

## Working Paper

# The feasibility of adding treatment data to the Canadian Cancer Registry using record linkage

by Carrière GM, Sanmartin C, Trudeau R, Murison P,  
MacIntyre M, Turner D, King MJ, Vriends K, Woods R,  
Louchini R, Wagar B, Lockwood G

Release date: November 23, 2015



Statistics  
Canada

Statistique  
Canada

Canada

---

## How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, [www.statcan.gc.ca](http://www.statcan.gc.ca).

You can also contact us by

**email at** [STATCAN.infostats-infostats.STATCAN@canada.ca](mailto:STATCAN.infostats-infostats.STATCAN@canada.ca)

**telephone**, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following toll-free numbers:

- |   |                |
|---|----------------|
| • Statistical Information Service                             | 1-800-263-1136 |
| • National telecommunications device for the hearing impaired | 1-800-363-7629 |
| • Fax line  | 1-877-287-4369 |

### Depository Services Program

- |                  |                |
|------------------|----------------|
| • Inquiries line | 1-800-635-7943 |
| • Fax line       | 1-800-565-7757 |

## Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on [www.statcan.gc.ca](http://www.statcan.gc.ca) under “Contact us” > “Standards of service to the public.”

## Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

## Standard table symbols

The following symbols are used in Statistics Canada publications:

- |                |  |
|----------------|--|
| .              | not available for any reference period   |
| ..             | not available for a specific reference period  |
| ...            | not applicable   |
| 0              | true zero or a value rounded to zero   |
| 0 <sup>s</sup> | value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded |
| <sup>p</sup>   | preliminary  |
| <sup>r</sup>   | revised  |
| x              | suppressed to meet the confidentiality requirements of the <i>Statistics Act</i>                                   |
| <sup>E</sup>   | use with caution   |
| F              | too unreliable to be published   |
| *              | significantly different from reference category ( $p < 0.05$ )   |

Published by authority of the Minister responsible for Statistics Canada

© Minister of Innovation, Science and Economic Development, 2015

All rights reserved. Use of this publication is governed by the Statistics Canada [Open Licence Agreement](#).

**An HTML version is also available.**

*Cette publication est aussi disponible en français.*

---

## Acknowledgements

Our gratitude and thanks are extended to the following people: Carol Russell, former Director of the Alberta Cancer Registry, Alberta Health Services, and Kim Boyuk, former Chief, Cancer Statistics, Health Statistics Division, Statistics Canada, for their earlier regular involvement in this study; Dr. Geoff Porter, for sharing his expertise and experience regarding clinical aspects of dual diagnoses in patients with colorectal cancer; Mary Sue Devereaux, Senior English Editor, Health Analysis Division, for her assistance in editing this manuscript; Dianne Zakaria, Health Statistics Division, for her development of methods to directly link the CCR to the DAD and for her earlier assistance in reviewing coding and preliminary results.

## Authors

Carrière GM, Sanmartin C,  
Health Analysis Division, Statistics Canada, Ottawa, Ontario.

Trudeau R, Murison P,  
Health Statistics Division, Statistics Canada, Ottawa, Ontario.

MacIntyre M,  
Surveillance and Epidemiology Unit, Cancer Care Nova Scotia, Halifax, Nova Scotia.

Turner D,  
Population Oncology, CancerCare Manitoba, Winnipeg, Manitoba; Department of Community Health Sciences, Faculty of Medicine, University of Manitoba, Winnipeg, Manitoba.

King MJ.  
CancerCare Ontario, Toronto, Ontario.

Vriends K,  
Prince Edward Island Cancer Registry, Charlottetown, Prince Edward Island.

Woods R,  
BC Cancer Agency, BC Cancer Registry, Cancer Control Research Unit, British Columbia.

Louchini R,  
Ministère de la Santé et des Services sociaux, Québec, Québec.

Wagar B,  
Canadian Institute for Health Information, Western Canada, Research and Analytical Projects, British Columbia.

Lockwood G  
Canadian Partnership Against Cancer, Analytics and Surveillance, Ontario.

## Executive Summary

The Canadian Cancer Registry (CCR) represents a collaborative effort between Statistics Canada and the thirteen provincial and territorial cancer registries to create a single database to report annually on cancer incidence and survival at the national and jurisdictional level. While gains have been made to ensure high quality, standardized, and comparable data, the CCR currently lacks information on cancer treatment. The Canadian Council of Cancer Registries (CCCCR) identified the need to capture treatment data at the national level as a key strategic priority for 2013/2014. Record linkage was identified as one possible approach to fill this information gap.

### Key findings:

- *High level of eligibility for linkage among CCR tumours:* Overall, 97% to 100% of breast, colorectal and prostate tumours identified from 2005 to 2008 in the four provinces were eligible for linkage;
- *Linkage rate varied by tumour type and availability of data across provinces:* Approximately 95% of eligible tumours were linked to the DAD/NACRS. Linkage rates for prostate tumours varied across provinces from 75% in Manitoba to over 90% in Ontario, for which NACRS data were available.
- *Overall treatment rates varied by tumour type and availability of data across provinces:* About 90% of breast and colorectal tumours were linked to at least one type of treatment. Overall treatment rates varied for prostate cancer from 75% in Ontario (DAD and NACRS) to 42% in Manitoba.
- *Feasibility of using CCR linked to hospital data to report on cancer treatment varied across treatment types:* The CCR linked data produced expected surgical treatment rates, as surgery is commonly reported as either an inpatient or outpatient service in the DAD. Rates for treatments occurring in other healthcare settings, such as radiation and pharmacotherapy, were consistently low in all provinces except Ontario where the NACRS data were available and which captures treatments performed in oncology centres and clinics.
- *Limitations of using linked data to report treatment rates are largely determined by the availability of high quality, comprehensive and standardized treatment information:* The CCR linked to DAD and NACRS (Ontario only) could feasibly be used to report on treatments such as surgery performed as either day or acute care hospital procedures; more comprehensive data are required to feasibly report on treatments conducted outside of acute care and day surgery settings such as radiation and pharmacotherapy.

The purpose of this study is to examine the feasibility of using record linkage to add cancer treatment information for selected cancers — breast, colorectal and prostate. The objectives are twofold: to assess the quality of the linkage processes and the validity of using linked data to estimate cancer treatment rates at the provincial level. The study is based on the Canadian Cancer Registry (2005 to 2008) linked to the Discharge Abstract Database (DAD) and the National Ambulatory Care Reporting System (NACRS) for four provinces (Ontario, Manitoba, Nova Scotia and Prince Edward Island). The linkage was proposed by Statistics Canada, the CCCR and the Canadian Institute for Health Information (CIHI). The linkage was approved and conducted at Statistics Canada.

## List of Tables and Appendices

Table 1. Canadian Cancer Registry (CCR) single malignant tumour cohorts by cancer and province, 2005 to 2008

Table 2. Percentage of Canadian Cancer Registry (CCR) tumours eligible to link to Discharge Abstract Database (DAD), and for Ontario, to National Ambulatory Care Reporting System (NACRS), single malignant tumours, by cancer type and province, 2005 to 2008

Table 3. Linkage rates within follow-up for Canadian Cancer Registry (CCR) tumour cohorts to Discharge Abstract Database (DAD), and for Ontario, to National Ambulatory Care Reporting System (NACRS) within follow-up, overall and by hospital service type, cancer and province, 2005 to 2008

Table 4. Treatment rates within follow-up for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR), by province, year and hospital service type, 2005 to 2008

Table 5. Treatment rates within follow-up for linked single malignant colorectal tumours identified in the Canadian Cancer Registry (CCR), by province, year and hospital service type, 2005 to 2008

Table 6. Treatment rates within follow-up for linked single malignant colon tumours identified in Canadian Cancer Registry (CCR), by province, year and hospital service type, 2005 to 2008

Table 7. Treatment rates within follow-up for linked single malignant rectum/rectosigmoid junction tumours identified in Canadian Cancer Registry (CCR), by province, year and hospital service type, 2005 to 2008

Table 8. Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR), by province, year and hospital service type, 2005 to 2008

Appendix A. Treatment codes (CCI versions 2003, 2006, 2009) and groupings, by cancer

Appendix B. Treatment rates within follow-up in all hospital service types combined for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR), by province, year and age group, 2005 to 2008

Appendix C. Treatment rates within follow-up in all hospital service types combined for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR), by province, year and tumour stage, 2005 to 2008

Appendix D. Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR), by province, year, hospital service type and sex, 2005 to 2008

Appendix E. Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR), by province, year, hospital service type and age group, 2005 to 2008

Appendix F. Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR), by province, year, hospital service type and tumour stage, 2005 to 2008

Appendix G. Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR), by province, year, hospital service type and age group, 2005 to 2008

Appendix H. Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR), by province, year and tumour stage, 2005 to 2008

## Introduction

Canada has a long record of data development to support cancer surveillance and control. The Canadian Cancer Registry (CCR), established in 1992, represents a collaborative undertaking between Statistics Canada and the thirteen provincial and territorial cancer registries to create a single database to report annually on cancer incidence and survival at the national and jurisdictional levels.<sup>1</sup> Data from the CCR are used for descriptive and analytic epidemiological studies to identify cancer risk factors; to plan, monitor and evaluate a broad range of cancer control programs (for example, screening); and to conduct research in health services and economics.<sup>2</sup>

While gains have been made in the production of high-quality, standardized, and therefore comparable data, the CCR lacks information about cancer treatment. This is partially because of the lack of national standards for the collection of treatment data by cancer registries. About half of registries collect some form of treatment data, but the treatment types that are recorded, their sources, and standards used for collection vary considerably across jurisdictions.

The Canadian Council of Cancer Registries (CCCR) identified the need to capture treatment data at the national level as a key strategic priority for 2013/2014.<sup>3</sup> The addition of treatment information would enhance the CCR's analytical capacity for researchers and epidemiologists. Furthermore, stakeholders at the provincial, territorial and national levels are interested in treatment data with respect to outcomes, wait times, surveillance and system performance monitoring. As a first step, the CCCR established the Treatment Working Group to define a minimum dataset for the CCR that would guide the collection of treatment information at the national level.<sup>4</sup> The Treatment Working Group was mandated to assess the feasibility of various data collection approaches, including record linkage to address treatment data gaps.

Record linkage is commonly used to fill information gaps and “add value” to existing data sources. For example, linkages between survey and administrative data have enhanced the capacity to report on health outcomes such as hospitalizations, mortality of subpopulations such as immigrants, low-income groups and the homeless,<sup>5-9</sup> and have improved understanding of risk factors to health across time.<sup>10</sup> Previous record linkages between provincial cancer registries and other health administrative data have provided new information about cancer treatment,<sup>11-13</sup> patient experiences with health care<sup>14,15</sup> and subsequent health risks related to initial cancer events.<sup>16</sup>

This study examines the feasibility of using record linkage to add treatment information to the 2005-to-2008 CCR for selected cancers—breast, colorectal and prostate. The objectives are to assess the quality of the linkage processes and the validity of using linked data to estimate cancer treatment rates at the provincial level. A project to link the CCR to the Discharge Abstract Database (DAD) and the National Ambulatory Care Reporting System (NACRS) for four provinces (Ontario, Manitoba, Nova Scotia and Prince Edward Island) was jointly proposed by Statistics Canada, the CCCR and the Canadian Institute for Health Information (CIHI). The linkage was approved by the Statistics Canada Policy Committee (June, 2012).<sup>17</sup> Use of the linked data is governed by the Directive on Record Linkage.<sup>18</sup>

## Data Sources

### Canadian Cancer Registry

The Canadian Cancer Registry (CCR) contains information about all cancers diagnosed in Canada. This database is compiled from provincial and territorial cancer registries and covers all Canadian residents, living or deceased, diagnosed with cancer since 1992, including new primary (incident) cancers among patients previously diagnosed with cancer. For each calendar year, the CCR reports confirmed information about each new tumour, including tumour type, date of diagnosis, and demographic data about the patient.<sup>19</sup>

For record linkage, the 2008 CCR data file, representing all tumours diagnosed between 1992 and 2008 (2.5 million tumours), was used. Given differences in the data linkage approach across provinces, specific data processing and exclusions were applied for Ontario and Manitoba versus Nova Scotia and Prince Edward Island. For Ontario and Manitoba, the full 2008 CCR was linked to both the Manitoba Health Services Insurance Plan (MHSIP) and the Ontario Registered Persons Database (RPDB). For Nova Scotia and Prince Edward Island, 4.3% and 2.9% of records had a missing or invalid HIN and were excluded from the direct linkage.<sup>20</sup> For validation and analysis, the static CCR tabulation master file (TMF), vintage September 19, 2012, was used to select breast, colorectal and prostate tumours diagnosed between 2005 and 2008 in Ontario, Manitoba, Nova Scotia and Prince Edward Island.



### Discharge Abstract Database (DAD)

The Discharge Abstract Database (DAD) contains demographic, administrative and clinical data for acute care, some psychiatric, chronic rehabilitation and day surgery hospital discharges. These are reported annually by all jurisdictions, excluding Quebec, to the Canadian Institute for Health Information (CIHI) on a fiscal year basis (April 1 to March 31).<sup>21</sup> The DAD contains approximately 3.2 million discharges per year.

For record linkage, the national DAD records for fiscal 2004/2005 through 2010/2011 were used to link to the Manitoba and Ontario tumour records using registry-obtained HINs. For Nova Scotia and Prince Edward Island, national DAD records from fiscal 1994/1995 to 2011/2012 were used to link to CCR (1992-to-2008) records with valid HINs. Further information on this record linkage is available elsewhere.<sup>20</sup>

### National Ambulatory Care Reporting System

The National Ambulatory Care Reporting System (NACRS) contains data regarding visits to health care facilities for ambulatory care, including community-based services. At each visit, patient demographics, clinical information (diagnoses, surgical interventions), and administrative, financial and service-specific data are recorded. NACRS data are reported to CIHI on a fiscal year basis (April 1 to March 31).<sup>22</sup>

The NACRS captures day surgery procedures, emergency department visits, diagnostic imaging, and ambulatory clinic visits (for example, oncology care). The NACRS data are reported most comprehensively by Ontario, and less comprehensively for Manitoba, Prince Edward Island and Nova Scotia.<sup>23-27</sup> The NACRS data from fiscal 2004/2005 through 2010/2011 for Ontario were eligible for record linkage to the CCR. For validation and analysis, approximately 27 million NACRS records from Ontario for fiscal years 2004/2005 to 2010/2011, excluding emergency room visits, were used.

### Provincial health insurance registries

Provincial health insurance registries for Ontario and Manitoba were used as bridge files to link the cancer and hospital data. The Manitoba Health Services Insurance Plan (MHSIP) and the Ontario Registered Persons Database (RPDB) contain records for all individuals registered to receive health services in Manitoba and Ontario, respectively. Each registrant is assigned a unique Health Insurance Number (HIN).

For record linkage, annual MHSIP for 1992 through 2009 and RPDB files for 1991 through 2011 were provided to Statistics Canada. Before linkage to the CCR, the MHSIP and RPDB were pre-processed, including identification of individuals with multiple HINs (Manitoba = 0.2% or 3,588; Ontario = 1% or 165,123). In total, 1,684,056 MHSIP and 16,580,805 RPDB registrants were eligible for linkage to the CCR. Details about pre-processing of the registry files are available elsewhere.<sup>28</sup>

## Methods

### Record linkage

Different record linkage approaches were used to accommodate differences in the availability of linkage keys across jurisdictions. Health insurance number, a variable used to link the CCR and DAD/NACRS, was available on the CCR for Nova Scotia and Prince Edward Island, but not for Ontario and Manitoba. Consequently, an indirect linkage method was used for Ontario and Manitoba, and a direct method was used for Nova Scotia and Prince Edward Island.

#### Indirect linkage method

The indirect method used to link the CCR to the DAD and the NACRS for Ontario and Manitoba involved a two-step process. First, the 2008 CCR was probabilistically linked to each respective provincial health insurance plan client registry to obtain a HIN. The Fellegi-Sunter probabilistic method was applied, based on name, date of birth, sex and postal code as linkage variables because they were common to both databases. The probabilistic linkage methods have been reported in detail elsewhere.<sup>28</sup> The result of the probabilistic linkage was a set of keys containing both the CCR unique patient identifier and the associated HIN. These keys were then used to deterministically link CCR records with national DAD records from fiscal 2004/2005 to 2010/2011 and Ontario NACRS records from fiscal 2004/2005 to 2010/2011.

#### Direct linkage method

A direct approach was used to link the CCR and DAD data in Nova Scotia and Prince Edward Island, based on the HIN available in both datasets. The HIN was used in combination with the tumour-reporting province as proxy for province/territory that issued the HIN, since HINs are not unique across provinces. These two pieces of information were used to deterministically link CCR records submitted by Nova Scotia and Prince Edward Island to the national DAD. Additional information about the direct linkage is available elsewhere.<sup>20</sup>

## Validation

To validate both the indirect and direct linkage methods, the eligibility of cancer tumours for linkage and linkage rates are reported. For Ontario and Manitoba, the rate for eligibility for linkage is defined as the percentage of tumours that linked to the provincial registries of all tumours. For Nova Scotia and Prince Edward Island, eligibility is defined as the percentage of tumours with a valid HIN of all tumours. This analysis also provides information about potential biases among non-eligible records. Linkage rates between the CCR and the DAD/NACRS for each cancer type are reported by province, age and hospital service type. Rates are defined as the percentage of eligible tumours that link to at least one hospitalization (any cause).

## Cohort selection

Cancers included for feasibility assessment were female breast, colorectal and prostate. These cancers are the leading causes of new cancers in Canada<sup>29,30</sup> and therefore, are expected to provide large sample sizes for analysis. Furthermore, these cancers have different treatment pathways, which allow assessment of the feasibility of using linked data to capture a range of treatment types.

*International Classification of Diseases for Oncology, Third Edition (ICD-O-3)*<sup>31</sup> codes were used to define all tumour cohorts; these were grouped using Surveillance, Epidemiology, and End Results (SEER) Program grouping definitions.<sup>32</sup> Total counts by province and year (2005 to 2008) are reported in Table 1.

### Breast cancer

Breast tumour ICD-O-3 codes were site/topography C50.0-C50.9, and where behaviour is malignant. The following morphologies were excluded: mesothelioma (9050-9055), Kaposi sarcoma (9140), and Hodgkin and non-Hodgkin lymphomas (9590-9992).

### Colorectal cancer

ICD-O-3 codes to define colorectal cancer were: colon site/topography C18.0, C18.2-C18.9; C26.0; and rectum/Rectosigmoid Junction site/topography C19.9, C20.9; both with malignant behaviour. Histology for both sites excluded: mesothelioma (9050-9055), Kaposi sarcoma (9140), and Hodgkin and non-Hodgkin lymphomas (9590-9992).

### Prostate cancer

ICD-O-3 code used to define prostate cancer was site/topography C61.9; and where behaviour is malignant. Histology included code ranges 8000-9049, 9056-9139, 9141-9589.

## Treatment codes and groups

A comprehensive list of potential treatments was developed for each cancer type based on published sources, including cancer treatment guidelines<sup>33-42</sup> and Facility Oncology Registry Data Standards (FORDS).<sup>43</sup> The lists were reviewed by members of the national advisory committee, technical experts at the provincial cancer agencies, and clinical experts when required. After consultations, a final set of treatments were selected and grouped to reflect the following treatment categories: *lymph node and diagnostic interventions, surgical interventions, radiation, and pharmacotherapy*. Appendix A presents lists of interventions included in each treatment category.

The Canadian Classification of Health Interventions versions 2003, 2006 and 200933-35 were used to define treatments in the DAD/NACRS for each treatment category (Appendix A). For each tumour, all linked hospitalizations were used to determine whether at least one instance of a given treatment occurred during the follow-up period. All available intervention fields in the linked DAD (20) and NACRS (10) records were used. This was done independently for each treatment type because multiple treatments in a single hospital admission are captured as separate treatment events.

It is possible that cancer patients with co-morbid conditions requiring the same interventions as certain selected cancer treatments might inflate cancer treatment rates since it was not possible to definitively determine which health condition was being treated. Treatment guidelines for different health conditions may overlap—for example, excision of testes in cases of prostate or testicular cancers. Therefore, linked CCR-DAD information was used to identify cases with relevant dual cancer diagnoses, specifically, prostate and testicular cancers, or colitis and colorectal cancer. For dual diagnoses cases involving prostate and testicular cancers, if the testicular cancer CCR-based diagnostic date fell within one year before the prostate linked excision of testes, that surgery was not used in the compilation of the overall selected prostate surgery treatment rates. This was to reduce the risk of including surgeries to treat the testicular cancer, rather than prostate, in treatment rates calculations.



## Follow-up periods

The follow-up period for inclusion of hospital records and treatment events depended on cancer type. The CCR-based tumour diagnostic date was the start date for calculating the follow-up period. For colorectal and female breast tumours, hospital records were included if the admission date was within 31 days before, or one year (365 days) after the linked tumour diagnosis date. For prostate tumours, the inclusion criteria were an admission date within 31 days before and two years (730 days) after the diagnosis date. The admission date of a tumour-linked hospital record was used to determine if the admission occurred during the follow-up period.

## Service type

The DAD and the NACRS represent different frames of hospital services that are expected to have an impact on reporting treatment rates. The DAD includes all discharges from acute care facilities and same-day surgery visits, except in Ontario, and for several hospitals in Nova Scotia since 2003, where day-surgery visits are recorded in the NACRS.<sup>44</sup> For Ontario, the NACRS data include visits to a broader range of services including: emergency room visits, day/night surgery, oncology clinics, Cancer Care Ontario for oncology care, and other types of ambulatory care (for example, renal dialysis clinics).<sup>23-27</sup> The Ontario NACRS data provided an opportunity to link tumours to treatment data that were comparatively unavailable for the other three provinces; as a result, overall treatment rates are expected to be higher in Ontario. To adjust for differences in data availability, linkage and treatment rates are reported overall and by service type. For all provinces except Ontario, this represents the combined day surgery and acute care visits. For Ontario, this also includes all other service types of hospitalizations captured in the NACRS. For treatment rates, results for Ontario are reported in two ways: overall treatments rates, which include treatments identified in both the DAD and the NACRS, and also, rates using acute/day surgery only to allow comparisons with the other provinces. Day surgery records for Ontario included both DAD and NACRS records.

To classify hospital records by service type, for the DAD, the analytical institution type code field was used to indicate acute care (1) or day surgery (A).<sup>21</sup> For Ontario, the NACRS Management Information System (MIS) Functional Centre Account Codes were used to classify each record as day surgery, oncology centres/clinics,<sup>23-27</sup> or “other” ambulatory care. The last consisted of records that were neither acute care nor day surgery records.

## Treatment rates

Treatment rates for each cancer are reported by province, year and type of treatment. The numerator is the number of tumours having at least one occurrence of a selected treatment during the follow-up period. The denominator is the number of tumours eligible for linkage to the DAD and/or the NACRS.

## Results

### Cancer cohorts

For 2005 through 2008, the following primary, single, malignant tumour cohorts were identified in the CCR: 37,984 female breast tumours; 36,171 colorectal tumours; and 43,448 prostate tumours (Table 1).

### Eligibility for linkage

Table 2 displays the numbers and percentages of tumours eligible for linkage to the DAD and/or NACRS. Throughout the 2005-to-2008 period, linkage eligibility rates of all tumours in a given cancer cohort ranged from 97.0% to 100% in Manitoba; from 98.1% to 99.0% in Ontario; from 99.1% to 100% in Nova Scotia; and from 98.8% to 100% in Prince Edward Island. No systematic biases in eligibility were evident overall, or according to patient and tumour characteristics (data not shown).

### Linkage rates

Table 3 displays linkage rates of tumours to the DAD, and for Ontario, to the NACRS, by province and hospital service type from 2005 to 2008. For breast cancer tumours, linkage to the DAD/NACRS was consistently above 95% in all provinces and years, except Manitoba in 2008 (94%).

The percentages of breast tumours that linked to acute care hospitalizations ranged from 52% (Ontario 2008) to 96% (Prince Edward Island, 2006). In Nova Scotia, linkage rates dropped from about 83% (2005 and 2006) to 75% in 2007, and to 73% in 2008. Linkage rates of breast tumours to same-day surgery ranged from 63% (Ontario, 2005) to 75% (Nova Scotia, 2008); the range in Prince Edward Island was lower (34% to 51%).

For colorectal tumours, the overall linkage rate between CCR and the DAD/NACRS was consistently above 96% in all provinces and years. Acute care linkage rates ranged from 91% (Nova Scotia, 2008) to 99% (Prince Edward Island, 2005). Day-surgery linkage rates were similar across years and provinces, ranging from 68% (Nova Scotia, 2005) to 79% (Prince Edward Island, 2007). Men had consistently

higher linkage rates than did women (data not shown). For example, in Manitoba, ranges were from 72% to 79% for men and from 64% to 73% for women.

For prostate cancer, overall linkage rates to hospitalizations varied across provinces from 75% to 80% in Manitoba to more than 90% in Ontario. Linkage rates to acute care hospitalizations ranged from 61% (Ontario, Nova Scotia, 2007) to 72% (Prince Edward Island, 2005). Linkage rates to day surgery ranged from less than 40% in Manitoba to more than 60% in Nova Scotia.

As noted, linkage rates to oncology-related services in the NACRS were available only for Ontario (Table 3). For breast tumours, rates ranged from 81% to 92%. For colorectal tumours, rates were around 64%, for rectum/rectosigmoid junction tumours, around 75% (data not shown), for all years except 2008. For prostate tumours, linkage rates to oncology-related services ranged from 42% to 56%.

## Treatment rates

### Breast tumours

Overall, more than 90% of cancer tumours identified between 2005 and 2008 were linked to at least one type of treatment during the follow-up period, except in Manitoba where the overall rate was 88.8% in 2008 (Table 4). In Ontario, the overall treatment rate ranged between 92.1% and 93.3% when all DAD and NACRS hospital events were considered, compared with 90.8% to 91.9% when only acute and day surgery admissions were considered. Overall treatment rates varied with the age of the patient and the stage of the breast tumour at diagnosis. Tumours among patients aged 70 or older were generally less likely than tumours among younger women to link to at least one treatment (Appendix B). Information about tumour staging was available only for Manitoba and Prince Edward Island. In both provinces, linkage rates to any of the selected treatments were lowest for stage IV tumours (Appendix C).

Treatment rates were generally highest for breast-conserving surgery and/or mastectomy in all provinces. The overall rate of treatment ranged from 89.1% to 90.5% in Ontario, from 86.6% to 91% in Manitoba, from 75.6% to 90.1% in Nova Scotia, and from 87.7% to 92.7% in Prince Edward Island. When specific procedures were considered, over half of tumours received breast-conserving surgery in Ontario and Manitoba, compared with about 35% in Nova Scotia and Prince Edward Island. Conversely, around one in three breast tumours received mastectomy only in Ontario and Manitoba, compared with approximately 40% in Nova Scotia, and between 33% and 43% in Prince Edward Island.

The rate of lymph node treatment varied across provinces and years. In Ontario, Nova Scotia and Prince Edward Island, the percentage of breast cancer tumours with at least one lymph node treatment was 80% or higher, except for Nova Scotia in 2008 (67.4%). The rate for Manitoba varied from 73.1% (2005) to 76.9% (2006). These rates may not have captured removal of nodes that occurred in radical excisions of breast (mastectomy); thus, numbers do not represent absolute rates of lymph node excisions.

Treatment rates for radiation were highest in Ontario—about 60%—when all hospital events were considered. The Ontario rate fell to less than 1% (similar to other provinces) when radiation treatment rates were restricted to acute care and day surgery hospital events.

Treatment rates for diagnostic biopsy (breast, not otherwise specified) were highest in Nova Scotia, ranging from 43.6% to 55.7%. This compared with approximately 5% in Ontario and less than 5% in Manitoba.

Differences in treatment rates also emerged by type of admission: acute versus day surgery. In Ontario, for example, linkage rates to same-day surgery exceeded linkage rates to acute care treatment (data not shown), owing largely to a greater likelihood of linking to “breast-conserving surgery only” in day surgery. In Manitoba and Prince Edward Island, linkage rates to treatments in acute care settings were generally higher than to day surgery (data not shown). In Nova Scotia, linkage rates to at least one treatment in acute care relative to rates for day surgery varied by year.

### Colorectal tumours

The overall treatment rates for colorectal tumours to any of the treatments was 90% or higher across all provinces and years (Table 5). Treatment rates for colorectal tumours varied by sex, age and tumour stage. Rates tended to be lower for women than for men (Appendix D) and for those aged 70 or older (Appendix E). For the two provinces where tumour stage information was available, consistent patterns in treatment rates emerged, with rates lowest among those with Stage IV (Appendix F).

Colorectal treatment rates primarily reflect surgery. Surgical treatment included excisions in the colon, and/or the rectum/rectosigmoid junction, pelvic or intra-abdominal lymph nodes, and tended to occur in acute care settings (data not shown). This explains why, for this cancer, the broader array of data for Ontario did not yield much higher overall colorectal treatment rates than those in the other provinces.

Treatment rates were generally highest for surgery/excision, with 80% or more of colorectal tumours experiencing this treatment. The surgical treatment rates were consistently highest in Ontario (overall rate) and Prince Edward Island.

More than 70% of colorectal tumours in Ontario, Manitoba and Prince Edward Island had a linked diagnostic procedure with at least one biopsy and/or colonoscopy, proctoscopy, lymph node excision. The corresponding diagnostic treatment rate in Nova Scotia was consistently below 70%.

Rates of treatments to repair or reconstruct the large intestine and/or rectum varied from about 5% in Ontario and Nova Scotia to 7% to 9% in Manitoba and Prince Edward Island.

Between 10% and 12 % of colorectal tumours in Ontario linked to radiation treatments when all available services were considered. However, based on combined acute care and day surgery, the treatment rate fell to 1% or less rates, which was comparable to radiation treatment rates in the other three provinces. The pattern was similar for pharmacotherapy treatment rates. At least one-third of colorectal tumours in Ontario linked to a pharmacotherapy treatment when all hospital events were considered, but the figure decreased to 2% when acute and day surgery hospital events were considered. Linkage rates in Manitoba, Nova Scotia, and Prince Edward Island were 2% or less.

Differences in treatment rates were also noted by type of service—acute versus day surgery. Overall treatment rates were higher in acute care, than in day surgery in all provinces, primarily due to higher surgical rates in acute care (data not shown). The reverse was true for the diagnostic treatment category, where rates were higher in day surgery than in acute care in all provinces.

### Colon and rectum/rectosigmoid junction tumours

Treatment rates for single malignant colon tumours resembled patterns for colorectal treatment (Table 6). This was expected, given that colon tumours comprised the majority (63% to 81%) of single malignant colorectal tumours.

However, treatment rates for surgery for colon tumours tended to be slightly higher than rates for colorectal tumours. At least 80% of these tumours linked to surgical treatments in each province. As well, 60% to 77% of these tumours linked to diagnostic treatments.

As expected, in Ontario, radiation treatment rates of colon tumours were high when all hospital events were considered, but similar to those of other provinces based only on combined acute care and day surgery: 1% to 2%, compared with less than 1% in the other provinces. Rates for systemic pharmacotherapy treatment in Ontario were at least 27% when all service types were considered, but only about 2% based on combined day surgery and acute care hospitalizations.

Based on all hospital service types, Ontario treatment rates for radiation and systemic pharmacotherapy were higher for rectum/rectosigmoid junction than for colon tumours (Table 7). Treatment rates for repairs also tended to be higher for rectum/rectosigmoid junction tumours, compared with colon tumours (Tables 6 and 7). Repair treatments were more likely to occur as day surgery than within acute care (data not shown).

### Prostate tumours

The overall treatment rate for prostate cancer varied across provinces. In Ontario, about three-quarters of tumours linked to at least one treatment when all service types were considered; the rate fell to about 50% when only inpatient and day surgery admissions were considered (Table 8). Comparable rates ranged from 42% to 45% in Manitoba, from 58% to 71% in Nova Scotia, and from 43% to 53% in Prince Edward Island. Consistent with other cancers, treatment rates for prostate tumours were inversely associated with patient age at diagnosis, with the lowest rates among men aged 70 or older (Appendix G). Patterns by stage were u-shaped; stage III tumours tended to have highest overall treatment rates (Appendix H).

Surgery was the most prevalent treatment in all provinces, with about 40% of prostate cancer tumours linking to at least one type of surgical intervention. In Ontario and Manitoba, 35% to 40% of tumours linked to a surgical treatment; in Prince Edward Island, 25% to 37%; and in Nova Scotia, from 40% to 43%. In every year, surgical treatment rates were highest in Nova Scotia. The interventions primarily contributing to these rates were radical excisions to, or complete destruction of, the prostate. These treatments generally were more likely to occur during acute care hospitalizations than in day surgery (data not shown) in all provinces except Nova Scotia.

Treatment rates for diagnostic procedures for prostate tumours varied widely across provinces. Rates were highest in Nova Scotia (30% to 47%), followed by Ontario (24% to 28%, overall rate), Manitoba (5% to 9%), and Prince



Edward Island (4% or less). The diagnostic procedure that primarily accounted for these rates was biopsy of the prostate. Diagnostic and surgical rates mainly accounted for differences across provinces for overall treatment rates.

As with other cancers, radiation treatment rates were highest in Ontario where about one-third of prostate tumours linked to radiation (29% to 33%); these rates fell to about 3% when acute care and day surgery only were considered. Comparable radiation rates were highest (9% to 18%) in Prince Edward Island; in most cases, these represented brachytherapy interventions submitted by hospitals in New Brunswick. Radiation rates ranged from 2% to 6% in Nova Scotia, and were not reportable in Manitoba because of small numbers.

Treatment rates for systemic pharmacotherapy for prostate cancer were about 5% in Ontario based on all service types, and about 1% based on combined day surgery and acute care services. Almost no prostate tumours in the other provinces linked to systemic pharmacotherapy.

## Discussion

The results of this study demonstrate that the CCR can be linked to hospital data, and thereby, can be used to report on selected types of cancer treatment. Linkage rates to the DAD and NACRS (Ontario) using HINs were 94% or more for breast and colorectal tumours in all provinces and years; rates for prostate cancer varied from between 75% to 79% in Manitoba to more than 90% in Ontario. Other linked data sources created using HINs that reported linkage rates at 75% have been judged to be of sufficient quality for use in research.<sup>6,45-51</sup>

Given that the majority of cancer tumours in this analysis were eligible for linkage, linkage rates were unbiased. The resulting linked data are comprehensive and accurate representations of total single malignant tumour cohorts for breast, colorectal and prostate cancers for 2005 through 2008. The patterns of treatment rates by age and stage generally reflected expected outcomes. For all three cancers, the likelihood of linkage to a treatment tended to be lower among the oldest patients and for stage IV cancers—results consistent with expectation. For example, the lowest rates of radical prostatectomy and lower rates of colon surgery have previously been reported for patients aged 75 or older.<sup>50,51</sup>

However, the feasibility of reporting treatment rates by type of procedure varied, based on the availability of data for record linkage. The CCR linked data could feasibly be used to report on treatments such as surgery occurring as

day or acute care hospital procedures, but the data were less complete for treatments, such as radiation and pharmacotherapy, that may occur outside of acute care and same-day surgery hospital settings. The exception was Ontario where information from oncology centres and clinics was available via the NACRS data. This limitation to treatment linkage reflects the nature of treatment capture available in the DAD/NACRS, rather than weakness in the linkage methodology.

Comparisons with published population treatment rates suggest that, for at least two cancers (breast and colorectal), the CCR linked data yielded expected rates for surgical treatment. The results of this study indicated that for breast cancer, surgical treatments such as breast-conserving surgery and mastectomy were the most prevalent types of treatment. This finding was confirmed by other published sources, which highlight these surgeries as integral to breast cancer treatment.<sup>38,52-57</sup> Linked results resemble surgery rates previously reported for Ontario, Manitoba and Prince Edward Island<sup>54,55</sup> when linked mastectomy and breast-conserving surgery/mastectomy rates are combined. Some differences were noted; for example, the surgery rates in Manitoba were generally below Cancer Care Manitoba's breast cancer surgery indicator for 2010,<sup>56</sup> but similar to the mastectomy rate reported by the Canadian Partnership Against Cancer.<sup>57</sup> Surgery rates for colorectal cancer in Ontario were similar to published rates.<sup>50</sup>

Conversely, surgical rates for prostate cancer derived from the linked data differed from other published reports. For example, surgical rates were lower than radical prostatectomy rates previously reported for Ontario<sup>51</sup> and Manitoba.<sup>56</sup> However, surgical rates in this study were similar to prostatectomy rates reported for Ontario's cancer system performance quality indicator<sup>52</sup> and for the U.S. population.<sup>62</sup>

Rates for treatments that commonly occur in other settings, such as radiation and pharmacotherapy, were consistently low in all provinces except Ontario where the NACRS data were used to capture treatments in oncology clinics. This is confirmed when rates for these treatments are compared with published provincial cancer control and system performance indicators.<sup>52,56,65</sup> The inability to accurately report rates for these types of treatments is less an issue of data linkage and more related to the comprehensiveness of available administrative data in capturing the full range of cancer treatments that occur in a variety of settings. With the continued expansion of the NACRS data in Canada, comprehensiveness in reporting radiation and pharmacotherapy therapy may improve.

Nonetheless, some types of treatment will not be captured through linkage to hospital records—for example, “watchful waiting” or “active surveillance” for low-risk prostate cancer cases,<sup>61</sup> which involve regular blood testing for prostate-specific antigen and digital rectal exams that occur elsewhere.

Other factors warrant consideration in assessments of the feasibility of using linked data to report cancer treatment. The utility of linked information in reporting treatment depends on the comprehensiveness and accuracy of the data used in the linkage process, namely, the DAD and the NACRS. Turner et al.<sup>12</sup> concluded that information about breast surgery was more complete in the Manitoba Registry than in the DAD, which suggests that the linked CCR-to-DAD/NACRS breast treatment rates may be underestimates. By contrast, other researchers concluded that although physician billing data were more accurate than the DAD data, definitive breast surgery information in the DAD accurately reflected original patient charts.<sup>13</sup>

Even if information is comprehensively reported to the DAD/NACRS, other limitations in the hospital administrative data may hinder the accurate reporting of treatment rates using the linked CCR data. These limitations arise from existing standards of coding practice in the DAD/NACRS. For example, treatments involving lymph node interventions generally had a low frequency of occurrence. In the DAD, axillary lymph node procedures for breast cancer may not be recorded distinctly to radical mastectomy procedures, with the result that rates for procedures involving axillary lymph nodes may be under-reported.<sup>12</sup>

Similarly, for prostate, lymph node removal is not always captured when radical prostatectomy is recorded, so it is possible that only the radical prostatectomy was coded even though regional lymph nodes were removed.<sup>34</sup> Again, low rates for those diagnostic or surgical treatments reflect the nature of the information available in the DAD/NACRS, rather than weakness in the linkage methodology. Therefore, obtaining comprehensive or absolute counts of lymph node interventions from hospital data is not feasible, and rates for treatment groupings that included lymph node procedures may be underestimated. Furthermore, given existing coding standards, available diagnostic and procedure codes cannot be used to distinguish between breast-conserving surgery and open excisional biopsy in the DAD/NACRS; therefore, treatment rates for one or the other may have been underestimated.

Another potential limitation of the hospital administrative data sources is the varying completeness in volume of reported ambulatory visits in Ontario’s NACRS across

years. Volume varied after changes to provincial mandatory reporting requirements in 2007.<sup>26,27</sup> Despite the decrease in the volume of submitted records of ambulatory visits, centres reporting chemotherapy and radiation were still required to submit abstracts to the NACRS. Consequently, the availability of records for linkage to day surgery, radiation and chemotherapy would likely not have been affected by decreased volume of reporting.<sup>66</sup>

An important limitation of these results pertains to the scope of data sources used in the linkage. Nova Scotia NACRS records were not included, although starting in 2003, some hospital facilities started to report day surgery visits to the NACRS rather than to the DAD.<sup>22,23,67</sup> As a result, treatment reporting for Nova Scotia may be incomplete in the DAD. Also, for Manitoba, breast treatments may have been underestimated based on linkage to the DAD alone, because out-of-hospital lymph node diagnostic procedures and breast-conserving surgery are available elsewhere.<sup>68</sup>

The study did not include *in situ* and multiple tumours, so the generalizability of the results of this study does not extend to such tumours. Future studies should attempt to include them to determine the feasibility of using linked data to report on treatment rates for these tumours.

An advantage of this linkage is that some inherent limitations of the DAD/NACRS were partly overcome through linkage to the CCR. The accuracy of reporting treatment for patients with dual cancer diagnoses was improved. Because coincident cancers can have overlapping treatment guidelines—for example, prostate and bladder cancers—incorrect attribution of treatment to a given tumour could occur using unlinked DAD/NACRS information. However, linked CCR-DAD/NACRS data yielded information about dual cancer diagnoses and the timing of tumour diagnosis, so the likelihood of incorrect attribution of treatment was reduced.

Another advantage of this methodology is the ability to locate information about treatment outside a patient’s province of residence before and after diagnosis, because the CCR was linked to the national DAD using HINs. Linkage depended on the patient’s using the same HIN and on out-of-province facilities’ recording this HIN correctly. The power of this methodology was demonstrated by prostate radiation treatment of residents of Prince Edward Island—almost 100% of their brachytherapy information was submitted by hospitals in New Brunswick, yet these linked successfully to prostate tumours in patients from Prince Edward Island.



## Conclusions

The addition of treatment information to the CCR through record linkage to the DAD/NACRS is feasible, with noted limitations. In the four provinces examined in this study, high, unbiased percentages of female breast, colorectal and prostate cancer tumours were eligible for linkage to the DAD/NACRS using direct or indirect linkage. Linkage rates to hospitalizations varied by cancer type, but generally exceeded acceptable linkage rates. Linkage rates between tumours and hospitalizations were consistently high for female breast and colorectal cancer; rates were lower for prostate cancer. The feasibility of linking tumours to treatment depended on the type of treatment. The results, which reflect the degree of national standardization in data collection systems, demonstrate that surgical information is most consistently available through linkage.

Non-surgical treatments, such as radiation, systemic pharmacotherapy and diagnostic interventions (even surgical ones), are significantly under-reported based only

on linkage to the DAD/NACRS; the results are somewhat more inclusive if linkages to the DAD via HINs are performed nationally, and if linkages include the NACRS.

The linkages in the current study provide new treatment information and validate methods that increase the analytical capacity of the CCR. These methods can be used to obtain surgical treatment information to add to the CCR. Stakeholders at the provincial, territorial and national levels can use these treatment data to investigate outcomes and wait times, for surveillance, to monitor system performance, and for resource planning.

Future development could include improvements to the comprehensiveness of captured treatments through linkage to the NACRS from other provinces.

Table 1

Canadian Cancer Registry (CCR)<sup>1</sup> single malignant tumour cohorts by cancer and province, 2005 to 2008

	CCR year <sup>1</sup>				Total
	2005	2006	2007	2008	
	number of tumours				
<b>Female breast</b>	9,205	9,492	9,677	9,610	37,984
Ontario	7,728	7,956	8,162	7,991	31,837
Manitoba	729	735	770	793	3,027
Nova Scotia	675	719	659	726	2,779
Prince Edward Island	73	82	86	100	341
<b>Colorectal</b>	8,797	8,875	9,148	9,351	36,171
Ontario	7,274	7,315	7,498	7,668	29,755
Manitoba	695	722	789	796	3,002
Nova Scotia	719	747	768	784	3,018
Prince Edward Island	109	91	93	103	396
<b>Colon tumour</b>	6,070	6,119	6,372	6,385	24,946
Ontario	5,047	5,091	5,271	5,242	20,651
Manitoba	468	474	517	499	1,958
Nova Scotia	475	493	524	561	2,053
Prince Edward Island	80	61	60	83	284
<b>Rectum/rectosigmoid junction</b>	2,727	2,756	2,776	2,966	11,225
Ontario	2,227	2,224	2,227	2,426	9,104
Manitoba	227	248	272	297	1,044
Nova Scotia	244	254	244	223	965
Prince Edward Island	29	30	33	20	112
<b>Prostate</b>	10,443	11,265	11,449	10,291	43,448
Ontario	9,018	9,525	9,669	8,819	37,031
Manitoba	582	675	727	618	2,602
Nova Scotia	735	916	890	736	3,277
Prince Edward Island	108	149	163	118	538

1. Data source: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada.

Table 2

Percentage of Canadian Cancer Registry (CCR)<sup>1</sup> tumours eligible to link to Discharge Abstract Database (DAD) and for Ontario to National Ambulatory Care Reporting System (NACRS), single malignant tumours, by cancer type and province, 2005 to 2008.

	2005 CCR <sup>1</sup>	Tumours eligible to link to DAD/NACRS		2006 CCR <sup>1</sup>	Tumours eligible to link to DAD/NACRS		2007 CCR <sup>1</sup>	Tumours eligible to link to DAD/NACRS		2008 CCR <sup>1</sup>	Tumours eligible to link to DAD/NACRS	
	number of tumours	N	%	number of tumours	N	%	number of tumours	N	%	number of tumours	N	%
<b>Female breast</b>												
Ontario	7,728	7,600	98.3	7,956	7,827	98.4	8,162	8,018	98.2	7,991	7,838	98.1
Manitoba	729	726	99.6	735	728	99.0	770	766	99.5	793	783	98.7
Nova Scotia	675	674	99.9	719	719	100.0	659	657	99.7	726	725	99.9
Prince Edward Island	73	73	100.0	82	82	100.0	86	86	100.0	100	100	100.0
<b>Colorectal</b>												
Ontario	7,274	7,166	98.5	7,315	7,185	98.2	7,498	7,389	98.5	7,668	7,571	98.7
Manitoba	695	681	98.0	722	717	99.3	789	780	98.9	796	786	98.7
Nova Scotia	719	718	99.9	747	745	99.7	768	766	99.7	784	781	99.6
Prince Edward Island	109	108	99.1	91	91	100.0	93	93	100.0	103	103	100.0
<b>Colon</b>												
Ontario	5,047	4,969	98.5	5,091	5,004	98.3	5,271	5,194	98.5	5,242	5,183	98.9
Manitoba	468	454	97.0	474	469	98.9	517	513	99.2	499	492	98.6
Nova Scotia	475	475	100.0	493	492	99.8	524	523	99.8	561	560	99.8
Prince Edward Island	80	79	98.8	61	61	100.0	60	60	100.0	83	83	100.0
<b>Rectum/rectosigmoid junction</b>												
Ontario	2,227	2,197	98.7	2,224	2,181	98.1	2,227	2,195	98.6	2,426	2,388	98.4
Manitoba	227	227	100.0	248	248	100.0	272	267	98.2	297	294	99.0
Nova Scotia	244	243	99.6	254	253	99.6	244	243	99.6	223	221	99.1
Prince Edward Island	29	29	100.0	30	30	100.0	33	33	100.0	20	20	100.0
<b>Prostate</b>												
Ontario	9,018	8,910	98.8	9,525	9,398	98.7	9,669	9,546	98.7	8,819	8,730	99.0
Manitoba	582	576	99.0	675	667	98.8	727	716	98.5	618	610	98.7
Nova Scotia	735	734	99.9	916	915	99.9	890	889	99.9	736	732	99.5
Prince Edward Island	108	107	99.1	149	148	99.3	163	162	99.4	118	118	100.0

1. Data source: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada.

Table 3

Linkage rates within follow-up for Canadian Cancer Registry (CCR)<sup>1</sup> tumour cohorts to Discharge Abstract Database (DAD) and for Ontario to National Ambulatory Care Reporting System (NACRS) by hospital service type, cancer, and province, 2005 to 2008.

	Tumours with 1 or more hospitalizations within follow-up, by service type										
	Tumours eligible to link to DAD/ NACRS	Tumours with 1 or more hosp. within follow-up	% linked	DAD Acute care	% linked	DAD- NACRS Day Surgery	% linked	NACRS Oncology Centre/ Clinics	% linked	NACRS Other AC	% linked
	N	N	%	N	%	N	%	N	%	N	%
Female breast											
2005											
Ontario	7,600	7,507	98.8	4,623	60.8	4,768	62.7	6,860	90.3	788	10.4
Manitoba	726	697	96.0	549	75.6	433	59.6	na	na	na	na
Nova Scotia	674	643	95.4	556	82.5	441	65.4	na	na	na	na
Prince Edward Island	73	71	97.3	69	94.5	25	34.2	na	na	na	na
2006											
Ontario	7,827	7,712	98.5	4,566	58.3	5,065	64.7	7,167	91.6	315	4.0
Manitoba	728	699	96.0	551	75.7	433	59.5	na	na	na	na
Nova Scotia	719	695	96.7	601	83.6	503	70.0	na	na	na	na
Prince Edward Island	82	81	98.8	79	96.3	42	51.2	na	na	na	na
2007											
Ontario	8,018	7,865	98.1	4,499	56.1	5,427	67.7	7,355	91.7	420	5.2
Manitoba	766	738	96.3	550	71.8	501	65.4	na	na	na	na
Nova Scotia	657	624	95.0	492	74.9	462	70.3	na	na	na	na
Prince Edward Island	86	82	95.3	80	93.0	44	51.2	na	na	na	na
2008											
Ontario	7,838	7,679	98.0	4,095	52.2	5,579	71.2	6,342	80.9	301	3.8
Manitoba	783	736	94.0	486	62.1	550	70.2	na	na	na	na
Nova Scotia	725	692	95.4	527	72.7	543	74.9	na	na	na	na
Prince Edward Island	100	96	96.0	90	90.0	40	40.0	na	na	na	na
Colorectal											
2005											
Ontario	7,166	7,090	98.9	6,772	94.5	5,113	71.4	4,545	63.4	822	11.5
Manitoba	681	658	96.6	630	92.5	468	68.7	na	na	na	na
Nova Scotia	718	698	97.2	663	92.3	487	67.8	na	na	na	na
Prince Edward Island	108	108	100.0	107	99.1	84	77.8	na	na	na	na
2006											
Ontario	7,185	7,099	98.8	6,734	93.7	5,154	71.7	4,602	64.1	429	6.0
Manitoba	717	704	98.2	672	93.7	525	73.2	na	na	na	na
Nova Scotia	745	720	96.6	682	91.5	508	68.2	na	na	na	na
Prince Edward Island	91	90	98.9	84	92.3	67	73.6	na	na	na	na
2007											
Ontario	7,389	7,260	98.3	6,853	92.7	5,293	71.6	4,783	64.7	437	5.9
Manitoba	780	766	98.2	718	92.1	594	76.2	na	na	na	na
Nova Scotia	766	733	95.7	705	92.0	544	71.0	na	na	na	na
Prince Edward Island	93	91	97.8	85	91.4	73	78.5	na	na	na	na
2008											
Ontario	7,571	7,520	99.3	7,049	93.1	5,522	72.9	3,544	46.8	460	6.1
Manitoba	786	766	97.5	726	92.4	571	72.6	na	na	na	na
Nova Scotia	781	755	96.7	712	91.2	546	69.9	na	na	na	na
Prince Edward Island	103	100	97.1	95	92.2	74	71.8	na	na	na	na
Prostate											
2005											
Ontario	8,910	8,494	95.3	5,777	64.8	5,265	59.1	4,989	56.0	849	9.5
Manitoba	576	457	79.3	388	67.4	207	35.9	na	na	na	na
Nova Scotia	734	648	88.3	455	62.0	513	69.9	na	na	na	na
Prince Edward Island	107	91	85.0	77	72.0	41	38.3	na	na	na	na
2006											
Ontario	9,398	8,905	94.8	5,870	62.5	5,369	57.1	5,050	53.7	850	9.0
Manitoba	667	503	75.4	420	63.0	248	37.2	na	na	na	na
Nova Scotia	915	792	86.6	624	68.2	578	63.2	na	na	na	na
Prince Edward Island	148	121	81.8	92	62.2	62	41.9	na	na	na	na

Table 3 (continued)

Linkage rates within follow-up for Canadian Cancer Registry (CCR)<sup>1</sup> tumour cohorts to Discharge Abstract Database (DAD) and for Ontario to National Ambulatory Care Reporting System (NACRS) by hospital service type, cancer, and province, 2005 to 2008.

	Tumours			Tumours with 1 or more hospitalizations within follow-up, by service type							
	Tumours eligible to link to DAD/ NACRS	with 1 or more hosp. within follow-up	% linked	DAD Acute care	% linked	DAD- NACRS Day Surgery	% linked	NACRS Oncology Centre/ Clinics	% linked	NACRS Other AC	% linked
	N	N	%	N	%	N	%	N	%	N	%
<b>2007</b>											
Ontario	9,546	9,002	94.3	5,788	60.6	5,425	56.8	5,270	55.2	914	9.6
Manitoba	716	544	76.0	458	64.0	252	35.2	na	na	na	na
Nova Scotia	889	770	86.6	546	61.4	597	67.2	na	na	na	na
Prince Edward Island	162	136	84.0	103	63.6	80	49.4	na	na	na	na
<b>2008</b>											
Ontario	8,730	8,090	92.7	5,459	62.5	5,265	60.3	3,629	41.6	1,440	16.5
Manitoba	610	473	77.5	381	62.5	237	38.9	na	na	na	na
Nova Scotia	732	648	88.5	455	62.2	513	70.1	na	na	na	na
Prince Edward Island	118	99	83.9	73	61.9	44	37.3	na	na	na	na

1. Data source: Canadian Cancer Registry Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada.

na Not Applicable



**Table 4**  
**Treatment rates within follow-up for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR)<sup>1</sup> by province, year, and hospital service type, 2005 to 2008**

Province, CCR year, Service type		Selected Treatments																	
		Hospitalized w/in follow-up and at least one selected treatment	Lymph nodes		Breast-Conserving Surgery/Mastectomy								Radiation		Diagnostic: biopsy, breast, NOS		None of these selected treatments		
			Biopsy/Partial/total excision ALN, radical mastectomy	Total BreastCS and/ or Mastectomy		BCS only		BCS and Mast.		Mastectomy only									
				% linkable N	% linkable tumours	% linkable N	% linkable tumours	% linkable N	% linkable tumours	% linked N	% linked tumours	% linkable N							% linkable tumours
Ontario	Overall																		
	2005	7,091	93.3	6,156	81.0	6,875	90.5	4,244	55.8	704	9.3	1,927	25.4	4,480	58.9	399	5.3	509	6.7
	2006	7,210	92.1	6,209	79.3	6,974	89.1	4,414	56.4	628	8.0	1,932	24.7	4,611	58.9	408	5.2	502	6.4
	2007	7,426	92.6	6,448	80.4	7,160	89.3	4,361	54.4	700	8.7	2,099	26.2	4,801	59.9	437	5.5	592	7.4
	2008	7,302	93.2	6,455	82.4	7,054	90.0	4,345	55.4	611	7.8	2,098	26.8	4,819	61.5	433	5.5	536	6.8
	acute/daysurgery																		
	2005	6,978	91.8	6,108	80.4	6,824	89.8	4,193	55.2	696	9.2	1,935	25.5	24	0.3	359	4.7	622	8.2
	2006	7,106	90.8	6,205	79.3	6,970	89.1	4,411	56.4	625	8.0	1,934	24.7	15	0.2	376	4.8	721	9.2
	2007	7,299	91.0	6,444	80.4	7,154	89.2	4,355	54.3	695	8.7	2,104	26.2	32	0.4	404	5.0	719	9.0
	2008	7,203	91.9	6,453	82.3	7,051	90.0	4,343	55.4	608	7.8	2,100	26.8	28	0.4	413	5.3	635	8.1
Manitoba																			
	acute/daysurgery																		
	2005	659	90.8	531	73.1	638	87.9	357	49.2	60	8.3	221	30.4	x	x	34	4.7	67	9.2
	2006	657	90.2	560	76.9	646	88.7	379	52.1	58	8.0	209	28.7	0	0.0	16	2.2	71	9.8
	2007	713	93.1	584	76.2	697	91.0	405	52.9	61	8.0	231	30.2	0	0.0	24	3.1	53	6.9
	2008	695	88.8	592	75.6	678	86.6	435	55.6	44	5.6	199	25.4	x	x	19	2.4	88	11.2
Nova Scotia																			
	acute/daysurgery																		
	2005	630	93.5	543	80.6	607	90.1	247	36.6	64	9.5	296	43.9	x	x	294	43.6	44	6.5
	2006	674	93.7	577	80.3	644	89.6	259	36.0	67	9.3	318	44.2	0	0.0	379	52.7	45	6.3
	2007	603	91.8	517	78.7	563	85.7	228	34.7	66	10.0	269	40.9	x	x	358	54.5	54	8.2
	2008	677	93.4	489	67.4	548	75.6	204	28.1	48	6.6	296	40.8	x	x	404	55.7	48	6.6
Prince Edward Island																			
	acute/daysurgery																		
	2005	67	91.8	60	82.2	64	87.7	25	34.2	15	20.5	24	32.9	x	x	x	x	6	8.2
	2006	x	x	67	81.7	76	92.7	35	42.7	14	17.1	27	32.9	0	0.0	6	7.3	x	x
	2007	77	89.5	70	81.4	76	88.4	24	27.9	17	19.8	35	40.7	0	0.0	x	x	9	10.5
	2008	91	91.0	80	80.0	88	88.0	27	27.0	18	18.0	43	43.0	0	0.0	7	7.0	9	9.0

x suppressed to meet the confidentiality requirements of the Statistics Act,

**Data sources:** Canadian Cancer Registry Tabulation master file (CCR rules), Sept 19, 2012, CCR\_DAD, CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

**Table 5**  
**Treatment rates within follow-up for linked single malignant colorectal tumours, identified in Canadian Cancer Registry (CCR)<sup>1</sup> by province, year, and hospital service type, 2005 to 2008**

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy (lymph node/large intestine/rectum) or colonoscopy or proctoscopy	At least one excision (partial, total,radical, destruction, large intestine/rectum/ lymph node)	Bypass/with exteriorization/ re-attachment/ construction/ reconstruction	Radiation/Implantation of internal device/ brachytherapy	Pharmacotherapy, total body							
								N	% linked tumours	N	% linked tumours	N		
N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	
<b>Ontario</b>														
Total hospitalization services 2005	6,791	94.8	5,349	74.6	6,062	84.6	426	5.9	828	11.6	2,575	35.9	375	5.2
acute/daysurgery 2005	6,731	93.9	5,344	74.6	6,062	84.6	426	5.9	35	0.5	152	2.1	435	6.1
Total hospitalization services 2006	6,783	94.4	5,203	72.4	6,104	85.0	367	5.1	750	10.4	2,369	33.0	402	5.6
acute/daysurgery 2006	6,733	93.7	5,196	72.3	6,104	85.0	367	5.1	36	0.5	127	1.8	452	6.3
Total hospitalization services 2007	6,936	93.9	5,251	71.1	6,158	83.3	416	5.6	820	11.1	2,447	33.1	453	6.1
acute/daysurgery 2007	6,879	93.1	5,246	71.0	6,158	83.3	416	5.6	30	0.4	108	1.5	510	6.9
Total hospitalization services 2008	7,175	94.8	5,409	71.4	6,377	84.2	369	4.9	842	11.1	2,507	33.1	396	5.2
acute/daysurgery 2008	7,105	93.8	5,398	71.3	6,377	84.2	369	4.9	44	0.6	124	1.6	466	6.2
<b>Manitoba</b>														
<b>acute/daysurgery</b>														
2005	620	91.0	487	71.5	556	81.6	54	7.9	x	x	9	1.3	61	9.0
2006	675	94.1	537	74.9	584	81.5	65	9.1	x	x	11	1.5	42	5.9
2007	737	94.5	565	72.4	629	80.6	72	9.2	x	x	12	1.5	43	5.5
2008	724	92.1	571	72.6	639	81.3	47	6.0	0	0.0	7	0.9	62	7.9
<b>Nova Scotia</b>														
<b>acute/daysurgery</b>														
2005	661	92.1	492	68.5	602	83.8	38	5.3	x	x	7	1.0	57	7.9
2006	675	90.6	497	66.7	609	81.7	32	4.3	x	x	7	0.9	70	9.4
2007	682	89.0	516	67.4	612	79.9	50	6.5	x	x	9	1.2	84	11.0
2008	711	91.0	536	68.6	616	78.9	39	5.0	x	x	8	1.0	70	9.0
<b>Prince Edward Island</b>														
<b>acute/daysurgery</b>														
2005	x	x	82	75.9	94	87.0	x	x	x	x	0	0.0	x	x
2006	83	91.2	70	76.9	77	84.6	6	6.6	x	x	x	x	8	8.8
2007	x	x	77	82.8	79	84.9	6	6.5	0	0.0	x	x	x	x
2008	96	93.2	75	72.8	83	80.6	7	6.8	x	x	x	x	7	6.8

x suppressed to meet the confidentiality requirements of the Statistics Act.

**Data sources:** Canadian Cancer Registry Tabulation master file (CCR rules), Sept 19, 2012, CCR\_DAD, CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

**Table 6**  
**Treatment rates within follow-up for linked single malignant colon tumours identified in Canadian Cancer Registry (CCR) by province, year, and hospital service type, 2005 to 2008**

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy(lymph node/ large intestine/rectum) or colonoscopy or proctoscopy	At least one excision (partial, total,radical, destruction, large intestine/rectum/ lymph node)	Bypass/with exteriorization/ re-attachment/ construction/ reconstruction	Radiation/ Implantation of internal device/ brachytherapy	Pharmacotherapy, total body							
								N	% linked tumours	N	% linked tumours	N		
<b>Ontario</b>														
Total hospitalization services 2005	4,665	93.9	3,542	71.3	4,277	86.1	201	4.0	92	1.9	1,533	30.9	304	6.1
acute/daysurgery 2005	4,631	93.2	3,539	71.2	4,277	86.1	201	4.0	x	x	99	2.0	338	6.8
Total hospitalization services 2006	4,692	93.8	3,421	68.4	4,314	86.2	178	3.6	64	1.3	1,362	27.2	312	6.2
acute/daysurgery 2006	4,660	93.1	3,419	68.3	4,314	86.2	178	3.6	6	0.1	87	1.7	344	6.9
Total hospitalization services 2007	4,825	92.9	3,471	66.8	4,351	83.8	214	4.1	67	1.3	1,405	27.1	369	7.1
acute/daysurgery 2007	4,792	92.3	3,470	66.8	4,351	83.8	214	4.1	7	0.1	78	1.5	402	7.7
Total hospitalization services 2008	4,885	94.3	3,476	67.1	4,472	86.3	150	2.9	65	1.3	1,454	28.1	298	5.7
acute/daysurgery 2008	4,847	93.5	3,471	67.0	4,472	86.3	150	2.9	7	0.1	88	1.7	336	6.5
<b>Manitoba</b>														
<b>acute/daysurgery</b>														
2005	404	89.0	301	66.3	363	80.0	21	4.6	0	0.0	7	1.5	50	11.0
2006	441	94.0	327	69.7	389	82.9	32	6.8	0	0.0	8	1.7	28	6.0
2007	480	93.6	345	67.3	419	81.7	38	7.4	x	x	6	1.2	33	6.4
2008	447	90.9	327	66.5	403	81.9	14	2.8	0	0.0	x	x	45	9.1
<b>Nova Scotia</b>														
<b>acute/daysurgery</b>														
2005	426	89.7	287	60.4	393	82.7	17	3.6	0	0.0	6	1.3	49	10.3
2006	435	88.4	296	60.2	403	81.9	8	1.6	0	0.0	x	x	57	11.6
2007	456	87.2	321	61.4	422	80.7	21	4.0	0	0.0	x	x	67	12.8
2008	501	89.5	357	63.8	446	79.6	24	4.3	0	0.0	7	1.3	59	10.5
<b>Prince Edward Island</b>														
<b>acute/daysurgery</b>														
2005	x	x	56	70.9	67	84.8	x	x	0	0.0	0	0.0	x	x
2006	54	88.5	43	70.5	49	80.3	6	9.8	0	0.0	x	x	7	11.5
2007	x	x	46	76.7	51	85.0	x	x	0	0.0	x	x	x	x
2008	76	91.6	57	68.7	66	79.5	x	x	0	0.0	x	x	7	8.4

x suppressed to meet the confidentiality requirements of the Statistics Act,

**Data sources:** CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

**Table 7**  
**Treatment rates within follow-up for linked single malignant rectum/rectosigmoid junction tumours identified in Canadian Cancer Registry (CCR) by province, year, and hospital service type, 2005 to 2008**

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy(lymph node/ large intestine/ rectum) or colonoscopy or proctoscopy		At least one excision (partial, total,radical, destruction, large intestine/rectum/ lymph node)		Bypass/with exteriorization/ re-attachment/ construction/ reconstruction		Radiation/ Implantation of internal device/ brachytherapy		Pharmacotherapy, total body			
			% linked N	% linked tumours	% linked N	% linked tumours	% linked N	% linked tumours	% linked N	% linked tumours	% linked N	% linked tumours		
<b>Ontario</b>														
Total hospitalization services 2005	2,126	96.8	1,807	82.2	1,785	81.2	225	10.2	736	33.5	1,042	47.4	71	3.2
acute/daysurgery 2005	2,100	95.6	1,805	82.2	1,785	81.2	225	10.2	30	1.4	53	2.4	97	4.4
Total hospitalization services 2006	2,091	95.9	1,782	81.7	1,790	82.1	189	8.7	686	31.5	1,007	46.2	90	4.1
acute/daysurgery 2006	2,073	95.0	1,777	81.5	1,790	82.1	189	8.7	30	1.4	40	1.8	108	5.0
Total hospitalization services 2007	2,111	96.2	1,780	81.1	1,807	82.3	202	9.2	753	34.3	1,042	47.5	84	3.8
acute/daysurgery 2007	2,087	95.1	1,776	80.9	1,807	82.3	202	9.2	23	1.0	30	1.4	108	4.9
Total hospitalization services 2008	2,290	95.9	1,933	80.9	1,905	79.8	219	9.2	777	32.5	1,053	44.1	98	4.1
acute/daysurgery 2008	2,258	94.6	1,927	80.7	1,905	79.8	219	9.2	37	1.5	36	1.5	130	5.4
<b>Manitoba</b>														
<b>acute/daysurgery</b>														
2005	216	95.2	186	81.9	193	85.0	33	14.5	x	x	x	x	11	4.8
2006	234	94.4	210	84.7	195	78.6	33	13.3	x	x	x	x	14	5.6
2007	257	96.3	220	82.4	210	78.7	34	12.7	x	x	6	2.2	10	3.7
2008	277	94.2	244	83.0	236	80.3	33	11.2	0	0.0	x	x	17	5.8
<b>Nova Scotia</b>														
<b>acute/daysurgery</b>														
2005	235	96.7	205	84.4	209	86.0	21	8.6	x	x	x	x	8	3.3
2006	240	94.9	201	79.4	206	81.4	24	9.5	x	x	x	x	13	5.1
2007	226	93.0	195	80.2	190	78.2	29	11.9	x	x	6	2.5	17	7.0
2008	210	95.0	180	81.4	170	76.9	15	6.8	x	x	x	x	11	5.0
<b>Prince Edward Island</b>														
<b>acute/daysurgery</b>														
2005	x	x	26	89.7	27	93.1	x	x	x	x	0	0.0	x	x
2006	x	x	27	90.0	28	93.3	0	0.0	x	x	0	0.0	x	x
2007	x	x	31	93.9	28	84.8	x	x	0	0.0	x	x	x	x
2008	20	100.0	18	90.0	17	85.0	x	x	x	x	x	x	0	0.0

x suppressed to meet the confidentiality requirements of the Statistics Act,

**Data sources:** CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

**Table 8.**  
**Treatment rates within follow-up<sup>1</sup> for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR) by province, year, and hospital service type, 2005 to 2008**

Province, CCR year, service type	Selected Treatments															
	Interventions to lymph nodes				Diagnostics		Surgeries									
	Hospitalized w/in follow-up period and at least one selected treatment				At least one of: Biopsy, pelvic lymph nodes; Excision partial, total, lymph nodes, pelvic		At least one of: Imaging, inspect prostate, biopsy prostate, PSA		At least one of: Excision radical, Destruction, prostate; Excision radical, bladder NEC, with reconstruction; Excision total, Excision radical testis		Radiation		Pharma		None of these selected treatments	
N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours			
<b>Ontario</b>																
Total hospitalization services 2005	6,628	74.4	304	3.4	2,522	28.3	3,422	38.4	2,574	28.9	469	5.3	2,282	25.6		
acute/daysurgery 2005	4,883	54.8	303	3.4	1,854	20.8	3,422	38.4	238	2.7	63	0.7	4,027	45.2		
Total hospitalization services 2006	6,864	73.0	351	3.7	2,393	25.5	3,579	38.1	2,795	29.7	498	5.3	2,534	27.0		
acute/daysurgery 2006	4,979	53.0	350	3.7	1,765	18.8	3,579	38.1	244	2.6	53	0.6	4,419	47.0		
Total hospitalization services 2007	6,975	73.1	336	3.5	2,260	23.7	3,506	36.7	3,112	32.6	478	5.0	2,571	26.9		
acute/daysurgery 2007	4,791	50.2	336	3.5	1,539	16.1	3,506	36.7	246	2.6	41	0.4	4,755	49.8		
Total hospitalization services 2008	6,385	73.1	265	3.0	2,068	23.7	3,254	37.3	2,834	32.5	441	5.1	2,345	26.9		
acute/daysurgery 2008	4,457	51.1	265	3.0	1,419	16.3	3,254	37.3	223	2.6	50	0.6	4,273	48.9		
<b>Manitoba</b>																
<b>acute/daysurgery</b>																
2005	260	45.1	32	5.6	40	6.9	221	38.4	x	x	x	x	316	54.9		
2006	282	42.3	35	5.2	35	5.2	257	38.5	x	x	0	0.0	385	57.7		
2007	321	44.8	22	3.1	42	5.9	283	39.5	x	x	x	x	395	55.2		
2008	263	43.1	11	1.8	55	9.0	214	35.1	x	x	x	x	347	56.9		
<b>Nova Scotia</b>																
<b>acute/daysurgery</b>																
2005	427	58.2	7	1.0	221	30.1	297	40.5	12	1.6	x	x	307	41.8		
2006	613	67.0	21	2.3	405	44.3	394	43.1	35	3.8	x	x	302	33.0		
2007	628	70.6	17	1.9	405	45.6	374	42.1	41	4.6	x	x	261	29.4		
2008	522	71.3	21	2.9	345	47.1	293	40.0	45	6.1	0	0.0	210	28.7		
<b>Prince Edward Island</b>																
<b>acute/daysurgery</b>																
2005	48	44.9	0	0.0	x	x	34	31.8	10	9.3	x	x	59	55.1		
2006	76	51.4	x	x	0	0.0	55	37.2	21	14.2	0	0.0	72	48.6		
2007	85	52.5	x	x	7	4.3	52	32.1	29	17.9	x	x	77	47.5		
2008	51	43.2	0	0.0	x	x	29	24.6	18	15.3	0	0.0	67	56.8		

x suppressed to meet the confidentiality requirements of the Statistics Act.

Data sources: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; Statistics Canada.



## References

1. Statistics Canada. *Cancer Incidence in Canada 2008 and 2009* (Catalogue 82-231-X) Ottawa: Minister of Industry, 2011. Available at: [www.statcan.gc.ca/pub/82-231-x/82-231-x2010001-eng.pdf](http://www.statcan.gc.ca/pub/82-231-x/82-231-x2010001-eng.pdf)
2. Statistics Canada. *Canadian Cancer Registry*. Available at: [www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3207&lang=en&db=imdb&adm=8&dis=2](http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3207&lang=en&db=imdb&adm=8&dis=2). Accessed: July 2, 2013.
3. Canadian Council of Cancer Registries. *2012/2013/2014 Canadian Council of Cancer Registries Strategies and Priorities*. Canadian Council of Cancer Registries.
4. Canadian Council of Cancer Registries Working Group. *Cancer Treatment Variables: Recommendations for a Minimum Data Set*. Canadian Council of Cancer Registries.
5. Ng E, Longitudinal Health Database (LHAD) Research Team. Insights into the healthy immigrant effect: Mortality by period of immigration and birthplace. *Health Research Working Paper Series* (Catalogue 82-622-2) Ottawa: Statistics Canada, 2011.
6. Ng E. The healthy immigrant effect and mortality rates. *Health Reports* 2011; 22(4): 2-9.
7. Wilkins R, Tjepkema M, Mustard C, Choinière. The Canadian census mortality follow-up study, 1991 through 2001. *Health Reports* 2008; 19(3): 25-43.
8. Wilkins R, Long A, Tjepkema M. Cause-specific mortality by income adequacy in Canada: A 16-year follow-up study. *Health Reports* 2013; 24 (7):14-22.
9. Hwang SW, Wilkins R, Tjepkema M, et al. Mortality among residents of shelters, rooming houses and hotels in Canada: 11-year follow-up study. *British Medical Journal* 2009; 339: b4036.
10. Manuel DG, Perez R, Bennet C, et al. Seven more years: The impact of smoking, alcohol, diet, physical activity, and stress on health and life expectancy in Ontario. *An ICES/PHO Report*. Toronto: Clinical Evaluative Sciences and Public Health Ontario, 2012.
11. McBride ML, Tyldesley S, Wai E, et al. Data Users Publication Committee Webinar: Use of cancer registry and administrative records for cancer survivorship research. Vancouver British Columbia, British Columbia Cancer Agency, University of British Columbia, May 9, 2013.
12. Turner D, Hildebrand KJ, Fradette K. Same question, different data source, Different Answers? Data source agreement for different surgical procedures on women with breast cancer. *HealthCare Policy* 2007; 3(1): 46-54.
13. Pinfold SP, Goel V, Sawka C. Quality of hospital discharge and physician data for type of breast cancer surgery. *Medical Care* 2000; 38(1): 99-107.
14. McBride ML, Rogers PC, Sheps SB, et al. Childhood, adolescent and young adult cancer survivors research program of British Columbia: Objectives, study design, and cohort characteristics. *Pediatric Blood and Cancer* 2010; 55(2): 324-30
15. Finelli A, Pace KT, Sharir S, et al. Surgery for prostate cancer. In: Urbach DR, Simunovic M, Schultz S, eds. *Cancer Surgery in Ontario: ICES Atlas*. Toronto: Institute for Clinical Evaluative Sciences, 2008.
16. Davis MK, Li, D, Wai E, et al. Hospital-related cardiac morbidity among survivors of breast cancer: Long-term risks and predictors. *Journal of Cardiac Failure* 2014; 20(8 Suppl.): S44-5.
17. Statistics Canada. *Approved Record Linkages*. Available at: [www.statcan.gc.ca/record-enregistrement/summ-somm-eng.htm](http://www.statcan.gc.ca/record-enregistrement/summ-somm-eng.htm)
18. Statistics Canada. *Directive on Record Linkage*, 2011. Available at: [www.statcan.gc.ca/record-enregistrement/policy4-1-politique4-1-eng.htm](http://www.statcan.gc.ca/record-enregistrement/policy4-1-politique4-1-eng.htm)
19. Health Statistics Division. *Canadian Cancer Registry System Guide—2007 Edition* (Catalogue 82-225 X). Ottawa: Statistics Canada, 2008.
20. Zakaria D, Trudeau R, Sanmartin C, et al. Using personal health insurance numbers to link the Canadian Cancer Registry and the Discharge Abstract Database. *Health Reports* 2015; 26(6): in press.
21. Canadian Institute for Health Information. *Data Quality Documentation for External Users: Discharge Abstract Database, 2010-11*. Ottawa: Canadian Institute for Health Information, 2011.
22. Canadian Institute for Health Information. *Data Quality Documentation for External Users: National Ambulatory Care Reporting System, 2010-11*. Ottawa: Canadian Institute for Health Information, 2011.

23. Canadian Institute for Health Information. *Database Background and General Data Limitations Documentation, National Ambulatory Care Reporting System (NACRS), FY 2004-200*. Ottawa: Canadian Institute for Health Information, 2011.
24. Canadian Institute for Health Information. *Executive Summary: Database Background and General Data Limitations Documentation, National Ambulatory Care Reporting System (NACRS), FY 2005-2006*. Ottawa: Canadian Institute for Health Information, 2006.
25. Canadian Institute for Health Information. *Executive Summary: Database Background and General Data Limitations Documentation, National Ambulatory Care Reporting System (NACRS), FY 2006-2007*. Ottawa: Canadian Institute for Health Information, 2007.
26. Canadian Institute for Health Information. *Database Background and General Data Limitations Documentation, National Ambulatory Care Reporting System, 2008-2009-Executive Summary*. Ottawa: Canadian Institute for Health Information, 2009.
27. Canadian Institute for Health Information. *Database Background and General Data Limitations Documentation, National Ambulatory Care Reporting System, 2009-2010-Executive Summary*. Ottawa: Canadian Institute for Health Information, 2011.
28. Rotermann M, Sanmartin, Carrière G, et al. Two approaches to linking census and hospital data. *Health Reports* 2014; 25(10): 3-14.
29. Canadian Cancer Society, National Cancer Institute of Canada. *Canadian Cancer Statistics* 2006. Available at: [cancer.ca/statistics/](http://cancer.ca/statistics/)
30. Canadian Cancer Society, National Cancer Institute of Canada. *Canadian Cancer Statistics* 2014. Available at: [cancer.ca/statistics/](http://cancer.ca/statistics/)
31. Fritz A, Percy C, Jack A, et al., eds. *International Classification of Diseases for Oncology, Third Edition*. Geneva, Switzerland: World Health Organization, 2000.
32. Horner MJ, Ries LAG, Krapcho M, et al. SEER Cancer Statistics Review, 1975-2006. Bethesda, Maryland: National Cancer Institute. Available at: [www.seer.cancer.gov/csr/1975\\_2006/](http://www.seer.cancer.gov/csr/1975_2006/)
33. Canadian Institute for Health Information. *Canadian Classification of Health Interventions (CCI), Canada*. Ottawa: Canadian Institute for Health Information, 2003.
34. Canadian Institute for Health Information. *Canadian Classification of Health Interventions (CCI), Canada*. Ottawa: Canadian Institute for Health Information, 2006.
35. Canadian Institute for Health Information. *Canadian Classification of Health Interventions (CCI), Canada*. Ottawa: Canadian Institute for Health Information, 2009.
36. Canadian Institute for Health Information. *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada*. Ottawa: Canadian Institute for Health Information, 2006.
37. Collaborative Staging Task Force of the American Joint Committee on Cancer. *Collaborative Staging Manual and Coding Instructions, Sixth Edition*. Available at: [www.cancerstaging.org/cstage/index.html](http://www.cancerstaging.org/cstage/index.html)
38. The Canadian Partnership Against Cancer website: [www.partnershipagainstcancer.ca/](http://www.partnershipagainstcancer.ca/)
39. Saskatchewan Cancer Registry Provincial Colorectal Cancer Treatment Guidelines. Available at: [www.saskcancer.ca/Default.aspx?DN=e0ca23f1-91ff-4f16-8271-48ac48caccee](http://www.saskcancer.ca/Default.aspx?DN=e0ca23f1-91ff-4f16-8271-48ac48caccee). Accessed: June 2011.
40. *National Comprehensive Cancer Network Guidelines for Clinicians: Colon Version 3*. 2013. National Comprehensive Cancer Network, Inc. 2002.
41. *National Comprehensive Cancer Network Guidelines for Clinicians: Rectum Version 4*. 2013. National Comprehensive Cancer Network, Inc. 2002.
42. Schultz SE, Simunovic M, Urbach DR. *Technical Appendix*. In: Urbach DR, Simunovic M, Schultz SE, eds. *Cancer Surgery in Ontario: ICES Atlas*. Toronto: Institute for Clinical Evaluative Sciences, 2008.
43. Facility Oncology Registry Data Standards (FORDS). Revised for 2011. Manual Appendix B Surgery Codes. Commission on Cancer, American College of Surgeons, 2002.
44. Canadian Institute for Health Information. *DAD Abstracting Manual. 2003-2004 Edition*. Ottawa: Canadian Institute for Health Information, 2006.
45. Lix L, Yogendran M, Burchill M, et al. *Defining and Validating Chronic Diseases: An Administrative Data Approach*. Winnipeg, Manitoba: Manitoba Centre for Health Policy, 2006.

46. Iron K, Zagorski BM, Sykora K, et al. Living and dying in Ontario: An opportunity for improved health information. *ICES Investigative Report*. Toronto: Institute for Clinical Evaluative Sciences, 2008.
47. Fransoo R, Martens P, Prior H, et al. Adult Obesity in Manitoba: Prevalence, Associations and Outcomes. Winnipeg, Manitoba: Manitoba Centre for Health Policy, 2011.
48. Brennan J, Lessard M. *A Record Linkage Example: Linkage of the Citizenship and Immigration (CIC) Landing File to the T1FF*. Statistics Canada Methodology Seminar. Ottawa: April 9, 2013.
49. Winkler WE. Record linkage. *Sample Surveys: Design, Methods and Applications* 2009; 29A: 351-80.
50. Nenshi R, Baxter N, Kennedy E, et al. Surgery for colorectal cancer. In: Urbach DR, Simunovic M, Schultz SE, eds. *Cancer Surgery in Ontario: ICES Atlas*. Toronto, Institute for Clinical Evaluative Sciences, 2008.
51. Finelli A, Pace KT, Sharir S, et al. Surgery for prostate cancer. In: Urbach DR, Simunovic M, Schultz SE, eds. *Cancer Surgery in Ontario: ICES Atlas*. Toronto: Institute for Clinical Evaluative Sciences, 2008.
52. Cancer Care Ontario, Cancer System Quality Indicator. Available at: [www.csqi.on.ca/cms/One.aspx?portalId=258922&pageId=272672](http://www.csqi.on.ca/cms/One.aspx?portalId=258922&pageId=272672).
53. National Comprehensive Cancer Network Guidelines for Clinicians Guidelines for Clinicians. National Comprehensive Cancer Network, Inc. 2002.
54. Quan ML, Hodgson N, Schultz SE, et al. Surgery for breast cancer. In: Urbach DR, Simunovic M, Schultz SE, eds. *Cancer Surgery in Ontario: ICES Atlas*. Toronto: Institute for Clinical Evaluative Sciences, 2008.
55. Canadian Institute for Health Information, Canadian Partnership Against Cancer. *Breast Cancer Surgery in Canada, 2007-08 to 2009-10*. Ottawa: Canadian Institute for Health Information, 2012.
56. *CancerCare Manitoba 2010 Community Health Assessment Report*. Available at: [www.cancercare.mb.ca/resource/File/communications/CCMB\\_2010\\_CHA-Report.pdf](http://www.cancercare.mb.ca/resource/File/communications/CCMB_2010_CHA-Report.pdf). Accessed: October 2, 2013.
57. Canadian Partnership Against Cancer. *Breast Cancer Control in Canada: A System Performance Special Focus Report*. Toronto: The partnership, 2012. Available at: [www.cancerview.ca/systemperformancereport](http://www.cancerview.ca/systemperformancereport)
58. Latosinsky S, Fradette K, Lix L, et al. Canadian breast cancer guidelines: Have they made a difference? *Canadian Medical Association Journal* 2007; 176(6): 771-6.
59. Iscoe NA, Goel V, Wu K, et al. Variation in breast cancer surgery in Ontario. *Canadian Medical Association Journal* 1994; 150(3): 345-63.
60. Goel V, Olivetto I, Hislop TG, et al. Patterns of initial management of node-negative breast cancer in two Canadian provinces. *Canadian Medical Association Journal* 1997; 156(1): 25-35.
61. Dragomir A, Cury FL, Aprikanian AG. Active Surveillance for low-risk prostate cancer compared with immediate treatment: a Canadian cost comparison. *Canadian Medical Association Journal Open* 2014; 2(2): E60-8. doi:10.9778/cmajo.20130037.
62. Meltzer D, Egleston B, Abdalla I. Patterns of prostate cancer treatment. *American Journal of Public Health* 2001; 91(1): 126-8.
63. Canadian Institute for Health Information, CIHI Data Quality Study of the 2006-2007 Discharge Abstract Database. Ottawa: Canadian Institute for Health Information, 2009.
64. Canadian Institute for Health Information. *CIHI Data Quality Study of the 2005-2006 Discharge Abstract Database*. Ottawa: Canadian Institute for Health Information, 2009.
65. Canadian Partnership Against Cancer. *The 2014 Cancer System Performance Report*. Toronto: The partnership, 2014. Cancer Quality Council of Ontario Quality Indicators Available at: [www.csqi.on.ca/cms/one.aspx?portalId=258922&pageId=274144#](http://www.csqi.on.ca/cms/one.aspx?portalId=258922&pageId=274144#).
66. Personal correspondence from Brandon Wagar, Canadian Institute for Health Information, to Gisèle Carrière, July 5, 2013.
67. Personal correspondence from Maureen MacIntyre, CancerCare Nova Scotia, to Gisèle Carrière, June 4, 2014.
68. Manitoba Breast Health Centres. Available at: [www.wrha.mb.ca/community/bhc/](http://www.wrha.mb.ca/community/bhc/). Accessed: October 15, 2014.

## Appendix A

## Treatment codes (CCI versions 2003, 2006, 2009) and groupings, by cancer

Selected treatments for female breast cancer			Selected treatments for colorectal cancer		
Lymph nodes	2.MD.71.^ <sup>^</sup> 1.MD.87.^ <sup>^</sup> 1.MD.89.^ <sup>^</sup> 1.YM.91.^ <sup>^</sup>	Biopsy, axillary lymph nodes Excision partial, lymph node(s), axillary Excision total, lymph node(s), axillary Excision radical, breast	Diagnostic	Biopsy, pelvic lymph nodes, intra abdominal lymph nodes 2.MH.71.^ <sup>^</sup> Biopsy, pelvic lymph nodes 2.MG.71.^ <sup>^</sup> Biopsy, intra abdominal lymph nodes Biopsy/ colonoscopy/proctoscopy 2.NM.70.^ <sup>^</sup> Colonoscopy 2.NM.71.^ <sup>^</sup> Biopsy, large intestine 2.NQ.71.^ <sup>^</sup> Biopsy, rectum 2.NQ.70.^ <sup>^</sup> Proctoscopy Lymph nodes Excision partial, total/ pelvic or intra abdominal lymph nodes	
Breast conserving surgery	1.YM.87.^ <sup>^</sup> 1.YM.88.^ <sup>^</sup>	Excision partial, breast Excision partial with reconstruction, breast		1.MH.87.^ <sup>^</sup> Excision partial, lymph node(s), pelvic 1.MH.89.^ <sup>^</sup> Excision total, lymph node(s), pelvic 1.MG.87.^ <sup>^</sup> Excision partial, lymph node(s), intra abdominal 1.MG.89.^ <sup>^</sup> Excision total, lymph node(s), intra abdominal	
Mastectomy	1.YM.89.^ <sup>^</sup> 1.YM.90.^ <sup>^</sup> 1.YM.91.^ <sup>^</sup> 1.YM.92.^ <sup>^</sup>	Excision total, breast Excision total with reconstruction, breast Excision radical, breast Excision radical with reconstruction, breast			
Radiation	1.YM.26.^ <sup>^</sup> 1.YM.27.^ <sup>^</sup> 1.YM.53.^ <sup>^</sup> 1.SZ.27.^ <sup>^</sup>	Brachytherapy, breast Radiation, breast Implantation of internal device, breast Radiation, soft tissue of chest and abdomen			
Diagnostic: biopsy, breast, not otherwise specified (NOS)	2.YM.71.^ <sup>^</sup>	Biopsy, breast NOS	Surgery	Excision, partial/ total 1.NM.87.^ <sup>^</sup> Excision partial, large intestine (right hemicolectomy) 1.NM.89.^ <sup>^</sup> Excision total, large intestine 1.NQ.87.^ <sup>^</sup> Excision partial, rectum 1.NQ.89.^ <sup>^</sup> Excision total, rectum Excision radical/ destruction 1.NM.91.^ <sup>^</sup> Excision radical, large intestine 1.NM.59.^ <sup>^</sup> Destruction, large intestine 1.NQ.59.^ <sup>^</sup> Destruction, rectum	
Selected treatments for prostate cancer					
Lymph nodes	2.MH.71.^ <sup>^</sup> 1.MH.87.^ <sup>^</sup> 1.MH.89.^ <sup>^</sup>	Biopsy, pelvic lymph nodes Excision partial, lymph node(s), pelvic Excision total, lymph node(s), pelvic			
Diagnostic	2.QT.70.^ <sup>^</sup> 2.QT.71.^ <sup>^</sup> 4.CU.42.02 3.OT.10.^ <sup>^</sup> 3.QZ.10.^ <sup>^</sup> 3.SQ.10.^ <sup>^</sup> 3.QT.20.^ <sup>^</sup> 3.QT.30.^ <sup>^</sup> 3.QT.40.^ <sup>^</sup> 3.WZ.70.^ <sup>^</sup>	Inspection, prostate Biopsy, prostate PSA test Xray, abdominal cavity Xray, male genital tract NEC Xray, pelvis Computerized tomography [CT], prostate Ultrasound, prostate Magnetic resonance imaging [MRI], prostate Diagnostic nuclear (imaging) study, musculoskeletal system NEC			
Surgery	1.QT.91.^ <sup>^</sup> 1.QT.59.^ <sup>^</sup> 1.PM.91.^ <sup>^</sup> 1.PM.92.^ <sup>^</sup> 1.QM.89.^ <sup>^</sup> 1.QM.91.^ <sup>^</sup>	Excision radical, prostate Destruction, prostate Excision radical, bladder NEC Excision radical with reconstruction, bladder NEC Excision total, testis Excision radical, testis	Repair	Bypass/with exteriorization/ re-attachment/construction/ reconstruction 1.NM.76.^ <sup>^</sup> Bypass, large intestine 1.NM.77.^ <sup>^</sup> Bypass with exteriorization, large intestine 1.NM.82.^ <sup>^</sup> Reattachment, large intestine 1.NQ.84.^ <sup>^</sup> Construction or reconstruction, rectum	
Radiation	1.QT.53.^ <sup>^</sup> 1.QT.26.^ <sup>^</sup> 1.QT.27.^ <sup>^</sup> 1.MH.27.^ <sup>^</sup>	Implantation of internal device, prostate Brachytherapy, prostate Radiation, prostate Radiation, lymph node(s), pelvic	Radiation	1.NP.27.^ <sup>^</sup> Radiation, small and large intestine 1.NM.27.^ <sup>^</sup> Radiation, large intestine 1.NQ.27.^ <sup>^</sup> Radiation, rectum 1.MH.27.^ <sup>^</sup> Radiation lymph node(s), Pelvic Implantation of internal device/brachytherapy 1.NQ.53.^ <sup>^</sup> Implantation of internal device, rectum 1.NQ.26.^ <sup>^</sup> Brachytherapy, rectum	
Systemic pharmacotherapy	1.ZZ.35.CA-M^ <sup>^</sup> 1.ZZ.35.HA-M^ <sup>^</sup> 1.ZZ.35.YA-M^ <sup>^</sup>	pharmacotherapy (antineoplastic immunomodulating agents) pharmacotherapy (antineoplastic immunomodulating agents) pharmacotherapy (antineoplastic immunomodulating agents)	Systemic pharmacotherapy	1.ZZ.35.CA.M^ <sup>^</sup> Pharmacotherapy, total body antineoplastic and immunomodulating agents 1.ZZ.35.HA.M^ <sup>^</sup> Pharmacotherapy, total body antineoplastic and immunomodulating agents 1.ZZ.35.YA.M^ <sup>^</sup> Pharmacotherapy, total body antineoplastic and immunomodulating agents	



## Appendix B

Treatment rates within follow-up in hospital service types combined for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR)<sup>1</sup> by province, year, and age group, 2005 to 2008

Province, CCR year, age (years) group	Selected Treatments																	
	Hospitalized w/in follow-up and at least one selected treatment		Lymph nodes		Breast-Conserving Surgery/Mastectomy										Diagnostic: biopsy, breast, NOS		None of these selected treatments	
			Biopsy/Partial/total excision ALN, radical mastectomy	Total BreastCS and/or Mastectomy	BCS only		BCS and Mast.		Mastectomy only		Radiation							
					N	%	N	%	N	%	N	%	N	%				
Ontario	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Total hospitalization services 2005	7,091	93.3	6,156	81.0	6,875	90.5	4,244	55.8	704	9.3	1,927	25.4	4,480	58.9	399	5.3	509	6.7
LT 50	1,768	94.7	1,630	87.3	1,730	92.7	1,013	54.3	227	12.2	490	26.2	1,246	66.7	95	5.1	99	5.3
50-69	3,338	95.5	3,048	87.2	3,248	92.9	2,142	61.3	326	9.3	780	22.3	2,339	66.9	159	4.5	157	4.5
70+	1,985	88.7	1,478	66.0	1,897	84.8	1,089	48.7	151	6.7	657	29.4	895	40.0	145	6.5	253	11.3
Acute/daysurgery 2005	6,978	91.8	6,108	80.4	6,824	89.8	4,193	55.2	696	9.2	1,935	25.5	24	0.3	359	4.7	622	8.2
LT 50	1,741	93.3	1,617	86.6	1,715	91.9	998	53.5	223	11.9	494	26.5	x	x	82	4.4	126	6.7
50-69	3,291	94.2	3,021	86.4	3,223	92.2	2,117	60.6	323	9.2	783	22.4	10	0.3	147	4.2	204	5.8
70+	1,946	87.0	1,470	65.7	1,886	84.3	1,078	48.2	150	6.7	658	29.4	x	x	130	5.8	292	13.0
Total hospitalization services 2006	7,210	92.1	6,209	79.3	6,974	89.1	4,414	56.4	628	8.0	1,932	24.7	4,611	58.9	408	5.2	502	6.4
LT 50	1,679	91.3	1,517	82.4	1,640	89.1	999	54.3	191	10.4	450	24.5	1,201	65.3	81	4.4	129	7.0
50-69	3,484	95.0	3,143	85.7	3,383	92.3	2,266	61.8	300	8.2	817	22.3	2,464	67.2	173	4.7	164	4.5
70+	2,047	88.2	1,549	66.7	1,951	84.1	1,149	49.5	137	5.9	665	28.7	946	40.8	154	6.6	209	9.0
Acute/daysurgery 2006	7,106	90.8	6,205	79.3	6,970	89.1	4,411	56.4	625	8.0	1,934	24.7	15	0.2	376	4.8	721	9.2
LT 50	1,652	89.8	1,515	82.3	1,638	89.0	998	54.2	190	10.3	450	24.5	x	x	74	4.0	188	10.2
50-69	3,438	93.8	3,141	85.7	3,382	92.3	2,265	61.8	299	8.2	818	22.3	8	0.2	160	4.4	228	6.2
70+	2,016	86.9	1,549	66.7	1,950	84.0	1,148	49.5	136	5.9	666	28.7	x	x	142	6.1	305	13.1
Total hospitalization services 2007	7,426	92.6	6,448	80.4	7,160	89.3	4,361	54.4	700	8.7	2,099	26.2	4,801	59.9	437	5.5	592	7.4
LT 50	1,670	94.1	1,512	85.2	1,618	91.2	924	52.1	222	12.5	472	26.6	1,196	67.4	103	5.8	105	5.9
50-69	3,668	95.6	3,318	86.5	3,535	92.1	2,279	59.4	334	8.7	922	24.0	2,595	67.6	184	4.8	170	4.4
70+	2,088	86.8	1,618	67.3	2,007	83.5	1,158	48.1	144	6.0	705	29.3	1,010	42.0	150	6.2	317	13.2
Acute/daysurgery 2007	7,299	91.0	6,444	80.4	7,154	89.2	4,355	54.3	695	8.7	2,104	26.2	32	0.4	404	5.0	719	9.0
LT 50	1,643	92.6	1,511	85.1	1,618	91.2	924	52.1	221	12.5	473	26.6	7	0.4	95	5.4	132	7.4
50-69	3,596	93.7	3,315	86.4	3,531	92.0	2,275	59.3	332	8.7	924	24.1	15	0.4	169	4.4	242	6.3
70+	2,060	85.7	1,618	67.3	2,005	83.4	1,156	48.1	142	5.9	707	29.4	10	0.4	140	5.8	345	14.3
Total hospitalization services 2008	7,302	93.2	6,455	82.4	7,054	90.0	4,345	55.4	611	7.8	2,098	26.8	4,819	61.5	433	5.5	536	6.8
LT 50	1,688	94.7	1,537	86.3	1,639	92.0	884	49.6	211	11.8	544	30.5	1,204	67.6	97	5.4	94	5.3
50-69	3,683	96.4	3,413	89.3	3,591	94.0	2,379	62.3	291	7.6	921	24.1	2,680	70.2	184	4.8	137	3.6
70+	1,931	86.4	1,505	67.3	1,824	81.6	1,082	48.4	109	4.9	633	28.3	935	41.8	152	6.8	305	13.6
Acute/daysurgery 2008	7,203	91.9	6,453	82.3	7,051	90.0	4,343	55.4	608	7.8	2,100	26.8	28	0.4	413	5.3	635	8.1
LT 50	1,661	93.2	1,536	86.2	1,637	91.9	882	49.5	211	11.8	544	30.5	x	x	93	5.2	121	6.8
50-69	3,644	95.4	3,413	89.3	3,591	94.0	2,379	62.3	290	7.6	922	24.1	13	0.3	174	4.6	176	4.6
70+	1,898	84.9	1,504	67.3	1,823	81.5	1,082	48.4	107	4.8	634	28.4	x	x	146	6.5	338	15.1



## Appendix B (continued)

Treatment rates within follow-up in hospital service types combined for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR)<sup>1</sup> by province, year, and age group, 2005 to 2008

Province, CCR year, age (years) group	Selected Treatments																	
	Hospitalized w/in follow-up and at least one selected treatment		Lymph nodes		Breast-Conserving Surgery/Mastectomy								Radiation		Diagnostic: biopsy, breast, NOS		None of these selected treatments	
			Biopsy/Partial/total excision ALN, radical mastectomy		Total BreastCS and/or Mastectomy		BCS only		BCS and Mast.		Mastectomy only							
			N	%	N	%	N	%	N	%	N	%						
Manitoba																		
Acute/daysurgery 2005	659	90.8	531	73.1	638	87.9	357	49.2	60	8.3	221	30.4	x	x	34	4.7	67	9.2
LT 50	122	94.6	106	82.2	121	93.8	52	40.3	19	14.7	50	38.8	0	0.0	x	x	7	5.4
50-69	332	94.9	300	85.7	320	91.4	197	56.3	29	8.3	94	26.9	x	x	15	4.3	18	5.1
70+	205	83.0	125	50.6	197	79.8	108	43.7	12	4.9	77	31.2	0	0.0	x	x	42	17.0
Acute/daysurgery 2006	657	90.2	560	76.9	646	88.7	379	52.1	58	8.0	209	28.7	0	0.0	16	2.2	71	9.8
LT 50	131	92.9	127	90.1	127	90.1	73	51.8	13	9.2	41	29.1	0	0.0	x	x	10	7.1
50-69	327	95.1	304	88.4	325	94.5	198	57.6	34	9.9	93	27.0	0	0.0	x	x	17	4.9
70+	199	81.9	129	53.1	194	79.8	108	44.4	11	4.5	75	30.9	0	0.0	9	3.7	44	18.1
Acute/daysurgery 2007	713	93.1	584	76.2	697	91.0	405	52.9	61	8.0	231	30.2	0	0.0	24	3.1	53	6.9
LT 50	135	96.4	130	92.9	132	94.3	73	52.1	12	8.6	47	33.6	0	0.0	x	x	x	x
50-69	353	95.7	320	86.7	346	93.8	215	58.3	30	8.1	101	27.4	0	0.0	9	2.4	16	4.3
70+	225	87.5	134	52.1	219	85.2	117	45.5	19	7.4	83	32.3	0	0.0	x	x	x	x
Acute/daysurgery 2008	695	88.8	592	75.6	678	86.6	435	55.6	44	5.6	199	25.4	x	x	19	2.4	88	11.2
LT 50	137	94.5	128	88.3	136	93.8	73	50.3	8	5.5	55	37.9	x	x	x	x	8	5.5
50-69	357	95.5	328	87.7	348	93.0	235	62.8	27	7.2	86	23.0	x	x	x	x	17	4.5
70+	201	76.1	136	51.5	194	73.5	127	48.1	9	3.4	58	22.0	0	0.0	12	4.5	63	23.9
Nova Scotia																		
Acute/daysurgery 2005	630	93.5	543	80.6	607	90.1	247	36.6	64	9.5	296	43.9	x	x	294	43.6	44	6.5
LT 50	141	95.9	133	90.5	140	95.2	60	40.8	19	12.9	61	41.5	0	0.0	69	46.9	6	9.3
50-69	291	97.3	273	91.3	284	95.0	125	41.8	31	10.4	128	42.8	x	x	132	44.1	8	10.8
70+	198	86.8	137	60.1	183	80.3	62	27.2	14	6.1	107	46.9	x	x	93	40.8	30	34.0
Acute/daysurgery 2006	674	93.7	577	80.3	644	89.6	259	36.0	67	9.3	318	44.2	0	0.0	379	52.7	45	6.3
LT 50	x	x	124	88.6	131	93.6	61	43.6	24	17.1	46	32.9	0	0.0	83	59.3	x	x
50-69	312	96.3	287	88.6	300	92.6	128	39.5	26	8.0	146	45.1	0	0.0	171	52.8	12	3.7
70+	x	x	166	65.1	213	83.5	70	27.5	17	6.7	126	49.4	0	0.0	125	49.0	x	x
Acute/daysurgery 2007	603	91.8	517	78.7	563	85.7	228	34.7	66	10.0	269	40.9	x	x	358	54.5	54	8.2
LT 50	x	x	104	89.7	107	92.2	39	33.6	23	19.8	45	38.8	0	0.0	63	54.3	x	x
50-69	274	96.5	257	90.5	261	91.9	125	44.0	25	8.8	111	39.1	x	x	180	63.4	10	14.3
70+	x	x	156	60.7	195	75.9	64	24.9	18	7.0	113	44.0	x	x	115	44.7	x	x
Acute/daysurgery 2008	677	93.4	489	67.4	548	75.6	204	28.1	48	6.6	296	40.8	x	x	404	55.7	48	6.6
LT 50	122	93.8	84	64.6	90	69.2	37	28.5	9	6.9	44	33.8	0	0.0	78	60.0	8	14.0
50-69	345	96.4	251	70.1	268	74.9	105	29.3	31	8.7	132	36.9	0	0.0	201	56.1	13	14.7
70+	210	88.6	154	65.0	190	80.2	62	26.2	8	3.4	120	50.6	x	x	125	52.7	27	32.4

## Appendix B (continued)

Treatment rates within follow-up in hospital service types combined for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR) by province, year, and age group, 2005 to 2008

Province, CCR year, age (years) group	Selected Treatments																	
	Hospitalized w/in follow-up and at least one selected treatment		Lymph nodes		Breast-Conserving Surgery/Mastectomy								Radiation		Diagnostic: biopsy, breast, NOS		None of these selected treatments	
			Biopsy/Partial/ total excision ALN, radical mastectomy		Total BreastCS and/or Mastectomy													
							BCS only		BCS and Mast.		Mastectomy only							
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Prince Edward Island																		
Acute/daysurgery 2005	67	91.8	60	82.2	64	87.7	25	34.2	15	20.5	24	32.9	x	x	x	x	6	8.2
LT 50	12	100.0	11	91.7	11	91.7	x	x	6	50.0	x	x	x	x	x	x	0	0.0
50-69	x	x	31	83.8	32	86.5	x	x	x	x	x	x	0	0.0	x	x	x	x
70+	x	x	18	75.0	21	87.5	x	x	x	x	11	45.8	x	x	x	x	x	x
Acute/daysurgery 2006	x	x	67	81.7	76	92.7	35	42.7	14	17.1	27	32.9	0	0.0	6	7.3	x	x
LT 50	x	x	10	100.0	10	100.0	x	x	x	x	x	x	0	0.0	x	x	x	x
50-69	x	x	43	86.0	48	96.0	24	48.0	8	16.0	16	32.0	0	0.0	0	0.0	x	x
70+	x	x	14	63.6	18	81.8	x	x	x	x	x	x	0	0.0	x	x	x	x
Acute/daysurgery 2007	77	89.5	70	81.4	76	88.4	24	27.9	17	19.8	35	40.7	0	0.0	x	x	9	10.5
LT 50	x	x	9	90.0	9	90.0	x	x	x	x	x	x	0	0.0	x	x	x	x
50-69	x	x	37	94.9	37	94.9	16	41.0	10	25.6	11	28.2	0	0.0	0	0.0	x	x
70+	31	83.8	24	64.9	30	81.1	x	x	x	x	x	x	0	0.0	x	x	6	16.2
Acute/daysurgery 2008	91	91.0	80	80.0	88	88.0	27	27.0	18	18.0	43	43.0	0	0.0	7	7.0	9	9.0
LT 50	x	x	16	84.2	15	78.9	x	x	x	x	7	36.8	0	0.0	x	x	x	x
50-69	x	x	43	82.7	49	94.2	19	36.5	6	11.5	24	46.2	0	0.0	x	x	x	x
70+	x	x	21	72.4	24	82.8	x	x	x	x	12	41.4	0	0.0	x	x	x	x

x suppressed to meet the confidentiality requirements of the Statistics Act.

Data sources: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

## Appendix C

## Treatment rates within follow-up in hospital service types combined for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR) by province, year, and tumour stage, 2005 to 2008

Province, CCR year	Selected Treatments																	
	Hospitalized w/in follow-up and at least one selected treatment	Lymph nodes		Breast-Conserving Surgery/Mastectomy										Diagnostic: biopsy, breast, NOS		None of these selected treatments		
		Biopsy/Partial/ total excision ALN, radical mastectomy	Total BreastCS and/or Mastectomy	BCS only		BCS and Mast.		Mastectomy only		Radiation								
				% linkable tumours	% linkable tumours	% linkable tumours	% linkable tumours	% linkable tumours	% linkable tumours	% linked tumours	% linkable tumours	% linkable tumours	% linkable tumours					
N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
Manitoba																		
Total acute/daysurgery 2005	659	90.8	531	73.1	638	87.9	357	49.2	60	8.3	221	30.4	x	x	34	4.7	67	9.2
Stage																		
Stage 0	x	x	x	x	x	x	x	x	0	0.0	x	x	0	0.0	0	0.0	x	x
Stage I	282	97.6	219	75.8	275	95.2	200	69.2	24	8.3	51	17.6	0	0.0	13	4.5	7	2.4
Stage II	256	96.2	219	82.3	252	94.7	127	47.7	23	8.6	102	38.3	0	0.0	9	x	10	3.8
Stage III	86	95.6	77	85.6	85	94.4	18	20.0	10	11.1	57	63.3	0	0.0	x	5.6	x	x
Stage IV	21	44.7	12	25.5	15	31.9	x	x	x	x	7	14.9	x	x	6	12.8	26	55.3
Unknown	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Total acute/daysurgery 2006	657	90.2	560	76.9	646	88.7	379	52.1	58	8.0	209	28.7	0	0.0	16	2.2	71	9.8
Stage																		
Stage 0	x	100.0	x	x	x	100.0	x	x	0	0.0	x	x	0	0.0	0	0.0	x	x
Stage I	270	95.4	230	81.3	267	94.3	198	70.0	19	6.7	50	17.7	0	0.0	x	x	13	4.6
Stage II	271	96.4	229	81.5	269	95.7	146	52.0	26	9.3	97	34.5	0	0.0	x	x	10	3.6
Stage III	89	92.7	85	88.5	88	91.7	24	25.0	13	13.5	51	53.1	0	0.0	x	x	7	7.3
Stage IV	16	35.6	12	26.7	12	26.7	x	x	0	0.0	8	17.8	0	0.0	x	x	29	64.4
Unknown	x	x	x	x	x	x	7	31.8	0	0.0	x	x	0	0.0	x	x	x	x
Total acute/daysurgery 2007	713	93.1	584	76.2	697	91.0	405	52.9	61	8.0	231	30.2	0	0.0	24	3.1	53	6.9
Stage																		
Stage 0	x	x	x	x	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	x	x
Stage I	308	98.7	237	76.0	305	97.8	214	68.6	23	7.4	68	21.8	0	0.0	x	x	x	x
Stage II	286	96.9	245	83.1	283	95.9	162	54.9	26	8.8	95	32.2	0	0.0	9	3.1	9	3.1
Stage III	94	90.4	92	88.5	93	89.4	26	25.0	11	10.6	56	53.8	0	0.0	x	x	10	9.6
Stage IV	13	44.8	6	20.7	7	24.1	0	0.0	x	x	6	20.7	0	0.0	7	24.1	16	55.2
Unknown	x	x	x	x	x	x	x	x	0	0.0	6	24.0	0	0.0	x	x	x	x
Total acute/daysurgery 2008	695	88.8	592	75.6	678	86.6	435	55.6	44	5.6	199	25.4	x	x	19	2.4	88	11.2
Stage																		
Stage 0	x	x	x	x	x	x	0	0.0	x	x	x	x	0	0.0	0	0.0	x	x
Stage I	314	94.9	250	75.5	309	93.4	246	74.3	20	6.0	43	13.0	0	0.0	x	x	17	5.1
Stage II	264	95.7	240	87.0	262	94.9	152	55.1	17	6.2	93	33.7	x	x	x	x	12	4.3
Stage III	89	89.0	83	83.0	87	87.0	30	30.0	7	7.0	50	50.0	x	x	x	x	11	11.0
Stage IV	21	42.0	15	30.0	16	32.0	x	x	x	x	12	24.0	x	x	x	x	29	58.0
Unknown	x	x	x	x	x	x	x	x	0	0.0	x	x	0	0.0	x	x	x	x

## Appendix C (continued)

Treatment rates within follow-up in hospital service types combined for linked single malignant female breast tumours identified in Canadian Cancer Registry (CCR) by province, year, and tumour stage, 2005 to 2008

Province, CCR year	Hospitalized w/in follow-up and at least one selected treatment		Selected Treatments															
			Lymph nodes		Breast-Conserving Surgery/Mastectomy										Diagnostic: biopsy, breast, NOS		None of these selected treatments	
					Total BreastCS and/or Mastectomy		BCS only		BCS and Mast.		Mastectomy only		Radiation					
			% linkable	% linkable	% linkable	% linkable	% linkable	% linkable	% linked	% linkable	% linkable	% linkable	% linkable	% linkable	% linkable	% linkable		
N	tumours	N	tumours	N	tumours	N	tumours	N	tumours	N	tumours	N	tumours	N	tumours	N	tumours	
Prince Edward Island																		
Total acute/daysurgery 2005	67	91.8	60	82.2	64	87.7	25	34.2	15	20.5	24	32.9	x	x	x	x	6	8.2
Stage																		
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	30	93.8	31	96.9	16	50.0	x	x	x	x	0	0.0	x	x	x	x
Stage II	x	x	21	84.0	22	88.0	x	x	x	x	10	40.0	0	0.0	0	0.0	x	x
Stage III	x	x	8	88.9	8	88.9	x	x	x	x	x	x	x	x	0	0.0	x	x
Stage IV	x	x	x	x	x	x	0	0.0	0	0.0	x	x	0	0.0	x	x	x	x
Unknown	x	x	x	x	x	x	x	x	0	0.0	0	0.0	x	x	0	0.0	0	0.0
Total acute/daysurgery 2006	x	x	67	81.7	76	92.7	35	42.7	14	17.1	27	32.9	0	0.0	6	7.3	x	x
Stage																		
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	35	85.4	40	97.6	26	63.4	x	x	x	x	0	0.0	x	x	x	x
Stage II	19	100.0	19	100.0	19	100.0	x	x	x	x	8	42.1	0	0.0	0	0.0	0	0.0
Stage III	12	92.3	11	84.6	12	92.3	x	x	x	x	6	46.2	0	0.0	x	x	x	x
Stage IV	7	77.8	x	x	x	x	x	x	x	x	x	x	0	0.0	x	x	x	x
Unknown	x	x	x	x	x	x	0	0.0	0	0.0	x	x	0	0.0	0	0.0	x	x
Total acute/daysurgery 2007	77	89.5	70	81.4	76	88.4	24	27.9	17	19.8	35	40.7	0	0.0	x	x	9	10.5
Stage																		
Stage 0	x	x	0	0.0	x	x	0	0.0	0	0.0	x	x	0	0.0	0	0.0	0	0.0
Stage I	31	100.0	29	93.5	31	100.0	15	48.4	6	19.4	10	32.3	0	0.0	0	0.0	0	0.0
Stage II	28	96.6	25	86.2	28	96.6	7	24.1	6	20.7	15	51.7	0	0.0	0	0.0	x	x
Stage III	9	90.0	9	90.0	9	90.0	0	0.0	x	x	x	x	0	0.0	0	0.0	x	x
Stage IV	x	x	x	x	x	x	x	x	0	0.0	x	x	0	0.0	x	x	6	60.0
Unknown	x	x	x	x	x	x	x	x	x	x	x	x	0	0.0	0	0.0	x	x
Total acute/daysurgery 2008	91	91.0	80	80.0	88	88.0	27	27.0	18	18.0	43	43.0	0	0.0	7	7.0	9	9.0
Stage																		
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	42	89.4	45	95.7	19	40.4	11	23.4	15	31.9	0	0.0	x	x	x	x
Stage II	29	100.0	25	86.2	29	100.0	x	x	x	x	18	62.1	0	0.0	x	x	0	0.0
Stage III	x	x	9	90.0	8	80.0	0	0.0	x	x	x	x	0	0.0	0	0.0	x	x
Stage IV	x	x	x	x	x	x	x	x	0	0.0	x	x	0	0.0	x	x	x	x
Unknown	x	x	x	x	x	x	x	x	0	0.0	x	x	0	0.0	0	0.0	x	x

x suppressed to meet the confidentiality requirements of the Statistics Act.

Data sources: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

## Appendix D

Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR)<sup>3</sup> by province, year, hospital service type, and sex, 2005 to 2008

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy(lymph node/large intestine/ rectum) or colonoscopy or proctoscopy		At least one excision (partial, total,radical, destruction, large intestine/rectum/ lymph node)		Bypass/with exteriorization/re- attachment/construction/ reconstruction		Radiation/Implantation of internal device/ brachytherapy		Pharmacotherapy, total body			
N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	
Ontario														
Total hospitalization services 2005	6,791	94.8	5,349	74.6	6,062	84.6	426	5.9	828	11.6	2,575	35.9	375	5.2
Male	3,707	95.7	2,922	75.5	3,308	85.4	265	6.8	535	13.8	1,518	39.2	165	4.3
Female	3,084	93.6	2,427	73.7	2,754	83.6	161	4.9	293	8.9	1,057	32.1	210	6.4
Acute/daysurgery 2005	6,731	93.9	5,344	74.6	6,062	84.6	426	5.9	35	0.5	152	2.1	435	6.1
Male	3,675	94.9	2,920	75.4	3,308	85.4	265	6.8	19	0.5	87	2.2	197	5.1
Female	3,056	92.8	2,424	73.6	2,754	83.6	161	4.9	16	0.5	65	2.0	238	7.2
Total hospitalization services 2006	6,783	94.4	5,203	72.4	6,104	85.0	367	5.1	750	10.4	2,369	33.0	402	5.6
Male	3,765	95.8	2,910	74.0	3,394	86.3	224	5.7	496	12.6	1,443	36.7	167	4.2
Female	3,018	92.8	2,293	70.5	2,710	83.3	143	4.4	254	7.8	926	28.5	235	7.2
Acute/daysurgery 2006	6,733	93.7	5,196	72.3	6,104	85.0	367	5.1	36	0.5	127	1.8	452	6.3
Male	3,734	95.0	2,906	73.9	3,394	86.3	224	5.7	22	0.6	76	1.9	198	5.0
Female	2,999	92.2	2,290	70.4	2,710	83.3	143	4.4	14	0.4	51	1.6	254	7.8
Total hospitalization services 2007	6,936	93.9	5,251	71.1	6,158	83.3	416	5.6	820	11.1	2,447	33.1	453	6.1
Male	3,809	94.8	2,893	72.0	3,396	84.5	247	6.1	540	13.4	1,452	36.1	208	5.2
Female	3,127	92.7	2,358	69.9	2,762	81.9	169	5.0	280	8.3	995	29.5	245	7.3
Acute/daysurgery 2007	6,879	93.1	5,246	71.0	6,158	83.3	416	5.6	30	0.4	108	1.5	510	6.9
Male	3,774	94.0	2,892	72.0	3,396	84.5	247	6.1	20	0.5	56	1.4	243	6.0
Female	3,105	92.1	2,354	69.8	2,762	81.9	169	5.0	10	0.3	52	1.5	267	7.9
Total hospitalization services 2008	7,175	94.8	5,409	71.4	6,377	84.2	369	4.9	842	11.1	2,507	33.1	396	5.2
Male	3,994	95.7	3,039	72.8	3,573	85.6	206	4.9	568	13.6	1,487	35.6	179	4.3
Female	3,181	93.6	2,370	69.7	2,804	82.5	163	4.8	274	8.1	1,020	30.0	217	6.4
Acute/daysurgery 2008	7,105	93.8	5,398	71.3	6,377	84.2	369	4.9	44	0.6	124	1.6	466	6.2
Male	3,961	94.9	3,033	72.7	3,573	85.6	206	4.9	30	0.7	67	1.6	212	5.1
Female	3,144	92.5	2,365	69.6	2,804	82.5	163	4.8	14	0.4	57	1.7	254	7.5
Manitoba														
Acute/daysurgery 2005	620	91.0	487	71.5	556	81.6	54	7.9	x	x	9	1.3	61	9.0
Male	342	92.4	271	73.2	306	82.7	35	9.5	x	x	x	x	28	7.6
Female	278	89.4	216	69.5	250	80.4	19	6.1	x	x	x	x	33	10.6
Acute/daysurgery 2006	675	94.1	537	74.9	584	81.5	65	9.1	x	x	11	1.5	42	5.9
Male	368	95.6	293	76.1	313	81.3	36	9.4	x	x	x	x	17	4.4
Female	307	92.5	244	73.5	271	81.6	29	8.7	x	x	x	x	25	7.5

## Appendix D (continued)

Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and sex, 2005 to 2008

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy(lymph node/large intestine/rectum) or colonoscopy or proctoscopy		At least one excision (partial, total,radical, destruction, large intestine/rectum/ lymph node)		Bypass/with exteriorization/re-attachment/construction/reconstruction		Radiation/Implantation of internal device/ brachytherapy		Pharmacotherapy, total body			
	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours
<b>Acute/daysurgery 2007</b>	737	94.5	565	72.4	629	80.6	72	9.2	x	x	12	1.5	43	5.5
Male	402	95.9	305	72.8	346	82.6	36	8.6	x	x	x	1.9	17	4.1
Female	335	92.8	260	72.0	283	78.4	36	10.0	x	x	x	1.1	26	7.2
<b>Acute/daysurgery 2008</b>	724	92.1	571	72.6	639	81.3	47	6.0	0	0.0	7	0.9	62	7.9
Male	398	92.3	320	74.2	350	81.2	29	6.7	0	0.0	x	x	33	7.7
Female	326	91.8	251	70.7	289	81.4	18	5.1	0	0.0	x	x	29	8.2
<b>Nova Scotia</b>														
<b>Acute/daysurgery 2005</b>	661	92.1	492	68.5	602	83.8	38	5.3	x	x	7	1.0	57	7.9
Male	343	93.5	256	69.8	312	85.0	18	4.9	x	x	x	x	24	6.5
Female	318	90.6	236	67.2	290	82.6	20	5.7	x	x	x	x	33	9.4
<b>Acute/daysurgery 2006</b>	675	90.6	497	66.7	609	81.7	32	4.3	x	x	7	0.9	70	9.4
Male	360	91.8	274	69.9	325	82.9	22	5.6	x	x	x	x	32	8.2
Female	315	89.2	223	63.2	284	80.5	10	2.8	x	x	x	x	39	11.0
<b>Acute/daysurgery 2007</b>	682	89.0	516	67.4	612	79.9	50	6.5	x	x	9	1.2	84	11.0
Male	369	89.6	284	68.9	325	78.9	32	7.8	x	x	x	x	43	10.4
Female	313	88.4	232	65.5	287	81.1	18	5.1	x	x	x	x	41	11.6
<b>Acute/daysurgery 2008</b>	711	91.0	536	68.6	616	78.9	39	5.0	x	x	8	1.0	70	9.0
Male	395	92.9	308	72.5	329	77.4	26	6.1	x	x	x	x	30	7.1
Female	316	88.8	228	64.0	287	80.6	13	3.7	x	x	x	x	40	11.2
<b>Prince Edward Island</b>														
<b>Acute/daysurgery 2005</b>	x	x	82	75.9	94	87.0	x	x	x	x	0	0.0	x	x
Male	x	x	39	81.3	44	91.7	x	x	x	x	0	0.0	x	x
Female	x	x	43	71.7	50	83.3	x	x	x	x	0	0.0	x	x
<b>Acute/daysurgery 2006</b>	83	91.2	70	76.9	77	84.6	6	6.6	x	x	x	x	8	8.8
Male	x	x	34	77.3	36	81.8	x	x	x	x	x	x	x	x
Female	x	x	36	76.6	41	87.2	x	x	x	x	x	x	x	x
<b>Acute/daysurgery 2007</b>	x	x	77	82.8	79	84.9	6	6.5	0	0.0	x	x	x	x
Male	x	x	46	80.7	51	89.5	x	x	0	0.0	x	x	x	x
Female	x	x	31	86.1	28	77.8	x	x	0	0.0	x	x	x	x
<b>Acute/daysurgery 2008</b>	96	93.2	75	72.8	83	80.6	7	6.8	x	x	x	x	7	6.8
Male	x	x	39	73.6	44	83.0	x	x	x	x	x	x	x	x
Female	x	x	36	72.0	39	78.0	x	x	x	x	x	x	x	x

x suppressed to meet the confidentiality requirements of the Statistics Act,

Data sources: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.



## Appendix E

Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and age group, 2005 to 2008

Province, CCR year, service type		Selected Treatments													
		Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
				At least one biopsy (lymph node/large intestine/rectum) or colonoscopy or proctoscopy	At least one excision (partial, total,radical, destruction, large intestine/rectum/lymph node)	Bypass/with exteriorization/ re-attachment/ construction/ reconstruction	Radiation/Implantation of internal device/ brachytherapy		Pharmacotherapy, total body						
							N	% linked tumours	N	% linked tumours	N	% linked tumours	N		
		N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours
Ontario															
Total hospitalization services 2005		6,791	94.8	5,349	74.6	6,062	84.6	426	5.9	828	11.6	2,575	35.9	375	5.2
LT 50		475	97.5	399	81.9	424	87.1	45	9.2	95	19.5	303	62.2	12	2.5
50-69		2,758	97.5	2,184	77.2	2,493	88.2	184	6.5	436	15.4	1,417	50.1	70	2.5
70+		3,558	92.4	2,766	71.8	3,145	81.7	197	5.1	297	7.7	855	22.2	293	7.6
Acute/daysurgery 2005		6,731	93.9	5,344	74.6	6,062	84.6	426	5.9	35	0.5	152	2.1	435	6.1
LT 50		471	96.7	399	81.9	424	87.1	45	9.2	0	0.0	24	4.9	16	3.3
50-69		2,719	96.1	2,182	77.2	2,493	88.2	184	6.5	15	0.5	86	3.0	109	3.9
70+		3,541	92.0	2,763	71.7	3,145	81.7	197	5.1	20	0.5	42	1.1	310	8.0
Total hospitalization services 2006		6,783	94.4	5,203	72.4	6,104	85.0	367	5.1	750	10.4	2,369	33.0	402	5.6
LT 50		468	96.3	371	76.3	417	85.8	31	6.4	83	17.1	311	64.0	18	3.7
50-69		2,785	97.5	2,165	75.8	2,534	88.8	155	5.4	388	13.6	1,338	46.9	70	2.5
70+		3,530	91.8	2,667	69.4	3,153	82.0	181	4.7	279	7.3	720	18.7	314	8.2
Acute/daysurgery 2006		6,733	93.7	5,196	72.3	6,104	85.0	367	5.1	36	0.5	127	1.8	452	6.3
LT 50		465	95.7	370	76.1	417	85.8	31	6.4	x	x	22	4.5	21	4.3
50-69		2,760	96.7	2,162	75.7	2,534	88.8	155	5.4	13	0.5	75	2.6	95	3.3
70+		3,508	91.3	2,664	69.3	3,153	82.0	181	4.7	x	x	30	0.8	336	8.7
Total hospitalization services 2007		6,936	93.9	5,251	71.1	6,158	83.3	416	5.6	820	11.1	2,447	33.1	453	6.1
LT 50		521	97.6	425	79.6	445	83.3	40	7.5	105	19.7	351	65.7	13	2.4
50-69		2,882	96.6	2,161	72.4	2,608	87.4	187	6.3	439	14.7	1,389	46.5	102	3.4
70+		3,533	91.3	2,665	68.8	3,105	80.2	189	4.9	276	7.1	707	18.3	338	8.7
Acute/daysurgery 2007		6,879	93.1	5,246	71.0	6,158	83.3	416	5.6	30	0.4	108	1.5	510	6.9
LT 50		514	96.3	424	79.4	445	83.3	40	7.5	x	x	18	3.4	20	3.7
50-69		2,848	95.4	2,160	72.4	2,608	87.4	187	6.3	13	0.4	57	1.9	136	4.6
70+		3,517	90.9	2,662	68.8	3,105	80.2	189	4.9	x	x	33	0.9	354	9.1
Total hospitalization services 2008		7,175	94.8	5,409	71.4	6,377	84.2	369	4.9	842	11.1	2,507	33.1	396	5.2
LT 50		528	96.2	402	73.2	456	83.1	36	6.6	92	16.8	316	57.6	21	3.8
50-69		2,933	96.7	2,210	72.9	2,658	87.7	157	5.2	437	14.4	1,442	47.6	99	3.3
70+		3,714	93.1	2,797	70.1	3,263	81.8	176	4.4	313	7.8	749	18.8	276	6.9
Acute/daysurgery 2008		7,105	93.8	5,398	71.3	6,377	84.2	369	4.9	44	0.6	124	1.6	466	6.2
LT 50		517	94.2	400	72.9	456	83.1	36	6.6	x	x	20	3.6	32	5.8
50-69		2,892	95.4	2,204	72.7	2,658	87.7	157	5.2	x	x	63	2.1	140	4.6
70+		3,696	92.6	2,794	70.0	3,263	81.8	176	4.4	28	0.7	41	1.0	294	7.4

## Appendix E (continued)

Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and age group, 2005 to 2008

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy (lymph node/large intestine/rectum) or colonoscopy or proctoscopy		At least one excision (partial, total, radical, destruction, large intestine/rectum/lymph node)		Bypass/with exteriorization/ re-attachment/ construction/ reconstruction		Radiation/Implantation of internal device/ brachytherapy		Pharmacotherapy, total body			
	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours
<b>Manitoba</b>														
Acute/daysurgery 2005	620	91.0	487	71.5	556	81.6	54	7.9	x	x	9	1.3	61	9.0
LT 50	x	x	45	76.3	48	81.4	6	10.2	0	0.0	x	x	x	x
50-69	x	x	186	78.2	216	90.8	20	8.4	x	x	x	x	x	x
70+	332	86.5	256	66.7	292	76.0	28	7.3	0	0.0	x	x	52	13.5
Acute/daysurgery 2006	675	94.1	537	74.9	584	81.5	65	9.1	x	x	11	1.5	42	5.9
LT 50	x	x	35	79.5	38	86.4	x	x	0	0.0	x	x	x	x
50-69	x	x	207	79.9	229	88.4	27	10.4	x	x	x	x	x	x
70+	377	91.1	295	71.3	317	76.6	x	x	x	x	x	x	37	8.9
Acute/daysurgery 2007	737	94.5	565	72.4	629	80.6	72	9.2	x	x	12	1.5	43	5.5
LT 50	x	x	46	80.7	42	73.7	9	15.8	x	x	x	x	x	x
50-69	301	97.1	231	74.5	261	84.2	34	11.0	0	0.0	8	2.6	9	2.9
70+	x	x	288	69.7	326	78.9	29	7.0	x	x	x	x	x	x
Acute/daysurgery 2008	724	92.1	571	72.6	639	81.3	47	6.0	0	0.0	7	0.9	62	7.9
LT 50	x	x	41	83.7	43	87.8	x	x	0	0.0	x	x	x	x
50-69	281	94.9	222	75.0	249	84.1	16	5.4	0	0.0	x	x	15	5.1
70+	x	x	308	69.8	347	78.7	27	6.1	0	0.0	x	x	x	x
<b>Nova Scotia</b>														
Acute/daysurgery 2005	661	92.1	492	68.5	602	83.8	38	5.3	x	x	7	1.0	57	7.9
LT 50	45	100.0	40	88.9	41	91.1	x	x	0	0.0	x	x	0	0.0
50-69	270	96.4	206	73.6	246	87.9	23	8.2	x	x	x	x	10	3.6
70+	346	88.0	246	62.6	315	80.2	x	x	x	x	x	x	47	12.0
Acute/daysurgery 2006	675	90.6	497	66.7	609	81.7	32	4.3	x	x	7	0.9	70	9.4
LT 50	x	x	34	79.1	37	86.0	x	x	0	0.0	x	x	x	x
50-69	x	x	211	71.5	256	86.8	12	4.1	x	x	6	2.0	x	x
70+	352	86.5	252	61.9	316	77.6	x	x	0	0.0	x	x	55	13.5
Acute/daysurgery 2007	682	89.0	516	67.4	612	79.9	50	6.5	x	x	9	1.2	84	11.0
LT 50	x	x	40	74.1	45	83.3	x	x	0	0.0	x	x	x	x
50-69	279	94.9	224	76.2	260	88.4	25	8.5	x	x	x	x	15	5.1
70+	x	x	252	60.3	307	73.4	x	x	x	x	x	x	x	x

## Appendix E (continued)

Treatment rates within follow-up<sup>1</sup> for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and age group, 2005 to 2008

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy (lymph node/large intestine/rectum) or colonoscopy or proctoscopy		At least one excision (partial, total, radical, destruction, large intestine/rectum/lymph node)		Bypass/with exteriorization/re-attachment/construction/reconstruction		Radiation/Implantation of internal device/brachytherapy		Pharmacotherapy, total body			
	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours
<b>Acute/daysurgery 2008</b>	711	91.0	536	68.6	616	78.9	39	5.0	x	x	8	1.0	70	9.0
LT 50	35	100.0	30	85.7	31	88.6	x	x	x	x	0	0.0	0	0.0
50-69	282	95.9	225	76.5	248	84.4	17	5.8	0	0.0	x	x	12	4.1
70+	394	87.2	281	62.2	337	74.6	x	x	x	x	x	x	58	12.8
<b>Prince Edward Island</b>														
<b>Acute/daysurgery 2005</b>	x	x	82	75.9	94	87.0	x	x	x	x	0	0.0	x	x
LT 50	6	100.0	x	x	6	100.0	0	0.0	0	0.0	0	0.0	0	0.0
50-69	x	x	25	0.0	x	x	x	x	x	x	0	0.0	x	x
70+	x	x	x	x	x	x	x	x	x	x	0	0.0	x	x
<b>Acute/daysurgery 2006</b>	83	91.2	70	76.9	77	84.6	6	6.6	x	x	x	x	8	8.8
LT 50	x	x	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0
50-69	x	x	30	85.7	31	88.6	0	0.0	0	0.0	x	x	x	x
70+	x	x	x	x	x	x	x	x	x	x	x	x	x	x
<b>Acute/daysurgery 2007</b>	x	x	77	82.8	79	84.9	6	6.5	0	0.0	x	x	x	x
LT 50	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	x	x
50-69	x	x	21	72.4	x	x	x	x	0	0.0	x	x	x	x
70+	x	x	x	x	51	85.0	x	x	0	0.0	x	x	x	x
<b>Acute/daysurgery 2008</b>	96	93.2	75	72.8	83	80.6	7	6.8	x	x	x	x	7	6.8
LT 50	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	x	x
50-69	41	100.0	36	87.8	35	85.4	x	x	0	0.0	x	x	0	0.0
70+	x	x	x	x	x	x	x	x	x	x	x	x	x	x

x suppressed to meet the confidentiality requirements of the Statistics Act,

Data sources: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

## Appendix F

## Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and tumour stage, 2005 to 2008

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy(lymph node/large intestine/ rectum) or colonoscopy or proctoscopy	At least one excision (partial, total,radical, destruction, large intestine/rectum/ lymph node)	Bypass/with exteriorization/re- attachment/construction/ reconstruction	Radiation/Implantation of internal device/ brachytherapy	Pharmacotherapy, total body							
								N	% linked tumours	N	% linked tumours	N		
N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	
Manitoba														
Total acute/daysurgery 2005	620	91.0	487	71.5	556	81.6	54	7.9	x	x	9	1.3	61	9.0
Stage														
Stage 0	x	x	x	x	x	x	0	0.0	x	x	0	0.0	0	0.0
Stage I	x	x	91	76.5	112	94.1	x	x	0	0.0	0	0.0	x	x
Stage II	x	x	135	81.3	157	94.6	11	6.6	0	0.0	x	x	x	x
Stage III	x	x	134	70.5	182	95.8	16	8.4	0	0.0	x	x	x	x
Stage IV	123	85.4	97	67.4	83	57.6	21	14.6	x	x	7	4.9	21	14.6
Unknown	x	x	x	x	x	x	x	x	0	0.0	0	0.0	x	x
Total acute/daysurgery 2006	675	94.1	537	74.9	584	81.5	65	9.1	x	x	x	x	42	5.9
Stage														
Stage 0	x	x	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0
Stage I	x	x	100	72.5	126	91.3	7	5.1	0	0.0	x	x	x	x
Stage II	x	x	165	80.9	184	90.2	21	10.3	x	x	x	x	x	x
Stage III	x	x	146	77.2	180	95.2	13	6.9	x	x	x	x	x	x
Stage IV	125	89.3	98	70.0	76	54.3	23	16.4	0	0.0	x	x	15	10.7
Unknown	x	x	x	x	x	x	x	x	0	0.0	0	0.0	x	x
Total acute/daysurgery 2007	737	94.5	565	72.4	629	80.6	72	9.2	x	x	12	1.5	43	5.5
Stage														
Stage 0	10	100.0	x	x	10	100.0	x	x	0	0.0	0	0.0	0	0.0
Stage I	x	x	108	74.5	139	95.9	x	x	0	0.0	0	0.0	x	x
Stage II	212	96.8	163	74.4	199	90.9	21	9.6	0	0.0	x	x	7	3.2
Stage III	x	x	158	79.0	188	94.0	15	7.5	0	0.0	x	x	x	x
Stage IV	145	88.4	109	66.5	79	48.2	27	16.5	x	x	6	3.7	19	11.6
Unknown	28	66.7	x	x	14	33.3	x	x	x	x	x	x	14	33.3
Total acute/daysurgery 2008	724	92.1	571	72.6	639	81.3	47	6.0	0	0.0	7	0.9	62	7.9
Stage														
Stage 0	15	100.0	9	60.0	15	100.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	112	78.3	133	93.0	x	x	0	0.0	0	0.0	x	x
Stage II	211	96.8	162	74.3	200	91.7	11	5.0	0	0.0	x	x	7	3.2
Stage III	x	x	170	79.8	198	93.0	13	6.1	0	0.0	x	x	x	x
Stage IV	120	81.1	92	62.2	77	52.0	17	11.5	0	0.0	x	x	28	18.9
Unknown	32	65.3	26	53.1	16	32.7	x	x	0	0.0	0	0.0	17	34.7

## Appendix F (continued)

Treatment rates within follow-up for linked single malignant colorectal tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and tumour stage, 2005 to 2008

Province, CCR year, service type	Selected Treatments													
	Hospitalized w/in follow-up and at least one selected treatment		Diagnostic		Surgery/Excision		Repair		Radiation		Pharmacotherapy		None of the selected procedures	
			At least one biopsy(lymph node/large intestine/ rectum) or colonoscopy or proctoscopy	% linked tumours	At least one excision (partial, total,radical, destruction, large intestine/rectum/ lymph node)	% linked tumours	Bypass/with exteriorization/re- attachment/construction/ reconstruction	% linked tumours	Radiation/Implantation of internal device/ brachytherapy	% linked tumours				
											Pharmacotherapy, total body	% linked tumours		
N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	
Prince Edward Island	x	x	82	75.9	94	87.0	x	x	x	x	0	0.0	x	x
Total acute/daysurgery 2005														
Stage														
Stage 0	x	x	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0
Stage I	16	100.0	10	0.0	16	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage II	x	x	25	80.6	29	0.0	0	0.0	x	x	0	0.0	x	x
Stage III	32	100.0	26	81.3	32	0.0	0	0.0	x	x	0	0.0	0	0.0
Stage IV	x	x	17	70.8	15	0.0	x	x	0	0.0	0	0.0	x	x
Unknown	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	x	x
Total acute/daysurgery 2006	83	91.2	70	76.9	77	84.6	6	6.6	x	x	x	x	8	8.8
Stage														
Stage 0	x	x	x	x	0	0.0	0	0.0	x	x	0	0.0	0	0.0
Stage I	x	x	17	0.0	21	95.5	0	0.0	0	0.0	0	0.0	x	x
Stage II	x	x	20	87.0	22	95.7	x	x	0	0.0	0	0.0	x	x
Stage III	27	100.0	24	88.9	27	100.0	x	x	x	x	x	x	0	0.0
Stage IV	x	x	7	53.8	7	53.8	x	x	0	0.0	x	x	x	x
Unknown	x	x	x	x	0	0.0	0	0.0	0	0.0	0	0.0	x	x
Total acute/daysurgery 2007	90	96.8	77	82.8	79	84.9	6	6.5	0	0.0	x	x	x	x
Stage														
Stage 0	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	18	78.3	21	91.3	x	x	0	0.0	x	x	x	x
Stage II	27	100.0	23	85.2	26	96.3	0	0.0	0	0.0	x	x	0	0.0
Stage III	x	x	23	92.0	23	92.0	x	x	0	0.0	0	0.0	x	x
Stage IV	13	100.0	9	69.2	7	53.8	x	x	0	0.0	x	x	0	0.0
Unknown	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	x	x
TOTAL acute/daysurgery 2008	96	93.2	75	72.8	83	80.6	7	6.8	x	x	x	x	7	6.8
Stage														
Stage 0	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	x	x
Stage I	x	x	14	73.7	18	94.7	0	0.0	0	0.0	0	0.0	x	x
Stage II	x	x	25	78.1	28	87.5	x	x	x	x	x	x	x	x
Stage III	28	100.0	19	67.9	27	96.4	x	x	0	0.0	0	0.0	0	0.0
Stage IV	x	x	15	83.3	9	50.0	x	x	0	0.0	x	x	x	x
Unknown	x	x	x	x	x	x	0	0.0	0	0.0	0	0.0	x	x

x suppressed to meet the confidentiality requirements of the Statistics Act,

**Data sources:** CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

## Appendix G

## Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and age group, 2005 to 2008

Province, CCR year, age (years) group	Selected Treatments													
	Interventions to lymph nodes				Diagnostics		Surgeries		Radiation		Pharma		None of these selected treatments	
	At least one of: Biopsy, pelvic lymph nodes;Excision partial, total, lymph nodes, pelvic				At least one of: Imaging, inspect prostate, biopsy prostate, PSA		At least one of: Excision radical, Destruction, prostate; Excision radical, bladder NEC, with reconstruction; Excision total, Excision radical testis							
	Hospitalized w/in follow-up period and at least one selected treatment													
	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours
Ontario														
Total hospitalization services 2005	6,628	74.4	304	3.4	2,522	28.3	3,422	38.4	2,574	28.9	469	5.3	2,282	25.6
LT 50	167	86.1	12	6.2	52	26.8	141	72.7	33	17.0	7	3.6	27	13.9
50-69	4,170	85.7	265	5.4	1,338	27.5	2,838	58.3	1,341	27.6	253	5.2	696	14.3
70+	2,291	59.5	27	0.7	1,132	29.4	443	11.5	1,200	31.2	209	5.4	1,559	40.5
Acute/daysurgery 2005	4,883	54.8	303	3.4	1,854	20.8	3,422	38.4	238	2.7	63	0.7	4,027	45.2
LT 50	153	78.9	12	6.2	33	17.0	141	72.7	x	x	x	x	41	21.1
50-69	3,404	70.0	264	5.4	909	18.7	2,838	58.3	169	3.5	29	0.6	1,462	30.0
70+	1,326	34.4	27	0.7	912	23.7	443	11.5	x	x	x	x	2,524	65.6
Total hospitalization services 2006	6,864	73.0	351	3.7	2,393	25.5	3,579	38.1	2,795	29.7	498	5.3	2,534	27.0
LT 50	180	86.5	16	7.7	55	26.4	146	70.2	32	15.4	13	6.3	28	13.5
50-69	4,401	83.3	291	5.5	1,271	24.0	2,967	56.1	1,485	28.1	271	5.1	884	16.7
70+	2,283	58.5	44	1.1	1,067	27.3	466	11.9	1,278	32.7	214	5.5	1,622	41.5
Acute/daysurgery 2006	4,979	53.0	350	3.7	1,765	18.8	3,579	38.1	244	2.6	53	0.6	4,419	47.0
LT 50	162	77.9	16	7.7	35	16.8	146	70.2	6	2.9	0	0.0	46	22.1
50-69	3,544	67.1	290	5.5	893	16.9	2,967	56.1	172	3.3	23	0.4	1,741	32.9
70+	1,273	32.6	44	1.1	837	21.4	466	11.9	66	1.7	30	0.8	2,632	67.4
Total hospitalization services 2007	6,975	73.1	336	3.5	2,260	23.7	3,506	36.7	3,112	32.6	478	5.0	2,571	26.9
LT 50	180	80.7	11	4.9	46	20.6	147	65.9	43	19.3	8	3.6	43	19.3
50-69	4,537	83.4	275	5.1	1,302	23.9	2,940	54.0	1,695	31.2	262	4.8	903	16.6
70+	2,258	58.2	50	1.3	912	23.5	419	10.8	1,374	35.4	208	5.4	1,625	41.8
Acute/daysurgery 2007	4,791	50.2	336	3.5	1,539	16.1	3,506	36.7	246	2.6	41	0.4	4,755	49.8
LT 50	163	73.1	11	4.9	30	13.5	147	65.9	7	3.1	x	x	60	26.9
50-69	3,532	64.9	275	5.1	832	15.3	2,940	54.0	187	3.4	11	0.2	1,908	35.1
70+	1,096	28.2	50	1.3	677	17.4	419	10.8	52	1.3	x	x	2,787	71.8
Total hospitalization services 2008	6,385	73.1	265	3.0	2,068	23.7	3,254	37.3	2,834	32.5	441	5.1	2,345	26.9
LT 50	180	85.7	11	5.2	42	20.0	147	70.0	47	22.4	7	3.3	30	14.3
50-69	4,113	82.8	211	4.2	1,164	23.4	2,697	54.3	1,517	30.5	198	4.0	856	66.5
70+	2,092	58.9	43	1.2	862	24.3	410	11.5	1,270	35.8	236	6.6	1,459	41.1



## Appendix G (continued)

Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and age group, 2005 to 2008

Province, CCR year, age (years) group	Selected Treatments																	
	Interventions to lymph nodes				Diagnostics				Surgeries				None of these selected treatments					
	Hospitalized w/in follow-up period and at least one selected treatment				At least one of: Biopsy, pelvic lymph nodes;Excision partial, total, lymph nodes, pelvic				At least one of: Imaging, inspect prostate, biopsy prostate, PSA						At least one of: Excision radical, Destruction, prostate; Excision radical, bladder NEC, with reconstruction; Excision total, Excision radical testis			
N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours					
Acute/daysurgery 2008	4,457	51.1	265	3.0	1,419	16.3	3,254	37.3	223	2.6	50	0.6	4,273	48.9				
LT 50	166	79.0	11	5.2	31	14.8	147	70.0	9	4.3	x	x	44	21.0				
50-69	3,271	65.8	211	4.2	776	15.6	2,697	54.3	166	3.3	23	0.5	1,698	34.2				
70+	1,020	28.7	43	1.2	612	17.2	410	11.5	48	1.4	x	x	2,531	71.3				
Manitoba																		
Acute/daysurgery 2005	260	45.1	32	5.6	40	6.9	221	38.4	x	x	x	x	316	54.9				
LT 50	x	x	x	x	x	x	x	x	x	x	0	0.0	x	x				
50-69	194	65.3	27	9.1	18	6.1	177	59.6	0	0.0	x	x	103	34.7				
70+	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
Acute/daysurgery 2006	282	42.3	35	5.2	35	5.2	257	38.5	x	x	0	0.0	385	57.7				
LT 50	x	x	x	x	0	0.0	6	60.0	0	0.0	0	0.0	x	x				
50-69	221	67.6	33	10.1	15	4.6	213	65.1	x	x	0	0.0	106	32.4				
70+	x	x	x	x	20	6.1	38	11.5	x	x	0	0.0	x	x				
Acute/daysurgery 2007	321	44.8	22	3.1	42	5.9	283	39.5	x	x	x	x	395	55.2				
LT 50	x	x	x	x	x	x	14	77.8	x	x	0	0.0	x	x				
50-69	248	64.6	18	4.7	16	4.2	231	60.2	0	0.0	x	x	136	35.4				
70+	x	x	x	x	x	x	38	12.1	x	x	x	x	x	x				
Acute/daysurgery 2008	263	43.1	11	1.8	55	9.0	214	35.1	x	x	x	x	347	56.9				
LT 50	x	x	x	x	x	x	12	92.3	0	0.0	x	x	x	x				
50-69	196	61.3	8	2.5	23	7.2	178	55.6	x	x	0	0.0	124	38.8				
70+	x	x	x	x	x	x	24	8.7	x	x	x	x	x	x				
Nova Scotia																		
Acute/daysurgery 2005	427	58.2	7	1.0	221	30.1	297	40.5	12	1.6	x	x	307	41.8				
LT 50	x	x	0	0.0	7	41.2	13	76.5	x	x	x	x	x	x				
50-69	282	71.8	x	x	119	30.3	236	60.1	8	2.0	x	x	111	28.2				
70+	x	x	x	x	95	29.3	48	14.8	x	x	0	0.0	x	x				
Acute/daysurgery 2006	613	67.0	21	2.3	405	44.3	394	43.1	35	3.8	x	x	302	33.0				
LT 50	x	x	x	x	x	x	15	78.9	0	0.0	x	x	x	x				
50-69	421	81.0	16	3.1	243	46.7	341	65.6	21	4.0	0	0.0	99	19.0				
70+	x	x	x	x	x	x	38	10.1	14	3.7	x	x	x	x				

## Appendix G (continued)

Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR) by province, year, hospital service type, and age group, 2005 to 2008

Province, CCR year, age (years) group	Selected Treatments													
	Interventions to lymph nodes				Diagnostics		Surgeries		Radiation		Pharma		None of these selected treatments	
	At least one of: Biopsy, pelvic lymph nodes;Excision partial, total, lymph nodes, pelvic				At least one of: Imaging, inspect prostate, biopsy prostate, PSA		At least one of: Excision radical, Destruction, prostate; Excision radical, bladder NEC, with reconstruction; Excision total, Excision radical testis							
	Hospitalized w/in follow-up period and at least one selected treatment	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N
Acute/daysurgery 2007	628	70.6	17	1.9	405	45.6	374	42.1	41	4.6	x	x	261	29.4
LT 50	23	100.0	x	x	x	x	22	95.7	0	0.0	0	0.0	0	0.0
50-69	410	80.2	12	2.3	243	47.6	302	59.1	32	6.3	x	x	101	19.8
70+	195	54.9	x	x	x	x	50	14.1	9	2.5	x	x	160	45.1
Acute/daysurgery 2008	522	71.3	21	2.9	345	47.1	293	40.0	45	6.1	0	0.0	210	28.7
LT 50	x	x	x	x	6	37.5	11	68.8	x	x	0	0.0	x	x
50-69	344	81.1	16	3.8	202	47.6	239	56.4	34	8.0	0	0.0	80	18.9
70+	x	x	x	x	137	46.9	43	14.7	x	x	0	0.0	x	x
Prince Edward Island														
Acute/daysurgery 2005	48	44.9	0	0.0	x	x	34	31.8	10	9.3	x	x	59	55.1
LT 50	x	x	0	0.0	0	0.0	x	x	x	x	0	0.0	x	x
50-69	36	56.3	0	0.0	x	x	27	42.2	7	10.9	x	x	28	43.8
70+	x	x	0	0.0	x	x	x	x	x	x	x	x	x	x
Acute/daysurgery 2006	76	51.4	x	x	0	0.0	55	37.2	21	14.2	0	0.0	72	48.6
LT 50	x	x	0	0.0	0	0.0	x	x	x	x	0	0.0	x	x
50-69	62	66.7	x	x	0	0.0	48	51.6	14	15.1	0	0.0	31	33.3
70+	x	x	x	x	0	0.0	x	x	x	x	0	0.0	x	x
Acute/daysurgery 2007	85	52.5	x	x	7	4.3	52	32.1	29	17.9	x	x	77	47.5
LT 50	x	x	0	0.0	0	0.0	0	0.0	x	x	0	0.0	x	x
50-69	63	65.6	x	x	x	x	42	43.8	19	19.8	x	x	33	34.4
70+	x	x	x	x	x	x	10	15.6	x	x	x	x	x	x
Acute/daysurgery 2008	51	43.2	0	0.0	x	x	29	24.6	18	15.3	0	0.0	67	56.8
LT 50	x	x	0	0.0	0	0.0	x	x	x	x	0	0.0	x	x
50-69	43	60.6	0	0.0	x	x	x	x	16	22.5	0	0.0	28	39.4
70+	x	x	0	0.0	x	x	x	x	x	x	0	0.0	x	x

x suppressed to meet the confidentiality requirements of the Statistics Act,

Data sources: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.

## Appendix H

## Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR) by province, year, and tumour stage, 2005 to 2008

Province, CCR year, tumour stage	Selected Treatments													
	Interventions to lymph nodes				Diagnostics		Surgeries		Radiation		Pharma		None of these selected treatments	
	At least one of: Biopsy, pelvic lymph nodes;Excision partial, total, lymph nodes, pelvic				At least one of: Imaging, inspect prostate, biopsy prostate, PSA		At least one of: Excision radical, Destruction, prostate; Excision radical, bladder NEC, with reconstruction; Excision total, Excision radical testis							
	Hospitalized w/in follow-up period and at least one selected treatment													
	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours
Manitoba														
Total acute/daysurgery 2005	260	45.1	32	5.6	40	6.9	221	38.4	x	x	x	x	316	54.9
Stage														
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	x	x
Stage II	186	46.3	x	x	23	5.7	165	41.0	x	x	x	x	216	53.7
Stage III	33	80.5	8	19.5	0	0.0	29	70.7	x	x	x	x	8	19.5
Stage IV	31	41.9	7	9.5	x	x	20	27.0	0	0.0	0	0.0	43	58.1
Unknown	x	x	x	x	x	x	7	12.3	0	0.0	0	0.0	x	x
Total acute/daysurgery 2006	282	42.3	35	5.2	35	5.2	257	38.5	x	x	0	0.0	385	57.7
Stage														
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	x	x
Stage II	200	40.8	19	3.9	22	4.5	185	37.8	x	x	0	0.0	290	59.2
Stage III	48	75.0	9	14.1	x	x	47	73.4	0	0.0	0	0.0	16	25.0
Stage IV	30	39.5	x	x	11	14.5	x	x	x	x	0	0.0	46	60.5
Unknown	x	x	x	x	x	x	x	x	0	0.0	0	0.0	x	x
Total acute/daysurgery 2007	321	44.8	22	3.1	42	5.9	283	39.5	x	x	x	x	395	55.2
Stage														
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage II	229	42.9	15	2.8	30	5.6	201	37.6	0	0.0	x	x	305	57.1
Stage III	56	84.8	x	x	x	x	55	83.3	0	0.0	0	0.0	10	15.2
Stage IV	x	x	x	x	8	10.4	x	x	x	x	0	0.0	x	x
Unknown	x	x	0	0.0	x	x	x	x	x	x	x	x	x	

## Appendix H (continued)

Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR) by province, year, and tumour stage<sup>4</sup>, 2005 to 2008

Province, CCR year, tumour stage	Selected Treatments																	
	Interventions to lymph nodes				Diagnostics				Surgeries				Radiation		Pharma		None of these selected treatments	
	At least one of: Biopsy, pelvic lymph nodes;Excision partial, total, lymph nodes, pelvic				At least one of: Imaging, inspect prostate, biopsy prostate, PSA				At least one of: Excision radical, Destruction, prostate; Excision radical, bladder NEC, with reconstruction; Excision total, Excision radical testis									
	Hospitalized w/in follow-up period and at least one selected treatment	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours			
Total acute/daysurgery 2008	263	43.1	11	1.8	55	9.0	214	35.1	x	x	x	x	347	56.9				
Stage																		
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
Stage I	x	x	0	0.0	0	0.0	x	x	0	0.0	0	0.0	x	x				
Stage II	184	39.4	8	1.7	41	8.8	146	31.3	x	x	0	0.0	283	60.6				
Stage III	46	83.6	x	x	x	x	46	83.6	0	0.0	0	0.0	9	16.4				
Stage IV	30	43.5	x	x	9	13.0	20	29.0	x	x	x	x	39	56.5				
Unknown	x	x	0	0.0	x	x	x	x	0	0.0	0	0.0	x	x				
Prince Edward Island																		
Total acute/daysurgery 2005	48	44.9	0	0.0	x	x	34	31.8	10	9.3	x	x	59	55.1				
Stage																		
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
Stage I	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	x	x				
Stage II	39	45.9	0	0.0	x	x	28	32.9	10	11.8	x	x	46	54.1				
Stage III	x	x	0	0.0	0	0.0	x	x	0	0.0	0	0.0	x	x				
Stage IV	x	x	0	0.0	x	x	x	x	0	0.0	x	x	x	x				
Unknown	x	x	0	0.0	x	x	0	0.0	0	0.0	0	0.0	x	x				
Total acute/daysurgery 2006	76	51.4	x	x	0	0.0	55	37.2	21	14.2	0	0.0	72	48.6				
Stage																		
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
Stage I	x	x	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	x	x				
Stage II	67	51.5	x	x	0	0.0	47	36.2	20	15.4	0	0.0	63	48.5				
Stage III	x	x	0	0.0	0	0.0	8	66.7	x	x	0	0.0	x	x				
Stage IV	x	x	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	x	x				
Unknown	x	x	x	x	0	0.0	0	0.0	x	x	0	0.0	x	x				
Total acute/daysurgery 2007	85	52.5	x	x	7	4.3	52	32.1	29	17.9	x	x	77	47.5				
Stage																		
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
Stage I	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
Stage II	63	50.8	x	x	x	x	39	31.5	23	18.5	x	x	61	49.2				
Stage III	15	71.4	x	x	x	x	10	47.6	x	x	0	0.0	6	28.6				
Stage IV	x	x	0	0.0	x	x	x	x	0	0.0	0	0.0	x	x				
Unknown	x	x	0	0.0	0	0.0	x	x	x	x	x	x	x	x				

## Appendix H (continued)

## Treatment rates within follow-up for linked single malignant prostate tumours identified in Canadian Cancer Registry (CCR) by province, year, and tumour stage, 2005 to 2008

Province, CCR year, tumour stage	Selected Treatments													
	Hospitalized w/in follow-up period and at least one selected treatment		Interventions to lymph nodes		Diagnostics		Surgeries		Radiation		Pharma		None of these selected treatments	
			At least one of: Biopsy, pelvic lymph nodes;Excision partial, total, lymph nodes, pelvic	At least one of: Imaging, inspect prostate, biopsy prostate, PSA	At least one of: Excision radical, Destruction, prostate; Excision radical, bladder NEC, with reconstruction; Excision total, Excision radical testis									
N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	N	% linked tumours	
Total acute/daysurgery 2008	51	43.2	0	0.0	x	x	29	24.6	18	15.3	0	0.0	67	56.8
Stage														
Stage 0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stage I	x	x	0	0.0	0	0.0	x	x	0	0.0	0	0.0	x	x
Stage II	44	43.6	0	0.0	x	x	x	x	18	17.8	0	0.0	57	56.4
Stage III	6	100.0	0	0.0	x	x	x	x	0	0.0	0	0.0	0	0.0
Stage IV	x	x	0	0.0	x	x	0	0.0	0	0.0	0	0.0	x	x
Unknown	x	x	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	x	x

x suppressed to meet the confidentiality requirements of the Statistics Act,

Data sources: CCR Tabulation master file (CCR rules), Sept 19, 2012, Statistics Canada, CCR\_DAD/ CCR\_NACRS linked databases 2004/05 - 2010/11; DAD 2004-2005 throughout 2010/11, Statistics Canada.