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The obesity penalty in the labor market using longitudinal Canadian data

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ABSTRACT

A Canadian study of weight discrimination also known as the obesity wage-penalty. This paper adds to the limited Canadian literature while also introducing a causal model, which can be applied to future Canadian studies. A general working-class sample group is utilized with personal income, which removes many biases introduced in other studies. The evidence suggests that a 1-unit increase in lagged BMI is associated with a 0.7% decrease in personal for obese Canadian females. Similar to other studies, the male results are inconsistent. The evidence brought forward in this study can provide an effective financial incentive for health promotion among Canadians for law and policy makers. Beyond health reasons, these results can also be applied as empirical evidence of gender discrimination based on body image perception. The evidence suggests that male physique is not a contributing factor in income, but larger female physique is associated with lower personal income.

1. Introduction and background

The direct cost of obesity has been studied substantially but the indirect cost of obesity is relatively unknown in Canada. The Canadian prevalence of adult obesity has drastically increased from 6% to 18% between 1989 and 2011 (Twells et al., 2014). Obesity has also been shown to be associated with increased healthcare utilization, decreased productivity, increased chronic diseases, and shorter life expectancy (Kpelitse et al., 2014). Luther (2010) in Alberta Law Review claimed that wage penalties exist for obese individuals in Canada. However this argument has very limited empirical evidence, especially since Canadian social norms is comprised of different cultures, genders, and races. This study disentangles the association and causations between the effects of obesity on personal income for Canadians in the general labor market, while simultaneously controlling for socioeconomic status, demographics, health, lifestyles, industry, and occupations. The results from this study will help find optimal solutions in cost savings and health promotions at the health policy level.

Currently, only two Canadian obesity-penalty studies exist. The first is a published study by Larose (2016) investigating the impact of obesity on employment and income for Canadians aged 25–53 in the labor market using a longitudinal data set. They found that obesity was associated with a reduction in annual income of 2% and 4.5% for men and women respectively. Their study found no causal evidence using lagged BMI. The same longitudinal data set will be applied in this study but with different methodologies. These methodological differences include a larger age sample, less restrictive sample inclusion criteria's, different extrapolation methods for missing variables, and an additional causal model. These differences will provide supporting evidence and ensure robustness of the results presented by Larose (2016) and add to the limited Canadian literatures.

The second Canadian study is unpublished by Kpelitse et al. (2014) where a cross-sectional data was used to study the effect of household income and obesity. Their causal model suggested that a 1% increase in household income caused a 0.76% and 0.27% decrease in the probability of being obese for men and women,

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respectively. Our study holds several advantages over Kpelitse et al. (2014) such as personal income instead of household income and the longitudinal nature of our data set allows for mixed models and lagged measurements. A comparison of the current study along with the other two studies would provide insight on the Canadian obesity wage-penalty and ensure robustness of all current Canadian literatures.

The effect of obesity on wage and employment has been investigated in many other countries such as Australia (Kortt and Leigh, 2010), Brazil (Thomas and Strauss, 1997), China (Shimokawa, 2008), Denmark (Greve, 2008), Ethiopia (Kedir, 2013), general Europe (Garcia and Quintana-Domeque, 2006; Brunello and D'hombres, 2007; Lunborg et al., 2006; Atella et al., 2008; Villar and Quintana-Domeque, 2009), Finland (Sarlio-Lahteenkorba and Lahelma, 1999), Germany (Cawley et al., 2005; Lechner, 2009), Russia (Huffman and Rizov, 2014), Spain (Mora, 2010), Taiwan (Tao, 2014), United Kingdom (Morris, 2006, 2007; Lindeboom et al., 2010; Johnston and Lordan, 2014), and the United States (Baum and Ford, 2004; Cawley, 2004; Cawley and Danziger, 2005; Cawley et al., 2005; Norton and Han, 2008; Han et al., 2009; Cawley et al., 2009; Schmeiser, 2009; Wada and Tekin, 2010; Kosteas, 2012).

It is important to establish if the obesity wage-penalty is an association or causation. Among working class females, obesity was found to have an inverse relationship with income in studies using data from Austria, Belgium, Italy (Villar and Quintana-Domeque, 2009), Denmark (Garcia and Quintana-Domeque, 2006; Villar and Quintana-Domeque, 2009), England (Morris, 2006), Finland (Garcia and Quintana-Domeque, 2006; Sarlio-Lahteenkorba and Lahelma, 1999; Villar and Quintana-Domeque, 2009), general Europe (Brunello and D'hombres, 2007; Atella et al., 2008), Germany, United States (Cawley et al., 2005), and Portugal (Garcia and Quintana-Domeque, 2006; Villar and Quintana-Domeque, 2009). Similarly, an inverse relationship for working class males was found in England (Morris, 2006), general Europe (Brunello and D'hombres, 2007), and Italy (Atella et al., 2008); while obesity was found to be associated with higher income for the working class males was in Belgium (Garcia and Quintana-Domeque, 2006), Brazil (Thomas and Strauss, 1997), China (Shimokawa, 2008), Finland, Portugal (Villar and Quintana-Domeque, 2009), and United States (Cawley et al., 2005). Studies have tried to impute causation and control for unobservable variable bias using a two-stage regression model, but unable to find any effects for both male and female working age groups in Australia (Kortt and Leigh, 2010), Brazil (Thomas and Strauss, 1997), China (Shimokawa, 2008), England (Morris, 2006), and Ethiopia (Kedir, 2013). However, one study (Brunello and D'hombres, 2007) found evidence of a negative causation in the working population for both genders in general Europe. Another study found evidence of a positive causation in post-Soviet Russia for the female working population (Huffman and Rizov, 2014).

Endogeneity has been a subject of great importance within the obesity wage-penalty literatures. Many studies have attempted to impute causation and control for unobservable characteristics. These unobservable characteristics are immeasurable variables that have associations with both obesity and income, which will bias the results. It has been suggested that these unobservable variables include differences in individual time preferences, such as ones willingness to sacrifice today's consumption for a higher future consumption. This causes differences in investments to human capital and health (Han et al., 2009).

It has also been suggested that these unobservable variables include individual abilities and genetic factors that influence both weight and income (Cawley, 2004). There are currently three general methodologies for endogeneity. The first is from older studies where lagged Body Mass Index (BMI) was used to control for reverse causation (Averett and Korenman, 1996; Conley and Glauber, 2006). However this fails if any serial inter-temporal correlation exists in the wage residuals; for example, any lagged factors from the past that is associated with obesity today could also be correlated with non-lagged factors from today (Cawley, 2004; Han et al., 2009). The remaining two methodologies for endogeneity in the obesity wage-penalty involve two-staged Instrumental Variable (IV) regression models. The first type of instrument is based on a genetic and non-genetic decomposition of body weight purposed by Cawley (2004). Genetic and non-genetic factors, such as individual environment and individual choices will contribute to ones body weight and income. These analogous factors are usually unobservable and will bias the true relationship. He suggested that a variable highly correlated with genetics but not with income, would be a strong IV. The respondents Sibling's BMI controlled for age and gender was used as an IV in Cawley (2004), which lead many subsequent studies to adopt similar family related variables as instruments (Cawley et al., 2005; Brunello and D'hombres, 2007; Lunborg et al., 2006; Atella et al., 2008; Norton and Han, 2008; Shimokawa, 2008; Greve, 2008; Kortt and Leigh, 2010; Lindeboom et al., 2010; Wada and Tekin, 2010). However this family or genetic decomposition method would fail if family members share unobserved earning endowment factors (Han et al., 2009).

The final general methodology is an area-based instrument purposed by Morris (2006). He argues that area based instruments such at the average BMI and prevalence rates of obesity in the respondent's inhabitant area will capture the environmental influences that affect attitudes and behaviors related to the determinants of obesity. Morris (2006, 2007) used the average BMI and prevalence rate of obesity as an IV for each respondent's health region, while simultaneously controlling for many regional characteristics that could affect the respondent's income. The advantage of such area based IV's are that any instrument correlations with the wage residual must be through the respondent's socio-economic status and health, which can be controlled with self-reported health and health region based measurements such as average income and average health status. To our knowledge, there exists no current criticism of the area based IV. There is currently only one other study besides Morris (2006, 2007) that has tried the area based instrumentation (Huffman and Rizov, 2014), due to the difficult nature of deriving such instrumentation.

This paper used a four year lagged BMI to provide comparisons with older studies and replicated the instrumentation methods from Morris (2006). This instrumentation used the prevalence of obesity in each respondent's health authority region while simultaneously control for each regions socio-economic status and health.

2. Data and methodology

2.1. Data

This paper used 5 waves[1] of restricted longitudinal data from the National Population Health Survey (NPHS) from 2002 to 2011 and the Postal Code^{OM} Conversion File[2] (PCCF) version June 2013. All inclusion criteria's were determined at each wave. Each NPHS wave were bootstrapped with its respective probability weight to

[1] The initial four waves were dropped due to changes in survey questionnaire and missing labor market variables.

[2] PCCF, 2014; Statistics Canada. Postal Code^{OM} Conversion File Plus (PCCF+) Version 6A, Reference Guide, 2014. Minister of Industry. Statistics Canada Catalogue no. 82- E0086-XDB.