Ontario Health
Cancer Care Ontario

Ontario Cancer Profiles
Data Sources and Notes

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Cancer Incidence

Definition

Age-standardized incidence rates are weighted averages of age-specific incidence rates. The weights for these rates are the proportion of people belonging to the corresponding age groups of a standard population. Age standardization provides the incidence rate that would occur if the population of interest had the same age distribution as a given standard population (in Ontario Cancer Profiles this is the 2011 Canadian Standard Population).[1]

An age-specific incidence rate is calculated by dividing the number of new cases of cancer per 100,000 people in a 5-year age group (0 to 4, 5 to 9… 85+) diagnosed during a time period (e.g., a year) by the total number of people in that age group and time period.

More information on rate standardization can be found on the Association of Public Health Epidemiologists of Ontario website.

Data sources

Ontario Cancer Registry records are created using data from various administrative databases, laboratory reports and clinical records. Four primary sources are used to generate case records in the registry:

- Provincial pathology reports from Ontario's public hospital laboratories and private laboratories;
- An activity-level reporting database containing data from Ontario's 14 regional cancer centres and their associated hospitals for selected systemic therapy and all radiation treatment;
- Admission and discharge information from the Canadian Institute of Health Information's hospital abstracting databases (Discharge Abstract Database, National Ambulatory Care and Reporting System); and
- Cause-of-death data from the Office of the Registrar General for Ontario in the Ministry of Government and Consumer Services.

For more information, visit the Ontario Cancer Registry web page.

Cancer incidence statistics in Ontario Cancer Profiles were generated using the Ontario Cancer Registry (OCR) SEER*Stat Package, with data extracted from the OCR in March 2021.

Data notes

- Incidence rates are per 100,000 person-years and age-adjusted to the 2011 Canadian Standard population.[1]

- All case counts for incidence are randomly rounded to multiples of 5 to ensure no back-calculation of data suppressed due to small case counts (i.e., 1 to 5). However, random rounding may result in counts from 6 to 9 being rounded down to 5.
- The "Insuff data" value in the tables indicates that the measure is suppressed due to:
    - A small case count (i.e., 1 to 5) to protect personal health information in accordance with the data privacy responsibilities of Ontario Health (Cancer Care Ontario); or
    - An imprecise estimate (i.e., a relative standard error greater than 23%). The relative standard error is equal to the standard error of the estimate divided by the estimate and multiplied by 100 to obtain a percentage.
- To be comparable with sub-region-level and public health unit-level statistics, overall Ontario incidence counts and rates exclude cases with unknown residence; therefore, provincial statistics may not match the counts and rates published elsewhere, such as in the *Ontario Cancer Statistics* report.
- For cancer incidence, data start with the year 2010 to account for changes to the Ontario Cancer Registry rules for counting multiple primary cancers. The Ontario Cancer Registry adopted The Surveillance, Epidemiology and End Results (SEER) Program Multiple Primary and Histology Coding Rules to count cancer cases diagnosed on January 1, 2010, onward, which replaced more conservative rules used previously (a modified version of the International Association of Cancer Registries rules). For more information, please see the Data Sources in the *Ontario Cancer Statistics* report.
- Female and male sex terms refer to the sex that is recorded in the Ontario Cancer Registry.

Cancer Mortality

Definition

Age-standardized mortality rates are weighted averages of age-specific mortality rates. The weights for these rates are the proportion of people belonging to the corresponding age groups of a standard population. Age standardization provides the mortality rate that would occur if the population of interest had the same age distribution as a given standard population (in Ontario Cancer Profiles this is the 2011 Canadian Standard Population).[1]

An age-specific mortality rate is calculated by dividing the number of deaths from cancer per 100,000 people in a 5-year age group (0 to 4, 5 to 9… 85+) that occurred during a time period (e.g., a year) by the number of people in that age group and time period.

More information on rate standardization can be found on the Association of Public Health Epidemiologists of Ontario website.

Data sources

Ontario Cancer Registry records are created using data from various administrative databases, laboratory reports and clinical records. Four primary sources are used to generate case records in the registry:

- Provincial pathology reports from Ontario's public hospital laboratories and private laboratories;
- An activity-level reporting database containing data from Ontario's 14 regional cancer centres and their associated hospitals for selected systemic therapy and all radiation treatment;
- Admission and discharge information from the Canadian Institute of Health Information's hospital abstracting databases (Discharge Abstract Database, National Ambulatory Care and Reporting System); and
- Cause-of-death data from the Office of the Registrar General for Ontario in the Ministry of Government and Consumer Services.

For more information, visit the Ontario Cancer Registry web page.

Cancer mortality statistics in Ontario Cancer Profiles were generated using the Ontario Cancer Registry (OCR) SEER*Stat Package, with data extracted from the OCR in December 2020.

Data notes

- Mortality rates are per 100,000 person-years and age-adjusted to the 2011 Canadian Standard Population.[1]
- All case counts for mortality are randomly rounded to multiples of 5 to ensure no back-calculation of data suppressed due to small case counts (i.e., 1 to 5). However, random rounding may result in counts from 6 to 9 being rounded down to 5.
- The "Insuff data" value in the tables indicates that the measure is suppressed due to:
    - A small case count (i.e., 1 to 5) to protect personal health information in accordance with the data privacy responsibilities of Ontario Health (Cancer Care Ontario); or
    - An imprecise estimate (i.e., a relative standard error greater than 23%). The relative standard error is equal to the standard error of the estimate divided by the estimate and multiplied by 100 to obtain a percentage.
- To be comparable with sub-region-level and public health unit-level statistics, overall Ontario counts and rates exclude cases with unknown residence; therefore, provincial statistics may not match the counts and rates published elsewhere, such as in the *Ontario Cancer Statistics* report.
- Female and male sex terms refer to the sex that is recorded in the Ontario Cancer Registry.

Cancer Prevalence

Definition

Cancer prevalence is defined as the number of people or percent of the general population who were still alive as of January 1, 2019, with a diagnosis of cancer in the previous 30 years. Prevalence includes people who are under active treatment for cancer, who recently completed their primary treatment or who are long-term survivors.

Data sources

Ontario Cancer Registry records are created using data collected for purposes other than cancer registration. This information comes from various administrative databases, laboratory reports and clinical records. Four primary sources are used to generate case records in the registry:

- Provincial pathology reports from Ontario's public hospital laboratories and private laboratories;
- An activity-level reporting database containing data from Ontario's 14 regional cancer centres and their associated hospitals for selected systemic therapy and all radiation treatment;
- Admission and discharge information from the Canadian Institute of Health Information's hospital abstracting databases (Discharge Abstract Database, National Ambulatory Care and Reporting System); and
- Cause-of-death data from the Office of the Registrar General for Ontario in the Ministry of Government and Consumer Services.

For more information, visit the Ontario Cancer Registry web page.

Cancer prevalence statistics in Ontario Cancer Profiles were generated using the Ontario Cancer Registry (OCR) SEER*Stat Package, with data extracted from the OCR in March 2021.

Data notes

- All case counts and population estimates for prevalence are randomly rounded to multiples of 5 to ensure no back-calculation of data suppressed due to small case counts (i.e., 1 to 5). However, random rounding may result in case counts from 6 to 9 being rounded down to 5.
- The "Insuff data" value in the tables indicates that the measure is suppressed due to a small case count (i.e., 1 to 5) to protect personal health information in accordance with the data privacy responsibilities of Ontario Health (Cancer Care Ontario).
- To be comparable with sub-region-level and public health unit-level statistics, overall Ontario counts and percentages exclude cases with unknown residence; therefore, provincial statistics may not match the counts and percentages published elsewhere, such as in the *Ontario Cancer Statistics* report.

- Female and male sex terms refer to the sex that is recorded in the Ontario Cancer Registry.

Cancer Survival

Definition

Cancer survival reflects prognosis, early detection of cancer and treatment effectiveness. Ontario Cancer Profiles expresses survival using a relative survival ratio (RSR), which is calculated as the observed survival of people with cancer divided by the expected survival of the general Ontario population for people of the same age and sex during the same time period. RSRs indicate the likelihood of surviving for a certain amount of time (e.g., 1, 3 or 5 years) after a cancer diagnosis. The 5-year RSR is provided in Ontario Cancer Profiles and is expressed as a percentage. The closer the value is to 100%, the closer the survival pattern is to that of the general population.

Data sources

Ontario Cancer Registry records are created using data collected for purposes other than cancer registration. This information comes from various administrative databases, laboratory reports and clinical records. Four primary sources are used to generate case records in the registry:

- Provincial pathology reports from Ontario's public hospital laboratories and private laboratories;
- An activity-level reporting database containing data from Ontario's 14 regional cancer centres and their associated hospitals for selected systemic therapy and all radiation treatment;
- Admission and discharge information from the Canadian Institute of Health Information's hospital abstracting databases (Discharge Abstract Database, National Ambulatory Care and Reporting System); and
- Cause-of-death data from the Office of the Registrar General for Ontario in the Ministry of Government and Consumer Services.

For more information, visit the Ontario Cancer Registry web page.

Survival statistics of the general population are derived from provincial life tables (released June 28, 2018) produced by Statistics Canada.

Cancer survival statistics in Ontario Cancer Profiles were generated using the Ontario Cancer Statistics (OCR) SEER*Stat Package, with data extracted from the OCR in March 2021.

Data notes

- Survival analyses were based on the first primary cancer per person. Relative survival ratios (RSRs) are calculated for cases diagnosed in people ages 15 to 99. Cases were excluded from the survival analyses if:
    - The age of the person was unknown;
    - The person was diagnosed based on an autopsy only; or
    - The date of diagnosis and date of death were the same (i.e., death certificate only cases where the diagnosis happened at or following death).
- Expected survival proportions were derived using the Ederer II approach from Ontario life tables produced by Statistics Canada.
- RSRs were estimated using the period method. Period analysis uses the survival experience of people in a recent interval to estimate survival. This analysis method allows for more up-to-date estimates because unlike the cohort method, period analysis does not require data on the full follow-up period. For example, 5-year survival using the cohort method for cancers diagnosed in 2016 would need to allow 5 years of follow-up time to accrue (2021), but the period method includes people diagnosed in the prior 5 years and having any amount of follow-up time during that period (i.e. from 2012 to 2016).
- For all ages combined only, RSRs were age-standardized by weighting with the International Cancer Survival Standard population age-group weights (for more information, see Analysis in the Ontario Cancer Statistics report). Age-specific RSRs are not age-standardized.
- To be comparable with sub-region-level and public health unit-level statistics, overall Ontario percentages exclude cases with unknown residence; therefore, provincial statistics may not match the percentages published elsewhere, such as in the *Ontario Cancer Statistics* report.
- The "Insuff data" value in the tables indicates that the measure is suppressed due to imprecise survival estimates (i.e., RSR based on fewer than 10 cases or with a standard error of greater than or equal to 10%).
- Female and male sex terms refer to the sex that is recorded in the Ontario Cancer Registry.

Cancer Incidence Projections

Definition

Projected age-standardized incidence rates are weighted averages of estimated future age-specific rates. The weights for these rates are the proportion of people belonging to the corresponding age groups of a standard population. Age standardization provides the incidence rate that would occur if the population of interest had the same age distribution as a given standard population (in Ontario Cancer Profiles this is the 2011 Canadian Standard Population).[1]

Data sources

The historical cancer incidence statistics (1986 to 2018) used to calculate incidence projections in Ontario Cancer Profiles were generated using the Ontario Cancer Registry (OCR) SEER*Stat Package, with data extracted from the OCR in March 2021. The Ontario and sub-region populations used for the cancer incidence projections are population projections up to year 2030 from the Ontario Ministry of Finance.

For more information, visit the Ontario Ministry of Finance Populations projections web page.

Data notes

- Projected cancer incidence rates are per 100,000 person-years and age-adjusted to the 2011 Canadian Standard population.
- The "Insuff data" value in the tables indicates that the measure is suppressed due to a small case count (i.e., 1 to 5) to protect personal health information in accordance with the data privacy responsibilities of Ontario Health (Cancer Care Ontario).
- To be consistent with the report, the overall Ontario cancer incidence counts include those with unknown residence; therefore, caution should be used when comparing sub-region statistics to provincial statistics.
- Female and male sex terms refer to the sex that is recorded in the Ontario Cancer Registry.

Projection Method

Regional projections of incidence for 2019 to 2030 were estimated using the Canproj projection package[2] in R software[3]. The Canproj package is a modified version of Nordpred Power 5 package[4], which is based on an age-period-cohort Poisson regression model. The Canproj package has enhancements that overcome difficulties in the standard Poisson model and improve projection accuracy.

Canproj consists of 3 sub-packages:

- Nordpred model (adpcproj: age-drift-period-cohort model);
- Age-cohort model (acproj: age-cohort model); and
- Hybrid model (hybdproj: age-only model).

Each sub-package can work independently for projections. Canproj has a built-in decision tree to help determine which of the 3 models is most appropriate. The package can also replace the Poisson distribution to a negative-binomial distribution when overdispersion is present in the data. Finally, Canproj tests the goodness-of-fit of the chosen model.

Projections for "All cancer" and each individual cancer site were estimated using the Canproj package.

Age-drift-period-cohort model (Nordpred)

The Norpred Power 5 model is represented as:

$$Case_{ap} \sim Poisson\ (\mu_{ap}),$$

$$R_{ap} = \frac{\mu_{ap}}{n_{ap}} = (A_a + P_p + C_c + Dp)^5$$

The symbols represent the following:

- R_{ap} is the incidence rate in age group a in calendar period p;
- μ_{ap} is the mean count of cases in age group a in calendar period p;
- n_{ap} is the size of the corresponding population;
- A_a is the age component for age group a;
- P_p is the non-linear period component of period p;
- C_c is the non-linear cohort component of cohort c;
- D is the common linear drift parameter; and
- p is the calendar period.

Cohorts were calculated as $c = A + p - a$ with A equaling the total number of age groups.[2]

Age-cohort model (acproj model)

The age-cohort model is a reduced form of the Nordpred model selected by Canproj when sparse data exist in the youngest and oldest birth cohorts. Due to sparseness of the data at both extreme cohorts, the remaining cohorts with complete observations are set as reference when age and cohort affects are estimated.[2]

The age-cohort model is represented as:

$$Case_{ap} \sim Poisson\ (\mu_{ap}),$$

$$R_{ap} = \frac{\mu_{ap}}{n_{ap}} = (A_a + C_c)^5, \quad c = A + p - a,$$

$$p = 1,2, \ldots, P, \quad c = 1,2, \ldots, C \text{ where } C = A + P - 1$$

The symbols included in this model are the same as those in the Nordpred Power 5 model above.

Hybrid models: age-only, common trend and age-specific trend models

When cohort effects are not significant, 3 types of hybrid models are used: age-specific (most complex), common trend and age-only (least complex). The hybrid models use a combination of averages, joinpoint regression and Poisson regression .[2,5] The Canproj package first compares the common trend model with the age-specific model using a chi-square test in the age groups when data exist for the entire periods. The age-specific model is selected when there is a significant difference between these 2 models. The common trend model is selected when there is no significant difference between the common trend and age-specific models, and the common trend is significant (i.e., the slope of the common trend parameter is not zero). The age-only model is selected when there is no significant difference between common trend and age-specific models, and the common trend is not significant (i.e., the slope of the common trend parameter does not differ from zero).

The incidence and population data were classified by year of diagnosis, sub-region and sex, and grouped by 5-year age groups (0 to 4, 5 to 9 … 85 and older). For incidence projections, cases meeting the International Association for Research on Cancer/International Association of Cancer Registries multiple primary rules from 1984 to 2018 were projected. These were later converted for the 2010 to 2018 period for Surveillance, Epidemiology and End Results multiple primary rules by applying an inflation factor based on the age-specific increase in multiple primary cancers. Projections for all cancers combined were estimated based on the sum of all data from the 23 cancer sites in this report. To get regional incidence projections for males and females, projections were calculated by sex and then summed. This approach was used to ensure that the projections for males and females combined are equal to the sum of the projections for these sexes. The lists of models used for all cancers and for each individual cancer site by sex and sub-region are in Tables A.1 to A.15 for incidence projections. These tables can be found in the Data Sources and Notes - Appendix on the Ontario Cancer Profiles web page.

Cancer Screening

Definition

Breast cancer screening participation

The percentage of Ontario screen-eligible people, 50 to 74 years old, who completed at least 1 mammogram within a 30-month period.

- Numerator: total number of Ontario screen-eligible people, 50 to 74 years old, who have completed at least 1 mammogram in a 30-month period.
- Denominator: total number of Ontario screen-eligible people, 50 to 74 years old, in the reporting period.

Cervical screening participation

The percentage of Ontario screen-eligible people, 21 to 69 years old, who completed at least 1 Pap test in a 42-month period.

- Numerator: total number of Ontario screen-eligible people, 21 to 69 years old, who have completed at least 1 Pap test in a 42-month period.
- Denominator: total number of Ontario screen-eligible people, 21 to 69 years old, in the reporting period.

Overdue for colorectal cancer screening

The percentage of Ontario screen-eligible people, 50 to 74 years old, who were overdue for colorectal cancer screening.

- Numerator: total number of Ontario screen-eligible people, 50 to 74 years old, who were overdue for colorectal cancer screening by the end of the reporting period. People were considered overdue for colorectal cancer screening if they did not have a guaiac fecal occult blood test within the last 2 years AND did not have a colonoscopy in the last 10 years AND did not have a flexible sigmoidoscopy in the last 10 years.
- Denominator: total number of Ontario screen-eligible people, 50 to 74 years old, in the reporting period.

Data sources

Breast cancer screening participation

The following data sources are used to generate the breast cancer screening participation indicator:

- Integrated Client Management System – Ontario Breast Screening Program mammograms;
- Ontario Health Insurance Plan's Claims History Database – non-Ontario Breast Screening Program mammogram and mastectomy claims;
- Ontario Cancer Registry – invasive and in-situ breast cancers;
- Registered Persons Database – demographics; and
- Postal Code Conversion File Plus – residence and socio-demographic information.

Cervical screening participation

The following data sources are used to generate the cervical screening participation indicator:

- CytoBase – Pap tests;
- Ontario Health Insurance Plan's Claims History Database – Pap tests, hysterectomy claims;
- Ontario Cancer Registry – resolved invasive cervical cancers;
- Registered Persons Database – demographics; and
- Postal Code Conversion File Plus – residence and socio-demographic information.

Overdue for colorectal cancer screening

The following data sources are used to generate the overdue for colorectal cancer screening indicator:

- Ontario Health Insurance Plan's Claims History Database – colectomy claims, non-ColonCancerCheck and ColonCancerCheck guaiac fecal occult blood test, colonoscopy, flexible sigmoidoscopy;
- Colonoscopy Interim Reporting Tool – ColonCancerCheck program colonoscopy records;
- Gastrointestinal Endoscopy Data Submission Portal – hospital colonoscopy data;
- Laboratory Reporting Tool – ColonCancerCheck guaiac fecal occult blood tests;
- Ontario Cancer Registry – resolved invasive colorectal cancers;
- Registered Persons Database – demographics; and
- Postal Code Conversion File Plus – residence and socio-demographic info.

Data notes

Breast cancer screening participation

Denominator

Total number of Ontario screen-eligible people, 50 to 74 years old, in the reporting period. Screening eligibility is defined on the Ontario Health website.

Inclusions:

- Ontario screen-eligible people ages 50 to 74 at the index date;
- Index date was defined as the midpoint of the reporting period; and
- Sub-region and public health unit assignment was determined using the Postal Code Conversion File Plus based on residential postal code.

Exclusions:

- People with a missing or invalid health insurance number, date of birth, postal code or sub-region;
- People with a prior diagnosis of invasive or in-situ breast cancer before the reporting period and a prior diagnosis of breast cancer defined as ICD-O-3 codes C50 – this morphology is indicative of

ductal carcinoma in-situ or invasive breast cancer and must be microscopically confirmed with a pathology report; and
- People with a mastectomy before the reporting period and the mastectomy was defined in the Ontario Health Insurance Plan by fee codes E505, E506, E546, R108, R109 or R117.

Numerator

Total number of Ontario screen-eligible people, 50 to 74 years old, who have completed at least 1 mammogram in a 30-month period.

- Ontario Breast Screening Program mammograms for screening purposes were identified in the Integrated Client Management System and non-Ontario Breast Screening Program mammograms were identified using the following fee codes in the Ontario Health Insurance Plan:
    - X178 (screening bilateral mammogram); and
    - X185 (diagnostic bilateral mammogram).
- All mammograms in the Integrated Client Management System were counted, including those with partial views.
- Each person was counted once regardless of the number of mammograms performed in a 30-month period; if someone had a program and non-program mammogram within a 30-month period, the program status was selected.

Considerations

A small proportion of mammograms performed as diagnostic tests outside of the Ontario Breast Screening Program could not be excluded from the analysis

Data availability and limitations

- Historical Registered Persons Database address information is incomplete; therefore, the most recent primary address was selected for reporting, even for historical study periods.
- Claims History Database code X178 for screening bilateral mammography was introduced in October 2010.
- Claims History Database code X185 was used for screening and diagnostic mammography before October 2010. Since October 2010, X185 has been used for diagnostic mammography only; however, some screening mammograms after October 2010 may still use X185 for claims.

Cervical screening participation

Denominator

Total number of Ontario screen-eligible people, 21 to 69 years old, in the reporting period. Screening eligibility is defined on the Ontario Health website.

- Ontario screen-eligible people ages 21 to 69 at the index date;
- Index date was defined as the midpoint of the reporting period; and
- Sub-region and public health unit assignment was determined using the Postal Code Conversion File Plus based on residential postal code.

Exclusions:

- People with a missing or invalid health insurance number, date of birth, sub-region or postal code.
- People diagnosed with an invasive cervical cancer before the reporting period and a prior diagnosis of cervical cancer defined as ICD-O-3 codes C53 – this morphology is indicative of cervical cancer and must be microscopically confirmed with a pathology report.
- People who had a colposcopy and/or treatment within 2 years before the reporting period.
- Colposcopy and/or treatment were identified through the Ontario Health Insurance Plan using the following fee codes:

  <u>Colposcopy</u>
  - Z731 – initial investigation of abnormal cytology of vulva and/or vagina or cervix under colposcopic technique with or without biopsies and/or endocervical curetting;
  - Z787 – follow-up colposcopy with biopsies with or without endocervical curetting; and
  - Z730 – follow-up colposcopy without biopsy with or without endocervical curetting.

  <u>Treatment</u>
  - Z732 – cryotherapy;
  - Z724 – electro;
  - Z766 – electrosurgical excision procedure;
  - S744 – cervix, cone biopsy, any technique with or without D&C; and
  - Z729 – cryoconization, electroconization or CO_2 laser therapy with or without curettage for premalignant lesion (dysplasia or carcinoma in-situ), outpatient procedure.
- People with a hysterectomy before the reporting period.
- People with a hysterectomy were identified through the Ontario Health Insurance Plan, using the following fee codes:
  - E862A – when hysterectomy is performed laparoscopically or with laparoscopic assistance;
  - P042A – obstetrics, labour, delivery, caesarean section that includes hysterectomy;
  - Q140A – exclusion code for enrolled people ages 35 to 70 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 enterocoele and/or vault prolapse repair when rendered;
- S759A – hysterectomy, with or without adnexa (unless otherwise specified), with anterior or posterior vaginal repair and including enterocoele 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), including node dissection;
- S765A – amputation of cervix;
- S766A – cervical stump, abdominal;
- S767A – cervical stump, vaginal; and
- S816A – hysterectomy, with or without adnexa (unless otherwise specified), vaginal.

Numerator

Total number of Ontario screen-eligible people, 21 to 69 years old, who have completed at least 1 Pap test in a 42-month period.

- Pap tests were identified through CytoBase or identified using fee codes through the Ontario Health Insurance Plan:
  - E430A – add-on to A003, A004, A005, A006 when Pap performed outside hospital;
  - G365A – periodic, Pap smear;
  - E431A – when Pap smear is performed outside of hospital, to G394;
  - G394A – additional for follow-up of abnormal or inadequate smears;
  - L713A – cervicovaginal specimen (including all types of cellular abnormality, assessment of flora and/or cytohormonal evaluation);
  - L733A – cervicovaginal specimen (monolayer cell methodology);
  - L812A – cervical vaginal specimens (including all types of cellular abnormality, assessment of flora and/or cytohormonal evaluation); and
  - Q678A – gynaecology, Pap smear, periodic, nurse practitioners.
- All Pap tests in CytoBase were counted, including those with inadequate specimens.
- Each person was counted once regardless of the number of Pap tests performed in a 42-month time frame.

Considerations

The Registered Persons Database address closest to the index date was used to assign postal code.

Data availability and limitations

It is difficult to determine whether a Pap test in Cytobase or the Ontario Health Insurance Plan was done for screening or diagnostic purposes; therefore, some Pap tests included in these analyses may have been performed for diagnostic purposes.

Overdue for colorectal cancer screening

Denominator

Total number of Ontario screen-eligible people, 50 to 74 years old, in the reporting period. Screening eligibility is defined on the Ontario Health website.

Inclusions:

- Ontario residents ages 50 to 74 at the index date;
- Index date was defined as the date in the middle of the reporting period; and
- Sub-region and public health unit assignment was determined using the Postal Code Conversion File Plus based on residential postal code.

Exclusions:

- People with a missing or invalid health insurance number, date of birth, sex, sub-region or postal code;
- People with an invasive colorectal cancer before the reporting period and prior diagnosis of colorectal cancer that was defined as ICD-O-3 codes C18.0, C18.2-C18.9, C19.9, C20.9 – this morphology is indicative of colorectal cancer and must be microscopically confirmed with a pathology report;
- People with a total colectomy before the reporting period; and
- Total colectomy was defined in the Ontario Health Insurance Plan by fee codes S169A, S170A, S172A.

Numerator

Total number of Ontario screen-eligible people, 50 to 74 years old, who were overdue for colorectal cancer screening by the end of the reporting period.

- People were considered overdue for colorectal cancer screening if they did not have a guaiac fecal occult blood test within the last 2 years AND did not have a colonoscopy in the last 10 years AND did not have a flexible sigmoidoscopy in the last 10 years.
- Identifying guaiac fecal occult blood tests:
    - ColonCancerCheck guaiac fecal occult blood test was identified in the Laboratory Reporting Tool or Ontario Health Insurance Plan: L179A ColonCancerCheck fecal occult blood testing; and

    - Non-program guaiac fecal occult blood test was identified using fee codes in the Ontario Health Insurance Plan: L181A lab med, biochem, occult blood.
- Colonoscopies were identified using fee codes Z555A, Z491A to Z499A in the Ontario Health Insurance Plan, or in the Colonoscopy Interim Reporting Tool or the Gastrointestinal Endoscopy Data Submission Portal.
- Flexible sigmoidoscopies were identified using fee code Z580A in the Ontario Health Insurance Plan.
- Multiple claims with the same health insurance number and service date were assumed for a single procedure.
- Each person was counted once regardless of the number of tests performed.

Data availability and limitations

- Historical Registered Persons Database address information is incomplete; therefore, the most recent primary address was selected for reporting, even for historical study periods.
- Guaiac fecal occult blood tests in hospital labs could not be captured.
- A small proportion of guaiac fecal occult blood tests performed as diagnostic tests could not be excluded from the analysis.

Cancer Risk Factors

Definition

Data on the 9 modifiable risk factors included in Ontario Cancer Profiles were taken from the 2015–20 Canadian Community Health Survey, Ontario Share Files, which are defined as:

- Active transportation: the percentage of Ontario adults age 18 and older who reported using active forms of transportation at least once in the past week. The most recent data on active transportation were available for 2016 to 2018.
- Alcohol consumption : the percentage of Ontario adults age 19 and older exceeding 2 standard drinks a week, which is the amount specified by the Canadian Centre on Substance Use and Addiction in Canada's Guidance on Alcohol and Health as the low-risk threshold for alcohol-related harms. The most recent data on alcohol consumption were available for 2018 to 2020.
- Binge drinking: the percentage of Ontario adults age 19 and older who have consumed at least 1 drink and had heavy consumption of alcohol at a single occasion (5 drinks for males and 4 drinks for females) at least once a month in the past 12 months. The most recent data on binge drinking were available for 2018 to 2020.
- Inadequate vegetable and fruit consumption: the percentage of Ontario adults age 18 and older who reported eating non-starchy vegetables and fruit less than 5 times per day. Respondents who reported consuming fruit juice more than once daily were counted as having consumed it only once

to align with the recommendations by the World Cancer Research Fund and the American Institute for Cancer Research. The most recent data on inadequate vegetable and fruit consumption were available for 2015 to 2017.

- Overweight and obesity: body mass index (BMI) estimates calculated from Canadian Community Health Survey data are based on respondents' self-reported height and weight. This indicator refers to the percentage of Ontario adults age 18 and older who are categorized according to their BMI as being overweight (BMI 25.0 to 29.99) or obese (BMI ≥ 30.0) corrected for biases in using self-reported height and weight based on sex-specific equations developed by Statistics Canada. The most recent data on overweight and obesity were available for 2018 to 2020.
- Physical inactivity: the percentage of Ontario adults age 18 and older that reported less than the recommended level of moderate-to-vigorous physical activity. The Canadian Physical Activity Guidelines define moderate-to-vigorous physical activity as physical activity causing a person to sweat at least a little and to breathe harder. Recommended levels of moderate-to-vigorous physical activity are 150 minutes or more a week in bouts of 10 minutes or more. The most recent data on physical inactivity were available for 2016 to 2018.
- Second-hand smoke exposure: the percentage of non-smokers in Ontario age 20 and older who reported exposure to second-hand smoke at home, school, or workplace every day, or almost every day or who were exposed in the past month to second-hand smoke in a private vehicle or in public places every day or almost every day. The most recent data on second-hand smoke exposure were available for 2019 and 2020.
- Current smoking ("smoking"): the percentage of Ontario adults age 20 and older who report smoking cigarettes daily or occasionally. The most recent data on current smoking were available for 2018 to 2020.
- Sun safety: percentage of Ontario adults age 18 and older who did not limit sun exposure or use protection against the sun on a typical day. Sun safety behaviour was defined as limiting sun exposure (such as seeking shade or avoiding being outside during peak hours) and using protection against the sun (such as wearing sunscreen, sunglasses, long sleeves or hats) on a typical day. The most recent data on sun safety behaviour were available for 2015 and 2016.

Analytic considerations:

- All estimates were age-standardized to the age distribution of the 2011 Canadian Standard Population[1] using the age groups from the Canadian Community Health Survey person-level sampling strategy: 18 to 34, 35 to 49, 50 to 64, 65 and older.
- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.
- Boot strapping techniques were used to obtain variance estimates and 95% confidence intervals of all estimates.
- In accordance with guidelines from Statistics Canada, the coefficient of variation was calculated to determine the sampling variability of the estimate. Statistics Canada requires estimates with coefficients of variation of 15% to 35% to be noted with a warning to users to interpret with caution and estimates with coefficients of variation greater than 35% to be suppressed. Estimates identified with a "Y" in the coefficient of variation flag should be interpreted with caution due to a large amount of sampling variability, as per Statistics Canada guidelines.

Data sources

Data on the 9 modifiable risk factors included in Ontario Cancer Profiles come from the 2015–20 Canadian Community Health Survey Ontario Share Files from Statistics Canada:

- The Canadian Community Health Survey is a population-based cross-sectional survey conducted by Statistics Canada that collects information on health status, health care use and determinants of health for the Canadian population age 12 and older living in private dwellings.
- It is representative of 98% of the Canadian population age 12 and older, and produces reliable estimates at the health region level. However, the COVID-19 pandemic impacted data collection for CCHS 2020 and resulted in significantly decreased response rates this year.
- People living on First Nations reserves and other Indigenous settlements, institutional residents, full-time members of the Canadian Forces and residents of certain remote regions are not sampled in the Canadian Community Health Survey.
- The Canadian Community Health Survey (CCHS) data are provided by the Ontario Ministry of Health. The statistics and indicators presented in Ontario Cancer Profiles are those of Ontario Health, and do not necessarily reflect those of Ontario or the Ministry of Health.
- This information cannot not be used, either alone or with other information, to identify an individual. This includes attempting to decrypt information that is encrypted, attempting to identify an individual based on encrypted information and attempting to identify an individual based on prior knowledge.

For more information on the Canadian Community Health Survey, visit Statistics Canada's website.

Data notes

The data on modifiable risk factors and social determinants of health (socio-demographic variables) presented in Ontario Cancer Profiles come from population-based sample surveys and are ecologic in nature.

- The estimates reflect the overall prevalence of risk factors and social determinants of health for the entire geographic region (sub-region and public health unit). However, heterogeneity often exists and is difficult to assess using the data available in sample surveys due to small sample sizes. More complex sub-regional analyses were outside the scope of this phase of the project, but they may be explored in future phases.
- All estimates are provided for 1 time period and for males and females.
- Canadian Community Health Survey data on modifiable risk factors are self-reported. Respondents of self-reported surveys tend to under-report behaviours that are socially undesirable or unhealthy, such as alcohol and tobacco use, and over-report behaviours that are socially desirable, such as physical activity and vegetable and fruit intake.
- Major changes to the design and collection strategy of the Canadian Community Health Survey were implemented, beginning with the 2015 survey. As a result, comparisons to previous years of the Canadian Community Health Survey are not recommended.

Socio-demographic Factors

Definition

Data on 5 of the 6 socio-demographic variables in Ontario Cancer Profiles were taken from the 2021 and 2016 Canadian Census of the Population's mandatory long-form questionnaire. The variables are defined as:

- Age 65 and older: percentage of the population age 65 and older.
- Level of educational attainment ("low education"): proportion of the Ontario population age 15 and older without a high school diploma.
- Income ("low income"): prevalence of low income after tax is the proportion or percentage of economic families or people not in economic families in a given classification that falls below the after-tax low income cut-offs. The low income cut-off is a statistical measure, adjusted for community size and family size, of the income threshold that Canadians fall below when they are estimated to spend at least 20% more of their income than the average family on necessities of food, shelter and clothing. These prevalence rates are calculated from unrounded estimates of economic families and people age 15 and older who are not in economic families.
- Unemployment: people were considered unemployed if they were not employed during the week before the census day, but were searching for a job in the past 4 weeks, waiting for recall from a temporary lay-off or waiting to begin a new job that started within the next 4 weeks. To be counted as unemployed, a person must have been available for work in the reference week. The

unemployment rate refers to unemployed expressed as a percentage of the labour force. The labour force does not include students, homemakers, retired workers, seasonal workers in an "off" season who were not looking for work, and people who could not work because of a long-term illness or disability.

- Visible minority: percentage of the population age 15 and older who self-identify as non-Caucasian in race or non-white in skin colour.

Data on 1 of the 6 socio-demographic variables in Ontario Cancer Profiles were taken from the 2018–2020 Canadian Income Survey (CIS), which is a voluntary cross-sectional questionnaire. The variable is defined as:

- Household food insecurity: the percentage of Ontario households that identified as food insecure at any point in the past 12 months due to lack of money. The Household Food Security Survey Module (HFSSM) within the Canadian Income Survey (CIS) is the Canadian measurement tool used to assess the self-reporting of households that witness unpredictable and/or insufficient occurrences of food accessibility, availability, stability and consumption due to low financial resources. This measure is based on a set of 18 questions that help categorize households into 4 categories: food secure, marginal food insecurity (indication of worry about food depletion and/or decreased presence of food), moderate food insecurity (indication of compromise in quality and/or quantity of food consumed) and severe food insecurity (indication of reduced food intake and disrupted eating patterns).

Data sources

Data on 5 of the socio-demographic variables included in Ontario Cancer Profiles (education, low income, unemployment, visible minority and population age 65 and older) come from the 2021 and 2016 Canadian Census of the Population from Statistics Canada.

- The census is conducted every 5 years and enumerates everyone living in Canada, including non-institutionalized Canadian citizens native-born and naturalized, landed immigrants and non-permanent residents, and members of their families living with them in Canada.
- Data are not available for incompletely enumerated Indian reserves or Indian settlements.
- Most households (80%) receive the short-form census questionnaire, which contains 8 questions on basic topics, such as relationship to person 1, age, sex, marital status and mother tongue. One in 5 households (20%) receive the long-form census questionnaire, which contains the 8 questions from the short-form census, plus 53 additional questions on topics such as education, ethnicity, mobility, income and employment.

For more information on the 2021 and 2016 Census of Population, visit Statistics Canada's website.

Data on 1 of the socio-demographic variables included in Ontario Cancer Profiles (household food insecurity) were taken from the 2018–2020 Canadian Income Survey (CIS), more specifically the Household Food Security Survey Module (HFSSM) in the CIS. The estimates come from the Household Food Insecurity Snapshot released by Public Health Ontario (PHO).

- The CIS is conducted annually and is a voluntary cross-sectional questionnaire that collects information on labour market activity, school attendance, disability, unmet health care needs, support payments, childcare expenses, inter-household transfers, personal income, food security, and characteristics and costs of housing.
- Tax information data collected from the Labour Force Survey and the Canadian Revenue Agency are supplemental to this questionnaire.
- This questionnaire is distributed nationwide. However, it is not distributed to people on Indian reserves or Indian settlements, people who live in institutional collective dwellings (e.g., hospitals, nursing homes and prisons) and people in extremely remote areas with very low population density.
- The sample of respondents who complete this cross-sectional questionnaire are a sub-sample of Labour Force Survey (LFS) respondents.
- The HFSSM consists of 18 overall survey questions with 10 questions specific to the experience of adults (assessed using the HFSSM Adult Scale) and 8 questions specific to the experience of children (assessed using the HFSSM Child Scale).
- PHO reported estimates from the CIS data on household food insecurity by public health unit for 2018 to 2020. Data at the sub-region level were not available.

For more information on the household food insecurity data, visit PHO's Household Food Insecurity Snapshot. For more information on the CIS, visit Statistics Canada's CIS web page.

Data notes

Ontario Cancer Profiles uses data from the 2021 and 2016 Canadian Census of Population and the 2018–2020 Canadian Income Survey, which represent the most recent data available.

Citation

The following citation for Ontario Cancer Profiles must be used:

Ontario Health (Cancer Care Ontario). Ontario Cancer Profiles [Internet]. 2023 [cited <date>]. Available from: https://cancercareontario.ca/ontariocancerprofiles.

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