The Effect of Diabetes on Canadian Labour Market Performance

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ABSTRACT

This study examines the impact of diabetes on the employment and personal income of Canadian males and females aged 30–64. Using data from the Canadian Community Health Survey (2007-2008), I use three versions for the diabetes variable (diabetes status, Type1 and Type2, and diabetic duration) in equations modeling the employment and income, with two different specifications for the control variables (without or with the chronic diseases other than diabetes). The study finds that diabetes is more significant in affecting the male employment probability than the female employment probability, perhaps because women have more of the other chronic diseases that also harm their overall health. Both types of diabetes have a significant negative impact on male personal income, but women's income is only affected by type1 diabetes. The results suggest that it is important to take other chronic diseases into account in estimating the impacts of a particular disease on labour market outcomes.

1. Introduction and Background

Diabetes is a chronic disease in which blood glucose levels are above normal because the body does not produce enough insulin or does not use insulin properly. There are two main types of diabetes: type1, juvenile diabetes, or insulin-dependent diabetes, is a disorder which results in the body's failure to produce insulin; it is usually first diagnosed in children, teenagers, or young adults. Type2 diabetes, that can result from insulin resistance or the loss of the body's ability to produce enough insulin, is the most common form of diabetes. People can develop type2 diabetes at any age, but it is more common in the older population. Nine out of ten people with diabetes have type2. The primary risk factors that cause diabetes are obesity, ageing, poor dietary habits and genetics (Murphy et al 2005).

Health status is a very important predictor of labour supply, and chronic diseases such as diabetes are growing contributors to morbidity related to labour market outcomes. In this case, diabetes is a major cause of mortality in the world among adults. It can result in both premature death and reduction of functional health. Health-adjusted life expectancy (HALE), a measurement that combines the effects of morbidity and mortality associated with disease, is reduced for both men and women living with diabetes. The HALE for males with diabetes in Ontario was 58.3 years compared to 70 years for those without diabetes, whereas it is 63.8 years for females with diabetes compared to 73.5 years for those without the disease (Manuel and Schultz 2002).

The prevalence of diabetes has been on the rise within Canada in the past decade. In 2000, the diagnosed diabetic population was about 1.3 million, whereas it is estimated that more than 2.5 million Canadians are living with diabetes in 2010. The diabetic population in Canada has doubled from 2000 to 2010. The proportion of the total population with diabetes has increased from 4.2% in 2000 to 7.3% in 2010, and it is expected increase further to 9.9% by 2020 (Canadian Diabetes Association 2009). In addition, there might be some people with hidden diabetes who have not been diagnosed yet, and this is estimated to be about one third of the all known diabetes cases.

Diabetes is a very costly disease for both individuals and society. It is a chronic disease which leads to complications requiring medical and hospital treatment. People who develop diabetes may live with the disease for decades. With an increased population with diabetes, the direct costs, such as hospitalization costs and medication costs, will continue to rise in Canada. Furthermore, the increasing number of diabetics leads to more long-term disability in terms of lost production and reduced productivity. Therefore, the indirect cost, such as the mortality cost and the long-term disability cost will also keep increasing. Indeed, the economic burden of diabetes in Canada is estimated to be about $12.2 billion dollars in 2010 (measured in 2005 dollars). It has risen by $5.9 billion, or almost doubled, since 2000. The total cost of the disease is expected to increase by another $4.7 billion by 2020 (Canadian Diabetes Association 2009). The direct cost of diabetes now accounts for approximately 3.5% of public health care expenditure in Canada; this will continue to grow given the expected increase in the population with diabetes in Canada.

An important question is whether diabetic people tend to have lower employment rates and to earn less than nondiabetic people. To answer this question, this paper uses the most recent data resource, the *Canadian Community Health Survey* (2007-2008), to study the effects of diabetes on employment and earnings of Canadian males and females aged 30 to 64. I use a discrete choice model for diabetics and non-diabetics to find out whether there is a significant effect of type 1 and 2 diabetes on employment status. I then re-estimate this model with diabetes duration added to the diabetes dummy in order to determine if the people with longer diabetic duration would have even lower chances to be employed than those with shorter durations. For people who are currently working, I then consider whether diabetes affects their earnings, and whether those with longer diabetes durations earn less than those with shorter durations.

I will go through a brief review of some recent literature in section 2. The methodology will be introduced in section 3. The estimated results will be presented in section 4. There will be a discussion in section 5. A conclusion will be in section 6.

2.Recent Literature

A lot of studies have estimated the relationship between health status and labour market outcomes. Most of these studies have examined the impact of self-perceived general health status on the employment probability and on personal income. Some studies have predicted the effect of particular diseases such as diabetes on labour market performance. All the studies mentioned that health, like education, can be considered as an endowment of human capital. This implies that healthy workers are more productive and more likely to participate in the work force, and that they gain higher returns from their work. Workers with poor health may have lower capacity or preference for working, so the amount of time working as well as their income would be reduced. In addition, in most Western countries, sickness gives an entitlement to income from social insurance benefits conditional on not working. There also exist some theoretical models of the relationship between health status and labour market outcomes, such that either better health would lead to improvement of labour market outcomes, or poorer health would lead to lower labour supply (Faria 1999).

Most of these studies use self-perceived health status as a proxy for potential individual health. Self-perceived health refers to an individual's chronic physical and mental disorders and acute illnesses; it is usually obtained from a following such as "In general, would you say your health is...?". The response is one from the categories "excellent, very good, good, fair, or poor". Self-perceived health could overestimate the impact of health on labour market outcomes because of potential measurement error and endogeneity for at least three reasons (Dwyer and Mitchell 1998; Campolieti 2002). First, poor health may be connected to unobserved household characteristics such as subjective time or risk preference that also affect labour market decisions. Second, social insurance eligibility conditions may encourage the surveyed individuals who do not participate in the labour force to overstate their sickness as a justification for their nonparticipation. Third, poor health may be a consequence of labour market outcomes, raising the possibility of simultaneity bias (Harris 2008). Furthermore, if we treat self-perceived health status as a control variable in either our employment regression or income regression, it would underestimate those direct impacts of chronic diseases such as diabetes on labour market outcomes, because self-perceived health already covers those chronic diseases.

The alternative to measures of self-perceived health is to use generic health status measures and clinical measures; they are also self-reported but they are less likely to be subject to measurement errors. For example, Kahn (1998) used the body mass index (BMI)[1] as a control variable in his model to examine the effects of type2 diabetes on US labour market performances. However, using only BMI will not suffice as a health proxy; other health conditions should also be taken into account. Tunceli et al. (2005) used two kinds of self-reported proxy measures, BMI and the number of other chronic health conditions, in estimating the effects of diabetes on employment status and work productivity. The number of other

[1] BMI is defined as a person's weight in kilograms divided by height in meters squared.

chronic health conditions is a variable which defines the number of conditions other than diabetes that the person has, with values ranging from 0 to 7, but to consider just the number of those chronic diseases as control variable may not be sufficient to illustrate the effect of diabetes on labour outcomes. The effects of the contribution of these diseases on labour market outcomes are not the same: having more of those diseases in the list does not definitely imply lower employment or less productivity. For an instance, a person with *two* diseases such as diabetes and cancer would be less likely to be hired and be less productive than one with *three* diseases such as diabetes, hypertension and arthritis. In this case, the number of other chronic health conditions is not a convincing health proxy measure.

Most of these studies usually focus on one particular chronic disease, such as diabetes, and treat the incidences of other chronic disease as exogenous variables. However, the other chronic diseases such as heart diseases and stroke may also affect labour market performances. Current research has shown that different chronic diseases are related to each other through some common risk factors or physiology. For instance, diabetes is associated with long-term conditions such as eye diseases and other diseases of the circulatory system. Specifically, diabetes itself is a risk factor for heart disease and stroke. (Public health agency of Canada 2008). Therefore, any degree of measurement errors from the subjectivity of the self-reported health conditions would also imply that the incidences of such reported chronic illnesses are potentially endogenous. There are some exceptions in this literature, such as Brown, Pagán and Bastida (2005) and Latif (2009), who have estimated the employment and diabetes equations jointly in a bivariate probit model by using family history of diabetes as genetic instrumental variables accounting for endogeneity.

Two recent Canadian studies have associated diabetes with labour market outcomes. Kraut et al.(2001) utilize a database with longitudinal information on individual encounters with the Manitoba health care system over a 7-year period (1983–1990). The authors estimate a logistic regression equation between employment probability and having diabetes in order to find whether diabetic people with or without complications[2] are more likely to be unemployed than nondiabetic people. Furthermore, the authors use tobit regression techniques to determine the influence of diabetes on income. The study shows that diabetics with complications are twice as likely not to be in the labour force than nondiabetics. Diabetics without complications earned total incomes that were similar to nondiabetics. The total income of diabetics with complications is about 72% of the nondiabetics' income. Latif (2009) uses data from the *National Population Health Survey* (1998). He utilizes a recursive bivariate probit approach to take into account the potential endogeneity of diabetes in the determination of employment status. The results suggest that treating diabetes as exogenous would lead to an over-estimation of the effects on male employment status since unobserved factors related to health status may be correlated with similarly unobserved factors influencing employment. The study also finds that diabetes has a significant negative impact on female employment status, but has no significant impact on the employment status of non-white Canadian males and females. This implies that policy-makers should take endogeneity into account in estimating labor market costs of chronic diseases such as diabetes. However, neither of the Canadian studies takes the other chronic health conditions into account while estimating the diabetes impact on labour market outcomes.

Because of the limitations of the information provided from the database- *Canadian Community Health Survey* (2007-2008), we do not have enough available information to estimate a bivariate employment probit regressions with instrumental variables of diabetes-related chronic conditions. The limitations here are due to absence of information on genetic factors such as family history with diabetes and

[2] Diabetic people with complications were identified by meeting one of the following two criteria: *1*) an individual having a hospital discharge abstract listing an end-organ complication of diabetes; or *2*) a diabetic patient with at least two medical claims for a condition likely to be associated with diabetes.

parents who died with diabetes, and on the visual problems such as glaucoma and cataracts. In contrast, I will adopt a similar model to the one of Tunceli and et al (2005), but instead of using the number of other chronic health conditions reported as a health proxy measure, I will treat all the other chronic illness conditions reported as control dummy variables. I also classify cases of type1 and type2 diabetes in separate groups in order to estimate the impact of both types on employment and income.

3.Methodology

3.1 Source of data

This study is based on the public use data of the year 2007-2008 *Canadian Community Health Survey (CCHS)*. It is a cross-sectional survey that collects information related to health status, health care utilization and health determinants for the Canadian population. The sample includes 131,061 respondents and is designed to provide reliable estimates at the health region level. The CCHS data is collected from persons aged 12 and older living in private dwellings in the 121 health regions covering all provinces and territories. Excluded from the sampling frame are individuals living on Indian Reserves and on Crown Lands, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions. The CCHS covers about 98% of the Canadian population aged 12 and older. This study includes only the adult group aged 30-64 who answered all the relevant parts of the questionnaire. After deleting the observations with missing values, the sample size becomes 18,961 males and 21,088 females. There are a lot of deletions compared to the original sample, because only 61,268 out of 131,061 respondents answered all the questions related to chronic conditions. These 61,268 respondents are all aged over 30, and I drop another 20,903 people who are older than 64. Among the remaining 48,890 respondents, I delete all observations with missing information on marital status, education level, racial origin, immigration status, region of residence, total personal income from all sources, and working status. In the end, the sample size becomes 40,049 (18,961 males and 21,088 females).

3.2 Variables description

The dependent variables are working status in the employment model, and the logarithm of mean total income in the income regression. They are defined as following:

Working status last week (**LBSDWSS**): there are initially four groups "at work", "absent", "no job", and "unable/permanent". I define the "at work" and "absent" as the "working" group (work=1), whereas, "no job" and "unable/permanent" as the "not working" group (work=0). In the later section, I use this dummy variable "work" as a proxy for employment.

Total personal income from all sources (**INCGPER**): this variable from the original data falls into six ranges "no income", "less than $20,000", "$20,000-$39,999", "$40,000-$59,999", "$60,000-$79,999" and "$80,000 or more". I generate a new mid-point total income variable such that income equals "0" for "no income", "10000" for "less than 20000", "30000" for "$20,000-$39,999", etc. For incomes greater than zero, I calculate the logarithm of total income, and use this logarithm to represent a personal earnings proxy since the public use data does not provide information about individual labour income and wage rates.

The following independent variables are used for diabetes: diabetic status, type1 & type2 diabetes, and diabetic duration:

Diabetic status (**CCC_101**): All respondents from CCHS were asked: "Do you have diabetes?" If a respondent answered "yes," he/she was assumed to have diabetes.

Distinction between type1 and type2 diabetes: From the CCHS questionnaire, based on a study by Ng, Dasgupta and Johnson (2008), the method called "Maddigan-Johnson algorithm" is used to classify individuals with diabetes into the type1 and type2 groups. Appendix1 gives the details of the method. I then generate two binary indicators for defining the type of diabetes that the person has.

Diabetic duration: Period of time (in years) during which a person has been living with diabetes. It is defined as the current age of a person minus the age first diagnosed with diabetes. Since both the age and age first diagnosed with diabetes (CCC_102) are reported as intervals, I take the mid-point of both the age group and age interval first diagnosed with diabetes. I assume that both the nondiabetics and newly diagnosed diabetics have a zero diabetic duration.

The following other variables related to health are included in both the employment model and the income regression. The survey weights and other control variables used in our models are described in Appendix II; they are age, marital status, education level, racial origin, immigration status, region of residence, and occupation groups.

Body mass index (**HWTGBMI**): BMI is calculated by each individual's weight in kilograms divided by the square of his/her height in meters squared. It is a measure of current nutritional status of each individual, and it reflects the demands made upon the body including these of chronic diseases, labour, and climate (Kahn 1998). Higher BMI may reflect a strong/healthy body for working. However, if it is too high, it indicates a fat/overweighed body. I drop the extremely small (less than or equal to 13) and large numbers (greater than or equal to 55). I also create a BMI squared variable.

Other illnesses: There are up to fourteen illnesses other than diabetes that are reported in the survey. They are asthma (CCC_031), arthritis (CCC_051), back problems excluding fibromyalgia and arthritis (CCC_061), high blood pressure (CCC_071), migraine headaches (CCC_081), chronic lung diseases including chronic bronchitis (CCC_91A), emphysema (CCC_91E) and chronic obstructive pulmonary disease (CCC_91F), heart disease (CCC_121), cancer (CCC_131), intestinal or stomach ulcers (CCC_141), stroke (CCC_151), urinary incontinence (CCC_161), bowel disorder (CCC_171), mood disorder (CCC_280), and anxiety disorder (CCC_290). I treat all of these illnesses as binary control variables in our models (specification 2) since many of them may impact labour market outcomes significantly.

3.3 Model Specification

There will be *three models* defined below for the impact of the diabetes variable for both employment and income regressions. I also estimate *two different specifications* for the control variables in each model: specification 1 controls for all demographic characteristics except for the fourteen other chronic diseases; specification 2 controls for all the demographic variables as well as these chronic diseases dummies.

Employment Discrete Choice

For the study of the relationship between diabetes and employment, I present the discrete choice employment model based on the following employment equation (1) :

$$Y^{*}= b_1 X+ b_2 \mathbf{Diab} + \varepsilon \quad Y=1 \text{ if } Y^{*}>0, 0 \text{ otherwise} \quad (1)$$

In this equation, Y^* is the a continuous latent variable indicating the propensity to be employed, and Y is the observed working status. For each individual who is employed, Y=1 if $Y^*>0$. For each individual who is not employed, Y=0 if $Y^*\leq 0$. Here, **Diab** is a binary variable that separates the diabetics (**Diab**=1) from the nondiabetics (**Diab**=0); b_2 is the coefficient of that dummy variable. X is a vector of exogenous influences on the employment decision and represents of all the control variables used in this model; they are age, age squared, marital status, education level, BMI, BMI squared, racial origin, immigration status, and region of residence. X will also contain the fourteen other chronic diseases; b2 denotes the coefficients of the control variables. ε is the error term and is distributed standard normal. Thus, the parametric form of the discrete choice model is probit.

The employment model (2) is used for predicting the significance of diabetes impacts on employment probability by classification of type1 and type2 diabetes. It is based on the following equation:

$$Y^* = b_1 X + \gamma_1 \textbf{Type1} + \gamma_2 \textbf{Type2} + u \qquad Y=1 \text{ if } Y^*>0, 0 \text{ otherwise} \quad (2)$$

Type1 and **Type2** are both dummy variables that denote individuals with type1 diabetes if **Type1**=1, with type2 if **Type2**=1, and those without diabetes if both **Type1** and **Type2** are equal to zero; γ_1 and γ_2 are the coefficients of binary variables **Type1** and **Type2** respectively. X is the same as in the previous model, and b1 is its coefficient. u denotes the error term with normal distribution in this model.

To find whether people with longer diabetic durations would tend to have lower employment rates, I introduce a measure for diabetic duration which is the length of time that a person lived with diabetes, defined as the current age of a person minus the age first diagnosed with diabetes, in equation (3):

$$Y^* = b_1 X + b_2 \textbf{Diab} + \theta \textbf{Diab\_dur} + v \qquad Y=1 \text{ if } Y^*>0, 0 \text{ otherwise} \quad (3)$$

The control variables X are defined in the previous models. Kahn (1998) only uses the diabetic duration, without a diabetic dummy, in his model, by assuming that both nondiabetics and newly diagnosed diabetics have zero duration. There are at least two reasons to include the diabetic dummy in this model. First, if we exclude the diabetic dummy, both the newly diagnosed diabetics and nondiabetics must have the same employment probability. Secondly, the newly diagnosed diabetics may have had diabetes several years before diagnosis, so that the true diabetic duration is greater than zero. To avoid these biases, we should control for diabetic status as well. θ is the coefficient of diabetic duration; v is the error term with normal distribution in this model.

Income Regression

For the study of the relationship between diabetes and personal income level, I estimate the income regression by controlling for the independent variables of age, age squared, marital status, education level, BMI, BMI squared, racial origin, immigration status, region of residence, and occupation groups, both with and without indicators for the fourteen diseases other than diabetes. Here, compared to the employment status model, I add one more control variable, namely occupation groups, since workers with different occupations would tend to have different wage rates. I am aware that it may be necessary to take account of the sample selection bias for the income equations. This bias is caused by choosing non-random data for statistical analysis, and it may distort the results. To solve the problem, we can use Heckman correction, which is a two-step statistical approach that corrects for non-randomly selected samples. However, it is often difficult to find variables that affect the probability of receiving the treatment but also do not enter the income equation. Even if the model is correctly specified, the two-step approach may be very inefficient compared with the maximum likelihood counterpart (Johnston and DiNardo 1997). Therefore, I just use simple OLS for the income regressions.

The following equation describes the income regression for diabetic and nondiabetic workers:

$$I = \beta_1 Z + \beta_2 \mathbf{Diab} + e, \quad \text{if } Y=1 \qquad (4)$$

In this equation, Y is working status as mentioned in the employment model, so the constraint Y=1 selects only workers. I is the logarithm of mean total income from all sources, which is used as a earning proxy. Z is the matrix of control variables in this income regression model. β_1 represents the coefficients of Z, whereas β_2 is the coefficient of the diabetic dummy (**Diab**), and e is the error term.

Furthermore, if diabetes has a significant negative impact on individual income, then we would be interested in whether type1 and type2 have different effects on personal income. To study this possibility, I carry out another regression based on equation (5):

$$I = \beta_1 Z + \lambda_1 \mathbf{Type1} + \lambda_2 \mathbf{Type2} + U, \quad \text{if } Y=1 \qquad (5)$$

Finally, if diabetes does impact personal income significantly, are the workers with longer diabetic durations worse off than those with shorter diabetic duration? I estimate another income regression:

$$I = \beta_1 Z + \beta_2 \mathbf{Diab} + \pi \mathbf{Diab\_dur} + V, \quad \text{if } Y=1 \qquad (6)$$

3.4 Summary Statistics

Table 3.1 in Appendix III shows the cross-section data summaries in both the CCHS sample (without the weights) and the estimated total covered population (with the weights). As mentioned before, we must incorporate the survey weights in the estimation, since the sample itself covers only a certain part of the entire population, and a small sample without weighting may not be an accurate representation of the population. For example, after deleting all of the observations with missing information, the sample only has 40,049 observations including 18,961 male (47.3% of sample size) and 21,088 female (52.7% of sample size) adults, but there is actually a greater proportion of male adults (51.0% of covered population size) in the population. Therefore, I will only discuss the characteristics of these variables in the covered population (weighted sample).

There are 6.3% of males and 5.0% of females in the population aged 30-64 who are living with diabetes. Among the diabetics, about 57.0 percent are males, whereas 43.0 percent are females. The mean age of the entire population is 46 years, whereas it is 53 years for diabetic population. All age intervals (30-34, 35-39,…, 60-64) of the population are approximately evenly distributed; the smallest proportion is in the group aged 60-64 years with 10.2% of the population, whereas the largest proportion is in the 45-49 years. As shown in "Prob." Column, the incidence of having diabetes increases substantially with age. The average BMI for the population is about 26, but it is about 30 for the diabetic group. This shows that diabetic people tend to be heavier than average.

Concerning marital status, 75.2 percent of the total population are reported as married, which includes "married" 63.2% and "common-law" 12.1%, whereas 24.8 percent of population are not married, which includes "Widowed/Separated/Divorced" 12.0% and "Single/Never married" 12.8%. The people in the "Widowed/Separated/Divorced" group have the highest incidence of having diabetes with a probability of 6.4%. Most people in the population are white, but non-whites have a 3.1% points higher probability of having diabetes. Immigrants have 2.5% points larger probability of having diabetes than non-immigrants. The majority of the covered population are highly educated, about 67.0 percent of people being post-secondary graduates. The "Prob" column shows that individuals with less than secondary education are more at risk of having diabetes.

Concerning the working status, 79.7 percent of people in the population are currently working. The non-working individuals tend to have a much higher probability of having diabetes. Specifically, the "permanently unable" and "no job" groups have incidence of a probability 20.6% and 9.6% respectively. In addition, the share of the covered population that is employed is 79.7%, while it is only 60.4% among diabetics. Mean employment rate for males from the entire sample is about 85.0% , which is 19.4% points higher than that of diabetic males (65.6%). The mean employment rate for all females is 74.2%, which is 20.6% points higher than that for diabetic females (53.6%).

Workers with higher total income are less likely to have diabetes than those with lower income. Indeed, the probability of having diabetes for the "no income" group is 9.6%, whereas it is 3.0% for the "$80,000 or more" group. The mean income of diabetic workers is only 78.7 percent of the mean income earned by all workers from the entire population. Indeed, men workers earn an average income of $ 53,652 per year, whereas diabetic males only earn about 79.6 percent of this amount. Diabetic females earn only about 71.2 percent of the income earned by all the women workers in the entire covered population. Among the eleven regions of residence, the individuals from Newfoundland are facing the highest probability of having diabetes with 7.9 percent, whereas people from Alberta exhibit the lowest incidence of 4.4 percent. Workers in the occupation groups of "Trades/Transportation" are at the highest risk of developing diabetes with a probability 5.5 percent, whereas in "Management/Art, Education", they are at the lowest risk with 3.6 percent.

Table 3.2 shows some characteristics of the diabetic respondents. Based on the method of Ng, Dasgupta and Johnson (2008), which is explained in Appendix I, it is estimated that about 90.9 percent of diabetics have type2 diabetes, while only 6.8 percent are diagnosed with type1 diabetes (the other 2.3

percent cannot be determined). The mean age first diagnosed with diabetes is about 44 years; the highest proportion of diabetes diagnosis is at age interval of 45 to 49 years, which captures about 18.6 percent of entire diabetic population. Moreover, the average diabetic duration for diabetics is 8.6 years with a standard deviation of 8.6, the average duration of female diabetics is about half a year longer than that of male diabetics.

4. Analysis of Regression Results

All the results are based on using STATA 10 program, and they incorporate the survey weights. I use a significance level α=0.05, or 95% confidence interval (CI), to examine the significance of effects.

4.1 Employment discrete choice model results

The results of three employment discrete choice models based on specification 1, which excludes the health dummies, are shown in following Table 1 for the diabetes variables. Complete results are in Appendix IV.

Table 1. Employment discrete choice model results, Specification 1
Dependent Variable is Working Status

		Male(obs=18961,pop=4642773.9)				**Female(obs=21088,pop=4445179.5)**			
Model	**Independent Variables**	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Equation(1)	Diabetes	-0.404	-0.0955	-4.30	0.000	-0.270	-0.0904	-3.32	0.001
Equation(2)	Type1 diabetes	-0.613	-0.1632	-2.65	0.008	-0.667	-0.2438	-2.97	0.003
	Type2 diabetes	-0.391	-0.0919	-3.93	0.000	-0.193	-0.0633	-2.38	0.017
Equation(3)	Diabetic duration	-0.009	-0.0018	-1.11	0.269	-0.004	-0.0012	-0.60	0.546
	Diabetes	-0.325	-0.0741	-2.84	0.005	-0.235	-0.0780	-2.27	0.023

Notes: "obs" denotes the number of raw observation, and "pop" is the number of observation after weighting. The results in this table are from Tables 4.1.1, 4.2.1 and 4.3.1 in Appendix IV.

Employment choice model (1) from Table 1 shows that there is a significant negative impact of having diabetes on employment probability for both gender. The coefficient of diabetic dummy for males is -0.404 with P-value=0, whereas for females it is -0.27 with P-value=0.001. Since both the P-values here are less than the significance level at α=0.05 and coefficients are both negative, it leads to rejection of the null hypothesis that b_1=0 in equation (1). In other words, it implies that diabetes has a significant negative effect on employment probability. The marginal effect of diabetes dummy for males is -0.0955, which means a 9.55% points reduction on males employment rate compared to these males without diabetes; for females, the marginal effect represents a 9.04% points reduction of employment probability compared to nondiabetic females.

In the employment choice model (2) from Table 1, both of the estimated coefficients of the Type1 diabetes dummy for males and females are negative at -0.613 and -0.667 respectively, and the P-values are 0.008 and 0.003 respectively, which are both less than the significance level at α=0.05. On the other hand, the coefficients of the Type2 diabetes are -0.391 and -0.193 for males and females respectively, and the P-values are 0 and 0.017 respectively, which are both less than 0.05. Therefore, according to equation (2), we reject the both null hypothesis of γ_1=0 and γ_2=0 for both genders. These results suggest that both types of diabetes have significant negative impacts on males and females employment probabilities. The magnitude of type1 marginal effect on males employment is 0.0713 greater than that of type2; whereas for females it is 0.1805 greater compared to the magnitude of the type2 marginal effect. This implies that type2 diabetes has a smaller impacts on employment of both genders compared to type1. This result might be expected since type1 is a more serious disease.

The employment choice model (3) shown in Table1 examines the relationship between diabetic duration and employment probability for males and females respectively. The coefficients of the diabetic duration measure are -0.009 and -0.004 for males and females respectively; the P-value for males is 0.369 and 0.546 for females, which are far greater than the significance level at α=0.05. This means, according to equation (3), that we fail to reject the null hypothesis of $\theta=0$ for both genders. Therefore, it implies that there is a no significant negative relationship between diabetic duration and employment probability after controlling for the effect of a diabetic dummy and the other demographic variables.

The results of the same three employment choice models but with the specification 2, which controls for the same independent variables as specification 1, but adds the fourteen chronic illness dummies, are shown in the following Table 2.

Table 2. Employment discrete choice model results, Specification 2

Dependent Variable is Working Status

		Male(obs=18961,pop=4642773.9)				**Female(obs=21088,pop=4445179.5)**			
Model	**Independent Variables**	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Equation(1)	Diabetes	-0.353	-0.0792	-3.53	0.000	-0.171	-0.0553	-2.07	0.038
Equation(2)	Type1 diabetes	-0.435	-0.1039	-2.25	0.025	-0.568	-0.2031	-2.57	0.010
	Type2 diabetes	-0.349	-0.0782	-3.30	0.001	-0.087	-0.0275	-1.05	0.294
Equation(3)	Diabetic duration	-0.006	-0.0012	-0.73	0.464	-0.002	-0.0006	-0.31	0.755
	Diabetes	-0.299	-0.0653	-2.50	0.012	-0.153	-0.0494	-1.49	0.137

Notes: "obs" denotes the number of raw observation, and "pop" is the number of observation after weighting. The results in this table are from Tables 4.1.2, 4.2.2 and 4.3.2 in Appendix IV.

Diabetes is debilitating for the overall health condition of adults, but the other chronic diseases also harm individual health. Comparing the results of Table 1 and 2, all the coefficients of the diabetes variables in specification 2 are smaller than those in specification 1. It seems that specification 1 overstates the diabetic effects on employment probabilities for both genders by not taking the other chronic conditions into account. More precisely in the equation(2), the results from specification 1 suggested that people with any type of diabetes have significantly lower employment rate than those without diabetes, with type1 having a stronger impact. In contrast, specification 2 indicates that only the male employment probability is affected by any types of diabetes, whereas women's employment is only influenced by type1.

The employment choice model (1) shown in Table 2 indicates a significant negative impact of having diabetes on employment probability for both genders. The coefficient of diabetic dummy for males is -0.353 with P-value=0, whereas for females it is -0.171 with P-value=0.038. The marginal effect of the diabetic dummy on males employment indicates a 7.92% point reduction on male employment rate compared to males without diabetes; for females, the marginal effect represents a 5.5% point reduction on females employment probability compared to nondiabetic females.

In the employment choice model (2) in Table 2, the coefficients of Type1 diabetes dummy for males and females are -0.435 and -0.568 respectively, and the P-values are 0.025 and 0.01, which are both less than the significance level. The coefficients of Type2 diabetes are -0.349 and -0.087 for males and females respectively, and the P-value for males is 0.001 which is less than 0.05, but for females it is 0.294 which is much greater than 0.05. These results suggest that type1 diabetes has a significant negative impacts on both males' and females' employment probability, whereas type2 diabetes has a significant negative effects only on males' employment probability. There is no significant relationship between type2 diabetes and females' employment probability. Since the magnitude of type1 diabetes marginal effect on employment probability for both genders is greater than the magnitude of type2, type1 has a greater impact on the probability of employment. However, the difference between the magnitude of type1 and type2 marginal effect on males employment is only 0.0257, while it is 0.1757 in females. In addition, the type1 diabetes has a negative effect on females' employment probability which is double the estimate for males.

The results of the employment choice model (3) shown in Table 2 show that the coefficients of diabetic duration are -0.006 and -0.002 for males and females respectively; the P-value for males is 0.464 and

0.755, which are both greater than α=0.05. Therefore, there is no statistically significant relationship between diabetic duration and employment probability. However, there is an impact of diabetes on male employment probability if we treat diabetic duration as a control variable because the P-value of diabetic dummy is reduced to 0.012 which is less than 0.05. For example, at diabetic duration=0, diabetic males have significantly lower employment probability than nondiabetic males. However, the P-value of diabetic dummy for females is 0.137, which is greater than 0.05, so newly diagnosed female diabetics would have no big difference on their employment rate compared to nondiabetic females.

By computing the marginal effects, we obtain the simulated employment probabilities for males and females separately for the two specifications . The results are shown in Table 3.

Table 3. Simulated Employment Probabilities

	Predicted Employment Probability			
	Specification 1		Specification 2	
Diabetic Status	**Male**	**Female**	**Male**	**Female**
Diabetic	79.2%	65.4%	80.9%	69.3%
Nondiabetic	87.8%	77.2%	87.6%	78.3%
Type1 diabetic	69.4%	53.5%	73.8%	60.4%
Type2 diabetic	80.3%	66.8%	77.1%	70.6%
Diabetic with 0 duration	81.0%	67.7%	82.1%	70.9%
5 years diabetic duration	80.0%	66.4%	81.5%	70.0%
10 years diabetic duration	79.0%	65.1%	80.8%	69.2%

Notes: the predicted employment rate is computed at means of all the relevant control variables.

The results shown on Table 3 point out that diabetic males have about 8.6% (Specification 1) or 6.6% points (Specification 2) lower predicted employment probability than nondiabetic males. For females it is 11.8% or 9.0% points lower compared to nondiabetic women. Among the diabetic groups, a type1 diabetic man has a predicted employment probability of 69.4% (or 73.8% for specification 2), whereas a man with type2 diabetes has about 10.9% or 3.3% points higher employment probability than someone with type1. On the other hand, a woman with type2 diabetes has 13.3% or 10.2% points higher employment probability than a subject with type1. Females with type2 only have about 10.4% or 7.7%

points lower probability compared with nondiabetic females, whereas males with type2 have about 7.4% or 10.5% points lower probability than those males without diabetes. By comparing the employment probabilities between type1 diabetics and nondiabetics, one sees that the difference is very large. Specifically, female type1 diabetics have 23.7% or 17.9% points lower employment probability than female nondiabetics. As mentioned before, it is important to include the diabetic dummy as a control variable in equation (3) for determining the effects of diabetic duration on employment probability. Without this control, there must be no difference on employment probabilities between nondiabtics and newly diagnosed diabetics with zero duration. However, the newly diagnosed diabetic males have 6.8% points (Specification 1) or 5.4% points (Specification 2) lower predicted probability of employment compared to nondiabetic males, whereas for females with 9.5% or 7.4% points less compared to nondiabetic women. For both genders, the employment probability goes down as diabetic duration increases. For every 5 years increased in males diabetic duration, the employment probability drops by an additional 1% or 0.6% point approximately; for females it drops about 1.3% or 0.8% point if duration is raised by another 5 years. Diabetic duration has really small effects on the predicted probability of employment so we do not consider it as a significant influence on employment probabilities for both genders.

4.2 Income regression results

The results including diabetes variables of the three income regressions with specification 1, controlling for the same demographic variables but adding occupation group dummies, are shown in Table 4. Table 5 shows the results of the income regressions with specification 2, which adds indicators for the fourteen chronic conditions. The complete results are listed in Appendix V. By comparing the results from the two tables, we observe that the estimated coefficients and P-values of the diabetes variables are a bit smaller in Table 5 than in Table 4.

Table 4. Income regression results, Specification 1

Dependent Variable is logarithm of mean income

Model	Independent Variables	Male(obs=15180,pop=3904968.3) Coef	t	P-value	Female(obs= 14843,pop=3272037) Coef	t	P-value
Equation(4)	Diabetes	-0.1090	-3.29	0.001	-0.0631	-1.35	0.178
Equation(5)	Type1 diabetes	-0.2876	-3.31	0.001	-0.2564	-2.79	0.005
	Type2 diabetes	-0.0948	-2.72	0.006	-0.0439	-0.88	0.382
Equation(6)	Diabetic duration	-0.0040	-1.19	0.233	-0.0010	-0.25	0.805
	Diabetes	-0.0783	-1.96	0.050	-0.0543	-0.93	0.355

Notes: "obs" denotes the number of raw observation, and "pop" is the number of observation after weighting. The results in this table are based on Tables 5.1.1, 5.2.1 and 5.3.1 from Appendix V.

Table 5. Income regression results, Specification 2

Dependent Variable is logarithm of mean income

Model	Independent Variables	Male(obs=15180,pop=3904968.3) Coef	t	P-value	Female(obs=14843,pop=327203) Coef	t	P-value
Equation(4)	Diabetes	-0.1073	-3.28	0.001	-0.0597	-1.29	0.198
Equation(5)	Type1 diabetes	-0.2790	-3.09	0.002	-0.2337	-2.48	0.013
	Type2 diabetes	-0.0933	-2.72	0.007	-0.0409	-0.83	0.408
Equation(6)	Diabetic duration	-0.0033	-1.04	0.300	-0.0003	-0.08	0.934
	Diabetes	-0.0814	-2.03	0.042	-0.0568	-0.98	0.328

Notes: "obs" denotes the number of raw observation, and "pop" is the number of observation after weighting. The results in this table are based on Tables 5.1.2, 5.2.2 and 5.3.2 from Appendix V.

The coefficient of the diabetes dummy in equation (4) from both tables for males is about -0.11 with P-value=0.001 which is less than the significance level α=0.05.This implies a negative significant relationship between the event of having diabetes and males personal income. The coefficient here means that male workers with diabetes earn about 11% points less than nondiabetic male workers. However, the P-values of the diabetic dummy variable for females are 0.178 and 0.198, which is much larger than the 0.05 significance level. Therefore, we fail to reject the null hypothesis in the case of women.

We just illustrated that females with diabetes do not have lower income, but does the type of diabetes matter? With this question, I now apply the income regression model (2), and the results refer to equation (5) in Table 4 and 5. In both specifications, the coefficients of Type1 diabetes dummy are about -0.28 for males, and they are respectively -0.256 (specification 1) and -0.233 (specification 2) for females. Since the P-values are 0.001 and 0.002 for males, and they are 0.005 and 0.013 for females, type1 diabetes in both specifications has a significant negative effects on male and female incomes. The coefficients imply that a male worker with type1 diabetes earns 28% points less than one without diabetes. The results from specification 1 indicate that a female worker with type1 earns 25.6% points less than a woman without diabetes, whereas she earns 23.3% points less in specification 2. On the other hand, the P-value of Type2 diabetic dummy for males is 0.006 or 0.007, which is less than the significance level used, and for females it is 0.382 or 0.408, which is much greater than 0.05. Therefore, Type2 diabetes has a significant negative impacts on male incomes, but not on female incomes.

The results of income regression model (3) are based on equation (6) that determines the relationship between diabetic duration and personal income. The P-value of diabetic duration variable for males is 0.233 (specification 1) or 0.3 (specification 2), which is more than the assumed significance level of 0.05, whereas for females it is 0.805 or 0.934 which is greater than 0.05. Therefore, we do not reject the null hypothesis that $\pi=0$ in equation (6) for either gender. This indicates that workers with different diabetic durations do not have significantly different earnings.

5. Discussion

According to a study by Levine (2008), women are subject to higher risk for the development of myocardial infarction, claudication, and stroke and are disproportionately afflicted by cardiovascular, cerebrovascular, and peripheral vascular disease. This means that diabetes itself may be a risk factor for causing other diseases so that women with diabetes are more likely to have other diseases such as stroke than men. When we control for the fourteen chronic diseases other than diabetes in our models, it separates these relevant illnesses from diabetes. In other words, without the other chronic conditions included as controls, this effect is stronger in women. For example, a person with both diabetes and a stroke condition, will not get a job due mainly to the reason of having stroke. In this case, if we did not take stroke into account in estimating the effects of diabetes on employment probability, we would believe that diabetes is responsible for that person not being employed.

In order to see whether females have more other chronic diseases than males, I generate a variable for the number of other illnesses which is calculated by the sum of the fourteen chronic dummies. For instance, if a person has two diseases out of the fourteen, let's say asthma and arthritis, the variables for other 12 illnesses are all equal to zero, and the number of diseases other than diabetes this person has is two. By doing so, Table 6 shows that the average number of illnesses is about 0.9 with a standard deviation of 1.17 in the covered male population, whereas it is about 1.2 with a standard deviation of 1.45 for the female population. In addition, males with diabetes have an average of 1.6 other chronic diseases with a standard deviation of 1.46, and diabetic females have an average of 2.3 illnesses other than diabetes with a standard deviation of 1.86 under weighting process. Therefore, specification 2 would be more accurate and reliable compared to specification 1, and controlling for the other chronic conditions is necessary in estimating the impacts of diabetes on labour markets outcomes. In addition , in Appendix IV and Appendix V, I do the Wald test in the employment discrete choice models and the F-test in the income regressions to test for the joint significance of the indicators of the other health conditions for both genders, all the values of "Prob > chi2" or "Prob > F" from those models are equal to zero, which is less than the significance level 0.05. These test results confirm that the other fourteen health conditions have joint significant effects on employment probability and personal income, so that we should take them into account in estimating those models.

Table 6. Average numbers of the diseases other than diabetes

Variables	Mean # of other diseases	Std. Dev.
Males	0.9	1.17
Females	1.2	1.45
Diabetic Males	1.6	1.46
Diabetic Females	2.3	1.86

6. Conclusions

The purpose of this paper was to examine the impact of diabetes on the incidence of employment and on personal income of Canadian men and women through two model specifications. The first one controls for human capital influences only. The second one takes into account the possibility that the other chronic diseases conditions also influence the incidence of employment and personal income. I also estimate three equations that include other indicators for the event of having diabetes in the employment probability and income regression, and find reasonable results.

For males, the results of the employment probit models suggest that diabetes has a significant negative impacts on the employment probability. Indeed, both types of diabetes are negatively related to males' employment probability, but diabetic duration does not affect males employment significantly. The log income regressions provide similar results as the employment choice model; each of these regressors negatively affect males income with a statistical significance except diabetic duration.

In contrast, diabetes is found less important in affecting female employment probability. The indicator for type2 is insignificant, but the indicator for type1 diabetes has a certain significant power on decreasing the employment probability. In general, women with diabetes do not have any significant difference in their personal incomes, but type1 diabetes seems to reduce females' income. Women with different diabetic duration also do not differ in their employment probability and income.

This study suggests that it is important to take all the other chronic diseases conditions into account while examining the impacts of a particular disease such as diabetes on labour market outcomes. Unobservables are correlated with diabetes and labor productivity, leading to endogeneity problems in the estimates. Thus the endogeneity of diabetes may be another consideration for better estimation. When endogeneity was addressed, there was no impact of diabetes on female working propensity in the study by Brown, Pagán and Bastida (2005). It is possible that gender differences in diabetes management, where female diabetics adhere to management better than males, may account for the differential effect of diabetes on labour market outcomes. However, it is really difficult and complicated to find all the risk factors potentially causing diabetes.

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8.Appendix

Appendix I- Method for classifing type1 and type2 diabetes (based on Ng, Dasgupta and Johnson 2008)

The chronic disease module of the CCHS(2007-2008) includes seven questions that deal specifically with diabetes:

CCC_101 Do you have diabetes?

CCC_102 How old were you when this was first diagnosed?

CCC_10A Were you pregnant when you were first diagnosed with diabetes? (asked of women aged 15 or older)

CCC_10B Other than during pregnancy, has a health professional ever told you that you have diabetes? (asked to women who had diabetes during pregnancy)

CCC_10C When you were first diagnosed with diabetes, and how long was it before you were started on insulin?

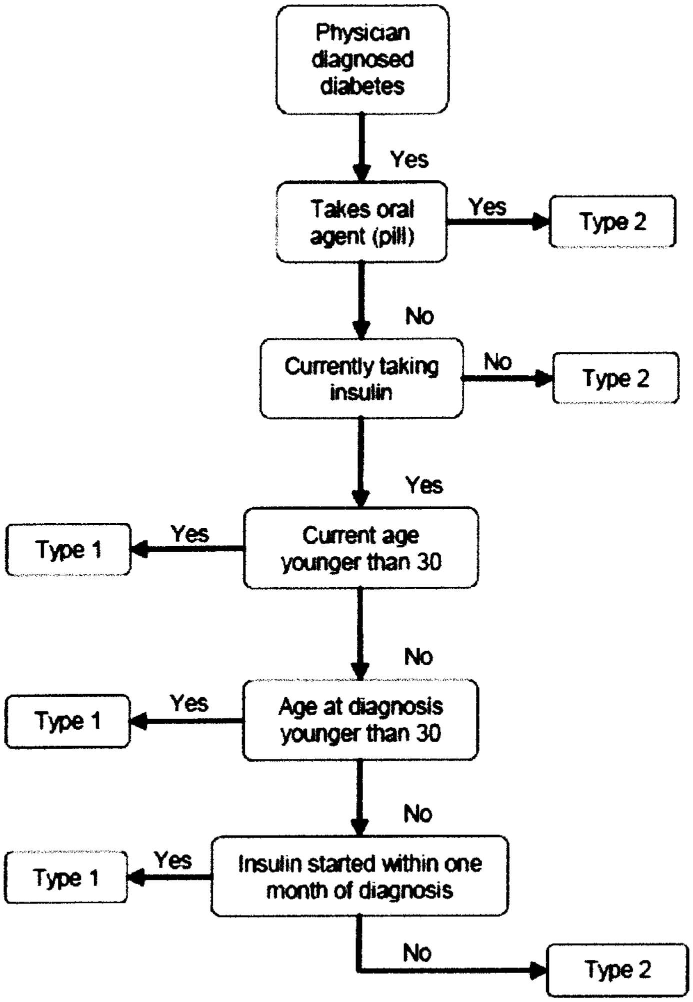
Less than 1 month
1 month to less than 2 months
2 months to less than 6 months
6 months to less than 1 year
1 year or more
Never

CCC_105 Do you currently take insulin for your diabetes?

CCC_106 In the past month, did you take pills to control your blood sugar?

We gather all the answers of these questions above from each individuals and use the following tree diagram (Figure 1 on next page) to separate the diabetic groups into type1 and type2.

Figure 1
Maddigan-Johnson algorithm



Source: Ng, Dasgupta and Johnson (2008)

Appendix II- other control variables

Weighting (**WTS_M**): In order for estimates produced from survey data to be representative of the covered population, we must incorporate the survey weights in the calculations. I use the "[pweights=WTS_M]" STATA command with the health regions (GEODPMF) acting as the primary frame. I always use this weighting process while estimating the employment discrete choice model or the income regression.

Age (**DHHGAGE**): the data do not provide the exact age information for each individual; instead, it falls into 16 groups: "12-14 years", "15-17 years", "18-19 years", "20-24 years", "25-29 years", ..., "65-69 years", "70-74 years", "75-79 years", and "80 years or more". I drop the individuals younger than 30 and older than 64. Then, I generate new mid-point age variables for each age group, for example, 32 years is the value corresponding to "30-34 years" (calculated by the sum of 30 and 34 divided by 2). From this, I calculate the age squared variable. Usually, age has a significant positive effect on the employment probability and on personal income, whereas, age squared would have a negative impact.

Marital status (**DHHGMS**): the original data have four categories: "married", "common-law", "widow/separate/divorce" and "single/never married". For simplification, I combine the first two categories as "married" and the last two categories as "non-married" group.

Education (**EDUDR04**): the data only provide the highest education level for individuals rather than schooling years. It falls into four groups: "less than secondary", "secondary degree", "other post-secondary", and "post-secondary degree". "Secondary degree" serves as the base.

Racial origin (**SDCGCGT**): this data separate race in two groups "white" and "visible minority", so I create a race dummy variable for this. The "visible minority" group is renamed "nonwhite" . In general, white people are more likely to get a job and are engaged at higher salaries.

Immigration status (**SDCFIMM**): all respondents from CCHS were asked: "Are you immigrant?" with answers "Yes" or "No". I then generate a immigration dummy variable; if immigration=1 then he/she is an immigrant, whereas immigration=0 implies that he/she is not an immigrant. In this sample, 99 percent of those people who answered "No" are native- born in Canada.

Region of residence (GEOGPRV): there are eleven categories of provinces of residence: Newfoundland, PEI(Prince Edward Island), Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, Yukon/Northwest/Nunavut. I create 11 dummy region variables, and treat Ontario as the base category since Ontario has the largest population in this sample of the data.

Occupation groups (LBSGSOC): it falls into five groups: " Management/Art/Education", "Business, Finance and Administration", "Sales and Service", "Trades, Transport and Equipment Operators", and "Primary Industry/Processing, Manufacturing and Utilities". I generate an occupational dummy variable for each group, and make the last group ""Primary Industry/Processing, Manufacturing and Utilities" the base category.

Appendix III- Summary Statistics

Table 3.1

Characteristics of respondents aged 30 to 64, N= 40,049 and diabetic sample size=2,469

Variables	Categories	sample distribution Freq.	Percent	diabetics in sample Percent	Prob.	Population distribution	diabetics in pop Percent	Prob.
Gender	Male	18961	47.34%	51.56%	6.71%	51.09%	56.98%	6.34%
	Female	21088	52.66%	48.44%	5.67%	48.91%	43.02%	5.00%
Age	-	Mean= 48	(sd= 9.97)	Mean=54	(sd=8.21)	Mean=46(sd=9.44)	Mean=53	(sd=8.17)
	aged 30-34	5,273	13.17	2.47%	1.16%	13.56%	2.49%	1.04%
	aged 35-39	5,458	13.63	5.39	2.44%	14.34%	6.03%	2.39%
	aged 40-44	5,548	13.85	7.86	3.50%	16.33%	10.37%	3.61%
	aged 45-49	5,283	13.19	10.41	4.86%	16.59%	11.26%	3.86%
	aged 50-54	6,154	15.37	17.38	6.97%	15.28%	19.69%	7.32%
	aged 55-59	6,455	16.12	24.34	9.31%	13.67%	26.10%	10.85%
	aged 60-64	5,878	14.68	32.16	13.51%	10.23%	24.06%	13.36%

BMI	-	Mean=27	(sd=5.29)	Mean=31	(sd=6.53)	Mean=26(sd=5.02)	Mean=30	(sd=6.44)
Marital status	Married	21,991	54.91	53.79%	6.04%	63.16%	66.22%	5.96%
	Common-law	4,326	10.80	7.45	4.25%	12.05%	9.01%	4.25%
	Wid/Sep/Div	6,808	17.00	21.87	7.93%	12.00%	13.43%	6.36%
	Single/Never marr	6,924	17.29	16.89	6.02%	12.79%	11.33%	5.03%
Racial origin	White	35,142	87.75	84.85	5.96%	80.93%	72.46%	5.09%
	Non-white	4,907	12.25	15.15	7.62%	19.07%	27.54%	8.20%
Immigrant status	Yes	5,482	13.69	13.93	6.28%	24.02%	31.89%	7.54%
	No	34,567	86.31	86.07	6.15%	75.98%	68.11%	5.09%
Highest Education	Less than secondary	5,116	12.77	22.32	10.77%	10.69%	19.75%	10.49%
	Secondary graduate	6,488	16.20	15.31	5.83%	15.59%	16.91%	6.16%
	Other post-sec.	2,606	6.51	7.41	7.02%	6.69%	7.74%	6.58%
	Post sec. graduate	25,839	64.52	54.96	5.25%	67.02%	55.60%	4.71%
Working status	Employed:	30,303	75.66%	56.70%	4.62%	79.71%	60.42%	4.31%
last week	At work	27,572	68.85	51.15	4.58%	73.21%	55.48%	4.31%
	Absent	2,731	6.82	5.55	5.02%	6.50%	4.93%	4.31%
	Unemployed:	9,746	24.34	43.30%	10.97%	20.29%	39.58%	11.09%
	No job	8,282	20.68	31.47	9.38%	17.49%	29.44%	9.57%
	Permanently unable	1,464	3.66	11.83	19.95%	2.80%	10.15%	20.57%
employment	-	-	75.66%	56.70%	-	79.71%	60.42%	-
	Males	-	80.82%	62.69%	-	85.02%	65.57%	-
	Females	-	71.03%	50.33%	-	74.17%	53.60%	-
Total personal income	No income	1,515	3.78%	4.46	7.26%	4.55%	7.65%	9.57%
	Less than 20,000	7,963	19.88	31.23	9.68%	16.90%	27.07%	9.10%
	$20,000-$39,999	11,174	27.90	28.59	6.32%	26.20%	27.63%	5.99%
	$40,000-$59,999	8,810	22.00	17.38	4.87%	22.97%	19.25%	4.76%
	$60,000-$79,999	5,452	13.61	10.29	4.66%	14.48%	10.43%	4.09%
	$80,000 or more	5,135	12.82	8.06	3.88%	14.91%	7.96%	3.03%
Mean person income	-	$42427	-	82.13%	-	$44586	78.70%	-
	Males	51,636	-	84.49%	-	53,652	79.58%	-
	Females	34,145	-	74.66%	-	35,117	71.23%	-

Region of residence	Newfoundland	1,427	3.56	5.14	8.90%	1.70%	2.36%	7.90%
	PEI	672	1.68	1.78	6.55%	0.43%	0.47%	6.21%
	Nova Scotia	1,636	4.08	4.94	7.46%	3.03%	3.61%	6.77%
	New Brunswick	1,814	4.53	5.63	7.66%	2.38%	3.19%	7.63%
	Quebec	7,629	19.05	18.23	5.90%	24.08%	22.95%	5.42%
	Ontario	13,166	32.87	34.1	6.40%	39.22%	43.54%	6.31%
	Manitoba	2,298	5.74	5.14	5.53%	3.39%	2.88%	4.83%
	Saskatchewan	2,157	5.39	5.87	6.72%	2.58%	2.69%	4.83%
	Alberta	3,632	9.07	7.41	5.04%	10.29%	7.77%	4.29%
	British Columbia	4,813	12.02	10.45	5.36%	12.71%	10.38%	4.64%
	Yukon/NW/Nunavut	805	2.01	1.3	3.98%	0.20%	0.15%	4.38%
Occupation group	MANAG./ART, EDUC	11,555	38.35	34.39	4.13%	40.54%	33.95%	3.61%
	BUSIN./FINANC	5,745	19.07	18.24	4.40%	19.67%	19.26%	4.22%
	SALES, SERVICES	5,521	18.32	20.62	5.18%	17.70%	20.91%	5.09%
	TRADES/TRANSP	4,718	15.66	19.03	5.60%	15.27%	19.38%	5.47%
	PRIM. IND./PROC.	2,590	8.6	7.71	4.13%	6.83%	6.50%	4.11%

Table 3.2
Characteristics of diabetic respondents aged 30 to 64, n=2,469

Variables	Categories	Freq.	Percent in Sample	pop distribution
Diabetes	Yes	2,469	6.16%	5.68%
	No	37,580	93.84	94.32%
	If answered YES then:			
	Type1	195	7.90%	6.75%
	Type2	2,251	91.17%	90.85%
	unable to determine	23	0.93%	2.40%
Age first diagnosed	-	Mean= 45 years	(sd = 12.55)	Mean=44(sd=11.39)
	0 - 11 Years	58	2.36%	1.68%
	12 - 17 Years	52	2.11	1.47%
	18 - 24 Years	85	3.45	2.99%
	25 - 29 Years	91	3.70	3.58%
	30 -34 Years	146	5.93	6.57%
	35 - 39 Years	224	9.10	11.81%
	40 - 44 Years	344	13.97	18.00%
	45 - 49 Years	402	16.33	18.57%
	50 - 54 Years	494	20.06	17.52%
	55 - 59 Years	421	17.10	13.37%
	60 - 64 Years	145	5.89	4.44%

Diabetic duration	for diabetics	Mean=9.0 (sd=9.54)	Mean=8.6(sd=8.57)
	for male diabetics	Mean= 8.7 (sd= 8.82)	Mean=8.3(sd=7.55)
	for female diabetics	Mean=9.3 (sd= 10.26)	Mean=8.9(sd=9.75)

Appendix IV- Employment Discrete Choice models

Table 4.1.1.

Employment choice model for Diabetics and Nondiabetics, Specification 1

Dependent Variable is Working Status

	Male(obs=18961,pop=4642773.9)				Female(obs=21088,pop=4445179.5)			
Independent Variables	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Diabetes	-0.404	-0.0955	-4.30	0.000	-0.270	-0.0904	-3.32	0.001
Mean age	0.198	0.0384	9.37	0.000	0.268	0.0830	14.77	0.000
Mean Age^2	-0.003	-0.0005	-11.55	0.000	-0.003	-0.0010	-16.26	0.000
Married	0.511	0.1165	12.88	0.000	-0.154	-0.0466	-4.07	0.000
less than secondary	-0.312	-0.0696	-4.23	0.000	-0.480	-0.1661	-7.52	0.000
other post-secondary	0.039	0.0075	0.49	0.626	-0.042	-0.0132	-0.49	0.624
post-secondary	0.122	0.0244	2.18	0.029	0.306	0.0979	7.02	0.000
BMI	0.095	0.0185	3.29	0.001	0.080	0.0247	4.33	0.000
BMI^2	-0.002	-0.0003	-3.40	0.001	-0.001	-0.0004	-4.79	0.000
White	0.305	0.0660	4.36	0.000	0.206	0.0665	3.56	0.000
Immigration	0.055	0.0106	0.90	0.367	-0.038	-0.0120	-0.76	0.445
Newfoundland	-0.616	-0.1630	-6.78	0.000	-0.344	-0.1180	-4.50	0.000
PEI	-0.128	-0.0268	-1.05	0.293	0.068	0.0207	0.71	0.476
Nova Scotia	-0.122	-0.0254	-1.50	0.134	0.079	0.0238	1.22	0.221
New Brunswick	-0.264	-0.0592	-3.30	0.001	-0.180	-0.0590	-2.75	0.006
Quebec	-0.177	-0.0362	-3.21	0.001	-0.068	-0.0215	-1.47	0.143
Manitoba	-0.021	-0.0042	-0.22	0.825	0.247	0.0700	3.18	0.001
Saskatchewan	0.176	0.0309	2.16	0.030	0.225	0.0641	2.60	0.009
Alberta	0.212	0.0372	2.93	0.003	0.127	0.0378	1.97	0.049
British Columbia	0.077	0.0144	1.28	0.200	-0.083	-0.0262	-1.57	0.116
Yukon/Northwest/Nunavut	0.124	0.0223	1.06	0.289	0.260	0.0728	2.57	0.010
constant	-4.313	-	-6.41	0.000	-5.950	-	-11.67	0.000

Log pseudolikelihood in males' model = -6700.2634
Log pseudolikelihood in females' model = -10648.135.

Table 4.1.2

Employment choice model for Diabetics and Nondiabetics, Specification 2

Dependent Variable is Working Status

	Male(obs=18961,pop=4642773.9)				Female(obs=21088,pop=4445179.5)			
Independent Variables	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Diabetes	-0.353	-0.0792	-3.53	0.000	-0.171	-0.0553	-2.07	0.038
Mean age	0.204	0.0382	9.31	0.000	0.275	0.0843	14.92	0.000
Mean Age^2	-0.003	-0.0005	-11.33	0.000	-0.003	-0.0010	-16.25	0.000
Married	0.441	0.0955	10.77	0.000	-0.219	-0.0648	-5.50	0.000
less than secondary	-0.264	-0.0559	-3.60	0.000	-0.446	-0.1525	-6.66	0.000
other post-secondary	0.092	0.0164	1.14	0.254	0.003	0.0009	0.03	0.973
post-secondary	0.119	0.0230	2.10	0.036	0.310	0.0985	6.96	0.000
BMI	0.084	0.0158	2.92	0.003	0.077	0.0237	4.15	0.000
BMI^2	-0.001	-0.0002	-2.92	0.003	-0.001	-0.0004	-4.30	0.000
White	0.316	0.0664	4.47	0.000	0.209	0.0672	3.59	0.000
Immigration	-0.009	-0.0017	-0.15	0.880	-0.083	-0.0257	-1.63	0.103
Newfoundland	-0.646	-0.1687	-6.99	0.000	-0.384	-0.1318	-5.02	0.000
PEI	-0.124	-0.0250	-1.04	0.296	0.045	0.0135	0.48	0.632
Nova Scotia	-0.111	-0.0222	-1.34	0.182	0.081	0.0242	1.27	0.205
New Brunswick	-0.280	-0.0614	-3.36	0.001	-0.204	-0.0668	-3.13	0.002
Quebec	-0.241	-0.0487	-4.18	0.000	-0.127	-0.0399	-2.69	0.007
Manitoba	-0.066	-0.0129	-0.66	0.506	0.238	0.0670	3.06	0.002
Saskatchewan	0.169	0.0286	1.93	0.054	0.214	0.0607	2.55	0.011
Alberta	0.209	0.0353	2.81	0.005	0.117	0.0346	1.82	0.068
British Columbia	0.073	0.0133	1.18	0.238	-0.091	-0.0286	-1.68	0.092
Yukon/Northwest/Nunavut	0.055	0.0099	0.44	0.658	0.200	0.0567	1.90	0.057
asthma	-0.132	-0.0264	-1.65	0.099	0.011	0.0032	0.17	0.864
arthritis	-0.204	-0.0420	-3.57	0.000	-0.115	-0.0363	-2.61	0.009
back problems	-0.129	-0.0251	-2.96	0.003	-0.034	-0.0104	-0.82	0.410
headache	-0.221	-0.0463	-3.26	0.001	0.004	0.0013	0.09	0.930
Chronic lung diseases	-0.040	-0.0077	-0.38	0.702	-0.162	-0.0522	-1.88	0.060
cancer	-0.185	-0.0386	-1.41	0.158	-0.188	-0.0611	-2.03	0.042
stomach/intestinal ulcers	-0.175	-0.0360	-1.79	0.074	-0.229	-0.0756	-2.57	0.010
stroke	-0.534	-0.1336	-3.85	0.000	-0.235	-0.0778	-1.16	0.245
urinary incontinence	-0.406	-0.0953	-3.50	0.000	-0.151	-0.0487	-1.89	0.059
bowel disorder	-0.205	-0.0430	-2.45	0.014	-0.084	-0.0264	-1.49	0.136
mood disorder	-0.541	-0.1326	-7.19	0.000	-0.366	-0.1230	-5.87	0.000
anxiety disorder	-0.280	-0.0610	-3.62	0.000	-0.245	-0.0806	-3.46	0.001
high blood pressure	-0.007	-0.0014	-0.12	0.901	-0.121	-0.0384	-2.56	0.010
heart disease	-0.300	-0.0660	-2.69	0.007	-0.115	-0.0368	-1.14	0.256
constant	-4.144	-	-6.05	0.000	-5.999	-	-11.67	0.000

Log pseudolikelihood in males' model = -6432.6231
Wald test for joint significance of the indicators for the other 14 health conditions:
chi2(14) = 266.85
Prob > chi2 = 0.0000

Log pseudolikelihood in females' model = -10418.684
Wald test for joint significance of the indicators for the other 14 health conditions:
chi2(14) = 155.37
Prob > chi2 = 0.0000

Table 4.2.1
Employment choice for Type1 & Type2 Diabetics and Nondiabetics, Specification 1

Dependent Variable is Working Status

	Male(obs=18961,pop=4642773.9)				**Female(obs=21088,pop=4445179.5)**			
Independent Variables	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Type1 diabetes	-0.613	-0.1632	-2.65	0.008	-0.667	-0.2438	-2.97	0.003
Type2 diabetes	-0.391	-0.0919	-3.93	0.000	-0.193	-0.0633	-2.38	0.017
Mean age	0.198	0.0385	9.38	0.000	0.269	0.0832	14.82	0.000
Mean Age^2	-0.003	-0.0005	-11.56	0.000	-0.003	-0.0010	-16.33	0.000
Married	0.510	0.1162	12.84	0.000	-0.156	-0.0471	-4.12	0.000
less than secondary	-0.313	-0.0699	-4.24	0.000	-0.478	-0.1656	-7.45	0.000
other post-secondary	0.039	0.0073	0.48	0.632	-0.036	-0.0111	-0.41	0.678
post-secondary	0.122	0.0244	2.18	0.029	0.310	0.0992	6.99	0.000
BMI	0.095	0.0185	3.28	0.001	0.079	0.0246	4.32	0.000
BMI^2	-0.002	-0.0003	-3.39	0.001	-0.001	-0.0004	-4.84	0.000
White	0.306	0.0662	4.38	0.000	0.214	0.0691	3.67	0.000
Immigration	0.055	0.0104	0.89	0.373	-0.040	-0.0124	-0.79	0.429
Newfoundland	-0.615	-0.1626	-6.77	0.000	-0.346	-0.1185	-4.53	0.000
PEI	-0.127	-0.0266	-1.04	0.297	0.068	0.0205	0.71	0.479
Nova Scotia	-0.122	-0.0254	-1.52	0.129	0.079	0.0238	1.22	0.222
New Brunswick	-0.266	-0.0596	-3.32	0.001	-0.182	-0.0596	-2.77	0.006
Quebec	-0.177	-0.0363	-3.22	0.001	-0.069	-0.0215	-1.47	0.142
Manitoba	-0.022	-0.0042	-0.22	0.823	0.250	0.0708	3.20	0.001
Saskatchewan	0.177	0.0310	2.17	0.030	0.226	0.0644	2.61	0.009
Alberta	0.212	0.0372	2.93	0.003	0.127	0.0379	1.98	0.048
British Columbia	0.076	0.0143	1.27	0.204	-0.081	-0.0257	-1.54	0.123
Yukon/Northwest/Nunavut	0.123	0.0222	1.05	0.292	0.262	0.0733	2.58	0.010
constant	-4.309	-	-6.40	0.000	-5.958	-	-11.69	0.000

Log pseudolikelihood in males' model = -6698.9848
Log pseudolikelihood in females' model = -10649.708

Table 4.2.2
Employment choice model for Type1 & Type2 Diabetics and Nondiabetics , Specification 2

Dependent Variable is Working Status

	Male(obs=18961,pop=4642773.9)				Female(obs=21088,pop=4445179.5)			
Independent Variables	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Type1 diabetes	-0.435	-0.1039	-2.25	0.025	-0.568	-0.2031	-2.57	0.010
Type2 diabetes	-0.349	-0.0782	-3.30	0.001	-0.087	-0.0275	-1.05	0.294
Mean age	0.204	0.0382	9.31	0.000	0.275	0.0845	14.96	0.000
Mean Age^2	-0.003	-0.0005	-11.33	0.000	-0.003	-0.0010	-16.30	0.000
Married	0.441	0.0954	10.75	0.000	-0.221	-0.0652	-5.54	0.000
less than secondary	-0.265	-0.0560	-3.61	0.000	-0.446	-0.1524	-6.65	0.000
other post-secondary	0.091	0.0163	1.14	0.256	0.009	0.0027	0.11	0.915
post-secondary	0.120	0.0230	2.10	0.036	0.313	0.0994	6.96	0.000
BMI	0.084	0.0158	2.92	0.004	0.077	0.0237	4.16	0.000
BMI^2	-0.001	-0.0002	-2.92	0.004	-0.001	-0.0004	-4.36	0.000
White	0.316	0.0665	4.48	0.000	0.216	0.0693	3.69	0.000
Immigration	-0.010	-0.0018	-0.16	0.877	-0.084	-0.0262	-1.66	0.097
Newfoundland	-0.646	-0.1685	-7.00	0.000	-0.385	-0.1322	-5.04	0.000
PEI	-0.124	-0.0249	-1.04	0.297	0.043	0.0131	0.47	0.640
Nova Scotia	-0.111	-0.0222	-1.34	0.182	0.081	0.0243	1.27	0.205
New Brunswick	-0.281	-0.0615	-3.36	0.001	-0.206	-0.0675	-3.16	0.002
Quebec	-0.241	-0.0487	-4.17	0.000	-0.127	-0.0400	-2.69	0.007
Manitoba	-0.067	-0.0129	-0.67	0.505	0.241	0.0677	3.07	0.002
Saskatchewan	0.169	0.0287	1.93	0.053	0.215	0.0609	2.57	0.010
Alberta	0.209	0.0353	2.81	0.005	0.117	0.0346	1.83	0.068
British Columbia	0.073	0.0133	1.18	0.239	-0.090	-0.0282	-1.66	0.096
Yukon/Northwest/Nunavut	0.054	0.0099	0.44	0.658	0.201	0.0571	1.91	0.057
asthma	-0.132	-0.0265	-1.65	0.099	0.010	0.0029	0.16	0.876
arthritis	-0.204	-0.0420	-3.57	0.000	-0.118	-0.0372	-2.64	0.008
back problems	-0.129	-0.0251	-2.97	0.003	-0.034	-0.0105	-0.84	0.402
headache	-0.220	-0.0462	-3.26	0.001	0.004	0.0013	0.09	0.929
Chronic lung diseases	-0.040	-0.0077	-0.38	0.701	-0.165	-0.0533	-1.92	0.055
cancer	-0.185	-0.0386	-1.41	0.158	-0.187	-0.0609	-2.03	0.043
stomach/intestinal ulcers	-0.175	-0.0361	-1.79	0.073	-0.230	-0.0756	-2.57	0.010
stroke	-0.533	-0.1330	-3.84	0.000	-0.242	-0.0804	-1.23	0.220
urinary incontinence	-0.407	-0.0954	-3.50	0.000	-0.152	-0.0488	-1.90	0.058
bowel disorder	-0.205	-0.0431	-2.45	0.014	-0.080	-0.0253	-1.44	0.150
mood disorder	-0.540	-0.1324	-7.18	0.000	-0.365	-0.1228	-5.86	0.000
anxiety disorder	-0.280	-0.0608	-3.62	0.000	-0.246	-0.0807	-3.47	0.001
high blood pressure	-0.007	-0.0013	-0.12	0.907	-0.129	-0.0409	-2.68	0.007
heart disease	-0.300	-0.0660	-2.69	0.007	-0.109	-0.0347	-1.09	0.277
constant	-4.142	-	-6.04	0.000	-6.008	-	-11.70	0.000

Log pseudolikelihood in males' model = -6432.243
Wald test for joint significance of the indicators for the other 14 health conditions:
chi2(14) = 267.92
Prob > chi2 = 0.0000

Log pseudolikelihood in females' model = -10417.89
Wald test for joint significance of the indicators for the other 14 health conditions:
chi2(14) = 156.98
Prob > chi2 = 0.0000

Table 4.3.1

Employment choice model for Diabetics and Nondiabetics based on diabetic duration, Specification 1

Dependent Variable is Working Status

	Male(obs=18961,pop=4642773.9)				Female(obs=21088,pop=4445179.5)			
Independent Variables	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Diabetic duration	-0.009	-0.0018	-1.11	0.269	-0.004	-0.0012	-0.60	0.546
Diabetes	-0.325	-0.0741	-2.84	0.005	-0.235	-0.0780	-2.27	0.023
Mean age	0.197	0.0384	9.34	0.000	0.268	0.0829	14.77	0.000
Mean Age^2	-0.003	-0.0005	-11.51	0.000	-0.003	-0.0010	-16.26	0.000
Married	0.510	0.1164	12.84	0.000	-0.154	-0.0466	-4.07	0.000
less than secondary	-0.312	-0.0696	-4.23	0.000	-0.480	-0.1661	-7.52	0.000
other post-secondary	0.038	0.0073	0.48	0.634	-0.042	-0.0131	-0.49	0.626
post-secondary	0.123	0.0245	2.19	0.028	0.306	0.0979	7.02	0.000
BMI	0.095	0.0184	3.28	0.001	0.080	0.0247	4.32	0.000
BMI^2	-0.002	-0.0003	-3.39	0.001	-0.001	-0.0004	-4.79	0.000
White	0.304	0.0658	4.35	0.000	0.206	0.0667	3.57	0.000
Immigration	0.055	0.0105	0.90	0.368	-0.039	-0.0121	-0.77	0.441
Newfoundland	-0.615	-0.1627	-6.78	0.000	-0.344	-0.1180	-4.50	0.000
PEI	-0.127	-0.0266	-1.05	0.295	0.068	0.0207	0.71	0.475
Nova Scotia	-0.121	-0.0251	-1.48	0.138	0.079	0.0239	1.23	0.220
New Brunswick	-0.265	-0.0596	-3.32	0.001	-0.180	-0.0591	-2.75	0.006
Quebec	-0.177	-0.0364	-3.23	0.001	-0.068	-0.0215	-1.47	0.143
Manitoba	-0.023	-0.0045	-0.24	0.812	0.247	0.0700	3.17	0.001
Saskatchewan	0.176	0.0309	2.16	0.030	0.224	0.0641	2.60	0.009
Alberta	0.211	0.0371	2.92	0.003	0.128	0.0381	1.99	0.047
British Columbia	0.076	0.0143	1.27	0.206	-0.083	-0.0262	-1.57	0.117
Yukon/Northwest/Nunavut	0.123	0.0222	1.06	0.290	0.260	0.0729	2.58	0.010
constant	-4.292	-	-6.38	0.000	-5.944	-	-11.66	0.000

Log pseudolikelihood in males' model = -6698.6597
Log pseudolikelihood in females' model = -10647.709

Table 4.3.2
Employment choice model for Diabetics and Nondiabetics based on diabetic duration , Specification 2

Dependent Variable is Working Status

	Male(obs=18961,pop=4642773.9)				Female(obs=21088,pop=4445179.5)			
Independent Variables	**Coef**	**dF/dx**	**t**	**P-value**	**Coef**	**dF/dx**	**t**	**P-value**
Diabetic duration	-0.006	-0.0012	-0.73	0.464	-0.002	-0.0006	-0.31	0.755
Diabetes	-0.299	-0.0653	-2.50	0.012	-0.153	-0.0494	-1.49	0.137
Mean age	0.204	0.0381	9.29	0.000	0.275	0.0843	14.92	0.000
Mean Age^2	-0.003	-0.0005	-11.30	0.000	-0.003	-0.0010	-16.24	0.000
Married	0.441	0.0954	10.73	0.000	-0.219	-0.0648	-5.49	0.000
less than secondary	-0.264	-0.0559	-3.60	0.000	-0.446	-0.1525	-6.66	0.000
other post-secondary	0.091	0.0163	1.13	0.257	0.003	0.0009	0.03	0.972
post-secondary	0.120	0.0230	2.11	0.035	0.310	0.0984	6.96	0.000
BMI	0.084	0.0157	2.92	0.003	0.077	0.0237	4.14	0.000
BMI^2	-0.001	-0.0002	-2.92	0.003	-0.001	-0.0004	-4.30	0.000
White	0.315	0.0663	4.47	0.000	0.210	0.0673	3.60	0.000
Immigration	-0.009	-0.0017	-0.15	0.882	-0.083	-0.0258	-1.63	0.103
Newfoundland	-0.646	-0.1686	-7.00	0.000	-0.384	-0.1318	-5.02	0.000
PEI	-0.123	-0.0249	-1.04	0.297	0.045	0.0135	0.48	0.631
Nova Scotia	-0.111	-0.0221	-1.31	0.189	0.081	0.0243	1.27	0.205
New Brunswick	-0.281	-0.0617	-3.36	0.001	-0.204	-0.0668	-3.13	0.002
Quebec	-0.242	-0.0488	-4.19	0.000	-0.127	-0.0400	-2.69	0.007
Manitoba	-0.067	-0.0131	-0.68	0.499	0.238	0.0669	3.05	0.002
Saskatchewan	0.169	0.0286	1.93	0.053	0.214	0.0607	2.56	0.011
Alberta	0.208	0.0352	2.80	0.005	0.117	0.0347	1.83	0.067
British Columbia	0.073	0.0132	1.17	0.242	-0.091	-0.0285	-1.68	0.093
Yukon/Northwest/Nunavut	0.054	0.0099	0.44	0.658	0.200	0.0568	1.91	0.057
asthma	-0.131	-0.0263	-1.64	0.100	0.010	0.0032	0.17	0.865
arthritis	-0.204	-0.0418	-3.56	0.000	-0.115	-0.0362	-2.61	0.009
back problems	-0.128	-0.0250	-2.95	0.003	-0.034	-0.0104	-0.83	0.407
headache	-0.221	-0.0463	-3.26	0.001	0.004	0.0013	0.08	0.933
Chronic lung diseases	-0.042	-0.0080	-0.40	0.692	-0.162	-0.0522	-1.88	0.060
cancer	-0.186	-0.0387	-1.42	0.157	-0.187	-0.0610	-2.03	0.042
stomach/intestinal ulcers	-0.174	-0.0359	-1.78	0.075	-0.229	-0.0755	-2.56	0.010
stroke	-0.531	-0.1325	-3.82	0.000	-0.233	-0.0773	-1.16	0.248
urinary incontinence	-0.407	-0.0956	-3.51	0.000	-0.151	-0.0486	-1.88	0.060
bowel disorder	-0.204	-0.0429	-2.44	0.014	-0.084	-0.0265	-1.50	0.135
mood disorder	-0.541	-0.1325	-7.16	0.000	-0.366	-0.1230	-5.87	0.000
anxiety disorder	-0.280	-0.0610	-3.62	0.000	-0.245	-0.0805	-3.46	0.001
high blood pressure	-0.007	-0.0014	-0.12	0.901	-0.121	-0.0384	-2.56	0.010
heart disease	-0.300	-0.0661	-2.70	0.007	-0.114	-0.0364	-1.12	0.261
constant	-4.129	-	-6.03	0.000	-5.996	-	-11.66	0.000

Log pseudolikelihood in males' model = -6431.9157
Wald test for joint significance of the indicators for the other 14 health conditions:
chi2(14) = 265.48
Prob > chi2 = 0.0000

Log pseudolikelihood in females' model = -10418.579
Wald test for joint significance of the indicators for the other 14 health conditions:
chi2(14) = 154.70
Prob > chi2 = 0.0000

Appendix V- Income Regression

Table 5.1.1

Income Regressions for Diabetics and Nondiabetics, Specification 1

Dependent Variable is logarithm of mean income

	Male(obs=15180,pop=3904968.3)			Female(obs=14843,pop=3272037)		
Independent Variables	**Coef**	**t**	**P-value**	**Coef**	**t**	**P-value**
Diabetes	-0.1090	-3.29	0.001	-0.0631	-1.35	0.178
Mean age	0.0477	6.44	0.000	0.0514	5.53	0.000
Mean Age^2	-0.0005	-6.25	0.000	-0.0005	-5.13	0.000
Married	0.1517	10.16	0.000	-0.1168	-7.20	0.000
less than secondary	-0.1473	-5.18	0.000	-0.2178	-5.67	0.000
other post-secondary	-0.0061	-0.20	0.841	-0.0018	-0.05	0.963
post-secondary	0.1289	6.32	0.000	0.1824	8.20	0.000
BMI	0.0662	7.08	0.000	0.0031	0.33	0.742
BMI^2	-0.0010	-6.69	0.000	-0.0002	-1.30	0.192
White	0.2010	7.49	0.000	0.0726	2.65	0.008
Immigration	-0.1202	-5.20	0.000	-0.0660	-2.68	0.007
MANAG./ART, EDUC	0.2518	9.25	0.000	0.4143	9.54	0.000
BUSIN./FINANC	0.1727	5.70	0.000	0.3128	7.25	0.000
SALES, SERVICES	-0.0252	-0.79	0.430	-0.1208	-2.67	0.008
TRADES/TRANSP	0.0479	1.74	0.082	0.0107	0.16	0.871
Newfoundland	-0.2030	-6.57	0.000	-0.2513	-5.83	0.000
PEI	-0.2872	-7.36	0.000	-0.1701	-4.04	0.000
Nova Scotia	-0.2355	-7.18	0.000	-0.1727	-4.61	0.000
New Brunswick	-0.2149	-7.69	0.000	-0.2474	-6.80	0.000
Quebec	-0.1875	-8.37	0.000	-0.1329	-5.91	0.000
Manitoba	-0.0970	-3.51	0.000	-0.1216	-3.36	0.001
Saskatchewan	-0.0164	-0.62	0.535	-0.0958	-3.22	0.001
Alberta	0.1065	5.22	0.000	-0.0091	-0.30	0.764
British Columbia	0.0105	0.51	0.609	-0.0544	-2.07	0.038
Yukon/Northwest/Nunavut	0.1362	4.24	0.000	0.1857	3.22	0.001
constant	8.3194	36.86	0.000	9.0348	34.82	0.000

Table 5.1.2

Income Regressions for Diabetics and Nondiabetics, Specification 2

Dependent Variable is logarithm of mean income

	Male(obs=15180,pop=3904968.3)			Female(obs=14843,pop=3272037)		
Independent Variables	**Coef**	**t**	**P-value**	**Coef**	**t**	**P-value**
Diabetes	-0.1073	-3.28	0.001	-0.0597	-1.29	0.198
Mean age	0.0471	6.36	0.000	0.0518	5.57	0.000
Mean Age^2	-0.0005	-6.06	0.000	-0.0005	-5.05	0.000
Married	0.1448	9.94	0.000	-0.1246	-7.73	0.000
less than secondary	-0.1435	-5.06	0.000	-0.2096	-5.42	0.000
other post-secondary	-0.0039	-0.13	0.897	0.0002	0.01	0.996
post-secondary	0.1311	6.46	0.000	0.1832	8.29	0.000
BMI	0.0639	6.98	0.000	0.0012	0.13	0.900
BMI^2	-0.0010	-6.56	0.000	-0.0002	-0.99	0.324
White	0.2029	7.65	0.000	0.0744	2.71	0.007
Immigration	-0.1258	-5.49	0.000	-0.0708	-2.89	0.004
MANAG./ART, EDUC	0.2487	9.05	0.000	0.4172	9.50	0.000
BUSIN./FINANC	0.1742	5.72	0.000	0.3172	7.25	0.000
SALES, SERVICES	-0.0207	-0.65	0.518	-0.1120	-2.45	0.014
TRADES/TRANSP	0.0532	1.92	0.055	0.0220	0.33	0.739
Newfoundland	-0.2003	-6.44	0.000	-0.2542	-5.88	0.000
PEI	-0.2870	-7.40	0.000	-0.1730	-4.07	0.000
Nova Scotia	-0.2300	-7.17	0.000	-0.1702	-4.51	0.000
New Brunswick	-0.2109	-7.55	0.000	-0.2468	-6.76	0.000
Quebec	-0.1929	-8.58	0.000	-0.1444	-6.43	0.000
Manitoba	-0.1005	-3.67	0.000	-0.1181	-3.25	0.001
Saskatchewan	-0.0158	-0.61	0.540	-0.0915	-3.05	0.002
Alberta	0.1075	5.32	0.000	-0.0065	-0.22	0.829
British Columbia	0.0083	0.40	0.686	-0.0497	-1.89	0.059
Yukon/Northwest/Nunavut	0.1303	3.91	0.000	0.1826	3.20	0.001
asthma	0.0186	0.80	0.424	0.0418	1.31	0.189
arthritis	-0.0687	-3.11	0.002	-0.0783	-3.06	0.002
back problems	-0.0041	-0.26	0.798	-0.0176	-0.87	0.384
headache	-0.0669	-2.41	0.016	0.0032	0.14	0.887
Chronic lung diseases	-0.1217	-2.60	0.009	0.0103	0.18	0.854
cancer	0.0102	0.12	0.904	-0.0929	-1.17	0.241
stomach/intestinal ulcers	-0.0540	-1.39	0.163	-0.1045	-2.26	0.024
stroke	-0.3178	-2.30	0.021	0.1203	0.78	0.435
urinary incontinence	-0.1432	-2.31	0.021	-0.1057	-2.39	0.017
bowel disorder	0.0097	0.32	0.753	-0.0250	-0.83	0.408
mood disorder	-0.0800	-2.29	0.022	-0.0734	-2.49	0.013
anxiety disorder	-0.0770	-1.80	0.072	-0.0529	-1.47	0.141
high blood pressure	0.0318	1.51	0.131	-0.0042	-0.16	0.872

heart disease	-0.0930	-2.63	0.008	0.0678	0.88	0.381
constant	8.3788	37.70	0.000	9.0485	34.99	0.000

F-test for joint significance of the indicators for the other 14 health conditions in males' regression:
F(14, 15140) = 4.92
Prob > F = 0.0000

F-test for joint significance of the indicators for the other 14 health conditions in females' regression:
F(14, 14803) = 3.65
Prob > F = 0.0000

Table 5.2.1
Income Regressions for Type1&Type2 Diabetics and Nondiabetics, Specification 1

Dependent Variable is logarithm of mean income

	Male(obs=15180,pop=3904968.3)			**Female(obs=14843,pop=3272037)**		
Independent Variables	**Coef**	**t**	**P-value**	**Coef**	**t**	**P-value**
Type1 diabetes	-0.2876	-3.31	0.001	-0.2564	-2.79	0.005
Type2 diabetes	-0.0948	-2.72	0.006	-0.0439	-0.88	0.382
Mean age	0.0479	6.46	0.000	0.0517	5.56	0.000
Mean Age^2	-0.0005	-6.28	0.000	-0.0005	-5.16	0.000
Married	0.1508	10.10	0.000	-0.1171	-7.21	0.000
less than secondary	-0.1478	-5.20	0.000	-0.2183	-5.69	0.000
other post-secondary	-0.0069	-0.23	0.822	-0.0012	-0.03	0.975
post-secondary	0.1286	6.31	0.000	0.1824	8.20	0.000
BMI	0.0662	7.08	0.000	0.0033	0.35	0.730
BMI^2	-0.0010	-6.71	0.000	-0.0002	-1.34	0.181
White	0.2012	7.50	0.000	0.0734	2.68	0.007
Immigration	-0.1202	-5.20	0.000	-0.0668	-2.71	0.007
MANAG./ART, EDUC	0.2523	9.27	0.000	0.4138	9.54	0.000
BUSIN./FINANC	0.1728	5.71	0.000	0.3124	7.25	0.000
SALES, SERVICES	-0.0247	-0.77	0.439	-0.1214	-2.68	0.007
TRADES/TRANSP	0.0482	1.75	0.081	0.0099	0.15	0.881
Newfoundland	-0.2028	-6.56	0.000	-0.2522	-5.86	0.000
PEI	-0.2847	-7.22	0.000	-0.1710	-4.06	0.000
Nova Scotia	-0.2353	-7.18	0.000	-0.1733	-4.62	0.000
New Brunswick	-0.2151	-7.70	0.000	-0.2482	-6.82	0.000
Quebec	-0.1872	-8.37	0.000	-0.1337	-5.95	0.000
Manitoba	-0.0968	-3.50	0.000	-0.1201	-3.31	0.001
Saskatchewan	-0.0160	-0.60	0.547	-0.0961	-3.24	0.001
Alberta	0.1068	5.24	0.000	-0.0094	-0.31	0.755
British Columbia	0.0105	0.51	0.611	-0.0544	-2.07	0.038
Yukon/Northwest/Nunavut	0.1365	4.25	0.000	0.1857	3.22	0.001
constant	8.3206	36.87	0.000	9.0292	34.81	0.000

Table 5.2.2

Income Regressions for Type1&Type2 Diabetics and Nondiabetics, Specification 2

Dependent Variable is logarithm of mean income

	Male(obs=15180,pop=3904968.3)			Female(obs=14843,pop=3272037)		
Independent Variables	**Coef**	**t**	**P-value**	**Coef**	**t**	**P-value**
Type1 diabetes	-0.2790	-3.09	0.002	-0.2337	-2.48	0.013
Type2 diabetes	-0.0933	-2.72	0.007	-0.0409	-0.83	0.408
Mean age	0.0472	6.38	0.000	0.0520	5.60	0.000
Mean Age^2	-0.0005	-6.09	0.000	-0.0005	-5.08	0.000
Married	0.1441	9.88	0.000	-0.1248	-7.74	0.000
less than secondary	-0.1440	-5.07	0.000	-0.2101	-5.44	0.000
other post-secondary	-0.0045	-0.15	0.880	0.0008	0.02	0.984
post-secondary	0.1309	6.45	0.000	0.1832	8.29	0.000
BMI	0.0639	6.98	0.000	0.0013	0.14	0.887
BMI^2	-0.0010	-6.57	0.000	-0.0002	-1.02	0.309
White	0.2031	7.66	0.000	0.0751	2.73	0.006
Immigration	-0.1259	-5.50	0.000	-0.0715	-2.92	0.004
MANAG./ART, EDUC	0.2491	9.07	0.000	0.4167	9.50	0.000
BUSIN./FINANC	0.1743	5.73	0.000	0.3168	7.25	0.000
SALES, SERVICES	-0.0202	-0.63	0.527	-0.1127	-2.47	0.014
TRADES/TRANSP	0.0534	1.93	0.054	0.0212	0.32	0.749
Newfoundland	-0.2001	-6.42	0.000	-0.2550	-5.90	0.000
PEI	-0.2847	-7.27	0.000	-0.1739	-4.09	0.000
Nova Scotia	-0.2298	-7.17	0.000	-0.1708	-4.53	0.000
New Brunswick	-0.2111	-7.56	0.000	-0.2476	-6.78	0.000
Quebec	-0.1927	-8.58	0.000	-0.1451	-6.45	0.000
Manitoba	-0.1003	-3.67	0.000	-0.1168	-3.20	0.001
Saskatchewan	-0.0154	-0.60	0.551	-0.0918	-3.06	0.002
Alberta	0.1078	5.34	0.000	-0.0068	-0.23	0.821
British Columbia	0.0083	0.40	0.687	-0.0497	-1.89	0.058
Yukon/Northwest/Nunavut	0.1306	3.92	0.000	0.1825	3.20	0.001
asthma	0.0179	0.77	0.441	0.0414	1.31	0.192
arthritis	-0.0686	-3.10	0.002	-0.0778	-3.04	0.002
back problems	-0.0047	-0.29	0.770	-0.0179	-0.88	0.377
headache	-0.0662	-2.38	0.017	0.0034	0.15	0.878
Chronic lung diseases	-0.1211	-2.58	0.010	0.0095	0.17	0.865
cancer	0.0096	0.11	0.910	-0.0932	-1.18	0.240
stomach/intestinal ulcers	-0.0545	-1.41	0.160	-0.1046	-2.26	0.024
stroke	-0.3186	-2.31	0.021	0.1159	0.76	0.449
urinary incontinence	-0.1433	-2.31	0.021	-0.1048	-2.36	0.018
bowel disorder	0.0087	0.28	0.776	-0.0243	-0.81	0.421
mood disorder	-0.0791	-2.26	0.024	-0.0731	-2.48	0.013
anxiety disorder	-0.0765	-1.78	0.074	-0.0531	-1.48	0.139

high blood pressure	0.0313	1.49	0.136	-0.0051	-0.20	0.844
heart disease	-0.0944	-2.67	0.008	0.0680	0.88	0.379
constant	8.3796	37.71	0.000	9.0436	34.98	0.000

F-test for joint significance of the indicators for the other 14 health conditions in males' regression:
F(14, 15139) = 4.91
Prob > F = 0.0000

F-test for joint significance of the indicators for the other 14 health conditions in females' regression:
F(14, 14802) = 3.62
Prob > F = 0.0000

Table 5.3.1

Income Regressions for Diabetics and Nondiabetics based on diabetic duration, Specification 1

Dependent Variable is logarithm of mean income

	Male(obs=15180,pop=3904968.3)			**Female(obs=14843,pop=3272037)**		
Independent Variables	**Coef**	**t**	**P-value**	**Coef**	**t**	**P-value**
Diabetic duration	-0.0040	-1.19	0.233	-0.0010	-0.25	0.805
Diabetes	-0.0783	-1.96	0.050	-0.0543	-0.93	0.355
Mean age	0.0476	6.41	0.000	0.0514	5.53	0.000
Mean Age^2	-0.0005	-6.22	0.000	-0.0005	-5.13	0.000
Married	0.1514	10.15	0.000	-0.1168	-7.20	0.000
less than secondary	-0.1469	-5.16	0.000	-0.2179	-5.67	0.000
other post-secondary	-0.0064	-0.21	0.835	-0.0019	-0.05	0.962
post-secondary	0.1291	6.33	0.000	0.1823	8.19	0.000
BMI	0.0663	7.09	0.000	0.0031	0.33	0.742
BMI^2	-0.0010	-6.71	0.000	-0.0002	-1.30	0.192
White	0.2010	7.49	0.000	0.0727	2.65	0.008
Immigration	-0.1201	-5.19	0.000	-0.0662	-2.69	0.007
MANAG./ART, EDUC	0.2522	9.27	0.000	0.4142	9.54	0.000
BUSIN./FINANC	0.1728	5.71	0.000	0.3128	7.25	0.000
SALES, SERVICES	-0.0246	-0.77	0.442	-0.1208	-2.67	0.008
TRADES/TRANSP	0.0485	1.76	0.079	0.0106	0.16	0.872
Newfoundland	-0.2032	-6.58	0.000	-0.2512	-5.83	0.000
PEI	-0.2867	-7.34	0.000	-0.1702	-4.05	0.000
Nova Scotia	-0.2353	-7.17	0.000	-0.1727	-4.61	0.000
New Brunswick	-0.2152	-7.70	0.000	-0.2475	-6.80	0.000
Quebec	-0.1877	-8.38	0.000	-0.1330	-5.92	0.000
Manitoba	-0.0974	-3.53	0.000	-0.1215	-3.35	0.001
Saskatchewan	-0.0162	-0.61	0.540	-0.0959	-3.22	0.001
Alberta	0.1062	5.21	0.000	-0.0090	-0.30	0.766
British Columbia	0.0105	0.51	0.611	-0.0544	-2.07	0.038

Yukon/Northwest/Nunavut	0.1367	4.25	0.000	0.1858	3.22	0.001
constant	8.3222	36.85	0.000	9.0353	34.83	0.000

Table 5.3.2

Income Regressions for Diabetics and Nondiabetics based on diabetic duration, Specification 2

Dependent Variable is logarithm of mean income

	Male(obs=15180,pop=3904968.3)			Female(obs=14843,pop=3272037)		
Independent Variables	**Coef**	**t**	**P-value**	**Coef**	**t**	**P-value**
Diabetic duration	-0.0033	-1.04	0.300	-0.0003	-0.08	0.934
Diabetes	-0.0814	-2.03	0.042	-0.0568	-0.98	0.328
Mean age	0.0470	6.34	0.000	0.0518	5.57	0.000
Mean Age^2	-0.0005	-6.03	0.000	-0.0005	-5.06	0.000
Married	0.1447	9.93	0.000	-0.1246	-7.73	0.000
less than secondary	-0.1432	-5.05	0.000	-0.2096	-5.42	0.000
other post-secondary	-0.0041	-0.14	0.891	0.0002	0.01	0.996
post-secondary	0.1312	6.47	0.000	0.1832	8.29	0.000
BMI	0.0640	6.98	0.000	0.0012	0.13	0.900
BMI^2	-0.0010	-6.57	0.000	-0.0002	-0.99	0.323
White	0.2029	7.65	0.000	0.0744	2.71	0.007
Immigration	-0.1257	-5.49	0.000	-0.0708	-2.89	0.004
MANAG./ART, EDUC	0.2489	9.06	0.000	0.4172	9.50	0.000
BUSIN./FINANC	0.1742	5.72	0.000	0.3172	7.25	0.000
SALES, SERVICES	-0.0202	-0.63	0.528	-0.1120	-2.45	0.014
TRADES/TRANSP	0.0536	1.93	0.053	0.0220	0.33	0.740
Newfoundland	-0.2006	-6.44	0.000	-0.2542	-5.88	0.000
PEI	-0.2867	-7.39	0.000	-0.1730	-4.07	0.000
Nova Scotia	-0.2299	-7.17	0.000	-0.1702	-4.51	0.000
New Brunswick	-0.2112	-7.56	0.000	-0.2469	-6.76	0.000
Quebec	-0.1931	-8.59	0.000	-0.1444	-6.43	0.000
Manitoba	-0.1009	-3.69	0.000	-0.1181	-3.24	0.001
Saskatchewan	-0.0157	-0.61	0.544	-0.0915	-3.05	0.002
Alberta	0.1072	5.31	0.000	-0.0064	-0.21	0.830
British Columbia	0.0083	0.40	0.687	-0.0497	-1.89	0.059
Yukon/Northwest/Nunavut	0.1307	3.92	0.000	0.1826	3.20	0.001
asthma	0.0186	0.80	0.424	0.0417	1.31	0.189
arthritis	-0.0685	-3.09	0.002	-0.0783	-3.06	0.002
back problems	-0.0040	-0.25	0.801	-0.0177	-0.87	0.384
headache	-0.0669	-2.41	0.016	0.0031	0.14	0.888
Chronic lung diseases	-0.1218	-2.60	0.009	0.0103	0.18	0.854
cancer	0.0093	0.11	0.912	-0.0929	-1.17	0.241
stomach/intestinal ulcers	-0.0539	-1.39	0.165	-0.1044	-2.26	0.024
stroke	-0.3174	-2.30	0.021	0.1201	0.78	0.436

urinary incontinence	-0.1430	-2.31	0.021	-0.1056	-2.38	0.017
bowel disorder	0.0097	0.32	0.753	-0.0250	-0.83	0.407
mood disorder	-0.0794	-2.27	0.023	-0.0734	-2.49	0.013
anxiety disorder	-0.0770	-1.80	0.072	-0.0529	-1.47	0.141
high blood pressure	0.0317	1.51	0.132	-0.0043	-0.16	0.870
heart disease	-0.0929	-2.64	0.008	0.0679	0.88	0.380
constant	8.3811	37.70	0.000	9.0487	35.01	0.000

F-test for joint significance of the indicators for the other 14 health conditions in males' regression:
F(14, 15139) = 4.90
Prob > F = 0.0000

F-test for joint significance of the indicators for the other 14 health conditions in females' regression:
F(14, 14802) = 3.64
Prob > F = 0.0000