Working Hours, Body Mass Index, and Health Status: A Time Use Analysis

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Abstract:
This paper examines the connection between time spent working and obesity as well as the mechanisms through which they might be related. Body Mass Index (BMI) might increase with more hours spent working since as leisure time declines, the opportunity cost of time rises, and it becomes more costly to undertake health-producing activities and seek medical care. Additionally, more time spent working would increase the incidence of detrimental effects of the workplace such as job-related stress, which would have a negative effect on health. The paper uses the 2006, 2007, and 2008 American Time Use Surveys (ATUS) linked with Eating and Health module data to estimate ordinary least squares and instrumental variables specifications. While other datasets provide information on individuals' market work time, the ATUS also provides insight into individuals' non-market work activities. Linked with the Eating and Health module, it permits inference to be drawn about individuals' time use in a variety of activities as well as measures relating to eating and health, including BMI. Making use of this data, the paper first examines the effect of time spent working on BMI and finds that working time is positively related to BMI. Finding this relationship, the analysis next explores the channels driving this result by examining the effect of time spent working on activities associated with eating, health, and non-market work. In the ordinary least squares specifications, increased working time was associated with an increase in time spent in secondary drinking and a decrease in time spent in sleeping, active time, housework, and screen time for both men and women. For women, increased working time was also found to be associated with a decrease in time spent in primary eating, food preparation, exercise, and own medical care. Controlling for endogeneity, the instrumental variables results showed increased working time was associated with a decrease in food preparation and housework time for women and sleep time for men, but did not appear to have a significant effect on time spent in other activities.

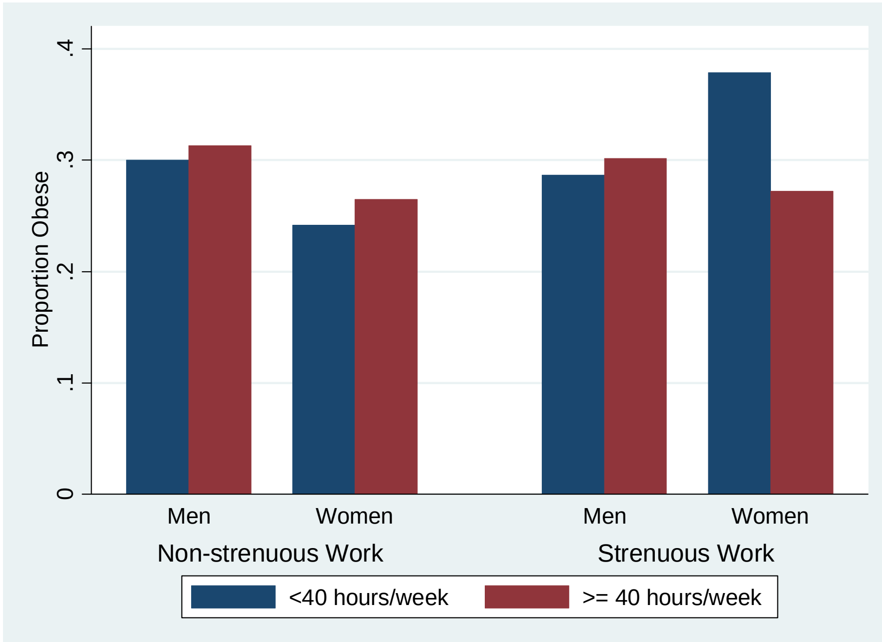
Introduction

Recent research has found that there is a growing disparity in working hours between Americans and those in other industrialized countries. The full consequences of increasing working hours are not explored in the literature and can have significant implications for labor and tax policy. This paper examines the connection between time spent working and obesity as well as the mechanisms through which they might be related. The paper contributes to the literature by using time use data to examine the effect of time spent working on Body Mass Index (BMI) and health as well as by modeling the channels through which time use affects weight and health outcomes.

BMI might increase with more hours spent working since as leisure time declines, the opportunity cost of time rises. As an individual works more hours, she has less leisure time available, and it thus becomes more costly to undertake health-producing activities such as exercise, food preparation, and sleep as well as to seek medical care. On the other hand, working could be associated with a lower BMI if it individuals use increased income to substitute away from time-intensive health investments to goods-intensive health investments. This paper will examine the relationship between hours worked and BMI and attempt to identify the mechanisms driving this relationship.

Figure 1 shows the proportion obese for men and women by working time and strenuousness of work. Here we can see that for both men and women in non-strenuous occupations, working longer hours appears to be associated with a higher likelihood of being obese, and the relationship appears to be stronger for women than for men. Examining the proportion obese for individuals in strenuous occupations, for men, the relationship appears to be similar to that for non-strenuous occupations, but for women, the opposite effect appears to be true: working longer hours appears to be associated with a lower likelihood of being obese. Since it is important to control for other factors as well as the endogeneity of the decision of how many hours to work, more in-depth analysis of this question is valuable.

Figure 1: Working Time and Obesity Status[1]



Several papers have examined the connection between work, weight, and health. Ruhm (2000, 2003, 2005, 2007) shows that employment and unemployment indicators are positively related to mortality, incidence of certain medical conditions, and obesity incidence and are negatively related to exercise. Courtemanche (2009) uses long differencing methods and the National Longitudinal Study of Youth 1979 (NLSY) to find that longer hours increase one's own BMI and probability of being obese. Berniell (2012) uses the change in the legal maximum workweek hours in France enacted in 1998 to find that a reduction of working time is associated with a drop in the probability of smoking, in alcohol consumption, and in physical inactivity. Xu and Kaestner (2010) examine the effects of wages and working hours on health behaviors of men aged 25-55 with some college education and finds that increases in hours worked are associated with an increase in cigarette smoking, a reduction in physical activity, and fewer visits to physicians. This paper first replicates the findings of other papers, that working time is positively associated with BMI, and then examines the channels through which these effects might be associated.

The analysis uses the 2006, 2007, and 2008 American Time Use Surveys (ATUS) linked with Eating and Health module interviews, Current Population Survey (CPS) data, and the Compendium of Physical Activities. While other datasets provide information on individuals' market work time, the ATUS also provides insight into individuals' non-market work activities. Linked with the Eating and Health module, it permits inference to be drawn about individuals' time use in a variety of activities as well as measures relating to eating and health, including BMI. The linked ATUS and Eating and Health module data provides great insight into the relationship between time use and weight and health and can be very valuable in understanding the relationship between working time and BMI and health.

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[1] From the 2006-2008 American Time Use Survey and Eating and Health Module.

The analysis aims to identify the effect of time spent working on BMI and activities associated with eating, health, and non-market work. However, identifying the causal effect of time spent working on health outcomes and time spent on health-related behaviors is challenging because the decision of how much time to spend working may be determined by unobserved factors that directly affect the outcomes of interest. First, I replicate the results of other papers by estimating the effect of working time on BMI. I estimate several ordinary least squares specifications, and then, to address unobserved heterogeneity in the choice of working hours, I estimate several instrumental variables specifications and use state unemployment rates to instrument for working time. I also examine whether working time has differential effects by strenuousness of work, marital status, and occupation type. To investigate the channels through which working time may impact BMI, I next estimate the effect of time spent working on time spent in activities associated with eating, health, and non-market work using ordinary least squares and instrumental variables specifications.

Results suggest that working time is positively related to BMI. Examining the channels for this relationship, in the ordinary least squares specifications, increased working time was associated with an increase in time spent in secondary drinking and a decrease in time spent in sleeping, active time, housework, and screen time for both men and women. For women, increased working time was also found to be associated with a decrease in time spent in primary eating, food preparation, exercise, and own medical care. Controlling for endogeneity, the instrumental variables results showed increased working time was associated with a decrease in food preparation and housework time for women and sleep time for men, but did not appear to have a significant effect on time spent in other activities.

The paper contributes to the literature by using time use data to examine the effect of time spent working on BMI as well as by modeling the channels through which time use affects weight and health outcomes. While previous work has explored the effect of working time on BMI, this paper considers the effect of working time on various measures of time use to get a fuller picture of how work time affects lifestyle choices that affect weight and health.

The rest of the paper is organized as follows. The next section provides some background on the literature examining the effects of time use on health. The section that follows presents a theoretical framework for understanding the channels through which time spent in work could affect BMI. The next sections present the data used in the analysis, outline the empirical specifications, and show results of the analysis. The last section concludes.

Effects of Time Use on Health

With the availability of time use data, much research has begun to investigate the impact of how individuals spend their time on their own health and the health of others. One of the first papers to examine the effect of time spent working on time spent in non-market activities and to emphasize the importance of investments of time in activities related to health and productivity was Biddle and Hamermesh (1990), who used the 1975-1976 Time Use Study to examine the relationship between time spent in the labor market and sleep. In cross-sectional and panel analysis, the paper found a significant negative relationship between time spent working and time spent sleeping, and, estimating a demand system for sleep and working, the paper found that people with higher predicted wages sleep less – men appear to shift time from sleep to leisure and women from market to non-market work. Hamermesh (2010) used the linked ATUS data to examine individuals' eating and grazing behavior. With regard to BMI and self-reported health status, the paper found that more time spent eating (and grazing) is associated with a lower BMI and with better self-reported health. Kolodinsky and Goldstein (2011) estimated the impacts of food expenditure and time use patterns on obesity in single female headed households of 31-50 years of age and identified a number of demographic characteristics associated with an increased probability of being overweight and that individual time uses related to food were insignificant in predicting the probability of being overweight, but that once an individual crosses the overweight threshold, these time uses are significant in predicting BMI. Zick, Stevens, and Bryant (2011) investigated the relationship between BMI and various uses of time including physical activity time, television/video viewing time, sleep time, primary eating time, secondary eating time, and food preparation time. While all of these papers considered different aspects through which individuals' time use can affect their health, this paper investigates the effect of working time on eating and health behaviors and BMI.

While the aforementioned papers examine time use on own outcomes, several papers have also examined how parents' working time affects time spent with children and children's health outcomes. Cawley and Liu (2007) used the ATUS to explore whether mother working and mother's time spent working impacted her time spent on activities associated with child academic development to investigate the mechanisms through which maternal employment affects worse child performance on tests of cognitive ability. To account for endogeneity, the paper used instrumental variables analysis instrumenting maternal employment with state unemployment rates in addition to probit and ordinary least squares models. The paper found that employed women spend significantly less time reading to their children, helping with homework, and in educational activities in general, but found no evidence that these decreases in time are offset by increases in time by husbands and partners. Fertig, Glomm, and Tchernis (2009) used the Child Development Supplement from the Panel Study of Income Dynamics to investigate the channels through which maternal employment affects childhood obesity and explore why the effect of maternal employment is more pronounced for children from higher socioeconomic backgrounds. The paper found some evidence that supervision and nutrition play significant but small roles in the relationship between maternal employment and childhood obesity. These papers investigated the effects of time spent in work on time spent in activities related to children; this paper will consider the effect of time spent in work on BMI and one's own time spent in eating and health-related activities.

Next, in order to understand the channels through which time spent working could affect time spent in eating and health-related activities and BMI, the paper presents a theoretical framework.

Theoretical Framework

Given the amount of time individuals spend working, it is important to consider the effects of work on health and the channels through which these might come about. To formally outline these channels, the theoretical framework used in this paper follows the model presented in Xu and Kaestner (2010) based on Grossman (1972, 2000). An individual maximizes his utility subject to time and budget constraints and health is included as a choice variable in his utility function. Health is generated according to a health production function reflecting investment in health-related commodities, time spent working, environmental factors, and genetic endowment. A change in hours worked could have several effects. The income effect of increased working time would be positively associated with the consumption of goods including health-related commodities and would thus lead to increased health. The substitution effect of increased working time would be negatively associated with time spent in other consumption including health-related commodities and would lead to decreased health. Since each of these effects act in opposite directions, the net effect would be ambiguous, but is likely to be positively (negatively) associated with consumption of goods that are relatively less (more) time-intensive.

There are several mechanisms through which work hours could affect weight and health. If an individual works more hours, her leisure time drops, which could increase her weight through four mechanisms. First, she might exercise less and spend less time in active pursuits, decreasing calories expended and leading to weight gain. Second, she might devote less time to food preparation and eating during meals, causing a substitution from home-prepared meals to snacking and eating unhealthy convenience food, such as fast food and prepared processed food. This substitution could increase caloric intake, as a variety of research links a higher frequency of eating fast food to greater consumption of calories, fat, and saturated fat and also to obesity. A third potential mechanism is sleep. Additional work may reduce time available for sleep, and research suggests that sleep deprivation is associated with weight gain. Fourth, she may devote less time to health-promoting activities such as seeking medical care and engaging in non-market work and activities.

This paper will examine the relationship between hours worked and BMI and attempt to identify the mechanisms driving this relationship.

Data

The analysis uses the 2006, 2007, and 2008 American Time Use Surveys (ATUS) linked with Eating and Health module interviews and Current Population Survey (CPS) data. While other datasets provide information on individuals' market work time, the ATUS also provides insight into individuals' non-market work activities. Linked with the Eating and Health module, it permits inference to be drawn about individuals' time use in a variety of activities as well as measures relating to eating and health, including BMI. The ATUS collects detailed information on how respondents spend their time over a 24-hour period and provides valid, reliable measures of time spent in various activities. Each ATUS respondent is randomly selected from the members ages 15 and older of households that completed their final interview for the Current Population Survey in the preceding 2-5 months. In addition to the time use data, the ATUS data includes selected variables collected as part of the respondents' previous CPS interviews. In 2006, 2007, and 2008, the ATUS respondents were also asked a series of questions known as the Eating and Health module. The Eating and Health module interviews asked respondents about their time spent eating and drinking as well as their height and weight and self-reported health status. The linked ATUS and Eating and Health module data provides great insight into the relationship between time use and weight and health and can be very valuable in understanding the relationship between working time and BMI and health.

For this analysis, in order to estimate the total physically active time of the respondents and to construct a variable controlling for strenuousness of work, the analysis follows Tudor-Locke et al. (2009) who have linked the ATUS time use lexicon to the Compendium of Physical Activities. Following Zick, Stevens, and Bryant (2011), physical activity is measured as the sum of time spent in all activities in the ATUS activity lexicon that generate metabolic equivalents (METs) of 3.3 or more. Further, to control for occupational physical activity requirements, a respondent who works in an occupational category designated with a MET value of 3.3 or more is considered to work in a strenuous occupation.

The analysis includes only employed individuals. Individuals enrolled in school are excluded from the analysis since it is unclear whether time spent in schooling should be considered work or leisure. The sample was limited to individuals ages 25-64 since they are likely to be living on their own and have completed their schooling.[2] In addition, individuals who reported being pregnant were excluded from the BMI analysis since their reported BMI might be uncharacteristic of the general population. The full sample includes 15,255 individuals. Summary statistics for the sample are presented in Table 1.

Table 1: Summary Statistics

Variable	Mean	Standard Deviation
Age	43.06	(10.51)
Proportion Married/Cohabiting	0.70	(0.46)
Children Aged<18 in Household	0.45	(0.50)
Children Aged<6 in Household	0.20	(0.40)
Proportion Less than High School Diploma	0.08	(0.28)
Proportion High School Graduates	0.30	(0.46)
Proportion Some College	0.26	(0.44)
Proportion College Graduates	0.36	(0.48)
Proportion White	0.70	(0.46)
Proportion Black	0.11	(0.31)
Proportion Hispanic	0.13	(0.34)
Proportion Other Race	0.06	(0.23)
Hourly Income ($)	21.55	(19.49)
BMI	27.69	(5.58)
Proportion Overweight	0.66	(0.47)
Proportion Obese	0.29	(0.45)
Proportion Reported Excellent Health	0.21	(0.41)
Proportion Reported Very Good Health	0.38	(0.49)
Proportion Reported Good Health	0.31	(0.46)
Proportion Reported Fair Health	0.09	(0.28)
Proportion Reported Poor Health	0.01	(0.10)
Weekly Work Hours	42.53	(11.40)
Proportion Engaged in Strenuous Work	0.09	(0.29)
Proportion with a Spouse Working Full-Time	0.55	(0.50)
Proportion Blue Collar	0.24	(0.43)
Proportion White Collar	0.63	(0.48)
Proportion Service	0.13	(0.34)
Observations	15,255	

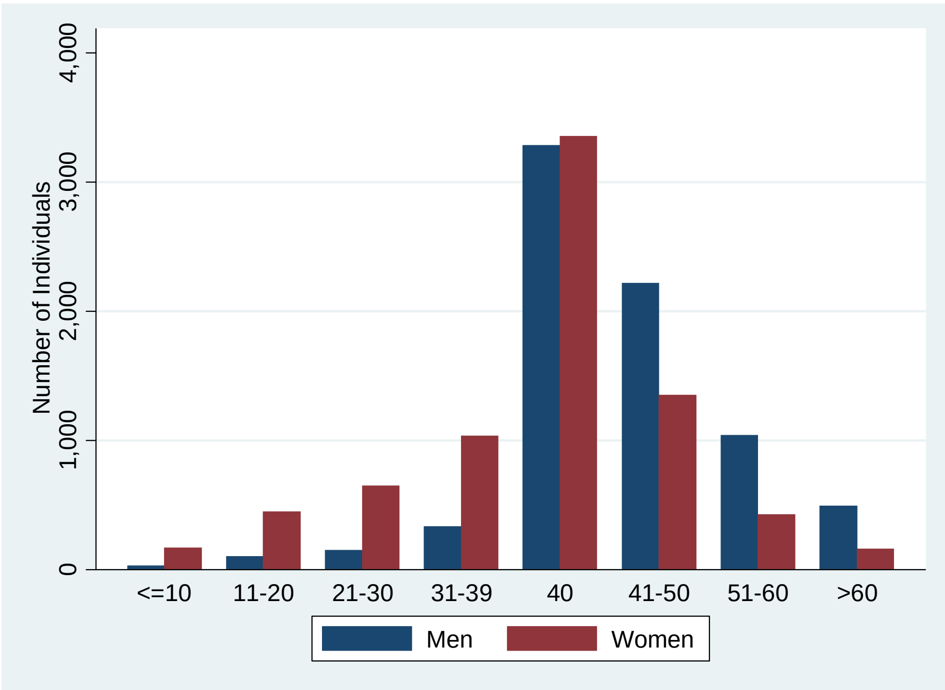
From the summary statistics, we see that the mean age in the sample is 43 years, 70 percent are white, 70 percent are married or living with a partner, 45 percent have children under the age of 18, and 20 percent have children under the age of 6. The average hourly income is $22, the average weekly work hours was 43, and only 9 percent of the sample were employed in strenuous occupations with the majority of individuals working in white collar jobs. The mean

[2] This follows the methodology in Zick, Stevens, and Bryant (2011).

BMI for the sample is 28, with a BMI of between 25 and 30 being classified as overweight. 66 percent and 29 percent of the sample are classified as overweight and obese, respectively. The majority reported at least good health. The majority have at least some college education.

To examine differences in time spent working between men and women, Figure 2 shows the distribution of usual weekly work hours by sex. As can be seen in the figure, the majority of both men and women work 40 hours per week, and the proportion of the sample working 40 hours per week is similar for men and women. However, more men appear to work more than 40 hours per week, while more women appear to work less than 40 hours per week. Given these differences, it could be the case that the effects of time spent working could vary for men and women, and accordingly, specifications are estimated separately by sex.

Figure 2: Usual Weekly Work Hours by Sex



Next, we will proceed with the empirical specification to estimate the effects of working time on BMI and time spent in eating and health-related activities.

Empirical Specification

Identifying the causal effect of time spent working on BMI and the time spent in eating and health-related activities is challenging because the decision of how much time to spend working may be determined by unobserved factors that directly affect the outcomes of interest. I first estimate ordinary least squares specifications, and then, to address this unobserved heterogeneity, I estimate instrumental variables specifications. In all specifications, the data is weighted to be population-representative.

Looking first at BMI, the ordinary least squares specifications estimate models where time spent working is treated as a predetermined variable that affects BMI:

$$y_i = \beta_0 + \beta_1 \text{WorkingTime} + \beta_2 \text{StrenuousWork} + \beta_3 [\text{WorkingTimeXStrenuousWork}] + \beta_4 X + \varepsilon$$

where y_i represents BMI, measured continuously.[3] Working time (β_1) measures the usual hours spent in work each week.[4] Strenuousness of work (β_2) is a dummy variable equal to 1 if the individual works in an occupational category associated with a MET of 3.3 or more controlling for occupational physical activity requirements.[5],[6] The interaction term of working time and the strenuousness of work (β_3) allows the effect of additional working time on BMI to vary by the strenuousness of the individual's occupation. The X vector (β_4) includes controls for spouse working full-time, age, age squared, race, sex, marital status,[7] hourly income, education, poor health, whether there are children younger than 18 living in the household, whether there are children younger than 6 living in the household, region, metropolitan status, season, and year.[8] The error term is represented by ε. Specifications are first estimated for the full sample and then separately for men and women.

Next, instrumental variables specifications estimate models where time spent working and BMI may be simultaneously determined. Time spent working is instrumented with annual state occupation-level unemployment rates using the 2006-2008 Current Population Survey. These specifications are estimated separately for men and women. Unemployment rates are related to hours worked since as unemployment increases, firms hire fewer workers and reduce the hours worked by current workers. The correlation between unemployment rates and hours worked in the data is -0.07 for men and -0.11 for women. Instrumental variables specifications include only workers employed in non-strenuous occupations.

To investigate the channels through which working time may impact BMI and health status, the effects of time spent working on time spent in activities associated with eating, health, and non-market work are estimated next. The activities investigated include: primary eating, secondary eating, secondary drinking, food preparation, sleeping, exercise, active time,[9] housework, screen time, and own medical care time. The specification follows that for BMI except that the log time

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[3] Specifications with overweight status and obesity status as the dependent variables, each measured as dummy variables equal to 1 if the individual is classified as being overweight (BMI≥25) or obese (BMI≥30), respectively, and equal to 0 otherwise were also estimated, and the results were qualitatively similar.
[4] Using log usual hours worked yielded qualitatively similar results.
[5] Following Zick, Stevens, and Bryant (2011), a METs value ≥ 3.3 is used as a cut-off as this captures occupations such as building and grounds cleaning and maintenance, farming, and construction and extraction.
[6] An interaction term of working time and the strenuousness of work was included in some specifications to allow the effect of additional working time on BMI to vary by the strenuousness of the individual's occupation, but did not appear to have a significant effect.
[7] Marital status controls for whether the individual was living with a spouse or partner at the time of the CPS interview.
[8] Specifications excluding the control for hourly income and specifications including occupation-level controls yielded qualitatively similar results.
[9] Following Zick, Stevens, and Bryant (2011), the variable for active time includes time spent in activities having METs values ≥ 3.3 which captures activities such as exterior house cleaning, lawn and garden work, caring for and helping household children, playing sports with household children, active transportation time (i.e., walking or biking), as well as most forms of sports, exercise, and recreation. It excludes such routine household activities such as interior housekeeping and playing with children in non-sports.

spent in each activity is included as the dependent variable,[10] a control is added for whether the diary day is a weekend or holiday, and the specification is estimated with a control for working in a strenuous occupation, but no interaction term. As with the analysis for BMI, both ordinary least squares and instrumental variables specifications were estimated.

Main Results

Table 2 presents results for the ordinary least squares and instrumental variables specifications for BMI. In general, for the full sample, we see a negative effect of household hourly income, age appears to have an inverse U-shape effect, women tend to have lower BMIs than men, blacks and Hispanics appear to have higher BMIs than whites with those with other races appear to have lower BMIs than whites. Being a college graduate appears to be associated with lower BMI. Living in a non-metropolitan area and poor health are both associated with a higher BMI. Having children under the age of 6 and under the age of 18 and being married appeared to have little effect on BMI.

As seen in Table 2, ordinary least squares results for men and women include an interaction of hours worked and strenuousness of work to identify any differential effects of working hours on BMI for individuals employed in strenuous occupations and those that are not. For both men and women, we see that for workers in non-strenuous occupations, additional time spent working is associated with a significantly lower BMI while for workers in strenuous occupations, there does not appear to be a significant effect of hours worked on BMI.

Since working hours only appear to impact BMI for workers in non-strenuous occupations, instrumental variables regressions include only these individuals. The first-stage regression F-statistics indicate that the instrument is only potentially valid for women,[11] and when instrumenting for working time, we see a positive effect of hours worked on BMI for women. These results are consistent with those of other papers (Courtemanche, 2009; Berniell, 2010) who find that increased working time is associated with a higher BMI.

[10] Including time in minutes yielded qualitatively similar results.
[11] This is consistent with Cawley and Liu (2007).

Table 2: Ordinary Least Squares and Instrumental Variables Results for BMI[12]

	OLS	OLS	IV	IV
	Women	Men	Women	Men
Weekly Hours Worked	0.0268***	0.0142*	0.248*	-0.0225
	(0.0087)	(0.0082)	(0.1320)	(0.3190)
Spouse's Weekly Hours Worked	0.275	-0.312*	0.161	-0.236
	(0.2850)	(0.1780)	(0.3070)	(0.4340)
Strenuous Work	0.52	0.606		
	(1.2710)	(1.0350)		
Strenuous Work X Weekly Hours Worked	-0.0377	-0.0235		
	(0.0311)	(0.0226)		
Hourly Income	-0.0149**	-0.00326	-0.00278	-0.00927
	(0.0063)	(0.0044)	(0.0085)	(0.0368)
Age	0.148*	0.248***	0.0091	0.305
	(0.0816)	(0.0706)	(0.1090)	(0.3250)
Age Squared	-0.00113	-0.00272***	0.00064	-0.00341
	(0.0009)	(0.0008)	(0.0013)	(0.0039)
Black	2.714***	0.298	2.554***	0.26
	(0.2770)	(0.2620)	(0.3050)	(0.3260)
Hispanic	1.088***	0.36	1.164***	0.315
	(0.3200)	(0.2400)	(0.3460)	(0.5470)
Other Race	-1.411***	-0.890**	-1.178***	-1.079
	(0.3540)	(0.3820)	(0.3990)	(0.7730)
High School Graduate	-0.553	0.271	-0.833	0.529
	(0.4720)	(0.3090)	(0.6180)	(0.4900)
Some College	-1.096**	0.45	-1.570**	0.625
	(0.4760)	(0.3180)	(0.6620)	(0.6730)
College Graduate	-2.707***	-0.835***	-3.699***	-0.528
	(0.4780)	(0.3120)	(0.8910)	(1.2960)
Married	-0.43	0.434*	-0.0984	0.456
	(0.2970)	(0.2300)	(0.4420)	(0.9190)
Non-Metropolitan	0.39	0.277	0.560*	0.324
	(0.2570)	(0.2310)	(0.2880)	(0.3850)
Children<Age 18 in Household	0.0438	-0.11	0.630*	-0.0583
	(0.2210)	(0.2040)	(0.3760)	(0.2300)
Children<Age 6 in Household	0.364	-0.121	0.622**	-0.189
	(0.2660)	(0.2000)	(0.3150)	(0.2790)
Poor Health	3.030**	1.812	3.854***	1.286
	(1.2510)	(1.3220)	(1.4690)	(1.5670)
Observations	7,602	7,653	7,323	6,708
R-squared	0.10	0.03		0.03
Test of Endogeneity - Chi-Squared			5.86	0.02
Test of Endogeneity - F			3.21	0.01
First-Stage Regression F-Statistic			19.53	1.48

[12]In all regressions, robust standard errors clustered by state are in parentheses and *** p<0.01, ** p<0.05, * p<0.1.

Channels for Effects of Working Time on BMI

Next, to investigate the channels through which working time may impact BMI, the effect of time spent working on time spent in activities associated with eating, health, and non-market work is estimated. Table 3 and Table 4 presents results for women and men, respectively, for regressions on working hours of time spent in activities associated with eating, health, and non-market work measured in log minutes.[13]

Table 3: Allocation of Time to Activities Associated with Eating and Health for Women

	OLS	IV		
Activity Time (Log Minutes)	Weekly Hours Worked	Weekly Hours Worked	Test of Endogeneity - Chi-Squared	Test of Endogeneity - F
Primary Eating	-0.00247**	-0.00261	0.92	0.58
	(0.0011)	(0.0161)		
Secondary Eating	0.00286	-0.0286	2.94	1.44
	(0.0021)	(0.0403)		
Secondary Drinking	0.00875**	0.0307	0.12	0.08
	(0.0037)	(0.0563)		
Food Preparation	-0.0103***	-0.0354*	0.32	0.22
	(0.0016)	(0.0203)		
Sleeping	-0.00239***	0.000739	0.02	0.01
	(0.0004)	(0.0060)		
Exercise	-0.00488*	-0.0168	0.20	0.13
	(0.0028)	(0.0132)		
Active Time	-0.00623**	0.0115	3.00	2.57
	(0.0030)	(0.0251)		
Housework	-0.0154***	-0.0694**	3.28	2.21
	(0.0017)	(0.0308)		
Screen Time	-0.00553***	-0.000402	0.18	0.11
	(0.0013)	(0.0184)		
Own Medical Care Time	-0.0230*	-0.0803	1.12	0.63
	(0.0138)	(0.1650)		
First-Stage Regression F-Statistic		12.39		

[13] Using log minutes restricts each regression to only individuals engaging in each activity for some amount of time. Both linear probability models examining the likelihood of spending any time in each activity and an analysis including all individuals and using minutes spent in each activity were also estimated, and the results were qualitatively similar.

Table 4: Allocation of Time to Activities Associated with Eating and Health for Men

	OLS		IV	
Activity Time (Log Minutes)	Weekly Hours Worked	Weekly Hours Worked	Test of Endogeneity - Chi-Squared	Test of Endogeneity - F
Primary Eating	-0.00106	-0.226	11.27	7.02
	(0.0011)	(0.4880)		
Secondary Eating	0.00417	-0.0343	0.21	0.15
	(0.0027)	(0.0739)		
Secondary Drinking	0.0154***	1.798	7.29	4.49
	(0.0039)	(60.3300)		
Food Preparation	-0.00181	0.0518	3.05	1.04
	(0.0022)	(0.1310)		
Sleeping	-0.00426***	0.217***	1.33	0.63
	(0.0005)	(0.0259)		
Exercise	-0.0014	-0.247	0.83	0.63
	(0.0029)	(0.3290)		
Active Time	-0.00827***	-0.322	5.27	2.90
	(0.0029)	(0.3710)		
Housework	-0.0116***	9.164	6.00	2.92
	(0.0025)	(280.5000)		
Screen Time	-0.0120***	-0.137	9.14	5.14
	(0.0013)	(0.1210)		
Own Medical Care Time	-0.0284	-0.478	5.79	1.94
	(0.0238)	(0.3700)		
First-Stage Regression F-Statistic			0.001	

In the ordinary least squares specifications, increased working time was associated with an increase in time spent in secondary drinking and a decrease in time spent in sleeping, active time, housework, and screen time for both men and women. For women, increased working time was also found to be associated with a decrease in time spent in primary eating, food preparation, exercise, and own medical care. Controlling for endogeneity, the instrumental variables results showed increased working time was associated with a decrease in food preparation and housework time for women and sleep time for men, but did not appear to have a significant effect on time spent in other activities. Again, the instrument is only valid for women, and when instrumenting for working time, we see no significant effect of hours worked on time spent in any of the activities for men.

Conclusion

This paper examined the connection between time spent working and obesity as well as the mechanisms through which they might be related. The analysis used the 2006, 2007, and 2008 American Time Use Surveys (ATUS) linked with Eating and Health module interviews and Current Population Survey (CPS) data to identify the effect of time spent working on BMI and activities associated with eating, health, and non-market work. To examine the effect of time spent working on BMI, the paper estimated ordinary least squares specifications, and then, to address unobserved heterogeneity in the choice of working hours, estimated instrumental variables specifications using annual state occupation-level unemployment rates to instrument for working time. Next, the paper estimated the effect of time spent working on time spent in activities associated with eating and health using ordinary least squares and instrumental variables specifications to investigate the channels through which working time may impact BMI.

Results suggest that working time is positively related to BMI. Examining the channels for this relationship, in the ordinary least squares specifications, increased working time was associated with an increase in time spent in secondary drinking and a decrease in time spent in sleeping, active time, housework, and screen time for both men and women. For women, increased working time was also found to be associated with a decrease in time spent in primary eating, food preparation, exercise, and own medical care. Controlling for endogeneity, the instrumental variables results showed increased working time was associated with a decrease in food preparation and housework time for women and sleep time for men, but did not appear to have a significant effect on time spent in other activities.

From this analysis, we see that the distribution of time spent working is different for men and women, and while it appears that some effects of increased working time are the same for men and women, they also differ for many activities. Consistent with other work, the instrument of unemployment rates appeared to only be potentially valid for women. Comparing the ordinary least squares and instrumental variables results suggests that many of the effects of working time on time spent in activities related to eating and health contribute to the selection into working long hours. This suggests that policies aiming to reduce obesity prevalence targeting working hours may not be effective. However, for women, the results of the instrumental variables analysis did suggest that there may be some potential for effective policy intervention since increased work time was found to be associated with a decrease in food preparation and housework time for women. Reduced time spent in food preparation could contribute to increased BMI if it is accompanied by a shift to unhealthy convenience food and decreased time in housework could contribute to increased BMI as housework could provide an opportunity for physical exertion.

The paper contributes to the literature by using time use data to examine the effect of time spent working on BMI as well as by modeling the channels through which time use affects weight and health outcomes. While previous work has explored the effect of working time on BMI, this paper considers the effect of working time on various measures of time use to get a fuller picture of how work time affects lifestyle choices that affect weight and health. This is valuable because recent research has found that there is a growing disparity in working hours between Americans and those in other industrialized countries, and the full consequences of increasing working hours are not explored in the literature and can have significant implications for labor and tax policy. Further, to prescribe effective policy interventions, it is necessary to know the channels through which any effects are arising.

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