

Low-Income, Unemployment and Health Outcomes of Working Age Men

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Abstract

This paper discusses the possibility that individuals who experience unemployment and/or low-income are more likely to experience health problems in the following years. The Longitudinal Administrative Database (LAD) is used due to its strong representation of the Canadian population and due to its ability to allow one to observe individuals over sufficiently long time periods. Also, The LAD contains the variables which are necessary for the appropriate empirical analysis. This study involves the observation of individuals who first exhibit an uninterrupted period of labour market activity and health which is followed by a period of low-income and/or unemployment. The probabilities that these individuals claim CPP/QPP disability, a 'disability amount for self' or medical expenses in subsequent years are calculated and compared to a control group.

1. Introduction

Individuals with disabilities can experience unique challenges in achieving higher education and also encounter barriers in the job market. Such persons can have difficulties with mobility, communication, stress management as well as other difficulties which obstruct their participation and progression in the work force. When one considers the many obstacles that disabled or sick persons must hurdle to achieve success in their work lives, it is easy to suppose that the onset of disability or sickness can make individuals more vulnerable to low-income and unemployment.

The interest of this paper is whether causation between the aforementioned variables can run in the opposite direction; we question whether or not the onset of low-income and/or unemployment can make individuals more vulnerable to disability or sickness. This paper will synopsise a body of literature which points toward the possibility that low-income and unemployment can lead to health problems. It is theorized that individuals who experience a spell of low-income and/or unemployment are more likely to subsequently show signs of disability or medical problems when compared to a control group of individuals who do not experience low-income or unemployment. Statistical tests will be performed using the Longitudinal Administrative Database to determine the validity of this theory.

2. Literature Review

Low-income and Health

This section will outline the research of a number of authors whose findings support the possibility that individuals who have experienced a bout of low-income are more susceptible to health problems than individuals who have not experienced low-income. A number of economic articles are referenced and findings from alternative fields such as sociology, psychology, public health and medicine are also examined throughout this

literature review.

There is evidence that persons of low-income may be particularly vulnerable to mental health problems. Link and Phalan (1993) identify a positive relationship between low-paying, low-status work and high incidences of depression. Kessler and Cleary (1980) find that people of lower socioeconomic status (SES)¹ are exposed to more of the stressful life problems which have been shown to lead to emotional distress. These authors also find that lower SES individuals are more likely than higher SES people to exhibit symptoms of distress at any given level of exposure to stressful experiences. Kessler and Cleary discuss how differences in living environments may explain why lower SES individuals are more responsive to stress than people of higher SES. These articles are pertinent to the research question of this paper because they establish the existence of correlation between low-income and mental health problems, however these authors do not answer any questions regarding the direction of causation.

Certain literature has discussed whether or not the adverse living conditions commonly associated with low-income can cause mental health conditions. Dohrenwend et al (1992) explain the difference between social causation and social selection theory in their study of the relationship between mental health problems and SES. The authors explain that social causation theory attributes the relationship between mental health problems and SES to the adversity and stress associated with low SES. Alternatively, social selection theory claims that certain persons are genetically predisposed to drift towards, or fail to climb out of, low SES. If such is the case then mental health problems, subsequent to an experience of low-income, would be attributed to these genetic predispositions. In their study, the authors find schizophrenia is best explained by social selection theory but social causation theory better explains depression of women and antisocial personality and substance use disorders of men. This literature suggests that experiences of low-income can cause mental health problems.

¹ SES is usually measured by levels of education and income as well as occupation type.

Low-income individuals in Canada may be living in conditions which are adverse to their physical health. Evans and Kantrowitz (2002) cite US census statistics which indicate that people living in low-income are more than 3 times as likely to have substandard quality housing and that in many instances such housing has extreme physical problems. Wu *et al.* (2007) outline the hazards of substandard living environments which include biological and chemical contaminants, as well as poor ergonomics, lighting, and physical design. The authors emphasize that such hazards can cause and exacerbate a list of health conditions, ranging from asthma to cancer. Wu *et al.* claim that poverty is a barrier to the prevention and reduction of poor health caused by certain conditions and reference research performed by the Institute of Medicine (IOM) which links lower SES with increased levels of asthma morbidity and mortality (IOM 2004). The above research shows that low-income individuals may live in substandard housing which causes physical health problems.

Unemployment and Health

Spells of unemployment can be very trying on one's health. Unemployed individuals may be more likely to experience social exclusion and extended periods of idleness, both of which can affect health. Unemployment has been correlated with a number of health problems such as depression (Hamilton *et al.* (1990)), alcohol abuse (Catalano *et al.* (1993)), and a heightened mortality rate (Sorlie and Rogot (1990)). Furthermore, being unstably employed has been shown to be connected to poor health (Pavalko *et al.* (1993), Rushing *et al.* (1992)). These findings relate to this paper because they show that labour market attachment is related to health; we wish to specify the relation by looking for a causal relationship between unemployment and health.

Employed individuals may receive positive health effects which are not received by individuals who are not employed. This paper examines the health effects of unemployment; we caution that unemployment is not synonymous with 'not employed' as individuals who are

not employed are considered 'not in the labour force' unless they are actively seeking employment in which case they are unemployed.² Nonetheless, unemployed individuals are not employed. Ross and Mirowski (1995) show that employment has positive effects on health. Employment often keeps individuals active and can be associated with connectivity to community. Ruchlin and Morris (1991) find through their statistical analysis that those who work report a higher quality of life than those who do not. Unemployed individuals of course do not receive any of the positive effects of employment on health.

In its policy evaluation paper titled, 'Transforming Disability into Ability,' the Organization for Economic Development (OECD) discusses the relationship between disability and unemployment programs (OECD 2003). The paper looks for a relationship between unemployment program expenditure and disability benefit expenditure using across-country variation. No significant relationship is found using across-country variation but the report does find a significant relationship when looking at within-country variation. Within-country variation suggests that an increase in disability benefit expenditure occurs as a result of rising unemployment in some OECD countries. Using within-country analysis the report also finds that unemployment and disability program interchangeability occurs in some countries.³ The paper states that data regarding the work and benefit status of new disability recipients before applying for a disability benefit is scarce, but was able to find that in Australia, Austria and the United Kingdom, around one third of all new recipients of disability benefits were previously unemployed. The OECD report explains disabled persons experience certain labour market difficulties over periods of relatively higher unemployment, also, increased unemployment creates conditions such as stress and poverty which result in higher rates of application for disability benefit.

² For example, a retired person is not employed and is also not considered unemployed; they are not in the labour force.

³ There is a body of literature which discusses the issues of program substitutability and moral hazard; for an example see Black and Sanders (2002). Although this literature is somewhat relevant to the topic of this paper it is not reviewed so as not to digress from our main interests.

The use of Longitudinal Data

Longitudinal data can serve as a useful tool for untangling the relationship between low-income and disability. Using simple cross sectional or time series data, one may see that low-income, unemployment and health problems are positively correlated, but directions of causation cannot be determined. One cannot know: have health problems caused unemployment and/or low-income or has low-income and/or unemployment caused health problems? A two-stage least squares approach can be used to solve this problem but it is often difficult to find appropriate instruments.

The unique feature of longitudinal data is that it tracks the same individuals over time. With such data, one can observe individuals who experience low-income or unemployment and then observe their health afterwards. The health outcomes of a group of individuals who first experience low-income or unemployment can then be compared to the health outcomes of a control group which does not experience low-income or unemployment. If health problems occur after an experience of low-income or unemployment one can rule out the possibility that the health problems caused the low-income or unemployment.

In many studies, longitudinal analysis has been used on families to explore the dependency of child health problems on the income of their parents. For instance, Currie (2008) finds that poor health is probably a primary cause of intergenerational persistence of economic status and references other research that connects low-income families to childhood health problems. Currie and Hyson (1999) show that among children whose fathers have occupations considered to be of greatest prestige, 5 percent had low birth weight (birth weight less than 2,500 grams) compared to 6.4 percent of children whose father's have occupations considered to be least prestigious. Our study is only interested in working age individuals but the literature on children is important to consider nonetheless because in the case of children, it is especially safe to glean that health is dependant on income as opposed to income being

dependant on health.

Some studies have made use of longitudinal data to study the relationship between the income and health of adults. Bardasi et al. (2000) used longitudinal data to study income and disability relationships in Britain. The authors restrict their attention to men who reported at least two years without a work-limiting health condition followed by at least two years with a work-limiting health condition. The authors identify disabled individuals as those that respond 'yes' to the survey question: 'Does your health keep you from doing some types of work?' Bardasi et al. find that the income of men before the onset of disability is significantly lower than non-disabled men.

Unlike Bardasi et al. which reports the average income of individuals before the onset of disability, this paper looks at the probability of onset of disability following the onset of low-income. We improve upon Bardasi et al. (2000) by using a larger sample size (Bardasi et al. have a sample size of 109). We also use a much less subjective indication of disability: whether an individual claims disability benefits.

Burkhauser and Daly (1998) perform the same analysis as Bardasi et al. (2000) using data from the US and Germany. These authors also find that disabled persons experienced sharp drops in their earnings prior to the date of onset of disability. Burchardt (2003) confirms these findings and specifies a trend of household incomes dropping before the onset of disability, with residual, smaller drops occurring at or following onset.

Another interesting aspect of longitudinal data is that it can also allow one to see if there are different effects of persistent versus transitory low-income on health. One may suspect that an individual who experiences short spells of low-income may be less vulnerable to health problems than an individual who experiences extended periods of low-income which last several years. McLeod and Shanahan (1993, 1996) and Strohschein (2005) find that the persistence of low-income better explains child mental health problems than a child's family's current low-income status alone. Our study does not consider the effects of persistent versus

transitory low-income on health but such research would be a natural extension to this paper.

No studies have been found which use longitudinal analysis to search for a causal relationship between low-income or unemployment on health. A recent survey of international literature released by the department of Human Resource and Social Development Canada (HRSDC) states, "Literature focusing on longitudinal data generally indicates that the causality between disability and low income can go both ways (HRSDC (2006))." Longitudinal analysis in following sections of this paper aims to confirm or refute these conclusions using Canadian data.

The framework for the longitudinal analysis of this paper has been adapted from a paper titled 'Displacement of Older Workers: Re-Employment, Hastened Retirement, Disability, or Other Destinations?' by Gray and Finnie (2007). The authors use the Longitudinal Administrative Database to analyse the post-separation labour market activity of displaced prime-age and older workers. These authors look at individuals who have a four year period where they show considerable employment income as well as no sign of receiving social assistance benefits, employment insurance (EI) benefits, Canada Pension Plan (CPP) benefits (both pension and disability income), or workers' compensation benefits. Their analysis involves splitting subjects into two groups: those that show separation from the labour market in the year that follows the four year 'clean' period and those that do not show separation from the labour market. The authors report the proportions of subjects who experience various labour market outcomes throughout the five years that follow their year of separation. The methodology used in this paper mimics that of Gray and Finnie (2007) but concerns the incidences of disability and medical expense that occur in the years which follow the onset of low-income and/or unemployment. Also, Gray and Finnie do not control health measures in the 'clear' period; this paper does not consider individuals who show signs of health problem prior to the period of separation.

3. Sample Selection and Empirical Framework

This section outlines the methodology which will be used to find evidence of whether unemployment and low-income affect health. Figure 1 and Figure 2 below summarize the following paragraphs.

A four year 'clean' period is represented by years $t-4$, $t-3$, $t-2$ and $t-1$ and is a period during which subjects must show self-reliance, labour market attachment and no sign of health problems to be included in the analysis. During the 'clean' period, individuals must have not: received employment insurance or social assistance, experienced low-income, have received CPP/QPP disability benefits, claimed a 'disability amount for self' or claimed medical expenses. Subjects must also have received an annual employment income of at least \$10 000 during the this period.

The sample selection process then involves multi-cohort identification which begins in 1992. Individuals are included in the first cohort if they meet the aforementioned 'clean' conditions over the four consecutive years: 1992, 1993, 1994 and 1995. Individuals are included in the second cohort if they meet the 'clean' conditions over the four consecutive years: 1993, 1994, 1995 and 1996. Of note is that these two cohorts share some of their subjects. This implies that our sample is not independent and identically-distributed. Since regression analysis is not preformed this is not considered a major problem. The aforementioned procedure is then repeated for each year from 1992 until 1997, which yields a total of 6 cohorts.

After the cohorts of individuals with 'clean' four-year employment records have been formed, the next step is to examine whether or not subjects experience unemployment and/or low-income in the subsequent year which is named 'year t '. At year t , $t+1$, $t+2$, $t+3$ and $t+4$, test groups differ from the control group by having an experience with unemployment and/or

low-income. The control group and test groups will be further described in a following section.

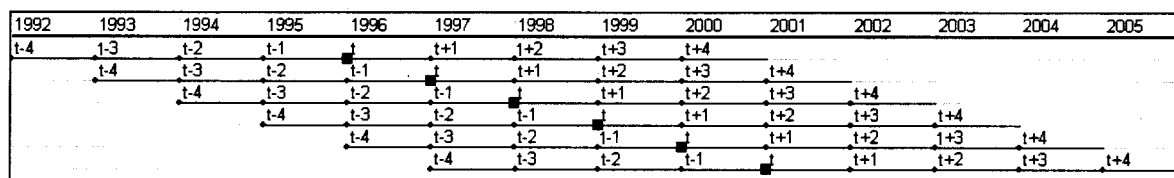
The focus of our analysis is whether or not individuals of the test groups claim CPP/QPP disability benefits, medical expenses, or a disability tax credit (known as a 'disability amount for self') at a higher rate than the control group during the four year period directly following year t . The four year period following year t will be called the period of observation and will be represented by years $t+1$, $t+2$, $t+3$ and $t+4$. For example, for the first cohort of individuals, the period of observation is 1997-2000. We are also interested in whether the test groups claim different average amounts of CPP/QPP disability benefits than the control group during this period.

Note that we do not restrict the control group or any of the test groups from receiving CPP/QPP disability benefits, medical expenses, or the disability tax credit at year t . Due to the annual frequency of the data, we are unable to see whether the test groups experience low-income and/or unemployment, or health problems first within the year. We assume that it takes a certain amount of time for the onset of low-income and/or unemployment to effect health, therefore, it is likely that the health outcomes which occur during year t have not been affected by any low-income or unemployment experienced in the same year. Inversely, we assume that health deterioration usually affects income and employment in a gradual manner. We assume that low-income and unemployment experienced by the test groups in this year has not been caused by the onset of health problems within the same year. We do not draw any conclusions on causality from observation of year t .

Figure 1: Specification of Cohorts (I)

| Cohort number | Window of observation for 'clean' period (t-4, t-3, t-2,t-1) | Year of potential unemployment and/or low-income experience (t) | Period of observation (t+1, t+2, t+3, t+4) |
|---------------|--|---|--|
| 1 | 1992-1995 | 1996 | 1997-2000 |
| 2 | 1993-1996 | 1997 | 1998-2001 |
| 3 | 1994-1997 | 1998 | 1999-2002 |
| 4 | 1995-1998 | 1999 | 2000-2003 |
| 5 | 1996-1999 | 2000 | 2001-2004 |
| 6 | 1997-2000 | 2001 | 2002-2005 |

Figure 2: Specification of Cohorts (II)



The following list summarizes the information given in the above paragraphs of this section and outlines some additional criteria that subjects must meet to be included in the analysis. In order to be included in any of the test groups or the control group, of any cohort, an individual must meet the following sample criteria:

I. Over all years (t-4 through to t+4)

1. Is between the ages 20 and 65
2. Is male
3. Is a resident of Canada
4. Is not a student
5. Is a tax-filer
6. Does not receive workers' compensation

II. Over the 'clean' period (t-4 through to t-1)

1. Does not receive social assistance income
2. Receives annual employment income greater than \$10 000.00
3. Does not experience low income or receive employment insurance benefits
4. Does not receive CPP/QPP Disability benefits
5. Does not claim medical expenses
6. Did not claim a 'disability amount for self'

A more detailed description of these criteria and the theory behind them follow in the 'variable description' section.

4. The data

The Longitudinal Administrative Database

The longitudinal analysis of this study makes use of The Longitudinal Administrative Database (LAD) which contains information on income, taxes and demographics in Canada. The LAD Dictionary (a guide to the data set released by Statistics Canada) explains that the LAD is a random 20 percent sample of the T1 Family File (T1FF). The T1FF is an annual cross-sectional data file of all tax filers of Canada and their families. The data consists of the information which Canadians provide on their annual tax forms.

This data is longitudinal due to the fact that once an individual has been selected for the LAD, the individual remains in the sample and their information contributes to the data set each subsequent year that he or she appears on the T1FF (i.e. files taxes). New tax filers are added to the LAD each year in the same 20% ratio which maintains a 20 percent representation of tax filers for every year.

The LAD includes data dating back to 1982, but only data since 1992 will be used for the purpose of this study because social assistance has been deemed insufficiently captured on

the file in earlier years (Gray and Finnie (2007)). Finnie and Sweetman (2003) point out one of the important virtues of the LAD; the authors explain that both upper-income and lower income Canadians must file their income tax forms and that lower income individuals have strong incentives to do so in order to recover income tax and other payroll tax deductions made throughout the year and also to receive tax credits. Finnie and Sweetman (2003) report that the full set of annual files that are used to construct the LAD are estimated to cover 95 to 97 percent of the population over the period covered, and therefore the LAD is favored over alternative databases in this respect.

One of the shortcomings of the LAD is that only annual data are available, as Canadians file tax returns just once a year. Annual data is particularly problematic when one wishes to observe individuals' low-income experience. An individual may exhibit an annual income on their tax forms which places them above a given poverty line, but such an individual could very well have experienced multiple short periods of poverty throughout the year which would not show up in the data. Also, an individual could experience a one year long spell of low-income that spans two one year periods. If such an individual's income before and after such a spell is sufficiently large this low-income experience will not show up on the data file. One can note that most literature looks at annual income when measuring low-income in Canada; short periods of low-income are not seen to be as detrimental to an individual's wellbeing as long periods.

Variable Description and Discussion

This section will define the LAD variables which are used in the empirical analysis of this paper. The definitions of these variables have been obtained from the LAD Dictionary (2006). There is also some discussion around the theory behind the inclusion of these variables in the analysis.

I. Control Variables

Workers' Compensation Payments

Individuals who are injured at work or develop health problems as a direct result of their employment can apply to receive worker's compensation payments. Any individuals who receive workers' compensation payments are not included in our analysis. Our empirical framework has been constructed with the intention of exposing only the effect of low-income and unemployment on health, therefore we do not include individuals whose health has been affected by workplace dangers.

As many as 17 percent of recipients of CPP/QPP disability also collect workers' compensation benefits (Campolieti and Krashinsky (2003)). Different provinces have different systems of program integration which allow individuals to receive both workers' compensation and CPP/QPP disability benefits, but workers' compensation benefits are usually reduced by the amount of the CPP/QPP disability benefits (Campolieti and Krashinsky (2003)). In the following analysis we will observe the incidence of CPP/QPP disability benefit receipt experienced by different test groups. If individuals receive workers' compensation with their CPP/QPP disability benefits they will not be counted.

Social Assistance Income

The LAD Dictionary explains that social assistance is meant to provide income which sufficiently meets the costs of the basic requirements of individuals or families who have exhausted all other financial resources. Social assistance is provided through provincial and municipal programs. Individuals are required to report all social assistance income they receive on their tax return forms. If applicable, the spouse with higher net income is required to report social assistance payments.

Our sample only includes individuals who do not receive social assistance income for at least four straight years prior to a year t where they either do or do not experience low-

income and/or unemployment because we wish to only observe individuals who display a history of self-reliance. We do not restrict our subjects from receiving social assistance income at year t or beyond because we believe that this would over-restrict our sample of individuals who experience low-income. Many individuals who experience low-income receive social assistance income. Receiving social assistance may also be part of the 'effect' of low-income along with (possible) health problems, the focus of our analysis.

Total Employment Income from T4 slips

We wish to observe individuals who display an uninterrupted history of labour market attachment during the four years prior to a year t where they either do or do not experience low-income and/or unemployment. The LAD Dictionary specifies that total employment income includes all paid-employment income. This income includes income from wages, salaries, and commissions, before deductions. It does not include self-employment income. We include only individuals with total employment income greater than \$10 000.00 for at least four years in our sample.

Other Control Variables

We include only individuals between the ages of 20 and 65 because these individuals are considered to be of 'working age.' We have included only men because they are known to have greater attachment to the labour market. It is also theorized that unemployment may be more psychologically damaging to men as they are more commonly the predominate breadwinners of their households. We recognize that these statements have become less and less true and wish to perform similar analysis using women in the future.

We have not included individuals residing outside of Canada because they are likely to have alternative factors affecting their health which can not be controlled. Also, individuals

who claim tuition on their tax forms are not included because students are viewed as having irregular income and labour patterns.

II. Economic Variables

Employment Insurance Benefits

Employment insurance benefits are paid to individuals experiencing employment income interruptions (i.e. job losses). Employment insurance benefits are also available for persons who stop working due to sickness, injury, pregnancy, birth, or the adoption of a child. Individuals are required to report employment insurance benefits on their tax forms.

In our analysis, an individual's receipt of employment insurance benefits is used as an indication of unemployment. On Canadian tax forms there is no place to indicate whether or not one has experienced unemployment. It is important to note that many individuals who are unemployed do not receive employment insurance benefits because they have not made adequate contributions or have chosen not to apply. Therefore, it is recognized that whether or not an individual has received employment insurance benefits is not a perfect indication of whether or not they have experienced unemployment. We do not use the absence of employment income as an indication of unemployment because an individual who does not report employment income could simply not be in the labour force (i.e. not looking for work). The only indication of unemployment is the receipt of employment insurance benefits.

It is important to note that not all unemployed individuals receive employment insurance. Individuals who are unemployed but do not qualify for employment insurance can not be identified. This is a weakness of the data set.

When individuals declare employment insurance benefits on their tax forms, the income could reflect 'regular' benefits stemming from an unemployment spell experienced after a layoff, or it could reflect 'special' benefits, such as maternity, parental, and sickness benefits. We therefore use a merged version of the LAD file and another file known as the

Status Vector and Record of Employment file. There is a record contained in the status vector portion of this file that identifies the ‘type’ of benefit, and makes the distinction between ‘regular’ and ‘special’ benefits. In our analysis, subjects who received ‘special’ employment insurance benefits are not counted as having received employment insurance.

Low-Income Status (SAADD total income after tax)

This measure of low income was chosen over the other low-income variables in the LAD because it shows low-income status after taxes are paid. An after tax measure gives an indication of an individual’s disposable income which is expected to be more closely tied to health than before tax income.

The low-income status variable identifies low-income individuals according to the low income measure (LIM). The LIM is one-half of the adjusted median family income after tax, where ‘adjusted’ refers to a consideration of family size. The SAADD definition of total after-tax income is used to establish this LIM threshold. SAADD defines total after tax income as total income minus provincial and federal taxes and including the Quebec abatement.⁴

More specifically, calculation of the LIMs proceeds as follows:

- (i) For each family, ‘adjusted family size’ is determined whereby the first adult is counted as one person and each additional adult adds 0.4 to the size, and each child (less than 16 years old) adds 0.3 to the size. In a single parent family the first child adds 0.4 to the family size. So, for example, two parents with three children would have a family size of 2.3, one parent with three children would have a family size of 2.0, and so on.
- (ii) For each family, ‘adjusted family income’ is determined by dividing family income by ‘adjusted family size.’
- (iii) Median ‘adjusted family income’ is determined. This is the level of ‘adjusted family

⁴ The Quebec Abatement is a reduction of 16.5 percentage points of federal personal income tax for all tax filers in Quebec.

income' such that 50 percent of families have a smaller 'adjusted family income' and 50 percent have a higher 'adjusted family income.'

(iv) The LIM for a family of size one is 50% of the median 'adjusted family income' and the LIMs for the other types of families are equal to this value multiplied by the family type's 'adjusted family size.'

(v) Individuals are deemed to be experiencing low-income if their 'adjusted family income' is below their family's corresponding LIM.

III. Health Outcomes

Calculated Medical Expenses

A tax filer can claim medical expenses as a tax deduction, provided the filer has not and will not be reimbursed for the expenses. However, a tax filer may claim reimbursed expenses if the reimbursement is included in his or her income and provided the tax filer did not deduct the reimbursement anywhere else on the tax return. For a full list of expenses which can be claimed see Canada Revenue Agency's Medical and Disability-Related Information (2007). Valid medical expenses range from blood transfusions, insulin, and vehicle modifications, to wigs, dentures, artificial eyes and cosmetic surgery. For most of these expenses, a doctor's prescription is required for a claim. The medical expenses shown on an individual's tax form reports the total amount of medical expenses incurred by the filer, their spouse, and all their dependent children younger than 18, therefore this variable is not a precise measure of the individual's own health specifically. Couples decide who will claim the medical expenses. Medical expenses can be claimed if the expenses were incurred in any twelve month period ending in the taxation year and not claimed the previous year.

Not all people who have medical expenses claim them on their tax forms. Individuals may not be aware that certain expenses can be claimed or may deem the cost of

expenses as insignificant. This variable is not a perfect measure of the total medical expenses and individual or family incurs.

CPP/QPP Disability Benefits Included in Income

Individuals may receive lump sum CPP/QPP disability benefits whereby some or all of these benefits may have been received in a previous year or years. Regardless, this amount is entered on the tax form. It is noted that this variable is not a perfect measure of an individual's current health state because there is no way to tell whether the amount on the form was for previous years or the current year. It is for this reason that the 'disability amount for self' variable (described below) is used also.

The amount of CPP/QPP disability benefit which an individual receives is calculated as a fixed amount plus an amount related to the individual's previous earnings. The earnings-related portion is equal to 75% of the retirement benefit, calculated as if the individual had turned 65 on the date he or she became disabled. There is a maximum level of benefit that one can receive which changes annually.

Campolieti and Krashinsky (2003) report on the history of the CPP/QPP disability program. The CPP/QPP disability program has been paying benefits since 1970 but eligibility requirements have not been constant over time or across provinces. The CPP/QPP disability program also had more lenient eligibility criteria between the years 1987 and 1997. During these years eligibility required contribution in two of the last three years or five of the last ten years or one third of the contribution period. Also, between the years 1989 and 1995 the CPP disability program required less stringent medical screening. The QPP program maintained tighter medical screening throughout this period.

To be eligible for CPP/QPP disability benefits one must be under 65, have stopped working because of a medical condition, and when working had been contributing to CPP/QPP for at least six years or have contributed to the CPP/QPP for at least 25 years and

has made valid contributions to CPP/QPP during three of the last six years. Valid medical conditions include mental and physical disabilities which must be considered to be both "severe" and "prolonged" by a physician according to the CPP/QPP legislation. Employees and employers both pay half of the contributions which cover the costs of CPP/QPP. In the case of self employed individuals, both portions are paid by the individual.

In order to apply for benefits one must fill out a series of forms related to themselves and their dependents. Individuals must disclose information about their work history and their medical condition. Most importantly, a medical report must be completed by an applicant's doctor. Doctors are provided with a physician's guide to CPP/QPP benefits and are requested to attach medical reports, tests, or other documents to the medical report. This medical report is significant because it limits the substitutability of CPP/QPP disability benefits for other social assistance programs. Theoretically, if there was to be a restriction of other social assistance programs a major increase in the number of Canadians receiving CPP/QPP disability benefits should not be expected as the medical report serves as a barrier to program substitution.

Disability Amount for Self

The 'disability amount for self' is a tax credit available to individuals whose lives have been affected by disability. The size of the tax credit is preset annually by the Department of Finance Canada. A tax filer may claim a disability amount for self if he or she was severely physically or mentally impaired in the tax year, and the impairment noticeably restricted the tax filer's activities of daily living. An individual who claims a disability amount for self does not necessarily receive CPP/QPP disability benefits. For example, a disabled individual who did not make adequate contributions to the CPP/QPP would not qualify for CPP/QPP disability benefits but could still be eligible for the disability amount for self. In order to

qualify for a disability amount for self an individual must provide appropriate documentation from their doctor just as is required for CPP/QPP disability benefits.

The following further describes the control group and the four test groups.

5. Specification of Control Group and Test Groups

Control Group

Members of this group do not experience low-income or receive employment insurance benefits at year t or in the period of observation ($t+1$, $t+2$, $t+3$, $t+4$). It is presumed that there is a 'natural' rate of disability and medical expense that occur in the absence of low-income or unemployment. By observing the health outcomes of this group in the period of observation one can see the rate of disability and medical expense which is not affected by low-income or unemployment. The experience of other groups which do experience low-income and/or unemployment will be compared to this group.

Suppose we were to permit members of the control group to experience low-income or receive employment insurance benefits in years $t+1$ through to $t+4$. In this case, the health outcomes of control subjects in period $t+4$ could be affected by low-income and/or unemployment in periods $t+1$, $t+2$, $t+3$; the health outcomes of control subjects in period $t+3$ could be affected by low-income and/or unemployment in periods $t+1$ and $t+2$, and so on. If we do not continue our restrictions regarding low-income and unemployment through the period of observation we can not be sure that the health outcomes which we observe are not affected by low-income or unemployment.

We must also note that by making these restriction on the control group during years $t+1$ to $t+4$ we may be introducing problems of endogeneity. Future research could test for the existance of endogeneity by loosening these restrictions and comparing results.

Test Group 1

Members of this group receive employment insurance benefits at year t and may or may not be in low-income. Through comparison of this group's health experience during the period of observation to the control group's, we attempt to observe the adverse effects of unemployment on health outcomes.

Test Group 2

Members of this group receive employment insurance benefits but do not experience low-income at year t. Through comparison of this group to the control group, we wish see the effect of unemployment on health, separate from any of the effects that low-income may have on health.

Test Group 3

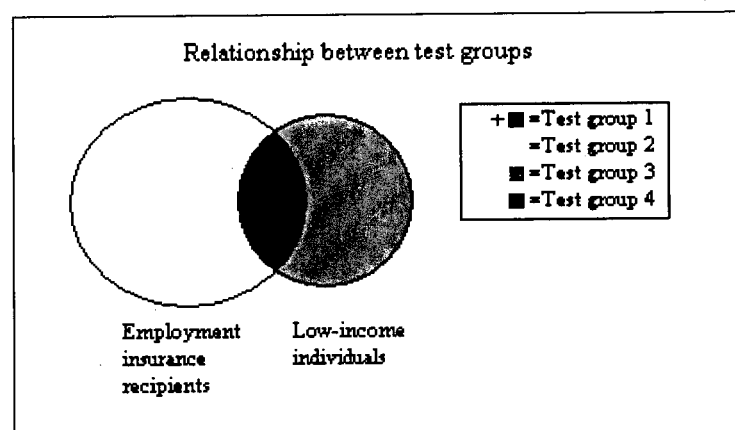
Members of this group experience low-income but do not receive employment insurance benefits at year t. Through comparison of this group to the control group, we wish to see the effect of low-income on health, separate from any of the effects that unemployment may have on health.

Test Group 4

Members of this group receive employment insurance benefits and experience low-income at year t. Through comparison of this group to the control group, we attempt to observe the combined effect that low-income and unemployment have on health. A priori it is believed that this group should display the highest incidence of disability and medical expense through the period of observation.

Figure 3 depicts the relationship between the test groups. Test group one (which contains all individuals who receive unemployment insurance in year t) exclusively includes all members of test group 2 (individuals who receive unemployment insurance but do not experience low-income in year t) and all members of test group 4 (individuals who receive unemployment insurance and also experience low-income in year t). Note that the circles of this diagram have not been drawn to scale.

Figure 3:



6. Empirical Findings

Analysis of Group Sizes

Figure 4 reports the size of each group for each cohort. The final column of Figure 4 uses a given group's size in each cohort of and reports the average. From this column one can calculate that we observe on average 305,365 individuals in each cohort.

The control group is by far the largest group. It is easy to see that the difference between the size of test group 1 and test group 2 is test group 4. Test group 4 is much smaller than the other groups. This shows that there are very few individuals who both receive employment insurance and experience low-income at year t.

One can observe that the number of individuals who qualify to be in the control group increases every cohort from 1996 to 2001. This increase could reflect the steady increase in Canada's population over those years. The number of individuals who qualify for test group 1 (i.e. receive employment insurance at year t) fluctuates from cohort to cohort. The large number of individuals who qualified for test group 1 in the 2001 cohort probably reflects the increase in unemployment which was experienced during the economic slowdown of that year. The size of test group 2 (individuals who receive employment insurance but do not experience low-income at year t) follows a similar trend to that of group 1 but its difference (the size of test group 4) diminishes every cohort. Test group 3 (low-income individuals who do not receive employment insurance at year t) shows comparably little change in size from cohort to cohort but also has a greatest size in the cohort of 2001. Meanwhile, test group 4 (low-income individuals who receive employment insurance at year t) decreases in size from cohort to cohort but shows upward spikes in cohorts 1999 and 2001.

Figure 4:

| | Cohort | | | | | | Average |
|----------------------|--------|--------|--------|--------|--------|--------|---------|
| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | |
| Control Group | 273435 | 279080 | 285025 | 294300 | 305490 | 321695 | 293171 |
| Test Group 1 | 5890 | 5215 | 5605 | 4960 | 4545 | 7430 | 5608 |
| Test Group 2 | 5685 | 5045 | 5470 | 4815 | 4440 | 7265 | 5453 |
| Test Group 3 | 1140 | 1150 | 1030 | 990 | 1160 | 1325 | 1133 |
| Test Group 4 | 205 | 170 | 135 | 140 | 105 | 165 | 153 |

(Source: LAD)

Analysis of Proportions

Figures 5, 7 and 9 show for each year, t to t+4, the proportions of each group which experience the three aforementioned health outcomes. The proportions are averages of all cohorts (i.e. all cohorts have been pooled together). Non-pooled figures are available in AP 1, 2, 3 and 6 of the appendix. By definition, no proportion of any of these groups experiences

any of the health outcomes in the four years prior to year t (t-4 to t-1). In most instances, the following can be observed:

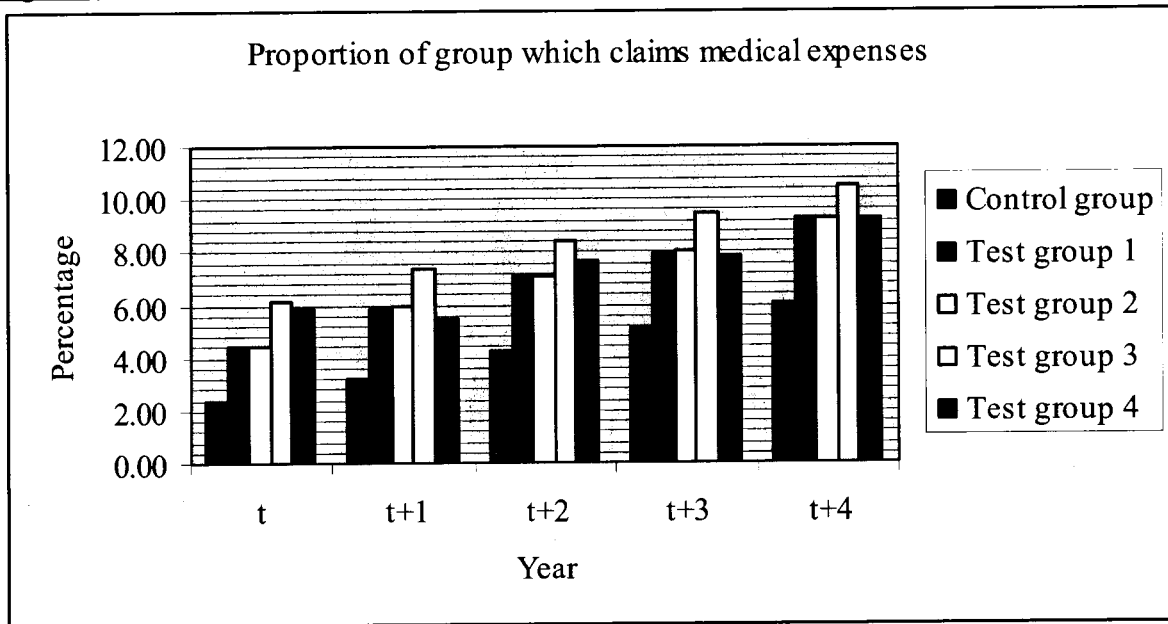
1. Higher proportions of the test groups experience the health outcomes compared to the control group. This is an indication that individuals who experience low-income and/or claim employment insurance at year t are more likely to claim medical expenses, CPPD/QPPD disability benefits and/or a 'disability amount for self' compared to individuals who do not experience low-income or claim employment insurance at year t.
2. The proportion of each group which experiences the given health outcome increase each year from year t to year t+4. It is believed that these proportions are converging to an average rate of experience of the given outcome which is experienced by the entire population of working age men who are not students in Canada.
3. There is very little difference between the experiences of test group 1 and test group 2. This is due to the fact that test group 1 includes all members of test group 2 and members of test group 2 constitute a large proportion of test group 1.
4. Test group 3 has the highest group proportion which experiences the given health outcome. This may be an indication that individuals who experience low-income at year t are particularly vulnerable to health problem even if they do not show indication of unemployment at year t. Another explanation is that these individuals have not received employment insurance at year t only because they did not qualify (i.e. did not make adequate contributions in previous years); therefore, these individuals have in effect 'gone fishing' for financial relief through alternative avenues such as tax credits, tax deductions and disability benefits. If such is the case than moral hazard may be a factor in these findings.

Figures 6, 8 and 10 show the percentage point difference between the proportion of a

group which experiences a given health outcome and the proportion of the control group which experiences the same outcome. These differences are calculated by taking the proportion of a group which experiences a given health outcome in a given year and subtracting the proportion of the control group which experiences the same outcome in that same year. These charts are meant to give an indication of the growth rates of the proportions of the test groups which experience a given outcome relative to the growth rate of the proportion of the control group which experience the same outcome. In most instances the test groups' differences increase from year t to year $t+4$. This shows that the proportions of the test groups which experience the given outcome are growing, from year t to $t+4$, at a greater rate than the control group. This may be explained by the fact that that in some cases low-income and unemployment take time to have affect on health.

Figure 5 shows the proportion of each group which claims medical expenses in a given year. The proportion of the control group which claims medical expenses grows every year from 2.38 percent in year t to 5.08 percent in year $t+4$. Meanwhile, the proportions of test groups 1 and 2 which claim medical expenses both grow from roughly 4.4 percent in year t to 8.0 percent in year $t+4$. The proportion of test group 3 which claims medical expenses is largest in all years, and grows from 6.18 percent in year t to 10.47 percent in year $t+4$. The proportion of test group 4 which claims medical expenses it grows from 5.82 percent in year t to 9.30 percent in year $t+4$. All of the numbers which were used to construct Figure 5 can be found in AP 4 of the appendix.

Figure 5:



(Source: LAD)

Figure 6 shows, for a given year, the percentage point difference between the proportion of a given group which claims medical expenses and the proportion of the control group which claims medical expenses. From year t to year t+4, these differences are positive and increase in every year for test groups 1, 2 and 3. This shows that not only do these test groups have greater proportions which claim medical expenses compared to the control group but their proportions grow from year t to year t+4 at a greater rate as well. The percentage point difference between the proportion of group 4 which claims medical expenses and the proportion of the control group which claims medical expenses fluctuates from year to year.

The final column of Figure 6 shows the average difference experienced by a group over all years t to t+4. Test group 3 shows the largest average difference, followed by test group 4. Test groups 1 and 2 show the lowest average difference.

Figure 6:

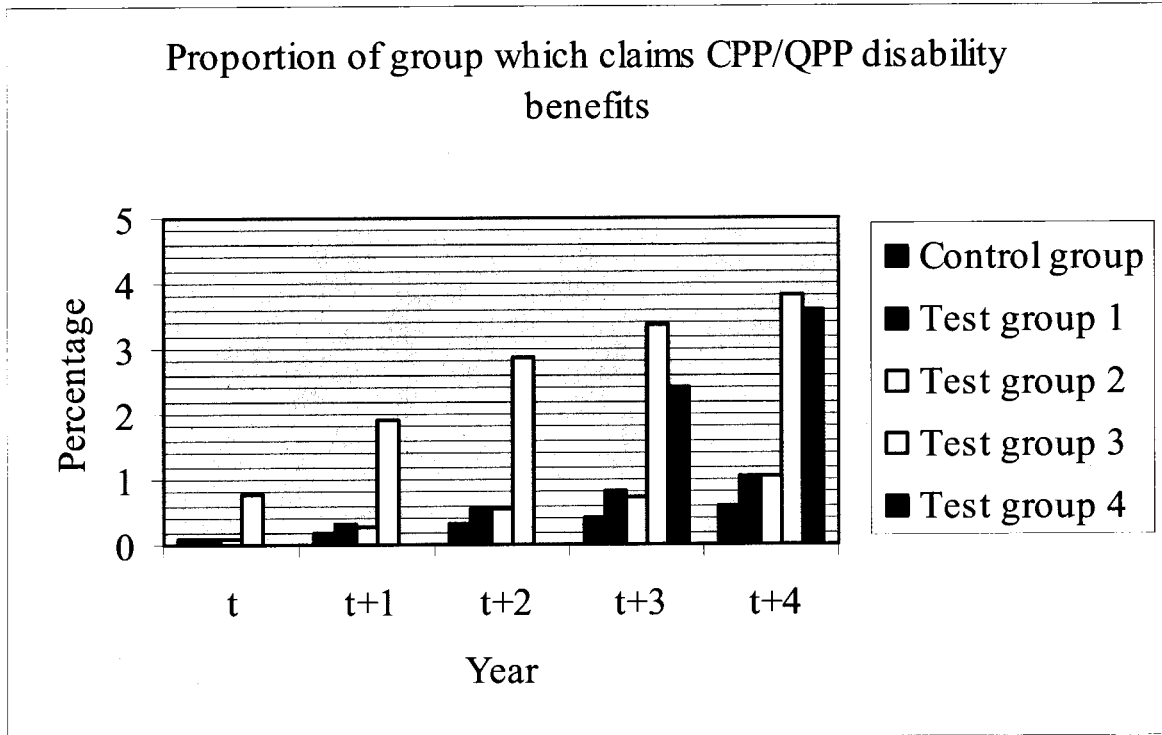
Percentage point difference between groups' proportions which claims medical expenses and the control group's proportion which claims medical expenses

| | Year | | | | | Average difference (over all years t to t+4) |
|----------------------|------|------|------|------|------|--|
| | t | t+1 | t+2 | t+3 | t+4 | |
| Control group | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Test group 1 | 2.05 | 2.67 | 2.88 | 2.90 | 3.17 | 2.73 |
| Test group 2 | 2.02 | 2.70 | 2.85 | 2.93 | 3.18 | 2.74 |
| Test group 3 | 3.80 | 4.10 | 4.20 | 4.35 | 4.40 | 4.17 |
| Test group 4 | 3.43 | 2.22 | 3.47 | 2.73 | 3.23 | 3.02 |

(Source: LAD)

Figure 7 shows the proportion of each group which claims CPP/QPP disability benefits in a given year. The proportion of the control group which claims CPP/QPP disability benefits grows every year from 0.1 percent in year t to 0.6 percent in year t+4. Meanwhile, the proportions of test groups 1 and 2 which claim CPP/QPP disability benefits both grow from roughly 0.1 percent in year t to 1.05 percent in year t+4. The proportion of test group 3 which claims CPP/QPP disability benefits is largest in all years, and grows from 1.92 percent in year t to 3.82 percent in year t+4. No proportion of test group 4 claims CPP/QPP disability benefits in years t to t+2. We believe these zero values are observed because of the relatively small number of subjects in this test group. In t+3 and t+4 the proportions of group 4 which claim CPP/QPP disability benefits are 2.4 percents and 3.60 percent respectively. All numbers which were used to make Figure 7 are available in AP 4 of the appendix.

Figure 7:



(Source: LAD)

Figure 8 shows, for each year, the percentage point difference between the proportion of a given group which claims CPP/QPP disability benefits and the proportion of the control group which claims CPP/QPP disability benefits. From year t to year t+4, the differences experienced by test groups 1, 2 and 3 are small, positive and increase in every year. We see that not only do these groups have greater proportions which experience this health outcome compared to the control group but their proportions grow from year t to year t+4 at a greater rate as well.

The percentage point difference between the proportion of group 4 which claims CPP/QPP disability benefits and the proportion of the control group which claims medical expenses is negative in years t to t+2 because no proportion of group 4 claims CPP/QPP disability benefits in these years. In t+3 and t+4 the percentage point differences experienced

by group 4 are 2.00 and 3.00 respectively.

Figure 8:

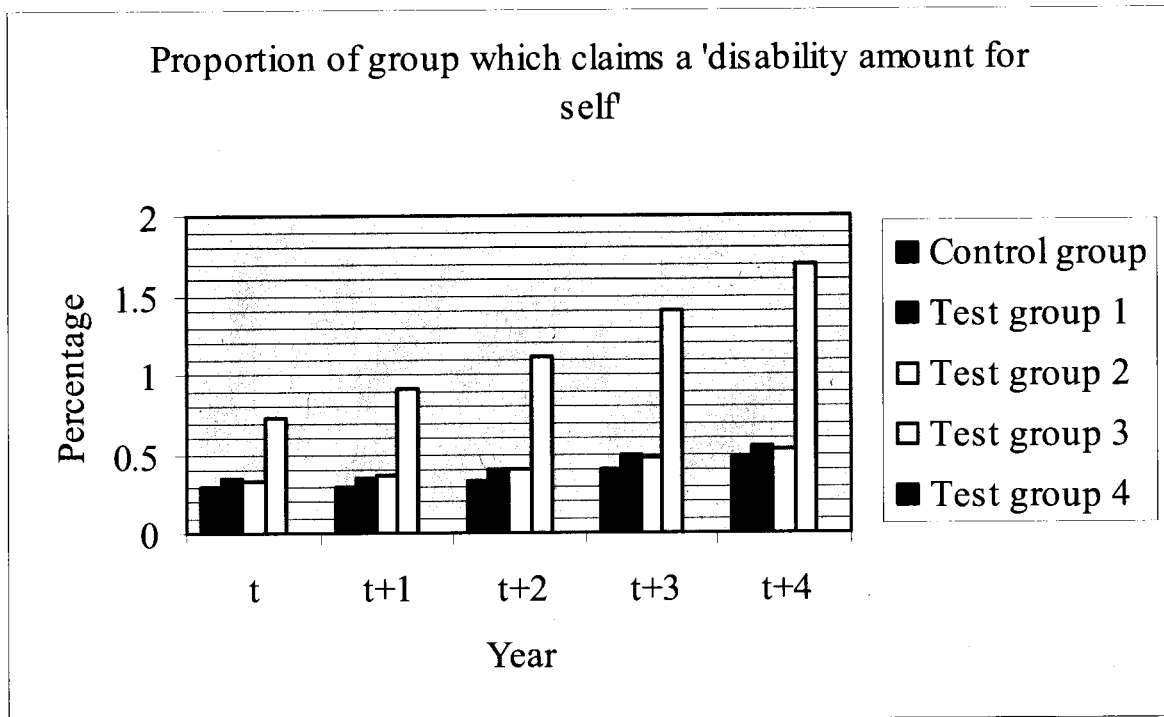
Percentage point difference between groups' proportions which claims CPP/QPP disability benefits and the control group's proportion which claims medical expenses CPP/QPP disability benefits

| | Year | | | | | Average difference (over all years t to t+4) |
|----------------------|-------|-------|-------|------|------|--|
| | t | t+1 | t+2 | t+3 | t+4 | |
| Control group | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Test group 1 | 0.00 | 0.12 | 0.23 | 0.40 | 0.47 | 0.24 |
| Test group 2 | 0.00 | 0.10 | 0.23 | 0.33 | 0.43 | 0.22 |
| Test group 3 | 0.68 | 1.73 | 2.57 | 2.97 | 3.22 | 2.23 |
| Test group 4 | -0.10 | -0.18 | -0.30 | 2.00 | 3.00 | 0.88 |

(Source: LAD)

Figure 9 shows the proportion of each group which claims a 'disability amount for self' in a given year. The proportion of the control group which claims a 'disability amount for self' grows every year from 0.28 percent in year t to 0.47 percent in year t+4. Meanwhile, the proportions of test groups 1 and 2 which claim a 'disability amount for self' both grow from roughly 0.34 percent in year t to 0.54 percent in year t+4. The proportion of test group 3 which claims a 'disability amount for self' is largest in all years, and grows from 0.72 percent in year t to 1.68 percent in year t+4. The proportion of test group 4 which claims a 'disability amount for self' is zero in all observation years. We believe these zero values are observed because of the relatively small number of subjects in this test group. All numbers which were used to make Figure 9 are available in AP 5 of the appendix.

Figure 9:



(Source: LAD)

Figure 10 shows, for each year, the percentage point difference between the proportion of a given group which claims a 'disability amount for self' and the proportion of the control group which claims a 'disability amount for self'. From year t to year t+4, the differences which are experienced by test groups 1 and 2 are relatively small and change very little. Test group 3, which experiences the largest differences, has a difference in proportion which is positive and grows in every year from year t to year t+4. The differences experienced by test group 4 are all negative due to the fact that no proportion of this group claims a 'disability amount for self' in any year.

Figure 10:

Percentage point difference between groups' proportions which claims a 'disability amount for self' and the control group's proportion which claims a 'disability amount for self'

| | Year | | | | | Average difference |
|----------------------|-------|-------|-------|-------|-------|--------------------|
| | t | t+1 | t+2 | t+3 | t+4 | |
| Control group | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Test group 1 | 0.07 | 0.05 | 0.07 | 0.08 | 0.08 | 0.07 |
| Test group 2 | 0.05 | 0.07 | 0.07 | 0.07 | 0.07 | 0.06 |
| Test group 3 | 0.44 | 0.62 | 0.77 | 1.00 | 1.22 | 0.81 |
| Test group 4 | -0.28 | -0.30 | -0.33 | -0.40 | -0.47 | -0.36 |

(Source: LAD)

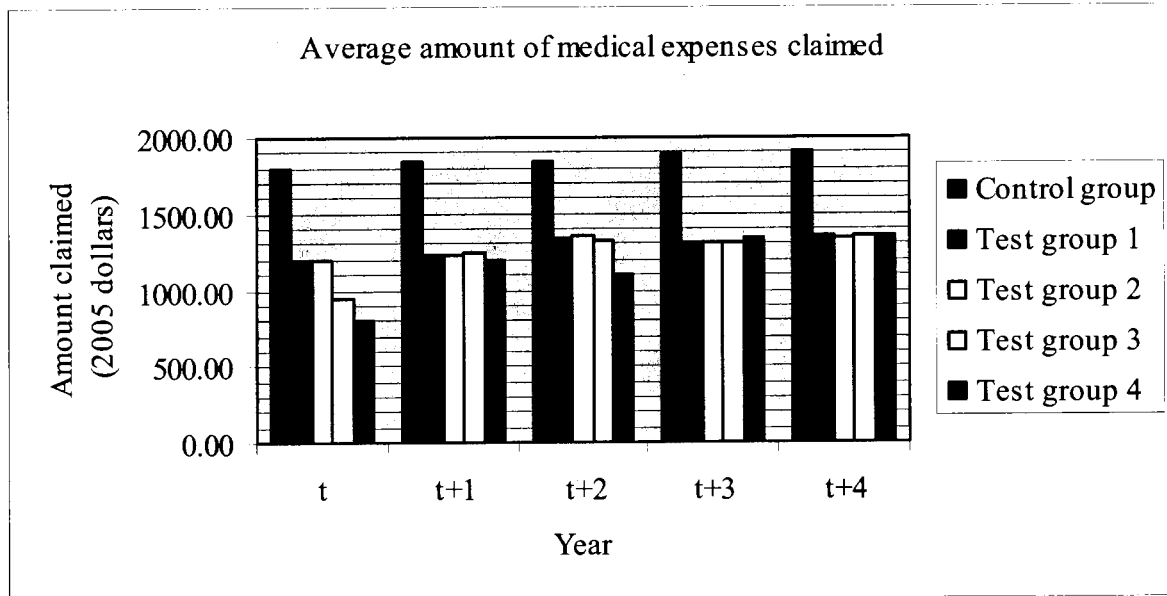
Analysis of Amounts

Figure 11 displays, for each group in each year, the average amount of medical expense claimed by individuals who claim a positive amount of medical expense. The control group has the largest average amount claimed in each year with average amounts growing from \$1800.00 to \$1900.00. Test groups 1 and 2 have amounts which grow from \$1200.00 to roughly \$1340.00 from year t to year t+4. Test groups 3 and 4 start with amounts below those of test groups 1 and 2 but average amounts are about equal across all test groups by year t+4. The test groups all have average amounts around \$1350.00 by year t+4. This amount is \$550.00 less than the average amount claimed by the control group in this year. All numbers which were used to make Figure 11 are available in AP 7 of the appendix.

Recall that the control group contains individuals which do not experience low-income or unemployment in any year. This means that most of the higher-income and middle-income, working age, male population will be contained in this group. Also recall that the medical expenses which individuals claim on their tax forms include the medical expenses of their spouses and dependent children. One possible explanation for the findings of figure

11 is that higher-income and middle-income men, who are more likely to be included in the control group, are more likely to have spouses and dependent children. These men's spouses and dependent children incur medical expenses additional to their own expenses.

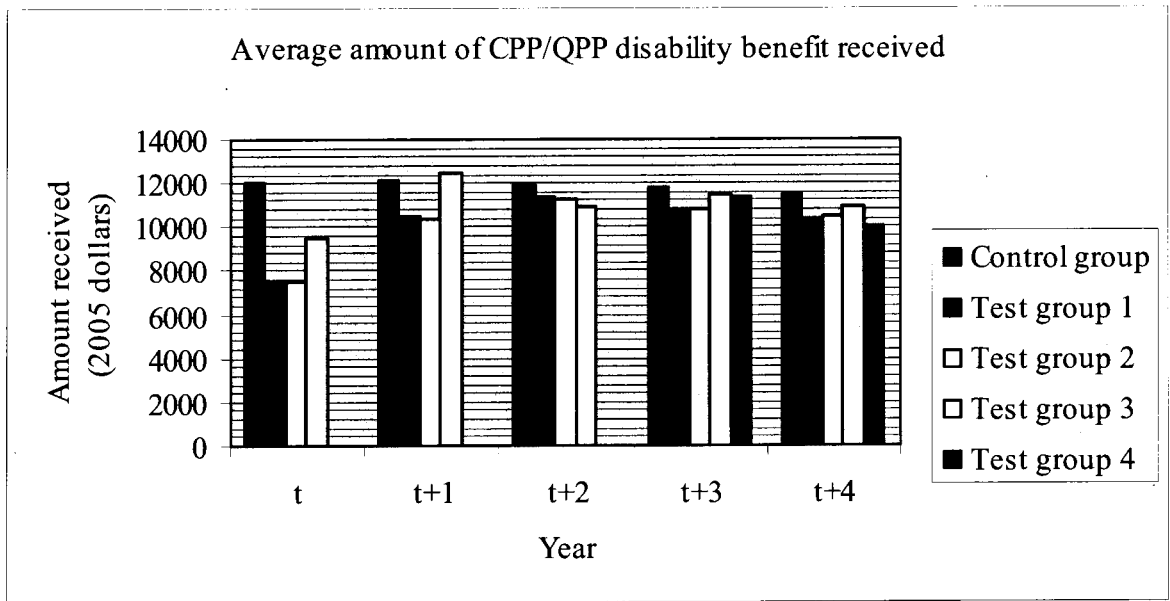
Figure 11:



(Source: LAD)

Figure 12 depicts, for each group in each year, the average amount of CPP/QPP disability benefit claimed by individuals who claim a positive amount of CPP/QPP disability benefit. In almost all years, members of the control group receive greater amounts of CPP/QPP disability benefits than the test groups. Again, recall that the control group contains individuals who do not experience low-income or unemployment in any year, and is therefore likely most representative of individuals of medium-income and high-income. Also recall that the amount of disability benefit which an individual receives is dependant on the individual's previous income. Subjects in the control group must have experienced higher levels of income on average compared to the test groups in previous years. We note that this could be an indication of endogeneity within the model.

Figure 12:



(Source: LAD)

7. Conclusion

We have found evidence that individuals who experience low-income and/or unemployment are more likely to subsequently experience health problems than individuals who do not experience low-income or unemployment. We have observed four test groups: group 1 which includes individuals who claim employment insurance at year t, group 2 which includes individuals who claim employment insurance but do not experience low-income at year t, group 3 which includes individuals who experience low-income but do not claim employment insurance at year t, and group 4 which includes individual who experience low-income and claim employment insurance at year t. In almost all instances, all test groups were found to have higher proportions which claim medical expenses, CPP/QPP disability benefits and a 'disability amount for self' in the years following their onset of low-income and/or unemployment when compared to the control group which does not experience low-income or claim employment insurance in any year.

We can be confident that the unemployment and/or low-income which is experienced by

the test groups at year t is not caused by health problems because we have only observed individuals who show clean records of health prior to year t. We can also be fairly confident that the low-income and/or unemployment experienced in year t played a causal role in the health outcomes of the test groups because these groups had greater proportions which experienced the negative health outcomes, in the years following year t, compared to the control group, and differed from the control group only by their experience with low-income and/or unemployment at year t.

The evidence regarding proportions leads us to believe that low-income and unemployment have negative effects on health in Canada. If such is the case, then a reduction in Canadian reliance on CPP/QPP disability benefits, Medicare, or other government health programs is an important effect of reducing low-income and unemployment levels in Canada.

We found that the control group generally claims a greater average amount of medical expenses and CPP/QPPD disability benefits compared to the test groups. We believe the amount of medical expenses which one incurs is dependant on family size. Perhaps the control group contains a larger proportion of middle-income and high-income individuals who are more likely to have spouses and dependant children. The amount of CPP/QPP disability benefit an individual receives is dependant on their previous income. We suspect that the control group experienced a higher average income than the test groups in the years leading up to year t. Future research should look into the income distribution and average family size among these groups. If one is to find that the control group has a larger average family size and a higher average income during the 'clean period,' compared to the test groups, then these theories regarding average amounts would be confirmed. This could also be an indication that endogeneity exists within the model.

This research has lead to the consideration of other research ideas. As has already been mentioned, it could be revealing to measure the effect of duration of low-income or unemployment on the three health outcomes observed in this study. One may also want to

consider mortality as a health measure as there is some indication of this variable in the LAD. An immediate extension of this research should consider inter cohort analysis to see if any time effect can be found in the data. The relevant data for such analysis has been included in the appendix for inspiration. Also, future research, which includes analysis of the type used in this paper, could be supported with regression analysis. Instrumental variables can be used to sort out problems concerning endogeneity.

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9. Appendix

AP 1 : Proportion of group which claims medical expenses and proportion of group which claims CPP/QPP disability benefits (cohorts separate)

| Cohort | | Medical Expenses | | | | | CPP/QPP Disability | | | | |
|--------|---------|------------------|-----|------|------|------|--------------------|-----|-----|-----|-----|
| | | t | t+1 | t+2 | t+3 | t+4 | t | t+1 | t+2 | t+3 | t+4 |
| 1996 | control | 2.3 | 2.2 | 3.9 | 4.5 | 5.2 | 0.1 | 0.2 | 0.3 | 0.4 | 0.6 |
| | T1 | 4.7 | 4.7 | 6.5 | 6.8 | 8.2 | 0.1 | 0.4 | 0.6 | 0.8 | 0.9 |
| | T2 | 4.5 | 4.7 | 6.5 | 6.9 | 8.3 | 0.1 | 0.4 | 0.6 | 0.7 | 0.9 |
| | T3 | 4.4 | 4.8 | 6.6 | 7 | 7.5 | 0 | 1.8 | 3.1 | 3.5 | 3.9 |
| | T4 | 7.3 | 4.9 | 7.3 | 4.9 | 7.3 | 0 | 0 | 0 | 2.4 | 2.4 |
| 1997 | control | 1.6 | 3.3 | 3.9 | 4.5 | 5.3 | 0.1 | 0.2 | 0.3 | 0.4 | 0.6 |
| | T1 | 3.6 | 6 | 6.7 | 7.7 | 9.6 | 0 | 0.3 | 0.4 | 0.7 | 1 |
| | T2 | 3.6 | 6 | 6.7 | 7.7 | 9.6 | 0 | 0.3 | 0.4 | 0.7 | 0.9 |
| | T3 | 4.3 | 7.8 | 8.3 | 8.7 | 11.3 | 0.4 | 1.3 | 2.2 | 3 | 3 |
| | T4 | 5.9 | 5.9 | 8.8 | 5.9 | 8.8 | 0 | 0 | 0 | 0 | 0 |
| 1998 | control | 2.7 | 3.4 | 4 | 4.8 | 5.9 | 0.1 | 0.2 | 0.3 | 0.4 | 0.6 |
| | T1 | 4.7 | 5.5 | 6.6 | 7.6 | 8.2 | 0 | 0.2 | 0.4 | 0.6 | 0.9 |
| | T2 | 4.7 | 5.5 | 6.6 | 7.6 | 8.2 | 0 | 0.2 | 0.4 | 0.5 | 0.8 |
| | T3 | 6.8 | 6.8 | 7.3 | 9.2 | 9.2 | 1 | 2.4 | 3.4 | 3.9 | 4.4 |
| | T4 | 3.7 | 7.4 | 3.7 | 7.4 | 7.4 | 0 | 0 | 0 | 0 | 0 |
| 1999 | control | 2.5 | 3.3 | 4.1 | 5.1 | 6.2 | 0.1 | 0.1 | 0.3 | 0.4 | 0.6 |
| | T1 | 4.4 | 6 | 7.2 | 8.6 | 9.5 | 0 | 0.4 | 0.7 | 1 | 1.4 |
| | T2 | 4.4 | 6.1 | 7.1 | 8.6 | 9.4 | 0 | 0.4 | 0.6 | 0.9 | 1.5 |
| | T3 | 6.6 | 8.6 | 8.6 | 9.6 | 11.1 | 0 | 2 | 2.5 | 3 | 3.5 |
| | T4 | 7.1 | 3.6 | 10.7 | 7.1 | 10.7 | 0 | 0 | 0 | 0 | 0 |
| 2000 | control | 2.5 | 3.4 | 4.5 | 5.5 | 6.8 | 0.1 | 0.2 | 0.3 | 0.4 | 0.6 |
| | T1 | 4.5 | 6.7 | 8.4 | 8.9 | 10.3 | 0 | 0.2 | 0.6 | 0.9 | 1.2 |
| | T2 | 4.5 | 6.8 | 8.3 | 9 | 10.4 | 0 | 0.2 | 0.6 | 0.8 | 1.1 |
| | T3 | 8.2 | 6.9 | 9.9 | 10.8 | 11.6 | 0.9 | 1.7 | 3 | 3.4 | 3.9 |
| | T4 | 4.8 | 4.8 | 9.5 | 9.5 | 9.5 | 0 | 0 | 0 | 0 | 4.8 |
| 2001 | control | 2.7 | 3.8 | 4.9 | 6.1 | 7 | 0.1 | 0.2 | 0.3 | 0.4 | 0.6 |
| | T1 | 4.7 | 6.5 | 7.2 | 8.3 | 9.6 | 0.1 | 0.3 | 0.5 | 0.8 | 1 |
| | T2 | 4.7 | 6.5 | 7.2 | 8.3 | 9.6 | 0.1 | 0.2 | 0.6 | 0.8 | 1 |
| | T3 | 6.8 | 9.1 | 9.8 | 11.3 | 12.1 | 0.8 | 2.3 | 3 | 3.4 | 4.2 |
| | T4 | 6.1 | 6.1 | 6.1 | 12.1 | 12.1 | 0 | 0 | 0 | 0 | 0 |

AP 2: Proportion of group which claims a 'disability amount for self' (cohorts separate)

| Cohort | | Disability Amount For Self | | | | |
|--------|---------|----------------------------|-----|-----|-----|-----|
| | | t | t+1 | t+2 | t+3 | t+4 |
| 1996 | control | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 |
| | T1 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| | T2 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| | T3 | 0 | 0.9 | 0.9 | 1.3 | 1.3 |
| | T4 | 0 | 0 | 0 | 0 | 0 |
| 1997 | control | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 |
| | T1 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 |
| | T2 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| | T3 | 0.4 | 0.9 | 0.9 | 0.9 | 1.3 |
| | T4 | 0 | 0 | 0 | 0 | 0 |
| 1998 | control | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 |
| | T1 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 |
| | T2 | 0.5 | 0.5 | 0.5 | 0.4 | 0.5 |
| | T3 | 1 | 1 | 1.5 | 1.5 | 1.9 |
| | T4 | 0 | 0 | 0 | 0 | 0 |
| 1999 | control | 0.3 | 0.3 | 0.3 | 0.4 | 0.5 |
| | T1 | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 |
| | T2 | 0.2 | 0.3 | 0.3 | 0.5 | 0.6 |
| | T3 | 0.5 | 1 | 0.5 | 1 | 1.5 |
| | T4 | 0 | 0 | 0 | 0 | 0 |
| 2000 | control | 0.3 | 0.3 | 0.3 | 0.4 | 0.5 |
| | T1 | 0.3 | 0.3 | 0.4 | 0.6 | 0.6 |
| | T2 | 0.3 | 0.3 | 0.5 | 0.6 | 0.6 |
| | T3 | 1.3 | 1.3 | 1.7 | 2.6 | 2.6 |
| | T4 | 0 | 0 | 0 | 0 | 0 |
| 2001 | control | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 |
| | T1 | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 |
| | T2 | 0.2 | 0.3 | 0.3 | 0.5 | 0.6 |
| | T3 | 0.4 | 0.4 | 1.1 | 1.1 | 1.5 |
| | T4 | 0 | 0 | 0 | 0 | 0 |

AP 3: Proportion of group which claims either medical expenses, CPP/QPP disability benefits or a 'disability amount for self' (cohorts separate)

| Cohort | | Either Medical Expenses, CPP/QPP Disability or Disability Amount For Self | | | | |
|--------|---------|---|------|------|------|------|
| | | t | t+1 | t+2 | t+3 | t+4 |
| 1996 | control | 2.7 | 2.6 | 4.4 | 5.1 | 5.9 |
| | T1 | 5.2 | 5.3 | 7.1 | 7.7 | 9.3 |
| | T2 | 5 | 5.3 | 7.1 | 7.7 | 9.3 |
| | T3 | 4.8 | 7 | 9.6 | 10.5 | 11.4 |
| | T4 | 9.8 | 7.3 | 7.3 | 9.8 | 9.8 |
| 1997 | control | 1.9 | 3.7 | 4.4 | 5.1 | 6 |
| | T1 | 4 | 6.5 | 7.4 | 8.4 | 10.5 |
| | T2 | 4 | 6.5 | 7.3 | 8.5 | 10.4 |
| | T3 | 5.2 | 9.6 | 10.4 | 10.4 | 13.5 |
| | T4 | 5.9 | 5.9 | 8.8 | 8.8 | 11.8 |
| 1998 | control | 3 | 3.8 | 4.4 | 5.3 | 6.6 |
| | T1 | 5.1 | 6 | 7.2 | 8.4 | 9.2 |
| | T2 | 5.1 | 6 | 7.3 | 8.3 | 9.1 |
| | T3 | 7.8 | 9.2 | 10.7 | 12.6 | 13.1 |
| | T4 | 3.7 | 7.4 | 7.4 | 11.1 | 7.4 |
| 1999 | control | 2.8 | 3.6 | 4.5 | 5.6 | 6.9 |
| | T1 | 4.7 | 6.6 | 7.9 | 9.6 | 10.7 |
| | T2 | 4.6 | 6.5 | 7.8 | 9.6 | 10.7 |
| | T3 | 7.6 | 10.1 | 11.1 | 12.1 | 14.1 |
| | T4 | 7.1 | 7.1 | 10.7 | 10.7 | 14.3 |
| 2000 | control | 2.8 | 3.8 | 4.9 | 6.1 | 7.5 |
| | T1 | 4.7 | 7.3 | 9.1 | 9.9 | 11.4 |
| | T2 | 4.7 | 7.2 | 9 | 9.9 | 11.4 |
| | T3 | 9.5 | 9.5 | 12.9 | 13.8 | 15.1 |
| | T4 | 4.8 | 9.5 | 9.5 | 9.5 | 14.3 |
| 2001 | control | 2.9 | 4.2 | 5.3 | 6.6 | 7.7 |
| | T1 | 5 | 6.9 | 7.7 | 9.1 | 10.6 |
| | T2 | 5 | 6.9 | 7.7 | 9 | 10.5 |
| | T3 | 7.9 | 10.9 | 12.1 | 14 | 15.5 |
| | T4 | 6.1 | 9.1 | 9.1 | 12.1 | 12.1 |

AP 4: Proportion of group which claims medical expenses and proportion of group which claims CPP/QPP disability benefits (cohorts pooled)

| | Medical Expenses | | | | | CPP/QPP Disability | | | | |
|---------------|------------------|------|------|------|-------|--------------------|------|------|------|------|
| | t | t+1 | t+2 | t+3 | t+4 | t | t+1 | t+2 | t+3 | t+4 |
| Control group | 2.38 | 3.23 | 4.22 | 5.08 | 6.07 | 0.10 | 0.18 | 0.30 | 0.40 | 0.60 |
| Test group 1 | 4.43 | 5.90 | 7.10 | 7.98 | 9.23 | 0.10 | 0.30 | 0.53 | 0.80 | 1.07 |
| Test group 2 | 4.40 | 5.93 | 7.07 | 8.02 | 9.25 | 0.10 | 0.28 | 0.53 | 0.73 | 1.03 |
| Test group 3 | 6.18 | 7.33 | 8.42 | 9.43 | 10.47 | 0.78 | 1.92 | 2.87 | 3.37 | 3.82 |
| Test group 4 | 5.82 | 5.45 | 7.68 | 7.82 | 9.30 | 0.00 | 0.00 | 0.00 | 2.40 | 3.60 |

AP 5: Proportion of group which claims a 'disability amount for self' and proportion of group which claims either medical expenses, CPP/QPP disability benefits or a 'disability amount for self' (cohorts pooled)

| | Disability Amount For Self | | | | | Either | | | | |
|---------------|----------------------------|------|------|------|------|--------|------|-------|-------|-------|
| | t | t+1 | t+2 | t+3 | t+4 | t | t+1 | t+2 | t+3 | t+4 |
| Control group | 0.28 | 0.30 | 0.33 | 0.40 | 0.47 | 2.68 | 3.62 | 4.65 | 5.63 | 6.77 |
| Test group 1 | 0.35 | 0.35 | 0.40 | 0.48 | 0.55 | 4.78 | 6.43 | 7.73 | 8.85 | 10.28 |
| Test group 2 | 0.33 | 0.37 | 0.40 | 0.47 | 0.53 | 4.73 | 6.40 | 7.70 | 8.83 | 10.23 |
| Test group 3 | 0.72 | 0.92 | 1.10 | 1.40 | 1.68 | 7.13 | 9.38 | 11.13 | 12.23 | 13.78 |
| Test group 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.23 | 7.72 | 8.80 | 10.33 | 11.62 |

AP 6: Average amount of medical expense and CPP/QPP disability benefit claimed (cohorts separate)

| | | Medical Expenses | | | | | CPP/QPP Disability | | | | |
|------|---------|------------------|------|------|------|------|--------------------|-------|-------|-------|-------|
| | | t | t+1 | t+2 | t+3 | t+4 | t | t+1 | t+2 | t+3 | t+4 |
| 1996 | control | 1600 | 1900 | 1800 | 1900 | 1900 | 13800 | 13500 | 12000 | 11600 | 11300 |
| | T1 | 1100 | 1100 | 1100 | 1200 | 1200 | 6400 | 11500 | 11200 | 10500 | 10400 |
| | T2 | 1100 | 1100 | 1100 | 1200 | 1200 | 6400 | 10600 | 11100 | 10400 | 10400 |
| | T3 | 1100 | 1400 | 1300 | 1300 | 1400 | | 15700 | 11200 | 12700 | 10700 |
| | T4 | 1000 | 1400 | 900 | 610 | 710 | | | | 11400 | 10700 |
| 1997 | control | 1900 | 1800 | 1900 | 1900 | 1900 | 13500 | 11900 | 11500 | 11700 | 11400 |
| | T1 | 1100 | 1300 | 1200 | 1400 | 1200 | | 10500 | 11500 | 10300 | 9800 |
| | T2 | 1100 | 1300 | 1200 | 1400 | 1200 | | 10600 | 11700 | 10300 | 10100 |
| | T3 | 980 | 1100 | 1600 | 1400 | 1200 | 14600 | 13900 | 10700 | 10500 | 10700 |
| | T4 | 1100 | 1900 | 1500 | 2400 | 980 | | | | | |
| 1998 | control | 1800 | 1900 | 1900 | 1800 | 1900 | 11200 | 11200 | 11500 | 11700 | 11700 |
| | T1 | 1200 | 1300 | 1300 | 1300 | 1400 | | 10700 | 10400 | 10900 | 11500 |
| | T2 | 1200 | 1300 | 1300 | 1300 | 1400 | | 10300 | 10200 | 10800 | 11500 |
| | T3 | 980 | 1500 | 1600 | 1400 | 1300 | 10600 | 10400 | 10800 | 10900 | 11500 |
| | T4 | 460 | 460 | 1100 | 1100 | 1300 | | | | | |
| 1999 | control | 1900 | 1900 | 1800 | 1900 | 1900 | 10500 | 11400 | 11800 | 12200 | 11300 |
| | T1 | 1100 | 1300 | 1700 | 1400 | 1500 | | 10000 | 11000 | 10700 | 10100 |
| | T2 | 1100 | 1300 | 1800 | 1400 | 1500 | | 10000 | 11100 | 10800 | 10200 |
| | T3 | 830 | 1000 | 1100 | 900 | 1200 | | 10300 | 11100 | 12000 | 10600 |
| | T4 | 1300 | 800 | 760 | 1200 | 1500 | | | | | |
| 2000 | control | 1900 | 1800 | 1900 | 1900 | 1900 | 11000 | 12000 | 12500 | 11900 | 11600 |
| | T1 | 1500 | 1100 | 1400 | 1300 | 1300 | | 10900 | 13300 | 11000 | 10400 |
| | T2 | 1500 | 1100 | 1400 | 1300 | 1300 | | 10800 | 12600 | 11100 | 10600 |
| | T3 | 980 | 1200 | 1300 | 1500 | 1800 | 6600 | 12000 | 10100 | 11800 | 11000 |
| | T4 | 380 | 1400 | 1400 | 1100 | 1500 | | | | | 9400 |
| 2001 | control | 1700 | 1800 | 1800 | 1900 | 1900 | 11900 | 12500 | 12000 | 12000 | 11800 |
| | T1 | 1200 | 1300 | 1300 | 1200 | 1500 | 8500 | 9200 | 10400 | 11100 | 10200 |
| | T2 | 1200 | 1300 | 1300 | 1200 | 1400 | 8500 | 9700 | 10500 | 11100 | 10300 |
| | T3 | 830 | 1300 | 990 | 1300 | 1200 | 6000 | 12400 | 11600 | 11000 | 11000 |
| | T4 | 550 | 1200 | 940 | 1600 | 2100 | | | | | |

AP 7: Average amount of medical expense and CPP/QPP disability benefit claimed (cohorts pooled)

| | Medical Expenses | | | | | CPP/QPP Disability | | | | |
|---------------|------------------|---------|---------|---------|---------|--------------------|----------|----------|----------|----------|
| | t | t+1 | t+2 | t+3 | t+4 | t | t+1 | t+2 | t+3 | t+4 |
| Control group | 1800.00 | 1850.00 | 1850.00 | 1883.33 | 1900.00 | 11983.33 | 12083.33 | 11883.33 | 11850 | 11516.67 |
| Test group 1 | 1200.00 | 1233.33 | 1333.33 | 1300.00 | 1350.00 | 7450 | 10466.67 | 11300 | 10750 | 10400 |
| Test group 2 | 1200.00 | 1233.33 | 1350.00 | 1300.00 | 1333.33 | 7450 | 10333.33 | 11200 | 10750 | 10516.67 |
| Test group 3 | 950.00 | 1250.00 | 1315.00 | 1300.00 | 1350.00 | 9450 | 12450 | 10916.67 | 11483.33 | 10916.67 |
| Test group 4 | 798.33 | 1193.33 | 1100.00 | 1335.00 | 1348.33 | 0 | 0 | 0 | 0 | 0 |