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

Cervical Cancer Screening Program

Cervical Cancer Screening Program 2013 Annual Report

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1.0 Message

Message from the Medical Director

We are pleased to present British Columbia's Cervical Cancer Screening Program's (CCSP) 2013 annual report. This report highlights the efforts of our dedicated pathologists, technologists, and laboratory and program staff.

The program works in partnership with the Cervical Cancer Screening Laboratory of the Provincial Health Services Authority to ensure that appropriate screening tests are available to eligible women to reduce cervical cancer mortality and morbidity. The program reminds healthcare providers when their patients are due for screening, tracks adherence to screening recommendations, and monitors system performance and outcomes of cervical screening activities.

As demonstrated in Figure 1, cervical cancer incidence and mortality rates have remained low in British Columbia, clearly demonstrating the value of an organized population-based screening program.

In 2012, a total of 527,189 women received Pap tests and 15,175 women required further follow-up including a repeat Pap test at six months, colposcopy or other investigations. Program statistics also emphasize the importance of regular screening – 42% of the 176 patients diagnosed with cervical cancer in 2011 were 5 years or more overdue for screening or had never been screened.

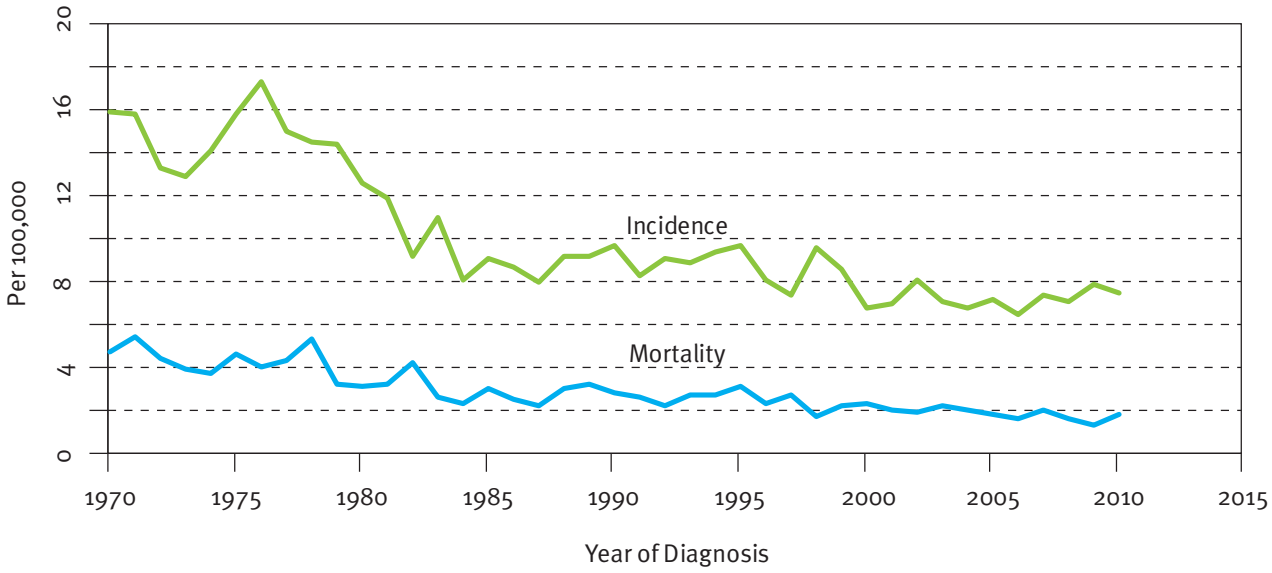
Our cervical screening participation rate for 21-69 year olds is currently 69.9%*. This rate is lower for some regions in BC including urban areas like Richmond, Vancouver and the Fraser Valley. To address this, we must continue to build awareness of the benefits of regular Pap tests.

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

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

** hysterectomy corrected rate*

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 Director, Screening Operations

The Cervical Cancer Screening Program (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.

CCSP remains committed to implementing innovative ways to promote regular screening, targeting both health care professionals, as well as our eligible population – women between the ages of 21 to 69.

The program 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 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 2 (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 2013, CCSP maintained a proactive approach to promoting the importance of Pap tests among eligible women in British Columbia.

In April, we launched a new, dedicated cancer screening website featuring an updated look, easier navigation and current information on the province's four organized screening programs – breast, cervical, colon and hereditary cancers.

The www.screeningbc.ca website is a comprehensive site where patients can access all cancer screening related information, including screening eligibility, screening procedures, and clinic and laboratory locations. The website also hosts a health care professionals section dedicated to keep providers updated about current screening recommendations and to provide easy access to resources to assist with discussions about cancer screening with patients. Resources range from patient support and physician information materials, to guidelines and forms, as well as evidence-based research and publications.

We also conducted a research project to investigate methods used by primary care to recall patients. The study utilized qualitative methods in conducting two key informant interviews with physicians, seven province-wide focus groups with physicians, one focus group with medical office assistants and four interviews with physicians with self-identified low retention for cervical cancer rescreening. The findings from this study will help guide our physician education and engagement activities to optimize retention rates for cervical cancer screening.

Our ongoing promotion activities include:

- Production of promotional tools, including brochures, posters and promotional giveaways that effectively communicate the benefits of Pap tests.
- A "@screeningbc" Twitter account that promotes relevant information about cancer screening.
- Regular presence at health fairs and events throughout the province by the BC Cancer Agency's Prevention group.

Commitment to Quality

Accreditation: The CCS Lab continues to demonstrate its ongoing commitment in providing quality patient care by following internationally recognized standards of excellence. In April 2013, the CCS Lab participated in another on-site accreditation inspection and was again successful in meeting the Laboratory Accreditation Program Standards for Accreditation established by the College of American Pathologists (CAP), an internationally recognized leader in laboratory quality assurance and accreditation programs.

To ensure continuous quality improvement, the CCS Lab monitors and evaluates quality indicators for appropriate quality improvement initiatives. Clinician feedback is a vital component in the quality improvement process. In 2013, over 800 clinicians used their valuable time to participate and provided important feedbacks in a brief CCS Lab Clinician Survey. Once analysis is completed, the feedbacks will be made available on the CCSP website.

Professional Development: Continuing education is encouraged and expected for all CCS Lab staffs. 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.

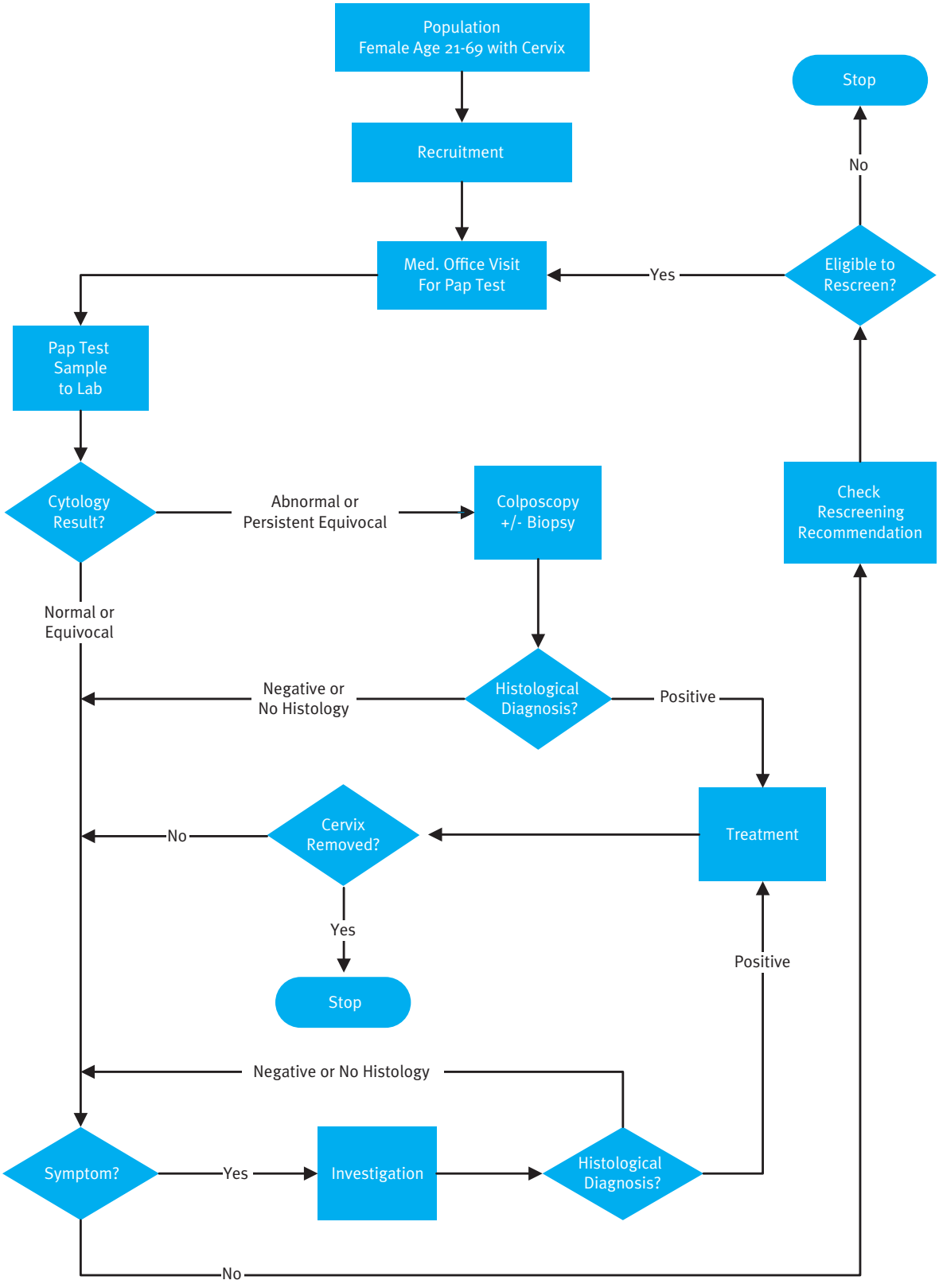
Professional and Academic Activities: Professional staff members of the Cervical Cancer Screening Program (CCSP) are involved in research, professional development, and teaching related to cervical cancer screening.

For the HPV FOCAL Study, 2013 was another busy year. This large BC women's health initiative, evaluating primary HPV (human papillomavirus) testing vs. cytology testing (the Pap smear), is in the fifth year of activity. Over 25,000 metro Vancouver and Victoria women have consented to participate in this landmark North American trial. To date, more than 11,000 women have completed the study and the remaining participants will attend their final study screen visits over the next two years. Countless clinicians around the province have seen FOCAL Study participants in their practices and clinics.

In 2013, FOCAL Study Investigators were honored to attend a variety of scientific meetings to present the preliminary findings to date. The preliminary findings from Round 1 screening illustrated that for women aged 35 and older, moderate or greater pathologically confirmed dysplasia was detected more in the HPV testing arm, than in the cytology testing arm. The team is looking forward to presenting the final Round 1 results when available, both locally and internationally through 2014. The HPV FOCAL Study is one of several large trials being conducted around the world evaluating HPV-based screening and the results will contribute to the growing body of evidence surrounding HPV testing in cervical cancer screening.

Preliminary HPV FOCAL results are available online: Ogilvie et al. British Journal of Cancer (2012) 107, 1917–1924. doi:10.1038/bjc.2012.489.

Figure 2: CCSP Screening Process Overview



3.0 Program Results

3.1 Utilization

BC healthcare providers submitted a total of 578,285 gynecological Pap test samples to the CCS Lab in 2012. An additional 5,499 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. Over 98% of the samples received were from the cervix/endocervix.

Table 1: Gynecological Cytology Samples Received / Processed, 2012

	<20	20-29	30-39	40-49	50-59	60-69	70+	All Ages
Number of Samples	17,655	123,653	128,847	124,878	112,358	66,202	4,670	578,285
Number of Samples Processed	17,307	121,657	126,789	123,102	110,778	65,244	4,544	569,440
(%)	98.0	98.4	98.4	98.6	98.6	98.6	97.3	98.5
Samples from Cervix Endocervix	17,285	121,437	126,163	120,958	107,064	61,658	3,609	558,193
(%)	99.9	99.8	99.5	98.3	96.6	94.5	79.4	98.0
Samples from Other Sites	22	220	626	2,144	3,714	3,586	935	11,247
(%)	0.1	0.2	0.5	1.7	3.4	5.5	20.6	2.0

NOTES:

1. CCSP data extraction date: November 21, 2013
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.

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	15,800	111,607	117,685	115,422	103,165	59,982	3,527	527,189
With 1 Sample	14,749	102,409	109,169	110,008	99,267	58,219	3,424	497,245
(%)	93.3	91.8	92.8	95.3	96.2	97.1	97.1	94.3
With 2 Samples	1,005	8,860	8,269	5,237	3,746	1,704	98	28,919
(%)	6.4	7.9	7.0	4.5	3.6	2.8	2.8	5.5
With 3+ Samples	46	338	247	177	152	59	5	1,025
(%)	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.2
New Patients	7,487	18,519	8,468	4,570	2,298	1,281	158	42,781
(%)	47.4	16.6	7.2	4.0	2.2	2.1	4.5	8.1

Notes:

1. CCSP data extraction date: November 21, 2013
2. Age is computed on patient's last Pap test

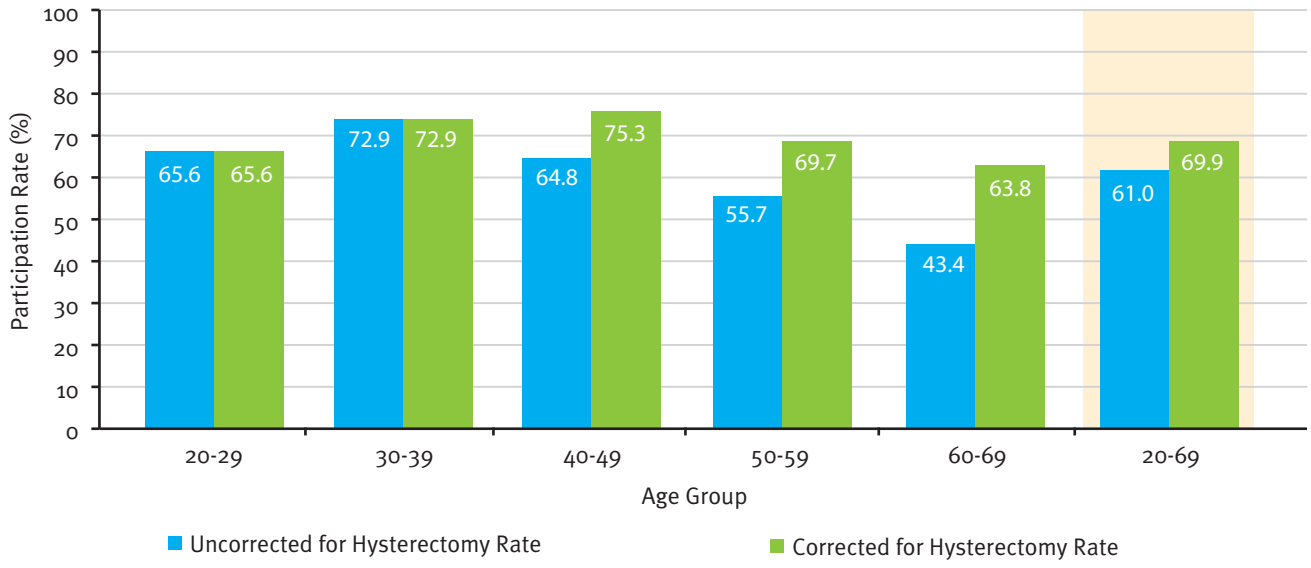
3.2 Participation Rates

The BC cervical cancer screening policy was updated in October 2011. The current policy advises women to begin screening at age 21 or approximately three years after first sexual contact, whichever occurs first. Women should continue having 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 3 shows the uncorrected and corrected participation rates by age group. The uncorrected and corrected participation rates for the BC female population ages 20-69 are 61.0% and 69.9% respectively. There is considerably more variation in the uncorrected rates across the age groups, from 72.9% among women ages 30-39 to 43.4% among women ages 60-69. With correction for hysterectomy, participation is highest at 75.3% among women 40-49 years of age, and participation is lowest among women ages 20-29 at 65.6%. This illustrates the importance of correcting for hysterectomy to avoid misdirecting promotional efforts.

Figure 3: Participation Rates by Age Group, 2010–2012



Notes:

1. Based on weighted average of 2010, 2011 and 2012 female population estimates
2. Population data source: P.E.O.P.L.E 2013 (September 2013), BC STATS, Service BC, BC Ministry of Citizens' Services
3. Hysterectomy adjustment calculated using 2008 Canadian Community Health Survey
4. CCSP data extraction date: November 21, 2013
5. Age is computed based on patient's age in 2011

Table 3 lists the uncorrected participation rates by Health Service Delivery Area (HSDA) for the younger female population in which hysterectomy is less prevalent. HSDAs with smaller populations are susceptible to year over year participation fluctuation due to population estimate changes from Statistics Canada.

- Participation in the 20-29 age group is a challenge in the Lower Mainland - especially in Richmond, Vancouver and Fraser North.
- Participation in the 30-39 age group was the lowest and below the 70% target for Fraser East, Fraser South and Northeast,
- Although participation is generally higher in the 30-39 age group than in the 20-29 age group, the opposite occurred in some HSDAs in the Interior and Island Health and for all Northern Health HSDAs.

Table 3: Participation Rates of Women 20-29 and 30-39 Years of Age by HSDA, 2010–2012

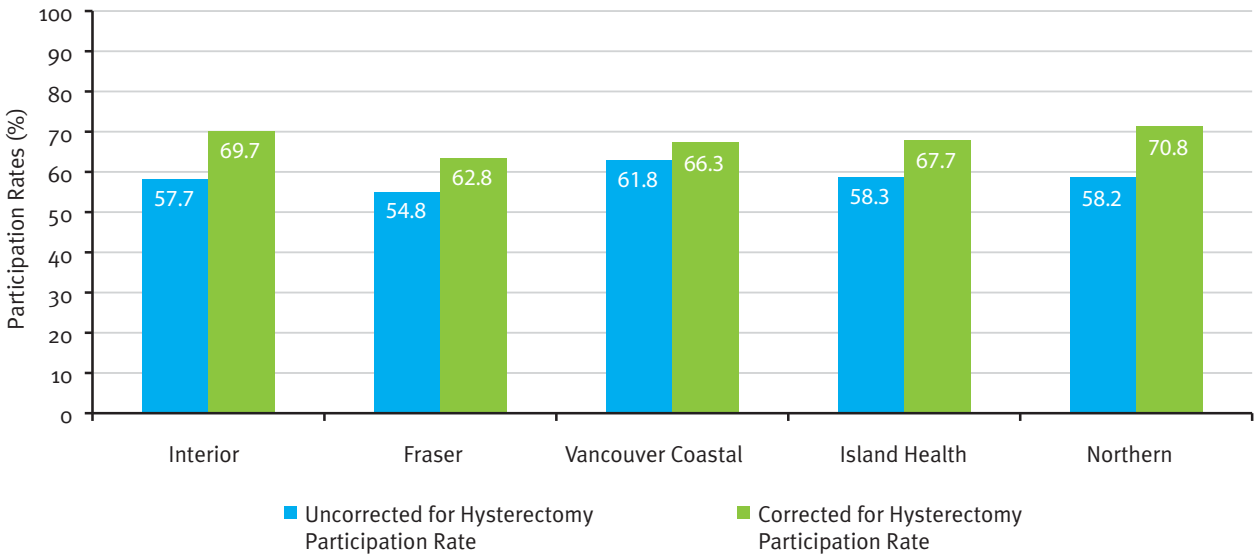
Health Authority	Health Service Delivery Area	20-29	30-39
Interior	East Kootenay	79.5%	72.5%
	Kootenay Boundary	85.5%	72.5%
	Okanagan	69.3%	72.0%
	Thompson Cariboo Shuswap	69.1%	67.0%
Fraser	Fraser East	56.4%	62.6%
	Fraser North	50.9%	68.1%
	Fraser South	54.2%	65.5%
Vancouver Coastal	Richmond	47.2%	69.1%
	Vancouver	50.2%	70.7%
	North Shore/Coast Garibaldi	69.2%	77.9%
Island Health	South Vancouver Island	63.2%	71.5%
	Central Vancouver Island	70.2%	68.5%
	North Vancouver Island	80.0%	71.4%
Northern	Northwest	78.2%	71.8%
	Northern Interior	73.3%	70.9%
	Northeast	71.1%	65.5%
BC		65.6%	72.9%

Notes:

1. Based on weighted average of 2010, 2011 and 2012 female population estimates
2. Population data source: P.E.O.P.L.E 2013 (September 2013), BC STATS, Service BC, BC Ministry of Citizens' Services
3. HSDA data acquired from Research Data Access Services, BC Ministry of Health
4. 1. CCSP data extraction date: November 21, 2013
5. Age is computed based on patient's age in 2011

Figure 4 compares the hysterectomy corrected participation rate against the uncorrected rate by Health Authority. Northern Health Authority has the highest overall participation (71% corrected for hysterectomy), while Fraser Health Authority has the lowest (63% corrected for hysterectomy). Using the uncorrected rates would provide a different impression.

Figure 4: Participation Rates by Health Authority, 2010–2012



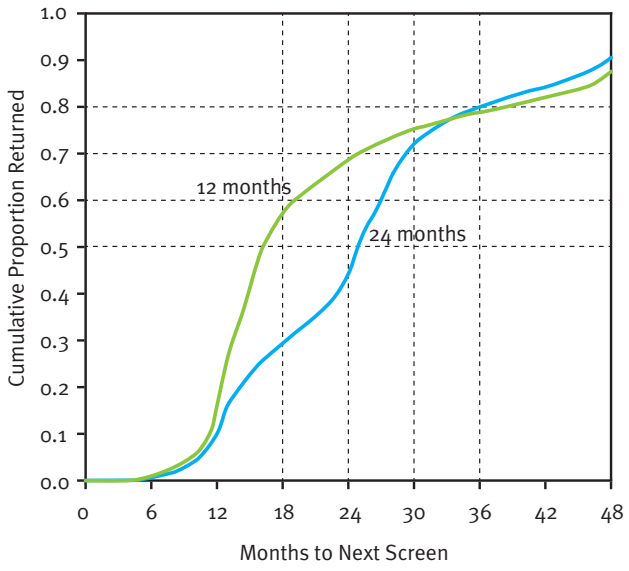
Notes:

1. Based on weighted average of 2010, 2011 and 2012 female population estimates
2. Population data source: P.E.O.P.L.E 2013 (September 2013), 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: November 21, 2013
6. Age is computed based on patient's age in 2011

3.3 Screening Interval

Retention is the percentage of eligible women re-screened after a negative Pap test. Figure 5 shows the retention rate by the actual recommended screening interval. For patients with a 12-month interval recommendation, 56% returned by 18 months, and 71% of those with a 24-month recommendation returned by 30 months. The percentage of women who did not return by 48 months is 12% and 9% respectively for the 12-month and 24-month groups.

Figure 5: Retention Rates by Screening Interval Recommendation, 2009



Notes:

1. CCSP data extraction date: November 21, 2013

Table 4 summarizes the retention rates for women last screened in 2009 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, 2009

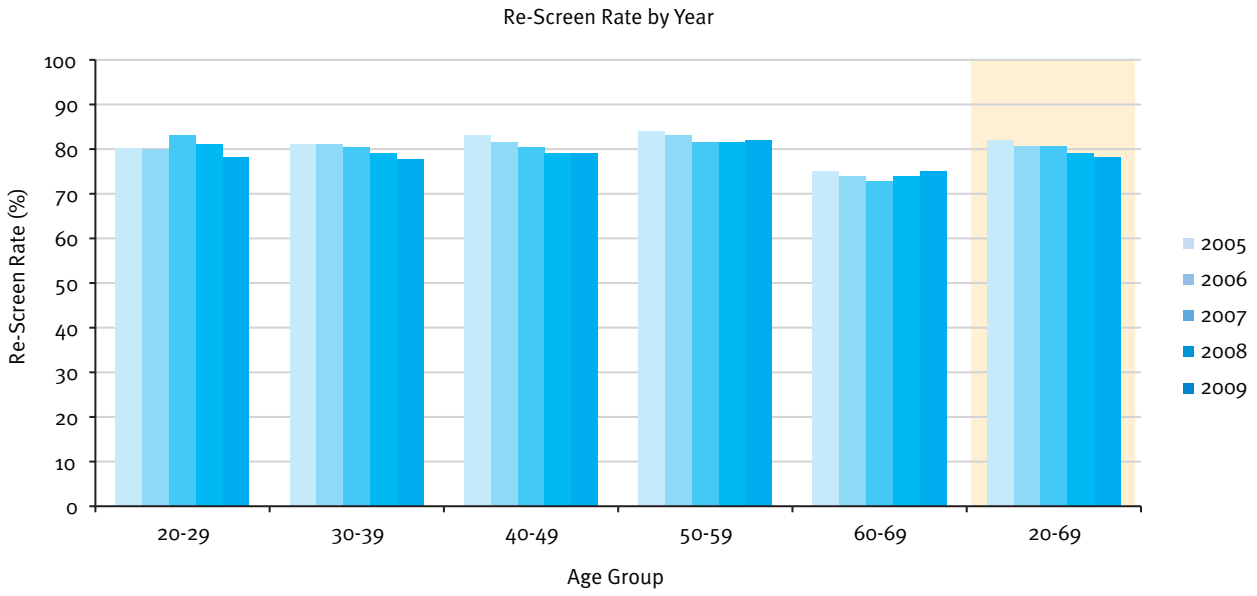
Timelist	20-29	30-39	40-49	50-59	60-69	20-69
Number of Patients	103,775	110,860	114,082	92,338	47,796	468,851
Re-screened by						
18 months	45.5%	40.3%	37.1%	36.5%	33.0%	39.2%
24 months	58.7%	53.2%	50.0%	49.5%	44.5%	52.0%
30 months	72.3%	71.1%	71.8%	74.8%	69.3%	72.1%
36 months	78.2%	78.1%	79.0%	81.6%	74.9%	78.7%

Notes:

1. CCSP data extraction date: November 21, 2013
2. Age is computed based on patient's age on report date of the index Pap test

Figure 6 shows the 36-month retention rate of women ages 20-69 by 10-year age groups for calendar years 2005-2009. The retention rate has been declining in every age group. The decline is largest in the 30-39 age group, 6%. CCSP has been working to identify enablers and challenges in retaining participants. Work is ongoing in this area to reverse the decline seen in the last few years.

Figure 6: 36-Month Retention Rate by Age Group over Time, 2005–2009



Notes:

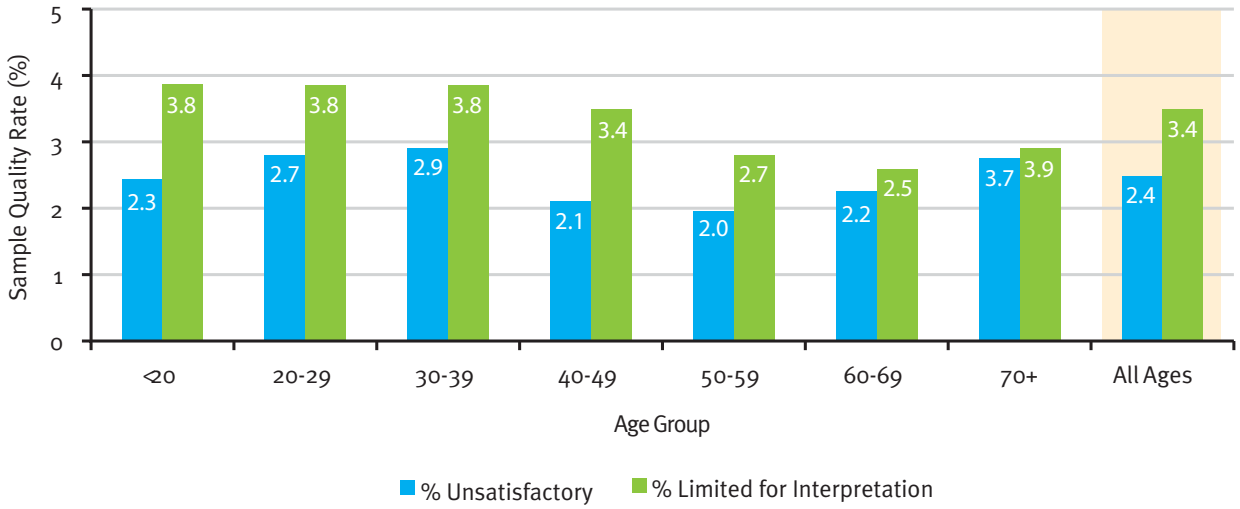
1. CCSP data extraction date: November 21, 2013
2. Age is computed on patient's age on report date of the index Pap test

3.4 Quality of Pap Test Samples

Figure 7 summarizes Pap test sample quality by 10-year age groups for cervical/endocervical samples. The percentage of samples reported as unsatisfactory or limited for interpretation are 2.4% and 3.4% respectively. This is an improvement over 2011.

The most commonly cited factor for inadequate sample is scanty sample material (93% of unsatisfactory samples and 79% 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 (6% in unsatisfactory samples and 14% in limited for interpretation samples). Multiple factors may be cited.

Figure 7: Cervical Sample Quality Rates by Age Group, 2012



Notes:

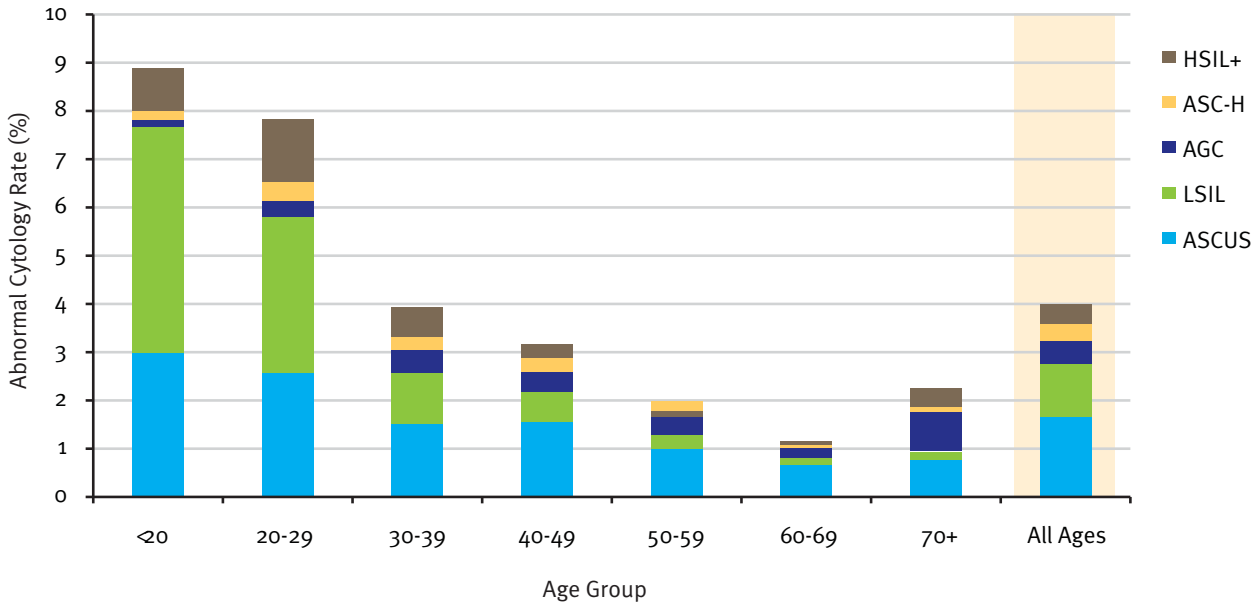
1. CCSP data extraction date: November 21, 2013
2. Age is computed based on sample date

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 21 days in 2012. This is a decrease from an average of 23 days in 2010. 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 8 and Table 5. Overall, 2.9% of Pap tests were reported as ASCUS/LSIL, 0.40% AGC, 0.24% ASC-H, and 0.55% HSIL+.

Figure 8: Abnormal Screening Test Result Distribution by Age Group, 2012



Notes:

1. CCSP data extraction date: November 21, 2013
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, 2012

	<20	20-29	30-39	40-49	50-59	60-69	70+	all ages
Patients with ASCUS/LSIL	1,208	6,356	3,067	2,551	1,436	527	30	15,175
Repeat in 6 Months	1,176	5,820	2,815	2,321	1,306	486	24	13,948
(%)	97.4	91.6	91.8	91.0	90.9	92.2	80.0	91.9
Other Investigation	32	536	252	230	130	41	6	1,227
(%)	2.6	8.4	8.2	9.0	9.1	7.8	20.0	8.1
Patients with High Grade or AGC	193	2,414	1,677	1,294	733	256	64	6,632
Colposcopy and/or ECC	179	2,348	1,621	1,089	479	166	18	5,901
(%)	92.7	97.3	96.7	84.2	65.3	64.8	28.1	89.0
Other Investigation	14	66	56	205	254	90	46	731
(%)	7.3	2.7	3.3	15.8	34.7	35.2	71.9	11.0

Notes:

1. CCSP data extraction date: November 21, 2013
2. Age is computed based on the date of the patient's most severe 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 9 and 10 show the colposcopy follow-up rate by age and their Pap test result. The 12-month follow-up rate was 80.5% for women with persistent ASCUS/LSIL Pap test results; and 84.4% for women with high grade or AGC Pap test results. Compared to the previous years, the overall follow-up rate is reduced by 2%.

Figure 9: Colposcopy Follow-up Rates for Women with Persistent ASCUS/LSIL Pap Test Result by Age Group, 2011

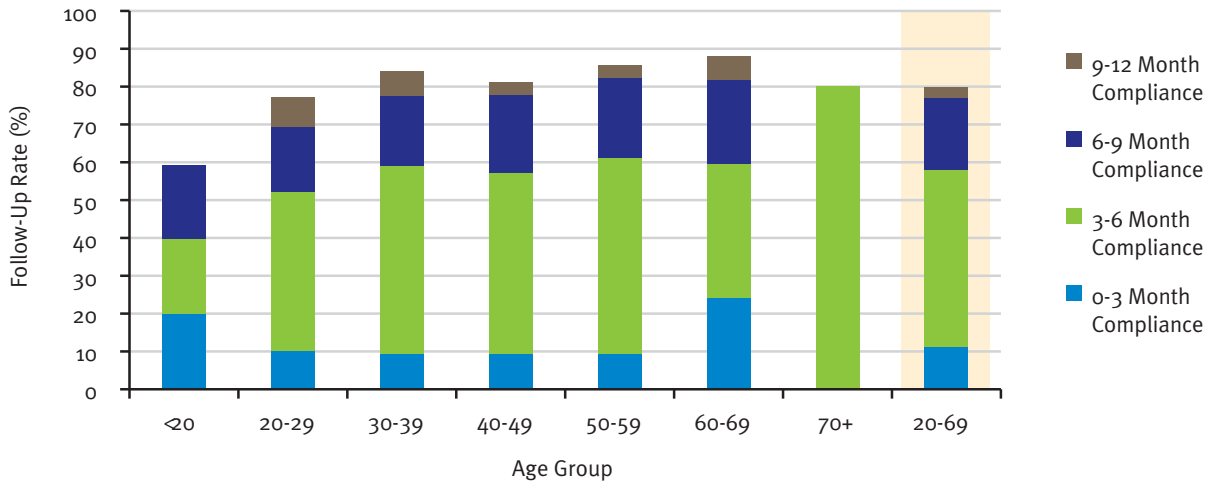
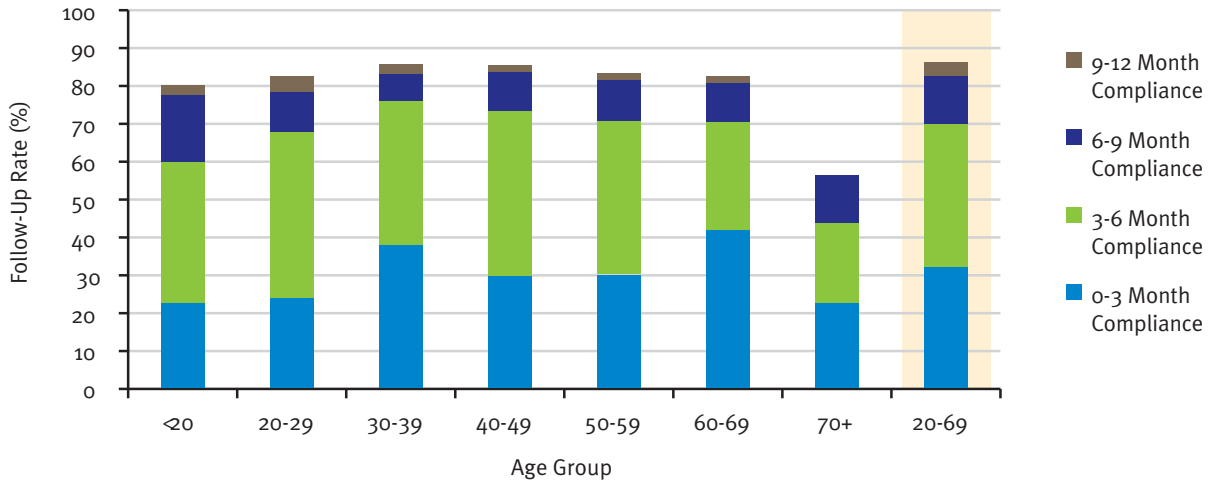


Figure 10: Colposcopy Follow-up Rates for Women with High Grade or AGC Pap Test Result by Age Group, 2011



Notes for figure 9 and 10:

1. CCSP data extraction date: November 21, 2013
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, i.e. 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.

82% 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% 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 or higher is 54% for high-grade or AGC, and is 25% for those ASCUS/LSIL referred for further investigation.

Table 6: Cytology-Histology Agreement, 2012

	ASCUS/LSIL	Rate %	High Grade or AGC	Rate %
Samples With Pathological Diagnosis:	1,003	74.5	5,633	82.2
CIN II or Higher	251	25.0	3,031	53.8
CIN III or Higher	92	9.2	1,905	33.8
Other Histology Findings				
Glandular Severe				
Glandular in Situ	4	0.4	98	1.7
Glandular Invasive	1	0.1	43	0.8

Notes:

1. CCSP data extraction date: November 21, 2013

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. 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 2012, 17,117 colposcopy examinations were provided. A cytological abnormality was the most common reason for the colposcopy referral (see Figure 11). No information for the reason for colposcopy likely indicates that the patient previously had a colposcopy and is returning for colposcopy follow-up. The primary site of investigation was the cervix (see Figure 12).

Figure 11:
Reason for Referral to Colposcopy Clinic, 2012

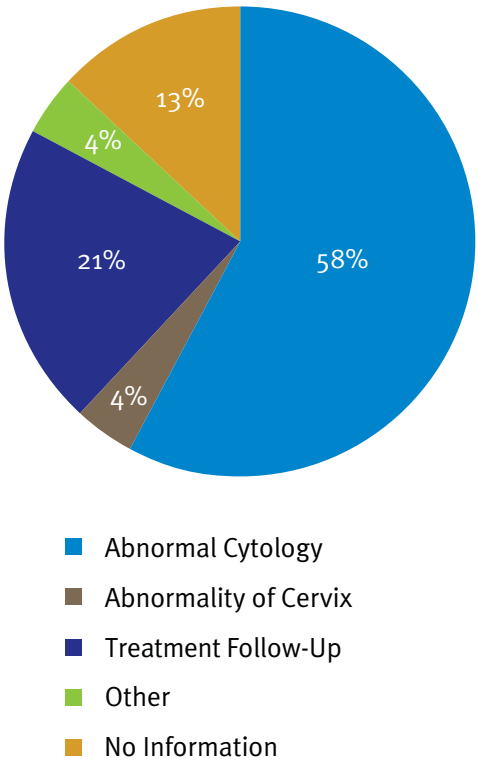
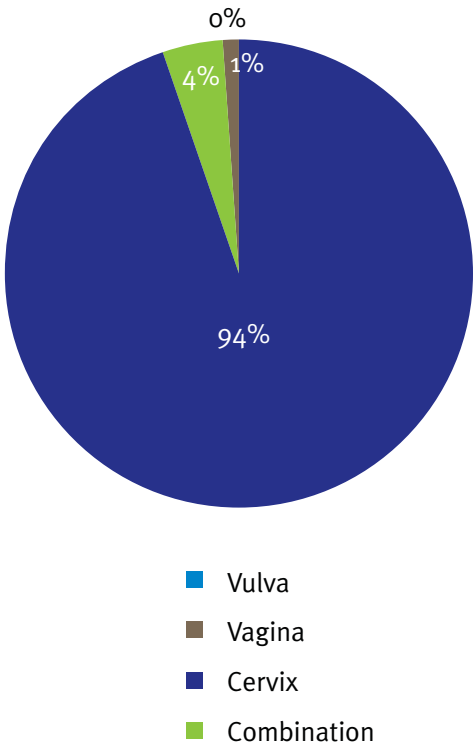


Figure 12:
Site of Colposcopic Investigation, 2012



Notes for figures 11 and 12:

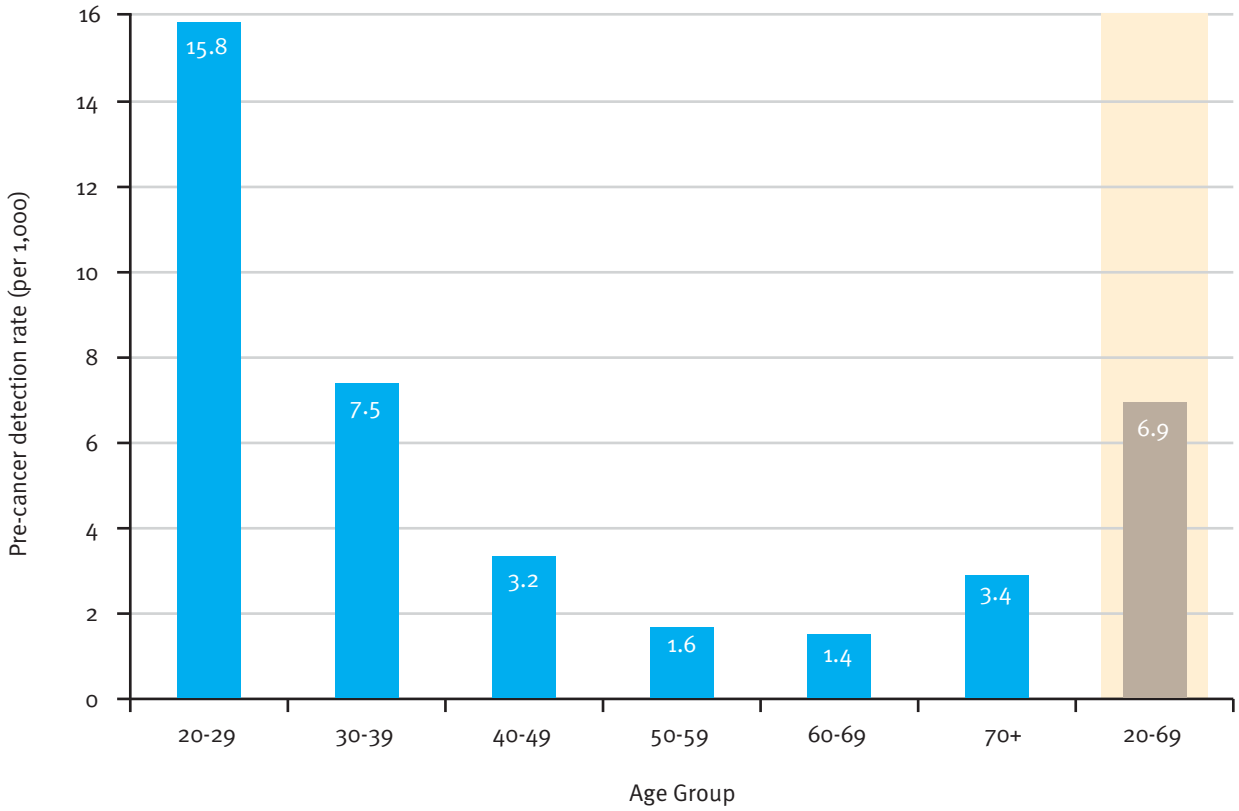
1. CCSP data extraction date: November 21, 2013

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 13 shows the pre-cancer detection rate for women ages 20-69 by 10-year age groups. The pre-cancer detection rate in 2012 for women ages 20-69 in BC is 6.9 per 1,000. This is an important indicator to monitor over time as the environment changes in screening participation, HPV vaccination, and screening policies. 2010 and 2011 pre-cancer detection rates were 5.8% and 6.3% respectively.

Figure 13: Pre-Cancer Detection per 1,000 Women Screened by Age Group, 2012



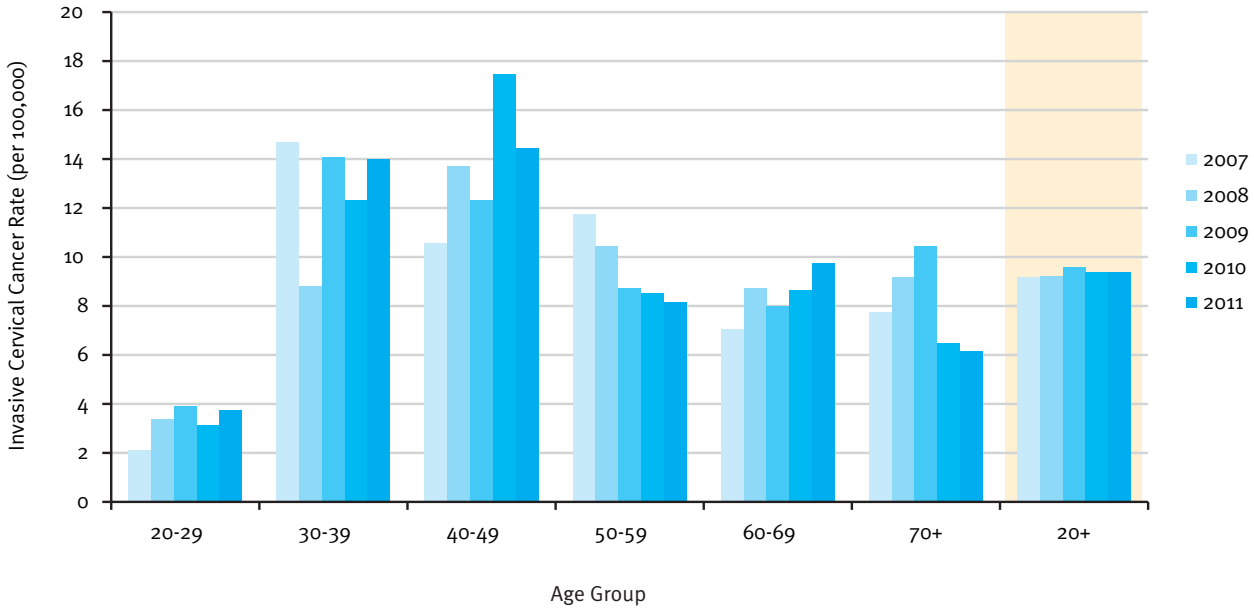
Notes:

1. CCSP data extraction date: November 21, 2013
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 2007 to 2011 were identified from the British Columbia Cancer Registry and the data collected by the CCSP. The age-specific cancer incidence rates for 2007-2011 are presented in Figure 14, and the cancer counts are shown in Table 7. Figure 14 shows that invasive cervical cancers are rare in women ages 20-29.

Figure 14: Invasive Cervical Cancer Incidence per 100,000 by Age Group, 2007 – 2011



Notes:

1. Population data source: P.E.O.P.L.E 2013 (September 2013), BC STATS, Service BC, BC Ministry of Citizens' Services
2. CCSP data extraction date: November 21, 2013
3. Age is computed based on date of diagnosis

Table 7: Number of Invasive Cervical Cancers by Age Group, 2007 – 2011

	20-29	30-39	40-49	50-59	60-69	70+	20+
2011 Number of cases							
All cell types	12	42	50	29	25	17	176
Squamous cell only	9	30	33	21	20	14	127
Incidence rate (per 100,000)							
All cell types	3.8	13.9	14.5	8.3	9.8	6.3	9.6
Squamous cell only	2.8	10.0	9.5	6.0	7.8	5.2	6.9
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

Notes:

1. Population data source: P.E.O.P.L.E 2013 (September 2013), BC STATS, Service BC, BC Ministry of Citizens' Services
2. CCSP data extraction date: November 21, 2013
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 15 and 16 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 disregarded in the categorization of screening history.

Figure 16 shows that 39% of patients with squamous cell carcinoma are "inactive" screening participants (>5 years or no screening history with CCSP), 11% are "under screened" (>3 to 5 years), and 40% are "active" screening participants (0.5 to 3 years). Figure 17 shows that 31% of patients with adenocarcinoma are "inactive" screening participants (>5 years or no screening history with CCSP), 13% are "under screened" (>3 to 5 years), and 55% are "active" screening participants (0.5 to 3 years). Although the number of invasive cancers is not significantly different in the 20-29 age group, the proportion screened in the last 5 years is increased.

In total, about 42% of the 176 patients diagnosed with invasive cervical cancer in 2011 were screened more than 5 years ago, or did not have a screening history.

Figure 15: Screening History of Women Diagnosed with Squamous Cell Carcinoma, 2011

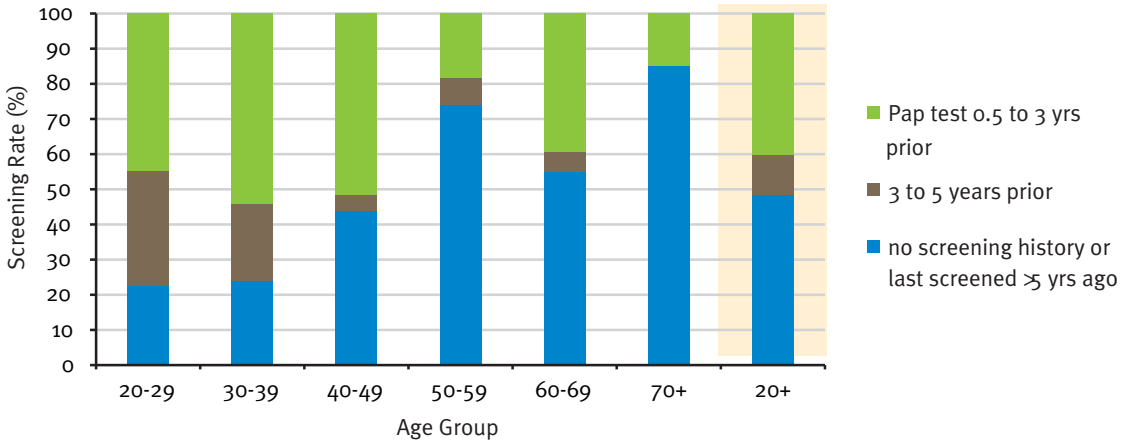
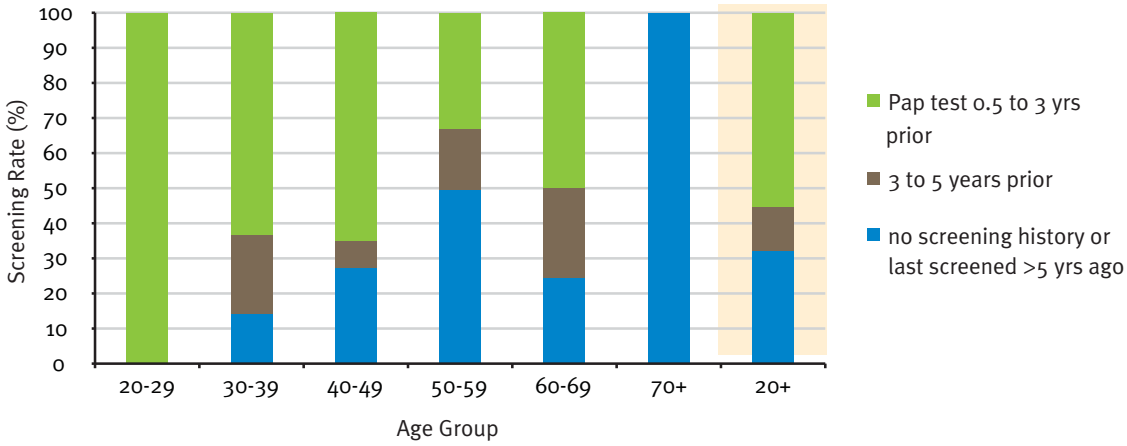


Figure 16: Screening History of Women Diagnosed with Adenocarcinoma, 2011



Notes for figures 15 and 16:

1. CCSP data extraction date: November 21, 2013
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

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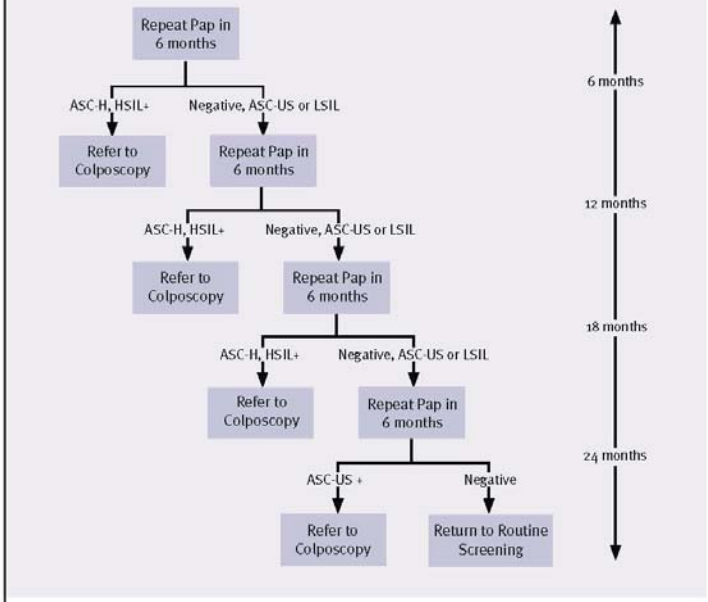
CARE + RESEARCH
An agency of the Provincial Health Services Authority

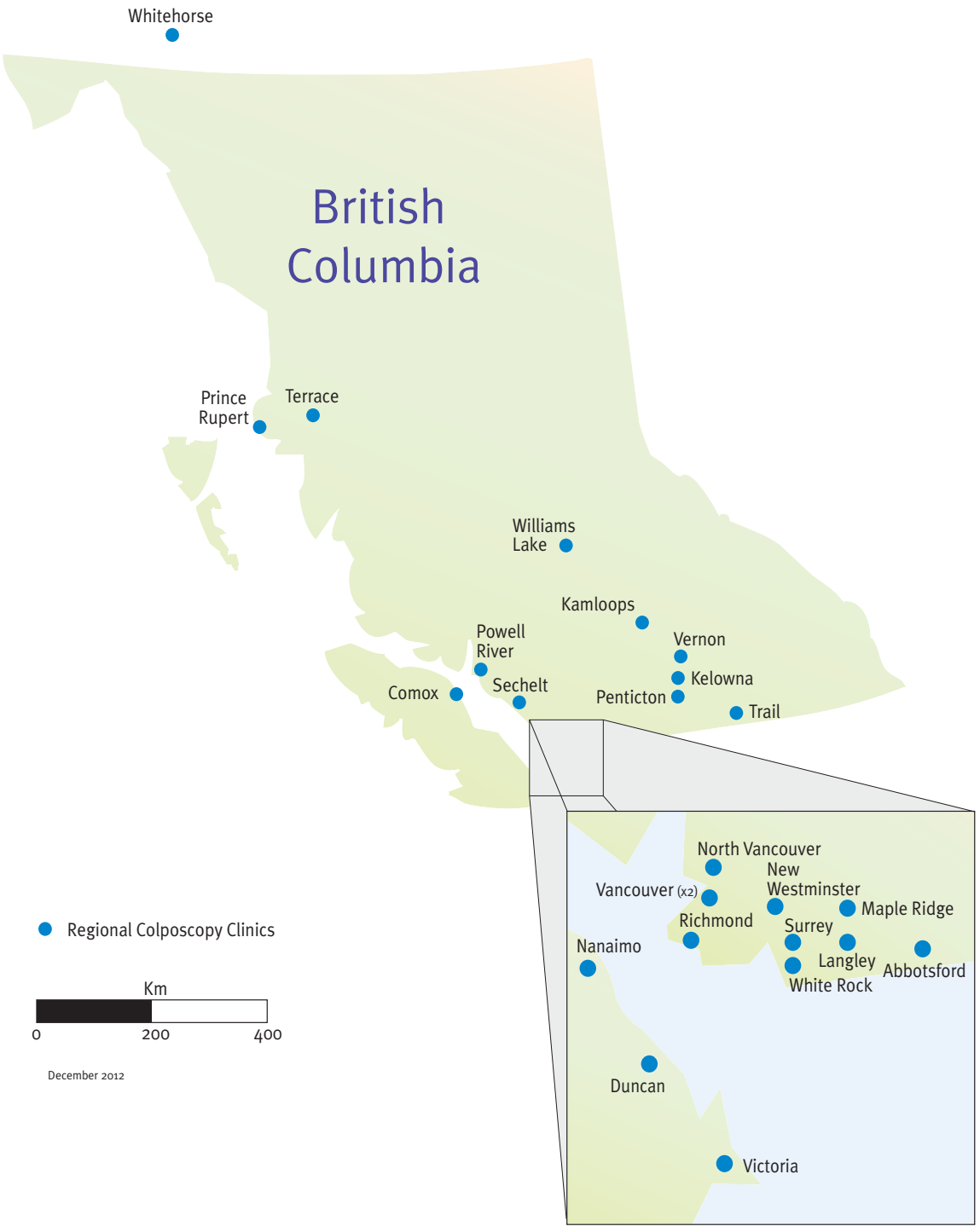
Cervical Cancer Screening

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	

February 2011

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):

- Dr. Tom Ehlen, Director, Provincial Colposcopy Program
- Ms. Laura Gentile, Operations Director, Cancer Screening
- Mr. Jeremy Hamm, Biostatistician, Surveillance and Outcomes Unit
- Ms. Ritinder Harry, Screening Promotions Leader
- Ms. Lisa Kan, Senior Director, Cancer Screening
- Ms. Jane Lo, Chief Cytotechnologist, Cervical Cancer Screening Laboratory
- Mr. Javis Lui, Coordinator, Screening Promotions
- Ms. Remy Malong, Program Secretary
- Dr. Dirk van Niekerk, Medical Leader, Cervical Cancer Screening Program
- Ms. Laurie Smith, Manager, HPV Focal Study

Appendix 9 — CCSP/BCCA Contact Information

Dr. Tom Ehlen
Director, Provincial Colposcopy Program
Phone: 604-877-6000 ext 2367
Email: Tom.Ehlen@vch.ca

Dr. Nick Foster
Chief Operating Officer & Vice-President
BC Cancer Agency
Phone: 604-877-6131
Email: nick.foster@bccancer.bc.ca

Laura Gentile
Operations Director, Cancer Screening
Phone: 604-707-5913
Email: laura.gentile@bccancer.bc.ca

Jeremy Hamm
Biostatistician, Surveillance & Outcomes
Phone: 604-707-5900 ext 4843
Email: jhamm@bccancer.bc.ca

Ritinder Harry
Screening Promotions Leader
Phone: 604-877-6000 ext 4836
Email: Ritinder.Harry@bccancer.bc.ca

Lisa Kan
Senior Director, Cancer Screening Programs
Phone: 604-877-6201
Email: lkan@bccancer.bc.ca

Administration Office
#801– 686 West Broadway
Vancouver, BC V5Z 1G1
Phone: 604-877-6200
Fax: 604-660-3645
Website: www.screeningbc.ca/cervix

Jane Lo
Chief Cytotechnologist, CCSP
Phone: 604-877-6000 ext 4907
Email: jlo@bccancer.bc.ca

Javis Lui
Coordinator, Screening Promotions
Phone: 604-707-5907
Email: Javis.Lui@bccancer.bc.ca

Laurie Smith
Manager, HPV FOCAL Study
Phone: 604-877-6000 ext 4829
Email: lsmith3@bccancer.bc.ca

Larry St. Germain
Screening Information
Management Leader
Phone: 604-877-6000 ext 4844
Email: lstgerm@bccancer.bc.ca

Dr. Dirk van Niekerk
Medical Leader, CCSP
Phone: 604-877-6000 ext 2068
Email: dvanniek@bccancer.bc.ca

Notes