November 2010

2010 System Performance Report
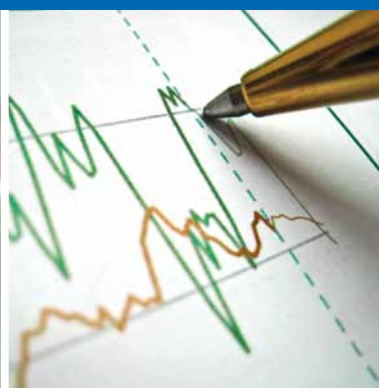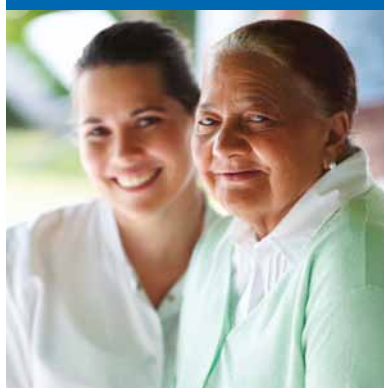
The project team responsible for the development of the *Report* was led by **Dr. Heather Bryant**, Vice President, Cancer Control, Canadian Partnership Against Cancer and **Mary Spayne**, Director, System Performance.

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Acknowledgements

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Executive Summary

In October 2009, the Partnership released *The System Performance Initiative: A First Year Report*, representing a first step in a systematic approach to measure and report on the quality of cancer control and health care delivery across the country. The *2010 System Performance Report* builds on this effort by refreshing indicator results with updated data, deepening analysis where possible on social determinants of health and adding new indicators, particularly in the Diagnosis and Treatment domain, an area identified by stakeholders in 2009 as representing a gap in indicator reporting.

While Canada enjoys publicly funded health care at a national level, the organization of health care services occurs on a provincial/territorial basis, and cancer control is carried out by different authorities and with different patterns across the country. Although Canada has a strong registry system and substantial national collection of risk factor data, there has not been a national approach to reporting on needs and performance across the entire cancer control system. The Canadian Partnership Against Cancer is an independent, not-for-profit organization funded by Health Canada to accelerate action on cancer control for all Canadians. One of the first priorities of the Partnership was to develop a deeper understanding of, and to report on, the performance of the cancer control system in Canada.

The *2010 Report* represents the product of a collaborative effort among the Partnership, Statistics Canada and the provincial cancer agencies or their equivalents. The work was overseen by the pan-Canadian System Performance Working Group, comprising representatives from all ten provinces. The indicators and their definitions were developed through a two-year consultative process that engaged knowledge leaders and stakeholders across the country through a series of regional workshops and webinars. Data were gathered from Statistics Canada (the Canadian Cancer Registry; the Canadian Community Health Survey), provincial screening programs and other health care organizations. For the indicators pertaining to Diagnosis and Treatment (including Guideline Concordance), data were collected from each of the provincial cancer agencies or their equivalents based on detailed data specifications.

The *2010 Report* presents indicators across the cancer control continuum from Prevention and Screening to Supportive Care and Survivorship. In addition, it introduces two special focus sections:

- The Colorectal Cancer (CRC) Focus Section features indicators on Screening, Diagnosis and Treatment (including Guideline Concordance), and Long-Term Outcomes to create an integrated overview of system performance for one cancer site.

- The Radiation Therapy Focus Section presents indicators on Capacity, Utilization, Wait Times and Guideline Concordance to provide a broader picture of radiation treatment across Canada.

Report Highlights

- Age-standardized cancer incidence rates (ASIRs) for all cancers across Canada remained relatively stable between 1995 and 2006. However, there was interprovincial variation in ASIRs in 2006 with rates in eastern and central Canada generally being higher than those for the western provinces. Age-standardized mortality rates (ASMRs) across Canada gradually decreased over the same time period. Once again, interprovincial variation in ASMRs for 2006 was substantial. Survival ratios for breast cancer and CRC patients improved over time, potentially reflecting improvements in early detection and treatment. Five-year survival for lung cancer patients remained lower, without evidence of improvement.

- Research has shown that cancer risk can be modified by lifestyle changes. On the positive side, the data reflect decreasing smoking rates across Canada over time. The remainder of prevention-based indicators, however, do not point to a significantly increased adoption of healthy lifestyles by Canadians. The deceleration in smoking quit rates may signal the need for a stronger effort to decrease this cancer risk. Physical activity rates have remained steady over the past decade with only a small proportion of the Canadian population being classified as active. In addition, overweight and obesity rates have continued to creep upward and the likelihood of exceeding low-risk alcohol drinking guidelines has also increased over time.

- With regard to screening, both breast and cervical cancer screening rates have remained high and relatively stable over time. As of 2010, all provinces have announced or are developing programs for colorectal cancer screening (CRC). Self-reported CRC screening rates ranged widely across the country, with those provinces with more established CRC screening programs reporting higher screening rates.

- The period of cancer diagnosis marks the entry point into the treatment phase for cancer patients. At this time, the scope of cancer diagnosis performance measurement is limited. While future reports will endeavour to report further on this domain, the *2010 Report* discusses selected markers of the diagnostic process. An emerging technology is the use of PET scanners for cancer diagnosis; substantial interprovincial variation was evidenced in the number of scanners available per population as well as the number of cancer-related exams performed per machine. A second diagnosis measure, "Wait Times: Abnormal Breast Screen to Resolution" also revealed interprovincial variation, with all provinces reporting 90th percentile wait times well in excess of national targets, particularly in cases requiring a tissue biopsy. A time trend of data between 2004 and 2008, however, indicated reduced wait times for women requiring tissue biopsies and a reduction in interprovincial variation over time.

- Research to evaluate the efficacy and safety of emerging cancer therapies is a key input for effective treatment and care. Data revealed that participation of the pediatric cancer population in clinical trials was substantially higher than that of the adult population. Pediatric cancers, however, represent only about 1% of total cancer cases in Canada. Higher pediatric clinical trial participation due to "well-organized multicentre clinical trials" was identified as a key driver for rapidly increasing patient survival rates in pediatric populations.

- Radiation therapy is an integral treatment modality for cancer control. Capacity is constrained by the high capital cost of linear accelerators (LINACS) and the availability of qualified human resources. A set of measures analyzing LINAC capacity and utilization revealed that machine availability was generally in line with international standards but that wide variation in LINAC utilization existed across provinces. Some of this variation may be explained by small provincial population sizes resulting in lower demand volumes per machine. An analysis of radiation therapy wait times (from "ready to treat to treatment") revealed that most

cancer cases were treated within the four-week wait times threshold, with some variation across provinces. Several provinces also achieved substantial reductions in the 90th percentile wait times between 2007 and 2009. A measure of the percentage of cancer cases receiving radiation therapy within two years of diagnosis revealed a variation in treatment rates across the country. Intraprovincial treatment rates by age group, however, were similar, with patients aged 80 years and over experiencing just under half the radiation treatment rate compared to that of lower age groups.

- New to the *2010 Report* is the introduction of indicators measuring concordance with well-established clinical guidelines. One such indicator recommends the delivery of adjuvant radiation therapy for stage I and II breast cancer patients receiving breast-conserving surgery. Concordance rates ranged from 68% to 86% for the four provinces reporting on the full guideline concordance measure. Several provinces found the requirement to link cancer registry and treatment databases to be challenging.

- Canada recognizes the importance of further developing indicators to report on supportive care and survivorship. The *2010 Report* presents selected indicators in this domain. A survey of provincial cancer agencies or their equivalents revealed that provinces are at different stages in implementing centrally tracked screening for distress tools. While two agencies centrally track symptom assessment for at least a portion of their patients at each cancer centre and several agencies are implementing a centralized tracking system, numerous provincial cancer agencies have not yet announced plans to develop a centralized implementation and tracking mechanism for symptom assessment and distress. A second indicator presents self-reported patient satisfaction rates related to person-centred care. Surveys showed that satisfaction with overall cancer care was extremely high, with all reporting provinces rated at 95% or higher. Other top rated categories were "Physical Comfort," "Respect for Patient Preferences" and "Access to Care"; again, there was little interprovincial variation among scores. Patient perceptions of person-centred care, however, were lower, with "emotional support" receiving the lowest satisfaction score across provinces, ranging from 44% to 59%. Finally, the majority of cancer patient deaths occurred in hospital, rather than at home or in home-like settings.

- The Special Focus section on CRC aims to evaluate system performance along the continuum of care and outcomes in an examination of one cancer site. CRC incidence rates were relatively stable during the last decade; however, rates for 2006 varied substantially among provinces. Males experienced approximately 50% higher incidence rates of CRC than females. Canadians living in urban areas experienced lower incidence of CRC relative to rural populations. Five-year CRC survival ratios were similar across the country for patients diagnosed during the 2001 to 2005 diagnosis period. There are early indications that screening programs will add to the overall screening rates for CRC across Canada. As well, future reports will investigate stage-specific incidence and mortality of CRC to ascertain the effectiveness of CRC screening initiatives across the country. With regard to radiation treatment wait times for CRC, in 2009 four of the six reporting provinces met or were well within the four-week target wait times from "ready to treat to treatment".

- The *2010 Report* introduces three well-established clinical guideline concordance indicators, specific to CRC: neoadjuvant radiation for stage II and III rectum cancer, removal of 12 or more lymph nodes for colon cancer resections and adjuvant chemotherapy for colon cancer. Substantial interprovincial variation was observed for each of these indicators. Further analysis will be required to explain these differences. Concordance rates generally decreased with increasing age, particularly for adjuvant chemotherapy for colon cancer.

The System Performance Initiative will continue to work in collaboration with the pan-Canadian System Performance Working Group and stakeholders across the country to report on cancer control system performance measurement in Canada. In the coming months, the Partnership, in collaboration with its provincial partners, will deepen the findings from the *2010 System Performance Report*.

I

Introduction

The *2010 System Performance Report* builds on *The System Performance Initiative—A First Year Report*, published in October of 2009. By developing an initial set of high-level pan-Canadian indicators, last year's inaugural *Report* marked the first step in a systematic approach to measuring and reporting on cancer control in Canada. This year's *Report* deepens existing indicators and includes new indicators, notably in the treatment domain. This effort would not have been possible without the extensive collaboration and support of provincial cancer agencies or their equivalents.

About the Partnership

The Canadian Partnership Against Cancer is an independent organization funded by Health Canada to accelerate action on cancer control for all Canadians. The Partnership is a group of cancer experts, charitable organizations, governments, patients and survivors, determined to bring change to the cancer control domain. We work together to stimulate the generation of new knowledge and to accelerate the implementation of existing knowledge about cancer control across Canada.

The Partnership strives to improve cancer control in Canada by being a catalyst for a coordinated approach that will:

- reduce the expected number of cancer cases;

- enhance the quality of life for those affected by cancer;

- lessen the likelihood of Canadians dying from cancer; and

- increase the effectiveness and efficiency of the cancer control domain.

In support of its vision, one of the Partnership's key mandates is to measure and report on the quality of cancer control and health care. The System Performance Initiative is one example of how this commitment is being realized.

The Importance of System Performance Measurement

Reporting on system performance provides valuable information that can be used by public health practitioners and policy-makers to assess and improve the ways a health care system is meeting the needs of its population.

Canada boasts a relatively rich repository of cancer control data. At the national level, Statistics Canada is the survey administrator and data steward for the Canadian Community Health Survey (CCHS), collecting information on health status, health care utilization and health determinants for the Canadian population. Statistics Canada also houses the Canadian Cancer Registry (CCR), which allows for the generation of key measures such as cancer incidence, mortality and survival, based on data submissions from the thirteen provincial and territorial cancer registries. At the provincial level, cancer agencies or their equivalents maintain cancer registries and collect detailed data on screening, diagnosis and treatment, and supportive care. The indicators presented in this *Report* leverage the richness of these datasets and further enhance their informational value by establishing complex data linkages. Work on future indicators may also include the opportunity to partner with the Canadian Institute for Health Information (CIHI).

Targets and Norms

System performance indicators help to identify gaps between actual and desired levels of performance. To do this, it is first necessary to identify performance targets, or at a minimum, norms against which to compare actual results. Many performance indicators have clearly defined national targets (e.g., wait times for radiation therapy), while others (e.g., incidence, mortality, screening rates, smoking quit rates, etc.) have no explicit targets, despite having a clear and desired directionality that can be tracked over time. With other indicators, particularly those in the treatment domain, desired directionality may be difficult to assess. Wherever possible, this *Report* references available national targets and comparative norms derived from studies conducted in other jurisdictions.

In addition, there is value in understanding the sources of variation within a particular indicator. In this *Report* such variation may be geographic (interprovincial and urban/rural/isolated), temporal (trends by year), demographic (age and sex) or socio-economic (income, education status) in nature. Identifying gaps in cancer control reporting as well as possible sources of variation within indicators can help to inform policy and planning decisions aimed at achieving greater equity in the delivery of cancer control services across the country.

How the *2010 System Performance Report* Should be Used

A key objective of this *Report* is to help identify priorities for action at the provincial and national levels, ranging from augmentation of data collection and quality, to initiatives in policy, planning and practice. The *Report* does not intend to deliver definitive conclusions on system performance but rather to promote discussion on indicator results. Discussion was initiated during the data collection phase of the *Report* and focused, for example, on assessing the extent to which observed differences across jurisdictions were due to inconsistencies in measurement versus "real" differences in performance. The System Performance Initiative will work in collaboration with provinces to sustain the discussion, with the aim of helping to identify opportunities for cancer system quality improvements into the future.
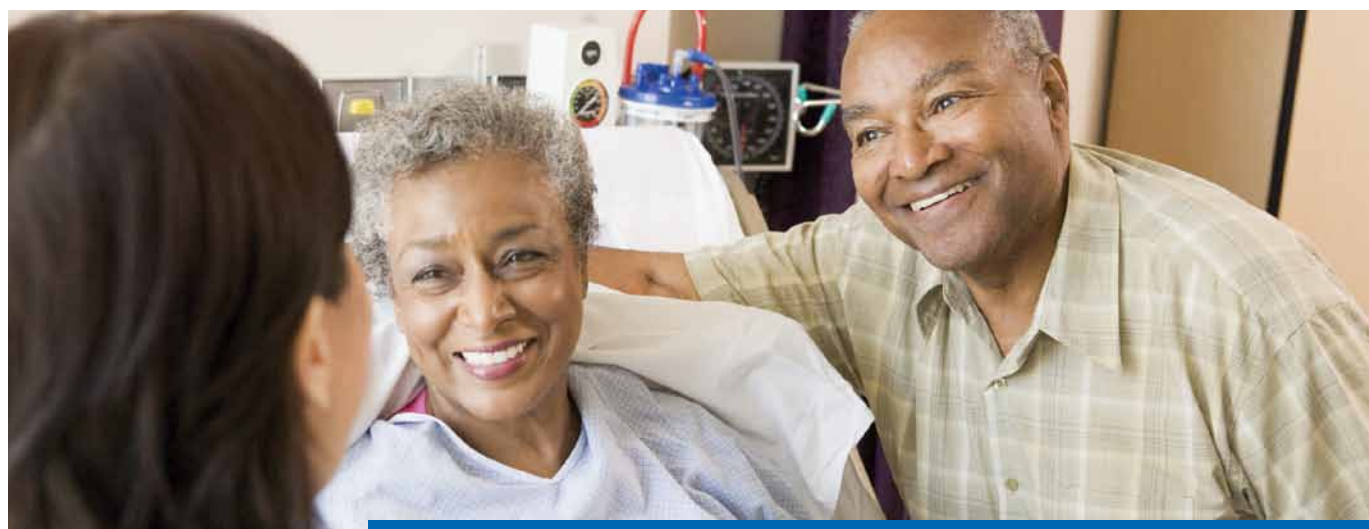
Process for Developing the Report

This *Report* represents the product of a collaborative effort among the Partnership, Statistics Canada and the provincial cancer agencies or their equivalents. The work was overseen by the pan-Canadian System Performance Working Group, comprising representatives from all ten provinces. The Partnership has also met with senior leadership in the Northwest Territories to identify future areas of focus in reporting that would be of impact to rural and isolated communities.

The indicators and their definitions were developed through a two-year consultative process engaging knowledge leaders and stakeholders across the country. For this *Report*, data required to calculate the indicators for Prevention, Screening and Long-Term Outcomes were obtained from the CCHS and CCR. Data for the Breast Cancer Wait Times indicator were gathered from provincial screening programs. For the indicators pertaining to Diagnosis and Treatment (including Guideline Concordance), data were collected from each of the provincial cancer agencies or their equivalents, based on detailed data specifications (see Technical Appendix). Draft results were reviewed and validated by the Working Group over several stages leading to the final results presented in this *Report*.

Organization of the Report

This *Report* focuses on interprovincial data, time trends, and demographic and socio-economic determinants of health where data are available and meaningful. While the *2009 Report* described indicators for which data were readily available, this *Report* has been expanded to include measures requiring more complex data linkages across multiple datasets. It also deepens discussion on the Diagnosis and Treatment domain, thereby starting to address a gap in reporting that was identified in the *2009 Report*.

The *2010 Report* maintains the general structure of the *2009 Report*, presenting indicators by domain (Prevention, Screening, Diagnosis and Treatment, Supportive Care and Survivorship, and Long-Term Outcomes). A new dimension to this *Report* is the addition of two special focus sections:

- The Colorectal Cancer (CRC) Focus Section reports on CRC indicators across the cancer control continuum, allowing for an integrated presentation on this cancer site.

- The Radiation Therapy Focus Section presents indicators on Capacity, Utilization, Wait Times and Guideline Concordance to provide a broader picture of radiation treatment across Canada.

Indicators—2010 System Performance Report

Cancer Control Continuum	Indicator	Data Source			
		CCHS	CCR	National Vital Statistics Database	P/T Cancer Agencies or Equivalent
Colorectal Cancer Focus Section	Screening Rates (FOBT and/or Colonoscopy/Sigmoidoscopy)	✔			
	Incidence		✔		
	Mortality		✔		
	Relative Survival		✔		
	Capture of Stage for CRC Data				✔
	Radiation Therapy Wait Times for CRC: Ready to Treat to Treatment				✔
	Neoadjuvant Radiation Therapy for Stage II and III Rectum Cancer				✔
	Removal of 12 or More Lymph Nodes in Colon Resections				✔
	Adjuvant Chemotherapy for Stage III Colon Cancer				✔
Prevention	Smoking Prevalence	✔			
	Smoking Quit Attempts	✔			
	Overweight and Obesity	✔			
	Alcohol Consumption	✔			
	Physical Activity	✔			
Screening	Breast Screening Rates (Mammography)	✔			
	Cervical Screening Rates (Pap Test)	✔			
Diagnosis & Treatment	Capture of Stage Data				✔
	PET Scanner Capacity and Utilization				✔
	Wait Times: Abnormal Breast Screen to Resolution				Provincial screening programs
	Clinical Trial Participation Ratio (Adult and Pediatric)				✔ and C[17]
Radiation Therapy Focus Section	LINAC Capacity and Utilization				✔
	Radiation Therapy Wait Times: Ready to Treat to Treatment				✔
	Radiation Therapy Utilization				✔
	Adjuvant Radiation Therapy for Stage I and II Breast Cancer				✔
Supportive Care & Survivorship	Screening for Distress				✔
	Self-Reported Outcomes				✔
	Place of Death			✔	
Long-Term Outcomes	Age-Standardized Incidence Rates		✔		
	Age-Standardized Mortality Rates		✔		
	Relative Survival Rates		✔		

The Technical Appendix provides additional detail on data sources and calculation methods.

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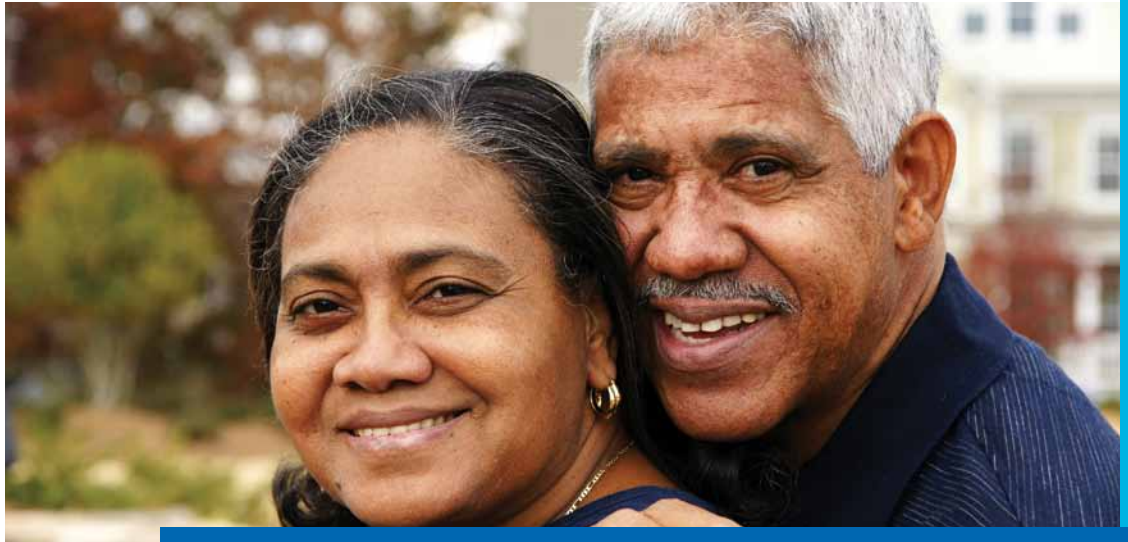
Colorectal Cancer—A Lens on the Continuum of Care

This focus chapter presents selected performance indicators assessing screening, treatment and long-term outcomes for colorectal cancer (CRC), thereby spanning a large part of the cancer control continuum for this disease. As the second leading cause of cancer death in Canada, CRC continues to pose a significant threat to the health and well-being of Canadians. It is estimated that 22,500 new cases of CRC will be diagnosed in 2010, and 9,100 Canadians will succumb to this disease.[1] By presenting information Canada-wide and linking several domains relating to CRC in one section, a deeper understanding of the effects of this disease across the country can be gained, along with efforts undertaken to combat it.

While prevention is not specifically addressed in this CRC focus chapter, the Prevention section of the *Report* (pages 32 to 42) provides information on the status of Canadians as regards known modifiable risk factors for CRC such as smoking, overweight and obesity, alcohol consumption and physical inactivity.

Many provinces have recently launched organized CRC screening programs, and those that have not yet implemented programs have all announced plans to launch them. While pan-Canadian indicators from organized CRC screening programs are not yet available, self-reported screening data are available from the CCHS and are presented in this section as the Indicators: **Percentage of the Population (50-74) reporting FOBT and/or Sigmoidoscopy/Colonoscopy for "Asymptomatic" or "Any Reason."**

Treatments for CRC are examined through high-level indicators including **Capture of Stage Data** and **Wait Times: Radiation Treatment for CRC**. In addition, this section introduces three well-established guideline concordance measures for the disease: **Neoadjuvant Radiation for Stage II and III Rectum Cancer**, **Removal of 12 or More Lymph Nodes for Colon Cancer Resections** and **Adjuvant Chemotherapy for Stage III Cancer**.

This focus chapter on CRC reports on long-term outcome indicators, including **Incidence** (outcomes for prevention), **Mortality** and **Relative Survival** (outcomes for screening and treatment). Where possible throughout the *Report*, analyses are presented for social determinants of health across Canada, including income quintile, education, and residence in urban, rural and isolated locations.

2.1 CRC SCREENING

Evidence from clinical trials and systematic reviews of the literature illustrate that screening can reduce mortality and incidence of CRC.[2-5]

In recognition of the importance of screening to CRC outcomes, guidelines from the Canadian Task Force on Preventive Health Care were established in 2001.[6] These guidelines were followed by population recommendations from the National Committee on Colorectal Cancer, convened by Health Canada in 2002.[7] As of 2010, all provinces have announced or are developing screening programs, all of which employ fecal occult blood tests (FOBTs) (either guaiac or immunochemical) as the entry screening test, and recommend screening for average risk persons aged 50–74. Colonoscopy is the diagnostic test typically recommended as a follow-up to a positive FOBT result or as screening for high-risk individuals. Colonoscopy, and also sigmoidoscopy, are sometimes used as screening tests for CRC.

There are early indications that screening programs will add to the overall screening rates across Canada. Figure 1 presents the availability of organized CRC screening programs within the country and dates they were announced. Currently, Ontario is the only province with an organized screening program available for 100% of its population.

Figure 1: Availability of Organized CRC Screening Programs
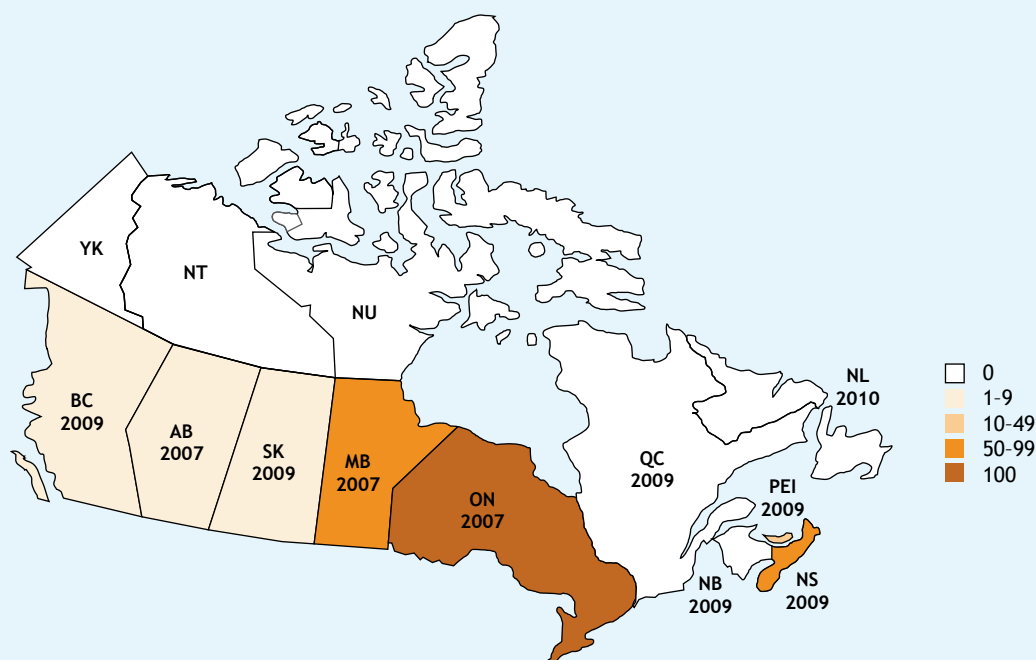
Shading reflects the percentage of target population for whom organized CRC screening programs are available. Program announcement date appears alongside province name.

Data source: Colorectal Cancer Screening Programs in Canada

Percentage of the Population (50-74) Reporting FOBT and/or Sigmoidoscopy/Colonoscopy for "Asymptomatic" or "Any Reason"

The CRC screening indicator is based on self-reported data from the CCHS. Survey questions regarding CRC screening were included in the 2008 CCHS cycle, with all provinces and territories reporting. The data are based on persons who reported being tested with FOBT within the past two years and/or sigmoidoscopy/colono-scopy within the past five years, with the purpose of capturing a comprehensive snapshot of CRC screening in Canada. As such, the scope of this indicator is not limited to screening through organized programs.

The CCHS data allow for the differentiation of screening reported for *asymptomatic reasons* (regular screening) or *for any reason* (including diagnosis confirmation or follow-up). In 2008, self-reported screening rates for CRC for asymptomatic reasons in individuals aged 50–74 varied across the country, ranging from 16% in Quebec to 47% in Manitoba, with an overall Canadian average of 32% (Figure 2). When including testing for any reason, the rates were substantially higher, ranging from 27% in Quebec to 55% in Manitoba (Figure 3). The difference between the asymptomatic and any reason rates for individual provinces ranged from 5% in Yukon to 11% in Prince Edward Island (data not shown).

Figure 4 reports the difference in screening rates (for asymptomatic reasons) for individual provinces that participated in the 2005 and 2008 CCHS cycles. Five of the six provinces participating in both cycles evidenced increases in screening rates for CRC; the increase in screening rates was greatest in Ontario, at 14%. In 2008, screening rates for FOBT and/or sigmoidoscopy/colonoscopy (for asymptomatic reasons) were higher for individuals aged 60-74 than for those in the 50-59 age group, at 38% and 28%, respectively (Figure 5). There was little difference in screening rates between males and females overall.

Figure 2

Percentage of population (50-74) reporting FOBT and/or sigmoidoscopy/colonoscopy for asymptomatic reasons
BY PROVINCE/TERRITORY—CCHS 2008
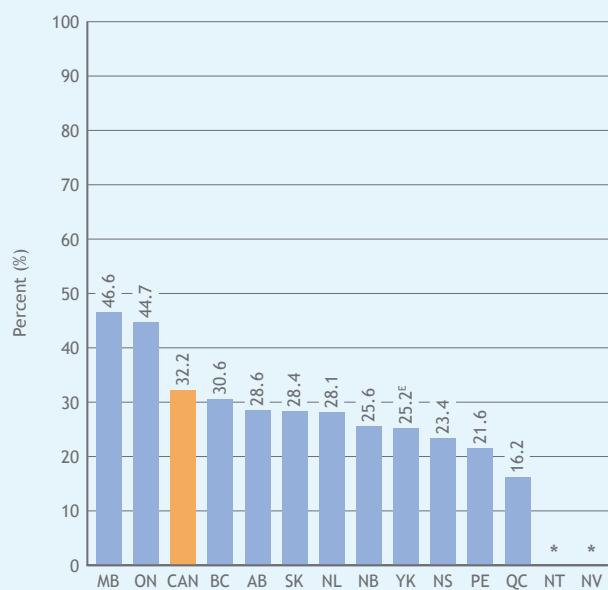
MB 46.6, ON 44.7, CAN 32.2, BC 30.6, AB 28.6, SK 28.4, NL 28.1, NB 25.6, YK 25.2^E, NS 23.4, PE 21.6, QC 16.2, NT *, NV *

* Suppressed due to statistical unreliability caused by small numbers.
Data Source: Statistics Canada, Canadian Community Health Survey
^{E} Interpret with caution; coefficient of variation between 16.6 and 33.3%

Figure 3

Percentage of population (50-74) reporting FOBT and/or sigmoidoscopy/colonoscopy for any reason
BY PROVINCE/TERRITORY—CCHS 2008
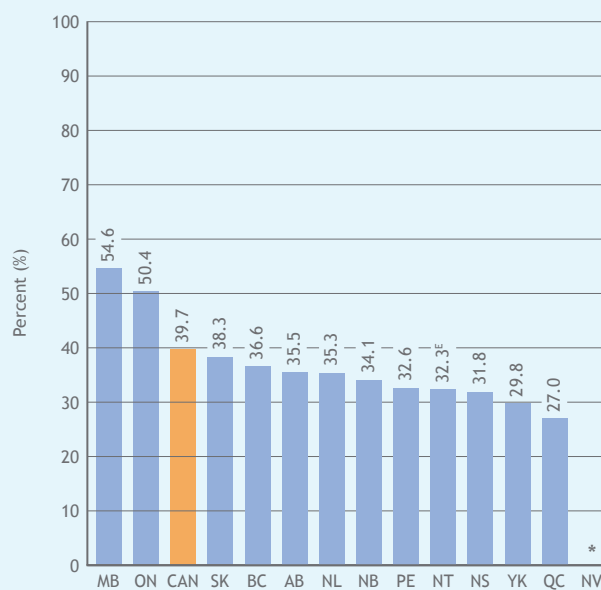
MB 54.6, ON 50.4, CAN 39.7, SK 38.3, BC 36.6, AB 35.5, NL 35.3, NB 34.1, PE 32.6, NT 32.3^E, NS 31.8, YK 29.8, QC 27.0, NV *

* Suppressed due to statistical unreliability caused by small numbers.
Data Source: Statistics Canada, Canadian Community Health Survey
^{E} Interpret with caution; coefficient of variation between 16.6 and 33.3%

Figure 4

Change in percentage of population (50-74) reporting FOBT and/or sigmoidoscopy/colonoscopy for asymptomatic reasons
DIFFERENCE FROM 2005 TO 2008, BY PROVINCE/TERRITORY—CCHS 2005 AND 2008
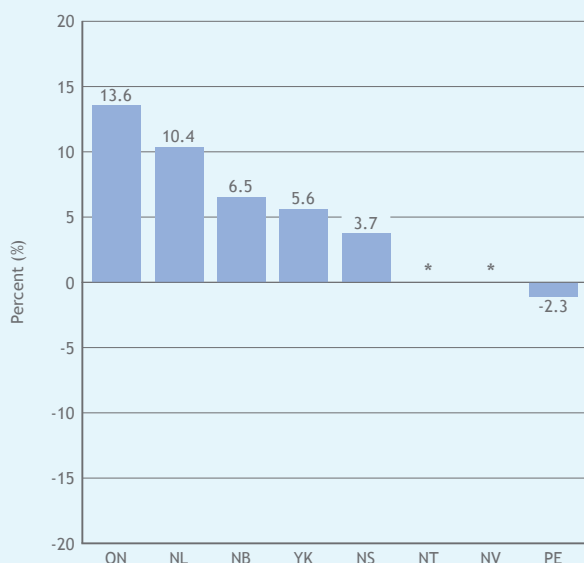
* Suppressed due to statistical unreliability caused by small numbers.
Data Source: Statistics Canada, Canadian Community Health Survey

Figure 5

Percentage of population (50-74) reporting FOBT and/or sigmoidoscopy/colonoscopy for asymptomatic reasons
BY AGE AND SEX, CANADA—CCHS 2008
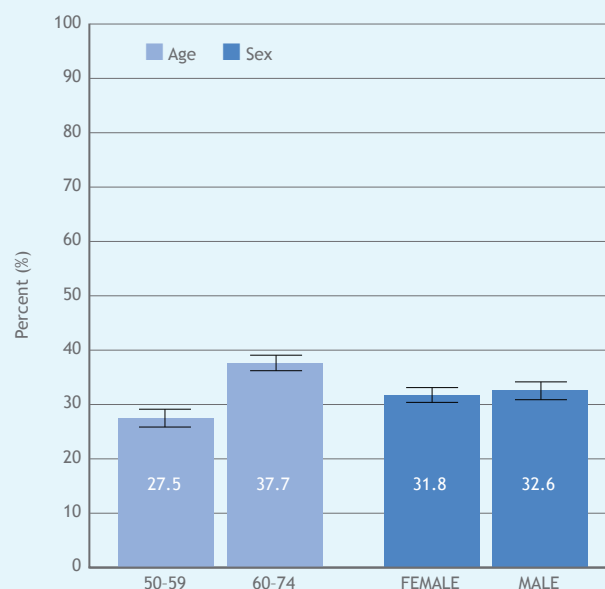
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

Individuals in higher income quintiles and with greater levels of education reported higher levels of screening in the 2008 CCHS cycle (Figure 6). When examining CRC screening across Canada, those living in "rural-isolated" and "rural-very isolated" areas reported lower levels of screening than those living in urban areas[a]. For definitions of "urban", "rural", "rural-isolated" and "rural-very isolated", please refer to page 113 of the Technical Appendix).

[a] Place of residence in Canada is analyzed using a concept developed by Statistics Canada and is based on community size and workforce commuting flows into urban areas. This concept allows rural communities to be subdivided by degree of rural isolation.
For ease of reference, in this *Report* the three rural subcategories are referred to as "rural", "rural-isolated" and "rural-very isolated".
Based on the 2006 census, 81% of the Canadian population would be categorized as "urban", 4% as "rural", 7% as "rural-isolated" and 8% as "rural-very isolated".

Figure 6

Percentage of population (50–74) reporting FOBT and/or
sigmoidoscopy/colonoscopy for asymptomatic reasons
BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY,
CANADA—CCHS 2008

Legend: Income, Education, Geography

Percent (%)

Category	Value
Q1 (LOWEST)	25.2
Q2	28.7
Q3	34.2
Q4	35.3
Q5 (HIGHEST)	37.7
<SEC. SCHOOL	27.2
SEC. SCHOOL GRAD.	32.2
SOME POST-SEC.	33.3
POST-SEC. GRAD.	34.1
URBAN	33.0
RURAL	30.6
RURAL—ISOLATED	27.7
RURAL—VERY ISOLATED	29.2

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

2.2 Treatment for CRC

CRC is a treatable disease if diagnosed early. The five-year survival rate is 62% overall but is reported to be 75% to 95% for stage I and II CRC, and an average of 55% for stage III CRC (although survival varies widely even within the same stage depending on lymph node involvement).[1] The primary treatment modality for CRC is surgery. Chemotherapy and radiation are both used in the pre- and post-operative settings. Pre-operatively, radiation therapy is sometimes used to improve the success rate of surgery for rectal cancer by shrinking the tumour. Used in the post-operative setting, chemotherapy and/or radiation may be used to help to eliminate residual traces of tumour cells and reduce the rate of recurrence.

The availability of stage data is crucial for making accurate diagnosis, estimating prognosis, planning targeted treatments and recommending clinical trials for patients. Staging levels for CRC range from 0 to IV, with each stage describing how deeply the cancer has penetrated the wall of the co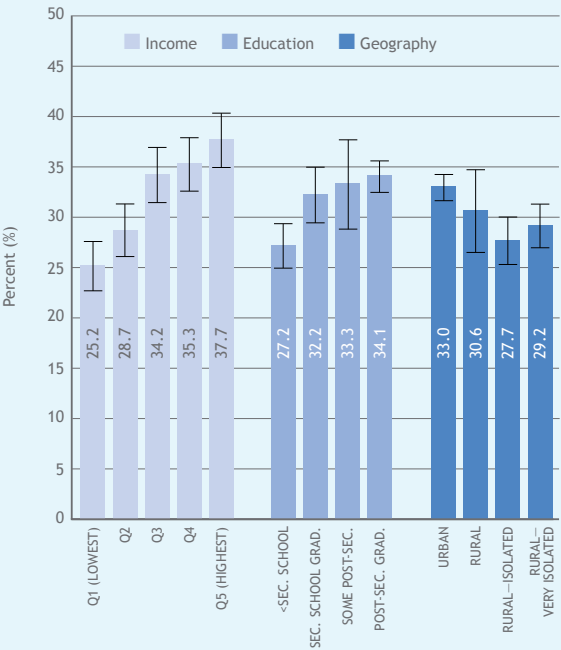lon, the number of nearby lymph nodes involved and whether the cancer has spread to distant parts of the body. In 1990, the Working Party to the World Congress of Gastroenterology recommended that at least 12 nodes be removed and examined to verify that the lymphatics draining colorectal tumour sites were free of metastasis.[8] Since then, numerous clinical trials have evaluated the benefit of nodal removal in CRC. With regards to survival and recurrence rates, international guidelines and studies report that removing 12 or more nodes contributes to better survival for patients with stage I or II CRC.[9]

Many clinical trials have demonstrated the benefits of the appropriate use of surgery, radiation, lymph node dissection and chemotherapy for the treatment of CRC. These trials have helped to inform the development of treatment guidelines at the local, provincial and national levels;[10,11,12] adherence in clinical practice to such guidelines is measured as concordance. The guideline concordance indicators in this *Report* are based on well-established guidelines that provide clear and compelling evidence for recommended treatment approaches for CRC. Proxy measures have also been included to allow for reporting by provinces that were not able to provide the necessary data required to calculate the full guideline concordance measures.

Data for the indicators in the treatment section were obtained directly from provincial cancer agencies or their equivalents through a survey conducted specifically for this *Report* and include:

- Capture of Stage Data for Colorectal Cancer;
- Wait Times: Radiation Treatment (Ready to Treat to Treatment) for Colorectal Cancer;
- Neoadjuvant Radiation for Stage II and III Rectum Cancer *(Guideline Concordance and Guideline Proxy Measure)*;
- Removal of 12 or More Lymph Nodes for Colon Cancer Resections *(Guideline Concordance)*; and
- Adjuvant Chemotherapy for Stage III Colon Cancer *(Guideline Concordance and Guideline Proxy Measure)*.

Capture of Stage Data for CRC

Centralized capture of stage data allows for the development of meaningful performance indicators at the system level. Stage data can be assigned by clinicians and reported to provincial cancer agencies (using the American Joint Committee on Cancer/International Union Against Cancer [AJCC/UICC] TNM Staging System) and/or be based on data elements abstracted directly from patient charts (as in Collaborative Staging). For this *Report*, nine provinces provided data on the percent of CRC cases for which stage data are available for the diagnosis years 2006, 2007 and 2008 (Figure 7). In Quebec, while stage data are not currently transferred to the central registry, many hospitals record stage data in local registries. The Fichier des tumeurs is in the process of being updated into the *Registre québécois du cancer* which will centrally receive stage data. As of March 2010, an estimated 44% of CRC cases in Quebec were documented in local registries. In 2007, the diagnosis year for which the guideline concordance indicators in this *Report* were calculated, the percent of CRC cases for which stage data were captured ranged from 55% to 100%, with six of the nine provinces reporting over 80% and the overall average being 82%. Of note, Alberta, Manitoba, Prince Edward Island and Saskatchewan each reported 100% capture of stage data for incident cases of CRC for all three years reported. As one of the "top 4 cancer sites", CRC staging is prioritized by many provinces. A national collaborative staging effort coordinated by the Partnership aims to achieve nationwide population level staging for CRC (and the other three sites) as of the 2010 diagnosis year.

Figure 7

Percentage of incident cases for which stage data are collected by provincial cancer agencies—colorectal cancer
TIME TRENDS BY PROVINCE—2006 TO 2008 DIAGNOSIS

	AB	MB	PE	SK	NB	ON	NS	NL	BC
2006	100.0	100.0	100.0	100.0	77.8	41.0	97.4	63.4	58.4
2007	100.0	100.0	100.0	100.0	69.2	84.7	95.6	65.3	55.1
2008	100.0	100.0	100.0	100.0	95.4	87.0	80.9	70.8	56.9
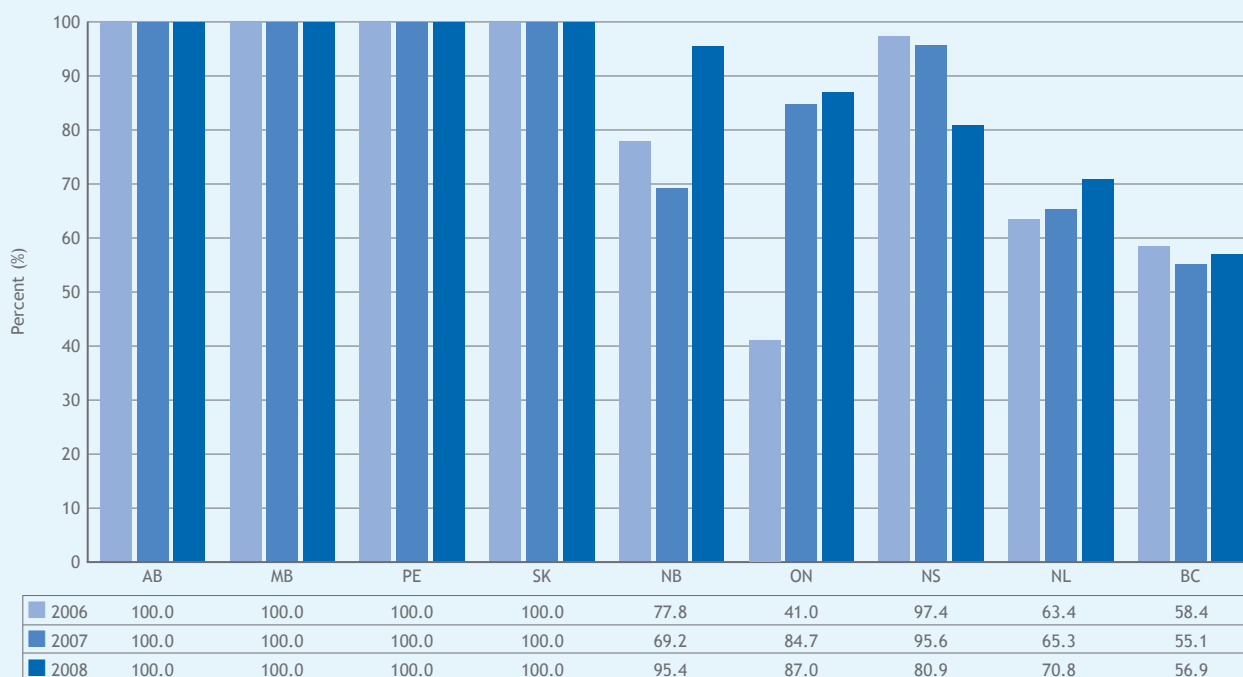
Data Source: Provincial cancer agencies

Wait Times: Radiation Treatment (Ready to Treat to Treatment) for CRC

This indicator measures the interval between a patient being identified as ready for radiation treatment and the start of the first session of therapy (Ready to Treat to Treatment). The interval derives from the *Final Report to the Federal Advisor on Wait Times (2006)*, which includes a list of national benchmarks for access to patient care and recommends that 90% of patients start radiation therapy within 4 weeks from the time they are deemed ready for treatment.[13]

CRC data reported by six provinces for the 2007 to 2009 period demonstrate that the 90th percentile wait times ranged from 10 to 28 days in 2007, 21 to 30 days in 2008 and 17 to 37 days in 2009 (Figure 8). These results suggest that 90th percentile wait times improved over the three-year reporting period; however, reductions in wait times were not uniformly experienced across Canada during this time. In 2007 and 2008, three of the provinces reporting data achieved (i.e., met or were below) the target wait times. In 2009, four of the six provinces reporting data were well under the 28-day target wait times. Other provinces (Newfoundland and Labrador and Manitoba) experienced an increase in the 90th percentile wait times. It is important to note that differences in definitions among provinces may have resulted in some of the observed variations. Of note, Nova Scotia did not begin collecting data on Ready to Treat to Treatment until 2010. For this reason, their wait times for 2007 to 2009 are not comparable to those of other provinces (and are shown separately to the right in the figure). For a list of Ready to Treat to Treatment definitions by province, please refer to Table B in the Technical Appendix.

Figure 8

90th percentile radiation therapy wait times in days—colorectal cancer
TIME TREND BY PROVINCE—2007 TO 2009
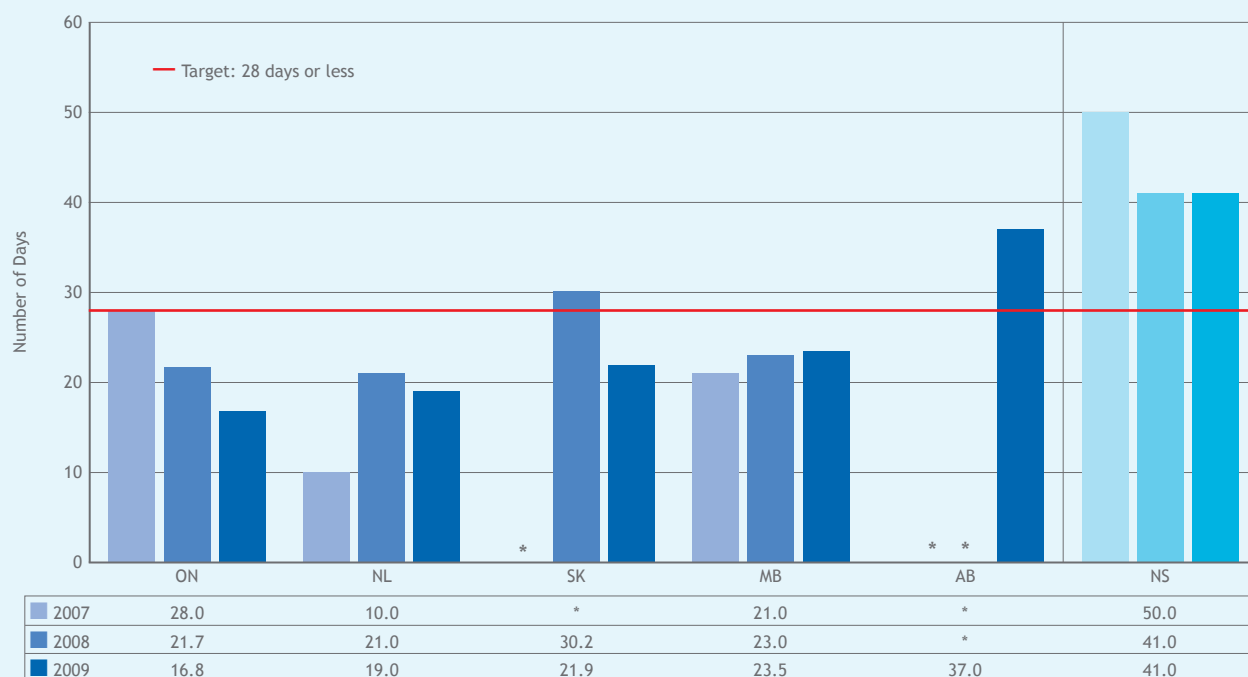
	ON	NL	SK	MB	AB	NS
2007	28.0	10.0	*	21.0	*	50.0
2008	21.7	21.0	30.2	23.0	*	41.0
2009	16.8	19.0	21.9	23.5	37.0	41.0

NS did not track ready to treat dates prior to 2009.
* Data not available.
Data Source: Provincial cancer agencies

Neoadjuvant Radiation for Stage II and III Rectum Cancer (Guideline Concordance and Guideline Proxy Measure)

Neoadjuvant (pre-operative) radiation therapy has been shown to improve surgical outcomes for patients with stage II and III (locally advanced) rectum cancer. For this *Report*, six provinces provided data for calculating the guideline concordance measure: "Percentage of stage II and III rectum cancer cases receiving radiation therapy preceding surgical resection". Concordance rates ranged from 25% to 49%, with an overall average of 41% among provinces reporting (Figure 9). In this and subsequent figures, concordance rates for British Columbia are shown but not included in the averages as the data reported included only cases referred to cancer centres and are subsequently not population-based. It should be noted that the expected concordance rate is not 100%. Valid reasons may exist for not adhering to the guideline, including situations where patients are medically unable to undergo treatment or where patients choose to forego radiation treatment. Nevertheless, the comparisons of patterns are of value in attempting to assess care patterns.

Figure 9

Guideline Concordance: Percentage of stage II and III rectum cancer cases receiving radiation therapy preceding surgical resection
RADIATION THERAPY STARTED WITHIN 120 DAYS BEFORE SURGERY, BY PROVINCE—2007 DIAGNOSIS

	ON	AVERAGE*	NS	AB	NL	MB	BC
% =	49	41	31	29	27	25	65
N =	805	1,301	97	262	22	115	357

BC data included only cases referred to the cancer centres.
* BC data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

Because several provinces were not able to provide surgery data on all cancer patients to calculate the guideline concordance indicator, a proxy indicator was developed. This proxy indicator was defined as "Percentage of stage II and III rectum cancer cases receiving radiation therapy within 120 days of diagnosis". The proxy indicator approximates neoadjuvant radiation treatment, although it does not specifically ensure either that surgery occurs for the identified cases or that radiation treatment occurs prior to surgery. The 120-day timeframe was chosen to capture the delivery of radiation therapy in the perioperative setting (as opposed to second line or palliative therapy).

Figure 10

Guideline Proxy Measure: Percentage of stage II and III rectum cancer cases receiving radiation therapy
WITHIN 120 DAYS OF DIAGNOSIS, BY PROVINCE—2007 DIAGNOSIS

	PE	NS	SK	ON	AVERAGE*	NL	AB	MB	BC
% =	82	68	60	52	49	43	35	32	61
N =	17	103	115	1,041	1,724	30	279	139	385
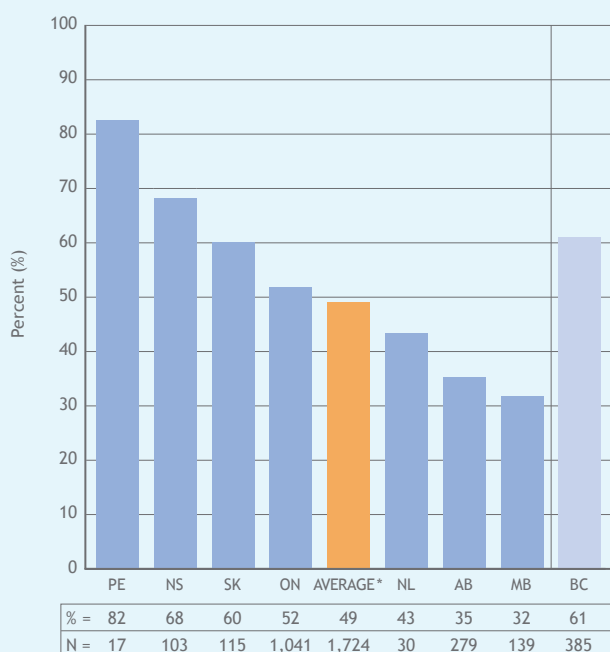
BC data included only cases referred to the cancer centres.
* BC data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

Eight provinces provided data to calculate the "proxy" indicator (Figure 10). Provincial rates ranged from 32% to 82%, with an overall average of 49% among provinces reporting. The fact that the proxy measure rates are higher than those of the guideline concordance measure suggests that a good proportion of rectum cancer patients may be receiving radiation therapy post-operatively. This is of particular note in Nova Scotia where the proxy rate is approximately double the guideline concordance rate. The treatment guidelines do call for post-operative radiation to be delivered if pre-operative radiation is not given.

Five provinces provided data that allowed for age stratification of the guideline concordance measure (Figure 11); data for Newfoundland and Labrador were suppressed due to low case volumes. Although the provincial rates within each age category varied, a higher percentage of patients aged 18–79 were treated according to the guideline than were patients aged 80 and over. In fact, the concordance rate for patients aged 80 and over was less than half that in the 18-59 age group (Figure 11: "Average"). As the population ages, it will become increasingly important to understand how treatment practices vary for different age groups and how other factors such as co-morbidity may play a role in the observed trends. Future reports will explore this issue in greater detail.

Figure 11

Guideline Concordance: Percentage of stage II and III rectum cancer cases receiving radiation therapy preceding surgical resection
RADIATION THERAPY STARTED WITHIN 120 DAYS BEFORE SURGERY, BY PATIENT AGE GROUP—2007 DIAGNOSIS
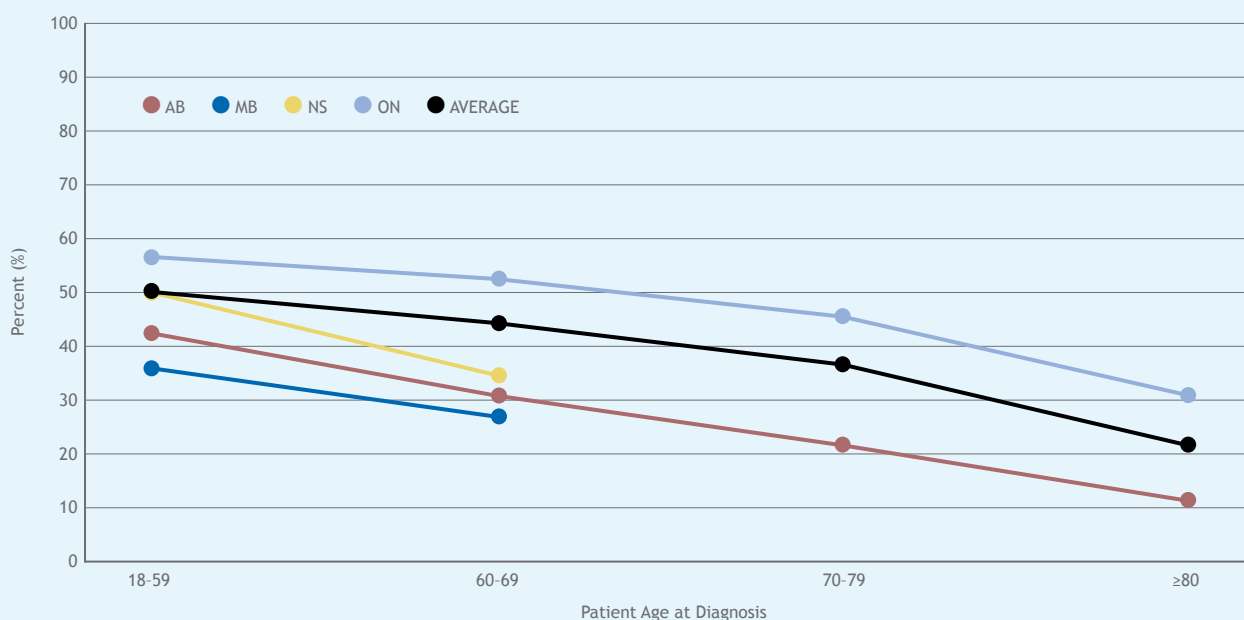
Some data suppressed due to small numbers, including all data from NL.
Data Source: Provincial cancer agencies

Data from all reporting provinces were combined to present the effects of age and sex on the guideline concordance measure. There was no statistically significant difference in the concordance rate between males and females (Figure 12).

Figure 12

Guideline Concordance: Percentage of stage II and III rectum cancer cases receiving radiation therapy preceding surgical resection
RADIATION THERAPY STARTED WITHIN 120 DAYS BEFORE SURGERY, BY PATIENT AGE AND SEX—2007 DIAGNOSIS
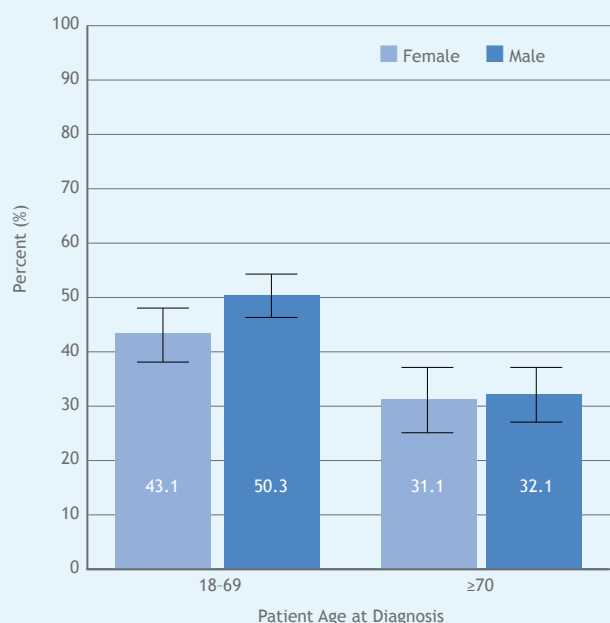
Average of provinces that submitted data (includes AB, MB, NL, NS, ON).
Note: 95% confidence intervals are indicated on figure.
Data Source: Provincial cancer agencies

Removal and Examination of 12 or More Lymph Nodes for Colon Cancer Resections (Guideline Concordance)

For this *Report*, nine provinces provided data for calculating the indicator: "Percentage of colon resections with 12 or more nodes removed and examined – 2007 diagnosis" (Figure 13). Concordance rates among the provinces ranged from 50% to 76%, with an average of 70% for the six provinces reporting data consistent with indicator specifications. The rates for New Brunswick, British Columbia and Ontario were not included in the average. New Brunswick reported only 2008 data, and the sample sets for British Columbia and Ontario included only a subset of provincial cases. (BC data included cases referred to cancer centres only; ON data included only hospitals with synoptic pathology reporting.)

Figure 13

Guideline Concordance: Percentage of colon resections
with 12 or more nodes removed and examined
COLON CANCER CASES DIAGNOSED IN 2007, BY PROVINCE

	AB	NL	AVERAGE*	MB	NS	SK	PE	NB	BC	ON
% =	76	71	70	69	69	62	50	43	60	86
N =	883	249	2,355	408	421	338	56	326	730	1,063

ON data were for 2009 and included only
hospitals with synoptic pathology reporting.
NB data were for 2008.
BC data included only cases referred to the cancer centres.
* ON, BC and NB data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

The percentage of colon resections with 12 or more nodes removed and examined by age group across provinces is shown in Figure 14. There appears to be a slight trend toward lower overall concordance for the older age groups (66% for the 80 and over age group versus 74% for the under 60 age group). This finding is consistent with those of similar population level studies conducted in other jurisdictions.[14,15] However, the age trend observed is much less pronounced than that observed for the other guideline concordance indicators. The examination of the effect of age and sex together on the guideline concordance measure evidenced no significant difference between males and females in either the 18-69 or 70 and older age groups (Figure 15). This result is consistent with the findings of the same international studies cited earlier.

Figure 14

Guideline Concordance: Percentage of colon resections with 12 or more nodes removed and examined
COLON CANCER CASES DIAGNOSED IN 2007, BY PATIENT AGE GROUP

ON data were for 2009 and included only hospitals with synoptic pathology reporting.
BC data included only cases referred to the cancer centres.
*ON and BC data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

Figure 15

Guideline Concordance: Percentage of colon resections with 12 or more nodes removed and examined
COLON CANCER CASES DIAGNOSED IN 2007,
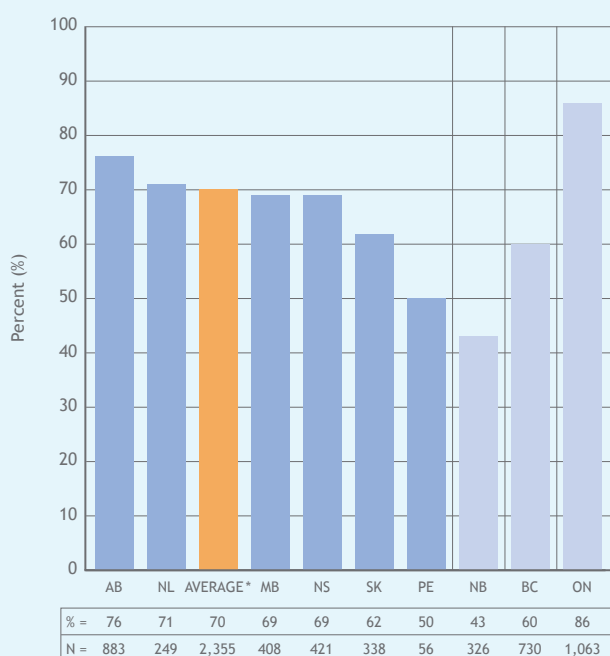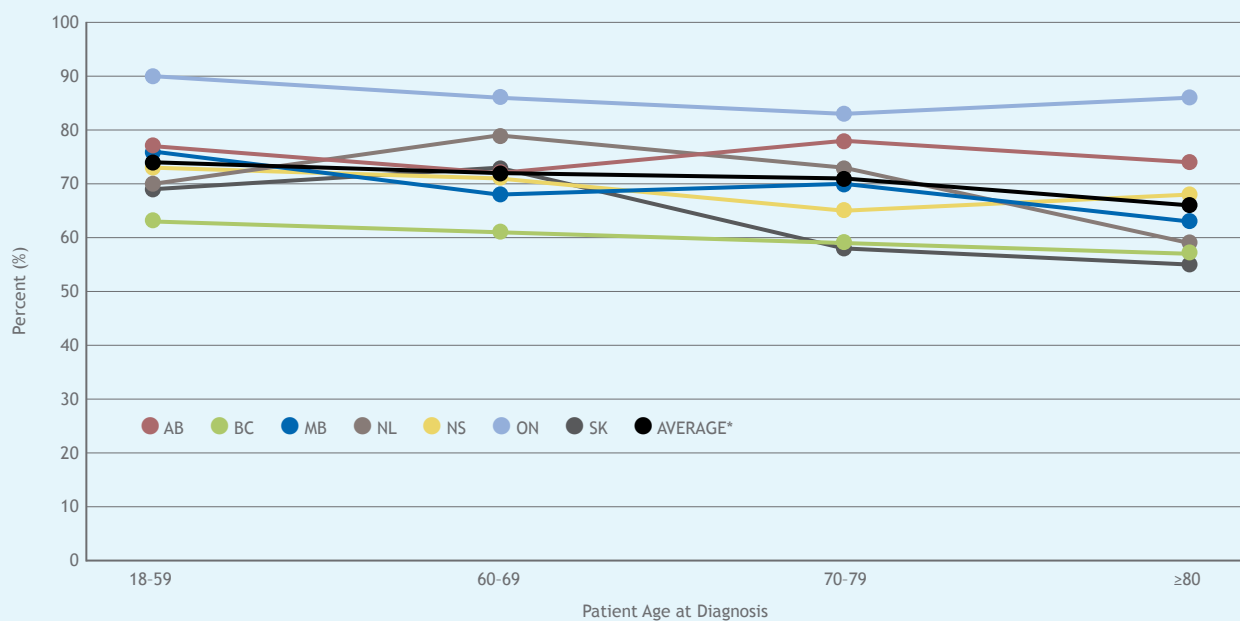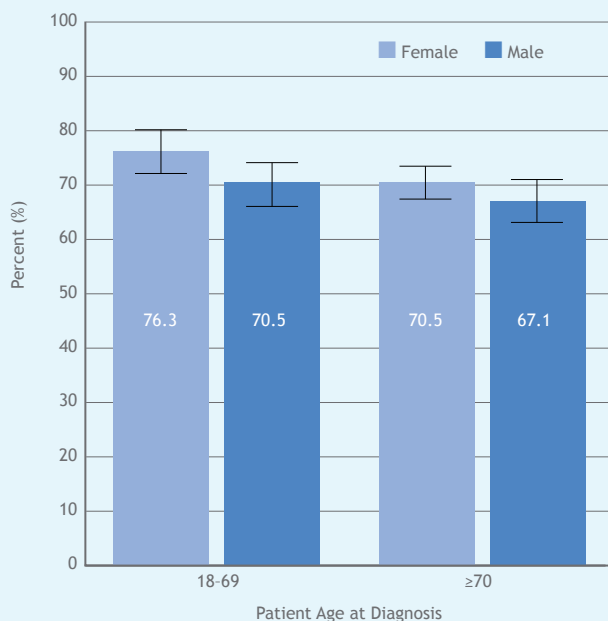BY PATIENT AGE AND SEX

Average of provinces that submitted data (includes AB, MB, NL, NS, SK).
Note: 95% confidence intervals are indicated on figure.
Data Source: Provincial cancer agencies

Synoptic Reporting

Synoptic reporting refers to the use of standardized electronic checklists with consistent terminology and a validated report structure.

Research has demonstrated that the use of synoptic checklists is positively correlated with information completeness.[16] The style and format of a synoptic report encourages completeness and consistency of reporting, diminishing the risk of misinterpretation and the need for clarification, questions and ad hoc explanations. In this way, synoptic reports help to improve patient care by streamlining clinical processes.[17] Clinical guidelines and standards can also be embedded in synoptic reports at the point of care, thereby increasing medical professionals' awareness of and adherence to clinical standards of care.[18]

Two provinces have pioneered synoptic reporting in Canada: in Alberta, the Alberta Cancer Board (now Alberta Health Services), together with regional clinicians developed web-based operative report templates; in Ontario, Cancer Care Ontario created synoptic pathology reporting templates based on checklists developed by the College of American Pathologists. Both provinces have high rates of concordance with the guideline for the number of lymph nodes removed.

The Partnership is spearheading nationwide programs in synoptic reporting (surgery and pathology) to support the development and implementation of reporting standards for specific types of cancer.

Adjuvant Chemotherapy for Stage III Colon Cancer (Guideline Concordance and Guideline Proxy Measure)

Evidence from clinical trials has suggested that the provision of adjuvant (post-operative) chemotherapy to stage III colon cancer patients yields improved survival compared to surgical resection alone. Five provinces reported data for the indicator: "Percentage of stage III colon cancer cases receiving chemotherapy following surgical resection and within 120 days of surgery" (Figure 16). A proxy measure was also calculated to allow for the inclusion of provinces that were not able to provide data for the full guideline concordance indicator. Seven provinces reported on the proxy measure: "Percentage of stage III colon cancer cases receiving chemotherapy within one year and 120 days of diagnosis (without being limited to resected cases)" (Figure 17). British Columbia and Nova Scotia were not included in the averages as their data included only patients referred to cancer centres. Ontario was also excluded from the averages as it did not capture chemotherapy delivered orally. That restriction will impact the comparability of results as a growing number of colon cancer patients are treated with oral instead of IV therapy.

The guideline concordance rate for the three provinces reporting data consistent with indicator requirements ranged from 55% to 80% (Figure 16). For the proxy measure, the rate for the four provinces reporting ranged from 54% to 76% (Figure 17).

Figure 16

Guideline Concordance: Percentage of stage III colon cancer cases receiving chemotherapy following surgical resection
CHEMOTHERAPY STARTED WITHIN 120 DAYS OF SURGERY, BY PROVINCE—2007 DIAGNOSIS

% =	80	63	63	55	68	52
N =	54	258	428	116	271	1,044
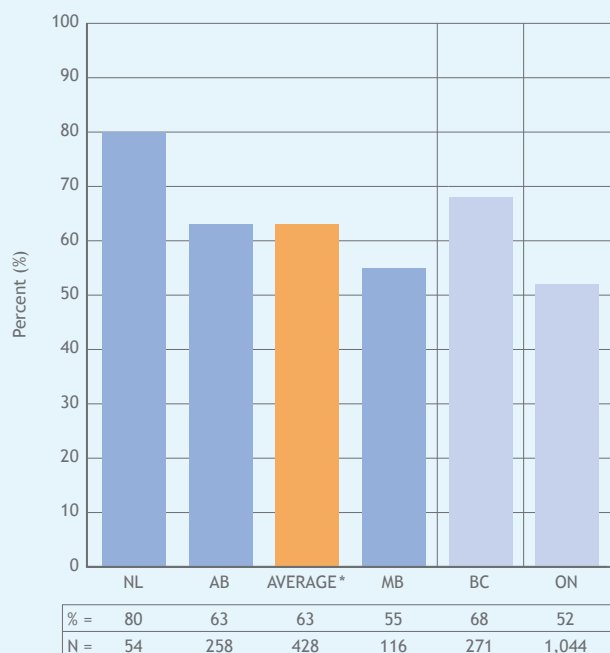
ON data excluded oral chemotherapy since those data are not reliably reported to Cancer Care Ontario.
BC data included only cases referred to the cancer centres.
* ON and BC data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

Figure 17

Guideline Proxy Measure: Percentage of stage III colon cancer cases receiving chemotherapy
CHEMOTHERAPY STARTED WITHIN 1 YEAR + 120 DAYS OF DIAGNOSIS, BY PROVINCE—2007 DIAGNOSIS

% =	76	63	63	62	54	70	62	60
N =	66	261	103	565	135	271	71	1 226
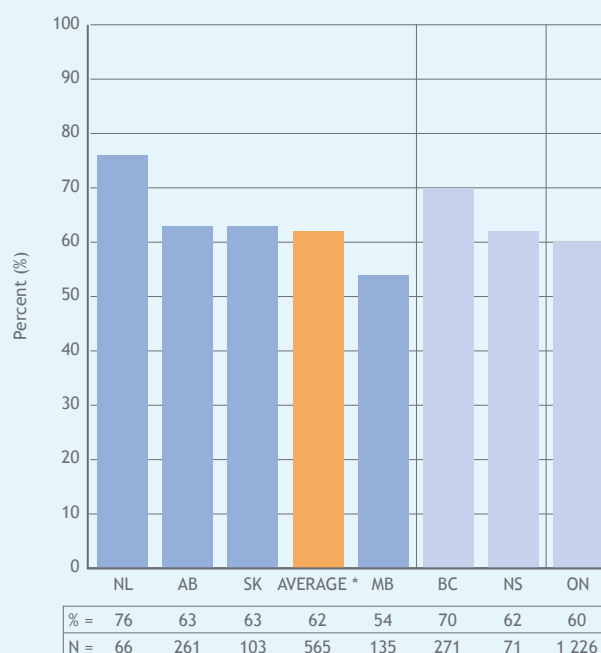
ON data excluded oral chemotherapy since those data are not reliably reported to Cancer Care Ontario.
BC data included only cases referred to the cancer centres.
NS included only patients residing in Cape Breton DHA and Capital Health because chemotherapy treatment information is only captured when provided in the cancer centres.
*ON, NS and BC data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

Analysis of the guideline concordance rate by patient age group revealed patterns relevant to the overall provincial concordance rates. As evidenced in Figure 18, there appears to be a strong correlation between patient age and the guideline concordance rate. A very high percentage of patients (85% to 100%) under 60 years of age were treated according to guidelines in the reporting provinces. Concordance rates decreased (with a range of 71% to 85%) for the 60-69 age group and declined further for the 70–79 age group (with a range of 45% to 80%).

One explanation for treatment rates decreasing with age might be that patient specific factors (e.g., co-morbidities and/or other contraindications) may be more prevalent in older patients and thus may lead to a less favourable risk/benefit ratio for chemotherapy for this population. However, most clinical trials that have enrolled older patients report similar survival rates and toxicity profiles as those observed in younger patients.[19] A pooled analysis examining safety and efficacy of chemotherapy for colon cancer patients found no differences between patients aged 70 and over and patients under 70[20] (although not enough data were available to effectively assess patients over 80). Another explanation for the observed trend may be that older patients are more likely to decline chemotherapy. However, a survey of elderly French and American cancer patients conducted in 2003 found that 78% of French patients and 71% of American patients over the age of 70 would be willing to undergo strong chemotherapy for a chance of cure, life prolongation or symptom relief.[21] The phenomenon of patient age-related treatment patterns will be explored in more depth in future reports.

Figure 18

Guideline Concordance: Percentage of stage III colon cancer cases receiving chemotherapy following surgical resection
CHEMOTHERAPY STARTED WITHIN 120 DAYS OF SURGERY, BY PATIENT AGE GROUP—2007 DIAGNOSIS
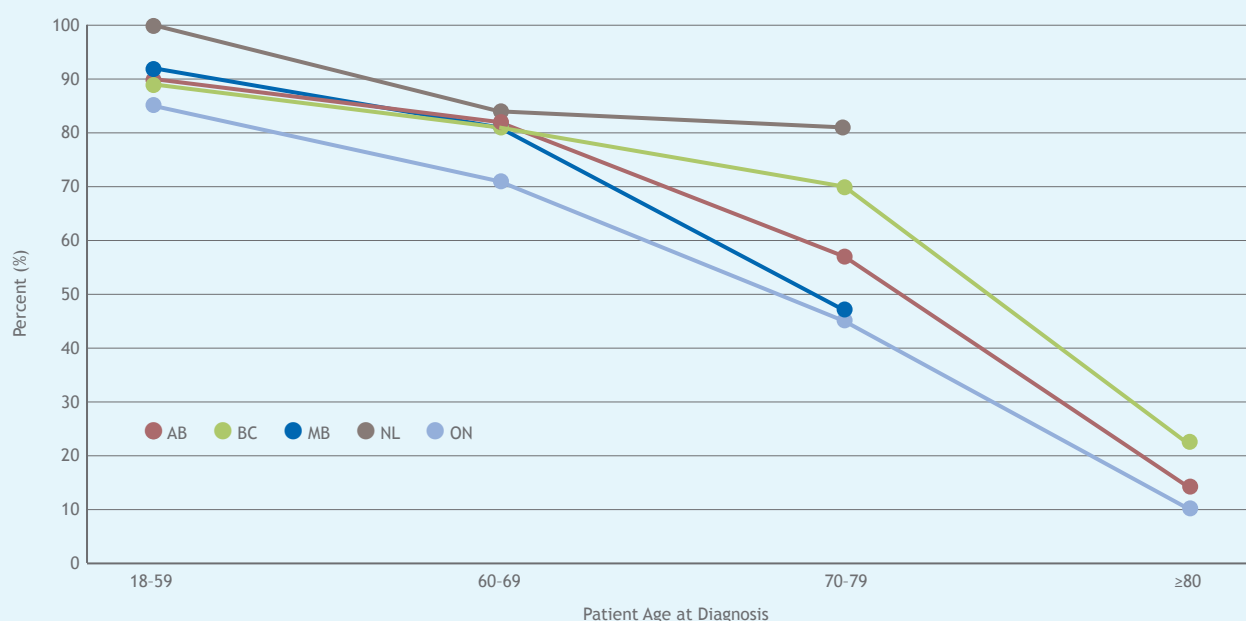
Some data suppressed due to small numbers.
Data Source: Provincial cancer agencies

There were no statistically significant differences in guideline concordance treatment rates between males and females within the 18–69 or over 70 age groups (Figure 19).

Figure 19

Guideline Concordance: Percentage of stage III colon cancer cases receiving chemotherapy following surgical resection
CHEMOTHERAPY STARTED WITHIN 120 DAYS OF SURGERY, BY PATIENT AGE AND SEX—2007 DIAGNOSIS
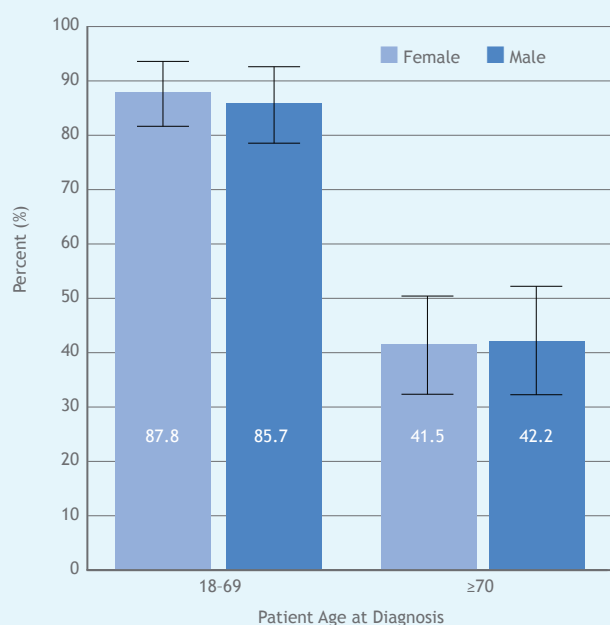
Average of provinces that submitted data (includes AB, MB, NL).
Note: 95% confidence intervals are indicated on figure.
Data Source: Provincial cancer agencies

2.3 Long-Term Outcomes for CRC

This section presents data on CRC incidence, mortality and survival. Age-standardized rates are often used to examine incidence and mortality because they allow comparisons by accounting for different age distributions in populations. It is important to remember, however, that because they are age-standardized, these rates cannot be used to calculate actual numbers of cases or deaths and are not intended to be used for resource planning.

Age-Standardized Incidence Rates (ASIRs) for CRC

From 1995 to 2006, age-standardized incidence rates (ASIRs) for CRC across Canada were relatively stable at approximately 50 new cases per 100,000 throughout the time period measured (Figure 20). While the overall average ASIRs in 2003-2007 were 61 and 41 new cases per 100,000 for males and females respectively, there was, however, considerable variation in incidence across the country, with a 50-60% difference between the lowest rates in British Columbia (53 and 37 per 100,000, males and females respectively) and the highest rates in Newfoundland and Labrador (85 and 55 per 100,000, males and females respectively) (Figure 21).

Figure 20

Age-standardized incidence rates—colorectal cancer
CANADA AND PROVINCE WITH LOWEST RATE—1995 TO 2006
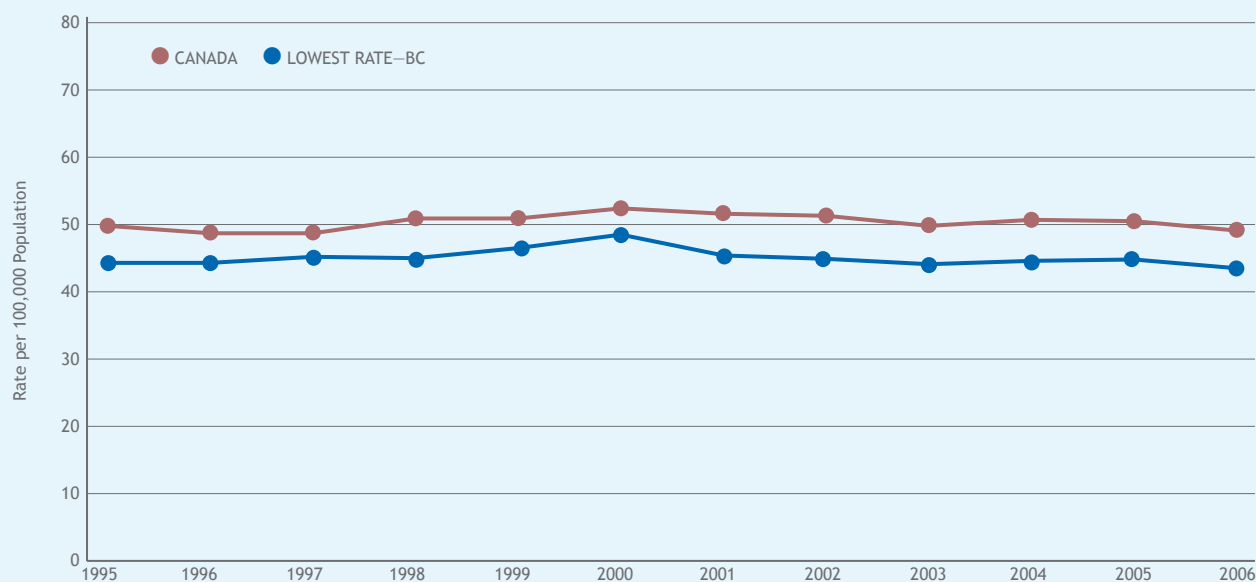
Note: Lowest Rate is based on province with a population of at least 1 million.
Data Source: Statistics Canada, Canadian Cancer Registry

In comparing ASIRs among males and females over the 10-year measurement period from 1996 to 2006, males consistently demonstrated approximately 50% higher incidence of CRC than females (Figure 22). In 2006, ASIRs in Canada differed slightly according to geographic location of residence, ranging from 47 per 100,000 in urban areas to 53 per 100,000 in "rural-very isolated" locations (Figure 23). There was very little difference in ASIRs evidenced by income quintile or education for 2006, and trends for both of these variables were similar for men and for women.

Figure 21

Age-standardized incidence rates—colorectal cancer
BY PROVINCE, BY SEX—2003-2007
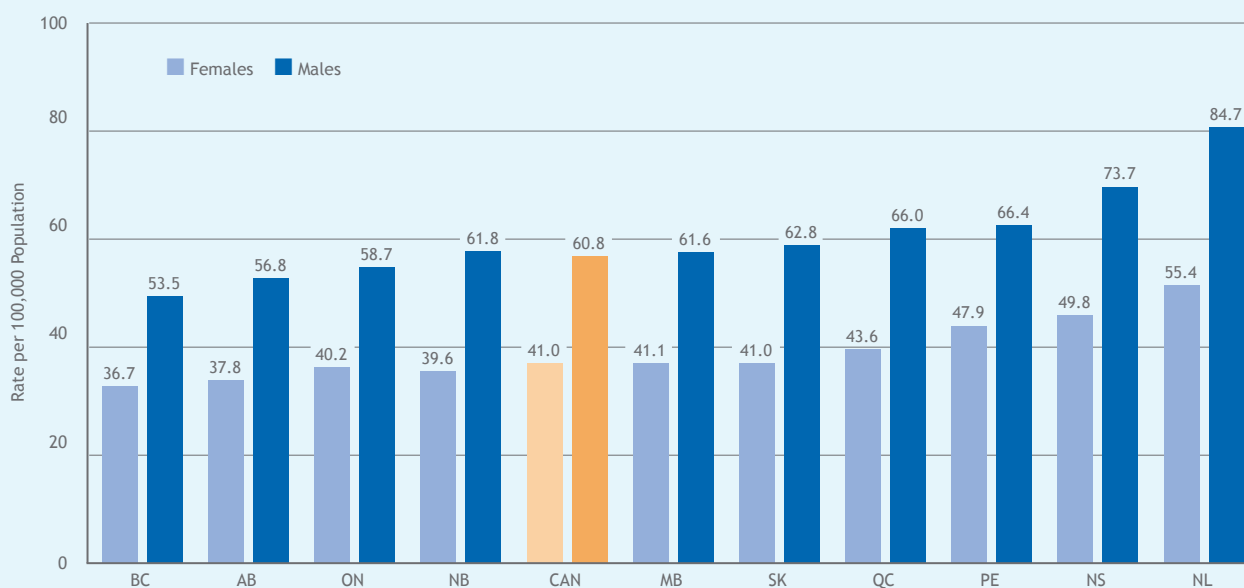
Analysis by: Chronic Disease Surveillance and Monitoring Division,
CCDPC, Public Health Agency of Canada
Source: Canadian Cancer Statistics 2011 (in press)
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 22

Age-standardized incidence rates—colorectal cancer
TIME TRENDS BY SEX, CANADA—1996 TO 2006

Data Source: Statistics Canada, Canadian Cancer Registry
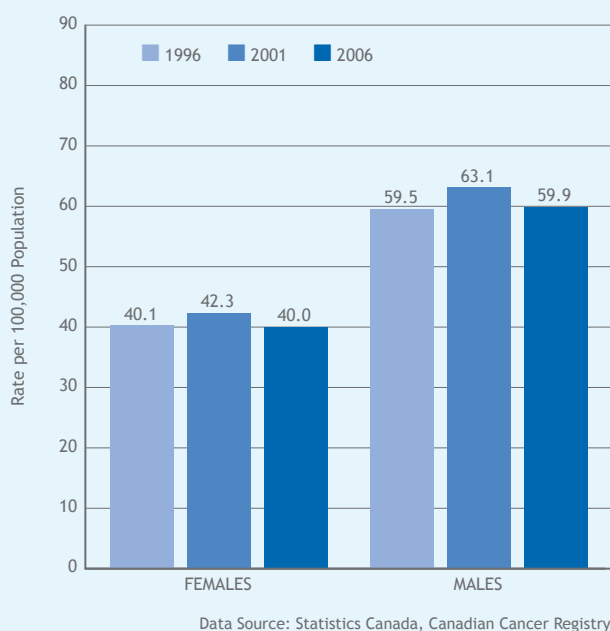
Figure 23

Age-standardized incidence rates—colorectal cancer
BY INCOME QUINTILE AND GEOGRAPHY, CANADA—2006

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Cancer Registry
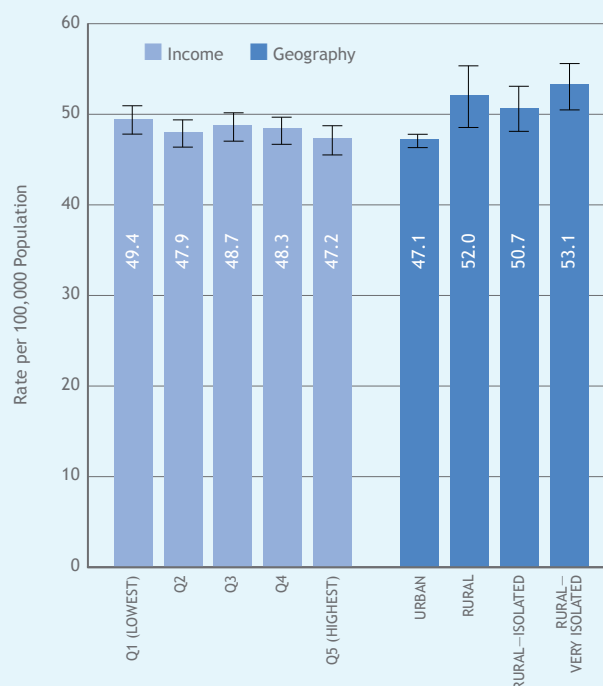
Age-Standardized Mortality Rates (ASMRs) for CRC

From 1995 to 2006, age-standardized mortality rates (ASMRs) for CRC decreased from 24 to 20 deaths per 100,000 (Figure 24). In 2003-2006, provincial average ASMRs for CRC for males ranged from 21 per 100,000 in British Columbia to 41 per 100,000 in Newfoundland and Labrador. ASMRs for females ranged from 15 per 100,000 in Alberta to 25 per 100,000 in Prince Edward Island (Figure 25).

Figure 24

Age-standardized mortality rates—colorectal cancer
CANADA AND PROVINCE WITH LOWEST RATE—1995 TO 2006
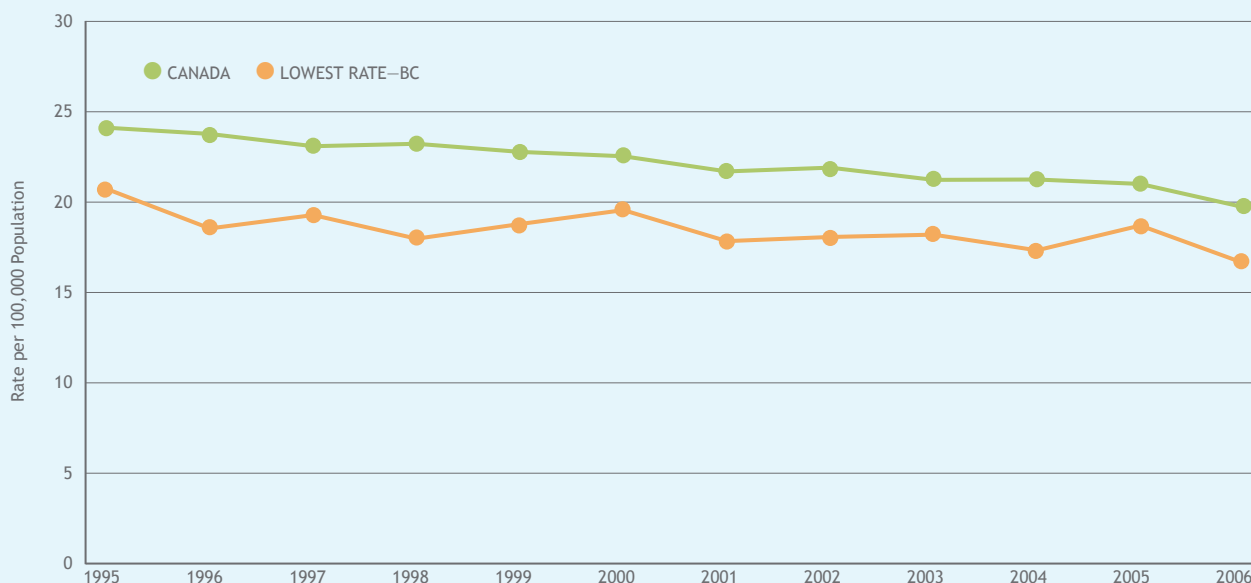
Note: Lowest Rate is based on province with a population of at least 1 million.
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Source: Canadian Cancer Statistics 2011 (in press)
Data Source: Statistics Canada, Vital Statistics Death Database

Figure 25

Age-standardized mortality rates—colorectal cancer
BY PROVINCE, BY SEX—2003-2006
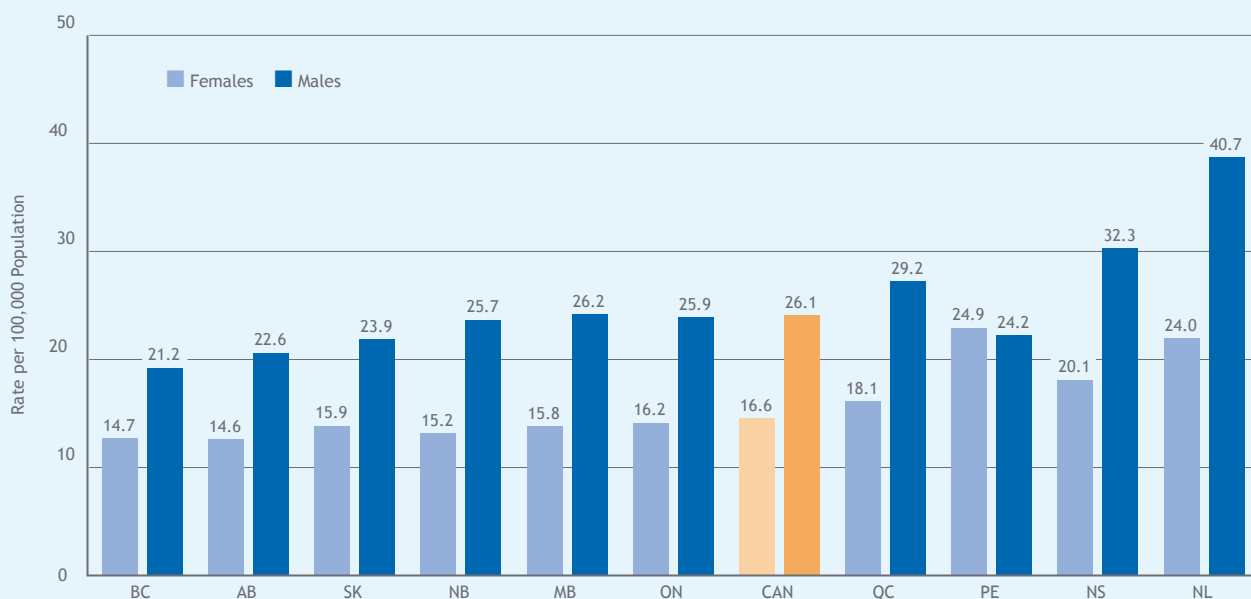
Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada
Source: Canadian Cancer Statistics 2011 (in press)
Data Source: Statistics Canada, Vital Statistics Death Database

Relative Survival for CRC

While there was considerable variation in incidence and mortality rates of CRC among provinces, five-year relative survival ratios were similar across the country, ranging from 58% in Prince Edward Island to 63% in Ontario for patients diagnosed during the 2001 to 2005 diagnosis period (Figure 26). Survival ratios increased slightly over time between the diagnosis periods of 1995 to 1997 and 2001 to 2005 (Figure 27). There was very little difference in relative survival ratios between males and females during the 2001 to 2005 diagnosis period (data not shown). The plan for future reports is to present survival by stage at diagnosis, which might help further explain demographic variations and patterns.

Figure 26

Five-year relative survival for colorectal cancer
BY PROVINCE—DIAGNOSIS YEARS 2001 TO 2005

Data Source: Statistics Canada, Canadian Cancer Registry
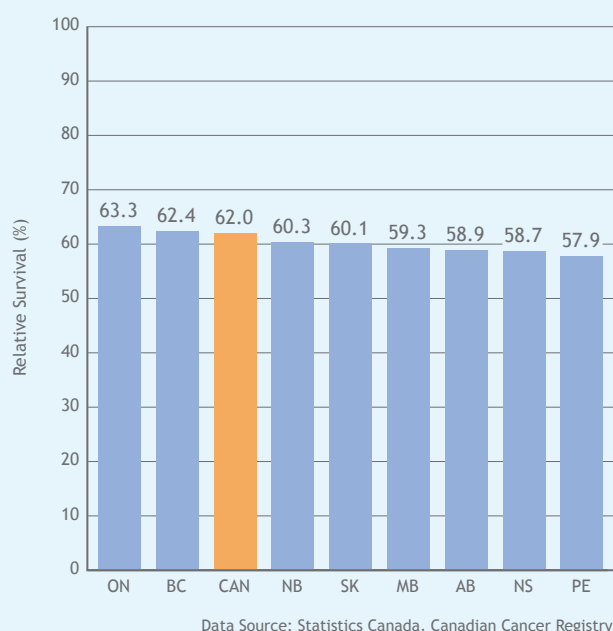
Figure 27

Relative survival ratios for colorectal cancer
BY DIAGNOSIS PERIOD, CANADA

Data Source: Statistics Canada, Canadian Cancer Registry
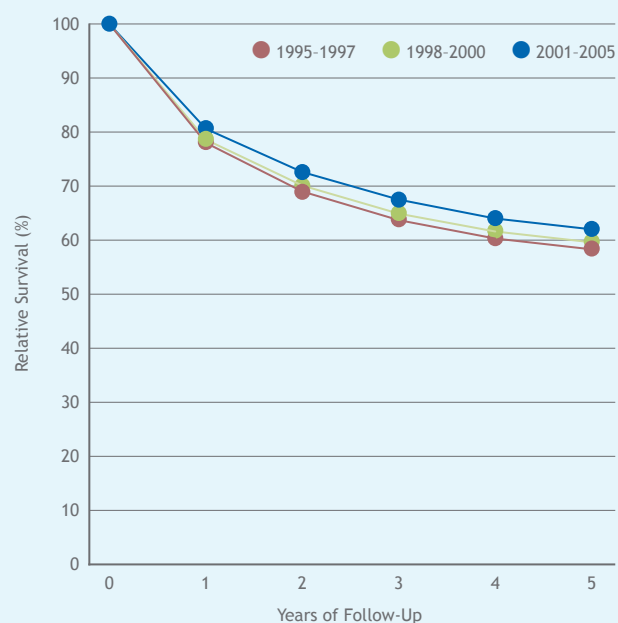
2.4 Synthesis and Next Steps

This focus chapter on CRC presents a set of national cancer control indicators by cancer site. It is important to note that there are several measurement gaps in the continuum. Further consistency among data element definitions and improved data quality will be necessary for optimal reporting of results across the country. The relationship between concordance with evidence-based guidelines and outcomes is also of interest; an example is survival as it relates to stage. One of the most important aspects of presenting the indicators, therefore, lies in the possibility of examining these inter-relationships.

III

Indicator Overview

This section of the *Report* presents indicators on Prevention, Screening, Diagnosis and Treatment, Supportive Care and Survivorship, and Long-Term Outcomes. It also includes the focus section on Radiation Therapy, reporting on Capacity, Utilization, Wait Times and Guideline Concordance indicators for that domain.

3.1 Prevention

The World Cancer Research Fund (WCRF) estimates that approximately one-third of cancers can be prevented by not smoking and that another third of cancers can be prevented through a combination of healthy food and nutrition, regular physical activity and healthy weight maintenance.[22] This statistic makes cancer prevention a highly effective long-term strategy to reduce the burden of cancer.

This chapter aims to build on the prevention indicators presented in the *2009 System Performance Report* by updating results for **Smoking Prevalence and Smoking Quit Attempts**, **Overweight and Obesity** and **Alcohol Consumption**. New to this *Report* is an indicator assessing levels of Physical Activity among Canadians, as well as further stratification of the indicators by sex and/or place of residence for Canadians living in urban, rural and isolated areas.

Smoking Prevalence and Smoking Quit Attempts

It has been well established that tobacco use is a major preventable cause of cancer in Canada, accounting for 85% of all new cases of lung cancer in the country.[23,24] As lung cancer is among the four most common cancers in Canada and is a leading cause of cancer deaths, a reduction in the use of tobacco is presently also the single most important action that can prevent cancer.

Last year's *Report* analyzed smoking prevalence and quit attempts among Canadians using 2007 data from Statistics Canada's Canadian Community Health Survey (CCHS). In this *2010 Report*, the results have been updated with 2008 data. The findings for 2007 and 2008 are largely similar. Overall, average reported rates of smoking prevalence, defined as daily or occasional smoking, were similar in the 2007 (data not shown) and 2008 (Figure 28) CCHS cycles (22% and 21% respectively). Once again, more men reported smoking than women (data not shown). British Columbia consistently reported the lowest daily and occasional smoking rates in the country while the three territories reported the highest rates.

A comparison of daily and occasional smoking rates between 2000-01 and 2008 reveals a consistent decrease in reported smoking rates (Figure 29). For the country overall, the average decrease in smoking rates between 2000-01 and 2008 was approximately 5%.

Figure 28

Percentage of population (≥12)
reporting daily or occasional smoking
BY PROVINCE/TERRITORY—CCHS 2008
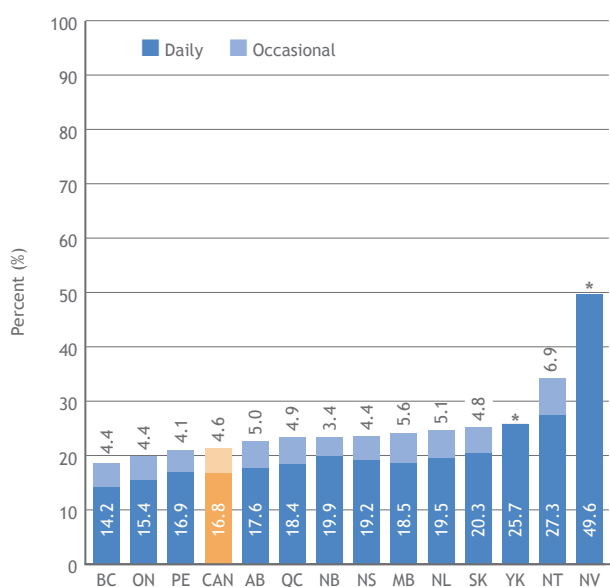
Daily ■ Occasional

	BC	ON	PE	CAN	AB	QC	NB	NS	MB	NL	SK	YK	NT	NV
Occasional	4.4	4.4	4.1	4.6	5.0	4.9	3.4	4.4	5.6	5.1	4.8	*	6.9	*
Daily	14.2	15.4	16.9	16.8	17.6	18.4	19.9	19.2	18.5	19.5	20.3	25.7	27.3	49.6

* Suppressed due to statistical unreliability caused by small numbers.
Data Source: Statistics Canada, Canadian Community Health Survey

Figure 29

Change in percentage of population (≥12)
reporting daily or occasional smoking
**DIFFERENCE FROM 2000-01 TO 2008,
BY PROVINCE/TERRITORY—CCHS 2000-01 AND 2008**
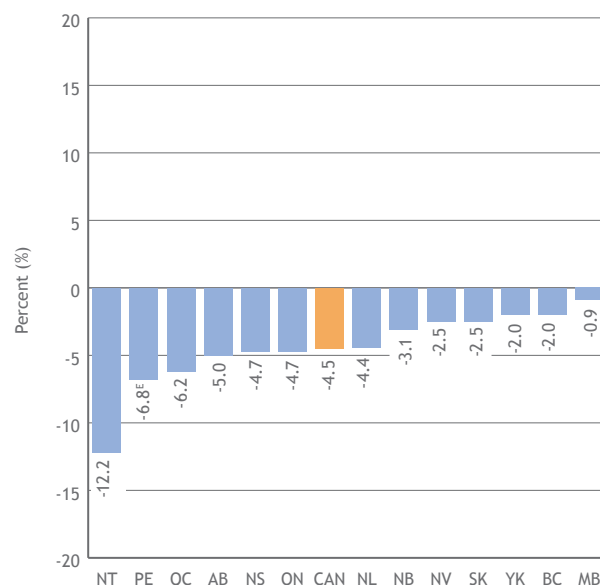
NT	PE	QC	AB	NS	ON	CAN	NL	NB	NV	SK	YK	BC	MB
-12.2	-6.8 E	-6.2	-5.0	-4.7	-4.7	-4.5	-4.4	-3.1	-2.5	-2.5	-2.0	-2.0	-0.9

Data Source: Statistics Canada, Canadian Community Health Survey
E Interpret with caution; coefficient of variation between 16.6 and 33.3%

Smoking rates are closely correlated with socio-economic factors. Income quintile, for example, showed a strong inverse relationship with smoking rates: the lower the income level, the higher the smoking prevalence rate (Figure 30). The pattern for smoking rates by education level was not as clear. The data shows that individuals with less than a secondary school education and those who graduated from post-secondary school were least likely to smoke on a daily or occasional basis. Finally, those living in urban areas were less likely to smoke than those living in "rural-isolated" and "rural-very isolated" areas.

The smoking quit attempts indicator reports on the proportion of ever-smokers twenty years and older who quit smoking anytime within the previous two years and who were still smoke-free at the time of being surveyed. Canadians surveyed in 2008 reported an average quit rate of 18%; the range in quit rates across Canada was 15% in Manitoba to 20% in Newfoundland and Labrador (Figure 31).

While smoking prevalence rates decreased between 2000-01 and 2008 (Figure 29), a similar trend was not seen for smoking cessation. In fact, according to CCHS data, between 2003 and 2008, quit rates decreased in all provinces and territories resulting in an overall 4% decrease for the country (Figure 32). This decrease was seen in each age group (data not shown).

Figure 30

Percentage of population (≥12)
reporting daily or occasional smoking
**BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY,
CANADA—CCHS 2008**
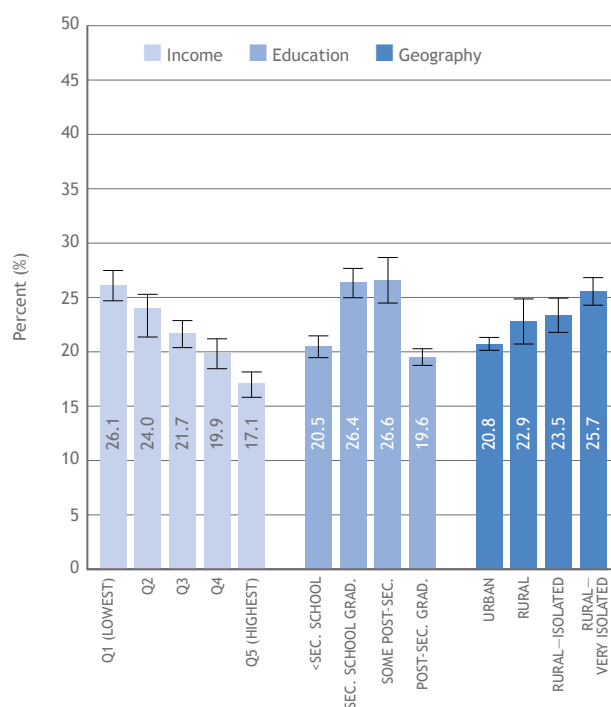
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

Figure 31

Percentage of smokers who have quit smoking
in the past 2 years
BY PROVINCE/TERRITORY—CCHS 2008
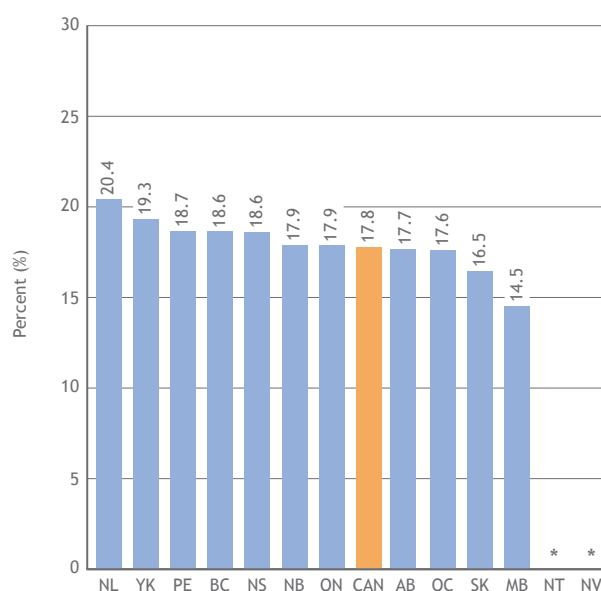
* Suppressed due to statistical unreliability caused by small numbers.
Data Source: Statistics Canada, Canadian Community Health Survey

Ever-smokers in the highest income quintiles and with the highest levels of education were most likely to have quit smoking sometime within the two years previous to having been surveyed (Figure 33).

Evidence is clear that the excess risk of developing lung cancer in previous smokers decreases as the time since quitting increases. Research has shown that if cessation occurs before middle age, the risk attributed to smoking tobacco is cut by over 90%.[25] Thus, the continued trend of decreased smoking quit rates suggests that smokers, in older age groups especially, are missing opportunities for the significant decrease in morbidity and mortality to be gained by quitting smoking.

Figure 32

Change in percentage of smokers who have quit smoking in the past 2 years
**DIFFERENCE FROM 2003 TO 2008,
BY PROVINCE/TERRITORY—CCHS 2003 AND 2008**

* Suppressed due to statistical unreliability caused by small numbers.
Data Source: Statistics Canada, Canadian Community Health Survey
E Interpret with caution; coefficient of variation between 16.6 and 33.3%
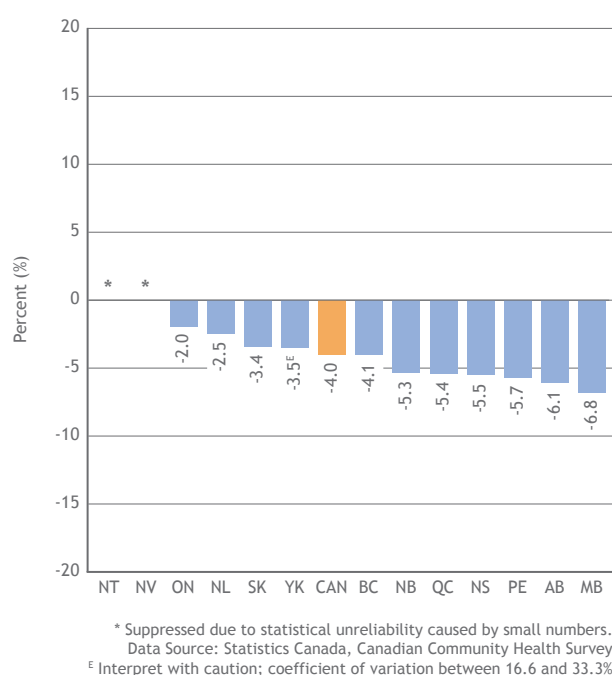
Figure 33

Percentage of smokers who have quit smoking in the past 2 years
**BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY,
CANADA—CCHS 2008**
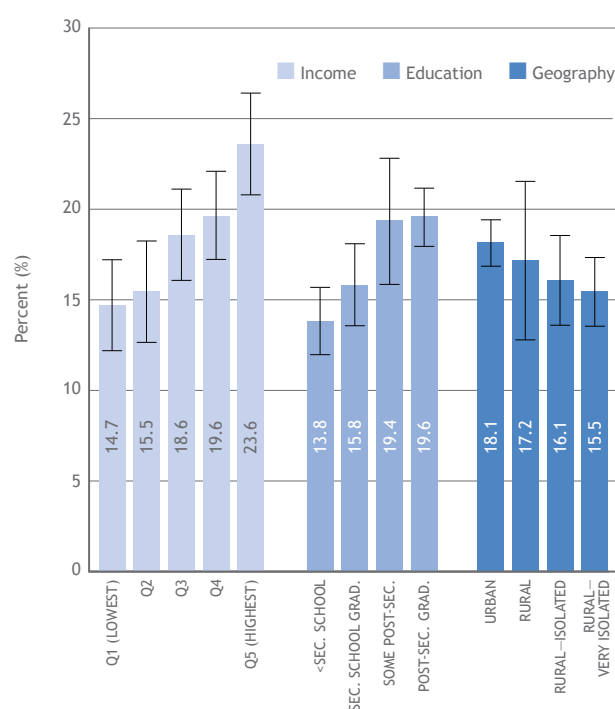
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

Overweight and Obesity

In addition to increasing the risk of ill health and potentially reducing life expectancy, overweight and obesity have also been found to raise the risk for a number of cancers.[22] In this *2010 Report*, data from the 2008 Canadian Community Health Survey (CCHS) were used to update last year's analysis of overweight and obesity rates across Canada for the population aged 18 years and over.

Survey respondents self-reported personal weight and height data, which were subsequently used in the calculation of Body Mass Index (BMI). Respondents were considered overweight if their BMI exceeded 25 kg/m^2 and obese if their BMI was greater than 30 kg/m^2.

According to 2008 CCHS survey results, 51% of Canadians surveyed reported being overweight or obese (Figure 34). Similar to 2007 CCHS results, British Columbia evidenced the lowest rates of overweight and obesity and Atlantic Canada the highest rates. Adults aged 50 to 64 years were most likely to report being overweight or obese, followed by those 65 years and older (data not shown).

Overweight and obesity rates in Canada have been consistently creeping upward over time,[26,27] as evidenced in the difference in rates between the 2003 and 2008 CCHS cycles. Combined overweight and obesity rates increased for ten of thirteen jurisdictions, with the greatest increases taking place in Nunavut. Overweight and obesity rates remained steady in Manitoba, Prince Edward Island and Quebec over the timeframe measured and decreased slightly in Yukon (1.0%). In Canada, overall, the increase in adults classified as overweight/obese was 2% (Figure 35).

Those in higher income quintiles were more likely to report being overweight or obese (Figure 36). However, trends for men were quite different than for women. Overweight and obesity rates in males increased with increasing income but women experienced the opposite pattern where overweight and obesity rates were highest in the lowest income quintile and, for the most part, decreased with increasing income (Figure 37).

Figure 34

Percentage of adults classified as overweight or obese
BY PROVINCE/TERRITORY—CCHS 2008

Data Source: Statistics Canada, Canadian Community Health Survey
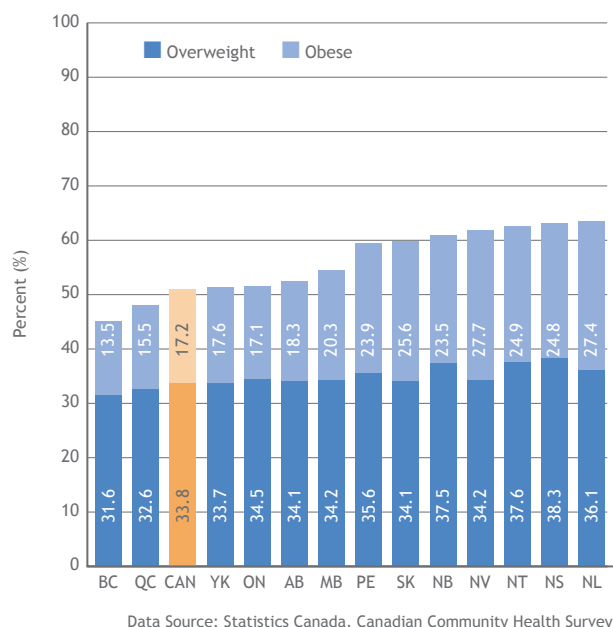
Figure 35

Change in percentage of adults classified as overweight or obese
DIFFERENCE FROM 2003 TO 2008, BY PROVINCE/TERRITORY—CCHS 2003 AND 2008

Data Source: Statistics Canada, Canadian Community Health Survey
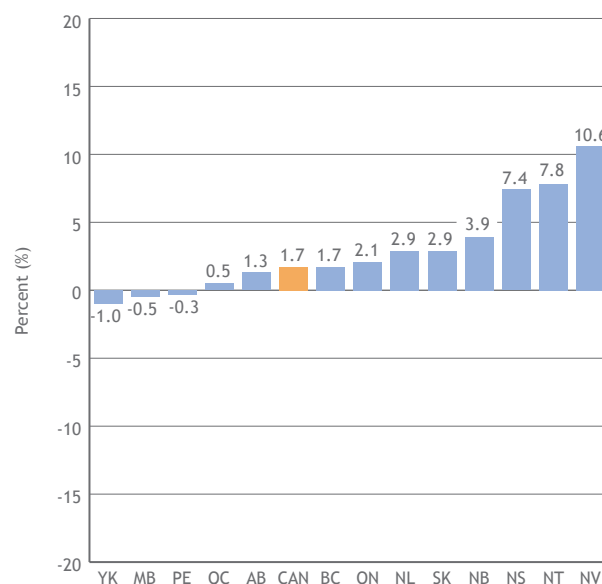
Figure 36

Percentage of adults classified as overweight or obese
BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY, CANADA—CCHS 2008
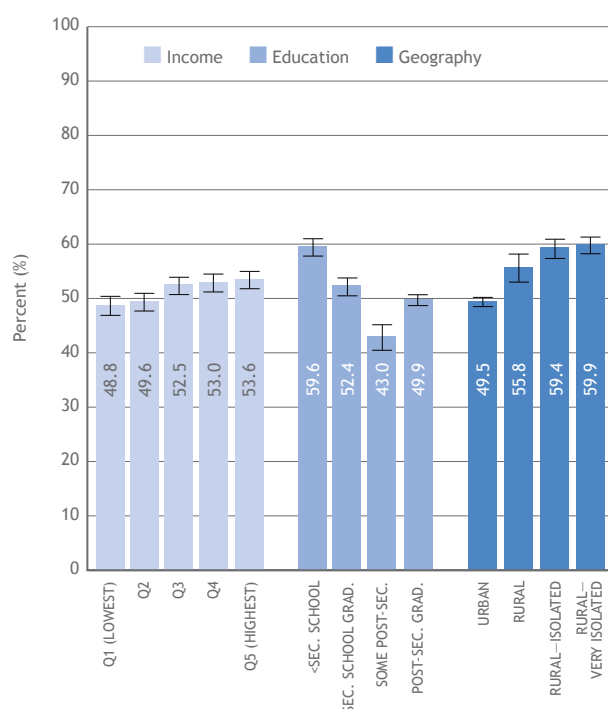
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

Figure 37

Percentage of adults classified as overweight or obese
BY INCOME QUINTILE AND SEX, CANADA—CCHS 2008
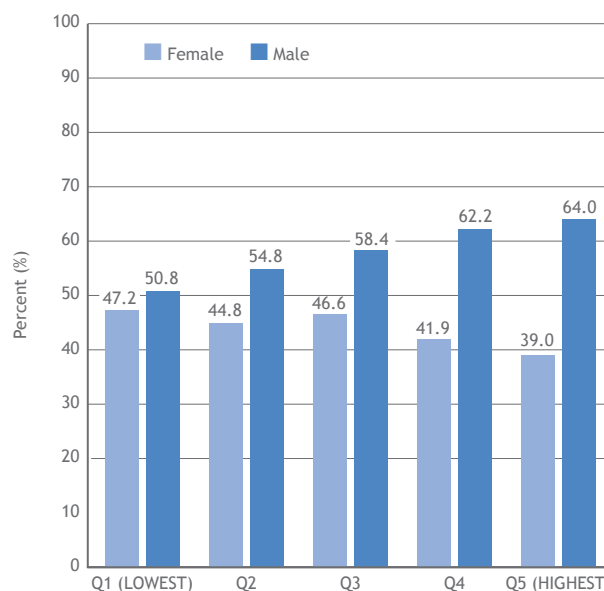
Data Source: Statistics Canada, Canadian Community Health Survey

Individuals with less than a secondary school education were also more likely to report being overweight or obese (Figure 36). Males across all levels of education reported higher levels of overweight or obesity (Figure 38).

Finally, respondents living in urban areas were less likely to report being overweight or obese compared to their rural counterparts (Figure 36). In contrast with the socio-economic trend observed for overweight or obesity combined, which was most prevalent in the highest income quintile, the proportion of adults classified as obese was highest in the lowest income quintile (Figure 39). On the other hand, the association between education and obesity was clear, with the highest proportion of adults classified as obese falling into the lowest education group and with rates generally decreasing as education levels increased. Similar to the trend observed for overweight or obesity, the proportion of adults classified as obese increased as the proximity to urban centres decreased, ranging from 16% in urban locations to 24% in "rural-very isolated" locations. Males with some secondary school education and residing in urban or rural locations reported somewhat higher levels of obesity than females, although differences were not as pronounced as in the combined overweight and obesity category (data not shown).

Figure 38

Percentage of adults classified as overweight or obese
BY EDUCATION AND SEX, CANADA—CCHS 2008

Female ■ Male

	<SEC. SCHOOL	SOME POST-SEC.	SEC. SCHOOL GRAD.	POST-SEC. GRAD.
Female	57.3	36.0	46.5	40.6
Male	61.8	50.1	58.5	59.0

Data Source: Statistics Canada, Canadian Community Health Survey
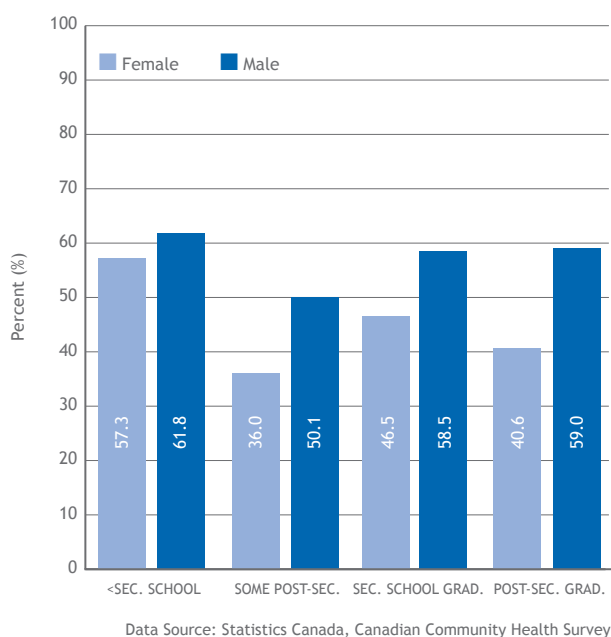
Figure 39

Percentage of adults classified as obese
BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY, CANADA—CCHS 2008

■ Income ■ Education ■ Geography

Q1 (LOWEST)	Q2	Q3	Q4	Q5 (HIGHEST)	<SEC. SCHOOL	SEC. SCHOOL GRAD.	SOME POST-SEC.	POST-SEC. GRAD.	URBAN	RURAL	RURAL—ISOLATED	RURAL—VERY ISOLATED
19.1	16.8	17.7	17.7	15.8	23.2	17.6	15.1	16.0	16.2	20.6	21.8	23.8

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey
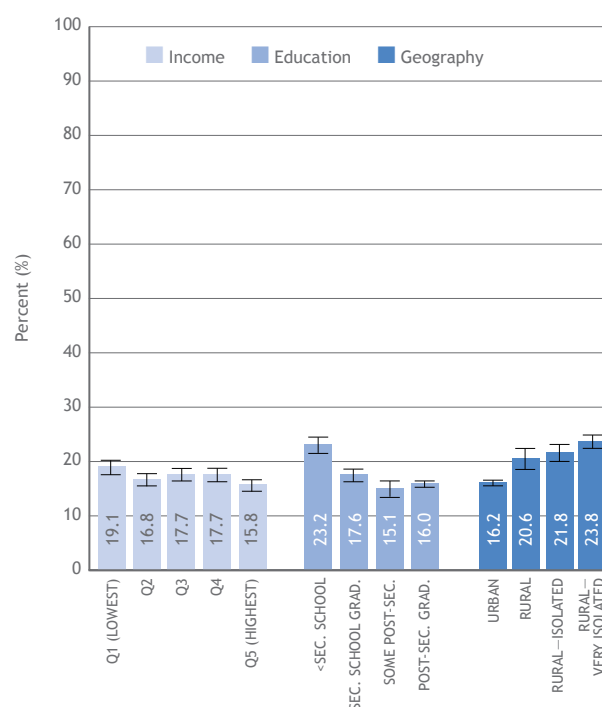
Alcohol Consumption

While research suggests there may be potential benefits of alcohol consumption for coronary heart disease, there is evidence that alcohol consumption may be a risk factor in the development of cancer.[22] Recognizing these factors, the WCRF established a low-risk drinking guideline of no more than 2 drinks per day for males and no more than 1 drink per day for females[22]. The alcohol consumption indicator is based on this guideline.

The 2008 cycle of the CCHS survey included questions on alcohol consumption as optional content, with four provinces participating. The most recent pan-Canadian data for alcohol consumption remains the 2005 cycle of the CCHS survey, which was presented in the *2009 System Performance Report*. In 2005, an overall average of 9% of Canadians surveyed reported exceeding low-risk drinking guidelines, with a range of 7% in Prince Edward Island to 13% in Yukon (Figure 40).

Between 2000-01 and 2005, the percentage of adults exceeding the low-risk drinking guidelines steadily increased for every age group (Figure 41). Men aged 18-34 years were most likely to have exceeded the guidelines (data not shown).

Figure 40

Percentage of adults exceeding low-risk drinking guidelines
BY PROVINCE/TERRITORY—CCHS 2005
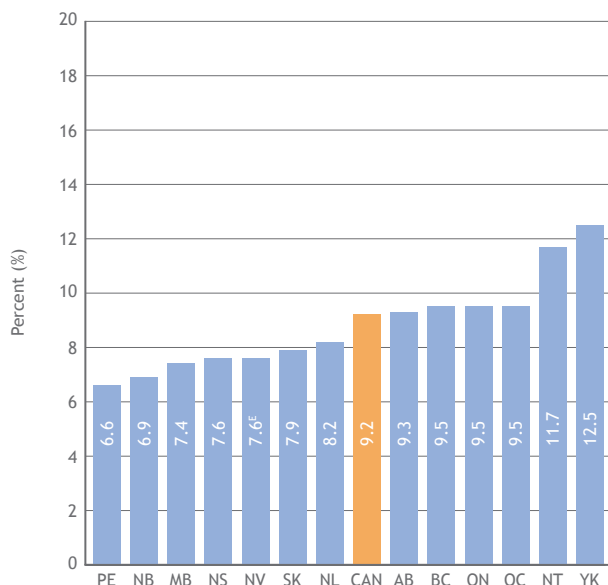
Percent (%)

PE	NB	MB	NS	NV	SK	NL	CAN	AB	BC	ON	QC	NT	YK
6.6	6.9	7.4	7.6	7.6 E	7.9	8.2	9.2	9.3	9.5	9.5	9.5	11.7	12.5

Data Source: Statistics Canada, Canadian Community Health Survey
E Interpret with caution; coefficient of variation between 16.6 and 33.3%

Figure 41

Percentage of adults exceeding low-risk drinking guidelines
TIME TRENDS BY AGE GROUP, CANADA—CCHS 2000-01 TO 2005

Percent (%)

Legend: 2000-01, 2003, 2005

Age Group	2000-01	2003	2005
18-34	9.8	10.8	12.8
35-49	7.7	7.8	8.7
50-64	6.8	7.6	8.3
65+	4.1	4.4	5.1

Age Group
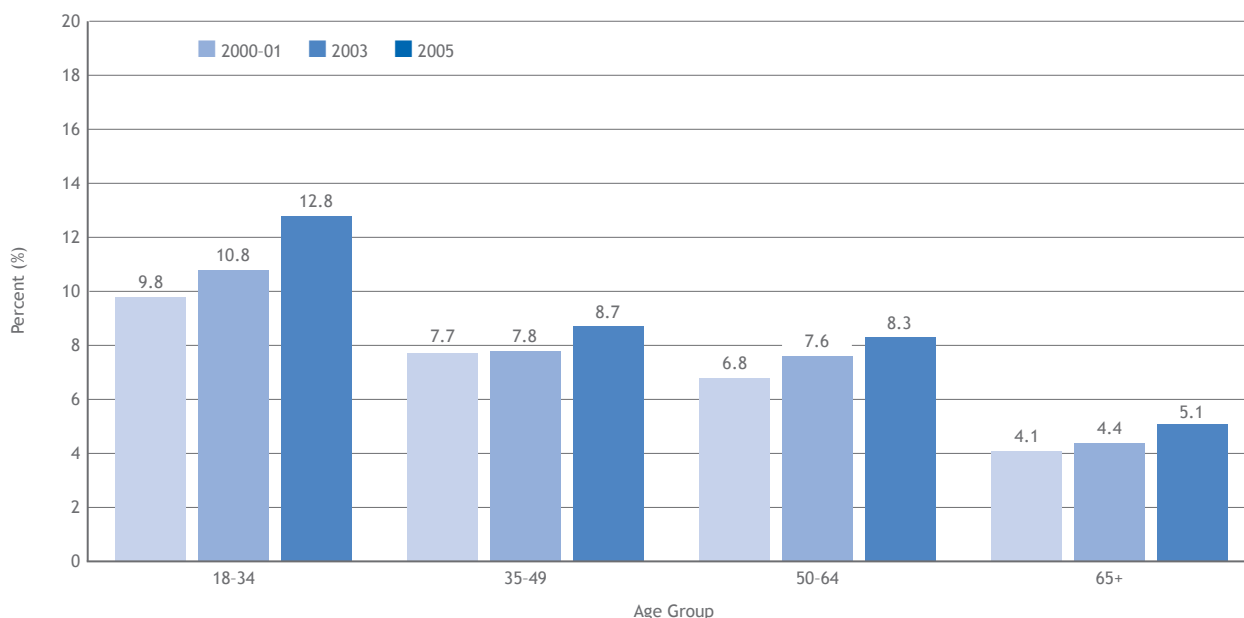
Data Source: Statistics Canada, Canadian Community Health Survey

A clear relationship existed between exceeding low-risk drinking guidelines and socio-economic status. The proportion of the population exceeding guidelines increased sharply as income increased (Figure 42). Secondary school graduates and those with some post-secondary education were most likely to exceed the low-risk drinking guidelines, while those with less than a secondary school education were least likely to do so. The proportion of the population who exceeded guidelines and who lived in urban, "rural-isolated" and "rural-very isolated" areas was similar, with rural areas being only slightly higher.

Figure 42

Percentage of adults exceeding low-risk drinking guidelines
BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY, CANADA—2005
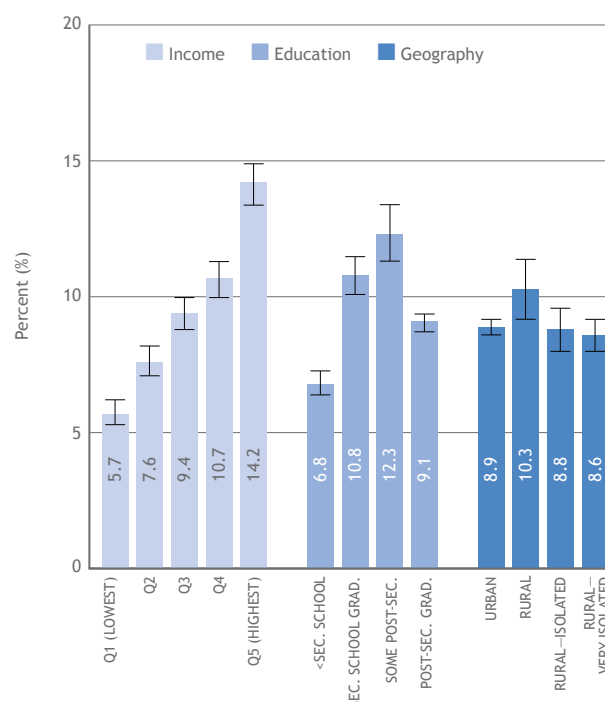
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

Physical Activity

Evidence of the protective effect of physical activity against the development of several different types of cancers has grown over the past two decades.[22] The *2007 Report* of the WCRF concluded that physical activity was protective against colon cancer and potentially protective against cancers of the breast (post-menopausal) and endometrium. Research is not yet conclusive on protection afforded from physical activity against cancers of the lung, pancreas and breast (pre-menopausal). Physical activity protects against overweight and obesity, factors that are additionally responsible for increased risk of cancer.

In order to measure the physical activity levels of Canadians, data on a range of physical activities and durations for each activity were collected as part of the suite of CCHS surveys. Activities during leisure (e.g., gardening, walking, playing soccer, skiing), transportation (e.g., walking, cycling) and occupation-based and household-related activities (e.g., sitting, walking, lifting light loads, climbing and heavy work) were captured. The average amount of energy expended daily was calculated by combining the three areas of activity and then categorizing them as inactive, moderately active and active based on tertiles of the observed data.[28] Questions used to assess types of activities varied over the CCHS cycles and work-related activities were not captured in the 2007/2008 CCHS survey; data in this *Report*, therefore, are restricted to the CCHS 2005 cycle (see the Technical Appendix for further details).

According to results from the 2005 CCHS survey, the percentage of individuals aged 15 to 75 years who reported being substantially active varied across the country, from 16% in Nunavut to 28% in Saskatchewan. Overall, only one-fifth, or 21% of Canadians surveyed, reported levels of leisure, transportation and occupation that would classify them as being 'active' (Figure 43).

Figure 43

Percentage of population (15-75) who report being active; leisure, transportation and occupation combined
BY PROVINCE/TERRITORY—CCHS 2005

Percent (%)

SK	27.9
NT	27.1
PE	26.1
YK	25.1
AB	24.9
NS	24.6
MB	23.3
BC	22.3
NB	21.6
CAN	20.8
NL	20.0
ON	19.9
QC	18.1
NV	16.3

Data Source: Statistics Canada, Canadian Community Health Survey

A smaller proportion of women (12%) reported being active, compared with 29% of men (Figure 44). Approximately 65% of women surveyed were classified as 'inactive', compared to 46% of men. Adults in the lowest income and education levels were least likely to report being active (Figure 45). Adults residing in urban locations were less likely to be physically active than their rural counterparts.

A temporal analysis of physical activity levels incorporating leisure, transportation and occupational activities is not available. However, a temporal analysis of leisure-based physical activity levels between 2000-01 and 2008 indicates very little change in population physical activity levels over time (data not shown).

Research has shown that cancer risk can be modified by lifestyle changes. Progress has been made in reducing smoking rates, but a deceleration in smoking quit rates has also been observed. In addition, physical activity rates have not increased over the past decade. Overweight and obesity continue to slowly creep upward. Based on data presented in the *2009 Report*, the likelihood of exceeding the low-risk drinking guidelines has also increased over time.

Figure 44

Percentage of population (15-75) according to reported physical activity level; leisure, transportation and occupation combined
BY SEX, CANADA—CCHS 2005

Percent (%)

■ Female ■ Male

	Female	Male
INACTIVE	65.4	45.5
MODERATELY ACTIVE	22.2	25.1
ACTIVE	12.4	29.4

Data Source: Statistics Canada, Canadian Community Health Survey
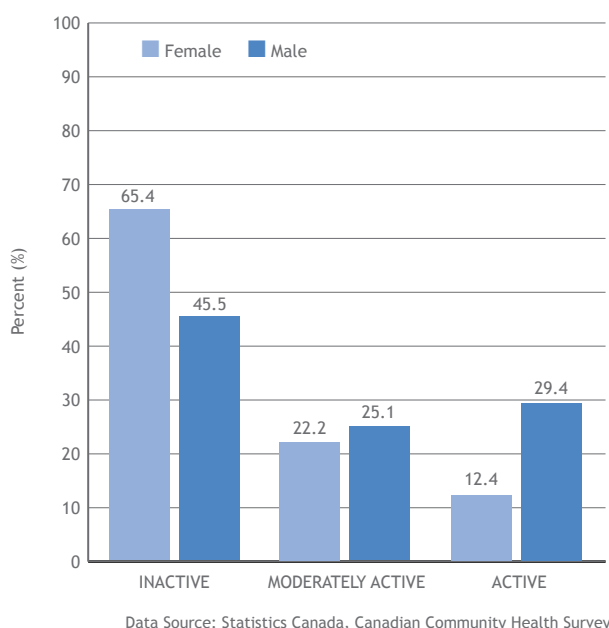
Figure 45

Percentage of population (15-75) who report being active; leisure, transportation and occupation combined
BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY, CANADA—CCHS 2005

Percent (%)

■ Income ■ Education ■ Geography

Q1 (LOWEST)	14.6
Q2	22.2
Q3	24.2
Q4	23.5
Q5 (HIGHEST)	21.5
<SEC. SCHOOL	16.6
SEC. SCHOOL GRAD.	25.8
SOME POST-SEC.	21.1
POST-SEC. GRAD.	20.7
URBAN	19.5
RURAL	26.7
RURAL-ISOLATED	25.1
RURAL—VERY ISOLATED	27.6

Note: 95% confidence intervals are indicated on figure.
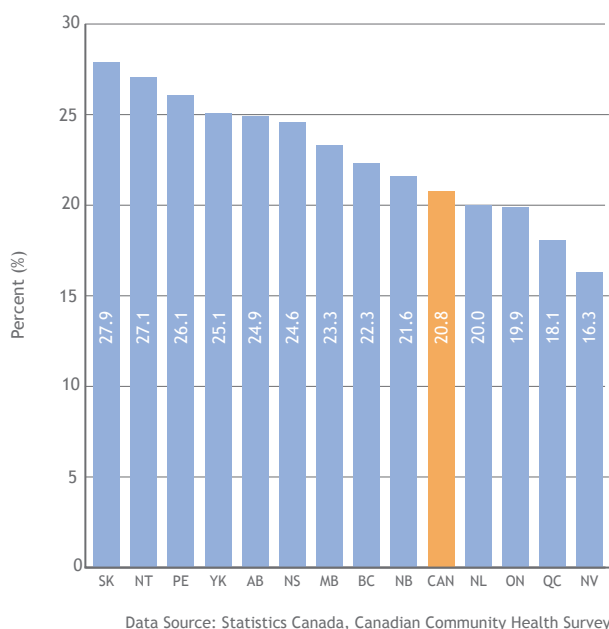Data Source: Statistics Canada, Canadian Community Health Survey
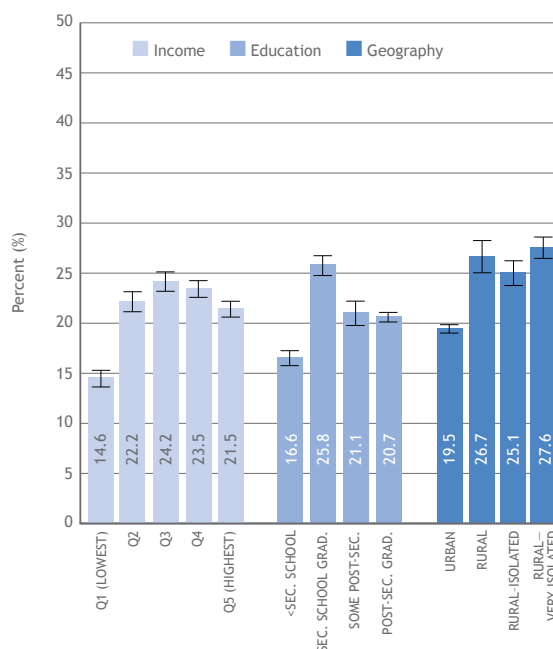
3.2 Screening

Regular screening to detect breast, cervical and colorectal cancer has been identified as an effective strategy for reduction of mortality from these diseases. For these gains to be realized, high-quality screening needs to be accessed by a large proportion of the target populations for each screening modality.

This section of the *Report* presents indicators on **Self-Reported Mammography for Breast Cancer Screening and Self-Reported Papanicolau (Pap) Test Screening for Cervical Cancer**. New to the *Report* is a deeper stratification of place of residence that describes screening rates for women living in urban areas and in rural locations of increasing isolation. Screening for colorectal cancer was reviewed earlier in the Colorectal Cancer Focus Section (page 9).

Self-Reported Mammography for Breast Cancer Screening

Breast cancer is the most common form of cancer for Canadian women (with the exception of non-melanoma skin cancer), with a lifetime probability of acquiring the disease predicted as 1 in 9.[29] Early breast cancer detection through mammography, coupled with effective adjuvant therapies following surgery, has likely contributed to the decrease in breast cancer mortality rates observed since the mid-1980s.[1]

Organized breast cancer screening programs began in British Columbia in 1988 and have since been implemented in all provinces, as well as Yukon and the Northwest Territories.[30] Currently, provincial/territorial organized screening programs recommend biennial screening for women aged 50 to 69 with no previous history of breast cancer, as this is the age group that most evidence-based guidelines groups recognize as benefiting from screening mammography. For more information on participation rates in organized provincial/territorial breast cancer screening programs during for 2007/2008, please refer to the Technical Appendix (Figure A, page 101).

Data for this indicator were drawn from the CCHS and refer to the percentage of asymptomatic women between the ages of 50 and 69 who report having received a screening mammogram within the previous two years. Although information on mammography rates is also available from the Canadian Breast Cancer Screening Database (CBCSD), it is limited to organized screening programs and may not capture a significant proportion of total breast screening activity in each province.

Self-reported data on mammography screening rates remained reasonably stable between the 2000-01 and 2008 CCHS cycles. In 2008, the percentage of women aged 50–69 reporting a screening mammogram within the previous two years ranged from 58% in Prince Edward Island to 75% in New Brunswick (Figure 46). The overall Canadian average was 72%. Women in higher income quintiles and with higher education levels were more likely to report having been screened relative to women in the lowest income and education strata (Figure 47). Reported screening rates were similar for women residing in urban, rural and isolated locations. Women between 60 and 64 years of age were most likely to report having been screened (76%) followed by women 55 to 59 years (75%) (data not shown). Younger women between the ages of 50 and 54 years were least likely to report participating in mammography screening (67%).

Figure 46

Percentage of women (50-69) reporting
a screening mammogram in the past 2 years
BY PROVINCE/TERRITORY—CCHS 2008

Note: * Suppressed due to statistical unreliability caused by small numbers.
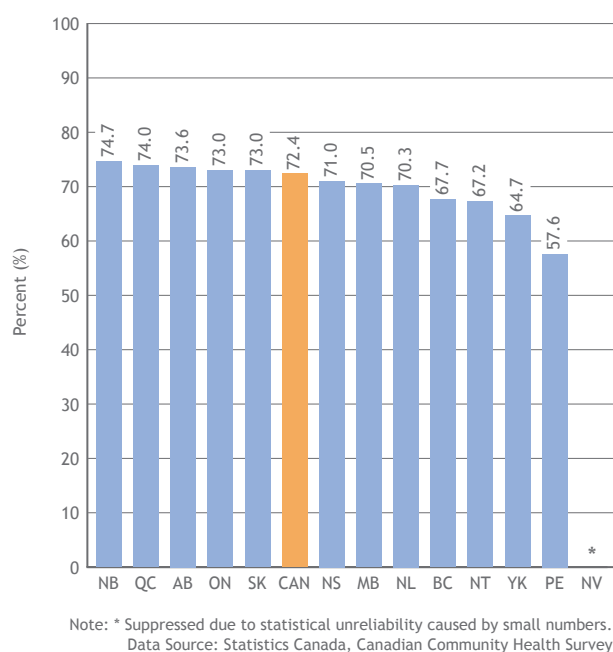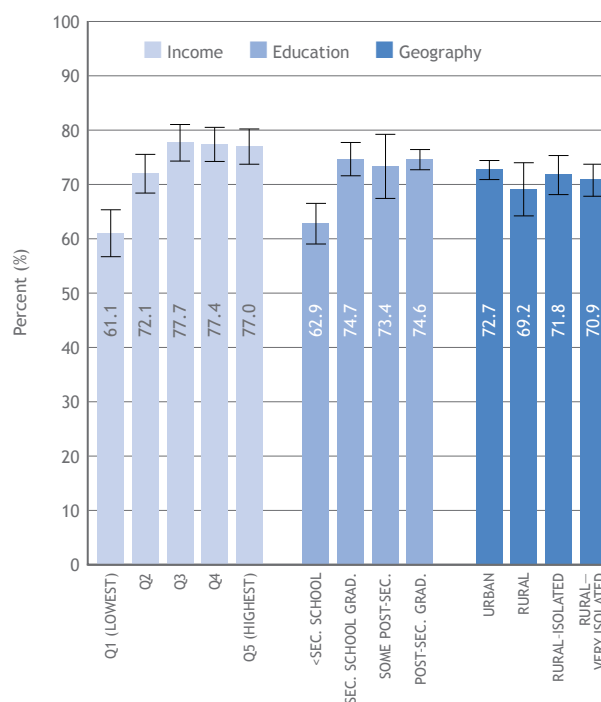Data Source: Statistics Canada, Canadian Community Health Survey

Figure 47

Percentage of women (50-69) reporting a
screening mammogram in the past 2 years
**BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY,
CANADA—CCHS 2008**

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

Self-Reported Papanicolau (Pap) Test for Cervical Cancer Screening

Cervical cancer incidence and mortality have decreased markedly since the introduction of the Papanicoloau (Pap) test in 1949.[1] Despite these gains, it is estimated that in 2010 as many as 1300 Canadian women will be diagnosed with cervical cancer and 370 women will die of the disease.[1] Research has indicated that more appropriate screening and follow-up could prevent many of these deaths.[31,32] Studies are also ongoing to evaluate the potential of HPV tests as an adjunct to Pap testing and the impact of HPV vaccination on cervical cancer control.[33] Future reports will present data pertaining to HPV immunization rates across the country.

To date, most provinces and territories have comprehensive cervical cancer screening programs in place. In 1989, the National Workshop on Screening for Cancer of the Cervix[34] recommended that initially, women who were sexually active should undergo two Pap tests, a year apart. If the test results were found to be satisfactory, the Workshop recommended Pap smears once every three years until age 69 for women in those regions with well-established organized screening systems. Alberta released revised cervical cancer guidelines in October 2009, eliminating the need for routine Pap smears before age 21 and recommending Pap tests every three years instead of annually up to age 70, after an initial period of three negative Pap tests at least 12 months apart within a five year period.[35] Guidelines in other provinces are also moving in a similar direction.

Data for this indicator were drawn from the CCHS and measure the percentage of women aged 18 to 69 years who report having received a Pap smear in the previous three years. The overall results have been age-standardized to account for differences in screening rates across the various age groups.

In 2008, the percentage of women aged 18–69 (who had not undergone a hysterectomy) who reported having had a Pap test in the previous three years ranged from 74% in Nunavut to 88% in the Northwest Territories (Figure 48). The overall Canadian average was 79%, compared to 75% in 2000-01.

Socio-economic trends for cervical cancer screening were similar to those of breast cancer screening. The likelihood of having being screened increased steadily with increasing income and education levels (Figure 49). Women in the lowest income quintile reported screening rates of 71% compared to 87% for women in the highest income quintile. Similarly, women with less than a secondary school education reported screening rates of 64% while post-secondary graduates reported screening rates of 83%. Geographical place of residence had little effect on cervical screening as shown by the similarity in Pap testing rates among women residing in urban, rural and isolated locations (Figure 49).

Younger women between 18 and 29 years of age and older women between 60 and 69 years reported lower Pap test rates than women in the middle age ranges during each of the four CCHS cycles (2000-01, 2003, 2005, 2008). For example, in 2008, women aged 18–29 and 60–69 reported screening rates of 73% and 71% respectively, whereas women aged 30–39, 40-49 and 50–59 reported screening rates of 84%, 83% and 77%, respectively (data not shown). Emerging guidelines, however, are no longer advocating population screening before age 21 and, in addition, are recommending discontinuing screening in older age groups after a long history of normal Pap smear results. Future iterations of this *Report* will monitor the release of updated recommendations with regards to frequency and age and will group results to reflect emerging guidelines.

Figure 48

Age-standardized percentage of women (18-69)
reporting a Pap smear in the past 3 years
BY PROVINCE/TERRITORY—CCHS 2008
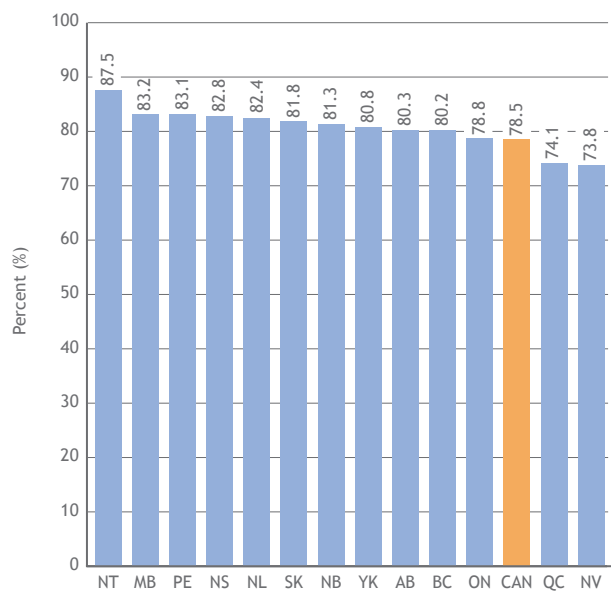
Data Source: Statistics Canada, Canadian Community Health Survey

Figure 49

Percentage of women (18-69) reporting a Pap smear
in the past 3 years
**BY INCOME QUINTILE, EDUCATION AND GEOGRAPHY,
CANADA—CCHS 2008**
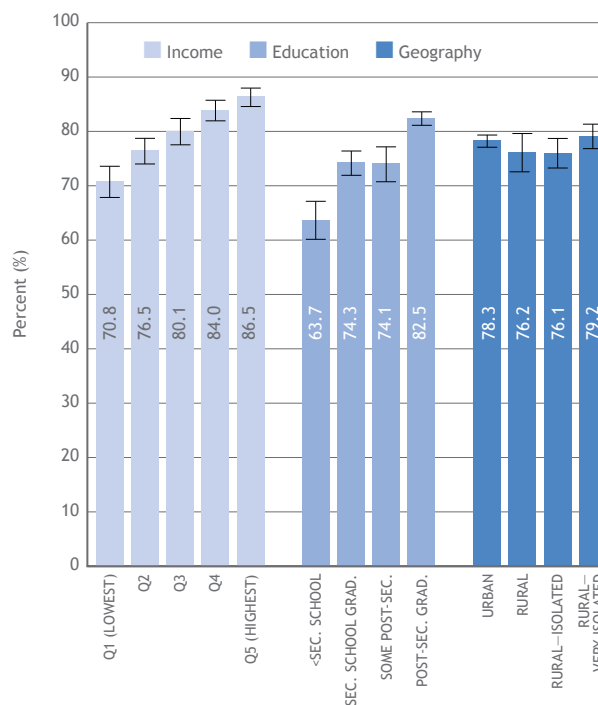
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Community Health Survey

Cervical cancer screening rates in Canada are in line with those of other international jurisdictions. In 2008, 79% of eligible Canadian women reported receiving a Pap test in the previous three years. For the years 2005 to 2007, 74% of Australian women aged 20-69 had received a Pap test in the previous three years.[36] In 2009, 80% of eligible British women aged 25-64 had received a Pap test in the previous five years.[37]

3.3 Diagnosis, Research &Treatment— Radiation Therapy Focus Section

This chapter of the *2010 System Performance Report* presents a review of several indicators in the Diagnosis and Treatment domains, with a special focus section on Radiation Therapy.

Cancer diagnosis marks the entry point into the treatment phase for cancer patients. As such, any measures that improve the diagnostic process will contribute to more timely treatment and less anxiety during the course of a patient's experience with the disease. For this reason, this chapter begins with an exploration of select markers of the diagnostic process including: **Capture of Stage Data** as a key diagnostic input to calculate other important indicators, **PET Scanner Capacity** as a measure of system capacity and use, and **Wait Times for Abnormal Breast Screen to Resolution** as a measure of timely access to services. In the future, the scope of cancer diagnosis performance measurement will be expanded as more data become available in that domain.

This chapter also presents indicators on **Adult** and **Pediatric Clinical Trials Participation**. These two indicators reflect participation rates in cancer research trials, which play a pivotal role in the development of best practice guidelines and more efficacious treatments for cancer patients.

Cancer treatment accounts for the majority of resources in the cancer control system, including researching and developing new treatment modalities as well as delivering services such as surgery, systemic therapy and radiation therapy. The *2010 Report* includes a number of indicators of cancer treatment, several of which are presented in "Colorectal Cancer —A Lens on the Continuum of Care", with the remainder being presented here. The Radiation Therapy Focus Section in this chapter presents key performance indicators including: **LINAC Capacity and Use, Wait Times (Ready to Treat to Treatment), Radiation Therapy Utilization** and Guideline Concordance for **Adjuvant Radiation Treatment Following Breast-Conserving Surgery for Stage I and II Breast Cancer**. Taken together, these indicators help to identify interprovincial variations that pertain to radiation therapy.

Diagnosis

Capture of Stage Data

Cancer staging involves determining the severity or extent of disease by characterizing tumour size, degree of invasion in the primary tumour site, and the degree to which cancer has metastasized beyond its primary site to lymph nodes and other organs or body sites at time of diagnosis. Physicians rely on stage information for determining the most appropriate treatments, for predicting the prognosis or outcome of disease, and for planning patient follow-up care. At the system level, population-based stage data allow for the calculation of a broad range of indicators that support system planning and performance measurement. For example, comprehensive stage data enable a deeper understanding of mortality and survival variations across centres, regions, and provinces and allow for reliable assessment and comparison of treatment patterns across the country. In addition, stage data are also useful for evaluating the impact of screening programs on decreasing the proportion of patients diagnosed late in the progression of disease. There are additional applications of stage data for research, funding and service planning.

Ongoing efforts are underway in Canada to improve the quality of capture of stage data in provincial cancer registries. One such effort is the Partnership's Staging Initiative, a pan-Canadian approach to cancer staging and standardization of stage data collection. Toward that end, the Staging Initiative is creating common linkages across Canada and supporting provinces and territories to implement population-based, electronic, collaborative stage data collection for the four major cancer sites: breast, colorectal, prostate and lung cancer. The goal of the Staging Initiative is to capture stage data for 90% of patients diagnosed in 2010 and beyond for those four cancer sites. To date, staging projects have been initiated in most provinces and territories.
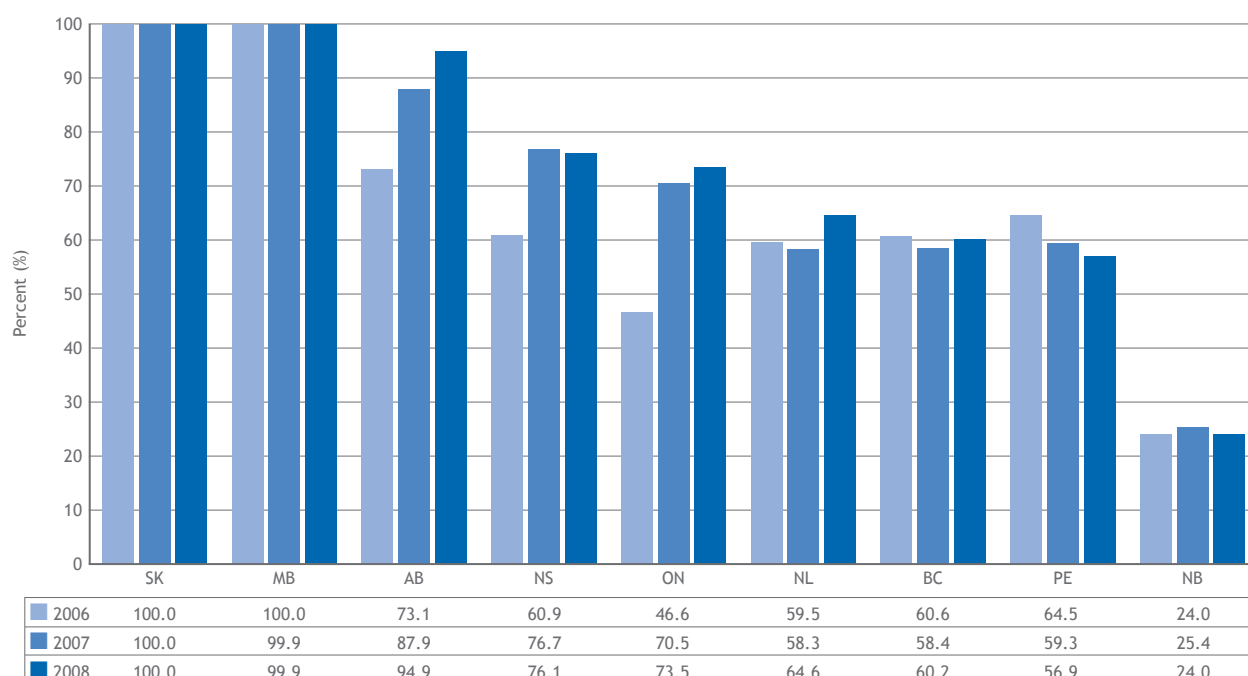
The indicator for capture of stage data provides a measure of the availability of valid stage at diagnosis data across Canada. The indicator is defined as the percent of new incident cancer cases with valid stage reported overall and for the top four cancer sites (breast, colorectal, prostate, and lung). This indicator includes stage data collected using the American Joint Committee on Cancer/International Union Against Cancer (AJCC/UICC) TNM Staging System and/or Collaborative Stage. Data were provided to the Partnership directly from provincial cancer agencies or their equivalents.

Nine provinces submitted data on the percent of incident cases with valid stage data reported for all invasive cancers and for the top four cancer sites for the diagnosis years 2006 to 2008. Quebec does not currently collect stage data centrally. Stage data collection is performed in local registries which will in the future source central stage data collection in the upcoming *Registre québécois du cancer*. Local registries presently capture 48% to 51% of cancer cases in Quebec. In 2007, the diagnosis year for which the guideline concordance indicators in this *Report* were calculated, the percent of incident cases for which stage data were captured for all invasive cancers ranged from 25% to 100% (Figure 50). The percent of incident cases for which stage data were captured for the top four cancer sites ranged from 41% to 100%, with six of nine provinces reporting a rate of over 80% (Figure 51). For all three diagnosis years, Alberta, Manitoba, Prince Edward Island and Saskatchewan reported 100% capture of stage data for incident cases for the top four cancer sites. In Quebec, as of March 2010, it is estimated that stage data capture in local registries for the top four cancer sites ranges between 22% (prostate) and 53% (breast).

Note that some provinces (e.g., British Columbia) with capture of stage data rates below 100% for the top four cancer sites capture stage only for cases referred to cancer centres. Others (e.g., Ontario) are beginning to collect stage data from cancer centres and community hospitals but have not yet reached 90% capture. The provinces without 100% stage data capture for "all cancers" or for the four major disease sites have plans to update their 2006 to 2008 stage data, which will likely result in higher stage data rates for future calculations.

Figure 50

Percentage of incident cases for which stage data is collected by provincial cancer agencies—all invasive cancers
TIME TRENDS BY PROVINCE—2006 TO 2008 DIAGNOSIS

	SK	MB	AB	NS	ON	NL	BC	PE	NB
2006	100.0	100.0	73.1	60.9	46.6	59.5	60.6	64.5	24.0
2007	100.0	99.9	87.9	76.7	70.5	58.3	58.4	59.3	25.4
2008	100.0	99.9	94.9	76.1	73.5	64.6	60.2	56.9	24.0

Data Source: Provincial cancer agencies

Figure 51

Percentage of incident cases for which stage data is collected by provincial cancer agencies—
top 4 cancer sites (breast, colorectal, prostate and lung)

TIME TRENDS BY PROVINCE—2006 TO 2008 DIAGNOSIS

	AB	MB	PE	SK	ON	NS	NL	BC	NB
2006	100.0	100.0	100.0	100.0	52.6	95.2	69.7	68.2	41.6
2007	100.0	100.0	100.0	100.0	84.0	93.0	69.6	64.7	40.5
2008	100.0	100.0	100.0	100.0	88.3	83.3	73.9	67.2	40.1
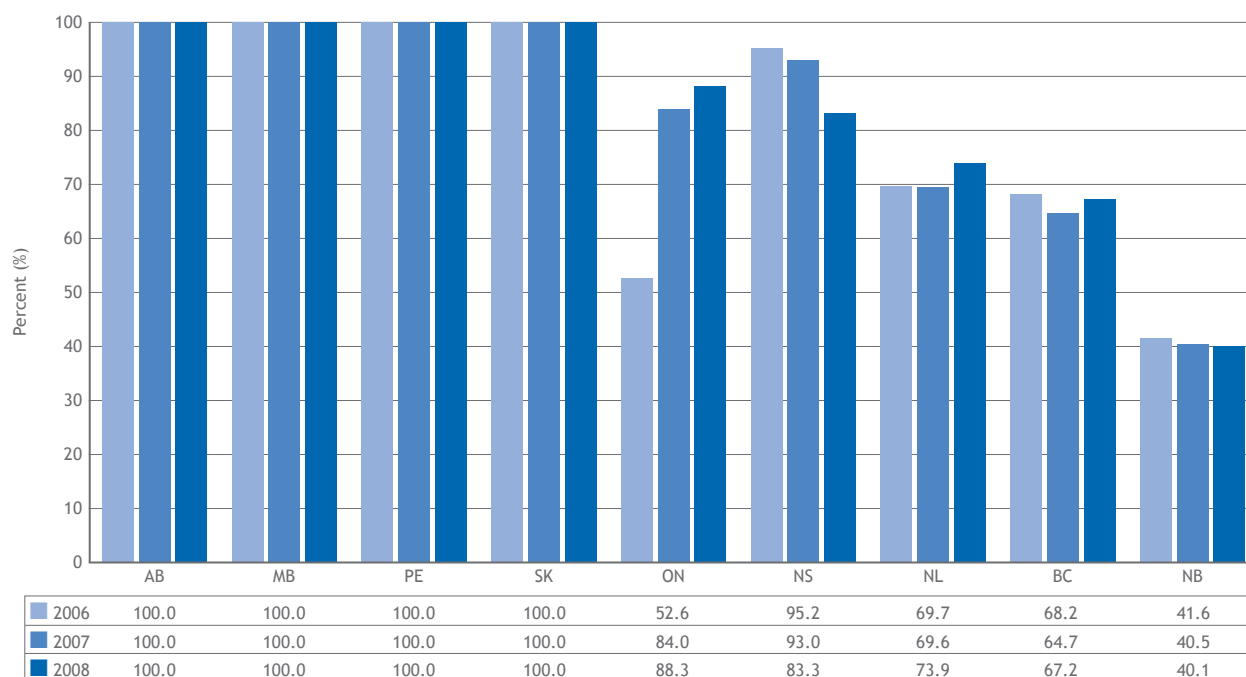
Data Source: Provincial cancer agencies

PET Scanner Capacity and Utilization

Positron emission tomography (PET) is a diagnostic imaging modality based on nuclear medicine technology that provides multi-dimensional scans detailing the location and extent of metabolic activity of abnormal tissue. Although the benefits of PET scanning, in terms of cancer diagnosis and treatment, are still being evaluated through evidence-based clinical trials,[38] the number of PET scanners per capita continues to be used as a common measure of cancer system capacity (as described in reports from the Organisation for Economic Co-operation and Development [OECD]).

This indicator assesses PET scanner availability by province through measuring the number of machines per million in the population 54 years of age and older[b]. The indicator measures the total number of PET scanners in the province used for cancer diagnosis and treatment but does not take into account operational capacity such as adequacy of health human resources required to operate machines, interpret exams results, and so on. In addition, it is important to note that jurisdictions without PET scanners may send patients to other provinces for PET evaluation, possibly biasing the numbers of exams per PET scanner attributed to each province. Data reflecting such interprovincial services were not available for this *Report*.

The number of PET scanners available for cancer care capacity was reported to the Partnership by each province at the time of data collection (March 2010). PET scanners used exclusively for research were excluded. At the time of data collection, three provinces (Saskatchewan, Prince Edward Island and Newfoundland and Labrador) reported having no PET scanners and two provinces (Quebec and Nova Scotia) were not able to disaggregate PET scanner data for cancer-related use only. Provinces reporting the number of PET scanner machines per million in the population aged 54 years of age and older, for cancer use only, ranged from one in British Columbia to five in Alberta (Figure 52).

Figure 52

PET scanner capacity: PET machines per million persons*
54 YEARS OF AGE OR OLDER, BY PROVINCE—2009
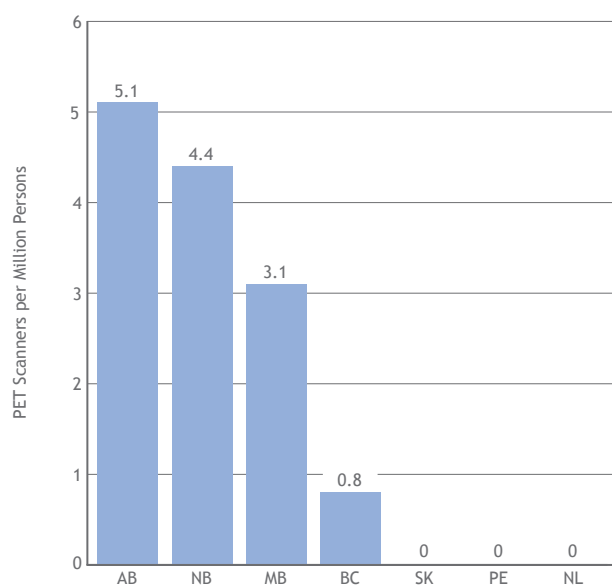
* Cancer use only.
Data Source: Provincial cancer agencies

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[b] 80% of cancer patients are diagnosed at age 54 or older. Using that age cut-off allows for the indicator to be expressed in proportion to the population most affected by cancer.[39]

Figure 53

PET scanner utilization: PET exams per machine*
BY PROVINCE—2009

Y-axis: Exams per PET Scanner

- BC: 3,144
- AVERAGE: 1,321
- AB: 1,103
- MB: 1,072
- NB: 619

* Cancer use only.
Data Source: Provincial cancer agencies

Figure 54

PET scanner utilization: PET exams per million persons*
54 YEARS OF AGE OR OLDER, BY PROVINCE—2009

Y-axis: Number of Exams per Million People

- AB: 5,616
- MB: 3,355
- AVERAGE: 2,763
- NB: 2,721
- BC: 2,510

* Cancer use only.
Data Source: Provincial cancer agencies
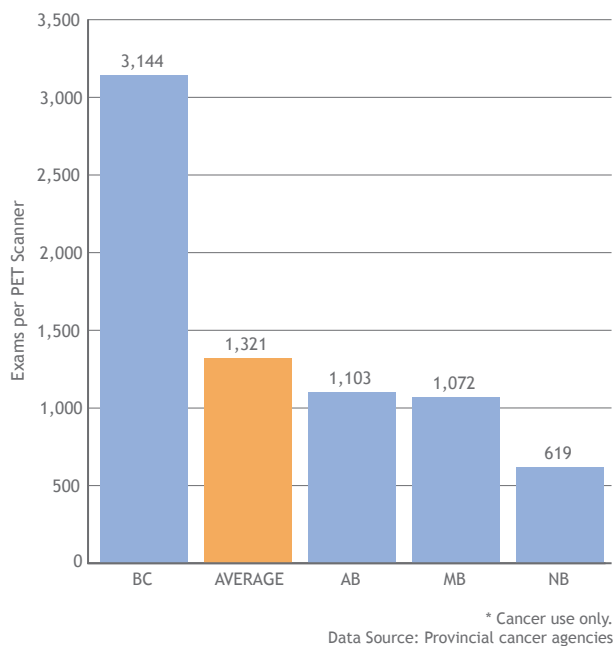
PET scanner utilization is explored by the indicator measuring the total number of cancer exams performed per PET scanner (Figure 53). In 2009, there was considerable variation among the four provinces reporting data; New Brunswick, for example, reported 619 exams per PET scanner and British Columbia reported 3,144 exams (Figure 53). The overall average for the four provinces reporting data for 2009 was 1,321 exams per machine. Future calculations of this indicator may yield more convergence of results across the country as PET scanner use becomes more standardized.

Combining the per million machine availability and utilization rate in one indicator yields number of PET exams per million (Figure 54). The results show that British Columbia, which has the lowest number of PET scanners per million but the highest machine utilization rate, is still delivering fewer exams per million than the other provinces submitting data. This is in contrast with New Brunswick, which has a relatively high machines per million rate but a lower per million exam rate.

Wait Times: Abnormal Breast Screen to Resolution

Timely resolution of an abnormal screen through clinical investigation, and a definitive biopsy if required, facilitates prompt initiation of treatment and potentially improved patient outcomes.

Guidelines identifying target wait times for abnormal breast screen to resolution were established by the Canadian Breast Cancer Screening Initiative[40] and Health Canada's Evaluation Indicators Working Group in 2002.[41] The guidelines apply to asymptomatic women between the ages of 50 and 69 years, with no prior diagnosis of breast cancer.

This indicator measures the wait times between a breast screen (mammogram or clinical breast exam) with a positive result (abnormal screen) and the resolution of a diagnosis. In the *2009 System Performance Report*, data for this indicator were drawn from the Canadian Breast Cancer Screening Database (CBCSD), which included data through 2004. For this year's *Report*, data were gathered directly from provinces in order to reflect more current results. It is important to note that data collected are relevant only for women receiving mammograms or clinical breast exams through organized provincial breast screening programs. Program enrollment rates vary widely across provinces (from 8% in Alberta to 55% in Quebec and New Brunswick in 2007 to 2008) and should be taken into account when interpreting results. For more information on participation rates in organized breast screening programs, please see Figure A in the Technical Appendix.

The provincial median wait times in 2008 for abnormal breast screen to resolution for women aged 50-69 **requiring a tissue biopsy** ranged from 6 to 9 weeks for the eight provinces reporting (data not shown); 90th percentile wait times ranged from 13 to 26 weeks (Figure 55). The percentage of cases resolved within the target timeframe of 7 weeks ranged from 41% in Newfoundland and Labrador to 63% in Manitoba (Figure 56).

Figure 55

Wait times for abnormal breast screen
to resolution—90th percentile
WOMEN (50-69) REQUIRING A TISSUE BIOPSY—2008
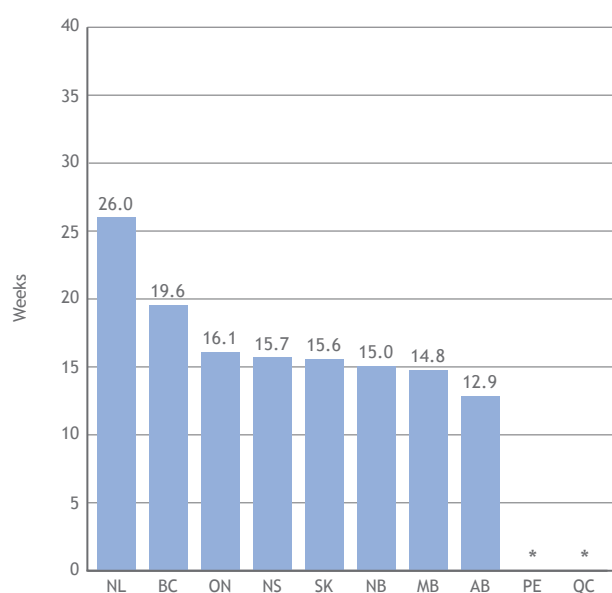
* Data not available
PE data unavailable due to insufficient system resources
to report results for the specified timeframe.
Alberta data reported are from the Screen Test program only.
Screen Test is an organized program that conducts approximately
10%-12% of screening mammograms in the province, about 65%
of which are performed in mobile screening units.
Data Source: Provincial breast cancer screening databases

Figure 56

Percentage with abnormal breast screen
and resolution within 7 weeks (target)
WOMEN (50-69) REQUIRING A TISSUE BIOPSY—2008

* Data not available
PE data unavailable due to insufficient system resources
to report results for the specified timeframe.
Alberta data reported are from the Screen Test program only.
Screen Test is an organized program that conducts approximately
10%-12% of screening mammograms in the province, about 65%
of which are performed in mobile screening units.
Data Source: Provincial breast cancer screening databases

Data reflecting time trends for the percentage of women with abnormal breast screen and resolution within the 7-week target timeframe, for cases **requiring a tissue biopsy**, from 2004 to 2008, are presented in Figure 57. In many cases, improvements in wait times have occurred (MB, NL, ON, SK), but in some cases, resolution within the 7-week target timeframe was similar to or below the levels for 2004. By 2008, however, most provinces evidenced reduced wait times, with closer convergence of rates occurring across the country.

Figure 57

Percentage with abnormal breast screen and resolution within 7 weeks (target)
WOMEN (50-69) REQUIRING A TISSUE BIOPSY—2004 TO 2008

PE data unavailable due to insufficient system resources to report results for the specified timeframe.
Alberta data reported are from the Screen Test program only. Screen Test is an organized program that conducts approximately 10%-12% of screening mammograms in the province, about 65% of which are performed in mobile screening units.
Data Source: Provincial breast cancer screening databases

In 2008, the provincial median wait times for abnormal breast screen to resolution for women aged 50-69 **not requiring a tissue biopsy** ranged from 2 to 6 weeks for eight provinces reporting (data not shown). Again, there was considerable variation for 90th percentile wait times for abnormal breast screen to resolution: 6 weeks in Saskatchewan to 17 weeks in Newfoundland and Labrador (Figure 58). The percentage of cases resolved within the target timeframe of 5 weeks ranged from 44% in Alberta to 84% in Ontario (Figure 59).

Figure 58

Wait times for abnormal breast screen
to resolution—90th percentile
WOMEN (50-69) NOT REQUIRING A TISSUE BIOPSY—2008
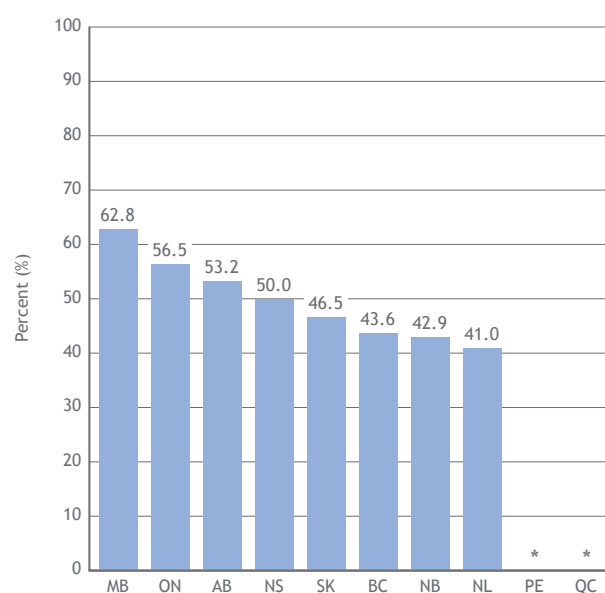

* Data not available
PE data unavailable due to insufficient system resources
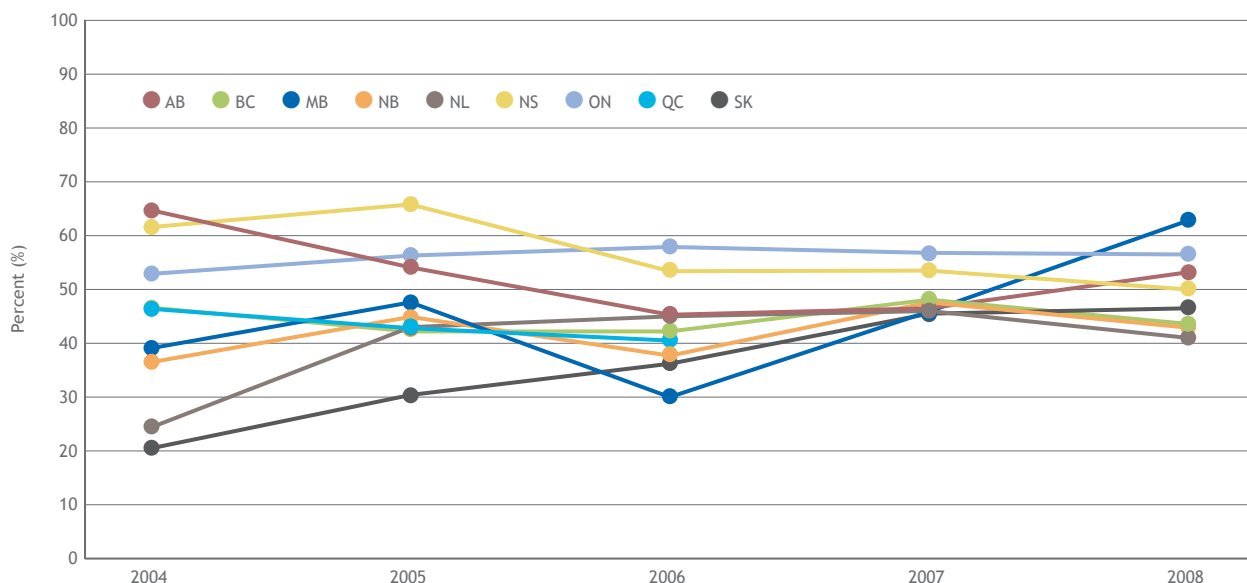to report results for the specified timeframe.
Alberta data reported are from the Screen Test program only.
Screen Test is an organized program that conducts approximately
10%-12% of screening mammograms in the province, about 65%
of which are performed in mobile screening units.
Data Source: Provincial breast cancer screening databases

Figure 59

Percentage with abnormal breast screen
and resolution within 5 weeks (target)
WOMEN (50-69) NOT REQUIRING A TISSUE BIOPSY—2008

* Data not available
PE data unavailable due to insufficient system resources
to report results for the specified timeframe.
Alberta data reported are from the Screen Test program only.
Screen Test is an organized program that conducts approximately
10%-12% of screening mammograms in the province, about 65%
of which are performed in mobile screening units.
Data Source: Provincial breast cancer screening databases

Figure 60

Percentage with abnormal breast screen and resolution within 5 weeks (target)
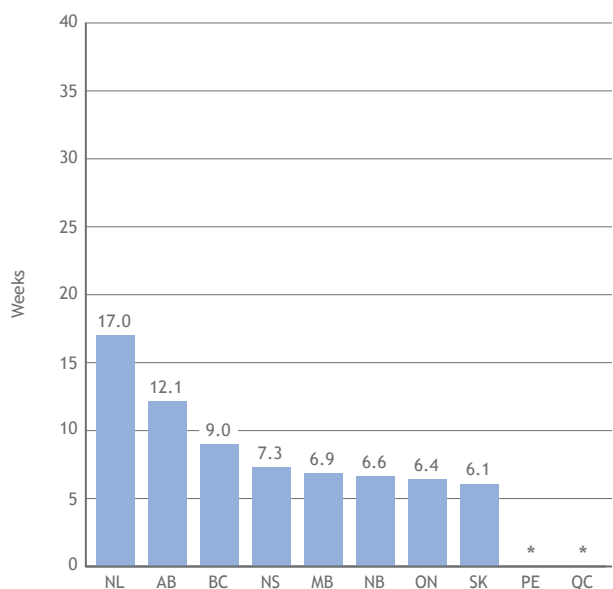**WOMEN (50-69) NOT REQUIRING A TISSUE BIOPSY—2004 TO 2008**

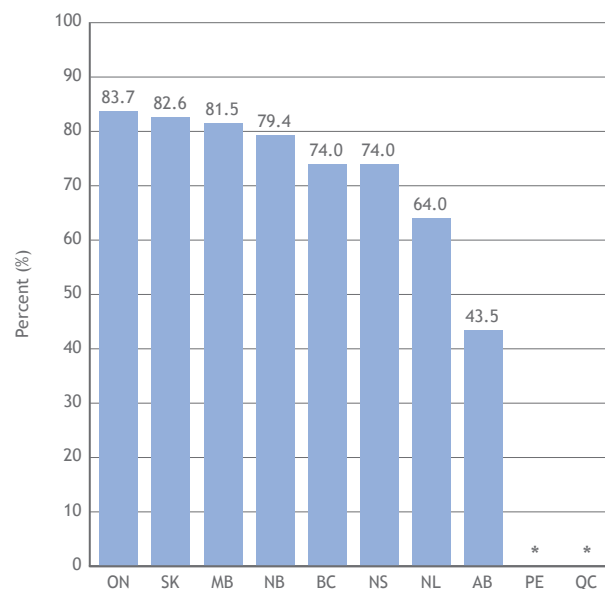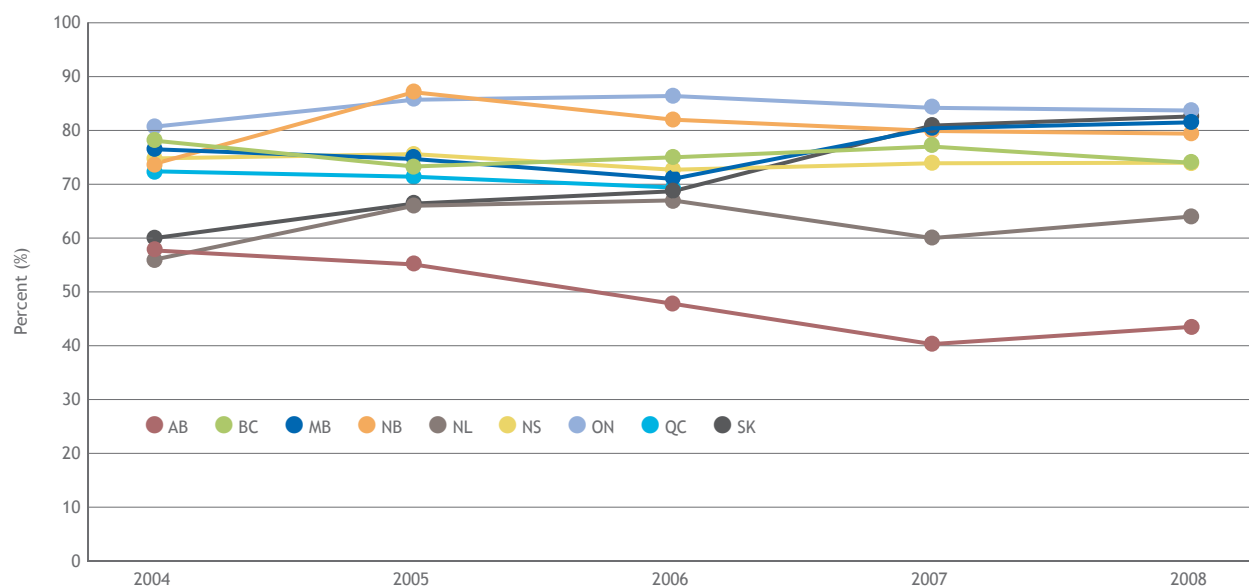

PE data unavailable due to insufficient system resources to report results for the specified timeframe.
Alberta data reported are from the Screen Test program only. Screen Test is an organized program that conducts approximately
10%-12% of screening mammograms in the province, about 65% of which are performed in mobile screening units.
Data Source: Provincial breast cancer screening databases

Data reflecting time trends for the percentage of women with abnormal breast screen and resolution within the 5-week target timeframe, for women **not requiring a tissue biopsy**, from 2004 to 2008, are presented in Figure 60. Similar to the trend observed for women requiring a tissue biopsy, there were fluctuations in the wait times for all provinces during this time period, but several provinces did evidence improved wait times.

Research

Clinical Trial Participation Ratio

Clinical trials are pivotal for evaluating the safety and efficacy of emerging cancer therapies and protocols. Participation by the patient population in clinical trials is therefore a crucial enabler of the development and evolution of best practice treatments and provides a critical opportunity for improved treatment and outcomes. It has been demonstrated that treatment centres engaging in clinical trial participation are also more likely to adhere to best practice guidelines for treating patients.[42,43]

Between 2002 and 2007 in Canada, the total number of all Phase I clinical trials increased, while the numbers of Phase II or III trials remained steady or potentially even decreased.[44] Several factors may explain this trend including high costs of conducting clinical trials, challenges in patient recruitment and registration, regulatory and ethical oversight, waning physician recruitment, emergence of more competitive markets for conducting trials, and cuts to clinical trials programs at home.[45] Canada is not alone in facing these challenges. Other countries such as the United Kingdom have experienced similar issues and have made significant investments in translational research, patient-centred research and increasing public access to clinical trials information.[46] In addition, during regional consultations of the development of the Pan-Canadian Cancer Research Strategy, concerns were expressed regarding the continuing ability of researchers to conduct cancer clinical trials in Canada. Indeed, this has been identified as a specific area for action by Canada's cancer research funders.[45]

For this *Report*, pediatric and adult indicators have been calculated for clinical trial participation ratios. The pediatric calculation of the clinical trial participation ratio was defined as the ratio of the total number of all patients (≤18 years) newly enrolled in cancer-related therapeutic trials or clinical research studies in 2009 to the total number of new cancer cases (≤18 years) diagnosed at pediatric cancer centres in 2009. Data for this indicator were collected by the C[17] Council, an organization composed of representatives from each of the individual pediatric cancer programs across Canada.[47]

It is challenging to ascertain the investment in cancer-related clinical trials by disease site. According to the analysis on cancer-related research investment conducted by the Canadian Cancer Research Alliance and the Partnership, breast cancer, leukemia and prostate cancer received the largest share of government and voluntary sector disease-site specific research funding.[48] Research funding for breast cancer and leukemia 'fared well' relative to the burden of illness (as measured by incidence, mortality and 10-year prevalence rates) experienced by each of these diseases. Based on the high productivity losses associated with premature mortality due to lung cancer, study authors concluded that investments in lung cancer research offered the largest potential for decreases in cancer-related productivity losses.

Figure 61

Pediatric clinical trial participation ratio—
cases seen by provincial pediatric cancer centres in 2009
BY PROVINCE

	ON	NL	AB	QC	AVERAGE	BC	NS	MB	SK
Value =	0.402	0.400	0.393	0.372	0.367	0.352	0.254	0.250	0.146
N =	495	10	117	274	1,144	108	59	40	41
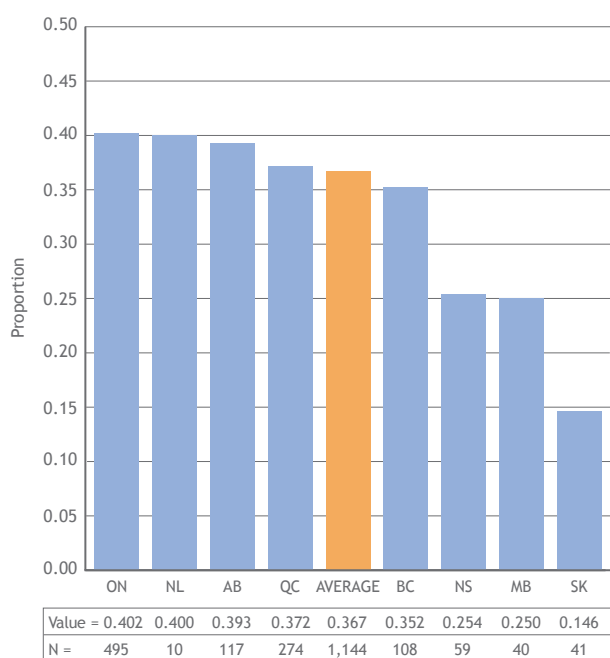
Data Source: C[17] Council, collected April 2010

Data for pediatric clinical trial ratios for 2009 were available for the eight provinces that have pediatric cancer centres treating children in Canada under the age of 14 years, as well as many 15 to 18 year olds. Ratios for pediatric clinical trial participation ranged from 15% in Saskatchewan to 40% in Ontario, with an overall national ratio of 37% (Figure 61). A portion of this variation may be due to differing sizes of individual pediatric cancer programs within each province. Some variation also stems from the extent to which individual cancer programs are affiliated with larger, multi-centre, international pediatric clinical trial cooperative groups that coordinate the majority of oncology clinical trials for children.

The definition of the adult clinical trial participation ratio was similar to that of the pediatric indicator. The numerator of the adult indicator is expressed as the total number of cancer cases (≥19 years), whether incident or previously diagnosed, newly enrolled in therapeutic clinical trials at provincial cancer centres in 2009. The denominator was defined as the total number of cancer centre cases, whether incident or previously diagnosed, newly referred to provincial

cancer centres in 2009. The denominator, new referrals to cancer centres, was specifically chosen as a proxy for those patients receiving active treatment only, and as such, excludes those patients on the cancer centre roster who were not receiving active treatment, and who by definition would be ineligible to participate in therapeutic clinical trials. This indicator is considered to be in development as it was not possible for all provinces to uniformly apply the inclusion/exclusion criteria comprising the indicator definition. For further details on data inclusions and exclusions among provinces, please refer to Table A in the Technical Appendix. Nine provinces reported on adult clinical trial participation rates, with ratios ranging from 2% in the Atlantic provinces to 11% in Alberta (Figure 62) for an overall national average of 7%.

Figure 62

Adult clinical trial participation ratio—
cases seen by provincial cancer centres in 2009
BY PROVINCE

Value =	0.107	0.081	0.069	0.051	0.045	0.024	0.023	0.022	0.021	0.018
N =	9,790	52,754	97,580	16,409	5,204	3,486	2,568	647	5,235	1,487
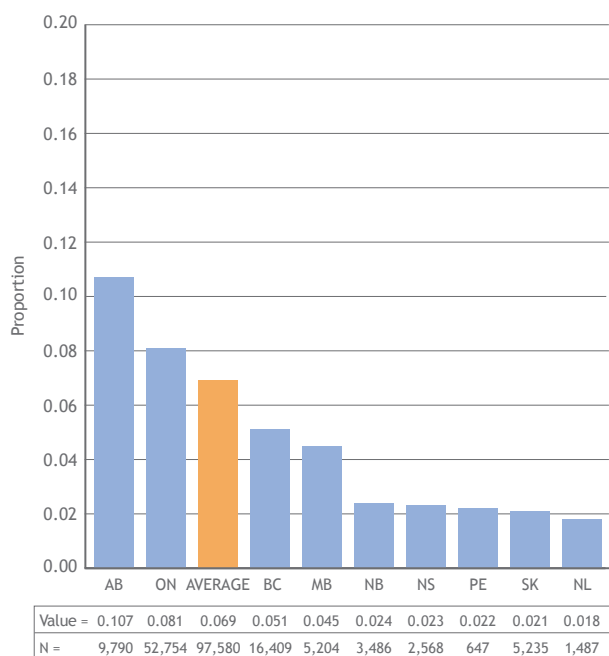
Data Source: Provincial cancer agencies

Pediatric cancers represent approximately 1% of total cancer cases in Canada. As such, each pediatric oncology program generally includes a relatively small number of new cases each year, rendering it challenging to establish research infrastructure and services for these cases. Despite this fact, clinical trial participation is significantly higher for the pediatric population than for the adult population. Experts in the field attribute high pediatric patient participation in "well-organized multicentre clinical trials" as a key driver for rapidly increasing patient survival rates.[49] It is estimated that five-year pediatric cancer survival for patients aged 0 to 19 years is about 82%.[50]

While the pediatric indicator includes patients younger than or equal to 18 years of age and the adult indicator focuses on individuals aged 19 years and older treated at cancer centres, data were not easily available for the "adolescent and young adult" cancer patient population (approximately 15–25 years of age). Adolescents and young adults are treated in either the pediatric or adult setting, based on their medical needs, local referral patterns and overall availability of services. Canadian research has shown that this group of patients, especially when treated in the adult setting, is less likely to be enrolled in clinical trials. As many as 80% of adolescents with cancer did not participate in clinical trials over the period from 1995 to 2000.[51]

Treatment—Radiation Therapy Focus Section

This focus section highlights a number of key performance indicators for radiation therapy. Radiation therapy is a crucial treatment modality for cancer control in pre-operative, curative, post-operative and palliative settings. Neoadjuvant radiation administered during the pre-operative setting reduces the size or extent of tumours to promote their operability (as in the case of stage II and III rectum cancer). Radiation treatment as a curative therapy, either alone or in conjunction with chemotherapy, targets tumours (e.g., locally advanced lung cancer). In the post-operative setting, adjuvant radiation therapy targets the remaining traces of cancer cells following resection to reduce the chance of cancer recurrence (e.g., stage I and II breast cancer). Radiation therapy in the palliative setting is used to alleviate symptoms associated with incurable cancers that may also have metastasized. As such, radiation therapy remains a mainstay of cancer treatment.

Data for these indicators were obtained directly from provincial cancer agencies or their equivalents through a survey conducted specifically for this *Report*. Further information on data collection and methodology is provided in the Technical Appendix. The indicators presented include:

• Linear Accelerator (LINAC) Capacity and Use;

• Radiation Therapy Wait Times (from Ready to Treat to Start of Radiation Treatment);

• Radiation Therapy Utilization; and

• Adjuvant Radiation Treatment Following Breast-Conserving Surgery for Stage I and II Breast Cancer (Guideline Concordance and Proxy Measure).

Linear Accelerator (LINAC) Capacity and Utilization

Radiation therapy capacity is constrained by the high capital cost of linear accelerators (LINACS) and the availability of trained personnel (i.e., radiation oncologists, physicists, dosimetrists and radiation therapists). This indicator assesses the physical capacity of radiation therapy by measuring the number of LINACS per million population, aged 54 years and older[c], and utilization by measuring radiation treatments per machine.

Data required to calculate this indicator for the 2009 calendar year were reported by all ten provinces. The indicator results ranged from 21 per million in Nova Scotia and Saskatchewan to 25.6 per million in Newfoundland and Labrador (Figure 63). The national average was 23.8 LINACS per million persons aged 54 and older. Several provinces have plans in place to add new LINACS to expand capacity over the next few years. For example, Nova Scotia (with the lowest rate in 2009) is planning on adding 3 new LINACS by mid-2011.[52] Note that this indicator does not measure operational capacity such as the availability of dedicated human resource personnel to run the LINACS, nor does it take into account interprovincial services.

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[c] 80% of cancer patients are diagnosed at age 54 or older. Using that age cut-off allows for the indicator to be expressed in proportion to the population most affected by cancer.[39]

Figure 63

LINAC capacity: LINAC machines per million persons
54 YEARS OF AGE OR OLDER, BY PROVINCE—2009

Data Source: Provincial cancer agencies
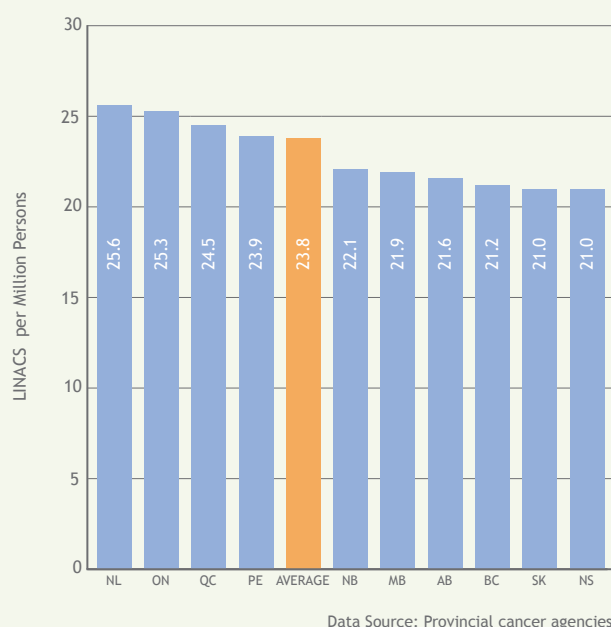
Many international studies have published data on the number of LINACS per million population by country. In 2005, the Organisation for Economic Co-operation and Development (OECD) reported an average of 6.2 LINACS per million population for OECD member countries.[53] This compares to an average of 6.4 LINACS per million population in Canada (based on the latest available numbers for 2009, not shown in this *Report*)[d]. This indicator is a crude measure of capacity, and as such requires the standardization of a number of factors in order to draw forth more meaningful comparisons.

Calculating the number of radiation treatments per machine adds to our understanding of variability in the utilization of LINACS across the country. Data required to calculate the number of radiation treatments[e] per machine in 2009 were reported by nine provinces (Figure 64). There was considerable variation across the country with machine usage rates ranging from 5,610 treatments per LINAC per year in Newfoundland and Labrador to 8,595 treatments per LINAC in New Brunswick. The national average among provinces reporting was 7,248 treatments per machine per year. The wide variation may reflect differences in demand relative to the available capacity. Lower numbers of treatments per machine could result from limitations in operational capacity, including human resource availability and/or funding. The lower utilization could also be related to the need to ensure appropriate access to treatment in small and/or geographically dispersed populations where the machines may not be utilized full-time.

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[d] It is not possible to compare the LINACS per million population aged 54 and older as this is a Canada-specific indicator.

[e] 'Radiation treatments' refers to the session of radiation delivered to a patient. Patients typically receive multiple treatments over several weeks during the treatment period. In some cases, patients may even receive two treatments on the same day. For the purposes of this indicator, one treatment is counted whenever a patient is taken into a treatment bunker, given radiation therapy and then taken out.

Figure 64

LINAC utilization: Radiation treatments per machine
BY PROVINCE—2009
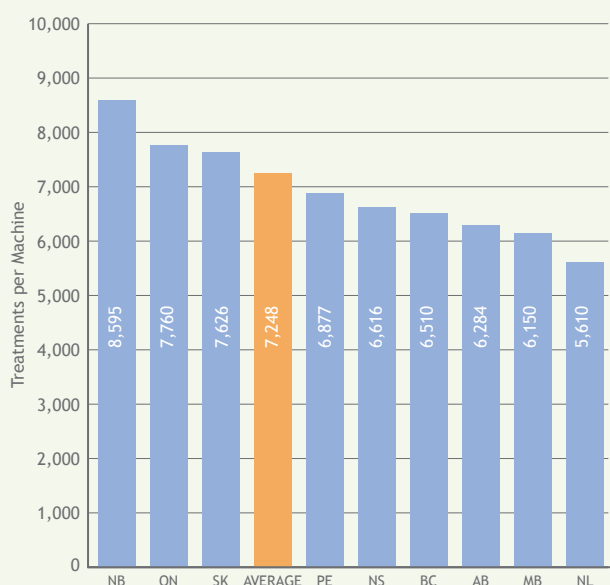
Data Source: Provincial cancer agencies

A preliminary review of internationally published values for the average number of radiation treatments per LINAC at the jurisdictional level yielded a range of 4,500 to 8,000 treatments per machine.[54]

Wait Times (Ready to Treat to Treatment)

The inherent challenges in meeting demand for radiation therapy may be manifested as longer wait times for treatment, which can contribute to increased patient anxiety and potentially affect treatment outcomes. While there may be delays between diagnosis and delivery of treatment in order to provide adequate time for treatment planning or to allow for recovery from cancer surgery, excessive delays can exacerbate emotional distress for patients and have a negative impact on quality of care.

In 2005, Canadian provinces and territories announced a set of national benchmarks for access to patient care services that included a radiation therapy wait times target of 4 weeks from the time patients are ready for treatment to the start of radiation therapy.[13] Since then, all provinces and territories have implemented processes for the measurement and reduction of radiation therapy wait times.

It must be stated that there are variations across the country in the definition of when a patient is considered "ready to treat"; therefore, data may not be directly comparable among provinces (for definitions by jurisdiction, please refer to Table B in the Technical Appendix). Despite this limitation, the indicator provides an important window into wait times across the country. For this *Report*, ten provinces submitted data for some or all of the measurement period from 2007 to 2009 (Figure 65). In 2009, the percentage of cancer cases treated within the 4-week target timeframe ranged from 74% in Alberta to 99% in Manitoba and Quebec. Wait times appear to have improved over the measurement period for four of the provinces, while for others the percentage of patients treated within the target timeframe has remained the same or dropped.

Figure 65

Percentage of cancer cases treated with radiation therapy within 4 weeks of being ready to treat—all cancers
TIME TREND BY PROVINCE—2007 TO 2009
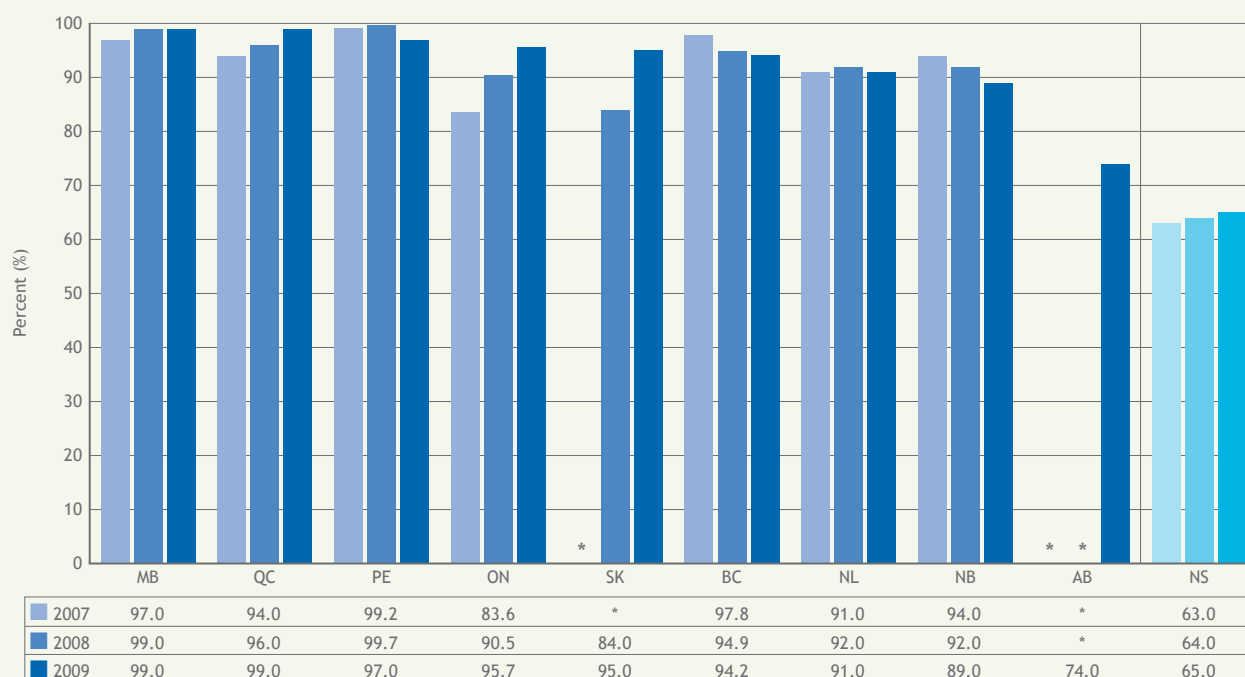
	MB	QC	PE	ON	SK	BC	NL	NB	AB	NS
2007	97.0	94.0	99.2	83.6	*	97.8	91.0	94.0	*	63.0
2008	99.0	96.0	99.7	90.5	84.0	94.9	92.0	92.0	*	64.0
2009	99.0	99.0	97.0	95.7	95.0	94.2	91.0	89.0	74.0	65.0

PE data for April to December 2008.
NS did not collect ready to treat dates prior to 2009.
* Data not available.
Data Source: Provincial cancer agencies

While the previous indicator measured the percentage of patients treated within 4 weeks, this next indicator measures the 90th percentile wait times in each province against the target of 4 weeks or 28 days. Six provinces provided wait times data in days for 2007 to 2009 according to the definition (NS did not track ready to treat dates during this timeframe). The 90th percentile wait times in 2009 ranged from 21 days in Prince Edward Island and Ontario to 37 days in Alberta (Figure 66). Five of the six provinces submitting comparable data achieved the wait times target by bringing their 90th percentile wait times to 28 days or below. Ontario and Saskatchewan achieved substantial reductions in the 90th percentile wait times over the assessed time periods.

Figure 66

90th percentile radiation therapy wait times in days—all cancers
TIME TREND BY PROVINCE—2007 TO 2009

	PE	ON	SK	MB	NL	AB	NS
2007	*	37.8	*	23.0	28.0	*	55.0
2008	17.0	28.0	36.0	23.0	28.0	*	49.0
2009	21.0	21.0	23.0	25.0	28.0	37.0	49.0
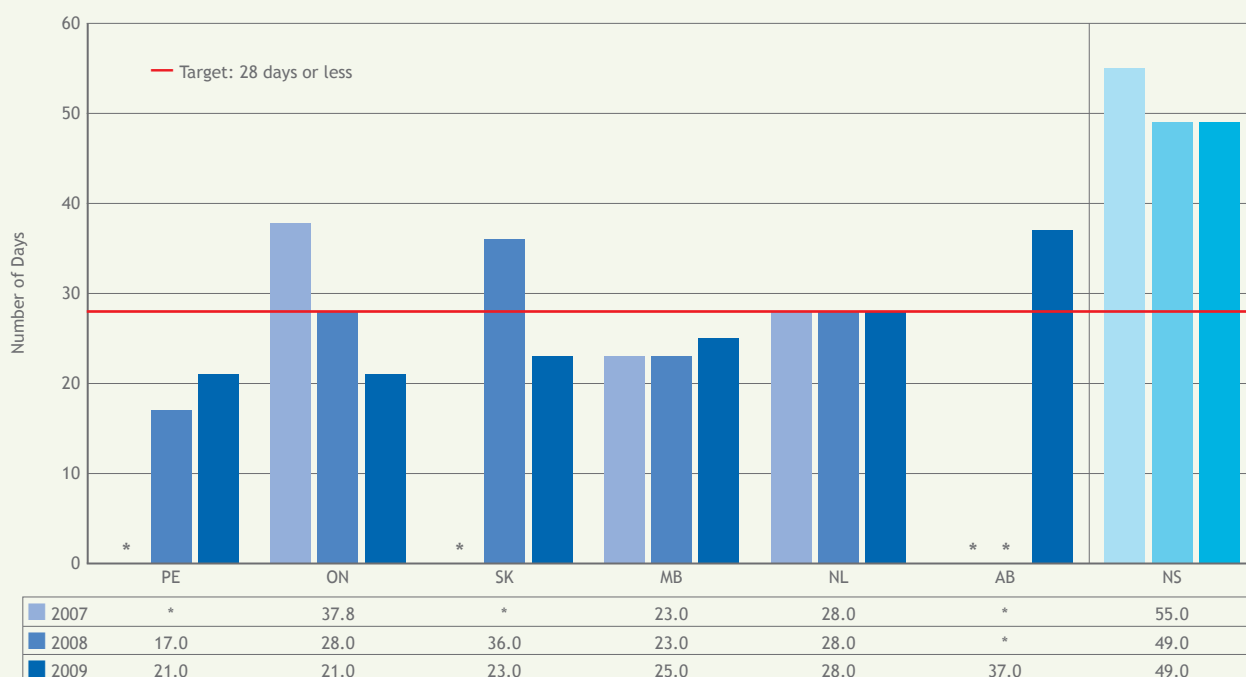
PE data for April to December 2008.
NS did not collect ready to treat dates prior to 2009.
Although QC could not provide data in days, 97% of patients
had their radiotherapy treatment in less than 28 days
* Data not available.
Data Source: Provincial cancer agencies

Radiation Therapy Utilization

A commonly cited indicator for radiation therapy utilization is the percent of cancer patients who receive radiation therapy at some point during the course of their lifetime. Given the challenge of collecting data on radiation therapy many years after diagnosis for each patient, a proxy indicator was used to indirectly measure the rate of radiation therapy utilization. This proxy measure, commonly used in international studies, is the ratio of total radiation therapy courses[f] delivered in a year (for all intents) to new invasive cancers diagnosed in that year. As a ratio, there is no explicit link between the numerator and denominator (some courses in the numerator would have been given to patients diagnosed in a prior year; some patients in the denominator may have been given radiation in subsequent years). The proxy measure can still be used to assess against a commonly cited figure of at least 50% of cancer patients typically receiving radiation therapy at some point during the course of their disease.[55]

For this *Report*, nine provinces provided data for some or all of the measurement period from 2006 to 2008 (Figure 67). For the nine provinces reporting data for 2007, the diagnosis year for which the guideline concordance indicators were calculated, radiation therapy utilization ratios ranged from 0.41 in Saskatchewan to 0.67 in Ontario. Eight of the provincial results were in the 0.40 to 0.60 range, which is in line with the commonly cited norm of 0.50 (or 50%). In order to better understand the sources of variation for this indicator, further analysis, including disease site-specific data collection, will be undertaken over the next year and presented in the *2011 Report*.

[f] A course of radiation therapy typically includes a number of fractions or treatments as planned by the radiation oncologist. A patient may receive one or more courses of radiation therapy in their lifetime.

Figure 67

Radiation therapy utilization: Ratio of radiation courses to new invasive incident cases
TIME TREND BY PROVINCE—2006 TO 2008

	ON	NB	BC	MB	NL	PE	SK	AB	NS
2006	*	0.46	0.51	0.52	0.57	0.64	0.44	0.47	0.42
2007	0.67	0.60	0.55	0.51	0.46	0.58	0.41	0.45	0.43
2008	0.72	0.61	0.54	0.54	0.51	0.50	0.46	0.43	0.42
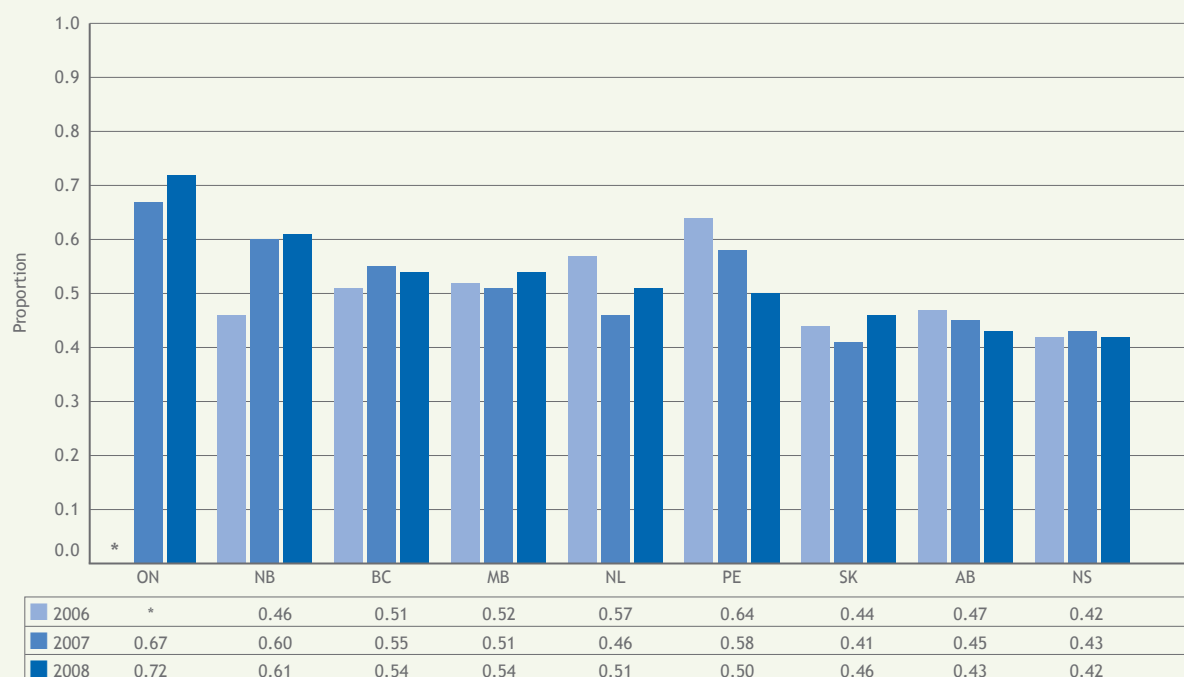
Data Source: Provincial Cancer Agencies

A more direct measure of radiation therapy utilization begins with all cancer cases diagnosed in a given year (2007 for the purposes of this *Report*) and reports on the percentage of those patients who received radiation therapy within two years[g] of their diagnosis date (Figure 68). Eight provinces reported data required to calculate this indicator. The radiation therapy treatment rates ranged from 23% in Alberta to 36% in Newfoundland and Labrador. The overall average among provinces reporting was 31%. There is less interprovincial variation in this indicator than in the preceding ratio. There is some congruence between the two indicators in the relative placement of the provinces with Alberta and Nova Scotia at the lower end, and Ontario and British Columbia at the higher end in both measures. However, the comparison of the two indicators is limited; these patterns will be further examined over the next year with the aim of consolidating to one definitive measure of radiation therapy utilization in future reports.

[g] The two-year period was chosen for a number of reasons. The first is that for many cancers (particularly prostate and breast), curative radiation therapy is typically given between 1-2 years after diagnosis. To enable a two-year follow-up period (e.g., December 31, 2009, for a patient diagnosed on December 31, 2007), 2007 incident cases were chosen as the cohort for this indicator calculation. The second reason is that a two-year timeframe allows the indicator to be driven by therapeutic rather than palliative intent (exceptions would include diseases typically diagnosed late, such as lung and pancreatic cancers, where palliative treatment is often given relatively soon following diagnosis).

Figure 68

Radiation therapy utilization: Percentage of cancer cases receiving radiation therapy
WITHIN 2 YEARS OF DIAGNOSIS—2007 DIAGNOSIS

Data Source: Provincial Cancer Agencies
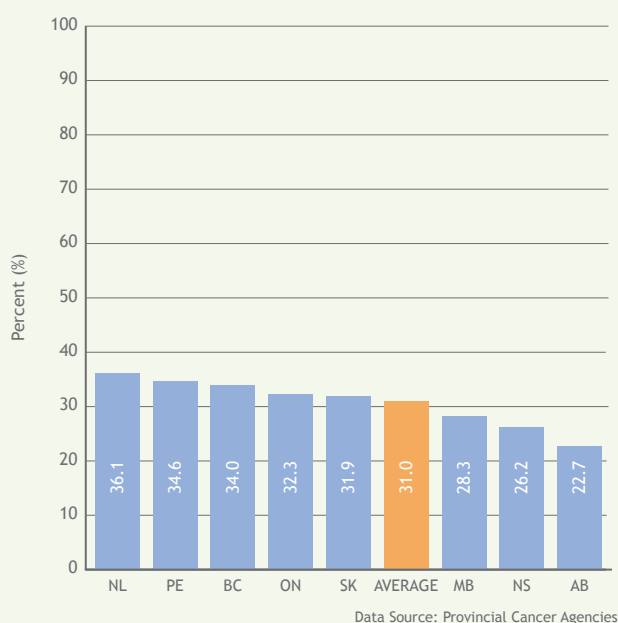
Six provinces also provided data that allowed for patient age analysis for the percentage of cancer patients receiving radiation therapy within two years of diagnosis (Figure 69). Within each province, treatment patterns for persons aged 18-59, 60-69 and 70-79 were similar. Patients aged 80 and older experienced just under half the treatment rate compared to the lower age groups. The phenomenon of the treatment rate decreasing in the elderly may be partially explained by patient specific factors, such as co-morbidities that preclude treatment or other contraindications that may be more prevalent in older patients and that lead to a less favourable risk/benefit ratio associated with radiation therapy.

Researchers in Ontario[55] have developed a statistical method to estimate predicted lifetime radiation therapy utilization rates based on current medical practice. They estimate that for Ontario, 48% of cancer patients will require radiation therapy at least once in their lifetime. Several other international studies have suggested similar ranges: 52% in one Australian study[56] and 44% to 48% in a Scottish study.[57] It is not known to what extent methodological or disease site differences may be affecting these statistics.

In its cancer system quality index (CSQI) report published in 2009, Cancer Care Ontario adopted a benchmark utilization rate of 48%. This benchmark rate is considerably higher than Ontario's actual utilization rate of 36% (range of 32% to 41% by Local Health Integration Network) in 2008/09.[58] The CSQI report shows that the lower rates in radiation therapy usage for the major disease sites appear to be for prostate and lung cancer where treatment guidelines are not as well established. The shortfalls for breast and rectal cancer cases appear much smaller.

Figure 69

Radiation therapy utilization: Percentage of cancer cases receiving radiation therapy
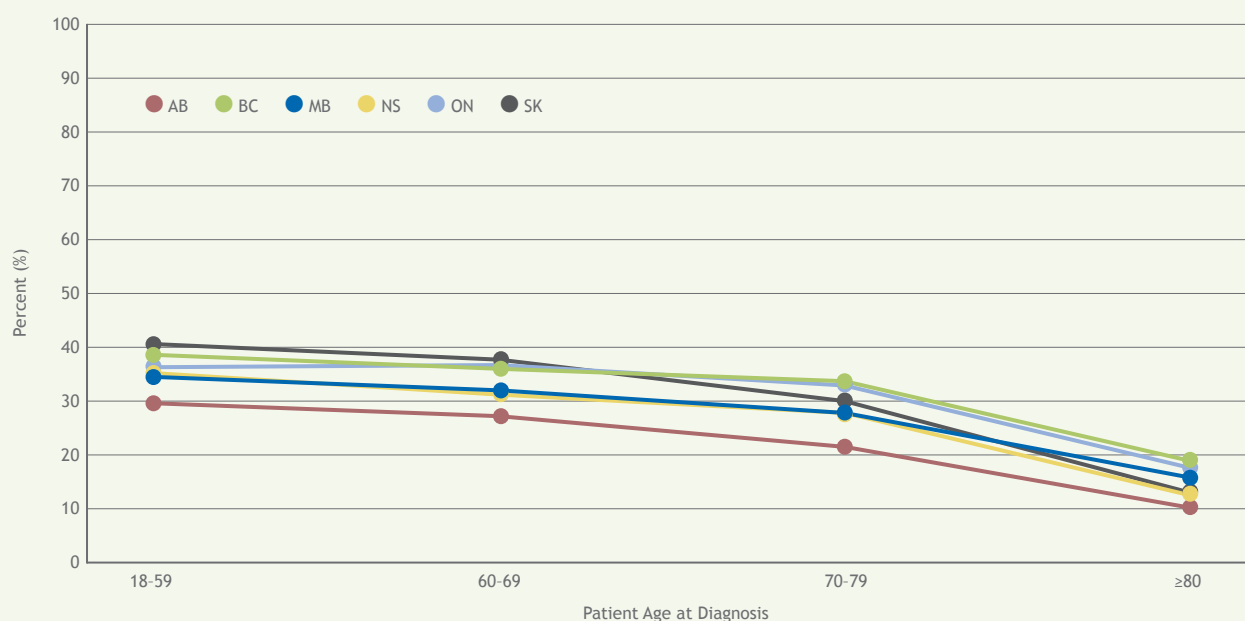**WITHIN 2 YEARS OF DIAGNOSIS, BY PATIENT AGE GROUP—2007 DIAGNOSIS**

Data Source: Provincial cancer agencies

The radiation therapy utilization rate was also examined by age group and sex combined (Figure 70). Males and females over 70 years of age were treated less frequently than those aged 18-69. Females aged 18 to 69 were treated more often than males of the same age group, but the reverse trend was observed for individuals aged 70 and older where the treatment rate was higher for males. This observation is likely explained by differing indications for radiation therapy for diseases that affect men and women at different ages, in particular breast and prostate cancer, which together account for nearly 50% of radiation therapy treatments delivered in many Canadian centres. Among women, breast cancer becomes increasingly more common after age 50 and breast-conserving surgery, normally complemented with radiation therapy, is more commonly employed in younger women. Among men, prostate cancer and the use of curative radiation therapy for this disease become increasingly common after age 70.

Figure 70

Radiation therapy utilization: Percentage of cancer cases receiving radiation therapy
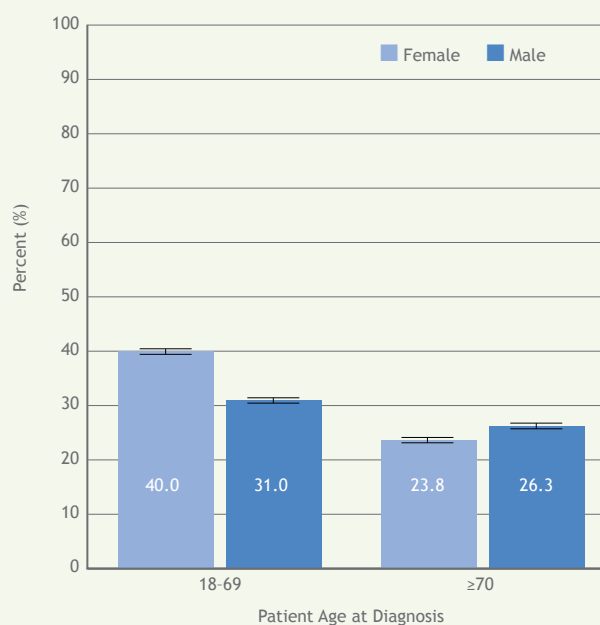**WITHIN 2 YEARS OF DIAGNOSIS, BY PATIENT AGE AND SEX— 2007 DIAGNOSIS**

Average of provinces that submitted data (includes BC, AB, SK, MB, ON, NS)
Note: 95% confidence intervals are indicated on figure.
Data Source: Provincial cancer agencies

Adjuvant Radiation Therapy Following Breast-Conserving Surgery for Stage I and II Breast Cancer (Guideline Concordance and Proxy Measure)

While the indicators for radiation therapy utilization provide an overall assessment of the use of radiation therapy to treat cancer, they are not necessarily useful in the evaluation of the appropriateness of clinical practice patterns. Guideline concordance indicators, on the other hand, measure the use of specific treatment modalities to treat particular cancers based on well-established evidence from clinical research. A well-established guideline recommends the delivery of post-operative (adjuvant) radiation therapy for early stage breast cancer patients who receive breast-conserving surgery. Clinical trials have shown that adjuvant radiation therapy significantly reduces the chance of recurrence in this cohort of patients.[59]

For this *Report*, four provinces provided data required to assess the guideline concordance measure: "Percentage of stage I and II breast cancer cases receiving radiation therapy (started within 270 days of surgery) following breast-conserving surgery". The 270-day timeframe was chosen because it marks the timeframe wherein 95% of patients have started radiation therapy. Using the available data, the guideline concordance rates measured ranged from 68% in Manitoba to 86% in Alberta, with an average of 80% (Figure 71). In this and subsequent figures, concordance rates for British Columbia are shown but not included in the average calculation as the data for British Columbia are restricted to cases referred to cancer centres (roughly 85% of breast cancer cases in British Columbia). The results for British Columbia are therefore not population-based and cannot be compared with those of other provinces.

It should be noted that the expected concordance rate is not 100%. Valid reasons may exist for not adhering to the guideline, including situations where patients are medically unable to undergo treatment or where patients choose to forego radiation treatment. Nevertheless, the comparisons of patterns are of value in attempting to assess patterns of care in general.

Figure 71

Guideline Concordance: Percentage of stage I and II breast cancer cases receiving radiation therapy following breast-conserving surgery
RADIATION THERAPY STARTED WITHIN 270 DAYS OF SURGERY, BY PROVINCE—2007 DIAGNOSIS

	AB	ON	AVERAGE*	MB	BC
% =	86	80	80	68	86
N =	725	3,842	4,953	386	1,240
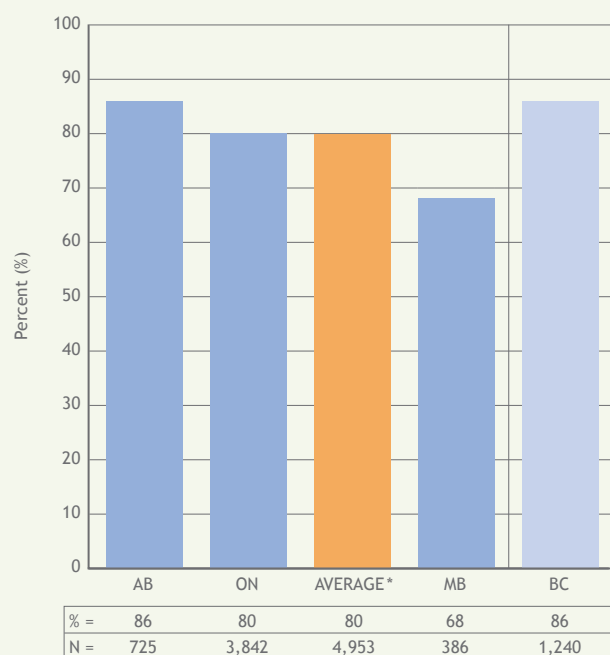
Note: Includes females only.
BC data included only cases referred to the cancer centres.
* BC data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

A comparative review of published results at the jurisdictional level for this indicator (adjuvant radiation therapy for early stage breast cancer cases following breast-conserving surgery) yielded concordance rates in the low- to mid-90% range. A U.S. study using SEER data from 2000 to 2002 published treatment rates of 94% for women aged 66 to 70.[60] A Swiss nationwide study reported a concordance rate of 92% for stage I to III patients under 80.[61]

Eight provinces reported on a 'proxy' indicator that measured the percentage of stage I and II breast cancer cases receiving radiation therapy within 635[h] days (1 year + 270 days) following diagnosis, without being limited to patients receiving breast-conserving surgery. While this indicator does not measure concordance with the specific guideline being assessed, it does provide useful information on the use of radiation therapy for treatment of stage I and II breast cancer and allows for the inclusion of provinces that were not able to link surgical and registry data as required for the guideline concordance indicator.

Treatment rates for the proxy measure ranged from 38% in Prince Edward Island to 66% in Ontario, with an overall average of 59% for the seven provinces reporting (Figure 72). Again, the results for British Columbia are shown separately and are not included in the overall average because they are based only on patients referred to cancer centres. Because the proxy measure may include stage I and II patients receiving mastectomies and because adjuvant radiation therapy is not generally indicated post mastectomy (unless there is significant axillary lymph node involvement), the rates for this indicator are expected to be substantially lower as they do not accurately reflect concordance to the guideline conditions. In addition, interprovincial differences in the mastectomy rates may contribute to the differences in the reported rates. Over the next year, the Partnership will work with provinces to enable reporting on the full guideline concordance indicator for publication in future reports.

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[h] The 635-day timeframe was chosen to be consistent with the guideline concordance indicator, which included surgeries within one year of diagnosis and radiation therapy within 270 days of surgery (365 days + 270 days = 635 days).

Figure 72

Guideline Proxy Measure: Percentage of stage I and II breast cancer cases receiving radiation therapy
WITHIN 1 YEAR + 270 DAYS OF DIAGNOSIS, BY PROVINCE—2007 DIAGNOSIS
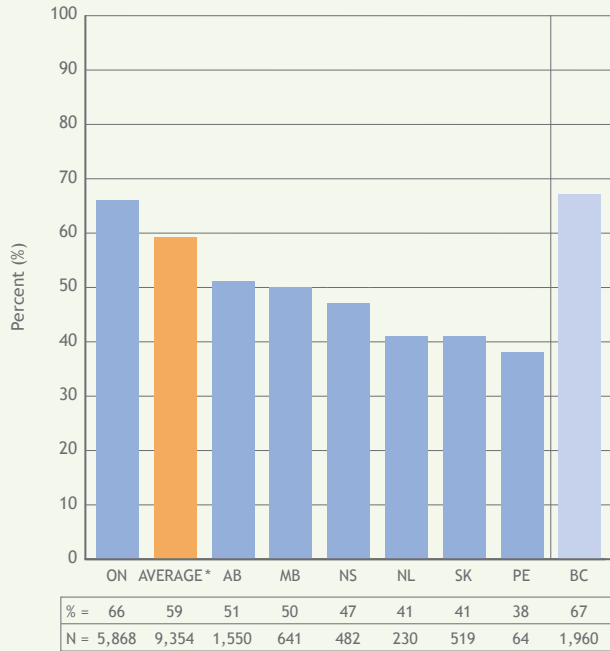
	ON	AVERAGE*	AB	MB	NS	NL	SK	PE	BC
% =	66	59	51	50	47	41	41	38	67
N =	5,868	9,354	1,550	641	482	230	519	64	1,960

Note: Includes females only.
BC data included only cases referred to the cancer centres.
* BC data were not included in "Average" calculation.
Data Source: Provincial cancer agencies

An analysis of the guideline concordance indicator by age group was also conducted (Figure 73). The high percentage (72% to 90%) of patients aged 18 to 59 treated in concordance with the guideline was in sharp contrast with the treatment rate of 22% to 45% for patients aged 80 and older. Several guidelines, such as from the National Comprehensive Cancer Network (NCCN)[62] based on a number of clinical trials showing limited benefit in recurrence and survival in that age group[63], do not recommend adjuvant radiation therapy for patients over 70 years of age. As more provinces are able to report data for this indicator, these age and interprovincial patterns will be analyzed further.

Figure 73

Guideline Concordance: Percentage of stage I and II breast cancer cases receiving radiation therapy following breast-conserving surgery
RADIATION THERAPY STARTED WITHIN 270 DAYS OF SURGERY, BY PATIENT AGE GROUP—2007 DIAGNOSIS
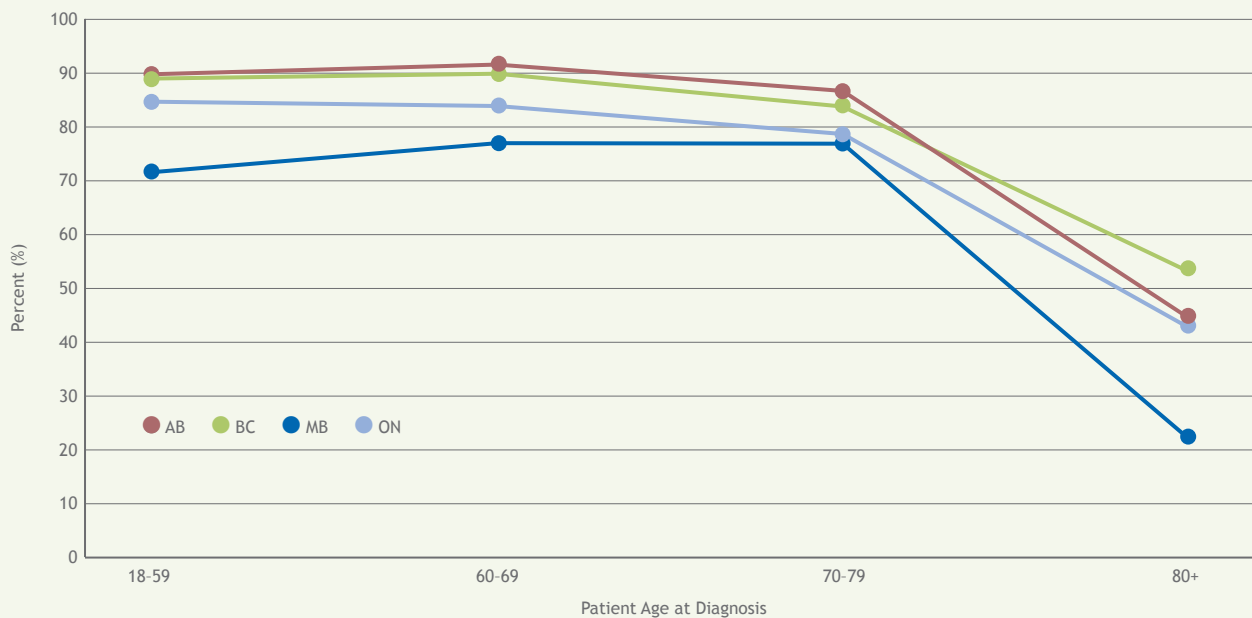
Data Source: Provincial cancer agencies

Numerous studies have provided evidence that even after co-morbidity factors and patient preferences were accounted for, older women were less likely than younger women to receive standard management of care. One aspect of the standard management of breast cancer patients involves breast-conserving surgery followed by radiation therapy, for cases where no mastectomies have been planned. In 2007, a retrospective cohort study of 1999 breast cancer incident cases from a region in England reported that non-standard management of breast cancer patients increased with age. The study also pointed out that breast cancer incidence rates were highest for women over the age of 70 years. Older women, above the age of 70 years were less likely to receive radiotherapy following breast-conserving surgery as compared with women with breast cancer aged 65–69.[64] At the same time, several guidelines (e.g., NCCN[62]) restrict their recommendation for adjuvant radiation therapy to patients under 70 years of age based on a number of clinical trials showing limited benefit in survival for patients 70 and older.[63] Thus, the drop in treatment according to guidelines after age 79 may reflect reasonable clinical practice.

Synthesis and Next Steps

The intent of the Radiation Therapy Focus Section is to provide an overview of system performance for a specific treatment modality. This thematic approach lends itself to identifying patterns that may, in turn, point to opportunities for improvements in the quality and consistency of clinical practice. Viewed as a whole, and not as independent measures, these indicators provide a broader perspective on system performance and may help to generate hypotheses and highlight areas that provinces may wish to explore within their own jurisdictions. The results also provide an important baseline for the identification of patterns worthy of further investigation. Nevertheless, there remain several factors that must be taken into account in order to make definitive conclusions between indicator results and actual system performance. Upcoming supplemental System Performance Reports will begin to steadily identify and examine these factors.

3.4 Supportive Care and Survivorship

A cancer diagnosis brings emotional, social, spiritual and practical consequences for patients and families that can reach well beyond the time spent in treatment. For many people, lack of access to information and supportive care services makes the cancer experience much more difficult. There is also growing evidence that survivors may continue to have special needs after their cancer has been treated. For others, improvements are needed in end-of-life care.

In Canada, the cancer community at large recognizes the need to develop indicators to assess supportive care and survivorship. In an initial effort to address this issue, the *2010 System Performance Report* presents data for three indicators: **Screening for Distress, Self-Reported Outcomes** and **Place of Death**. The data for Screening for Distress represent a deepening of the analysis presented for Symptom Assessment in the *2009 System Performance Report*. The indicators for Self-Reported Outcomes and Place of Death are new to this *Report*. Taken together, these three indicators contribute toward a greater understanding of elements important to supportive care and survivorship for cancer patients and begin to address an under-represented domain in the cancer control continuum.

Screening for Distress

The use of tools for standardized symptom assessment and screening for distress signals the extent to which symptoms of pain and emotional distress are being experienced by patients and identified by health care providers. In the spring of 2009, the Partnership endorsed a minimum data set for screening for pain and distress. The data elements identified as part of this minimum dataset are contained in the Edmonton Symptom Assessment Scale (ESAS) and the Canadian Problem Checklist (CPC).[65] ESAS is the most commonly used screening tool in Canada. It is designed to assist in the assessment of nine commonly experienced symptoms: pain, tiredness, nausea, depression, anxiety, drowsiness, appetite, well-being and shortness of breath. The CPC, designed by a subcommittee of the Partnership's Cancer Journey Advisory Group, asks a series of 21 questions to screen for psychosocial concerns (e.g., fears and worries, sadness, feeling like a burden), practical concerns (e.g., work or school issues, finances, getting to and from appointments) and physical concerns (e.g., concentration and memory, sleeplessness, weight). As a whole, the recommended minimum dataset would provide a basis for identifying key patient concerns and causes for distress at regular intervals in time. The aim is to quickly identify and then address physical, psychosocial and practical issues as early as possible, thereby moving toward person-centred care.

Currently the Cancer Journey Advisory Group is partnering with seven jurisdictions in six Canadian provinces that will complete their implementation of Screening for Distress programs by early 2012. Simultaneously, the implementation of centrally tracked, standardized symptom assessment tools by provincial cancer agencies provides an opportunity to assess the extent to which provincially-led initiatives for symptom management and person-centred care are underway.

In the *2009 System Performance Report*, data were presented on the number of cancer centres in each province using centralized, standardized symptom assessment tools for at least a portion of their patient population. Data for this *Report* were obtained in June of 2010 by directly polling provincial cancer agencies on the implementation of centrally-tracked, standardized symptom assessment tools in their respective provinces. Updated data were available for seven provinces.

Similar to the data presented in the *2009 System Performance Report*, British Columbia and Ontario once again reported using a centrally tracked, standardized symptom assessment tool for at least a portion of patients at each cancer centre. In British Columbia, all patients visiting Pain and Symptom Management Clinics are assessed using ESAS at every visit. In Ontario, a web-based information system centrally collects ESAS data and provides easy access by health care providers to patients' results, ultimately allowing for swift and effective symptom management. By December 2009 in Ontario, 57% of lung cancer patients and 31% of all other cancer patients had been screened at least monthly for symptom severity.[66]

Three additional provinces, Saskatchewan, Manitoba and Nova Scotia, reported currently being in the process of introducing centralized symptom assessment and implementing a tracking system. Saskatchewan aims to commence data collection for a pilot project in late 2010, using both the ESAS tool as well as the CPC. CancerCare Manitoba uses the ESAS tool routinely for patients seen at the two main treatment sites in the province. Cancer Care Nova Scotia is currently leading a phased implementation of symptom assessment, using both the ESAS tool and the CPC.

Three provinces, Alberta, Prince Edward Island and Newfoundland and Labrador, reported that select individual facilities use some form of symptom assessment but that no central tracking mechanism is in place. In Alberta, tertiary cancer centres tend to use symptom assessment tools; however, smaller urban centres do not. The Charlottetown Cancer Centre in PEI has developed symptom assessment questionnaires for select radiation patients. In Newfoundland and Labrador, individual cancer centres have been using standardized symptom assessment tools.

Self-Reported Outcomes

In 2003, the Ontario Hospital Association and Cancer Care Ontario collaborated with the National Research Corporation (NRC) and Smaller Worlds Communication to develop the NRC Picker Ambulatory Oncology Patient Satisfaction Survey (AOPSS), which helps detail cancer patients' perceptions of their quality of care.[67] Refined from the Picker Institute's Cancer survey, the AOPSS categories report on satisfaction rates across six key dimensions of person-centred care: physical comfort; respect for patient preferences; access to care; coordination and continuity of care; information, communication and education; and emotional support. The survey also asks about overall perceptions of the quality of care received.

Surveys are mailed out to eligible participants (i.e., those over 18 years of age with a confirmed cancer diagnosis and who have received chemotherapy, radiation treatment or ambulatory care follow-up [in most provinces]), based on timelines and sampling frames determined by each province individually. Results are collated from the completed surveys mailed back to NRC Picker.

Seven provinces participated in the AOPSS survey, conducted at different times between 2007 and 2009 for each province. Overall patient satisfaction rates were high: greater than 95% of respondents in each province were satisfied with the overall quality of care they received during the previous six months (Figure 74). When specifically polled about the six individual domains, however, satisfaction rates were lower. Patterns of scores were similar across provinces: all provinces reported patient satisfaction levels ranging from 60% to 85% for physical comfort; respect for patient preferences; access to care; coordination and continuity of care; and information, communication and education. Considerably lower rates of patient satisfaction were reported for emotional support, ranging from 44% to 59% among provinces. Prince Edward Island and Nova Scotia reported the highest levels of satisfaction in all categories.

Figure 74

Percent positive scores for self-reported patient-centred care categories and overall quality of care
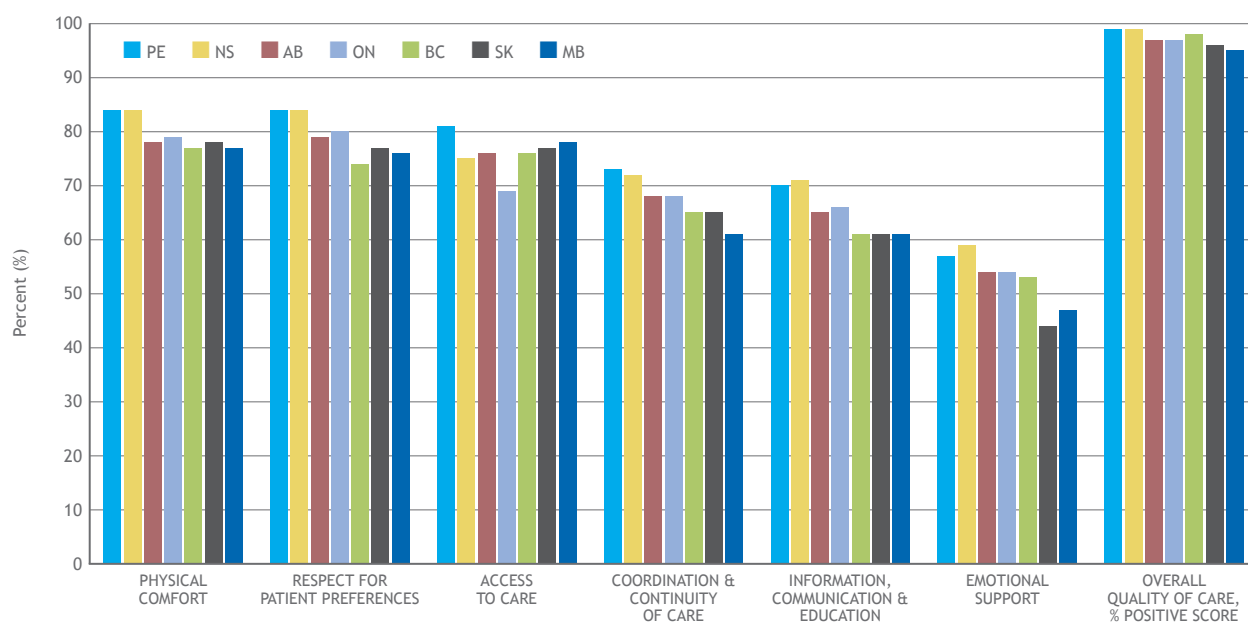
Data Source: NRC Picker Ambulatory Oncology Patient Satisfaction Survey results, 2007-2009. Data provided by individual provincial cancer agencies.

Emotional support, as defined in the AOPSS survey, consists of numerous sub-components that may not be applicable to every respondent. These sub-components include:

- evaluating the extent to which oncology providers went out of their way to help;

- receiving sufficient information on emotional changes that could result due to cancer;

- getting the help required to figure out payments for any required out-of-pocket expenses;

- sending referrals to professionals to assist them in dealing with anxieties and fears related to diagnosis and/or treatment;

- receiving enough information on possible relationship changes and/or changes in sexual activity; and

- being told of one's diagnosis in a sensitive manner.

While Quebec did not participate in the AOPSS survey, a 2008 patient satisfaction survey based on self-reported outcomes for treatment in 2005-2006 evidenced similar results. Methodological differences between surveys prevent direct comparison, but 97% of respondents reported satisfaction with overall quality of care, and 61% reported satisfaction for emotional support.[68]

Patient perceptions on the quality of person-centred care are valued by provincial care providers and other stakeholders. Regular surveys on the part of provinces provide important information in understanding the patient point of view and in informing the provision of care.

Place of Death

Many surveys have suggested that terminal cancer patients prefer to die at home or in home-like settings, such as hospices or other residential facilities.[69] Data from Statistics Canada from 2003 to 2005, however, shows greater than 70% of all cancer deaths occurred in hospital settings (see discussion below), emphasizing the disparity between end-of-life practice and patient preference. In its special topic on end-of-life care, the 2010 Canadian Cancer Statistics publication confirms that measures are still needed to refine end-of-life care systems and address the uneven access to end-of-life services both within and among provinces.[1]

The "Place of Death" indicator describes the percentage of patients who die in hospital or in several non-hospital locations. As such, this indicator begins to address one important aspect of end-of-life care and may help to contribute toward better planning and quality of end-of-life care for cancer patients.

The data source for this indicator is the National Vital Statistics Database, containing coded "cause of death" as well as "place of death" information. It is important to note, however, that there is considerable variation in the completeness of "place of death" coding for at least two provinces over the years examined. This variation complicates the interpretation of the results. In particular, in British Columbia all deaths in 2005 were coded as "unknown locality". In Ontario, the coding of the non-hospital death categories varied greatly. In 2005, no deaths were coded as "unknown locality", whereas in 2004, the "unknown locality" was reported as 26%. In contrast, deaths coded as "private home" jumped from 0% in 2004 to 20% in 2005. For Ontario, there were similar large increases or decreases for "other health care facility" and "other specified locality". For more details please refer to Table C in the Technical Appendix. The extreme variability in the estimates of the non-hospital categories suggests that the coding of these categories for Ontario may be unreliable.

Figure 75 presents the place of death for cancer patients in Canada using the data as coded. The majority of deaths occurred in hospital, with the percentage dropping from 73% in 2003 and 2004 to 65% in 2005. However, this apparent decrease occurs because in 2005, all the deaths in BC were coded as "unknown locality". If the estimate for British Columbia in 2004 were applied to the 2005 data, the overall estimate of "hospital" deaths would remain stable at 72%. Figure 76 presents the place of death for cancer patients in Canada excluding the data for British Columbia and Ontario. The apparent variability over time in the estimates of non-hospital deaths seen in Figure 75 disappears when the data from British Columbia and Ontario are removed: approximately 5% of deaths from cancer occurred in each of "other health care facilities" and "private homes" and 11% in "other specified locations" (Figure 76).

Figure 75

Cancer patient place of death
TIME TREND BY LOCATION, CANADA—2003 TO 2005
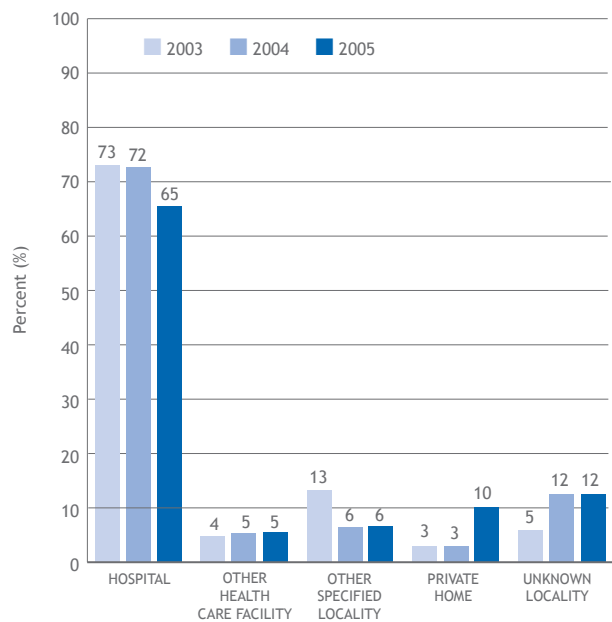
Data Source: Statistics Canada, Vital Statistics Death Database

Figure 76

Cancer patient place of death,
**TIME TREND BY LOCATION, CANADA
(EXCLUDING BC AND ON)—2003 TO 2005**
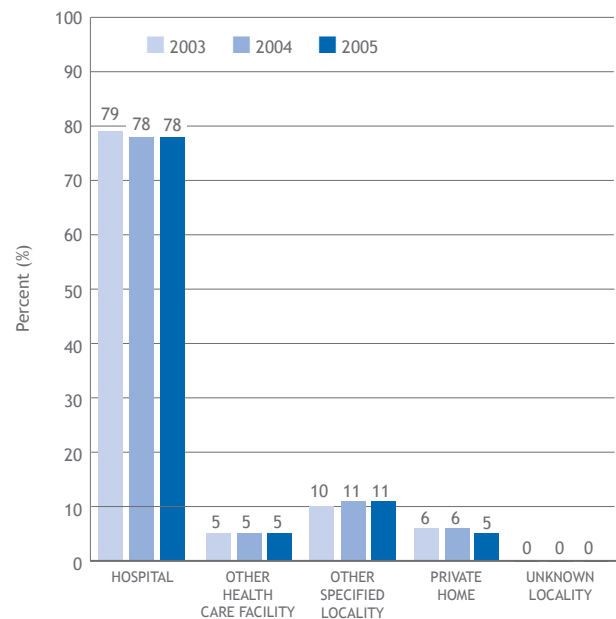
Data Source: Statistics Canada, Vital Statistics Death Database

From 2003 to 2005, the percentage of non-hospital deaths remained relatively similar within each of the provinces (Figure 77). The "unknown locality" has been included in the non-hospital deaths because most provinces had very low numbers for that category (except British Columbia and Ontario). Excluding the unknown for Ontario would underestimate the non-hospital deaths because only non-hospital deaths were coded as "unknown locality". During 2003 to 2005, the percentage of deaths in non-hospital settings was quite consistent, with the exception of the known anomaly in British Columbia. Eight of ten provinces reported that 20% or greater of cancer deaths occurred in non-hospital settings. In 2005, there was little difference between males and females in the percentage dying in hospital or non-hospital settings (data not shown).

This domain looks beyond the disease to assess the overall well-being of those diagnosed with cancer. While pan-Canadian data are not yet available, progress to collect data and measure indicators is being made at local and regional levels. As more data become available, the Partnership will deepen its reporting on this domain.

Figure 77

Percentage of non-hospital deaths for cancer patients
BY PROVINCE—2003 TO 2005
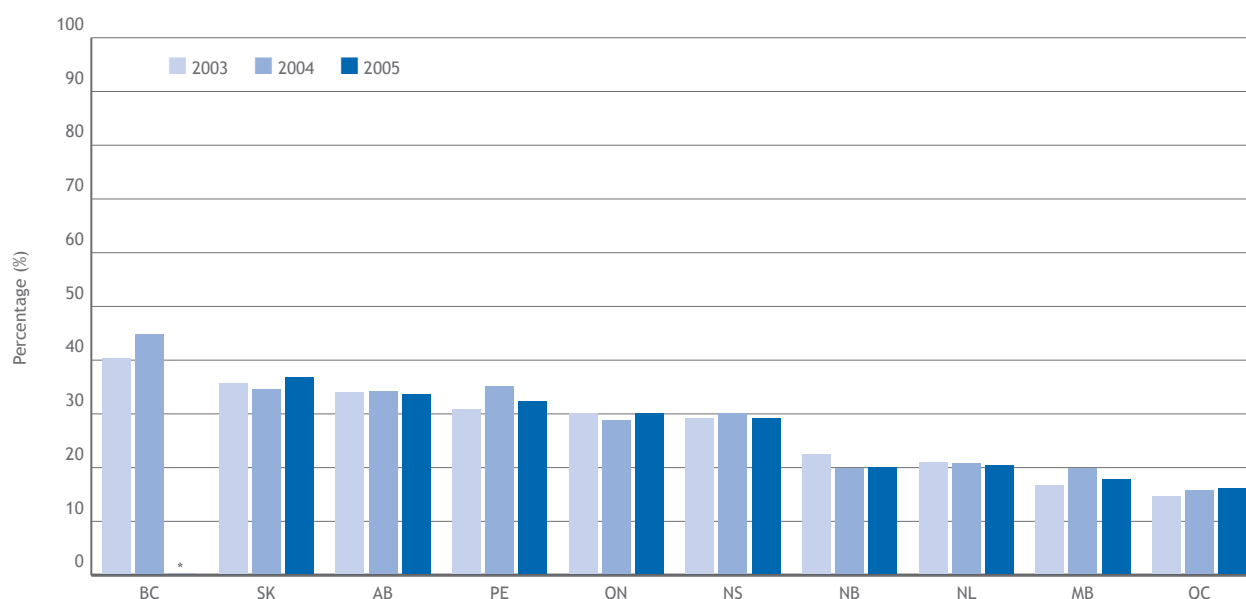
* All deaths coded as unknown location
Data includes deaths of unknown location.
Data Source: Statistics Canada, Vital Statistics Death Database

3.5 Long-Term Outcomes

Cancer surveillance statistics, including incidence, mortality and survival, help us understand the burden of cancer in Canada and how well we are doing to reduce its effects across the country. Cancer incidence refers to the number of newly diagnosed cases of cancer in Canada each year and cancer mortality to the number of deaths attributed to cancer each year. The data are often presented as age-standardized rates so that comparisons can be made over time and across jurisdictions without the results being skewed by differences in a population's age structure. For this reason, however, age-standardized rates cannot be quoted as "real" rates and so should not be used for resource planning; actual incidence and mortality numbers are more relevant for that purpose. In this *Report*, all data are age-standardized to the 1991 Canadian population and exclude non-melanoma skin cancer.

Cancer survival refers to the proportion of patients living at some point after the diagnosis of their disease. Relative survival measures a cancer patient's probability of surviving compared to the overall population of the same age and sex in Canada over a specific period of time.

In this section of the *Report*, indicators for **Incidence**, **Mortality** and **Relative Survival** are presented for all cancers, breast cancer, lung and prostate cancer. Where possible, analyses are presented for sex and social determinants of health across Canada, including income quintile, education and residence in urban, rural and isolated locations. For the long-term outcome indicators pertaining to colorectal cancer, please refer to Colorectal Cancer—A Lens on the Continuum of Care, on pages 25 to 29 of this *Report*.

All Cancers

The age-standardized cancer incidence rate (ASIR) for cancers overall in Canada remained relatively stable from 1995 to 2006. There was a gradual decrease in the age-standardized mortality rate (ASMR) during the same time period. Based on rates for 2006 and on provinces with a population of more than one million persons, British Columbia evidenced the lowest incidence and mortality rates across the country. In fact, their rates were generally lower than the national average in Canada during the last decade (Figure 78).

Figure 78

Age-standardized incidence and mortality rates—all cancers
CANADA AND PROVINCE WITH LOWEST RATE—1995 TO 2006
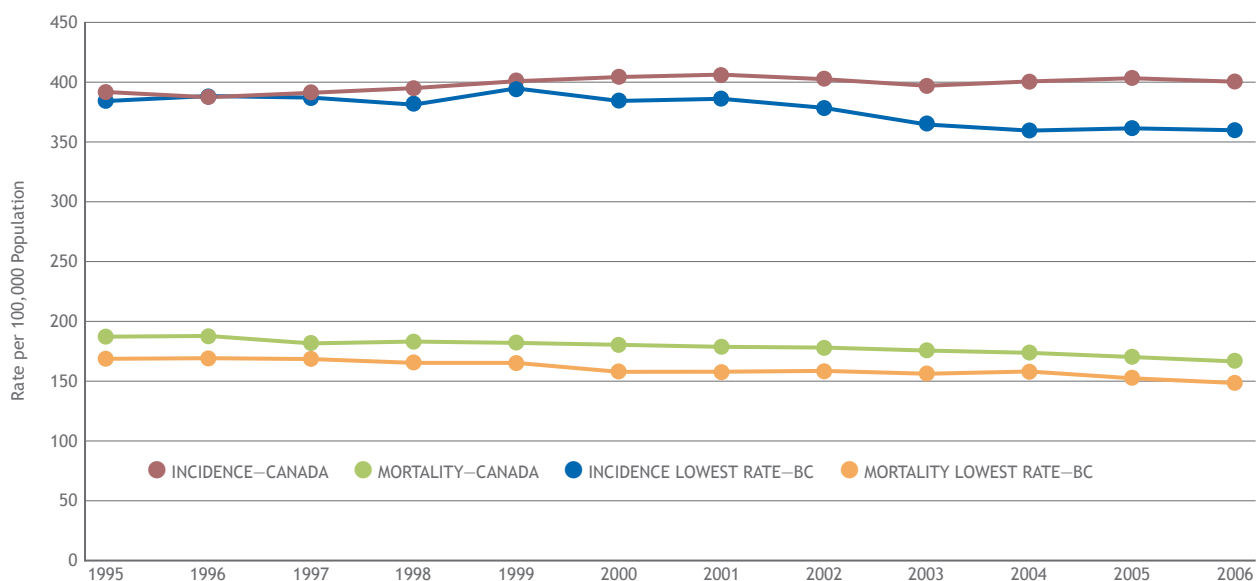
Note: Lowest Rate is based on provinces with a population of at least 1 million.
Data Source: Statistics Canada—Canadian Cancer Registry, Vital Statistics Death Database

Across Canada, there were differences among provinces in incidence (Figure 79) and mortality (Figure 80) rates for all cancers. In 2006, most of Atlantic Canada, Ontario and Quebec experienced higher incidence rates in comparison with Western Canada. The overall average ASIR for Canada was 400 per 100,000 people and ranged from 360 per 100,000 people in British Columbia to 472 per 100,000 people in Nova Scotia. Atlantic Canada and Quebec also experienced higher mortality rates in comparison to most of Western Canada and Ontario.

ASMRs ranged from 149 per 100,000 people in British Columbia to 194 per 100,000 people in Newfoundland and Labrador. Although Atlantic Canada, in general, evidenced higher incidence and mortality rates, the estimates have larger variability due to the small population in these provinces; thus, ASIRs and ASMRs may change substantially from year to year.

Figure 79

Age-standardized incidence rates—all cancers
BY PROVINCE—2006

Data Source: Statistics Canada, Canadian Cancer Registry

Figure 80

Age-standardized mortality rates—all cancers
BY PROVINCE—2006
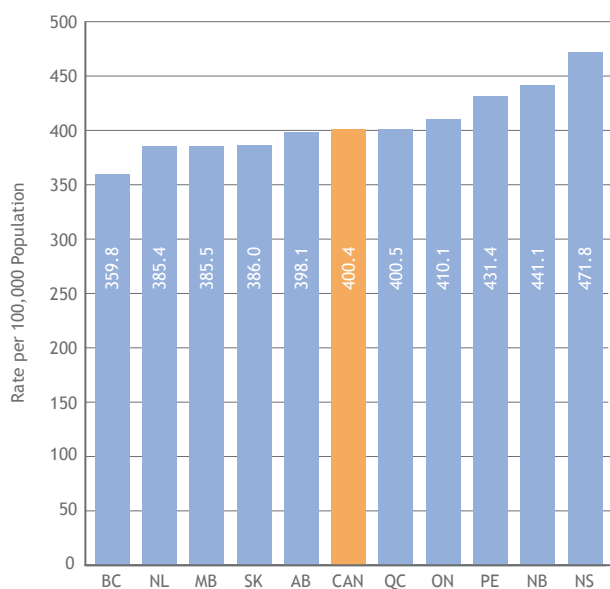
Data Source: Statistics Canada, Vital Statistics Death Database

The case fatality ratio (CFR) is the ratio of the number of deaths to the number of new cases of a particular cancer, expressed per 100 individuals. The CFR provides a crude measure of potential survival and is used to estimate cancer burden. It can also reflect deficits in reporting of incidence. In 2006, the CFR for Canada for all cancers was 42 per 100 individuals. The CFRs were relatively constant across Canada with the exception of Newfoundland and Labrador where the CFR was 50 per 100 individuals (Figure 81). This higher number could be largely attributable to under-reporting of incident cancers, as well as differences in stage at cancer presentation or differences in treatment.

Figure 81

Age-standardized case fatality ratio—all cancers
BY PROVINCE—2006
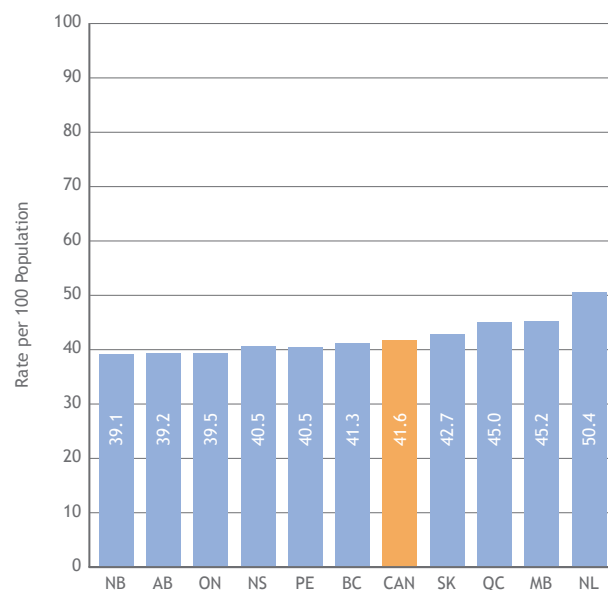
Data Source: Statistics Canada—Canadian Cancer Registry,
Vital Statistics Death Database

Males and females in Canada experienced different rates in cancer incidence and mortality. The most common cancers for females are breast, lung and colorectal cancer, and the incidence rates for these three cancers remained fairly stable for women throughout the last decade, although lung cancer did increase from 42 per 100,000 women in 1996 to 47 per 100,000 in 2006 (data not shown). The most common cancers for males are prostate, lung and colorectal cancer. The incidence of prostate cancer increased slightly for men over the last decade and colorectal cancer remained stable. Lung cancer incidence dropped for men, from 82 per 100,000 men in 1996 to 68 per 100,000 men in 2006. This reflects the different patterns of smoking prevalence and cessation among men and women in the past few decades (men smoked in greater numbers earlier on but began quitting earlier than women). Nevertheless, ASIRs for all cancers throughout the time period measured remained much higher for men than for women (Figure 82).

Age-standardized mortality rates for all cancers in Canada decreased measurably for males and females throughout the time period, from 237 per 100,000 men in 1996 to 202 per 100,000 men in 2006 and from 155 per 100,000 women in 1996 to 142 per 100,000 women in 2006 (Figure 83).

Figure 82

Age-standardized incidence rates—all cancers
**TIME TRENDS BY SEX, CANADA—1996 TO 2006**
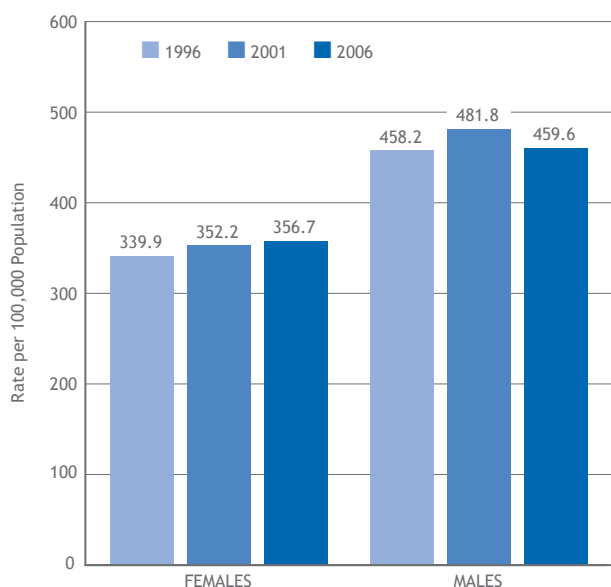
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 83

Age-standardized mortality rates—all cancers
TIME TRENDS BY SEX, CANADA—1996 TO 2006
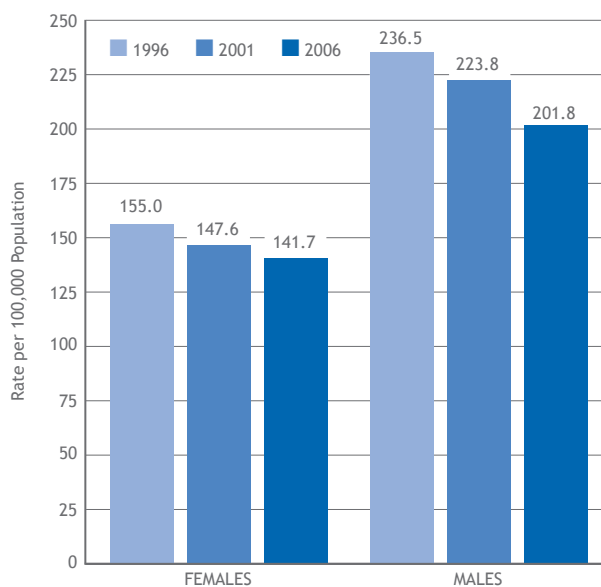
Data Source: Statistics Canada, Vital Statistics Death Database

Age-standardized incidence rates for all cancers in Canada were relatively similar across all income quintiles for women in 2006, with the highest incidence occuring in the lowest income quintile. There was a slightly larger difference for men, however, with incidence in the lowest income quintile considerably higher than in the highest income quintile (483 per 100,000 as compared to 459 per 100,000, respectively) (Figure 84). ASIRs were lowest for both women and men living in urban areas as compared to isolated areas and increased for women residing in progressively more isolated locations (Figure 85).

Figure 84

Age-standardized incidence rates—all cancers
INCOME BY SEX, CANADA—2006
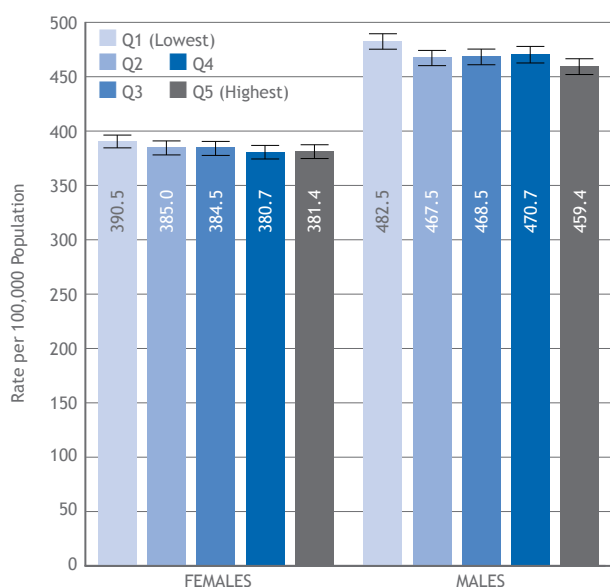
Legend: Q1 (Lowest), Q2, Q3, Q4, Q5 (Highest)

FEMALES: 390.5, 385.0, 384.5, 380.7, 381.4
MALES: 482.5, 467.5, 468.5, 470.7, 459.4

Rate per 100,000 Population

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 85

Age-standardized incidence rates—all cancers
GEOGRAPHY BY SEX, CANADA—2006
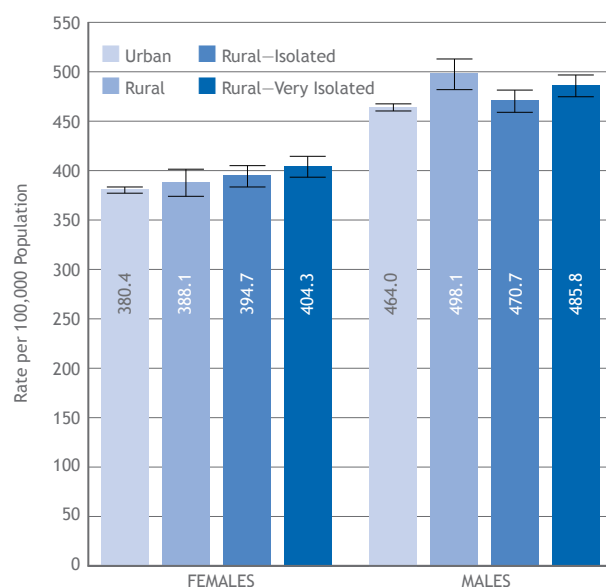
Legend: Urban, Rural, Rural—Isolated, Rural—Very Isolated

FEMALES: 380.4, 388.1, 394.7, 404.3
MALES: 464.0, 498.1, 470.7, 485.8

Rate per 100,000 Population

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Cancer Registry

Age-standardized mortality rates for all cancers in Canada evidenced a similar trend for women and for men, with highest mortality occurring in the lowest income quintile and decreasing with increased income; however, the gradient was sharper for men than for women (Figure 86). As with incidence, ASMRs were also lowest among those living in urban areas. For women, the rates were relatively similar in urban and rural locations, but there was a marked trend of increasing mortality for men residing in rural areas of increasing isolation (Figure 87).

Figure 86

Age-standardized mortality rates—all cancers
INCOME BY SEX, CANADA—2006

Legend: Q1 (Lowest), Q2, Q3, Q4, Q5 (Highest)

FEMALES: 141.5, 134.3, 133.4, 132.4, 124.3
MALES: 215.3, 200.3, 191.9, 182.1, 171.9

Rate per 100,000 Population

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Vital Statistics Death Database

Figure 87

Age-standardized mortality rates—all cancers
GEOGRAPHY BY SEX, CANADA—2006
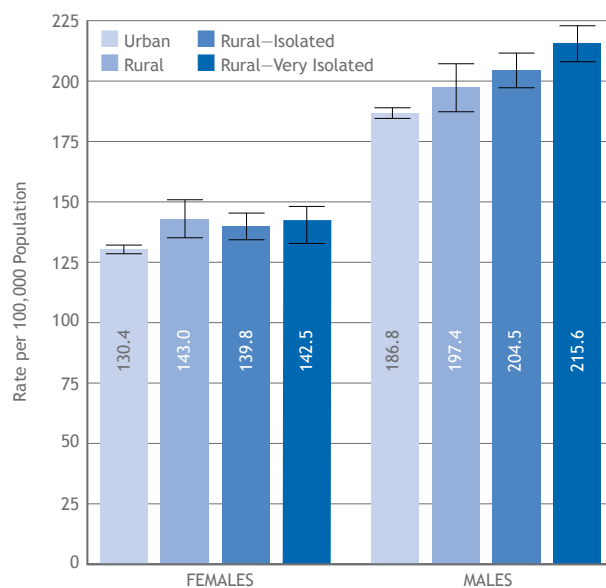
Legend: Urban, Rural, Rural—Isolated, Rural—Very Isolated

FEMALES: 130.4, 143.0, 139.8, 142.5
MALES: 186.8, 197.4, 204.5, 215.6

Rate per 100,000 Population

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Vital Statistics Death Database

Breast Cancer

Breast cancer incidence fluctuated somewhat between 1995 and 2006, but overall rates remained relatively stable throughout the decade. Mortality rates declined from 29 per 100,000 in 1995 to 22 per 100,000 in 2006. Based on rates for 2006 and on provinces with a population of more than one million persons, British Columbia evidenced the lowest breast cancer incidence and mortality rates across the country (Figure 88).

Figure 88

Age-standardized incidence and mortality rates—breast cancer
CANADA AND PROVINCE WITH LOWEST RATE—1995 TO 2006

Note: Lowest Rate is based on provinces with a population of at least 1 million; in 2006 Newfoundland had the lowest incidence rate across all provinces.
Data Source: Statistics Canada—Canadian Cancer Registry, Vital Statistics Death Database

The five-year relative survival ratio for breast cancer improved slightly in the last decade from 85% for patients diagnosed in 1995 to 1997 to 87% for patients diagnosed in 2001 to 2005 (Figure 89), probably reflecting improvements in early detection and treatment.

Incidence rates for breast cancer followed a reverse trend as compared to cancers overall regarding income quintile, with rates of 91 per 100,000 and 102 per 100,000 in the lowest and highest income quintiles, respectively. There was a lesser gradient in geographic location of residence, with those living in the most isolated location having the lowest incidence of breast cancer and those living in urban areas having the highest (Figure 90). There was very little difference in mortality rates for breast cancer in Canada by income quintile and geographic residence (Figure 91).

Figure 89

Relative survival ratios—breast cancer
BY DIAGNOSIS PERIOD, CANADA

● 1995-1997 ● 1998-2000 ● 2001-2005
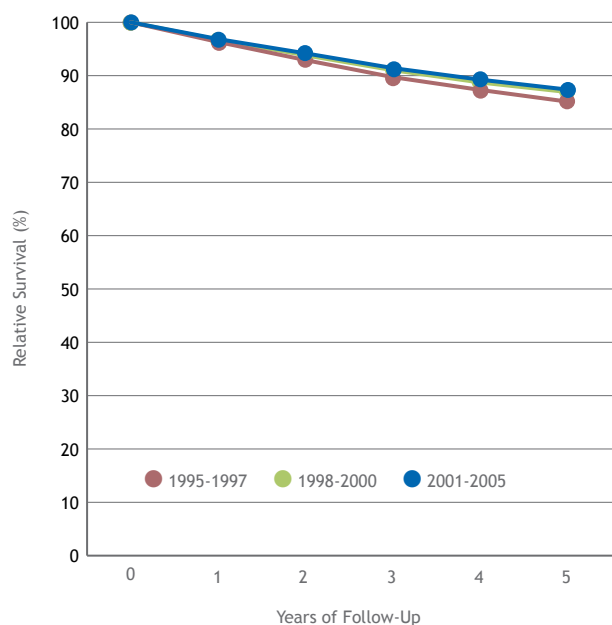
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 90

Age-standardized incidence rates—breast cancer
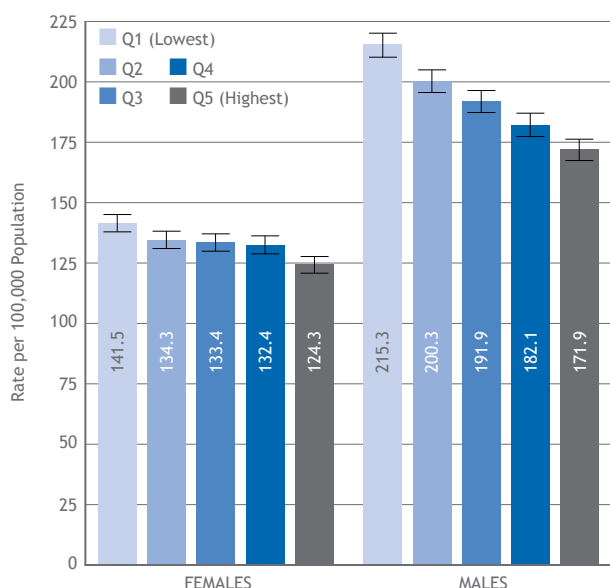**BY INCOME QUINTILE AND GEOGRAPHY, CANADA—2006**
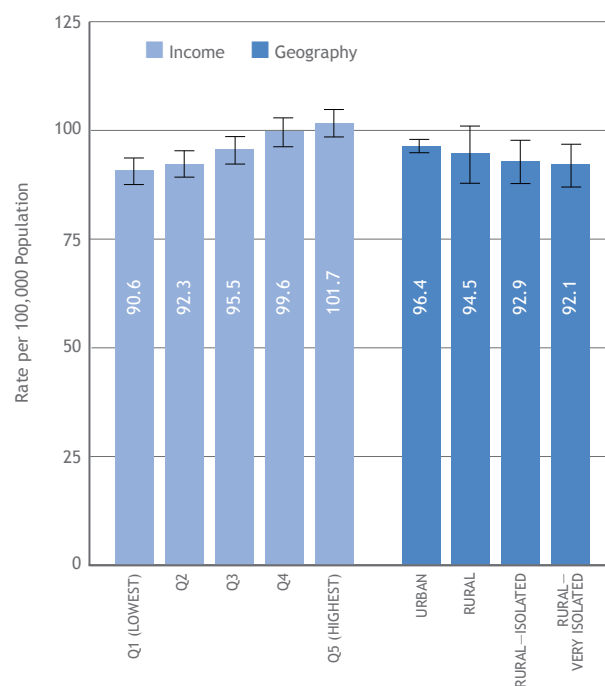
■ Income ■ Geography

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 91

Age-standardized mortality rates—breast cancer
BY INCOME QUINTILE AND GEOGRAPHY, CANADA—2006
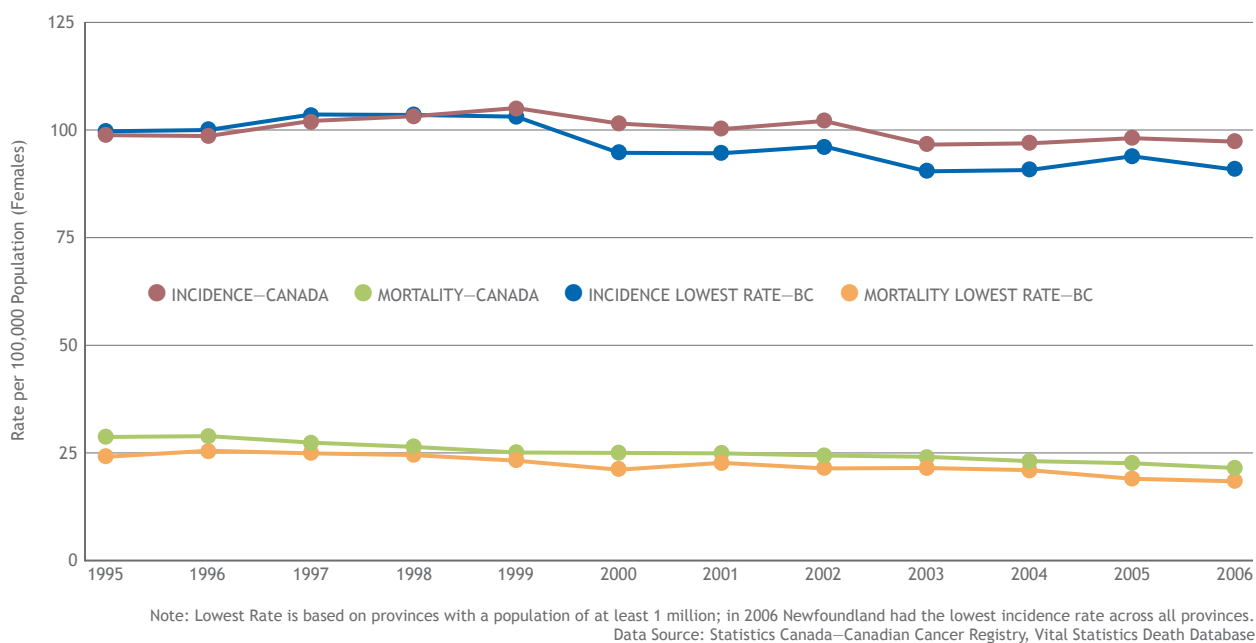

■ Income ■ Geography
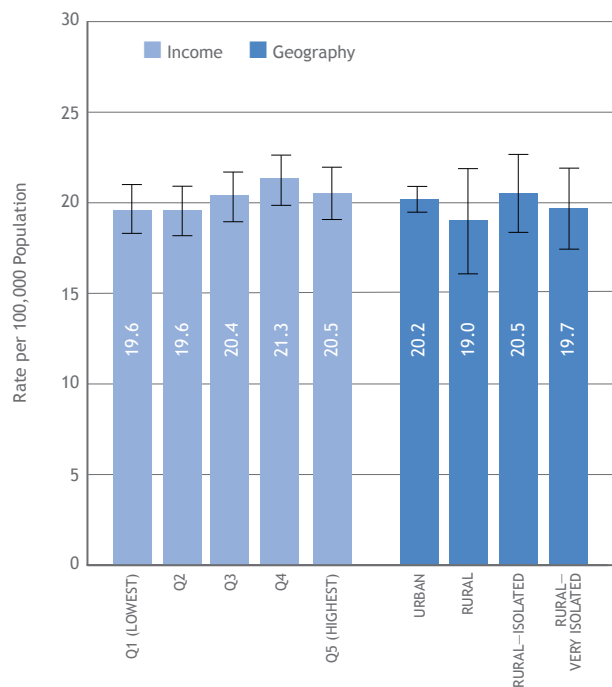
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Vital Statistics Death Database

Colorectal Cancer

Surveillance statistics, including incidence, mortality and survival for colorectal cancer are described in the special focus section "Colorectal Cancer—A Lens on the Continuum of Care" on pages 25 to 29 of this *Report*.

Lung Cancer

Incidence and mortality rates for lung cancer declined very slightly over the last decade: incidence declined from 60 per 100,000 people in 1995 to 56 per 100,000 people in 2006; and mortality declined from 49 per 100,000 people in 1995 to 46 per 100,000 people in 2006. Based on rates for 2006 and on provinces with a population of more than one million persons, British Columbia evidenced the lowest lung cancer incidence rates and Alberta the lowest lung cancer mortality rates across the country (Figure 92).

Figure 92

Age-standardized incidence and mortality rates—lung cancer
**CANADA AND PROVINCE WITH LOWEST RATE—1995 TO 2006**
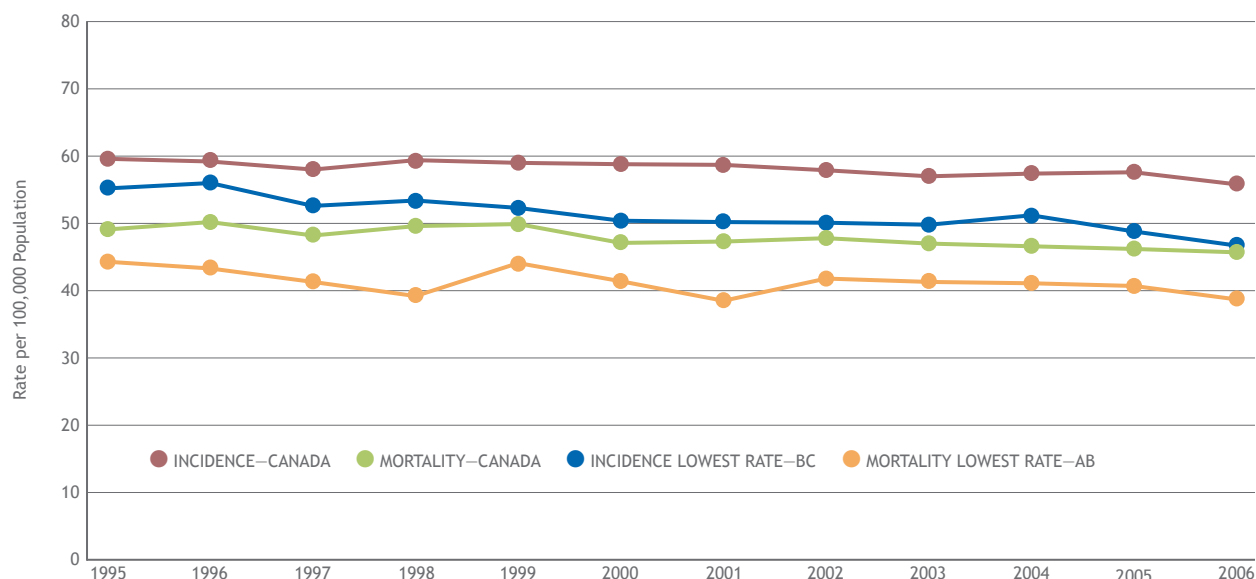
Legend: INCIDENCE—CANADA ● MORTALITY—CANADA ● INCIDENCE LOWEST RATE—BC ● MORTALITY LOWEST RATE—AB

Note: Lowest Rate is based on provinces with a population of at least 1 million.
Data Source: Statistics Canada—Canadian Cancer Registry, Vital Statistics Death Database

As was the case for colorectal cancer in 2006, there were considerable differences in rates among provinces, with both incidence and mortality being higher in Atlantic Canada and Quebec as compared to Western Canada. In fact, lung cancer incidence rates were approximately 50 percent higher in New Brunswick as compared to British Columbia (Figure 93), and lung cancer mortality rates were just below 50 percent higher in Nova Scotia as compared to Alberta (Figure 94).

Figure 93

Age-standardized incidence rates—lung cancer
BY PROVINCE—2006
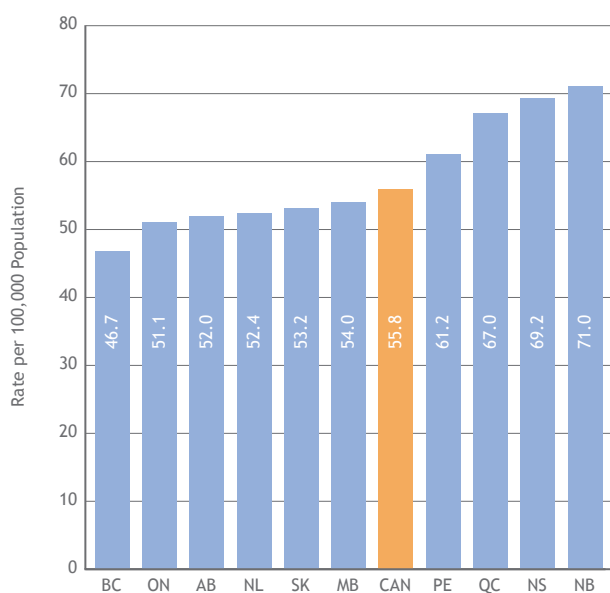
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 94

Age-standardized mortality rates—lung cancer
BY PROVINCE—2006
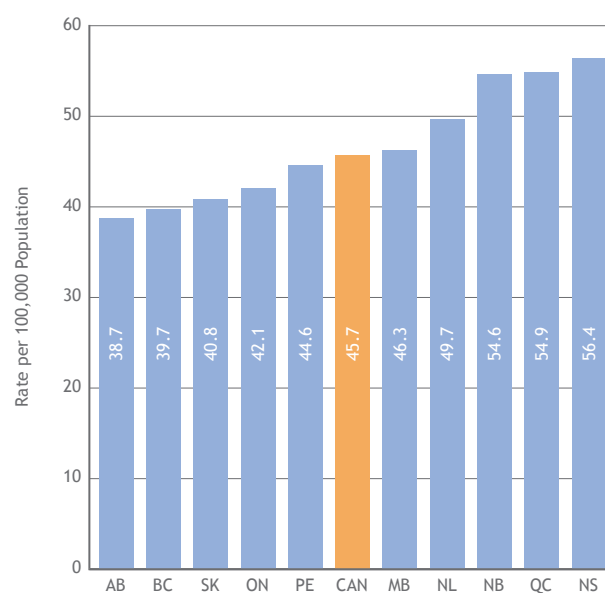
Data Source: Statistics Canada, Vital Statistics Death Database

Lung cancer ASIRs in Canada continued to be considerably higher for males as compared to females, with rates increasing slightly for women in the measurement period and decreasing significantly for men. The same trend was true for lung cancer mortality; ASMR's increased for women from 31 per 100,000 in 1995 to 37 per 100,000 in 2006 and decreased from 73 per 100,000 in 1996 for men to 58 per 100,000 in 2006 (Figure 95). Both trends may largely reflect past patterns in tobacco use and tobacco cessation.

Figure 95

Age-standardized incidence and mortality rates—lung cancer
BY SEX, CANADA—1995 TO 2006
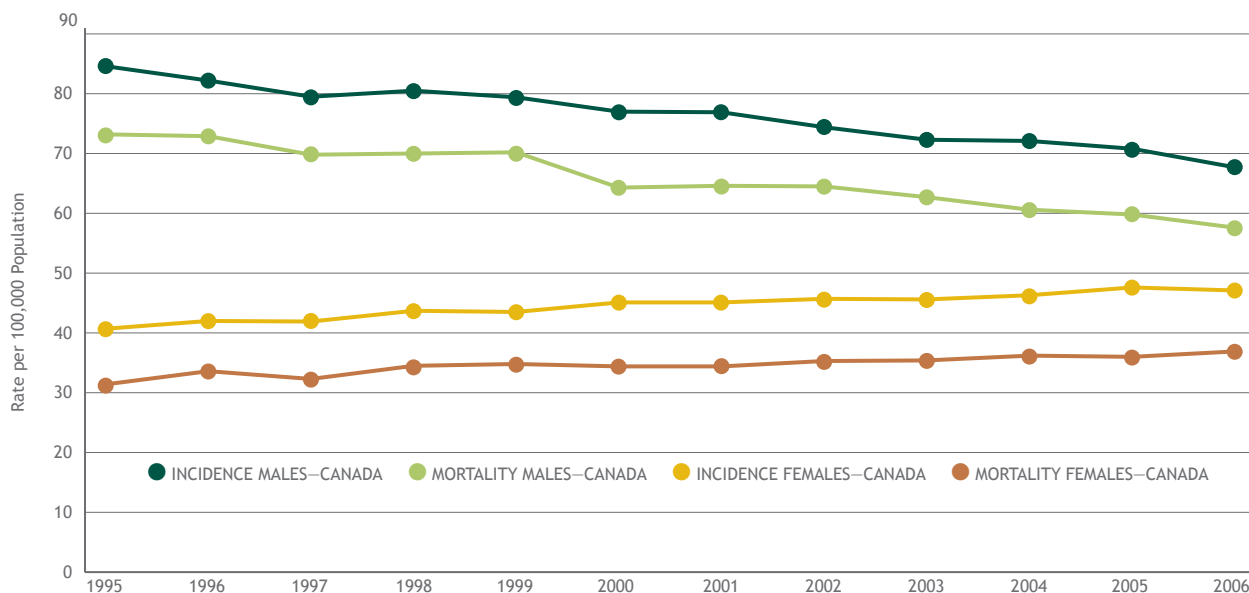
Data Source: Statistics Canada—Canadian Cancer Registry, Vital Statistics Death Database

Lung cancer incidence increases with age. While overall incidence rates are falling, the trend is true only for those under the age of 75 (Figure 96), and rates are still higher for those over 75 in 2006 as compared to 1996. This reflects secular patters occurring when a population begins to reduce tobacco use; in general, rates fall first in younger age groups.[70]

Figure 96

Age-standardized incidence rates—lung cancer
BY AGE GROUP, CANADA—1996 AND 2006
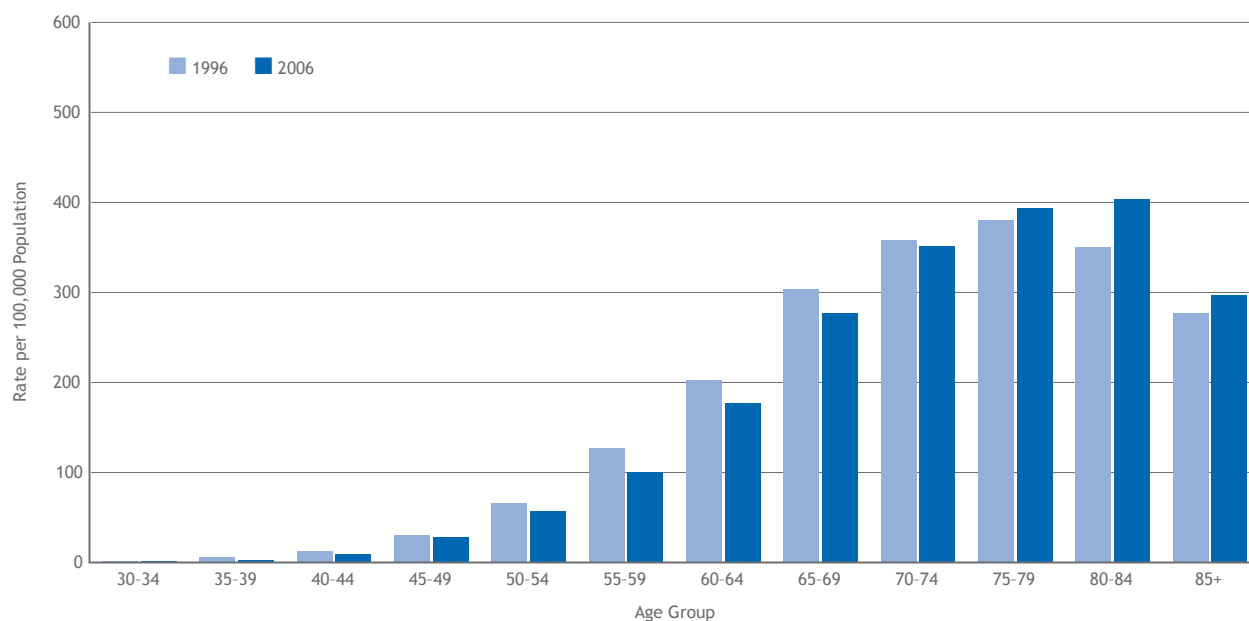
Data Source: Statistics Canada, Canadian Cancer Registry

Lung cancer incidence rates in 2006 were highest for those in the lowest income quintile and followed a clearly decreasing trend from lowest to highest income quintile for both women and men; however, the gradient was sharper for men with rates of 86 per 100,000 in the lowest income quintile and 50 per 100,000 in the highest income quintile (Figure 97). ASIRs for both men and women were again lowest in urban areas and higher in rural and isolated areas (Figure 98).

Figure 97

Age-standardized incidence rates—lung cancer
INCOME BY SEX, CANADA—2006
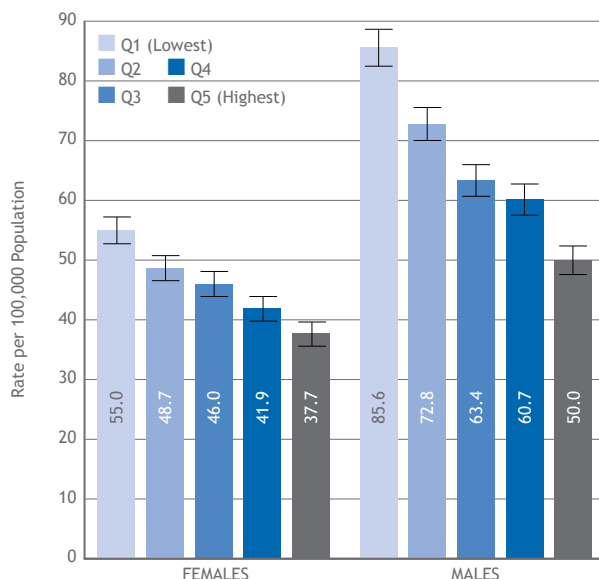
Q1 (Lowest)
Q2
Q3
Q4
Q5 (Highest)

Rate per 100,000 Population

FEMALES: 55.0, 48.7, 46.0, 41.9, 37.7
MALES: 85.6, 72.8, 63.4, 60.7, 50.0

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 98

Age-standardized incidence rates—lung cancer
GEOGRAPHY BY SEX, CANADA—2006
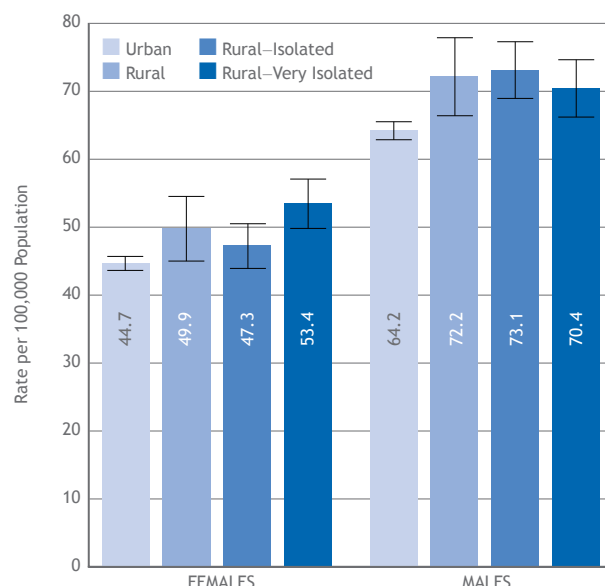
Urban
Rural
Rural–Isolated
Rural–Very Isolated

Rate per 100,000 Population

FEMALES: 44.7, 49.9, 47.3, 53.4
MALES: 64.2, 72.2, 73.1, 70.4

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Cancer Registry

Lung cancer mortality shared the same marked trend for men and women by income quintile (Figure 99). For lung cancer mortality by geographic location, ASMRs were again lowest in urban areas for both men and women and evidenced an increasing gradient for men according to increasing levels of geographic isolation (Figure 100). This data reflects patterns described in the Smoking Prevalence and Smoking Cessation indicators in the Prevention section of this *Report*.

Figure 99

Age-standardized mortality rates—lung cancer
INCOME BY SEX, CANADA—2006

Q1 (Lowest)
Q2
Q3
Q4
Q5 (Highest)

Rate per 100,000 Population

FEMALES: 40.3, 37.2, 33.8, 33.5, 28.5
MALES: 70.3, 59.2, 54.2, 49.8, 41.8

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Vital Statistics Death Database

Figure 100

Age-standardized mortality rates—lung cancer
GEOGRAPHY BY SEX, CANADA—2006
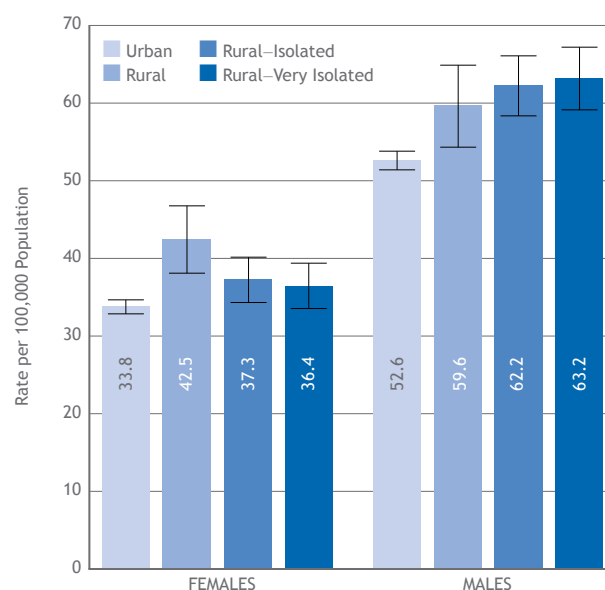
Urban
Rural
Rural–Isolated
Rural–Very Isolated

Rate per 100,000 Population

FEMALES: 33.8, 42.5, 37.3, 36.4
MALES: 52.6, 59.6, 62.2, 63.2

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Vital Statistics Death Database

Five-year relative survival for lung cancer remains poor, and there is little evidence of improvement (Figure 101). For patients diagnosed in 2001 to 2005, five-year relative survival ranged from 11.7% in Prince Edward Island to 18.1% in Manitoba (data not shown).

Figure 101

Relative survival ratios—lung cancer
BY DIAGNOSIS PERIOD, CANADA
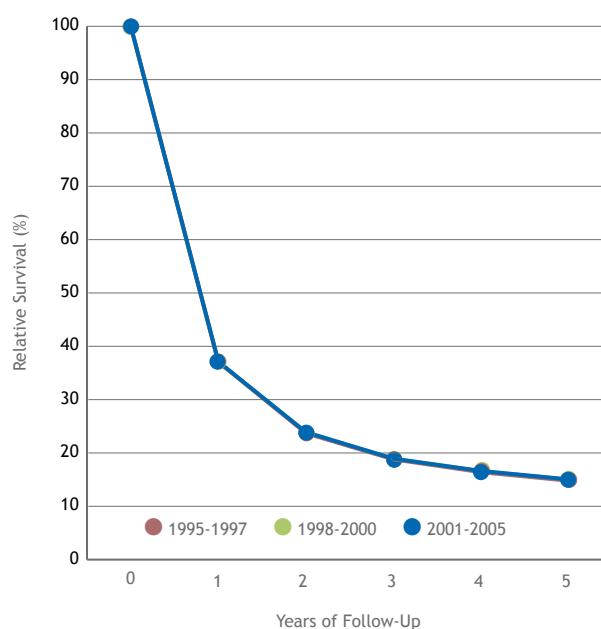
Note: Survival for the periods of 1995-1997 and 1998-2000 are not visible as they are nearly identical to 2001-2005 and the lines are superimposed.
Data Source: Statistics Canada, Canadian Cancer Registry

Prostate Cancer

The incidence of prostate cancer rose slightly between 1995 and 2006, whereas mortality due to prostate cancer declined during the same period. Based on rates for 2006 and on provinces with a population of more than one million persons, Quebec evidenced the lowest incidence and mortality rates across the country (Figure 102). Incidence rates varied among provinces for 2006 (data not shown), which may be partly due to differences in the use of the prostate specific antigen (PSA) test across the country.

As with breast cancer incidence, ASIRs for prostate cancer followed a markedly increasing gradient from lowest to highest income quintile, although there was no particular trend evidenced by location of residence; this may again reflect differences in PSA use (Figure 103). Conversely, age-standardized mortality rates for prostate cancer were relatively stable across income quintile but followed an increasing trend by location of residence, with fewer deaths in males in urban areas as compared to males residing in areas of increasing isolation (Figure 104).

Figure 102

Age-standardized incidence and mortality rates—prostate cancer
CANADA AND PROVINCE WITH LOWEST RATE—1995 TO 2006
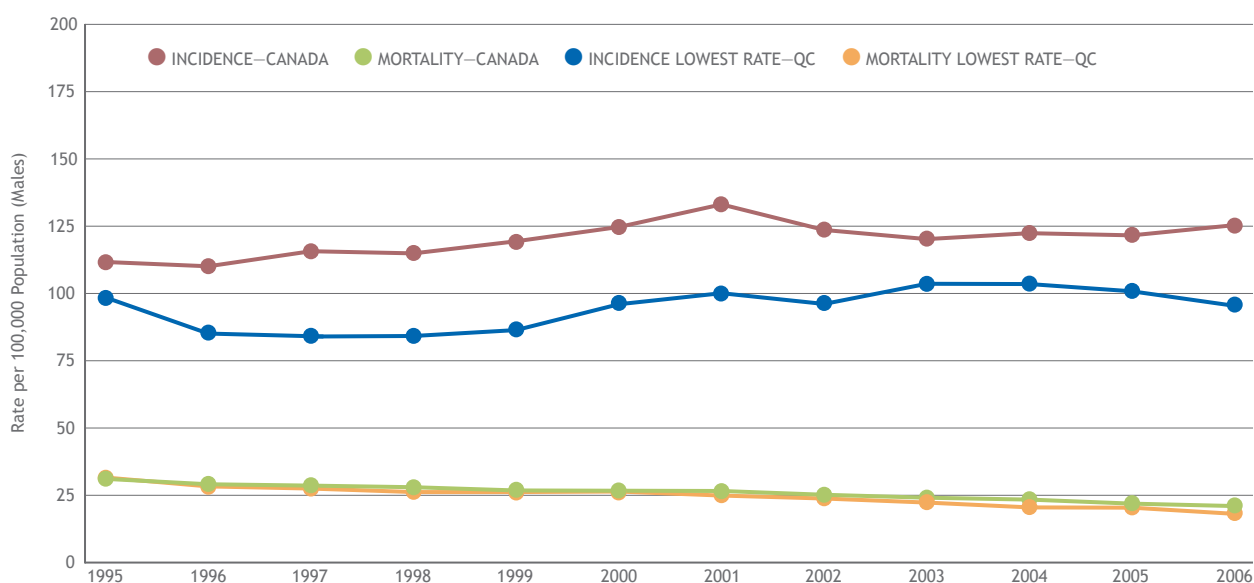
● INCIDENCE—CANADA ● MORTALITY—CANADA ● INCIDENCE LOWEST RATE—QC ● MORTALITY LOWEST RATE—QC

Note: Lowest Rate is based on provinces with a population of at least 1 million.
Data Source: Statistics Canada—Canadian Cancer Registry, Vital Statistics Death Database

Figure 103

Age-standardized incidence rates—prostate cancer
BY INCOME QUINTILE AND GEOGRAPHY, CANADA—2006
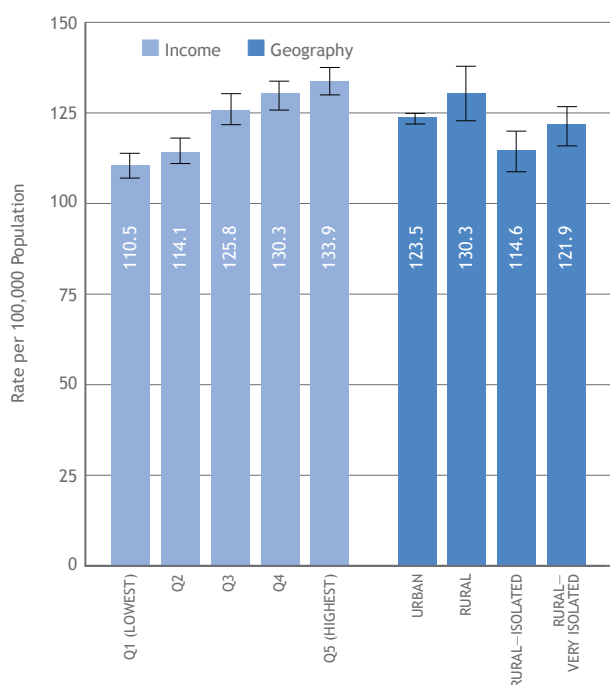
Income   Geography

Q1 (LOWEST): 110.5
Q2: 114.1
Q3: 125.8
Q4: 130.3
Q5 (HIGHEST): 133.9
URBAN: 123.5
RURAL: 130.3
RURAL—ISOLATED: 114.6
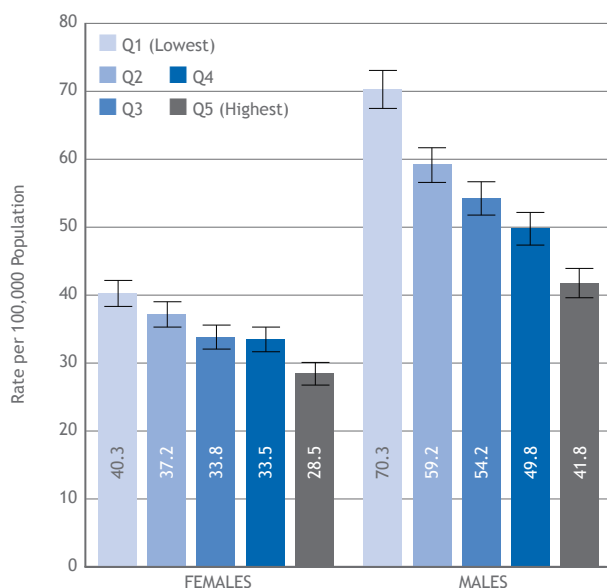RURAL—VERY ISOLATED: 121.9

Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Canadian Cancer Registry

Figure 104

Age-standardized mortality rates—prostate cancer
BY INCOME QUINTILE AND GEOGRAPHY, CANADA—2006

Income   Geography

Q1 (LOWEST): 19.2
Q2: 18.0
Q3: 19.7
Q4: 19.6
Q5 (HIGHEST): 20.3
URBAN: 18.0
RURAL: 21.5
RURAL—ISOLATED: 23.5
RURAL—VERY ISOLATED: 24.0
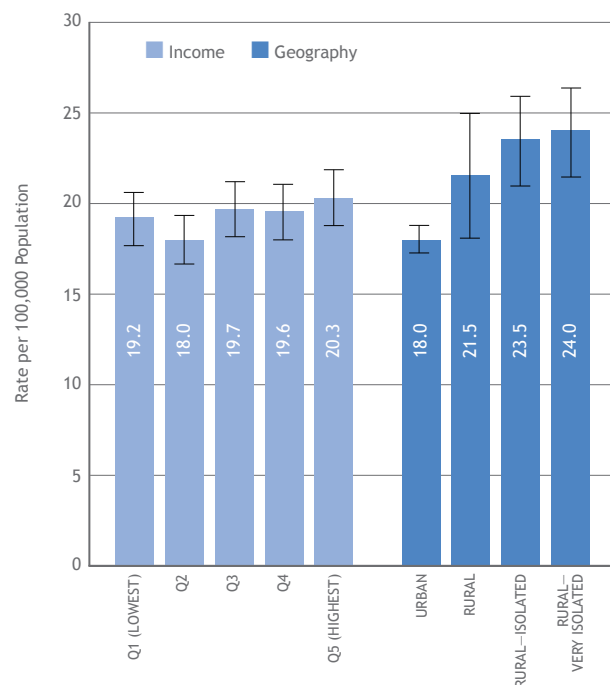
Note: 95% confidence intervals are indicated on figure.
Data Source: Statistics Canada, Vital Statistics Death Database

IV

Moving Forward

The *2010 System Performance Report* builds on *The System Performance Initiative—A First Year Report (2009)*, by refreshing indicator results with updated data, deepening analysis where possible on social determinants of health and adding new indicators, particularly in the Diagnosis and Treatment domain, an area identified by stakeholders in 2009 as representing a gap in indicator reporting.

This year's *Report* also includes indicators presented along thematic lines through two special focus sections: colorectal cancer and radiation therapy. The first evaluates system performance along the continuum of care and outcomes in an examination of one cancer site; and the second examines a treatment modality by reporting on measures of capacity, utilization, access (wait times) and guideline concordance. Finally, the *2010 Report* investigates selected indicators more deeply in an attempt to better understand factors underlying indicator results and shed light on findings such as interprovincial variability. It is hoped that the information in this year's *Report* will help add to the understanding of cancer control in Canada and stimulate discussion on possible reasons underlying the variations and patterns observed.

Over the next months, the System Performance Initiative, in collaboration with provincial partners, plans to deepen selected findings from the *2010 Report* and present them in two supplemental bulletins. One stream of work will focus on population health factors that have an impact on cancer incidence and mortality, particularly in recent immigrant populations across Canada. The second analysis will focus on gaining a better understanding of the guideline concordance indicator results.

Further work is still required to develop a valid set of indicators in the Supportive Care and Survivorship domain. Concerted efforts are underway around the country to define meaningful measures and develop the required data collection mechanisms. At this time, however, comparable data are scarce at a pan-Canadian level. Upcoming System Performance Reports will continue to focus and report on this domain.

The System Performance Initiative will continue to work in collaboration and leverage expertise from the pan-Canadian System Performance Working Group and from stakeholders across the country in what has become a valuable joint effort in system performance measurement. The results contained in this *Report* are intended to catalyze discussions leading to a better understanding of cancer control and identify successes and gaps in the cancer control continuum in Canada. Taken as a whole, these continuing discussions and collaborative work will build momentum toward ultimately reducing the burden of cancer in Canada and enhancing the quality of life for Canadians affected by this disease.

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Technical Appendix

Prevention

SMOKING PREVALENCE

DEFINITION:
Percentage of population aged 12 years and older in each specified group—daily, occasional, former or never smokers

NUMERATOR:
Number of daily, occasional, former or never smokers

DENOMINATOR:
All respondents, aged 12+

DATA SOURCE:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2000-01 (CCHS Cycle 1.1); 2003 (CCHS Cycle 2.1); 2005 (CCHS Cycle 3.1); CCHS 2007; CCHS 2008 —Pan-Canadian data

CCHS VARIABLES:
- 100 or more cigarettes during lifetime
- Ever smoked a whole cigarette
- Type of smoker at present time
- Ever smoked cigarettes daily

STRATIFICATION VARIABLES:
Income, education, urban/rural/rural-isolated/rural-very isolated (see CCHS stratification variables on page 113)

SMOKING QUIT ATTEMPTS

DEFINITION:
Percentage of recent smokers aged 20 and older who quit smoking in the last 2 years

NUMERATOR:
Recent quitters (former smokers who are not currently smoking at the time of the survey) who have quit for 2 years or less

DENOMINATOR:
Recent quitters plus current smokers (those who are currently daily or occasional smokers)

DATA SOURCES:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2003 (CCHS Cycle 2.1); 2005 (CCHS Cycle 3.1); CCHS 2007; CCHS 2008—Pan-Canadian data

CCHS VARIABLES:
- Current smoking status
- Number of years stopped smoking daily
- Number of years stopped smoking completely

STRATIFICATION VARIABLES:
Age, income, education, urban/rural/rural-isolated/rural-very isolated (see CCHS stratification variables on page 113)

NOTES:
This indicator could not be derived in Cycle 1.1 (2000-01) because respondents were asked only whether they had stopped smoking daily. Someone could have switched from being a daily smoker to an occasional smoker, so it would be impossible to determine if they had stopped smoking completely. From Cycle 2.1 onward, additional questions were asked: "When you stopped smoking daily, was this when you completely stopped? If not, when did you stop smoking completely?"

OVERWEIGHT & OBESITY

DEFINITION:
Percentage of adults aged 18 years and older in each BMI group—underweight (BMI < 18.00); normal weight (BMI 18.01-24.99); overweight (BMI 25.00-29.99) or obese (BMI 30.00+)

NUMERATOR:
Number of adults underweight, normal weight, overweight or obese

DENOMINATOR:
Total number of adult respondents with valid height and weight responses

EXCLUSIONS:
Pregnant women, lactating women, persons less than 3 feet tall or greater than 6 feet 11 inches

DATA SOURCE:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2003 (CCHS Cycle 2.1); 2005 (CCHS Cycle 3.1); CCHS 2007; CCHS 2008—Pan-Canadian data

CCHS VARIABLES:
- Self-reported weight (kg)
- Self-reported height (m)
- Calculated BMI values: $BMI=weight/(height)^2$

STRATIFICATION VARIABLES:
Sex, income, education, urban/rural/rural-isolated/rural-very isolated (see CCHS stratification variables on page 113)

NOTES:
Although heights and weights were reported in CCHS Cycle 1.1 (2000-01), they are not included in this analysis because the age range differed from subsequent years (Adults: 20-64).

ALCOHOL CONSUMPTION

DEFINITION:
Percentage of adults aged 18 and older who reported exceeding the low-risk drinking guideline as defined below:

Low-Risk Drinking Guideline: An AVERAGE of no more than 2 drinks per day for males, and an AVERAGE of no more than 1 drink per day for females. The daily average was calculated based on the total number of drinks the respondent reported consuming in the week prior to the CCHS interview, divided by 7 days.

NUMERATOR:
Number of adults (>18 years) who reported exceeding the low-risk drinking guideline

DENOMINATOR:
All adult respondents (>18 years)

EXCLUSIONS:
Respondents who had missing alcohol consumption information for any day during the week preceding the interview

DATA SOURCE:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2000-01 (CCHS Cycle 1.1); 2003 (CCHS Cycle 2.1); 2005 (CCHS Cycle 3.1)—Pan-Canadian Data; CCHS 2007 — Optional content available for NL, NS, ON, BC, NV

CCHS VARIABLES:
- During the past 12 months, have you had a drink of beer, wine, liquor or any other alcoholic beverage?
- Thinking back over the past week, did you have a drink of beer, wine, liquor or any other alcoholic beverage?
- How many drinks did you have on each day during the past week?

STRATIFICATION VARIABLES:
Sex, age, income, education, urban/rural/rural-isolated/rural-very isolated (see CCHS stratification variables on page 113)

NOTES:
A national estimate was not calculated for 2007 or 2008 as data are not available for all provinces/territories.

PHYSICAL ACTIVITY

DEFINITION:
Percentage of population aged 15-75 years in each physical activity level—inactive (<15.4 KKD); moderately active (15.4-27.6 KKD); active (27.7+ KKD)

The average amount of energy expended daily was calculated by combining the three areas of activity: leisure, transportation and occupation-based activities. Physical activity is measured in kilocalories per day (KKD).

Kilocalories per day (KKD) for each activity is calculated by (hours of activity per week × 52 weeks per year) × activity expenditure (MET values)/365 days per year.

Activity expenditure (MET value) is the energy cost of the activity expressed as kilocalories expended per kilogram of body weight per hour of activity.

NUMERATOR:
Number of respondents who are inactive, moderately active or active

DENOMINATOR:
All respondents, aged 15-75

DATA SOURCE:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2005 (CCHS Cycle 3.1)—Pan-Canadian data, for leisure, transportation and occupation combined

CCHS VARIABLES:
- Type of physical activities for leisure, transportation and work-related activities
- Number of hours spent on the physical activities for leisure, transportation and work-related activities

STRATIFICATION VARIABLES:
Sex, income, education, urban/rural/rural-isolated/rural-very isolated (see CCHS stratification variables, page 113)

NOTES:
1. If respondent is unemployed or disabled, the occupational energy is zero.

2. Work-related activities were not captured in the 2007/2008 CCHS survey, thus data are restricted to the CCHS 2005 cycle.

3. Examples of leisure activities include gardening, walking, playing soccer, skiing; transportation activities include walking or cycling; occupation-based activities include sitting, walking, lifting light loads, climbing and heavy work.

4. Cut points for the categories were determined based on tertiles of the observed data.[1]

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[1] Probert A, Tremblay MS, Gorber SC Desk Potatoes: The importance of occupational physical activity on health. *Cdn J of Pub Health*. 2008; 99:311-318.

Screening

BREAST CANCER SCREENING-MAMMAGRAPHY

DEFINITION:
The percentage of asymptomatic females aged 50-69 receiving a mammogram within the past 2 years, where asymptomatic is defined as:

Asymptomatic: Respondents who indicated going for a mammogram for any of following reasons:

- Family history; Routine screen/check-up; Age; HRT while answering NO for **ALL** of the following:

- Lump; Breast problem; Follow-up to breast cancer treatment; Other

NUMERATOR:
Asymptomatic female aged 50-69 who indicated going for a mammogram within the past 2 years

DENOMINATOR:
Asymptomatic females aged 50-69

DATA SOURCES:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2000-01 (CCHS Cycle 1.1); 2003 (CCHS Cycle 2.1); 2005 (CCHS Cycle 3.1); CCHS 2008—Pan-Canadian data; CCHS 2007 —Optional content available for NL, NS, NB, ON, SK and NT

CCHS VARIABLES:
- Ever had a mammogram

- Reasons for having mammogram (mark all that apply): Family history; Routine screen; Age; HRT; Lump; Follow-up to breast cancer treatment; Breast problem; Other

- Last time respondent had undergone a mammogram

STRATIFICATION VARIABLES:
Income, education, urban/rural/rural-isolated/rural-very isolated (see CCHS stratification variables on page 113)

NOTES:
CCHS 2007 (Cycle 4.1) is not included in this analysis as data are not available for all provinces/territories.

CERVICAL CANCER SCREENING—PAP TESTING

DEFINITION:
Percentage of women aged 18-69 who reported having received a Papanicolaou (PAP) smear in the previous three years

NUMERATOR:
Number of women (18-69) who reported a PAP smear test in the past three years

DENOMINATOR:
Total number of female respondents aged 18-69

EXCLUSIONS:
Women who had a hysterectomy

DATA SOURCE:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2000-01 (CCHS Cycle 1.1); 2003 (CCHS Cycle 2.1); 2005 (CCHS Cycle 3.1)—Pan-Canadian Data CCHS 2007—Optional content available for NB, ON, SK and NT

CCHS VARIABLES:
- Have you ever had a PAP smear test?

- When was the last time?

- Have you had a hysterectomy?

STRATIFICATION VARIABLES:
Age, income, education, urban/rural/rural-isolated/ rural-very isolated (see CCHS stratification variables on page 113)

NOTES:
1. Overall percentages were age-standardized to the 1991 Canadian population.

2. Crude rates are used for analysis by age group and by socio-demographic variables (education, income quintile, urban/rural area).

3. A national estimate was not calculated for 2007 as data are not available for all provinces/territories.

COLORECTAL CANCER SCREENING—ASYMPTOMATIC

DEFINITION:
Percentage of asymptomatic individuals aged 50-74 who reported undergoing a colorectal cancer (CRC) screening test where asymptomatic is defined as:

Asymptomatic: Respondents who reported having a CRC screening test for any of the following reasons:

- Family history; Part of routine check-up/screening; Age; Race and not for any of the following reasons:

- Follow-up of a problem; Follow-up of colorectal cancer treatment; Other Reason

NUMERATOR:
1. Number of asymptomatic individuals aged 50-74 reporting having had an FOBT within the past 2 years

2. Number of asymptomatic individuals aged 50-74 reporting having had an FOBT within the past 2 years and/or a colonoscopy/sigmoidoscopy within the past 5 years

DENOMINATOR:
Total number of asymptomatic respondents aged 50-74

DATA SOURCE:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2008 (CCHS Cycle 5.1)—Pan-Canadian data
CRC data were available as optional content and selected by the following provinces: 2005 (CCHS Cycle 3.1)—NL, PE, NS, NB, ON, YK, NT, NV

CCHS VARIABLES:
- Have you ever had an FOBT test? When was the last time? Why did you have it?
- Have you ever had a colonoscopy or sigmoidoscopy? When was the last time? Why did you have it?

STRATIFICATION VARIABLES:
Sex, age, income, education, urban/rural/rural-isolated/rural-very isolated (see CCHS stratification variables on page 113)

COLORECTAL CANCER SCREENING—ANY REASON

DEFINITION:
Percentage of individuals aged 50-74 who reported undergoing a colorectal cancer (CRC) screening test for any reason (including diagnosis confirmation or follow-up)

NUMERATOR:
Number of individuals aged 50-74 reporting having had an FOBT within the past 2 years and/or a colonoscopy/sigmoidoscopy within the past 5 years

DENOMINATOR:
Total number of respondents aged 50-74

DATA SOURCE:
Canadian Community Health Survey

MEASUREMENT TIMEFRAME:
2008—Pan-Canadian data

CCHS VARIABLES:
- Have you ever had an FOBT test? When was the last time?
- Have you ever had a colonoscopy or sigmoidoscopy? When was the last time?

Diagnosis

CAPTURE OF STAGE DATA

DEFINITION:
Percentage of incident cancer cases for which stage data are collected by provincial cancer agencies

NUMERATOR:
Number of incident cases for which a stage value are available to the provincial cancer agency for:

1. All cancers
2. Breast
3. Colorectal
4. Lung
5. Prostate

DENOMINATOR:
Total number of stageable incident cancer cases:

1. All invasive cancers
2. Breast
3. Colorectal
4. Lung
5. Prostate

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
Diagnosis years: 2006, 2007, 2008

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NB, NS, PE, NL

PROVINCE SPECIFIC NOTES:
NB
- Colorectal data include Colon and Rectum (not Anus).
- Colorectal & Breast cases were staged through Collaborative Staging (CS) starting in 2008 (previously TNM).
- Prostate cases were staged though TNM for all years (only cases that underwent Radical Prostatectomy were staged).

GENERAL NOTES:
1. Only invasive incident cases that are stageable as per AJCC Cancer Staging Manual 7th Edition are included in denominator. *In-situ* and non-melanoma skin cases are excluded.

2. Indicator is based on data reported directly by the provinces for this *Report*. No separate validation or verification of the submitted data was done.

3. Staging can be based on AJCC TNM staging reported directly by clinicians and/or based on the Collaborative Staging methodology. Data from other staging systems or standards were not included as valid stage data in the indicator.

4. The Canadian Partnership Against Cancer has recently launched an initiative to support the implementation of Collaborative Staging across the country. Upon the conclusion of this initiative, complete staging is expected to be available from the participating provinces for the top four disease sites: Breast, Prostate, Lung and Colorectal, as of the 2010 diagnosis year.

PE   No PET scanners in province
NS   Unable to isolate cancer use only
NL   No PET scanners in province

GENERAL NOTES:
1. A proration was applied for PET scanners commissioned or decommissioned partway through the year based on number of days in service.

2. Only PET scanners used for cancer diagnosis and treatment were included in the calculations. PET scanners used exclusively for research were excluded.

PET SCANNER CAPACITY AND UTILIZATION

DEFINITIONS:
1. Per capita PET scanner machine availability

2. Per capita PET scanner exam rate

3. PET scanner machine utilization rate

NUMERATOR:
1. Number of operational PET scanners in the province used for cancer diagnosis and treatment

2. Total number of diagnostic exams performed on cancer patients on PET scanners

3. Total number of diagnostic exams performed on cancer patients on PET scanners

DENOMINATOR:
1. Total population above 54 years of age (the 20th percentile age at cancer diagnosis in Canada) in millions

2. Number of operational PET scanners in the province used for cancer diagnosis and treatment

3. Total population above 54 years of age (the 20th percentile age at cancer diagnosis in Canada) in millions

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2009 calendar year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, NB, NL, PE

PROVINCE SPECIFIC NOTES:
SK   No PET scanners in province
QC   Quebec reported having 12 PET scanners available for cancer use, but were unable is isolate cancer use only

WAIT TIMES: ABNORMAL BREAST SCREEN TO RESOLUTION

DEFINITION:
Time (in weeks) from abnormal breast screen to resolution (test date of definitive diagnosis)

POPULATION:
Women aged 50–69 participating in an organized breast screening program with an abnormal breast screen result (mammogram or clinical breast examination):

1. Requiring a tissue biopsy

2. Not requiring a tissue biopsy

MEASURES:
1. Median

2. 90th percentile

3. Percentage with resolution within the target wait time targets of 7 weeks for women requiring a tissue biopsy and 5 weeks for women not requiring a tissue biopsy[2]

DATA SOURCE:
Provincial breast cancer screening databases

MEASUREMENT TIMEFRAME:
2004–2008: BC, AB, SK, MB, ON, QC (2004–2006), NB, NS, NL

STRATIFICATION VARIABLE:
Age group (50–54), (55–59), (60–64), (65–69)

PROVINCE SPECIFIC NOTES:
AB   Data reported are from the Screen Test program only. Screen Test is an organized program that conducts approximately 10%–12% of screening mammograms in the province, about 65% of which are performed in mobile screening units.

PE   Data are unavailable due to insufficient system resources to report results for the specified timeframe.

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[2] Public Health Agency of Canada. *Organized Breast Cancer Screening Programs in Canada – Report on Program Performance in 2001 and 2002.* July 4, 2008. Available at: http://www.phac-aspc.gc.ca/publicat/2008/obcsp-podcs-03-04/back-cont-eng.php.

[3] Public Health Agency of Canada. *Organized Breast Cancer Screening Programs in Canada – Report on Program Performance in 2003 and 2004.* July 4, 2008. Available at: http://www.phac-aspc.gc.ca/publicat/2008/obcsp-podcs-03-04/back-cont-eng.php.

YK Yukon does not keep electronic records this jurisdiction is therefore excluded from the Canadian Breast Cancer Screening Database.[3]

NV Nunavut does not have an organized program, this jurisdiction is therefore excluded from the Canadian Breast Cancer Screening Database.[3]

NT Northwest Territories are not included in the wait times indicators as wait times data from this jurisdiction were not available at the time of analysis.

GENERAL NOTES:
The wait times presented must be evaluated in the context of the overall participation in organized breast cancer screening programs. Participation in organized breast cancer screening programs across Canada was calculated in 2-year intervals due to biennial recall. Figure A displays the participation rate by province, for women aged 50–69, for the 2003-04, 2005-06, 2007-08 screen years. Denominator includes total number of women aged 50-69 eligible for participation in the organized breast screening programs. These values are slightly different from the denominators used in previously published reports; therefore, the participation rates are not identical to those published. Northwest Territories data are not included in this figure as data were available only for 2004.

Research

DEFINITION:
The ratio of the total number of all patients (≤18 years) newly enrolled in cancer-related therapeutic trials or clinical research studies in 2009 to the total number of new cancer cases (≤18 years) diagnosed at pediatric cancer centres in 2009

NUMERATOR:
All patients (≤18 years) newly enrolled in cancer-related therapeutic trials or clinical research studies in 2009

DENOMINATOR:
New cancer cases (≤18 years) diagnosed at pediatric cancer centres in 2009

DATA SOURCE:
Reported by C[17] Council to the Canadian Partnership Against Cancer for this *Report*, collected April 2010

MEASUREMENT TIMEFRAME:
2009 calendar year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, QC, NS, NL

Figure A

Two-year participation rates for provincial breast screening programs
2003-04, 2005-06, 2007-08

	BC	AB	SK	MB	ON	QC	NB	NS	NL
2003-04	49	10	52	51	27	48	53	41	26
2005-06	50	9	48	53	33	51	55	52	38
2007-08	50	8	48	54	40	55	55	53	40
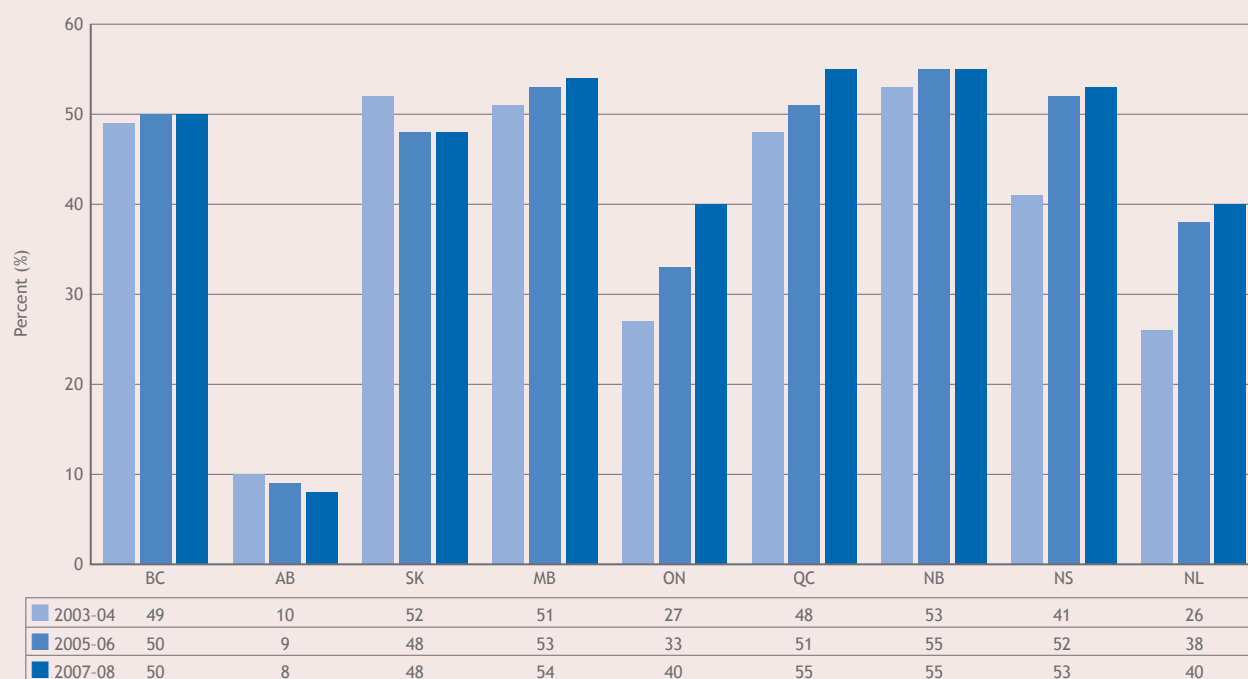
Data Source: Provincial breast cancer screening databases

NOTES:
For the purposes of registration, a clinical trial is any cancer-related research study that prospectively assigns human participants to a health-related intervention to evaluate the effects on health outcomes. Data exclude enrollments in biology studies and include Phase I to Phase IV clinical trials.

ADULT CLINICAL TRIAL PARTICIPATION RATIO

DEFINITION:
The ratio of the total number of all patients (≥19 years) newly enrolled in cancer-related therapeutic trials or clinical research studies in 2009 to the total number of cancer cases (≥19 years) newly referred to provincial cancer centres in 2009

NUMERATOR:
Total number of cancer cases (≥19 years), whether incident or previously diagnosed, newly enrolled in therapeutic clinical trials at provincial cancer centres in 2009

DENOMINATOR:
Total number of cancer centre cases, whether incident or previously diagnosed, newly referred to provincial cancer centres in 2009

EXCLUSIONS:
See Table A below.

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2009 calendar year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NB, NS, PE, NL

PROVINCE SPECIFIC NOTES:
BC 2009 draft data (registry still entering 2009 data).

AB Data are from the two tertiary centres only. Clinical Trial accrual does not generally occur at the Associate cancer centres in the province. Patients in both the numerator and denominator are all 19 or older at the time of recruitment and were Alberta residents.

PE Data are from medical oncology referrals only.

GENERAL NOTES:
Data include Phase I to IV clinical trials. See Table A below for indicator inclusion and exclusion by province.

Table A: Adult Clinical Trial Provincial Indicator Definitions, Inclusions and Exclusions

	BC	AB	SK	MB	ON	NB	NS	PE	NL
Numerator:									
Cases for non-therapeutic trials	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded
Cases registered for longer-term follow-up	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded
Questionnaire/interview studies without intervention	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded
Cases identified but did not commence intervention in 2009	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded
Denominator:									
Persons who did NOT have a cancer diagnosis	Excluded	Excluded	Excluded	Included	Included	Included	Excluded	Included	Excluded
Persons with borderline tumours	Excluded	Excluded	Excluded	Included	Included	Included	Excluded	Included	Excluded
Persons with *in situ* cancer	Excluded	Excluded	Excluded	Included	Included	Included	Excluded	Included	Excluded

Treatment

LINEAR ACCELERATOR (LINAC) CAPACITY AND UTILIZATION

DEFINITIONS:
1. Per capita LINAC availability

2. Linear accelerator utilization rate

NUMERATOR:
1. Number of operational LINACS (available for radiation therapy) in province

2. Number of radiation therapy treatments delivered through LINACS

DENOMINATOR:
1. Total provincial population 54 years of age and older in millions

2. Number of operational LINACS (available for radiation therapy) in province

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2009 calendar year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB,ON, QC, NB, NS, NL

PROVINCE SPECIFIC NOTES:
QC   Quebec did not provide data on number of radiation therapy treatments.

NS   All radiation therapy treatment visits including those from the superficial treatment unit

GENERAL NOTES:
In Canada, 80% of cancer patients are diagnosed at 54 years of age and older. Applying a threshold of 54 years and older for the per capita rate has the effect of applying a simple age adjustment.

RADIATION THERAPY WAIT TIMES (READY TO TREAT TO TREATMENT)

DEFINITIONS:
1. The elapsed time from ready to treat to start of radiation therapy measured in days/weeks

2. The percentage of radiation therapy cases for which the above wait time was within target timeframes

MEASURES:
1. Median wait time in days

2. 90th percentile wait time in days

3. Percentage of patients starting treatment within target timeframe (4 weeks after "ready to treat")

POPULATION:
All cancer patients receiving radiation therapy who have wait time data collected consistent with the specifications of this indicator

DATA SOURCE:
Reported by provincial cancer agencies or equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2007, 2008 and 2009 treatment years

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, QC, NB, NS, PE, NL

PROVINCE SPECIFIC NOTES:
BC   • Data were based on fiscal year, not calendar year.

   • 90th percentile data were not reported.

AB   Began reporting data for 2009

MB   • All patients were prioritized for starting radiation therapy based on medical need.

   • Wait time guarantee of 4 weeks from "ready to treat" was implemented April 1, 2008.

   • Patients waiting over 4 weeks due to medical decision to put on hold were excluded from % going over 4 weeks.

SK   Began reporting data for 2008

QC   Median and 90th percentile data were not reported, QC unable to provide data in days

NB   Median and 90th percentile data were not reported.

NS   NS did not track ready to treat date prior to 2010 The wait times reported are based on a proxy developed by the province.

PE   • Data available for 2008 are incomplete for the calendar year, covering only April through to December 2008.

   • Ready to treat to treatment wait times data presented here do not include emergency cases to remain consistent with CIHI standards.

GENERAL NOTES:
1.   The source data for this indicator were submitted by the provincial cancer agencies or their equivalents based on definitions provided by the Canadian Partnership Against Cancer.

2.   There are known discrepancies in the ways in which different provinces measure wait times. One of the key sources of variation is the way the "ready to treat" timeframe is defined. Efforts are underway to standardize these definitions. Table B outlines the definitions used by the different provinces.

Table B: Provincial Definitions of "Ready to Treat" for the Radiation Wait Times Indicator

PROVINCE	"READY TO TREAT" DEFINITION:
BC	The date at which both oncologist and patient agree that treatment can commence. Being ready to treat requires that all diagnostic tests and procedures required to assess the appropriateness of, indications for, and fitness to undergo Radiation therapy are complete.
AB	The date when the patient is physically ready to commence treatment.
SK	The date when the patient is ready to receive treatment, taking into account clinical factors and patient preference. In the case of radiation therapy, any preparatory activities (e.g., simulation, treatment planning, dental work) do not delay the "ready to treat" date.
MB	The date when a decision has been made by the radiation oncologist and is agreed to by the patient that radiation therapy is appropriate and should commence AND the patient is medically ready to start treatment AND the patient is willing to start treatment.
ON	The time at which the specialist is confident that the patient is ready to begin treatment.
QC	At consultation, the radiation oncologist enters the date at which the patient will be ready to treat on a formulary requesting treatment.
NB	The date when any planned delay is over and the patient is ready to begin treatment from both a social/personal and medical perspective.
NS	The date when all pre-treatment investigations and any planned delay is over, and the patient is ready to begin the treatment process from both a social/personal and medical perspective. Nova Scotia did not have a ready to treat date until February 2010; a proxy date was used prior to this time.
PE	The date when all pre-treatment investigations and any planned delay is over and the patient is ready to begin the treatment process from both a social/personal and medical perspective.
NL	The date when all pre-treatment investigations and any planned delay is over and the patient is ready to begin the treatment process from both a social/personal and medical perspective.

Treatment

RADIATION THERAPY UTILIZATION RATIO

DEFINITION:
Ratio of the number of courses of radiation therapy delivered in a year (for all intents) to the number of new cases of invasive cancer diagnosed in that year

NUMERATOR:
Number of courses of radiation therapy (any reason, any indication, including palliative, curative, benign disease, first and subsequent courses) in each province

DENOMINATOR:
Total number of cancer incident cases diagnosed in 2007

EXCLUSIONS:
- *In-situ* cases
- Non-melanoma skin cancer

DATA SOURCE:
Numerator: Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

Denominator: Canadian Cancer Registry—Analyzed by Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NB, NS, PE, NL

MEASUREMENT TIMEFRAME:
2006, 2007 and 2008

PROVINCE SPECIFIC NOTES:
ON   The definition of a course counts multiple phases of treatment as multiple courses whereas some provinces may not follow this definition.

GENERAL NOTES:
1. The source data for the numerator in this indicator were submitted by the provincial cancer agencies or their equivalents based on definitions provided by the Canadian Partnership Against Cancer. Nine of the ten provinces provided data for this indicator. Eight of the nine provided data for all three years.

2. A course of treatment usually includes a series of radiation therapy sessions over a defined period of time, in accordance with a treatment or symptom management plan. The same patient may receive multiple radiation treatment courses as part of the treatment and management of the disease and within each course there will be multiple radiation treatment sessions.

3. Courses associated with Brachytherapy treatment are included.

4. A "case" is identified at the patient/primary disease level as per Canadian Cancer Registry. The same person with two separate primaries would be treated as two incident cases (within applicable CCR/NAACCR rules).

RADIATION THERAPY UTILIZATION RATE

DEFINITION:
Percentage of cancer cases receiving radiation therapy within 2 years of diagnosis date

NUMERATOR:
Total number of cancer incident cases diagnosed in 2007 receiving radiation therapy for any reason in the 24 months following diagnosis

DENOMINATOR:
Total number of cancer incident cases diagnosed in 2007

EXCLUSIONS:
- *In-situ* cases
- Non-melanoma skin cancer

DATA SOURCE:
Numerator: Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

Denominator: Canadian Cancer Registry—Analyzed by Chronic Disease Surveillance Division, CCDPC, Public Health Agency of Canada

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NS, PE, NL

PROVINCE SPECIFIC NOTES:
PE   No patient age and sex breakdown was provided.

NL   No patient age and sex breakdown was provided.

GENERAL NOTES:
1. Treatments associated with Brachytherapy treatment are included.

2. The "incident case" is at the patient/primary disease level as per Canadian Cancer Registry. The same person with two separate primaries would be treated as two incident cases (within applicable CCR/NAACCR rules).

GUIDELINE CONCORDANCE—ADJUVANT RADIATION THERAPY FOLLOWING BREAST-CONSERVING SURGERY FOR STAGE I AND II BREAST CANCER

DEFINITION:
Percentage of stage I and II breast cancer cases receiving adjuvant radiation therapy following breast-conserving surgery

NUMERATOR:
Stage I and II breast cancer cases diagnosed in 2007 and starting radiation therapy within 270 days following breast-conserving surgery

DENOMINATOR:
All stage I and II breast cancer cases in the province in 2007 and receiving breast-conserving surgery

EXCLUSIONS:
Cases receiving mastectomy

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, MB, ON

PROVINCE SPECIFIC NOTES:
BC   Data include only cases referred to cancer centres, which represent around 85% of BC residents diagnosed with breast cancer.

AB   Segmental resections were included as lumpectomy.

MB   Radiation therapy was not limited to primary tumour site.

ON   Radiation therapy was not limited to primary tumour site.

GENERAL NOTES:
1. Cases for patients under 18 years of age were excluded.

2. Breast cases identified as ICDO3 codes: C50.0 to C50.9; AJCC group stage at diagnosis = I or II.

3. Only cases receiving breast-conserving surgery and no subsequent mastectomy are included. Include CCI codes: 1YM87 or 1YM88; exclude CCI codes = 1YM89 to 1YM92 in specified time period.

4. Timeframe: Last resection date (if multiple)—diagnosis date ≤ 365 days.

GUIDELINE PROXY MEASURE RADIATION THERAPY FOR STAGE I AND II BREAST CANCER

DEFINITION:
Percentage of stage I and II breast cancer cases receiving radiation therapy

NUMERATOR:
Stage I and II breast cancer cases diagnosed in 2007 and starting radiation therapy within 1 year plus 270 days (635 days) following diagnosis

DENOMINATOR:
All stage I and II breast cancer cases diagnosed in the province in 2007

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this Report

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NS, PE, NL

PROVINCE SPECIFIC NOTES:
BC • Data include only cases referred to cancer centres, which represent around 85% of BC residents diagnosed with breast cancer.

• Filter for treatment intent was applied to restrict to adjuvant therapy.

NS • Cases from Cumberland Health Authority were excluded as they may be receiving cancer care in New Brunswick, and Nova Scotia does not have out of province treatment data.

• In the event of synchronous primaries, analysis restricted to a single disease.

GENERAL NOTES:
1. No filter for treatment intent was used unless otherwise specified in the province specific notes.

2. Cases for patients under 18 years of age were excluded.

3. Breast cases identified as ICDO3 codes: C50.0 to C50.9, AJCC Group Stage at Diagnosis = I or II.

4. Note that unlike the guideline concordance indicator, patients who receive a mastectomy may not be candidates for radiation therapy, and therefore would be included in the proxy indicator.

GUIDELINE CONCORDANCE—NEOADJUVANT RADIATION THERAPY FOR STAGE II AND III RECTUM CANCER

DEFINITION:
Percentage of resected stage II and III rectum cancer cases receiving neoadjuvant (pre-operative) radiation therapy preceding surgical resection

NUMERATOR:
Stage II and III resected rectum cancer cases diagnosed in 2007 receiving neo-adjuvant radiation therapy up to 120 days before resection

DENOMINATOR:
All stage II and III resected rectum cancer cases diagnosed in the province in 2007

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, MB, ON, NS, NL

PROVINCE SPECIFIC NOTES:
BC Data include only cases referred to cancer centres, which represent around 68% of BC residents diagnosed with rectal cancer.

AB Extent of the surgery (i.e., fully resected) was not captured.

MB Radiation therapy was not limited to primary tumour site.

ON Radiation therapy was not limited to primary tumour site.

NS • Cases from Cumberland Health Authority were excluded as they may be receiving cancer care in New Brunswick, and Nova Scotia does not have out of province treatment data.

• In the event of synchronous primaries, analysis restricted to a single disease.

GENERAL NOTES:
1. Rectum cases defined as ICDO3 codes: C19.9 or C20.9, AJCC group stage at diagnosis = II or III.

2. Rectum resections defined as CCI codes: 1NQ59 or 1NQ87 or 1NQ89.

3. Last Resection Date (if multiple)—Diagnosis Date ≤ 365 days.

4. Cases for patients under 18 years of age were excluded.

GUIDELINE PROXY MEASURE RADIATION THERAPY FOR STAGE II AND III RECTUM CANCER

DEFINITION:
Percentage of stage II and III rectum cancer cases receiving radiation therapy

NUMERATOR:
Stage II and III rectum cancer cases diagnosed in 2007 receiving radiation therapy within 120 days of diagnosis

DENOMINATOR:
All stage II and III rectum cancer cases diagnosed in the province in 2007

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NS, PE, NL

PROVINCE SPECIFIC NOTES:
BC • Data include only cases referred to cancer centres, which represent around 68% of BC residents diagnosed with rectal cancer.

  • Treatment intent filter was applied to identify neoadjuvant therapy.

NS • Cases from Cumberland Health Authority were excluded as they may be receiving cancer care in New Brunswick, and Nova Scotia does not have out of province treatment data.

  • In the event of synchronous primaries, analysis restricted to a single disease.

GENERAL NOTES:
1. No filter for treatment intent was used, unless otherwise specified in the province specific notes.

2. Rectum cases defined as ICDO3 codes: C19.9 or C20.9, AJCC group stage at diagnosis = II or III.

3. Cases for patients under 18 years of age were excluded.

GUIDELINE CONCORDANCE REMOVAL AND EXAMINATION OF 12 OR MORE LYMPH NODES FOR COLON CANCER RESECTIONS

DEFINITION:
Number of colon cancer resections for which 12 or more lymph nodes removed and examined (data collected by patient age and sex)

NUMERATOR:
Colon cancer cases, diagnosed in 2007 and resected within one year of diagnosis, for which 12 or more lymph nodes removed and examined

DENOMINATOR:
All colon cancer cases diagnosed in the province in 2007 and resected within one year of diagnosis

EXCLUSIONS:
Cases with unknown number of nodes removed and examined

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NB, NS, PE, NL

PROVINCE SPECIFIC NOTES:
BC • Cases with unknown number of nodes removed and examined were NOT excluded from the denominator.

  • Patients referred after relapse or for follow-up after treatment elsewhere were excluded (n=19).

  • Carcinoid, goblet cell carcinoid, neuroendocrine and GI stromal tumours were excluded from the counts.

  • Invasive and *in situ* cases were included.

  • Cases referred to the BC Cancer Agency at some point in time (this group comprises 46% of all colon cancer cases diagnosed in 2007) were included.

AB • Surgery information from cancer registry was used; however, the registry does not collect information that specifies the extent of the surgery (i.e., fully resected).

SK • Date of histological proof was used instead of the last resection date.

ON • Data are based on malignant resection pathology reports and exclude records with polyp, rectal abscess, rectal polyp, polypectomy.

  • Data included only hospitals with synoptic pathology reporting.

  • Data are from 2009.

NB • Data are for 2008 diagnosis year.

  • No patient age and sex breakdown was provided.

PE • No patient age and sex breakdown was provided.

GENERAL NOTES:
1. Colon cases defined as ICDO3 codes: C18.0 to C18.9.

2. Colon resections identified as CCI codes: 1NM87 or 1NM89 or 1NM91.

3. Last resection date (if multiple)—diagnosis date ≤ 365 days.

4. Cases for patients under 18 years of age were excluded.

GUIDELINE CONCORDANCE—ADJUVANT CHEMOTHERAPY FOR STAGE III COLORECTAL CANCER

DEFINITION:
Percentage of stage III colon cancer cases receiving chemotherapy following surgical resection

NUMERATOR:
Stage III resected colon cancer cases diagnosed in 2007 starting adjuvant chemotherapy within 120 days of surgery

DENOMINATOR:
All stage III resected colon cancer cases diagnosed in the province in 2007

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, MB, ON, NL

PROVINCE SPECIFIC NOTES:
BC • BC data include only cases referred to the regional cancer centres, which in 2007 represented 46% of all BC residents diagnosed with colon cancer (*in situ* or invasive).

MB • Oral drugs are included but may be undercounted.

ON • Chemotherapy data exclude most oral chemotherapy since that data are not reliably reported to Cancer Care Ontario.

GENERAL NOTES:
1. No filter for treatment intent was used unless otherwise specified by province.

2. Colon cases defined as ICDO3 codes: C18.0 to C18.9, AJCC group stage at diagnosis = III.

3. Colon resections defined as CCI codes: 1NM87 or 1NM89 or 1NM91.

4. Last resection date (if multiple)—diagnosis date ≤ 365 days.

5. Cases for patients under 18 years of age were excluded.

GUIDELINE PROXY MEASURE—ADJUVANT CHEMOTHERAPY FOR STAGE III COLORECTAL CANCER

DEFINITION:
Percentage of stage III colon cancer cases receiving chemotherapy

Chemotherapy started within 1 year + 120 days of diagnosis

NUMERATOR:
Stage III colon cancer cases diagnosed in 2007 starting adjuvant chemotherapy within one year + 120 days of diagnosis

DENOMINATOR:
All stage III colon cancer cases diagnosed in the Province in 2007

DATA SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

MEASUREMENT TIMEFRAME:
2007 diagnosis year

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NS, NL

PROVINCE SPECIFIC NOTES:
BC • BC data include only cases referred to the regional cancer centres, which in 2007 represented 46% of all BC residents diagnosed with colon cancer (*in situ* or invasive).

• Treatment intent filter used to identify adjuvant therapy.

MB • Oral drugs are included but may be undercounted.

ON • Chemotherapy data excluded most oral chemotherapy since that data are not reliably reported to Cancer Care Ontario.

NS • Cases residing outside the two District Health Authorities that host the provincial cancer centres (Cape Breton DHA and Capital Health) were excluded because chemotherapy treatment information was not yet available.

• In the event of synchronous primaries, analysis restricted to a single disease.

GENERAL NOTES:
1. No filter for treatment intent was used unless otherwise specified by province.

2. Colon cases defined as ICDO3 codes: C18.0 to C18.9, AJCC group stage at diagnosis = III.

3. Cases for patients under 18 years of age were excluded.

Supportive Care and Survivorship

SCREENING FOR DISTRESS

DEFINITION:
Extent to which provincial cancer agencies or their equivalents undertake centralized data collection of screening for distress results. Examples of such tools include the Edmonton Symptom Assessment Scale (ESAS) and the Canadian Problem Checklist (CPC).

INFORMATION REQUESTED:
Provincial cancer agencies or their equivalents were asked to provide information for the following:

- Identify if any cancer centres in the province implemented standardized screening for distress tools at time of data request (June 2009)

- Identify total number of unique patients assessed using such tools

- Identify total number of assessments completed.

- Describe the role of the provincial cancer agency in managing the implementation of standardized symptom assessment and screening for distress tools

- Information on the number of centres in each province using standardized tool(s); this will include only instances where the tool has been implemented centrally, on behalf of the provincial cancer agency.

- Who gets screened? What percent of patients are screened?

- How often are they screened?

INFORMATION SOURCE:
Reported by provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*

INFORMATION AVAILABILITY:
Information was collected on a free-form basis based on the general questions posed above. Provinces were free to select a timeframe of their choosing.

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NB, NS, PE, NL

Most provinces provided descriptive information but did not provide numerical data.

PATIENT REPORTED OUTCOMES

DEFINITION:
NRC Picker AOPSS Survey (self-reported data)—provincial % positive score (% of valid respondents that replied 'good', 'very good' or 'excellent') for the six dimensions of patient-centred care

1. Physical comfort

2. Respect for patient preferences

3. Access to care

4. Coordination and continuity of care

5. Information, communication & education

6. Emotional support

Also, % positive score for the question: "Overall, how would you rate the quality of care at *your hospital* in the past 6 months?"

DATA SOURCE:
NRC Picker AOPSS survey results were reported by individual provincial cancer agencies or their equivalents to the Canadian Partnership Against Cancer for this *Report*.

MEASUREMENT TIMEFRAME:
Most recent year available (see below)

PROVINCES SUBMITTING DATA:
BC, AB, SK, MB, ON, NS, PE

PROVINCE SPECIFIC NOTES:
BC   Survey date: 2007

AB   Survey date: 2008

SK   Survey date: 2009

MB   Survey date: 2008

ON   Survey date: 2009

NS   Survey date: 2009 (fiscal year)

PE   Survey date: 2008 for overall satisfaction score and 2009 for patient satisfaction scores by domain

Sampling frames and survey timeframes varied by province. However, all data were collected and centrally analyzed by NRC Picker.

DEFINITION:
The percentage of patients with cancer who died in specified location: hospital, other health care facility, other specified location, private home or unknown location

NUMERATOR:
Number of patients with cancer who died in: hospital, other health care facility, other specified location, private home or unknown location

DENOMINATOR:
Number of patients with cancer who have died

DATA SOURCES:
Canadian Vital Statistics, Death Database (annual file)

MEASUREMENT TIMEFRAME:
2003 to 2005

STRATIFICATION VARIABLES:
Sex

PROVINCE SPECIFIC NOTES:
BC   All deaths in British Columbia in 2005 were recorded as unknown location.

ON   The coding of non-hospital deaths in Ontario was very variable over the 3-year time span and is likely unreliable (see table below).

Table C: Location of Cancer Patient Death in Ontario—2003 to 2005

Location of Cancer Patient Death (%) by Year			
Ontario	2003	2004	2005
Hospital	69.9	71.2	70.0
Other health care facility	0.0	0.0	8.1
Other specified locality	21.6	2.4	2.3
Private home	0.1	0.0	19.5
Unknown locality	8.4	26.4	0.0

Long-Term Outcomes

DEFINITION:
The incidence rate that would have occurred if the age distribution of the population of interest was the same as that of the standard, where incidence rate is defined as the number of cases of cancer (malignant neoplasms) newly diagnosed during a year, per 100,000 population at risk

NUMERATOR:
Number of new cancer cases (all ages)

1. All cancers

2. Breast (female)

3. Colorectal

4. Lung

5. Prostate

DENOMINATOR:
1., 3., 4. Annual population estimates in hundreds of thousands

2. Annual female population estimate in hundreds of thousands

5. Annual male population estimate in hundreds of thousands

AGE- STANDARDIZATION:
Direct method using the 1991 Canadian Census population

DATA SOURCES:
Canadian Cancer Registry (CCR) Database (July 2007 file)—cancer incidence data

Demography Division of Statistics Canada— population estimates

MEASUREMENT TIMEFRAME:
1995 to 2006

STRATIFICATION VARIABLES:
Sex (except breast and prostate), age, income, urban/rural/rural-isolated/rural-very isolated (see Canadian Census 2006 stratification variables)

NOTES:
1. World Health Organization, International Classification of Diseases for Oncology, Third Edition (ICD-O-3) and the International Agency for Research on Cancer (IARC) rules for determining multiple primaries sites were used: colorectal (ICD-O-3 C18.0 to C18.9, C19.9, C20.9, C26.0), lung and bronchus (ICD-O-3 C34.0 to C34.9), female breast (ICD-O-3 C50.0 to C50.9) and prostate (ICD-O-3 C61.9). The four categories exclude morphology types M-9050 to M-9055, M-9140 and M-9590 to M-9989. "All cancers" included all invasive sites and *in situ* bladder and excluded non-melanoma skin cancer (basal and squamous).

2. Cells with small counts were suppressed as well as any cell that could result in the disclosure of a previously suppressed cell by using the column or row total. If the variables that defined the rows and columns were province and age group, then the program suppressed low counts first within each province. If any province contained only one suppressed cell, the next lowest count in that province was suppressed. This process was repeated within each age group. Records where age was not specified were included in the total.

3. CRC incidence rates by province are presented for a five year span 2003-2007. This analysis was done by the Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada and kindly provided by Canadian Cancer Statistics 2011 (in press).

AGE-STANDARDIZED MORTALITY RATES

DEFINITION:
The mortality rate that would have occurred if the age distribution of the population of interest were the same as that of the standard where mortality rate is defined as the number of deaths due to cancer (malignant neoplasms) in a year per 100,000 population at risk

NUMERATOR:
Number of deaths from cancer (all ages)

1. All cancers

2. Breast (female)

3. Colorectal

4. Lung

5. Prostate

DENOMINATOR:
1., 3., 4. Annual population estimates in hundreds of thousands

2. Annual female population estimate in hundreds of thousands

5. Annual male population estimate in hundreds of thousands

AGE- STANDARDIZATION:
Direct method using the 1991 Canadian Census population

DATA SOURCES:
Canadian Vital Statistics, Death Database (annual file)—cancer mortality data. Demography Division of Statistics Canada—population estimates

MEASUREMENT TIMEFRAME:
1995 to 2006

STRATIFICATION VARIABLES:
Sex (except Breast and Prostate), age, income, urban/rural/rural—isolated/rural—very isolated (see Canadian Census 2006 stratification variables)

NOTES:
1. Up to the year 1999, causes of death were coded according to World Health Organization (WHO), International Classification of Diseases, Ninth Revision (ICD-9): All cancers (ICD-9: 140-208), colorectal (ICD-9: 153-154), lung (ICD-9: 162), female breast (ICD-9: 174) and prostate cancer (ICD-9: 185).

2. After the year 1999, causes of death were coded according to the World Health Organization (WHO), International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10): All Cancers (ICD-10: C00-C97), colorectal (ICD-10: C18-C20,C26), lung (ICD-10: C33-C34), female breast (ICD-10: C50) and prostate cancer (ICD-10: C61).

3. CRC mortality rates were calculated by the Chronic Disease Surveillance and Monitoring Division, CCDPC, Public Health Agency of Canada and kindly provided by Canadian Cancer Statistics 2011 (in press).

4. CRC mortality rates by province are presented for a four year span 2003-2006.

5. Cells with small counts were suppressed as well as any cell that could result in the disclosure of a previously suppressed cell by using the column or row total. If the variables that defined the rows and columns were province and age group, then the program suppressed low counts first within each province. If any province contained only one suppressed cell, the next lowest count in that province was suppressed. This process was repeated within each age group. Records where age was not specified were included in the total.

AGE-STANDARDIZED CASE FATALITY RATIO

DEFINITION:
The case fatality ratio is the ratio of the number of deaths to the number of new cases of cancer, expressed per 100 individuals

NUMERATOR:
Number of deaths from cancer (all ages)

DENOMINATOR:
Number of new cancer cases (all ages)

DATA SOURCES:
Calculated from incidence and mortality rates (see Incidence and Mortality sections)

MEASUREMENT TIMEFRAME:
2006

NOTES:
Refer to notes in Incidence and Mortality sections

RELATIVE SURVIVAL RATIOS

DEFINITION:
Relative survival is the ratio of the observed survival for a group of cancer patients (malignant neoplasms) to the expected survival for members of the general population (referred to as the comparison population) that have the same main factors affecting survival (sex, age, place of residence) as the cancer patients

NUMERATOR:
Observed survival of cancer patients (aged 15–99) 1, 2, 3, 4 and 5 years after diagnosis for each of three diagnosis cohorts: 1995–1997; 1998–2000 and 2001–2005

1. All cancers

2. Breast (female)

3. Colorectal

4. Lung

5. Prostate

DENOMINATOR:
Expected survival of the comparison population 1, 2, 3, 4 and 5 years for each of three cohorts: 1995–1997; 1998–2000 and 2001–2005.

1., 3., 4. Both sexes

2. Females

5. Males

EXCLUSIONS:
- Age <15 or >99 at time of diagnosis
- Subjects diagnosed through autopsy only or death certificate only
- Subjects with an unknown year of birth or death

DATA SOURCES:
Canadian Cancer Registry (January 2008 with death clearance complete up to 2004), Provincial life tables (Statistics Canada)

MEASUREMENT TIMEFRAME:
3 cohorts of cancer patients diagnosed between: 1995 and 1997; 1998 and 2000; 2001 and 2005

STRATIFICATION VARIABLES:
Sex (except breast and prostate), age, income (see Canadian Census 2006 stratification variables)

NOTES:
1. World Health Organization, International Classification of Diseases for Oncology, Third Edition (ICD-O-3) and the International Agency for Research on Cancer (IARC) rules for determining multiple primaries sites were used: colorectal (ICD-O-3 C18.0 to C18.9, C19.9, C20.9, C26.0), lung and bronchus (ICD-O-3 C34.0 to C34.9), female breast (ICD-O-3 C50.0 to C50.9) and prostate (ICD-O-3 C61.9). The four categories exclude morphology types M-9050 to M-9055, M-9140 and M-9590 to M-9989. "All cancers" included all invasive sites and in situ bladder and excluded non-melanoma skin cancer (basal and squamous).

2. "Canada" represents all provinces and territories, minus Quebec. Data from Quebec have been excluded, in part, because the method of ascertaining the date of cancer diagnosis differs from the method used by other registries and also because of issues in correctly ascertaining the vital status of cases.

3. Survival estimates from Newfoundland and Labrador are included in the national average but are not shown in this *Report*. In the years under study, there was known under-reporting of cancer cases in Newfoundland and Labrador because cancer cases identified by death certificates only were not included. There is likely some overestimation of survival for this province as the survival of such 'missed' cases is generally less favourable than that of cases in the registry population.

4. Cells with small counts were suppressed. As well, any cell that could result in the disclosure of a previously suppressed cell by using the column or row total was suppressed. If the variables that defined the rows and columns were province and age group, then the program suppressed low counts first within each province. If any province contained only one suppressed cell, the next lowest count in that province was suppressed. This process was repeated within each age group. Records where age was not specified were included in the total.

5. Cohort analysis was used for cases diagnosed in 1995–1997 and 1998–2000. Period analysis was used for cases diagnosed in 2001–2005. A longer interval of years was used for the period analysis to improve the stability of the estimates.

6. Expected survival proportions were derived from sex-specific, complete provincial life tables produced by Statistics Canada, using the Ederer II approach.[4]

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[4] Ederer F, Heise H. *The effect of eliminating deaths from cancer on general population survival rates* (methodological note 11, End Results Evaluation section). National Cancer Institute, Bethesda, MD.,1959.

CCHS *Stratification Variables*

1. INCOME QUINTILES (SOCIO-ECONOMIC STATUS)

DEFINITION:
A relative measure of each respondent's household income to the household incomes of all other respondents. The measure is a ratio of the total household income to the low income cut-off (LICO) (varies according to the size of the household and the community where the household is located). After calculating the ratio between the household income and its corresponding LICO, the ratios are standardized across all regions of Canada and then ordered from lowest to highest and then divided into 5 equal quintiles.

2. URBAN/RURAL/RURAL-ISOLATED/RURAL-VERY ISOLATED STATUS

DEFINITION:
Whether the respondent lives in an urban or rural area. Rural area is subcategorized into 'Rural', 'Rural-Isolated' and 'Rural-Very Isolated'.

- Urban: areas having a population concentration of 10,000 or more and adjacent areas with 50% or more of the population commuting to the urban core.
- Rural: areas with a population less than 10,000 and a proportion of population that commutes to an urban area of 30% to 49%.
- Rural-Isolated: areas with a population less than 10,000 and a proportion of population that commutes to an urban area of 5% to 29%.
- Rural-Very Isolated: areas with a population less than 10,000 and a proportion of population that commutes to an urban area of 0% to less than 5%. This category includes non-urban parts of territories.

3. HIGHEST LEVEL OF EDUCATION

DEFINITION:
Highest level of education acquired by the respondent:

- Less than secondary school graduation
- Secondary school graduation, no post-secondary education
- Some post-secondary education
- Post-secondary degree/diploma
- Don't know, refusal, not stated

Canadian Census 2006 *Stratification Variables*

1. NEIGHBOURHOOD INCOME QUINTILES (SOCIO-ECONOMIC STATUS)

DEFINITION:
Neighbourhood income per person equivalent is a household size-adjusted measure of household income, based on 2006 census summary data at the Dissemination Area (DA) level and using person-equivalents implied by the 2006 low income cut-offs (LICOs).

NOTES:
1. The postal code of each subject's (non-institutional population) usual place of residence at the time of diagnosis was ascertained with the Postal Code Conversion File 5C+.[5]

2. Quintiles of population by neighbourhood (Dissemination Area) are derived within Census Metropolitan Areas, Census Agglomerations or Residual areas within each province and then pooled across areas. The rationale for creating the quintiles within each area is based on the large variation in housing costs across Canada.

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[5] Russell Wilkins. *PCCF+ Version 5C User's Guide. Automated Geographic Coding Based on the Statistics Canada Postal Code Conversion Files, Including Postal Codes through March 2008*. Catalogue 82F0086-XDB. Health Information and Research Division, Statistics Canada. November 2008.

2. URBAN/ RURAL/RURAL-ISOLATED/RURAL-VERY ISOLATED STATUS

DEFINITION:
Whether the respondent lives in an urban or rural area. Rural area is subcategorized into 'Rural', 'Rural-Isolated' and 'Rural-Very Isolated'.

- Urban: areas having a population concentration of 10,000 or more and adjacent areas with 50% or more of the population who commute to the urban core.

- Rural: areas with a population less than 10,000 and a proportion of population that commutes to an urban area of 30% to 49%.

- Rural-Isolated: areas with a population less than 10,000 and a proportion of population that commutes to an urban area of 5% to 29%.

- Rural-Very Isolated: areas with a population less than 10,000 and a proportion of population that commutes to an urban area of 0% to less than 5%. This category includes non-urban parts of territories.

NOTES:
1. The postal code of each subject's (non-institutional population) usual place of residence at the time of diagnosis was ascertained with the Postal Code Conversion File 5C+.[5]

2. Community Size is defined in terms of the 2006 census population in each census metropolitan area or census agglomeration (CMA or CA), as shown above. Community Size 1 consists of Toronto, Montreal and Vancouver CMAs. Community Size 2 consists of Ottawa-Gatineau, Edmonton, Calgary, Québec, Winnipeg and Hamilton CMAs. Community Size 3 includes all 18 other CMAs plus 7 of the larger CAs. Community Size 4 includes all 106 other CAs. Community Size 5—"rural and small town Canada"—includes all places not included in any CMA or CA. (i.e., places with an urban area population less than about 10,000, plus rural areas).

3. For rural postal codes and for urban postal codes of outlying suburban and rural areas, the same postal code is generally used for multiple enumeration areas or dissemination areas. The selection of a single such area for coding purposes is random but with probabilities respecting the proportions of population with that postal code in each of the possible small areas. Thus, the coding is far less precise than for centralized urban postal codes, which are usually only linked to a single enumeration area or dissemination area.

3. EDUCATION LEVEL

Note this variable was not available from the census data.