

Screen *for* Life
Cancer screening sees what you can't

-  Breast
-  Cervical
-  Colorectal

Ontario Cervical Screening Program 2012 Report



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Message from Dr. Linda Rabeneck, Dr. Joan Murphy and Dr. Laurie Elit

Cervical cancer is a preventable and treatable disease. However, the Canadian Cancer Society estimates that in 2013 there will be approximately 610 new cases of cervical cancer and 150 deaths as a result of this disease in the province of Ontario.¹ Most cervical cancers are caused by human papillomavirus (HPV), so primary prevention is possible through vaccination, while disease progression can be stopped through screening with the Pap test, which provides an opportunity to identify pre-cancerous or early-stage cancerous lesions. There has been a decline in cervical cancer incidence and mortality in Ontario due to widespread (opportunistic) screening with the Pap test since the 1960s.

Launched in 2000, the Ontario Cervical Screening Program (OCS) is a province-wide screening program that has contributed to these reductions in incidence and mortality. The program aims to reduce the burden of cervical cancer by prevention and detection, and to optimize the capacity of primary care providers to be highly engaged in comprehensive cervical cancer screening.

This OCS report builds and expands on the report published in 2011, which contained data from 2003 to 2008. Several new performance indicators have been introduced, providing a more complete picture of Ontario's performance in cervical cancer screening, and most indicators take socio-demographic variables into consideration. This report also highlights the strengths of the OCS, shows its progress since the previous report and identifies areas of focus for further improvement.

Our priorities for the coming few years will be twofold. First, we will work towards realizing Cancer Care Ontario's (CCO's) 2012 evidence-based cervical screening guidelines,² which recommend that primary screening of women 30 years of age and older be performed with HPV testing and positive cases triaged with cytology. Second, we have begun to organize the delivery of colposcopy services in Ontario.

The OCS will continue to monitor new evidence and evaluate its program in order to improve the quality, effectiveness and delivery of its cervical cancer screening services to Ontario women.



A handwritten signature in black ink that reads "Linda Rabeneck".

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Executive Summary

BURDEN OF INVASIVE DISEASE

Although the incidence and mortality for cervical cancer have been significantly reduced by screening, this disease continues to occur in Ontario. In 2013, the Canadian Cancer Society estimates that there will be approximately 610 new cases of cervical cancer in the province of Ontario and 150 deaths as a result of this disease.¹ Moreover, it is predominantly found in women in their mid-30s and beyond, which means that cervical cancer and its precursors often occur before childbearing is complete, amplifying the level of burden on those it affects.³ This report evaluates the performance of the Ontario Cervical Screening Program (OCSP) in reducing this burden as reflected by specific performance indicators, with particular attention to socio-demographic variables.

ONTARIO CERVICAL SCREENING PROGRAM (OCSP)

The OCSP was launched in 2000 as a province-wide initiative to help prevent cervical cancer by identifying and removing pre-cancerous lesions, and to reduce cancer deaths by identifying this disease at a pre-clinical stage when it is still curable and easier to treat.

In 2005, cervical screening guidelines recommended initiation of screening within three years of first vaginal sexual activity and after three consecutive annual normal Pap tests, screening every two to three years until age 70. In 2012, these guidelines were revised, recommending screening initiation at age 21 and then every three years until age 70.² This report reflects the program's performance from 2009 to 2012, prior to the implementation of the 2012 guidelines.

PROGRAM EVALUATION FRAMEWORK

This program report builds on the report published in October 2011, which evaluated performance from 2003 to 2008. Seven performance indicators from that report are evaluated again and nine new indicators have been added.

Coverage

Participation Rate

Percentage of Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a three-year period.

New Participant Rate (NEW)

Percentage of Ontario screen-eligible women 30 to 69 years of age who completed a Pap test for the first time in the last 10 years.

Retention Rate

Percentage of Ontario screen-eligible women 20 to 66 years of age who had a subsequent Pap test within 36 months of a previous normal Pap test result.

Screening Test

Abnormal Result Rate

Percentage of Ontario screen-eligible women 20 to 69 years of age who had an abnormal Pap test result in a 12-month period.

Abnormal Cytology Results

Percentage of Ontario screen-eligible women 20 to 69 years of age by their most severe abnormal Pap test result in a 12-month period.

Performance Of Screening – Unsatisfactory Results

Percentage of unsatisfactory Pap test specimens among Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a 12-month period.

Laboratory Capacity – Cytology Turnaround Time

Time interval in calendar days from the date a Pap test specimen was obtained by a healthcare provider to the date the laboratory report was issued, for Pap tests performed on Ontario screen-eligible women 20 to 69 years of age in a 12-month period.

Positive Predictive Value for Cervical Intraepithelial Neoplasia Grade III/Adenocarcinoma in Situ (CIN III/AIS) and Cancer (NEW)

Percentage of Ontario screen-eligible women 20 to 69 years of age with a screen-detected invasive cervical cancer or pre-cancer (CIN III/AIS) among those who had an abnormal Pap test result followed by a colposcopy or cervical surgery in a three-year period.

Screening History in Cases of Invasive Cervical Cancer

Percentage of Ontario screen-eligible women 30 to 69 years of age diagnosed with invasive cervical cancer in a three-year period, who were screened within a 10-year period prior to diagnosis.

CIN III/AIS Pre-Cancer Detection Rate (NEW)

Rate per 10,000 Ontario screen-eligible women 20 to 69 years of age with a screen-detected CIN III/AIS pre-cancerous cervical lesion among those who were screened using a Pap test in a three-year period.

Diagnostic Follow-Up

Follow-Up of Unsatisfactory Cytology (NEW)

Percentage of Ontario screen-eligible women 20 to 69 years of age with an unsatisfactory Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (not including hysterectomy) within six months of the unsatisfactory screen test result in a 12-month period.

Follow-Up of Low-Grade Abnormal Cytology (NEW)

Percentage of Ontario screen-eligible women 20 to 69 years of age with a low-grade abnormal Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (including hysterectomy) within nine months of the low-grade abnormal screen test result in a 12-month period.

Follow-Up of High-Grade Abnormal Cytology (NEW)

Percentage of Ontario screen-eligible women 20 to 69 years of age with a high-grade abnormal Pap test result who underwent a colposcopy or definitive treatment (including hysterectomy) within six months of the high-grade abnormal screen test result in a 12-month period.

Colposcopy – New and Follow-Up Cases (NEW)

Number of new and follow-up colposcopy cases in Ontario screen-eligible women 20 to 69 years of age in a 12-month period.

Colposcopist Annual Colposcopy Volume (NEW)

Percentage of colposcopists who perform a minimum of 25 new colposcopies or a minimum of

100 new and follow-up colposcopies in a 12-month period.

Primary Care

Participation, Retention and Follow-Up of High-Grade Lesions in Patient Enrolment Models (PEMs) (NEW)

Participation rate, retention rate and follow-up of high-grade abnormal Pap tests by enrolment status with a PEM physician, for the most recent time period.

PROGRAM RESULTS

Coverage

Participation Rate: Cervical cancer screening participation among women ages 20 to 69 increased from 61.6% in 2000–2002 to 64.9% in 2009–2011. Screening participation rates decreased with increasing age, with the lowest rate in women 60 to 69 years of age, where only 53.4% of women were screened in 2009–2011. Screening participation was lowest among women living in the lowest income quintile neighbourhoods (57.6%) and highest among women living in the highest income quintile neighbourhoods (70.0%).

New Participant Rate: The rate of entry of new participants into the program was 7.5% in 2009–2011. The rate was highest in women ages 30 to 39 (10.2%) and lowest in women ages 50 to 59 (5.7%). New participant rates were highest in women living in areas with a high percentage of immigrants (12.9%).

Retention Rate: Screening retention was high among women 20 to 66 years of age but decreased slightly from 81.0% in 2006 to 79.9% in 2009. Retention was highest in women living in the highest neighbourhood income quintile (82.6%) and lowest in women in neighbourhoods in the lowest income quintile (75.3%). When evaluated by age group, retention was highest in women ages 20 to 29 (81.7%) and lowest in women ages 60 to 66 (76.5%).

Screening Test

Abnormal Result Rate: The abnormal result rate increased slightly over time, from 4.2% in 2000 to 5.5% in 2012. The abnormal result rate varied by socio-demographic factor and across Local Health Integration Networks (LHINs).

Abnormal Cytology Results: Of all the abnormal Pap test results in 2012, 89.9% were low-grade (51.6% were atypical squamous cells of undetermined significance or ASCUS, and 38.3% were low-grade squamous intraepithelial lesions or LSIL). Only 5.9% were high-grade squamous intraepithelial lesions (HSIL) and 3.4% were atypical squamous cells, cannot exclude HSIL (ASC-H).

Performance of Screening – Unsatisfactory Results: The unsatisfactory rate for Pap test specimens has changed little over time, ranging from 0.3% in 2000 to 0.6% in 2012.

Laboratory Capacity – Cytology Turnaround Time: In 2012, the median cytology turnaround time was 12 days, a three-day decrease from the median in 2009. Most Pap tests in 2012 (90.0%) were processed within 21 days.

Positive Predictive Value for CIN III/AIS and Cancer: In a three-year period (2009–2011), 4.6% of women who had an abnormal Pap test followed by colposcopy or cervical surgery were diagnosed with CIN III/AIS or invasive cervical cancer. Most of these women had CIN III/AIS, while less than 0.5% had invasive cervical cancer. The goal of cervical cancer screening is to identify pre-invasive disease. These data show that pre-invasive disease (CIN III/AIS) is largely what is identified by the Pap test.

Screening History in Cases of Invasive Cervical Cancer: More than half of women diagnosed with invasive cervical cancer (54.6%) in 2009–2011 were either under-screened (had not completed a Pap test in more than three years) or never-screened. In addition, 45.4% of women diagnosed with invasive

cervical cancer *had* been screened in the previous three years.

CIN III/AIS Pre-Cancer Detection Rate: The CIN III/AIS detection rate remained steady from 2009 to 2011, ranging from 20.4 to 22.6 per 10,000 women. For every 10,000 women 20 to 69 years of age screened in 2011, 21.6 were diagnosed with CIN III/AIS.

Diagnostic Follow-Up

Follow-Up of Unsatisfactory Cytology: In 2011, 37.4% of women ages 20 to 69 had follow-up within six months after an unsatisfactory result. The lowest follow-up rates were in women ages 60 to 69 (27.7%).

Follow-Up of Low-Grade Abnormal Cytology: In 2011, 74.4% of women received follow-up within nine months after a low-grade abnormal Pap test result (ASCUS and LSIL).

Follow-Up of High-Grade Abnormal Cytology: In 2011, 58.1% of women 20 to 69 years of age received follow-up within three months after a high-grade abnormal Pap test result, which increased to 71.1% at four months and 80.9% at six months.

Colposcopy – New and Follow-Up Cases: In 2012, 57.6% of all colposcopy visits in Ontario were new cases. The percentages of new and follow-up cases varied by LHIN.

Colposcopist Annual Colposcopy Volume: In 2011, 88.6% of physicians met the Cancer Care Ontario (CCO) standard (that is, performed a minimum of 100 colposcopies, including a minimum of 25 new cases, each year).

Primary Care

Participation, Retention and Follow-Up of High-Grade Lesions in Patient Enrolment Models (PEMs): In 2009–2011, 71.5% of women enrolled with a physician in a PEM practice were screened for cervical cancer, which is 31% higher than for women

not enrolled with a physician in a PEM practice (40.9%) and 6.6% higher than the provincial rate (64.9%).

SUMMARY

The OCSP was launched in 2000 with an aim to reduce incidence and mortality for cervical cancer through an organized screening program and to improve the capacity of primary care to be highly engaged in comprehensive cervical cancer screening (*Appendix A*).

The program has continued to evolve. A legal and regulatory framework was established to allow identification and follow-up of the target population. An information management system was also developed and is being used to invite eligible women in Ontario to be screened, inform them of their screening test results and remind them to get screened when they are due.

In addition, promotional efforts targeting the public and providers have raised awareness of the program and have encouraged participation. Furthermore, in 2012, CCO's clinical guidelines for cervical cancer screening were updated to optimize screening for women, while balancing its associated benefits and harms.

Although this report does not capture data following the 2012 clinical guidelines change, it expands considerably on the previous report, providing a more complete picture of cervical cancer screening in Ontario with additional indicators of program performance. Socio-demographic factors, such as neighbourhood income quintile and neighbourhood percent immigrant, have been calculated for most indicators. Studies have shown that the burden of cervical cancer is higher in disadvantaged women in the population.^{4,5,6} Moreover, screening participation tends to be lower in certain sub-populations of

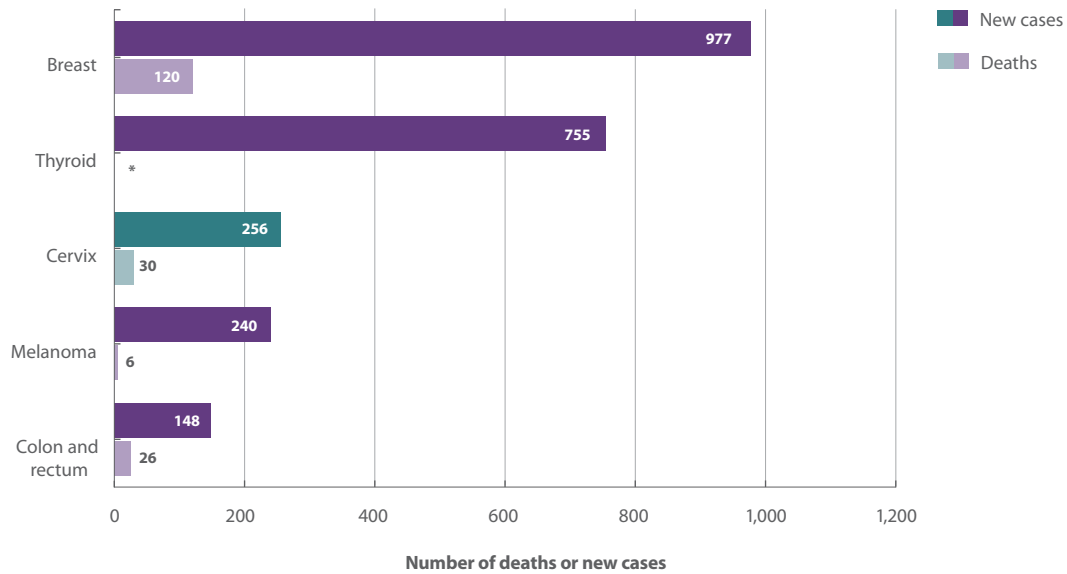
women.^{7,8,9} The data in this report will help support efforts to engage with these sub-populations to further reduce the burden of cervical cancer on women and their families.

In the future, the OCSP will focus on increasing screening participation and retention, improving diagnostic follow-up rates for women with abnormal screening test results and continuing to improve quality throughout the screening process.

Burden of Disease

FIGURE 1

Number of deaths and new cases for the most common cancers in Ontario females 20 to 44 years of age, 2010



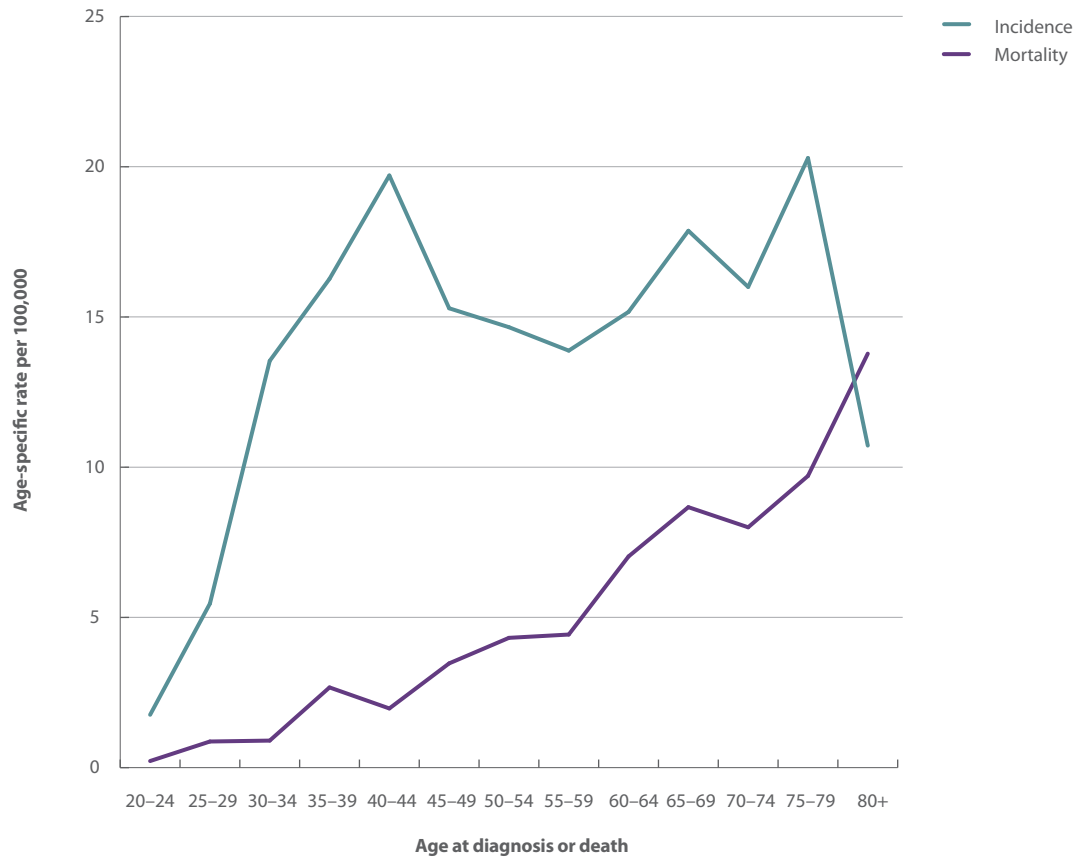
Note: *Statistic not displayed due to fewer than 6 deaths.

Data Source: Ontario Cancer Registry

Cervical cancer is the third most common type of cancer in Ontario women 20 to 44 years of age (after breast and thyroid cancer) and the second most common cause of cancer death (after breast cancer).

FIGURE 2

Cervical* cancer age-specific incidence and mortality rates[†], by age group, Ontario, 2010



Note: *Cervix uteri: ICD-0-3 C53 (incidence); ICD-10 C53 (mortality).

[†]Calculated with hysterectomy-corrected population at risk.

Data Source: Ontario Cancer Registry

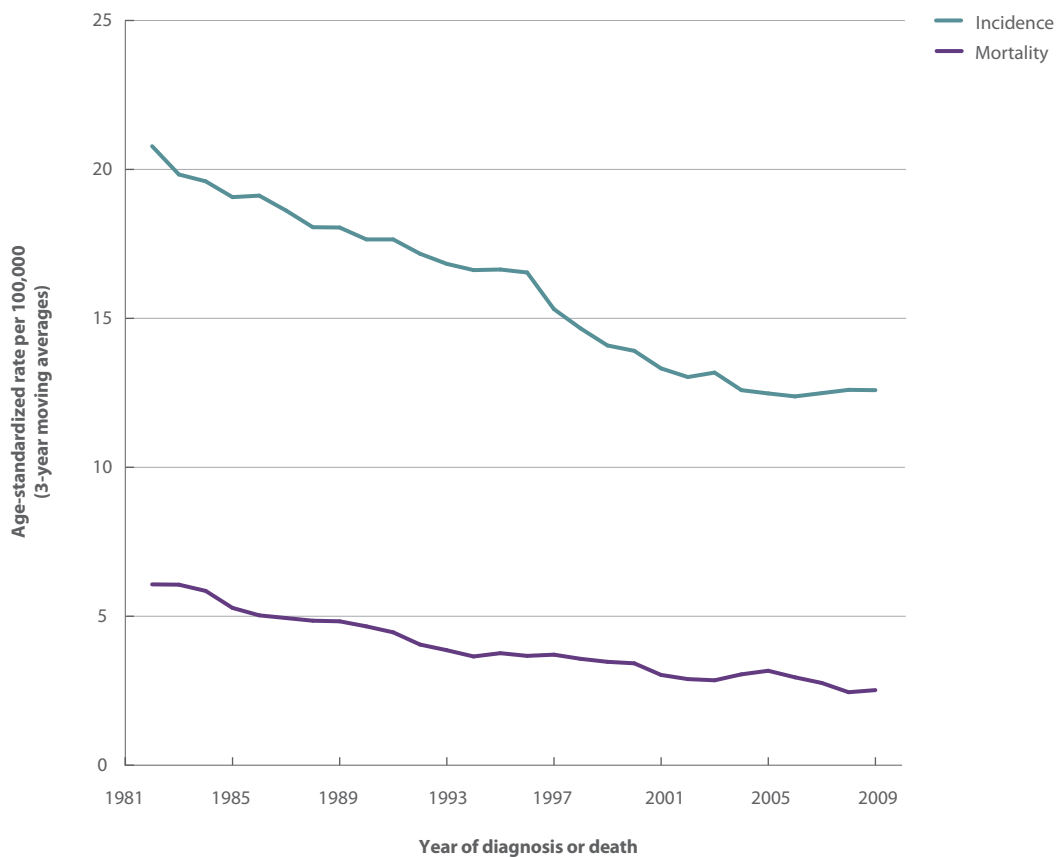
Cervical cancer incidence is lowest in women 20 to 29 years of age and higher in older women. The median age at diagnosis is 47, much younger than for many other cancers. Mortality rises gradually with age, with the median age at death being 60.

Ontario's cervical cancer incidence rates are mid-way between the lowest and highest rates for the provinces.¹

Ontario's and Canada's rates of cervical cancer are similar to rates in the U.S., Australia and New Zealand, and lower than rates in some European countries. Cervical cancer is more prevalent in parts of the world where screening for pre-cancerous cervical lesions is not widely available.¹⁰

FIGURE 3

Age-standardized cervical* cancer incidence and mortality rates[†], ages 20 to 69, Ontario, 1981–2010



Note: *Cervix uteri: ICD-0-3 C53 (incidence); ICD-10 C53 (mortality).

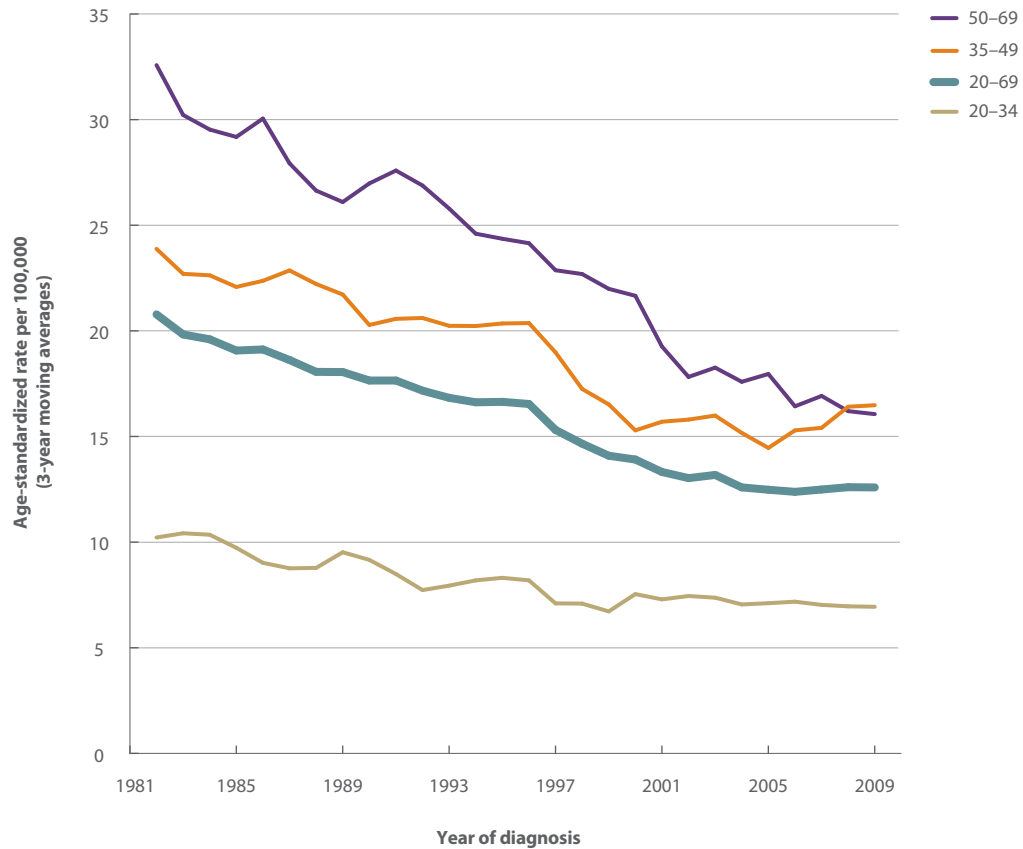
[†]Calculated with hysterectomy-corrected population at risk.

Data Source: Ontario Cancer Registry

Age-standardized cervical cancer incidence in women aged 20 to 69 fell by 2.0% per year, from 21.1 per 100,000 in 1981 to 12.8 per 100,000 in 2010. Mortality rates showed a bigger decline of 3.1% per year, from 5.8 per 100,000 in 1981 to 2.8 per 100,000 in 2010.

FIGURE 4

Age-standardized cervical* cancer incidence rates†, by age group, Ontario, 1981–2010



Note: *Cervix uteri: ICD-0-3 C53.

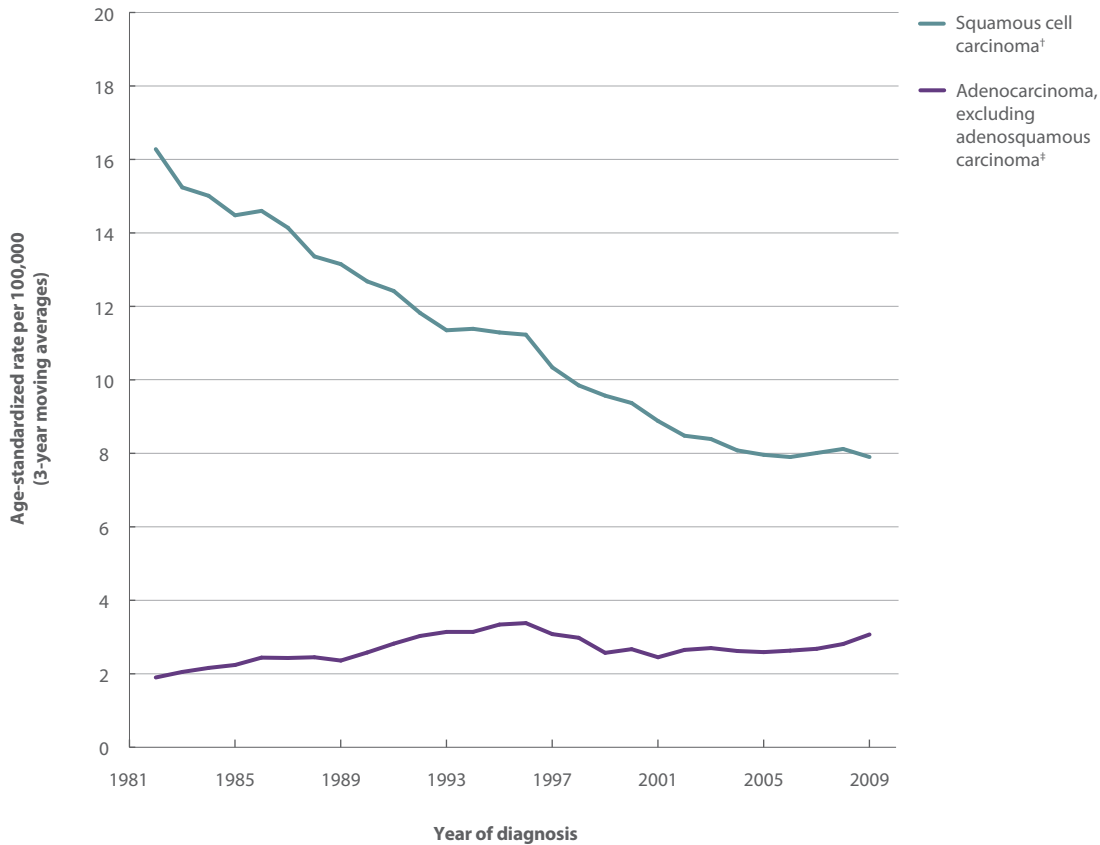
†Calculated with hysterectomy-corrected population at risk.

Data Source: Ontario Cancer Registry

Cervical cancer incidence rates are highest in older age groups. The rate declined significantly between 1981 and 2010 by 1.4% per year in women ages 20 to 34. The rate for women ages 35 to 49 declined significantly by 2.1% per year between 1981 and 2006 and then increased to 2010, although this recent increase is not statistically significant. Incidence declined at 2.6% per year in women ages 50 to 69.

FIGURE 5

Age-standardized cervical* cancer incidence rates,† by morphology subgroup‡, ages 20 to 69, Ontario, 1981–2010



Note: *Cervix uteri; ICD-0-3 C53.

†Calculated with hysterectomy-corrected population at risk.

‡Squamous cell carcinoma: ICD-0-3 morphology codes 8050–8078, 8083–8084; Adenocarcinoma, excluding adenosquamous carcinoma: ICD-0-3 morphology 8140–8141, 8190–8211, 8230–8231, 8260–8263, 8310, 8380, 8382–8384, 8440–8490, 8571–8574, 8576.

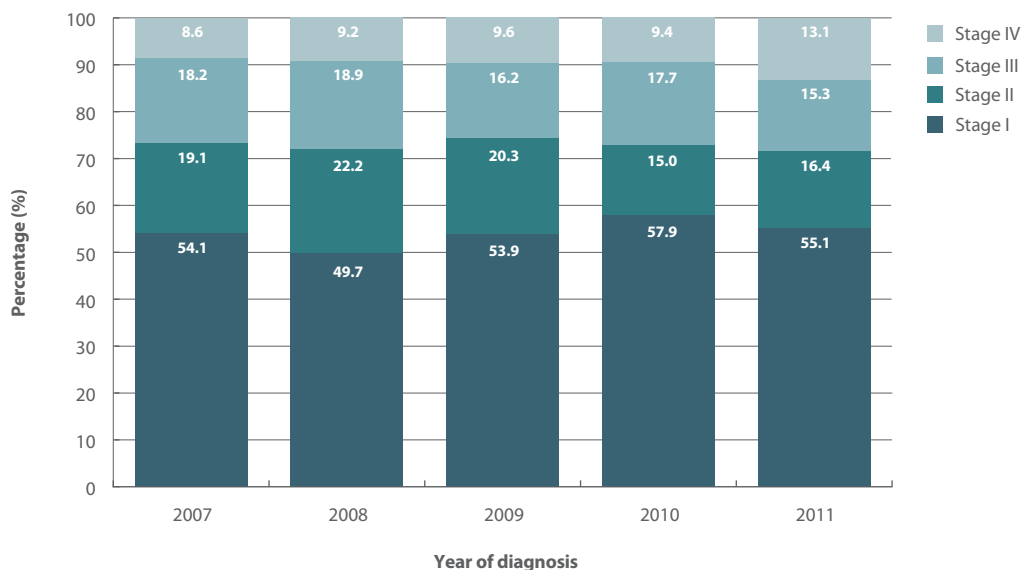
Data Source: Ontario Cancer Registry

Incidence rates of squamous cell carcinoma of the cervix, the most common morphologic subgroup, declined by 2.8% per year between 1981 and 2010. Rates of adenocarcinoma rose by 4.4% per year between 1981 and 1996, stabilized and then increased between 2000 and 2010 by 2.7% per year.

The decline in squamous cell carcinoma of the cervix is largely due to widespread screening with the Pap test. Pap tests are less effective in detecting pre-invasive glandular lesions of the cervix than squamous cell carcinoma and have limited impact in preventing adenocarcinoma.¹¹

FIGURE 6

Stage of diagnosis for cervical cancer patients diagnosed from 2007–2011, Ontario



Data Sources: Ontario Cancer Registry, Collaborative Staging Database

Of the cervical cancers that were staged, over half were diagnosed at an early stage (stage I). The data in the figure shows variability in the percentage of population-stage distribution of cervical cancer diagnosed from 2007 to 2011. *Figure 6* shows that over 50% of cervical cancer patients were being diagnosed at stage I, with almost equal proportions

of cervical cancer patients being diagnosed in stages II to IV. In 2011, there were equal proportions of women with stage III and IV disease. It is not clear if this is related to use of more aggressive surgical staging, use of positron emission tomography (PET) scans, or more completeness and quality of the data. In 2011, 92.4% of cervical cancers were staged.¹²

Risk Factors for Cervical Cancer

The necessary cause of virtually all cervical cancers and their precursors is persistent infection with high-risk (oncogenic) human papillomavirus (HPV) types, especially types 16 and 18, which are implicated in the development of 70% of cervical cancer cases (other oncogenic HPV types include 31, 33, 34, 45, 52 and 58).^{13,14,15,16} HPV is transmitted through intimate sexual contact and is common among sexually active women. Most HPV infections resolve spontaneously (i.e., go away on their own without medical intervention).

The probability of HPV infection increases among women and men who have a high lifetime number of partners and early age at first sexual intercourse.¹⁷ The probability that a woman will become infected with oncogenic HPV and her risk of cervical cancer are associated with his or her partner(s') of lifetime partners.^{17,18}

A number of behaviours or exposures act as co-factors among women infected with high-risk HPV that appear to increase the likelihood that cervical cancer will develop. These include smoking, high parity (number of complete births), earlier age at first birth or full-term pregnancy, immunosuppression, long-term use of hormonal contraception and exposure to other sexually transmitted diseases (herpes simplex virus-2 [HSV-2], *Chlamydia trachomatis* and human immunodeficiency virus [HIV]).¹⁹ Some co-factors appear to have different impacts on the risk of developing adenocarcinoma versus squamous cell carcinoma.²⁰

Primary Prevention: Vaccination

Virtually all cases of cervical cancer and its precursors are caused by a persistent infection with one or more of the oncogenic types of human papillomavirus (HPV).^{13,14,15,16} HPV immunization can prevent virus acquisition. HPV immunization of pre-adolescent and adolescent females who are HPV-naïve is likely to be effective in reducing cervical cancer incidence and mortality, and is cost-effective when compared with screening alone. Three doses of the vaccine are recommended for complete protection.

Ontario introduced a voluntary, publicly-funded, school-based HPV immunization program for grade 8 girls, which was implemented in the 2007/2008 school year. The school-based HPV immunization program is administered by the province's public health units (PHUs). Starting in September 2012, girls in grades 9 to 12 who did not receive or did not complete the three-dose HPV immunization in grade 8 can receive the vaccine free of charge until the end of grade 12.²¹

Based on a survey of PHUs, estimated HPV immunization coverage was 51% (2007/2008), 58% (2008/2009) and 59% (2009/2010), with large variation by health unit.²² These findings likely underestimate the true coverage achieved by the Ontario program because not all health units were able to report on HPV vaccine coverage for extended eligibility doses (i.e., extended eligibility refers to completion of the three-dose series in grade 9). While the coverage appears to be increasing over time, the 59% rate for 2009/2010 is less than optimal.

Vaccinated women must continue to be screened for cervical cancer because current vaccines target only two of the most common oncogenic types of HPV (HPV types 16 and 18), which together are implicated in the development of about 70% of cervical cancer cases.

Secondary Prevention: Ontario Cervical Screening Program

EVIDENCE FOR SCREENING

Screening is the application of a test, examination or other procedure to an asymptomatic target population to distinguish between those who may have the disease and those who probably do not. Screening for cervical cancer aims specifically to prevent this disease by identifying and removing pre-cancerous changes and to reduce cervical cancer-related deaths by finding this disease at an early stage when it is easier to treat.

The efficacy of cervical cancer screening with cytology was never tested in a randomized controlled trial. Effectiveness of cervical cancer screening was shown in observational studies and studies relating trends in cervical cancer incidence and mortality over time after screening with the Pap test was introduced. These observational studies demonstrated long-term declines in cervical cancer incidence and mortality due to screening. For example, cervical cancer incidence and mortality have been reduced by up to about 80% where the cytology screening quality, coverage and follow-up of women are high.²³

While the role of cervical screening is to decrease cervical cancer incidence and mortality, it has limitations. For example, false-negative results can occur, which means that a woman with cervical cancer has a negative or normal Pap test result. It is partly due to false-negatives that screening tests are repeated at regular intervals. Moreover, Pap tests are less effective in detecting pre-invasive glandular lesions of the cervix than pre-invasive squamous cell lesions, and therefore have limited impact in preventing adenocarcinoma.¹¹

Screening also has potential harms. Women who have been screened may have a false-positive result (i.e., a woman without disease has a positive or abnormal screening test). Over-diagnosis of pre-cancerous lesions that may not progress to cervical

cancer may also occur. Women who are diagnosed must undergo further investigations, including cervical biopsies and possibly excisional procedures that are associated with anxiety, discomfort and potential short- or long-term morbidity.^{24,25}

In addition, over treatment of pre-cancerous lesions can cause problems. When loop electrosurgical excision procedure (LEEP), laser biopsy or cone biopsy are conducted, there is an increased risk of bleeding, infection and a two- to three-fold increase in the rate of pre-term delivery.^{26,27,28,29}

Despite these challenges, screening is effective and works best when offered through an organized program that uses quality assurance to maximize screening benefits and minimize harms. An organized screening program should contain the following elements:²³

- 1) an explicit policy with specified age categories, method(s) and intervals for screening
- 2) a defined target population
- 3) a management team responsible for implementation
- 4) a healthcare team for decision and care
- 5) a quality assurance structure
- 6) a method for identifying cancer occurrence in the target population

During the years covered in this report, there was no systematic process for inviting women for cervical screening or follow-up of an abnormal screening test. However, Ontario has implemented four of the six organized screening components; there are current cervical cancer screening guidelines, a defined target population, a provincial management team and healthcare teams for patient care. The program also partially fulfills the mandate for quality assurance and identification of cancer cases.

Program Evaluation Framework and Indicators

The Ontario Cervical Screening Program (OCSF) has adapted the Public Health Agency of Canada (PHAC) quality determinant framework for program evaluation.³⁰ Indicators are limited by available data. While the OCSF currently has access to 87% of cytology data, it does not have complete histology and other data. Therefore, the OCSF reports partial information for pre-invasive disease (cervical intraepithelial neoplasia III or CIN III/adenocarcinoma in situ or AIS) and invasive cervical cancer but does not have access to cervical disease (CIN I and CIN II), which better reflects the burden of disease. These data will be included in future reports. Indicators are grouped into four domains: coverage, screening test, diagnostic follow-up and primary care.

This program report builds on the previous one, published in 2011, updating the indicators previously presented and expanding to include nine new indicators.

I. Coverage

- Participation Rate
- New Participant Rate (NEW)
- Retention Rate

II. Screening Test

- Abnormal Result Rate
- Abnormal Cytology Results
- Performance of Screening – Unsatisfactory Results
- Laboratory Capacity – Cytology Turnaround Time
- Positive Predictive Value for CIN III/AIS and Cancer (NEW)
- Screening History in Cases of Invasive Cervical Cancer
- CIN III/AIS Pre-Cancer Detection Rate (NEW)

III. Diagnostic Follow-Up

- Follow-Up of Unsatisfactory Cytology (NEW)
- Follow-Up of Low-Grade Abnormal Cytology (NEW)

- Follow-Up of High-Grade Abnormal Cytology (NEW)
- Colposcopy – New and Follow-Up Cases (NEW)
- Colposcopist Annual Colposcopy Volume (NEW)

IV. Primary Care

- Participation, Retention and Follow-Up of High-Grade Lesions in Patient Enrolment Models (PEMs) (NEW)

The following analyses focus on screening in Ontario screen-eligible women 20 to 69 years of age. *Appendix C* provides methodology details. All indicators were assessed over time, by region and by socio-demographic factor (e.g., age, neighbourhood income quintile, rural or urban residence, neighbourhood percent immigrant and size of the community of residence). These univariate analyses are merely observations that may be affected by multiple socio-demographic variables. Regional variation is analyzed by Local Health Integration Network (LHIN). LHINs are Ontario's regional health authorities and are responsible for planning, funding and managing health services in their communities.

For a map of Ontario's LHINs, visit <http://www.lhins.on.ca/FindYourLHIN.aspx>.

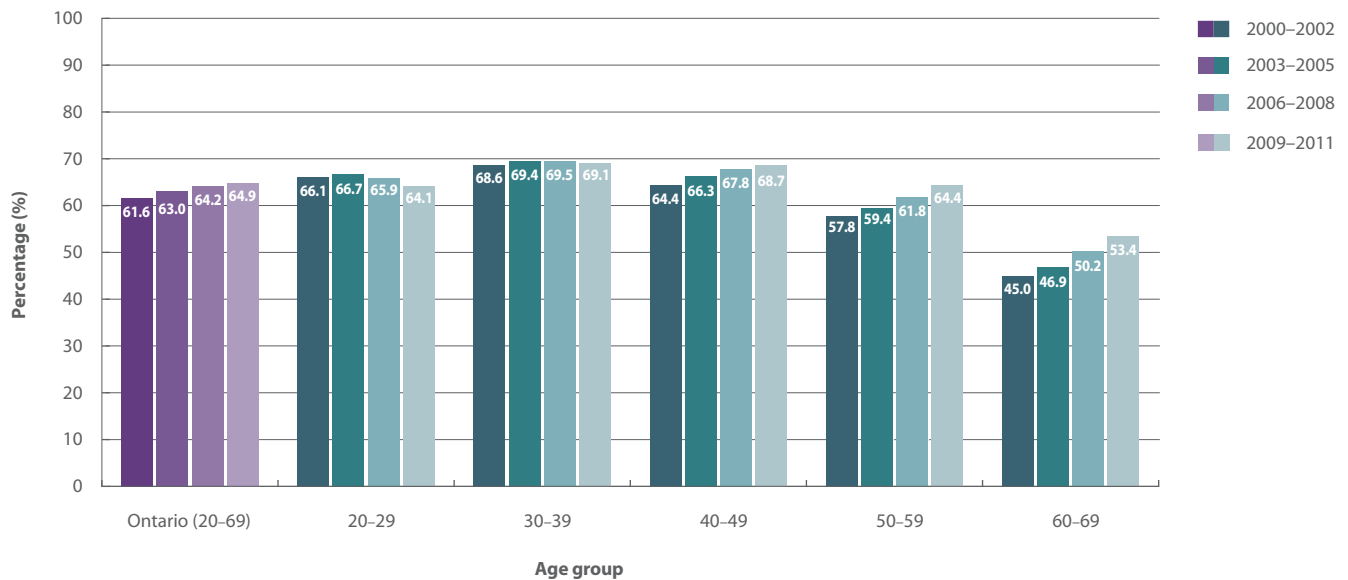
Note that numbers represented in the following tables, figures and text have been rounded to one decimal place. As a result, some numbers may not add up to the expected value.

I. COVERAGE

PARTICIPATION RATE

FIGURE 7

Percentage of Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a three-year period, 2000–2002 to 2009–2011, by age group and corrected for hysterectomy



Note: The Ontario rate is age-standardized to the 2006 Canadian population.

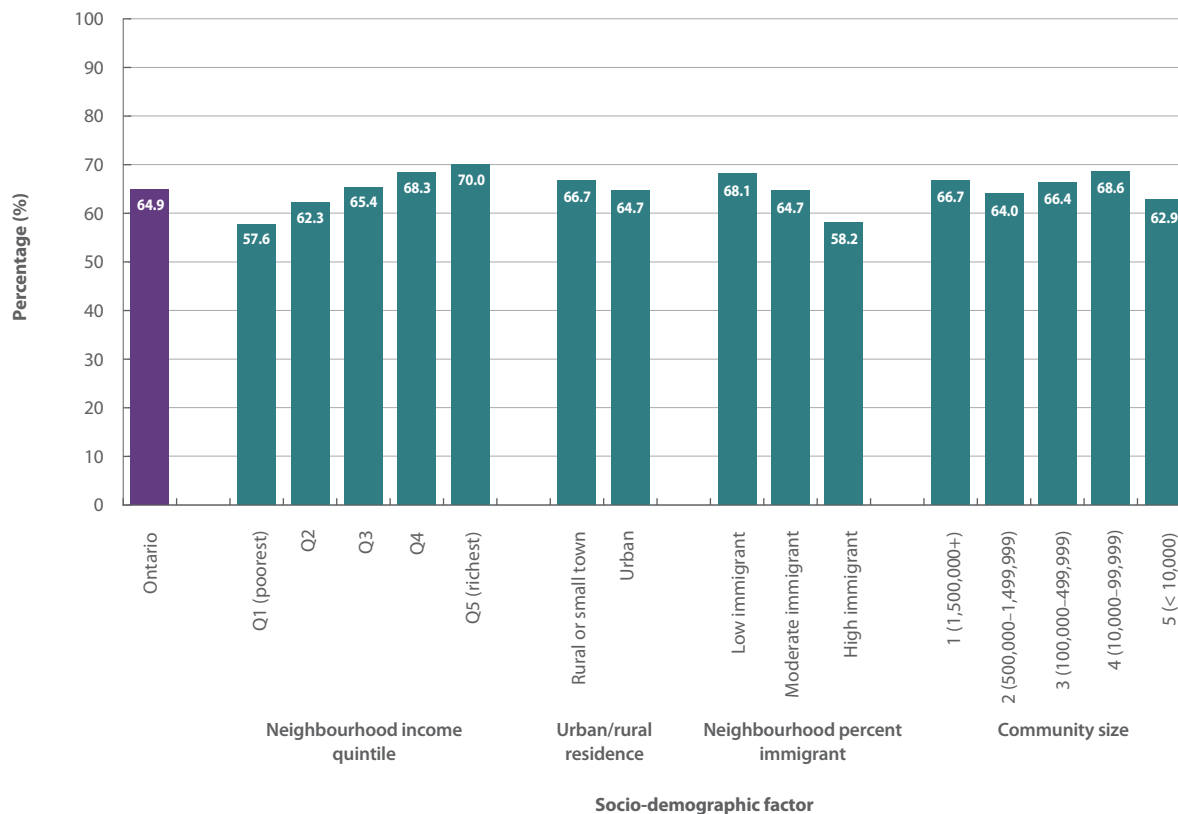
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

Cancer Care Ontario's (CCO's) 2012 cervical screening guidelines recommend that women ages 21 to 69 be screened with the Pap test every three years. Participation was calculated for women age 20 to 69 for the years 2009–2011, prior to the implementation of the 2012 guidelines. In 2009–2011, there were 4.2 million women screened for cervical cancer. Participation in cervical cancer screening among screen-eligible Ontario women has steadily improved between 2000–2002 and 2009–2011, from 61.6% to 64.9%, respectively.

In 2009–2011, screening participation was highest in women 30 to 39 years of age (69.1%) and lowest in women 60 to 69 years of age (53.4%). The same pattern is seen in earlier time periods. The participation rate in each age group increased from 2000–2002 to 2009–2011, with the exception of the youngest age group (ages 20 to 29). While the participation rate has been increasing for women in older age groups, low screening participation among older women is a concern due to their increased risk of developing and dying from cervical cancer.

FIGURE 8

Age-standardized percentage* of Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a three-year period, 2009–2011, by socio-demographic factor and corrected for hysterectomy



Note: *Age-standardized to the 2006 Canadian population.

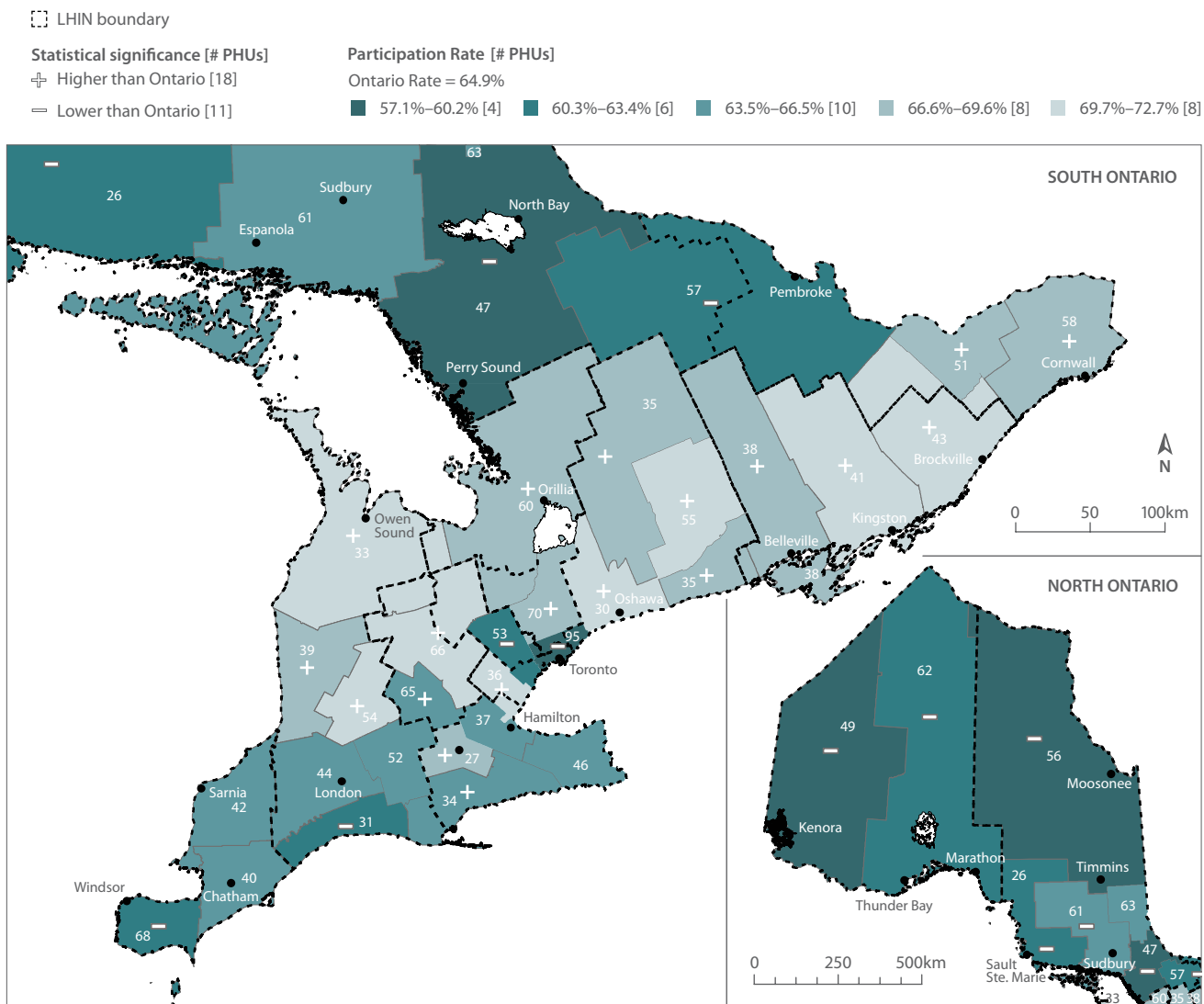
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

In 2009–2011, the participation rate increased as neighbourhood income rose, with 57.6% participation in the lowest income quintile areas and 70.0% in the highest. A slight difference in participation rates was seen between rural and urban areas, with 66.7% in rural areas and 64.7% in

urban areas. Participation was lower in areas with a high percentage of immigrants (58.2%) compared to the rate among women in areas with the lowest percentage of immigrants (68.1%). There was very little difference in women's participation rates based on community size.

FIGURE 9

Age-standardized percentage* of Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a three-year period, 2009–2011, by public health unit (PHU) and corrected for hysterectomy



Note: *Age-standardized to the 2006 Canadian population.
Data Sources: CytoBase, OHIP’s Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

TABLE 1Index of public health units (PHUs) (see *Figure 9*)

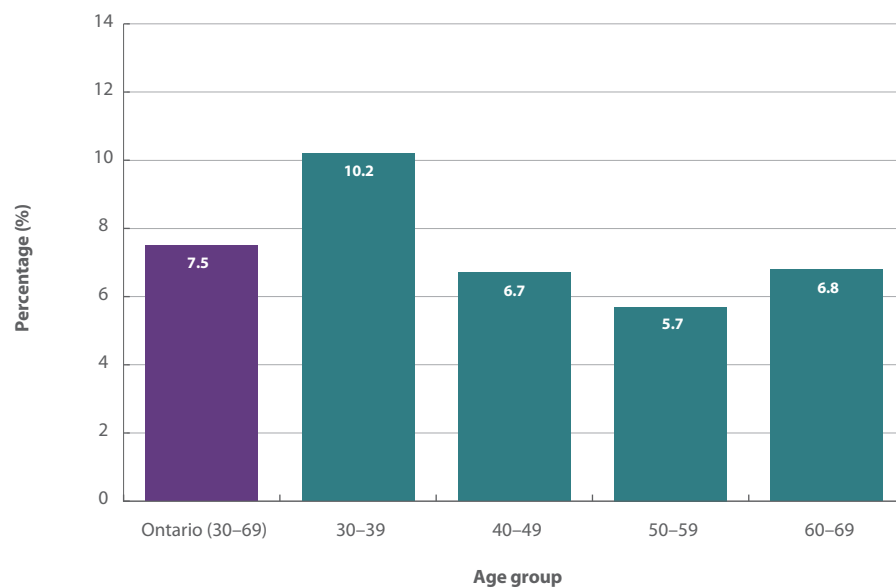
ID	PUBLIC HEALTH UNIT
26	Algoma
27	Brant County
30	Durham Region
31	Elgin-St. Thomas
33	Grey Bruce
34	Haldimand-Norfolk
35	Haliburton, Kawartha, Pine Ridge District
36	Halton Region
37	City of Hamilton
38	Hastings and Prince Edward Counties
39	Huron County
40	Chatham-Kent
41	Kingston, Frontenac and Lennox and Addington
42	Lambton
43	Leeds, Grenville and Lanark District
44	Middlesex-London
46	Niagara Region
47	North Bay Parry Sound District
49	Northwestern
51	Ottawa
52	Oxford County
53	Peel
54	Perth District
55	Peterborough County-City
56	Porcupine
57	Renfrew County and District
58	Eastern Ontario
60	Simcoe Muskoka District
61	Sudbury and District
62	Thunder Bay District
63	Timiskaming
65	Region of Waterloo
66	Wellington-Dufferin-Guelph
68	Windsor-Essex County
70	York Region
95	Toronto

In 2009–2011, Perth District Health Unit had the highest participation rate of all the PHUs at 72.7%. The highest quintile category included Kingston, Frontenac and Lennox and Addington (72.2%); Halton Region (71.4%); Peterborough County-City (71.0%); Wellington-Dufferin-Guelph (70.9%); Durham Region (70.5%); Grey Bruce (70.3%); and Leeds, Grenville and Lanark District (70.0%). Participation rates in 2009–2011 were the lowest in Northern Ontario, where all PHUs had significantly lower rates than the overall Ontario rate (64.9%); the North Bay Parry Sound District Health Unit had the lowest rate (57.1%) of all PHUs in Ontario. In Southern Ontario, the lowest participation rate was seen in Toronto Public Health (59.7%); however, Peel, Elgin-St. Thomas and Windsor-Essex County all had lower rates than the overall Ontario rate (61.3% to 62.3%).

NEW PARTICIPANT RATE (NEW)

FIGURE 10

Percentage of Ontario screen-eligible women 30 to 69 years of age who completed a Pap test for the first time in the last 10 years, 2009–2011, by age group



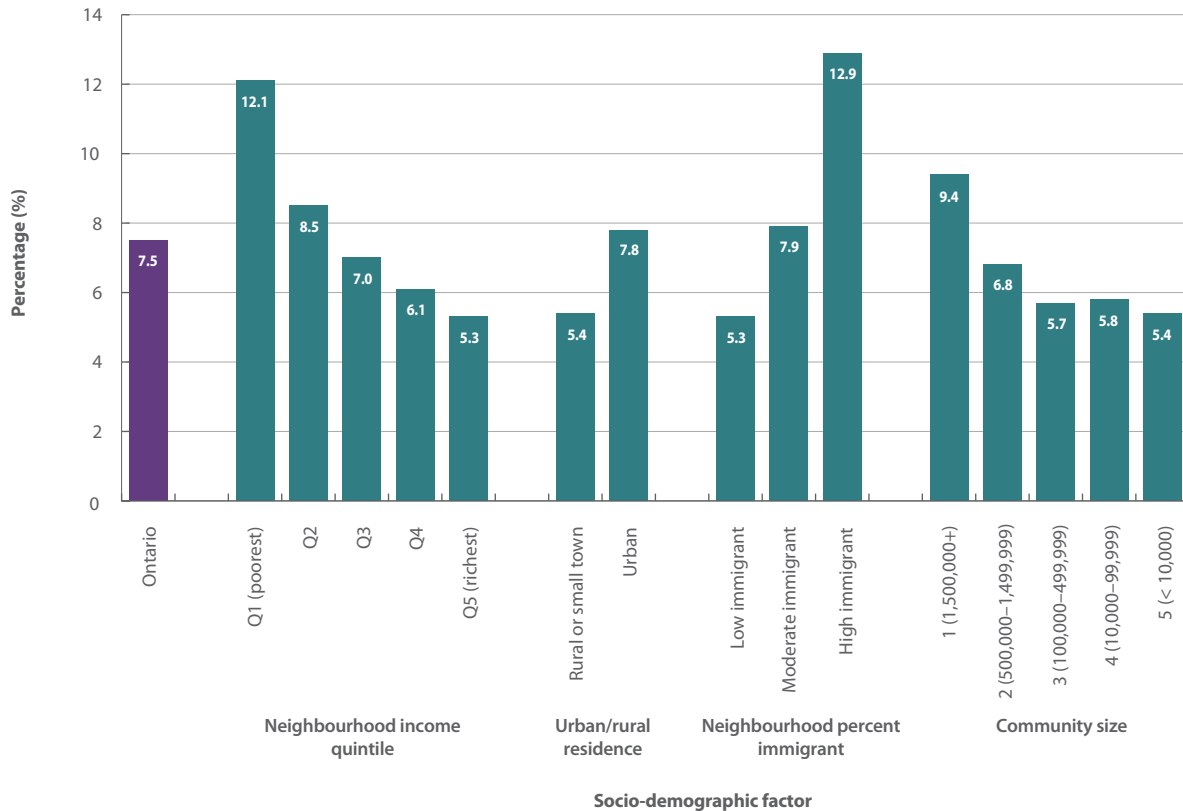
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

The new participant rate indicator evaluates the percentage of screened women who had their first Pap test in the past 10 or more years. Therefore, we begin by looking at 30-year-old women because the earliest age of Pap test in the past 10 years would be 20 years old, according to the 2005 provincial

guidelines. In 2009–2011, the new participant rate was highest in women 30 to 39 years of age (10.2%) and lowest in women 50 to 59 years of age (5.7%). Cervical screening after 39 years of age represents recruitment of women who were under- and never-screened.

FIGURE 11

Percentage of Ontario screen-eligible women 30 to 69 years of age who completed a Pap test for the first time in the last 10 years, 2009–2011, by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

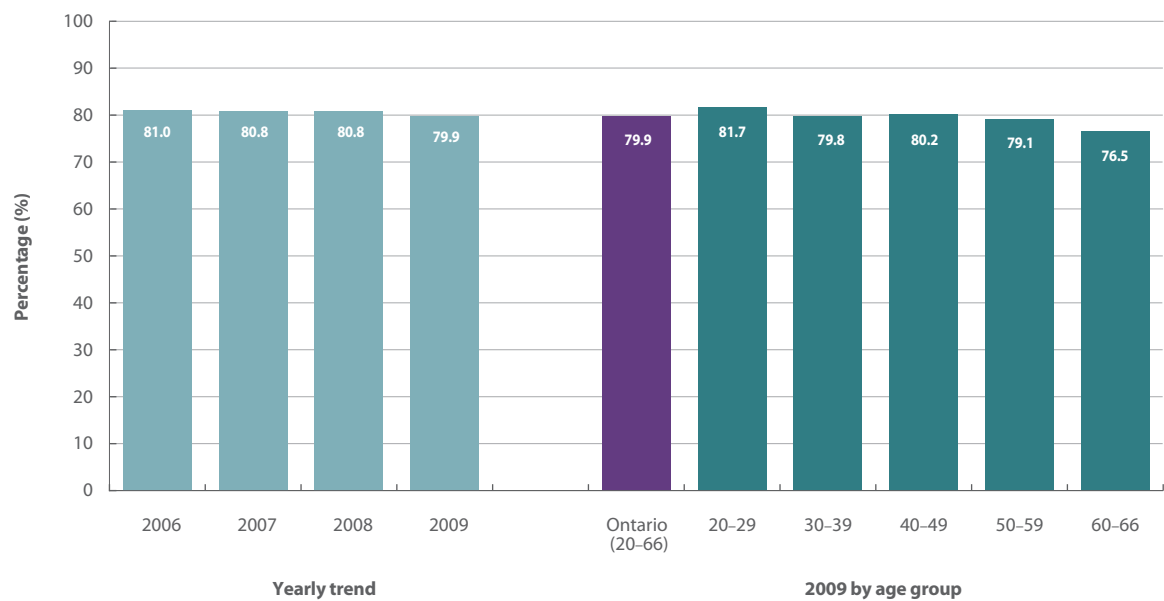
In 2009–2011, the new participant rate was highest in the lowest income quintile neighbourhood and steadily decreased as neighbourhood income quintile rose. The new participant rate also varied widely by urban/rural residence, neighbourhood

percent immigrant and community size. Data by LHIN shows that the new participant rate varied from 5.0% in North Simcoe Muskoka to 10.0% in Toronto Central (see *Appendix F*).

RETENTION RATE

FIGURE 12

Percentage of Ontario screen-eligible women 20 to 66 years of age who had a subsequent Pap test within 36 months of a previous normal Pap test result that took place during a 12-month period (2009) by year (2006–2009) and by age group



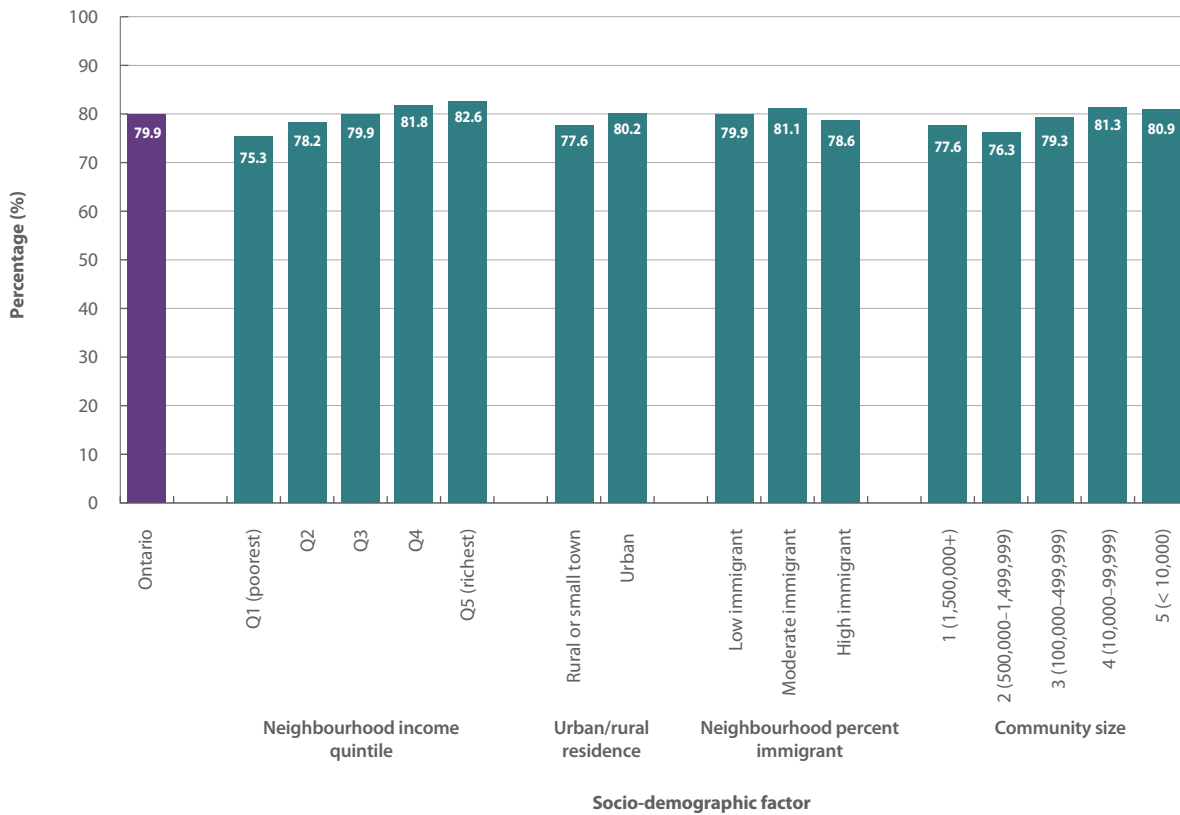
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

It is important to ensure that women return for regular testing at the recommended interval to realize the full benefit of screening in the reduction of cervical cancer incidence and mortality. From 2006 to 2009, the percentage of Ontario women who had a subsequent Pap test within 36 months of a normal Pap test result decreased slightly, from 81.0% in 2006 to 79.9% in 2009. The Ontario retention rate reflects the behaviour of women and providers because the program did not send reminders to women during this reporting period.

In 2009, the retention rate was the highest for women in the youngest age group (ages 20 to 29) at 81.7%, and generally decreased slightly with increasing age; the lowest retention rate was 76.5% for women 60 to 66 years of age, which is similar to the pattern observed in screening participation. Lower screening participation and retention in older women is a concern because cervical cancer risk increases with age. The retention rate for each age group decreased slightly (< 2%) from 2006 to 2009 (data not shown).

FIGURE 13

Percentage of Ontario screen-eligible women 20 to 66 years of age who had a subsequent Pap test within 36 months of a previous normal Pap test result that took place during a 12-month period (2009), by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

In 2009, retention rates increased steadily with rising neighbourhood income, from 75.3% in the lowest income quintile to 82.6% in the highest income quintile. Women living in urban areas had a retention rate of 80.2%, which was 2.6% higher than those living in rural areas (77.6%). Among areas with different percentages of immigrants,

areas with a high percentage of immigrants had the lowest retention rate at 78.6%. Among communities of different sizes, retention was highest in the two largest community sizes at around 81%. LHIN data showed that retention rates varied from 72.9% in North East to 82.7% in Central (see *Appendix F*).

II. SCREENING TEST

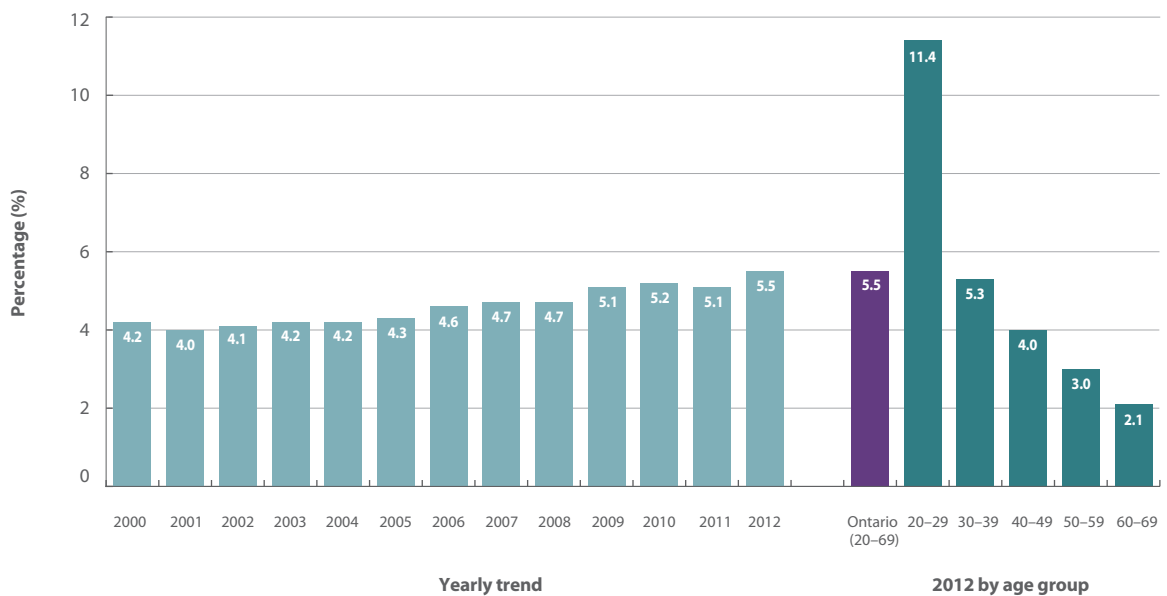
TABLE 2
Cytology test results definitions

CYTOLOGY TEST RESULT	ONTARIO MODIFIED BETHESDA SYSTEM
Unsatisfactory	Unsatisfactory specimen (for evaluation)
Normal	NILM: Negative for intraepithelial lesion or malignancy
Low-grade abnormal	ASCUS: Atypical squamous cells of undetermined significance
	LSIL: Low-grade squamous intraepithelial lesion
High-grade abnormal	AGC: Atypical glandular cells
	ASC-H: Atypical squamous cells, cannot exclude high-grade squamous intraepithelial lesion
	HSIL: High-grade squamous intraepithelial lesion
	AIS: Adenocarcinoma in situ
	CA: Squamous cell carcinoma, adenocarcinoma, other malignancies

In the following analysis, the cervical cytology results were classified as described in *Table 2*.

ABNORMAL RESULT RATE

FIGURE 14
Percentage of Ontario screen-eligible women 20 to 69 years of age who had an abnormal Pap test result in a 12-month period, by year (2000–2012) and by age group



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

Figure 14 shows a slight increase in the percentage of abnormal Pap test results between 2000 and 2012, from 4.2% in 2000 to 5.5% in 2012.

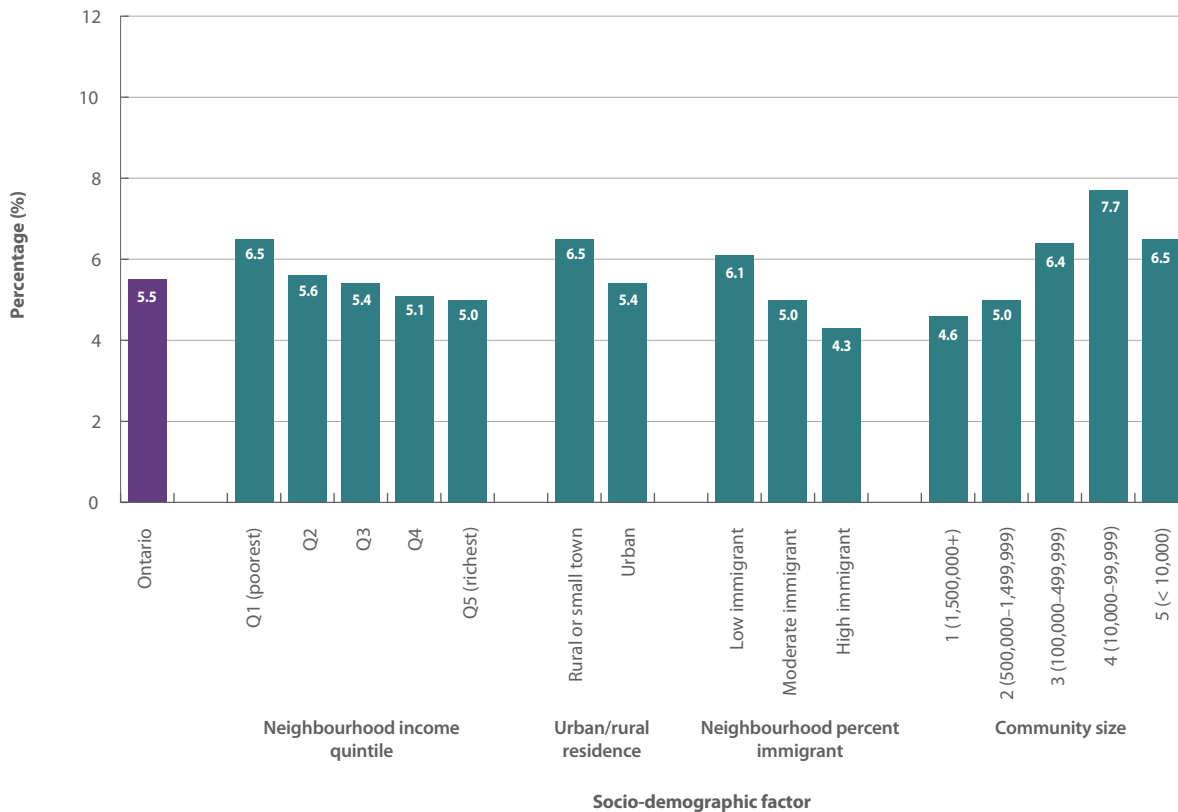
The percentages of abnormal cytology decreased with increasing age, with the highest abnormal rate in women 20 to 29 years of age (11.4%) and the lowest rate in women 60 to 69 years of age (2.1%).

While human papillomavirus (HPV) prevalence is highest in women 20 to 29 years of age, most

HPV infections in this age group are transient and will clear within two years.^{31,32} The higher rate of abnormal Pap tests in women ages 20 to 29 is because the Pap test is unable to discriminate between a transient HPV infection and a true (albeit rare) high-grade preneoplastic lesion.^{31,32} Among older women, abnormal Pap test results are more likely to reflect persistent HPV infections of greater clinical significance than abnormal Pap test results in women ages 20 to 29.

FIGURE 15

Percentage of Ontario screen-eligible women 20 to 69 years of age who had an abnormal Pap test result in a 12-month period, 2012, by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

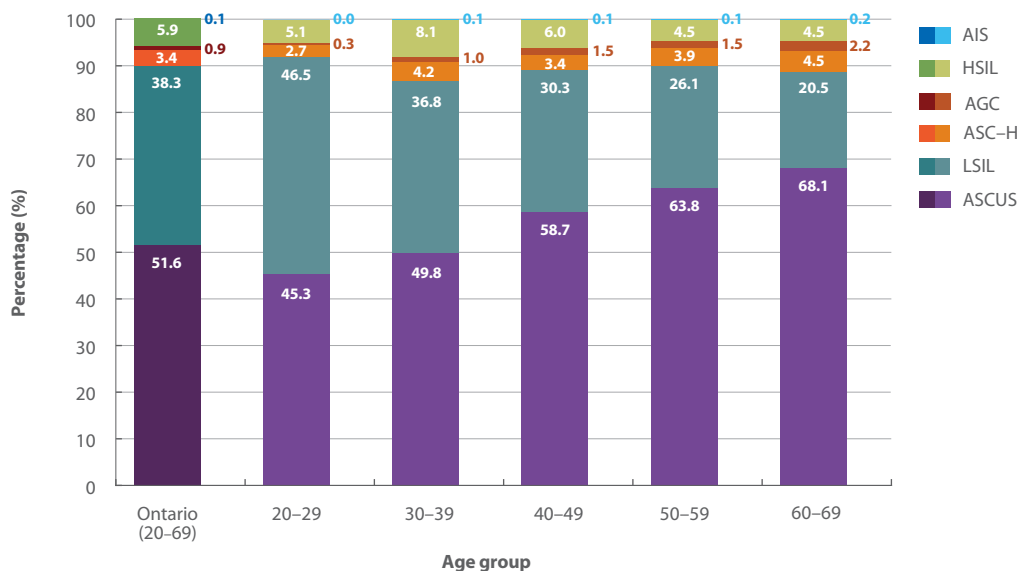
In 2012, a slight decrease in abnormal rates was seen with increasing income. Abnormal cytology rate varied by urban/rural residence, neighbourhood

percent immigrant and community size. Abnormal rates varied from 4.3% in the Central West LHIN to 8.9% in the North West LHIN (see Appendix F).

ABNORMAL CYTOLOGY RESULTS

FIGURE 16

Percentage of Ontario screen-eligible women 20 to 69 years of age by their most severe abnormal Pap test result* in a 12-month period, 2012, by age group



Note: *Does not include cancer cytology because the counts are too small to be reported. It also does not include unsatisfactory or endometrial results.

Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

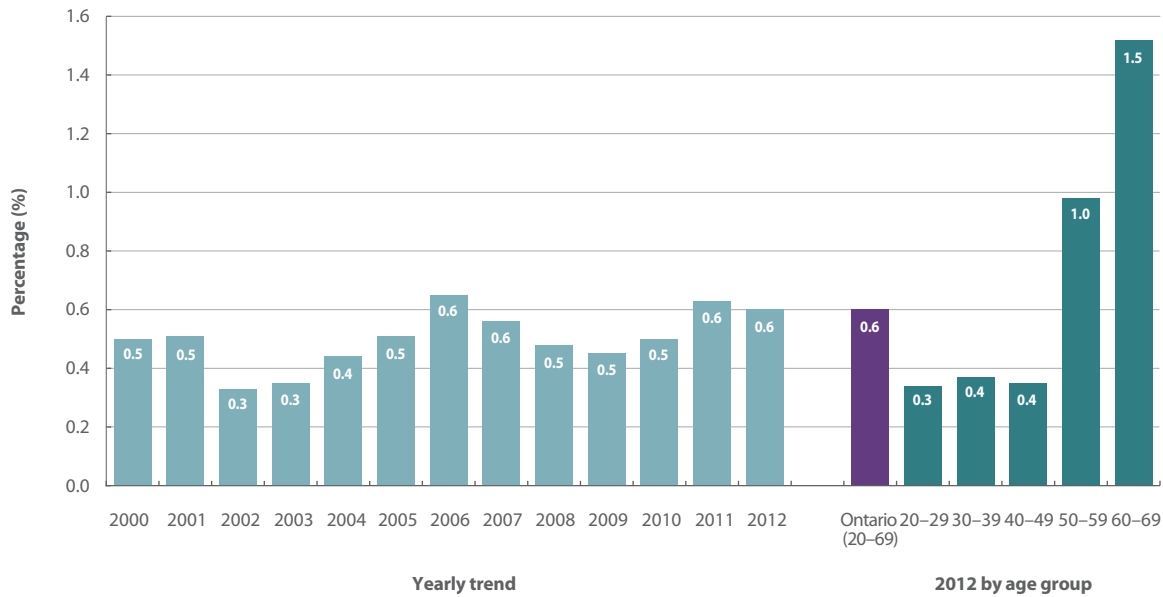
Figure 16 shows that in 2012, of all the abnormal Pap test results, 89.9% were low-grade (51.6% were ASCUS and 38.3% were LSIL). Only 5.9% of abnormal Pap test results were HSIL and 3.4% were ASC-H. Abnormal results differed slightly by age group. The rate of LSIL was the highest in women 20 to 29

years of age (46.5%) and decreased with increasing age. The rate of ASCUS was lowest in women 20 to 29 years of age (45.3%) and increased with age showing the highest rate in women 60 to 69 years of age (68.1%). The highest percentage of HSIL was in women ages 30 to 39 (8.1%).

PERFORMANCE OF SCREENING – UNSATISFACTORY RESULTS

FIGURE 17

Percentage of unsatisfactory Pap test specimens among Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a 12-month period, by year (2000–2012) and by age group



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

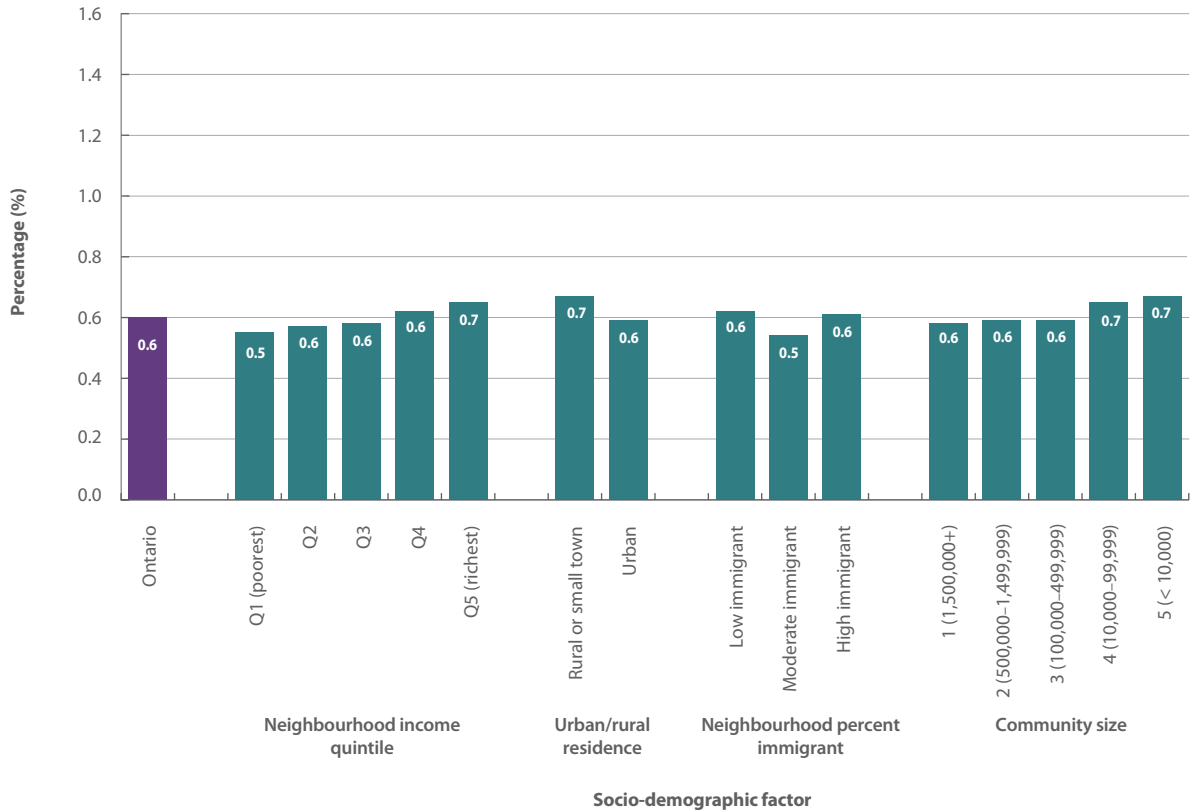
From 2000 to 2012, the percentage of unsatisfactory Pap test specimens among Ontario women was largely stable over time.

In 2012, the percentage of unsatisfactory Pap test specimens increased somewhat with increasing age.

The rate was the highest in women 60 to 69 years of age (1.5%) and lowest in women 20 to 29 years of age (0.3%). Unsatisfactory results are caused by low cellularity or obscuration (i.e., blood, inflammation or poor preservation).

FIGURE 18

Percentage of unsatisfactory Pap test specimens among Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a 12-month period, 2012, by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

In 2012, the percentage of unsatisfactory Pap test specimens showed a slight increase with higher neighbourhood income quintiles. The unsatisfactory rate varied slightly by urban/rural residence,

neighbourhood percent immigrant and community size. The unsatisfactory Pap test specimen rate varied across LHINs from 0.38% in Erie St. Clair to 1.18% in North West (see *Appendix F*).

LABORATORY CAPACITY – CYTOLOGY TURNAROUND TIME

TABLE 3

Time interval in calendar days from the date a Pap test specimen was obtained by a healthcare provider to the date the laboratory report was issued, for Pap tests performed on Ontario screen-eligible women 20 to 69 years of age in a 12-month period, 2009 and 2012

LABORATORY	CYTOLOGY TURN-AROUND TIME IN DAYS			
	2009		2012	
	MEDIAN	90TH PERCENTILE*	MEDIAN	90TH PERCENTILE*
Lab 1	22	35	15	24
Lab 2	25	40	14	19
Lab 3	16	30	18	27
Lab 4	32	43	13	19
Lab 5	17	28	14	24
Lab 6	10	17	–	–
Lab 7	12	16	–	–
Lab 8	7	10	7	11
Lab 9	12	18	11	15
Lab 10	4	8	–	–
Lab 11	14	20	10	16
Lab 12	30	69	17	23
Lab 13	22	29	13	19
ALL TESTS	15	45	12	21

Note: *90th percentile means that 90% of the Pap tests were analyzed within that time period. Laboratories are not arranged in any particular order.

Data Sources: CytoBase, Registered Persons Database

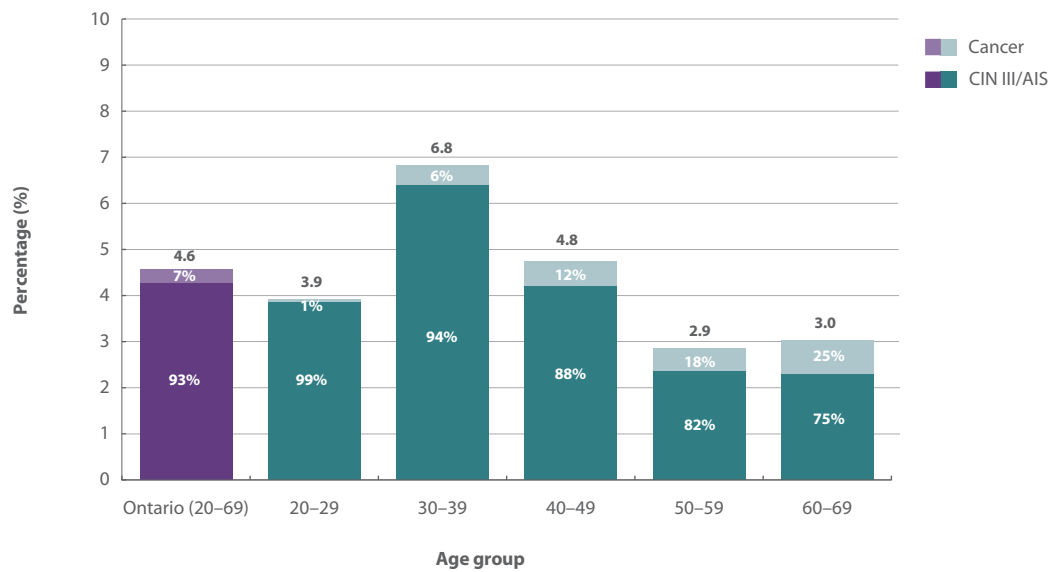
In 2012, the median cytology turnaround time was 12 days, a three-day decrease from the median in 2009. Most Pap tests in 2012 (90.0%) were processed within 21 days, compared to 45 days in 2009. The decrease in the turnaround time between 2009 and 2012 was consistent in almost all labs. The median cytology turnaround time has improved in each LHIN (data not shown).

There is currently no target for cytology turnaround time in Ontario. In the United Kingdom (UK), the National Health Service (NHS) Cervical Screening Programme has required that all women receive their results within two weeks (14 days) of the completed test.³³ If a 14-day turnaround time is used as a benchmark, most Ontario laboratories would have met this performance standard in 2012, as measured by the median. If measured by the 90th percentile, one laboratory would have met this standard.

POSITIVE PREDICTIVE VALUE FOR CIN III/AIS AND CANCER (NEW)

FIGURE 19

Percentage of Ontario screen-eligible women 20 to 69 years of age with a screen-detected invasive cervical cancer or pre-cancer (CIN III/AIS) among those who had an abnormal Pap test result followed by a colposcopy or cervical surgery in a three-year period, 2009–2011, by age group



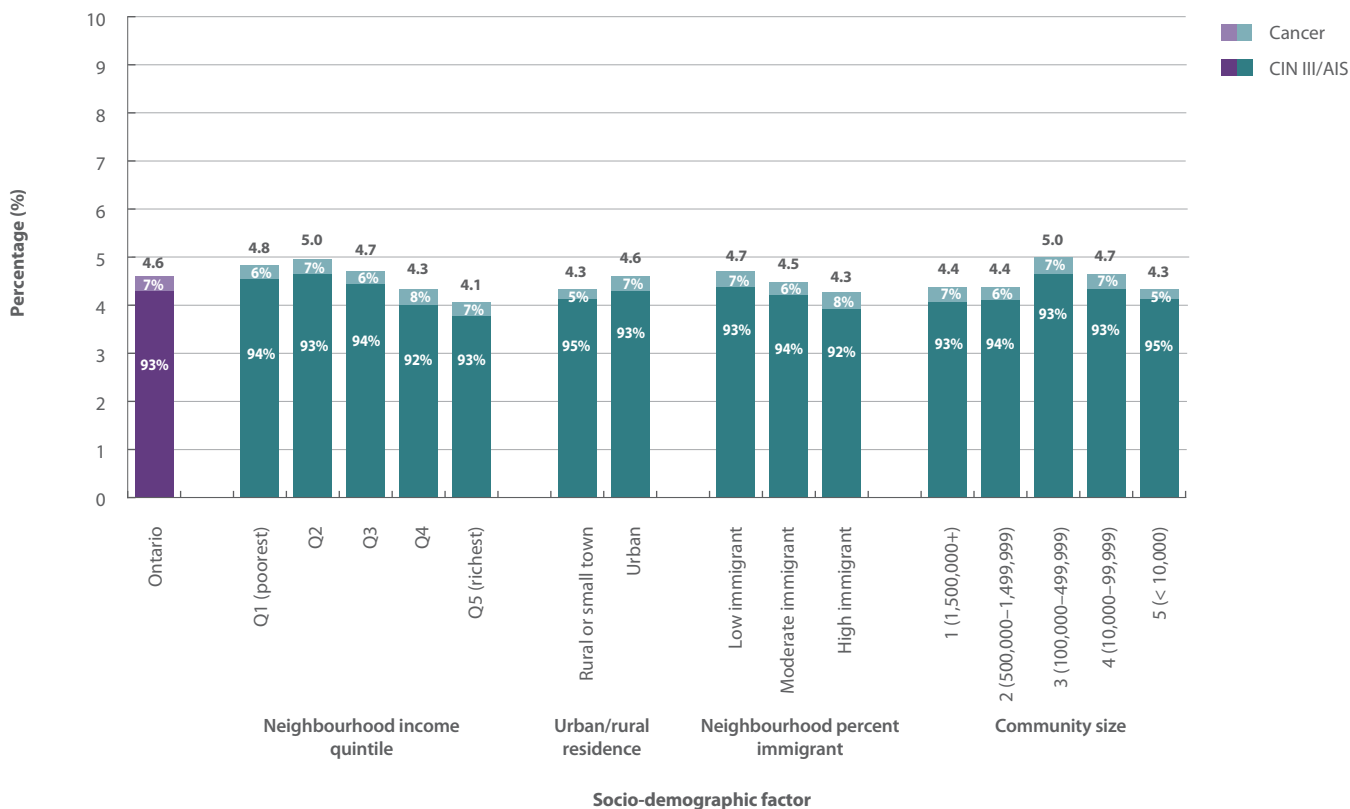
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

In a three-year period (2009–2011), most women who had an abnormal Pap test followed by colposcopy or cervical surgery were diagnosed with CIN III/AIS or pre-invasive disease. A very small percentage of women were diagnosed with cervical cancer. Positive predictive value (PPV) was highest in

women 30 to 39 years of age (6.8%) followed by women 40 to 49 years of age (4.8%). The goal of cervical cancer screening is to identify pre-invasive disease. These data show that pre-invasive disease (CIN III/AIS) is largely what is picked up by the Pap test.

FIGURE 20

Percentage of Ontario screen-eligible women 20 to 69 years of age with a screen-detected invasive cervical cancer or pre-cancer (CIN III/AIS) among those who had an abnormal Pap test result followed by a colposcopy or cervical surgery in a three-year period, 2009–2011, by socio-demographic factor



Note: Only CIN III lesions and adenocarcinomas in situ are included.

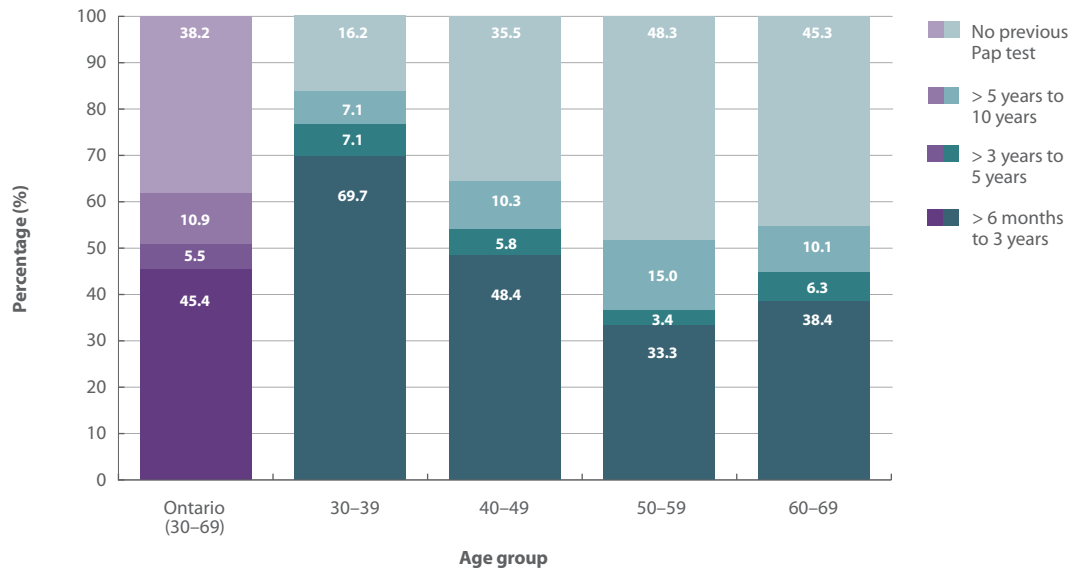
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

When measuring PPV of CIN III/AIS and cervical cancer by socio-demographic factor, most women with abnormal Pap tests were found to have pre-invasive disease (CIN III/AIS). PPV was higher in women living in lower neighbourhood income quintiles and in women living in areas with a low percentage of immigrants.

SCREENING HISTORY IN CASES OF INVASIVE CERVICAL CANCER

FIGURE 21

Percentage of Ontario screen-eligible women 30 to 69 years of age diagnosed with invasive cervical cancer in a three-year period who were screened within a 10-year period prior to diagnosis, 2009–2011, by age group



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

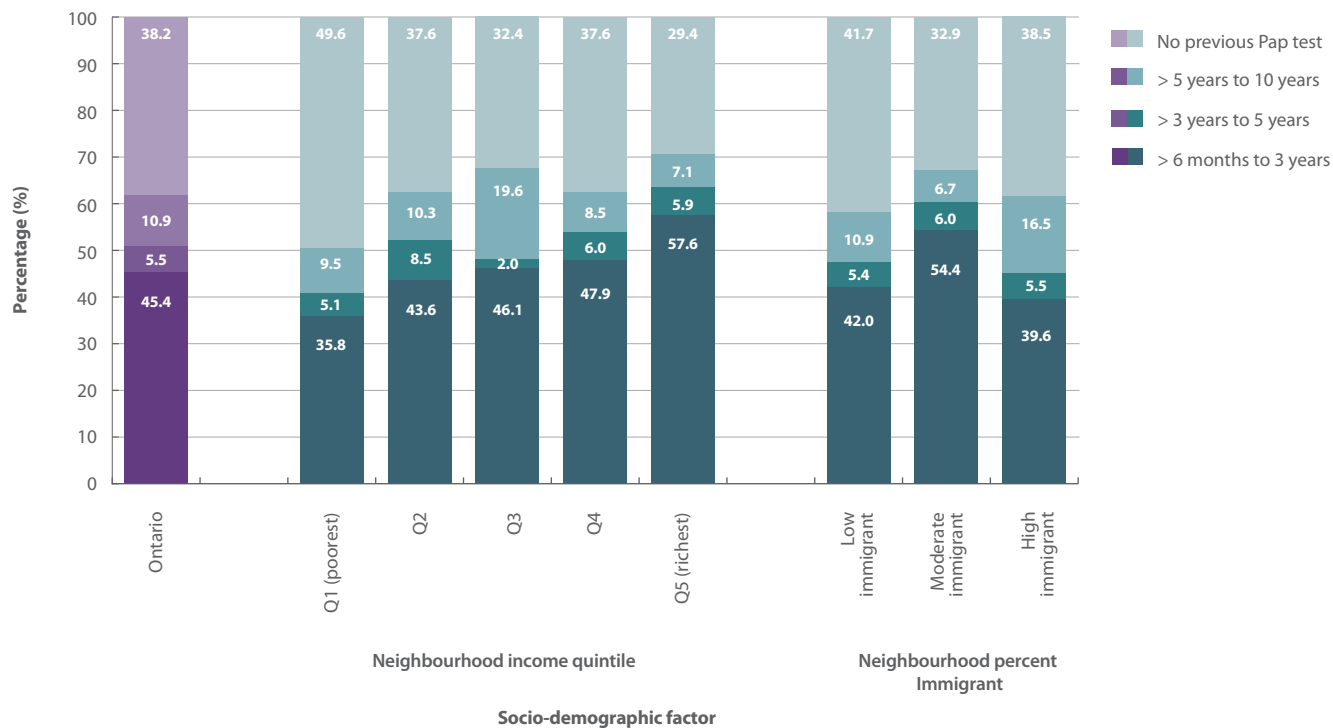
Figure 21 shows that 54.6% of women diagnosed with cervical cancer in 2009–2011 were under- or never-screened (had not completed a Pap test within the three years prior to diagnosis), which is consistent with other reported findings.³⁴ Of the women diagnosed with cervical cancer in 2009–2011, those in the youngest age group had the highest percentage of recent screening (69.7% screened > six months to three years prior to diagnosis) and the lowest percentage of not being screened in the previous 10 years (16.2%). Conversely, women in older age groups diagnosed with cervical cancer had

a lower percentage of recent screening and higher percentage of not being screened in the past 10 years.

Figure 21 also shows that 45.4% of women diagnosed with invasive cervical cancer had completed a Pap test within six months to three years prior to their diagnosis in 2009–2011, which is consistent with other reported findings.³⁵ The results of these Pap tests are not included in this analysis. Unfortunately, colposcopy, histology and other follow-up data are unavailable, which limits inferences from these findings.

FIGURE 22

Percentage of Ontario screen-eligible women 30 to 69 years of age diagnosed with invasive cervical cancer in a three-year period who were screened within a 10-year period prior to diagnosis, 2009–2011, by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

Figure 22 shows that in 2009–2011, almost half (49.6%) of the women diagnosed with cervical cancer who lived in the lowest income quintile neighbourhoods were never screened (had not had a Pap test in the 10 years prior to diagnosis), which was 11% higher than the Ontario rate and 20% higher than women who lived in the highest income quintile.

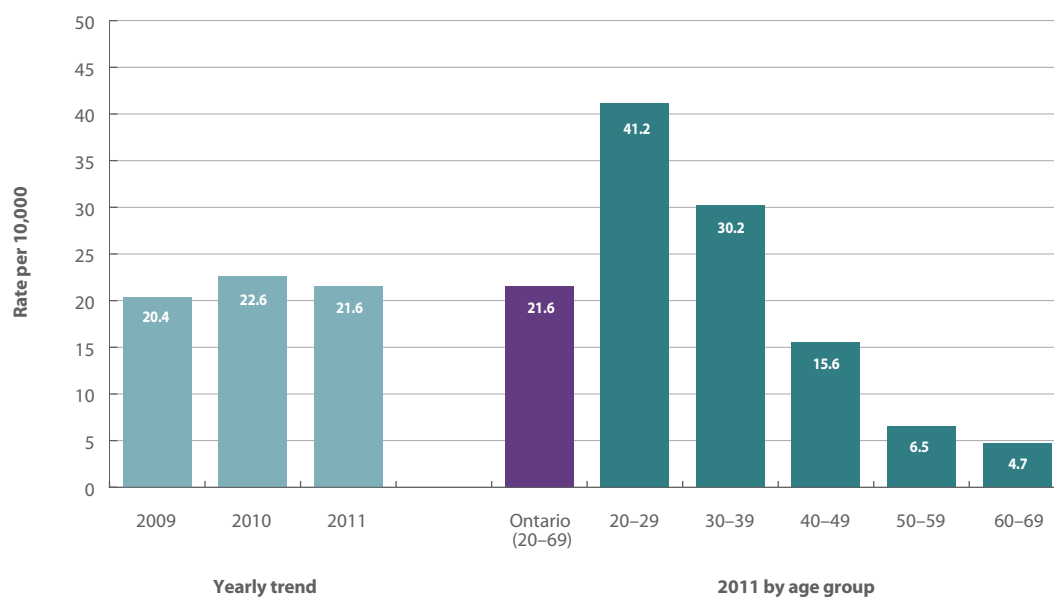
Of the women diagnosed with cervical cancer in 2009–2011, 57.6% of those living in the highest-income quintile areas had been screened (> six

months to three years), which was 12.2% higher than the provincial average. In areas with a high percentage of immigrants, 60.4% of women diagnosed with invasive cervical cancer had been under- or never-screened, compared to a slightly lower rate (58.0%) for women living in areas with a low percentage of immigrants. However, the areas with a moderate percentage of immigrants had a lower percentage of women who had been under- or never-screened prior to their cancer diagnosis (45.6%).

CIN III/AIS PRE-CANCER DETECTION RATE (NEW)

FIGURE 23

Rate per 10,000 Ontario screen-eligible women 20 to 69 years of age with a screen-detected CIN III/AIS pre-cancer cervical lesion among those who were screened using a Pap test in a three-year period, by year (2009–2011) and by age group

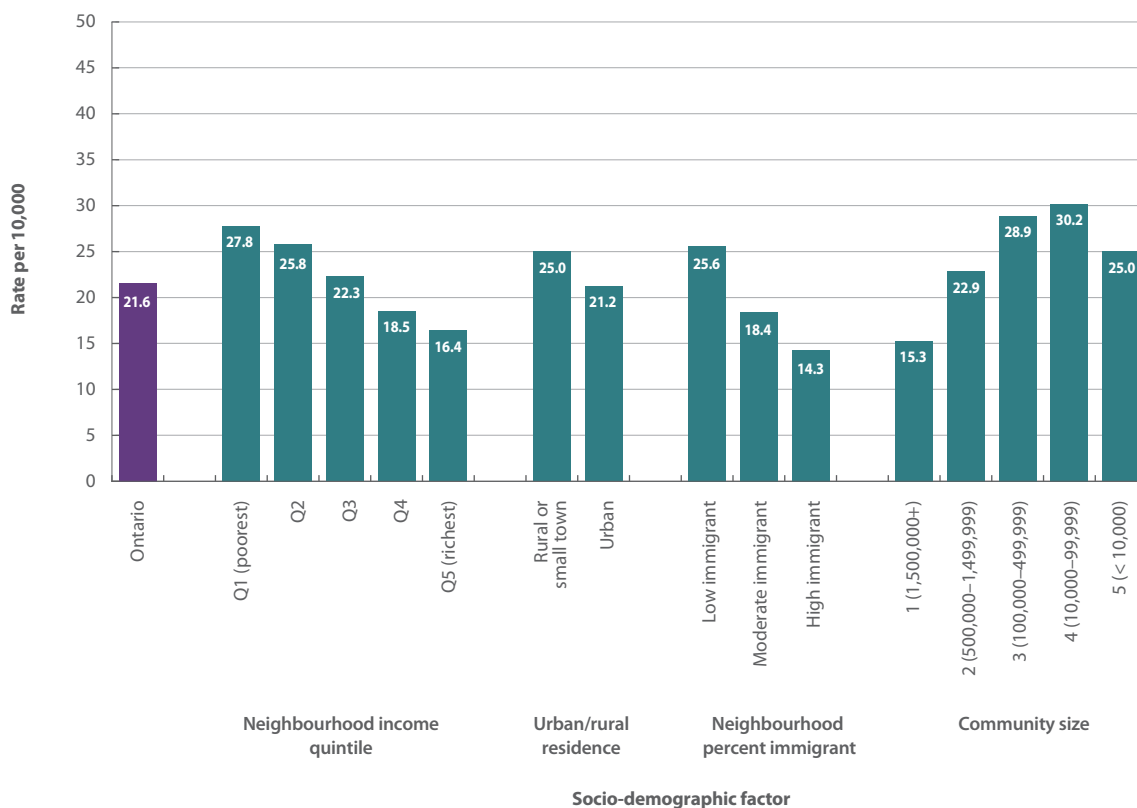


Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

From 2009 to 2011 the CIN III/AIS detection rate remained steady, ranging from 20.4 to 22.6 per 10,000 women. For every 10,000 women 20 to 69 years of age who were screened in 2011, 21.6 were diagnosed with CIN III/AIS. The highest CIN III/AIS detection rate was in women 20 to 29 years of age (41.2 per 10,000) and was lowest in women 60 to 69 years of age (4.7 per 10,000).

FIGURE 24

Rate per 10,000 Ontario screen-eligible women 20 to 69 years of age with a screen-detected CIN III/AIS pre-cancer cervical lesion among those who were screened using a Pap test in a three-year period, 2011, by socio-demographic factor



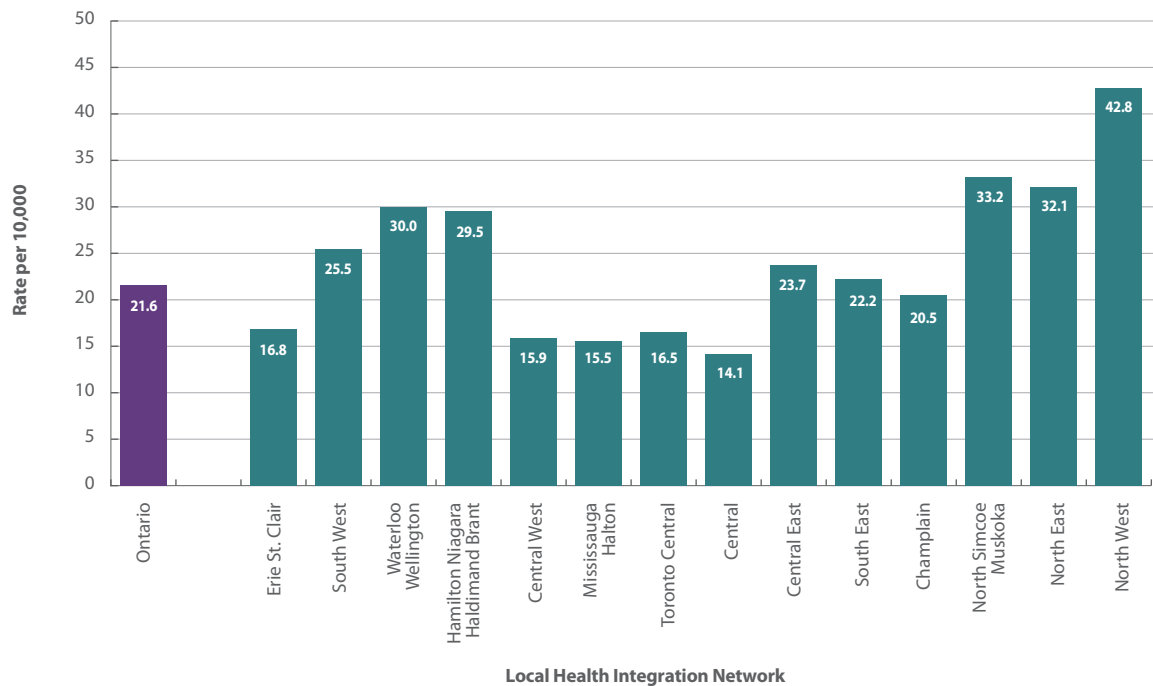
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

In 2011, CIN III/AIS detection rates were highest in women living in the lowest neighbourhood income quintile (27.8 per 10,000) and lowest in those living in the highest income quintile (16.4 per 10,000). Women living in rural areas had a slightly higher cervical pre-cancer detection rate compared to women in urban areas (25.0 versus 21.2 per 10,000).

Cervical CIN III/AIS detection rates decreased as neighbourhood percent immigrant increased, with a rate of 14.3 per 10,000 women in areas with a high percentage of immigrants. Pre-cancer detection rates were highest in the second smallest community size (30.2 per 10,000) and lowest in the largest community size (15.3 per 10,000).

FIGURE 25

Rate per 10,000 Ontario screen-eligible women 20 to 69 years of age with a screen-detected CIN III/AIS pre-cancer cervical lesion among those who were screened using a Pap test in a three-year period, 2011, by Local Health Integration Network (LHIN)



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

In 2011, regional CIN III/AIS detection rates varied widely between 14.1 per 10,000 women in the Central LHIN and 42.8 per 10,000 women in the North West LHIN. The highest CIN III/AIS detection rates were in the North West (42.8 per 10,000), North Simcoe

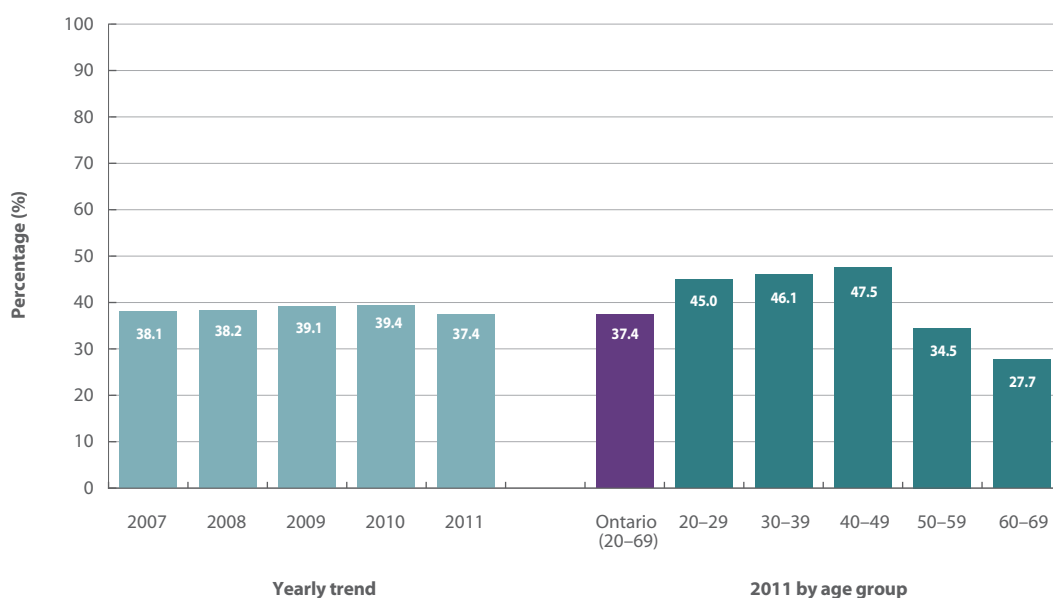
Muskoka (33.2 per 10,000) and North East (32.1 per 10,000) LHINs, while the lowest rates were in the Central (14.1 per 10,000), Mississauga Halton (15.5 per 10,000), Central West (15.9 per 10,000) and Toronto Central (16.5 per 10,000) LHINs.

III. DIAGNOSTIC FOLLOW-UP

FOLLOW-UP OF UNSATISFACTORY CYTOLOGY (NEW)

FIGURE 26

Percentage of Ontario screen-eligible women 20 to 69 years of age with an unsatisfactory Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (not including hysterectomy) within six months of the unsatisfactory screen test result in a 12-month period, by year (2007–2011) and by age group



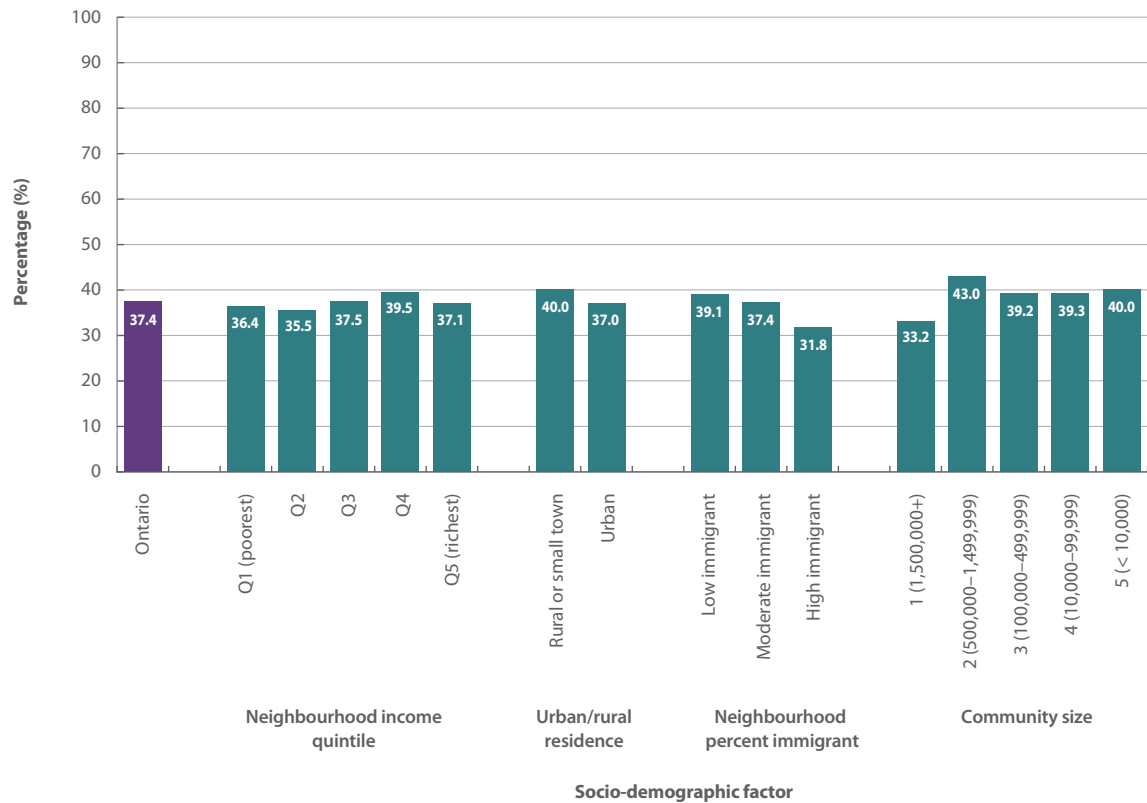
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

CCO's cervical cancer screening guidelines recommend that women with an unsatisfactory Pap test result receive a repeat Pap test in three months. In 2011, 37.4% of women 20 to 69 years of age had follow-up within six months after an unsatisfactory result. Follow-up rates of unsatisfactory cytology

remained steady over time. In 2011, 47.5% of women 40 to 49 years of age received follow-up by six months after an unsatisfactory Pap test result, which was the highest rate among all age groups. The lowest rates were in women 60 to 69 years of age (27.7%).

FIGURE 27

Percentage of Ontario screen-eligible women 20 to 69 years of age with an unsatisfactory Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (not including hysterectomy) within six months of the unsatisfactory screen test result in a 12-month period, 2011, by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

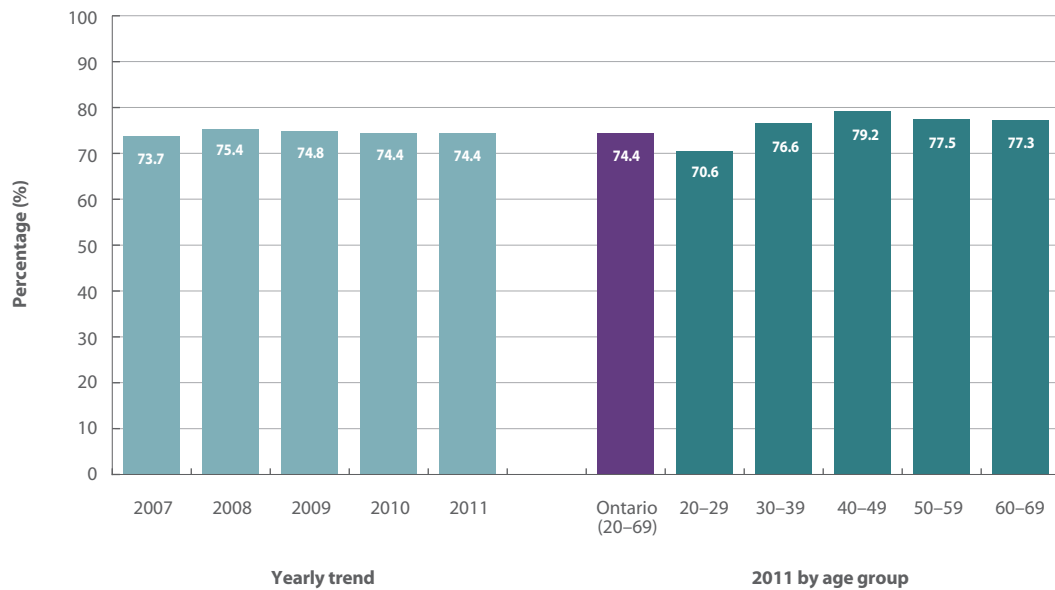
The follow-up rates of unsatisfactory Pap tests in 2011 were stable across all neighbourhood income quintiles. Follow-up rates of unsatisfactory Pap tests were higher for women in rural areas (40.0%) than for women in urban areas (37.0%). A slight decreasing trend could be observed in areas with increasing percentages of immigrants. While rates

by community size did not show a trend, women who lived in areas with more than 1.5 million people had a lower follow-up rate than all other community sizes. Follow-up rates of unsatisfactory Pap tests varied from 30.2% in the Central West LHIN to 51.2% in the North West LHIN (see *Appendix F*).

FOLLOW-UP OF LOW-GRADE ABNORMAL CYTOLOGY (NEW)

FIGURE 28

Percentage of Ontario screen-eligible women 20 to 69 years of age with a low-grade abnormal Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (including hysterectomy) within nine months of the low-grade abnormal screen test result in a 12-month period, by year (2007–2011) and by age group



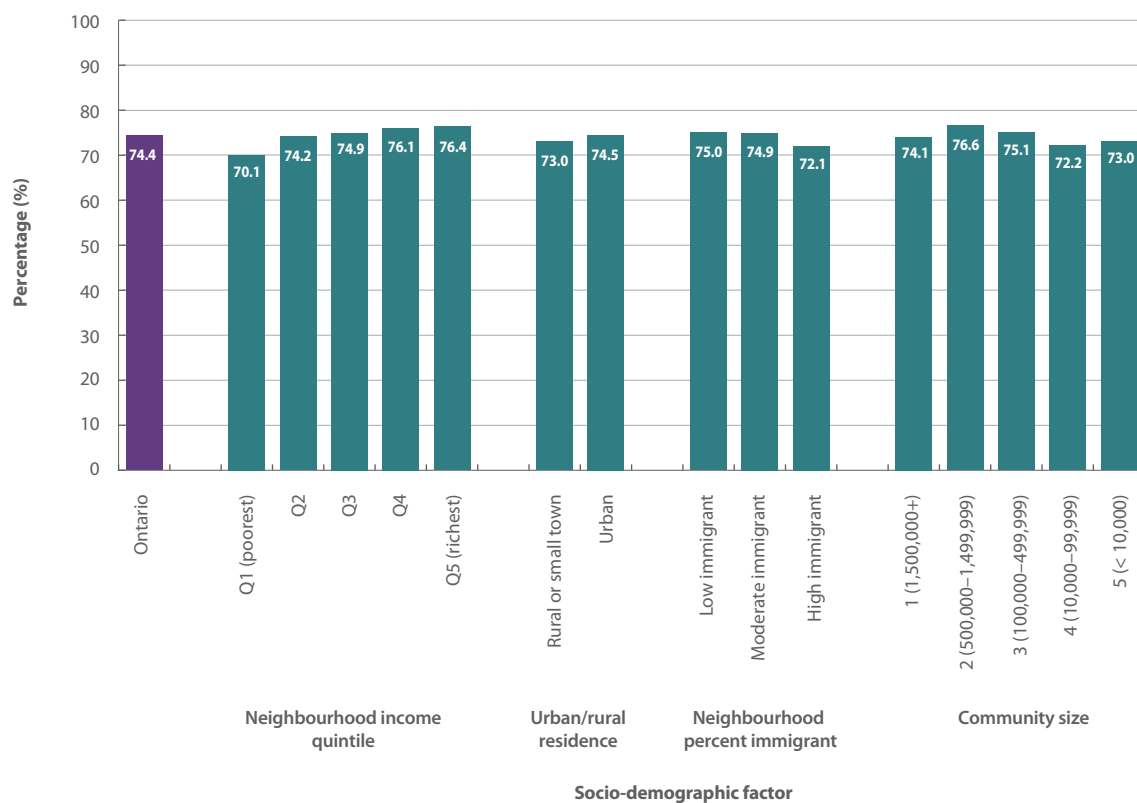
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

CCO's cervical cancer screening guidelines recommend a repeat Pap test in six months following a cytology result of ASCUS. Evidence suggests that either repeat cytology at six months or colposcopy would be acceptable management options after the first LSIL result. *Figure 28* shows

that in 2011, 74.4% of women received follow-up within nine months after a low-grade abnormal Pap test result (ASCUS or LSIL). The follow-up rates for women with LSIL cytology results were 54.9% at six months, 74.4% at nine months and 81.1% at 12 months (data not shown).

FIGURE 29

Percentage of Ontario screen-eligible women 20 to 69 years of age with a low-grade abnormal Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (including hysterectomy) within nine months of the low-grade abnormal screen test result in a 12-month period, 2011, by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

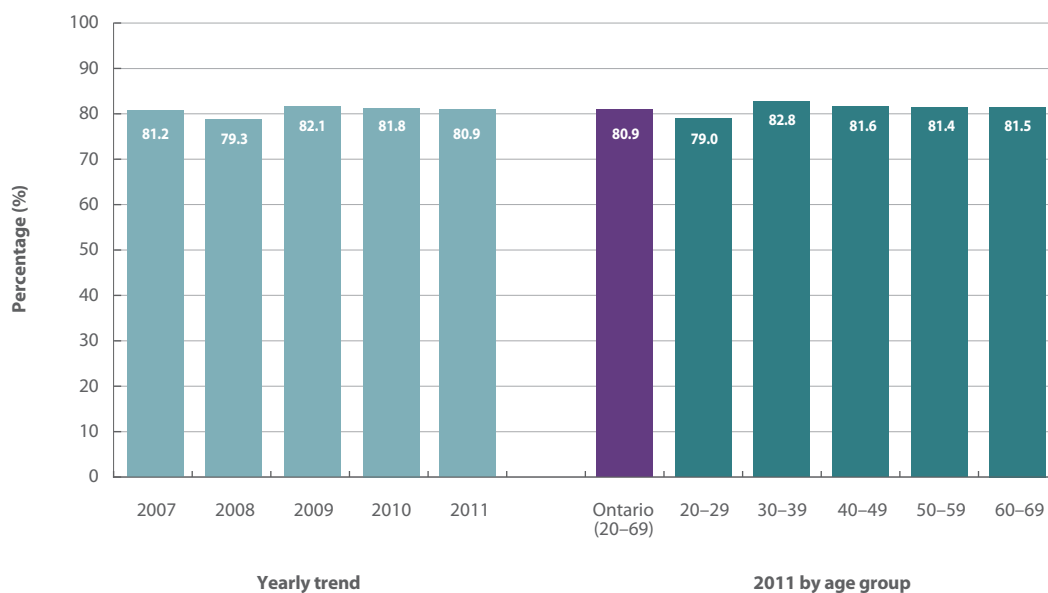
In 2011, women living in the lowest neighbourhood income quintile had a follow-up rate of 70.1% after a low-grade abnormal cytology result, which was lower than the provincial average. The follow-up of low-grade abnormal cytology increased steadily as neighbourhood income quintiles rose. Women who

lived in areas with a high percentage of immigrants had a lower rate of follow-up (72.1%) than women living in areas with a low percentage of immigrants. Follow-up rates varied from a low of 66.8% in the North West LHIN to a high of 78.4% in the Erie St. Clair LHIN (see *Appendix F*).

FOLLOW-UP OF HIGH-GRADE ABNORMAL CYTOLOGY (NEW)

FIGURE 30

Percentage of Ontario screen-eligible women 20 to 69 years of age with a high-grade abnormal Pap test result who underwent a colposcopy or definitive treatment (including hysterectomy) within six months of the high-grade abnormal screen test result in a 12-month period, by year (2007–2011) and by age group



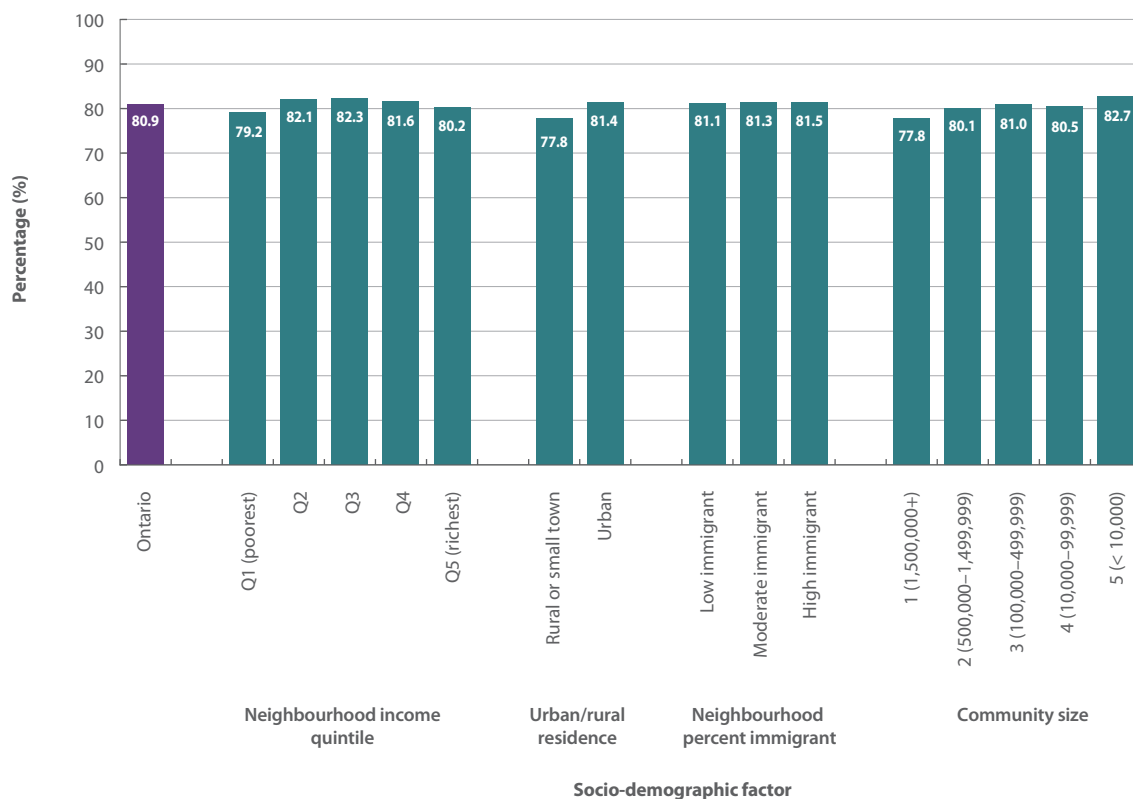
Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

From 2007 to 2011, the follow-up rate of women with high-grade abnormal cytology results at six months was the lowest in 2008 at 79.3%, after which it remained constant at a rate of 80.9% to 82.1% between 2009 and 2011. The Ontario colposcopy standards recommend a colposcopic follow-up in less than eight to 12 weeks.³⁶ Most women have follow-up by six months. However, national guidelines

recommend colposcopic assessment of high-grade lesions within four to six weeks.³⁷ Our data show only 58.1% of women with high-grade cytology received follow-up at three months and this rate jumped to 71.1% at four months (data not shown). There was little variation in rates of follow-up after a high-grade abnormal cytology result by age group.

FIGURE 31

Percentage of Ontario screen-eligible women 20 to 69 years of age with a high-grade abnormal Pap test result who underwent a colposcopy or definitive treatment (including hysterectomy) within six months of the high-grade abnormal screen test result in a 12-month period, 2011, by socio-demographic factor



Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

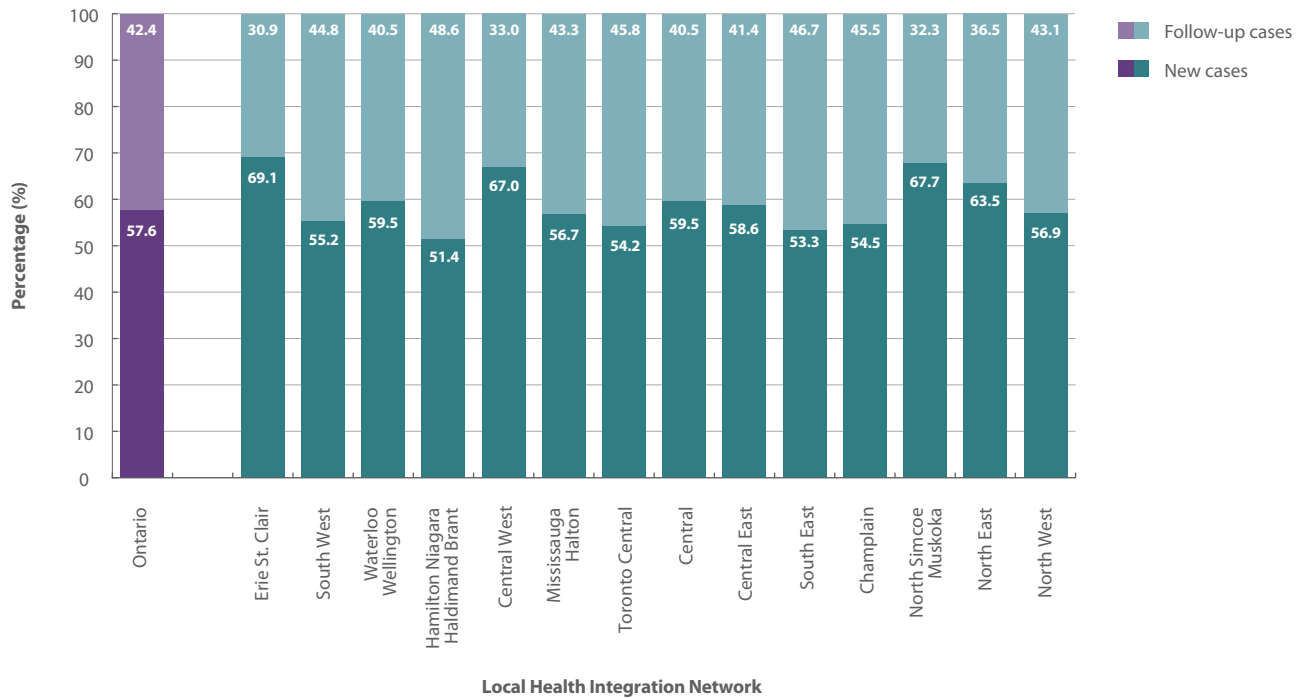
The 2011 follow-up rates of high-grade cytology did not show any notable differences by neighbourhood income quintile or by neighbourhood percent immigrant. The follow-up rate for women living in rural areas was 77.8%, which was 3.6% lower than for women living in urban areas (81.4%). Women living

in the largest communities (over 1.5 million people) had the lowest follow-up rate at 77.8%. Among LHINs, follow-up of high-grade Pap tests was lowest in the Erie St. Clair LHIN at 68.3% and highest in the South East LHIN at 86.7% (see *Appendix F*).

COLPOSCOPY–NEW AND FOLLOW-UP CASES (NEW)

FIGURE 32

Number of new and follow-up colposcopy cases in Ontario screen-eligible women 20 to 69 years of age in a 12-month period, 2012, by Local Health Integration Network (LHIN)



Note: If instead of counting women, we were to count claims, the percentage of new colposcopy claims in Ontario would drop to 45%.

Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System and Registered Persons Database

Of all the colposcopy visits in 2012, 57.6% of the visits were new and 42.4% were for follow-up. The percentage of new cases ranged from 51.4% in the Hamilton Niagara Haldimand Brant LHIN to 69.1% in the Erie St. Clair LHIN. The percentage of follow-up cases ranged from 30.9% in Erie St. Clair to 48.6% in Hamilton Niagara Haldimand Brant. The Erie St. Clair (69.1%), North Simcoe Muskoka (67.7%)

and Central West (67.0%) LHINs had the highest proportion of new colposcopy cases. The proportion of new to follow-up cases did not vary from 2007 to 2011 (data not shown). There was no variation by age group, neighbourhood income quintile, rural versus urban, neighbourhood percent immigrant or community size (data not shown).

COLPOSCOPIST ANNUAL COLPOSCOPY VOLUME (NEW)

TABLE 4

Percentage of colposcopists who perform a minimum of 25 new colposcopies or a minimum of 100 new and follow-up colposcopies in a 12-month period

YEAR	ANNUAL VOLUME \geq 25 INITIAL COLPOSCOPIES OR \geq 100 INITIAL+FOLLOW-UP COLPOSCOPIES	ANNUAL VOLUME $<$ 25 INITIAL COLPOSCOPIES OR $<$ 100 INITIAL+FOLLOW-UP COLPOSCOPIES	TOTAL NUMBER OF PHYSICIANS
2009	287 (72.3%)	110 (27.7%)	397
2010	350 (87.7%)	49 (12.3%)	399
2011	356 (88.6%)	46 (11.4%)	402

Note: Counting the number of physicians who performed at least five colposcopies each year.

Data Sources: OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System, Registered Persons Database

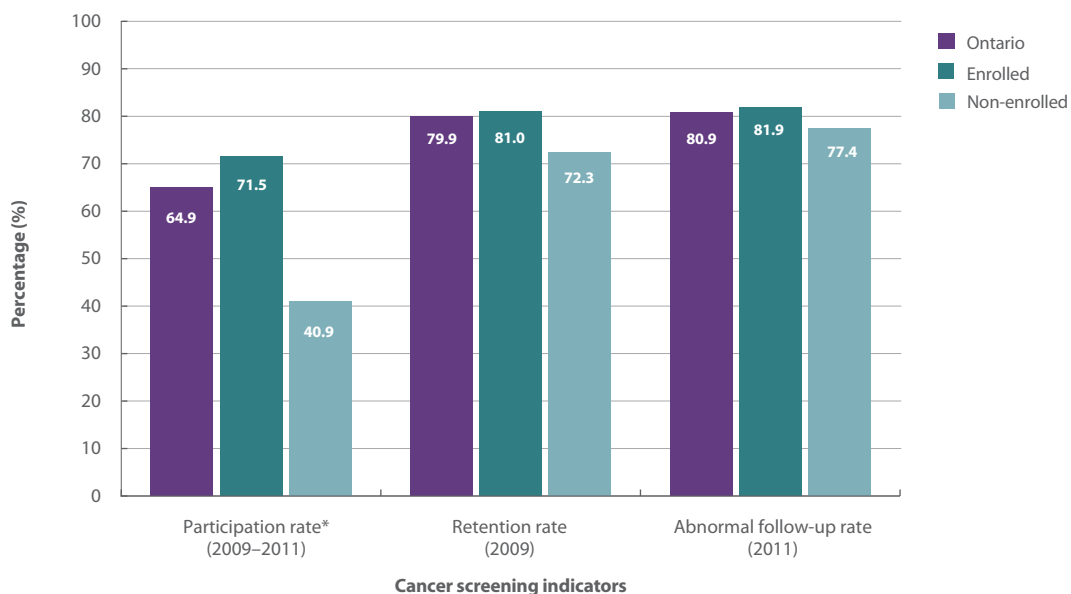
CCO's colposcopy standards recommend that colposcopists perform a minimum of 100 new and follow-up colposcopies each year, including a minimum of 25 new cases per year in order to maintain competency.³⁶ Between 2009 and 2011 there was an increase in the percentage of physicians who meet this standard, from 72.3% to 88.6%.

IV. PRIMARY CARE

PARTICIPATION, RETENTION AND FOLLOW-UP OF HIGH-GRADE LESIONS IN PATIENT ENROLMENT MODELS (PEMS) (NEW)

FIGURE 33

Participation rate, retention rate and follow-up of high-grade abnormal Pap tests by enrolment status with a patient enrolment model (PEM) physician, 2009–2011



Note: *Age-standardized to the 2006 Canadian population.

Data Sources: CytoBase, OHIP's Claims History Database, Ontario Cancer Registry, Pathology Information Management System, Registered Persons Database, Corporate Providers Database and Client Agency Program Enrolment database

In Ontario, approximately 8,000 physicians practice within a patient enrolment model (PEM), with a network of approximately 10 million patients.³⁸ In PEM practices, patients enrol with a primary care physician; the physician agrees to provide comprehensive primary care and the patient agrees to see that physician or other physicians in his/her practice exclusively for primary care, except in emergency situations.

Ontario has a number of different types of PEMs, ranging from primarily fee-for-service to those who are primarily capitated or salaried. Family health organizations (FHOs) and family health groups (FHGs) are the two largest enrolment models, each with approximately 4 million enrolled patients.³⁹

All PEM types provide various incentives for preventive health care (including cancer screening) and for enrolling unattached and complex/vulnerable patients.^{40,41}

In 2009–2011, 71.5% of women who were enrolled with a physician in a PEM practice had a Pap test, 31% higher than for women not enrolled with a physician in a PEM practice (40.9%) and higher than the overall cervical cancer screening rate for the province (64.9%). Although not as big a difference as for participation, retention in 2009 was higher in women enrolled with a PEM physician (9% difference). PEM-enrolled women had better follow-up rates after an abnormal test in 2011 (5% difference) compared to non-PEM-enrolled individuals.

Summary

The Ontario Cervical Screening Program (OCSPP) does not currently meet all of the International Agency for Research on Cancer (IARC) criteria for a fully organized program. However, progress is being made toward this end; for example, annual reporting of specific indicators in the Cancer System Quality Index (CSQI) and triennial reporting of a more extensive list of indicators (program reports like this one) provide insight into the strengths and weaknesses of the program. Socio-demographic factors have also been calculated for most indicators, which are summarized below. In this 2012 report, we have shown the following:

- The goal of screening is to decrease mortality and incidence due to cervical cancer, which are important to measure over time. Data in this report confirm a decreasing trend in mortality and there has been a stage shift of cancer identification so that currently at least 50% of women with cervical cancer present with stage I disease.
- Cervical cancer screening participation among women ages 20 to 69 increased from 61.6% to 64.9% between 2000–2002 and 2009–2011. The program has not as yet defined an annual target. In this report, the rate of entry of new participants into the program was 7.5% in 2009–2011. As one would predict, this rate was highest in the youngest age group of women. Screening retention remained high at about 80% in 2009. These three indicators assessing **coverage**—participation, new participants and retention—confirm that the OCSPP needs to encourage screen-eligible women to be screened and at appropriate regular intervals.
- In terms of **Pap test performance**, the abnormal Pap test result rate has slowly risen over time from 4.2% in 2000 to 5.5% in 2012. The unsatisfactory rate was low and stable from 2000 to 2012. The cervical cancer rate in women with an abnormal Pap test (positive predictive value or PPV) was low at 3.1%. The cervical intraepithelial neoplasia III

(CIN III)/adenocarcinoma in situ (AIS) pre-cancer detection rate has also been stable over time at and was 21.6/10,000 in 2011. The majority of women diagnosed with cervical cancer were screened less frequently than recommended by the guidelines (54.6% were under- or never-screened compared to 45.4% who were screened six months to three years before diagnosis, in 2009–2011). These data emphasize the need to focus on ensuring that all Ontario women 21 to 69 years of age are screened at appropriate intervals and that women with abnormal screening test results are managed appropriately.

- The report also addressed **further assessment** of women with an abnormal or unsatisfactory result. According to guidelines, women with an unsatisfactory Pap test should have a repeat Pap test at three months. The unsatisfactory follow-up rate was 37.4% at six months in 2011 and has been stable over time. The guidelines also recommend follow-up at six months of women with a low-grade Pap test. The low-grade abnormal Pap test follow-up rate was 74.4% at nine months in 2011 and has been stable over time. Follow-up of women with high-grade Pap test results is recommended to take place in less than three months. The follow-up rate for high-grade abnormal results was 80.9% at six months in 2011. Strategies to improve appropriate and timely follow-up of women are needed, especially for women with high-grade abnormalities.

Socio-demographic factors have been calculated for most indicators. However, these univariate analyses are merely observations that may be influenced by multiple factors concurrently.

- Most indicators show clear variations by **age group**. Screening participation and retention rates both decreased with increasing age. The rate of entry of new participants was highest in young women. Moreover, the rate of

abnormal results was highest in the youngest age group, which is in keeping with the onset of sexual activity and new exposures to human papillomavirus (HPV) types. Low-grade squamous intraepithelial lesion (LSIL) Pap test rates decreased with increasing age. The highest LSIL rates were in the youngest women, who also had the lowest follow-up rates. The unsatisfactory rate increased with age and follow-up of an unsatisfactory Pap test was lowest in older women (i.e., those most at risk for the disease). The PPV of an abnormal Pap test for cervical cancer was highest in older women.

- The cancer rate was highest in women who had not had a Pap test in more than 10 years. However, the CIN III/AIS pre-cancer detection rate was lowest in older women, which is concerning since they are at the highest risk for disease progression to cancer.
- A recurring theme in this report involves the impact of **neighbourhood income quintile** on various indicators. Screening participation rate decreased as income quintiles fell. The new participant rate, however, was highest in women in the lowest neighbourhood income quintile. Retention rates fell with decreasing income quintiles. The highest abnormal result rate was in women from the lowest income quintile. There was a slight decrease in the unsatisfactory result rate in women from the lowest income quintile. PPV did not vary by income quintile. Women diagnosed with cervical cancer in the lowest income quintile were the least likely to have had a Pap test in the prior 10 years. CIN III/AIS detection was high in women living in the lowest income quintile. While showing no change across income quintiles for unsatisfactory Pap tests, follow-up rates for low- and high-grade abnormal Pap test results were low in women living in the lowest income quintiles. Further effort is needed to recruit and retain women

living in low neighbourhood income quintiles to cervical screening.

- When assessing indicators based on **rural or urban residence**, screening participation was slightly lower for women living in urban settings, but their new participant rate was highest. Screening retention was slightly higher in women living in urban areas compared to those living in rural areas. Abnormal result rates and unsatisfactory result rates were higher in women living in rural areas. While the PPV for cancer did not differ by urban or rural residence, the CIN III/AIS pre-cancer detection rate was lower in urban settings. Follow-up of unsatisfactory Pap tests did not vary by urban or rural residence. Follow-up of low- and high-grade Pap test abnormalities was slightly higher in women living in urban settings. These data suggest a slightly higher performance for women living in urban areas.
- When assessed by a woman's **community size**, screening participation was lower among women living in communities with a population of less than 10,000, the new participant rate was lowest in community sizes of less than 500,000, and the retention rate was higher in communities of less than 100,000. Abnormal results were highest in smaller communities and there was a slight increase in unsatisfactory results in smaller communities. The PPV for cancer did not differ by community size. CIN III/AIS detection was higher in women living in small community sizes. Follow-up rates of unsatisfactory and low-grade Pap tests were not affected by community size. The follow-up rate of high-grade Pap tests was slightly lower in women living in the largest communities. These data suggests that community size does not impact cervical cancer screening performance in Ontario.

-
- Screening participation was lower but new participant rate was highest in women living in areas with a high percentage of immigrants (**neighbourhood percent immigrant**). Screening retention was not affected by neighbourhood percent immigrant. The abnormal result rate was lowest in areas with a high percentage of immigrants. Neither the unsatisfactory result rate nor PPV for cancer were affected by neighbourhood percent immigrant. Regardless of percent immigrant category, the indicator reflecting time since last Pap test in women with cervical cancer was the same. The CIN III/AIS detection rate was lowest in women living in areas with a high percentage of immigrants. Follow-up of low-grade Pap tests was slightly lower in women from areas with a high percentage of immigrants, but follow-up of high-grade Pap tests was not affected by this variable. Therefore, a prime opportunity for improving the efficacy of the OCSP is to recruit to screening women living in areas with a high immigrant percentage and retain them in the program.

The evaluation of socio-demographic variables in this report suggest that the OCSP should undertake specific efforts to focus on under- and never-screened women of advancing age, women living in lower neighbourhood income quintiles and those living in areas with a high percentage of immigrants.

Future Directions

In the future, the Ontario Cervical Screening Program (OCS) will focus on increasing screening participation, improving follow-up after abnormal Pap tests, and improving the quality of screening and diagnostic assessment.

INCREASING SCREENING PARTICIPATION

With Ontario's changes in the recommended screening interval to three years, a reminder system that supports clinicians and women in adopting this new paradigm becomes pivotal to adherence. To this end, the OCS has initiated a comprehensive correspondence initiative inviting women to be screened, reminding them to return for screening three years after a negative screen, issuing screening results notifications and sending reminders for women who have not acted upon an abnormal screen test result. These efforts are intended to improve participation, maintain and improve retention, and improve follow-up of abnormal tests.

Promotional efforts to encourage participation are a vital consideration for a screening program. The program will continue to support public and provider education about the importance of and opportunities to improve screening women for cervical cancer, and target under-screened groups.

One such targeted program built on the success of the Ontario Breast Screening Program's (OBSP's) mobile coach, which provides breast cancer screening services to women in remote and isolated communities in Northwestern Ontario. Cancer Care Ontario (CCO) provided one-time funding in 2011 to the Hamilton Niagara Haldimand Brant and North West Regional Cancer Programs (RCPs), which had low participation rates, to pilot an integrated cancer screening program on two mobile coaches. In June 2013, the North West and Hamilton Niagara Haldimand Brant RCPs launched integrated cancer screening services, which included breast cancer screening with digital mammography, colorectal

cancer screening with the distribution of fecal occult blood tests (FOBTs) and cervical cancer screening with the Pap test. Trained nurses distribute FOBT kits and perform Pap tests for women 50 to 74 years of age. The Hamilton Niagara Haldimand Brant coach is targeting women who live in neighbourhoods with a high percentage of immigrants, lower socioeconomic status and lower literacy levels, while the North West mobile coach program targets geographically isolated communities.

CCO and its regional partners continue to look at new and innovative approaches for recruiting women for screening, particularly those from marginalized groups.^{42,43} Many under-/never-screened (U/NS) initiatives have been developed with key partners to provide public outreach and education, offer screening services and build capacity in key partner organizations to sustain the initiatives. Examples of project work include providing cultural awareness training to health service providers and the recruitment of First Nations, Inuit and Métis peer ambassadors to provide educational focus groups.

In the coming years, CCO is working with the Ministry of Health and Long-Term Care (MOHLTC) to implement a new paradigm for cervical cancer screening within the OCS: primary screening with the human papillomavirus (HPV) test. CCO's guidelines recommend primary HPV screening for women 30 years and older every five years until age 65; however, at present our recommendation is that women 21 to 29 continue to be screened with cervical cytology (Pap testing). It is recommended that women with positive HPV tests be triaged with cytology in order to determine appropriate follow-up. Women with a positive HPV test and abnormal cytology result (\geq ASCUS) should be referred to colposcopy for further investigation. Women with a positive HPV test and negative cytology should have a repeat HPV test in 12 months. When HPV

testing is performed by a provider, the woman's experience is the same as screening with the Pap test. However, HPV testing may offer an opportunity for self-collection, which the OCSP will explore as a potential way to increase screening rates among under- and never-screened women.

IMPROVING FOLLOW-UP RATES AFTER ABNORMAL PAP TESTS (UNSATISFACTORY, LOW-GRADE AND HIGH-GRADE)

The program has undertaken initiatives to improve follow-up rates for women who have unsatisfactory and abnormal screening test results. Correspondence to women about their Pap test results will provide a failsafe to ensure that they know about their results and understand the next steps that are needed.

In addition, the program will begin tracking and monitoring the management of women with abnormal results, and include this information in regular reports to physicians about their eligible patient population.

IMPROVING THE QUALITY OF SCREENING

A cancer screening registry has been established to enable the optimal operation of the OCSP. The program has also implemented a comprehensive correspondence campaign, which tells women about their Pap test results. In addition, if a woman fails to have timely follow-up, she will receive a reminder letter. The goal is to improve follow-up rates and timeliness.

Ontario Laboratory Accreditation (OLA) is already mandated for all medical laboratories in Ontario. The OCSP will go beyond OLA standards to enhance its quality assurance and performance monitoring framework for laboratories, as well as for colposcopy services and data quality.

Ongoing performance monitoring and evaluation will be enhanced with more detailed and

comprehensive data (e.g., colposcopy, histology) to ensure that the highest quality cervical cancer screening services are available to Ontario women. Program reporting will continue to improve, with future program reports that expand the breadth of indicators measuring the quality and impact of cervical cancer screening in Ontario.

DIAGNOSTIC ASSESSMENT (COLPOSCOPY)

The OCSP has undertaken the organization of colposcopy services in Ontario. This initiative will include development of comprehensive quality improvement processes. Regional Colposcopy/ Cervical Screening Leads are being recruited to participate in this agenda. To characterize our vision of colposcopy services, an expert panel is currently updating CCO's colposcopy standards document. In addition, CCO is developing a colposcopy data collection plan so that comprehensive colposcopy data can be collected for analysis and action. The OCSP will therefore have the data and the framework to actively manage colposcopy performance in the province.

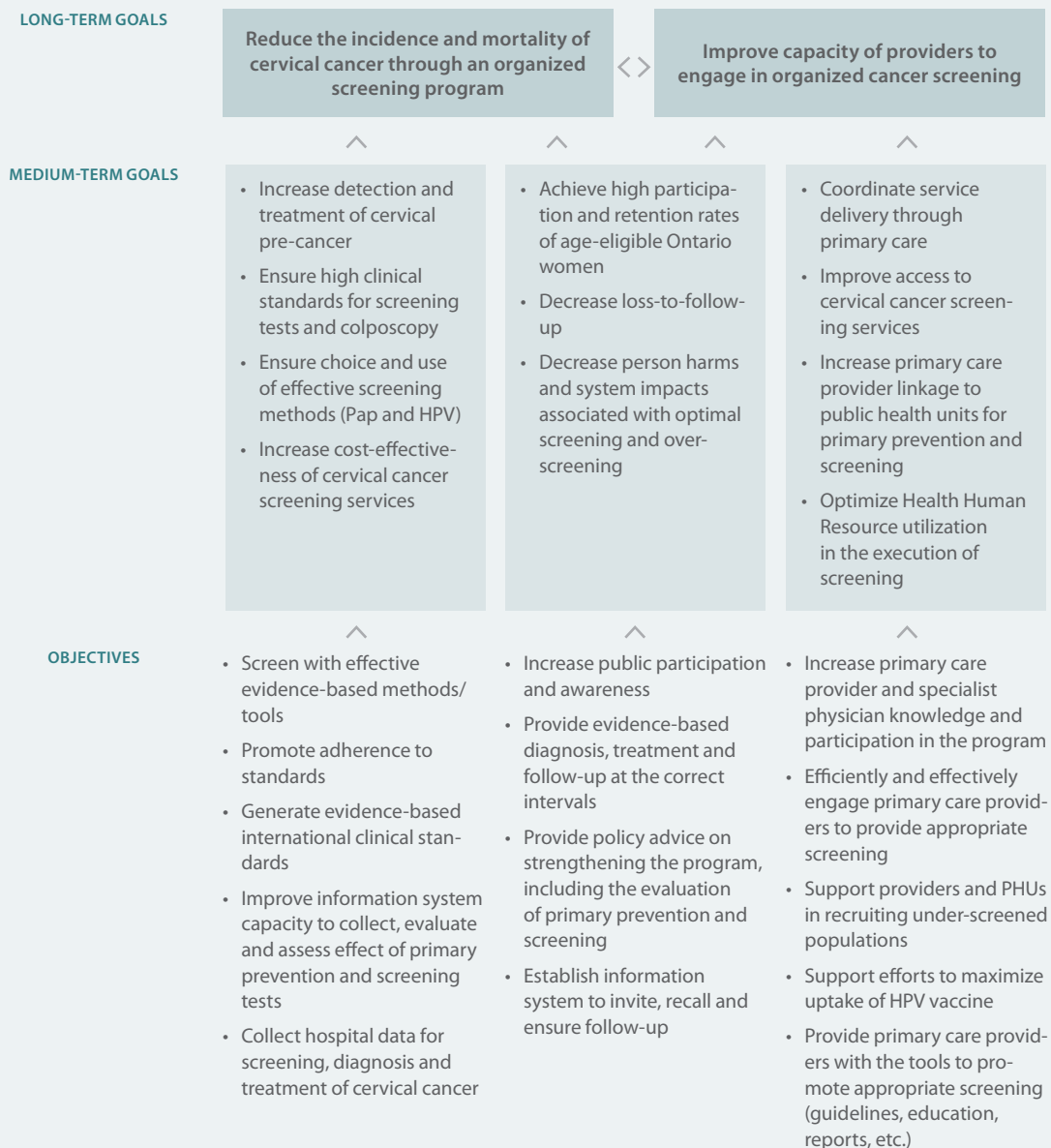
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Appendix A: Ontario Cervical Screening Program Goals and Objectives Framework

FIGURE 34

Ontario Cervical Screening Program goals and objectives framework



Appendix B: List of Methodological Definitions

Note: This report does not capture activity at Kingston General Hospital.

Hysterectomy codes (from the Claims History Database or CHDB)

- E862A When hysterectomy is performed laparoscopically or with laparoscopic assistance
- P042A Obstetrics – labour – delivery – caesarean section, including hysterectomy
- Q140A Exclusion code for enrolled female patients 35 to 70 years of age with hysterectomy
- S710A Hysterectomy – with or without adnexa (unless otherwise specified) – with omentectomy for malignancy
- S727A Ovarian debulking for stage 2C, 3B or 4 ovarian cancer and may include hysterectomy
- S757A Hysterectomy – with or without adnexa (unless otherwise specified) – abdominal – total or subtotal
- S758A Hysterectomy – with or without adnexa (unless otherwise specified) – with anterior and posterior vaginal repair and including enterocele and/or vault prolapse repair when rendered
- S759A Hysterectomy – with or without adnexa (unless otherwise specified) – with anterior or posterior vaginal repair and including enterocele and/or vault prolapse repair when rendered
- S762A Hysterectomy – with or without adnexa (unless otherwise specified) – radical trachelectomy - excluding node dissection
- S763A Hysterectomy – with or without adnexa (unless otherwise specified) – radical (Wertheim or Schauta) – includes node dissection
- S765A Amputation of cervix
- S816A Hysterectomy – with or without adnexa (unless otherwise specified) – vaginal

If one of E862, P042, Q140, S710, S727, S757, S758, S759, S816, S763A and one of S765, S762 OR if one of E862, P042, Q140, S710, S727, S757, S758, S759, S816, S763A without any of S765, S762

Pap test codes (from CHDB)

- E430 D/T proc-Pap smear performed outside of hospital-add
- G365 D/T proc-Gynaecology-Papanicolaou smear
- G394 Add. Pap smear for follow-up of abnormal or inadequate smears

- L713 Gynaecological specimen
- L733 Cervicovaginal specimen
- L812 Cervical vaginal specimen

Colposcopy codes (from CHDB)

- Z731 Initial investigation of abnormal cytology of vulva and/or vagina or cervix under colposcopic technique with or without biopsy(ies) and/or endocervical curetting
- Z787 Follow-up colposcopy with biopsy(ies) with or without endocervical curetting
- Z730 Follow-up colposcopy without biopsy with or without endocervical curetting

Cervical procedure codes (from CHDB)

- Z732 Cryotherapy
- Z724 Electro
- Z766 Electrosurgical Excision Procedure (LEEP)
- S744 Cervix – cone biopsy – any technique, with or without D&C
- Z729 Cryoconization, electroconization or CO2 laser therapy with or without curettage for premalignant lesion (dysplasia or carcinoma in situ), out-patient procedure

Cervical cancer definition (from the Ontario Cancer Registry or OCR, and the Pathology Information Management System or PIMS)

Cervical cancer was defined as an ICD-O-3 code of C53 in either the OCR or the PIMS with behaviour code for invasive (3), excluding all morphologic codes for lymphomas, leukemias and other hematopoietic (9590 to 9989).

Cervical pre-cancer definition (from PIMS)

Cervical pre-cancer was defined as an ICD-O-3 code of C53 in PIMS, with behavior code for in situ (2), excluding all morphologic codes for lymphomas, leukemias and other hematopoietic (9590 to 9989). Ninety-five percent of these cases are cervical intraepithelial neoplasia (CIN) III and 2% are adenocarcinomas in situ. Pre-cancer calculations did not include CIN I or CIN II because these data are not currently available.

PAP TEST RESULTS CLASSIFICATION (FROM CYTOBASE)

TABLE 5

Pap test result classification, 2001 Bethesda version

LOW-LEVEL CATEGORY	HIGH-LEVEL CATEGORY	2001 VERSION
UNSATISFACTORY	Unsatisfactory	2.2
NORMAL	Normal	4.1, 4.2, 4.3
ENDOMETRIAL	Endometrial	4.4, 4.6.2, 4.9.1.1
ASC	Low-grade abnormal	All 4.5 except 4.5.8
ASC-H	High-grade abnormal	4.5.8
AGC	High-grade abnormal	4.6.1, 4.6 (not 4.6.2, 4.6.3, 4.6.4)
ADENOCARCINOMA IN SITU	High-grade abnormal	4.6.3
LSIL	Low-grade abnormal	4.7
HSIL	High-grade abnormal	4.8
CARCINOMA	High-grade abnormal	4.9
SQUAMOUS CELL CARCINOMA	High-grade abnormal	4.9.2
ADENOCARCINOMA	High-grade abnormal	4.9.1.2, 4.9.1.4
OTHER MALIGNANCY	High-grade abnormal	4.6.4, 4.10
OTHER ABNORMALITIES	Other abnormal	4.9.1.3, 4.11

TABLE 6

Pap test result classification, 2005 Bethesda version

LOW-LEVEL CATEGORY	HIGH-LEVEL CATEGORY	2005 VERSION
UNSATISFACTORY	Unsatisfactory	2.1
NORMAL	Normal	4.1, 4.2, 4.3.1, 4.3.2, 4.3
ENDOMETRIAL	Endometrial	4.3.3, 4.5.10, 4.5.11, 4.5.12, 4.5.13
ASC	Low-grade abnormal	All 4.4 except 4.4.5
ASC-H	High-grade abnormal	4.4.5
AGC	High-grade abnormal	4.5.1-4.5.9
ADENOCARCINOMA IN-SITU	High-grade abnormal	4.5.8, 4.6
LSIL	Low-grade abnormal	4.7
HSIL	High-grade abnormal	4.8
CARCINOMA	High-grade abnormal	4.9
SQUAMOUS CELL CARCINOMA	High-grade abnormal	4.9.1
ADENOCARCINOMA	High-grade abnormal	4.9.2, 4.9.3
OTHER MALIGNANCY	High-grade abnormal	4.10
OTHER ABNORMALITIES	Other abnormal	4.9.4, 4.9.5, 4.11

DEFINING SOCIO-DEMOGRAPHIC INDICATORS

All the socio-demographic factors were determined using postal code conversion file (PCCF)+, version 5k.

Neighbourhood income quintile

This indicator was based on income quintiles developed by Statistics Canada using the 2006 Census; income quintiles range from 1 to 5 (low to high).

Rural/urban residence

This indicator assesses whether an individual was living within a census metropolitan area (CMA) or census agglomeration (CA) based on the 2006 census; those living within a CMA or CA were considered urban, while those living in towns and rural municipalities outside the commuting zone of larger urban centres (those with populations of 10,000 or more in the commuting zone) were considered rural.

Neighbourhood percent immigrant

This indicator divides dissemination areas (DAs) into three categories according to the percentage of immigrants: low immigrant ($\leq 27\%$ immigrant population), moderate immigrant (27.1% to 51.8% immigrant population) and high immigrant ($\geq 51.9\%$ immigrant population).

Community size

This indicator was defined in terms of the 2006 census population in each CMA or CA.

Appendix C: Methodology for Program Indicators

Data for this report were extracted from two main sources: CytoBase and the Claims History Database (CHDB). CytoBase is a database of cervical screening test results containing data from most community laboratories in Ontario. CytoBase includes 87% of all Pap tests performed in Ontario. The number of laboratories reporting to CytoBase in 2009 was 13 and in 2012 it was 10. The number of laboratories decreased over time as some of them closed, stopped submitting data or re-routed their tests through another laboratory. In order to capture Pap tests that were not in CytoBase, Ontario Health Insurance Plan (OHIP) claims data (CHDB) were also used. In addition, the CHDB was used to capture data on hysterectomies, colposcopies and surgical procedures involving the cervix. Analyses do not include cytology data from hospitals, which are not currently available.

CHDB data were used to capture hysterectomy, colposcopy and cervical treatment claims. Because the CHDB has a data lag of three to six months, 2012 data were not complete at the time of analysis, causing some indicator data to only be reported to 2011. The CytoBase data are more current, with a lag of 30 days.

Other data sources were also used, such as the Ontario Cancer Registry (OCR) for cervical cancer data and the Pathology Information Management System (PIMS) for data on cervical cancer and pre-cancer (cervical intraepithelial neoplasia or CIN III and adenocarcinoma in situ or AIS). Data for CIN I and CIN II are not available in PIMS.

The Registered Persons Database (RPDB) was used to collect demographic and geographic information on individuals, such as age, death and postal code. Using PCCF+ version 5k and the postal code from the RPDB, Local Health Integration Network (LHIN) and socio-demographic indicators were calculated for each individual.

CANCER INCIDENCE

Definition	<p>Age-specific incidence rate: the number of new cases of cancer diagnosed in a given age group during a defined period of time, per 100,000 persons in that age group during that time period.</p> <p>Age-standardized incidence rate: the number of new cases of cancer that would occur in a specified population if it had the same age-distribution as a given standard population, per 100,000 people, during a defined time period.</p>
Calculation	<p>Age-specific incidence rate:</p> $\frac{\text{Total number of new cases of cancer in a given age group}}{\text{Total female population in that age group, adjusted for hysterectomy prevalence}} \times 100,000$ <p>Age-standardized incidence rate:</p> $\frac{\sum \text{Age-specific incidence rate in a given age group} \times \text{standard population in that age group}}{\text{Total standard population}} \times 100,000$
Denominator	See "Calculation"
Numerator	See "Calculation"
Analysis	<p>Age-specific incidence rates:</p> <ul style="list-style-type: none"> For cervical cancer (ICD-O-3 code: C53) by five-year age group (20–24, 25–29, 30–34, ...80+), 2010. <p>Age-standardized incidence rates:</p> <ul style="list-style-type: none"> Age-standardized to the age distribution of the 1991 Canadian census population using the direct method. For cervical cancer (ICD-O-3 code: C53), 1981–2010, age 20–69 and by age group (20–34, 35–49, 50–69); age 20–69 by morphology subgroup (squamous cell carcinoma ICD-O-3 codes 8050–8078, 8083–8084; adenocarcinoma, excluding adenosquamous carcinoma, ICD-O-3 codes 8140–8141, 8190–8211, 8230–8231, 8260–8263, 8310, 8380, 8382–8384, 8440–8490, 8571–8574, 8576; codes chosen as per Egevad L, Heanue M, Berney D, Fleming K, Ferlay J. Chapter 4. Histological groupings. In: Curado MP, Edwards B, Shin HR, Storm H, Ferlay J, Heanue M, et al., editors. <i>Cancer Incidence in Five Continents, Vol. IX</i>. IARC Scientific Publications No. 160. Lyon, IARC; 2007. p. 61–66). Trends analyzed with Joinpoint software from the US National Cancer Institute, available and described at http://surveillance.cancer.gov/joinpoint/. Joinpoint fits one to four lines connected at "joinpoints" to trend data and selects the simplest model that best fits the data. Monte Carlo methods are used for tests of significance. Trends are described as stable unless increases or decreases over time are statistically significant. Three-year moving averages are used for graphical presentation of time trends to smooth fluctuations caused by random variation from one year to another. Incidence analyzed for Ontario as a whole and by Local Health Integration Network, for the period 2006–2010. <p>Other incidence-based analyses and data:</p> <ul style="list-style-type: none"> Most common cancers diagnosed in Ontario women ages 20–44, 2010 (numbers of cases). International data and map (estimates of cervical cancer incidence rates, standardized to the world population), downloaded from GLOBOCAN 2008. Data analyzed using SEER*Stat, available from http://www.seer.cancer.gov/seerstat/.
Data Sources	<ul style="list-style-type: none"> Cancer incidence data: Ontario Cancer Registry (OCR), Cancer Care Ontario, 2013 (Surveillance extract July 2013). Population data: Statistics Canada. CANSIM Table 051-0001 Estimates of population, by age group and sex for July 1, Canada, Provinces and Territories. Feb. 2013 release. Hysterectomy-corrected populations estimated by surveillance staff, Prevention and Surveillance, Prevention and Cancer Control, Cancer Care Ontario.
Data Availability and Limitations	<ul style="list-style-type: none"> Incidence was calculated for cancers diagnosed through 2010, the most recent year for which the OCR had received complete data at the time of analysis.

CANCER MORTALITY (DEATHS FROM CANCER)

Definition	<p>Age-specific mortality rate: the number of new deaths attributed to cancer in a given age group during a defined period of time, per 100,000 persons in that age group during that time period.</p> <p>Age-standardized mortality rate: the number of new deaths from cancer that would occur in a specified population if it had the same age-distribution as a given standard population, per 100,000 people, during a defined time period.</p>
Calculation	<p>Age-specific mortality rate:</p> $\frac{\text{Total number of new cancer deaths in a given age group}}{\text{Total population in that age group, adjusted for hysterectomy prevalence}} \times 100,000$ <p>Age-standardized mortality rate:</p> $\frac{\sum \text{Age-specific mortality rate in a given age group} \times \text{standard population in that age group}}{\text{Total standard population}} \times 100,000$
Denominator	See "Calculation"
Numerator	See "Calculation"
Analysis	<p>Age-specific mortality rates:</p> <ul style="list-style-type: none"> For cervical cancer (ICD-10 code: C53), by five-year age group (20–24, 25–29, 30–34, ...80+), 2010. <p>Age-standardized mortality rates:</p> <ul style="list-style-type: none"> Age-standardized to the age distribution of the 1991 Canadian census population using the direct method. For cervical cancer (ICD-10 code: C53), 1981–2010, age 20–69 and by age group (20–34, 35–49, 50–69). <ul style="list-style-type: none"> Trends analyzed with Joinpoint software from the US National Cancer Institute, available and described at http://surveillance.cancer.gov/joinpoint/. Joinpoint fits one to four lines connected at "joinpoints" to trend data and selects the simplest model that best fits the data. Monte Carlo methods are used for tests of significance. Trends are described as stable unless increases or decreases over time are statistically significant. Three-year moving averages are used for graphical presentation of time trends to smooth fluctuations caused by random variation from one year to another. Mortality analyzed for Ontario as a whole and by Local Health Integration Network, for the period 2006–2010. <p>Other mortality-based analyses:</p> <ul style="list-style-type: none"> Deaths attributed to five most common causes of cancer death in Ontario women ages 20–44, 2010 (numbers of deaths). Data analyzed using SEER*Stat, available from http://www.seer.cancer.gov/seerstat/.
Data Sources	<ul style="list-style-type: none"> Cancer mortality data: Ontario Cancer Registry (OCR), 2013. Population data: Statistics Canada. CANSIM Table 051-0001 Estimates of population, by age group and sex for July 1, Canada, Provinces and Territories. Feb. 2013 release. Hysterectomy-corrected populations estimated by surveillance staff, Prevention and Surveillance, Prevention and Cancer Control, Cancer Care Ontario. Causes of death data: Death, Ontario Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO Date Data Last Refreshed Oct, 2011.
Data Availability and Limitations	<ul style="list-style-type: none"> Mortality rates were calculated through 2010, the most recent year for which the OCR had received complete data at the time of analysis.

CANCER STAGE AT DIAGNOSIS⁴⁴

Definition	The population-based measure reports the percentage of all eligible new cancer cases in Ontario for which a valid stage at diagnosis is derived from information in the Ontario Cancer Registry (OCR) and the collaborative staging (CS) database.
Calculation	<p>Population stage rate:</p> $\frac{\text{Reportable incident cases in Ontario Cancer Registry where a valid stage at diagnosis is available}}{\text{Reportable incident cases in Ontario Cancer Registry which are TNM stageable}} \times 100$
Denominator	Total number of reportable registered cases in OCR for which TNM staging is applicable and exclusion criteria are applied.
Numerator	Total number of reportable incident cases in OCR for which a valid stage at diagnosis is available.
Analysis	<ul style="list-style-type: none"> For January 2004 to December 2011. % of reportable incident cases in OCR with valid stage by calendar year, by top four disease sites (breast, colorectal, lung, prostate) plus melanoma skin and gynecological cases, including cervix.
Considerations	<ul style="list-style-type: none"> The American Joint Committee on Cancer (AJCC) Collaborative Staging (CS) Data Collection System is used by Cancer Care Ontario (CCO) CS analysts to collect the base data elements from cancer patient hospital health records (i.e., cancer pathology report, computed tomography/magnetic resonance imaging (CT/MRI) or other radiology reports, operative note, etc.) in 85 hospitals and regional cancer centers across Ontario. CS data collection is semi-automated with electronic data capture from CCO's ePath data holdings and Ontario Cancer Registry Information System (OCRIS). The CS minimum data set can derive AJCC tumour, node, metastasis (TNM) staging values and includes additional prognostic information, such as prostate-specific antigen (PSA) test results for prostate cancer and estrogen receptor/progesterone receptor (ER/PR) results for breast cancer. This indicator does not assess the accuracy of the staging information. It is a measure of the completeness in reporting. The calculation integrates two sources of stage data: AJCC TNM staging, which historically has been reported to CCO by Ontario's 14 Regional Cancer Centers (RCCs) and the CS data collection system where trained CCO abstractors collect the base data elements from hospital health records via remote access to charts in 71 Ontario hospitals and beginning in March 2010, all 14 RCCs for the top four sites. In situ cases are not included. Currently the CS data collection system in Ontario is expanding from the top four disease sites to ultimately include all primary cancers in the OCR. CS is a data collection system for staging of cancer based on the TNM categories and stage groupings, Summary Stage, and the SEER Extent of Disease coding structure. The development of the Collaborative Staging coding system was sponsored by the AJCC in collaboration with the National Cancer Institute Surveillance, Epidemiology and End Results Program (NCI-SEER); Centers for Disease Control and Prevention National Program of Cancer Registries (CDC/NPCR); National Cancer Registrars Association (NCRA); North American Association of Central Cancer Registries (NAACCR); and American College of Surgeons (ACOS) Commission on Cancer (CoC). Canadian input was provided by the Canadian Cancer Registry. Collaborative Staging has been endorsed by all Canadian provinces/territories and US state registries as the pan-American standard for cancer staging data collection.
Technical Specifications	<ul style="list-style-type: none"> Eligible cases include all cancers identifiable in OCR except those cancers for which TNM staging is not appropriate. For cases with more than one valid stage value (due to multiple visits for Cancer Centers or staging using both TNM and CS systems), the resolved best stage is derived based on a specified algorithm. Inclusion of "Unknown" as a valid stage group, according to the AJCC Staging Guidelines. Exclusions: pediatric cases (those patients who are < 18 years of age); non-melanoma skin cancer; CCO Diagnosis grouping with primary unknown.
Data Sources	<ul style="list-style-type: none"> Ontario Cancer Registry, Cancer Care Ontario Activity Level Reporting, Cancer Care Ontario Collaborative Staging Database, Cancer Care Ontario
Data Availability and Limitations	<ul style="list-style-type: none"> The availability of population-based stage information relies on the timeliness of the Canadian Institute for Health Information (CIHI) database. It can take up to 18 months after diagnosis to ensure all cancer cases for a given year are identified. Combined TNM stage data from RCCs and CS data from CCO for the top four disease sites are available from January 2007 forward. Recent studies conducted to assess the timeliness, validity and reliability of CS stage data as published in Collaborative Staging Data Quality Reports for 2007/2008 and 2009/2010 and 2011 (pending) found that these data are of high quality. Starting with the 2010 diagnosis year, the CS data collection system is used exclusively for the four most common cancers; starting with the 2011 diagnosis year, in addition to the four most common cancers, the CS data collection system was used exclusively for melanoma skin and gynecological sites. TNM data will continue to be submitted to CCO by RCCs for all other sites, until full CS implementation.

COVERAGE: PARTICIPATION RATE

Definition	Percentage of Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a three-year period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, in a given three-year period. <p>Inclusions</p> <ul style="list-style-type: none"> Ontario women, ages 20–69, at the index date. Index date was defined as the midpoint in a three-year period, e.g. July 1st 2010 for 2009–2011. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women with an invasive cervical cancer prior to the January 1st that begins a three-year period, e.g., January 1st 2009 for 2009–2011 (see <i>Appendix B</i> for definition of cervical cancer). Women with a hysterectomy prior to the January 1st that begins a three-year period, e.g., January 1st 2009 for 2009–2011. Women with a hysterectomy were identified through the CHDB (see <i>Appendix B</i>).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, who have completed at least one Pap test in a given three-year period. <p>Inclusions</p> <ul style="list-style-type: none"> Pap tests were identified in CytoBase and CHDB (see <i>Appendix B</i>). All Pap tests in CytoBase were counted, including those with inadequate specimens. Each woman was counted once regardless of the number of Pap tests performed in a three-year period.
Analysis	<ul style="list-style-type: none"> For three-year periods in 2000–2011. The 2006 Canadian population was used as the standard population for calculating age-standardized rates. For 2009–2011 by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions), LHIN (see <i>Table 7</i> in <i>Appendix F</i>) and public health unit (PHU). LHIN, PHU and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Pap test and hysterectomy claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data.

COVERAGE: NEW PARTICIPANT RATE

Definition	Percentage of Ontario screen-eligible women 30 to 69 years of age who completed a Pap test for the first time in the last 10 years.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 30–69, who had a Pap test in a given period. <p>Inclusions</p> <ul style="list-style-type: none"> Ontario women, ages 30–69, at the index date. Index date was defined as the date of specimen collection in CytoBase or the service date in OHIP, whichever happened first. Pap tests were identified in CytoBase and the Claims History Database (CHDB) (see <i>Appendix B</i>). All Pap tests in CytoBase were counted, including those with inadequate specimens. Each woman was counted once regardless of the number of Pap tests performed in a three-year period. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women with an invasive cervical cancer prior to the index date (see <i>Appendix B</i> for definition of cervical cancer). Women with a hysterectomy prior to the index date. Women with a hysterectomy were identified through CHDB (see <i>Appendix B</i>).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 30–69 who had a Pap test in a three-year period, and no other Pap test 10 years prior to the index date. <p>Inclusions</p> <ul style="list-style-type: none"> No previous Pap test in the 10 years prior to index date. Previous Pap tests were identified in CytoBase and CHDB (see <i>Appendix B</i>).
Analysis	<ul style="list-style-type: none"> For the three-year period between 2009–2011. By 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 7</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Pap test and hysterectomy claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data.

COVERAGE: RETENTION RATE

Definition	Percentage of Ontario screen-eligible women 20 to 66 years of age who had a subsequent Pap test within 36 months of a previous normal Pap test result.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–66, who had a normal Pap test in a given year reported in CytoBase. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–66, at the index date who had a normal Pap test result in a given year in CytoBase. Index date was defined as the date of a normal Pap test (see <i>Appendix B</i>). If a woman had multiple normal tests in a given year, the specimen date of the last normal test was chosen as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women with an invasive cervical cancer (see <i>Appendix B</i> for definition of cervical cancer) before the subsequent Pap date or during the follow-up interval (for cases where there was no subsequent Pap). Women with a hysterectomy prior to the index date. Women with a hysterectomy were identified through CHDB (see <i>Appendix B</i>).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–66, who had a subsequent Pap test within 36 months of a previous normal Pap test result in a given year. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–66, who had a normal Pap test result in CytoBase in a given year, followed by a subsequent Pap test within 36 months. Subsequent Pap tests were identified through CytoBase. All tests were considered, regardless of test result.
Analysis	<ul style="list-style-type: none"> For calendar years 2006–2009. For 2009, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 7</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

SCREENING TEST: ABNORMAL RESULT RATE

Definition	Percentage of Ontario screen-eligible women 20 to 69 years of age who had an abnormal Pap test result in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, who had a Pap test in a given time period. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–69, at the index date, who had a Pap test in CytoBase, regardless of result. Index date was defined as the date of specimen collection in CytoBase. If a woman had multiple Pap tests in a given year, the date of the most severe test was taken as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women with an invasive cervical cancer (see <i>Appendix B</i> for definition of cervical cancer) before the index date. Women with an unsatisfactory, endometrial or other abnormalities result on a Pap test (see <i>Appendix B</i> for Pap result definitions). Women with a hysterectomy prior to the index date. Women with a hysterectomy were identified through CHDB (see <i>Appendix B</i>).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with an abnormal Pap test result in a given time period. <p>Inclusions</p> <ul style="list-style-type: none"> Women with an abnormal Pap test result in CytoBase (see <i>Appendix B</i> for Pap result definitions).
Analysis	<ul style="list-style-type: none"> For calendar years 2000–2012. For 2012, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 8</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

SCREENING TEST: ABNORMAL CYTOLOGY RESULTS

Definition	Percentage of Ontario screen-eligible women 20 to 69 years of age by their most severe abnormal Pap test result in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, who had a satisfactory Pap test in a given time period. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–69, at the index date, who had a Pap test in CytoBase, regardless of result. Index date was defined as the date of specimen collection in CytoBase. If a woman had multiple Pap tests in a given year, the date of the most severe test was taken as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women with an invasive cervical cancer (see <i>Appendix B</i> for definition of cervical cancer) before the index date. Women with an unsatisfactory, endometrial or other abnormalities result on a Pap test (see <i>Appendix B</i> for Pap result definitions). Women with a hysterectomy prior to the index date. Women with a hysterectomy were identified through CHDB (see <i>Appendix B</i>).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with an abnormal Pap test result in a given time period. <p>Inclusions</p> <ul style="list-style-type: none"> Women with an abnormal Pap test result in CytoBase (see <i>Appendix B</i> for Pap result definitions), by their most severe result.
Analysis	<ul style="list-style-type: none"> For 2012, by 10-year age group.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

SCREENING TEST: PERFORMANCE OF SCREENING – UNSATISFACTORY RESULTS

Definition	Percentage of unsatisfactory Pap test specimens among Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Pap test specimens among Ontario screen-eligible women, ages 20–69, in a given time period. <p>Inclusions</p> <ul style="list-style-type: none"> All Pap test specimens among Ontario screen-eligible women, ages 20–69. Index date was defined as the date of specimen collection in CytoBase. If a woman had multiple Pap tests in a given year, count all tests. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Pap tests for women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Pap tests for women with an invasive cervical cancer (see <i>Appendix B</i> for definition of cervical cancer) before the index date. Endometrial or other abnormalities result on a Pap test (see <i>Appendix B</i> for Pap result definitions). Pap tests for women with a hysterectomy prior to the index date. Pap tests for women with a hysterectomy were identified through CHDB (see <i>Appendix B</i>).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of unsatisfactory Pap test specimens among Ontario screen-eligible women, 20–69 years old, in a given time period. <p>Inclusions</p> <ul style="list-style-type: none"> Unsatisfactory Pap test results in CytoBase (see <i>Appendix B</i> for Pap result definitions).
Analysis	<ul style="list-style-type: none"> For calendar years 2000–2012. For calendar year 2012, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 8</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

SCREENING TEST: LABORATORY CAPACITY – CYTOLOGY TURNAROUND TIME

Definition	Time interval in calendar days from the date a Pap test specimen was obtained by a health care provider to the date the laboratory report was issued, for Pap tests performed on Ontario screen-eligible women 20 to 69 years of age in a 12-month period.
Calculation	<p>Definition</p> <ul style="list-style-type: none"> Median and mean time and 90th percentile, in calendar days from the date a Pap test specimen was collected to the date the laboratory report was issued. <p>Inclusions</p> <ul style="list-style-type: none"> All Pap test specimens among Ontario screen-eligible women, ages 20–69. Index date was defined as the date of specimen collection in CytoBase. If a woman had multiple Pap tests in a given year, count all tests. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Pap tests for women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code.
Analysis	<ul style="list-style-type: none"> For calendar years 2009 and 2012, by laboratory.
Data Sources	<ul style="list-style-type: none"> CytoBase – Pap tests Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

SCREENING TEST: POSITIVE PREDICTIVE VALUE FOR CIN III/AIS AND CANCER

Definition	Percentage of Ontario screen-eligible women 20 to 69 years of age with a screen-detected invasive cervical cancer or pre-cancer (CIN III/AIS) among those who had an abnormal Pap test result followed by a colposcopy or cervical surgery in a three-year period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of eligible Ontario women, ages 20–69, who had an abnormal Pap test result followed by a colposcopy or a surgical procedure involving the cervix within six months of the abnormal Pap test, in a three-year period. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–69, who had an abnormal Pap test followed by a colposcopy or a cervical surgical procedure such as: cervical biopsy, endocervical biopsy, loop electrosurgical excision procedure (LEEP), cone biopsy or hysterectomy within six months. Abnormal Pap test results were identified from CytoBase (see <i>Appendix B</i>). Colposcopies and cervical surgical procedures were identified from CHDB (see <i>Appendix B</i>). Index date was defined as the date of the abnormal Pap test in CytoBase. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women who died during the follow-up period. Women with an invasive cervical cancer (see <i>Appendix B</i>) before the index date. Women with a hysterectomy prior to the index date. Women with a hysterectomy were identified through CHDB (see <i>Appendix B</i>). Women with a normal, unsatisfactory, endometrial or other abnormalities that are not indicative of cervical abnormalities (see <i>Appendix B</i>).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of eligible women, ages 20–69, with an invasive cervical cancer or CIN III/AIS among those with an abnormal Pap test result in each time period. <p>Inclusions</p> <ul style="list-style-type: none"> Women with an invasive cervical cancer (see <i>Appendix B</i> for definition of cervical cancer) diagnosed between seven days before and up to three months after colposcopy or within \pm seven days of the surgical procedure.
Analysis	<ul style="list-style-type: none"> For time period 2009–2011, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 8</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy, colposcopy and other cervical procedures claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

SCREENING TEST: SCREENING HISTORY IN CASES OF INVASIVE CERVICAL CANCER

Definition	Percentage of Ontario screen-eligible women 30 to 69 years of age diagnosed with invasive cervical cancer in a three-year period who were screened within a 10-year period prior to diagnosis.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario women diagnosed with invasive cervical cancer in a three-year period. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 30–69, who were diagnosed with invasive cervical cancer (see <i>Appendix B</i> for definition of cervical cancer) in a given time period. Index date was defined as the date of the cervical cancer diagnosis. If a woman had multiple cervical cancer diagnoses in the three-year period, the date of the first cervical cancer diagnosis was chosen as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. If date of birth was missing or HIN was not in RPDB, age at diagnosis from OCR was used.
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of women with an invasive cervical cancer who had a Pap test 10 years prior to the cancer diagnosis. <p>Inclusions</p> <ul style="list-style-type: none"> Women with an invasive cervical cancer (see <i>Appendix B</i> for definition of cervical cancer). Women with a Pap test in CytoBase or OHIP (see <i>Appendix B</i> for Pap test definitions) prior to the cancer diagnosis date. All Pap tests in CytoBase were counted, including those with inadequate specimens and endometrial results. If a CytoBase Pap test occurred within 14 days of an OHIP Pap test, then it was considered to be the same Pap test and the date of the CytoBase Pap test was chosen as the final Pap test date, because the CytoBase Pap test can also give the result information.
Analysis	<ul style="list-style-type: none"> Looked at the screening history for: > six months to three years, > three years to five years and > five years to 10 years, no previous Pap. For time period 2009–2011, by 10-year age group and socio-demographic factor (see <i>Appendix B</i> for definitions). Socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data.

SCREENING TEST: CIN III/AIS PRE-CANCER DETECTION RATE

Definition	Rate per 10,000 Ontario screen-eligible women 20 to 69 years of age with a screen-detected CIN III/AIS pre-cancerous cervical lesion among those who were screened using a Pap test in a three-year period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of screen-eligible Ontario women, ages 20–69, screened using a Pap test in a given time period. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–69, who had a Pap test in a given year in CytoBase. Index date was defined as the specimen date of the Pap test. If a woman had multiple tests in a given year, the specimen date of the most severe test was chosen as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women who died during the follow-up period. Women with an invasive cervical cancer or a hysterectomy prior to the index date (see <i>Appendix B</i> for definitions). Women with an unsatisfactory, endometrial or other abnormalities that are not indicative of cervical abnormalities (see <i>Appendix B</i> for Pap test result definitions).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of screen-eligible women, ages 20–69, with a screen-detected pre-cancer cervical lesion (CIN III/AIS). <p>Inclusions</p> <ul style="list-style-type: none"> Women with a screen-detected pre-cancer lesion (see <i>Appendix B</i>). Pre-cancers will be counted as “detected” by the Pap test if: <ul style="list-style-type: none"> Abnormal Pap test was followed by a colposcopy or a cervical surgical procedure or hysterectomy within six months, AND Date of pre-cancer diagnosis occurred between seven days before and up to three months after colposcopy or within ± seven days of the surgical procedure Abnormal Pap test results were identified from CytoBase (see <i>Appendix B</i>). Colposcopies and cervical procedures were identified from CHDB (see <i>Appendix B</i>).
Analysis	<ul style="list-style-type: none"> For calendar years 2009–2011. For 2011, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 8</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP’s Claims History Database (CHDB) – Hysterectomy, colposcopy and other cervical procedures claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers and pre-cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of Pap tests performed as a diagnostic test could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

DIAGNOSTIC FOLLOW-UP: FOLLOW-UP OF UNSATISFACTORY CYTOLOGY

Definition	Percentage of Ontario screen-eligible women 20 to 69 years of age with an unsatisfactory Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (not including hysterectomy) within six months of the unsatisfactory screen test result in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with an unsatisfactory Pap test in a given year. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–69, who had an unsatisfactory Pap test in a given year in CytoBase. Index date was defined as the specimen date of the Pap test. If a woman had multiple unsatisfactory tests in a given year, the specimen date of the most recent test was chosen as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women who died during the follow-up period, or had an invasive cervical cancer or a hysterectomy prior to the index date (see <i>Appendix B</i> for definitions).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with an unsatisfactory Pap test in a given calendar year, who underwent a repeat Pap, colposcopy or definitive treatment (not including hysterectomy) within six months of the Pap test. <p>Inclusions</p> <ul style="list-style-type: none"> Women with an unsatisfactory result on a Pap test who underwent a repeat Pap, colposcopy or definitive treatment (not including hysterectomy) within six months of the unsatisfactory Pap test. First check if there was a repeat Pap six months after the index Pap, using both CytoBase and OHIP (see <i>Appendix B</i>); if none found, search for a colposcopy or other definitive treatment (not including hysterectomy) in CHDB (see <i>Appendix B</i>). If a woman had colposcopy within +/- seven days of her Pap test, preceding tests in CytoBase and OHIP up to six months before were used to verify if this colposcopy might have been associated with a previous Pap test; if there was a previous Pap test, that Pap test date would be used as the index date.
Analysis	<ul style="list-style-type: none"> For calendar years 2007–2011. For 2011, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 9</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy, colposcopy and other cervical definitive treatment claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of diagnostic Pap tests could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

DIAGNOSTIC FOLLOW-UP: FOLLOW-UP OF LOW-GRADE ABNORMAL CYTOLOGY

Definition	Percentage of Ontario screen-eligible women 20 to 69 years of age with a low-grade abnormal Pap test result who underwent a repeat Pap test, colposcopy or definitive treatment (including hysterectomy) within nine months of the low-grade abnormal screen test result in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with a low-grade abnormal Pap test in a given year. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–69, who had a low-grade abnormal Pap test in a given year in CytoBase (see <i>Appendix B</i> for definition of low-grade abnormal Pap test). Index date was defined as the specimen date of the Pap test. If a woman had multiple low-grade abnormal tests in a given year, the specimen date of the most recent test was chosen as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women who died during the follow-up period, or had an invasive cervical cancer or a hysterectomy prior to the index date (see <i>Appendix B</i> for definitions).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with a low-grade cervical abnormality on a Pap test in a given calendar year, who underwent a repeat Pap, colposcopy or definitive treatment (including hysterectomy) within nine months of the low-grade abnormal Pap test. <p>Inclusions</p> <ul style="list-style-type: none"> Women with a low-grade abnormal result on a Pap test who underwent a repeat Pap, colposcopy or definitive treatment within nine months of the Pap test. First check if there was a repeat Pap nine months after the index Pap, using both CytoBase and OHIP (see <i>Appendix B</i>); if none found, search for a colposcopy or other definitive treatment, or hysterectomy in CHDB (see <i>Appendix B</i>). If a woman had colposcopy within +/- seven days of her Pap test, preceding tests in CytoBase and OHIP up to six months before were used to verify if this colposcopy might have been associated with a previous Pap test; if there was a previous Pap test, that Pap test date would be used as the index date.
Analysis	<ul style="list-style-type: none"> For calendar years 2007–2011. For 2011, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 9</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy, colposcopy and other cervical definitive treatment claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of diagnostic Pap tests could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

DIAGNOSTIC FOLLOW-UP: FOLLOW-UP OF HIGH-GRADE ABNORMAL CYTOLOGY

Definition	Percentage of Ontario screen-eligible women 20 to 69 years of age with a high-grade abnormal Pap test result who underwent a colposcopy or definitive treatment (including hysterectomy) within six months of the high-grade abnormal screen test result in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with a high-grade abnormal Pap test in a given year. <p>Inclusions</p> <ul style="list-style-type: none"> Women, ages 20–69, who had a high-grade abnormal Pap test in a given year in CytoBase (see <i>Appendix B</i> for definition of high-grade abnormal Pap test). Index date was defined as the specimen date of the Pap test. If a woman had multiple high-grade abnormal tests in a given year, the specimen date of the most recent test was chosen as the index date. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women who died during the follow-up period, or had an invasive cervical cancer or a hysterectomy prior to the index date (see <i>Appendix B</i> for definitions).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of Ontario screen-eligible women, ages 20–69, with a high-grade cervical abnormality on a Pap test in a given calendar year, who underwent a colposcopy or definitive treatment (including hysterectomy) within six months of the low-grade abnormal Pap test. <p>Inclusions</p> <ul style="list-style-type: none"> Women with a high-grade abnormal result on a Pap test who underwent a repeat Pap, colposcopy or definitive treatment within six months of the Pap test. First check if there was a colposcopy; if none found, search for other definitive treatments, or hysterectomy in CHDB (see <i>Appendix B</i>). If a woman had colposcopy within +/- seven days of her Pap test, preceding tests in CytoBase and OHIP up to six months before were used to verify if this colposcopy might have been associated with a previous Pap test; if there was a previous Pap test, that Pap test date would be used as the index date.
Analysis	<ul style="list-style-type: none"> For calendar years 2007–2011. For 2011, by 10-year age group, socio-demographic factor (see <i>Appendix B</i> for definitions) and LHIN (see <i>Table 9</i> in <i>Appendix F</i>). LHIN and socio-demographic factor assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy, colposcopy and other cervical definitive treatment claims CytoBase – Pap tests Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of diagnostic Pap tests could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario.

DIAGNOSTIC FOLLOW-UP: COLPOSCOPY – NEW AND FOLLOW-UP CASES

Definition	Number of new and follow-up colposcopy cases in Ontario screen-eligible women 20 to 69 years of age in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of colposcopies in Ontario screen-eligible women, ages 20–69, in a given year. <p>Inclusions</p> <ul style="list-style-type: none"> All colposcopies in women ages 20–69 in a given year in CHDB (see <i>Appendix B</i> for definition of colposcopy). Index date was defined as the service date for the colposcopy claim. If a woman had multiple colposcopies in a given year, they were all counted. The RPDB address closest to the index date was used to assign postal code. <p>Exclusions</p> <ul style="list-style-type: none"> Women with a missing or invalid health insurance number, date of birth, Local Health Integration Network (LHIN) or postal code. Women who had an invasive cervical cancer or a hysterectomy prior to the index date (see <i>Appendix B</i> for definitions).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Total number of new colposcopies in Ontario screen-eligible women, ages 20–69, in a given year. Total number of follow-up colposcopies in Ontario screen-eligible women, ages 20–69, in a given year.
Analysis	<ul style="list-style-type: none"> For calendar year 2012, by LHIN. LHIN assignment was determined from residential postal code using PCCF+, version 5k.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Hysterectomy and colposcopy claims Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of diagnostic Pap tests could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data.

DIAGNOSTIC FOLLOW-UP: COLPOSCOPIST ANNUAL COLPOSCOPY VOLUME

Definition	Percentage of colposcopists who perform a minimum of 25 new colposcopies or a minimum of 100 new and follow-up colposcopies in a 12-month period.
Denominator	<p>Definition</p> <ul style="list-style-type: none"> Total number of colposcopists in Ontario. <p>Inclusions</p> <ul style="list-style-type: none"> All physicians who claimed five colposcopies or more in CHDB in a given period are considered colposcopists (see <i>Appendix B</i> for colposcopy definition).
Numerator	<p>Definition</p> <ul style="list-style-type: none"> Colposcopists who performed 25 or more initial colposcopies or 100 or more initial and follow-up colposcopies.
Analysis	<ul style="list-style-type: none"> For calendar years 2009–2011.
Data Sources	<ul style="list-style-type: none"> OHIP's Claims History Database (CHDB) – Colposcopy claims
Data Availability and Limitations	<ul style="list-style-type: none"> The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data.

PRIMARY CARE

Definition	Participation rate, retention rate and follow-up of high-grade abnormal Pap tests by enrolment status with a patient enrolment model (PEM) physician, for the most recent time period.
Calculation	<p>Participation rate (see methodology for participation rate)</p> <ul style="list-style-type: none"> Percentage of Ontario screen-eligible women 20 to 69 years of age who completed at least one Pap test in a three-year period. <p>Retention rate (see methodology for retention rate)</p> <ul style="list-style-type: none"> Percentage of Ontario screen-eligible women 20 to 66 years of age who had a subsequent Pap test within 36 months of a previous normal Pap test result. <p>Follow-up rate of high-grade abnormal cytology (see methodology for follow-up of high-grade cytology)</p> <ul style="list-style-type: none"> Percentage of Ontario screen-eligible women 20 to 69 years of age with a high-grade abnormal Pap test result who underwent a colposcopy or definitive treatment (including hysterectomy) within six months of the high-grade abnormal screen test result in a 12-month period. <p>Inclusions</p> <ul style="list-style-type: none"> Physician in a PEM practice was determined from CPDB using the B28 affiliation; patient enrolment status was determined using CAPE. PEM status and enrolment was determined at the index date.
Analysis	<ul style="list-style-type: none"> Participation rate, time period 2009–2011. Retention rate, year 2009. Follow-up of high-grade cytology, year 2011.
Data Sources	<ul style="list-style-type: none"> CytoBase – Pap tests OHIP CHDB (Claims History Database) – Hysterectomy, colposcopy and other cervical definitive treatment claims Ontario Cancer Registry (OCR) – Resolved invasive cervical cancers Pathology Information Management System (PIMS) – Invasive cervical cancers Corporate Providers Database (CPDB) - Physician PEM status Client Agency Program Enrolment database (CAPE) – Physician/patient enrolment information Registered Persons Database (RPDB) – Demographics
Data Availability and Limitations	<ul style="list-style-type: none"> A small proportion of diagnostic Pap tests could not be excluded from the analysis. The accuracy and completeness of data presented is dependent on the accuracy and completeness of the source data. CytoBase contains 87% of all Pap tests performed in Ontario. Some family physician groups, e.g., Community Health Centers (CHC), Northern Physician Retention Initiative (NPRI) and Nurse Practitioner-Led Clinics, are also considered comprehensive models of primary care, but are not considered PEM practices as they do not enrol patients to a family doctor; patients seen in those groups were included in the non-PEM enrolled category, which may boost non-PEM rates.

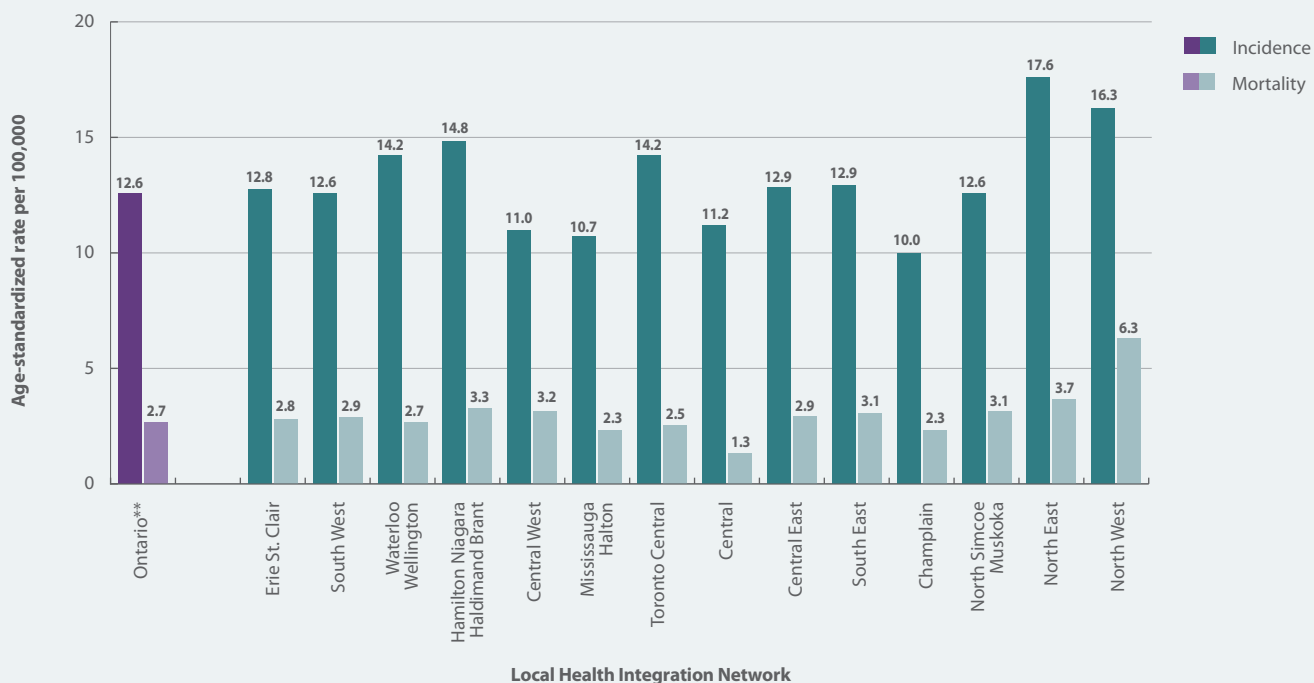
Appendix D: Data Sources

- OHIP's Claims History Database
- Ontario Cancer Registry
- Pathology Information Management System
- Corporate Providers Database
- Client Agency Program Enrolment database
- Registered Persons Database
- CytoBase

Appendix E: Incidence and Mortality Rates by Local Health Integration Network (LHIN)

FIGURE 35

Cervical* cancer incidence and mortality rates[†] by Local Health Integration Network (LHIN), women 20 to 69 years of age, 2006–2010



Note: *Cervix uteri: ICD-0-3 C53 (incidence); ICD-10 C53 (mortality).

[†]Calculated with hysterectomy-corrected population at risk. Rates are per 100,000 and standardized to the age distribution of the 1991 Canadian population.

**Cases/deaths with unknown residence were excluded.

Data source: Ontario Cancer Registry

Appendix F: Program Indicators by Local Health Integration Network (LHIN)

In the following tables, the light green cells represent rates that are better than the Ontario average, whereas pink cells represent rates that need improvement with respect to the Ontario rate.

TABLE 7

Regional variation in Ontario Cervical Screening Program (OCSP) screening, by Local Health Integration Network (LHIN), coverage indicators

LOCAL HEALTH INTEGRATION NETWORK	PARTICIPATION RATE, 2009–2011		NEW PARTICIPATION RATE, 2009–2011		RETENTION RATE, 2009	
	DENOMINATOR (N)	PARTICIPATION RATE (%)	DENOMINATOR (N)	NEW PARTICIPATION RATE (%)	DENOMINATOR (N)	RETENTION RATE (%)
Erie St. Clair	192,408	62.5%	92,803	6.7%	58,711	79.2%
South West	282,643	66.3%	143,184	5.6%	86,377	78.6%
Waterloo Wellington	228,179	67.4%	118,939	5.9%	75,143	79.2%
Hamilton Niagara Haldimand Brant	424,326	66.6%	220,432	5.9%	131,573	78.8%
Central West	282,394	61.5%	137,840	9.7%	78,490	78.2%
Mississauga Halton	386,823	64.5%	204,846	8.4%	116,384	80.9%
Toronto Central	430,750	60.8%	205,983	10.0%	121,262	80.4%
Central	600,821	64.8%	318,832	9.3%	193,023	82.7%
Central East	493,614	65.2%	255,464	7.2%	155,746	80.6%
South East	149,398	69.3%	81,224	5.8%	48,580	78.3%
Champlain	406,691	68.6%	219,730	7.0%	130,059	81.8%
North Simcoe Muskoka	132,927	66.3%	69,072	5.0%	41,654	78.0%
North East	169,821	61.2%	78,145	5.6%	41,181	72.9%
North West	73,232	61.8%	34,105	7.3%	20,312	74.5%
ONTARIO	4,254,027	64.9%	2,180,599	7.5%	1,298,495	79.9%



 Needs improvement  Better than Ontario average

TABLE 8

Regional variation in Ontario Cervical Screening Program (OCSP) screening, by Local Health Integration Network (LHIN), screening indicators

LOCAL HEALTH INTEGRATION NETWORK	ABNORMAL RESULT RATE, 2012		UNSATISFACTORY RATE, 2012		POSITIVE PREDICTIVE VALUE, 2009–2011		CIN III/AIS PRE-CANCER DETECTION RATE, 2011	
	DENOMINATOR (N)	ABNORMAL RESULT RATE (%)	DENOMINATOR (N)	UNSATISFACTORY RATE (%)	DENOMINATOR (N)	POSITIVE PREDICTIVE VALUE (%)	DENOMINATOR (N)	RATE PER 10,000
Erie St. Clair	58,112	7.5%	63,059	0.38%	9,867	2.4%	63,829	16.8
South West	79,640	6.2%	83,827	0.55%	13,030	4.8%	91,534	25.5
Waterloo Wellington	70,206	6.1%	75,517	0.60%	11,304	5.9%	78,377	30.0
Hamilton Niagara Haldimand Brant	128,419	5.8%	136,111	0.71%	19,629	5.2%	139,925	29.5
Central West	77,679	4.3%	81,892	0.56%	8,206	4.0%	85,461	15.9
Mississauga Halton	114,847	4.5%	120,841	0.56%	12,916	3.9%	127,338	15.5
Toronto Central	115,154	5.0%	121,506	0.52%	15,217	4.8%	129,392	16.5
Central	186,687	4.6%	198,553	0.62%	20,020	4.1%	206,872	14.1
Central East	147,007	4.9%	155,518	0.59%	18,247	6.1%	165,238	23.7
South East	45,841	7.7%	49,041	0.74%	9,022	4.0%	51,368	22.2
Champlain	120,600	5.2%	127,144	0.58%	17,197	3.6%	136,851	20.5
North Simcoe Muskoka	40,637	6.7%	42,743	0.45%	6,639	5.0%	44,909	33.2
North East	40,812	7.8%	43,580	0.83%	9,666	4.4%	45,194	32.1
North West	19,209	8.9%	20,663	1.18%	3,769	5.8%	22,415	42.8
ONTARIO	1,244,850	5.5%	1,319,995	0.60%	174,729	4.6%	1,388,703	20.4

Needs improvement Better than Ontario average

TABLE 9

Regional variation in Ontario Cervical Screening Program (OCSP) screening, by Local Health Integration Network (LHIN), follow-up indicators

LOCAL HEALTH INTEGRATION NETWORK	FOLLOW-UP OF UNSATISFACTORY CYTOLOGY, 2011		FOLLOW-UP OF LOW GRADE ABNORMAL CYTOLOGY, 2011		FOLLOW-UP OF HIGH GRADE ABNORMAL CYTOLOGY, 2011	
	DENOMINATOR (N)	FOLLOW-UP RATE (%)	DENOMINATOR (N)	FOLLOW-UP RATE (%)	DENOMINATOR (N)	FOLLOW-UP RATE (%)
Erie St. Clair	286	45.5%	3,779	78.4%	539	68.3%
South West	526	33.7%	4,557	74.4%	479	79.1%
Waterloo Wellington	540	38.1%	3,899	76.7%	380	83.4%
Hamilton Niagara Haldimand Brant	1,087	37.8%	6,351	74.5%	666	84.4%
Central West	510	30.2%	2,894	71.6%	250	84.0%
Mississauga Halton	727	36.7%	4,819	75.6%	380	82.4%
Toronto Central	714	34.9%	5,190	74.5%	484	84.9%
Central	1,265	31.9%	7,254	74.4%	587	80.2%
Central East	1,023	35.2%	6,346	73.3%	605	85.6%
South East	472	36.0%	3,021	74.4%	360	86.7%
Champlain	1,014	45.1%	5,569	76.5%	590	77.5%
North Simcoe Muskoka	201	40.3%	2,296	75.0%	262	82.8%
North East	448	43.3%	2,808	67.4%	277	79.1%
North West	252	51.2%	1,502	66.8%	166	73.5%
ONTARIO	9,065	37.4%	60,285	74.4%	6,025	80.9%

Needs improvement
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Appendix G: List of Abbreviations

AGC	atypical glandular cells	OCRIS	Ontario Cancer Registry Information System
AIS	adenocarcinoma in situ	OCSP	Ontario Cervical Screening Program
ASC-H	atypical squamous cells, cannot exclude high-grade squamous intraepithelial lesion	OHIP	Ontario Health Insurance Plan
ASCUS	atypical squamous cells of undetermined significance	OLA	Ontario Laboratory Accreditation
CA	census agglomeration	PCCF	postal code conversion file
CAPE	Client Agency Program Enrolment database	PEM	patient enrolment model
CCO	Cancer Care Ontario	PET	positron emission tomography
CCPCN	Cervical Cancer Prevention and Control Network	PHAC	Public Health Agency of Canada
CHDB	Claims History Database	PHU	public health unit
CIN	cervical intraepithelial neoplasia	PIMS	Pathology Information Management System
CMA	census metropolitan area	PPV	positive predictive value
CPDB	Corporate Providers Database	PSA	prostate-specific antigen
CS	collaborative staging	RCP	Regional Cancer Program
CSQI	Cancer System Quality Index	RPDB	Registered Persons Database
CT/MRI	computed tomography/magnetic resonance imaging	TNM	tumour, node, metastasis
DA	dissemination area	UK	United Kingdom
ER/PR	estrogen receptor/progesterone receptor	U/NS	under-/never-screened
HIN	health insurance number		
HIV	human immunodeficiency virus		
HPV	human papillomavirus		
HSIL	high-grade squamous intraepithelial lesion		
HSV	herpes simplex virus		
IARC	International Agency for Research on Cancer		
ICD	International Classification of Diseases		
ICD-O	International Classification of Diseases for Oncology		
LHIN	Local Health Integration Network		
LEEP	loop electrosurgical excision procedure		
LSIL	low-grade squamous intraepithelial lesion		
MOHLTC	Ministry of Health and Long-Term Care		
NHS	National Health Service		
NILM	negative for intraepithelial lesion or malignancy		
OBSP	Ontario Breast Screening Program		
OCR	Ontario Cancer Registry		

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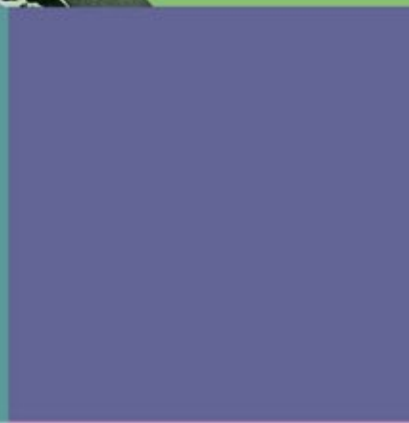
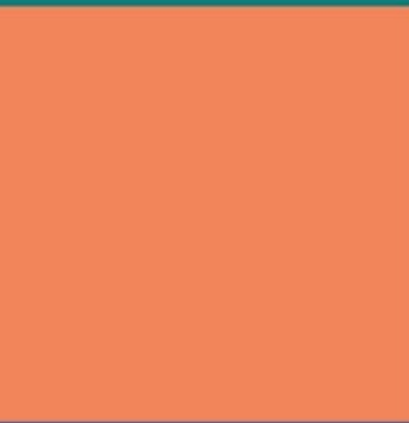
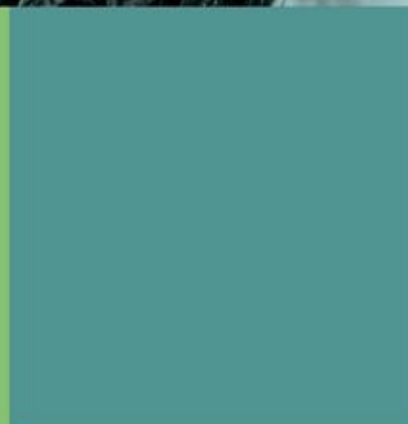
For More Information

Cancer screening resources are available at www.cancercare.on.ca/screenforlife, including program reports for the Ontario Breast Screening Program (OBSP) and the ColonCancerCheck Program.

The Cancer Screening Quality Index (CSQI) is a web-based tool that reports on a variety of evidence-based indicators covering every aspect of cancer control, from cancer prevention to end-of-life care, and tracks progress against six dimensions of quality. Please see www.csqi.on.ca for more information.

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