



Income-related Disparities in Private Prescription Drug Coverage in Canada: A Cross-sectional Survey Analysis

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Abstract:	<p>Introduction: Canada does not have universal public coverage for prescription drugs, leaving a significant role for private insurance. However, we do not have recent on the characteristics of Canadians who report holding such private coverage, particularly differences based on household income.</p> <p>Methods: We used data 97,900 respondents to the 2015-2016 cycle of the Canadian Community Health Survey (CCHS) to investigate the relationship between household income and holding private drug insurance coverage. We constructed modified multivariate Poisson regression model with robust error variances including several potential confounders.</p> <p>Results: Overall, 59.4% of Canadians reported holding private drug insurance coverage. We found a strong dose-response relationship between household income levels and private drug insurance coverage: just 19.9% of those with household incomes <\$20,000 reported private coverage, compared to 76.2% of those with household incomes >\$80,000.</p> <p>Interpretation: Higher-income households are much more likely to hold private drug insurance coverage in Canada. This likely results in differential access to medicines and health outcomes across incomes.</p>

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Location in study
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Title
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Introduction
Objectives	3	State specific objectives, including any pre-specified hypotheses	Page 5, para 1
Methods			
Study design	4	Present key elements of study design early in the paper	Page 5, para 2
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Methods
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	Page 6, para 1
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 6, para 2
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Methods
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	Page 7, para 2
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page 6, para 2
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	Page 7, para 1
		(b) Describe any methods used to examine subgroups and interactions	

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		(c) Explain how missing data were addressed	
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed	
		<i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	
		<i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	N/A
		(e) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page 7, para 1
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page 7, Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Figure 1
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	Results
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Page 8, para 2
		(b) Report category boundaries when continuous variables were categorized	N/A
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Page 9, para 2
Discussion			
Key results	18	Summarise key results with reference to study objectives	Pages 9-10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 10, para 2
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Pages 10-11

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2 Generalisability 21 Discuss the generalisability (external validity) of the study Page 9, para 3
3 results
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5 **Other information**

6 Funding 22 Give the source of funding and the role of the funders for the Acknowledgements
7 present study and, if applicable, for the original study on which
8 the present article is based
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11 *Give information separately for cases and controls in case-control studies and, if applicable, for exposed and
12 unexposed groups in cohort and cross-sectional studies.
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15 **Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and
16 published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely
17 available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at
18 <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is
19 available at www.strobe-statement.org.
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8 **Income-related Disparities in Private Prescription Drug Coverage in Canada: A**
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10 **Cross-sectional Survey Analysis**
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14 **Running Head: Private Drug Coverage in Canada**
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Competing Interests

Talshyn Bolatova reports no potential conflicts of interest. Michael Law has consulted for Health Canada, the Health Employees' Union, the Conference Board of Canada, and provided expert witness testimony for the Attorney General of Canada.

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Abstract

Introduction: Canada does not have universal public coverage for prescription drugs, leaving a significant role for private insurance. However, we do not have recent on the characteristics of Canadians who report holding such private coverage, particularly differences based on household income.

Methods: We used data 97,900 respondents to the 2015-2016 cycle of the Canadian Community Health Survey (CCHS) to investigate the relationship between household income and holding private drug insurance coverage. We constructed modified multivariate Poisson regression model with robust error variances including several potential confounders.

Results: Overall, 59.4% of Canadians reported holding private drug insurance coverage. We found a strong dose-response relationship between household income levels and private drug insurance coverage: just 19.9% of those with household incomes <\$20,000 reported private coverage, compared to 76.2% of those with household incomes >\$80,000.

Interpretation: Higher-income households are much more likely to hold private drug insurance coverage in Canada. This likely results in differential access to medicines and health outcomes across incomes.

Introduction

Canada has a universal health insurance plan that covers medically necessary physician services and hospital stays. However, expenses for prescription drugs are not included in the universal plan and are instead covered by a “patchwork” of public and private drug insurance plans and out-of-pocket payments by patients (1). Private insurance companies accounted for \$12.1 billion in spending on prescription drugs in 2017, representing 36% of total spending on prescription medicines (2). Despite the importance of private insurance in the financing of prescription drugs, there is a growing concern that the ability to access private insurance benefits outside of the universal healthcare system is related to socioeconomic status in Canada, leaving more vulnerable groups without coverage.

In countries where health services are predominantly covered through private insurance policies, there is an income and health-related gradient whereby people with higher income and better health are more likely to purchase private health coverage (3–5). In the Canadian setting, the relationship between income and private insurance coverage has been studied for dental and vision care coverage. As one would expect, these studies have found significant associations between having a higher income and holding private insurance coverage. For example, one study found that only 17% of respondents with low household income reported having private dental insurance, compared to 80% with high household incomes (6). Similarly, other studies have found that the number of individuals with vision coverage in low to moderate income groups was half that of middle income and high-income groups (7).

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5 With respect to prescription drugs, previous research has tended to focus on the impact
6 of private drug insurance on inequities in utilization and on medication use for chronic
7 conditions among older people (4,8–10). Overall, these studies have found that people
8 with private drug insurance were more likely fill prescription medications compared to
9 uninsured individuals. To our knowledge, however, no recent studies have investigated
10 the relationship between private drug insurance coverage and household income in
11 Canada. Increased household share of spending on private insurance in general (11),
12 increased inequality and subsequent increase in the demand for private insurance (12),
13 and evidence of cost-related non-adherence to prescription drugs (13–15) provide a
14 rationale for updating our knowledge in this area. Therefore, we examined the
15 relationship between household income and private drug insurance coverage.
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33 **Methods**

34 *Study design*

35 We used data from the 2015-2016 cycle of the Canadian Community Health Survey
36 (CCHS), a cross-sectional survey that collects information from the community-dwelling
37 Canadian population (16). This CCHS cycle had 109,659 respondents aged 12 years of
38 age and older and who resided in private dwellings, with a response rate of 59.5% (16).
39 The sample was collected using multistage cluster sampling and is representative of
40 98% of the population (16).
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54 *Analytical sample*

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3 Our sample included individuals aged 12 years of age and older with valid responses to
4 the CCHS questions asking about prescription drug insurance status, the type of drug
5 coverage, and all confounding variables. Specifically, those who responded “don’t
6 know”, “refused to answer”, or “not stated” for each question were excluded.
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13 14 *Study variables*

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16 We constructed a binary outcome variable for self-reported private drug insurance
17 coverage through a series of questions. Respondents were classified as having private
18 drug insurance if they (1) responded “Yes” to the question “Do you have insurance that
19 covers all or part of your prescription medication?”, and (2) who responded that it was
20 either “employer-sponsored” or “sponsored through an association/private plan”. Those
21 who reported public coverage or no coverage were considered not to have private drug
22 coverage. We did not study the availability of public drug coverage in our study, as prior
23 work has demonstrated significant under-reporting among people known to be covered
24 in existing public plans, therefore we considered these responses unreliable (17).
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40 Our main explanatory variable for this analysis was self-reported household income
41 based on 5 categories (\$0 to \$19,999; \$20,000 to \$39,999; \$40,000 to \$59 999;
42 \$60,000 to \$79 999; \$80 000 and above). We also included a range of confounding
43 variables, including age (grouped in 10-year intervals), sex, province, number of chronic
44 conditions (none; 1; 2 or more), self-reported ethnicity (white; visible minority), and
45 highest level of educational attainment (less than secondary school; secondary school
46 graduate; some post-secondary education and post-secondary certificate).
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Statistical analysis

As the prevalence of the outcome was high (more than 10%), we chose to use a modified Poisson model (18). With a modified Poisson model, the unbiased prevalence ratio can be measured directly (18–20). We conducted both unadjusted bivariate analyses to assess the relationship between the outcome and exposure variables, as well as a multivariate adjusted model. All models used robust error variances, and survey weights were used for all statistical analyses to account for the survey sampling design. Ethics approval for this study was not required as this study used a publicly available dataset.

Results

Sample characteristics

Of the 109 659 survey respondents, 89.3% had valid responses to all study questions, leading to a final analytic sample of 97,900 (see Figure 1). The overall study sample was equally distributed among males and females, and well-distributed across age groups, with a smaller number of respondents in the oldest and the youngest groups (Table 1). More than 77% of respondents identified as white, and more than 60% had completed post-secondary education.

Overall, 59.4% of respondents self-reported as having private insurance that covers all or part of the cost of prescription medications (Table 1). In terms of income, nearly half (49.8%) reported an annual household income of \$80,000 or more, compared to 6.6%

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3 in the lowest category of \$0 to \$19,999. The proportion of individuals with private
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5 insurance increased with higher annual household income: 19.9% of individuals in the
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7 lowest income band reported private drug insurance, compared to 76.2% in the highest
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9 income band.
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14 *Model Results*

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17 In both our unadjusted and multivariable modified Poisson regression models, the
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19 prevalence of private drug insurance was positively associated with household income.
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21 Compared to households with an annual income below \$20,000, the prevalence ratio of
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23 private drug insurance coverage versus no private insurance increased with each
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25 additional \$20,000 of household income: from 1.49 (95%CI: 1.35 to 1.63) to 2.47
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27 (95%CI: 2.26 to 2.70), 3.04 (95%CI: 2.78 to 3.32) to 3.83 (95% CI: 3.52 to 4.18) among
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29 households with an annual income of \$80,000 or more (Table 2). Model adjustment for
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31 age, sex, ethnicity, education level, province, and number of chronic conditions only
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33 attenuated these results to a small degree, as they increased from 1.54 (95%CI: 1.41 to
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35 1.69) to 3.22 (95%CI: 2.95 to 3.50).
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42 In terms of confounding effects, we found a statistically significant association between
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44 all of the other variables and private drug insurance coverage. In particular, the
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46 prevalence of private insurance coverage was higher among whites compared to visible
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48 minorities, among the youngest age group compared to all other age groups, and
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50 among people with completed post-secondary education compared to lower education
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3 levels. The number of chronic conditions was not significantly related to private
4 insurance coverage in our final adjusted model.
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10 *Age-stratified analysis*

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12 In stratified analysis by age categories, the dose-response pattern of an increasing
13 prevalence rate of employer and private insurance with increasing income was stronger
14 within the age group between 25 and 64 years. For example, as shown in Table 3, the
15 prevalence ratio for people with household incomes above \$80,000 was 4.03 (95%CI:
16 3.53 to 4.59) compared to the lowest household income group. Similarly, among adults
17 over age 65, this estimate was 4.53 (95%CI: 3.66 to 5.61).
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28 **Interpretation**

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30 Private insurance provides drug coverage for many Canadians. We found that this
31 coverage is highly related to household income, with higher-income households being
32 more than three times more likely to report holding private drug insurance. The results
33 of our study are in line with previous studies conducted in Canada that have also found
34 income-related disparities in holding private dental and vision coverage (6,7). Our
35 results are also similar to the older studies demonstrating that Canadians with higher
36 incomes were more likely to have private drug insurance (8).
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49 The findings of this study showed that individuals aged 18 to 24 years have slightly
50 lower rates of insurance coverage. This could be due to the fact that individuals at this
51 age become ineligible to be covered under their parent's employer sponsored insurance
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3 coverage. Another plausible explanation to these results might be that these individuals
4 have not yet entered the workforce (i.e. do not possess employment insurance) or might
5 be employed in industries with limited or no health coverage. This has been found in a
6 previous study investigating coverage rates among age groups and professions (22).
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8 The very low estimates of private insurance coverage among seniors who are older than
9 65 years is likely due to the fact of their retirement and subsequent loss of their
10 employer-sponsored insurance plans.
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21 *Limitations*

22 While we used high quality data from the CCHS drawn from a representative sample of
23 Canadians, our study has limitations worth noting. The cross-sectional nature of the
24 study cannot, of course, establish causal relationships. Another limitation arises from
25 the self-reported nature of some of sensitive variables such as income. If this led some
26 households to bias their responses towards a more socially desirable response, it might
27 have attenuated our results towards the null. We also are unable to quantify any under-
28 reporting of private insurance by people who are not aware that they have it through
29 workplace coverage plans. Finally, we were not able to study the presence of public
30 insurance in our work, given the known issues with reporting of public sector drug
31 coverage.
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49 *Conclusion*

50 In this study we found significant income-related inequities in the access to private drug
51 insurance. As insurance coverage has been linked to less issues affording prescription
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medications, this is likely leading to differential access to medicines and health outcomes by different income groups, and could be contributing to health inequalities in Canada.

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Appendix

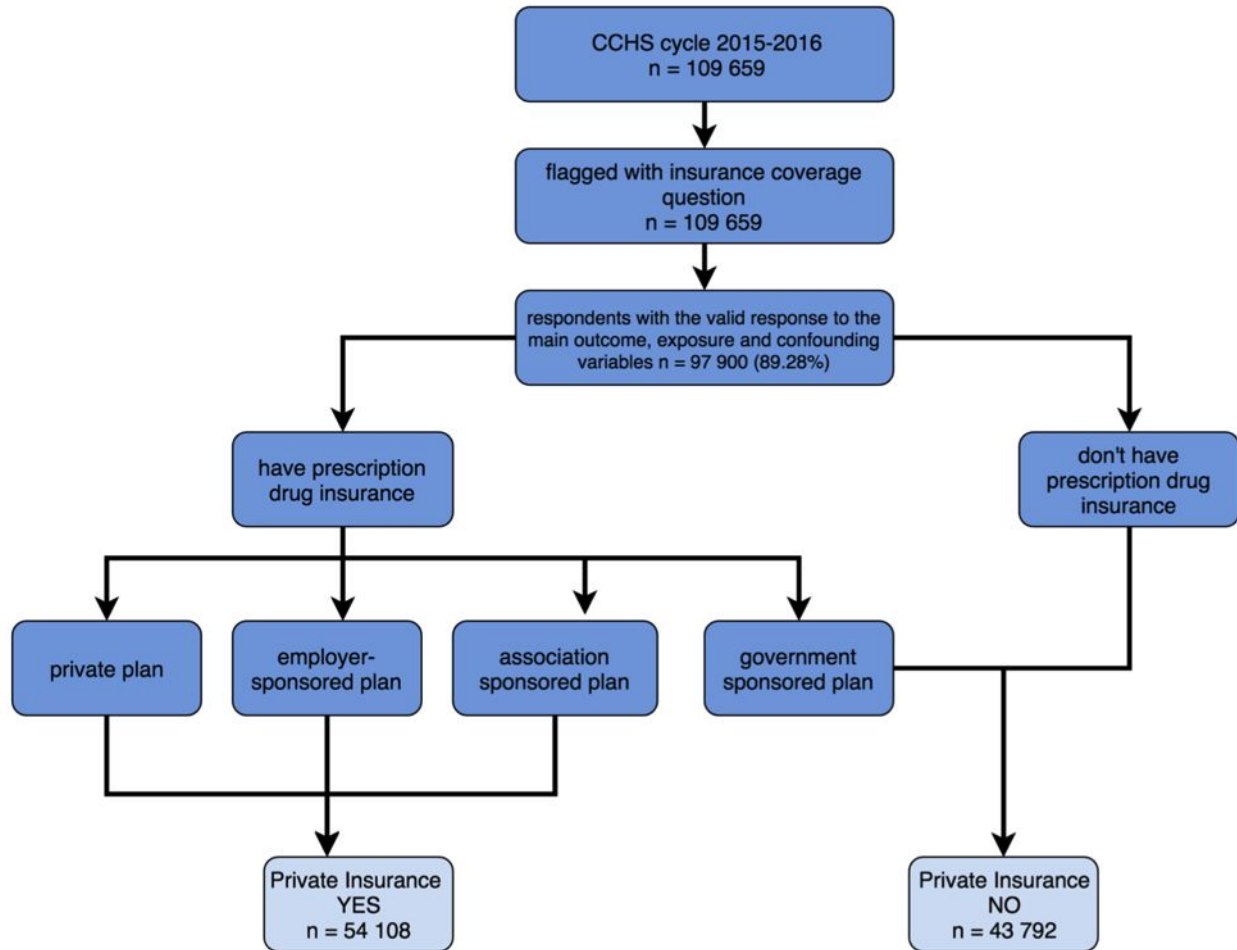


Figure 1. Study Sample from CCHS 2015-16 for the analysis of relationship between annual Household Income and Private Prescription Drug Coverage.

Table 1. Sociodemographic characteristics and prevalence of Private Drug insurance coverage among respondents to the Canadian Community Health Survey.

	Number of respondents	Weighted proportion of Total Population	Weighted proportion with Private Drug Insurance	Estimated proportion with Private Drug Insurance
Total	97,900			59.4
Household income				
None or less than \$20, 000	8,840	6.6	2.2	19.9
\$20, 000 - \$39, 999	17,721	14.3	7.1	29.6
\$40, 000 - \$59, 999	16,265	15.0	12.3	49.0
\$60, 000 - \$79, 999	13,566	14.3	14.6	60.4
> \$80, 000	41,508	49.8	63.8	76.2
Sex				
Male	45,286	49.3	49.9	60.1
Female	52,614	50.7	50.1	58.8
Age				
12-17 years	7,638	7.1	8.5	70.8
18-24 years	6,084	9.7	8.9	54.5
25-34 years	12,841	16.6	18.1	64.9
35-44 years	12,711	15.0	18.3	72.7
45-54 years	14,111	17.0	20.4	71.5
55-64 years	17,303	16.2	17.4	63.8
65-74 years	16,100	11.5	5.9	30.4
75+ years	11,112	7.0	2.6	21.9
Ethnicity				

White	86,376	77.8	79.9	61.0
Visible minority	11,524	22.2	20.1	53.9
Education				
Less than secondary school graduation	21,327	17.8	14.2	47.6
Secondary school	20,966	22.2	19.8	54.3
Post-secondary school	55,607	60.5	66.0	64.8
Province				
Ontario	29,789	38.7	38.2	58.7
Newfoundland and Labrador	2,711	1.5	1.5	62.2
Prince Edward Island	1,727	0.4	0.4	60.9
Nova Scotia	4,397	2.7	2.9	62.6
New Brunswick	3,092	2.1	2.4	65.5
Quebec	21,369	23.7	22.0	55.4
Manitoba	4,556	3.2	3.5	64.8
Saskatchewan	4,046	2.9	3.1	64.0
Alberta	11,948	11.6	13.3	68.4
British Columbia	12,867	13.1	12.5	56.8
Yukon	751	0.1	0.1	48.6
Northwest territories	484	0.1	0.1	61.9
Nunavut	163	0.0	0.0	76.6
Chronic				

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conditions				
None	41,912	49.4	54.1	65.2
1	25,047	25.2	25.6	60.3
2+	30,941	25.4	20.3	47.4

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Table 2. Unadjusted and multivariate parameter estimates from a modified Poisson model estimating the association with private drug insurance coverage.

	Unadjusted PR(CI)	Adjusted PR (CI)
Household income		
None or less than \$20,000	1	1
\$20,000 - \$39,999	1.49 (1.35, 1.63)	1.54 (1.41, 1.69)
\$40,000 - \$59,999	2.47 (2.26, 2.70)	2.35 (2.16, 2.57)
\$60,000 - \$79,999	3.04 (2.78, 3.32)	2.74 (2.51, 2.99)
More than \$80,000	3.83 (3.52, 4.18)	3.22 (2.95, 3.50)
Sex		
Male	1	1
Female	0.98 (0.96, 1.00)	1.03 (1.01, 1.04)
Age		
12-17 years	1	1
18-24 years	0.77 (0.74, 0.80)	0.66 (0.63, 0.70)
25-34 years	0.92 (0.89, 0.95)	0.74 (0.71, 0.78)
35-44 years	1.03 (1.00, 1.06)	0.80 (0.77, 0.84)
45-54 years	1.01 (0.98, 1.04)	0.79 (0.75, 0.82)
55-64 years	0.90 (0.87, 0.93)	0.74 (0.71, 0.78)
65-74 years	0.43 (0.41, 0.45)	0.40 (0.38, 0.42)
75+ years	0.31 (0.29, 0.33)	0.33 (0.31, 0.35)
Ethnicity		
White	1	1
Visible minority	0.88 (0.86, 0.91)	0.87 (0.85, 0.90)
Education		
Less than secondary school graduation	1	1
Secondary school	1.14 (1.11, 1.11)	1.19 (1.14, 1.24)
Post-secondary school	1.36 (1.33, 1.33)	1.29 (1.24, 1.34)
Province		
Ontario	1	1
Newfoundland and Labrador	1.06 (1.01, 1.11)	1.09 (1.05, 1.13)
Prince Edward Island	1.04 (0.99, 1.09)	1.08 (1.03, 1.14)
Nova Scotia	1.07 (1.03, 1.11)	1.10 (1.07, 1.13)
New Brunswick	1.12 (1.07, 1.16)	1.16 (1.12, 1.20)

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Quebec	0.94 (0.92, 0.97)	0.97 (0.94, 0.99)
Manitoba	1.10 (1.06, 1.15)	1.09 (1.06, 1.13)
Saskatchewan	1.09 (1.05, 1.13)	1.03 (1.00, 1.07)
Alberta	1.17 (1.14, 1.19)	1.05 (1.03, 1.08)
British Columbia	0.97 (0.94, 1.00)	0.99 (0.96, 1.01)
Yukon	0.83 (0.75, 0.92)	0.74 (0.67, 0.81)
Northwest territories	1.05 (0.96, 1.16)	0.83 (0.75, 0.91)
Nunavut	1.30 (1.18, 1.45)	0.98 (0.89, 1.08)
Chronic conditions		
None	1	1
1 chronic condition	0.93 (0.91, 0.95)	1.00 (0.99, 1.02)
2 or more chronic conditions	0.73 (0.71, 0.74)	0.96 (0.94, 0.99)

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Table 3. Age stratified Adjusted Prevalence Ratio (PR) for Holding Private Drug
Insurance Coverage

	1	2	3	4
Household income	12-17 years	18-24 years	25-64 years	65+ years
\$0 - \$20,000	1	1	1	1
\$20,000 - \$39,999	1.24 (0.95, 1.62)	1.06 (0.88, 1.28)	1.84 (1.60, 2.12)	1.97 (1.59, 2.43)
\$40,000 - \$59,999	1.81 (1.42, 2.32)	1.17 (0.98, 1.40)	2.91 (2.54, 3.33)	3.37 (2.72, 4.17)
\$60,000 - \$79,999	2.23 (1.76, 2.83)	1.26 (1.06, 1.50)	3.41 (2.98, 3.89)	4.01 (3.23, 4.97)
>= \$80,000	2.62 (2.08, 3.30)	1.56 (1.35, 1.80)	4.03 (3.53, 4.59)	4.53 (3.66, 5.61)

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