

The Impact of Prescription Drug Insurance on Healthcare Utilization

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Abstract

This is an empirical paper examining the impact of having public drug insurance on healthcare utilization using the Canadian Community Health Survey for 2005 and 2013. This paper quantifies this impact by exploiting the exogenous change in prescription insurance coverage that occurs once an individual turns 65, which is a novel approach. My findings suggest that individuals between the ages of 60 and 70 may have adequate insurance coverage from other sources (i.e., employers) and therefore do not change their behavior as a result of receiving public prescription drug insurance at 65.

1. Introduction

Senior citizens represent the largest and fastest growing demographic in Canada and they are the largest consumers of healthcare services (Li et al., 2007). Currently in Canada, the majority of prescription drugs for seniors is covered through government insurance. Since the introduction of public health insurance in Canada prescription drugs have become a much more important tool in controlling and managing illness (Devlin et al., 2007). This means that at a time when total pharmaceutical expenditures has been one of the fastest growing sector of Canada's healthcare system¹, the affordability of this coverage is a growing concern (CIHI, 2011).

Additionally the absence of public prescription drug insurance for the rest of the Canadian population calls into question the true universality of the Canadian healthcare system. This gap in coverage raises both equity and efficiency concerns. On equity grounds, leaving prescription drugs to be privately funded creates a barrier to healthcare

¹ A CIHI study found that from 1998 to 2007 healthcare costs grew on an average of 10.0% per year (CIHI, 2011)

access for low income Canadians. On efficiency grounds, if doctors are prescribing different treatment plans based on a patient's financial situation, not what is best for their health, the most efficient healthcare mix is not achieved.

In light of this, it is important to understand how public health insurance covering pharmaceutical drugs might affect seniors' healthcare utilization. The answer can have significant policy implications. To this end, I exploit an exogenous change in coverage, namely turning sixty-five and thus qualifying for pharmaceutical insurance through the government, to see how this may affect the consumption of public healthcare services by senior citizens.

Before any analysis is done I need to establish the basics of how the Canadian healthcare system works to give context to our discussion. Both federal and provincial governments can affect the healthcare system in Canada. At the federal level, the Canadian government enforces the Canada Health Act (CHA), introduced in 1984, which outlines five national principles of healthcare that are meant to ensure that "medically necessary" healthcare services are provided to all Canadians without barriers, financial or otherwise (Rice & Unruh, 2009).² However since healthcare is actually an area of provincial jurisdiction it falls to each provincial government's discretion to determine what services are "medically necessary" (Allin, 2008).

Prescription drugs are not generally covered by public insurance. However, all of the provinces have some drug insurance plan for seniors, which vary in generosity.³ For example, Ontario has arguably one of the most complete drug insurance programs where most prescription drugs are covered for seniors who pay a small premium of one hundred

² The five national principles of healthcare are: public administration, comprehensiveness, universality, portability and accessibility (Rice & Unruh, 2009).

³ British Columbia and Manitoba are the only provinces that operate principally under needs based, not age based, criteria for public prescription drug coverage.

dollars per year and face a maximum co-payment of six dollars and eleven cents with each prescription. At the other end of the spectrum, seniors living in New Brunswick face premiums as high as one hundred and five dollars per month and pay a co-payment of fifteen dollars per prescription. New Brunswick is also the only province that does not provide seniors with catastrophic drug coverage (Chicoine, 2012). Some public pharmacare plans, such as in Quebec and Nova Scotia, exclude seniors who have a secondary type of supplemental drug insurance. In Ontario, however seniors can have double coverage. For a detailed account of the prescription drug coverage for seniors in each province see Table 1. Over the years there have been calls from policymakers and pundits to extend public drug insurance to Canadians of all ages (Blomqvist & Xu, 2001; Morgan et al., 2013; Willison et al., 1998).

Spending on drugs represents nearly sixteen percent of total healthcare expenditures in Canada and the private sector funds sixty-two percent of that (CIHI, 2014). This represents the second largest share of health expenditures, only behind hospitals (CIHI 2014). Clearly providing pharmaceutical insurance to seniors, or even potentially to all Canadians, represents a large expense for provincial governments. An important question then becomes: how does having public prescription drug insurance affect other healthcare decisions? Some research into this question has already been done (Allin & Hurley, 2009; Devlin et. al., 2011; Li et. al., 2007; Shang & Goldman, 2007). My approach to this question however is novel. I am employing regression discontinuity design by exploiting the exogenous change in prescription insurance coverage in Canada at age 65.

To answer that question this paper will be divided into three main sections. The first section will give a focused literature review of the relevant existing work on

prescription drug insurance. The second section will describe the data set used and provide details on the methodology. Finally, the third section will discuss the results and draw conclusions.

2. Literature Review

A landmark study on the impact of insurance on the use of services was undertaken by the Rand Corporation, based on a large-scale randomized experiment conducted in the United States in the 70s (Manning et al, 1987). It is among the first and certainly the most notable study to look at the relationship between insurance and healthcare services (Manning et al, 1987). This study randomly assigned people into different insurance plans ranging from full coverage to no coverage and then observed how each group consumed healthcare services. Overall the study found that the more an individual had to pay out of pocket, the less their total healthcare expenditures were implying that insurance does create a moral hazard effect (Manning et al, 1987).

In Canada we have a healthcare system whereby most services are covered by publicly funded insurance. However, some large exceptions exist, such as for prescription drugs. It is thus interesting to look at the relationship between private and public services, and to consider how that relationship changes when prescription drugs become publically financed. Some research has already been done. Researchers began by considering how having public prescription drug insurance affects prescription drug use. In a study of prescription drug use by Ontario residents, Grootendorst (1995) addresses this question and shows that the presence of prescription drug insurance increases the number of drugs that an individual takes. To do this, he exploits the fact that from the age 65 onwards all residents of Ontario are eligible for full prescription coverage while before 65 the

coverage differs and in many cases is incomplete. Grootendorst found that turning 65 did increase drug use, most noticeably among individuals with chronic health conditions. This is consistent with existing economic theory that when the price of a good decreases (as it does once you are eligible for public drug insurance) demand for that good increases and with the findings of the Rand study. Interestingly, a later study found that this increase in demand almost exclusively affects those with lower health statuses, implying that the presence of insurance has a much more significant impact on the behavior of “sicker” individuals relative to others (Grootendorst et al., 1997). In other words, the presence of insurance is likely to cause an individual already on medication to increase the number of medications they are taking but not likely to influence someone who is not taking medication to begin to take them.

The next more complicated, and perhaps more interesting question is, how does having private prescription drug insurance affect the use of other public healthcare services. There have been multiple studies that have considered the effect of private insurance on a publicly funded healthcare system. Stabile (2001) considered how government subsidies to employer provided health insurance affects the use of publicly funded healthcare services. He found that Canadians who had supplemental private insurance consumed 10% more publically funded healthcare services, and he demonstrated that as much as half of this can be attributed to moral hazard.

A number of other studies support a complementary relationship between the presence of private insurance and publicly funded (i.e., free) medical services. Both Devlin et al. (2011) and Allin and Hurley’s (2009) papers found that this complementary relationship is stronger for “healthy” individuals. Devlin et al. examined the effect of supplemental insurance on public healthcare services separating individuals into either

“low” or “high” healthcare users. They found that “low” users are more sensitive to the presence of insurance. They contend that this is perhaps because “healthy” individuals are more likely to visit the doctor for preventative care reasons implying that the absence of supplemental insurance reduces preventative care. Allin and Hurley’s research examined how the private financing of prescription drugs impacts access to public healthcare services. They found evidence to suggest that public healthcare services and private prescription drug insurance are complements. Interestingly Allin and Hurley’s research highlights that this relationship leads to a “pro-rich” inequity in public healthcare services while public prescription drug insurance has a “pro-poor” effect.

Other researchers have found that prescription drugs and other public healthcare services may also behave as substitutes, particularly for chronically ill patients whose diseases can often be controlled with drugs (Shang & Goldman, 2007). In the absence of access to those drugs, they will use other publically funded healthcare services to seek treatment, such as doctor visits or hospital stays. Shang and Goldman (2007) comment that this substitution effect decreases as income increases income, implying that public prescription drug insurance would most benefit low income individuals, consistent with Allin and Hurley’s research.

While these studies have largely focused on the impact of voluntary private insurance, this paper will consider the impact of “universals” public insurance. As Grootendorst did in his papers, I will exploit the exogenous change in insurance associated with turning 65, whereby individuals become eligible for publicly funded prescription drug insurance. Since all seniors benefit from public insurance there is no problem of adverse selection, therefore I can more easily identify the effect of moral hazard.

How public prescription drug insurance affects public healthcare services in Canada has also been considered by researchers (Wang, 2012; Li et al., 2007). Wang exploited a policy change in 1997 in Quebec that introduced mandatory prescription drug insurance for all residents. This policy made it so that any Quebec resident eligible for a private prescription drug insurance plan was required to join and all those who were not eligible automatically qualified for public prescription drug insurance (Wang, 2012). Using a difference in difference approach Wang found that increased prescription drug coverage as a result of this policy led to increased drug use which is consistent with Grootendorst's research. Wang also showed that use of general practitioner services increased as a result of this policy although specialized visits and hospital stays were unaffected.

Li et al.'s paper focused on prescription drug expenditures and healthcare utilization, specifically by seniors in B.C. with rheumatoid arthritis. They also exploited an exogenous policy change affecting the price of drugs to estimate healthcare demand elasticity. They found negative own-price elasticity, which is consistent with Grootendorst's and Wang's research (Li et al., 2007). They also found a positive cross-price elasticity implying that when seniors face higher out of pocket costs for drugs they have fewer prescriptions but more doctors' visits. This implies that prescription drugs and doctors' visits are substitutes, at least in the case of rheumatoid arthritis (Li et al., 2007). Since rheumatoid arthritis is a chronic disease their findings are consistent with current existing literature.

In my paper I will try to address how "universal" public drug insurance for seniors may affect their healthcare utilization. The results from this research can help to

inform policy decisions regarding existing provincial pharmacare plans and contribute to the debate about extending drug insurance to all Canadians.

3. Data Set

This paper draws from the Canadian Community Health Surveys (CCHS) produced by Statistics Canada. These are nationally representative surveys that represent approximately 98% of Canadians twelve years of age and older excluding individuals living on Indian Reserves and Crown Lands, residents of health institutions, full-time members of the Canadian Forces Bases and some remote areas in Ontario and Quebec. The survey collects data about the health of Canadians; some socio-demographic and economic data are also collected. I use data from both the 2005 and 2013 CCHS. The 2005 CCHS (cycle 3.1) was conducted between January 2005 and December 2005. I chose this particular cycle because it is the only one that collected detailed information of individual's supplemental health insurance (although only from residents of Ontario). For this survey I will first look at a subsample of Ontario residents only and then I will consider the whole sample. The 2013 CCHS was conducted between January 2013 and December 2013 and represents the most recent CCHS to date.

I restrict my sample by age. I do this to mitigate the effect age can have on healthcare utilization, particularly for very young or old individuals and for women of child bearing age. Recall that the objective is to examine how turning 65 and thus being eligible for prescription drug coverage affects health care utilization. I construct two subsamples: those comprised of individuals between sixty and seventy years of age, and those of individuals between sixty-two and sixty-seven. I will also restrict my sample by region, excluding residents from British Columbia, Manitoba and the Northwest

Territories as their Public Prescription Drug Insurance Plans do not begin at age 65⁴ (see Table 1).

The dependent variable is *HealthcareUtilization* for which I construct four different measures: if an individual saw a medical doctor in the last year; the number of times an individual saw a medical doctor in the last year; if an individual was an overnight patient in a hospital in the last year and finally the number a days an individual was an overnight patient in a hospital in the last year.

Table 2 defines all dependent and independent variables in my analysis and Table 3 provides their means and standard deviations. My variable of interest is *sixtyfive*. Since individuals just under sixty-five do not qualify for public insurance while those sixty-five and over do, this dummy variable signals whether or not public insurance is present. I have also controlled for a number of individual attributes such as gender, marital status, education and income with dummy variables. I also included variables typically used in the health insurance literature such as self-assessed health status and whether an individual has a chronic illness. I only know if someone had private insurance prior to turning 65 for Ontario respondents in 2005, hence I include a dummy variable (*priv_ins*), for the Ontario subsample of the 2005 CCHS. Another variable of interest is an interaction term of *chronic* and *sixtyfive*. This should give us the marginal effect of having public insurance if an individual has a chronic condition.

⁴ In the Northwest Territories benefits begin at 60 and in British Columbia they begin at 75 and are largely income based. Manitoba's public prescription drug insurance is completely income based. Note that Quebec does offer public prescription drug insurance to all residents but the benefits are significantly more generous when residents turn 65 therefore Quebec is still included in the sample.

4. Methodology

I want to estimate the effect of having public insurance on healthcare utilization. I will use the regression discontinuity approach to estimate the relationship. Regression discontinuity is a quasi-experimental design where whether an individual receives the treatment (in this case public insurance) changes discontinuously (in this case with age). It relies on two assumptions: continuity of individuals around the threshold (65) and conditional independence, which maintains that do not select whether they receive the treatment (Hahn et. al., 2001).⁵ This method has not yet been applied to estimate the effect of having public insurance on healthcare utilization, which makes this research approach novel.

Using regression discontinuity will allow me to take advantage of the fact that public prescription drug insurance kicks in for everyone at sixty-five years of age. From this I can establish the causal impact of having public insurance on healthcare utilization (Carpenter & Dobkin, 2011).

As discussed previously, individuals just under sixty-five do not qualify for public insurance while those sixty-five and over do, but otherwise these two groups should be relatively similar. In other words, it is reasonable to assume that individuals sixty-two to sixty-four years old should be comparable to individuals sixty-five to sixty-seven years old. This satisfies the continuity assumption. It is also clear that individuals cannot influence whether or not they are eligible for these prescription benefits and thus the conditional independence assumption is also satisfied. This also implies that the adverse selection problem is eliminated. Therefore I will be able to estimate the magnitude of moral hazard that exists when public prescription drug insurance is present.

⁵ For additional information on estimation with regression discontinuity, consult Hahn et al. (2001).

This paper will look at three population samples with the two surveys: 2005 CCHS Ontario residents only, the 2005 CCHS and the 2013 CCHS. As mentioned above, the sample for the 2005 CCHS and the 2013 CCHS will exclude residents of British Columbia, Manitoba and the Northwest Territories because all three provinces do not begin their public prescription drug insurance programs once residents turn 65. For each of these samples I will restrict the age twice, first to between sixty and seventy and then again between sixty-two and sixty-seven.

I first consider the Ontario portion of the 2005 CCHS. I estimate the impact of having public prescription drug insurance relative to having no insurance by controlling for individuals who have either employer provided or private prescription drug insurance. The regression will be:

$$\text{HealthcareUtilization} = \beta_0 + \beta_1 (\text{sixtyfive}) + \beta_2 (\text{priv_ins}) + \gamma(\mathbf{X}) + \Psi(\mathbf{Z}) + \epsilon$$

Here \mathbf{X} represents individual and locational characteristics and \mathbf{Z} represents health variables. A detailed list of all independent variables can be found in Table 1 of the appendix.

Following Kahn (2001), I consider the presence of public insurance at 65 as the treatment. I will estimate the outcome (\hat{Y}_1) of this regression when public insurance is provided (i.e. sixtyfive = 1) and the outcome (\hat{Y}_0) in the absence of public insurance (i.e. sixtyfive = 0). The impact of the presence of public insurance (β_1) (i.e., the treatment effect) is estimated by the difference of the two above outcomes ($\hat{Y}_1 - \hat{Y}_0$) as they approach the age 65.

Next I will consider both the whole 2005 CCHS and the 2013 CCHS where we have no information regarding private prescription drug insurance. Again I will estimate

the impact of turning 65 and qualifying for public prescription drug insurance on healthcare utilization. The regression will be:

$$\mathbf{HealthcareUtilization} = \beta_0 + \beta_1 (\mathbf{sixtyfive}) + \gamma(\mathbf{X}) + \Psi(\mathbf{Z}) + \varepsilon$$

The four the dependent variables used to measure healthcare utilization (as described above) are all examples of limited dependent variables,⁶ specifically there are two binary variables (*doc* and *hosp*) and two count variables (*freq_doc* and *freq_hosp*). It is not reasonable to treat these variables as approximately continuous (Wooldridge, 2009). This presents a problem for traditional regression techniques because it violates ordinary least squares assumptions of continuity and the normal distribution of errors (Hoffman, 2014). To address this problem I will take two approaches.

I will use a probit model for the two binary variables. The probit regression will look like:

$$P(\mathbf{HealthcareUtilization} = 1) = \alpha\{\beta_0 + \beta_1 (\mathbf{sixtyfive}) + \gamma(\mathbf{X}) + \Psi(\mathbf{Z}) + \varepsilon\},$$

where α is the cumulative normal distribution (Wooldridge, 2009). I will estimate two probit equations; the probability an individual has seen a medical doctor in the past year and the probability that an individual has been an overnight patient in a hospital over the past year.

I will use a negative binomial distribution for the two count variables. I chose to use a negative binomial distribution rather than a Poisson distribution because it is less restrictive and does not impose the assumptions of equality of the conditional mean and variance functions (Greene, 2012). The regression will look like:

$$f(\mathbf{HealthcareUtilization}) = \delta\{\beta_0 + \beta_1 (\mathbf{sixtyfive}) + \gamma(\mathbf{X}) + \Psi(\mathbf{Z}) + \varepsilon\},$$

where δ is the negative binomial distribution function (Greene, 2012).

⁶ A limited dependent variable is a variable whose range of values are discrete and relatively limited (Wooldridge, 2009)

5. Results

All results can be found in Tables 4-7. I will discuss the results in four subsections, each representing a dependent variable.

5.1 Results: *doc*

The marginal effects of the probit equation when the dependent variable is whether an individual has been to the doctors in the past year can be found in Table 4. In this equation both variables of interest (*sixtyfive* and *chronicsixtyfive*) are statistically insignificant across all three survey samples. This finding is not surprising as it likely reflects the fact that having public prescription drug insurance does not affect going to the doctor for, say, an annual check-up. The presence of private prescription drug insurance (in the Ontario file) also has an insignificant impact on the likelihood of seeing a medical doctor in a year, which is consistent with the explanation above.

Several other variables this study looked at did have a statistically significant effect on healthcare utilization. My results show that being married increases the probability of visiting a doctor by a factor ranging from 0.233 to 0.463⁷. Not surprisingly I also found that having a chronic illness increases the probability of visiting a doctor by a factor ranging from 0.339 to 0.618. My results also suggest that being male is negatively related to visiting a doctor. Specifically I found that being male reduces the probability of seeing a doctor by a factor ranging from 0.205 to 0.537. Existing literature supports the notion that men and women use healthcare differently. Finally several of the provincial dummies (Newfoundland, Quebec, Saskatchewan, Alberta,

⁷ The factor by which variables are impacted will be reported in ranges. This is because there are 6 sample groups being estimated and each has a factor with a unique magnitude.

Yukon and Nunavut) are negatively significant. This implies that residents from those provinces are less likely to visit a doctor compared to residents of Ontario. The remaining provinces (PEI, Nova Scotia and New Brunswick) are insignificant.

5.2 Results: *hosp*

The marginal effects from the probit estimations on whether an individual has been an overnight patient in a hospital in the past year can be found in Table 5. These results are similar to what I found with respect to seeing a medical doctor. Neither of the variables of interest is significant with the exception of the 2013 CCHS subsample of individuals between 62 and 67. In that case I found that once individuals turn 65 the probability that they become an overnight patient in a hospital is reduced by a factor of 0.402. My results for the 2013 CCHS sample also show that the marginal effect of turning 65, given you have a chronic illness, increases the probability of being an overnight patient in a hospital by a factor of 0.522. However, as the other five subsamples are insignificant no conclusions can be drawn. Note that the fact that drug insurance is not found to affect the likelihood of a hospital stay is not very surprising given that drugs are free for those who are admitted to a hospital and is consistent with Wang's findings.

My results again showed that having a chronic illness is both strongly and positively related to healthcare utilization. Specifically I found that having a chronic illness increases the probability of being an overnight patient in a hospital by a factor ranging from 0.306 to 0.630. My results show that being male increases the probability of being a hospital patient by a factor ranging from 0.107 to 0.408. Recall in the previous section we found that males are less likely to see a doctor. A potential explanation for

this change in is that because males are less likely to visit the doctor they receive less preventative care and therefore are more likely to be a patient in a hospital.

Not surprisingly, my results showed that the self-assessed health status dummies (*exc_health* and *good_health*) were found to be strongly negatively significant. This implies that individuals who consider themselves to be in good, very good or excellent health have a reduced probability of being a hospital patient. The provincial dummies are significantly varying relative to the reference group Ontario, across surveys; however unlike in the previous section the pattern is for them to be positively significant. This result may reflect provincial policies: the availability of doctors, for instance, may help explain why residents of some provinces are less likely visit the doctor, therefore less likely to receive preventative care and more likely to need a hospital. In the appendix you can find tables, provided by CIHI, on the number of doctors per 100,000 people in each province. Most notably my results showed that Alberta is positively significant across all surveys and subsamples. This implies that residents of Alberta have a higher probability of being an overnight patient in a hospital compared to resident of Ontario by a factor ranging from 0.190 to 0.308.

5.3 Results: freq_doc

The results of the negative binomial distribution equation estimating the factors influencing the number of times an individual has been to the doctor in the past year can be found in Table 6. Unlike with the previous two dependent variables, in this case the presence of private insurance (*priv_ins*) identified for the Ontario file is positive and statistically significant. This result suggest that, compared to those without private insurance, those with insurance increase the number of times they see a doctor by a factor of 0.132 to 0.136. This is consistent with the literature that finds that having prescription

drug insurance impacts how you use the public health care system (Stabile, 2001; Devlin et. al, 2011; Wang, 2012). I was expecting my variable of interest (*sixtyfive*) to be positive and significant, but that is not the case. Across all surveys and subsamples, except the CCHS 2005 for ages 60-70, both *sixtyfive* and *chronicsixtyfive* are insignificant. For the CCHS 2005 (all provinces included) with the subsample of individuals aged 60-70 I found being 65 increased the number of visits to a doctor by a factor of 0.193 and that the marginal impact of having a chronic illness given you are 65 reduced the number of visits to a doctor by a factor of 0.182. These findings are consistent with the theory however because they are not found in any of the other subsamples it is difficult to draw a conclusion from them.

My results show that having a chronic illness increases the number of visits to a doctor by a factor ranging from 0.583 to 0.900. My results also show that if an individual is working they will reduce the number of times they see a doctor by a factor ranging from 0.001 to 0.186. This is likely due to the fact that people with a job face a higher opportunity cost of time. As expected I once again found that *exc_health* and *good_health* are all strongly significant and negative. This implies that those who report themselves to be “healthy” visit the doctor less often, which seems intuitive. When looking at the impacts of the provincial dummies I found that, New Brunswick, Quebec and Nunavut are all negatively significant. This implies that residents from those provinces visit the doctor fewer times relative to residents of Ontario.

5.4 Results: freq_hosp

The results of the negative binomial distribution equation estimating the factors influencing the number of times an individual has been an overnight patient in the hospital in the past year can be found in Table 7. The results of the variables of interest

here are highly inconclusive. In the Ontario subsection of the 2005 CCHS I find that *sixtyfive* is positively significant while *chronicsixtyfive* is negatively significant.

Specifically these results suggest that being 65 increases the number of nights spent in a hospital by a factor of 1.455 and that the marginal impact of having a chronic illness given you are 65 reduces the number of nights spent in a hospital by a factor of 1.342.

The Ontario subsection of the 2005 CCHS is also the only sample for which I was able to control for having private insurance. My results reveal that those with private insurance increase the number of nights they spend in a hospital by a factor of 0.541 to 0.741.

These findings suggest that insurance matters.

However, in the other survey samples it is a different story. For the 2005 CCHS (including all provinces) both variables of interest (*sixtyfive* and *chronicsixtyfive*) are statistically insignificant. Finally, for the 2013 CCHS I found *sixtyfive* to be negative while *chronicsixtyfive* is positive contradicting the results for the Ontario subsection of the 2005 CCHS. Specifically found that a person who is 65 will stay in a hospital for fewer nights by a factor of 1.446 and that the marginal impact of having a chronic illness given being 65 will increase the number of nights spent in a hospital by a factor of 1.110.

Again my results show that a person with a chronic illness will increase the number of nights spent in hospital by a factor ranging from 1.172 to 1.862. I also found that being male is strongly and positively significant, which is consistent with my finding under dependent variable *hosp*. These results show that a male, compared to a female, spends more nights in a hospital by a factor of 0.305 to 1.280. As expected, my results showed again that the self-assessed health status dummies (*exc_health* and *good_health*) are both strongly negatively significant. Although the provincial dummies show some

significance in varying subsamples they appear less important than in the three previous sections.

6. Discussions and Conclusions

The purpose of this paper was to identify the impact of public prescription drug insurance given to seniors on healthcare utilization. Using the 2005 and 2013 CCHS I employed a regression discontinuity technique to try to identify that impact, an approach that has not been done before. This method allowed me to exploit the exogenous change in prescription insurance coverage when an individual turns 65. Unfortunately my results were largely inconclusive.

In this paper I also looked at a number of other variables that may impact healthcare utilization. As I would have expected, my results showed that people with a chronic illness use more healthcare. I found that people who consider themselves to be in good, very good or excellent health use less healthcare than individuals who consider themselves to be in poor or very poor health. As well my results supported the fact that men and women use healthcare differently. Finally, my results showed that people who are employed have been to the doctor and, to a lesser extent, been an overnight patient in a hospital fewer times than people who are unemployed. This is likely because of the higher opportunity cost of time people who are working face. All of these results are logical, consistent with economic theory and supported by the existing literatures.

The fact that my probit models produced insignificant results is not altogether surprising. The binary measures for healthcare utilization (*doc* and *hosp*) are not most convincing measures as they fail to capture the change in people healthcare utilization at the margins. On the other hand I would have expected the results with the count data (*freq_doc* and *freq_hosp*) to reflect the impact of prescription drug insurance on

healthcare use. Perhaps the reason my results were insignificant is that people close to retirement already having prescription insurance from other sources (i.e., employer) and therefore do not change their behavior when they turn 65 and qualify for seniors' drug insurance. In fact, this possibility is brought out in the Ontario subsection of the 2005 CCHS, where I found *priv_ins* to reflect a positive relationship between insurance and healthcare utilization for both the number of doctors' visits and hospital stays. This finding suggests that insurance does matter but perhaps those 65 and over already have sufficient coverage.

This paper looked specifically at prescription drug insurance given to people once they turn 65. However in two provinces (Manitoba and British Columbia) public prescription drug insurance is provided on income-based criteria, rather than age-based criteria. The impact of these drug policies on healthcare utilization may be clearer because they provide low income people with improved access to prescription drugs. This may be an area of interest for future researchers.

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TABLES**Table 1: Public Prescription Drug Insurance Plans for Seniors**

Provinces & Territories	Income Level	Deductible/Premium	Co-Payment
British Columbia *	You must have a net income of \$475,000 or less to qualify	Ranges from \$0 to \$9,000 depending on income level	You pay 25% per prescription to a given annual maximum given income.
Alberta	N/A	None	You pay 30% to a maximum of \$25 per prescription
Saskatchewan	You must have a net income of \$80,256 or less to qualify	None	Maximum payment of \$20 per prescription.
Manitoba	Public prescription drug insurance is purely income based and gives no consideration to age.		
Ontario	If you are single with a yearly net income of less than \$16,018 or a couple with yearly net income of less than \$24,175	None	Maximum payment of \$2 per prescription.
	If you are single with a yearly net income of \$16,018 or a couple with yearly net income of \$24,175	You pay the first \$100 of your prescriptions drug cost.	Maximum payment of \$6.11 per prescription.
Quebec**	94%-100% GIS	None	None
	1% to 93% GIS	You pay a monthly maximum of \$51.16 and an annual maximum of \$614.	None
	No Guaranteed Income Supplement (GIS)	You pay a monthly maximum of \$83.83 and an annual maximum of \$1,006.	None
New Brunswick***	Receive GIS	None	You pay \$9.05 per prescription up to a maximum of \$500 per year.
	If you: (a) are single with a yearly net income of less than \$17,199 (b) a couple (both over 65) with yearly net income of less than \$26,955 (c) a couple (one over 65) with yearly net income of less than \$32,390	None	You pay \$15 per prescription.
	Otherwise	Pay a premium of \$105 per month.	You pay \$15 per prescription.
Nova Scotia**	If you are single with a yearly net income of less than \$18,000 or a couple with yearly net income of less than \$21,00	None	You pay 30% to of the cost of each prescription up to an annual maximum of \$382.
	If you are single with a yearly net income between \$18,000 and \$24,00 or a couple with yearly net income between \$21,00 and \$28,00	Pay a reduced premium	You pay 30% to of the cost of each prescription up to an annual maximum of \$382.

	If you are single with a yearly net income of more than \$24,000 or a couple with yearly net income of more than \$28,00	Pay a premium	You pay 30% to of the cost of each prescription up to an annual maximum of \$382.
Newfoundland & Labrador	Receive GIS and Old Age Security (OAS)	None	You pay a maximum of \$6 per prescription.
Prince Edward Island	N/A	None	You a maximum of \$8.25 per prescription.
Yukon****	N/A	None	None
Northwest Territories*****	N/A	None	Provides up to 100% coverage
Nunavut	N/A	None	None

* Public prescription drug insurance is available to all B.C. residence based on income. However, for seniors age 75 and older, while benefits are also based on income, the rates are reduced. To see the rates visit:

http://www.health.gov.bc.ca/pharmacare/plani/calculator/pdf/income_bands_fair_pcare_enhanced.pdf

**Only persons what are not eligible for a private plan may register for the public prescription drug insurance. Quebec offers public prescription drug insurance to all residents however benefits become much more generous for residents 65 and older.

*** Higher income seniors who don't qualify here may apply for the income based public drug insurance offered to all New Brunswick residents.

****If you are 60 years of age or older you are eligible if you are married to someone who is at least 65 years of age. Also in this plan if you have prescription drug insurance through an employer of third party agency claims must be submitted to these insurers first.

*****Benefits start at the age of 60.

Table 2: Variable Definitions

Table 2: Variable Definitions	
Dependent Variable	
doc	=1 if individual has consulted a medical doctor in the past here, otherwise=0
freq_doc	number of consultations with a medical doctor in the past year
hosp	=1 if respondent has been a patient overnight in a hospital in the past year, otherwise=0
freq_hosp	number of nights that the respondent has been a patient overnight in a hospital
Independent Variable	
sixtyfive	=1 if age is sixty-five or older, otherwise=0
age	respondent' age
male	=1 if respondent is male, otherwise = 0
female	=1 if respondent is female, otherwise=0 (reference group)
married	=1 if respondent is married or common law, otherwise=0
working	=1 if respondent is working full time or part time, otherwise=0
excel_health	=1 if respondent's self-perceived health status is excellent or very good, otherwise=0
good_health	=1 if respondent's self-perceived health status is good, otherwise=0
poor_health	=1 if respondent's self-perceived health status is fair or poor, otherwise=0 (reference group)
chronic	=1 if respondent has a chronic condition, otherwise=0
priv_ins	=1 if respondent has employer sponsored, government sponsored or private insurance and if the respondent's age is sixty-four or younger, otherwise=0 (provided for Ontario residents only)
less_sec	=1 if respondent has less than a secondary education, otherwise=0 (reference group)
high_schl	=1 if respondent has finished secondary education, otherwise=0
somepost_sec	=1 if respondent has some post-secondary education, otherwise=0
post_sec	=1 if respondent has finished post-secondary education, otherwise=0
low_inc	=1 if respondent's income is less than \$30,000, otherwise=0 (reference group)
mid_inc	=1 if respondent's income is \$30,000-\$79,999, otherwise=0
high_inc	=1 if respondent's income is \$80,000 or more, otherwise=0
notstated_inc	=1 if respondent did not give their income, otherwise=0
ON	=1 if respondent lives in Ontario, otherwise=0 (reference group)
AB	=1 if respondent lives in Alberta, otherwise=0
SK	=1 if respondent lives in Saskatchewan, otherwise=0
ON	=1 if respondent lives in Ontario, otherwise=0
QC	=1 if respondent lives in Quebec, otherwise=0
NB	=1 if respondent lives in New Brunswick, otherwise=0
NS	=1 if respondent lives in Nova Scotia, otherwise=0
PEI	=1 if respondent lives in Prince Edward Island, otherwise=0
NFLD	=1 if respondent lives in Newfoundland & Labrador, otherwise=0
YK	=1 if respondent lives in Yukon, otherwise=0
NV	=1 if respondent lives in Nunavut, otherwise=0

Table 3: Variable Means						
Variables	CCHS 2005 (Ontario N=41,766)		CCHS 2005 (whole sample N=132,947)		CCHS 2013 (whole sample N=64,346)	
	Age: 60-70 N=5,491	Age: 62-67 N=2,967	Age: 60-70 N= 14,174	Age: 62-67 N= 7,718	Age: 60-70 N=9,595	Age: 62-67 N= 5,471
Dependent Variables						
doc	0.95	0.95	0.94	0.94	0.93	0.93
freq_doc	4.90	4.95	4.49	4.54	4.33	4.21
hosp	0.09	0.08	0.10	0.09	0.09	0.09
freq_hosp	0.79	0.94	0.92	1.06	0.82	0.99
Independent Variables						
sixtyfive	0.49	0.47	0.47	0.45	0.50	0.50
age	64.55	64.30	64.49	64.31	64.61	64.50
male	0.48	0.48	0.49	0.48	0.49	0.49
female	0.52	0.52	0.51	0.52	0.51	0.51
married	0.77	0.77	0.75	0.75	0.73	0.73
single	0.23	0.23	0.25	0.25	0.27	0.27
working	0.34	0.34	0.31	0.31	0.37	0.37
exc_health	0.50	0.50	0.49	0.49	0.52	0.52
good_health	0.31	0.32	0.32	0.33	0.31	0.30
poor_health	0.18	0.18	0.19	0.19	0.16	0.17
chronic*	0.88	0.87	0.86	0.86	0.76	0.76
priv_ins	0.76	0.76	-	-	-	-
less_sec	0.14	0.14	0.18	0.18	0.11	0.11
high_schl	0.14	0.13	0.13	0.12	0.16	0.15
somepost_sec	0.04	0.04	0.04	0.04	0.03	0.03
post_sec	0.68	0.69	0.65	0.66	0.70	0.71
low_inc	0.20	0.20	0.26	0.26	0.21	0.22
med_inc	0.45	0.43	0.45	0.44	0.49	0.48
high_inc	0.22	0.22	0.16	0.17	0.30	0.31
notstated_inc	0.13	0.14	0.13	0.13	-	-
AB	-	-	0.09	0.09	0.10	0.09
SK	-	-	0.03	0.03	0.03	0.03
ON	-	-	0.47	0.47	0.45	0.45
QC	-	-	0.31	0.31	0.30	0.31
NB	-	-	0.03	0.03	0.03	0.03
NS	-	-	0.04	0.04	0.05	0.05
PEI	-	-	0.01	0.01	0.01	0.01
NFLD	-	-	0.02	0.02	0.02	0.02
YK	-	-	.001	0.001	0.001	0.001
NV	-	-	.0002	0.0003	0.0004	0.001

* The 2005 CCHS has a more broad definition of chronic illness than the 2013 CCHS. As a result the dummy variable *chronic* (which equals 1 if an individual has a chronic illness and equals 0 otherwise) has a larger mean in the 2005 survey compared to the 2013 survey.

Table 4: Probit Model- Dependent Variable: *doc*

VARIABLES	CCHS 2005 (ON)	CCHS 2005 (ON)	CCHS 2005	CCHS 2005	CCHS 2013	CCHS 2013
	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67
sixtyfive	0.107 (0.255)	0.438 (0.304)	0.0608 (0.140)	0.179 (0.171)	-0.107 (0.159)	-0.0643 (0.180)
chronicsixtyfive	-0.0754 (0.230)	-0.497 (0.310)	-0.0710 (0.121)	-0.214 (0.162)	-0.00206 (0.154)	-0.0386 (0.191)
age64to67	0.139 (0.184)		0.0837 (0.111)		0.287** (0.113)	
age68to70	0.139 (0.223)		0.138 (0.132)		0.283* (0.150)	
med_inc	0.104 (0.0972)	0.0989 (0.138)	0.142** (0.0601)	0.139* (0.0820)	0.268*** (0.0887)	0.263** (0.123)
high_inc	0.167 (0.140)	0.267 (0.178)	0.179* (0.104)	0.192 (0.138)	0.397*** (0.129)	0.382** (0.160)
notstated_inc	-0.162 (0.137)	-0.217 (0.179)	-0.0574 (0.0827)	-0.0978 (0.110)		
married	0.238*** (0.0823)	0.233* (0.121)	0.281*** (0.0515)	0.264*** (0.0717)	0.326*** (0.0794)	0.463*** (0.0969)
high_schl	0.198 (0.130)	0.305 (0.222)	0.115 (0.0766)	0.167 (0.108)	-0.00912 (0.118)	0.0524 (0.160)
somepost_sec	0.190 (0.172)	0.0789 (0.221)	0.154 (0.104)	0.209 (0.139)	-0.187 (0.194)	0.102 (0.214)
post_sec	-0.0771 (0.0920)	-0.123 (0.128)	0.0607 (0.0568)	0.0583 (0.0771)	-0.0628 (0.104)	0.0754 (0.149)
working	0.0817 (0.102)	0.206 (0.144)	-0.0499 (0.0652)	0.00515 (0.0950)	0.00725 (0.0804)	0.0927 (0.0933)
chronic	0.339* (0.182)	0.513** (0.231)	0.562*** (0.0898)	0.606*** (0.123)	0.585*** (0.105)	0.618*** (0.127)
male	-0.329*** (0.0879)	-0.537*** (0.125)	-0.261*** (0.0528)	-0.391*** (0.0749)	-0.205*** (0.0697)	-0.227** (0.0904)
exc_health	-0.0563 (0.115)	-0.153 (0.134)	-0.104 (0.0721)	-0.188** (0.0928)	-0.0165 (0.125)	-0.135 (0.152)
good_health	0.0278 (0.113)	0.0275 (0.146)	0.0315 (0.0703)	0.0390 (0.0906)	-0.00717 (0.121)	-0.0479 (0.149)
NFLD			-0.273*** (0.105)	-0.253* (0.152)	-0.329** (0.131)	-0.372** (0.174)
PEI			-0.175 (0.123)	-0.0105 (0.180)	-0.153 (0.183)	-0.288 (0.234)
NS			0.219* (0.120)	0.223 (0.165)	-0.255** (0.118)	-0.287* (0.168)
NB			0.129 (0.117)	-0.0834 (0.150)	-0.0865 (0.130)	-0.0276 (0.166)
QC			-0.238*** (0.0600)	-0.269*** (0.0863)	-0.469*** (0.0848)	-0.472*** (0.108)
SK			-0.199** (0.0850)	-0.304** (0.120)	-0.610*** (0.112)	-0.599*** (0.142)
AB			-0.180* (0.104)	-0.204 (0.157)	-0.528*** (0.136)	-0.802*** (0.162)
YK			-0.441** (0.211)	-0.414 (0.290)	-0.796*** (0.196)	-1.021*** (0.266)
NV			-2.527*** (0.313)	-2.580*** (0.407)	-2.498*** (0.379)	-2.772*** (0.512)
priv_ins	0.168 (0.107)	0.153 (0.156)				
age64to65				0.0613 (0.117)		0.341*** (0.122)
age66to67				0.0508 (0.162)		0.343* (0.183)
Constant	1.118*** (0.206)	1.190*** (0.270)	0.980*** (0.119)	1.107*** (0.171)	0.960*** (0.156)	0.787*** (0.211)
Observations	5,523	2,985	14,238	7,754	9,666	5,509

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Probit Model- Dependent Variable: hosp

VARIABLES	CCHS 2005 (ON)	CCHS 2005 (ON)	CCHS 2005	CCHS 2005	CCHS 2013	CCHS 2013
	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67
sixtyfive	0.308 (0.259)	0.419 (0.332)	0.133 (0.166)	0.119 (0.217)	-0.225 (0.165)	-0.402* (0.227)
chronicsixtyfive	-0.295 (0.249)	-0.462 (0.319)	-0.0909 (0.158)	-0.0605 (0.215)	0.192 (0.156)	0.522** (0.226)
age64to67	0.0231 (0.125)		0.00822 (0.0828)		0.108 (0.0971)	
age68to70	-0.0119 (0.152)		0.0534 (0.0991)		0.240* (0.127)	
med_inc	0.0972 (0.0859)	0.0729 (0.107)	-0.0717 (0.0512)	-0.110* (0.0664)	0.0145 (0.0713)	0.0992 (0.0974)
high_inc	0.238** (0.118)	0.317** (0.149)	0.111 (0.0843)	0.101 (0.113)	0.0162 (0.0975)	0.0212 (0.139)
notstated_inc	0.163 (0.117)	0.226 (0.146)	-0.0320 (0.0695)	0.0369 (0.0897)		
married	-0.0844 (0.0781)	-0.136 (0.0943)	-0.00336 (0.0470)	-0.0345 (0.0588)	0.0899 (0.0581)	0.0643 (0.0808)
high_schl	-0.161 (0.115)	-0.190 (0.159)	-0.0773 (0.0739)	-0.0300 (0.102)	0.128 (0.113)	0.0818 (0.143)
somepost_sec	0.369** (0.162)	0.256 (0.215)	0.220** (0.109)	0.118 (0.142)	0.0286 (0.146)	0.143 (0.199)
post_sec	-0.0220 (0.0883)	-0.112 (0.120)	0.0255 (0.0533)	-0.0257 (0.0704)	0.0695 (0.0895)	0.0620 (0.121)
working	-0.0375 (0.0806)	0.0122 (0.105)	-0.0819 (0.0550)	-0.0416 (0.0731)	-0.165** (0.0665)	-0.137 (0.0870)
chronic	0.357* (0.204)	0.630*** (0.239)	0.328*** (0.127)	0.306* (0.167)	0.416*** (0.117)	0.349** (0.156)
male	0.186** (0.0724)	0.408*** (0.0812)	0.107** (0.0455)	0.238*** (0.0551)	0.153** (0.0594)	0.143* (0.0772)
exc_health	-0.939*** (0.0893)	-0.793*** (0.119)	-0.849*** (0.0568)	-0.727*** (0.0755)	-0.771*** (0.0751)	-0.805*** (0.101)
good_health	-0.539*** (0.0886)	-0.422*** (0.113)	-0.488*** (0.0548)	-0.345*** (0.0716)	-0.438*** (0.0771)	-0.434*** (0.102)
NFLD			0.202** (0.102)	0.250* (0.144)	0.0236 (0.131)	0.00896 (0.176)
PEI			0.204 (0.126)	0.240 (0.164)	0.390** (0.162)	0.454** (0.200)
NS			0.0320 (0.0913)	0.0343 (0.131)	-0.0290 (0.124)	-0.0665 (0.160)
NB			0.0929 (0.0830)	0.0826 (0.108)	0.148 (0.113)	0.244* (0.134)
QC			0.102* (0.0546)	0.120 (0.0754)	0.135* (0.0747)	0.223** (0.0989)
SK			0.224*** (0.0746)	0.175* (0.0987)	0.109 (0.110)	0.175 (0.144)
AB			0.190** (0.0764)	0.246*** (0.0947)	0.199** (0.0935)	0.308** (0.124)
YK			-0.171 (0.197)	-0.221 (0.266)	0.312 (0.256)	-0.144 (0.356)
NV			0.929** (0.442)	0.427 (0.412)	0.967** (0.468)	0.539 (0.717)
priv_ins	0.145* (0.0779)	0.0641 (0.103)				
age64to65		0.155 (0.129)		0.0624 (0.0887)		0.0257 (0.109)
age66to67		0.241 (0.187)		0.0426 (0.121)		-0.163 (0.159)
Constant	-1.380*** (0.231)	-1.850*** (0.283)	-1.221*** (0.141)	-1.376*** (0.182)	-1.515*** (0.156)	-1.430*** (0.207)
Observations	5,520	2,983	14,231	7,748	9,666	5,506

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Negative Binomial Distribution Model- Dependent Variable: *freq_doc*

VARIABLES	CCHS 2005 (ON)	CCHS 2005 (ON)	CCHS 2005	CCHS 2005	CCHS 2013	CCHS 2013
	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67
sixtyfive	-0.130 (0.145)	-0.0677 (0.193)	0.193* (0.100)	0.224 (0.140)	-0.104 (0.112)	0.0367 (0.128)
chronicsixtyfive	0.132 (0.133)	0.0874 (0.185)	-0.182** (0.0918)	-0.223 (0.138)	0.0652 (0.113)	-0.113 (0.132)
age64to67	0.0552 (0.0780)		-0.0458 (0.0510)		0.0735 (0.0645)	
age68to70	-0.0114 (0.0927)		-0.0816 (0.0608)		0.248** (0.122)	
med_inc	0.0847* (0.0491)	0.0926 (0.0670)	0.0627** (0.0314)	0.0595 (0.0432)	0.0407 (0.0638)	0.0212 (0.0801)
high_inc	0.0308 (0.0719)	0.0381 (0.0862)	0.140** (0.0588)	0.134* (0.0696)	0.0527 (0.0808)	0.0395 (0.0928)
notstated_inc	0.0134 (0.0654)	-0.0161 (0.0960)	-0.0318 (0.0484)	-0.110* (0.0623)		
married	-0.0567 (0.0429)	-0.0407 (0.0565)	-0.0416 (0.0314)	-0.00125 (0.0392)	-0.0204 (0.0558)	-0.0282 (0.0559)
high_schl	0.0383 (0.0752)	0.0443 (0.101)	0.0359 (0.0480)	0.0705 (0.0663)	0.0782 (0.0789)	0.0479 (0.106)
somepost_sec	-0.00402 (0.0897)	-0.0895 (0.143)	0.150* (0.0905)	0.0504 (0.106)	0.258 (0.160)	0.156 (0.163)
post_sec	0.0179 (0.0574)	0.000761 (0.0811)	0.0425 (0.0343)	0.0416 (0.0504)	0.230*** (0.0691)	0.185** (0.0916)
working	-0.162*** (0.0482)	-0.158** (0.0617)	-0.186*** (0.0351)	-0.175*** (0.0443)	-0.00147 (0.0884)	-0.0691 (0.0582)
chronic	0.700*** (0.102)	0.725*** (0.146)	0.889*** (0.0611)	0.900*** (0.0838)	0.583*** (0.0798)	0.625*** (0.0969)
male	-0.0628 (0.0418)	-0.0558 (0.0539)	-0.0595* (0.0313)	-0.0296 (0.0376)	-0.0894 (0.0589)	-0.122** (0.0518)
exc_health	-0.931*** (0.0571)	-0.929*** (0.0741)	-0.877*** (0.0387)	-0.923*** (0.0519)	-0.841*** (0.0702)	-0.838*** (0.0922)
good_health	-0.507*** (0.0578)	-0.481*** (0.0738)	-0.517*** (0.0393)	-0.509*** (0.0508)	-0.481*** (0.0717)	-0.602*** (0.0886)
NFLD			0.309*** (0.0983)	0.316** (0.150)	-0.0174 (0.0769)	-0.0653 (0.0935)
PEI			-0.0374 (0.0710)	-0.0264 (0.0744)	-0.142 (0.116)	-0.0235 (0.135)
NS			0.121* (0.0666)	0.0466 (0.0599)	0.0232 (0.0691)	0.0611 (0.0797)
NB			-0.131*** (0.0505)	-0.156** (0.0792)	-0.199*** (0.0661)	-0.157** (0.0750)
QC			-0.372*** (0.0340)	-0.353*** (0.0481)	-0.415*** (0.0623)	-0.345*** (0.0687)
SK			-0.0418 (0.0416)	-0.106* (0.0565)	0.0306 (0.167)	-0.0561 (0.0961)
AB			0.0949 (0.0798)	0.0290 (0.0733)	-0.0997 (0.0798)	-0.0498 (0.0781)
YK			-0.0666 (0.153)	-0.00849 (0.206)	0.183 (0.218)	-0.0311 (0.254)
NV			-0.674** (0.282)	-0.856** (0.353)	-1.206*** (0.338)	-1.216** (0.488)
priv_ins	0.132*** (0.0479)	0.136** (0.0655)				
age64to65		0.0528 (0.0808)		-0.0580 (0.0546)		0.0451 (0.0752)
age66to67		0.0215 (0.117)		-0.0425 (0.0773)		0.0316 (0.101)
Constant	1.441*** (0.121)	1.403*** (0.174)	1.349*** (0.0760)	1.336*** (0.106)	1.413*** (0.118)	1.522*** (0.156)
Observations	5,503	2,973	14,195	7,732	9,611	5,478

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Negative Binomial Distribution Model- Dependent Variable: *freq_hosp*

Freq_hosp VARIABLES	CCHS 2005 (ON)	CCHS 2005 (ON)	CCHS 2005	CCHS 2005	CCHS 2013	CCHS 2013
	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67	Age: 60-70	Age: 62-67
sixtyfive	1.455** (0.645)	1.316 (0.863)	0.609 (0.475)	0.618 (0.571)	-1.088** (0.528)	-1.446** (0.684)
chronicsixtyfive	-1.342** (0.621)	-1.630* (0.851)	-0.634 (0.441)	-0.953* (0.560)	0.302 (0.446)	1.110* (0.636)
age64to67	0.307 (0.302)		0.389 (0.246)		0.801** (0.325)	
age68to70	-0.102 (0.389)		0.126 (0.296)		0.969** (0.379)	
med_inc	0.00672 (0.233)	-0.492 (0.326)	-0.214 (0.140)	-0.493*** (0.185)	0.0419 (0.195)	0.295 (0.244)
high_inc	-0.0748 (0.319)	-0.177 (0.404)	0.0721 (0.237)	0.0714 (0.327)	0.161 (0.287)	0.276 (0.355)
notstated_inc	0.234 (0.318)	0.204 (0.430)	-0.00585 (0.199)	0.108 (0.252)		
married	-0.307 (0.194)	-0.310 (0.255)	-0.234* (0.128)	-0.00363 (0.165)	-0.0629 (0.189)	-0.115 (0.238)
high_schl	-0.0398 (0.320)	0.257 (0.473)	-0.262 (0.207)	0.129 (0.281)	-0.224 (0.275)	-0.294 (0.361)
somepost_sec	0.220 (0.380)	-0.0917 (0.443)	-0.0483 (0.241)	-0.363 (0.293)	-0.694* (0.384)	-0.446 (0.500)
post_sec	0.153 (0.235)	0.176 (0.317)	-0.0757 (0.150)	-0.00702 (0.184)	-0.133 (0.248)	-0.168 (0.317)
working	-0.220 (0.238)	-0.328 (0.289)	-0.428** (0.175)	-0.301 (0.225)	-0.637*** (0.198)	-0.649*** (0.237)
chronic	1.464*** (0.484)	1.862*** (0.708)	1.149*** (0.324)	1.323*** (0.412)	1.279*** (0.345)	1.172*** (0.430)
male	0.779*** (0.181)	1.280*** (0.242)	0.561*** (0.126)	0.922*** (0.179)	0.305* (0.164)	0.282 (0.212)
exc_health	-2.411*** (0.235)	-2.393*** (0.314)	-2.180*** (0.146)	-2.191*** (0.202)	-2.343*** (0.197)	-2.249*** (0.239)
good_health	-1.338*** (0.215)	-1.065*** (0.286)	-1.064*** (0.139)	-0.909*** (0.187)	-1.227*** (0.220)	-1.125*** (0.274)
NFLD			0.552* (0.305)	0.351 (0.453)	-0.303 (0.377)	-0.868** (0.411)
PEI			0.569** (0.276)	0.485 (0.422)	0.666 (0.498)	0.460 (0.522)
NS			0.142 (0.231)	0.115 (0.332)	-0.632** (0.286)	-0.812** (0.386)
NB			0.166 (0.225)	0.479 (0.375)	-0.0133 (0.307)	0.270 (0.444)
QC			0.0740 (0.157)	0.267 (0.218)	0.0153 (0.198)	-0.0330 (0.246)
SK			0.204 (0.192)	0.283 (0.286)	0.0784 (0.306)	-0.238 (0.359)
AB			0.382* (0.195)	0.444* (0.250)	0.555** (0.255)	0.760** (0.335)
YK			-0.259 (0.434)	-0.112 (0.851)	0.967 (0.676)	1.291 (0.818)
NV			3.286*** (0.923)	0.228 (0.639)	0.312 (0.947)	-0.667 (0.979)
priv_ins	0.541** (0.214)	0.741*** (0.278)				
age64to65		0.528 (0.329)		0.327 (0.244)		0.393 (0.338)
age66to67		1.109** (0.491)		0.802** (0.360)		-0.127 (0.429)
Constant	-1.312** (0.556)	-2.188*** (0.793)	-0.328 (0.381)	-0.966** (0.485)	-0.258 (0.435)	0.0658 (0.543)
Observations	5,514	2,980	14,219	7,740	9,661	5,504

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix
General Family Physician Rate per 100,000 by Province

2001			
Province	Average	Max	Min
NFL	112	103	96
PEI	83		
NS	102	123	84
NB	92	91	87
QC	106	154	80
ON	85	121	54
Man	94	100	74
Sas	93		
Alb	88		
BC	108	173	73
YT	166		
NT	58		
NUN	25		
Canada	95		

2005			
Province	Average	Max	Min
NFL	98	102	89
PEI	89		
NS	117	140	93
NB	102	105	94
QC	109	166	82
ON	85	133	57
Man	94	99	75
Sas	88	103	83
Alb	103	114	75
BC	111	167	76
YT	184		
NT	70		
NUN	43		
Canada	98		

2008			
Province	Average	Max	Min
NFL	115	130	103
PEI	102		
NS	119	138	85
NB	107	136	98
QC	113	179	81
ON	86	139	53
Man	95	155	45
Sas	93	116	56
Alb	112	124	74
BC	114	162	76
YT	205		
NT	76		
NUN	32		
Canada	101		

2009			
Province	Average	Max	Min
NFL	118	125	113
PEI	89		
NS	117	136	86
NB	109	137	101
QC	110	179	81
ON	90	141	53
Man	95	145	53
Sas	94	118	61
Alb	113	127	89
BC	119	171	80
YT	190		
NT	69		
NUN	31		
Canada	103		

2010			
Province	Average	Max	Min
NFL	118	121	110
PEI	89		
NS	114	117	89
NB	109	140	98
QC	111	190	81
ON	92	145	53
Man	99	143	60
Sas	95	117	61
Alb	109	120	84
BC	119	169	79
YT	180		
NT	55		
NUN	30		
Canada	104		