A Framework for Health Outcomes Analysis: Diabetes and Depression Case Studies
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The Canadian Institute for Health Information (CIHI) collects and analyzes information on health and health care in Canada and makes it publicly available. Canada’s federal, provincial and territorial governments created CIHI as a not-for-profit, independent organization dedicated to forging a common approach to Canadian health information. CIHI’s goal: to provide timely, accurate and comparable information. CIHI’s data and reports inform health policies, support the effective delivery of health services and raise awareness among Canadians of the factors that contribute to good health.

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It should be noted that the analyses and conclusions in this report do not necessarily reflect those of the individual members of the Advisory Committee or their affiliated organizations.

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About This Report

There is a growing need for information to understand the degree to which investments in health care and treatment interventions have a positive impact on the health and well-being of Canadians. While annual investments in health care are large, the ways in which health interventions may produce a range of health outcomes are difficult to measure and there are limited data available to assess the effectiveness of the health system.

The Canadian Institute for Health Information (CIHI) and Statistics Canada have worked in collaboration to create this report, which explores the feasibility of conducting health outcomes analyses using existing data with a specific focus on diabetes and depression. The report explores data gaps and research implications. The overall intent is to inform current and future health outcomes analyses and provide specific findings related to diabetes and depression.

For the purposes of this analysis, we have defined health outcomes as changes in health status that occur as a result of an intervention. Our analysis explores health outcomes at the population level using existing CIHI and Statistics Canada data sources.

In creating this report, CIHI and Statistics Canada developed the new Health Outcomes Conceptual Framework to guide data development and analysis for health outcomes at a population level. For analyses included in this report, the framework was used to describe the source and nature of factors that potentially influence links between interventions and outcomes at the pan-Canadian level. The framework can also be used at the local, provincial or international level to examine health outcomes.

It is intended that the framework and case studies profiled will be of interest to health system decision-makers, health care providers, policy-makers and researchers working at different levels and points within the health sector. It is hoped that the report will also serve to highlight gaps in existing data and inform future information development efforts related to outcomes of care.
Why Focus on Diabetes and Depression?

Diabetes and depression were selected as the two areas for study because both conditions fit with the priorities for health outcomes research identified through a key informant survey; existing CIHI and Statistics Canada data were available for analysis; evidence-based recommendations for quality care are available for these conditions; and both of these conditions place a significant burden on the health of the population and the health care system.

Highlights

• Reporting and understanding health outcomes from a population-based perspective is an important part of addressing the question of “what works best for whom” in a real-world environment.

• A pan-Canadian perspective allows comparisons across jurisdictions that may illuminate differences in the delivery of health services that result in improved outcomes. This perspective also provides the opportunity to study outcomes of care for “rare” events for which there may not be an adequate sample at a regional level. The pan-Canadian lens can be complementary to local studies.

• Outcomes of care do not occur in isolation but rather are often influenced by a broad range of factors. Hence, it is important to consider health outcomes within the broader context of factors including patient characteristics (for example, socio-economic status and other risk factors) and health system factors (for example, quality and process of care). The CIHI–Statistics Canada Health Outcomes Conceptual Framework provides a conceptual model to guide a comprehensive approach to the study of outcomes of care.

• Use of the Health Outcomes Conceptual Framework helped to structure the analyses using existing population-based pan-Canadian data holdings to study outcomes of care. Administrative and registry data provided information regarding use of services, while population-based survey data provided comprehensive information regarding patient characteristics and health status. Data linkage processes, which brought these data sets together, allowed for a more comprehensive look at outcomes of care.

• Despite best efforts to use existing data in the most creative ways, existing administrative data sources were not developed with the overall intent of assessing interventions and associated outcomes. Use of these pan-Canadian data sources for our analyses limited the extent to which health outcomes for diabetes and depression could be explored and pointed to gaps in the data sources.
• The first noted gap is the lack of standard, comprehensive and repeated measures of health status at the population level. While existing data provide indirect measures of health outcomes such as hospital admissions, direct measures are required to track changes in health status before and after care.

• A second major gap is the lack of comprehensive information regarding the full spectrum of health care services received—specifically at the primary care level—critical for the study of outcomes for individuals with chronic conditions such as diabetes and depression. Future health outcomes analysis using information regarding a variety of health care interventions could provide a more comprehensive understanding of the ongoing care patients receive.

• Existing data sources were limited in their capacity to address the Health Outcomes Conceptual Framework. A second joint report will be undertaken in 2008 to describe the options for data development to measure outcomes of a broad range of interventions.
Answering “what works best and for whom” is one goal of studying health outcomes. This question is not new. For millennia, healers have tried different approaches to aid and comfort those under their care. More than a century ago, Florence Nightingale used mortality rates to show that sanitary reforms could reduce deaths in the Crimean War. Likewise, E. A. Codman undertook pioneering work on “end results” or “results-based” health care in the United States in the early part of the 20th century. He believed that hospitals should follow every patient after surgery to determine whether the intervention was successful and, if not, why.5

Today, rigorous research on results and side-effects is a regulatory requirement before introducing new drugs and a range of medical devices. Many randomized clinical trials take place each year as a prerequisite for regulatory approval. However, for a wide range of other health care interventions, including various kinds of surgery, no such regulatory requirements exist. Moreover, even where clinical trials are required before approval, the focus is typically on a specific group of patients who may not be representative of the eventual target population. The challenge addressed in this report is different: we focus on the effects of interventions as they occur in diverse and complex real-world environments.

Current efforts in health outcomes build on earlier studies and address emerging questions. For example, research in the early 1980s found marked differences in medical practices in different communities. Hysterectomies, hernias and other common procedures occurred much more often in some areas than in others.6 Researchers suggest that these variations were much larger than could be explained by differences in disease rates. A number of studies have also challenged the effectiveness of widely used interventions. Examples include certain school-based anti-smoking programs, efforts to detect breast cancer early
through breast self-examination, cardiac interventions and elective surgery.\textsuperscript{7-10} Often controversial when published, these types of research continue to prompt questions about which groups of patients fare best and what interventions are in fact effective.\textsuperscript{11} The lack of clear answers continues to challenge researchers, clinicians and health leaders to develop new tools to assess health outcomes so that the effectiveness of interventions can be measured and understood and system changes can be introduced to improve health outcomes where needed.

While there have been improvements in data and analysis related to health outcomes, many basic questions remain unanswered. Studies now use a wide range of approaches and track outcomes that are important to both patients and health care providers. Mortality rates continue to be important measures of “end results,” but many local-level and site-specific analyses now also cover aspects such as quality of life, condition-specific measures of the results of interventions, patient satisfaction, patient expectations and cost-effectiveness.\textsuperscript{12-14} Unfortunately, these studies remain largely locally focused, ad hoc and uncoordinated. In Canada, as in virtually all other countries, there is no systematic information system, except in some registries, enabling routine assessment of health outcomes, though there are some important localized efforts in the U.S. and the United Kingdom.\textsuperscript{15-17}

In this context, this report presents the new Health Outcomes Conceptual Framework for studying health outcomes—changes in health status that occur as a result of an intervention—at a population level.\textsuperscript{4} Through case studies, we used this framework to test the types of health outcomes information that can be derived from existing CIHI and Statistics Canada data sources for diabetes and depression. Given the limited results that were available, the report concludes by exploring data gaps and research and data collection implications.

In addition to providing a new conceptual framework to be used by others for studying health outcomes, it is hoped that the findings from related case studies will provide information on decisions about Canadians with diabetes and depression, with a focus on improving their health outcomes.
Outcomes analysis is undertaken to answer the basic question of the actual effects of health interventions for patients and populations. Health outcomes can differ by age or socio-economic status, for those who have different health histories, or based on expectations and other personal characteristics. Variations in the care path or in how care is provided, such as access to care and waits, treatment choice and acute care availability, may also matter. So may contextual factors, such as the environment in which the intervention takes place, including community norms and characteristics.

To help untangle these relationships, CIHI and Statistics Canada have developed a conceptual framework for health outcomes. It describes the source and nature of many factors that potentially influence links between interventions and outcomes (Figure 1). The Health Outcomes Conceptual Framework is meant to guide data development and analysis in this area. It can be used at local, provincial or pan-Canadian levels.
A conceptual framework for health outcomes was developed to guide data development and analysis. It describes the complex interplay between the various factors that can influence health outcomes.
The Health Outcomes Conceptual Framework draws primarily on three streams of thinking:

- **Donabedian’s structure-process-outcome model**: First presented in 1966, this work continues to form the basis of many of today’s efforts to measure and evaluate the quality and performance of health services. In short, Donabedian’s model defines medical care quality in terms of outcomes, which are measured as expected improvements in health status attributable to care.

- **Chronic disease management frameworks**, which highlight factors that shape—positively or negatively—the environment for the prevention and management of chronic conditions.

- **A population health and health promotion perspective**, which recognizes that patterns of health and disease are largely a consequence of where and how we live, learn, work and play. This approach focuses on understanding why some groups of people are healthy while others are not.

The result is a framework with four main components: the care path, characteristics of the health care system, characteristics of patients and the place or environment in which the intervention takes place.

**The Care Path**

Canadians typically receive a wide variety of health care services in the course of their lives. Often it is difficult to track the outcomes related to a specific intervention. Depending on the overall health status and age of the patient population under study, patients may be receiving care (or interventions) from a variety of providers in a variety of settings, and there are no systematic efforts to track individuals’ health status as they require care, receive care, recover and repeat this cycle.

**Interventions**

An intervention may be defined as an interfering or interceding act that has the intention of modifying an outcome. Health interventions typically aim to prevent, treat or cure health problems. Examples include specific types of medical or surgical care, or prevention-oriented policies or programs that target underlying determinants of health, such as smoking, physical activity or healthy eating.

Within the care path we have identified the importance of understanding and including the need for an intervention. Interventions may refer to either a single intervention or a series of interventions (that is, different episodes of care). The outcome of a given intervention can be affected by the contributions of many persons during a sequence of events that takes place over several years, and may require longitudinal follow-up. In health outcomes analysis, the way these events are defined and identified has implications for study design, data sources and the approach taken to evaluate the effects of interventions.
Outcomes

The framework recognizes that there are both patient-related outcomes and health system performance–related outcomes.

Within the patient-related outcomes, there are health status, health-related and non–health related outcomes. The outcome of interest depends on the reason for the analysis, and the perspective of those who will use its results:

- **Health status measures**: For the case study analyses included in this report, and for most of the existing health outcome research, the primary outcome of interest is change in health status as a result of a health care intervention. Health status measures may vary in scope depending on the nature of the study. Conceptually, broad overall or generic measures of health status such as health-related quality of life (for example, QALYs or quality-adjusted life years) are widely considered to be fundamental. Equally important are more targeted health status measures that are specifically tailored to be sensitive to the kinds of health changes expected from the intervention—for example, vision measures in connection with cataract surgery, and pain and mobility measures in the case of joint replacement surgery. These latter more specific measures may be helpful in informing some types of clinical decision-making. On the other hand, the generic measures are essential for any analysis that goes across interventions, for example in order to obtain a more global assessment of the impacts of health care.

- **Health-related measures**: Given the type of information available in existing health databases, direct measures of health status are generally not available. As a result, researchers and clinicians often measure health-related outcomes such as hospital admissions, complications or results of specific tests, for example, A1C tests for people with diabetes. These measures are often intrinsically important, and due to limited availability of other outcomes data, have to serve as a proxy measure for health status.

- **Non–health related measures**: A patient-oriented approach may also involve the collection of non–health related outcomes such as patient satisfaction. Information for these measures is collected at the patient level, but this information can also be used to inform assessments of system performance.

Outcome measures with different characteristics can be used to understand the effects of health interventions. Specifically, outcomes can be expressed differently depending on their orientation. Clinically oriented measures tend to track outcomes that are meaningful to health professionals, some of which patients may not be able to observe directly. Examples include physiological markers of disease or disease severity, such as markers in blood or urine. Patient-oriented measures capture the effects of disease from the patient’s point of view. For instance, osteoarthritis patients might report on how much pain they are in, whether they feel stiff or whether they have problems carrying out day-to-day activities. These types of measures can be valuable to health care providers and patients when they face decisions that may affect symptoms experienced, how much time someone will likely live, the ability to do activities that he or she values or similar outcomes.
While outcomes are most appropriately measured at the patient level, information may be collected at a population level and used to report on the overall performance of the system. At a population level, mortality and morbidity rates are commonly used measures of outcomes. A broader range of population health outcomes measures is required to understand “what works best and for whom.” Existing health system performance measures at the national level include information on some health indicators.

### Characteristics of the Health System

More detailed process, structure and quality information needed for specific health outcomes analysis is sometimes, but not always, available. The Health Outcomes Conceptual Framework highlights the importance of understanding the process, structure and quality of health care as important characteristics to measure when considering health outcomes analysis.

In the 1960s, Donabedian linked quality with the organization and delivery of health services. He argued that changes in health care processes and structures can affect quality and efficiency.

- **Process-related** factors include whether or not patients receive (or access) recommended care or receive certain services such as appropriate follow-up after surgery, and wait times to receive services.

- **Structure-related** factors include characteristics of the setting in which care is provided, for example whether a surgical procedure was conducted at a hospital carrying out a high or low volume of such procedures, and the nature and vintage of specialized diagnostic equipment, as well as how the health system is organized (including legislation that defines what tasks different health professionals perform or how health professionals are paid).

- **Quality-related** factors may focus on measures related to patient safety or patient perceptions of care.

Through data collected and reported by CIHI, Statistics Canada and other national organizations, we currently have a relatively good understanding of the overall characteristics of the health system in Canada. We also have good high-level information on how much is spent on health care and we have a good idea of who is using facility-based services in the country. For example, Health Care in Canada 2007 provides comprehensive details related to characteristics of Canada’s health care system. Of the roughly $148 billion that was spent on health care in 2006, more than half of the total spending went toward hospitals (30%), retail drug sales (17%) and physician services (13%). On the other hand, we generally lack detailed data at the patient level, including information on all the wide range of health care encounters both within and outside hospitals and physician offices (for example, cancer treatment, home care and nursing home use, pharmaceutical use, rehabilitation services) and detailed cost and outcome data at the patient level.
Characteristics of Patients

Engineering science allows us to build machines that reliably convert raw materials into finished products. But the ways that health interventions generate health outcomes are not so easy to predict, as they involve the complexities of human biology, personalities and interactions. Any evaluation of outcomes must consider a variety of patient characteristics. A range of factors may influence both care and outcomes, including:

- **Socio-demographic characteristics** include a person’s age, sex, ethnicity, education, income, marital status and other socio-economic attributes.

- **Risk factors** include aspects of a person’s genetic endowment, behaviour (for example, smoking, drinking, physical activity and diet), personal resources (for example, social support and life stress) and other factors that predispose him or her to illness or disability, or conversely that offer protective benefits.

- **Health status and comorbidity**—Health status is a basic description of a person’s capacity to function, for example, in domains like physical mobility, pain, hearing and psychological well-being. The World Health Organization (WHO) International Classification of Functioning (ICF) provides a useful framework for distinguishing the concept of health status from bio-medically classified diseases (as in WHO’s International Classification of Diseases [ICD]). Any given disease can result in several different health statuses as described by functional limitations, and any one kind of functional limitation can be the result of several diseases. In addition to health status, defined in terms of functioning, it is also important to characterize patients in terms of diseases—both the severity of the disease, which is the object of a given intervention, and any co-existing or comorbid conditions. Co-existing or comorbid conditions can complicate effective treatment. For example, joint replacement for an immunocompromised individual is higher risk than for a patient in otherwise good health, and this needs to be considered in assessing health outcomes.

- **Expectations/preferences** include an individual’s expectations for the level and nature of health care received and of his or her future health status, as well as preferences for certain types of care, lifestyles or other relevant choices (for example tolerance for risk or pain).

The Health Outcomes Conceptual Framework also recognizes place and environment as framing the context within which health system and patient characteristics are shaped and care is delivered. Geographic, social, economic, cultural, political or other broad circumstances and trends may influence health outcomes.
Analyzing Health Outcomes
Using a Case Study Approach

The CIH–Statistics Canada Health Outcomes Conceptual Framework outlines the many factors that can influence the outcomes of health interventions. It is important to take these into account when assessing outcomes. Researchers who run clinical trials have long recognized this challenge. They often use approaches such as randomization to ensure that comparison groups are as similar as possible. Studies then compare outcomes for patients receiving a given treatment (for example, a new drug) with those who do not, holding as many of the other factors fixed, so they do not confound the results.

To understand the effects of interventions outside of controlled clinical trials, different methods need to be used. This is necessary to ensure accurate inferences. The result may be new insights, such as in which settings or for which groups of people the intervention is most effective. Ongoing outcomes analysis may also drive quality improvement. For example, a health region can compare its results over time or to those achieved by others to identify opportunities to improve care.

Good health outcomes analysis ideally requires comprehensive data that cover all of the dimensions of the framework. The clear definition of interventions, as well as other influencing factors, is important. Often existing data sources provide some—but not all—pieces of the puzzle. For example, most existing health survey and administrative data only capture parts of the patient’s care path. That said, pockets of data exist to support more complete health outcomes analysis. These data have already led to changes in care paths, informed clinical guidelines and strengthened understanding of the real-world effects of several interventions, such as inductions during childbirth and which types of heart surgery work best for different patients.6,30
Recent pan-Canadian consultations on priorities suggest strong and continued interest in better information on health outcomes. To test what new types of health outcomes analysis are possible with existing pan-Canadian data, we undertook a case-study approach to health outcomes analyses using existing CIHI and Statistics Canada data sources. We focused independently on patients with two chronic health problems—diabetes and depression—using data from the Canadian Community Health Survey (CCHS) and linking them to the Hospital Morbidity Database (HMDB), as well as using data from the Canadian Organ Replacement Register (CORR) and the Continuing Care Reporting System (CCRS). For more details on data sources and methods, see Appendix A.

**Why Diabetes and Depression?**

To explore the utility of the Health Outcomes Conceptual Framework, we chose to focus on chronic health problems for three reasons. First, worldwide, chronic, non-communicable diseases place a considerable burden on individuals, communities and health services. In Canada, they are the leading cause of death and disability. One-third of Canadians aged 12 years and older in 2005 reported having at least one of the following chronic health conditions: arthritis, cancer, chronic obstructive pulmonary disease, diabetes, heart disease and high blood pressure or mood disorders. The WHO estimates that 4% to 5% of health budgets are spent on diabetes-related illnesses. Second, outcomes often vary.

Researchers have identified a number of strategies to prevent chronic conditions and to reduce the risk of complications. However, local and international studies suggest that there are gaps between recommended and actual care. Finally, much of the previous work on health outcomes, including that undertaken by CIHI and Statistics Canada, has focused on surgery and other interventions that occur at a particular point in time or that take place over a relatively short period. Chronic conditions require a longer view, as the benefits from some interventions may only be seen in the reduction of complication rates five or more years later. The case studies presented in this report explore outcomes for patients with two chronic conditions—diabetes and depression.
Case Studies for Diabetes

The WHO estimates that over 180 million people worldwide have diabetes. It also reports rising rates of diabetes and projects that death rates will grow in the years to come. In Canada, about 1.3 million people aged 12 and over, or 5% of the population, reported that they had been diagnosed with diabetes in 2005. Experts say that these figures likely underestimate the problem. They suggest that many others have undiagnosed diabetes or pre-diabetes. In total, diabetes was reported as causing more than 7,800 deaths in 2004. This makes it the seventh leading cause of death.
A Framework for Health Outcomes Analysis: Diabetes and Depression Case Studies

Based on the Health Outcomes Conceptual Framework, this report explored answers to three different questions related to health outcomes for patients with diabetes (see Figure 3). To the extent possible with existing data, the analyses took into account aspects of the patient’s care path, as well as health system and patient characteristics that might influence outcomes. In some cases, we were able to explore direct health outcomes, such as survival following a kidney transplant. In other cases, we had to rely on indirect measures of health outcomes. For instance, we used hospitalization as a proxy for poorer health outcomes among patients with diabetes.

Factors included in the analysis were selected to cover the three components of our Health Outcomes Conceptual Framework for assessment of health outcomes—health care system characteristics, patient characteristics and the care path. Figure 3 outlines the specific case studies for diabetes discussed in this report using this framework. Given the major limitations of existing pan-Canadian data for health outcomes analysis, these case studies are ad hoc and opportunistic. They are designed to make the best possible use of available data, but they fall well short of the kinds of analysis indicated by the Health Outcomes Conceptual Framework in Figure 1.

How Common Is Diabetes?

Millions of Canadians reported having been diagnosed with diabetes. The map below shows the percentage of teens and adults living in each province and territory who reported having been diagnosed with diabetes in 2002.

Notes
* Rate estimate has high coefficient of variation; interpret with caution.
† Rate estimate suppressed due to extreme coefficient of variation.
‡ Significantly different from Canada (p<0.05).
Prevalence rates for diabetes are derived from surveys collected in 2005, and are based on the population of community-dwelling Canadians 12 years of age and older.
Source
Canadian Community Health Survey, Cycle 3.1 (Diabetes), 2005, Statistics Canada.
More specifically, the “Good Diabetes Care” study explored the predictors of good diabetic care—including consulting a medical doctor, access to a specialist and whether good diabetic care was associated with better health status. The study “Acute Hospital Use Among People With Diabetes in Canada” linked Canadian Community Health Survey (CCHS) data to the Hospital Morbidity Database (HMDB) for patients diagnosed with diabetes and looked at the type of care received based on consultations with regular medical doctors and specialists. The hospitalizations that occurred for these patients were considered proxy outcomes. The third case study, “Diabetes and End-Stage Renal Disease,” looked at the survival of patients diagnosed with diabetes after undergoing dialysis treatment and kidney transplants.
### Health Outcomes Analysis in Diabetes

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<td>Duration of dialysis</td>
<td>Facility volume&lt;br&gt;Facility geographic region&lt;br&gt;Diabetic ESRD status&lt;br&gt;Age&lt;br&gt;Sex&lt;br&gt;Ethnicity&lt;br&gt;Body mass index&lt;br&gt;Comorbidity index&lt;br&gt;Residence urban/rural designation&lt;br&gt;Neighbourhood income</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Live donor status</td>
<td>Facility volume&lt;br&gt;Facility geographic region&lt;br&gt;Diabetic ESRD status&lt;br&gt;Age&lt;br&gt;Sex&lt;br&gt;Ethnicity&lt;br&gt;Body mass index&lt;br&gt;Comorbidity index&lt;br&gt;Residence urban/rural designation&lt;br&gt;Neighbourhood income</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age of donor</td>
<td>Facility volume&lt;br&gt;Facility geographic region&lt;br&gt;Diabetic ESRD status&lt;br&gt;Age&lt;br&gt;Sex&lt;br&gt;Ethnicity&lt;br&gt;Body mass index&lt;br&gt;Comorbidity index&lt;br&gt;Residence urban/rural designation&lt;br&gt;Neighbourhood income</td>
</tr>
</tbody>
</table>

### Sources
* Canadian Community Health Survey, Cycle 3.1, 2005, Statistics Canada.
‡ Canadian Organ Replacement Register, 1995 to 2004, Canadian Institute for Health Information.
Outcomes for Diabetes

Diabetes mellitus is a chronic illness resulting from impaired pancreatic insulin production (type 1) or the inability to use insulin effectively (type 2). This leads to sustained high blood sugar levels that can impair the circulatory, nervous and immune systems. Diabetes also affects vital organs including the eyes, skin and kidneys. As a result, it reduces life expectancy and how long patients live in good health. For example, individuals with diabetes are more likely to die from heart disease or strokes. They are also more likely to experience blindness, nerve damage, kidney failure and foot ulcers.

These and other serious complications do not always occur, however. Clinical trials and other research show that high quality care can often delay or prevent them. Managing diabetes can include blood sugar control, risk factor management, foot and skin care and monitoring for related health problems. Appropriate care for complications may also affect health outcomes. Treatment sometimes includes medication, kidney dialysis and transplantation, eye surgery and lower-limb amputation.

Pockets of data exist in Canada on rates of diabetes, complications and how often patients receive recommended care, but linking all three together is difficult. Using the Health Outcomes Conceptual Framework, three case studies were undertaken to explore what we know—and don’t know—about diabetes care and the outcomes patients experience at a pan-Canadian level.

Diabetes Care in Canada
(Case Study One: “Good” Diabetes Care)

In 2003, the Canadian Diabetes Association published guidelines for the prevention and management of diabetes in Canada. These guidelines were based on a review of the best available evidence and expert advice. Among other things, the guidelines suggest that individuals with diabetes should undergo:

- Lab tests to measure blood sugar (A1C blood tests) approximately every three months to ensure that glycemic goals are being met or maintained;
- Lab tests to measure blood cholesterol when diabetes is diagnosed and then every one to three years;
- Blood pressure checks at every diabetes-related health care visit;
- A foot examination at least every year;
- Eye exams for retinopathy when diabetes is diagnosed and then at least every one to two years.
- Urine tests for ACR (albumin to creatinine ratio) to screen for diabetic nephropathy.
These recommendations reflect findings from research studies on patients with type 2 diabetes\textsuperscript{49} and type 1 diabetes.\textsuperscript{50} These studies found that those who received recommended care were more likely to be in good health. Relatively modest improvements in test results substantially lowered the risk of complications.\textsuperscript{50} For instance, the type 2 diabetes study found that a 1\% reduction in average blood sugar levels was linked to:

- A 37\% decline in the risk of damage to blood vessels, which can lead to kidney disease and eye damage;
- A 14\% lower rate of heart attack; and
- A 21\% reduction in deaths related to diabetes.

Likewise, the type 1 diabetes study showed that lowering blood sugar levels to normal levels (pre-meal: 4.0 to 7.0 mmol/L and post-meal: 5.0 to 10.0 mmol/L, per 2003 \textit{Clinical Practice Guidelines}) reduced the risk of eye disease by 76\% and kidney disease by just over 50\%.

How likely are Canadians to receive this recommended care? A number of local and provincial studies have addressed this question. Results vary from study to study and by recommendation.\textsuperscript{46} In general, however, they have found that fewer than half of those with diabetes receive all recommended lab and other tests. This gap between actual and recommended care is not unique to Canada. An international survey of diabetes care in Canada and five other countries (Australia, New Zealand, the U.K., the U.S. and Germany) in 2005 found that 38\% of Canadian adults with diabetes had received a foot exam, eye exam and cholesterol check in the previous year, as well as a blood sugar lab test (A1C) in the previous six months.\textsuperscript{51}

To compare diabetes care across the country, the results of the diabetes care module of the 2005 CCHS was used.\textsuperscript{38} Six provinces and territories opted to collect this module of the survey. The results show that about three-quarters of respondents (74\%) had an A1C lab test in the previous year. Fewer reported having had an eye test in the previous two years (68\%) or a professional foot exam in the previous year (48\%). The guidelines also recommend that patients check their own feet.

Based on their responses, two diabetes care indices were created to reflect the rates of comprehensive care according to recommended guidelines:

- “Optimal” care: Receipt of four or more A1C tests plus a foot check in the past 12 months, and an eye examination.
- “Moderate” care: At least one A1C test plus a foot exam in the last year and an eye exam. This grouping recognizes that some find it difficult to adhere to the recommended frequency of A1C testing, and information from at least one test over the previous 12 months provides valuable information regarding glucose levels.

Based on this approach, about 14\% of the survey respondents with diabetes reported receiving optimal care, while 32\% reported moderate care. These rates varied by province and territory (see Figure 4).
Diabetes Care Across Canada

Most Canadian adults who have diabetes do not receive all of the care recommended by recent guidelines. The table below shows rates of “optimal” and “moderate” diabetes care for the six provinces and territories that participated in the diabetes care module of the 2005 Canadian Community Health Survey.

<table>
<thead>
<tr>
<th>Optimal (%)</th>
<th>Moderate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
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</tbody>
</table>

Canadian Average

- Optimal: 14.5%
- Moderate: 32.2%

<table>
<thead>
<tr>
<th>Province/Territory</th>
<th>Optimal</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Columbia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manitoba</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td></td>
<td></td>
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<tr>
<td>Saskatchewan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yukon</td>
<td></td>
<td></td>
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<tr>
<td>Newfoundland &amp; Labrador</td>
<td></td>
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<tr>
<td>New Brunswick</td>
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<tr>
<td>Nova Scotia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quebec</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes

* Rate estimate has high coefficient of variation; interpret with caution.
† Rate estimate suppressed due to extreme coefficient of variation.
‡ Significantly different from overall rate (p<0.05).
— Jurisdiction did not participate in the diabetes care module of the survey.

Values represent weighted estimates (in percentages), where moderate and optimal care = Yes.

Rates are derived from survey data collected during 2005 and are based on community-dwelling Canadians with diabetes, 18 years of age and older.

Source
Canadian Community Health Survey, Cycle 3.1, 2005, Statistics Canada.

Based on multivariate analyses looking at factors associated with good diabetes care, results suggest that some individuals are more likely than others to receive good care. While the survey did not ask about all possible patient and health system characteristics that might affect how likely someone was to receive more comprehensive care, results show that the following groups were more likely to receive moderate or optimal care:

- Older patients;
- Women;
- Those with higher level of education;
- Individuals in lower income groups were more likely to receive optimal care;

i Results for these groups were statistically significantly different from the overall rate (p<0.05).
• Patients who use insulin;
• Those who had consulted with a medical specialist in the previous 12 months; and
• Those who had a regular medical doctor.

What about the relationship between “good” diabetic care and health outcomes? Based on available data, we were able to examine the relationship between “good” diabetic care and self-reported health status. Patients who had received “optimal” or “moderate” care were less likely to report “very good or excellent” health (after adjusting for other known determinants of health) compared with those who did not receive care. This may be a reflection of the fact that those in greater need are more likely to receive care. When we looked at the relationship between good diabetic care and improvements in health status, however, the relationship reversed—these same individuals were more likely to report that their health was better than one year ago compared with those who did not receive optimal or moderate diabetes care.

What about longer-term outcomes? Since the survey was administered in 2005, the follow-up period is short. It is too soon to say whether patients who had less comprehensive care will be more likely to die, to have amputations or to experience other serious complications in the years that follow. Subsequent research may use the linked survey and administrative health data to answer these questions once adequate follow-up time has lapsed.
Collaborating for Better Care

From heart attacks and strokes to amputations and blindness, complications of diabetes can be serious for patients and costly for health systems. Many regions and provinces are focusing on reducing the risk of these events. Strategies differ, but most aim to achieve this goal by improving management of blood sugar, cholesterol, blood pressure, weight and similar risk factors. Clinical practice guidelines suggest that careful monitoring provides key information that patients and clinicians need to develop and adapt care plans. A recent study in Alberta stresses the need for a “significant” improvement in health care services tailored to adhere to clinical practice guidelines, due to increasing complications seen among people with diabetes.34

For example, a Nova Scotia primary health care reform initiative established practice teams with a nurse practitioner and at least one physician. Alternative funding arrangements for physicians and an information system were implemented in order to achieve increased emphasis on health promotion, disease prevention and the management of chronic diseases in the primary health care setting. An evaluation focused on patients with diabetes and hypertension52 found that over a three-year period:

- The percentage of patients with diabetes who achieved target blood pressure control rose from 20.4% to 28.5%.
- Annual eye screening for retinopathy increased from 33.8% to 41.9% and foot exams for nephropathy from 61.7% to 71.3%.
- The percentage of patients monitoring blood glucose levels at home increased from 61.5% to 69.1%.
- Body mass index was recorded and moderate exercise prescribed for more patients.
- More patients had recorded fasting blood glucose levels (from 37.7% to 67.1%) and lipid profiles (from 62.6% to 69.1%).

“Collaboratives” are another approach to improve care. They typically bring together teams of health professionals who work on a common challenge, such as achieving more comprehensive diabetes care. These teams often test ideas about how to improve care using “plan-do-study-act” cycles. Participants plan a course of action, carry it out, study the results and act on the knowledge that they have gained.
Collaborating for Better Care (cont’d)

Collaboratives in British Columbia have increased appropriate testing for patients with diabetes and reduced health complications, while lowering provincial costs for diabetes care per patient. They have also documented fewer emergency department visits and hospital stays. In Saskatchewan, collaboratives have improved drug prescribing and rates of appropriate testing for patients with diabetes, and Newfoundland and Labrador is also introducing similar collaboratives to improve diabetes care.

Case Study Two: Acute Care Hospitalization Among People With Diabetes

Not enough time had passed to be able to look at long-term complications for people with diabetes who responded to the 2005 CCHS diabetes module. Longer follow-up is possible for previous years; however, previous surveys included less information about the types of care that persons with diabetes received.

They did, however, ask about the types of physicians seen in the previous year. Previous research suggests that there may be differences in care provided by specialists and general practitioners. For example, studies have found that specialists tend to provide more frequent HbA1C tests than primary care physicians. Researchers have suggested that possibly specialists provide more aggressive care or that individuals who receive care from specialists may be more likely to have access to other care providers (for example, nurse educators, dieticians).

Do outcomes differ for Canadian diabetes patients seen by specialists and others? A recent study using data from Saskatchewan compared the quality of care and mortality for patients who had consultations with an endocrinologist or internal medicine specialist within the first year of diagnosis and those seen by general practitioners alone. Patients who had specialty care tended to be younger, to have more comorbidities and to visit more doctors before and after their diabetes diagnosis than others. These patients were more likely to get recommended diabetes care but also more likely to die. This relationship remained even for patients with less severe health problems. The authors concluded that specialty care was associated with better disease-specific process measures, but not improved survival in adults with diabetes cared for in ambulatory care settings. This therefore reinforces the importance of having high quality severity/comorbidity data in order to properly assess health outcomes—probably using different modes of data collection such as the electronic health record.
To see whether specialist consultations are associated with other outcomes for patients with diabetes, we linked pan-Canadian survey and hospitalization data. We obtained data on patient characteristics and medical consultations from the Canadian Community Health Survey, Cycle 1.1. This survey took place across Canada in 2000 and 2001. Data on acute care hospital stays come from the HMDB. We examined both all-cause hospitalizations (excluding pregnancy-related hospitalizations) and those due to diabetes that include both diabetes-specific and diabetes-related conditions (referred to as diabetes-related conditions).

In the context of the Health Outcomes Conceptual Framework, these data sources allowed us to look at the relationship between an aspect of the care path (physician consultations) and an outcome (hospitalization), taking into account various health system and patient characteristics. This analysis assumes that diabetes-related hospitalizations are an indirect indicator of poor outcomes, likely related to complications of the disease.

After taking patient and health system characteristics into account, we found that the odds that people with diabetes would have a diabetes-related hospitalization were about the same whether or not they had consulted with a general practitioner/family physician or other medical (specialist) doctor in the last year. However, this was not true for hospital stays in general. Those who had not seen a general practitioner in the previous 12 months were 40% more likely (O.R. = 1.41) to have been hospitalized in the next 24 months. In contrast, those who had not consulted with another type of doctor were 23% less likely (O.R. = 0.77) to have had a hospital stay in the two years after the survey.

There are a number of possible reasons for these results. On the one hand, it is possible that something about the care path for patients with specialty consultations leads to worse outcomes. But it is also possible that patients with serious health problems are more likely to be referred to a specialist, either during their hospital stay or at another time. In addition, since we do not know the reason for the specialist visits, consultations with other doctors might be a marker for health problems beyond diabetes. Thus, it might be the severity of illness or other patient characteristics that make hospital stays more common for patients who have consulted with specialist physicians than for others. Other explanations are also possible. Unfortunately, the available data do not allow us to tell which are true and which are not.

Even after controlling for the type of care received, there were several socio-economic and health factors associated with hospitalization among the diabetic population. Specifically, people with diabetes are more likely to have overnight hospital stays related to diabetes than others if they were men, patients with type 1 diabetes, those with lower-middle or middle incomes, current and former smokers, and those who did not report unmet health care needs. Some of the same results hold for hospitalizations for any cause (not just diabetes related).
Another interesting finding here pertains to the regional hospitalization rate, which attempts to measure the "system response" characteristics at the health region level. It is well known that there are unexplained regional variations in the use of health care services. It is possible, then, that an individual's likelihood of hospital admission may be explained in part by where he or she lives; if one resides in a “high-use” area, then all other things being equal, one may be more likely to be admitted to acute care. Our analysis here found that this regional hospitalization rate factor was highly significant in all-cause hospitalization, implying that regions with relatively higher rates of any hospitalization did have higher risk of hospitalization among the diabetic cohort. Living in high hospital–use health regions made individuals close to three times as likely to make use of acute care in the two-year follow-up period. However, this regional rate was not significant for diabetes-related hospitalization.

The graph on the next page (Figure 5) depicts the odds that a person who reported having been diagnosed with diabetes in a 2000 and 2001 survey had an acute care hospital stay within two years of responding to the survey. The horizontal bars represent 95% confidence intervals. Thus, the results denoted by the dots are estimated to be accurate to within the range shown by the bars 19 times out of 20. If the entire bar is to the right of the vertical line, the odds of hospitalization are higher than the overall average. If the bar is to the left of the line, the group of patients is less likely to have had a hospital stay than other patients. All results are adjusted for the factors listed and other variables based on a logistic regression analysis.
Which Patients With Diabetes Are More Likely to Be Hospitalized?

Note
Odds ratios are adjusted via logistic regression for a larger set of factors than those depicted. Results exclude Quebec because linkage was not possible for respondents from this province. Linkage was conducted only for those who agreed to have their survey responses linked.

Source
Case Study Three: Diabetes and End-Stage Renal Disease

Some people with diabetes develop kidney disease. Between 1981 and 1996, the number of Canadians diagnosed with diabetes and kidney failure increased from 16% to 28%. Diabetes has been noted as the fastest growing cause for end-stage renal disease (ESRD). Further, statistics from the Canadian Organ Replacement Register (CORR) show that there was an increase of 7% over 10 years (that is, from 28% in 1996 to 35% in 2005), among ESRD patients with diabetes.

Kidney disease—a serious long-term complication of diabetes—can lead to chronic kidney failure, also known as end-stage renal disease. In Canada, 40% of registered ESRD patients who began treatment between 1995 and 2004 had been diagnosed with diabetes. This makes diabetes the leading cause of chronic kidney failure. Treatment typically involves replacing kidney function by dialysis or kidney transplantation. Transplantation is generally the preferred method of renal-replacement therapy, but its use is limited by the availability of organs, co-existing illnesses that render a patient ineligible for this type of treatment and other factors.

How do patients with diabetes who have ESRD fare? To answer this question, we looked at patients’ survival chances after diagnosis with ESRD (the outcome). Our first analysis focused on ESRD patients who initially received dialysis (the intervention). The second explored features of the care path for patients who had transplants. In both cases, we took into account a range of patient and health system characteristics. All data used in the analysis came from the Canadian Organ Replacement Register. We focused on ESRD patients first registered between 1995 and 1999 (see Figure 6). Given the difference in outcomes between dialysis and transplantation patients, we conducted two separate survival analyses using Cox proportional hazards models.

Figure 6 describes characteristics of ESRD patients in Canada registered between 1995 and 1999. This population is divided into two groups—one based on initiation of dialysis and a second who had a primary kidney transplant. Note that some patients would fall into both groups, for example, some patients who received dialysis at the beginning will fall into the transplant group later.
### Characteristics of End-Stage Renal Disease Patients

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Sample Size</td>
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<td>4,385</td>
</tr>
<tr>
<td>% Male</td>
<td>60</td>
<td>64</td>
</tr>
<tr>
<td>Mean Age (SD)</td>
<td>60 (16.6)</td>
<td>43 (14.8)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Caucasian</td>
<td>72</td>
<td>78</td>
</tr>
<tr>
<td>% Aboriginal</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>% Asian</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>% Black</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>% Other/Unknown</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td><strong>Primary Disease Causing ESRD</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Diabetes</td>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>% Glomerulonephritis</td>
<td>16</td>
<td>33</td>
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<tr>
<td>% Polycystic/Pyelonephritis</td>
<td>9</td>
<td>18</td>
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<tr>
<td>% Nephropathy—Drug-Induced</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>% Renal Vascular Disease</td>
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<td>7</td>
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<tr>
<td>% Other</td>
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<td>23</td>
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<tr>
<td><strong>Body Mass Index</strong></td>
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</tr>
<tr>
<td>% Underweight</td>
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<td>% Normal Weight</td>
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<td>% Overweight</td>
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<tr>
<td>% Obese</td>
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<td>10</td>
</tr>
<tr>
<td>% Unknown</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td>% Residing in Rural Neighbourhood</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td><strong>Neighbourhood Income Quintile</strong></td>
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<tr>
<td>% in Q1 (Lowest)</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td>% in Q2</td>
<td>21</td>
<td>19</td>
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<tr>
<td>% in Q3</td>
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</tr>
<tr>
<td>% in Q4</td>
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<td>17</td>
</tr>
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<td>% in Q5 (Highest)</td>
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<td>17</td>
</tr>
<tr>
<td>% Unknown</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>% Hemodialysis</td>
<td>76</td>
<td>–</td>
</tr>
<tr>
<td>Median Duration of Dialysis (Days)</td>
<td>–</td>
<td>583</td>
</tr>
<tr>
<td>% Living Donor</td>
<td>–</td>
<td>32</td>
</tr>
<tr>
<td>Mean Age of Donor (SD)</td>
<td>–</td>
<td>38 (15.7)</td>
</tr>
<tr>
<td>% Censored</td>
<td>40</td>
<td>84</td>
</tr>
<tr>
<td>% Due to Survival up to 2004</td>
<td>14</td>
<td>79</td>
</tr>
<tr>
<td>% Due to Lost Follow-up/Withdraw</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>% Due to Transplant</td>
<td>23</td>
<td>–</td>
</tr>
<tr>
<td>% Due to Second Transplant</td>
<td>–</td>
<td>5</td>
</tr>
<tr>
<td>Mean Survival Time in Days (SD)*</td>
<td>1,608 (10.0)</td>
<td>3,156 (14.2)</td>
</tr>
</tbody>
</table>

**Note**

* The mean survival time and its standard error were underestimated because the largest observation was censored and the estimation was restricted to the largest event time.

**Source**

Canadian Organ Replacement Register, 1995 to 2004, Canadian Institute for Health Information.
Published results from previous studies are mixed, but we found that after accounting for patient and health system characteristics, survival was about the same for patients who initially had hemodialysis and peritoneal dialysis. That said, regardless of the type of dialysis, some groups of patients were less likely to survive than others (see Figure 7). These included patients whose ESRD was caused by diabetes and those who:

- Were older;
- Were underweight;
- Had co-existing illnesses;
- Received dialysis in certain geographic regions; or
- Received dialysis in a lower-volume facility.ii

ii Average number of dialysis patients (load) in each facility in a year was first calculated and were classified into low, medium and high volume by their respective load ranks.
Factors Associated With Death Among Patients Undergoing Dialysis

Source
Canadian Organ Replacement Register, 1995 to 2004, Canadian Institute for Health Information.
While this analysis has some limitations, including a lack of information on disease severity at diagnosis, two important findings for the health care system are apparent. First, the results reinforce a growing body of research that higher volumes are associated with better results. Second, the significant interregional differences, after controlling for a range of factors, reinforce the long-standing and pervasive result on unexplained small-area variations. These in turn raise questions about important, but as yet unmeasured, differences in practice patterns, or what some have called the “surgical signature.” They suggest that outcomes could be improved if (a) the factor accounting for these interregional differences could be identified and (b) the local practice patterns could be changed to achieve the best possible outcomes across all regions.

The second analysis focused on patients who had kidney transplants. It explored a number of features of the care path. The first was time spent on dialysis prior to transplantation (patients who have very short wait times for transplantation may not have to resort to interim dialysis). We also looked at the age of the kidney donor and whether the transplant was from a live or deceased donor.

Patients with less time on dialysis before their first transplant, as well as those who received organs from younger donors and live donors, tended to have better survival chances than others. Outcomes were worse for transplant patients who had a diagnosis of diabetes. Other patient and health system characteristics also mattered (see Figure 8).
Factors Associated With Death Following Primary Kidney Transplantation

Other patient characteristics are also associated with outcomes, as the graph below shows. Among Canadians with end-stage renal disease, a number of factors are related to survival time following primary kidney transplantation. The graph below depicts hazard ratios for ESRD patients in Canada registered between 1995 and 1999 who had a primary kidney transplant, based on follow-up data through 2004. The horizontal bars represent 95% confidence intervals. If the entire bar is to the right of the vertical line, the risk of death is higher. If the bar is to the left of the line, the group of patients had better survival chances than those in the reference group. All results are adjusted for the factors listed and other variables based on a proportional hazards regression analysis.

Note
Hazard ratios are adjusted via proportional hazards regression for a larger set of factors than those depicted.

Source
Canadian Organ Replacement Register, 1995 to 2004, Canadian Institute for Health Information.
Findings Related to Outcomes for Diabetes

Based on analysis from the three case studies, the following were the findings pertaining to the patient characteristics, health system characteristics, the care path and the final outcomes.

• Most people with diabetes do not receive all care recommended by clinical practice guidelines.

• Women and older individuals, those with higher levels of education, those who use insulin and those who had consulted a specialist and have a regular physician are more likely to receive moderate or optimal care.

• Those people with diabetes who are in greater need are more likely to receive care.

• Those who received good diabetes care were more likely to report that their health was better than one year ago compared with those who did not receive optimal or moderate diabetes care.

• Those who had not seen a general practitioner in the previous 12 months were 40% more likely to have been hospitalized. In contrast, those who had not consulted with another type of doctor were 23% less likely to have had a hospital stay in the two years after the survey. This latter result, while seeming paradoxical, may be an artefact of confounding—those who did see another type of doctor (typically a specialist) could have been in a more serious condition, since there were no data available to adjust the analysis for disease severity.

• After considering the type of care received, patient health status, socio-economic status and risk factors (for example, smoking) were related to hospitalizations.

• Regional hospitalization rate was highly significant in all-cause hospitalization, implying that regions with relatively higher rates of any hospitalization did have higher risk of hospitalization among the diabetic cohort.

• End-stage renal disease patients with diabetes and those who are older, underweight or with co-existing illnesses were less likely to survive than others.

• Patients who received transplants from younger and live donors tended to have better chances of survival.
Case Studies for Depression

According to the WHO, depression affects about 121 million people worldwide, which includes individuals of all ages, genders and backgrounds. It states that depression was the leading cause of disability and the fourth largest contributor to the global burden of disease in 2000. In 2002, 4.8% of Canadians aged 15 and older reported having experienced symptoms or feelings associated with major depression in the previous 12 months. People with “major depressive episodes” (that is, those whose symptoms of depression persist longer than two weeks) are considered to have a chronic condition.
How Common Is Depression?

A number of Canadians reported experiencing a major depressive episode in the previous 12 months in the Canadian Community Health Survey. The map below shows the percentage of teens and adults living in each province who reported having symptoms of depression in 2002.

<table>
<thead>
<tr>
<th>Province</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>4.9%</td>
</tr>
<tr>
<td>British Columbia</td>
<td>5.6%</td>
</tr>
<tr>
<td>Manitoba</td>
<td>4.9%</td>
</tr>
<tr>
<td>Ontario</td>
<td>4.7%</td>
</tr>
<tr>
<td>Quebec</td>
<td>4.8%</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>4.8%</td>
</tr>
<tr>
<td>Newfoundland &amp; Labrador</td>
<td>4.5%</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>3.5%</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>2.6%</td>
</tr>
<tr>
<td>Yukon</td>
<td>3.7%</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Canadian Average: 4.8%

Notes
* Rate estimate has high coefficient of variation; interpret with caution.
† Significantly different from Canada (p<0.05).
Prevalence rates for major depressive episodes are derived from surveys collected in 2002, and are based on the population of community-dwelling Canadians 15 years of age and older.
Information not available for the territories.
Source
Canadian Community Health Survey, Cycle 1.2 (Depression), 2002, Statistics Canada.

Based on the Health Outcomes Conceptual Framework, this report explored answers to questions related to health outcomes for patients with depression (see Figure 10). To the extent possible with existing data, the analyses took into account aspects of the patient’s care path, as well as health system and patient characteristics that might influence outcomes. We had to rely on indirect measures of health outcomes. For instance, we used hospitalization as a proxy for poorer health outcomes among patients with depression. In this report, the fourth case study, “Depression in Type 2 Diabetes,” used CCHS data and examined the factors associated with patients diagnosed with type 2 diabetes and with symptoms of depression.

The fifth case study, “Depression Outcomes,” linked CCHS data with the HMDB for people with symptoms of depression and examined the final proxy outcome of hospitalizations following consults with doctors, counsellors and social workers. The sixth and final case study was based on patients with symptoms of depression in complex continuing care.
### Health Outcomes Analysis in Depression

<table>
<thead>
<tr>
<th>Question</th>
<th>Case Studies</th>
<th>Care Path</th>
<th>Health Care System and Patient Characteristics Taken Into Account</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the relationship between diabetes and depression?</td>
<td>Depression and Diabetes*</td>
<td>Regular MD Unmet health care needs</td>
<td>Type of diabetes and duration Age, Sex Comorbidities Risk factors Disease burden Marital status Immigrant status Income</td>
</tr>
<tr>
<td>What factors are associated with acute care hospitalization among community-dwelling persons with probable depression in Canada?</td>
<td>Acute Hospitalizations Among Persons With Probable Depression†‡</td>
<td>GP consult in past year Other MD consult (specialist) in past year Psychologist/mental health care provider consult in past year Social work consult in past year Hospitalization in past year</td>
<td>Regional hospitalization rate Age Sex Ethnicity Marital status Level of education Household income Health utility index Level of physical activity Smoking status Level of alcohol consumption Body mass index Number of chronic conditions Perceived unmet health care needs Has regular medical doctor Level of stress Sense of belonging</td>
</tr>
<tr>
<td>How do patients’ depressive symptoms change during their stay in complex continuing care in Ontario?</td>
<td>Depression in Complex Continuing Care§</td>
<td>Discharge disposition</td>
<td>Diagnosis of depression Antidepressant use in past week Psychotherapy in past week</td>
</tr>
</tbody>
</table>

**Note**
* This study compared the magnitude of association between type 2 diabetes and depression and osteoarthritis and depression, and did not focus on interventions or outcomes.

**Sources**
Outcomes for Depression

Depression is a common mental disorder. In Canada’s first-ever national survey of mental health and well-being in 2002, 4.8% of Canadians described themselves as having the symptoms of a major depressive episode within the past year. Depression itself is characterized by a depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy and poor concentration. Patients experience a variety of symptoms, such as feeling worthless, helpless or hopeless; having changes in appetite; fatigue or decreased energy; and suicidal thoughts. When a person suffers with five or more of these typical symptoms for at least two weeks, this is called a “major depressive episode.” People with major depressive episodes, that is, where the symptoms of depression usually persist longer than two weeks, are considered to have a chronic condition. Depression often recurs and patients can experience relapses. This chronic condition may restrict patients’ activities of daily living, affect their economic and social lives and have a major impact on family members and caregivers.

There are many possible approaches to prevent and treat depression, a number of which have been shown to be effective in research studies. For example, following a timely diagnosis, management of this illness may include social and economic support, counselling and medications. The benefits of the use of antidepressants and brief structured forms of psychotherapy are noted in a number of studies. However, it is important to note that many—perhaps most people with depression—do not receive these types of care, as noted by WHO and other groups, mainly because many of those who report symptoms of depression do not seek help. This is in line with the recent Canadian survey data, discussed in more detail below. Experts suggest that the most common reasons for not seeking help are a belief that the symptoms will clear up on their own or that the individual is capable of handling the situation him- or herself, as well as the stigma and discrimination associated with mental illnesses.

The 2002 CCHS survey collected information on why people did not get any help for problems associated with their emotions, mental health or use of alcohol or drugs. Among those who responded, the most frequently reported reasons were: “they preferred to manage themselves (31%); they did not get around to it, or did not bother to (19%) and 18% reported that they were afraid to ask for help, or they were afraid of what others would think.”

A U.S. study suggests that about half of those diagnosed with depression received appropriate antidepressant treatment in a community practice setting. That said, other researchers have found that less than 20% of patients who started on antidepressants were seen a minimum of three times in the following three months to monitor their progress. Studies have found that about one-third of patients discontinue their antidepressant medication within the first month, with adherence rates falling to about 50% in the first three months. In a recent review of randomized clinical trials evaluating chronic disease management models for depression in primary care, the authors report that there is consistent and convincing evidence of the benefits of changing the way systems of care are organized for patients with depression. Primary care–based quality improvement programs, including chronic disease management programs, have been shown to improve the quality of care, patient satisfaction and patient-oriented health outcomes for depression.
Care for Depression in Canada

A diagnosis is often the first step in a care path for patients with symptoms of depression. Based on the 2002 CCHS, about half (46%) of Canadians aged 15 and older with symptoms suggesting probable depression reported some contact with a mental health professional in the previous year. Three-quarters (75%) reported contact within their lifetime. Most of those with contacts in the previous year (39% overall) said that they had had four or more interactions with mental health professionals during this period. About the same proportion (40%) indicated that they were taking antidepressants. In contrast, fewer (7%) reported attending a support group.

Based on the types of care they received, people reporting symptoms of depression over the previous 12 months on the survey were divided into three groups:

- **Most care:** Eight or more contacts with a mental health professional in the past 12 months or at least four contacts with a mental health professional and the use of antidepressants in the past year.

- **Some care:** Less care, but at least one contact with a mental health professional or use of antidepressants in the past year.

- **No care:** No contact with a mental health professional and no use of antidepressants in the past year.

Based on this approach, just over a third of survey respondents with probable depression (36%) fell into the “most care” category, while another 27% reported receiving “some care.” The remaining 37% had neither contacted a mental health professional nor used antidepressants in the previous year.

Unfortunately, a one-time survey alone tells us little about the short- or long-term outcomes for those who followed these different care paths. It did, however, ask respondents for consent to link their survey responses with other data sources. By doing so, it might be possible to track proxy outcomes, such as future use of antidepressant medication, physician visits for depression treatment or hospital admissions.
Case Study Four: Depression and Diabetes

One of the factors that complicates both care and our understanding of health outcomes is that patients often have more than one health problem. For example, adult Canadians who have diabetes are more likely to report symptoms of depression (7.4% in 2002) than those who do not (4.6%). There are a number of theories about how the two diseases might be linked. For example, experts suggest that depression may or may not develop as a result of:

- Biological changes associated with type 2 diabetes (for example, increased cortisol production, alteration in neurotransmitter production, central nervous system microvascular changes) or its treatment; and
- Psychosocial demands of type 2 diabetes treatment. 78

Other recent studies have shown that depressive symptoms often pre-date a diagnosis of type 2 diabetes. 79 As a result, some suggest that depression might contribute to the development of diabetes and its complications by:

- Exacerbating insulin resistance; or
- Poor self-care behaviours, such as physical inactivity and excess energy intake. 79

The relationship may also be complicated because factors such as being overweight and having a low income are associated with both conditions. 80

To further explore this relationship, we used data from the 2000–2001 CCHS. Our analysis contrasted the strength of the association between depression and type 2 diabetes with that between depression and osteoarthritis, another chronic condition. We focused on respondents aged 20 and over who did not also have a series of other major chronic health problems (rheumatoid arthritis, epilepsy, dementia, Parkinson’s disease, multiple sclerosis, cancer, Crohn’s disease, chronic fatigue syndrome and chronic pulmonary disease). Compared to those in the osteoarthritis group, respondents with diabetes tended to be older, male, less affluent, free of pain or discomfort, overweight or obese and physically inactive.
Chapter 4  Case Studies for Depression

After taking a variety of patient characteristics into account (for example, age and sex), both groups were more likely to report symptoms of depression than the general population. The statistical association was stronger for osteoarthritis than for diabetes, but this appears to be partly related to whether or not respondents reported pain or discomfort. In the case of diabetes, the association with depression appears to be largely accounted for by the presence of cardiovascular disease, a frequent complication of diabetes, and obesity, a risk factor for diabetes. As or more significant than the two specific diseases, obesity and pain were sex, age and access to health care. Women, younger respondents and those who reported unmet health needs were more likely to report symptoms of depression.

An Alberta study report released recently found that the (age- and sex-adjusted) prevalence of mental illness was consistently higher in people with diabetes compared to those without diabetes.\textsuperscript{34}

**The Body and the Mind**

Physical and mental health are intertwined in complex ways. For example, Manitoba researchers studied hospital use for a range of health problems. They found that people who had a diagnosis of depression, anxiety disorders, substance abuse, schizophrenia and/or personality disorder over a five-year period were more than twice as likely as others to be admitted to an acute care hospital during that time. People with these diagnoses were also more likely to be hospitalized with circulatory, musculoskeletal and other types of physical health problems.\textsuperscript{35}
Case Study Five: Acute Care Hospitalization Among Persons With Probable Depression

Most patients treated for depression receive their care in community-based settings. Some, however, require overnight hospital stays. Hospitalization admission rates at any point in time partly reflect evolving practice patterns. In Canada, care for those with mental illness has changed over time. In 2002–2003, there were about 607 hospitalizations per 100,000 population in Canada, down by about 15% from rates 10 years before. Most of these hospital stays (34%) were for depression and other mood disorders.

There were not enough respondents to the 2002 Mental Health Survey to look at rates of subsequent hospital use, but the 2000–2001 CCHS survey, albeit with a much more limited set of questions to determine whether the respondent had depression, had a larger sample size. As a result, we were able to track acute care hospitalizations within two years of the survey for those who reported symptoms of probable depression on this survey. In doing so, we were able to take into account answers to questions about personal characteristics, but little information on the care path was available. The primary factor that we were able to consider was consultations with mental health professionals in the year before the survey (see Figure 11). This analysis assumes that hospitalizations are an indirect indicator of poor outcomes. The figure on the next page compares characteristics of persons who reported symptoms consistent with probable depression and the non-depressed population, based on responses to the 2000–2001 CCHS. Results exclude Quebec because linkage with hospital data was not possible for respondents from this province.
### Who Has Probable Depression

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Persons With Probable Depression</th>
<th>Overall (Non-Depressed)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age Group (Years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% 12–19</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>% 20–44</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>% 45–64</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>% 65+</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td><strong>% Female</strong></td>
<td>65</td>
<td>49</td>
</tr>
<tr>
<td><strong>% Completed Postsecondary Education</strong></td>
<td>41</td>
<td>43</td>
</tr>
<tr>
<td><strong>% in Highest Income Quintile</strong></td>
<td>23</td>
<td>30</td>
</tr>
<tr>
<td><strong>% Obese</strong></td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td><strong>% Physically Inactive</strong></td>
<td>51</td>
<td>47</td>
</tr>
<tr>
<td><strong>% Current Smoker</strong></td>
<td>42</td>
<td>23</td>
</tr>
<tr>
<td><strong>% Regular Alcohol Consumption</strong></td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td><strong>Mean Number of Chronic Conditions</strong></td>
<td>1.97</td>
<td>0.63</td>
</tr>
<tr>
<td><strong>Consultation in Past 12 Months</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% With General Practitioner</td>
<td>89</td>
<td>80</td>
</tr>
<tr>
<td>% With Other Doctor</td>
<td>41</td>
<td>25</td>
</tr>
<tr>
<td>% Mental Health Provider</td>
<td>42</td>
<td>5</td>
</tr>
<tr>
<td>% With Psychologist</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>% With Social Worker or Counsellor</td>
<td>21</td>
<td>4</td>
</tr>
<tr>
<td><strong>Acute Care Hospitalization</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% All-Cause Within Next 24 Months</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

**Note**
Overall statistics exclude Quebec. Linkage to psychiatric hospital stays not reported through the Hospital Morbidity Database was not possible. Hospital stays related to the birth of a baby were also excluded.

**Source**
The analysis included more than 8,000 respondents who reported symptoms suggesting probable depression on the survey. Only 76 individuals had a hospital stay with a primary diagnosis of depression in the two years following the survey. Given the small numbers, we were not able to look at outcomes for this group in detail. More (about 150 or 2% of those with depression) had a mental health–related hospital stay. All-cause admissions were even more common.

After taking patient and health system characteristics into account, we found that persons with probable depression who had not contacted a mental health professional were less likely to have been hospitalized than those who did. As with some of the findings for diabetes described earlier, why is not clear. It could be that those with more serious health problems are more likely to seek help. In this case, having consulted with a medical doctor and a psychologist, mental health provider or counsellor could be a partial proxy for severity of illness. The available data do not allow us to determine whether this or other factors are the main drivers of patient outcomes.

Interestingly, results were not identical for mental health–related and all-cause hospitalizations. For example, those with a weak sense of belonging were more likely to have a subsequent hospital stay related to a mental health problem. But this factor did not explain all-cause hospital use. In contrast, those who lived in a region with high overall hospital use were more likely to have a hospitalization for any cause, after taking other factors into account. These regional rates were not, however, a significant predictor of mental health–related hospitalizations. The results showed a strong inverse relationship between health-related quality of life as measured by the Health Utility Index (HUI) and likelihood of admission for both all-cause and mental health–related hospitalizations—that is, the likelihood of admission increased with decreasing HUI.

Some people with probable depression are more likely to have overnight hospital stays related to mental health than others. Examples include women; single/never-married respondents; and those with a weak sense of belonging, poorer overall health and more chronic conditions or hospitalizations in the year before the survey. Some of the same results hold for hospitalizations for any cause (not just related to mental health). The graph on the next page depicts the odds that a person who reported symptoms consistent with probable depression in a 2000 and 2001 survey had an acute care hospital stay within two years following the survey. The horizontal bars represent 95% confidence intervals. Thus, the results denoted by the dots are estimated to be accurate to within the range shown by the bars 19 times out of 20. If the entire bar is to the right of the vertical line, the odds of hospitalization are higher than the overall average. If the bar is to the left of the line, the group of patients is less likely to have had a hospital stay than other patients. All results are adjusted for the factors listed and other variables based on a logistic regression analysis.
Which Persons With Probable Depression Are More Likely to Be Hospitalized?

![Diagram showing odds ratios for various factors related to hospitalization.](diagram.png)

**Note**

Odds ratios are adjusted via logistic regression for a larger set of factors than those depicted. Statistics exclude Quebec and hospital stays related to childbirth. Linkage to psychiatric hospital stays not reported through the Canadian Hospital Morbidity Database (that is, less than 15% of all mental health–related admissions) was not possible.

**Source**

Case Study Six: Depression in Complex Continuing Care

Complex continuing care (CCC) is a type of hospital-based care in Ontario that provides specialized care for medically complex patients with multiple health problems and functional impairments. The sector provides a variety of services including active rehabilitation, palliative and end-of-life care, and support to families with respite care needs. Patients may stay for weeks or months or, in a small number of cases, for years.

This study includes patients admitted between 2002 and March 2007 to a complex continuing care facility in Ontario. While depression is rarely the primary reason for admission to CCC, many of the conditions contributing to admission have been shown to be associated with increased prevalence of depression.

A quarter (25%) of patients in CCC were assessed as having signs of depression on admission. Of these, 35% had a formal diagnosis of depression recorded on their admission assessment. While this proportion increased to 44% on patients’ last assessment in the facility, the data support the research that suggests depression may be under-diagnosed in elderly patients with complex health conditions.

Information on patients in Ontario CCC is collected through the Resident Assessment Instrument Minimum Data Set (RAI-MDS 2.0) and submitted to the Continuing Care Reporting System (CCRS). It captures a wide range of clinical information, including diagnoses, cognitive and physical functioning, mood and behaviour, medication use and treatments received.

One of the clinical measures derived from the RAI-MDS 2.0 is the Depression Rating Scale (DRS), which measures symptoms related to seven verbal and non-verbal indicators of depression and anxiety. Validation studies of DRS, on comparison with the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) diagnoses of major or minor depression, showed 91% sensitivity and 69% specificity at a cut-point score of three. A score of three (which was used in this analysis) or more indicates the potential presence of a depressive disorder.

A quarter (25%) of patients in CCC were assessed as having signs of depression on admission. Of these, 35% had a formal diagnosis of depression recorded on their admission assessment. While this proportion increased to 44% on patients’ last assessment in the facility, the data support the research that suggests depression may be under-diagnosed in elderly patients with complex health conditions.

Figure 13 compares treatments for patients with signs of depression (based on their DRS score) by whether or not they had a formal diagnosis of depression in their charts. There was a large difference in antidepressant use and a smaller difference in use of psychotherapy if they had a diagnosis of depression recorded on their assessment. With a diagnosis of depression, 70% of patients received antidepressants, compared with 29% of those with no depression diagnosis. Fewer than one in five patients with signs of depression received psychotherapy, and there was only a slight difference between those with and without a depression diagnosis.
Interventions for Patients With Signs of Depression in Ontario CCC

Note
Based on last assessment prior to discharge of patients with at least two assessments completed during their stay and with a DRS score of 3 or more reported.

Source

Figure 14 shows whether patients’ signs of depression recorded at admission improved, worsened or stayed the same over their stay in CCC, by their discharge disposition. The proportion whose depression symptoms worsened was highest among those who died. In contrast, the highest proportion of patients experiencing improvement in their depression symptoms were those discharged home.
There are complex relationships between overall health outcomes and depression in the diverse populations cared for in this sector, for example, those receiving physical rehabilitation or palliative and end-of-life care. In order to assess the impact of specific clinical interventions, further analysis of the CCRS data is required.

With adoption of the RAI-MDS 2.0© assessment taking place across Canada, such analysis will soon be feasible not only for hospital-based CCC in Ontario but also the residential care sector across the country. The RAI-MDS 2.0© assessments support care on the front lines by giving care providers information on individual patient strengths, risks and outcomes. These real-time outputs are used to develop appropriate care plans and monitor progress. These assessments will also provide a rich longitudinal data source covering a wider range of settings, affording a series of “natural experiments” comparing quality across facilities, jurisdictions and types of continuing care.
Findings Related to Outcomes for Depression

Based on the two case studies that focused on people with depression, here's what we found in terms of the Health Outcomes Conceptual Framework—care path, patient and health system characteristics:

- The majority of people with probable depression do not seek medical care for their depression, even though the vast majority are in contact with a doctor at least once a year for other reasons.

- The data currently available do not support any definitive results on the health outcomes actually achieved in Canada with regard to the treatment of Canadians with probable depression.

- Still, as related pieces of information, the available data do show that those with probable depression are more likely to be admitted to acute care hospitals than the non-depressed population.

- People with a weak sense of belonging and those who are single/never married are more likely to be admitted to hospital with a mental health–related principal diagnosis, all else being equal.

- People with probable depression who had not contacted a mental health professional were less likely to have been hospitalized than those who did. This apparently paradoxical result may reflect the possibility that those who did contact a mental health professional likely had more severe symptoms.

- Living in a high–hospital use area is associated with greater likelihood of admission to acute care for people with probable depression.

- In CCC, 70% of patients with signs of depression and a formal diagnosis received antidepressants, compared with 29% of those with signs of depression, but with no depression diagnosis. Fewer than one in five patients with signs of depression received psychotherapy.

- Patients who were discharged home were most likely to have experienced an improvement in their depression symptoms during their stay in CCC; the proportion whose depression symptoms worsened was highest among those who died.
Health Outcomes: Conclusion

Results from recent health care stakeholder consultations\textsuperscript{1,90} confirm that there is an increased interest among policy-makers and decision-makers in understanding health outcomes from a “return on investment” or “what does health care spending buy?” perspective. To understand what new information current data sets could contribute to answering these questions, including through linking data holdings, CIHI and Statistics Canada undertook a joint program of study.

In order to frame analysis of health outcomes questions such as “what works best, for whom and in what contexts,” CIHI and Statistics Canada created the Health Outcomes Conceptual Framework. Based on existing theories, conceptual models and expert consultations, the framework is intended to guide data development and analysis at the pan-Canadian, provincial/territorial and local levels. The framework incorporates both micro- (patient-level) and macro- (system-level) measures.

We then undertook six separate analyses covering two major chronic conditions—diabetes and depression—applying existing pan-Canadian data to our conceptual framework. A major finding of the analyses was that existing pan-Canadian data sources are incomplete. The full range of pan-Canadian data required to undertake rigorous and systematic health outcome analysis for these types of conditions and others simply does not yet exist. As a result, we are very limited in our ability to understand what works and what does not work in terms of effective care. Further, there is relatively little population-based information available anywhere in the world that links changes in health status to intervention strategies.\textsuperscript{91}
The CIHI–Statistics Canada framework did help us conceptualize and guide analysis of health outcomes. This type of approach focuses on the results of care, the continuum of the care path and other factors that may affect outcomes. To do so requires information on the following:

- Standard, comprehensive and repeated measurements of health status. Without this information, it is difficult to track changes in health status before and after an intervention.
- Health care interventions provided across the spectrum of care, particularly services provided at the primary care level for those with chronic conditions.
- Patient, health system and place/environment characteristics that may influence outcomes or otherwise affect the results of an intervention.

Recent pan-Canadian consultations have called for progress on understanding what works to improve population health and on understanding the effects of health services interventions. The challenge now is to identify how best to meet this need with focused studies and targeted surveys, as well as systematic tracking of health outcomes at local, regional and national levels.

What We Know

- Outcomes are affected by a wide variety of factors such as health system and patient characteristics, and the care paths (for example, sequence of health care encounters and interventions) of patients.

- Existing health survey, administrative and registry data provide a wealth of information related to patient and health system characteristics. At a Canadian level, however, they provide very limited information regarding the full spectrum of care received by patients, particularly so for those with chronic conditions such as diabetes and depression. On their own, however, these data sources are of very limited use in measuring changes in health status or relating interventions to specific health conditions.

- Most existing administrative databases were not designed to collect information on health outcomes, resulting in a paucity of information pertaining to the effectiveness of the medical or surgical intervention, which is critical for assessing patient outcomes. For example, direct measures of health status are not readily available in many existing pan-Canadian databases. As such, current health outcomes analysis relies on proxy outcomes measures such as hospital admissions.
What We Don’t Know

• We do not know about the effectiveness of interventions at the national level associated with care for those with diabetes and depression. In addition, we do not know which preventive interventions variously being deployed across Canada are most effective, for example, programs designed to help individuals improve their diets and their physical activity—both of which are known to reduce the incidence of diabetes.

• There are currently limited data on patient interactions with different types of health care providers such as physicians, alternative health care providers, therapists, etc. to assess care path and outcomes.

• While we do have some indication of how often primary care interventions for people with diabetes, such as regular blood testing and foot and eye examinations, are needed to prevent progression of the disease, we do not know what frequency of such chronic disease management interventions is optimal in terms of health outcomes.

• In terms of the health system characteristics, the extent to which patients actually receive the recommended care (or treatment) per clinical practice guidelines, over time, is hard to determine. For example, we know what is prescribed; we do not know details of patient adherence.

• Longitudinal follow-up of patients at a pan-Canadian level would provide valuable information on patient characteristics (for example, comorbidities, risk factors, preferences) and the care path—that is, need for intervention(s) and outcomes.

• The extent to which evolving data sources external to Statistics Canada and CIHI could further support health outcome analysis, including the future potential of electronic health records. The study on acute care hospitalizations among people with diabetes reinforces the importance of having high quality severity/comorbidity data to properly assess health outcomes, probably via the electronic health record.

• Information linking patients’ medical intervention(s) to pharmaceutical drug use could lead to improved monitoring of chronic conditions like depression, thus improving quality of care at the provincial/territorial and national levels.
What’s Next

Statistics Canada and CIHI are continuing to work together to advance Canada’s capacity to understand health outcomes. Next steps include developing a joint report on the capacity of current and developing data holdings to support health outcomes reporting and research, and strategies and options to strengthen information holdings to address gaps. The report will explore best practices in health outcomes measurement in Canada and other countries, and will offer options to address the information required to measure health status and the path from risk factors and environment to illness, treatment and outcomes.

The report will look broadly at major diseases and a range of interventions of interest. Options explored will span from modifications to existing surveys and databases to leveraging the power of data through record linkage and simulation modelling to overcoming gaps with new data collection initiatives.

Other CIHI and Statistics Canada Health Outcomes–Related Initiatives

CIHI Projects

As part of environmental scanning to develop the new strategic plan, CIHI learned that stakeholders value and encourage ongoing research and reporting on health outcomes for Canadians. We know that health regions and others use the Health Indicators report to identify areas where improvements are needed and to learn from jurisdictions with the best outcomes. In Health Indicators 2008, we continue, in partnership with Statistics Canada, to report on indicators related to health status; non-medical determinants of health; health system performance; and community and health system characteristics. In addition, we will highlight regional variation and outcomes related to ambulatory care–sensitive conditions.

Other analytic reports that will focus on health outcomes include, but are not limited to, the following:

- Analysis of in-hospital mortality rates, building on CIHI’s hospital standardized mortality ratio (HSMR) initiative;
- Evaluating clinical outcomes as part of the Hospital Reports series; and
- Hip and knee replacement revision rates.

We will continue to develop our CCRS and home care data holdings based on validated clinical assessments designed to capture longitudinal information on health outcomes and resource utilization. Work is also under way to develop a minimum data set for primary health care reporting.

CIHI is also working closely with Health Infoway to provide expertise and insight into the discussions related to data collection and use for research and other purposes.
Statistics Canada Projects

Statistics Canada is continuing to develop new and innovative ways to bring data sets together so that they may serve to address complex health-related issues such as those related to health outcomes. Statistics Canada will continue efforts to link population-based health surveys to administrative data sources including both future cycles of the CCHS and the National Population Health Survey (NPHS). The longitudinal nature of the NPHS will allow for a more in-depth analysis of outcomes of care.

Statistics Canada is also continuing to develop population-based modelling techniques, such as POHEM, to study the health of populations including outcomes of care. POHEM is a sophisticated empirically grounded, policy-oriented micro-simulation model of diseases and risk factors realistically representing the lifecycle dynamics of the Canadian population. POHEM is a unique analytic tool incorporating data from a variety of sources including information on health status, risk factors and use of health care services, as well as “upstream” factors such as income and education. POHEM can be used to report on health outcomes in any future year and at any level of detail, for example, by age group, sex, geography, income, education, ethnicity, family status, disease or for high-risk groups. Furthermore, hypothetical what-if scenarios are easily applied to evaluate the effect of changing various parameters, such as reducing risk-factor levels or alternative care, on the various health outcomes.

Finally, Statistics Canada is working in collaboration with the federal, provincial and territorial ministries of health and CIHI on the Longitudinal Health and Administrative Data (LHAD) initiative. The LHAD initiative will bring together routinely collected health administrative data from across Canada with survey data and vital events data to support innovative pan-Canadian research and comparative analysis. This initiative, while still in the formative stages, will result in a wealth of data that can be applied to critical and policy-relevant research questions focused on health and health care use, including outcomes of care.

For more information about work that CIHI and Statistics Canada have undertaken with respect to health outcomes, please see www.cihi.ca or www.statcan.ca.
Appendix A.
Data Sources and Methods

Canadian Community Health Survey

The Canadian Community Health Survey (CCHS) is the only national cross-sectional survey on the health status of Canadians, important health determinants and health care services use. The objective of the CCHS is to provide health-related data at sub-provincial levels of geography (health region or combined health regions). The 2005 survey, CCHS 3.1, included optional content that focused on diabetes care. This module consisted of a set of questions developed by Statistics Canada, in collaboration with the Public Health Agency of Canada, to collect in-depth information regarding the care practices of individuals with diabetes. The optional Diabetes Care Module (DCM) was selected by all health regions in Newfoundland and Labrador, Prince Edward Island, New Brunswick, Ontario, Manitoba and the Yukon Territory.

The CCHS 1.1 survey included questions concerning major depression, based on the short form of the Composite International Diagnostic Interview for depression (CIDI–SF), which consists of a short set of questions about common depressive symptoms. For the study that looked at depression and diabetes, respondents who had indicated a 90% probability of major depression were identified as being depressed. Respondents with type 1 diabetes, gestational diabetes and rheumatoid arthritis, as well as those less than 20 years of age, were excluded from the analysis. The likelihood of depression associated with type 2 diabetes or osteoarthritis was examined in this study using an incremental logistic regression model.
Canadian Community Health Survey Linked With Hospital Morbidity Database

The Hospital Morbidity Database (HMDB) is a national administrative database containing information on acute care services. To study acute hospital use among people with diabetes in Canada, data from the first cycle of the CCHS, conducted during 2000 and 2001, was linked to the HMDB. The survey included questions on socio-demographic information (age, sex, education, income, etc.), information on health care services utilization and other risk factors related to health status, including diabetes and related treatment. More than 90% of respondents who agreed to this linkage were linked using probabilistic techniques to the HMDB. The analysis, however, excludes respondents from Quebec, as the HMDB records for this province do not contain identifiers essential to link the data. All the individuals who responded affirmatively to the diabetes question were identified as the diabetes cohort in this CCHS–HMDB linked analysis study. Hospital admissions that occurred one year prior to the date of the CCHS survey and two years following the date of the survey were retained for analysis, with the exception of admissions related to childbirth, which were excluded. The same methodology described here was used to study acute hospital use among people with depression in Canada using the CCHS 1.1 survey and the HMDB data.

Canadian Organ Replacement Register

The analysis pertaining to diabetes and end-stage renal disease is based on data from CIHI’s Canadian Organ Replacement Register (CORR). Results presented pertain to diabetes and end-stage renal disease patient cohorts in CORR registered between 1995 and 1999 with a five-year follow-up period (that is, between 2000 and 2004). This study focused on examining outcomes between dialysis and transplantation patients based on separate survival analysis using a Cox proportional hazards model.

Complex Continuing Care Reporting System

Patients included in the depression and complex continuing care case study were identified using the Complex Continuing Care Reporting System (CCRS) database. Data from complex continuing care hospitals in Ontario (where reporting to CCRS is mandatory) were used. Complex continuing care (CCC) is a type of hospital-based care in Ontario that provides specialized care for medically complex patients with multiple health problems and functional impairments. Descriptive analysis is used to present results from this data source.

For additional details related to technical notes or methods for the case studies, please write to research@cihi.ca.
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A Framework for Health Outcomes Analysis: Diabetes and Depression Case Studies


