

The Impact of Not Having a Primary Care Physician Among People with Chronic Conditions



ICES Investigative Report

July 2008

The Impact of Not Having a Primary Care Physician Among People with Chronic Conditions

ICES Investigative Report

Authors

Richard H. Glazier, MD, MPH, CCFP

Rahim Moineddin, PhD

Mohammad M. Agha, PhD

Brandon Zagorski, MS

Ruth Hall, PhD

Doug G. Manuel, MD, MSc, FRCPC

Lyn M. Sibley, PhD

Alexander Kopp, BA

July 2008

Publication Information

Published by the Institute for Clinical Evaluative Sciences (ICES) © 2008

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any format or by any means, electronic, mechanical, photocopying, recording or otherwise, without the proper written permission of the publisher.

How to cite this publication

Glazier RH, Moineddin, R, Agha MM, Zagorski B, Hall R, Manuel DG, Sibley LM, Kopp A. The Impact of Not Having a Primary Care Physician Among People with Chronic Conditions. ICES Investigative Report. Toronto: Institute for Clinical Evaluative Sciences; 2008.

Institute for Clinical Evaluative Sciences (ICES)
G1 06, 2075 Bayview Avenue
Toronto, ON M4N 3M5
Telephone: 416-480-4055
www.ices.on.ca

Authors' Affiliations

Richard H. Glazier, MD, MPH, CCFP, FCFP

Senior Scientist, Institute for Clinical Evaluative Sciences

Scientist, Centre for Research on Inner City Health, St. Michael's Hospital

Associate Professor, Department of Family and Community Medicine, University of Toronto

Rahim Moineddin, PhD

Affiliated Scientist, Institute for Clinical Evaluative Sciences

Associate Professor, Public Health Sciences and Family and Community Medicine, University of Toronto

Mohammad M. Agha, PhD

Senior Research Associate, Centre for Research on Inner City Health, St. Michael's Hospital

Associate Professor, Department of Public Health Sciences, University of Toronto

Brandon M. Zagorski, MS

Analyst, Institute for Clinical Evaluative Sciences

Ruth Hall, PhD

Affiliated Scientist, Institute for Clinical Evaluative Sciences

Douglas M. Manuel, MD, MSc, FRCPC

Senior Scientist, Institute for Clinical Evaluative Sciences

Chair in Applied Public Health, Canadian Institute for Health Research and the Public Health Agency of Canada

Associate Professor, Department of Public Health Sciences, University of Toronto

Associate, Manitoba Centre for Health Policy

Lyn M. Sibley, PhD

Research Fellow, Institute for Clinical Evaluative Sciences

Alexander Kopp, BA

Senior Analyst, Institute for Clinical Evaluative Sciences

Acknowledgments

The authors gratefully acknowledge the following organizations and individuals for their contributions to this report:

The Ontario Medical Association*

Institute for Clinical Evaluative Sciences, *Knowledge Transfer*

Gary Spencer, *Director*

Evelyne Michaels, *Editor*

Laura Benben, *Senior Web and Graphic Designer*

Randy Samaroo, *Graphic Designer*

Paulina Carrión, *Knowledge Transfer Coordinator*

Nancy MacCallum, *Knowledge Transfer Coordinator*

**As the study sponsor, the Ontario Medical Association had no involvement in or control over the design and conduct of the study; the collection, analysis and interpretation of the data; the preparation of the data; the decision to publish; or the preparation, review and approval of the manuscript.*

About ICES

Ontario's resource for informed health care decision-making

The Institute for Clinical Evaluative Sciences (ICES) is an independent, non-profit organization that produces knowledge to enhance the effectiveness of health care for Ontarians. Internationally recognized for its innovative use of population-based health information, ICES' evidence supports health policy development and guides changes to the organization and delivery of health care services.

Key to our work is our ability to link population-based health information, at the patient-level, in a way that ensures the privacy and confidentiality of personal health information. Linked databases reflecting 12 million of 30 million Canadians allow us to follow patient populations through diagnosis and treatment, and to evaluate outcomes.

ICES brings together the best and the brightest talent under one roof. Many of our scientists are not only internationally recognized leaders in their fields, but are also practicing clinicians who understand the grassroots of health care delivery, making the knowledge produced at ICES clinically-focused and useful in changing practice. Other team members have statistical training, epidemiological backgrounds, project management or communications expertise. The variety of skill sets and educational backgrounds ensures a multi-disciplinary approach to issues and creates a real-world mosaic of perspectives that is vital to shaping Ontario's future health care system.

ICES receives core funding from the Ontario Ministry of Health and Long-Term Care. In addition, our faculty and staff compete for peer-reviewed grants from federal funding agencies, such as the Canadian Institutes of Health Research, and project-specific funds are received from provincial and national organizations. These combined sources enable ICES to have a large number of projects underway, covering a broad range of topics. The knowledge that arises from these efforts is always produced independent of our funding bodies, which is critical to our success as Ontario's objective, credible source of *Evidence Guiding Health Care*.

Executive Summary

Background

Primary care plays a pivotal role in health care systems as the first point of access to care. According to recent surveys, nearly one in ten (nine percent) of Ontarians reported not having a regular medical doctor, and many more people said they had problems accessing primary care.

Individuals with chronic illnesses and conditions place substantial demands on the health care system. One might expect that these individuals in particular would experience adverse consequences from not receiving appropriate primary care.

Purpose and methods

The purpose of this study was to examine specific health system impacts related to Ontarians with chronic health conditions who did not have a primary care physician at the time they were surveyed. Data from Cycle 1.1 of the Canadian Community Health Survey (CCHS) from 2000–01 were obtained and analyzed, along with a 20% random sample of Ontario's population (2003–05). This information was then linked to data on health care use in Ontario in 2005–06.

Several sub-groups of Ontarians with chronic health conditions were examined in relation to emergency department (ED) visits and medical non-elective hospital admissions. These sub-groups were: people without a regular medical doctor (CCHS data); people with a history of fewer than three physician visits in the previous two-year period (20% random population sample data); and people with a history of three or more physician visits but whose scores were low (< 50%) on a continuity of care index (20% random population sample data). Continuity of care was defined as the proportion of visits made by each person to the same physician. Regression analyses were used to control for sociodemographic characteristics and case mix.

Among Ontarians with at least one chronic condition, 4.6 percent reported having no regular medical provider (CCHS data analysis); 5.2 percent had made fewer than three visits to a physician in a two-year period (20% random population sample data analysis); and 10.1 percent showed patterns of health system usage suggesting low continuity of care (20% random population sample data analysis).

Findings about Ontarians without a regular doctor

After adjustment, Ontarians with chronic conditions who said they did not have a regular medical doctor (CCHS data analysis) were 1.22 times more likely to have visited an emergency department (ED) (95% CI 1.02, 1.46) in the previous two years than those who reported having a regular doctor. This translates to an estimated 17,741 excess ED visits.

People in this same sub-group were also 1.32 times more likely to have had a medical non-elective hospital admission 95% CI (0.85, 2.06) in the previous two years compared to those who reported having a regular doctor. This translates to an estimated 1,932 excess hospital admissions attributable to not having a regular doctor.

Findings about Ontarians who made few physician visits

After adjustment, people with chronic illness who made fewer than three physician visits in a two-year period (20% random population sample) were 1.17 times more likely to have sought care in a hospital ED (95% CI 1.15, 1.19) in the previous two years compared to those who had made more than three physician visits. This translates to an estimated 16,868 excess ED visits attributable to not having a regular doctor.

People in this same sub-group were also 1.19 times more likely to have had a medical non-elective hospital admission (95% CI 1.13, 1.24) compared to those who had made more than three physician visits. This translates to an estimated 3,863 excess hospital admissions attributable to not having a regular doctor.

Findings about Ontarians with low continuity of care

After adjustment, people with chronic illness who made three or more physician visits but for whom continuity of care was low had 1.55 times more ED visits (95% CI 1.53, 1.56) than those with high continuity of care (20% random population sample). This translates to an estimated 101,313 excess ED visits. They also had 1.35 times more medical non-elective hospital admissions (95% CI 1.32, 1.38), which translates to an estimated 13,481 excess admissions.

Conclusion

Our analyses of data on Ontarians with chronic health conditions demonstrate that the majority of these people—90 to 95 percent—reported having a regular medical doctor at the time they were surveyed. The patterns of care we observed in this group suggest they experienced few serious access barriers to primary care.

However, among the remaining minority of people with chronic conditions, we were able to link three specific patient groups with potentially avoidable and costly demands on the health care system. These included thousands of excess ED visits and thousands of excess medical non-elective hospital admissions. Such potentially avoidable ED visits and hospital admissions contribute to the crowding of EDs and to hospital bed shortages. They are also highly likely to be associated with preventable suffering and clinical deterioration which can sometimes be irreversible.

We believe that all three patient groups—those who did not have a regular medical doctor; those whose records showed relatively few physician visits in the previous two years; and those whose pattern of health system usage suggested low continuity of care—represent Ontarians with chronic illness who are having trouble accessing primary care.

We also believe that, given these impacts on health services and on people, implementing policies to address the current shortage of primary health care physicians in Ontario should be seen as a top health system priority.

Contents

Publication Information	ii
Authors' Affiliations	iii
Acknowledgments	iv
About ICES	v
Executive Summary	vi
Background	
Purpose and methods	
Findings about Ontarians without a regular doctor	
Findings about Ontarians who made few physician visits	
Findings about Ontarians with low continuity of care	
Conclusion	
List of Exhibits	ix
Introduction	1
Privacy, Data Sources and Methods	3
Findings and Exhibits	5
Interpretation of Study Findings	14
Limitations of the current study	15
Summary and Conclusion	16
Appendix: How the Research was Done	17
Outcome measures	18
References	19

List of Exhibits

- Exhibit 1.** Sociodemographic and health characteristics among adult Ontarians with at least one chronic health condition, according to whether they had a regular medical doctor, [2000/01 Canadian Community Health Survey (CCHS) sample]
- Exhibit 2.** Sociodemographic and health characteristics of Ontarians of all ages with at least one chronic health condition, according to continuity of care history, [20% random sample of the population]
- Exhibit 3.** Emergency department (ED) visits and medical non-elective hospital admissions, among Ontarians with at least one chronic health condition, according to whether they had a regular medical doctor and to continuity of care history, [2000/01 Canadian Community Health Survey (CCHS) sample and 20% random sample of the population]
- Exhibit 4.** Regression analysis for emergency department (ED) visits and medical non-elective hospital admissions, among adult Ontarians with at least one chronic health condition, [2000/01 Canadian Community Health Survey (CCHS) sample]
- Exhibit 5.** Regression analysis for emergency department (ED) visits and medical non-elective hospital admissions, among respondents with at least one chronic condition, [20% percent random sample of the population]
- Exhibit 6.** Emergency department (ED) visits, medical non-elective hospital admissions, and attributable risks among adult Ontarians with at least one chronic health condition, according to whether they had a regular medical doctor, to a history of fewer than three physician visits in the previous two years, and to a low continuity of care history, [2000/01 Canadian Community Health Survey (CCHS) and 20% random sample of the population]

Introduction

Primary care plays a pivotal role in the health care system, serving as the first point of access to care. According to recent data, nearly one in ten Ontarians reported that they did not currently have a regular medical doctor. Many more said they had trouble accessing primary care.^{1,2}

Individuals with chronic conditions such as ischemic heart disease, diabetes, asthma, congestive heart failure and recurrent depression make substantial demands on the health care system. One might expect that these individuals in particular would experience adverse consequences from not receiving appropriate primary care.

Difficulty accessing care

Difficulty accessing care, linked with a shortage of health care providers, is among the major challenges facing Ontario's health care system and many other jurisdictions worldwide. According to a 2003 study, primary care doctors—mainly family physicians—were the health professionals most frequently contacted by Canadians: 80 percent said they had contacted a family doctor at least once during the previous year compared to 64 percent who said they had contacted a dentist at least once in the same time period.¹

But according to more recent estimates, 15 percent of Ontarians said they had difficulty accessing routine or ongoing care (at any time of day); 25 percent reported difficulties accessing immediate care for a minor health problem (also at any time of day); and nine percent said they did not currently have a regular medical doctor.² In 2004, fewer than 13 percent of Ontario primary care physicians said they were currently accepting new patients—compared to 18 percent of doctors who said the same thing in 2001.³

Studies show that people without a regular medical doctor tend to be young, male, single and from lower-income groups. Recent immigrants are also less likely to have a primary care physician, as are those who perceive themselves to be in good health.¹⁵ To ensure accuracy in our findings, we adjusted for these factors.

Primary care plays a pivotal role in the health care system

Primary care plays a pivotal role in the health care system, serving as the first point of access to care. This includes the diagnosis, treatment and management of disease, and the primary and secondary prevention of illness. Research suggests that the strength and extent of a country's primary health care system are related to population life expectancy and infant mortality rates, to self-reported health among citizens, to socioeconomic disparities and to population satisfaction in relation to overall health system costs.^{4,5} For example, a 2001 systematic review found evidence that increased accessibility to physicians working in primary care contributed to better population health and lower total health care costs.⁶

Evidence about the effectiveness of primary health care at the national or regional level is supported by studies exploring individual access to care. Lack of access to a regular source of medical care has been associated with excess emergency department visits.⁷ Having a regular source of care has also been linked to increased preventive health care⁸ (i.e., people are more likely to go for regular screening tests to identify health problems), and also to improved glycemic control for people with diabetes.⁹

Appropriate access to primary health care usually involves the patient seeing the same provider over a period of time (continuity of care) which builds familiarity and trust. Good continuity of care has been associated with increased preventive care,¹⁰ lower rates of hospitalization^{10,11} and fewer emergency department visits.¹²

In Canada, people who have a regular medical doctor are more likely to undergo preventive screening, are less likely to be smokers,¹³ and are more likely to receive recommended preventive services. These include regular blood pressure measurements to detect hypertension, mammography to detect breast cancers and Pap smears to detect cervical cancer.¹⁴

On the other hand, not having access to a primary care physician can have serious negative consequences on individuals' health in several areas. These include: the likelihood that they will undergo preventive exams and screening; how well any acute illnesses will be managed; and finally, how well any chronic illnesses will be controlled. The impact of not having enough family physicians or of poor access to these care providers may be significant—both in terms of patient health and avoidable health system impacts caused by excess emergency department (ED) visits and non-elective hospital admissions.

Chronic health conditions are characterized by long duration or frequent recurrence. Individuals with chronic problems such as ischemic heart disease, diabetes, asthma, congestive heart failure and recurrent depression place substantial demands, both on health care providers and on health care delivery systems overall.

Why this study was conducted

The purpose of this study was to examine the direct health system impact related to Ontarians with chronic conditions who reported that they did not have a primary care physician at the time they were surveyed.

Privacy, Data Sources and Methods

A note about privacy

ICES routinely receives health services administrative data feeds according to a data-sharing agreement with the Ministry of Health and Long-Term Care (MOHLTC). This agreement is signed in accordance with the 2004 *Personal Health and Information Protection Act* (PHIPA; section 45 [1] and O. Reg 329/04 section 19 [1]) which designates ICES as a “prescribed entity” in the Province of Ontario. This designation allows ICES to legally store and use encrypted, individual-level personal health information for the purposes of health system reporting, evaluation and research. Access to individual-level encrypted data is strictly controlled. No persons can be identified and no information about individual persons can be released.

Data sources

This study used two data sources: Cycle 1.1 of the 2000/01 Canadian Community Health Survey (CCHS), and a 20% random sample drawn from the entire Ontario population in 2003–05. Both of these data sets were linked to administrative data regarding subsequent emergency department (ED) visits and medical non-elective hospital admissions.

About the Canadian Community Health Survey (CCHS)

The 2000/01 Canadian Community Health Survey (CCHS) was one cycle of a national survey conducted by Statistics Canada. The CCHS is designed to provide timely, cross-sectional estimates of health determinants, health status and health system utilization at a sub-provincial level (i.e., in a single health region or a combination of health regions). The 2000/01 survey employed a multi-stage, stratified cluster design; the Ontario portion consisted of 37,681 respondents age 12 years and over.

The target population included household residents in all provinces and territories, with the principal exclusion of populations currently living in First Nations reserves, on Canadian Forces Bases and in some remote areas.

For the purposes of our study, we only used survey data from adults age 20 years and over; this was done to avoid proxy responses from parents on behalf of their children. Pregnant women were excluded since their health care utilization is known to be different from that of the general population.

CCHS respondents were asked to provide their Ontario health card numbers and to consent to having their survey responses linked with their health care utilization data. The responses of those who gave consent were then linked to data in the Ontario Registered Persons Database (RPDB), a population-based register maintained by the Ministry of Health and Long-Term Care (MOHLTC) to manage publicly funded health care services covered under the Ontario Health Insurance Plan (OHIP).

After their survey responses were linked with RPDB data, respondents' health card numbers were linked with three other databases. These were:

- The OHIP database containing information on physician fee-for-service claims for 2000/01. (Approximately 94 percent of all patient-physician encounters are included in this database which is updated regularly.)
- Data pertaining to emergency department (ED) visits for 2004–06 collected by the National Ambulatory Care Reporting System (NACRS). (Nearly 100 percent of ED visits are included in this database which is managed by the Canadian Institute for Health Information.)
- Data on hospital discharges contained in the Discharge Abstract Database (DAD) for 2004–06. (This database is also managed by the Canadian Institute for Health Information.)

Based on the goal of our study, the population of interest was adult Ontarians with chronic conditions. (The CCHS asked about chronic conditions diagnosed by a physician; the survey provided respondents with a list of specific conditions and allowed them to add others not on the list. Seasonal allergies, food allergies and multiple chemical sensitivities were excluded because these conditions do not necessarily require physician or hospital care.)

Survey respondents were asked whether or not they had a regular medical doctor. In this wave of the CCHS, respondents' reasons for not having a regular medical doctor were not elicited, nor did this survey distinguish whether the regular medical doctor was a family physician/general practitioner or some other type of physician.

About the 20% random sample of the Ontario population (2003–05)

Although there are numerous advantages to using data from the CCHS, its sample size is modest. This can be problematic for researchers wishing to focus on a specific group of people (such as those with a chronic condition but no regular medical doctor) or on those with relatively rare outcomes (such as medical non-elective hospital admissions).

For those reasons, a random 20% sample of the Ontario population in 2003–05 was obtained and used as an additional data source. (At the time of sampling, Ontario's population was approximately 12.5 million people.)

The selection of chronic health conditions for analysis

The chronic health conditions selected for analysis (in the 20% random population sample) were based on a list of 11 high impact/high prevalence (HIHP) conditions developed by the British Columbia Centre for Health Services and Policy Research.¹⁶ These included: recurrent depression, hypertension, asthma, diabetes, degenerative joint disease, ischemic heart disease, cancer, cardiac arrhythmia, chronic obstructive pulmonary disease/chronic bronchitis/emphysema, congestive heart failure and cerebrovascular disease.

HIHP conditions were flagged using the Johns Hopkins Adjusted Clinical Group (ACG) Case-Mix System Version 717–19 (This software examines diagnoses in claims and hospital data and determines if a person has a HIHP condition.) The HIHP analysis utilized diagnoses identified in OHIP physician claims and hospital discharge abstracts for 2003–05.

The use of proxy measures

Based on the available administrative data, we were unable to determine with certainty which Ontarians in both our samples did not currently have a regular medical doctor. Therefore, proxy measures had to be employed.

- The first proxy was **a history of fewer than three physician visits in two years** (2003–04). The selection of this proxy was based on the rationale that people with one or more chronic health conditions but whose records showed few or no physician visits in a two-year period might not have had a regular medical doctor. A lack of physician visits could also mean the person had other problems accessing care (i.e., limited availability, long wait times or inconvenient access).
- The second proxy was **a history of low continuity of care**. This was defined as patients scoring less than 50 percent on the Usual Provider of Care (UPC) index.²⁰ (The UPC index is a measure that determines the proportion of all physician visits made by one person to a particular provider.) When our analysis showed that a patient had been referred by a physician to some other doctor, that visit was attributed to the referring physician. For example, if a person's health records showed at least three visits to a physician in the previous two years, but also showed that fewer than half of those visits were to the same doctor, one might conclude that he/she did not have a regular medical doctor at the time. (However, this pattern could also suggest other difficulties in accessing care.)

We restricted our calculations about continuity of care to people whose records showed at least three physician visits in 2003–04. This is based on the fact that the UPC index is not reliable in situations involving very low numbers of visits.

Outcome measures

The primary outcome measures for this study were: the number of visits to a hospital emergency department (ED) and the number of medical non-elective hospital admissions. (For details on how outcome measures were calculated, see "Appendix: How the Research was Done" at the end of this report.)

Findings and Exhibits

Findings from the 2001 Canadian Community Health Survey (CCHS)

Our analysis was based on data from the 2000/01 Canadian Community Health Survey (CCHS) which included 27,011 adult respondents living in Ontario. Our final data set included 13,028 Ontarians with at least one self-reported chronic health condition. (This number works out to nearly half—48.2 percent—of all CCHS respondents included in our analyses; this suggests that, if extrapolated, our findings could apply to approximately 3,459,000 Ontarians.)

Further analysis yielded several relevant findings:

- Among Ontarians in our CCHS sample with at least one chronic condition, 4.6 percent reported not having a regular medical doctor. The sociodemographic characteristics of people reporting at least one chronic condition are shown in Exhibit 1, along with the proportion that did not have a regular medical doctor.
- People in the youngest age group (20–44 years), males, those with the highest educational attainment and rural residents were least likely to report they had a regular medical doctor.
- People with depression were also less likely to report having a regular medical doctor.
- Those with fair-to-poor self-rated health, disability and higher levels of morbidity and co-morbidity were more likely to say they had a regular physician.

Exhibit 1. Sociodemographic and health characteristics among adult Ontarians with at least one chronic health condition, according to whether they had a regular medical doctor, [2000/01 Canadian Community Health Survey (CCHS) sample]

	Population		Those Without a Regular Medical Doctor	
	N=	%	N=	%
Overall	13,028		629	
Age* (years)				
20–44	3,695	33.9	341	8.5
45–64	4,707	37.5	176	3.2
65–74	4,626	28.6	112	2.0
Sex*				
Female	7,950	48.3	298	3.2
Male	5,078	51.7	331	6.5
Education*				
Low	3,978	19.4	146	3.0
Medium	3,426	30.6	162	4.2
High	5,538	50.0	316	5.9
Income*				
Low	4,923	28.0	247	4.7
Medium	4,075	34.2	212	5.2
High	2,933	37.8	138	4.7
Residential Location[†]				
Rural	3,185	12.5	174	5.5
Small Urban	3,992	21.9	170	4.5
Large Urban	5,641	65.6	272	4.5
Self-Rated Health*				
Poor-Fair	3,637	13.7	117	3.0
Good or Better	9,386	86.3	512	5.2
Depression*				
Yes	2,105	11.6	113	5.3
No	10,923	88.4	516	4.5
Disability*				
Yes	4,409	15.7	124	2.4
No	8,609	84.3	504	5.6
ADGs[‡]				
High ≥ 6	6,237	31.4	165	2.1
Low < 6	6,791	68.6	464	6.9
RUBs[‡]				
High ≥ 4	3,272	13.2	72	1.7
Low < 4	9,756	86.8	557	5.5

* 2001 Canadian Community Health Survey 1.1, 2000–01, adults aged 20–74 years

[†] Rurality Index of Ontario, (RIO) [large urban 0–9, small urban 10–44, rural ≥ 45]

[‡] Aggregated Diagnostic Groups and Resource Utilization Bands, Johns Hopkins Adjusted Clinical Groups, derived from Discharge Abstract Database (DAD) and Ontario Health Insurance Plan (OHIP) physician claims, 1999–2001

Findings from the 20% random sample of the Ontario population (2003–05)

The 20% random sample of the Ontario population in 2003–05 consisted of 2,616,222 people of all ages. Among this sample, we found that 30.2 percent (790,099 people) had a high impact/high prevalence (HIHP) chronic condition. (This calculation is based on a total Ontario population of 12.5 million people at the time of sampling.) Further analysis yielded several relevant findings:

- We observed that 5.2 percent of people with a HIHP condition had made fewer than three visits to physicians in the previous two years.
- We also found that 10.1 percent of people with a HIHP condition scored less than 50 percent (<50%), on the Usual Provider of Care (UPC) index, suggesting low continuity of care (see Exhibit 2).
- Those whose data indicated they had made fewer than three visits to a physician in the previous two years were more likely to be young, male, to live in more rural parts of Ontario and to have lower rates of morbidity and co-morbidity.
- Those who made at least three visits but whose scores on the UPC index were under 50 percent (indicating low continuity of care) were more likely to be young, female, to live in large urban centres and to have slightly higher rates of morbidity and co-morbidity.

Exhibit 2. Sociodemographic and health characteristics of Ontarians of all ages with at least one chronic health condition, according to continuity of care history, [20% random sample of the population]

	Continuity (Usual Provider of Care Index)									
	Overall		< 3 visits		< 50.0%		50.0–79.9%		≥ 80.0%	
	N=	%	N=	%	N=	%	N=	%	N=	%
Overall	790,099	100	41,019	5.2	79,659	10.1	223,044	28.2	446,377	56.5
Age (years)										
0–19	81,801	10.4	14,751	18.0	16,643	20.3	26,551	32.5	23,856	29.2
20–64	451,505	57.1	20,617	4.6	48,942	10.8	135,582	30.0	246,364	54.6
65+	256,793	32.5	5,651	2.2	14,074	5.5	60,911	23.7	176,157	68.6
Sex										
Female	421,615	53.4	15,404	3.7	43,695	10.4	123,018	29.2	239,498	56.8
Male	368,484	46.6	25,615	7.0	35,964	9.8	100,026	27.1	206,879	56.1
Education										
Q1 Low	188,644	23.9	9,338	5.0	17,641	9.4	50,664	26.9	111,001	58.8
Q2	212,915	26.9	10,477	4.9	19,942	9.4	58,589	27.5	123,907	58.2
Q3	199,422	25.2	10,073	5.1	20,711	10.4	57,373	28.8	111,265	55.8
Q4 High	181,477	23.0	10,667	5.9	20,298	11.2	54,102	29.8	96,410	53.1
Income										
Q1 Low	145,540	18.4	7,865	5.4	16,063	11.0	40,290	27.7	81,322	55.9
Q2	153,993	19.5	7,534	4.9	14,957	9.7	42,285	27.5	89,217	57.9
Q3	155,472	19.7	7,711	5.0	15,135	9.7	43,652	28.1	88,974	57.2
Q4	159,126	20.1	8,124	5.1	16,157	10.2	45,780	28.8	89,065	56.0
Q5 High	153,731	19.5	8,623	5.6	14,693	9.6	44,482	28.9	85,933	55.9
Residential Location[†]										
Rural	106,666	13.5	5,985	5.6	8,812	8.3	29,225	27.4	62,644	58.7
Small Urban	172,604	21.8	8,564	5.0	14,715	8.5	47,470	27.5	101,855	59.0
Large Urban	510,829	64.7	26,470	5.2	56,132	11.0	146,349	28.6	281,878	55.2
Unemployment										
High	65,920	8.3	3,810	5.8	7,536	11.4	18,357	27.8	36,217	54.9
Low	716,538	90.7	36,745	5.1	71,056	9.9	202,371	28.2	406,366	56.7
Immigration										
High	82,431	10.4	4,379	5.3	9,571	11.6	24,216	29.4	44,265	53.7
Low	698,476	88.4	36,027	5.2	68,686	9.8	196,022	28.1	397,741	56.9
Aboriginal										
High	5,370	0.7	427	8.0	840	15.6	1,637	30.5	2,466	45.9
Low	777,088	98.4	40,128	5.2	77,752	10.0	219,091	28.2	440,117	56.6
ADG count[‡]										
High 6+	480,773	60.8	7,604	1.6	56,580	11.8	149,946	31.2	266,643	55.5
Low 1–5	309,326	39.2	33,415	10.8	23,079	7.5	73,098	23.6	179,734	58.1
RUB[‡]										
High 4+	258,158	32.7	4,201	1.6	30,056	11.6	81,085	31.4	142,816	55.3
Low 1–3	531,941	67.3	36,818	6.9	49,603	9.3	141,959	26.7	303,561	57.1

[†] Rurality Index of Ontario (RIO) [large urban 0–9, small urban 10–44, rural ≥ 45]

[‡] Aggregated Diagnostic Groups and Resource Utilization Bands, Johns Hopkins Adjusted Clinical Groups, derived from Discharge Abstract Database (DAD) and Ontario Health Insurance Plan (OHIP) physician claims, 1999–2001

Exhibit 3. Emergency department (ED) visits and medical non-elective hospital admissions, among Ontarians with at least one chronic health condition, according to whether they had a regular medical doctor and to recent continuity of care history, [2000/01 Canadian Community Health Survey (CCHS) sample and 20% random sample of the population]

	Canadian Community Health Survey (CCHS) Sample*			20% Random Population Sample**				
	All	No Regular Medical Doctor	With Regular Medical Doctor	All	<Fewer Than Three Physician Visits	UPC Index <50.0%	UPC Index 50.0%–79.9%	UPC Index ≥80.0%
N=	13,028	629	12,399	790,099	41,019	79,659	223,044	446,377
%	100	4.6	94.4	100	5.2	10.1	28.2	56.5
ED Visits[‡]								
% with ≥1 ED visit	50.0	52.4	49.8	26.6	22.9	31.9	28.8	24.8
% with 1 ED visit	20.5	18.7	20.6	16.4	15.1	18.0	17.2	15.9
% with 2 ED visits	10.3	10.9	10.3	5.5	4.4	6.6	6.0	5.1
% with ≥3 ED visits	19.2	18.0	19.3	4.7	3.3	7.3	5.5	3.9
Medical Non-Elective Hospital Admissions[§]								
% with ≥1 admission	9.4	9.2	9.5	7.2	4.1	7.5	7.5	7.2
% with 1 admission	7.8	7.9	7.8	5.3	3.3	5.5	5.5	5.4
% with 2 admissions	1.3	1.1	1.3	1.2	0.6	1.3	1.3	1.2
% with ≥3 admissions	0.3	0.2	0.4	0.6	0.3	0.9	0.7	0.6

* Canadian Community Health Survey (CCHS) sample of adults aged 20–74 years, 2000–2001

** 20% random sample of Ontario population, 2003–2005

‡ National Ambulatory Care Reporting System (NACRS) and Discharge Abstract Database (DAD), 2004–2006

§ Discharge Abstract Database (DAD), 2004–2006

According to the unadjusted CCHS analysis (see Exhibit 3), people who did not have a regular medical doctor showed a similar pattern of emergency department (ED) visits and medical non-elective hospital admission as those who did have a regular medical doctor. Similarly, in the 20% random population sample, people with fewer than three visits to physicians in the previous two years had fewer ED visits and medical non-elective hospital admissions.

However, people who had made at least three visits to physicians in the previous two years and who showed a pattern of visits consistent with lower continuity of care (UPC index score < 50.0%), had more ED visits and more medical non-elective hospital admissions compared to all those with HIHP conditions.

Exhibit 4. Regression analysis for emergency department (ED) visits and medical non-elective hospital admissions, among adult Ontarians with at least one chronic health condition, [2000/01 Canadian Community Health Survey (CCHS) sample]

	Emergency Department Visits [¥]		Medical Non-Elective Hospital Admissions ^{§¶}	
	Adjusted RR	95% CI	Adjusted RR	95% CI
Number With No Regular Medical Doctor*	1.22	1.02, 1.46	1.32	0.85, 2.06
Age (vs. 20–44 years)*				
65+ years	0.83	0.75, 0.91	2.04	1.57, 2.65
45–64 years	0.79	0.73, 0.85	1.62	1.27, 2.07
Male (vs. Female)*	1.05	0.98, 1.12	0.82	0.68, 0.98
Education (vs. High)				
Low	1.23	1.13, 1.34	0.78	0.62, 0.99
Medium	1.08	1.00, 1.16	0.92	0.73, 1.15
Income (vs. High)*				
Low	1.39	1.27, 1.52	0.90	0.70, 1.16
Medium	1.19	1.10, 1.29	0.93	0.73, 1.18
Self-Perceived Health* (vs. Excellent)				
Poor	1.36	1.26, 1.47	1.23	0.97, 1.55
Good	1.22	1.12, 1.32	1.08	0.86, 1.34
Depression*	1.07	0.99, 1.16	0.99	0.77, 1.28
Disability*	1.05	0.98, 1.13	1.12	0.90, 1.39
Rural[†] (vs. Large Urban)				
Smaller Urban	1.72	1.60, 1.86	1.42	1.17, 1.73
	1.30	1.20, 1.40	1.04	0.85, 1.28
ADG ≥ 6 (v s.0-5)^{‡¶}	1.41	1.32, 1.50	1.15	0.94, 1.41
RUB 4,5 (vs. 0.1)^{‡¶}				
3	1.96	1.68, 2.29	3.10	1.16, 8.27
	1.46	1.27, 1.68	2.44	0.95, 6.30
2	1.19	1.02, 1.39	2.30	0.87, 6.06

Note: CI = confidence interval

* Canadian Community Health Survey (CCHS) 2000–01, adults aged 20–74 years

¥ National Ambulatory Care Reporting System (NACRS) and Discharge Abstract Database (DAD), 2004–2006

§ Discharge Abstract Database (DAD), 2004–2006

† Rurality Index of Ontario, (RIO) [large urban 0–9, small urban 10–44, rural ≥ 45]

‡ Aggregated Diagnostic Groups and Resource Utilization Bands, Johns Hopkins Adjusted Clinical Groups, derived from Discharge Abstract Database (DAD) and Ontario Health Insurance Plan (OHIP) physician claims, 1999–2001

Our regression analysis of the CCHS sample (see Exhibit 4) shows that people who did not have a regular medical doctor were 1.22 (95% CI 1.02, 1.46) times more likely to have an ED visit and 1.32 (95% CI 0.85, 2.06) times more likely to have a medical non-elective hospital admission than those who did have a regular medical doctor. However, the latter finding did not reach statistical significance. Two factors—living in a rural area and being in poor health—were strongly associated with both ED visits and medical non-elective admissions. These results translate to an estimated 17,741 excess ED visits and 1,932 hospital admissions attributable to not having a regular medical doctor (see Exhibit 6).

Exhibit 5. Regression analysis for emergency department (ED) visits and medical non-elective hospital admissions, among respondents with at least one chronic condition, [20% percent random sample of the population]

	Emergency Department Visits [¥]		Medical Non-Elective Hospital Admissions [§]	
	Adjusted RR	95% CI	Adjusted RR	95% CI
Continuity (vs. ≥ 80.0%)				
< 3 visits	1.17	1.15, 1.19	1.19	1.13, 1.24
< 50.0%	1.55	1.53, 1.56	1.35	1.32, 1.38
50.0%–79.9%	1.25	1.24, 1.26	1.15	1.13, 1.17
Age (vs. 0–19 years)				
65+ years	0.74	0.73, 0.75	3.19	3.08, 3.31
45–64 years	0.81	0.80, 0.82	1.23	1.19, 1.28
Male (vs. Female)	1.05	1.05, 1.05	1.21	1.20, 1.23
Education (vs. Highest)				
Quartile 1	1.24	1.22, 1.25	1.19	1.16, 1.22
Quartile 2	1.18	1.17, 1.19	1.17	1.14, 1.19
Quartile 3	1.11	1.10, 1.12	1.13	1.10, 1.15
Income (vs. Quintile 5, Highest)				
Quintile 1	1.42	1.40, 1.44	1.32	1.28, 1.36
Quintile 2	1.23	1.22, 1.24	1.18	1.15, 1.21
Quintile 3	1.08	1.07, 1.09	1.09	1.07, 1.12
Quintile 4	1.04	1.03, 1.05	1.05	1.02, 1.07
High Unemployment (vs. Low)	1.13	1.12, 1.15	1.12	1.09, 1.15
High Aboriginal (vs. Low)	1.15	1.11, 1.19	1.27	1.18, 1.38
High Recent Immigration (vs. Low)	0.76	0.75, 0.77	0.83	0.81, 0.85
Rural[†] (vs. Large Urban)				
Smaller Urban	2.01	2.00, 2.03	1.25	1.22, 1.27
	1.43	1.42, 1.44	1.19	1.17, 1.21
ADG ≥ 6 (vs. 0–5)^{‡¶}	1.61	1.60, 1.63	1.46	1.43, 1.49
RUB 4,5 (vs. 0–3)^{‡¶}	1.78	1.77, 1.79	2.56	2.51, 2.60

Note: CI = confidence interval

[¥] National Ambulatory Care Reporting System (NACRS) and Discharge Abstract Database (DAD), 2006–2007

[§] Discharge Abstract Database (DAD), 2006–2007

[†] Rurality Index of Ontario, (RIO) [large urban 0–9, small urban 10–44, rural ≥ 45]

[‡] Aggregated Diagnostic Groups and Resource Utilization Bands, Johns Hopkins Adjusted Clinical Groups, derived from Discharge Abstract Database (DAD) and Ontario Health Insurance Plan (OHIP) physician claims, 1999–2001

Our regression analysis of the 20% random population sample (see Exhibit 5) demonstrated a similar increase in ED visits (RR = 1.17, 95% CI 1.15, 1.19) and in medical non-elective admissions (RR = 1.19, 95% CI 1.13, 1.24) among those with fewer than three visits to physicians in the previous two years. This translates to an estimated 16,868 excess ED visits and 3,863 hospital admissions (see Exhibit 6).

Exhibit 6. Emergency department (ED) visits, medical non-elective hospital admissions, and attributable risks among adult Ontarians with at least one chronic health condition, according to whether they had a regular medical doctor, to a history of fewer than three physician visits in the previous year, and to a low continuity of care history, [2000/01 Canadian Community Health Survey (CCHS) and 20% random sample of the population]

	No Regular Medical Doctor		Fewer Than Three Physician Visits		Low Continuity of Care	
	Emergency Department Visits	Hospital Admissions	Emergency Department Visits	Hospital Admissions	Emergency Department Visits	Hospital Admissions
Annual Visits/Admissions	60,986	5,690	76,610	11,035	279,415	45,250
Attributable Risk (RR-1) (95% CI)	0.22 (0.02, 0.46)	0.32 (-0.15, 1.06)	0.17 (0.15, 0.19)	0.19 (0.13, 0.24)	0.55 (0.53, 0.56)	0.35 (1.32, 1.38)
Exposed Attributable Fraction (%)* (95% CI)	0.18 (0.02, 31.5)	24.2 (-17.6, 51.5)	14.5 (13.0, 16.0)	0.16 (11.5, 19.4)	35.5 (34.6, 35.9)	25.9 (24.2, 27.5)
Population Attributable Fraction (%)** (95% CI)	1.0 (0.1, 2.1)	1.5 (-0.7, 4.7)	0.9 (0.8, 1.0)	1.0 (0.7, 1.2)	5.3 (5.1, 5.3)	3.4 (3.1, 3.7)
Annual Population Visits/Admissions	1,757,250	132,160	1,928,745	395,605	1,928,745	395,605
Excess Visits/Admissions Projected to 2021 (rise) Projected to 2031 (rise)	17,741 23,279 (31%) 27,408 (54%)	1,932 2,669 (38%) 3,127 (62%)	16,868 22,073 (31%) 26,260 (56%)	3,863 5,426 (40%) 6,983 (81%)	101,313 132,571 (31%) 157,717 (56%)	13,481 18,936 (40%) 24,370 (81%)

Note: CI = confidence interval

* Exposed attributable fraction (RR-1)/RR where RR = rate ratio, the proportion of emergency department visits and medical non-elective hospital admissions among those without a regular medical doctor/fewer than three physician visits/low continuity of care attributable to not having a regular medical doctor/fewer than three physician visits/low continuity of care

** Population attributable fraction $p(RR-1)/(1+p(RR-1))$ where p = the proportion of the population without a regular medical doctor/fewer than three physician visits/low continuity of care and RR = rate ratio, the proportion of emergency department visits and medical non-elective hospital admissions in the population attributable to not having a family doctor/having fewer than three physician visits/having low continuity of care

We also noted an increase in ED visits (RR = 1.55, 95% CI 1.53, 1.56) and medical non-elective hospital admissions (RR = 1.35, 95% CI 1.32, 1.38) among those with three or more physician visits and lower continuity of care based on the UPC index (< 50.0%). As we noted from the CCHS regression analysis, rural residence and higher morbidity and co-morbidity were strongly and independently associated with increased ED visits and medical non-elective hospital admissions.

These results translate to an estimated 101,313 excess ED visits and an estimated 13,481 excess hospital admissions (see Exhibit 6).

What happens when we project these findings, which are based on data from 2004–06 (CCHS sample) and from 2005–06 (20% random population sample), and apply them to Ontario’s future population?

- By the year 2021, we can expect excess ED visits by people with chronic illnesses who have no regular medical doctor or who have difficulty accessing care to increase by 31%; excess non-elective hospital admissions will increase by 38–40 percent.
- By the year 2031, we can expect excess ED visits by people with chronic illnesses who have no regular medical doctor or who have difficulty accessing care to increase by 54–56%; excess non-elective hospital admissions will increase by 62–81 percent (Exhibit 6).

Interpretation of Study Findings

Our analyses of data on Ontarians with chronic conditions showed that the vast majority of these people—90–95%—reported having a regular medical doctor at the time they were surveyed. Among these people, we observed a pattern of care which suggested few serious access barriers to primary care.

However, among the remaining minority, we were able to link three specific patient groups with potentially avoidable and costly demands on the health care system. These included tens of thousands of potentially avoidable ED visits and thousands of potentially avoidable medical non-elective hospital admissions. We believe that all three patient groups—those who did not have a regular medical doctor; those whose records showed relatively few physician visits in the previous two years; and those whose pattern of health system usage suggested low continuity of care—represent Ontarians with chronic illness who are having trouble accessing primary care.

As expected, those who did not have a regular medical doctor, those with few physician visits and those with low continuity of care (based on UPC index scores) were not representative of the population with at least one chronic condition. Observational designs are challenging. However, this type of study was essential for our purposes, since random assignment to care providers would have been ethically and logistically difficult.

The sub-groups of people we studied who had no regular medical doctor and who had made relatively few physician visits in the previous two years had lower levels of morbidity and co-morbidity compared to people in the general chronic disease population. As for the sub-groups of people with low continuity of care, they had higher levels of morbidity and co-morbidity compared to people in the general chronic disease population. Controlling for demographic factors and health status changed the direction of association in the former two groups, demonstrating the necessity of adjustment for case mix.

Without an experimental design, it is difficult to prove that the associations we observed are causal. Several features, however, do suggest a causal relationship. First, our findings of excess ED visits and non-elective medical admissions were consistent across two data sources (the 2000/01 CCHS and the 20% random population sample). The findings were likewise consistent across three different measures of difficulty accessing primary care (i.e., having no regular medical doctor; a recent history of fewer than three physician visits in two years; and a recent history of at least three visits and also lower continuity of care based on UPC index scores).

Continuity of care showed a gradient across low continuity (UPC index < 50.0%), medium continuity (UPC index >50.0–79.9%), and high continuity (UPC index ≥ 80%) for both the adjusted risk of ED visits and of medical non-elective hospital admissions. We found that risks for excess visits and admissions increased as continuity of care scores decreased. (Note: In this study, measures of exposure—not having a regular doctor, the number of physician visits and continuity of care—and measures of case mix were assessed during a time period prior to the outcomes, so the temporal sequence is correct.)

Both of our data sources (the 2000/01 CCHS and the 20% random population sample) made use of actual rather than self-reported health care utilization. They also involved populations that were representative of Ontario as a whole. Such data are difficult to obtain in many health systems outside Canada.

Previous studies have found that not having a regular source of medical care is associated with negative and potentially serious health consequences. For example, ED utilization among seniors in Quebec was found to be higher among those without a primary care physician and with low continuity of care.²¹ As we did in our own study, the Quebec researchers controlled for demographic and case mix differences; after adjusting for these factors, they noted excess ED visits of a similar magnitude to those observed in our low continuity of care group. However, that study did not examine hospital admissions and was limited to seniors.

Excess ED visits^{7,12} and hospital admissions¹¹ have also been reported among people without a regular source of medical care. A recent Health Council of Canada study²² found that 93 percent of Canadians with high impact/high prevalence chronic (HIHP) health conditions reported having a regular medical doctor; one-third (33 percent) said they had visited a hospital ED in the previous 12 months. (Both of these figures are comparable with our findings.)

In that study, one-third of people with chronic conditions who had visited an ED in the previous 12 months said they believed their most recent ED visit would not have been necessary if they could have been treated by their primary care provider (i.e., either they did not have a primary care doctor at the time, or else their doctor was not available at the time of their ED visit).

Limitations of the current study

This study examined specific health outcomes. Impacts on patients' quality of life, disability and preventive health care were not addressed, nor were other potential consequences of difficulty in accessing primary care.

Our study of health care utilization by Ontarians with chronic health conditions was also limited by the fact that all parts of the health care system were not included—for example, we did not look at all physician visits, diagnostic tests, medications, or post-hospitalization care in the community or in a health facility.

All three analyses yielded consistent results. However, our findings about the rates of medical non-elective hospital admissions among Ontarians with no regular medical doctor did not reach statistical significance. The wide confidence intervals reported reflect low power in that particular sample, even though three years of data were used.

The possibility exists that people in our study populations who had a recent history of few physician visits and patterns consistent with lower continuity of care actually did have a family doctor. The low number of visits and lower continuity of care we observed could be explained by other barriers to care, such as limited availability, long wait times or inconvenient access.

It is important to understand that a shortage of family doctors may have negative consequences even for those who do have regular physicians. In some communities and some practices, demand for care may exceed physicians' ability to provide timely care for urgent problems. Long waiting times for appointments can cause people with regular doctors to seek alternate sources of care such as emergency departments and walk-in clinics.

Another limitation is that our analyses did not identify those Ontarians who did not perceive themselves as needing a regular primary care physician, even though they were affected by at least one chronic health condition.

As we stated earlier, the 2000/01 Canadian Community Health Survey (CCHS) which was used to generate our data did not question respondents who did not have a family doctor about why this was the case. However, this question was included in the 2005 CCHS.

In that survey, 4.1 percent of Ontarians said they did not have a regular doctor because they could not find one who would accept them as new patients; 4.7 percent said the reason they did not currently have a regular doctor was because they had "not looked for one."²³ Since many Ontario communities are known to have no family doctors accepting new patients, "not looked for one" may reflect a situation of futility rather than the perception of not needing a doctor. (Unfortunately, data generated by the 2005 CCHS mentioned here were not available to us for linkage with health care utilization data at the time of the study. Thus it was not possible for us to further examine these sub-groups of respondents.)

A final potential limitation lies with the fact that Canadian census data, which we used to characterize area of residence, were from 2001. Results from the 2006 census were not fully available when our analyses for this study were carried out.

Summary and Conclusion

A number of initiatives are currently underway in Ontario and across Canada to improve access to primary health care—for people with and without chronic health conditions.

For example, after-hours telephone advice is now available in Ontario and in most other provinces. In addition, Ontario has established 150 inter-professional groups known as Family Health Teams (to date). These teams employ an approximately equal mix of physicians and non-physician health professionals who provide health care services throughout the province.

Certain demographic trends mean that more and more Canadians are moving into older age—many of them physicians nearing retirement. One net result is expected to be a serious shortage of physicians. A number of efforts are being implemented across the country to deal with this situation. These include increasing medical school enrollments and encouraging greater uptake of foreign-trained physicians residing in Canada. Organizing primary and secondary care and introducing systems to help patients manage their chronic conditions may also be required to achieve better control of chronic conditions and to lessen their impact on the health care system.^{24–26}

In summary, this study found substantial excess emergency department (ED) use and medical non-elective hospital admissions among sub-groups of Ontarians with chronic health conditions who reported that they did not have a regular primary care doctor. These excess ED visits and admissions could be associated with not having a source of regular medical care and/or with patients' difficulties accessing primary care. Future projections suggest a large increase in these impacts as our population ages.

An investment in primary health care for people with chronic conditions has the potential to reduce excess ED visits and non-elective hospital admissions. These potentially avoidable impacts on the health system contribute to the crowding of EDs and to related shortages of hospital beds. They are also highly likely to be associated with preventable suffering and clinical deterioration which can sometimes be irreversible.

We believe that, given these adverse consequences—both for the people of Ontario and for the province's health care system—implementing policies to address the current shortage of primary health care physicians in Ontario should be seen as a top health system priority.

Appendix: How the Research was Done

Regression analysis was used to assess and test the association between the independent variables and the outcomes while controlling for potential confounders. All covariates of interest were entered in the Poisson multivariate regression model simultaneously. All tests were two-sided, and statistical significance was defined at the 0.05 level. The analysis was conducted using SAS Version 9.1.

For the Canadian Community Health Survey (CCHS) analysis, regression was used to control for age, sex, education, income, self-perceived health, depression, disability and urban or rural location (all data obtained from the CCHS).

For the 20% random sample of the Ontario population, age, sex, morbidity and co-morbidity were captured at the individual level. Education, income, employment, immigration, and Aboriginal identity were captured at the census dissemination area level using the 2001 Canadian census.

- Education was defined as the quartile distribution of the percentage of the population aged 20 years of age or older without a high school diploma.
- Income was defined as the quintile distribution of the percentage of the population below the low-income cutoff.
- Aboriginal identity was defined as greater than 20 percent of the population who self-identified as belonging to an Aboriginal group.
- Unemployment was defined as greater than the 90th percentile (11.3 percent) aged 20 years of age or older who were currently unemployed.
- “Recent immigrant” was defined as greater than the 90th percentile (12.5 percent) in the distribution of the percentage of the population that immigrated to Canada between 1996 and 2001.
- Postal code was used to assign location using the Rurality Index of Ontario²⁷ with three levels: large urban (0–9), small urban (10–44) and rural (≥ 45).

The Johns Hopkins ACG system was additionally used to account for expected resource use and patient co-morbidity.^{17–19} This method of adjusting for case-mix has previously been used in Canada,²⁸ and has also been validated by U.S. researchers. The system utilizes individual level data to assign measures of resource use and co-morbidity from diagnoses during a specified time period, obtained from administrative records.

For the CCHS sample, Ontario Health Insurance Plan (OHIP) claims and hospital admissions from 1999–2001 were used to determine case mix. For the 20% random population sample, OHIP claims and hospital admissions from 2003–05 were used. The variables from the ACG software that were input into the model were: aggregated diagnostic groups (ADGs) to measure co-morbidity; and resource utilization bands (RUBs) to measure expected resource use.

All CCHS analyses were performed with the weight variable (WTSA_ON) provided by Statistics Canada to reflect sampling design and variation. Unweighted counts of less than 30 were not reported. Estimates with a coefficient of variation of $>33.3\%$ were not reported, while those between $16.5\text{--}33.3\%$ were reported as marginal estimates to be interpreted accordingly, as recommended by Statistics Canada. All confidence intervals and the co-efficients of variation were calculated by means of bootstrap methods with 500 replications using bootstrap weights provided by Statistics Canada. Model fit for Poisson regression was assessed using the ratio of deviance to degrees of freedom, with good fit being close to 1.

Outcome Measures

The primary outcome measures for this study were: the number of visits to an emergency department (ED) in 2005–06; the number of medical non-elective hospital admissions; and attributable ED visits and hospital admissions. Attributable risk was calculated as $RR-1$ (rate ratio); exposed attributable fraction was calculated as $(RR-1)/RR$; and population attributable fraction was calculated as $p(RR-1)/(1+p(RR-1))$ where p is the proportion of the population without a regular medical doctor, the proportion of the population with fewer than three physician visits, or the proportion of the population with low continuity of care scores, depending on the group examined.²⁹

Excess ED visits and medical non-elective admissions were calculated by multiplying the population attributable fraction times the annual number of ED visits and medical non-elective hospital admissions in the population.

Annual population ED visits and medical non-elective hospital admissions were derived for the CCHS sample by dividing three-year estimates by three; ED visits and medical non-elective hospital admissions were derived for the 20% random sample of the Ontario population by multiplying by five.

The age-specific prevalence of chronic conditions and the age-specific rate of ED visits and medical non-elective hospital admissions in 2005–06 were applied to Ontario population projections³⁰ to obtain projected estimates of ED visits and medical non-elective hospital admissions in 2021 and 2031. (The baby boom generation in Canada was born between 1946 and 1966; in 2031 the average member of this group will be turning 75 years of age).

Note: This study was approved by the Sunnybrook Health Sciences Centre Research Ethics Board.

References

1. Canadian Institute for Health Information. Canada's Health Care Providers: 2005 Chartbook. Ottawa: CIHI; 2005. Accessed May 20, 2008, at http://secure.cihi.ca/cihiweb/products/HCP_Chartbook05_e.pdf.
2. Statistics Canada. Canadian Community Health Survey (CCHS 3.1), 2003. Table 105-0458. Regular medical doctor, by age group and sex, household population aged 12 and over, Canada, provinces, territories, health regions (June 2005 boundaries) and peer groups, every 2 years. Accessed January 21, 2008, at http://cansim2.statcan.ca/cgi-win/CNSMCGI.EXE?&Lang=E&ArrayId=105-0458&Array_Pick=1&Detail=1&ResultTemplate=CII/CII___&RootDir=CII/.
3. Canadian Institute for Health Information. Family Physicians Accepting New Patients: Comparison of 2001 Janus Survey and 2004 National Physician Survey Results. Ottawa: CIHI; 2005. Accessed May 20, 2008, at http://secure.cihi.ca/cihiweb/en/downloads/PDAB2-2005_FP_accept_new_pt_e.pdf.
4. Starfield B. Primary care and health. A cross-national comparison. *JAMA*. 1991; 266(16):2268–71.
5. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q*. 2005; 83(3):457–502.
6. Engstrom S, Foldevi M, Borgquist L. Is general practice effective? A systematic literature review. *Scand J Prim Health Care*. 2001; 19(2):131–44.
7. Oster A, Bindman AB. Emergency department visits for ambulatory care sensitive conditions: insights into preventable hospitalizations. *Med Care*. 2003; 41(2):198–207.
8. Bindman AB, Grumbach K, Osmond D, Vranizan K, Stewart AL. Primary care and receipt of preventive services. *J Gen Intern Med*. 1996; 11(5):269–76.
9. O'Connor PJ, Desai J, Rush WA, Cherney LM, Solberg LI, Bishop DB. Is having a regular provider of diabetes care related to intensity of care and glycemic control? *J Fam Pract*. 1998; 47(4):290–7.
10. Saultz JW, Lochner J. Interpersonal continuity of care and care outcomes: a critical review. *Ann Fam Med*. 2005; 3(2):159–66.
11. Gill JM, Mainous AG. The role of provider continuity in preventing hospitalizations. *Arch Fam Med*. 1998; 7(4):352–7.
12. Gill JM, Mainous AG, Nsereko M. The effect of continuity of care on emergency department use. *Arch Fam Med*. 2000; 9(4):333–8.
13. Qi V, Phillips SP, Hopman WM. Determinants of a healthy lifestyle and use of preventive screening in Canada. *BMC Public Health*. 2006; 6:275.
14. McIsaac WJ, Fuller-Thomson E, Talbot Y. Does having regular care by a family physician improve preventive care? *Can Fam Physician*. 2001; 47(1):70–6.
15. Talbot Y, Fuller-Thomson E, Tudiver F, Habib Y, McIsaac WJ. Canadians without regular medical doctors. Who are they? *Can Fam Physician*. 2001; 47(1):58–64.
16. Broemeling AM, Watson D, Black C. Chronic Conditions and Co-morbidity Among Residents of British Columbia. Vancouver: Centre for Health Services and Policy Research; 2005. Accessed May 20, 2008, at <http://www.chspr.ubc.ca/files/publications/2005/chspr05-08.pdf>.
17. Johns Hopkins Bloomberg School of Public Health. The Johns Hopkins ACG Case-Mix Adjustment System. Accessed May 20, 2008, at <http://www.acg.jhsph.edu>.
18. Weiner JP, Starfield BH, Steinwachs DM, Mumford L. Development and application of a population-oriented measure of ambulatory care case-mix. *Med Care*. 1991; 29(5):452–72.
19. Starfield B, Weiner J, Mumford L, Steinwachs D. Ambulatory care groups: A categorization of diagnoses for research and management. *Health Serv Res*. 1991; 26(1):53–74.
20. Breslau N, Reeb KG. Continuity of care in a university-based practice. *J Med Educ*. 1975; 50(10):965–9.
21. Ionescu-Iltu R, McCusker J, Ciampi A, Vadeboncoeur AM, Roberge D, Larouche D, et al. Continuity of primary care and emergency department utilization among elderly people. *CMAJ*. 2007; 177(11):1362–8.

22. Health Council of Canada. Canadians' Experiences with Chronic Illness Care in 2007. A Data Supplement to Why Health Care Renewal Matters: Learning from Canadians with Chronic Conditions. Toronto: The Council; 2007. Accessed May 20, 2008, at <http://www.healthcouncilcanada.ca/docs/rpts/2007/outcomes2/Outcomes2ExperiencesFINAL.pdf>.
23. Statistics Canada. Canadian Community Health Survey 3.1, 2005. Table 105-0458. Regular medical doctor, by age group and sex, household population aged 12 and over, Canada, provinces, territories, health regions (June 2005 boundaries) and peer groups, every 2 years. Accessed May 20, 2008 at <http://cansim2.statcan.ca/cgi-win/CNSMCGI.EXE?&Lang=E&Arrayd=105-0458&Array Pick=1&ResultTemplate=CII/CII&RootDir=CII/>.
24. Weingarten SR, Henning JM, Badamgarav E, Knight K, Hasselblad V, Gano A Jr, et al. Interventions used in disease management programmes for patients with chronic illness: Which ones work? Meta-analysis of published reports. *BMJ*. 2002; 325(7370):925.
25. Powell H, Gibson PG. Options for self-management education for adults with asthma. *Cochrane Database Syst Rev*. 2003; (1):CD004107.
26. Effing T, Monninkhof EM, van der Valk PD, van der Palen J, van Herwaarden CL, Partidge MR, et al. Self-management education for patients with chronic obstructive pulmonary disease. *Cochrane Database Syst Rev*. 2007; (4):CD002990.
27. Kralj B. Measuring "rurality" for purposes of health-care planning: an empirical measure for Ontario. *Ont Med Rev*. 2000; 67(9):33-52.
28. Reid RJ, MacWilliam L, Verhulst L, Roos N, Atkinson M. Performance of the ACG case-mix system in two Canadian provinces. *Med Care*. 2001; 39(1):86-99.
29. Spasoff RA. *Epidemiologic Methods for Health Policy*. New York: Oxford University Press; 1999. pp 50-1.
30. Ontario Ministry of Finance. Ontario Population Projections Update 2006-2031. Accessed May 20, 2008, at <http://www.fin.gov.on.ca/english/economy/demographics/projections/2007>.