ESSAYS ON HEALTH ECONOMICS, HEALTH BEHAVIOURS, AND LABOUR OUTCOMES

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Abstract

This thesis consists of three chapters that investigate issues related to health economics, health behaviours, and labour outcomes.

Using the longitudinal data from the National Population Health Survey (NPHS), Chapter 1 examines the association between minimum wage increases and a wide range of health outcomes and behaviours, such as physical health, mental health, chronic conditions, unmet health need, obesity, insurance, smoking, drinking, food insecurity and fruit and vegetable consumption using Difference-in-Difference (DD) and Difference-in-Difference-in-Difference (DDD) models. There is no evidence that minimum wage increases are associated with most health outcomes and behaviours, including better health. There is an association for low-education females with a higher probability of reporting overall fair or poor health, and excess drinking but a lower probability of work absences due to illness and being physically inactive. For low-education men, there is an association with improved mental health and less drinking and smoking. Broadly there is more evidence that minimum wage increases lead to healthier behaviours than evidence of an actual improvement in health, perhaps because of lags effects that are not captured in this analysis.

Chapter 2 links the survey data from 2015-16 Canadian Community Health Survey (CCHS) to job characteristics from O*Net to explore the role of job characteristics in explaining the positive association between drinking alcohol and income, which is commonly found in the literature. The study finds that controlling for job characteristics reduces “income return to drinking” substantially (by between one fifth and one half, depending on gender and the measure of alcohol consumption).

Last, using data from the Ontario sample of the 2020 CCHS, Chapter 3 estimates the marginal effects of an index of social capital (at the individual or aggregated level) on changes in intentions to get vaccinated. Results show that individual-level social capital is associated with a greater willingness to get vaccinated against Covid-19 at all ages, while aggregate-level social capital is associated with higher vaccination willingness only among older adults.

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Declaration of Academic Achievement

The second and third essays are co-authored with Professor Michel Grignon. An article based on the third essay has been published as "A cross-sectional analysis of the effect of social capital on self-reported mental health and willingness to get Covid-19 vaccine in Ontario, Canada" at the *Canadian Journal of Public Health*. A study based on the second essay is being prepared for publication. I am the sole author for the first essay although subsequently some of the research there has become part of two studies with Professor Michael Veall. The first part of this paper focusing on the mental health outcomes has just been published at the journal *Social Science and Medicine – Mental Health*. The second part of this paper focusing on health equity outcomes, is being prepared for publication. I participated in all stages of the research and have written all the material in this dissertation.

Introduction

The multifaceted relationships between health economics, health behaviours, and labour outcomes have been extensively studied in various contexts (Cawley, 2015; Currie & Madrian, 1999; Glied & Smith, 2011). However, comprehensive investigations addressing these interconnections in Canada are scarce. This thesis aims to fill this gap by providing an in-depth examination of the interplay between these three critical areas in the Canadian context, contributing to a better understanding of their individual and collective impacts on population health and well-being.

Health economics, encompassing the study of resource allocation, efficiency, and equity in the healthcare sector (Folland et al., 2020), plays a crucial role in shaping health behaviours and labour outcomes in Canada. Health behaviours, including smoking, and alcohol consumption, are key determinants of health and well-being (World Health Organization, 2009). In the Canadian context, these behaviours are influenced by a range of socioeconomic factors, including labour market conditions and economic circumstances (Shields et al., 2008). This thesis seeks to identify the pathways through which economics factors shape health behaviours and, in turn, impact labour market outcomes (McDonald & Kennedy, 2004).

The first chapter focuses on the relationship between the level of the minimum wage and health outcomes and health behaviours. Provincial nominal minimum wages in Canada increased from an average of around $5 to about $10 from 1994 to 2011, while the comparable average real minimum wage increased by approximately 26%. There is a debate on whether the minimum wage increase improves average health, where the use of economic theory or the study of the relevant economic institutions does not provide an unambiguous prediction. Accordingly, this chapter aims to evaluation the minimum wage policy, whether increasing the minimum wage improved health in Canada, and to examine the association between minimum wage increases and a wide range of health outcomes and health behaviours by using a reduced form approach. To study this question, we use Canadian panel data for 1994 to 2011 from the National Population Health Survey (NPHS). There is considerable related literature, largely for countries besides Canada, which has explored the health impact of increases in minimum wages on low-skilled workers with the assumption that changes in minimum wages are exogenous to health (e.g. Horn et al. 2017, Averett et al. 2017, Lenhart 2017). Unlike most of these other studies, our true longitudinal microdata panel allows for the use of individual fixed effects to mitigate the effects of unobserved heterogeneity.

The second chapter focuses on the relationship between alcohol drinking and earnings. The statistical relationship between alcohol consumption and earnings (of those who work) is disputed, but a consensus seems to have emerged around the idea of an inverted U-shape, according to which increased consumption is linked to increased income at the lower end of the distribution of consumption but is negatively linked to income at higher levels of consumption. Part of that relationship may be driven by human capital variables, such as education or job tenure (French and Zarkin, 1994) or health (Shaper et al. 1988), but it remains even after controlling for these variables. It is of course almost impossible to establish a causal relationship from alcohol consumption to earnings due to plausible reverse causality (alcohol is a normal good, with a positive income elasticity), although it might be expected that at least at higher incomes much of the effect of increasing income on alcohol expenditure would be manifested in purchasing more expensive products as opposed to higher personal alcohol consumption of alcohol volume. There could also be unobservable heterogeneity i.e., those who can drink more within this range are more "resilient" or in better-unobserved health, and hence are more productive. This study links the survey data from the 2015-16 Canadian Community Health Survey (CCHS) to job characteristics from O*Net and empirically tests the additional possibility that variation in job characteristics can explain a portion of the association, at least in the portion of the curve where increased consumption is associated with higher income. The intuition is that individuals in occupations with job characteristics that are associated with higher wages (conditional on human capital) may also be more likely to drink or drink more frequently or drink more heavily because of these job characteristics (such as job stress, leadership). We find that the drinking premium decreases by one-third after adding job characteristics. We also find that the decrease is more important among women (up to 50%) than men (around 20%), suggesting that, among women, a large share of the premium detected in previous studies resulted from unaccounted for heterogeneity in the occupational environment.

The third chapter focuses on the relationship between social capital and willingness to get Covid-19 vaccine. While most of the literature on the determinants of vaccine hesitancy is concerned with belief systems about health or vaccines (e.g., Larson et al. 2014, Troiano and Nardi 2021), we posit that social capital could explain some of the inter-individual variation in vaccine hesitancy. This has been suggested by studies of vaccine hesitancy showing that trust in the government or healthcare workers were determinants of the willingness to take the vaccine (Steinert et al. 2022, Biswas et al. 2021, Mesch and Schwirian 2015). Using data collected in

Ontario from September to December 2020, before any Covid-19 vaccine was made available in that province, we test whether individuals with higher levels of social capital were also those with a higher expressed willingness to get the vaccine when such a vaccine would be ready.

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Chapter 1 The Effect of Minimum Wages on Health in Canada

1.1 Introduction

Provincial nominal minimum wages in Canada increased by 100% from an average of around $5 to about $10 from 1994 to 2011 (Table 1.1). The comparable average real minimum wage increased by approximately 26% (Table 1.2). While there is a federal minimum wage that applies to federally regulated industries, that covers only about 6% of employees, all other employees are subject to minimum wages set by provinces or territories through the following steps: research and consultation, review and recommendations, the legislative process, implementation and enforcement. The territories will not be considered in this chapter, given that the territories have fewer than 0.5% of all Canadian workers. The frequency of minimum wage increases and the magnitude of those changes varied across during this time. Figure 1.1 shows that the increase in the nominal minimum wage was rather low until 2005 but accelerated during after that year across all provinces except British Columbia. The consequence (Figure 1.2) for those same provinces is that the real minimum wage was stable or declining until about 2005, after which it increased sharply. During the period, wage inequality increased, with a growing gap between high-wage earners and low-wage earners. A significant contributing factor to this trend was the rising returns to education and experience, with workers holding post-secondary degrees experiencing higher wage growth compared to those with lower levels of education (Fortin et al. 2012). Wage distribution also varied by region, with differences in economic conditions, industry composition, and labor market dynamics contributing to disparities in wage growth and inequality across Canadian provinces and territories (Green and Kesselman 2011).

According to Statistics Canada, in 2019, approximately 4.3% of all employees in Canada earned the minimum wage. The percentage of minimum wage earners was highest in the provinces of Prince Edward Island (9.1%), Newfoundland and Labrador (8.0%), and Nova Scotia (7.4%). The percentages were lowest in the provinces of Alberta (1.7%), Saskatchewan (2.2%), and Quebec (2.8%). Younger workers, particularly those between the ages of 15 and 24, are more likely to earn minimum wage compared to older workers. Minimum wage workers are more commonly found in certain industries, such as retail, food services, and accommodation. There are some exemptions and variations in minimum wage regulations in Canada, similar to the United States. In Canada, these exemptions and variations are typically determined by provincial and territorial governments, as they have jurisdiction over minimum wage laws. In the service industry, some workers may receive different minimum wage rates or exemptions based on their job type, such as tipped employees or liquor servers. For example, in Ontario, liquor servers have a separate minimum wage rate that is lower than the general minimum wage. This lower rate takes into account the fact that these workers receive tips as part of their income (Ontario Ministry of Labour, Training and Skills Development, 2021). However, there are some spillover effects of the minimum wage in Canada. Brochu and Green (2013) suggest that wage increases not only affected minimum wage earners but also impacted workers with wages up to the 20th percentile of the wage distribution, especially for women and younger workers.

Figure 1.1 Province minimum wages over 1994-2011 period

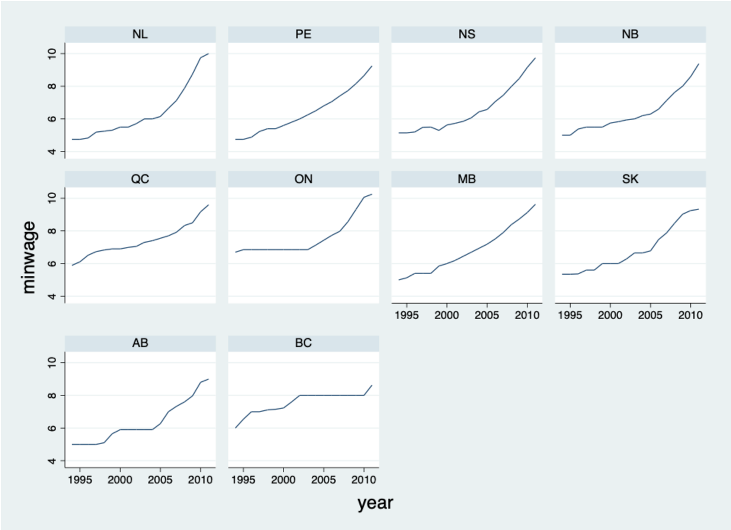
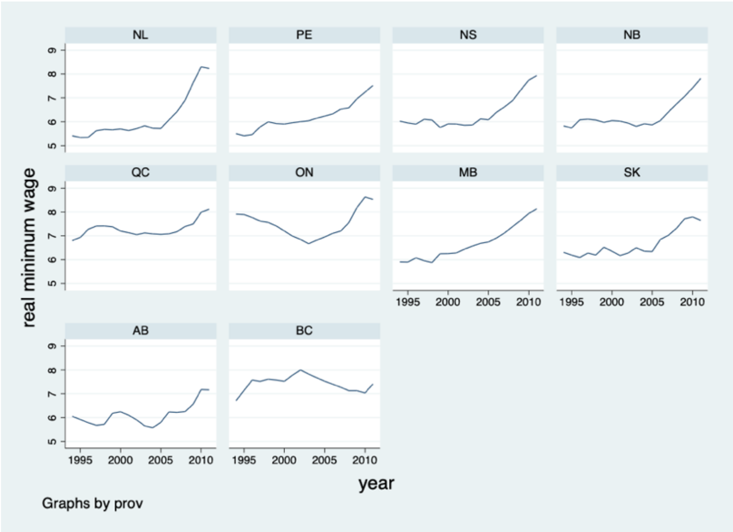


Figure 1.2 Province real minimum wages over 1994-2011 period



Changing minimum wages is a controversial policy. Higher minimum wages could reduce hiring rates and job separation rates (Brochu and Green 2013). Proponents of higher minimum wages argue that the policy could increase the well-being of low-skilled workers through higher earnings, and reduce income inequality (Fortin et al. 2012). Opponents, however, suggest that higher minimum wages may increase the cost to firms and raise prices. Some argue it will raise unemployment, mostly for younger workers in Canada (Campolieti et al. 2005), and reduce working hours, particularly for less experienced workers (Jardim et al. 2022). Many economics studies focus on the effects of minimum wages on labour market outcomes and poverty (e.g., Card and Krueger 1995, Neumark et al. 2004).

What is the impact of minimum wage increases on health? Most studies agree that minimum wage hikes lead to higher income for most low skilled individuals (Aaronson et al. 2012, DiNardo et al. 1996). Therefore, there is a connection with the literature on the impacts of income on health. Marmot (2002) and Lenhart (2019) use changes in the earned income tax credit (EITC) as a natural experiment to explore the effect of income on health. Other studies use lottery winnings or the Great Recession in 2008 as exogenous shocks to income (Apouey et al. 2015, Ásgeirsdóttir et al. 2014). In general, these studies find positive but limited effects of income increases on health. However, low-income families suffer from worse health outcomes than wealthier families (Deaton 2002), and these studies do not pay special attention to the case where individuals at the bottom of the income distribution receive modest increases in the range that might be delivered by a minimum wage increase. The effect of exogenous shocks on income could be different on low-income individuals' health than the average person's health. However recently, some studies, largely for countries other than Canada, have directly explored the health impact of increases in minimum wages on low-skilled workers with the assumption that changes in minimum wages are exogenous to health (e.g. Horn et al. 2017, Averett et al. 2017, Lenhart 2017).

There are at least five possible pathways through which minimum wages could affect health. The first one, already mentioned, is that the minimum wage will increase the incomes of some workers. Healthcare is a normal good (Rexford and Stephen 2004). People with higher incomes could live a healthier lifestyle e.g., by purchasing healthier foods, gym passes, and more health care services. However, the higher income could also increase the consumption of less healthy products, such as cigarettes and alcohol. The second pathway is that the higher income would reduce financial stress for workers and increase their job satisfaction, which could have a significant impact on workers' mental health (Robertson et al. 2011). The third pathway is the opportunity cost. The higher income increases the opportunity cost of being sick, as being ill could reduce current and future earnings (Grossman 1972). Thus, people would care more about preserving their health. But it could also be that the consequence is worse health as when workers get sick and should take care of themselves, the higher wage encourages them to work anyway. This is an example of a substitution effect, where it could also be that higher wages induce workers to substitute towards hours of labour supply and away from health-producing leisure time, such as exercise. The fourth pathway is healthcare demand. Raising the minimum wage can lead to higher labour costs for healthcare providers, which may be passed on to consumers in the form of increased prices for certain services (Folland et al. 2017). It could also be that the minimum wage hikes increase demand for health services as the usage goes up for some, possibly with the consequence of straining the system so that there is more unmet need for others (Folland et al. 2017). The last one is reactions by firms. Firms may cut hours or lay off their workers in response to higher minimum wages. Job loss could have a negative impact on health and health care access (Schaller and Stevens 2015). Relatedly, some workers at or around minimum wage have full-time work with some benefits (health insurance), but if a firm reduces their hours with a minimum wage increase, they may no longer qualify for benefits (Dworsky et al. 2022).

Thus, there is a debate on whether minimum wage increases improve average health, where the use of economic theory or the study of the relevant economic institutions does not provide an unambiguous prediction. Accordingly, this chapter aims to examine the association between minimum wage increases and a wide range of health-related outcomes by using a reduced form approach. To study this question, we use Canadian panel data for 1994 to 2011 from the National Population Health Survey (NPHS). While there is considerable related literature, some of which will be discussed in the next section, almost none of that literature uses Canadian data. Moreover, unlike most other studies, our true longitudinal microdata panel allows for the use of individual fixed effects to mitigate the effects of unobserved heterogeneity. While there are many possible individual characteristics that may matter, in a health-oriented study it may be that individual variation in preconditions and health vulnerabilities is particularly important. The longitudinal data with person-fixed effects allow us to compare "before and after" changes for the same person.

1.2 Literature Review

While there is little research on the association of minimum wages and health outcomes/health behaviours for Canada, there is a large literature using data from the United States and elsewhere that is difficult to summarize. This is particularly so in that some studies focus on quite specific outcomes/behaviours but many others study collections of outcomes/behaviours, with the particular variables chosen often a consequence of data availability. Because there are so many papers that cannot be easily categorized, even in broad categories, these papers have been mixed together in a single section. The overriding message from this section is that this is a literature where empirical consensus is rare.

Adams et al. (2012) find a positive association between the level of the minimum wage and the rate of alcohol-related fatal traffic accidents among teenagers in the United States. However, a similar relationship could not be obtained among adults. The study suggests that higher minimum wages increase the consumption of alcoholic beverages among youth. But, Sabia et al. (2019) find Adams et al. (2012) result does not hold when the analysis period is expanded to include 1991 through 2013.

Using fixed-effects regression models, Hoke & Cotti (2016) find a positive relationship between minimum wage increases and binge drinking among teenagers. They find that a $1 increase in the minimum wage would increase binge drinking among teenagers by around 9% after controlling for demographic characteristics, different types of risky behaviours, tax, state and time fixed effects, and time-varying state effects.

Using 2SLS and assuming that minimum wage changes are exogenously related to fast food prices conditional on income and employment (the F-statistics indicate that the minimum wage and its corresponding lagged values successfully pass the weak instrument tests), Cotti and Tefft (2013) show that fast food price changes have no significant impact on adult BMI or obesity prevalence in the U.S., even after adding additional controls such as location and time fixed effects, area time trends, demographic characteristics, substitute prices.

Horn et al. (2017) use data from the 1993 to 2014 BRFSS and employ difference in difference (DD) and difference in difference in differences (DDD) methods. They find that minimum wage hikes lead to worsening general health among both male and female low-skilled workers in the US, even though some aspects of health may have been improved. Their results indicate that a 10% increase in the lagged minimum wage could increase the probability of reporting fair or poor overall health by 3.74% for males and 1.97% for females. In addition, the study shows that female workers experience slight reductions in the number of days with bad mental health following the minimum wage increases, as a 10% increase in the lagged minimum wage reduces the number of days of bad mental health for females by 1.55%.

Averett et al. (2017) use DD models and US data from the Current Population Survey and estimate the differential effects of the increase of the minimum wage on the health of teenage workers among different races, ethnicity, and genders. The study finds that white females are more likely to report better health while Hispanic males are more likely to report worse health following the minimum wage increase.

Using longitudinal data from the British Household Panel Survey for a period of ten years, Lenhart (2017) examines the effect of the introduction of the National Minimum Wage (NMW) in the United Kingdom in 1999 on health outcomes. The study finds that NMW significantly improved self-reported health status and reduced negative health conditions. In addition, the study suggests that changes in health behaviours, leisure expenditures, and financial stress could be potential mechanisms through which the NMW affects health. They estimate that the NMW reduced smoking at a statistically significant 2.51 percentage points. Thus, cigarettes might be an inferior good for low-income workers perhaps because increases in income reduce financial stress and hence the tendency to smoke. (After the reform, affected workers are estimated to be a statistically significant 4.16 percentage points less likely to report feeling financial stress.) In addition, after the introduction of the NMW, households with affected workers are more likely to spend at least £80 per week on leisure activities and to go on a family vacation of at least one week.

Using country-level aggreged data from1980 to 2010, Lenhart (2017) finds that higher minimum wages have a significantly negative association with overall mortality rates and the number of deaths due to diabetes, disease of the circulatory system, stroke, which are related to low socioeconomic status in 24 OECD countries. The study uses the Kaitz index (the ratio of the nominal minimum wage to the median wage) to measure generosity of minimum wages and finds that a 10%-point increase in the Kaitz index significantly increases life expectancy by 0.44 years. Also, the study suggests that minimum wages impact health through the potential channels of poverty, unmet medical needs, the number of doctor consultations, tobacco consumption, calorie intake, and obesity.

Using data for 2005-2010 from the United States Behavioural Risk Factor Surveillance System (BRFSS), Kuroki (2018) finds that a 10% increase in the minimum wage is associated with a 0.03-point increase, on a 4-point scale, in life satisfaction for low-skilled workers (without a high school diploma). In addition, this study does not find evidence that the minimum wage increases decrease the well-being of self-employed people and business owners.

Reeves et al. (2017) use panel data from the British Household Panel Survey and compare the health effects of higher wages on minimum wage recipients (who earned less than £3.60 per hour in 1998 and who then earned between £3.60 and £4.00 per hour in 1999 with the NMW) with otherwise similar persons who were unlikely affected because (1) their wages were already between 100 and 110% of the new minimum wage and were not increased or (2) their firms did not increase wages to meet the threshold. They mentation that "We select the intervention group based on post-intervention wages because we assume that any increase in earnings above 110% of the minimum wage is likely to be because of reasons other than the intervention (such as a job promotion or transition). This approach differs from previous intention to treat analyses that examine the impact on the policy change on those who were earning less than £3.60 per hour at baseline. This restriction, especially for control group 2, may create some selection bias, because psychologically fragile people may be more likely to be exploited by their firms and so not receive the National Minimum Wage." They find that the intervention group, whose wages rose, has a reduction in the probability of mental health problems compared with the two control groups. Their results indicate that there is a 0.37 standard deviation improvement, comparable to the effect of antidepressants (0.39 of a standard deviation) on depressive symptoms. However, the study does not find evidence of change in blood pressure, hearing ability, or smoking for the intervention group. Thus, the study suggests wage increases affect health via improving mental health by reducing financial stress in low-wage workers. In contrast, Kronenberg et al. (2017) use UK panel data and employ DD models. They find that the introduction of the UK NMW had no effect on the mental health of low-wage earners.

A number of the studies consider the issue of access, where it may be that U.S. experience is less relevant for Canada. Using data from the Behavioral Risk Factor Surveillance Survey (BRFSS) and multilevel logistic regressions, McCarrier et al. (2011) find that higher state-level minimum wage rates are significantly negatively associated with the odds of reporting unmet medical needs after control for other covariates. However, the study cannot find a significant association between higher minimum wages and being insured.

Using American Community Survey data from 2011-2016 and DD methods, Kahn et al. (2018) find robust evidence that state-level minimum wage increases reduce medical access in the US. Especially for workers in very low-paying occupations (food and beverage serving workers, other food preparation and serving related workers, and entertainment attendants and related workers), employer-sponsored health insurance coverage declines offset 9 percent of the wage gains following minimum wage increases. The study also finds the effects on minimum wages changes on health insurance spillover into moderately higher-paid occupations, such as retail sales workers, personal care and service workers.

Using longitudinal data from the Panel Study of Income Dynamics for 1997–2013 and DD/DDD methods, Du and Leigh (2018) examine the effects of minimum wage increases on absence from work due to own and other family members' illnesses. To explore changes at extensive and intensive margins, they use individual-fixed effects within linear and two-part models. This study finds that minimum wage increases significantly reduce rates of absence due to own and others' illness combined and due to own illness alone, but not significantly for the rates due to others' illness alone for the likely affected group (low-educated). They suggest that the pathway could be that minimum wage hikes improve health for lower-skilled workers. Specifically, their results show that a $1 increase in the real minimum wage reduces the absence rate due to own illness evaluated at the mean by 19 % in the DD model and 32 % in the DDD model. In addition, they show that these effects are unlikely due to changes in annual weeks worked or job-related attributes.

Andreyeva and Ukert (2018) use data from the 1993–2015 BRFSS and employ DD methods to estimate that higher minimum wages increase the probability of being obese and decrease daily fruit and vegetable intake. The study also shows that higher minimum wages reduce the number of days with functional limitations and have no impact on healthcare access. In addition, by subsample analyses, they find that the increase in obesity and decrease in fruit and vegetable consumption are driven by the older population, married, and whites. The probability of smoking increases, driven by males, non-married, whites, younger individuals, and those with a high school diploma. The higher minimum wage also significantly reduced the number of days with mental health problems for the young, old, women, and non-married individuals, and also reduced the number of days with health-related limitations for the non-white, middle-aged, and married individuals.

Lenhart (2019) uses cross-sectional data from the American Time Use Survey from 2003 to 2017 to examine the association of changes in the minimum wage with the time allocation between health-enhancing activities and leisure, which could be a potential pathway which would explain why higher minimum wages have some negative impacts on general health but are still positively associated with mental well-being. The study finds that a $1 increase in minimum wages reduces the time spent on exercising and total personal health time by 13 and 20 minutes per week. Instead, workers spend more time on other types of leisure. The results are primarily driven by males and employed workers.

Using Current Population Survey data from 1989 to 2009 and DD models, Lenhart (2019) finds that higher minimum wages increase purchases of health insurance coverage by low-educated workers who are more likely affected by the minimum wage policy. The study also uses data from BRFSS from the same period to show that minimum wage hikes improve health care access/affordability and increase health care utilization. Their results show that a 10% increase in minimum wages increases individually purchased insurance coverage by 4.44%, increases the likelihood of having a routine health checkup by 0.65%, and decreases the likelihood of not being able to afford necessary doctor visits by 2.19%. By the subsample analysis, the study finds that those results are mainly driven by low-educated people aged between 18 and 29.

Using US data from the Current Population Survey-Tobacco Use Supplement (1998–2015), Huang et al. (2020) find that higher minimum wages increase smoking among low-skilled workers. Their results show that a $1 increase in the minimum wage increases the prevalence of smoking by about 2.3% and reduces cessation by about 13.7%. In addition, they suggest that the income effect is one potential mechanism. When examining heterogeneous effects, the study finds the effect is small among low-skilled adults, and the smoking increase is most likely driven by people who are not in the labour force, a somewhat puzzling finding which perhaps reduces the contrast with the Leigh et al. (2019) contrary finding discussed in below paragraph that minimum wage increases are robustly related to smoking reductions by workers.

Clark et al. (2020) use data from BRFSS and show that the minimum wage hikes have a positive causal effect on fruit and vegetable consumption among low-wage earners. Employing DDD methods and deflating nominal minimum wages by consumer price index (CPI) for fruits and vegetables, the study shows that minimum wage elasticity of fruit and vegetable consumption is around 0.12, which implies minimum wage earner spend most their increased income on other goods rather than better healthy diet.

Using the DD method and US data, Wehby et al. (2020) find that minimum wage increases are associated with a small but statistically significant increase in birth weight. (While this is not a variable in this study, it arguably is related to other aspects of health.) Their estimates show that a $1 increase in the real minimum wage is associated with increases in birth weight by around two grams (0.06 percent), and fetal growth rate by about 0.03 units (0.04 percent). However, they cannot find evidence that increased prenatal care use and reduced smoking during pregnancy are pathways through which minimum wage increases improve infant health.

Chen (2021) uses data from the 2014 and 2016 China Labor-force Dynamic Survey (CLDS) and finds minimum wage increases significantly improve living standards and job satisfaction, as well as some aspects of health outcomes (self-reported health status and the reported absence of adverse health conditions) of low-skilled workers in China. However, the study shows that higher minimum wages have a limited impact on health behaviours (smoking, drinking, and regular exercise). In a subsample analysis, Chen finds that higher minimum wages have a larger impact on health among rural hukou workers aged 35 and above.

Employing DD methods and using data from the UK Household Longitudinal Study (Understanding Society), Maxwell et al. (2022) finds that the effects of the 2016, 2017 and 2018 UK National Minimum Wage (NMW) increases on mental and physical health are insignificant. They use Short Form-12 (SF-12) mental component summary (MCS) scores and physical component summary (PCS) scores as dependent variables.

Linking data from the German panel study 'Labour Market and Social Security' (PASS) to administrative employment records, Hafner and Lochner (2022) evaluate the effect of the introduction of the general minimum wage in Germany in 2015 on workers' self-rated health. Employing DD methods combined with propensity score matching (PSM), the study finds that individuals who were most likely to be affected by the minimum wage reform experience health improvement. They also suggest the result may be driven by higher satisfaction with pay, reduced working hours, and time pressure reduction.

Leigh et al. (2019) review many of these studies as well as a few others on the topic of minimum wage increases and public health across western countries. Among 15 studies they deem to be high quality, they find that the null hypotheses that minimum wage increases have no effects on most health outcomes cannot be rejected. However, as mentioned they conclude that there is robust evidence that a $1 increase in minimum wages reduces smoking prevalence by 1.4 percentage points (4% evaluated at mean). They argue that some studies do not focus on the groups of workers likely affected by the minimum wage policy and lack "falsification tests" on persons unlikely affected, which they argue is a serious methodological weakness. Thus, Leigh et al. suggest better studies on this topic need to have well-defined treatment (or likely affected) and control (unaffected) groups and use longitudinal data.

While there is little research on this topic for Canada, there is one paper on the health-related topic of teen fertility by Sen and Ariizumi (2013). They use aggregate Canadian data and suggest that a 10% increase in minimum wages could significantly increase teen birth rates by 3%-5% in Canada. In addition, they find that minimum wage hikes are significantly associated with higher teen marriage rates, higher earnings among male teens, and higher fertility among married teens.

1.3 Data

This study uses Canadian panel data for 1994-2011 NPHS (all cycles 1-9) accessed in the Research Data Centre (RDC) at McMaster University. The objectives of the NPHS are to aid in the development of public policy by providing measures of the level, trend and distribution of the health status of the population; and provide data for analytic studies that will assist in understanding the determinants of health; collect data on the economic, social, demographic, occupational and environmental correlates of health; increase the understanding of the relationship between health status and health care utilization, including alternative as well as traditional services; and provide information on a panel of people who will be followed over time to reflect the dynamic process of health and illness (Statistics Canada 2012).

The NPHS collects information related to health and some socio-demographic information every two years. It has three components: Households, Health Institutions, and the North. This study uses the household component, which started in 1994. The first three cycles

(1994/1995, 1996/1997 and 1998/1999) were both cross-sectional and longitudinal. After 2000, the survey became strictly longitudinal. The target population of the NPHS Household component includes household residents in the 10 Canadian provinces in 1994/1995 excluding persons living on Indian Reserves and Crown Lands, residents of health institutions, full-time members of the Canadian Forces Bases and some remote areas in Ontario and Quebec. Data collection is performed using a computer-assisted interview (CAI) system.

Responding to this survey is voluntary. Cycle response rates: Cycle 1: 83.6%; Cycle 2: 92.8%; Cycle 3: 88.3%; Cycle 4: 84.9%; Cycle 5: 80.8%; Cycle 6: 77.6%; Cycle 7: 77.0%; Cycle 8: 70.7%; Cycle 9: 69.7%. The study uses longitudinal sampling weights to compensate for non-response. We restricted attention to persons who were 18–64 years old, in the labour force, not be a student, and had wage or salary as their major source of household income.

1.3.1 Dependent Variables

Health Outcomes

NPHS asked respondents to report self-evaluations of their health with possible answers of “excellent”, “very good”, “good”, “fair”, and “poor.” This study used three alternative dependent variables for the health condition. The first is a categorical variable based on the above category with 5 = excellent and 1 = poor. The second is a binary dummy variable which like all such variables in this study takes the values of 0 or 1. The value one corresponds to health being reported as “very good”, or “excellent”, and zero otherwise; the third is a binary variable of bad health that equals one if health is “fair”, or “poor”.

The McMaster Health Utility Index Mark 3 (HUI3), developed at McMaster University's Centre for Health Economics and Policy Analysis, is another measurement of health and provides a description of an individual’s overall functional health based on eight attributes:

vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain (Furlong et al. 1998). HUI3 assigns a single numerical value, between zero and one, for all possible combinations of levels of these eight self-reported health attributes, a score of one indicating perfect health.

Chronic Conditions

NPHS also asked respondents whether they have the following chronic health conditions: allergies, asthma, fibromyalgia, arthritis or rheumatism, high blood pressure, migraine, headaches, chronic bronchitis or emphysema, diabetes, epilepsy, heart attack, angina, cancer, stroke, bowel disorder, cataracts, glaucoma, thyroid condition. Chronic conditions are defined as 'long-term conditions' that have lasted or are expected to last 6 months or more and that have been diagnosed by a health professional. This study uses two variables to measure chronic problems: one is a dummy variable that equals one if the respondent has any chronic condition, and another one is the number of chronic conditions.

Body Mass Index (BMI)

BMI is a method of classifying body weight that is related to health risks. BMI = kg/m2 where kg is a person's weight in kilograms and m2 is their height in metres squared. The obesity variable used in this study equals one if BMI is greater or equal to 30.

Restriction of Activities

NPHS asked respondents whether "because of a long-term physical or mental condition or a health problem, are you limited in the kind or amount of activity you can do at home, school, or work?". The dummy variable "restriction" equals one if the individual reports a limitation in any activity.

Cognition Problem

NPHS asked respondents whether they had any cognition problems. The dummy variable "cognition" equals one if the individual report yes.

Job Absence (cycles 4-9)

The NPHS questions are these: "Last week, did you have a job or business from which you were absent?"; followed by: "What was the main reason you were absent from work last week?". This study creates two dummy variables: one is "absent" which equals one if the individual was absent in the past week; another one is "ill-absent" which equals one if the individual was absent in the past week due to their own illness or disability.

Mental Health

The NPHS provides information on a distress scale score (0-24) and a depression scale score (0-8), with a higher value indicating a higher level of distress and depression. This also uses the work stress index from NPHS to estimate the impact of minimum wage changes on work stress.

Health Behaviour

Physical Activity

The NPHS collects information on physical activity. The physical activity index is a derived variable with three values: inactive, moderate, and active. This study uses a dummy variable "inactive", which equals one if the respondent's physical activity index is inactive. This study also uses a dummy variable indicating whether the individual reports participation in a leisure physical activity.

Alcohol Drinking

The NPHS asked respondents: "Since our interview in [month and year of last response interview], have you had a drink of beer, wine, liquor or any other alcoholic beverage?". This study uses that question to create a dummy variable for drinkers, which equals one if the individual drank alcohol in the past year.

The variable of frequency of drinking is derived from the question: "During the past 12 months, how often did you drink alcoholic beverages?". The question has seven responses: Less than once a month, once a month, 2 to 3 times a month, once a week, 2 to 3 times a week, 4 to 6 times a week and every day. This study uses the midpoint of above seven responses to generate a monthly frequency of drinking with values of 0.5, 1, 2.5, 4, 10, 20, and 30.

The variable of frequency of binge drinking is derived from the question: "During the past 12 months, how often did you have 5 or more drinks on one occasion?". The question has six responses: never, less than once a month, once a month, 2 to 3 times a month, once a week, more than once a week. This study uses the midpoint of the above six responses to generate a monthly frequency of binge drinking with values of 0, 0.5, 1, 2.5, 4, and 10. The study also creates a dummy variable for heavy drinking, which equals one if the individual has 5 or more drinks on one occasion at least once a month.

The NPHS also asked respondents: "In the past week, how many drinks did you have on Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday?". This study uses this question to create a continuous variable of average daily alcohol consumption (ADAC).

Cigarette Smoking

We analyze five different smoking variables. For the incidence of smoking, we use answers to the NPHS question "At the present time do you smoke cigarettes daily, occasionally or not at all?". The first variable, dsmoker, indicates current daily smoking and the second variable, dosmoker, indicates current daily or occasional smoking. The variable cig is the average daily cigarette consumption question and includes zeroes for non-smokers. The variable cig|dsmoker is the average daily cigarette consumption among daily smokers and cig|dosmoker is the average daily consumption of cigarettes for all current smokers.

Sleep (cycles 5-9)

NPHS asked respondents the frequency that they have trouble with sleeping. The question has five responses: none of the time, a little of the time, some of the time, most of the time, and all the time. The study creates a dummy variable for sleep trouble which equals one if the individual answers most of the time or all the time.

Fruits and Vegetable Consumption (cycles 4-9)

This derived variable is created by Statistics Canada from the annual consumption variables. Annual consumption variables are summed up and the total is then divided by 365 to derive an aggregate of the daily frequency of fruit and vegetables consumed. The variable of fruits and vegetables measures the number of times (frequency), not the amount consumed.

Health Care Access/Utilization

Medicare Insurance (cycles 2-5)

NPHS asked respondents whether they have medical insurance to cover private room or semi-private room hospital charges, eyeglasses/contact lenses, dental expenses, and prescription medications. This study creates a binary variable of medical insurance that equals one when the respondent is covered by any one or more of the above types of insurance.

Unmet Health Need

The NPHS asked respondents: "during the past 12 months, was there ever a time when you felt that you needed health care, but you didn't receive it?". This study creates a dummy variable that equals one when the respondent reports there is unmet health care in the past year.

Labour Market Outcomes

Total Usual Hours Worked Per Week

The NPHS asked respondents the total usual hours they worked per week among people who worked at a job or a business in past 12 months.

Number of Weeks Worked

The NPHS asked respondents: "during the past 52 weeks, how many weeks did you do any work at a job or a business (include paid vacation leave, paid maternity leave, and paid sick leave)?" among people who worked at a job or a business in past 12 months.

Number of Weeks Looked for Work

The NPHS asked respondents: "during the past 52 weeks, how many weeks were you looking for work?" among people who answered "yes" to the question: "during the past 12 months, did you do anything to find work?".

Job Satisfaction (cycles 4-9)

The NPHS asked respondents: "How satisfied are you with your job?" with four responses from not at all satisfied to very satisfied. The study creates the dummy variable "job unsatisfying" which equals one if the individuals report not too satisfied or not at all satisfied with their jobs.

1.3.2 Independent Variables

The key independent variable in this study is the provincial level of minimum wages. If the minimum wage increase happens at some point of the year, we calculate the weighted average. For example, if ON increases the minimum wage from $5 to $7 on May 1st, 2001, we use the value of $6.3 for 2001. In this study, we use the real minimum wage, which is the nominal minimum wage adjusted by provincial CPI (in 2002 dollars).

Table 1.1 Province nominal minimum wages over 1994-2011 period

	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC
1994	4.75	4.75	5.15	5.00	5.89	6.70	5.00	5.35	5.00	6.00
1995	4.75	4.75	5.15	5.00	6.11	6.85	5.13	5.35	5.00	6.54
1996	4.83	4.88	5.20	5.38	6.51	6.85	5.40	5.37	5.00	7.00
1997	5.19	5.23	5.49	5.50	6.73	6.85	5.40	5.60	5.00	7.00
1998	5.25	5.40	5.50	5.50	6.83	6.85	5.40	5.60	5.10	7.11
1999	5.31	5.40	5.30	5.50	6.90	6.85	5.85	6.00	5.65	7.15
2000	5.50	5.60	5.63	5.75	6.90	6.85	6.00	6.00	5.90	7.23
2001	5.50	5.80	5.73	5.83	6.99	6.85	6.19	6.00	5.90	7.60
2002	5.71	6.00	5.85	5.94	7.05	6.85	6.44	6.28	5.90	8.00
2003	6.00	6.25	6.06	6.00	7.30	6.85	6.69	6.65	5.90	8.00
2004	6.00	6.50	6.44	6.20	7.40	7.13	6.94	6.65	5.90	8.00
2005	6.15	6.80	6.58	6.30	7.55	7.43	7.19	6.78	6.27	8.00
2006	6.65	7.06	7.06	6.60	7.70	7.73	7.51	7.47	7.00	8.00
2007	7.13	7.41	7.45	7.13	7.92	7.98	7.90	7.88	7.33	8.00
2008	7.88	7.73	7.98	7.63	8.33	8.56	8.38	8.48	7.60	8.00
2009	8.75	8.16	8.48	8.01	8.50	9.31	8.73	9.03	7.97	8.00
2010	9.75	8.65	9.16	8.60	9.17	10.06	9.13	9.25	8.80	8.00
2011	10.00	9.25	9.74	9.38	9.60	10.25	9.63	9.33	9.00	8.63

Table 1.2 Province real minimum wages over 1994-2011 period

	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC
1994	5.41	5.50	6.02	5.82	6.80	7.91	5.91	6.31	6.05	6.70
1995	5.34	5.41	5.95	5.73	6.94	7.89	5.90	6.19	5.92	7.14
1996	5.34	5.46	5.90	6.08	7.27	7.77	6.08	6.10	5.79	7.58
1997	5.62	5.78	6.10	6.10	7.41	7.62	5.96	6.28	5.68	7.52
1998	5.68	5.99	6.07	6.07	7.42	7.56	5.88	6.19	5.72	7.61
1999	5.66	5.92	5.75	5.97	7.38	7.41	6.25	6.52	6.18	7.57
2000	5.69	5.90	5.91	6.05	7.20	7.20	6.26	6.36	6.24	7.52
2001	5.63	5.95	5.90	6.02	7.13	6.99	6.28	6.17	6.10	7.78
2002	5.71	6.00	5.85	5.94	7.05	6.85	6.44	6.28	5.90	8.00
2003	5.83	6.04	5.86	5.80	7.12	6.67	6.57	6.50	5.65	7.83
2004	5.73	6.14	6.12	5.91	7.08	6.82	6.69	6.36	5.57	7.68
2005	5.72	6.23	6.08	5.87	7.06	6.95	6.74	6.34	5.80	7.53
2006	6.07	6.33	6.39	6.04	7.08	7.10	6.91	6.85	6.23	7.40
2007	6.42	6.52	6.62	6.41	7.17	7.20	7.12	7.02	6.22	7.27
2008	6.89	6.58	6.89	6.74	7.39	7.56	7.39	7.32	6.25	7.12
2009	7.64	6.96	7.33	7.06	7.50	8.19	7.65	7.71	6.56	7.12
2010	8.30	7.24	7.75	7.42	7.99	8.64	7.94	7.79	7.17	7.03
2011	8.24	7.52	7.94	7.82	8.11	8.53	8.13	7.65	7.16	7.41

We also control for other provincial-level variables reflecting the provincial-level economic environments that may have changed during the period. Real GDP per capita and unemployment rates could affect the health outcomes of low-educated individuals. Additional controls used in the estimation of drinking and smoking behaviours. include real cigarette and alcohol prices at the provincial level.

Individual-level time-relevant covariates include age, age squared (age*age/100), education level, marital status, household sizes (HHS), area of residence, and immigration status.

Age and age squared are continuous variables. Marital status is also a dummy variable, which equals one if the respondent is married or has a common-law partner. In this study, we use four levels of education: some elementary or high school, high school diploma, some post-secondary education, and post-secondary degree, certificate, or diploma. HHS is a continuous variable that indicates the number of members in the household. The variable of the area of residence has five values: 1. Rural area; 2. Urban area with less than 30000 people; 3. Urban area with 30000 to 99999 people; 4. Urban are with 100000 to 499999 people; 5. Urban area with 500000 people or more.

There are 115,904 observations in the data. We focus on the sample of individuals aged from 18 to 65. This restriction leads to 36,716 observations being dropped. Then, we restrict the sample to those in the labour force (employed or unemployed), and another 17,257 observations are dropped. We also restrict the sample to those who reported wage as their main source of income, and another 12,059 observations are dropped. Moreover, we restrict the sample to those who are not students, and another 4,331 observations are dropped. In addition, another 235 observations are dropped due to missing values for control variables. This leaves 45,306 observations (10,456 individuals with the average number of surveys completed per individual is

5.9) for the DDD model we propose, in which those with at most high school education are regarded as the treatment group and those with more education are the control group. For the DD model, the sample is only those with at most high school education, 12,868 observations (3,591 individuals with the average number of surveys completed per individual is 5.4).

Table 1.3 in the Appendix displays the description and summary statistics for all the binary and continuous variables used in our regressions for both low and high educated sample (DDD model) , and Table 1.4 shows the frequency distribution of all categorical variables. There are around 52.5% of males in our sample, and the sample age mean is around 41.7. Around 67% of observations in our sample report their physical health as very good or excellent, with 5.4% of observations reporting their physical health as fair or poor. There are around 23% of observations in our sample with at most high school education.

1.4 Estimation Strategy

Since provinces introduced minimum wage increases in different years, this study uses time variation in the enactment of new minimum wage across ten provinces in Canada to identify the difference-in-differences (DD) coefficients.

1.4.1 DD Estimation

$$Y_{ist} = \beta_1 MW_{st} + \beta_2 X_{ist} + \beta_3 P_{st} + \phi_i + \gamma_t + \varepsilon_{ist}$$

Y_{ist} represents health outcomes for individual i as surveyed in province s in year t. MW_{st} is the measure of the current real minimum wage in 2002 dollars for each province and year. This study also estimates models using the one-year lagged value of real minimum wage (MW_{st-1}) and the log of the real minimum wage ($LogMW_{st}$). X_{ist} represents a set of individual-level control variables, such as age, education, and household sizes. Time-invariant variables, such as sex and immigration status, are omitted in fixed-effect models. P_{st} takes into account other provincial-level control variables (real GDP per capita and unemployment rate) that could affect the health outcomes of low-educated individuals. Extra control includes real cigarette and alcohol prices at the provincial level in the estimation of drinking and smoking behaviours. The equation also controls for individual and year fixed effects while ε_{ist} is a random error term. The parameter of interest, β_1, captures the reduced-form effects of higher minimum wages on the different measures of health outcomes.

The estimation technique is ordinary least squares (OLS) which for binary outcomes means the linear probability model is being employed. There are two reasons to use linear probability models rather than nonlinear models. First, it is difficult to compare parameter estimates across nonlinear models with different sets of covariates. (Cameron and Pravin 2005). Second, there are challenges in estimating logit and probit models with fixed effects (Horn et al., 2017).

Because our data are panel, models use individual fixed effects. Standard errors for DD estimates may be inconsistent if the serial correlation is not corrected (Bertrand et al. 2004). Using cluster–robust standard errors and critical values of a t distribution is asymptotically valid for a fixed number of groups and a growing sample size (Bester et al. 2011). This study compares the results of non-clustered robust standard errors and province-clustered robust standard errors. To report province-clustered standard errors, we need to further restrict our sample to be people who did not migrate across provinces during the period. The impacts of minimum wage hikes on migration of employed low-skilled is small and insignificant (Monras 2019). The two-way fixed-effect model - equation (1) is a difference-in-differences (DD) estimator because it estimates the effect of minimum wage increases (measured by β_1) through variation of minimum wage at the provincial levels over time. If only one province changed its minimum wage once, the DD approach can be thought of the comparing the treatment group of individuals in the province with the change, while the comparison group is composed of the individuals in the provinces with no change. In the data, all the provinces change their minimum wages but with different timing, so individuals within a province can sometimes be thought of as the treated group and sometimes the comparison group. The key assumption in the DD approach is that the underlying trends of health outcomes are the same in all provinces so that any changes in health relative to those trends that are associated with minimum wage changes can plausibly be interpreted as due to those minimum wage changes. We estimate eq. (1) using the group of low-skilled workers who get at most high school education. We apply weights provided by the NPHS to generate nationally representative estimates.

1.4.2 DDD Estimation

To guard against the possibility that changes in health relative to underlying trends are correlated with minimum wage changes for other reasons, this study also uses the triple difference approach (DDD). Here the key assumption is that province-specific health changes affect all individuals in the province; the treatment group becomes the low educated who are more likely to be affected by minimum wage increases than the comparison group (the more highly educated). The DDD estimator can be obtained by comparing the affected and the unaffected comparison groups.

$$Y_{ist} = \delta_1 MW_{st} + \delta_2 X_{ist} + \delta_3 P_{st} + \upsilon_t + \theta_1 A_i MW_{st} + \theta_2 A_i X_{ist} + \theta_3 A_i P_{st} + A_i \upsilon_t + \omega_i + \mu_{ist}$$

where ω_i are now the individual effects, υ_t are now the year effects (relative to the first year) and μ_{ist} is the new error term. The indicator for whether the individual belongs to the low-education group, A_i, equals one if the person has at most high school education during the period and equals zero if the person has more than high school education. The parameter of interest, θ_1, the coefficient on the interaction term $A_i MW_{st}$ provides the effect of the minimum wage on the lower-educated group relative to the higher educated group. The X_{ist} and P_{st} variables are the same as in the DD case, and as is the use of individual fixed effects.

With the development of the DD approach, Goodman-Bacon (2021) decomposes multiple treatments occurring at different point in time and shows two-way fixed effects DD estimator is simply a weighted average of all treatment effects, and negative weights may be assigned when treatment effects change over time. A similar point applies to DDD estimates. Hence interpretating our results as the effect of the treatment on the dependent variable, which in each case consist of a single estimated parameter, is dependent upon the assumption that the treatment effects do not change over time or province.

1.5 Results

Broadly, there is little evidence that minimum wage hikes have consistent, statistically significant, positive effects on most health outcomes. Indeed, many of the statistically significant coefficients would point to negative health effects. This is particularly so for females, where there is some evidence of a positive association with the probability of self-reported poor or fair health and heavy drinking, although little evidence of an association with obesity. Again, for women, there is fairly consistent evidence of minimum wage increases being associated with increased supplementary health insurance and quite strong evidence of an association with reduced work absences, but not for work absences associated with ill health. For males, there is some weak evidence of minimum wage increases leading to modest reductions in distress and depression, perhaps due to reduction in financial stressors. While there are other significant coefficients scattered through the health outcomes results, we note that using the 5 percent level would also suggest that one in twenty coefficients would be significant by random chance, even if the true coefficients were all zero. Moreover, in some cases it is difficult to postulate a mechanism that would explain the coefficient sign.

After providing the health outcomes results, we present some results on health behaviours. Among the more consistent results, there is some evidence that at least for males, minimum wage increases are associated with less alcohol consumption and less heavy drinking. There is also consistent evidence of an association of higher minimum wages with reduced smoking among both men and women and reduced physical inactivity among women. Hence the most consistent results suggest that minimum wage increases reduce at least some unhealthy behaviours.

Finally, we present some additional results on potential labour market effects as estimated by these methods on our sample. We find some evidence that minimum wage increases increased labour market hours for men and fewer labour market hours for women. For women, we report some estimates suggesting that a minimum wage increase may improve job satisfaction.

1.5.1 Health Outcomes

Appendix Tables 1.5, 1.6, 1.7, 1.8, 1.9, and 1.10 show the estimation effect of minimum wage hikes on various health outcomes. For each outcome, the effect for males and females is separately estimated. Tables 1.5 and 1.6 present results using real current minimum wages, Tables 1.7 and 1.8 present results using one-year lag real minimum wages, and Tables 1.9 and 1.10 present results using log current real minimum wages. Tables 1.5, 1.7, and 1.9 show results from the DD models, while Tables 1.6, 1.8, and 1.10 give results from the DDD models. The left panel of each table shows estimations with robust standard error, and the right panel of the table shows estimations with province-clustered standard error.

Turning to our results, throughout our analysis, unless suggested otherwise, we will describe coefficients as "statistically significant" if they have p-values less than 0.05. Only four such coefficients are statistically significant by this standard when robust standard errors are used in our estimates of the above DD equation as presented in Table 1.5. One of these does suggest that a $1 increase in the current real minimum wage increases the probability of a female reporting having supplementary health insurance by around 3.5 percentage points (where the estimate is 1.4 percentage points but not statistically significant when both genders are included). The other statistically significant coefficients, interpreted causally, would indicate that higher minimum wages increase BMI where the result appears to be driven by females, and reduce job absences in females. (We note that there is some evidence that higher minimum wages reduce distress for all and for males, but that those coefficients have p-values of 0.097 and 0.065, above the 0.05 threshold.) There are a few more statistically significant coefficients when clustered standard errors are used, recalling that the sample in this case is slightly smaller as it now excludes those who switch provinces. These coefficients indicate that minimum wage hikes increase poor or fair health incidence (for all), BMI (all, females), chronic conditions (all, females), activity limits (all, males), chronic conditions (females), and drug (medication) use (for all), and reduce distress (males), depression (all, males), HUI (females), job absence (all, females), and chronic conditions (males).

The DDD results from Table 1.6 have the same flavour. Here there are four statistically significant coefficients, all for females, when robust standard errors are used. Coefficients indicate that minimum wage increases increase women's BMI and probability of having health insurance while reducing their unmet health need and job absence. In the province-clustered robust standard errors case, the statistically significant coefficients are somewhat more plentiful but again indicate that minimum wage increases increase the incidence of poor or fair health for females while reducing depression, in a result driven by the male sample.

From Table 1.7 and the DD results where the key independent variable is the lagged real minimum wage, there are seven estimated coefficients that have p-values less than 0.05 when robust standard errors are used. These coefficients indicate that minimum wage increases increase BMI (all, females), the probability of reporting any chronic condition (females), and the probability of having health insurance (all, females) while reducing distress (males) and job absence (females). There are thirteen statistically significant coefficients when clustered standard errors are used. In this case the coefficients indicating that minimum wage hikes increase poor or fair health incidence (females), BMI (all, females), the probability of having a chronic condition (all, females), number of chronic conditions (females), and unmet health need (males) and reduce obesity (males), distress (all, males), HUI (females), job absence (females) and cognition problems (males).

From Table 1.8 and the DDD results with lagged real minimum wage as the key independent variable, there are only four statistically significant coefficients when robust standard errors are used. One suggests that a $1 increase in the one-year lag real minimum wage increases BMI by around 0.23 for all and by 0.36 for females. Such an increase is also estimated to reduce work absences for women and increase the number of friends for men. Again, there are a few more statistically significant coefficients when clustered standard errors are used. In this case those coefficients indicating a $1 increase in the one-year lag real minimum wage increases the probability of reporting poor or fair health by around 2.2 percentage points for all and by 4.2 percentage points for females. These coefficients also suggest minimum wage hikes increase BMI (all, males, females), the probability of a chronic condition (all, females), the number of chronic conditions (males), unmet medical need (all), work absences (females), and the number of friends (for all, but the result appears to be driven by men) while reducing HUI and work absences for women. We note in these results with the lagged wage variable, there is only limited evidence of reduction of mental health problems, with the distress coefficient being negative for the full sample and for males, but with p-values of 0.097 and 0.175 respectively.

From Table 1.9 and the DD results with the log of the real minimum wage as the wage variable, there are only four estimated coefficients that have p-values less than 0.05 when robust standard errors are used. One of these does suggest that a 1% increase in the current real minimum wage increases the probability of a female reporting has supplementary health insurance by around 0.25%. The other statistically significant coefficient, continuing our causal interpretations, would indicate that minimum wage increases increase BMI (all, females), and reduce work absence (females). There are a few more statistically significant coefficients when clustered standard errors are used. Those coefficients indicating that minimum wage hikes increase poor or fair health incidence (females), BMI (all, females), the probability of a chronic condition (all, females), the number of chronic conditions (all, females), activity limits (all, males), cognition problems (females), and drug (medication) use (for all in a result that appears more driven by females) and reduce HUI (females), work absence (females), and cognition problems (males). Throughout we have paid special attention to the mental health variables and note that for males, the DD coefficient for distress indicates a negative and significant at the 0.10 level effect of a minimum wage increase, with similar DDD results for males for distress and depression.

The DDD results from Table 1.10 show that there are four statistically significant coefficients when robust standard errors are used. These coefficients are suggesting that a 1% increase in the current real minimum wage increases the probability of a female reporting has supplementary health insurance by around 0.23%, as well as indicating that minimum wage hikes increase BMI (females) and reduce unmet health need (females), and work absence (females). In the province-clustered robust standard errors case, the statistically significant coefficients again indicate that minimum wage increases increase the incidence of poor or fair health (females), BMI (all, females), number of chronic problems (males), activity limits (males), cognition problems (females), and drug (medication) use (males) as well as reduce depression (for all in a result driven by the male sample), unmet health need (females), HUI (females), and job absence (females).

1.5.2 Health Behaviours

Appendix Tables 1.11, 1.12, 1.13, 1.14, 1.15, and 1.16 show the estimation effect of minimum wage hikes on various health behaviours outcomes. For each outcome, the effect for males and females is separately estimated. Tables 1.11 and 1.12 present results using real current minimum wages, Tables 1.13 and 1.14 present results using one-year lag real minimum wages, and Tables 1.15 and 1.16 present results using log current real minimum wages. Tables 1.11, 1.13, and 1.15 show results from the DD models, while Tables 1.12, 1.14, and 1.16 give results from the DDD models. The left panel of each table shows estimations with robust standard errors, and the right panel of the table shows estimations with province-clustered standard errors.

Turning to Table 1.11 and the DD results, there are seven estimated coefficients that have p-values less than 0.05 when robust standard errors are used. These coefficients suggest that a $1 increase in the current real minimum wage increases alcohol binge drinking frequency by 0.12 time per month for female drinkers, while reducing average daily alcohol consumption (ADAC) by around 0.1 for all, and around 0.15 for males. Such a minimum wage increase would also reduce the probability of being a current smoker by around 2.1 percentage points for all and reduce the probability of physically inactivity by around 5.2 percentage points for females. There are a few more statistically significant coefficients when clustered standard errors are used, recalling that the sample in this case is slightly smaller as it now excludes those who switch provinces. Some of these coefficients indicate that minimum wage hikes reduce binge drinking and heavy drinking (males), ADAC (all, males), the incidence and intensity of smoking (particularly for males), physical inactivity(females), and increase binge drinking and heavy drinking for females.

The DDD results from Table 1.12 show that there are seven statistically significant coefficients when robust standard errors are used. This coefficient suggests that a $1 increase in the current real minimum wage increase ADAC by around 0.12 for all, and 0.19 for males. Other coefficients indicate that the minimum wage hikes reduce physically inactivity (all, females), average daily smoking by smokers(males), and increase heavy drinking for females (with no evidence of increased average alcohol consumption). Among the results for the province-clustered robust standard errors case, statistically significant coefficients again indicate that minimum wage increases reduce binge drinking, heavy drinking, and ADAC (all, males), incidence of current smoking (all, males), average daily smoking by smokers(males), and physically inactivity (females).

From Table 1.13 and the DD results for a lagged real minimum wage, there are eight estimated coefficients that have p-values less than 0.05 when robust standard errors are used. These coefficients suggest that one-year lag minimum wage increases increase the drinking frequency for females and reduce the drinking frequency and ADAC for males. There are twenty-four statistically significant coefficients when clustered standard errors are used. These results include coefficients indicating that minimum wage hikes increase drinking frequency (all, males), and reduce binge drinking frequency and ADAC (all, males), the incidence and intensity of smoking (particularly among males) and physically inactivity (females).

The DDD results using a lagged real minimum wage from Table 1.14 have the same flavour. Here there are nine statistically significant coefficients when robust standard errors are used. These coefficients suggest that a $1 increase in the one-year lag current real minimum wage reduces the frequency of binge drinking by around 0.25 time per month for males, as well as indicating that minimum wage increases reduce the ADAC (all, males), average cigarette consumption by daily smokers (males), and physically inactivity (all, females). In the province-clustered robust standard errors case, there are statistically significant coefficients again indicating that minimum wage increases reduce the frequency of binge drinking and ADAC (all, males), the incidence of heavy drinking (males), the incidence and intensity of smoking (particularly among males), physically inactivity (females), and sleep problems (all, males).

Turning to Table 1.15 and the DD results for the case where the wage variable is the log of the real minimum wage, there are eight estimated coefficients that have p-values less than 0.05 when robust standard errors are used. These coefficients suggest that minimum wage hikes reduce ADAC (all, male), the incidence of current smoking (males), physically inactivity (females), and increase the frequency of binge drinking for females. There are a few more statistically significant coefficients when clustered standard errors are used. In this case the coefficients indicating that minimum wage hikes reduce frequency of binge drinking and ADAC (males), the incidence of and intensity of smoking (particularly for males), and physically inactivity (females).

From Table 1.16 and the DDD results for the log wage case, there are eight estimated coefficients that have p-values less than 0.05 when robust standard errors are used. These coefficients suggest that a 1% increase in the current real minimum wage reduce ADAC by around 0.83% for all and by around 1.4% for males. Other coefficients suggest that minimum wage hikes increase the incidence of heavy drinking (females) and reduce average cigarette consumption by daily smokers (males) and physically inactivity (females). There are a few more statistically significant coefficients when clustered standard errors are used. In this case, the coefficients indicating that minimum wage hikes reduce the frequency of binge drinking and ADAC (all, males), incidence and intensity of smoking by males, and physically inactivity (all, females).

1.5.3 Labour Market Outcomes

While my focus is on health, one of the possible mechanisms by which minimum wages might affect health is through the labour market: that is a minimum wage increase may increase how many hours the respondent works, how many weeks they have been able to work in the past year, how many weeks of searching they had in the past year and whether or not they are unsatisfied with their job, and those variables, in turn, could affect health. Hence, we turn to a brief discussion of this aspect, noting that overall, there is some fairly consistent evidence that increases in the minimum wage in our sample are associated with an increase in the working hours of men and a reduction in the working hours of women.

Appendix Tables 1.17, 1.18, 1.19, 1.20, 1.21, and 1.22 show the estimated effect of minimum wage hikes on various labour market outcomes, and the effect for males and females is separately estimated. Tables 1.17 and 1.18 present results using real current minimum wages, Tables 1.19 and 1.20 present results using one-year lag real minimum wages, and Tables 1.21 and 1.22 present results using log current real minimum wages. In addition, Tables 1.17, 1.19, and 1.21 show results from the models, while Tables 1.18, 1.20, and 1.22 show results from the DDD models. The left panel of each table shows estimations with robust standard error, and the right panel of the table shows estimations with province-clustered standard error.

Turning to Table 1.17 and the DD results, there is no statistically significant coefficient that have p-values less than 0.05 when robust standard errors are used. There are a few more statistically significant coefficients when clustered standard errors are used. In this case, the coefficients indicating that minimum wage hikes reduce working hours per week, and the probability of “unsatisfying job” for females.

The DDD results from Table 1.18 show that there is no statistically significant coefficient when robust standard errors are used. In the province-clustered robust standard errors case, the statistically significant coefficient indicates that minimum wage increases reduce working hours (females).

Table 1.19 and the DD results in this case for the lagged real minimum wage shows that there is no statistically significant coefficient when robust standard errors are used. In the province-clustered robust standard errors case, the statistically significant coefficients indicate that minimum wage hikes reduce working hours per week and the probability of reporting “job unsatisfying” for females.

The DDD results from Table 1.20 for the case of the lagged wage variable show that there is no statistically significant coefficient when robust standard errors are used. In the province-clustered robust standard errors case, the statistically significant coefficients again indicate that minimum wage hikes reduce working hours for females.

From Table 1.21 and the DD results, with the wage variable entered in log form, there is no statistically significant coefficient when robust standard errors are used. There is also no statistically significant coefficient when clustered standard errors are used.

The DDD results from Table 1.22, with the wage variable in logs, show that there is there is no statistically significant coefficient when robust standard errors are used. In the province-clustered robust standard errors case, the statistically significant coefficients indicate that minimum wage hikes increase the working hours for males, but reduce the working hours for females.

1.6 Discussion

While we provide the results for both robust standard errors and province-clustered robust standard errors given that minimum wages change at provincial level, we focus on the latter, where we note that makes the sample size somewhat smaller because interprovincial migrants are excluded. We note that those who change provinces may be a somewhat different population than those who do not.

Leigh et al. (2019) suggests that null hypotheses that minimum wage increases have no effects on most health outcomes cannot be rejected. We also find most coefficients are not significant. While Lenhart (2017) finds that changing the National Minimum Wage in the UK significantly improved self-reported health status, this study finds it is more complex with some evidence that higher minimum wages increase the incidence of self-reported fair or poor health among women. This is partially consistent with Horn et al. (2017) who show that minimum wage hikes lead to worsening general health among both male and female low-skilled workers in the US.

Our findings suggest that higher minimum wages could improve the mental health of low-skilled workers by reducing depression and distress. Those results are in line with Horn et al. (2017) who find female workers experience slight reductions in the number of days with bad mental health following the minimum wage increases and Reeves et al. (2017) who find a reduction in the probability of mental health problems along with higher wages for minimum wage recipients in the UK. However, Kronenberg et al. (2017) and Maxwell et al. (2022) cannot find a significant association between UK NMW and the mental health of low-wage earners. In contrast with the Horn et al. (2017) findings for the United States which emphasize the positive effects on females, and the Kuroki (2021) results which find positive effects for both females and males, our results for Canada suggest that the positive effects on mental health are largely male.

In line with Du and Leigh (2018) who find that higher state-level minimum wage rates are significantly negatively associated with absence rate due to own illness in the US, our results suggest that real minimum wage hikes reduce the probability of job absence for females (Table 7), although our findings are for job absence that is unrelated to illness. Moreover, we have some concern about reliability in this case as we have an extremely small sample size for job absence.

Chen (2021) using data from China suggests that higher minimum wages have a limited impact on health behaviours (smoking, drinking, and regular exercise) among low-skilled workers. Other studies show that minimum wages hikes may change some health behaviours of low-skilled workers. Lenhart (2017) shows that the NMW significantly reduced smoking by 2.51 percentage points in the UK. Our results also indicate that higher minimum wages are significantly associated with a lower smoking rate and less cigarette consumption for males. However, Reeves et al. (2017) cannot find evidence of change in smoking for the affected group. And Huang et al. (2020) find opposite results, which indicate that higher minimum wages increase smoking for low-skilled workers. Consistent with Lenhart (2017), our study finds minimum wage hikes encourage low-skill female workers to reduce inactivity.

There are many instances where we find that results no consistent with each other, but where different findings have been reported in the literature. For example, Andreyeva and Ukert (2018) find that higher minimum wages increase the probability of being obese and decrease daily fruit and vegetable intake in the US. However, we cannot find evidence of the effect of minimum wage changes on the daily frequency of fruit and vegetable consumption.

We return to a puzzle posed by one of our main findings. As noted, we find fairly consistent evidence of an association between increased minimum wages and lower self-reported women's health. We also find very little evidence of an association with improved men's health, with the important exception of weak evidence of improvement in men's mental health. Yet we also find fairly consistent evidence of an association between increased minimum wages and reduced drinking and heavy drinking for men and reduced smoking (again particularly for men) as well as reduced physical inactivity (particularly for women). While there is some evidence that could point to increased heavy drinking by women and an increase in body mass (with no corresponding obesity result), that evidence is not very consistent. Accordingly, as a very broad conclusion, there seems to be more evidence that minimum wage increases lead to healthier behaviours among those affected than evidence of an actual improvement in health. One possibility is that the investments in health behaviours have a longer payoff period that is not be well captured in this relatively short-term analysis.

We do not regard the mixed results from our estimation as itself a limitation. Neumark (2023) surveys many different studies with different samples and methods and finds mixed results. We show that our application of a consistent methodology to study a variety of health behaviours and outcomes on a single Canadian panel data set (the NPHS) also yields mixed results in the sense that they do not point to clear results for outcomes that would flow from clear channels of behavioural change induced by minimum wage changes.

However, despite these noteworthy findings, several limitations must be acknowledged. Primarily, the research scope is restricted to individuals within the labour force, which could potentially engender bias against the identification of negative impacts arising from minimum wage increases (Neumark, 2023). We have done some preliminary analysis for the relationship between minimum wage changes and drinking and smoking and do not find that this changes our results, at least for adults, but this analysis is incomplete.

Our investigation does not fully explore the implications of fixed effects estimation. Again, our preliminary analysis involving drinking and smoking explored the consequences of using province-fixed effects rather than person-fixed effects. We found this did not tend to change the signs of the key minimum wage coefficients but tended to reduce the magnitudes. Future research could incorporate probit models for binary outcomes as part of a robustness check.

Furthermore, the impact of minimum wage policies may be unevenly distributed across various age groups, with evidence indicating a greater influence on teenagers and young adults compared to adults in Canada (Sen et al., 2011). Referring again to our preliminary analysis of smoking and drinking, we have found that higher minimum wages correlate with an increased likelihood of daily smoking among young males, whereas the opposite pattern is observed among adult males. To obtain a more nuanced understanding of these associations, future studies should estimate the heterogeneous impact of minimum wages for other outcomes across age groups and immigration status.

Lastly, minimum wage policies may interact with other socio-economic policies, thereby affecting individual health outcomes indirectly. Several studies have used instrument variables, such as the average minimum wage in other provinces, to mitigate this potential confounding effect (Sen et al., 2011; Rybczynski and Sen, 2018). Moreover, an alternate approach might entail the creation of binary treatment indicators for provinces that have undergone significant minimum wage hikes. We plan to test these alternative estimations in future research to better untangle the complex effects of minimum wage policy on health.

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Appendix

Table 1.3 Data description and summary

Variables	Description	Mean	Std. dev
male	=1 if male	0.53	0.50
immigrant	=1 if born outside Canada	0.17	0.38
treat	=1 if belong to the affected group	0.26	0.44
married	=1 if married or have a common law partner	0.68	0.47
age	individual year indicators for age at time of interview	40.26	11.14
age2	age squared divided by 100	17.45	9.03
priceal	price of alcohol	99.76	10.05
pricecig	price of cigarettes	96.89	37.49
cpi	consumer price index (2002=100)	100.12	10.48
ur	unemployment rate	7.83	2.23
gdp	real GDP per capita	39051.48	10746.02
goodh	=1 if physical health is very good or excellent	0.67	0.47
poorh	=1 if physical health is very fair or poor	0.05	0.22
hui	McMaster Health Utility Index Mark 3	0.92	0.13
bmi	Body Mass Index	26.03	4.77
obesity	=1 if BMI>=30	0.17	0.38
chronic	=1 if has any chronic problem	0.60	0.49
nchronic	number of chronic problems	1.15	1.32
drug	number of different medications in past two days	0.99	1.34
insurance	number of types of medical insurance	2.89	1.51
nfriend	number of friends	6.73	6.20
fv	daily frequency of fruit and vegetables consumed	4.32	2.23
limit	=1 if has limitation in any activity	0.15	0.36
drinker	=1 if is a current drinker	0.94	0.24
heavy	=1 if has binge drinking as least once a month	0.26	0.44
fre	frequency of alcohol drinking per month	6.12	7.74
bfre	frequency of binge drinking per month	0.81	1.81
ADAC	average daily alcohol consumption	0.57	1.05
unmet	=1 if there is an unmet health care in the past year	0.08	0.27
leisure	=1 if participate in leisure physical activity	0.94	0.24
inactive	=1 if physical inactive	0.51	0.50
cognition	=1 if has any cognition problem	0.21	0.41
absent	=1 if absent from job in last week	0.70	0.46
illabsent	=1 if absent from job in last week due to own illness	0.14	0.35
sleep	=1 if if has trouble with sleeping most of the time or all the time	0.35	0.48
ddepress	=1 if feels any depression	0.09	0.28
ddistress	=1 if feels any distress	0.70	0.46
dosmoker	=1 if is a current smoker	0.29	0.45
dsmoker	=1 if is a current daily smoker	0.24	0.43
hour	usual number of working hours per week	41.86	12.65
cig	average daily cigarettes consumption	4.00	8.12
workweek	number of weeks working	48.70	8.84
lookweek	number of weeks looking for a job	5.97	10.96
jobu	=1 if not too satisfied or not at all satisfied with job	0.08	0.27

Table 1.4 Frequency table of factor variables

Variable	Percent	Cum.
province of residence		
NL	1.75	1.75
PE	0.52	2.26
NS	3.19	5.46
NB	2.54	8.00
QC	25.15	33.15
ON	37.54	70.69
MB	3.65	74.34
SK	3.13	77.48
AB	10.54	88.02
BC	11.98	100.00
city		
rural area	15.11	15.11
Urban area with less than 30000 people	10.17	25.28
Urban area with 30000 to 99999 people	9.71	34.99
Urban are with 100000 to 499999 people	17.50	52.49
Urban area with 500000 people or more	47.51	100.00
physical health		
poor	0.61	0.61
fair	4.62	5.23
good	28.12	33.34
very good	42.88	76.22
excellent	23.78	100.00
education		
some elementary or high school	11.94	11.94
high school diploma	15.98	27.93
some post-secondary education	26.17	54.09
post-secondary degree or diploma	45.91	100.00
year of interview		
1994	8.49	8.49
1995	3.58	12.07
1996	9.36	21.44
1997	3.60	25.04
1998	8.44	33.48
1999	3.11	36.58
2000	7.67	44.25
2001	4.88	49.13
2002	7.87	57.00
2003	3.71	60.71
2004	7.28	67.99
2005	3.77	71.76
2006	7.05	78.81
2007	3.13	81.94
2008	6.08	88.03
2009	3.06	91.08
2010	6.72	97.81
2011	2.19	100.00

Table 1.5 DD estimator of real current minimum wage changes on health outcomes

		robust std. err.			cluster std. err.		
		coeff.	p-value	n	coeff.	p-value	n
goodh	all	-0.001	0.958	12868	0.008	0.500	11677
	male	-0.004	0.856	7238	0.016	0.293	6559
	female	0.000	0.998	5630	-0.007	0.601	5118
poorh	all	0.014	0.112	12868	0.017	0.112	11677
	male	0.008	0.492	7238	0.001	0.889	6559
	female	0.023	0.104	5630	0.037**	0.036	5118
bmi	all	0.198**	0.037	12477	0.251**	0.032	11318
	male	0.136	0.248	7189	0.122	0.182	6513
	female	0.332**	0.022	5288	0.468***	0.009	4805
obesity	all	-0.001	0.917	12477	-0.001	0.923	11318
	male	-0.005	0.770	7189	-0.013	0.103	6513
	female	0.006	0.782	5288	0.016	0.468	4805
ddistress	all	-0.028*	0.097	12871	-0.030	0.134	11680
	male	-0.041*	0.065	7240	-0.051**	0.023	6561
	female	-0.007	0.797	5631	-0.001	0.974	5119
ddepress	all	-0.002	0.866	12871	-0.016**	0.037	11680
	male	-0.011	0.436	7240	-0.033**	0.034	6561
	female	0.010	0.590	5631	0.007	0.625	5119
chronic	all	0.018	0.270	12845	0.029***	0.004	11659
	male	0.007	0.744	7226	0.012	0.509	6551
	female	0.034	0.160	5619	0.050**	0.015	5108
nchronic	all	0.052	0.129	12781	0.057**	0.024	11599
	male	0.055	0.170	7198	0.035	0.253	6527
	female	0.054	0.345	5583	0.091***	0.008	5072
unmet	all	-0.002	0.852	12867	-0.001	0.835	11676
	male	0.011	0.336	7239	0.010	0.160	6560
	female	-0.017	0.187	5628	-0.014	0.118	5116
hui	all	-0.003	0.560	12768	-0.003	0.421	11586
	male	0.001	0.858	7178	0.003	0.533	6504
	female	-0.008	0.264	5590	-0.010***	0.005	5082
limit	all	0.009	0.503	12858	0.019***	0.008	11668
	male	0.013	0.469	7235	0.025**	0.034	6556
	female	0.004	0.831	5623	0.012	0.377	5112
absent	all	-0.192	0.180	887	-0.199*	0.064	808
	male	0.087	0.401	449	0.087	0.417	417
	female	-0.648***	0.000	438	-0.631***	0.001	391
illabsent	all	-0.042	0.418	887	-0.057	0.446	808
	male	0.061	0.473	449	0.061	0.514	417
	female	-0.042	0.646	438	-0.014	0.925	391
cognition	all	-0.003	0.846	12839	-0.003	0.810	11652
	male	-0.026	0.197	7224	-0.028**	0.024	6546
	female	0.032	0.197	5615	0.032**	0.029	5106
drug	all	0.063	0.236	10086	0.088*	0.052	9147
	male	0.038	0.540	5167	0.044	0.446	4683
	female	0.084	0.334	4919	0.123	0.137	4464
nfriend	all	0.157	0.565	8586	0.182	0.261	7737
	male	0.571	0.102	4705	0.402	0.309	4232
	female	-0.490	0.222	3881	-0.244	0.536	3505
insurance	all	0.014	0.167	12871	0.007	0.651	11680
	male	-0.001	0.941	7240	-0.004	0.796	6561
	female	0.035***	0.007	5631	0.021	0.303	5119

Table 1.6 DDD estimator of real current minimum wage changes on health outcomes

		robust std. err.			cluster std. err.		
		coeff.	p-value	n	coeff.	p-value	n
goodh	all	-0.003	0.857	45306	0.008	0.663	40135
	male	-0.007	0.796	22716	0.012	0.507	20198
	female	-0.004	0.878	22590	-0.004	0.863	19937
poorh	all	0.019*	0.060	45306	0.021	0.125	40135
	male	0.014	0.292	22716	0.003	0.791	20198
	female	0.029*	0.073	22590	0.046**	0.045	19937
bmi	all	0.199*	0.066	43771	0.300***	0.001	38783
	male	0.113	0.405	22604	0.099	0.217	20093
	female	0.360**	0.029	21167	0.603***	0.001	18690
obesity	all	0.001	0.947	43770	0.005	0.640	38782
	male	-0.001	0.967	22604	-0.010	0.371	20093
	female	0.006	0.780	21166	0.025	0.214	18689
ddistress	all	-0.014	0.485	45313	-0.018	0.162	40142
	male	-0.025	0.352	22721	-0.041	0.104	20203
	female	0.006	0.834	22592	0.013	0.648	19939
ddepress	all	-0.005	0.718	45313	-0.016**	0.011	40142
	male	-0.018	0.297	22721	-0.032**	0.034	20203
	female	0.014	0.508	22592	0.007	0.699	19939
chronic	all	0.011	0.558	45234	0.022**	0.048	40071
	male	0.018	0.473	22672	0.034	0.171	20160
	female	0.006	0.817	22562	0.013	0.336	19911
nchronic	all	0.040	0.322	44992	0.064	0.103	39852
	male	0.091*	0.067	22572	0.117**	0.039	20072
	female	-0.008	0.898	22420	0.022	0.457	19780
unmet	all	-0.009	0.377	45300	-0.004	0.357	40129
	male	0.009	0.513	22715	0.015*	0.083	20197
	female	-0.030**	0.043	22585	-0.025***	0.003	19932
hui	all	-0.003	0.574	44974	-0.002	0.475	39837
	male	-0.001	0.864	22517	0.002	0.744	20017
	female	-0.006	0.418	22457	-0.008***	0.016	19820
limit	all	0.004	0.787	45280	0.014	0.303	40114
	male	0.013	0.522	22703	0.027	0.053	20188
	female	-0.006	0.802	22577	-0.001	0.979	19926
absent	all	-0.224	0.132	3361	-0.232*	0.066	2942
	male	-0.004	0.976	1399	-0.007	0.953	1261
	female	-0.605***	0.000	1962	-0.610***	0.002	1681
illabsent	all	-0.056	0.378	3361	-0.085	0.215	2942
	male	0.062	0.532	1399	0.059	0.390	1261
	female	-0.051	0.613	1962	-0.031	0.833	1681
cognition	all	0.005	0.794	45234	0.011	0.517	40073
	male	-0.018	0.463	22677	-0.009	0.510	20163
	female	0.041	0.147	22557	0.042**	0.030	19910
drug	all	0.079	0.197	37157	0.097*	0.080	32877
	male	0.079	0.300	17071	0.087**	0.034	15154
	female	0.081	0.407	20086	0.108	0.237	17723
nfriend	all	0.253	0.442	32873	0.329	0.202	28821
	male	0.703	0.138	16040	0.569	0.305	14102
	female	-0.453	0.296	16833	-0.135	0.764	14719
insurance	all	0.009	0.396	45313	0.008	0.432	40142
	male	-0.007	0.685	22721	-0.014	0.162	20203
	female	0.034**	0.016	22592	0.034*	0.063	19939

Table 1.7 DD estimator of one-year lag minimum wage changes on health outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
goodh	all	-0.007	0.676	0.001	0.883
	male	-0.011	0.597	0.003	0.835
	female	-0.004	0.879	-0.006	0.637
poorh	all	0.016*	0.087	0.019*	0.055
	male	0.012	0.273	0.010	0.277
	female	0.022	0.157	0.031**	0.042
bmi	all	0.210**	0.025	0.246**	0.017
	male	0.147	0.205	0.138*	0.096
	female	0.345**	0.018	0.430***	0.008
obesity	all	-0.006	0.697	-0.005	0.559
	male	-0.008	0.684	-0.016**	0.042
	female	-0.001	0.979	0.010	0.676
ddistress	all	-0.029*	0.075	-0.030***	0.009
	male	-0.047**	0.036	-0.055**	0.012
	female	-0.001	0.957	0.006	0.787
ddepress	all	-0.001	0.922	-0.011	0.192
	male	0.002	0.882	-0.011	0.419
	female	-0.005	0.797	-0.007	0.637
chronic	all	0.022	0.187	0.033**	0.034
	male	0.006	0.781	0.014	0.617
	female	0.047**	0.044	0.060***	0.001
nchronic	all	0.048	0.172	0.056*	0.091
	male	0.046	0.294	0.037	0.396
	female	0.060	0.284	0.088**	0.016
unmet	all	0.005	0.629	0.006	0.315
	male	0.015	0.249	0.018**	0.018
	female	-0.008	0.540	-0.008	0.491
hui	all	-0.001	0.781	-0.002	0.487
	male	0.003	0.581	0.005	0.224
	female	-0.008	0.257	-0.011***	0.006
limit	all	-0.001	0.960	0.007	0.458
	male	0.002	0.892	0.011	0.424
	female	-0.004	0.827	0.003	0.800
absent	all	-0.190	0.202	-0.211*	0.076
	male	0.240*	0.063	0.255*	0.063
	female	-0.490***	0.001	-0.552***	0.000
illabsent	all	-0.028	0.610	-0.067	0.206
	male	0.010	0.928	0.012	0.894
	female	0.056	0.482	0.025	0.814
cognition	all	-0.006	0.715	-0.007	0.664
	male	-0.034*	0.093	-0.037***	0.006
	female	0.038	0.111	0.037	0.141
drug	all	0.045	0.406	0.064	0.161
	male	-0.009	0.893	-0.010	0.854
	female	0.106	0.208	0.135	0.112
nfriend	all	0.302	0.276	0.246	0.302
	male	0.605*	0.082	0.420	0.249
	female	-0.214	0.614	-0.107	0.853
insurance	all	0.024**	0.019	0.019	0.352
	male	0.016	0.266	0.013	0.459
	female	0.036***	0.010	0.025	0.280

Table 1.8 DDD estimator of one-year lag minimum wage changes on health outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
goodh	all	-0.007	0.712	0.003	0.804
	male	-0.003	0.918	0.015	0.467
	female	-0.016	0.548	-0.017	0.305
poorh	all	0.021*	0.053	0.022**	0.048
	male	0.016	0.227	0.007	0.437
	female	0.03*	0.090	0.042**	0.020
bmi	all	0.229**	0.034	0.32***	0.000
	male	0.166	0.218	0.176**	0.035
	female	0.363**	0.030	0.548***	0.000
obesity	all	0.000	0.993	0.003	0.729
	male	0.002	0.941	-0.008	0.479
	female	0.001	0.976	0.018	0.358
ddistress	all	-0.013	0.491	-0.014*	0.097
	male	-0.026	0.337	-0.038	0.175
	female	0.009	0.729	0.020	0.280
ddepress	all	-0.006	0.692	-0.012	0.150
	male	-0.006	0.745	-0.012	0.479
	female	-0.003	0.885	-0.009	0.654
chronic	all	0.018	0.365	0.027**	0.018
	male	0.019	0.482	0.034	0.181
	female	0.021	0.419	0.025*	0.096
nchronic	all	0.048	0.248	0.074	0.119
	male	0.085	0.112	0.117**	0.050
	female	0.016	0.801	0.039	0.379
unmet	all	-0.005	0.629	0.004	0.408
	male	0.011	0.489	0.023***	0.001
	female	-0.024	0.107	-0.018*	0.082
hui	all	-0.003	0.545	-0.003	0.213
	male	0.000	0.989	0.003	0.497
	female	-0.009	0.279	-0.012**	0.026
limit	all	0.000	0.987	0.011	0.582
	male	0.003	0.867	0.014	0.451
	female	-0.004	0.857	0.007	0.758
absent	all	-0.208	0.179	-0.245	0.102
	male	0.182	0.217	0.160	0.268
	female	-0.422***	0.007	-0.518***	0.003
illabsent	all	-0.029	0.654	-0.084*	0.094
	male	-0.017	0.894	-0.015	0.848
	female	0.081	0.372	0.041	0.698
cognition	all	-0.005	0.765	-0.005	0.829
	male	-0.036	0.139	-0.03*	0.091
	female	0.042	0.118	0.036	0.264
drug	all	0.064	0.305	0.081	0.163
	male	0.046	0.570	0.048	0.274
	female	0.095	0.313	0.120	0.209
nfriend	all	0.560*	0.093	0.545***	0.010
	male	0.920**	0.050	0.728	0.154
	female	-0.030	0.948	0.159	0.795
insurance	all	0.016	0.181	0.013	0.194
	male	0.008	0.649	-0.001	0.960
	female	0.029*	0.056	0.029*	0.071

Table 1.9 DD estimator of log current minimum wage changes on health outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
goodh	all	-0.008	0.943	0.062	0.473
	male	-0.044	0.757	0.109	0.307
	female	0.019	0.909	-0.031	0.782
poorh	all	0.101*	0.096	0.126	0.110
	male	0.050	0.504	0.003	0.971
	female	0.172*	0.083	0.277**	0.031
bmi	all	1.358**	0.039	1.766**	0.030
	male	0.939	0.249	0.862	0.171
	female	2.276**	0.024	3.283***	0.009
obesity	all	-0.009	0.927	-0.005	0.946
	male	-0.039	0.761	-0.098*	0.094
	female	0.044	0.758	0.121	0.439
ddistress	all	-0.181	0.124	-0.186	0.189
	male	-0.258*	0.089	-0.325*	0.059
	female	-0.038	0.830	0.002	0.994
ddepress	all	-0.002	0.980	-0.104*	0.054
	male	-0.059	0.558	-0.208*	0.065
	female	0.073	0.583	0.048	0.658
chronic	all	0.112	0.322	0.195***	0.005
	male	0.054	0.716	0.097	0.469
	female	0.198	0.238	0.319**	0.035
nchronic	all	0.348	0.142	0.390**	0.028
	male	0.389	0.164	0.244	0.265
	female	0.340	0.394	0.616***	0.009
unmet	all	-0.015	0.810	-0.012	0.790
	male	0.081	0.330	0.078	0.171
	female	-0.129	0.148	-0.118*	0.080
hui	all	-0.017	0.585	-0.021	0.423
	male	0.007	0.874	0.014	0.650
	female	-0.048	0.309	-0.065***	0.008
limit	all	0.065	0.497	0.133**	0.012
	male	0.099	0.428	0.179**	0.036
	female	0.019	0.888	0.073	0.497
absent	all	-1.188	0.219	-1.267*	0.090
	male	0.544	0.447	0.530	0.489
	female	-4.094***	0.001	-4.241***	0.003
illabsent	all	-0.134	0.696	-0.235	0.638
	male	0.434	0.472	0.431	0.509
	female	-0.081	0.901	0.059	0.951
cognition	all	-0.025	0.819	-0.023	0.799
	male	-0.181	0.194	-0.195**	0.029
	female	0.216	0.208	0.222**	0.042
drug	all	0.464	0.216	0.652**	0.040
	male	0.256	0.557	0.290	0.484
	female	0.666	0.284	0.966	0.107
nfriend	all	1.327	0.486	1.621	0.150
	male	4.210*	0.085	3.059	0.274
	female	-3.196	0.249	-1.274	0.667
insurance	all	0.101	0.146	0.053	0.639
	male	-0.001	0.993	-0.024	0.811
	female	0.249***	0.006	0.146	0.301

Table 1.10 DDD estimator of log current minimum wage changes on health outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
goodh	all	-0.025	0.847	0.072	0.590
	male	-0.069	0.695	0.082	0.515
	female	-0.005	0.980	0.007	0.968
poorh	all	0.136*	0.052	0.153	0.121
	male	0.094	0.292	0.010	0.893
	female	0.211*	0.061	0.341**	0.039
bmi	all	1.332*	0.077	2.101***	0.001
	male	0.744	0.429	0.680	0.215
	female	2.440**	0.034	4.238***	0.001
obesity	all	0.010	0.924	0.042	0.576
	male	0.000	1.000	-0.064	0.424
	female	0.043	0.779	0.184	0.202
ddistress	all	-0.086	0.530	-0.115	0.239
	male	-0.140	0.443	-0.249	0.199
	female	0.033	0.872	0.079	0.696
ddepress	all	-0.025	0.790	-0.104**	0.016
	male	-0.107	0.373	-0.198*	0.063
	female	0.094	0.525	0.041	0.750
chronic	all	0.061	0.645	0.14*	0.082
	male	0.124	0.484	0.239	0.178
	female	0.010	0.960	0.058	0.560
nchronic	all	0.252	0.369	0.431	0.114
	male	0.611*	0.078	0.795**	0.044
	female	-0.087	0.849	0.142	0.487
unmet	all	-0.072	0.322	-0.033	0.249
	male	0.061	0.537	0.113*	0.091
	female	-0.226**	0.029	-0.194***	0.002
hui	all	-0.020	0.579	-0.018	0.458
	male	-0.010	0.836	0.008	0.841
	female	-0.041	0.449	-0.057**	0.014
limit	all	0.038	0.732	0.107	0.267
	male	0.106	0.462	0.201**	0.040
	female	-0.041	0.796	-0.005	0.976
absent	all	-1.384	0.170	-1.504*	0.094
	male	-0.089	0.912	-0.159	0.858
	female	-3.720***	0.003	-4.048***	0.008
illabsent	all	-0.185	0.664	-0.388	0.348
	male	0.465	0.510	0.433	0.384
	female	-0.073	0.918	0.015	0.987
cognition	all	0.026	0.840	0.072	0.541
	male	-0.133	0.426	-0.070	0.519
	female	0.278	0.152	0.294**	0.033
drug	all	0.600	0.165	0.730*	0.062
	male	0.553	0.296	0.58**	0.047
	female	0.675	0.331	0.900	0.180
nfriend	all	1.837	0.422	2.479	0.192
	male	4.836	0.144	3.875	0.341
	female	-2.967	0.322	-0.526	0.876
insurance	all	0.065	0.406	0.051	0.440
	male	-0.042	0.712	-0.099	0.156
	female	0.233**	0.020	0.238*	0.058

Table 1.11 DD estimator of real current minimum wage changes on health behaviours

		robust std. err.			cluster std. err.		
		coeff.	p-value	n	coeff.	p-value	n
drinker	all	-0.010	0.376	11799	-0.011	0.191	10701
	male	-0.016	0.285	6705	-0.016	0.173	6071
	female	-0.001	0.970	5094	-0.003	0.755	4630
fre	all	0.192	0.376	11629	0.321	0.210	10545
	male	0.032	0.916	6594	0.151	0.588	5968
	female	0.374	0.207	5035	0.455	0.116	4577
fre|drinker	all	0.188	0.416	10573	0.298	0.285	9558
	male	0.006	0.985	6079	0.063	0.849	5485
	female	0.400	0.209	4494	0.522	0.106	4073
bfre	all	-0.052	0.448	11731	-0.099	0.117	10641
	male	-0.174	0.111	6663	-0.281***	0.003	6034
	female	0.123**	0.022	5068	0.141**	0.031	4607
bfre|drinker	all	-0.042	0.517	10681	-0.092	0.127	9659
	male	-0.155	0.137	6152	-0.271***	0.005	5554
	female	0.128**	0.026	4529	0.155**	0.023	4105
ADAC	all	-0.083**	0.032	11677	-0.098***	0.002	10592
	male	-0.152**	0.018	6611	-0.18***	0.003	5986
	female	0.002	0.955	5066	0.001	0.961	4606
ADAC|drinker	all	-0.089**	0.033	10627	-0.104***	0.001	9610
	male	-0.163**	0.019	6100	-0.197***	0.001	5506
	female	0.004	0.910	4527	0.008	0.575	4104
heavy	all	0.012	0.475	12871	0.012	0.230	11680
	male	0.009	0.695	7240	0.012	0.463	6561
	female	0.019	0.428	5631	0.015	0.174	5119
heavy|drinker	all	-0.002	0.908	10749	-0.004	0.662	9719
	male	-0.027	0.198	6194	-0.032**	0.017	5591
	female	0.032*	0.071	4555	0.032**	0.035	4128
dsmoker	all	-0.014	0.188	12858	-0.023**	0.020	11667
	male	-0.014	0.356	7231	-0.030**	0.042	6552
	female	-0.014	0.383	5627	-0.013	0.268	5115
dosmoker	all	-0.021**	0.050	12858	-0.03***	0.002	11667
	male	-0.017	0.250	7231	-0.031***	0.007	6552
	female	-0.027*	0.075	5627	-0.03***	0.007	5115
cig	all	-0.324*	0.087	12652	-0.441***	0.005	11482
	male	-0.404	0.124	7119	-0.562***	0.001	6451
	female	-0.216	0.408	5533	-0.264	0.168	5031
cig|dsmoker	all	-0.280	0.397	4507	-0.253	0.166	4041
	male	-0.752	0.107	2596	-0.628***	0.006	2319
	female	-0.048	0.906	1911	-0.181	0.153	1722
cig|dosmoker	all	-0.046	0.889	4904	-0.064	0.708	4379
	male	-0.399	0.408	2826	-0.423**	0.032	2507
	female	0.198	0.626	2078	0.137	0.554	1872
inactive	all	-0.030*	0.090	12556	-0.020	0.123	11387
	male	-0.013	0.579	7008	0.005	0.747	6343
	female	-0.052**	0.033	5548	-0.052***	0.003	5044
leisure	all	-0.003	0.757	12556	-0.005	0.569	11387
	male	-0.015	0.278	7008	-0.019	0.338	6343
	female	0.010	0.487	5548	0.013	0.289	5044
sleep	all	0.001	0.977	5488	0.015	0.470	4920
	male	0.012	0.773	2982	0.026	0.409	2661
	female	-0.009	0.809	2506	0.004	0.892	2259
fv	all	-0.091	0.388	5405	-0.141	0.142	4845
	male	-0.157	0.205	2939	-0.146	0.206	2622
	female	-0.006	0.974	2466	-0.092	0.275	2223

Table 1.12 DDD estimator of real current minimum wage changes on health behaviours

		robust std. err.			cluster std. err.		
		coeff.	p-value	n	coeff.	p-value	n
drinker	all	-0.016	0.192	42139	-0.019*	0.068	37300
	male	-0.019	0.233	21306	-0.020	0.174	18940
	female	-0.010	0.580	20833	-0.015	0.270	18360
fre	all	0.125	0.631	41464	0.184	0.513	36689
	male	-0.037	0.922	20937	0.038	0.911	18598
	female	0.240	0.483	20527	0.231	0.458	18091
fre|drinker	all	0.132	0.632	38824	0.177	0.581	34260
	male	-0.086	0.827	19767	-0.059	0.891	17523
	female	0.317	0.385	19057	0.347	0.314	16737
bfre	all	-0.087	0.250	41974	-0.145***	0.005	37156
	male	-0.196	0.106	21203	-0.286**	0.013	18850
	female	0.076	0.197	20771	0.050	0.477	18306
bfre|drinker	all	-0.073	0.317	39352	-0.135***	0.006	34740
	male	-0.176	0.135	20044	-0.273**	0.026	17783
	female	0.087	0.165	19308	0.063	0.419	16957
ADAC	all	-0.116***	0.007	41725	-0.122***	0.005	36931
	male	-0.185***	0.009	21004	-0.181**	0.016	18672
	female	-0.025	0.478	20721	-0.045*	0.065	18259
ADAC|drinker	all	-0.125***	0.008	39103	-0.128***	0.006	34515
	male	-0.202***	0.008	19845	-0.199**	0.012	17605
	female	-0.022	0.568	19258	-0.037	0.151	16910
heavy	all	0.017	0.371	45313	0.019	0.161	40142
	male	0.009	0.752	22721	0.014	0.223	20203
	female	0.031	0.249	22592	0.026	0.123	19939
heavy|drinker	all	0.003	0.869	39517	-0.001	0.879	34884
	male	-0.033	0.174	20147	-0.037**	0.038	17873
	female	0.05**	0.012	19370	0.043**	0.026	17011
dsmoker	all	-0.003	0.806	45271	-0.009	0.292	40104
	male	-0.001	0.972	22694	-0.012	0.232	20178
	female	-0.005	0.757	22577	-0.003	0.809	19926
dosmoker	all	-0.013	0.305	45271	-0.022***	0.006	40104
	male	-0.011	0.537	22694	-0.024**	0.011	20178
	female	-0.016	0.340	22577	-0.021*	0.090	19926
cig	all	-0.182	0.411	44627	-0.247	0.230	39521
	male	-0.318	0.326	22372	-0.427	0.196	19882
	female	-0.017	0.952	22255	0.007	0.972	19639
cig|dsmoker	all	-0.533	0.227	11327	-0.635*	0.059	10062
	male	-1.511**	0.016	6154	-1.759***	0.001	5463
	female	0.131	0.818	5173	0.026	0.902	4599
cig|dosmoker	all	-0.108	0.808	12945	-0.286	0.301	11435
	male	-0.785	0.219	6993	-1.158***	0.005	6171
	female	0.313	0.583	5952	0.325	0.436	5264
inactive	all	-0.044**	0.036	44586	-0.036**	0.044	39472
	male	-0.020	0.501	22171	-0.001	0.965	19689
	female	-0.076***	0.006	22415	-0.081***	0.002	19783
leisure	all	0.007	0.565	44586	0.007	0.167	39472
	male	-0.007	0.659	22171	-0.004	0.709	19689
	female	0.023	0.153	22415	0.022	0.172	19783
sleep	all	-0.019	0.543	22400	-0.010	0.671	19500
	male	-0.002	0.974	10828	0.002	0.959	9428
	female	-0.032	0.446	11572	-0.018	0.402	10072
fv	all	-0.085	0.483	22149	-0.085	0.525	19273
	male	-0.190	0.191	10691	-0.180	0.253	9307

female	0.036	0.856	11458	0.043	0.764	9966

Table 1.13 DD estimator of one-year lag minimum wage changes on health behaviours

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
drinker	all	-0.002	0.845	-0.003	0.588
	male	-0.001	0.967	0.002	0.766
	female	-0.005	0.779	-0.008	0.347
fre	all	0.255	0.282	0.398**	0.029
	male	0.166	0.620	0.334**	0.032
	female	0.373	0.220	0.446	0.111
fre|drinker	all	0.213	0.403	0.341*	0.077
	male	0.084	0.813	0.200	0.348
	female	0.391	0.236	0.502	0.104
bfre	all	-0.086	0.224	-0.125**	0.044
	male	-0.225**	0.041	-0.313***	0.001
	female	0.123**	0.033	0.14**	0.030
bfre|drinker	all	-0.087	0.190	-0.129**	0.032
	male	-0.218**	0.034	-0.313***	0.001
	female	0.122**	0.045	0.144**	0.036
ADAC	all	-0.081*	0.058	-0.095**	0.013
	male	-0.154**	0.024	-0.179**	0.014
	female	0.020	0.500	0.021	0.290
ADAC|drinker	all	-0.092**	0.047	-0.105***	0.004
	male	-0.169**	0.021	-0.196***	0.007
	female	0.020	0.528	0.027	0.230
heavy	all	0.009	0.625	0.008	0.428
	male	0.013	0.604	0.016	0.369
	female	0.007	0.771	0.001	0.911
heavy|drinker	all	-0.005	0.746	-0.008	0.199
	male	-0.023	0.287	-0.027**	0.034
	female	0.021	0.242	0.016	0.253
dsmoker	all	-0.015	0.162	-0.024***	0.006
	male	-0.017	0.263	-0.033**	0.034
	female	-0.012	0.431	-0.010	0.301
dosmoker	all	-0.019*	0.071	-0.028***	0.002
	male	-0.015	0.325	-0.03**	0.024
	female	-0.026*	0.067	-0.027**	0.028
cig	all	-0.342*	0.078	-0.43**	0.011
	male	-0.443	0.101	-0.565***	0.005
	female	-0.209	0.430	-0.238	0.199
cig|dsmoker	all	-0.451	0.199	-0.414	0.138
	male	-0.912*	0.055	-0.778**	0.019
	female	-0.242	0.589	-0.417***	0.003
cig|dosmoker	all	-0.181	0.605	-0.183	0.459
	male	-0.535	0.284	-0.518	0.193
	female	0.059	0.893	-0.049	0.803
inactive	all	-0.042**	0.026	-0.030**	0.027
	male	-0.039	0.127	-0.022	0.155
	female	-0.043*	0.087	-0.041**	0.034
leisure	all	0.006	0.572	0.006	0.536
	male	0.003	0.832	0.000	0.989
	female	0.009	0.563	0.013	0.253
sleep	all	-0.033	0.281	-0.018	0.589

	male	-0.030	0.511	-0.012	0.545
	female	-0.031	0.468	-0.018	0.740
fv	all	-0.098	0.414	-0.147	0.172
	male	-0.129	0.365	-0.123	0.448
	female	-0.055	0.779	-0.143	0.295

Table 1.14 DDD estimator of one-year lag minimum wage changes on health behaviours

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
drinker	all	-0.009	0.461	-0.010	0.229
	male	-0.003	0.825	-0.001	0.876
	female	-0.017	0.391	-0.020	0.132
fre	all	0.066	0.815	0.176	0.337
	male	0.015	0.970	0.159	0.559
	female	0.056	0.873	0.092	0.729
fre|drinker	all	0.051	0.863	0.157	0.464
	male	-0.070	0.869	0.043	0.907
	female	0.136	0.716	0.209	0.468
bfre	all	-0.122	0.119	-0.16***	0.002
	male	-0.246**	0.049	-0.308***	0.006
	female	0.067	0.284	0.056	0.418
bfre|drinker	all	-0.120	0.111	-0.159***	0.001
	male	-0.24**	0.043	-0.306***	0.006
	female	0.077	0.242	0.067	0.394
ADAC	all	-0.124***	0.009	-0.13**	0.015
	male	-0.197***	0.010	-0.193**	0.043
	female	-0.021	0.565	-0.037	0.131
ADAC|drinker	all	-0.137***	0.007	-0.14***	0.009
	male	-0.218***	0.007	-0.213**	0.028
	female	-0.017	0.661	-0.028	0.324
heavy	all	0.010	0.611	0.011	0.351
	male	0.005	0.862	0.010	0.338
	female	0.019	0.479	0.015	0.343
heavy|drinker	all	-0.006	0.726	-0.012	0.192
	male	-0.040	0.116	-0.044***	0.008
	female	0.038*	0.058	0.030	0.120
dsmoker	all	-0.005	0.692	-0.012	0.122
	male	-0.005	0.768	-0.018	0.103
	female	-0.004	0.806	-0.003	0.811
dosmoker	all	-0.010	0.414	-0.02***	0.009
	male	-0.012	0.500	-0.027***	0.000
	female	-0.010	0.530	-0.014	0.324
cig	all	-0.181	0.428	-0.239	0.182
	male	-0.395	0.237	-0.511*	0.073
	female	0.072	0.806	0.109	0.522
cig|dsmoker	all	-0.731	0.125	-0.876***	0.004
	male	-1.838***	0.006	-2.138***	0.000
	female	0.076	0.899	-0.075	0.798
cig|dosmoker	all	-0.246	0.604	-0.45*	0.095
	male	-1.063	0.119	-1.475**	0.011
	female	0.344	0.557	0.335	0.476
inactive	all	-0.055**	0.011	-0.045**	0.014
	male	-0.044	0.155	-0.028	0.288
	female	-0.069**	0.017	-0.067***	0.001
leisure	all	0.019	0.132	0.02**	0.035

	male	0.017	0.329	0.020	0.219
	female	0.021	0.219	0.021	0.107
sleep	all	-0.055	0.112	-0.049**	0.034
	male	-0.047	0.361	-0.045*	0.059
	female	-0.056	0.243	-0.044	0.319
fv	all	-0.095	0.489	-0.075	0.574
	male	-0.184	0.266	-0.159	0.420
	female	0.003	0.989	0.025	0.895

Table 1.15 DD estimator of log current minimum wage changes on health behaviours

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
drinker	all	-0.064	0.394	-0.075	0.217
	male	-0.109	0.277	-0.113	0.164
	female	0.002	0.983	-0.012	0.876
fre	all	1.096	0.472	2.120	0.248
	male	0.032	0.988	1.036	0.595
	female	2.299	0.265	2.912	0.180
fre|drinker	all	1.104	0.498	1.980	0.315
	male	-0.080	0.972	0.475	0.837
	female	2.463	0.268	3.351	0.169
bfre	all	-0.371	0.433	-0.703	0.126
	male	-1.167	0.121	-1.925***	0.005
	female	0.774**	0.041	0.919*	0.068
bfre|drinker	all	-0.300	0.508	-0.642	0.142
	male	-1.021	0.154	-1.847***	0.007
	female	0.802**	0.048	1.018*	0.054
ADAC	all	-0.618**	0.021	-0.726***	0.001
	male	-1.12**	0.011	-1.324***	0.002
	female	0.000	0.998	-0.009	0.938
ADAC|drinker	all	-0.656**	0.024	-0.763***	0.001
	male	-1.189**	0.013	-1.427***	0.001
	female	0.018	0.935	0.049	0.682
heavy	all	0.072	0.542	0.074	0.375
	male	0.058	0.721	0.078	0.497
	female	0.112	0.506	0.087	0.363
heavy|drinker	all	-0.028	0.776	-0.043	0.571
	male	-0.193	0.181	-0.238**	0.022
	female	0.198	0.119	0.202	0.112
dsmoker	all	-0.111	0.147	-0.179**	0.015
	male	-0.109	0.288	-0.234**	0.038
	female	-0.102	0.365	-0.095	0.287
dosmoker	all	-0.154**	0.038	-0.229***	0.002
	male	-0.130	0.199	-0.243***	0.006
	female	-0.193*	0.074	-0.214***	0.008
cig	all	-2.516*	0.058	-3.428***	0.003
	male	-3.197*	0.081	-4.438***	0.001
	female	-1.599	0.386	-1.967	0.159
cig|dsmoker	all	-2.273	0.320	-2.017	0.121
	male	-5.695*	0.075	-4.744***	0.002
	female	-0.291	0.920	-1.285	0.195
cig|dosmoker	all	-0.640	0.778	-0.705	0.585
	male	-3.338	0.315	-3.49**	0.029
	female	1.499	0.599	1.058	0.548
inactive	all	-0.223*	0.067	-0.153	0.109

	male	-0.120	0.475	0.009	0.938
	female	-0.359**	0.032	-0.366***	0.004
leisure	all	-0.025	0.718	-0.036	0.516
	male	-0.106	0.270	-0.136	0.337
	female	0.061	0.542	0.080	0.356
sleep	all	0.034	0.857	0.168	0.295
	male	0.105	0.723	0.256	0.331
	female	-0.039	0.878	0.070	0.741
fv	all	-0.460	0.536	-0.835	0.274
	male	-0.694	0.422	-0.629	0.527
	female	-0.085	0.945	-0.725	0.287

Table 1.16 DDD estimator of log current minimum wage changes on health behaviours

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
drinker	all	-0.105	0.210	-0.126*	0.094
	male	-0.131	0.230	-0.137	0.174
	female	-0.057	0.640	-0.092	0.386
fre	all	0.791	0.663	1.303	0.503
	male	-0.281	0.914	0.381	0.873
	female	1.543	0.517	1.496	0.510
fre|drinker	all	0.876	0.650	1.274	0.564
	male	-0.547	0.842	-0.245	0.935
	female	2.047	0.421	2.264	0.371
bfre	all	-0.610	0.242	-1.029***	0.006
	male	-1.338	0.110	-1.963**	0.018
	female	0.475	0.247	0.279	0.594
bfre|drinker	all	-0.507	0.317	-0.944***	0.008
	male	-1.184	0.145	-1.858**	0.035
	female	0.553	0.206	0.373	0.523
ADAC	all	-0.829***	0.006	-0.866***	0.007
	male	-1.353***	0.006	-1.303**	0.017
	female	-0.151	0.541	-0.304*	0.092
ADAC|drinker	all	-0.885***	0.006	-0.902***	0.010
	male	-1.458***	0.005	-1.417**	0.015
	female	-0.125	0.644	-0.242	0.200
heavy	all	0.107	0.424	0.119	0.245
	male	0.047	0.801	0.088	0.275
	female	0.202	0.281	0.173	0.195
heavy|drinker	all	0.001	0.993	-0.031	0.732
	male	-0.239	0.155	-0.278**	0.046
	female	0.325**	0.021	0.281*	0.077
dsmoker	all	-0.030	0.732	-0.075	0.241
	male	-0.011	0.929	-0.094	0.207
	female	-0.046	0.708	-0.030	0.768
dosmoker	all	-0.097	0.268	-0.165***	0.004
	male	-0.087	0.481	-0.185**	0.011
	female	-0.116	0.341	-0.148	0.101
cig	all	-1.559	0.315	-2.056	0.164
	male	-2.582	0.254	-3.415	0.147
	female	-0.293	0.886	-0.136	0.924
cig|dsmoker	all	-4.144	0.174	-4.811**	0.046
	male	-10.904**	0.011	-12.704***	0.001
	female	0.645	0.871	-0.085	0.955
cig|dosmoker	all	-1.055	0.729	-2.183	0.286
	male	-5.808	0.187	-8.422***	0.005

	female	2.061	0.600	2.246	0.430
inactive	all	-0.318**	0.028	-0.268**	0.039
	male	-0.163	0.425	-0.037	0.827
	female	-0.523***	0.007	-0.572***	0.002
leisure	all	0.043	0.592	0.045	0.183
	male	-0.053	0.637	-0.034	0.683
	female	0.153	0.169	0.144	0.190
sleep	all	-0.119	0.581	-0.034	0.857
	male	0.007	0.984	0.068	0.849
	female	-0.233	0.424	-0.121	0.420
fv	all	-0.352	0.681	-0.346	0.752
	male	-0.879	0.389	-0.772	0.559
	female	0.290	0.834	0.334	0.767

Table 1.17 DD estimator of real current minimum wage changes on labour outcomes

		robust std. err.			cluster std. err.		
		coeff.	p-value	n	coeff.	p-value	n
hour	all	-0.251	0.660	7106	0.163	0.747	6401
	male	0.562	0.449	3899	1.374*	0.080	3504
	female	-1.028	0.242	3207	-1.089**	0.036	2897
workweek	all	-0.333	0.510	7109	-0.293	0.595	6402
	male	-0.308	0.590	3903	-0.160	0.646	3506
	female	-0.440	0.599	3206	-0.444	0.560	2896
lookweek	all	1.265	0.544	1855	0.465	0.798	1648
	male	-1.752	0.528	1014	-2.685	0.252	913
	female	0.860	0.752	841	1.058	0.477	735
jobu	all	-0.019	0.169	6556	-0.02*	0.052	5893
	male	-0.025	0.207	3602	-0.022	0.255	3225
	female	-0.015	0.447	2954	-0.018**	0.038	2668

Table 1.18 DDD estimator of real current minimum wage changes on labour outcomes

		robust std. err.			cluster std. err.		
		coeff.	p-value	n	coeff.	p-value	n
hour	all	-0.052	0.938	27990	-0.102	0.771	24475
	male	0.980	0.256	13682	1.458*	0.051	11985
	female	-1.030	0.306	14308	-1.671***	0.001	12490
workweek	all	-0.113	0.845	28006	-0.598	0.136	24488
	male	-0.029	0.967	13695	-0.553	0.225	11994
	female	-0.185	0.841	14311	-0.603	0.105	12494
lookweek	all	1.679	0.462	6093	1.545	0.408	5190
	male	-0.296	0.924	2798	-0.737	0.714	2431
	female	0.750	0.801	3295	2.154	0.427	2759
jobu	all	-0.006	0.722	26390	-0.007	0.594	23066
	male	0.008	0.758	12872	0.002	0.911	11248
	female	-0.024	0.280	13518	-0.017*	0.084	11818

Table 1.19 DD estimator of one-year lag minimum wage changes on labour outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
hour	all	-0.990	0.135	-0.541	0.521
	male	-0.136	0.864	0.812	0.405
	female	-1.827*	0.089	-1.895**	0.033
workweek	all	-0.158	0.774	-0.162	0.707
	male	-0.008	0.990	0.058	0.875
	female	-0.527	0.562	-0.460	0.471
lookweek	all	1.215	0.609	1.109	0.689
	male	-3.115	0.315	-3.352	0.333
	female	3.766	0.215	3.495	0.172
jobu	all	-0.024	0.165	-0.021**	0.011
	male	-0.035	0.134	-0.033	0.195
	female	-0.014	0.556	-0.009	0.611

Table 1.20 DDD estimator of one-year lag minimum wage changes on labour outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
hour	all	-0.470	0.531	-0.565	0.502
	male	0.791	0.397	1.318	0.245
	female	-1.659	0.159	-2.389***	0.005
workweek	all	0.164	0.793	-0.416	0.266
	male	0.310	0.689	-0.418	0.337
	female	-0.125	0.900	-0.446	0.169
lookweek	all	1.252	0.629	1.880	0.477
	male	-1.915	0.588	-1.988	0.598
	female	3.579	0.286	4.622	0.186
jobu	all	-0.008	0.693	-0.005	0.656
	male	0.008	0.767	0.000	0.999
	female	-0.027	0.315	-0.011	0.346

Table 1.21 DD estimator of log current minimum wage changes on labour outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
hour	all	-1.395	0.720	2.070	0.588
	male	3.773	0.454	10.039*	0.080
	female	-6.167	0.306	-6.146	0.122
workweek	all	-1.647	0.637	-1.475	0.716
	male	-1.819	0.637	-1.116	0.619
	female	-1.995	0.732	-1.877	0.754
lookweek	all	6.187	0.660	0.703	0.957
	male	-12.185	0.499	-18.500	0.226
	female	1.049	0.953	2.804	0.769
jobu	all	-0.114	0.228	-0.119	0.143
	male	-0.160	0.239	-0.130	0.370
	female	-0.080	0.549	-0.108*	0.077

Table 1.22 DDD estimator of log current minimum wage changes on labour outcomes

		robust std. err.		cluster std. err.	
		coeff.	p-value	coeff.	p-value
hour	all	0.223	0.961	0.059	0.982
	male	7.252	0.222	10.809**	0.050
	female	-6.161	0.373	-10.633***	0.007
workweek	all	-0.221	0.956	-3.796	0.188
	male	0.144	0.976	-4.114	0.173
	female	-0.427	0.947	-3.128	0.298
lookweek	all	9.254	0.550	8.933	0.463
	male	0.274	0.989	-2.462	0.843
	female	-0.741	0.970	10.316	0.516
jobu	all	-0.032	0.788	-0.032	0.719
	male	0.060	0.735	0.025	0.836
	female	-0.147	0.338	-0.101	0.194

Chapter 2 Why do drinkers earn more? Job characteristics as a possible link

2.1 Introduction

There is a vast literature on the relationship between alcohol consumption and health (mortality and morbidity). The economic literature on alcohol consumption focuses on the determinants of alcohol consumption as well as on its potential effects, notably on labour market outcomes (participation, employment, and earnings). This study is part of that latter literature, and we investigate a potential explanation for the puzzling relationship between alcohol consumption and earnings, namely that moderate to high consumption is associated with higher earnings.

The statistical relationship between alcohol consumption and income (of those who work) is disputed, but a consensus seems to have emerged around the idea of an inverted U-shape, according to which increased consumption is linked to increased income at the lower end of the distribution of consumption but is negatively linked to income at higher levels of consumption. There have been attempts to explain this in the health literature. For example, in the past it has been suggested that moderate alcohol consumption might be good for health or cognitive functions (e.g. Britton et al., 2004, Baum-Baicker, 1985; Shapter et al. 1988). However more recent epidemiological evidence suggests that, even at low levels of consumption, alcohol does not improve health (Burton & Sheron, 2018) and that the better cognitive function of drinkers relative to non-drinkers mostly captures reverse causality (some non-drinkers have pre-existing health issues preventing them from drinking, including cognitive impairment, (Hassing, 2018). The latter is consistent with the non-causal explanation we suggest that occupational characteristics explain some of the drinking premium.

It is of course almost impossible to establish a causal relationship from alcohol consumption to earnings, especially on the left portion of the inverted U-shaped curve, due to plausible reverse causality (alcohol is a normal good, with a positive income elasticity), although it might be expected that at least at higher incomes much of the effect of increasing income on alcohol expenditure would be manifested in purchasing more expensive products as opposed to higher personal alcohol consumption of alcohol volume. There could also be unobservable heterogeneity i.e., those who can drink more within this range are more "resilient" or in better unobserved health, and hence are more productive. This study suggests and empirically tests the additional possibility that variation in job characteristics can explain a portion of the association, at least in the portion of the curve where increased consumption is associated with higher income.

The intuition is that individuals in occupations with some job characteristics may be more likely to drink or drink more frequently or drink more heavily. Such job characteristics could include for example that the occupation involves social interactions which may involve alcohol; that the occupation has regular work schedules that facilitate alcohol consumption (going for drinks after work); or that the occupation is demanding in some dimensions such that alcohol may be used either to reduce stress or to “unwind”. These same job characteristics can be associated with positions with better earnings, contributing in a non-causal way to the correlation between income and alcohol consumption.

To our knowledge, only one study so far used job characteristics in an exploration of the drinking income premium. Studying workers 36 and younger in the United States, Adams et al. (2022) link a population survey with data on drinking behaviours, income, the determinants of income (human capital) and occupation to a data set called O*NET describing occupations by their required skills or main activities. They then classify occupations as "social" or "non-social" based on four work skills ("social perceptiveness", "coordination", "persuasion", and "negotiation"): for each occupation, they calculate a score by summing these four variables; they then calculate the average over all occupations and classify any occupation with a score higher than the average as "social". They then compare the premium across these two categories of jobs and find that the return on drinking is significantly higher for individuals holding social jobs than for those holding non-social jobs: controlling for age, one additional year of regular drinking in the past is associated with an increase in income of 5.3% if the current job is "social", but 3.7% only if the job is "non-social". Their interpretation of this difference is that social capital is the link between alcohol consumption and earnings: the building of social capital may involve alcohol consumption and higher social capital leads to higher income. We then continue by, instead of comparing the return or premium across categories of jobs, focusing on how much of the drinking return or premium is "explained" (or reduced) by controlling for job characteristics (beyond the social/non-social divide) and how that varies with gender. We also add to the literature by testing a variety of definitions of alcohol consumption (binary: drinkers versus non-drinkers, by frequency of drinking, by average daily amount, and using a combination of frequency and volume). We find that the drinking premium decreases by one-third after adding job characteristics. We also find that the decrease is more important among women (up to 50%) than men (around 20%), suggesting that, among women, a large share of the premium detected in previous studies resulted from unaccounted for heterogeneity in occupational environment. We believe that this is an innovative direction of research that can help explain the paradoxical observed earnings advantage that has been linked to drinking behaviour.

2.2 What do we know of the link between drinking and income?

The literature on associations between alcohol consumption and income can be divided as follows: First, different studies use different outcome variables (labour market participation, employment, or income of those who work). Second, different studies deal differently with the potential for spurious correlation. Some studies add controls to the regression, in order to identify variables linked both to alcohol consumption and income whereas other studies attempt to use instruments and isolate a pure causal relationship between alcohol consumption and income. This study belongs in the former school, and we test a plausible link by measuring the effect on the association between alcohol consumption and income of introducing a series of variables associated with job characteristics, that are potentially linked both with alcohol consumption and income.

Related to the theoretical work by Becker (1962) on human capital, Grossman (1972) suggests a positive relationship between health and earning. Health is a combination of exogenous factors (genetics) and endogenous factors (health behaviours) such as smoking and drinking. While a prevailing view of abusive drinking is that it has a depressant effect on earnings and wages (e.g., Fisher 1927; Rice 1993), most researchers have found an inverted U-shape according to which income first increases with alcohol consumption, until a peak is reached and then income decreases when consumption increases further.

According to the estimates of Berger and Leigh, 1988, the peak is at two drinks per day for men and one or two a week for women from a sample with individuals who work 20 or more hours per week; Using data from 1985 Canadian General Survey and restrict sample of working males, Hamilton and Hamilton, 1997 find that moderate drinkers do better than abstainers and heavy drinkers (the latter being defined as those who drank at least once a week in the last year and drank eight or more drinks on one or more days in the previous week); Using a randomly selected sample of workers of four worksites, French and Zarkin (1995) find that wages reach their peak at around 1.5 to 2.5 drinks per day on average.

Auld (2005) argues that smoking and drinking are highly correlated behaviours, and that the positive link between moderate drinking and income may have been underestimated by not entering smoking behaviour as a control: smokers tend to earn less than non-smokers (see for instance, Bhai, 2020 or Darden et al. 2021 for recent references on this topic) and drinkers are more likely to be smokers. Therefore, the positive link between drinking and income for moderate drinking might be stronger than previously thought once smoking is controlled for. Controlling for smoking might even reveal a positive link above the conventional thresholds: indeed, Auld (2005) finds a positive link between drinking and income even among heavy drinkers, once controlling for the fact that these heavy drinkers are smokers. In our empirical study, we control for smoking behaviour.

Social networks may be one pathway to explain the drinking premium. Peters and Stringham (2006) suggest that it is not so much whether you drink but also where you drink that matters and their study of social drinking (a variable indicating whether the individual frequents a bar at least once a month) indicates that it is more strongly associated with higher earnings than non-social drinking (the premium of the former is 17% relative to non-drinkers, compared to 10% for non-social drinkers). Mundt and French (2013) build on that idea to suggest that a portion of the positive link between alcohol consumption and earnings can be explained by individual sociability and social interaction. They use wave I and IV of the National Longitudinal Survey of Adolescent Health to measure the link between adolescent (up to age 18 in Wave I) drinking habits and earnings as adults (the same individuals observed in Wave IV). They confirm the existence of a premium (adults who drank as adolescents make more) but, after controlling for characteristics of the neighborhood where the respondent lived when an adolescent, such as level of friendship, trust, and social participation, and personal sociability such as friendship and sport/club participation, they find that the future earning premium of adolescent up to age 18 in Wave I) binge drinking (having 5 or more drinks in a row) is reduced. However as will be discussed (in the variables sub-section) and as in Dilmaghani (1995), we find that social networks and social capital do not seem to explain much of the positive correlation between drinking and income in our data.

As mentioned, some researchers try to estimate the causal portion of the link by instrumenting alcohol consumption. McDonald and Shields (2001) find that the link is not entirely spurious but Auld, (2005) objects that the instruments are weak and cannot really tease out causal relationships. Overall, it appears to be largely agreed upon in that literature that it is almost impossible to find good instruments for the relationship between alcohol consumption and income (Cook and Peters, 2005), mostly because instruments such as chronic diseases, religion, and attitude toward the risk of alcohol are likely to affect earnings directly as well as through any potential link through alcohol consumption. Another approach is to use fixed effects with longitudinal data: Böckerman et al. (2017) find a negative causal relationship between heavy drinking and income (former drinkers and heavy drinkers earn almost 20% less than moderate drinkers) and Tekin (2014) finds alcohol consumption has a small, positive, and linear causal effect on the wage rate by using fixed effect models. The issue with these studies is that while they can potentially tease out causal from spurious relationships, they don't explain why there could be a relationship (causal or spurious). Analysis of Finnish twin data by Böckerman et al. (2018) does not completely rule out non-causal explanations for the negative association between alcohol consumption and labour market outcomes later in life. They indicate that some unmeasured characteristic may also be significantly related to alcohol consumption and labour market success, which may lead to alcohol consumption and long-term labour market outcomes to be correlated. Tekin shows that fixed effect models generate drinking premium estimates which are smaller in magnitude compared with those of cross-sectional models.

As noted, in this study, we follow another approach: we try to model explicitly the sources of heterogeneity that might explain the spurious correlation. One plausible such source of heterogeneity is that alcohol consumption is associated with certain job characteristics, which in turn are linked with higher income. That is: a) some job characteristics leads to more drinking, and b) those same job characteristics are associated with higher earnings. As the link between job characteristics and earnings is well documented and accepted, we provide below an overview of empirical findings in the literature on the former only.

2.3 Link between job characteristics and drinking

The job characteristic that the literature has mostly associated with drinking behaviour is job stress (pressure, strain, level of responsibility) and it is usually found to increase drinking or heavy or binge drinking. Thus, Crum et al. (1995) using data from the

US National Institute of Mental Health Epidemiologic Catchment Area (ECA) Program, find that men working in jobs with high psychological demand and low job control are 27.5 times more likely to suffer from alcohol abuse dependence. Martin et al. (1996) use data from the US National Employee Survey (NES) to show that workers with high job pressure and low decisional authority are more likely to engage in job-escape drinking. In addition, participation in work-based drinking networks and levels of social support also substantially affect workers' drinking behaviours. Zhang and Snizek (2003) use data from O*NET and the US National Household Survey on Drug Abuse (NHSDA) and show that steady employment and job security could significantly reduce alcohol use among US full-time workers. Moreover, they find that characteristics such as the pace of activity, job independence, and skills utilization, and feelings of accomplishment have no significant impact on employees' alcohol use. In addition, they find that workers in well-paid occupations are more likely to have used alcohol than are workers in lower paying occupations. After demographic characteristics are controlled for, this significant association of wage level with casual and heavy drinking disappears. Using data from the Québec Health and Social Survey (QHSS), Marchand (2008) finds that workplace harassment is positively associated with drinking, and Azagba and Sharaf (2011), using the Canadian National Population Health Survey find a strong association between job stress and heavy drinking but also emphasize it can be mediated by unobserved characteristics such as self-control, stress-coping ability, personality traits and health preferences. Last, Heikkilä et al. (2012) use European cross-sectional data to find evidence that non-drinkers and heavy drinkers have higher odds of job strain compared with moderate drinkers, while intermediate drinkers are less likely to report work-related stress.

Other occupational characteristics influencing drinking are the level of physical activity (how physically demanding the job is) and hazards: Crum et al. (1995) find that men with a high physical demand and low job control are 3.4 times more likely to suffer from an alcohol disorder in US data. Using data from O*NET, US National Health Interview Survey, and US National Health and Nutrition Examination Survey, Alterman et al. (2008) find that physical activity and hazardous work exposures are positively associated with heavy drinking, while other factors such as being kept informed within the workplace and having a positive psychosocial work environment while working with others are negatively linked to heavy alcohol intake. Barnes and Zimmerman (2013) use combined data from the NLSY79 and O*NET and conduct an exploratory factor analysis on the potential relationship of 119 occupational attributes on occupational attributes and excessive drinking. The study finds that physical demands, job autonomy, and social engagement could explain most of the variation in drinking behaviour.

Lastly, it has been found that prestige can be positively associated with alcohol behaviour: Using data from US National Health Interview Surveys, McKetta et al. (2021) finds that among an adult sample (ages 30 to 49), both males and females in high-prestige occupations increased binge drinking at higher rates during 2006-2018 than those in low-prestige occupations. Females and those in jobs with higher authority, autonomy and expertise increased binge drinking by more.

2.4 Data and Methods

2.4.1 Data

We combine two data sets: First, individual-level data on income and drinking behaviours, as well as the usual determinants of income, come from the 2015-2016 Canadian Community Health Survey (CCHS) accessed in the Research Data Centre (RDC) at McMaster University. The CCHS is a cross-sectional survey that collects information related to health and health care utilization on a random sample of 110,095 respondents who are representative of the Canadian population aged 12 and older living independently (no institutionalized respondents) and excluding some remote northern regions of the country. In this study, we use data on health-related behaviours (drinking), health status (excluding individuals in poor health), National Occupation Code (NOC), and the social determinants of health such as income. In order to obtain results that are representative of the population, as well as to honor confidentiality restrictions imposed by Statistics Canada, all analyses are based on weighted data, with weights provided by Statistics Canada. The sampling weights also embody a post-stratification weighting procedure to correct for non-response.

Second, we use the Occupational Information Network (O*Net), developed under the sponsorship of the US Department of Labor/Employment and Training Administration (USDOL/ETA). It aims to provide up-to-date information on the characteristics of workers and jobs for understanding changes in the nature and environment of work and their impacts on the labour force (www.onetonline.org). The information on each occupation (job) is collected via a survey of job incumbents and includes numerical assessments of the importance and level of various tasks, activities, required knowledge, education and training, work style components and work context elements. Occupations are then described based on the average responses to each dimension (average importance and average level). To supplement this survey information, a team of trained occupational analysts rate the importance and level of various abilities and skills for each occupation. Each descriptor in O*NET is standardized between 0 and 100.

To use O*NET data, we convert US occupation codes in O*NET to Canada's NOC system; to do so, we update the Brookfield Institute's O*NET-NOC Crosswalk (https://github.com/BrookfieldIIE/NOC_ONet_Crosswalk) by manually replacing old O*NET codes with new ones. The occupations of workers to CCHS are known through their NOC code and we then merge the two files, thus assigning to each CCHS respondent the O*NET descriptors of their occupation.

This study uses a restricted sample of CCHS respondents aged 25 to 64, thus studying those likely to be in the labour force. This brings the sample size to 63,773 (58% of the original sample, which is in line with the share of the 25-64 in the 12 and older population in Canada, at 59% in Statistics Canada Table 17-10-0005-01).

We also exclude 2,223 individuals (or 3.5% of selected respondents) who report being in poor health (out of five possible answers: excellent, very good, good, fair and poor), bringing the sample size to 61,550. The rationale for excluding these respondents is that they are less likely to drink (because of their health status) and also less likely to earn high incomes (for the same reason). It is standard in the literature on the so-called drinking premium to exclude those individuals, in order to focus on a relationship between alcohol consumption and income that is not entirely explained by health.

We then keep only respondents who are employed or self-employed and who have strictly positive income and working hours in the 12 months preceding the interview, bringing the sample size to 42,415 (10,622 are excluded because they do not report being in the labour force, 3,543 because their income or working hours are 0, and another 4,970 due to missing value on hours of work). Another 512 respondents are dropped due to a missing value for NOC. We could not find the job reported by 1,044 respondents in the O*Net file and had to drop those observations as well. Finally, 1,791 respondents were missing information on one of the independent variables we enter in the analysis and were dropped, bringing the final sample size to 35,191 if we use the restricted sample (major source of income is wage or self-employment income) or 39,068 if we use all in the workforce.

2.4.2 Variables

Income is measured as total annual personal income from all sources before taxes and deductions. We enter log (Income) in the regressions to reduce skewness. CCHS does not have an earnings question. Because income is not earnings (it also includes interest received, capital gains and dividends, plus social transfers), we use an auxiliary variable: we know what the main source of income is, and we can therefore select as our population of reference individuals whose main source of income is earnings. We run the preferred version of the model on individuals who reported their main source of income was earnings (n=35,191) and another on all 39,068 respondents as a sensitivity check. Average income is CAD 65,755, which is somewhat higher than the average individual income of those aged 25 to 64 with a positive income (57,700 in Statistics Canada Table 17-10-0005-01). As another sensitivity check we use total income divided by the self-reported usual number of hours in the week (multiplied by 52) to get an approximation of hourly earnings; this allows us to test whether the premium is mostly a matter of longer hours of work or higher earnings per hour. Average hourly income is 32.4, which is substantially higher than the average hourly wage of the Canadian population (around 28 in Statistics Canada Table 14-10-0064-01), but this is not surprising since our estimate includes all sources of income and not only wages.

The main independent variable of interest: drinking behaviour.

We use four different descriptions of drinking behaviour (in five separate models):

1. A binary variable separating non-drinkers (no alcohol consumption in the past 12 months) from drinkers (at least one instance of alcohol consumption in the same period). About 13% of the sample report themselves as non-drinkers.

2. A further distinction is made among drinkers between regular (at least once a month) and occasional drinkers. We create a variable taking three possible values: non-drinker, occasional drinker, and regular drinker.
3. Volume: Average Daily alcohol consumption (ADAC) in the week before the interview, measured in number of drinks (continuous variable). There are 41.5% of respondents in our sample report 0 here, including the 4,285 non-drinkers.
4. Frequency of drinking during the past 12 month in eight categories: 1. Never drinks, 2. Less than once a month, 3. Once a month, 4. Two to three times a month, 5. Once a week, 6. Two to three times a week, 7. Four to six times a week, 8. Every day.
5. A categorization of drinking behaviour using a combination of frequency of drinking and frequency of binge drinking based on a definition from the Substance Abuse and Mental Health Services Administration (SAMSHA). The first variable in the combination is the one described in bullet point 4, aggregated as follows: never; less than once a month; once or more per month. The second variable describes the frequency of binge drinking: how many times the respondent drank 5 (males) or 4 (females) drinks on one occasion, with values "less

than once a month", "more than once a month but less than once a week" and "once a week or more". The combined variable takes five possible values: non-drinkers, light drinkers (drink less than once a month and binge drink less than once a month), moderate drinkers (drink more than once a month but binge drink less than once a month), binge drinkers (binge drink more than once a month but less than once a week) and heavy drinkers (binge drink once a week or more). Table A2.0 in the appendix details the categories.

The coefficients on these variables in the regressions will describe the drinking premium (binary alcohol variable) or return to consumption (ordinal or continuous variables).

Plausible mechanism: Job characteristics.

We use three different ways to control the drinking premium by job characteristics:

1. Occupational group:

1.1. Management

1.2. Business, finance and administration

1.3. Natural and applied sciences

1.4. Health

1.5. Education, law, social/community/government services

1.6. Art, culture, recreation and sport

1.7. Sales and services

1.8. Trades, transport, equipment operators

1.9. Natural resources, agriculture

1.10. Manufacturing and utilities

2. Perceived stress at work (in CCHS): “not at all stressful”, “not very stressful”, “a bit stressful”, “quite a bit stressful”, and “extremely stressful.” We built a binary variable separating those reporting “quite a bit stressful” or “extremely stressful” from the rest.

3. Job characteristics from O*Net:

3.1. Competition: Amount of competition that the worker will face as part of this job.

3.2. Conflict: How often are there conflict situations the employee has to face in this job?

3.3. Free: How much decision-making freedom, without supervision, does the job offer?

3.4. Team: How important is it to work with others in a group or team in this job?

3.5. Hazard: How often does this job require the worker to be exposed to hazards?

3.6. Impact: The frequency and nature of the impact of worker's decisions on the organization.

3.7. Lead: How important is it to lead others in accomplishing work activities in this job?

3.8. Outcome: How responsible is the worker for the work outcomes and results of other workers?

3.9. Schedules: How regular are the work schedules for this job?

We also use two pieces of information from O*NET, “job zones”, a summary of the level of responsibility in an occupation and “job interests”, a summary of the type of occupation (another occupation classification, comparable to our first variable).

3.10. Job Zones from O*Net, a grouping of occupations into one of five categories based on levels of education, experience, and on-job training need to do the work: Job Zone 1: Little or No Preparation Needed; Job Zone 2: Some Preparation Needed; Job Zone 3: Medium Preparation Needed; Job Zone 4: Considerable Preparation Needed; Job Zone 5: Extensive Preparation Needed.

3.11. Job interests: preferences for work environments and outcomes. There are five types of interests in O*NET: 1. What are called “realistic” occupations frequently involve work activities that include practical, hands-on problems and solutions; workers in realistic occupations often deal with plants, animals, tools, and machinery; 2. Investigative occupations frequently involve working with ideas and require an extensive amount of thinking; 3. Artistic occupations frequently involve working with forms, designs and patterns; 4. Social occupations frequently involve working with, communicating with, and teaching people; 5. Enterprising occupations frequently involve starting up and carrying out projects; 6. Conventional occupations frequently involve following set procedures and routines.

As control variables, we enter these variables that can be associated with income: sex, age, education, cohabitation status, immigration status, household size, area classification, and smoking behaviour.

Sex is entered as a dummy for male (the reference is female or other).

Age is entered as a continuous variable. Age2 in the regression is age square divided by 100.

Education: 1. less than secondary school graduation (reference); 2. secondary school graduation, no post-secondary education; 3. post-secondary certificate diploma or university degree.

Cohabitation status is entered as a dummy for people who are married or have common-law partner (the reference is non-married or have no common-law partner)

Immigration status is entered as a dummy for immigrant (the reference is people born in Canada).

Area classification: 1. Rural area (less than 1,000, reference), 2. Small population centre (1,000 to 29,999), 3. Medium population centre (30,000 to 99,999), 4. Large urban population centre (100,000 or greater).

Smoking behaviour is entered as a dummy for current smoker (the reference is people who did not smoke any cigarettes in the past month).

2.4.3 Method

We estimate the relationship between alcohol consumption and income. We run regressions on the restricted sample (major source of income is wage or self-employment income) for our main results and use the sample that includes all in the workforce for robustness checks. We use Ordinary Least Squares (OLS) using the CCHS sampling weights and estimate first without controls for job characteristics and then with these controls, measuring the change in the strength of the association between alcohol consumption and income or hourly rate, thus estimating the contribution of job characteristics to the apparent link between alcohol consumption and labour market outcomes. We also run separated regressions for males and females because we expect the premium/return and the role of job characteristics in the premium/return to differ across genders.

We use bootstrap weights provided in CCHS to estimate regression standard errors.

2.5 Results

From Table 2.1, our sample mean of age is around 43.3 and around 73% of observations are regular drinkers. From Table A2.1, in the raw comparison without any controls, drinkers earn around $17,000 more per year and with our income per hour measure $7 more than that for non-drinkers on average. Table A2.1 in the Appendix also shows a strong rate of return of frequency of drinking, plateauing only at very high frequencies (everyday compared to 4-6 times a week). The bottom panel of the table gives the regression coefficients for the linear and squared number of drinks variables The squared variable's coefficient is small in magnitude implying that maximum income would occur with around 45 drinks, an unrealistic value.

Table A2.2 in the Appendix reproduces and confirms the results of Adams et al. (2022): in Canada, as in the US, among workers aged 25 to 35, the drinking premium is larger in social occupations (22%) than in non-social ones (14%). The effect would be even larger for workers aged 25 to 65 (27% versus 11%).

Table A2.3 in the Appendix shows that there is little variation in the percentage of drinkers across occupation groups, but income premium for drinkers varies a lot by occupations. People in the occupation groups of management are associated with the largest premium (0.34), while people in occupation groups of “art, culture, recreation and sport”, and “trades”, “transport”, and “equipment operators” do not appear to benefit from any premium. From table A2.4 in the Appendix, the variation of percentage of drinkers across job zones is also small. In addition, people working in a high-end occupation (i.e. lawyer, general manager) are more likely to get a larger drinking premium. Table A2.5 in the Appendix reports the drinking premium across groups of job interests. The drinking premium is highest for people with investigative occupations (0.37), while workers with realistic and artistic occupations get no drinking premium.

Our main result concerns the effect of including controls for job characteristics in a regression of income on drinking behaviours. Table 2.2 presents the result for the binary drinking variable.

The first column in Table 2.2 shows the OLS estimate of the log income premium of being a drinker, controlling for all confounders except occupation and job characteristics (where it is the controlling for some confounders that explains why these premiums are different from those presented in Table A2.1). Drinkers earn around 22% more than non-drinkers and the difference is highly significant. Adding a set of dummy variables for occupation groups reduces the premium to 19% and adding occupation groups and job characteristics further reduces it to 15%. Therefore, jobs explain around 32% of the link between drinking and income. Table A2.6 in the Appendix gives all coefficients of the regression and shows that competition, job impact, leadership, and job stress significantly correlate with higher income.

Separated by sex, Table 2.2 indicates that the drinking premium decreases from 20% to 16.5% (a reduction of 18%) for males and from 23.7% to 12.5% (a reduction of 47%) for females when adding job characteristics.

In addition, Table A2.7 from the Appendix shows the OLS estimates of log hourly income equations. Most of the drinking premium is from higher hourly income rather than longer working hours. In addition, the hourly income premium for drinkers decreases from 18.3% to 12.7% (also a 31% reduction) after adding job characteristics variables. In line with Adams et al. (2022), we find that annual income results show a similar pattern as hourly income results. Thus, we use annual income as the dependent variable.

We now re-run the same analysis for different measures of drinking behaviour (Tables 2.3 to 6).

Among drinkers, occasional ones benefit from a small premium (8% in total, due only to a female premium of 9%, and nothing for men), which is reduced by 32% when job characteristics and occupation groups are controlled. The reduction is by 26% for the female premium. Regular drinkers have a much larger premium, at 25% (23% for males and 20% for females) and introducing job characteristics and occupation groups reduces it by 31% (19% for the male premium and 27% for the female premium).

Table 2.4 shows that premiums, once controlling for standard determinants of income, increase with frequency of drinking, from 8% to 33% for those who drink 4 to 6 times a week, before falling somewhat at 28% for those who drink every day, showing some form of inverted U-shaped relationship, but at a very high level of frequency (confirming French and Zarking, 1995 and Hamilton and Hamilton, 1997). This is true for males (from no premium among those who drink less than once a month to 31% at 4-6 times a week and 23% for every day) and less so for females (the premium is 14% for less than once a month, goes up to 34% for 4-6 times a week and stays there at every day). Introducing job characteristics make the premium non statistically different from 0 at a frequency of once a month (true for both males and females) and reduces it by between 26% and 32% for all other frequencies. The largest reduction is for females who drink 4 to 6 times a week (46%).

Controlling for usual determinants of income, income increases with quantity until a maximum of 6.3 (7.1 if we restrict the sample to drinkers only) drinks per day, which is a very high volume. (Berger and Leigh, 1988, estimated that the peak income occurs at 2 drinks per day for males and 1 for females but Auld, 2005, finds no real peak on a sample of Canadian individuals.) The peak is at 6.4 for males and 3.3 for females. Adding job characteristics reduces the linear rate of return by 25% (23% for males and 36% for females). The peak remains very high (at 6.6) after entering job characteristics.

Table 2.6 confirms that the premium increases from light to moderate to binge drinkers but plateaus between binge and heavy drinkers. After adding job characteristics and occupation groups, the drinking premium decreases by around 30% for all types of drinkers (20% for males and 50% for females).

Tables A2.8 and A2.9 in the Appendix presents the results of robustness checks on the alternate sample with all individuals, including those for whom earnings are not the primary source of income. The coefficients of drinking premium are larger than those from the restricted sample. After adding job characteristics, the drinking premium decreases by 26% for all, 18% for males, and 32% for females, thus confirming the results from the restricted sample.

2.6 Conclusion

Linking the US National Longitudinal Survey of Youth (NLSY97) with O*Net data on social skills requirements, Adams et al. (2022) find that the workers 36 and younger with social jobs get large drinking premium than similar workers in non-social jobs for each additional year of drinking. They suggest that social jobs provide more opportunities for workers to accumulate social capital, which leads higher earnings. Our study uses Canadian Community Health Survey for workers aged 25 to 64 and multiple dimensions of job characteristics from O*Net to further explore the contribution of job characteristics on the returns to drinking.

After adding job characteristics, the drinking effect on income decreases by around 32% (47% for females) but is still significant. We can therefore say that half of the apparent drinking premium among women and one fifth among men could actually be the result of the effects of job characteristics on both alcohol consumption and income. In addition, we find that the drinking premium for males is only significant at a fairly substantial drinking level (at least 2 to 3 times a month). For males, the difference is not so much between non-drinkers and drinkers but rather between "regular" drinkers and less-than-regular drinkers, including very occasional drinkers and abstainers.

This study, while comprehensive, is not without its limitations. Primarily, the research solely utilizes continuous log income as the dependent variable in an approach which may not fully capture nonlinearities in the relationship with alcohol consumption. Secondly, the dimensions of professional socialization and networking hold different levels of importance across various age groups. Alongside this, age may also be a determinant of the association of alcohol consumption and income; e.g. heavy drinking may have a different relationship to income for older individuals than it has for those younger.

In future research, we aim to delve further into these complexities by estimating the heterogeneous effects of alcohol consumption on income across different age demographics. One possibility is also to use multinomial logit models to capture non-linearities in income, which allow us to identify the impacts jumping between different categories of income. This will allow us to provide a more holistic understanding of the multifaceted links between alcohol use and economic outcomes.

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Appendix

Table 2.1 descriptive statistics

2.1.A Continuous and binary variables (mean and standard deviation)

Variable	Definition	Mean	Std. dev.
age	individual age at time of interview	43.31	10.82
married	=1 if married or have a common law partner	0.72	0.45
immigrant	=1 if born outside Canada	0.26	0.44
smoker	=1 if current smoker	0.20	0.40
income	total annual personal income in last year	65755.43	100194.30
hw	hourly personal income in last year	32.39	71.07
hours	total usual number of hours worked per week	41.55	12.54
stressful	=1 if feel stressful at work	0.30	0.46
drinker	=1 if current drinker	0.87	0.33
ADAC	average daily alcohol consumption in last week	0.58	1.02
	job skills		
competition	Amount of competition that the worker will face as part of this job.	51.85	14.31
conflict	How often are there conflict situations the employee has to face in this job?	52.00	13.40
free	How much decision-making freedom, without supervision, does the job offer?	76.41	11.07
team	How important is it to work with others in a group or team in this job?	82.12	9.78
hazard	How often does this job require the worker to be exposed to the hazards?	20.17	23.21
impact	The frequency and nature of the impact of worker's decisions on the organization.	71.99	11.43
lead	How important is it to lead others in accomplishing work activities in this job?	66.25	12.67
outcome	How responsible is the worker for work outcomes and results of other workers?	57.96	17.01
schedules	How regular are the work schedules for this job?	12.74	11.54

2.1.B Categorical variables (distribution and cumulative distribution)

Variable	Definition	Percent	Cumulative %
og	Occupation group		
	1. Management occupations	10.90	10.90
	2. Business, finance and administration occupations	17.27	28.18
	3. Natural and applied sciences and related occupations	9.59	37.77
	4. Health occupations	8.31	46.08
	5. Occupations in education, law, social/community/gov services	11.66	57.73
	6. Occupations in art, culture, recreation and sport	2.93	60.66
	7. Sales and service occupations	19.09	79.75
	8. Trades, transport, equip operators and related occupations	13.97	93.72
	9. Natural resources, agriculture and related occupations	1.68	95.41
	10. Occupations in manufacturing and utilities	4.59	100.00
edu	education		
	1. less than secondary school graduation	6.43	6.43
	2. secondary school graduation, no post-secondary education	19.40	25.83
	3. post-secondary certificate diploma or univ degree	74.17	100.00
city	Area classification		
	1. Rural area (less than 1,000)	16.48	16.48
	2. Small population centre (1,000 to 29,999)	11.83	28.31
	3. Medium population centre (30,000 to	8.46	36.77
	4. Large urban population centre (100,000 or more)	63.23	100.00
freq	Drinking Frequency		
	Never drink	12.85	12.85
	Less than once a month	14.26	27.11
	Once a month	8.82	35.94
	2 to 3 times a month	12.37	48.31
	Once a week	16.07	64.38
	2 to 3 times a week	22.92	87.30
	4 to 6 times a week	6.81	94.10
	Every day	5.90	100.00
Occasional/Regular Drinker			
	Non-drinkers	12.85	12.85
	Occasional Drinkers	14.26	27.11
	Regular Drinkers	72.89	100.00
Type of Drinker			
	Non-drinkers	12.86	12.86
	Light drinkers	13.21	26.07
	Moderate drinkers	24.27	50.34
	Binge drinkers	3.69	54.03
	Heavy drinkers	45.97	100.00
interests	preferences for work environments and outcomes		
	1. Realistic	24.90	24.90
	2. Investigative	8.54	33.45
	3. Artistic	2.69	36.14
	4. Social	15.74	51.88
	5. Enterprising	28.43	80.32
	6. Conventional	19.68	100.00
zone	job zone		
	Zone 1	3.44	3.44
	Zone 2	33.00	36.44
	Zone 3	21.26	57.71
	Zone 4	30.54	88.25
	Zone 5	11.75	100.00

Table 2.2 Effect of job characteristics and occupation groups on drinking premium, binary drinking variable.

	Log Income						
	All			male		female	
drinker	0.217***	0.189***	0.147***	0.201***	0.165***	0.237***	0.125***
	0.021	0.022	0.022	0.032	0.033	0.029	0.028
control							
Occupation group	no	yes	yes	no	yes	no	yes
other job characteristics	no	no	yes	no	yes	no	yes
N	35191	35191	35191	17726	17726	17465	17465
Note: *:0.1, **:0.05, ***:0.01, and SE is reported below coef.							

Table 2.3 Effect of job characteristics and occupation groups on drinking premium, ordinal drinking variable (occasional and regular).

	Log Income					
Type of drinker (ref.=non-drinker)	All		Male		Female	
Occasional Drinker	0.078***	0.053**	0.005	0.018	0.092***	0.068**
SE	0.024	0.023	0.038	0.035	0.024	0.027
Regular Drinker	0.250***	0.172***	0.231***	0.188***	0.203***	0.148***
SE	0.020	0.020	0.029	0.030	0.020	0.027
control job characteristics	no	yes	no	yes	no	yes
Note: *:0.1, **:0.05, ***:0.01						

Table 2.4 Effect of job characteristics and occupation groups on drinking premium, ordinal variable on frequency of drinking.

	Log Income					
freq (ref.=never drink)	All		Male		Female	
less than once a month	0.079***	0.054**	0.005	0.019	0.140***	0.070***
SE	0.024	0.023	0.038	0.035	0.028	0.027
Once a month	0.109***	0.066	0.093	0.08	0.125**	0.048
SE	0.042	0.041	0.059	0.056	0.056	0.050
2 to 3 times a month	0.223***	0.164***	0.188***	0.168***	0.263***	0.159***
SE	0.024	0.024	0.035	0.035	0.033	0.033
Once a week	0.220***	0.156***	0.217***	0.187***	0.222***	0.112***
SE	0.022	0.022	0.032	0.032	0.032	0.031
2 to 3 times a week	0.326***	0.225***	0.288***	0.225***	0.369***	0.215***
SE	0.023	0.022	0.033	0.033	0.031	0.028
4 to 6 times a week	0.331***	0.225***	0.308***	0.235***	0.343***	0.186***
SE	0.026	0.025	0.037	0.037	0.036	0.034
everyday	0.275***	0.190***	0.233***	0.182***	0.341***	0.204***
SE	0.027	0.026	0.037	0.036	0.042	0.038
control job characteristics	no	yes	no	yes	no	yes
Note: *:0.1, **:0.05, ***:0.01						

Table 2.5 Effect of job characteristics and occupation groups on drinking premium, continuous variable on the volume of drinking.

	Log Income					
	All		Male		Female	
ADAC	0.088***	0.066***	0.077***	0.059***	0.139***	0.089***
SE	0.008	0.007	0.009	0.009	0.019	0.016
ADAC^2	-0.007***	-0.005***	-0.006***	-0.005***	-0.021***	-0.014***
SE	0.001	0.001	0.001	0.001	0.005	0.004
Conditional on Drinker						
ADAC	0.071***	0.053***	0.063***	0.047***	0.111***	0.072***
SE	0.008	0.008	0.01	0.009	0.019	0.016
ADAC^2	-0.005***	-0.004***	-0.005***	-0.004***	-0.017***	-0.012***
SE	0.001	0.001	0.001	0.001	0.005	0.003
control job characteristics	no	yes	no	yes	no	yes
Note: *:0.1, **:0.05, ***:0.01						

Table 2.6 Estimated drinking premium by drinker's type

	Log Income					
type (ref.=non-drinker)	All		Male		Female	
light drinker	0.079***	0.054**	0.005	0.019	0.139***	0.069***
	0.024	0.023	0.038	0.035	0.029	0.027
moderate drinker	0.237***	0.161***	0.219***	0.179***	0.259***	0.137***
	0.021	0.021	0.031	0.031	0.03	0.028
binge drinker	0.278***	0.201***	0.253***	0.203***	0.300***	0.188***
	0.022	0.022	0.031	0.032	0.031	0.03
heavy drinker	0.261***	0.171***	0.237***	0.184***	0.298***	0.141***
	0.033	0.032	0.04	0.04	0.057	0.052
control job characteristics	no	yes	no	yes	no	yes

Note: *:0.1, **:0.05, ***:0.01

Table A2.0 Categorization of drinkers:

Frequency of drinking	Frequency of binge drinking			
	Never	Less than once per month	Once per month but less than once per week	At least once per week
Never	Non-drinkers	Impossible	Impossible	Impossible
Less than once a month	Light drinkers	Light drinkers	Impossible	Impossible
Once a month	Moderate drinkers	Moderate drinkers	Binge drinkers	Impossible
2, 3 times a month	Moderate drinkers	Moderate drinkers	Binge drinkers	Impossible
Once a week	Moderate drinkers	Moderate drinkers	Binge drinkers	Heavy drinkers
2, 3 times a week	Moderate drinkers	Moderate drinkers	Binge drinkers	Heavy drinkers
4, 6 times a week	Moderate drinkers	Moderate drinkers	Binge drinkers	Heavy drinkers
Every day	Moderate drinkers	Moderate drinkers	Binge drinkers	Heavy drinkers

Table A2.1 Income by drinking behaviours:

	Annual Income	Hourly Income
Non-Drinker	50943.48	26.24
Drinker	67939.18	33.30
by frequency:		
Less than once a month	51377.23	26.19
Once a month	66521.22	36.50
2 to 3 times a month	63178.98	30.71
Once a week	66467.32	32.22
2 to 3 times a week	75480.50	34.85
4 to 6 times a week	85539.06	40.56
Every day	74497.63	39.62
by type:		
Light drinkers	51284.86	26.11
Moderate drinkers	67454.05	33.74
Binge drinkers	62598.24	29.59
Heavy drinkers	73440.13	35.44
Return to drinking volume without controls		
	coeff.	SE
ADAC	0.02269	0.001
ADAC^2	-0.00025	0.000

Table A2.2 Drinking premium between social and non-social occupations

	Aged 25-64		Aged 25-35	
	social	non-social	social	non-social
drinker	0.271***	0.111***	0.218***	0.144**
SE	0.029	0.032	0.045	0.065

Note: *:0.1, **:0.05, ***:0.01

Table A2.3 Drinking premium across occupation groups

	og1	og2	og3	og4	og5	og6	og7	og8	og9	og10
Percentage of drinkers %	91.9	89.0	87.8	84.4	88.8	92.7	83.2	86.5	90.3	82.4
Drinking Premium on income	0.342***	0.188***	0.198**	0.203***	0.236***	0.029	0.181***	-0.022	0.245*	0.293***
Std. Err.	0.078	0.059	0.085	0.057	0.058	0.123	0.043	0.061	0.123	0.096
Drinking Premium on hourly rate	0.319***	0.13**	0.192**	0.186***	0.16***	-0.016	0.133***	-0.021	0.269*	0.312***
Std. Err.	0.083	0.059	0.089	0.058	0.058	0.108	0.043	0.063	0.121	0.092
N	3596	5977	2942	3144	4393	836	6511	5289	852	1651

Note: *:0.1, **:0.05, ***:0.01

Table A2.4 Drinking premium across job zones

	zone1	zone2	zone3	zone4	zone5
Percentage of drinkers	79.3	83.5	90.4	90.7	87.2
Drinking Premium on income	-0.045	0.159***	0.043	0.221***	0.233***
Std. Err.	0.09	0.03	0.054	0.045	0.065
Drinking Premium on hourly rate	-0.02	0.138***	0.034	0.196***	0.155**
Std. Err.	0.082	0.03	0.057	0.046	0.062
N	1280	12297	7790	9724	4100

Note: *:0.1, **:0.05, ***:0.01

Table A2.5 Drinking premium across job interests

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Percentage of drinkers	84.3	88.5	88.6	86.7	89.1	87.6
Drinking Premium on income	0.051	0.370***	0.092	0.215***	0.284***	0.163***
Std. Err.	0.045	0.103	0.115	0.043	0.042	0.048
Drinking Premium on hourly rate	0.054	0.331***	0.141	0.151***	0.246***	0.122**
Std. Err.	0.044	0.103	0.132	0.047	0.041	0.048
N	9493	2510	790	6132	9369	6897

Note: *:0.1, **:0.05, ***:0.01

Table A2.6 Estimates with and without job characteristics

Variable	Log Income				
male	0.355***	0.331***	0.286***	0.275***	0.264***
	0.013	0.017	0.017	0.017	0.017
age	0.078***	0.068***	0.063***	0.065***	0.064***
	0.006	0.006	0.005	0.005	0.005
age2	-0.077***	-0.066***	-0.060***	-0.062***	-0.061***
	0.006	0.006	0.006	0.006	0.006
education (ref.=less than secondary)					
secondary	0.103***	0.091***	0.049*	0.054**	0.059**
	0.029	0.028	0.027	0.027	0.026
post-secondary	0.332***	0.253***	0.168***	0.172***	0.157***
	0.027	0.027	0.026	0.026	0.025
married	0.087***	0.065***	0.041***	0.041***	0.038***
	0.015	0.014	0.014	0.013	0.013
immigrant	-0.236***	-0.225***	-0.199***	-0.203***	-0.197***
	0.02	0.019	0.019	0.019	0.019
City (ref.=rural)					
Small city	0.055***	0.068***	0.067***	0.069***	0.070***
	0.016	0.016	0.015	0.015	0.015
Medium city	0.070***	0.076***	0.063***	0.066***	0.062***
	0.02	0.019	0.018	0.018	0.018
Large city	0.102***	0.110***	0.092***	0.091***	0.084***
	0.015	0.015	0.014	0.014	0.014
smoker	-0.142***	-0.130***	-0.111**	-0.107**	-0.106**
	0.048	0.046	0.046	0.046	0.046
drinker	0.217***	0.189***	0.162***	0.158***	0.147***
	0.021	0.022	0.021	0.022	0.022
smoker*drinker	-0.006	0.018	0.002	0.002	0.006
	0.051	0.049	0.048	0.049	0.049

og (Ref.= Management)					
Business, finance and administration		-0.202***	-0.002	-0.004	0.079***
		0.026	0.027	0.029	0.029
Natural and applied sciences		0.001	0.242***	0.144***	0.189***
		0.028	0.032	0.038	0.042
Health		-0.099***	0.019	0.022	0.102**
		0.031	0.033	0.037	0.04
Education, law, social services		-0.188***	-0.031	-0.018	0.009
		0.024	0.028	0.032	0.034
Art, culture, recreation and sport		-0.528***	-0.281***	-0.161***	-0.123**
		0.044	0.044	0.058	0.057
Sales and service		-0.535***	-0.323***	-0.335***	-0.181***
		0.024	0.026	0.026	0.029
Trades, transport, equip operators		-0.269***	0.023	0.022	0.161***
		0.03	0.034	0.035	0.038
Natural resources, agriculture		-0.142***	0.226***	0.214***	0.363***
		0.049	0.047	0.048	0.052
Manufacturing and utilities		-0.290***	0.013	0.022	0.136***
		0.04	0.042	0.043	0.043
competition			0.006***	0.005***	0.002***
			0.001	0.001	0.001
conflict			0.001	0.002**	0.002***
			0.001	0.001	0.001
free			0.005***	0.005***	0.000
			0.001	0.001	0.001
team			0.001	0.001	0.001
			0.001	0.001	0.001
hazard			0.000	0.000	0.001*
			0.000	0.000	0.000
impact			0.005***	0.005***	0.005***
			0.001	0.001	0.001
lead			0.004***	0.005***	0.002***
			0.001	0.001	0.001
outcome			-0.001*	-0.002***	-0.001
			0.001	0.001	0.001
schedules			-0.005***	-0.004***	-0.003***
			0.001	0.001	0.001
stressful			0.168***	0.163***	0.152***
			0.013	0.013	0.013
interests (ref.=Realistic)					
Investigative				0.218***	0.076**
				0.031	0.033
Artistic				-0.185***	-0.195***
				0.059	0.058
Social				-0.075**	-0.159***
				0.032	0.032
Enterprising				0.023	0.001
				0.025	0.027
Conventional				-0.026	-0.039
				0.029	0.029
zone (ref.=zone1)					
zone2					0.073*
					0.044
zone3					0.173***
					0.049
zone4					0.398***
					0.05
zone5					0.492***
					0.055
_cons	8.280***	8.831***	7.486***	7.495***	7.779***
	0.125	0.127	0.164	0.165	0.171
N	35191	35191	35191	35191	35191

Note: *:0.1, **:0.05, ***:0.01, and SE is reported below coef.

Table A2.7 Estimates on hourly income

	Log Hourly Income						
	All			male		female	
drinker	0.183***	0.159***	0.127***	0.192***	0.163***	0.177***	0.090***
	0.021	0.022	0.022	0.032	0.034	0.03	0.028
control							
Occupation group	no	yes	yes	no	yes	no	yes
other job characteristics	no	no	yes	no	yes	no	yes
N	35191	35191	35191	17726	17726	17465	17465

Note: *:0.1, **:0.05, ***:0.01, and SE is reported below coef.

Table A2.8 Effect of drinking status on the whole sample

Variable	Log Income					Log Hourly Income				
male	0.374***	0.352***	0.309***	0.296***	0.283***	0.180***	0.202***	0.173***	0.162***	0.152***
age	0.078***	0.069***	0.063***	0.064***	0.063***	0.049***	0.041***	0.038***	0.039***	0.038***
age2	-0.076***	-0.066***	-0.060***	-0.060***	-0.060***	-0.041***	-0.033***	-0.029***	-0.029***	-0.029***
edu (ref.=less than secondary)										
secondary	0.094***	0.084***	0.056*	0.057*	0.060**	0.088***	0.070**	0.052*	0.054*	0.056**
post-secondary	0.339***	0.263***	0.191***	0.192***	0.177***	0.324***	0.236***	0.188***	0.190***	0.174***
married	0.097***	0.075***	0.057***	0.055***	0.053***	0.104***	0.087***	0.075***	0.073***	0.071***
imm	-0.255***	-0.246***	-0.219***	-0.221***	-0.215***	-0.253***	-0.246***	-0.230***	-0.232***	-0.227***
City (ref.=rural)										
Small city	0.054***	0.067***	0.067***	0.069***	0.067***	0.050***	0.053***	0.052***	0.053***	0.051***
Medium city	0.074***	0.082***	0.073***	0.076***	0.072***	0.107***	0.104***	0.098***	0.099***	0.096***
Large city	0.106***	0.114***	0.096***	0.094***	0.086***	0.129***	0.118***	0.105***	0.103***	0.095***
smoker	-0.117**	-0.099**	-0.081*	-0.079*	-0.072	-0.120**	-0.097**	-0.080*	-0.079*	-0.074
drinker	0.245***	0.217***	0.195***	0.190***	0.183***	0.208***	0.185***	0.170***	0.168***	0.161***
smoker*drinker	-0.027	-0.008	-0.025	-0.024	-0.024	-0.043	-0.028	-0.04	-0.04	-0.039
og (Ref.= Management)										
Business, finance and administration		-0.180***	-0.002	0.009	0.085***		-0.032	0.070**	0.075**	0.132***
Natural and applied sciences		-0.004	0.213***	0.144***	0.168***		0.116***	0.237***	0.156***	0.173***
Health		-0.104***	0.004	0.073*	0.126***		0.087***	0.160***	0.179***	0.202***
Education, law, social services		-0.180***	-0.014	0.049	0.055		-0.036	0.062**	0.085**	0.069*
Art, culture, recreation and sport		-0.510***	-0.313***	-0.151***	-0.119**		-0.237***	-0.132***	-0.016	0.009
Sales and service		-0.520***	-0.315***	-0.310***	-0.170***		-0.332***	-0.211***	-0.212***	-0.094***
Trades, transport, equip operators		-0.265***	0.026	0.061	0.185***		-0.202***	-0.01	0.001	0.106***
Natural resources, agriculture		-0.130***	0.214***	0.227***	0.399***		-0.167***	0.077	0.073	0.203***
Manufacturing and utilities		-0.273***	0.018	0.045	0.156***		-0.192***	0.004	0.016	0.115**
competition			0.007***	0.006***	0.003***			0.006***	0.005***	0.002***
conflict			-0.001	0.000	0.001*			-0.001	0.000	0.001
free			0.004***	0.003***	0.000			0.002**	0.002*	-0.001
team			0.002	0.002	0.000			0.002	0.001	0.001
hazard			0.000	0.000	0.001			0.000	0.000	0.000
impact			0.005***	0.004***	0.002**			0.003***	0.002***	0.001
lead			0.005***	0.006***	0.005***			0.004***	0.005***	0.004***
outcome			-0.001**	-0.003***	-0.001*			-0.002**	-0.003***	-0.002**
schedules			-0.005***	-0.004***	-0.003***			-0.004***	-0.003***	-0.003***
stressful			0.159***	0.152***	0.143***			0.053***	0.048***	0.039***
interests (ref.=Realistic)										
Investigative				0.222***	0.087***				0.191***	0.072**
Artistic				-0.212***	-0.236***				-0.174***	-0.194***
Social				-0.109***	-0.211***				-0.075**	-0.157***
Enterprising				0.070***	0.01				0.026	-0.023
Conventional				0.013	-0.032				-0.012	-0.041
zone (ref.=zone1)										
zone2					0.159***					0.083
zone3					0.255***					0.196***
zone4					0.472***					0.364***
zone5					0.527***					0.459***
_cons	8.155***	8.682***	7.427***	7.491***	7.731***	1.255***	1.587***	0.761***	0.807***	1.058***
N	39068	39068	39068	39068	39068	39068	39068	39068	39068	39068

Note: *:0.1, **:0.05, ***:0.01, and SE is reported below coef.

Table A2.9 Effect of drinking status by sex on the whole sample

	Log Income				Log Hourly Income			
	male		female		male		female	
drinking premium	0.220***	0.181***	0.277***	0.189***	0.201***	0.173***	0.219***	0.151***
control job characteristics	no	yes	no	yes	no	yes	no	yes
N	19430	19430	19638	19638	19430	19430	19638	19638

Note: *:0.1, **:0.05, ***:0.01

Chapter 3 A cross-sectional analysis of the association between social capital and willingness to get Covid-19 vaccine in Ontario, Canada

Grignon, M., Bai, Y. A cross-sectional analysis of the association between social capital and willingness to get COVID-19 vaccine in Ontario, Canada. Can J Public Health 114, 175–184 (2023). https://doi.org/10.17269/s41997-023-00746-9

3.1 Introduction

In the first months of the Covid-19 pandemic (February to December of 2020), public health measures such as lockdowns were the only means societies had at their disposal to try to control the surge in mortality. Toward the end of 2020, it was becoming clear that a vaccine would be available soon and the main question became that of the time at which it would be made available. Less often discussed, however, was another phenomenon, already emerging at that time, vaccine hesitancy: some segments of the population were not willing to get vaccinated and protected against a deadly virus (McDonald et al. 2021). Griffith et al. (2021) found that only about 75% of people in Canada planned to receive one of the vaccines at the end of 2020. The anti-vaccine opinion was not new, of course, but its magnitude and the fact that it manifested after such a massive health scare prompted numerous studies to try to understand its origin.

Most of the literature on the determinants of vaccine hesitancy is concerned with belief systems about health or vaccines (e.g., Larson et al. 2014, Troiano and Nardi 2021). We summarize the main determinants identified in the literature in Table 3.1.

In this study, we posit that social capital could explain some of the inter-individual variation in vaccine hesitancy. This has been suggested by studies of vaccine hesitancy showing that trust in the government or health care workers were determinants of the willingness to take the vaccine (Steinert et al. 2022, Biswas et al. 2021, Mesch and Schwirian 2015). Using data collected in Ontario from September to December 2020, before any Covid-19 vaccine was made available in that province, we test whether individuals with higher levels of social capital were also those with a higher willingness to get the vaccine when such a vaccine would be ready.

Coleman (1988) defines social capital as a productive resource that is located “in the structure of relations between actors and among actors.” The measurement of social capital is multi-dimensional, encompassing cognitive (what people feel) as well as structural (what people do) elements (Xue et al. 2020). Cognitive social capital includes social trust, the perception of social support, the perception of social cohesion, perceived reciprocity, sense of belonging, and loneliness. Structural social capital includes participation in some form of social activity, networks of personal relationships, social support, social engagement, volunteering, group membership, social integration, and social relationship (Xue et al. 2020). The idea that communities with higher levels of social capital are better positioned to fight epidemics has been suggested by Pitas and Ehmer (2020), who hypothesized that communities with more social capital would do better by sharing scarce recourses and information, trusting each other, and engaging in collective action.

Social capital has already been documented to have positive effects on individual health and health-related behaviours and it has been documented that social capital has played an important role to protect individuals from the effects of the Covid-19 pandemic. In a study of seven European countries, Bartscher et al. (2021) show that a one-standard-deviation increase in social capital reduces Covid-19 cases per capita by between 14% and 34%, depending on the country, and excess deaths by between 6% and 35%. They explain that informal rules of containment are more easily adopted in areas with higher levels of social capital, which may lead to a lower number of infections. A study of 37 countries (Arachchi and Managi 2021) mixing high- and low-income countries, found that some aspects of social capital (family bonds and security) were associated with fewer deaths during the Covid-19 pandemic but other (community attachment and social trust) were associated with more deaths. In the early phases of the Covid-19 pandemic, before the vaccines, Americans living in counties with high levels of social capital were more likely to reduce mobility linked to retail and recreational activities than people living in counties with low levels of social capital (Borgonovi and Andrieu 2020). Closer to our question, Hu et al. (2022) show that dense social capital is positively associated with the intention to take Covid-19 vaccine booster shots among urban workers in China.

3.2 Methods

3.2.1 Data collection and sampling

We use data from the 2020 Canadian Community Health Survey (CCHS) accessed in the Research Data Centre (RDC) at McMaster University. CCHS is a regular (annual) survey conducted by Statistics Canada to describe the health and health-related behaviours of the Canadian population. In the fall of 2020, Statistics Canada conducted a special version of the survey, adding questions relative to intentions to get vaccinated as well as having felt symptoms of Covid-19.

Data were collected between September and December 2020. The Covid-19 vaccination program started in Ontario on December 14, 2020, and vaccines became widely available in that province on April 8, 2021 (Misha et al. 2021).

The sample was randomly selected by Statistics Canada among individuals aged 12 and over, living in private dwellings (institutional residents are excluded), in 100 regions covering all provinces, but excluding territories, Indian Reserves and Crown Lands as well as remote areas. Because questions on social capital were not asked to respondents in all provinces, we chose to focus on the sample of respondents from Ontario. The sample size was determined by Statistics Canada so as to get enough power to be able to detect changes in health or health-related behaviours between annual cross-sections at the level of 80 health regions in the country. However, whereas Statistics Canada usually achieves a high response rate on its surveys, this one, being conducted in the middle of a pandemic, was accepted by only one selected individual out of five, yielding a sample of 7,317 respondents in Ontario. This is an issue, but we address it by using post-sampling weights provided by Statistics Canada to reproduce the distribution of the Ontarian population by age and sex.

3.2.2 Study sample

511 observations were dropped due to missing values for our Covid-related variables (intention to get vaccinated and symptoms), another 143 observations due to missing values for social capital variables and 147 observations due to missing values for other covariates. Thus, our final sample has 6,516 observations.

The study sample is not different from the initial sample in age and sex distributions or in distributions by immigration status, marital status, or labour force participation status.as shown in Table 3.2 in appendix Table A3.1.

3.2.3 Dependent variables

The binary dependent variable in this study is willingness to get the Covid vaccine; it takes a value of 1 if the respondent intends to get vaccinated and 0 otherwise. It is based on the following question: "How likely is it that you would get a Covid-19 vaccine?", with four response items: very likely, somewhat likely, somewhat unlikely, and very unlikely. We created a binary variable taking the value 1 for individuals responding, "very likely" and 0 otherwise[1].

3.2.4 Independent variables

The independent variable of interest in this study is social capital.

In the literature on social capital, two types of measures exist, capturing different aspects of the concept (Kim et al. 2020). Social capital is often measured at the community level, using aggregate-level data to reflect that what matters is how well the community in which the individual lives functions. But it can also be measured at the individual level, reflecting the ability of the individual to muster resources such as trust or sense of security that are available in their community. In the current survey, we have data at the individual level only (self-reports) but we recreate community-level values by taking the mean of the individual values for all individuals living in a given community.

For each individual, we use five questions on relationships to build a numerical index, taking values between 0 (low level of social capital) and 5 (highest level). Each question is about whether the individual benefits from one aspect of social capital (Do the respondent's relationships provide a sense of emotional security and well-being? Does the respondent feel there is someone to talk to about important decisions in life? Do the respondent's relationships recognize their skills and competence? Do the respondent's relationships share their attitudes and beliefs? Are there people the respondent can count on in an emergency?) and has responses from "strongly agree" to "strongly disagree". We coded the variable as 1 if the respondent chose

[1] We ran a sensitivity analysis defining willingness to get the vaccine as "very likely" or "somewhat likely". Results are similar and available in an appendix Table 3.A2 (supplementary material).

"strongly agree" (and 0 otherwise)[2]. We then added all these variables to create an index of social capital (ISC) between 0 (lowest level of social capital) and 5. We aggregated individual values at the community level, using 76 Local Health Integration Networks (LHIN) Sub-regions provided by Statistics Canada to produce aggregate-level social capital. The main roles of 14 LHINs in Ontario are to plan, fund and integrate health care services locally. LHINs were subdivided into 76 sub-LHINs to plan performance improvement and service integration at a community level (Land Information Ontario). The sample size was increased in Ontario in order to produce estimates reliable at the sub-LHIN level, and the CCHS stratification had to be adjusted. Because values are averaged at the sub-LHIN level, the range of the aggregate-level of social capital (ALSC) is much narrower than for the ISC, between 1.6 and 3.3.

Our objective is to measure how much social capital adds to our understanding of the individual variation in willingness to get vaccinated beside usual determinants such as demographic factors (age, sex, marital status), socio-economic background (education, income, immigration and labour-force participation status), and geography (the urban density of residence). Age is entered in quadratic form (age and age squared divided by 100), to capture non-linear effects; the reference category for sex is female (all our observations are either male or female and we study the effect of being male on willingness to get vaccinated). The reference for marital status is "not in a couple", including single, separated, divorced and widowed, and we study the effect of being in a couple versus being not in a couple. Education is entered in three categories, the reference being "less than secondary", with the other categories being "secondary graduation but no post-secondary education" and "post-secondary degree/diploma or above".

[2] If we define the variable as 1 if the individual answers "strongly" or "somewhat" agree, around 90% of respondents have a score of 5 on the index (versus 36% if we define the variable as 1 if the individual answers "strongly" only).

Income is entered as the natural log value of total household income. We also include immigration status (the reference is Canadian-born) and labour-force participation measured as "having worked in the past week" (the reference is those who did not work) as a proxy for labour market status. The urban density of residence is in four categories, with "rural" as the reference, and other categories being "small city", "medium size city", and "large city".

We also control for other possible confounding factors identified in the literature as potentially related to social capital and the willingness to get vaccinated, such as self-reported health status (the reference is poor, with four possible categories: fair, good, very good and excellent), and self-perceived symptoms of Covid-19 since the beginning of the pandemic (the reference is no reported symptoms).

3.3 Statistical analysis

The design of the study is observational cross-sectional. As the dependent variable is binary, we estimate logistic regressions (one with social capital measured at the individual level and one with social capital measured at the aggregate level).

3.4 Results

Table 3.2 shows that the study sample is close to the Ontarian population aged 12 and older on basic demographic characteristics: 49% are males and the average age is 45, close to the average age of the population 12 and older in Ontario (at 46, authors' calculations based on the life table for 2020), meaning the non-response was not concentrated on some age groups. Immigrants were more likely to respond than Canadian-born, yielding a proportion of immigrants in the sample of 34% versus 29% in Ontario (according to census 2016). Table 3.2

also shows that 50% of respondents were very likely to get the Covid-19 vaccine (and 76% very or somewhat likely).

Table 3.3 and 3.4 present the results (odds-ratios and their confidence intervals, and marginal effect calculated at the sample mean on all other variables with its standard error and p-value) of the models, Table 3.3 for social capital measured at the individual level and Table 3.4 for social capital measured at the aggregated level.

At the sample mean for all other independent variables, each level of individual-level social capital is associated with an increase in the intention to get vaccinated by 2 percentage points. Therefore, from the lowest level of social capital to the highest, the intention to get vaccinated increases by 10 percentage points. To check our results did not reflect our linear assumption (treating ISC as a continuous variable), we ran a regression using all levels of ISC as dummy variables (level 0 being the reference); we confirm a positive association, with levels 0 to 2 being associated with the same willingness to get vaccinated and levels 3 to 5 being associated with a higher willingness.

The association between aggregate-level social capital and willingness to get vaccinated is not significantly different from 0 at the 5% level (the confidence interval for the odds ratio includes 1), but the point estimate of the marginal effect is quite large (suggesting a 9.5-percentage point difference across the range of values for aggregate-level social capital (1.6-3.3)). The association remains not significant when we define ALSC as a binary variable (low: lower than the first quintile of the distribution, versus other values).

Other determinants: once social capital is controlled for, we find no effect of self-assessed health on the willingness to get vaccinated for Covid-19; controlling for social capital at the individual level neutralizes the effect of marital status, but those living in a couple are more likely to get vaccinated when social capital is controlled at the aggregate level. Other determinants remain statistically significant when social capital is controlled whether at the individual or the aggregate level: the willingness decreases with age until approximately 30 and then increases rapidly (see Figure 3.1). Men are more likely to get the vaccine, as are those who are more educated, live in medium or large cities, are born in Canada, have a higher income or have experienced symptoms of Covid-19.

We check whether these associations between social capital and willingness to get vaccinated were homogeneous across age categories by re-running the analyses separately for three age groups: younger than 20 (teenage), 20 to 60 (working-aged people), and greater than 60 (older people). The upper panel of Table 3.5 shows that individual-level social capital is significantly positively associated with the intention to get vaccinated after 20, but not for teenagers. When social capital is measured at the aggregate level, the association is not significant among active age adults (20-60) but significant and strong (an effect of 28.6-percentage point over the range of ALSC) among older adults.

The association between social capital and willingness to get vaccinated is the same for both genders.

3.5 Discussion

Using data from 2020 CCHS September to December special interviews, Ontario sample, we find that individuals with higher levels of trust in their community as well as larger social networks were more likely to plan to get the Covid-19 vaccine when available than were individuals with lower levels of trust and smaller social networks, controlling for other determinants of the willingness to be vaccinated. On the other hand, living in a community with higher level of social capital is not reliably associated with the willingness to be vaccinated, except for older adults: after age 60, our model predicts a variation of 29 percentage points in the willingness to be vaccinated across the range of aggregate-level social capital (for comparison the variation in actual vaccination rates observed across neighbourhoods in Ottawa is 15 percentage points, https://www.neighbourhoodstudy.ca/covid-19-vaccination-coverage-in-ottawa-neighbourhoods/). To the extent that these results can be interpreted as supportive of public policy to build trust, a possible policy response is creating more community centres.

Socio-economic determinants of vaccine hesitancy are highly context-dependent. Our main contribution is to show that social capital, measured as the amount of trust in the community and the perception one has to have a social network, is associated with the willingness to get vaccinated: the association of individual-level social capital with willingness to get vaccinated is comparable to that of education (12 percentage points between lowest and highest levels of education and 10.5 percentage points between lowest and highest levels of social capital). The estimated association between aggregate-level social capital, which represents the fact of living in a community where individuals have more trust or a better perception of their own social network, and willingness to get vaccinated, is large among older adults, suggesting that, for them, what matters is to live in a sharing community rather than the amount of social capital they can muster for themselves. We are not aware of any previous study of the association between social capital and willingness to get vaccinated, but our results confirm findings that higher trust in institutions, or the health care system are associated with lower vaccine hesitancy.

Our study is cross-sectional and, as a result, we cannot infer causality and recommend that investing on social capital would improve vaccine acceptance. We can, however, point toward the fact that, in this sample, communities with lower levels of social capital (where lower income and lower education individuals tend to live) can be less receptive to traditional public health messages based on the rational cost-benefit analysis of the outcomes of the vaccine. Also, the results from our sample confirm that receptiveness to messages on vaccines are linked to levels of trust in society in general. If we could understand why some individuals are less integrated in society and feel marginalized, we might be able to find ways to convince them to get vaccinated and protect their own community. Or, in a more pessimistic way, we can conclude that vaccine hesitancy is not something that public health can really cure, as it reflects a deeper social ill, that sociologists call anomy (Durkheim 1898) and a recent study of mortality among Americans without a bachelor's degree (BA) described as a deprivation of meaning and structure for working-class communities (Case and Deaton 2021).

3.5.1 Limitations

A limitation of our analysis is that the response rate is lower than that in previous years of CCHS. Using post-stratification weights, and focusing on co-variations rather than univariate statistics, we don't think this limitation prevents us from concluding that there is a protective effect of social capital, at least in Ontario. We were reassured to see that intention to get the vaccine (very or somewhat likely) as estimated in our sample is very close to the estimate of Griffith and Monkman (2021), using twitter profiles in Canada. Also, all associations with variables such as age or having had symptoms of Covid-19 have the expected signs.

The questions on social capital have not been posed to respondents from other provinces and we cannot therefore test for our hypotheses outside of Ontario.

3.5.2 Strengths

The main strength of this study is to prove the association of vaccine hesitancy with a community-driven determinant, something that had been suggested but never established in previous literature.

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Appendix

Table 3.1 main determinants of vaccine hesitancy identified in the literature

determinants	Hudson and Montelpare 2021	Guay et al. 2019	Gerretsen et al. 2021	Biswas et al. 2021	Soares et al. 2021	Aw et al. 2021	Basta et al. 2022	Steinert et al. 2022	Mesch and Schwirian 2015
age	X	X	X	X	X	X	X		
sex			X	X		X	X		
employment			X						
race			X			X	X		X
income	X	X			X				
education	X	X		X		X	X		
language		X							
health status	X	X	X			X			
healthcare access		X							
rurality	X						X		
parental status	X								
trust	X	X	X	X	X			X	X
risk aversion	X		X						
vaccine knowledge		X			X	X	X	X	
having kid		X							
perceived seriousness			X	X	X	X	X		X
political affiliation			X						X

Table 3.2 descriptive statistics

Variable	Description	Mean/Prevalence	Std. dev.	95% conf. interval	
Sex	=1 if male	0.487	0.006	0.475	0.499
Age	individual year indicators for age at time of interview	45.157	0.239	44.688	45.626
Immigrant	=1 if born outside Canada	0.340	0.006	0.329	0.352
Labour force status	=1 if work at job or business last week	0.546	0.006	0.534	0.558
Marital status	=1 if married or have a common law partner	0.585	0.006	0.573	0.597
hhd income	household income	136010.700	2044.798	132002.200	140019.100
physical health condition					
	poor	0.022	0.002	0.018	0.025
	fair	0.075	0.003	0.069	0.082
	good	0.259	0.005	0.249	0.270
	very good	0.404	0.006	0.392	0.416
	excellent	0.239	0.005	0.229	0.250
education					
	less than secondary school graduation	0.129	0.004	0.120	0.137
	secondary school graduation, no post-secondary education	0.223	0.005	0.213	0.233
	post-secondary certificate diploma or univ degree	0.649	0.006	0.637	0.660
urban density of residence					
	Rural area (less than 1,000)	0.133	0.004	0.124	0.141
	Small population centre (1,000 to 29,999)	0.093	0.004	0.086	0.100
	Medium population centre (30,000 to	0.075	0.003	0.068	0.081
	Large urban population centre (100,000 or more)	0.700	0.006	0.689	0.711
social capital 1	=1 if strongly agree that have close relationships that provide with a sense of emotional security and wellbeing	0.553	0.006	0.541	0.565
social capital 2	=1 if strongly agree that there is someone could talk to about important decisions in life	0.652	0.006	0.641	0.664
social capital 3	=1 if strongly agree that have relationships where my competence and skill are recognized	0.518	0.006	0.505	0.530
social capital 4	=1 if strongly agree that feel part of a group of people who share attitudes and beliefs.	0.476	0.006	0.464	0.488
social capital 5	= 1 if strongly agree that There are people can count on in an emergency	0.680	0.006	0.668	0.691
index of social capital, individual level	individual-level social capital index (ISC)	2.879	0.025	2.831	2.928
index of social capital, sub-LINC level	aggregate-level social capital index (ALSC)	2.787	0.003	2.780	2.794
Covid19 symptoms	=1 if has experienced COVID-19 symptoms - since beginning of pandemic	0.124	0.004	0.116	0.132
Willingness to get vaccinated	Very unlikely	0.121	0.004	0.113	0.129
	Somewhat unlikely	0.114	0.004	0.107	0.122
	Somewhat likely	0.259	0.005	0.248	0.270
	Very likely	0.505	0.006	0.493	0.517

Table 3.3 Association between individual-level social capital and willingness to get vaccinated

	Very likely to get vaccinated					
	Odds ratio	95% conf. interval OR		marginal effect	standard error	p-value
Age	0.971	0.944	0.998	-0.007	0.004	0.039
age*age	1.044	1.015	1.073	0.011	0.004	0.002
married	1.110	0.906	1.360	0.026	0.026	0.315
male	1.291	1.079	1.544	0.064	0.023	0.005
immigrant	0.719	0.581	0.890	-0.083	0.027	0.002
work	1.149	0.928	1.422	0.035	0.027	0.202
physical health						
Fair	1.243	0.703	2.196	0.054	0.072	0.452
good	1.205	0.709	2.048	0.046	0.067	0.488
very good	1.250	0.740	2.114	0.056	0.066	0.401
excellent	1.334	0.770	2.311	0.072	0.069	0.301
education						
secondary school	1.641	1.172	2.298	0.123	0.042	0.003
post-secondary	1.587	1.160	2.173	0.114	0.039	0.003
Urban density of residence:						
small city	1.235	0.943	1.618	0.052	0.034	0.125
medium city	1.456	1.090	1.944	0.093	0.037	0.011
large city	1.489	1.190	1.863	0.099	0.028	0.000
log hhd income	1.210	1.077	1.359	0.048	0.015	0.001
Symptom	1.551	1.183	2.034	0.110	0.035	0.002
Index of Social Capital (ISC)	1.083	1.032	1.137	0.020	0.006	0.001
_cons	0.038	0.008	0.178			
N				6516		

Table 3.4 Association between aggregate-level social capital and willingness to get vaccinated

	Very likely to get vaccinated					
	Odds ratio	95% conf. interval OR		marginal effect	standard error	p-value
Age	0.968	0.942	0.995	-0.008	0.004	0.022
age*age	1.047	1.018	1.076	0.011	0.004	0.001
Married	1.137	0.931	1.389	0.032	0.026	0.209
Male	1.232	1.030	1.473	0.052	0.023	0.023
Immigrant	0.703	0.568	0.869	-0.088	0.027	0.001
Work	1.157	0.934	1.432	0.036	0.027	0.183
physical health						
Fair	1.252	0.714	2.195	0.056	0.071	0.430
Good	1.249	0.740	2.108	0.055	0.066	0.401
very good	1.340	0.799	2.249	0.073	0.065	0.262
Excellent	1.477	0.863	2.528	0.097	0.068	0.151
Education						
secondary school	1.663	1.186	2.331	0.126	0.042	0.003
post-secondary	1.654	1.212	2.257	0.124	0.038	0.001
Urban density of residence						
small city	1.266	0.966	1.659	0.058	0.034	0.087
medium city	1.478	1.111	1.967	0.097	0.036	0.007
large city	1.506	1.206	1.879	0.102	0.028	0.000
log hhd income	1.214	1.080	1.365	0.049	0.015	0.001
Symptom	1.562	1.191	2.050	0.112	0.035	0.001
ALSC	1.251	0.888	1.761	0.056	0.044	0.200
_cons	0.024	0.004	0.146			
N	6516					

Table 3.5 Analyses of heterogeneity of associations by age

	age<=20						20<age<=60						age>60					
	Odds ratio	95% conf. interval		dy/dx	std. err.	p-value	Odds ratio	95% conf. interval		dy/dx	std. err.	p-value	Odds ratio	95% conf. interval		dy/dx	std. err.	p-value
individual-level social capital																		
symptom	3.308	1.571	6.966	0.091	0.029	0.002	1.311	0.941	1.826	0.068	0.042	0.109	1.401	0.819	2.396	0.082	0.067	0.218
ISC	1.106	0.944	1.296	0.024	0.019	0.213	1.099	1.028	1.176	0.024	0.009	0.006	1.050	0.988	1.116	0.012	0.008	0.113
aggregate-level social capital																		
symptom	1.198	1.626	6.727	0.285	0.086	0.001	1.323	0.949	1.845	0.070	0.042	0.099	1.389	0.819	2.354	0.080	0.066	0.223
ALSC	2.272	0.793	6.508	0.196	0.127	0.124	1.032	0.644	1.653	0.008	0.060	0.897	1.991	1.251	3.170	0.168	0.058	0.004
N	488						2958						3070					

Table 3.6 Analyses of heterogeneity of associations by gender

	male						female					
	Odds ratio	95% conf. interval		dy/dx	std. err.	p-value	Odds ratio	95% conf. interval		dy/dx	std. err.	p-value
individual-level social capital												
symptom	2.274	1.482	3.488	0.204	0.054	0.000	1.129	0.792	1.609	0.030	0.045	0.504
ISC	1.069	0.993	1.152	0.017	0.009	0.078	1.095	1.029	1.164	0.023	0.008	0.004
aggregate-level social capital												
symptom	2.258	1.465	3.482	0.202	0.055	0.000	1.151	0.812	1.633	0.035	0.044	0.430
ALSC	1.329	0.774	2.282	0.071	0.069	0.303	1.133	0.744	1.725	0.031	0.053	0.561
community-level social capital												
n	2878						3638					

Figure 3.1 Probability of being very likely to get the vaccine by age (marginal effect)

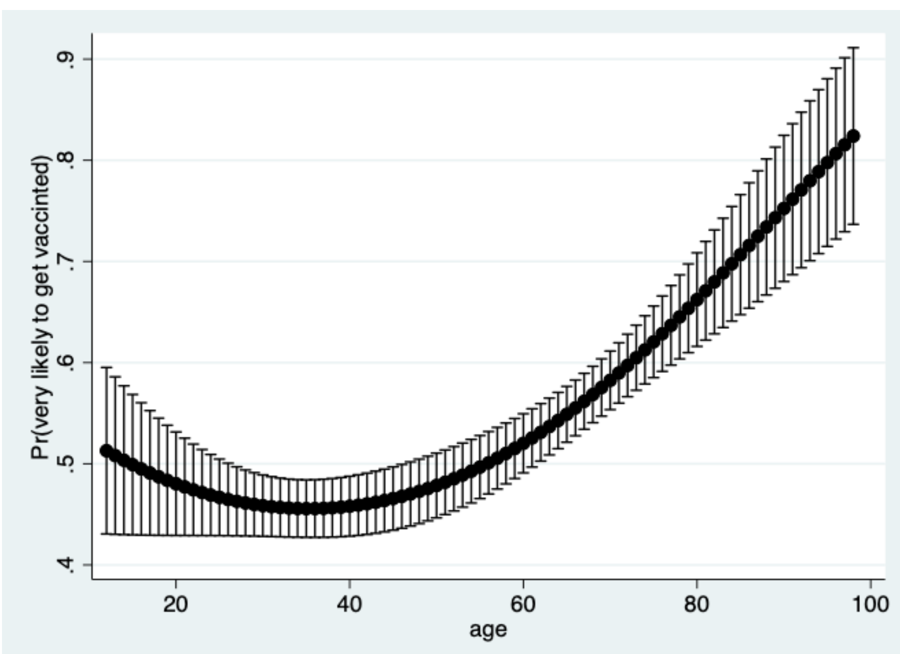

Table A3.1 Descriptive statistics the initial sample

Variable	Description	Mean/Prevalence	Std. dev.	95% conf. interval	
Sex	=1 if male	0.490	0.006	0.479	0.502
Age	individual year indicators for age at time of interview	45.829	0.233	45.373	46.285
Immigrant	=1 if born outside Canada	0.344	0.006	0.334	0.355
Labour force status	=1 if work at job or business last week	0.515	0.006	0.504	0.527
Marital status	=1 if married or have a common law partner	0.574	0.006	0.562	0.585
hhd income	household income	131611.600	1854.957	127975.400	135247.900
physical health condition					
	poor	0.030	0.002	0.026	0.034
	fair	0.085	0.003	0.078	0.091
	good	0.263	0.005	0.253	0.273
	very good	0.392	0.006	0.381	0.403
	excellent	0.230	0.005	0.221	0.240
education					
	less than secondary school graduation	0.144	0.004	0.136	0.153
	secondary school graduation, no post-secondary education	0.224	0.005	0.215	0.234
	post-secondary certificate diploma or univ degree	0.631	0.006	0.620	0.642
urban density of residence					
	Rural area (less than 1,000)	0.128	0.004	0.121	0.136
	Small population centre (1,000 to 29,999)	0.091	0.003	0.085	0.098
	Medium population centre (30,000 to	0.077	0.003	0.071	0.083
	Large urban population centre (100,000 or more)	0.703	0.005	0.693	0.714
social capital 1	=1 if strongly agree that have close relationships that provide with a sense of emotional security and wellbeing	0.548	0.006	0.536	0.559
social capital 2	=1 if strongly agree that there is someone could talk to about important decisions in life	0.646	0.006	0.635	0.657
social capital 3	=1 if strongly agree that have relationships where my competence and skill are recognized	0.514	0.006	0.503	0.526
social capital 4	=1 if strongly agree that feel part of a group of people who share attitudes and beliefs.	0.473	0.006	0.461	0.484
social capital 5	= 1 if strongly agree that There are people can count on in an emergency	0.673	0.006	0.662	0.684
index of social capital, individual level	individual-level social capital index (ISC)	2.862	0.024	2.814	2.909
index of social capital, sub-LINC level	aggregate-level social capital index (ALSC)	2.784	0.003	2.778	2.790
Covid19 symptoms	=1 if has experienced COVID-19 symptoms – since beginning of pandemic	0.123	0.004	0.116	0.131
Willingness to get vaccinated	Very unlikely	0.125	0.004	0.117	0.133
	Somewhat unlikely	0.116	0.004	0.108	0.124
	Somewhat likely	0.256	0.005	0.246	0.266
	Very likely	0.503	0.006	0.491	0.515

Table A3.2 Willingness to get vaccinated include "very likely" or "somewhat likely"

	Very likely/likely to get vaccinated							Very likely/likely to get vaccinated					
	Odds ratio	95% conf. interval OR		marginal effect	standard error	p-value		Odds ratio	95% conf. interval OR		marginal effect	standard error	p-value
age	0.950	0.920	0.982	-0.009	0.003	0.002	age	0.949	0.919	0.980	-0.009	0.003	0.001
age*age	1.066	1.031	1.101	0.011	0.003	0.000	age*age	1.067	1.033	1.103	0.011	0.003	0.000
married	1.054	0.834	1.333	0.009	0.021	0.659	married	1.076	0.852	1.359	0.013	0.021	0.540
male	1.397	1.136	1.718	0.058	0.018	0.002	male	1.358	1.109	1.661	0.053	0.018	0.003
immigrant	0.873	0.689	1.106	-0.024	0.021	0.262	immigrant	0.849	0.670	1.076	-0.028	0.021	0.177
work	1.038	0.815	1.321	0.006	0.021	0.763	work	1.044	0.820	1.328	0.007	0.021	0.727
physical health							physical health						
fair	1.459	0.791	2.693	0.075	0.065	0.249	fair	1.469	0.798	2.705	0.078	0.066	0.238
good	1.648	0.921	2.947	0.096	0.063	0.123	good	1.704	0.956	3.036	0.104	0.063	0.098
very good	1.713	0.966	3.038	0.103	0.062	0.097	very good	1.809	1.025	3.193	0.115	0.063	0.067
excellent	1.409	0.779	2.548	0.069	0.064	0.284	excellent	1.517	0.847	2.719	0.084	0.064	0.190
education							education						
secondary school	1.755	1.237	2.490	0.115	0.037	0.002	secondary school	1.759	1.241	2.493	0.116	0.037	0.002
post-secondary	2.156	1.565	2.969	0.150	0.035	0.000	post-secondary	2.203	1.602	3.030	0.155	0.035	0.000
Urban density of residence							city						
small city	1.449	1.083	1.938	0.071	0.028	0.011	small city	1.458	1.089	1.953	0.072	0.028	0.010
medium city	1.155	0.848	1.572	0.029	0.032	0.357	medium city	1.151	0.847	1.566	0.029	0.032	0.365
large city	1.603	1.259	2.040	0.088	0.024	0.000	large city	1.614	1.269	2.054	0.090	0.024	0.000
log hhd income	1.252	1.122	1.398	0.039	0.010	0.000	log hhd income	1.264	1.132	1.412	0.041	0.010	0.000
symptom	1.946	1.383	2.740	0.116	0.030	0.000	symptom	1.955	1.389	2.751	0.116	0.030	0.000
Index of Social Capital (ISC)	1.050	0.995	1.108	0.008	0.005	0.079	ALSC	0.901	0.617	1.314	-0.018	0.033	0.588
_cons	0.090	0.020	0.405				_cons	0.120	0.020	0.712			
n				6516			n				6516		

Table A3.3 All levels of ISC as category variables

	Very likely to get vaccinated					
	Odds ratio	95% conf. interval OR		marginal effect	standard error	p-value
			all			
ISC						
1	1.039	0.724	1.492	0.010	0.046	0.834
2	1.255	0.890	1.770	0.057	0.044	0.195
3	1.924	1.384	2.674	0.162	0.041	0.000
4	1.307	0.956	1.788	0.067	0.040	0.093
5	1.495	1.148	1.945	0.100	0.033	0.003
			male			
ISC						
1	1.061	0.637	1.767	0.015	0.065	0.820
2	1.289	0.789	2.105	0.063	0.062	0.309
3	1.987	1.247	3.165	0.167	0.056	0.003
4	1.315	0.816	2.118	0.068	0.060	0.259
5	1.374	0.922	2.048	0.079	0.051	0.117
			female			
ISC						
1	0.942	0.574	1.547	-0.014	0.060	0.814
2	1.225	0.750	2.000	0.050	0.062	0.420
3	1.789	1.151	2.779	0.144	0.055	0.009
4	1.271	0.853	1.893	0.059	0.050	0.239
5	1.558	1.114	2.178	0.110	0.042	0.009
			age<=20			
ISC						
1	0.729	0.255	2.080	-0.071	0.119	0.551
2	0.591	0.209	1.673	-0.113	0.113	0.316
3	1.566	0.528	4.647	0.109	0.135	0.418
4	0.804	0.304	2.125	-0.050	0.113	0.660
5	1.525	0.626	3.714	0.103	0.109	0.344
			20<age<=60			
ISC						
1	1.028	0.608	1.739	0.007	0.065	0.918
2	1.737	1.052	2.869	0.137	0.063	0.030
3	2.105	1.329	3.336	0.184	0.057	0.001
4	1.416	0.918	2.184	0.086	0.054	0.114
5	1.663	1.146	2.413	0.126	0.046	0.006
			age>60			
ISC						
1	1.133	0.739	1.739	0.031	0.054	0.565
2	0.886	0.575	1.365	-0.030	0.055	0.583
3	1.938	1.226	3.064	0.155	0.052	0.003
4	1.375	0.878	2.152	0.078	0.055	0.157
5	1.223	0.886	1.689	0.050	0.040	0.221

Table A3.4 ALSC as a binary variable

	Very likely to get vaccinated					
	Odds ratio	95% conf. interval OR		marginal effect	standard error	p-value
all sample						
Low-ALSC	0.886	0.712	1.103	-0.030	0.028	0.279
male						
Low-ALSC	0.812	0.581	1.133	-0.052	0.042	0.221
female						
Low-ALSC	0.982	0.738	1.306	-0.005	0.036	0.901
age<=20						
Low-ALSC	0.547	0.282	1.061	-0.144	0.080	0.074
20<age<=60						
Low-ALSC	0.991	0.735	1.336	-0.002	0.038	0.953
age>60						
Low-ALSC	0.712	0.535	0.947	-0.083	0.036	0.020

Conclusion

The first chapter of this thesis studies the effect of minimum wage hikes on population health in Canada. Using data from the National Population Health Survey (NPHS), we find fairly consistent evidence of an association between increased minimum wages and lower self-reported women's health. We also find very little evidence of an association with improved men's health, with the important exception of weak evidence of improvement in men's mental health. Yet we also find fairly consistent evidence of an association between increased minimum wages and reduced drinking and heavy drinking for men and reduced smoking (again particularly for men) as well as reduced physical inactivity (particularly for women). While there is some evidence that could point to increased heavy drinking by women and an increase in body mass (with no corresponding obesity result), that evidence is not very consistent. Accordingly, as a very broad conclusion, there seems to be more evidence that minimum wage increases lead to healthier behaviours among those affected than evidence of an actual improvement in health.

The second chapter uses the CCHS for workers aged 25 to 64 and multiple dimensions of job characteristics from O*Net to explore the contribution of job characteristics on the returns to drinking. After adding job characteristics, the drinking effect on income decreases by around 32% (47% for females) but is still significant. We can therefore say that half of the apparent drinking premium among women and one fifth among men could be the result of the effects of job characteristics on both alcohol consumption and income. In addition, we find that the drinking premium for males is only significant at a fairly substantial drinking level (at least 2 to

3 times a month). For males, the difference is not so much between non-drinkers and drinkers but rather between “regular” drinkers and less-than-regular drinkers, including very occasional drinkers and abstainers.

Using data from 2020 CCHS September to December special interviews, Ontario sample, the third chapter finds that individuals with higher levels of trust in their community, as well as larger social networks, were more likely to plan to get the Covid-19 vaccine when available than were individuals with lower levels of trust and smaller social networks, controlling for other determinants of the willingness to be vaccinated. On the other hand, living in a community with a higher level of social capital is not reliably associated with the willingness to be vaccinated, except for older adults. Our study is cross-sectional and, as a result, we cannot infer causality and recommend that investing on social capital would improve vaccine acceptance. We can, however, point toward our finding that, in this sample, communities with lower levels of social capital (where lower income and lower education individuals tend to live) can be less receptive to traditional public health messages based on the rational cost-benefit analysis of the outcomes of the vaccine. Also, the results from our sample confirm that receptiveness to messages on vaccines is linked to levels of trust in society in general.

By addressing three distinct research questions through the three chapters, the thesis contributes new insights and empirical evidence to the existing literature, thereby enhancing our understanding of the various factors that influence individual and population health and well-being in Canada. In addition, by examining these three distinct aspects of health economics, health behaviours, and labour outcomes, this thesis advances our understanding of the complex interconnections between these factors in the Canadian context. These findings can help inform the development of more effective policies and interventions that promote better health outcomes, reduce health disparities, and support a healthier, more productive workforce in Canada.