Cancer Risk Factors in Ontario

Appendix A, B, C, D

APPENDIX A: DATA SOURCES

CANADIAN COMMUNITY HEALTH SURVEY (CCHS), ONTARIO SHARE FILES

The Canadian Community Health Survey (CCHS) is a population-based cross-sectional survey conducted by Statistics Canada that collects information on health status, healthcare utilization, and determinants of health for the Canadian population aged 12 years and older living in private dwellings. Individuals living on First Nation Reserves and other Aboriginal settlements, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions are excluded from the CCHS. It is representative of 98% of the Canadian population aged 12+ and produces reliable estimates at the health region level.

The CCHS began in 2000/2001 and was initially designed to be administered every two years, sampling approximately 130,000 respondents (39,000 in Ontario) in each cycle. In 2007, this format changed to its current iteration where approximately 65,000 respondents (20,000 in Ontario) are sampled annually.

For this report, CCHS full survey waves 2003 and 2005 and half-survey annual waves 2007 to 2011 were used in most analyses. CCHS cycle 1.1, administered in 2000/2001, was used to obtain historic estimates of smoking prevalence to estimate the burden of cancer in Ontario that could be attributed to tobacco.

YOUTH SMOKING SURVEY (YSS)

The Youth Smoking Survey (YSS) is a cross-sectional survey conducted by the Propel Centre for Population Health Impact that collects information on tobacco use, social and demographic factors, attitudes and beliefs about smoking, and experience with alcohol and drugs in school-aged children (grades 6–9 and 10–12).

In this report, results based on YSS data were extracted from:

Youth Smoking Survey: Propel Centre for Population Health Impact, 2012. 2010/2011 Youth Smoking Survey: Results Profile for Ontario. Waterloo (ON): University of Waterloo, 1–21. Available at *http://www.yss.uwaterloo.ca/results/yss10_EN_Provincial%20Report_Ontario_20120514.pdf.*

ONTARIO CANCER REGISTRY (OCR)

The Ontario Cancer Registry (OCR) is operated by Cancer Care Ontario and registers all newly diagnosed cases of invasive neoplasia, except for basal and squamous cell skin cancers. Electronic records are linked at the person level and then "resolved" into incident cases of cancer using computerized medical logic. Major data sources are:

1. Cancer-related hospital discharge and day surgery records from the Canadian Institute for Health Information

2. Cancer-related pathology reports, received mostly electronically from hospital and community laboratories

3. Consultation and treatment records of patients referred to one of 14 Regional Cancer Centres

4. Death certificates with cancer identified as the underlying cause of death, received from the Ontario Registrar General

The OCR was used to obtain the number of new cancer cases diagnosed in 2009 for the analysis of population attributable fractions (PAF) calculated for tobacco. It was also the source of the lung cancer incidence rates calculated by public health unit (PHU) for the period 2007–2009.

APPENDIX B: INDICATOR DEFINITIONS

CURRENT SMOKING

Definition: Percentage of Ontario adults aged 20 years and older (or teens aged 12–19) who report smoking cigarettes daily or occasionally.

Method of Calculation:

$$\frac{\text{Weighted number of adults aged 20+ who smoke cigarettes daily or occasionally}}{\text{Weighted total population aged 20+ years}} \times 100$$

$$\frac{\text{Weighted number of teens aged 12-19 who smoke cigarettes daily or occasionally}}{\text{Weighted total population aged 12-19}} \times 100$$

• Respondents identified as a refusal, don't know or not stated to the required survey question were excluded.

Survey Questions:

• At the present time, do you smoke cigarettes daily, occasionally or not at all?

SMOKING ABSTINENCE

Definition: Percentage of Ontario teens aged 12–19 who have always abstained from smoking (i.e., never smoked a whole cigarette).

Method of Calculation:

$$\frac{\text{Weighted number of teens aged 12–19 who reported never smoking a whole cigarette}}{\text{Weighted total population aged 12–19}} \times 100$$

• Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

• Have you ever smoked a whole cigarette?

FORMER SMOKING

Definition: Percentage of Ontario adults aged 20 years and older who do not smoke cigarettes at the present time but have smoked at least 100 cigarettes in their lifetime.

Method of Calculation:

$$\frac{\text{Weighted number of adults aged 20+ who used to smoke daily or occasionally}}{\text{Weighted total population aged 20+}} \times 100$$

• Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

• In your lifetime, have you smoked a total of 100 or more cigarettes (about 4 packs)?

• At the present time, do you smoke cigarettes daily, occasionally or not at all?

CIGARETTE CONSUMPTION

Definition: Median number of cigarettes smoked per day among adults aged 20 years and older who are current daily smokers.

Method of Calculation:

Weighted median number of cigarettes smoked per day among daily adult smokers aged 20+

• Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

• At the present time, do you smoke cigarettes daily, occasionally or not at all?

• How many cigarettes do you smoke each day now?

OTHER TOBACCO PRODUCTS

Definition: Percentage of Ontario adults aged 20 years and older that used tobacco products other than cigarettes (cigars, pipes, snuff, or chewing tobacco) in the last month.

Method of Calculation:

$$\frac{\text{Weighted number of adults aged 20+ who used tobacco products other than cigarettes in the last month}}{\text{Weighted total population aged 20+}} \times 100$$

• Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

• In the past month, have you smoked cigars?

• In the past month, have you smoked a pipe?

• In the past month, have you used snuff?

• In the past month, have you used chewing tobacco?

RECENT QUIT RATIO (SMOKING CESSATION)

Definition: Percentage of recent smokers (i.e., current smokers and former smokers who have quit smoking in the last year) aged 20 years and older who quit smoking in the last year.

Method of Calculation:

$$\frac{\text{Weighted number of adults aged 20+ who quit smoking in the last year}}{\text{Weighted number of adults who are current smokers or have quit smoking in the last year aged 20+}} \times 100$$

• Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

• In your lifetime, have you smoked a total of 100 or more cigarettes (about 4 packs)?

• At the present time, do you smoke cigarettes daily, occasionally or not at all?

• When did you stop smoking [and] how many years ago was it?

LONG-TERM QUIT RATIO (SMOKING CESSATION)

Definition: Percentage of ever-smoking adults aged 20 years and older who quit smoking completely at least 1 year ago.

Method of Calculation:

$$\frac{\text{Weighted number of adults aged 20+ who quit smoking at least 1 year ago}}{\text{Weighted population of ever smokers aged 20+}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

- In your lifetime, have you smoked a total of 100 or more cigarettes (about 4 packs)?
- At the present time, do you smoke cigarettes daily, occasionally or not at all?
- When did you stop smoking [and] how many years ago was it?

SECOND-HAND SMOKE EXPOSURE

Definition: Percentage of non-smoking adults aged 20 years and older (or teens ages 12–19) who were regularly (every day or almost every day) exposed to second-hand smoke in their home, in a vehicle or in public places (e.g., bars, restaurants, shopping malls, arenas).

Method of Calculation:

Second-hand smoke exposure at home:

$$\frac{\text{Weighted number of non-smoking adults aged 20+ exposed to second hand smoke at home}}{\text{Weighted number of non-smoking adults aged 20+}} \times 100$$

$$\frac{\text{Weighted number of non-smoking teens aged 12–19 exposed to second hand smoke at home}}{\text{Weighted number of non-smoking teens aged 12–19}} \times 100$$

Second-hand smoke exposure in a vehicle:

$$\frac{\text{Weighted number of non-smoking adults aged 20+ exposed to second hand smoke in a vehicle}}{\text{Weighted number of non-smoking adults aged 20+}} \times 100$$

$$\frac{\text{Weighted number of non-smoking teens aged 12–19 exposed to second hand smoke in a vehicle}}{\text{Weighted number of non-smoking teens aged 12–19}} \times 100$$

Second-hand smoke exposure in public places:

$$\frac{\text{Weighted number of non-smoking adults aged 20+ exposed to second hand smoke in public places}}{\text{Weighted number of non-smoking adults aged 20+}} \times 100$$

$$\frac{\text{Weighted number of non-smoking teens aged 12–19 exposed to second hand smoke in public places}}{\text{Weighted number of non-smoking teens aged 12–19}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

- Including both household members and regular visitors, does anyone smoke inside your home every day or almost every day?
- In the past month, were you exposed to second-hand smoke every day or almost every day in a car or other private vehicle?
- In the past month, were you exposed to second-hand smoke every day or almost every day in public places (such as bars, restaurants, shopping malls, arenas, bingo halls, bowling alleys)?

SMOKE-FREE HOMES

Definition: Percentage of Ontario households (or households with children 17 years old and younger) where smokers are asked to refrain from smoking in the house.

Method of Calculation:

$$\frac{\text{Weighted number of households where smokers were asked to refrain from smoking in the house}}{\text{Weighted total number of households}} \times 100$$

$$\frac{\text{Weighted number of households with children aged 17 years and younger where smokers were asked to refrain from smoking in the house}}{\text{Weighted total number of households with children aged 17 years and younger}} \times 100$$

- Respondents identified as a refusal, don't know or not stated to the required survey questions were excluded.

Survey Questions:

- Is smoking allowed inside your home?
- The derived variables DHHDYKD (persons ages ≤15) and DHHDOKD (persons ages 16 and 17) were used to identify homes with kids 17 years and younger.

DEFINITION OF CANCER TYPES ASSOCIATED WITH TOBACCO SMOKING

CANCER TYPE	ICD-O-3 SITE/HISTOLOGY TYPE CODE*
Lip, oral cavity and pharynx	C00–C06, C10, C12–C14
Nasal cavity, nasal sinuses, nasopharynx	C11, C30.0–C30.1, C31.0–C31.9
Esophagus	C15
Stomach	C16
Colon and rectum	C18–C20, C26.0
Liver	C22.0–C22.1
Pancreas	C25
Larynx	C32
Lung and bronchus	C34
Cervix uteri	C53
Ovary	C56.9
Kidney (excluding renal pelvis)	C64.9
Lower urinary tract (bladder, ureter, renal pelvis)	C65.9, C66.9, C67
Acute myeloid leukemia	9840, 9861, 9866, 9867, 9871–9874, 9895–9897, 9910, 9920

* ICD-O-3 refers to the Third Edition of the International Classification of Diseases for Oncology (2000). ICD-O-3 site/histology codes were based on the SEER site recode definition. See http://seer.cancer.gov/siterecode/icdo3_d01272003/.

APPENDIX C: ANALYTIC METHODS

TOBACCO-RELATED PREVALENCE ESTIMATES

- Most estimates were age-standardized to the age distribution of the 2006 Canadian population using the age groups from the Canadian Community Health Survey (CCHS) person-level sampling strategy: 20–29, 30–44, 45–64 and 65+. The exceptions were age-specific estimates and estimates for youth and median cigarette consumption, for which unadjusted estimates were provided.

- Bootstrapping techniques were used to obtain variance estimates and 95% confidence intervals of all estimates.[1]

- Time periods varied according to the availability of CCHS content for a given indicator or population:

  2000/2001: Used in the population attributable fraction analyses and the correlation between historic smoking rates and lung cancer incidence rates among public health units (PHUs) to provide the greatest lag time between smoking exposure and cancer outcome.

  2011: Used for most analyses because it is the most current CCHS data available when writing this report.

  2003–2011: Used to examine time trends; estimates from the 2000/2001 CCHS cycle were excluded because a change in the administration of the survey beginning in 2003 affected some smoking estimates.[2]

  2009–2011 combined: Pooled data used for second-hand smoke exposure indicators to increase the survey sample to a size that is acceptable for the release of these indicators stratified by several socio-demographic characteristics and by Local Health Integration Network (LHIN) without introducing a high degree of sampling variability.

  2007–2011: Used for analyses of the off-reserve Aboriginal population because the period during which the CCHS question used to ascertain Aboriginal identity remained constant; survey years were combined to increase the sample size where necessary.

- Socio-demographic characteristics were analyzed for adults aged 30+ to restrict the sample to those who have likely completed their education and reached their adult socio-demographic status. These factors were defined as follows:

  Urban/rural residence: Respondents living within any census metropolitan area (CMA) or census agglomeration (CA) were considered "urban residents" and those living outside of any CMA or CA were classified as "rural residents."

  Income quintile: Sorts respondents' derived household income into quintiles based on the ratio of household income to the low-income cut-off (LICO) for the household size and community. Starting in 2011, Statistics Canada imputed all missing household incomes to account for the one-third of missing responses to the income question.

  Education: Highest level of education attained by the respondent, according to three categories: less than secondary school graduation, secondary school graduation or some post-secondary education, and post-secondary graduation.

Immigration status: Distinguishes immigrants, according to time since immigration, from the Canadian-born population based on three categories: Canadian-born, immigrant > 10 years in Canada and immigrant ≤ 10 years in Canada. The years since immigration refers to the first time the respondent arrived in Canada (excluding holidays) to live as a landed immigrant by claiming refugee status, with a work permit or with a study permit.

Aboriginal identity (off-reserve): Distinguishes respondents who self-identify as Aboriginal (First Nations, Métis or Inuk/Inuit) and were born in Canada, the United States or Germany, from those who do not identify themselves as Aboriginal or were not born in the specified countries, based on CCHS derived variable socio-demographic characteristics for Aboriginal identity (SDCDABT). Aboriginal (off-reserve) respondents were further subdivided based on self-identification with any of First Nations, Métis or Inuk/Inuit groups. Self-identified off-reserve First Nations (Status and Non-Status Indians) were categorized as First Nations if they had not also identified as Métis, while those identifying as Métis at any time were categorized as Métis. Respondents identifying as only Inuk/Inuit were excluded from further sub-group analysis due to a small sample size, but were included in the analyses of all Aboriginal groups combined.

- Estimates for LHINs were analyzed using survey weights that were calibrated to the LHIN geographic boundaries, which do not correspond to the standard population weights at the public health unit (PHU) level.

- Statistically significant differences in risk factor prevalence between a given LHIN and Ontario and between categories of a given socio-demographic factor were tested by comparing the absolute difference between the two estimates with the square root of the sum of the margin of error (i.e., the upper 95% confidence limit minus the estimate) squared for each estimate being compared. If the difference between the estimates was greater than the square root of the sum of the squares of the two margin of errors then the estimates were considered significantly different (approximately $p < 0.05$).

  ○ Socio-demographic factors were compared against the following reference variables: urban areas for analyses by urban/rural residence, income quintile 5 (Q5) for analyses by income quintile, post-secondary graduate for analyses by education status, and Canadian born for analyses by immigration status.

- Limitations to analyses that used CCHS data include:

  ○ The relatively short time period available to examine time-trends in prevalence estimates.

  ○ The use of self-reported data, where socially-undesirable behaviours such as tobacco-use are likely to be under-reported by respondents.

  ○ The presentation of prevalence estimates that were adjusted for age only and did not adjust for other important factors (e.g., socioeconomic status) that may contribute to differences in prevalence estimates between groups.

REFERENCES:

[1] Statistics Canada. 2005. *Bootvar: User Guide (Bootvar 3.1 – S AS version)*. Ottawa, Ontario. *http://prod.library.utoronto.ca/datalib/ codebooks/cstdli/gss/gss18/sasbootdoc_eng.pdf* (accessed March 6, 2013).

[2] St-Pierre M. and Béland Y. Mode effects in the Canadian Community Health Survey: A comparison of CAPI and CATI, 2004 Proceedings of the American Statistical Association Meeting, Survey Research Methods. Toronto, Canada: American Statistical Association; 2004.

POPULATION ATTRIBUTABLE FRACTIONS (PAF) FOR TOBACCO SMOKING

- Population attributable fraction (PAF) for tobacco smoking was calculated using the following formula:

$$PAF = \frac{[(P1(RR1 - 1) + P2(RR2 - 1))]}{[1 + (P1(RR1 - 1) + P2(RR2 - 1))]}$$

Where P1 is the prevalence of current smokers, P2 is the prevalence of former smokers, RR1 is relative risk of cancer for current smokers vs. never-smokers, RR2 is the relative risk of cancer for former smokers vs. never-smokers.

- For each cancer type associated with tobacco smoking, the PAF was calculated for each sex and age group combination, using sex-specific relative risk estimates for current and former smokers and sex- and age-specific prevalence estimates of current and former smoking. Sex- and age-specific PAFs were summed for each cancer type and sex to obtain an overall PAF for that particular cancer.

- Relative risk estimates for current and former smokers were primarily obtained from a large meta-analysis published by Gandini S et al, 2008. Ovarian cancer and colorectal cancer were not included in this meta-analysis. Relative risk estimates for these cancers were supplemented from more recent studies as noted in the table below.

- Prevalence data were obtained from the 2000/2001 Canadian Community Health Survey (CCHS), the earliest year for which data on tobacco smoking could be easily extracted, instilling a latent period between the time of exposure to tobacco smoke to cancer diagnosis of approximately 10 years. The age groups used to generate age-specific prevalence estimates were 20–29, 30–44, 45–64 and 65+, consistent with the age group sampling strategy of the CCHS. Based on this 10-year latency, the age groups used for extracting cancer incidence data were 30–39, 40–54, 54–74 and 75+.

REFERENCES:

[1] Gandini S, Botteri E, Iodice S, Boniol M, Lowenfels AB,Maisonneuve P, et al. Tobacco smoking and cancer: a meta-analysis. Int J Cancer 2008 Jan 1;122(1):155–64.

[2] Liang PS, Chen TY, Giovannucci E. Cigarette smoking and colorectal cancer incidence and mortality: systematic review and meta-analysis. Int J Cancer 2009;124(10):2406–15.

[3] Collaborative Group on Epidemiological Studies of Ovarian Cancer. Ovarian cancer and smoking: individual participant meta-analysis including 28,114 women with ovarian cancer from 51 epidemiological studies. Lancet Oncol 2012 Sep;13(9):946–56.

RELATIVE RISK ESTIMATES FOR TOBACCO-RELATED CANCERS, CURRENT AND FORMER CIGARETTE SMOKERS

	RELATIVE RISK			
	CURRENT SMOKER		FORMER SMOKER	
CANCER TYPE	MALES	FEMALES	MALES	FEMALES
Lip, oral cavity and pharynx	3.52	3.8	1.18	1.18
Nasal-sinuses, nasopharynx	1.95	1.95	1.39	1.39
Esophagus	2.52	2.28	2.03	2.03
Stomach	1.74	1.45	1.31	1.31
Colon and rectum[a]	1.17	1.17	1.25	1.25
Liver	1.85	1.49	1.49	1.49
Pancreas	1.63	1.73	1.18	1.18
Larynx	6.98	6.98	4.65	4.65
Lung and bronchus	9.87	7.58	3.85	3.85
Cervix	–	1.83	–	1.26
Ovary (mucinous)[b]	–	1.49	–	1.08
Kidney	1.59	1.35	1.25	1.25
Lower urinary tract (renal pelvis, bladder, ureter)	2.8	1.73	1.72	1.72
Myeloid leukemia	1.09	1.09	1.27	1.27

Source: Gandini et al. 2008 (except a Liang et al., 2009 and b Collaborative Group on Epidemiological Studies of Ovarian Cancer, 2012)

APPENDIX D: MAP OF ONTARIO'S LHINS AND PHUS

Ontario Local Health Integration Network (LHIN) and public health unit (PHU) correspondence map
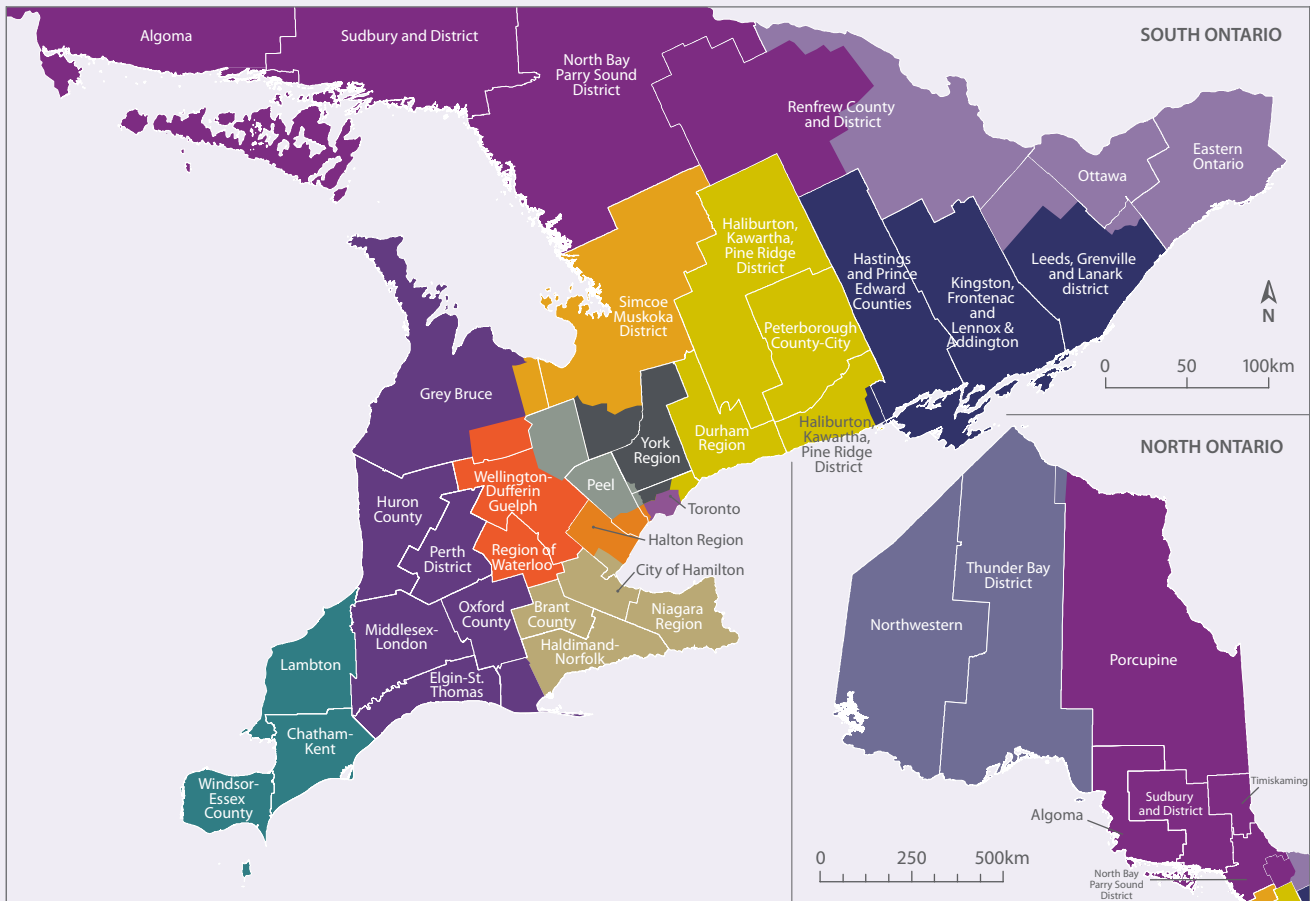
PHU boundary

LHIN regions

- Erie St. Clair
- South West
- Waterloo Wellington
- Hamilton Niagara Haldimand Brant
- Central West
- Mississauga Halton
- Toronto Central
- Central
- Central East
- South East
- Champlain
- North Simcoe Muskoka
- North East
- North West

For more information:

Cancer Risk Factors in Ontario: Evidence Summary, published 2013, is the first in a series of publications designed to support Cancer Care Ontario's priority to reduce chronic disease through prevention. This report summarizes the epidemiologic evidence for a wide range of cancer risk factors.

Please see *www.cancercare.on.ca/riskfactor*

Ontario Cancer Facts are short, monthly fact sheets intended to increase knowledge about cancer and its risk modifiers in Ontario. Data typically originate from several sources including the Ontario Cancer Registry, Cancer Care Ontario publications, and Canadian, provincial or regional health surveys. Readers may subscribe to receive Ontario Cancer Facts by e-mail.

Please see *www.cancercare.on.ca/cancerfacts*

The Cancer Quality Council of Ontario is an advisory council to Cancer Care Ontario and the Ministry of Health and Long-Term Care established in 2002 to guide quality improvement efforts and monitor and publicly report on the performance of Ontario's Cancer System. One mechanism by which this is achieved is the **Cancer System Quality Index,** an interactive web-based tool released annually since 2005, that reports on a variety of evidence-based indicators covering every aspect of cancer control, from cancer prevention to recovery and end-of-life care, and tracks Ontario's progress against seven dimensions of quality.

Please see *www.csqi.on.ca*

Cancer Care Ontario's **Aboriginal Tobacco Program (ATP)** aims to reduce high smoking rates among Ontario's First Nation, Inuit, and Métis (FNIM) populations by enhancing the Aboriginal community's knowledge, skills, capacity and behaviour through the delivery of programming that is aligned with the tobacco control objectives of the renewed Smoke-Free Ontario Strategy. The primary goal is to build capacity toward Tobacco-Wise FNIM communities among FNIM and non-FNIM policy-makers, healthcare administrators, and social and healthcare practitioners.

Please see *www.tobaccowise.com*