



## Developing a Model for Measuring the Efficiency of the Health System in Canada—Data Availability



## Our Vision

Better data. Better decisions.  
Healthier Canadians.

## Our Mandate

To lead the development and maintenance of comprehensive and integrated health information that enables sound policy and effective health system management that improve health and health care.

## Our Values

Respect, Integrity, Collaboration,  
Excellence, Innovation

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# 1 Data Availability

This document provides comprehensive information about the data sources available at the Canadian Institute for Health Information (CIHI) and Statistics Canada that can be used for analyzing health system efficiency. Designed as a one-stop-shop, this document provides knowledge about key indicators of health and health systems across Canada at the provincial/territorial and health region levels. It highlights the strengths and limitations of the data and data sources, and explains differences in definitions and data collection processes among Canadian jurisdictions. In addition, the document describes discrepancies that may exist due to ongoing updates to databases.

The document is organized as follows. Section 1 highlights the inputs of the health system, including labour inputs (such as physicians, nurses) and capital inputs (such as hospital beds). It also looks at the input in monetary terms, for example, health expenditures. Section 2 reviews non-medical determinants of health. It provides information on population density, unemployment rates, income, immigrant population, and modifiable lifestyles and behaviours, including tobacco smoking, alcohol drinking and obesity problems. Section 3 examines outputs and outcomes of the health system.

## 1.1 Inputs Controlled by the Health System

### 1.1.1 Health Regions

Health regions are provincially defined geographic areas that represent regions of administrative responsibility for regional health authorities or hospital boards. These regions have evolved over time. There are different reporting units in different regions and umbrellas of responsibility may vary depending on the jurisdiction. For example, in Nova Scotia, district health authorities (DHAs) are responsible for planning and delivering health services, but data can also be reported by zones; in Ontario, there are local health integration networks (LHINs) and public health units. Most health regions represent health authorities.<sup>1</sup>

For some northern health regions, Statistics Canada's data is sometimes combined for reporting, to avoid suppression due to small numbers or impact on data quality due to small sample size. In Manitoba, the data of two RHAs, Burntwood Regional Health Authority and Churchill Regional Health Authority, is combined. In Saskatchewan, the data of three regions is combined: Mamawetan Churchill River Regional Health Authority, Keewantin Yatthé Regional Health Authority and Athabasca Health Authority.<sup>2</sup>

Health regions can be mapped to census geographic units, and vice versa, using the correspondence files developed by Statistics Canada.<sup>3</sup> For the 2007 health region boundaries, correspondence files are available for linkage to 2006 and 2001 census geographies. Data containing full postal code information can be mapped to health regions by first using the Statistics Canada Postal Code Conversion File (PCCF) to convert to census geographic units and then applying the correspondence files to link to the health regions.<sup>1</sup> The PCCF conforms to the new census geographic areas for five years after each census. It is updated regularly to reflect ongoing postal code changes. A new version of PCCF is released every six months. The most recent release covered postal codes up to May 2011.<sup>4</sup> Estimates based on different

versions of PCCF may have minor differences. Additional information on the methodologies and limitations regarding the correspondence files and PCCF can be found in the related Statistics Canada documentation.<sup>1, 4</sup>

## 1.1.2 Health Expenditures

### Jurisdictional Health Expenditures (CIHI)

Information on macro-level health expenditures in Canada can be obtained from the National Health Expenditure Database (NHEX). The NHEX data is collected primarily from public sources such as jurisdictional Public Accounts, health ministries' annual reports, private insurance industry reports and Statistics Canada. NHEX includes data for health care spending on activities with the primary purpose of improving or maintaining health status. The health expenditure data is broken down by source of finance and by use of funds. Both public- and private-sector health expenditures are available. Public-sector health expenditures by social security funds can be separated out. The use of funds is grouped into nine broad categories: hospitals, other institutions, physicians, other professionals, drugs, capital, public health, administration and other health spending.<sup>5</sup>

Total health expenditures are available annually from 1975. Since the NHEX data is captured at an aggregate level, regional data is not available and cannot be computed using NHEX data. Private-sector data broken down into out-of-pocket, private insurance and non-consumption expenditures is available from 1988.<sup>5</sup>

### Cost of Physician Consultations (CIHI)

Information on fee-for-service payments by physician specialization is available from the National Physician Database (NPDB). Provinces and territories submit physician claim data and the associated physician and patient demographic information. The population includes only people who are eligible for medical service paid by the provinces and territories but not those who are covered by federal medical insurance programs. Data is excluded for certain categories of persons who are covered under other public programs, for example, members of the Canadian Forces and Royal Canadian Mounted Police and inmates of federal and provincial penitentiaries.<sup>6</sup> These persons account for close to 1% of the total population.<sup>6, 7</sup>

In addition to compensation by fee-for-service, provinces and territories have alternative payment programs that make direct payment to physicians by other arrangements. These alternative payments can be clinical-based (such as payment by salary or by hour) or non-clinical-based (such as rural incentive payments and employment benefits). All jurisdictions, other than Nunavut, submit aggregate alternative payment data that can be further separated by physician specialty except for Alberta, Yukon and Nunavut. Ontario (for 2001) and Manitoba (for 2001 to 2003) did not submit alternative payment data, so CIHI's NHEX was used as a source of estimates in those cases.<sup>6</sup>

For the territories, data on fee-for-service and alternative payments is missing for 1999 to 2009 for Nunavut, and is missing up to 2001 for Yukon and up to 2003 for the Northwest Territories.<sup>6</sup>

Sub-province statistics can be created using the NPDB data. However, the level of geographic detail varies across jurisdictions. Some provinces provide information on full postal code, some provide the forward sortation area (FSA) code, and others provide the census metropolitan area (CMA) code.

### **Hospitals' Financial Information (CIHI)**

Financial information from hospitals can be obtained from the Canadian MIS Database (CMDB). All jurisdictions, except Nunavut, provide data for all publicly funded hospitals. Data from Quebec is not collected according to the MIS Standards. As a result, data mapping is carried out in order to use the data to compute some of the financial indicators. Some private hospitals do not submit data to the CMDB; this should be taken into consideration in order to evaluate data quality. The response rates for 1995–1996 and 1996–1997 were comparatively lower, but started improving in 1997–1998. However, not all organizations submitted a complete data set. In 2009, 100% of all hospitals in submitting jurisdictions provided data to the CMDB. Postal codes of individual hospitals are collected and can be used to calculate regional estimates.<sup>8</sup>

### **Cost per Weighted Case (CIHI)**

Cost per weighted case (CPWC) is a measure of relative cost-efficiency of a facility in providing acute inpatient care. The CPWC calculation involves dividing the hospital's total acute inpatient care expenses by the total number of acute inpatient weighted cases related to the inpatients for which it provided care. The numerator of the CPWC statistic, the cost of inpatient care, is determined using hospital-level data that submitting jurisdictions have reported to the CMDB. The denominator of the CPWC statistic, the total number of weighted cases, is summarized by CIHI using data from the DAD. Health-region values are calculated as the sum of all health-region hospitals' numerators divided by the sum of all health-region hospitals' denominators.<sup>8</sup> The number of weighted cases is computed using CMG+ grouping methodologies, which is updated annually. Weighted case indicators are available only for a five-year period for a given CMG+ methodology year. Hence, CPWC can be compared over a five-year time span only.<sup>9</sup>

There are several caveats that need to be taken into consideration when interpreting the CPWC indicator. For example, labour costs, a relatively large proportion of the CPWC numerator, can vary greatly between jurisdictions. Also, costs tend to vary by institution type.<sup>8</sup>

### **1.1.3 Health Human Resources (CIHI)**

Information on health human resources can be obtained from the Health Personnel Database (HPDB) and selected profession-specific databases. The HPDB contains information on supply-based trends for 24 health occupations by province and territory. Years of available data and completeness of geographical coverage vary across health occupations. Regional statistics cannot be computed, because individual record-level data and information on postal codes are not captured in the HPDB.<sup>10</sup>

The profession-specific databases include information on the supply, demographic, geographic, education and employment status of physicians, nurses, pharmacists, occupational therapists, physiotherapists, medical radiation technologists and medical laboratory technologists. Years of data coverage are most numerous for physicians and nurses. Information for some of the other profession-specific databases dates back to 2006. The geographical coverage varies across these databases.<sup>11–17</sup>

### **Physicians<sup>11, 18</sup> (CIHI)**

There are three methods to measure physician supply. The first one is the number of medical graduates.<sup>19</sup> However, this method does not allow mapping physicians to health regions, because graduates do not necessarily work in the same health region in which the medical school is located. The second method is National Physician Database (NPDB), which provides information on the demographic characteristics of physicians and their level of activity within the Canadian medical care system. Information on activity levels includes full-time equivalent physician counts. The physician counts are based on fee-for-service data only. Non-fee-for-service payments are not included in the calculation, as this information is not submitted by all jurisdictions. The third data source is Scott's Medical Database (SMDB), which includes active physicians in clinical and non-clinical practice (for example, research and academia) who have a medical doctor designation and a valid mailing address (defined as mail that is sent to the physician by Scott's Medical Database and not returned). The data excludes residents, physicians in the military and semi-retired and retired physicians. Residents accounted for 7% of total physicians in 2010. We propose to use this database to estimate health service efficiency.

The SMDB data is divided into two categories: family medicine physicians and specialist physicians. Family medicine physicians include general practitioners (physicians, excluding interns and residents, without a current medical specialty certified in Canada) and family medicine and emergency family medicine specialists. Specialists include certificants of the Royal College of Physicians and Surgeons of Canada (RCPSC) and the Collège des médecins du Québec (CMQ). Some jurisdictions also include non-certified specialists: from 2004 onward for Saskatchewan and Newfoundland and Labrador; from 2007 onward for New Brunswick, Nova Scotia and Yukon; from 2009 onward for Quebec and Prince Edward Island; and from 2010 onward for Alberta.

The six-digit postal code of a physician's primary mailing address can be used to assign a physician to a health region.

### **Nurses<sup>12</sup> (CIHI)**

The Nursing Database includes all regulated nurses with active practising registration in a province or territory. The data is divided into three categories: registered nurses (RNs, including nurse practitioners), licensed practical nurses (LPNs) and registered psychiatric nurses (RPNs).

The reported data is for RNs working in direct care, which includes data from the area of responsibility of medical/surgical, psychiatric/mental health, pediatric, maternal/newborn, geriatric/long-term care, critical care, community health, ambulatory care, home care, occupational health, operating room, emergency room, nursing in several clinical areas, oncology, rehabilitation, public health, telehealth and other patient care. RNs in direct care



accounted for 89.3% of the RN workforce in 2010, ranging from 91.6% in Alberta to 86.8% in Manitoba. The other 10.7% of the RN workforce worked in the areas of administration, education and research.

For place of work, in 2010, 63% of RNs worked in hospitals (varies from 67.8% in Newfoundland and Labrador to 38.4% in the Northwest Territories/Nunavut), 14% in the community health sector and 9.6% in a nursing home/long-term care.

Postal code data and Statistics Canada's PCCF were used to assign the regulated nursing workforce to health regions. The six-digit Postal Code of Employer (Work Site) was used first; in situations where this postal code was missing or invalid, the six-digit Postal Code of Residence was used.

### **Full-Time Equivalent Personnel in Residential Care Facilities (Statistics Canada)**

The number of full- and part-time personnel on the payroll of residential care facilities, as of the last day of the fiscal period, is available from Statistics Canada's Residential Care Facilities Survey (RCF). In all jurisdictions, residential care facilities with four or more beds that provide one or more of the five types of care (counselling, custodial, supervisory, personal and nursing care) to at least one resident are included. Facilities that mainly provide active medical treatments are excluded.<sup>20</sup> Facilities submit information to the RCF. The response rate varies by year, by province and by type of care. The overall response rate for 1984 to 1999 (except 1994 and 1995, when the survey was not conducted) was more than 70%; starting in 2000, the rate increased to more than 80% of all facilities. Data adjusted for non-response is available from 1984 onwards.<sup>21</sup> The addresses of all facilities are captured and can be used to compute regional statistics. Some reporters submit one questionnaire for multiple facilities that can be located in more than one health region (C. Sanmartin and B. Augustin, Health Analysis Division, Statistics Canada, written communication, February 2012).

#### **1.1.4 Capital and Medical Supplies (CIHI)**

Information on hospital beds, including cribs and bassinets, staffed and ready to provide services is available from the CMDB.<sup>8</sup> The definition and interpretation of "staffed and available bed" varied prior to 2006. A more stable and accurate counting of hospital beds is available from 2006 onwards.

Information on 10 specific types of medical imaging and treatment equipment, including computed tomography (CT) and magnetic resonance imaging (MRI) scanners, is available from the National Survey of Selected Medical Imaging Equipment. Information is collected from public and private facilities with at least one of the seven types of equipment in the original 2003 survey. Annual data on the number of units and type, year of installation and site address with postal code for each piece of equipment is available from 2003. Starting in 2004, the average weekly hours of usage of each piece of equipment has been collected. For 2006, the total number of examinations performed at the facility level is available for some imaging types, such as CT and MRI scans. Information on health region was also collected at the facility level. Since 2003, quite a few provincial ministries of health have reorganized their health regions. This may have affected the health region results from later survey years.<sup>22</sup>

Information on drug claims made to public drug programs of selected provinces is captured by the National Prescription Drug Utilization Information System (NPDUIS) Database. Drug claims that are accepted by the provincial drug programs for reimbursement or for credit toward a deductible are included in the NPDUIS. Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia have been submitting data to the NPDUIS since 2002. P.E.I. started submitting data in 2005. Claims to selected public drug programs from these provinces are not submitted to the NPDUIS.<sup>23</sup> Ontario began submitting data in 2011.<sup>24</sup>

Information on the percentage of the population that had an influenza immunization can be obtained from Statistics Canada's Canadian Community Health Survey (CCHS).<sup>25</sup> The CCHS gathers information on health status, health determinants and health care utilization from a large sample of respondents. It is designed to provide estimates that are reliable at the regional level. Its target population is all Canadians age 12 and over, excluding members of the Canadian Forces, residents of institutions, people living on Indian reserves and residents of some remote regions. CCHS data is available for 2000–2001, 2003 and 2005, and annually from 2007 onwards. Identifiable data is suppressed.<sup>26</sup> Some health regions with small population size are combined to minimize data suppression.<sup>25</sup> Published regional data for 2000–2001 is based on 2000 health region boundaries.<sup>27</sup>

## 1.2 Inputs Beyond the Control of the Health Care System

### 1.2.1 Non-Medical Determinants of Health (Statistics Canada)

Non-medical determinants of health are factors outside the control of the health system that are known to affect health. Health indicators in this dimension are categorized into four groups: health behaviours, living and working conditions, personal resources and environmental factors. Data for these indicators is available from Statistics Canada.<sup>28</sup>

Information on health behaviours, personal resources and environmental factors is available from the CCHS data. Indicators for health behaviours include measures on smoking, heavy drinking, physical activity, fruit and vegetable consumption and bicycle helmet use; indicators for personal resource include measures on sense of community belonging and life satisfaction; and indicators for environmental factors include measures on exposure to second-hand smoke.<sup>25</sup>

Data on living and working conditions comes from an array of Statistics Canada surveys. Information on household food insecurity is available from the CCHS.<sup>29</sup> Information on crime incidents can be obtained from Statistics Canada's Uniform Crime Reporting Survey. The number of crime incidents and the rate per 100,000 population are available by province and territory and by census metropolitan area.<sup>30</sup>

Information on education attainment, income, long-term unemployment and housing affordability is computed using census data. These measures are available at the provincial and regional level.<sup>31</sup> Information on the unemployment rate at the provincial and regional levels is available from the Labour Force Survey.<sup>32</sup> The unemployment rate measures the proportion of the labour force age 15 and older that did not have a job during a one-week reference period, whereas the long-term unemployment rate measures the proportion that did not have a job any time during a two-year period.<sup>33</sup>

## 1.2.2 Community Characteristics (Statistics Canada)

Health indicators on community characteristics provide important contextual information.<sup>28</sup> Community characteristics such as population density, Aboriginal population, immigrant population, visible minority population and lone-parent families can be obtained from the census data. Dependency ratio—the ratio of the combined population age 18 and younger and age 65 and older to the population age 20 to 64—and population estimates are computed using census and administrative data on births, deaths and migration.<sup>33</sup> These indicators are available at the provincial, territorial and regional levels.<sup>31</sup>

## 1.3 Output of the Health System

Volume of discharge from hospital and total and average length of hospital stay can be computed from the Discharge Abstract Database (DAD) and the Hospital Morbidity Database (HMDB). All jurisdictions except Quebec submit data on acute inpatient separations to the DAD. Quebec's acute inpatient separations are submitted to the HMDB.<sup>34</sup>

The DAD data from 1990 onward is most readily available for use. However, not all provinces submitted data to the DAD in the early 1990s. Newfoundland and Labrador and Nova Scotia did not submit data until 1995; Saskatchewan and P.E.I. until 1998; and Manitoba until 2004 (only Winnipeg facilities submitted data before 2004). In 2004, a new data element, the Analytical Institutional Type Code, was introduced to identify the true level of care of submitting facilities. This data element should be used to identify acute inpatient separations in the DAD data. Full postal codes of patients are captured in the DAD.<sup>34</sup>

The ministère de la Santé et des Services sociaux du Québec submits data on inpatient separations to the HMDB. This data is merged with acute care data from the DAD to create a national database on acute inpatient separations. Prior to 2004, Manitoba submitted inpatient separations from all acute care facilities to the HMDB. Prior to 1998, the HMDB data for provinces that did not submit data to the DAD was provided by the provincial ministries of health. Nunavut did not submit data to the DAD or the HMDB for 2002. Quebec does not submit full postal codes of patients to the HMDB; only the forward sortation area, the first three digits of postal codes, is submitted to the HMDB. However, a ministry-assigned region code has been provided for Quebec residents since 2006–2007.<sup>35</sup>

Information on day surgery procedures can be obtained from the DAD and National Ambulatory Care Reporting System (NACRS). Day surgery data from all valid institutions in Newfoundland and Labrador, P.E.I., New Brunswick, Manitoba, Saskatchewan, British Columbia and the territories is submitted to the DAD; Ontario submits all day surgery data to NACRS. Before 2003–2004, Ontario submitted day surgery to the DAD. Some facilities in Nova Scotia submit day surgery data to the DAD and some submit data to NACRS. As of 2010, Alberta submits all day surgery data to NACRS;<sup>34, 36</sup> day surgery data prior to 2010 can be obtained from the Alberta Ambulatory Care Reporting System of Alberta Health and Wellness.<sup>37, 38</sup> For Quebec, day surgery data is available from fichier des hospitalisations MED-ÉCHO.<sup>35</sup>

Information on emergency department (ED) visits can be obtained from NACRS. For 2010–2011, Ontario, Alberta and Yukon submitted data on all ED visits to NACRS, while Saskatchewan, P.E.I., Nova Scotia and Manitoba did not submit data from all facilities.<sup>39</sup> Data on ED visits from Alberta prior to 2010 can be obtained from the Alberta Ambulatory Care Reporting System.<sup>37, 38</sup>

Number of services by physician specialization can be obtained from the NPDB data. There are 17 specialty groupings in the NPDB, which are rolled up to three broad groups: family medicine, medical specialists and surgical specialists. Number of services by National Grouping System category is also available. As with cost of physician consultations, data is missing for the period 1999 to 2009 for Nunavut, up to 2001 for Yukon and up to 2003 for the Northwest Territories. Sub-province statistics can be created, but the level of geographic detail varies across jurisdictions.

Information on long-term care recipients in institutions can be obtained from Statistics Canada’s RCF. Total residents includes residents on the books at the end of the reporting year.<sup>40</sup>

### 1.3.1 Health Outcomes

#### Health Status

Health indicators on health status inform the health of the population. They are categorized into four groups: well-being, health conditions, human function and deaths.<sup>28</sup>

##### *Well-Being Indicators (Statistics Canada)*

Perceived health is a self-reported measure of overall health status. The proportion of the population age 12 and older who reported perceived health as being very good or excellent is used as an indicator of well-being. Information on perceived health is obtained from the CCHS data.<sup>33</sup>

##### *Health Conditions Indicators (Statistics Canada)*

Information on selected health conditions, such as diabetes and high blood pressure, can be obtained from the CCHS data. Information on cancer incidence is captured in Statistics Canada’s Canadian Cancer Registry (CCR).<sup>33</sup> Regional data, based on 2005 health region boundaries, is available for cancer incidence by selected sites of cancer from 2001 to 2003.<sup>41</sup> Information on birth-related indicators, such as low birth weight and preterm birth, is obtained from Statistics Canada’s Vital Statistics, Birth Database.<sup>33</sup> Regional data on three-year averages is available for the periods 2000 to 2002 and 2005 to 2007. Some health regions with small population size are combined to minimize data suppression.<sup>42</sup>

##### *Human Function Indicators*

Life expectancy measures only quantity, not quality, of life. Adjustments can be made to the measure of life expectancy to capture quality of life. Health-adjusted life expectancy (HALE) is the number of years—in full health—that a person at a prescribed age is expected to live. It reflects both morbidity and mortality statistics. The Health Utility Index (HUI) is used to assign a higher weight to years lived in good health than to years lived in poor health. Disability-free life expectancy (DFLE) is the number of years—free of any activity limitation—that a person at a

prescribed age is expected to live. Only years lived free of any activity limitation are counted. Disability-adjusted life expectancy (DALE) is a comprehensive index of mortality and health status. Health status is categorized into four states, ranging from “no activity limitations” to “institutionalize in a health care facility.” Higher weights are assigned to years lived in better states of health.<sup>33</sup>

Data from Statistics Canada’s Vital Statistics, Death Database, CCHS, National Population Health Survey (NPHS) and censuses is used to compute HALE. Only provincial data has been published for HALE.<sup>46</sup> Statistics Canada’s Vital Statistics, Birth and Death databases, population estimates from its Demography Division and censuses are used to compute disability-free and disability-adjusted life expectancy. Regional level data is available for 1996, but it is based on former health region boundaries.<sup>47–49</sup>

In addition to HALE, DFLE and DALE, measures of functional health and participation and activity limitation are indicators of human function. Information on these two indicators can be obtained from the CCHS data.<sup>33</sup> Functional health, as very good or perfect health, is based on the HUI. Data on functional health is available from 2009 onward.<sup>25</sup> Data on activity limitation from the NPHS is based on different questions and response categories not comparable with the CCHS data.<sup>33</sup>

### *Deaths Indicators (Statistics Canada)*

Statistics Canada’s Vital Statistics, Death Database and population estimates from its Demography Division are used to compute total mortality, life expectancy and potential years of life lost (PYLL). Total mortality—the rate of death from all causes—is presented as a crude rate and age-standardized rate per 100,000 population. Life expectancy is the number of years that a person at a prescribed age is expected to live. PYLL is the number of years of life short of age 75 (for persons who die before age 75), presented as a rate per 100,000 population; it is computed by subtracting the median age in each age group from 75 and then multiplying by the number of deaths, disaggregated by sex and cause, in that age group.<sup>33</sup> Regional data on three-year averages is available for the periods 2000 to 2002 and 2005 to 2007. Some health regions with small population size are combined to minimize data suppression.<sup>43, 44</sup>

Information on infant and perinatal mortality can be obtained from Statistics Canada’s Vital Statistics, Birth, Death and Stillbirth databases. Infant mortality measures deaths of infants in the first year of life. It is presented as a count or rate per 1,000 live births. Perinatal mortality measures stillbirths with gestational age of 28 weeks or more and deaths of infants in the first week of life.<sup>33</sup> Regional data on three-year averages suppressed due to confidentiality requirements.<sup>45</sup>

### 1.3.2 Health System Performance

Some of the health indicators on the dimension of health system performance use hospitalization data. Examples of these indicators are wait times, in-hospital mortality and readmission rate.

#### Indicators

##### *Wait Time (CIHI)*

Wait time for hip fracture surgery is a measure of accessibility; longer wait times may signify the lack of resources for this surgery. Wait-time for hip fracture is computed using the DAD data for all jurisdictions except Quebec, due to differences in data collection.<sup>50</sup>

Starting from 2009, information on start time of procedure is available in the DAD and wait time for hip fracture surgery can be computed based on hours from inpatient admission to time of surgery. For prior years, this indicator is available based on days only.<sup>50</sup> Using a modified methodology based on days, the wait time for hip fracture surgery from time of admission to the ED to time of surgery is available for Quebec, Ontario and Alberta. This modified methodology requires emergency ED data. Since not all provinces submit comprehensive ED data to CIHI, the wait time for hip fracture surgery from time of admission to the ED to time of surgery cannot be computed for all provinces.<sup>51</sup>

Provinces have been submitting wait-time data to CIHI from 2008 onwards. The wait-time data focuses on five priority areas, including cancer (radiation therapy), heart (coronary artery bypass grafts [CABGs]), diagnostic imaging (MRI and CT), joint replacement (total hip and knee replacements) and sight restoration (cataract surgery). For each associated indicator, agreed-upon definitions have been established. Provincial data on wait times at the median and 90th percentiles and the percentage meeting the benchmark, where applicable (radiation, hips and knees, CABG, cataracts), are collected for each indicator. Due to challenges with data collection and reporting, the data from some provinces may not conform strictly with the established definitions for some of these wait-time indicators. Also, not all provinces submit information for all indicators. Additional information can be found in an annual CIHI report *Wait Times in Canada—A Comparison by Province*.<sup>52</sup>

Information on wait times in the ED can be obtained from NACRS and the DAD. Wait times for initial physician assessments, from the time the patient registered or triaged to the initial assessment by an ED physician, can be computed using NACRS data. Prior to 2003, the time at which a patient was first seen by a doctor was not collected. For 2003, this data element was not recorded for approximately 25% of ED visits, including cases where the patient left before being seen by a physician.<sup>53</sup> In 2010, 8.2 million abstracts were submitted to NACRS, which represent 51.8% of all ED visits in Canada.<sup>39</sup>

Bed wait times, from the time a decision has been made by an authorized health professional to admit a patient to the time the patient leaves the ED, can be computed using DAD data. Information on the date and time a patient left the ED is required to calculate bed wait time.<sup>54</sup> These data elements are mandatory in certain submitting provinces: Newfoundland, Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia.<sup>34</sup> Inpatient data submitted to CIHI by Quebec does not have the information necessary to identify inpatients admitted from the ED.<sup>54</sup>

### **In-Hospital Mortality (CIHI)**

In-hospital mortality indicators are computed using DAD data. Two examples of these indicators are the 30-day in-hospital mortality for acute myocardial infarction (AMI) and stroke. Both are based on three years of pooled data because of small incidence in a single year. Both indicators can be associated with effectiveness of the health system; for example, lower risk-adjusted rates may be associated with quality of care or factors that are not included in the adjustment. Beginning with rates reported for reference year 2004, based on 2003–2004 and 2005–2006 data, the case selection criteria for AMI and stroke were revised. These changes in methodology may affect the comparability of these indicators from earlier years.<sup>50</sup>

### **Readmission (CIHI)**

In addition to in-hospital mortality, risk-adjusted rates of unplanned readmission for related conditions following a recent discharge, for selected conditions and interventions, are measures of quality of care. Other factors that lie outside of health care can influence readmission rates. Data from the DAD and NACRS and from the Alberta Ambulatory Care Database are used to compute these indicators. Implementation of new classification systems for coding diagnoses and interventions and subsequent updates may affect the comparability of some of these indicators across years. For example, ICD-9 classifies an AMI case that occurred between four and eight weeks from an earlier AMI as an acute AMI, but ICD-10-CA considers this a chronic case; and subtotal hysterectomy is identified in version 2006 of the Canadian Classification of Health Interventions (CCI) but not in earlier versions. Further detail on associated coding changes and their impact on these indicators can be found in the technical notes of CIHI's *Health Indicators* report.<sup>50</sup>





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