Healthcare Costs Attributable to Hypertension

Canadian Population-Based Cohort Study

Colin G. Weaver, Fiona M. Clement, Norm R.C. Campbell, Matthew T. James, Scott W. Klarenbach, Brenda R. Hemmelgarn, Marcello Tonelli, Kerry A. McBrien; for the Alberta Kidney Disease Network and the Interdisciplinary Chronic Disease Collaboration

Abstract—Accurately documenting the current and future costs of hypertension is required to fully understand the potential economic impact of currently available and future interventions to prevent and treat hypertension. The objective of this work was to calculate the healthcare costs attributable to hypertension in Canada and to project these costs to 2020. Using population-based administrative data for the province of Alberta, Canada (>3 million residents) from 2002 to 2010, we identified individuals with and without diagnosed hypertension. We calculated their total healthcare costs and estimated costs attributable to hypertension using a regression model adjusting for comorbidities and sociodemographic factors. We then extrapolated hypertension-attributable costs to the rest of Canada and projected costs to the year 2020. Twenty-one percent of adults in Alberta had diagnosed hypertension in 2010, with a projected increase to 27% by 2020. The average individual with hypertension had annual healthcare costs of $5768, of which $2341 (41%) were attributed to hypertension. In Alberta, the healthcare costs attributable to hypertension were $1.4 billion in 2010. In Canada, the hypertension-attributable costs were estimated to be $13.9 billion in 2010, rising to $20.5 billion by 2020. The increase was ascribed to demographic changes (52%), increasing prevalence (16%), and increasing per-patient costs (32%). Hypertension accounts for a significant proportion of healthcare spending (10.2% of the Canadian healthcare budget) and is projected to rise even further. Interventions to prevent and treat hypertension may play a role in limiting this cost growth. (Hypertension. 2015;66:502-508. DOI: 10.1161/HYPERTENSIONAHA.115.05702.)

Key Words: cardiovascular diseases ■ cost of illness ■ healthcare costs ■ healthcare economics and organization ■ hypertension

Hypertension affects ≈1 in 5 Canadian adults.1,2 It is an important modifiable risk factor for cardiovascular diseases, accounting for 54% of strokes and 47% of ischemic heart disease.3 The economic burden of cardiovascular disease is considerable; healthcare costs for cardiovascular disease were estimated to be $11.7 billion CAD in Canada in 2008 (2010 dollars).4 Although the costs of treating cardiovascular disease in Canada have been quantified,4 the healthcare costs that can be attributed to hypertension are unknown. Interventions to prevent and treat hypertension have been shown to be effective. For example, dietary salt reduction initiatives,5 weight loss programs,6 and exercise programs7,8 have been shown individually to lead to decreases in systolic and diastolic blood pressures. Furthermore, recent studies in the United States have found that both population reductions in dietary sodium and guideline-concordant care would lead to cost savings.9,10 Documenting the attributable costs of hypertension in the Canadian context is required to fully understand the economic burden of hypertension in a publicly funded healthcare system and the potential economic impact of prevention and treatment programs.

Using population-based administrative data from Alberta, and the perspective of the publicly funded healthcare system, we estimated the direct annual attributable cost of diagnosed...
hypertension for the years 2002 to 2010. We then projected the national prevalence and attributable cost of diagnosed hypertension to 2020.

Methods

Data Sources

We used population-level data from the Alberta Kidney Disease Network for the years 1994 to 2011 (www.akdn.info).11 This provincial network links Alberta administrative data files for all residents with public health insurance (>99% of the population). Cost data were available from 2002 to 2010 and included all direct healthcare costs, for hypertension and hypertension-related diseases, as well as other diseases. Costs included hospitalizations, physician claims, and ambulatory care (emergency department use, day surgery, and diagnostic imaging). Costs for prescription medications were only available for residents aged ≥65 years because only these individuals have a universal publicly funded drug plan.

Population

We identified individuals with diagnosed hypertension using a validated case definition from physician and hospital diagnosis codes (2 physician claims within 2 years or 1 hospitalization).12 A 3-year prestudy wash-out period and a 1-year poststudy wash-out period were used to define incident cases of hypertension. Hypertension status was therefore available from 1998 to 2010.

Individual characteristics including age, sex, and First Nations status were available from the health insurance registry. Postal code data were used to determine rural or urban location of residence and was linked to Statistics Canada Census information to identify individuals’ aggregate neighborhood income quintile. Physician and hospital diagnosis codes were used to identify 17 Charlson comorbidities13 (which include cardiovascular diseases) as well as the Charlson morbidity index, a measure of the burden of chronic disease and a predictor of mortality.14,15

Costs

Hospitalization costs were calculated using the Canadian Institute for Health Information’s case mix grouper. The groupers are developed based on 3 broad characteristics: (1) the most responsible diagnosis, (2) the severity of illness based on secondary diagnoses, and (3) the risk of mortality of given subgroups based on secondary diagnoses, age, sex, and the presence of nonoperative procedures. A resource intensity weight is developed for each grouper which is a weight representing the severity of the cases included in a specific grouper compared with the average patient. The grouper cost is calculated by multiplying the resource intensity weight by the average cost. Ambulatory care costs were derived in a similar fashion using Alberta’s Ambulatory Care Classification System groupers. Physician claims costs are the total amount paid by the government, and total prescription drug costs were available for dispensed medications. Total annual costs were calculated for each individual. All costs were inflated to 2014 Canadian dollars using Statistic Canada’s Consumer Price Index16 ($1 CAD=$0.94 USD, July 1, 201416).

Statistical Analysis

Crude and age- and sex-standardized annual hypertension prevalence for the years 1998 to 2010 was calculated. The annual mean per-patient attributable cost of diagnosed hypertension was estimated using an econometric approach. This method estimates the difference in cost between a cohort with a disease and one without disease; it compares the total costs of care using regression analysis to account for confounding factors. Specifically, for each year between 2002 and 2010, we divided the population into 5 age groups (18–44, 45–54, 55–64, 65–74, ≥75 years). We then used a regression model, with total cost as the dependent variable and hypertension as the independent variable, to adjust for age, sex, First Nations status, residence (urban or rural), neighborhood income quintile, and the 17 Charlson comorbidities. We calculated the attributable cost of hypertension as the difference between the average predicted cost for those with hypertension and the average predicted cost for the same group, assuming no hypertension (ie, the predicted cost when the hypertension dummy variable was set to zero).17 Given the skewed distribution and zero mass inherent in cost data, we examined 6 candidate regression models and found the best fit was with a 2-part Gamma model with a log link.18 We compared the models using mean absolute error, root mean squared error, and the Bayesian information criteria. Missing data were only present for 0.2% of the population and these individuals were excluded from the regression analyses. We also calculated the hypertension-attributable costs by cost type: hospitalizations, ambulatory care, physician claims, and drug costs (for those aged ≥65 years).

We conducted 2 sensitivity analyses on the per-patient attributable cost. First, to account for possible overadjustment for diseases caused by hypertension,18 we omitted the following 5 comorbidities from the regression model: myocardial infarction, stroke, congestive heart failure, peripheral vascular disease, and renal disease. Second, we conducted a matched analysis as an alternative to regression analysis. Within each age group, individuals with hypertension were matched to an individual without hypertension using their propensity for having hypertension.18 The propensity took into account the same variables as the regression analysis, and matching was done with replacement on the logit of the propensity score (calipers of 0.2 of the SD of the logit propensity). The attributable cost of hypertension was calculated as a weighted average of the difference between the cost of those with hypertension and their matched nonhypertensive controls.

Cost Projections

A logistic regression model was used to project annual prevalence for each age and sex combination. Population projections by age and sex were obtained from Statistics Canada.19 We used a linear regression model to project, by age group, increases in average attributable costs. To estimate population costs, we multiplied projected prevalence rates by the projected population and projected costs and summed these across age groups. We determined the contribution to

Table 1. Demographic Characteristics for Those With and Without Hypertension in Alberta, Canada, 2010

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Without Hypertension</th>
<th>With Hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD), y</td>
<td>39.4 (14.4)</td>
<td>62.3 (14.7)</td>
</tr>
<tr>
<td>Age, % ≥65 y</td>
<td>5.2</td>
<td>44.1</td>
</tr>
<tr>
<td>Sex, % female</td>
<td>49.9</td>
<td>51.4</td>
</tr>
<tr>
<td>First Nations status, %</td>
<td>3.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Residence, % rural</td>
<td>11.3</td>
<td>14.2</td>
</tr>
<tr>
<td>Socioeconomic status, % in lowest neighborhood income quintile</td>
<td>19.6</td>
<td>19.9</td>
</tr>
<tr>
<td>Annual mortality rate, %</td>
<td>0.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Comorbidities, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of myocardial infarction</td>
<td>0.3</td>
<td>5.4</td>
</tr>
<tr>
<td>History of stroke</td>
<td>0.6</td>
<td>5.5</td>
</tr>
<tr>
<td>History of congestive heart failure</td>
<td>0.3</td>
<td>6.4</td>
</tr>
<tr>
<td>History of peripheral vascular disease</td>
<td>0.3</td>
<td>3.6</td>
</tr>
<tr>
<td>History of renal disease</td>
<td>0.3</td>
<td>4.4</td>
</tr>
<tr>
<td>Charlson Comorbidity Score, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>83.5</td>
<td>49.8</td>
</tr>
<tr>
<td>1</td>
<td>12.2</td>
<td>25.6</td>
</tr>
<tr>
<td>2</td>
<td>2.9</td>
<td>11.5</td>
</tr>
<tr>
<td>&gt;2</td>
<td>1.4</td>
<td>13.1</td>
</tr>
</tbody>
</table>
the change in population cost of the following 4 factors by holding each one constant in turn: population size, population age and sex structure, age- and sex-specific hypertension prevalence, and per-person hypertension-attributable costs. Finally, we estimated the current population costs and those anticipated in 2020 at the national level by extrapolating the findings in Alberta to the Canadian population, taking into account relative differences in per capita health expenditures, medical inflation rates, age composition (of both the general and the hypertensive populations), and age- and sex-specific hypertension prevalence. We used publicly available data for per capita health expenditure from the Canadian Institute for Health Information,20 population projections from Statistics Canada,19 and published estimates of national age- and sex-specific hypertension prevalence rates.3

All statistical analyses were done in Stata (version 11.2/MP, Stata Corporation, College Station, TX). Ethics approval for this study was obtained from the Conjoint Health Research Ethics Board at the University of Calgary.

Results

Standardized to the 2006 Alberta population, the prevalence of diagnosed hypertension increased from 13.0% in 1998 to 21.0% in 2010, with a projected prevalence of 23% by 2020 (27% unstandardized in 2020).

Table 1 depicts the characteristics of individuals with and without hypertension in 2010. Individuals with hypertension...
Weaver et al

Healthcare Costs Attributable to Hypertension

505

were older (44.1% versus 5.2%, aged ≥65 years) and had more comorbidities than those without (50.2% versus 16.5% with at least 1 comorbidity).

The direct healthcare cost of caring for individuals with hypertension increased over time, from an average of $4833 per person in 2002 to $5768 in 2010, excluding medication costs (Figure 1; regression model estimates are provided in Table S1 in the online-only Data Supplement). The per-person attributable cost of hypertension increased from $1923 in 2002 to $2341 in 2010. Costs related to hospitalizations were the largest component of the costs at all time points (Figure 2).

The attributable cost of hypertension varied significantly with age; the 2010 per person attributable cost ranged from $1990 in the 18- to 44-year-old age category to $3522 in the 75-year-old and over age category (Table 2).

We estimated the population attributable cost of hypertension in Alberta to be $1.42 billion in 2010, with a projected increase to $2.8 billion in 2020. Thirty percent of the projected $1.4 billion increase was because of population growth (from 2.9 to 3.5 million adults), 22% was because of an aging population (from 13.5% to 17.5% of adults being ≥65 years), 16% was because of increasing age- and sex-specific hypertension prevalence (from a standardized 21.0% to 23%), and 32% was because of increasing per-patient hypertension-attributable costs (from $2341 to $2900; Figure 3).

Extrapolating these 2010 data to the whole of Canada, we estimated a per-person attributable cost of hypertension of $2053 and a total $13.9 billion in direct healthcare spending attributable to hypertension (Table 3). We projected that the total Canadian hypertension-attributable cost will reach $20.5 billion in 2020.

In sensitivity analyses, when we excluded hypertension-related complications from the model we found a higher 2010 attributable cost estimate, $2581 per hypertensive patient (10% greater than our primary analysis result of $2341). Using a matched analysis, we obtained a 2010 per-patient attributable estimate of $2072 (11% less than our primary analysis). Of note, matching with replacement resulted in multiple hypertensive patients being matched to the same nonhypertensive individuals (average in 55- to 64-year age group, 41.3:1). Covariate values were similar in the matched pairs; the greatest mean standardized difference of all the covariates between the matched individuals in any of the 5 age groups was 1.6%.

Discussion

On average, we found that individuals with diagnosed hypertension had an annual direct healthcare cost of $5768, 41% of which ($2341) was attributed to hypertension. We estimated that the total direct healthcare cost attributable to hypertension in Alberta was $1.4 billion in 2010, with a projected increase to $2.8 billion by 2020. Translated to the national level, the cost of hypertension in 2010 was estimated at $13.9 billion, with a projected increase to $20.5 billion by 2020.

The projected $1.4 billion increase in hypertension-attributable costs in Alberta from 2010 to 2020 was ascribed to 4 components: an aging population, a growing population, increasing per-patient costs, and increasing hypertension prevalence. The latter 2, increasing per-patient costs and prevalence, are potentially modifiable. Increasing age-specific
per-patient costs may be caused by increased disease severity (ie, for a given age, hypertensive patients are tending to have had hypertension for longer) or by the use of more expensive health technologies. Relatively affordable interventions for the prevention and treatment of hypertension have been shown to reduce blood pressure as well as associated cardiovascular diseases and costs,5–6,22 which could have a direct effect on prevalence and an indirect effect on per-patient costs.

Although guideline-adherent treatment has been shown to be cost-saving, this is often challenging to attain in practice. However, a 2010 Cochrane review23 of randomized controlled trials examining interventions to improve blood pressure control found that self-monitoring and organized, regular reviews of patients resulted in improved blood pressure control. These interventions, and potentially other novel interventions, including pharmacy-based management or team-based care may help limit the per hypertensive patient cost growth. Keeping age- and sex-specific prevalence rates at 2010 levels would save $0.2 billion annually in Alberta and $2.4 billion in Canada by 2020 (1.2% of the 2010 Alberta healthcare budget and 8.4% of the 2020 hypertension-attributable costs). More aggressive measures may lower prevalence rates, not just limit their increase, leading to even greater reductions in morbidity and costs.

The current focus of many health systems is on treating the sequelae of hypertension, such as myocardial infarction, stroke, and dialysis.24,25 Although such treatments effectively reduce morbidity and mortality, they are also costly. Refocusing efforts on primary prevention or treatment, rather than treating the acute consequences of hypertension, may have a significant impact on costs in the long term.

We used a regression-based approach applied to individual-level cost data to estimate the per-person attributable cost of hypertension. Therefore, our estimate accounts for the cost of treating hypertension, differences in spending resulting from the complicating effect of hypertension, such as more frequent visits or longer length of stay in hospital, as well as conditions associated with hypertension not captured in the 17 Charlson comorbidities.17 Even so, we used a conservative approach in our base case estimate, adjusting our model for conditions for which hypertension is often upstream in the chain of causality (cardiovascular diseases, renal disease). Our sensitivity analysis showed that not adjusting for these diseases would have resulted in estimates that were 10% higher. Conversely, the matched sensitivity analysis gave estimates that were 11% lower than our primary analysis. We are less confident in the matched analysis because of the high prevalence of hypertension in older age groups, and thus the need to rely on relatively few nonhypertensive patients for the matched analysis (eg, in 2010 and in the 55- to 64-year age group, the average number of hypertensives per nonhypertensive was 41.3, with a maximum of 4063).

We compared our findings with those of other jurisdictions. Using data from the Canadian Institute for Health Information,20 we estimated the proportion of total health care spending attributable to hypertension as 8.2% for Alberta and 10.2% for Canada in 2010 (nationally $13.9 billion of $136 billion).20 Using American figures we estimated that a similar proportion (12.0% of direct healthcare spending) was attributed to hypertension in that country ($130.7 of $1087 billion USD 2008).26,27 Similarly, our Canadian growth projection of $13.9 billion in 2010 to $20.5 billion in 2020 is comparable with the US projections ($130.7 in 2010 to $222.5 billion in 2020 [USD 2008]).27 Finally, using US census,28 hypertension prevalence, and cost data,27 we estimate that the hypertension-attributable cost per patient in the United States ($1648 USD 2008) is similar to that in Canada ($1998). Internationally, a 2009 study estimated that 9.7% of direct healthcare costs can be attributed to hypertension in high-income countries.29

Our study has limitations. First, our study was observational in design, leaving the possibility of residual confounding. We were not able to adjust for race, ethnicity (apart from First Nations status), cigarette smoking, alcohol consumption, body mass index, diet, and dyslipidemia. However, in our primary analysis we controlled for disease complications that are common to these factors and hypertension, which would have taken into account much of the cost associated with these potentially confounding factors. Second, although we made every effort to adjust for other conditions, our regression analysis may have misattributed costs.30 Furthermore, hypertension is often upstream in the chain of causality and a complicating factor for other conditions. Third, using an administrative definition of hypertension, we will have misclassified some patients. Although some types of misclassification may have biased our results toward overestimation of costs, the underdiagnosis of hypertension31 and the resulting misappropriation of these costs to the nonhypertensive cohort likely overpowers these effects. Furthermore, we did not account for the burden of disease attributed to suboptimal blood pressures that do not meet the formal definitions for hypertension. Fourth, we did not have access to long-term care costs or drug costs for those aged <65 years; our hypertension-attributable cost estimates would have been larger with access to these data sources. Likewise, we did not examine the indirect (societal) costs of hypertension, which are also substantial (estimated at 16.3% of the total attributable cost of hypertension in the United States in 2010). Finally, although our cohort was limited to Alberta, we expect our main findings to be generalizable to other jurisdictions, and we have shown that they are comparable with American and other developed-world estimates.

Our study has several strengths including data from a large population-based cohort, which assured
comprehensive sociodemographic and geographic representation. Furthermore, because of our publicly funded and administered healthcare system, clinical and cost data were available for nearly every resident (>99% of the population). Another strength of our study was its use of linked clinical, cost, sociodemographic, and residency data. As well, the size of our cohort (2.9 million in 2010) ensures that our findings are not affected by a small number of outlier cases, and the longitudinal nature of our data allowed us to robustly assess historic trends and project hypertension prevalence and costs into the future. Finally, with the availability of individual-level data, we were able to use the econometric method of calculating disease-attributable costs. This method allows all healthcare utilization to be included and takes into account individual variability in disease severity.\textsuperscript{17}

Perspectives

Using comprehensive healthcare utilization data for a large population-based cohort and econometric regression modeling to estimate the attributable cost of hypertension, we found the costs attributable to hypertension to be considerable: $13.9 billion in Canada or 10.2% of direct healthcare spending nationally. The cost of hypertension is expected to increase, in part because of population growth and aging, but also because of per-patient cost increases and increases in standardized prevalence. Increased uptake of interventions for the prevention and treatment of hypertension has potential to limit this cost growth.

Sources of Funding

F.M. Clement is supported by a Harkness/Canadian Foundation for Healthcare Improvement Fellowship in Healthcare Policy and Practice. B.R. Hemmelgarn is supported by the Roy and Vi Baay Chair in Kidney Research. The Interdisciplinary Chronic Disease Collaboration is funded by Alberta Innovates Health Solutions–Collaborative Research and Innovation Opportunities Team Grants Program.

Disclosures

None.

References

27. Heidenreich PA, Trogdon JG, Khavjou OA, et al; American Heart Association Advocacy Coordination Committee; Stroke Council; Council on Cardiovascular Radiology and Intervention; Council on Clinical Cardiology; Council on Epidemiology and Prevention; Council on Arteriosclerosis; Thrombosis and Vascular Biology; Council on Cardiovascular Pulmonary; Critical Care; Perioperative and Resuscitation; Council on...


---

### Novelty and Significance

**What Is New?**
- To our knowledge, this is the first study to use a large population-based cohort (>2 million adults and >99% of the residents of Alberta, Canada) to estimate the healthcare costs attributable to hypertension.

**What Is Relevant?**
- Our study estimated 10.2% of direct healthcare spending in Canada can be attributed to hypertension, similar to estimates of 12.0% in the United States and 9.7% in high-income countries.
- The direct healthcare costs attributable to hypertension are expected to increase 95% from 2010 to 2020 in Alberta, Canada. This increase is because of demographic changes (52%), per-patient cost increases (32%), and increasing prevalence rates (16%).

---

**Summary**

The attributable cost of hypertension is significant. Increased uptake of interventions for the prevention and treatment of hypertension has potential to limit this cost growth.
Healthcare Costs Attributable to Hypertension: Canadian Population-Based Cohort Study
Colin G. Weaver, Fiona M. Clement, Norm R.C. Campbell, Matthew T. James, Scott W. Klarenbach, Brenda R. Hemmelgarn, Marcello Tonelli and Kerry A. McBrien
for the Alberta Kidney Disease Network and the Interdisciplinary Chronic Disease Collaboration

Hypertension. 2015;66:502-508; originally published online July 13, 2015;
doi: 10.1161/HYPERTENSIONAHA.115.05702
Hypertension is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2015 American Heart Association, Inc. All rights reserved.
Print ISSN: 0194-911X. Online ISSN: 1524-4563

The online version of this article, along with updated information and services, is located on the
World Wide Web at:
http://hyper.ahajournals.org/content/66/3/502

Data Supplement (unedited) at:
http://hyper.ahajournals.org/content/suppl/2015/07/13/HYPERTENSIONAHA.115.05702.DC1

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Hypertension can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Hypertension is online at:
http://hyper.ahajournals.org/subscriptions/
Online Supplement

Health Care Costs Attributable to Hypertension: a Canadian Population-Based Cohort Study

Colin G. Weaver BSc1,2, Fiona Clement PhD1,2, Norman Campbell MD1,2,3,4, Matthew T. James MD PhD1,2,3,4, Scott Klarenbach MD MSc5, Brenda R. Hemmelgarn MD PhD1,2,3,4, Marcello Tonelli MD SM1,3, Kerry A. McBrien MD MPH1,2,6; for the Alberta Kidney Disease Network (AKDN) and the Interdisciplinary Chronic Disease Collaboration (ICDC)

1. Department of Community Health Sciences, Cumming School of Medicine, University of Calgary
2. O’Brien Institute for Public Health, Cumming School of Medicine, University of Calgary, Calgary
3. Department of Medicine, Cumming School of Medicine, University of Calgary, Calgary
4. Libin Cardiovascular Institute, Cumming School of Medicine, University of Calgary, Calgary
5. Department of Medicine, Faculty of Medicine and Dentistry, University of Alberta, Edmonton
6. Department of Family Medicine, Cumming School of Medicine, University of Calgary, Calgary

Correspondence to:
Dr. Kerry McBrien
Teaching Research and Wellness Building
3280 Hospital Drive NW
Calgary, Alberta; T2N 4Z6
Phone: 403-210-8625
Fax: 403-270-4329
kamcbrie@ucalgary.ca
Table S1. Regression estimates from one of the 45 groups in the primary analysis (2010, age group 65-74). We used a two-part model, with a logistic model identifying patients with non-zero annual costs, and a Gamma regression model with a log link estimating the non-zero cost.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logistic model (n = 207,033)</th>
<th></th>
<th>Gamma model (n = 195,121)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR*</td>
<td>95% CI</td>
<td>P Value</td>
<td>RR</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.25</td>
<td>0.24</td>
<td>0.26 &lt;0.001</td>
<td>1.47</td>
</tr>
<tr>
<td>Aged 70-74 (reference group: 65-69)</td>
<td>0.93</td>
<td>0.89</td>
<td>0.96 &lt;0.001</td>
<td>1.13</td>
</tr>
<tr>
<td>Sex (Male)</td>
<td>1.50</td>
<td>1.44</td>
<td>1.55 &lt;0.001</td>
<td>1.05</td>
</tr>
<tr>
<td>Status First Nations</td>
<td>1.26</td>
<td>1.08</td>
<td>1.47 0.003</td>
<td>1.23</td>
</tr>
<tr>
<td>Urban</td>
<td>1.07</td>
<td>1.01</td>
<td>1.12 0.018</td>
<td>0.97</td>
</tr>
<tr>
<td>Neighbourhood income quintile (reference group: lowest)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>0.79</td>
<td>0.74</td>
<td>0.84 &lt;0.001</td>
<td>0.92</td>
</tr>
<tr>
<td>3rd</td>
<td>0.76</td>
<td>0.71</td>
<td>0.80 &lt;0.001</td>
<td>0.89</td>
</tr>
<tr>
<td>4th</td>
<td>0.69</td>
<td>0.65</td>
<td>0.73 &lt;0.001</td>
<td>0.91</td>
</tr>
<tr>
<td>5th (highest income)</td>
<td>0.64</td>
<td>0.60</td>
<td>0.67 &lt;0.001</td>
<td>0.85</td>
</tr>
<tr>
<td>Cancer</td>
<td>0.26</td>
<td>0.23</td>
<td>0.29 &lt;0.001</td>
<td>1.55</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>0.64</td>
<td>0.55</td>
<td>0.74 &lt;0.001</td>
<td>1.33</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>0.66</td>
<td>0.56</td>
<td>0.79 &lt;0.001</td>
<td>1.76</td>
</tr>
<tr>
<td>Congestive obstructive pulmonary disease</td>
<td>0.34</td>
<td>0.32</td>
<td>0.37 &lt;0.001</td>
<td>1.49</td>
</tr>
<tr>
<td>Dementia</td>
<td>0.51</td>
<td>0.41</td>
<td>0.64 &lt;0.001</td>
<td>2.25</td>
</tr>
<tr>
<td>Diabetes (with complications)</td>
<td>0.64</td>
<td>0.52</td>
<td>0.79 &lt;0.001</td>
<td>1.61</td>
</tr>
<tr>
<td>Diabetes (without complications)</td>
<td>0.45</td>
<td>0.42</td>
<td>0.49 &lt;0.001</td>
<td>1.16</td>
</tr>
<tr>
<td>Condition</td>
<td>OR</td>
<td>CI</td>
<td>RR</td>
<td>P-value</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>---------</td>
</tr>
<tr>
<td>Human immunodeficiency virus (HIV)</td>
<td>0.48</td>
<td>0.11</td>
<td>2.02</td>
<td>0.32</td>
</tr>
<tr>
<td>Metastatic solid tumour</td>
<td>1.10</td>
<td>0.82</td>
<td>1.46</td>
<td>0.53</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>0.56</td>
<td>0.48</td>
<td>0.67</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mild liver disease</td>
<td>0.55</td>
<td>0.41</td>
<td>0.74</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Moderate or severe liver disease</td>
<td>0.57</td>
<td>0.25</td>
<td>1.30</td>
<td>0.18</td>
</tr>
<tr>
<td>Hemiplegia</td>
<td>0.64</td>
<td>0.39</td>
<td>1.03</td>
<td>0.065</td>
</tr>
<tr>
<td>Peptic ulcer disease</td>
<td>0.44</td>
<td>0.36</td>
<td>0.54</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>0.60</td>
<td>0.50</td>
<td>0.72</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Renal disease</td>
<td>0.71</td>
<td>0.57</td>
<td>0.87</td>
<td>0.001</td>
</tr>
<tr>
<td>Rheumatologic disease</td>
<td>0.26</td>
<td>0.20</td>
<td>0.33</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

OR indicates odds ratio; CI, confidence interval; RR, rate ratio
*The odds ratio is for the odds of having annual health care costs of $0.