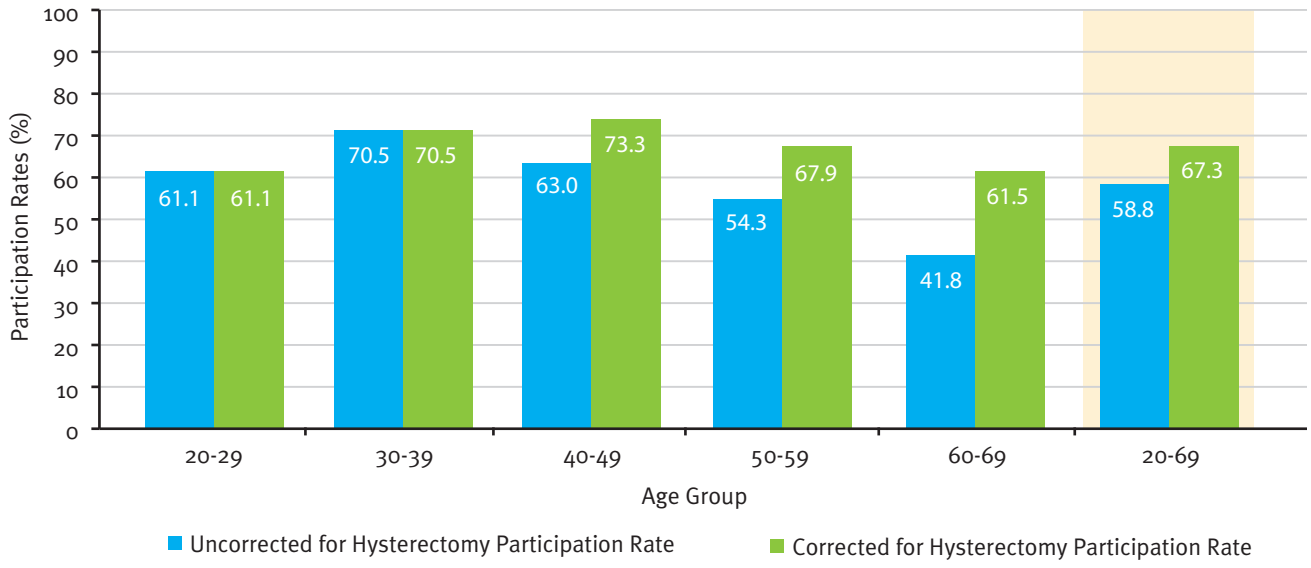
3.2 Participation Rates

The BC cervical cancer screening policy was updated in October 2011. The policy advises women to begin screening at age 21 or approximately three years after first sexual contact, whichever occurs first. This is a change from the previous recommendation to start Pap test screening shortly after becoming sexually active. As with the previous screening policy, women should continue to have a Pap test once a year until they have three consecutive normal results. At that point, women should be screened every two years until age 69. At age 69, women can discontinue screening if no significant abnormality has been detected in their screening history. BC's current screening guidelines are listed in Appendix 2.

Participation rate is defined as the percent of eligible women with at least one cervical/endocervical Pap test in a three-year period. The participation rate should exclude women who have had a total hysterectomy, as most of these women do not need routine screening. In 2012, BC started using data from Statistic Canada's Canadian Community Health Survey (CCHS), to correct for hysterectomy. However, due to the survey's small sample size, the hysterectomy correction can only be applied in two ways: by 10-year age group for the entire province or by Health Authority for age 20-69 combined.

Figure 4 shows the hysterectomy uncorrected and corrected participation rates by age group. The uncorrected and corrected participation rates for the BC female population ages 20-69 are 58.8% and 67.3% respectively. There is considerably more variation in the uncorrected rates across the age groups, from 70.5% among women ages 30-39 to 41.8% among women ages 60-69. With correction, participation is highest at 73.3% among women 40-49 years of age, and participation is lowest among women ages 20-29 at 61.5%. This illustrates the importance of correcting for hysterectomy to avoid misdirecting promotional efforts.

Figure 4: Participation Rates by Age Group, 2009–2011



Notes:

1. Based on weighted average of 2009, 2010 and 2011 female population estimates
2. Population data source: P.E.O.P.L.E 36 population estimates (July 2011), BC STATS, Service BC, BC Ministry of Citizens' Services
3. Hysterectomy adjustment calculated using 2008 Canadian Community Health Survey
4. CCSP data extraction date: October 25, 2012
5. Age is computed based on patient's age in 2010

Table 3 lists the uncorrected participation rates by Health Service Delivery Area (HSDA) for the younger female population in which hysterectomy is less prevalent.

- Participation in the 20-29 age group is a challenge in the Lower Mainland — especially in Richmond, Vancouver and the Fraser Valley.
- Participation in the 30-39 age group is more uniform across the province, with only Fraser East, Northeast, Vancouver and Richmond falling below the 70% target.
- Although participation is generally higher in the 30-39 age group than in the 20-29 age group, the opposite occurred in Okanagan, Nothern Vancouver Island and Northeast.

Table 3: Participation Rates of Women 20-29 and 30-39 Years of Age by HSDA, 2009–2011

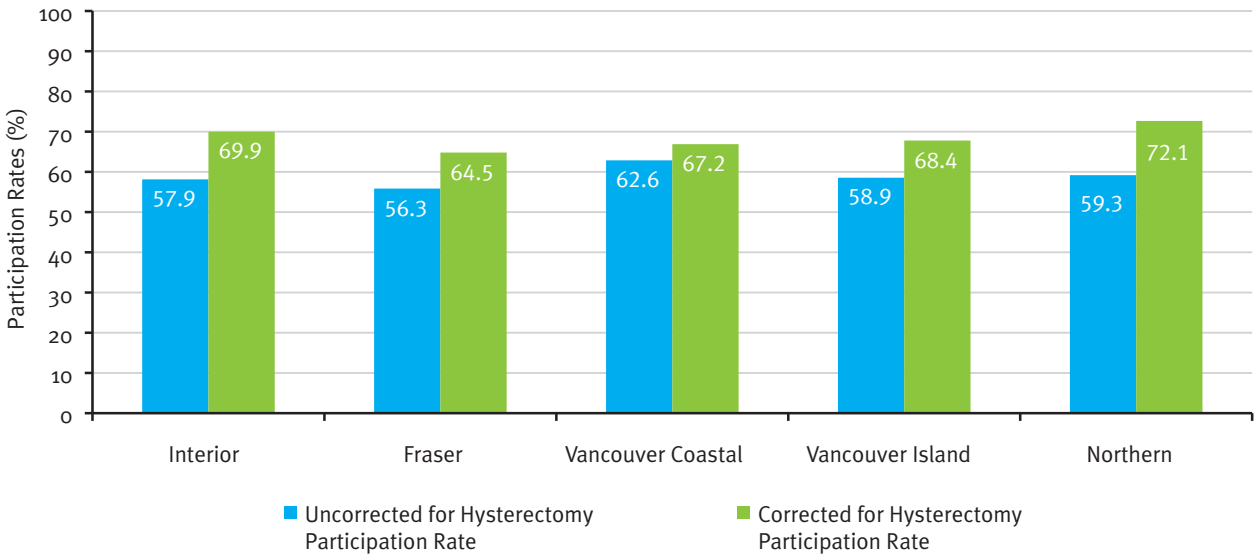
Health Authority	Health Service Delivery Area	20-29	30-39
Interior	East Kootenay	72%	75%
	Kootenay Boundary	70%	77%
	Okanagan	74%	74%
	Thompson Cariboo	68%	70%
Fraser	Fraser East	58%	60%
	Fraser North	52%	70%
	Fraser South	58%	70%
Vancouver Coastal	Richmond	46%	67%
	Vancouver	57%	69%
	North Shore/Coast Garibaldi	69%	84%
Vancouver Island	South Vancouver Island	64%	72%
	Central Vancouver Island	70%	71%
	North Vancouver Island	78%	71%
Northern	Northwest	74%	78%
	Northern Interior	72%	73%
	Northeast	79%	67%
BC	British Columbia	61%	71%

Notes:

1. Based on weighted average of 2009, 2010 and 2011 female population estimates
2. Population data source: P.E.O.P.L.E 36 population estimates (July 2011), BC STATS, Service BC, BC Ministry of Citizens' Services
3. HSDA data acquired from Research Data Access Services, BC Ministry of Health
4. CCSP data extraction date: October 25, 2012
5. Age is computed based on patient's age in 2010

Figure 5 compares the corrected participation rate against the uncorrected rate by Health Authority. Northern Health Authority has the highest overall participation (72.1% corrected for hysterectomy), while Fraser Health Authority has the lowest (64.5% corrected for hysterectomy). Using the uncorrected rates would provide an entirely different impression.

Figure 5: Participation Rates by Health Authority, 2009–2011



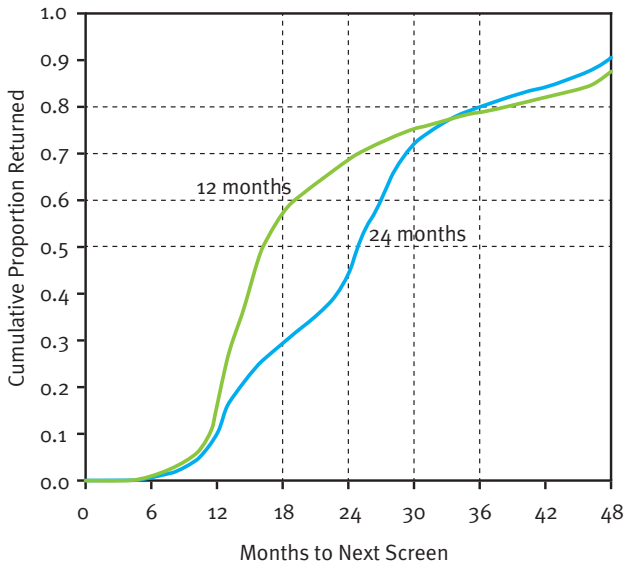
Notes:

1. Based on weighted average of 2009, 2010 and 2011 female population estimates
2. Population data source: P.E.O.P.L.E 36 population estimates (July 2011), BC STATS, Service BC, BC Ministry of Citizens' Services
3. Hysterectomy adjustment calculated using 2008 Canadian Community Health Survey
4. HA data acquired from Research Data Access Services, BC Ministry of Health
5. CCSP data extraction date: October 25, 2012
6. Age is computed based on patient's age in 2010

3.3 Screening Interval

Retention is the percentage of eligible women re-screened after a negative Pap test. Figure 6 shows the retention rate by the actual recommended screening interval. For patients with a 12-month interval recommendation, 56% returned by 18 months, and 73% of those with a 24-month recommendation returned by 30 months. The percentage of women who did not return by 48 months is 11% and 9% respectively for the 12-month and 24-month groups.

Figure 6: Retention Rates by Screening Interval Recommendation, 2008



Notes:

1. CCSP data extraction date: October 25, 2012

Table 4 summarizes the retention rates for women last screened in 2008 by 10-year age groups. It shows that more women in their 20's are returning by 18 months, which is consistent with the recommendation to have three negative annual screens before extending to biennial screening. About 79% of women with a negative Pap test return within 36 months.

Table 4: Retention Rates by Age Group, 2008

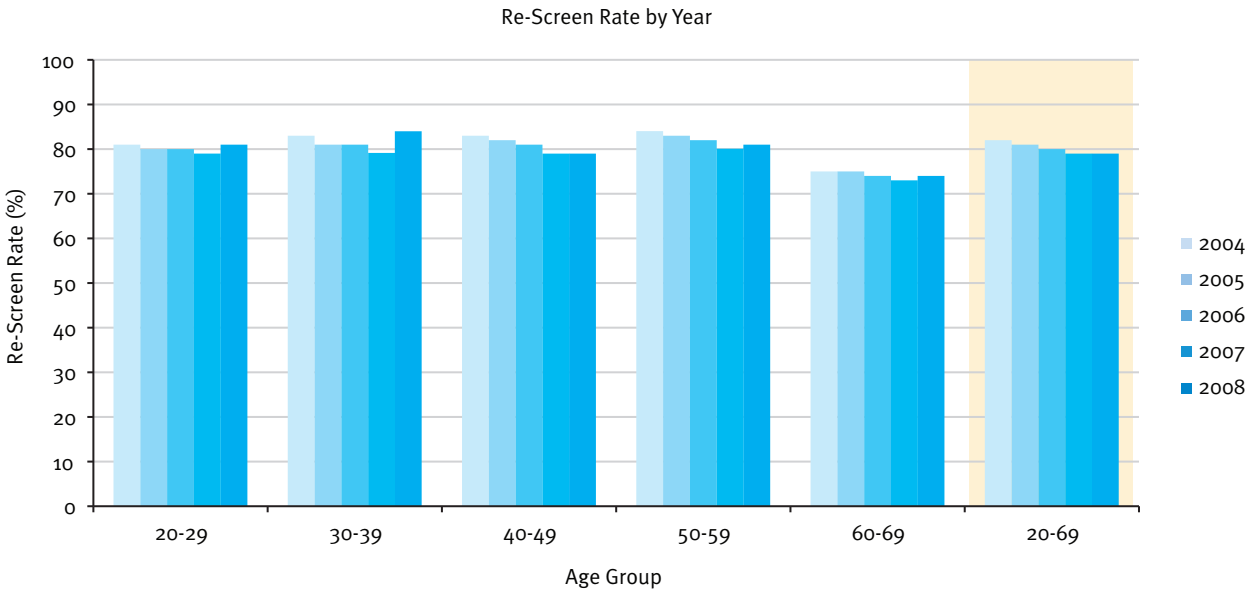
Timelist	20-29	30-39	40-49	50-59	60-69	20-69
Number of Patients	102,898	114,832	118,717	92,784	46,259	475,490
Re-screened by						
18 months	47.2%	41.2%	37.5%	36.3%	31.7%	39.7%
24 months	61.7%	55.3%	51.5%	50.7%	44.4%	53.8%
30 months	75.1%	73.0%	72.8%	74.9%	69.1%	73.4%
36 months	80.6%	79.2%	79.1%	80.9%	74.2%	79.3%

Notes:

1. CCSP data extraction date: October 25, 2012
2. Age is computed based on patient's age on report date of the index Pap test

Figure 7 shows the 36-month retention rate of women ages 20-69 by 10-year age groups for calendar years 2004-2008. The retention rate has been declining in every age group, and the decline is 5% in ages 30-39, 40-49 and 50-59. The retention for 2008 is more stable than previous years but further intervention is needed to reverse the decline.

Figure 7: 36-Month Retention Rate by Age Group over Time, 2004–2008



Notes:

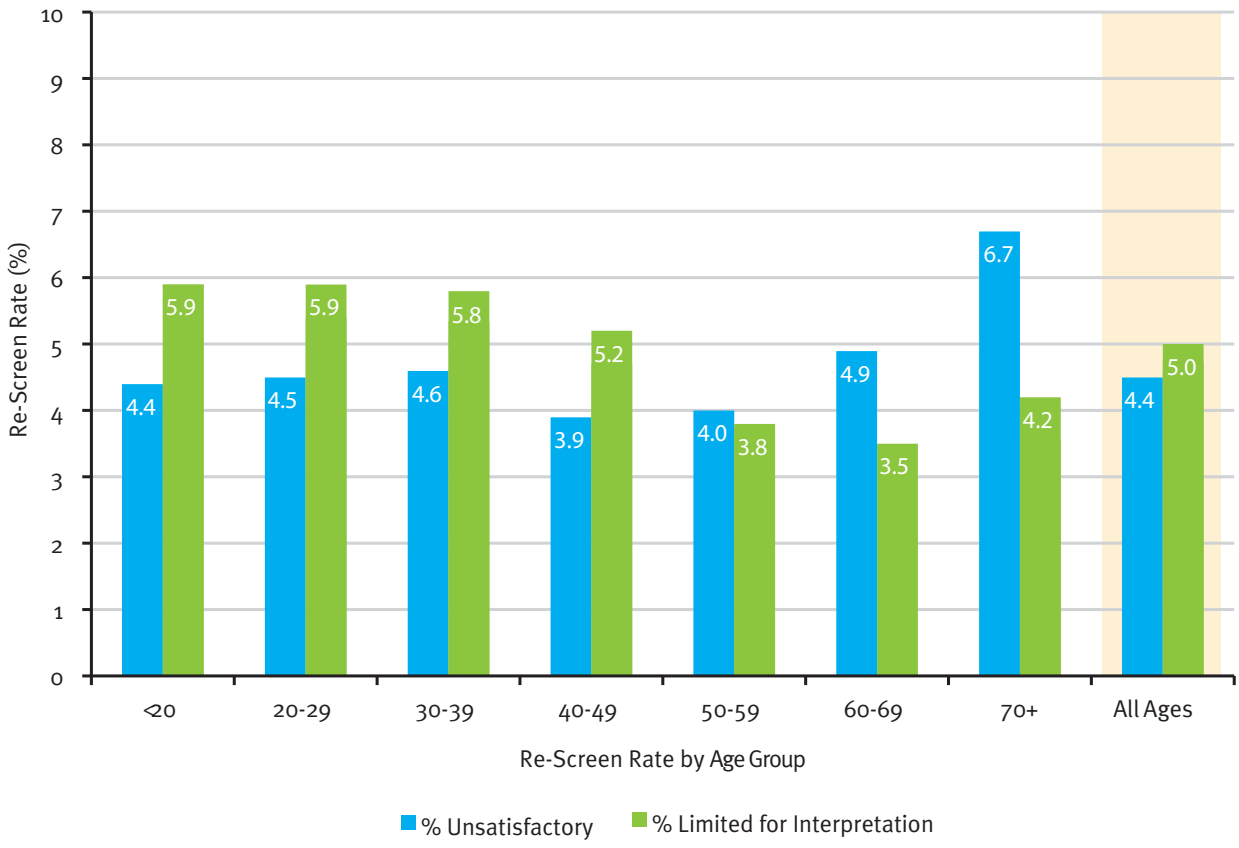
1. CCSP data extraction date: October 25, 2012
2. Age is computed on patient's age on report date of the index Pap test

3.4 Quality of Pap Test Samples

Figure 8 summarizes Pap test sample quality by 10-year age groups for cervical/endocervical samples. The percentage of samples reported as unsatisfactory for interpretation remained stable over last year at 4.4%.

The most commonly cited reason for an unsatisfactory sample is scanty sample material (93.9% of unsatisfactory samples and 83.0% of samples that are limited for interpretation). Scanty sample material is especially common in the older age groups. The next most cited reason is inflammatory exudates (5.3% in unsatisfactory samples and 12.5% in limited for interpretation samples). Multiple factors may be cited.

Figure 8: Cervical Sample Quality Rates by Age Group, 2011



Notes:

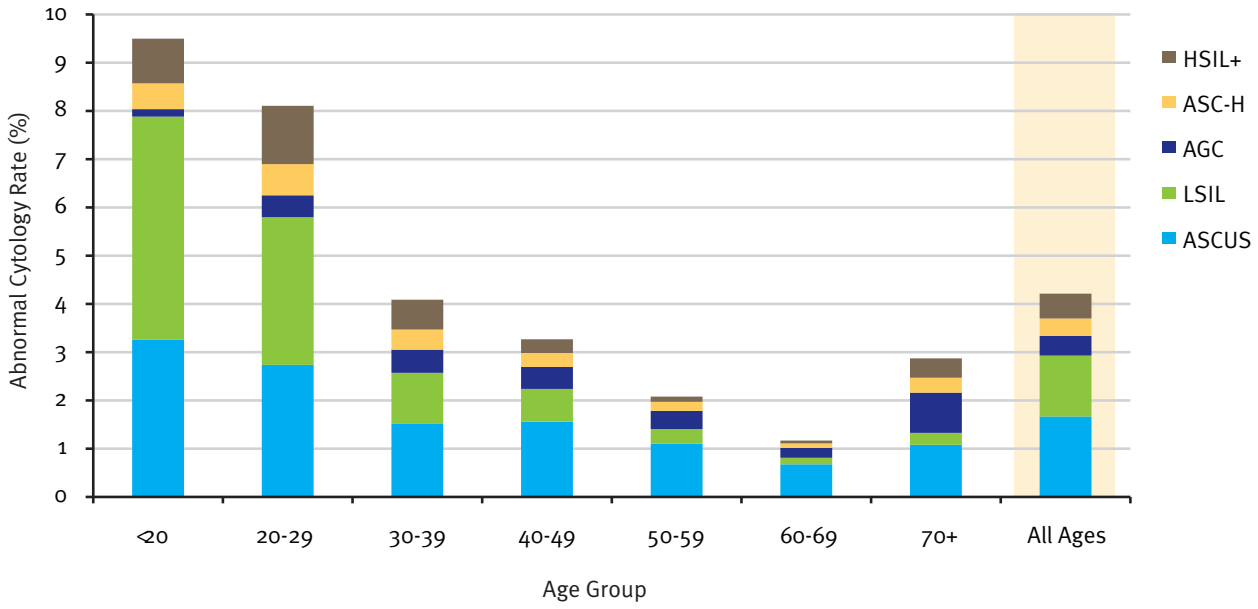
1. CCSP data extraction date: October 25, 2012
2. Age is computed based on sample date

3.5 Screening Test Results

Cytology turnaround time is the average number of days from the date the sample is received in the CCS Lab to the date the finalized report is issued. The average turnaround time was 23 days in 2011. This is increased from an average of 13 days in 2010. This is predominantly related to reporting changes that increased workload for pathologists. The turnaround time standard for Pap tests is 20 working days. The CCS Lab is working towards meeting this standard.

The CCS Lab uses the international standardized Bethesda nomenclature to report Pap test results. The most severe abnormal screening test results for patients are summarized in Figure 9 and Table 5. Overall, 2.9% of Pap tests were reported as ASCUS/LSIL, 0.41% AGC, 0.36% ASC-H, and 0.51% HSIL+.

Figure 9: Abnormal Screening Test Result Distribution by Age Group, 2011



Notes:

1. CCSP data extraction date: October 25, 2012
2. Age is computed based on sample date

3.6 Follow-up of Abnormal Pap Test Results

Follow-up Recommendation

The current screening guideline is to follow ASCUS/LSIL results with a repeat Pap test at six-month intervals for up to two years. Patients with persistent ASCUS/LSIL are then advised to have a colposcopy. Other procedures may be recommended on the basis of a patient's clinical condition and cytology history.

Table 5 summarizes follow-up recommendations for patients by their screening test results.

Table 5: Follow-up Recommendations by Age Group, 2011

	<20	20-29	30-39	40-49	50-59	60-69	70+	all ages
Patients with ASCUS/LSIL	1,349	6,028	2,819	2,474	1,349	444	45	14,508
Repeat in 6 Months	1,281	5,476	2,560	2,269	1,233	417	40	13,276
(%)	95.0	90.8	90.8	91.7	91.4	93.9	88.9	91.5
Other Investigation	68	552	259	205	116	27	5	1,232
(%)	5.0	9.2	9.2	8.3	8.6	6.1	11.1	8.5
Patients with High Grade or AGC	288	2,518	1,716	1,225	710	233	60	6,751
Colposcopy and/or ECC	276	2,483	1,665	1,059	512	145	28	6,169
(%)	95.8	98.6	97.0	86.4	72.1	62.2	46.7	91.4
Other Investigation	12	35	51	166	198	88	32	582
(%)	4.2	1.4	3.0	13.6	27.9	37.8	53.3	8.6

Notes:

1. CCSP data extraction date: October 25, 2012
2. Age is computed based on the date of the patient's worst Pap test in the year
3. The predominant recommendation was colposcopy investigation
4. ECC: Endocervical Curettage

Colposcopy Follow-up Rate

The colposcopy follow-up rate is the percentage of women recommended to have a colposcopy examination that had the follow-up procedure within 12 months of the Pap test. Colposcopies performed within one week of the Pap test are excluded, as the Pap test is unlikely to be the reason for the colposcopy referral. Figures 10 and 11 show the colposcopy follow-up rate by age and Pap test result. The 12-month follow-up rate was 82.0% for women with persistent ASCUS/LSIL Pap test results; and 86.4% for women with high grade or AGC Pap test results.

Figure 10: Colposcopy Follow-up Rates for Women with Persistent ASCUS/LSIL Pap Test Result by Age Group, 2011

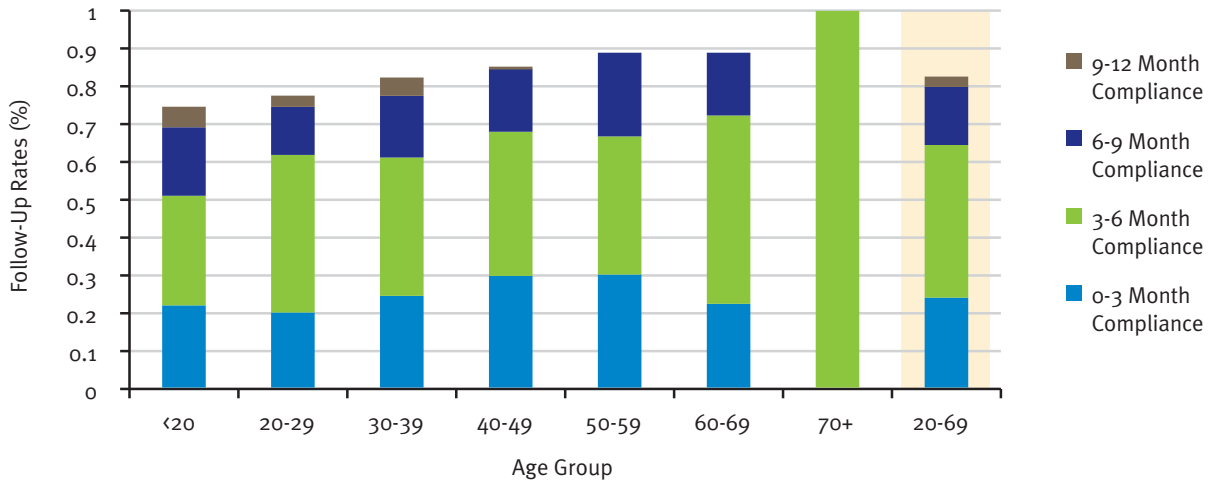
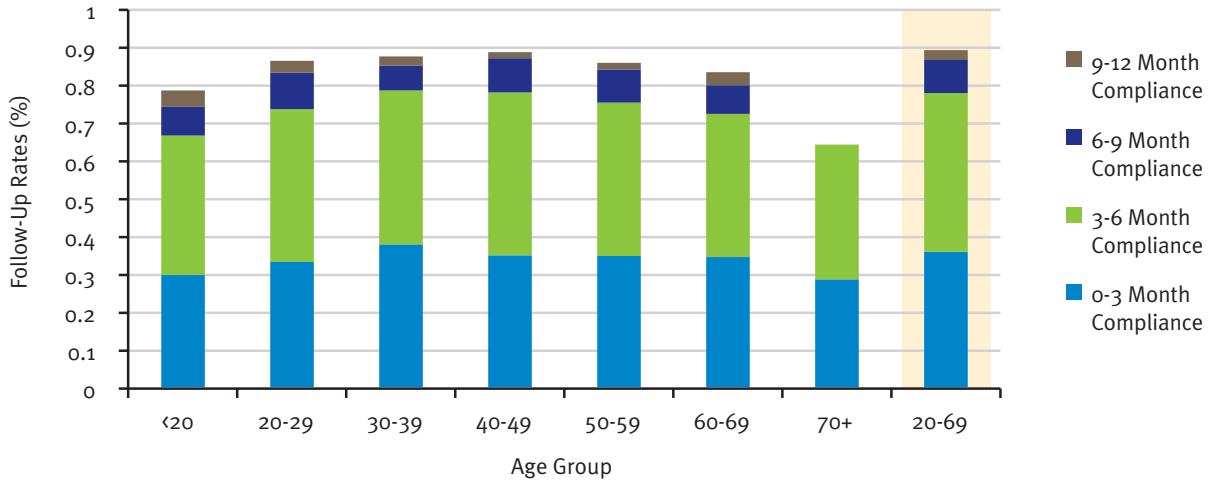


Figure 11: Colposcopy Follow-up Rates for Women with High Grade or AGC Pap Test Result by Age Group, 2011



Notes for figure 10 and 11:

1. CCSP data extraction date: October 25, 2012
2. Age is computed based on patient's age on report date of the index Pap test

Cytology-Histology Agreement

The cytology-histology agreement or positive predictive value (PPV) of cytology is the percentage of positive Pap tests that have had histological confirmation of significant cervical dysplasia. This measure is an indicator of the predictive validity of a positive test. However, it is important to note the limitations of cytology and histology. Specimen sampling may not be representative of the lesion, and interpretation is subject to observer variability for cytology, and to lesser extent for histology. Furthermore, there may be progression or regression of the lesion in the period between cytology and histology, particularly with mildly abnormal lesions. Histological diagnosis was based on the most severe histological diagnosis from cervical pathology reported up to one year after the Pap test. Cervical intraepithelial neoplasia (CIN) result reporting terminology is used.

83.6% of women with high-grade or ACG Pap test results had a histological diagnosis in the following 12 months. For those women with persistent ASCUS/LSIL that were referred for further investigation, only 74.3% had a subsequent histological investigation. Table 6 shows the level of cytology-histology agreement or PPV for different cytology and histology results. The PPV for CIN II+ is 51.5% for high-grade or AGC, and is 23.0% for those ASCUS/LSIL referred for further investigation.

Table 6: Cytology-Histology Agreement, 2011

	ASCUS/LSIL	Rate %	High Grade or AGC	Rate %
Samples With Pathological Diagnosis:	1,007	74.3	5,840	83.6
CIN II or Higher	232	23.0	3008	51.5
CIN III or Higher	98	9.7	2022	34.6
Other Histology Findings				
Glandular Severe		0.0	5	0.1
Glandular in Situ	3	0.3	93	1.6
Glandular Invasive		0.0	47	0.8

Notes:

1. CCSP data extraction date: October 25, 2012

3.7 Provincial Colposcopy Program

The Provincial Colposcopy Program consists of 24 hospital-based clinics located throughout the province. It is estimated that 97% of all colposcopy procedures performed in BC are done through the Provincial Colposcopy Program. Colposcopists affiliated with the Provincial Colposcopy Program are certified and have agreed to use a uniform reporting system with standardized terminology. Results of all colposcopic examinations and suggested course of follow-up action are documented using a standardized form. Copies of this form are sent to both the referring physician and to CCSP for incorporation into the provincial database. The data are summarized for the annual continuing medical education workshop in colposcopy, held by the Provincial Colposcopy Program.

In 2011, 15,605 colposcopy examinations were provided. A cytological abnormality was the most common reason for the colposcopy referral (see Figure 12) and the primary site of investigation was the cervix (see Figure 13).

Figure 12:
Reason for Referral to Colposcopy Clinic, 2011

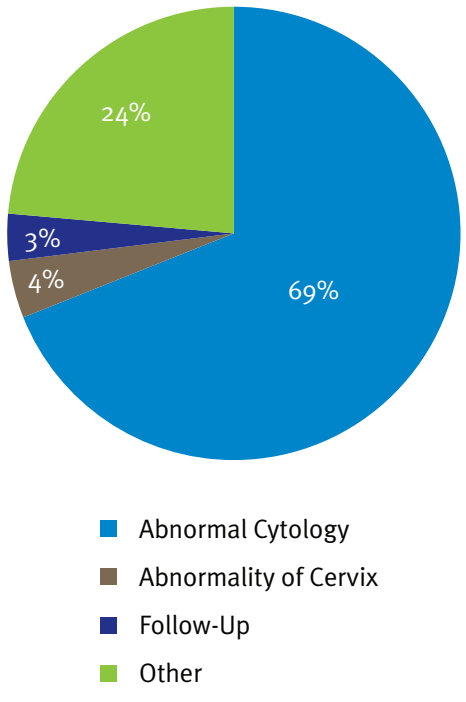
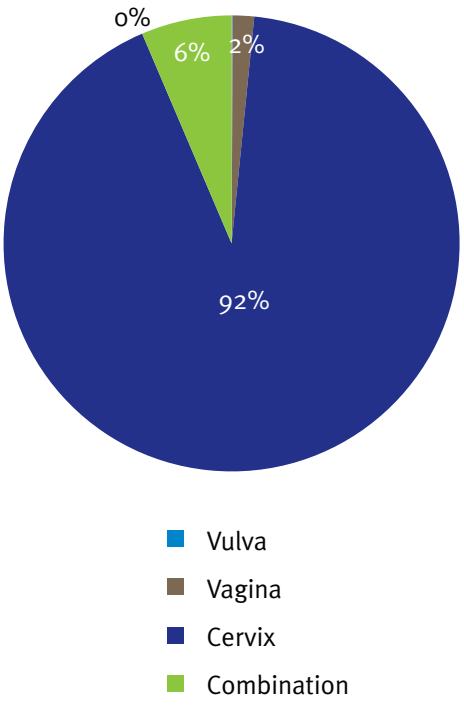


Figure 13:
Site of Colposcopic Investigation, 2011



Notes for figure 12 and 13:

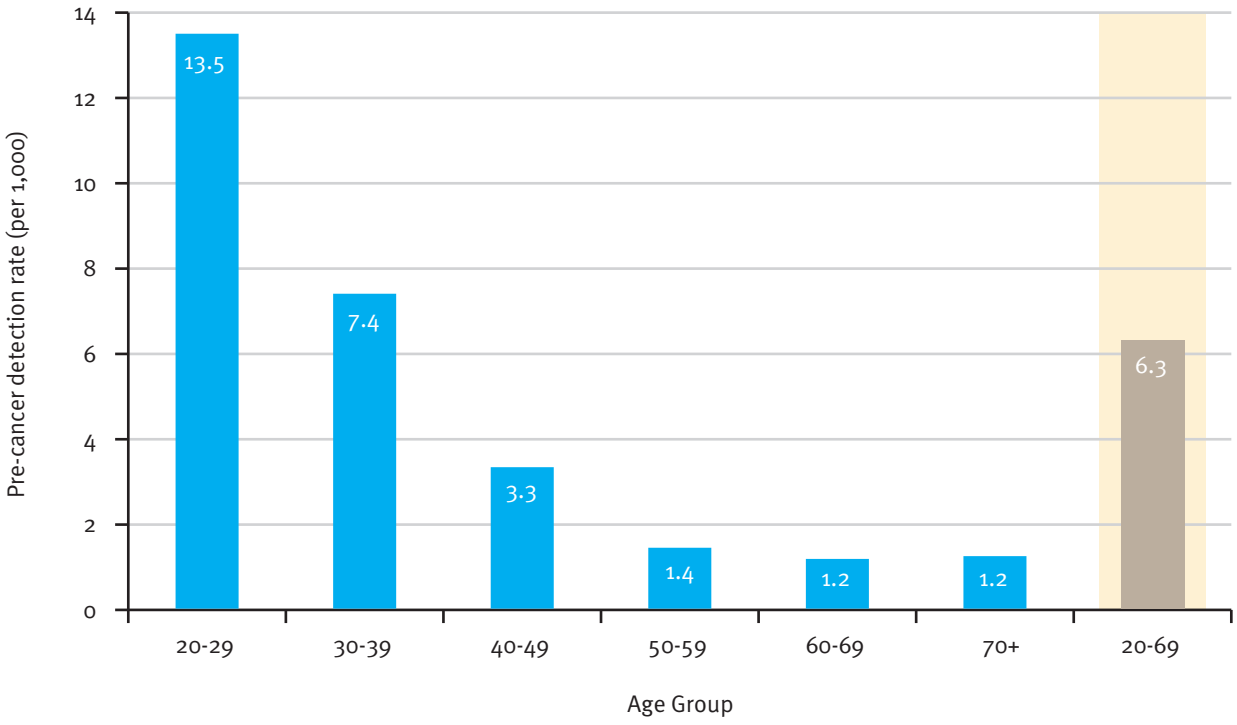
1. CCSP data extraction date: October 25, 2012

3.8 Pre-Cancer Detection Rate

Pap tests can identify pre-cancerous lesions where treatment is more likely to be effective in preventing the development of cervical cancer and, thus, reducing the morbidity of treating more advanced disease. Pre-cancerous lesions are histologically confirmed CIN II or III lesions. The pre-cancer detection rate is influenced by a number of factors, such as the screening test, the population's risk profile, and the screening coverage.

Figure 14 shows the pre-cancer detection rate for women ages 20-69 by 10-year age groups. The pre-cancer detection rate in 2011 for women ages 20-69 in BC is 6.3 per 1,000. This is an important indicator to monitor over time as the environment changes in screening participation, HPV vaccination, and screening policies.

Figure 14: Pre-Cancer Detection per 1,000 Women Screened by Age Group, 2011



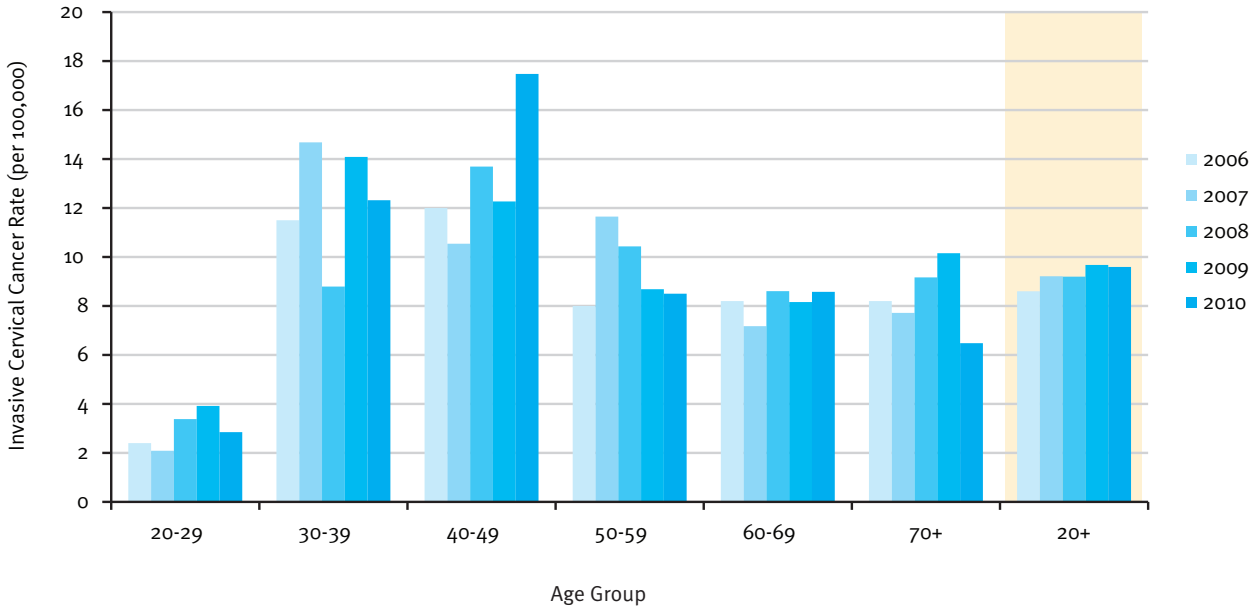
Notes:

1. CCSP data extraction date: October 25, 2012
2. Age is computed based on the date of the patient's worst Pap test in the year

3.9 Cancer Incidence

New invasive cervical cancers diagnosed in 2006 to 2010 were identified from the British Columbia Cancer Registry and the data collected by the CCSP. The age-specific cancer incidence rates for 2006-2010 are presented in Figure 15, and the cancer counts are shown in Table 7. Figure 15 shows that invasive cervical cancers are rare in women ages 20-29.

Figure 15: Invasive Cervical Cancer Incidence per 100,000 by Age Group, 2006 – 2010



Notes:

1. Population data source: P.E.O.P.L.E 36 population estimats 9July 2011), BC STATS, Service BC, BC Ministry of Citizens' Services
2. Cancer data source: BC Cancer Registry and Cervical Cancer Screening Program of BC Cancer Agency. Extracted October 25, 2012
3. Age is computed based on date of diagnosis

Table 7: Number of Invasive Cervical Cancers by Age Group, 2006 – 2010

	20-29	30-39	40-49	50-59	60-69	70+	20+
2010 Number of cases							
All cell types	9	37	61	29	21	17	174
Squamous cell only	5	24	44	22	14	12	121
Incidence rate (per 100,000)							
All cell types	2.9	12.3	17.5	8.5	8.6	6.5	9.6
Squamous cell only	1.6	8.0	12.6	6.5	5.7	4.6	6.7
2009 Number of cases							
All cell types	12	42	43	29	19	26	172
Squamous cell only	11	27	25	22	12	25	122
Incidence rate (per 100,000)							
All cell types	3.9	14.1	12.3	8.7	8.2	10.2	9.7
Squamous cell only	3.6	9.1	7.1	6.6	5.2	9.8	6.9
2008 Number of cases							
All cell types	10	26	48	34	19	23	160
Squamous cell only	6	16	38	25	13	16	114
Incidence rate (per 100,000)							
All cell types	3.4	8.8	13.7	10.4	8.6	9.2	9.2
Squamous cell only	2.0	5.4	10.8	7.7	5.9	6.4	6.6
2007 Number of cases							
All cell types	6	43	37	37	15	19	157
Squamous cell only	5	28	23	30	13	14	113
Incidence rate (per 100,000)							
All cell types	2.1	14.7	10.5	11.6	7.2	7.7	9.2
Squamous cell only	1.7	9.6	6.6	9.4	6.2	5.7	6.6
2006 Number of cases							
All cell types	7	35	43	25	16	20	146
Squamous cell only	4	23	26	20	13	17	103
Incidence rate (per 100,000)							
All cell types	2.4	11.5	12.0	8.0	8.2	8.2	8.6
Squamous cell only	1.4	7.5	7.3	6.4	6.7	7.0	6.0

Notes:

1. Population data source: P.E.O.P.L.E 36 population estimats 9July 2011), BC STATS, Service BC, BC Ministry of Citizens' Services
2. Cancer data source: BC Cancer Registry and Cervical Cancer Screening Program of BC Cancer Agency. Extracted October 25, 2012
3. Age is computed based on date of diagnosis

3.10 Screening History in Cases of Invasive Cancer

Screening history of women diagnosed with invasive cancer is summarized in Figure 16 and 17 for squamous cell carcinomas and adenocarcinoma respectively. As Pap tests performed within six months prior to the invasive cancer diagnosis are less likely to be done for screening purpose, these Pap samples are excluded.

Figure 16 shows that 56.5% of patients with squamous cell carcinoma are "inactive" screening participants (›5 years or no screening history with CCSP), 7.0% are "under screened" (›3 to 5 years), and 36.5% are "active" screening participants (0.5 to 3 years). Figure 17 shows that 17.8% of patients with adenocarcinoma are "inactive" screening participants, 6.7% are "under screened", and 75.6% are "active" screening participants.

In total, about 42.5% of the 174 patients diagnosed with invasive cervical cancer in 2010 were screened more than 5 years ago, or did not have a screening history.

Figure 16: Screening History of Women Diagnosed with Squamous Cell Carcinoma, 2010

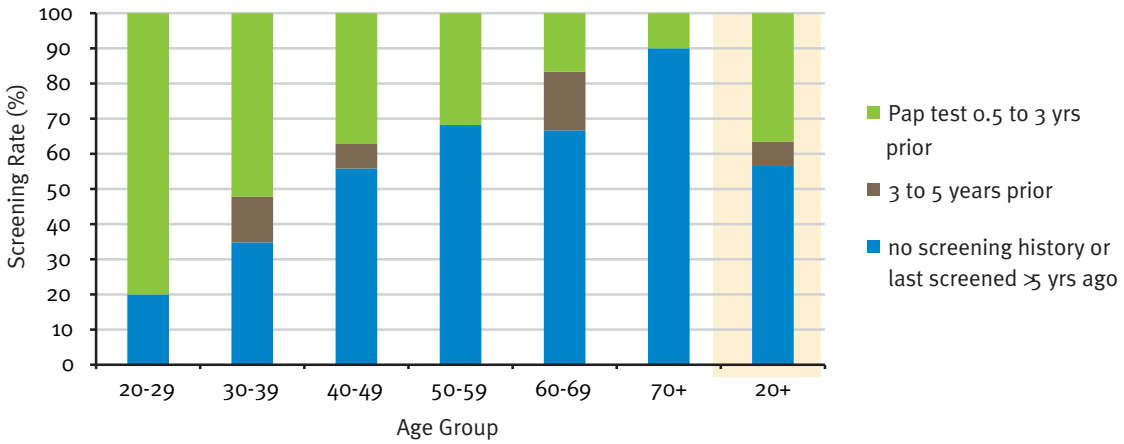
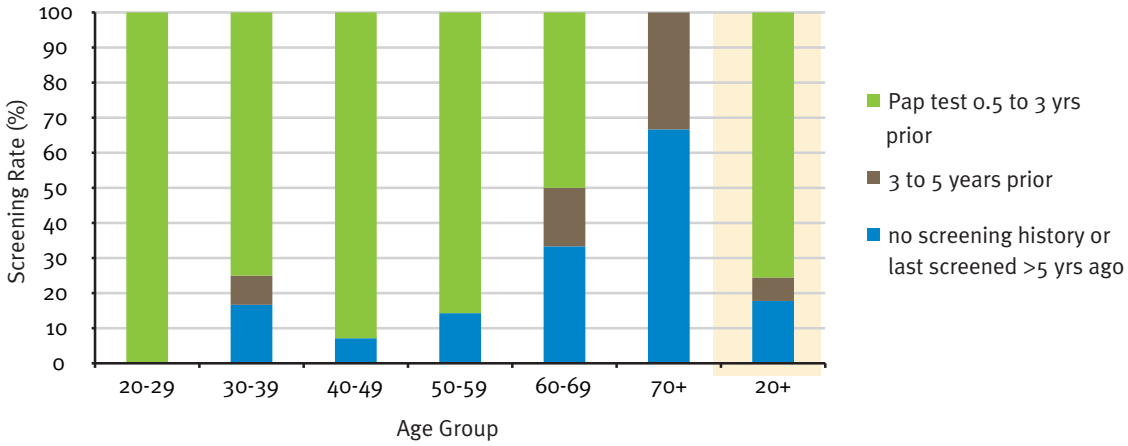


Figure 17: Screening History of Women Diagnosed with Adenocarcinoma, 2010



Notes for figure 16 and 17:

1. CCSP data extraction date: October 25, 2012
2. Age is computed based on date of diagnosis

Appendix 1 — General Cancer Screening Program Overview

Definition of Screening

Screening is a prevention strategy. Primary cancer prevention strategies involve changes of behavior 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 strategies target disease in process.[1] A secondary prevention can reduce cancer morbidity and mortality by diagnosing invasive disease at an earlier prognostic stage; and, detecting precursor lesions associated with some cancers that once eliminated, prevent progression to invasive disease. Screening is "*the application of various tests to apparently healthy individuals to sort out those who probably have risk factors or are in the early stages of specified conditions.*"[2]

Limitations of Screening

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

The overall objective of an organized 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 is also 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 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
6. Evaluation/Research Partnerships

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

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

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

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

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

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

Appendix 2 — Cervical Cancer Screening Guidelines

Cervical Cancer Screening

Clinical Practice Guidelines

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

Screening Initiation

Cervical cancer screening should begin at age 21 or approximately three years after first sexual contact, whichever occurs first. Sexual contact includes intercourse as well as digital or oral sexual contact involving the genital area with a partner of either gender.

The guideline of screening initiation at age 21 provides a way for healthcare providers to offer cervical screening and have a discussion about sexual history. Unfortunately, some women may be reluctant to share information about previous sexual contacts with their healthcare provider. This may be due to a number of reasons, such as embarrassment, fear of disclosing premarital sexual relationship(s), or a history of sexual abuse or assault. A woman's choice to be screened or not should always be respected.

Women who have never had any sexual contact do not need to be screened.

Screening Interval

Repeat Pap tests every 12 months until there are three consecutive negative results, then continue at 24-month intervals.

Discontinue Screening

Women older than 69 years should discontinue screening if they have had at least three negative Pap tests in the past 10 years, with no previous history of biopsy confirmed significant abnormalities (CIN*2 or CIN 3, AIS** or invasive cervical cancer).

Women older than 69 who have never been screened, should be screened with three annual Pap tests. If results are negative, discontinue screening.

HPV vaccination is recommended for females between nine and 26 years of age. For National Advisory Committee on Immunization (NACI) guidelines visit:
www.phac-aspc.gc.ca/publicat/ccdr-rmtc/07vol33/acs-02/index-eng.php

A woman with a visibly abnormal cervix or abnormal bleeding should be referred appropriately, regardless of the Pap test findings

Screening Women with Special Circumstances

- Women should follow regular guidelines for screening if they (1) received the HPV vaccine, (2) are lesbian or (3) are pregnant.
- Women with immunosuppression should be screened annually. This includes women with human immunodeficiency virus (HIV/AIDS), lymphoproliferative disorders, an organ transplant, and women under long-term immunosuppression therapy.
- Women currently being assessed by a colposcopy clinic or being followed by a cancer clinic should not undergo additional Pap testing unless being directed by the treating physician.
- Women who have ever had biopsy confirmed CIN 2, CIN 3, AIS or invasive cervical cancer should be screened annually thereafter.
- Women who have had a hysterectomy with the cervix removed
  - and have a history of invasive cervical cancer, should have a vault smear annually thereafter;
  - and have a history of CIN 2, CIN 3 or AIS, should have a vault smear until there are three consecutive negative results in a three-year period, then discontinue screening;
  - due to benign disease, may discontinue screening if adequate pathological documentation exists that the cervix has been removed completely and there is no history of biopsy confirmed CIN 2, CIN 3, AIS or invasive cervical cancer.
- Women who have undergone subtotal hysterectomy and retained their cervix should continue with screening according to the guidelines.

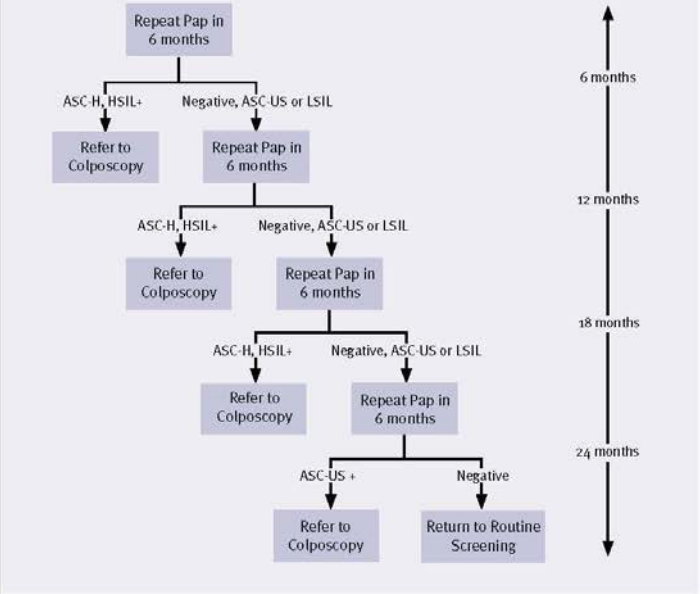
* CIN - cervical intraepithelial neoplasia
** AIS - adenocarcinoma in situ

February 2011

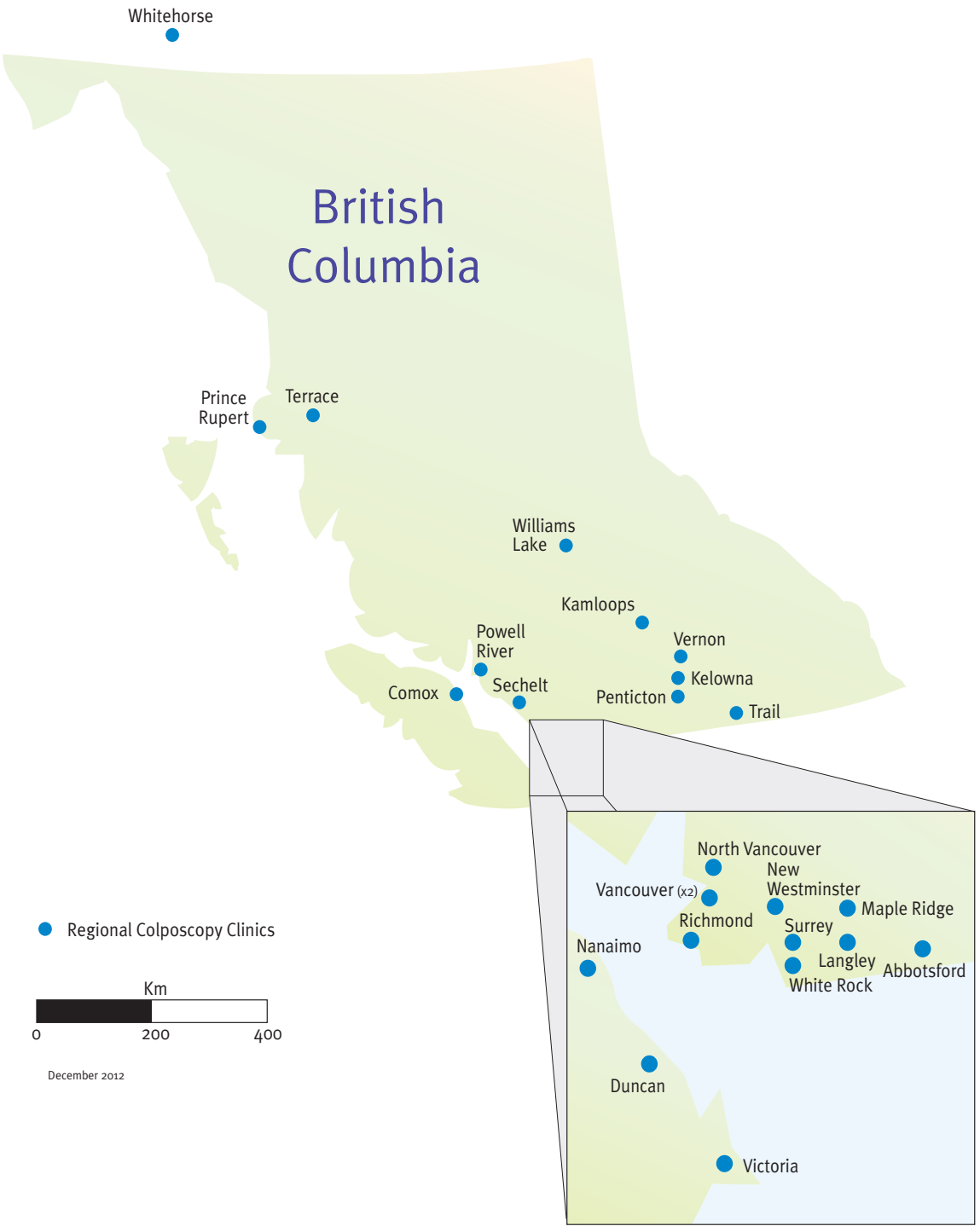
BC Cancer Agency
CARE + RESEARCH
An agency of the Provincial Health Services Authority

Cervical Cancer Screening

Results and Recommended Management

Pap Test Result	Recommended Management
Atypical squamous cells of undetermined significance (ASC-US) Low-grade squamous intraepithelial lesion (LSIL)	 ASC-US in background of atrophy should be repeated after topical estrogen
Atypical squamous cells – cannot exclude HSIL (ASC-H) High-grade squamous intraepithelial lesion (HSIL) Atypical glandular cells (AGC), Adenocarcinoma in situ (AIS)	Refer for colposcopy
Squamous cell carcinoma, adenocarcinoma, other malignancy	Refer to specialist care
After age 40, endometrial cells should be managed as appropriate	

Appendix 3 — Colposcopy Clinic Locations



Appendix 4 — Colposcopy Clinic Contact Information

Abbotsford	604-851-4700
Comox	250-339-2242
Duncan	250-746-4141
Kamloops	250-374-5111
Kelowna	250-862-4000
Langley	604-514-6069
Maple Ridge	604-463-4111
Nanaimo	250-754-2141
New Westminster	604-520-4253
North Vancouver	604-988-3131
Penticton	250-492-4000
Powell River	604-485-3211
Prince Rupert	250-624-2171
Richmond	604-278-9711
Sechelt	604-885-2224
Surrey	604-581-2211
Terrace	250-635-2211
Trail	250-368-3311
Vancouver	
St. Paul's Hospital	604-682-2344 ext 62436
Vancouver Hospital & Health Sciences Centre	604-875-5022
Vernon	250-558-1347
Victoria	250-370-8619
White Rock	604-535-4503
White Horse	867-393-8915
Williams Lake	250-392-4411

Appendix 5 — Educational Materials

Education materials for health care providers and women are available at no charge from the Cervical Cancer Screening Program.

For health care providers

- Educational video (online or DVD) – A Women-Centered Approach to Cervical Cancer Screening
- Information cards on the following:
  - Cervical Cancer Screening Clinical Practice Guidelines
  - Pap Sampling Technique

For women

- Brochures about Pap tests and HPV
- Booklets about cervical cancer and abnormal results
- Posters
- Postcards
- Calendar reminder stickers

Educational materials online

Educational materials and the order form are available at:
www.screeningbc.ca/cervix

Appendix 6 — Glossary

- **Age-Standardized Incidence Rate**
  Age-standardized incidence rate is the weighted average of the age-range specific incidence rates, where the weights are the proportions of people in the corresponding age groups of the 1991 Canadian population.

$$\text{Age - Standardized Incidence Rate} = \sum_i \left(\frac{\text{Ca}_\text{i}}{\text{Pop}_\text{i}} \times \text{weight}_\text{i} \times 100{,}000 \right)$$

  Where Ca_i is the number of cervical cancers detected in a given year for age group *i*, pop_i is the BC female population in a given year for age group *i*, and weight_i is the proportion of people in age group *i* of the 1991 Canadian population.

- **Age-Standardized Mortality Rate**
  Age-standardized mortality rate is the weighted average of the age-range specific mortality rates, where the weights are the proportions of people in the corresponding age groups of the 1991 Canadian population.

$$\text{Age - Standardized Mortality Rate} = \sum_i \left(\frac{\text{Deaths}_\text{i}}{\text{Pop}_\text{i}} \times \text{weight}_\text{i} \times 100{,}000 \right)$$

  Where $Deaths_i$ is the number of cervical cancer deaths in a given year for age group *i*, pop_i is the BC female population in a given year for age group *i*, and weight_i is the proportion of people in age group *i* of the 1991 Canadian population.

- **Incidence Rate**
  Incidence rate is the proportion of women in the population who develop cervical cancer in a given year, expressed as the number of deaths per 100,000 people.

$$\text{Incidence Rate} = \frac{\text{Number of cervical cancer detected in a given year}}{\text{BC female population in a given year}} \times 100{,}000$$

- **Mortality Rate**
  Mortality rate is the proportion of women in the population who died of cervical cancer in a given year, expressed as the number of deaths per 100,000 people at risk.

$$\text{Mortality Rate} = \frac{\text{Number of cervical cancer deaths in a given year}}{\text{BC female population in a given year}} \times 100{,}000$$

- **Participation Rate**
  BC Overall
  Proportion of women in the BC female population (20-69 years of age) had a Pap test sample taken from the cervix and/or endocervix and processed at least once over a three-year period. Age is calculated in year two of the reporting period.

$$\text{Participation Rate} = \frac{\text{Number of women (age 20 - 69) with at least one Pap test in a 3 - year period}}{\text{Number of women in the BC (age 20 - 69) population at year two}} \times 100$$

  BC Adjusted for Hysterectomy
  Proportion of women out of the target BC female population (20-69 years of age) without hysterectomy had a Pap test sample taken from the cervix and/or endocervix and processed at least once over a three-year period. The BC female population without hysterectomy is computed using the hysterectomy rates estimated from the 2008 Canadian Community Health Survey.

- **Positive Predictive Value**
  Proportions of Pap test samples with significant cytology findings and have histological confirmation of cervical abnormality out of those samples with significant cytology and had follow-up investigation with pathological result. Surveillance with repeat Pap test only is not regarded as follow-up investigation.

$$\text{PPV} = \frac{\text{Number of samples with significant pathology and cytology findings}}{\text{Number of samples with significant cytology findings, investigated and has pathological diagnosis}}$$

- **Pre-Cancer Detection Rate**
  Number of pre-cancerous lesions detected per 1,000 women who had a Pap test in a 12-month period.

$$\text{Pre - Cancer Detection Rate} = \frac{\text{Number of women with histology CIN II and CIN III}}{\text{Number of women who had at least one Pap test}} \times 1{,}000$$

- **Retention Rate**
  Proportion of women with a negative sample returned for Pap test.

$$\text{Rescreen Rate} = \frac{\text{Number of women returned for Pap test after an index sample with negative result}}{\text{Number of women with a negative sample eligible to return for Pap test}}$$

Appendix 7 — Acknowledgments and Contributors

The Cervical Cancer 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 taking the cervical Pap test samples
- Dedicated and highly trained staff to process and read the slides
- Community facilities providing space and personnel to support regional colposcopy clinics
- Medical specialists to provide colposcopy follow-up and treatment

We would also like to thank the following organizations for their ongoing support:

- All Hospitals participating in the Provincial Colposcopy Program
- BC Centre for Disease Control
- BC College of Registered Nurses
- BC Medical Association
- BC Naturopathic Association
- BC Women's Hospital and Health Centre
- Canadian Cancer Society
- First Nations Health Council
- SFU Faculty of Health Sciences
- UBC Faculty of Medicine
- Women's Health Bureau

Contributors (Alphabetical Listing):

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- Ms. Remy Malong, Program Secretary
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- Ms. Laurie Smith, Manager, HPV Focal Study

Appendix 8 — Publications and Presentations

Publications

Alicia A. Tone, Shannon Salvador, Sarah J. Finlayson, Anna V. Tinker, Janice S. Kwon, Cheng-Han Lee, Trevor Cohen, Tom Ehlen, Marette Lee, Mark S. Carey, Mark Heywood, Judith Pike, Paul J. Hoskins, Gavin C. Stuart, Kenneth D. Swenerton, David G. Huntsman, C. Blak Gilks, Dianne M. Miller, Jessica N. McAlpine. ***The Role of the Fallopian Tube in Ovarian Cancer***. Clinical Advances in Hematology & Oncology Volume 10, Issue 5, May 2012.

Ogilvie G, Krajden M, van Niekerk D, Martin R, Ehlen T, Ceballos K, Peacock S, Smith L, Kan L, Cook D, Stuart G, Franco E, Coldman A. ***Primary Cervical Cancer Screening with HPV Testing Compared with Liquid-based Cytology: Results of Round 1 of a Randomized Controlled Trial – the HPV FOCAL Study***. British Journal of Cancer (accepted). 6 October 2012 (not yet published).

Mayrand MH, Coutlée F, Taylor Y, Ogilvie G, Mai V, Bentley J, Goggin P, van Niekerk D. Canadian Partnership Against Cancer, HPV Testing for Cervical Cancer Screening Expert Panel. HPV Testing for Cervical Cancer Screening Expert Panel: Summary of Evidence. Toronto: Canadian Partnership Against Cancer; 2012

Decker K, McLachlin M, Kan L, Rose J, Onysko J, Ahmad R, Atkin K, Goggin P, Mai V, Fekete S, Zupancic MA, Hamm J, Gao S, Alvi R, Zhu T, Biswanger N, Przybysz R, Zhang B, Halfyard B, MacDonald S, Fung S, Niu J, Lockwood G. ***Cervical Cancer Screening in Canada Monitoring Program Performance 2006–2008***, Canadian Partnership Against Cancer, 2012.

Presentations

Dirk van Niekerk

1. HPV FOCAL: First Round Screen Results From a Canadian Population-Based Screening Program. *Eurogin 2012*. Prague, Czech Republic. July 2012.
2. HPV FOCAL: Round 1 Results of a Cervical Cancer Screening Trial. Congress of International Academy of Pathology. Capetown, South Africa. September 2012.

Tom Ehlen

3. HPV FOCAL: Round 1 Results of a Cervical Cancer Screening Trial International Gynecology Cancer Society Meeting. Vancouver, BC. October 2012.

Andy Coldman

4. HPV FOCAL: Round 1 Results of a Cervical Cancer Screening Trial. BC Cancer Agency: Research Rounds. Vancouver, BC. October 2012.

Appendix 9 — CCSP/BCCA Contact Information

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Notes

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