

Dental insurance, income and the use of dental care in Canada*

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Abstract

Using recent Canadian health survey data, we investigate the effect of individuals' socio-economic status on their use of dental services and dental insurance coverage. Our results point to an important socio-economic gradient in the use of dental services. The probability of receiving any dental care over the course of a year increases markedly with dental insurance, household income, and ones level of educational attainment. Conditional on receiving some dental care, however, ones general oral health – not financial factors – largely determines visit frequency. The insurance effect appears to operate through a reduction in price paid at point of service, not the decision of those with high anticipated need for dental care to selectively purchase insurance. Indeed, those with poorer self assessed oral health, as well as those from Quebec (where dental benefits are subject to personal income tax), and those 65+ (who have likely lost employer-provided coverage) are less likely to be insured.

Extended Abstract

Introduction

Canadians are by and large responsible for financing their own dental care; hospital and physicians' services, by contrast, are largely collectively financed. The reliance on private finance raises questions about the equity of the distribution of dental services. In particular, to what extent do individuals' financial resources, including income and dental insurance coverage, affect their use of dental services? Is it the case, for instance, that those with limited means with no insurance coverage pay out of pocket to receive regular dental care? We investigate this and related issues using data from the 2003 Statistics Canada Canadian Community Health Survey (CCHS), a survey of the health, health services use and health related behaviours of community-dwelling Canadians.

Methods

We estimated models of dental insurance coverage and dental services use using data from the 108,861 CCHS respondents aged 25 and older. In particular we used probit regression to explore the effects of general oral health status, household income, respondent age, sex, education, marital status and province of residence on the probability of dental insurance coverage. We used the "two-part" regression model to estimate the effects of these variables on annual dental visit frequency. The two part model is a flexible way of modeling skewed individual level health service use data, that is, data in which a large fraction of individuals have zero visits, whereas a small fraction have numerous visits.

Results

Our results point to an important socio-economic gradient in the use of dental services. The probability of receiving any dental care over the course of a year increases markedly with dental insurance, household income, and ones level of educational attainment. For instance, those with household incomes of \$80,000 or more are 25% more likely to receive dental care than otherwise comparable individuals with household incomes less than \$15,000. But among those receiving care, high income individuals have only 10% more visits than comparable low income individuals. Indeed, among those receiving some dental care, ones general oral health – not financial factors – largely determines visit frequency. The insurance effect appears to operate through a reduction in price paid at point of service, not the decision of those with high anticipated need for dental care to selectively purchase insurance. Indeed, those with poorer self assessed oral health, as well as those from Quebec (where dental benefits are subject to personal income tax), and those 65+ (who have likely lost employer-provided coverage) are less likely to be insured.

Our models also point to marked regional differences in the use of dental services. Residents of Ontario, for instance, are 22 percentage points more likely to receive dental care over the course of a year than otherwise comparable residents of Newfoundland. These differences could be driven in part by the regional supply of dentists. Specifically, a relatively small proportion of the residents of the provinces with the lowest dentist-to-population ratios in 2002 (namely Newfoundland, Saskatchewan, and New Brunswick) receive dental care; conversely a relatively large proportion of residents of “dentist rich” regions (Ontario and British Columbia) receive dental care.

Discussion

Our results suggest that ones use of dental services varies markedly depending on ones insurance coverage status, income, education and ones province of residence. The attendant effect of these differences on Canadians' oral health is a ripe area for research.

Introduction

Canadians are by and large responsible for financing their own dental care, either through private insurance or through direct payment. Physicians' and hospital-based services, by contrast, are largely publicly funded. Given the effectiveness of dental services in improving oral health, and the importance of oral health to general health related quality of life,¹ the system of private finance raises questions about the equity of the distribution of dental services. In particular, to what extent do individuals' financial resources, including income and dental insurance coverage, affect their use of dental services? Is it the case, for instance, that those with limited means with no insurance coverage pay out of pocket to receive regular dental care? The evidence suggests that the answer is no. Using data from the Statistics Canada National Population Health Survey (NPHS), Miller and Locker (1999) (hereafter ML) report that income and insurance are important determinants of one's decision to visit a dentist over the course of a year.² In particular, holding other factors constant, the highest income Canadians were almost three times as likely to visit a dentist compared to the lowest income Canadians. Similar differences were found among those with and without dental insurance. Less affluent, uninsured Canadians are therefore markedly less likely to receive regular dental care than their affluent, insured counterparts. Other analysts have found similar results for different jurisdictions and different time periods.^{3,4}

In this paper, we extend ML's analysis of the distribution of dental care in Canada in several ways. First, we investigate the effect of household financial resources on the number of dental consultations made in the past year, while controlling for a variety of other factors such as age, sex, education, and oral health. While ML's results suggest

that income and insurance affects the probability of visiting a dentist, it is unclear how these and other variables affect the frequency of use. For instance, are insured individuals more likely to be frequent users of dental care? How do visits vary over the lifecycle? Are those with poorer oral health getting more dental care? Our model addresses precisely such questions.

Our second contribution is more subtle. ML found that the insured are much more likely to receive dental care than the non-insured. It is unclear, however, to what extent this association operates through the normal insurance response (i.e. insurance lowers the direct cost of care to patients and hence increases use) rather than through those with poor oral health purchasing insurance (i.e. “adverse selection”). We investigate this by estimating a model of the probability of dental insurance coverage as a function of, among other factors, self-assessed general oral health status. If those with poorer oral health are no more likely than those with excellent oral health to report dental insurance coverage, then selection effects are probably not driving the positive association between insurance and dental services use.

Third, we estimate our models using more recent data. Whereas ML used data from the 1996-97 NPHS, we use data from the 2003 Statistics Canada Canadian Community Health Survey (CCHS), which has a sampling frame similar to that of the NPHS and includes information on dental services use, dental insurance and oral health.

Methods

The public use version of the 2003 CCHS contains detailed information on the health services use, health status and health risk factors of 134,072 Canadians. The survey is intended to be representative of all persons living in private households and therefore excludes those residing in long-term care facilities, hospitals, aboriginal reserves, and penal institutions. Households were sampled by random digit dialing and data were collected via telephone interview with a randomly chosen household member. The survey is a stratified multi-stage sample, and lower population regions such as the Atlantic provinces are over-sampled. We therefore used sampling weights provided by Statistics Canada to ensure descriptive statistics are nationally representative.

We estimated models of dental insurance coverage and dental services use using data from the 108,861 CCHS respondents aged 25 and older. In particular we used probit regression to explore the effects of general oral health status, household income, respondent age, sex, education, marital status and province of residence on the probability of dental insurance coverage. Regression techniques estimate the separate contribution of each explanatory factor on an outcome variable, while holding constant the influence of other factors. Why is this important? The unadjusted correlation between, say, income and probability of insurance reflects in part the positive correlation between income and education: Highly educated people likely earn more and are also more likely to have access to dental insurance. The unadjusted correlation therefore likely overestimates the impact of income on the probability of insurance. Regression attempts to parcel out the effect of income while holding constant the influence of education and other variables. We report the model “pseudo R-squared”, which is a measure of the degree to which explanatory factors are able to

account for variations in the outcome variable. The pseudo R-squared takes on values from 0 to 1, with larger values reflecting better predictive performance.

Oral health was assessed using the question: “In general, would you say the health of your teeth and mouth is: excellent, very good, good, fair, or poor?” Dental insurance was assessed using the question: “Do you have insurance that covers all or part of your dental expenses?” We used the “two-part” regression model⁵⁻⁷ to estimate the effects of these variables on dental visits, which were assessed using the question: “In the past 12 months, how many times have you seen, or talked on the telephone, about your physical, emotional or mental health with a dentist or orthodontist?” The two part model is a flexible way of modeling skewed individual level health service use data, that is, data in which a large fraction of individuals have zero visits, whereas a small fraction have numerous visits. The technique consists of a probit regression model of the decision to receive any dental care (1+ visit annually) and a separate linear regression of the log number of visits among those who receive care. The effect of an explanatory factor thus can be decomposed into separate effects on a “decision to receive care” component and a “frequency of visits conditional on receiving care” component. We used the probit and linear regression routines, along with their heteroskedasticity-robust covariance matrix estimators, implemented in Stata version 9.1.⁸

The general oral health status variables were included in the regression models of dental visits to identify the ‘pure’ effect of household income on visit frequency, that is, the effect of income holding constant the influence of oral health. Because the more affluent likely have healthier teeth, and those with healthier teeth likely have fewer visits,

failure to control for oral health might lead to underestimation of the pure effect of income on visits. One difficulty with including the oral health variables in the visits model, however, is that oral health might be partly determined by visit frequency. In other words, those who go to dentist more often might have healthier teeth. This is not necessarily the case in our model, however: the CCHS asks about “general” oral health status, so it could be the case that oral health determines, but is not determined by, visits made in the last 12 months. In any event, we estimated the visits models with and without the inclusion of the oral health variables to determine if this had any appreciable effect on the estimated effects of income and insurance on visits.

Results

Before turning to the regression model estimates, we describe mean annual dental visit frequency by values of the factors considered in our analyses. The mean number of dental visits is higher among: those with dental insurance (Figure 1), those with higher household income (Figure 2), females (Figure 3), those who are married (Figure 4), and those with higher levels of formal educational attainment (Figure 5). Mean visit frequency has a “U-shaped” relation with self-assessed oral health status; specifically, mean visits are highest for those at the extremes of oral health (excellent and poor) and lower for those with intermediate values (very good, good and fair) (Figure 6). Mean visit frequency increases with age until middle age. Visits drop off markedly thereafter and stabilize at around 1 visit annually after age 65 (Figure 7). Mean visit frequency varies markedly by province with the highest rates observed in

Ontario and British Columbia and the lowest rates observed in Newfoundland and New Brunswick (Figure 8).

Estimates of the effect of oral health, income and other factors on the probability of dental insurance coverage are presented in Table 1. We report estimated effects in terms of absolute differences in probability of coverage between the group in question and the reference group. Hence, those with household incomes of \$80,000 or more are 33 percentage points more likely to have dental insurance than otherwise comparable individuals with household incomes less than \$15,000. And this estimate appears to be precise: the 95% confidence interval around this estimate is 32-35%. Our results suggest that better self-assessed oral health is associated with a *higher* probability of dental insurance coverage. Other notable findings include a precipitous drop in coverage at age 65 and the markedly lower rates of dental insurance in Quebec vis-à-vis the other provinces.

The estimates of the visits models both with and without the inclusion of the oral health variables are reported in Table 2. The first notable finding is that oral health has opposing effects on the decision to receive care and the amount of care received among those receiving care: those with poor self-assessed oral health are 19 percentage points *less* likely to receive dental care relative to those reporting excellent oral health and, again, holding constant insurance, income and other factors, among those receiving dental care, poor oral health is associated with 34% more visits. Dental insurance coverage seems to have its primary effect on the decision to receive dental care, not on visit frequency. Specifically, insured individuals are 17 percentage points more likely to receive care, but among those receiving care, the insured have only 9%

more visits than comparable non-insured individuals. Similar patterns were observed for income: those with household incomes of \$80,000 or more are 25% more likely to receive dental care than otherwise comparable individuals with household incomes less than \$15,000. But among those receiving care, high income individuals have only 10% more visits than comparable low income individuals. As was expected, the estimates of the effect of income on the number of visits were attenuated when oral health was not controlled for. The omission of oral health had little effect on the magnitudes of the insurance effects or on the probability model estimates.

The probability of receiving dental care declines over the lifecycle, but among those who do receive care, annual dentist visit frequency increases with age. Visits are lower among males and higher among those with more education. The probability of receiving any dental care over the course of a year is lowest in Newfoundland, Saskatchewan, and New Brunswick and highest in Ontario and British Columbia. Conditional on receiving dental care, mean visit frequency is lowest in Saskatchewan and Quebec and highest in Nova Scotia and British Columbia.

Discussion

Our results point to an important socio-economic gradient in the use of dental services in Canada. We find that the probability of receiving any dental care over the course of a year and, to a lesser extent, the amount of care received increases with dental insurance, household income, and ones level of educational attainment. The insurance effect appears to operate through a reduction in price paid at point of service, not the decision of those with high anticipated need for dental care to selectively

purchase insurance. Indeed, those with poorer self assessed oral health are less likely to be insured.

Oral health has opposing effects on the probability of receiving any dental care and the amount of care received. We find those with poorer oral health are *less* likely to receive dental care; this association could reflect the consequences of failure to receive regular dental care. Among those receiving dental care, however, those with poorer oral health visit the dentist more frequently. Indeed, among those who use some dentist services, the primary determinant of dental visit frequency was oral health: it dominated the combined effect of income and insurance. Hence financial factors are particularly important determinants of the decision to receive any care, but health care needs drive the intensity/volume of services delivered to those who do receive care. This finding has also been reported for other health services, including drug and physician services.⁹

One limitation of our study is the “noisy” measure of dental services use contained in the CCHS. While it can distinguish those who did and did not access dentists’ services over the course of a year, it does not capture consultations with denturists. Nor does it distinguish service intensity; indeed, an encounter can range from a short telephone conversation up to the provision of multiple procedures in a three hour appointment. The nature of this outcome measure therefore precludes analysis of the effects of income and insurance on the use of specific dental services. ML did, however, provide some evidence on this. They found that the largest income and insurance related differences occurred in the use of routine dental care (checkups, cleaning and fillings).

The probability of receiving any dental care varies markedly by region with a 22% difference in probabilities between those residing in Ontario and those in Newfoundland; ML report similar differences. These differences could be driven in part by the regional supply of dentists. Specifically, a relatively small proportion of the residents of the provinces with the lowest dentist-to-population ratios in 2002 (namely Newfoundland, Saskatchewan, and New Brunswick¹⁰) receive dental care; conversely a relatively large proportion of residents of “dentist rich” regions (Ontario and British Columbia) receive dental care.

Our model of dental insurance produced some additional notable findings that corroborate those of ML. First, there is a markedly lower rate of dental insurance in Quebec relative to the other provinces and second, we find that the probability of coverage drops off markedly after age 65. The first result could be due in part to the fact that employer-provided health benefits have been subject to personal income tax in Quebec since 1993, but are not taxed elsewhere.^{11,12} The second result is possibly due to the loss of employer-provided coverage upon retirement. One might expect that those who lose employer-provided group coverage would secure alternative, possibly non-group coverage. Coverage available to individual subscribers, however, is typically expensive and non-comprehensive due to problems of adverse selection. The dental insurance coverage prospects for the large numbers of Canadians who expect to retire from the labour force over the next two decades do not look promising.

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Table 1: Estimated effects of income, oral health, age, sex, education, marital status, and province of residence on the probability of dental insurance coverage

Explanatory Variable	Sample Mean	Estimated Effect	95% Conf. Interval		
Income	=1 if household income \$15,000 - \$29,999	0.191	-0.012	-0.026	0.001
	=1 if household income \$30,000 - \$49,999	0.231	0.133	0.120	0.145
	=1 if household income \$50,000 - \$79,999	0.248	0.273	0.261	0.285
	=1 if household income \$80,000+	0.219	0.336	0.324	0.347
	<i>reference: household income < \$15,000</i>				
Oral Health	=1 if self assessed oral health: very good	0.311	-0.022	-0.031	-0.012
	=1 if self assessed oral health: good	0.319	-0.052	-0.062	-0.042
	=1 if self assessed oral health: fair	0.110	-0.091	-0.105	-0.078
	=1 if self assessed oral health: poor	0.048	-0.147	-0.165	-0.129
	<i>reference: excellent self assessed oral health</i>				
Age	=1 if age is from 35 to 44	0.205	0.034	0.022	0.045
	=1 if age is from 45 to 54	0.200	0.016	0.004	0.027
	=1 if age is from 55 to 64	0.176	-0.074	-0.086	-0.062
	=1 if age is from 65 to 74	0.132	-0.271	-0.283	-0.258
	=1 if age is from 75+	0.101	-0.287	-0.302	-0.273
	<i>reference: age 25-34</i>				
Sex	=1 if male	0.457	-0.015	-0.023	-0.008
	<i>reference: female</i>				
Education	=1 if completed secondary education	0.176	0.041	0.029	0.052
	=1 if completed some post-secondary	0.062	0.048	0.032	0.064
	=1 if post-secondary graduate	0.529	0.047	0.037	0.057
	<i>reference: less than secondary education</i>				
Marital Status	=1 if married or commonlaw	0.608	0.026	0.016	0.037
	=1 if widowed, separated or divorced	0.234	0.036	0.024	0.048
	<i>reference: single (never married)</i>				
Province	=1 if from pei	0.015	0.041	0.008	0.074
	=1 if from nova scotia	0.037	0.096	0.072	0.120
	=1 if from new brunswick	0.037	0.123	0.099	0.146
	=1 if from quebec	0.206	-0.078	-0.099	-0.057
	=1 if from ontario	0.330	0.166	0.147	0.185
	=1 if from manitoba	0.056	0.130	0.108	0.152
	=1 if from saskatchewan	0.054	0.114	0.091	0.136
	=1 if from alberta	0.096	0.164	0.144	0.184
	=1 if from british columbia	0.120	0.128	0.108	0.148
	=1 if from the territories	0.018	0.263	0.240	0.287
	<i>reference: from newfoundland</i>				
	Number of observations	89,760			
	Pseudo R-Squared	0.180			

Source: 2003 Statistics Canada CCHS respondents aged 25+

Table 2: Two part model estimates of number of annual dental visits, with and without the inclusion of oral health variables

Explanatory Variable	Outcome variable											
	Probability of receiving dental care			Proportional change in number of visits among those receiving dental care			Probability of receiving dental care			Proportional change in number of visits among those receiving dental care		
	Estimated Effect	95% Conf. Interval		Estimated Effect	95% Conf. Interval		Estimated Effect	95% Conf. Interval		Estimated Effect	95% Conf. Interval	
Insurance =1 if person has dental insurance <i>reference: no dental insurance</i>	0.166	0.158	0.173	0.087	0.076	0.099	0.172	0.165	0.180	0.077	0.066	0.088
Income =1 if household income \$15,000 - \$29,999	0.046	0.033	0.058	0.022	-0.003	0.048	0.052	0.040	0.065	0.001	-0.025	0.027
=1 if household income \$30,000 - \$49,999	0.127	0.115	0.140	0.051	0.027	0.076	0.140	0.128	0.152	0.015	-0.010	0.039
=1 if household income \$50,000 - \$79,999	0.189	0.176	0.201	0.069	0.044	0.093	0.207	0.195	0.219	0.023	-0.002	0.047
=1 if household income \$80,000+ <i>reference: household income < \$15,000</i>	0.250	0.237	0.262	0.096	0.070	0.121	0.274	0.262	0.286	0.038	0.013	0.064
Oral Health =1 if self assessed oral health: very good	-0.037	-0.047	-0.027	0.023	0.011	0.034						
=1 if self assessed oral health: good	-0.122	-0.132	-0.112	0.085	0.072	0.098						
=1 if self assessed oral health: fair	-0.145	-0.158	-0.132	0.202	0.181	0.222						
=1 if self assessed oral health: poor <i>reference: excellent self assessed oral health</i>	-0.194	-0.212	-0.177	0.344	0.306	0.382						
Age =1 if age is from 35 to 44	0.055	0.044	0.066	0.028	0.013	0.042	0.049	0.038	0.060	0.033	0.018	0.047
=1 if age is from 45 to 54	0.046	0.035	0.057	0.051	0.035	0.066	0.035	0.024	0.046	0.062	0.046	0.077
=1 if age is from 55 to 64	0.033	0.021	0.044	0.075	0.059	0.092	0.026	0.014	0.038	0.080	0.063	0.096
=1 if age is from 65 to 74	0.037	0.024	0.051	0.092	0.072	0.112	0.034	0.021	0.047	0.091	0.071	0.111
=1 if age is from 75+ <i>reference: age 25-34</i>	0.013	-0.002	0.028	0.082	0.058	0.105	0.009	-0.006	0.023	0.083	0.059	0.106
Sex =1 if male <i>reference: female</i>	-0.087	-0.094	-0.080	-0.038	-0.048	-0.028	-0.099	-0.106	-0.092	-0.023	-0.033	-0.013
Education =1 if completed secondary education	0.112	0.101	0.122	0.037	0.019	0.055	0.117	0.107	0.127	0.028	0.010	0.046
=1 if completed some post-secondary	0.127	0.113	0.140	0.074	0.050	0.099	0.132	0.119	0.146	0.069	0.045	0.093
=1 if post-secondary graduate <i>reference: less than secondary education</i>	0.182	0.173	0.191	0.058	0.043	0.074	0.193	0.184	0.202	0.042	0.027	0.058
Marital Status =1 if married or commonlaw	-0.027	-0.037	-0.016	-0.049	-0.064	-0.034	-0.030	-0.040	-0.020	-0.039	-0.053	-0.024
=1 if widowed, separated or divorced <i>reference: single (never married)</i>	-0.043	-0.055	-0.031	-0.017	-0.035	0.001	-0.045	-0.057	-0.033	-0.010	-0.028	0.009
Province =1 if from pei	0.186	0.160	0.212	0.033	-0.019	0.085	0.185	0.159	0.211	0.036	-0.016	0.089
=1 if from nova scotia	0.148	0.126	0.170	0.079	0.036	0.123	0.145	0.122	0.167	0.085	0.042	0.129
=1 if from new brunswick	0.091	0.067	0.115	0.006	-0.039	0.050	0.085	0.061	0.109	0.015	-0.029	0.059
=1 if from quebec	0.119	0.100	0.138	-0.054	-0.090	-0.017	0.117	0.098	0.136	-0.045	-0.081	-0.009
=1 if from ontario	0.216	0.197	0.234	0.060	0.024	0.095	0.205	0.187	0.224	0.079	0.044	0.115
=1 if from manitoba	0.112	0.090	0.134	0.012	-0.029	0.054	0.106	0.084	0.128	0.026	-0.015	0.067
=1 if from saskatchewan	0.069	0.046	0.092	-0.074	-0.115	-0.033	0.057	0.034	0.080	-0.052	-0.093	-0.011
=1 if from alberta	0.104	0.083	0.124	-0.039	-0.077	-0.001	0.095	0.074	0.115	-0.019	-0.057	0.019
=1 if from british columbia	0.193	0.175	0.211	0.063	0.026	0.101	0.184	0.166	0.202	0.085	0.047	0.122
=1 if from the territories <i>reference: from newfoundland</i>	0.099	0.070	0.129	-0.018	-0.067	0.032	0.076	0.047	0.106	0.023	-0.027	0.072
Number of observations	89,760			51,865			91,511			52,561		
Pseudo R-Squared	0.134			0.037			0.126			0.019		

Figure 1 Mean annual dental visit frequency by level of drug insurance

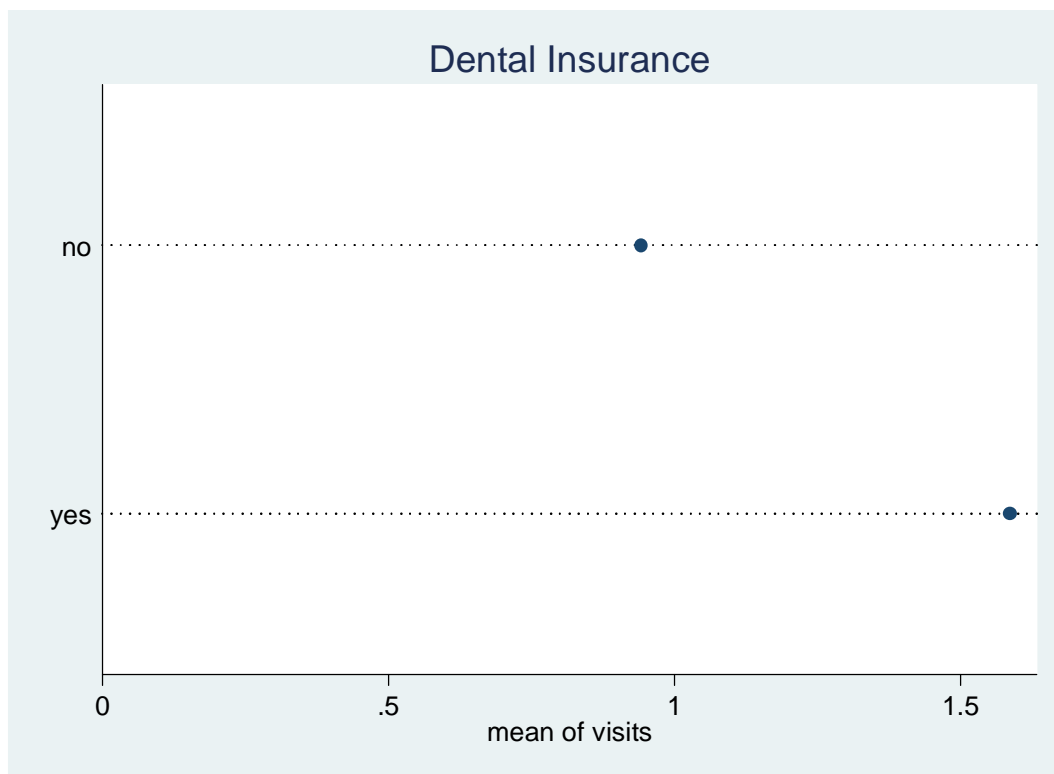


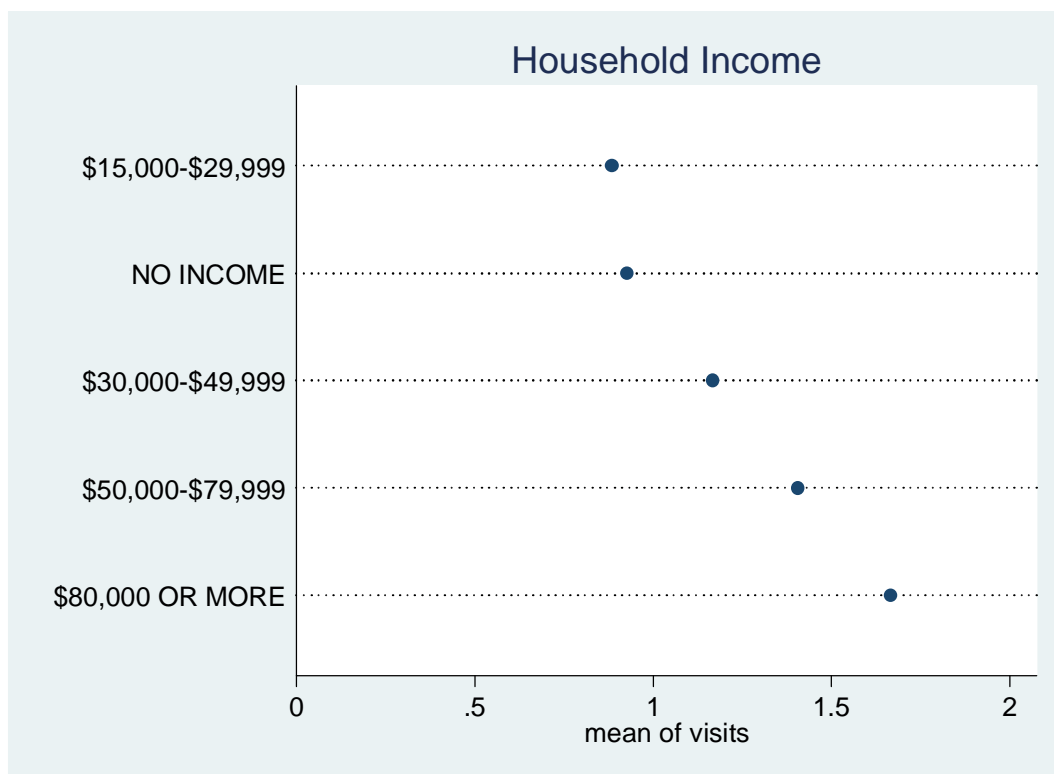
Figure 2 Mean annual dental visit frequency by level of household income

Figure 3 Mean annual dental visit frequency by sex

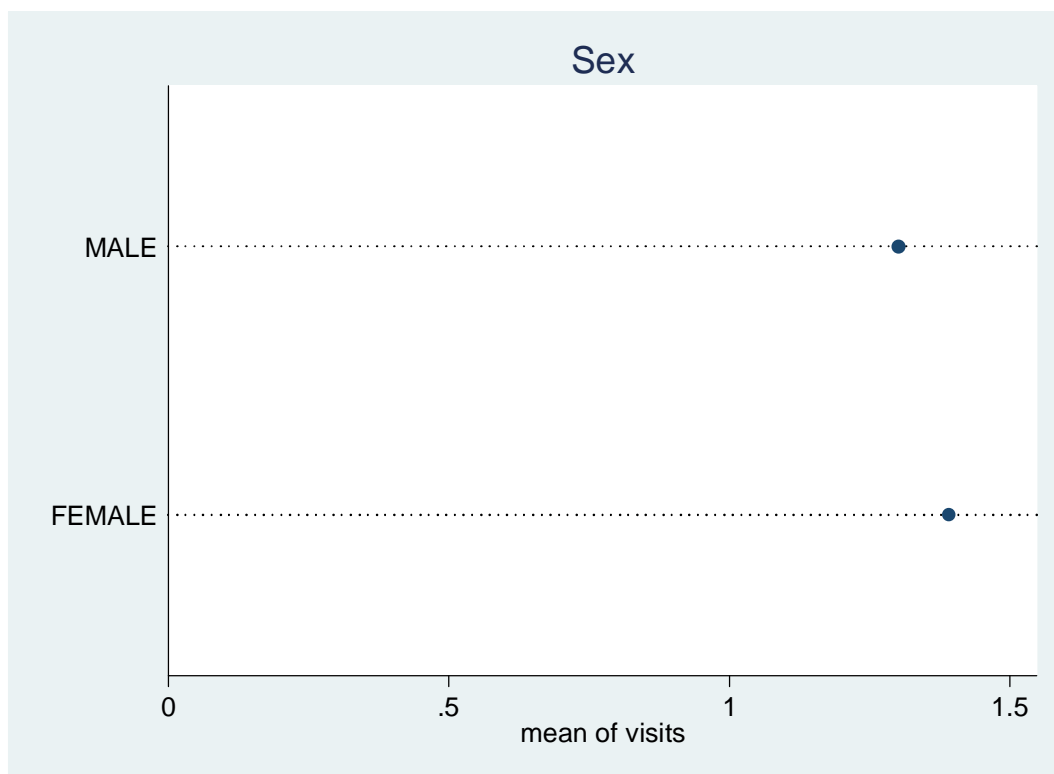


Figure 4 Mean annual dental visit frequency by level of marital status

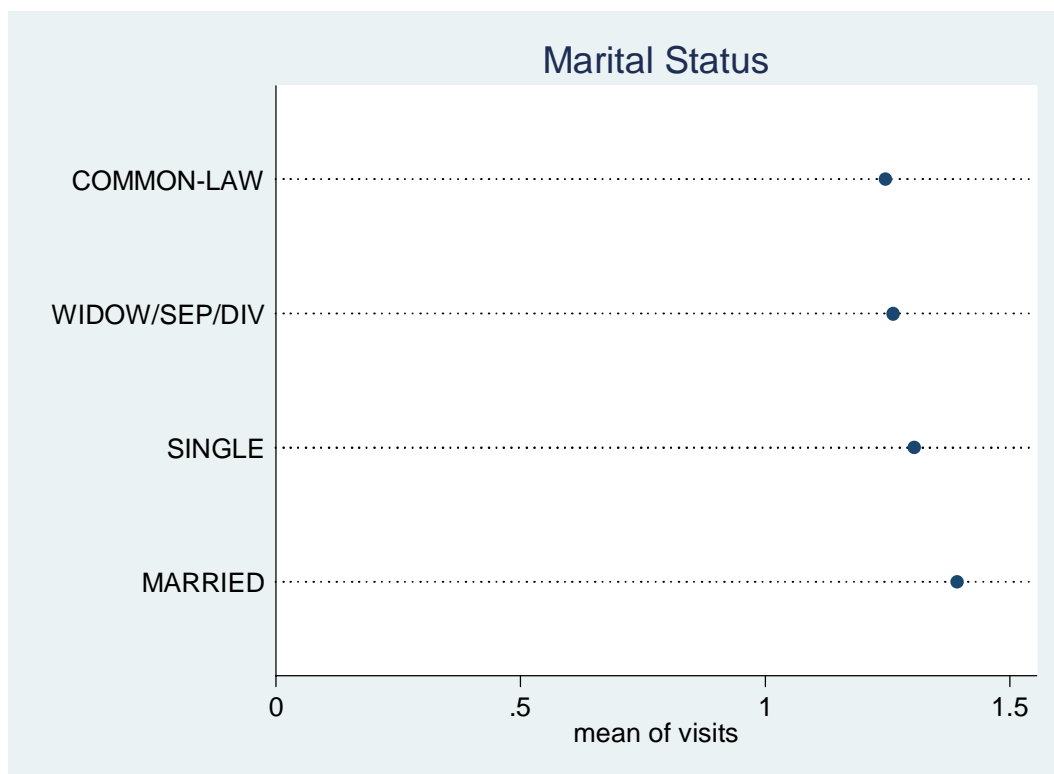


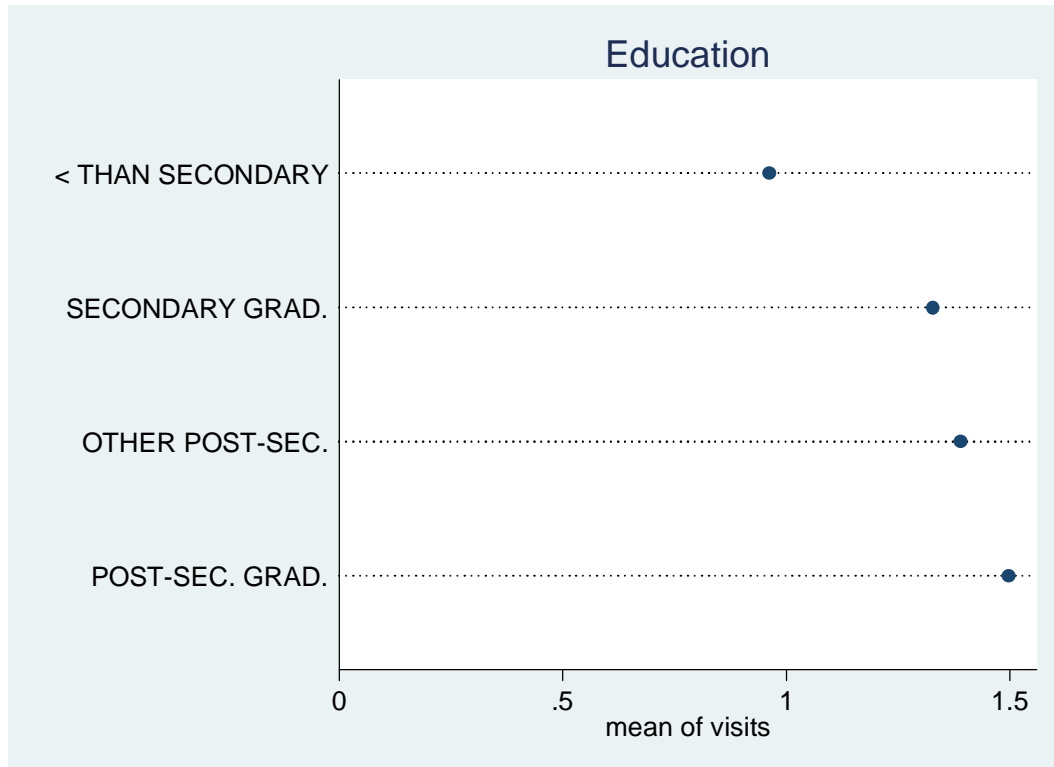
Figure 5 Mean annual dental visit frequency by level of educational attainment

Figure 6 Mean annual dental visit frequency by level of self assessed oral health

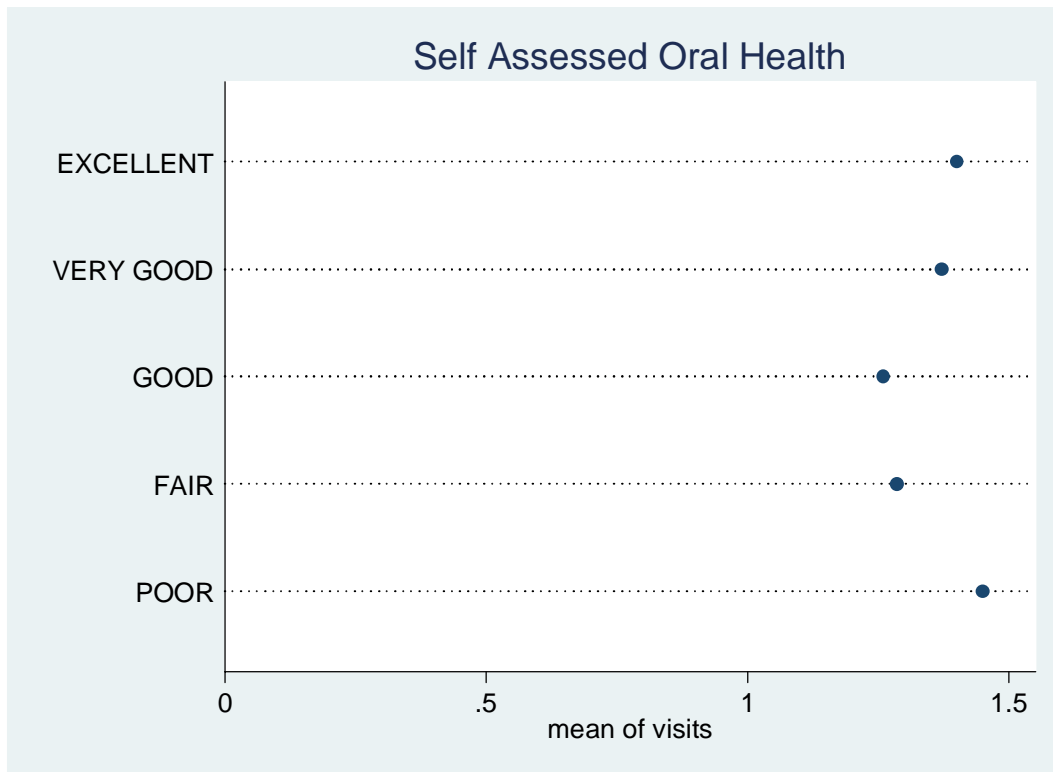


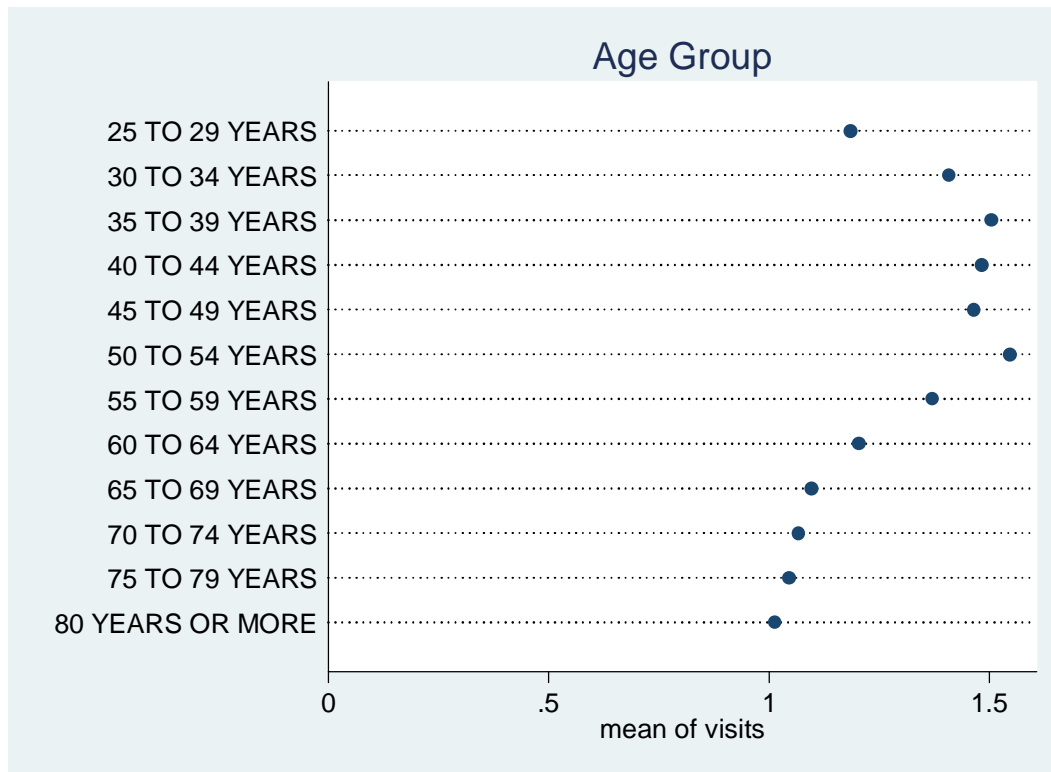
Figure 7 Mean annual dental visit frequency by age group

Figure 8 Mean annual dental visit frequency by province of residence

