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23 November 2016

Online at https://mpra.ub.uni-muenchen.de/75228/
MPRA Paper No. 75228, posted 03 Jul 2017 14:48 UTC

How May Working Hours and Occupations Affect Arthritis? Results from a Nationally Representative Dataset

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Authors declare no conflict of interest. There was no funding for this study.

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Abstract

Objective: Even though many studies have focused on the relationship between osteoarthritis and occupation, few studies have examined the relationship between arthritis and working hours; this paper seeks to fill this gap in the literature.

Methods: We used a Cox regression method for the sample from Health and Retirement Survey.

Results: We found that working more hours reduces the probability of arthritis among older workers in the United States. We also showed which occupations put workers at greater risk for developing arthritis.

Conclusion: It is important to understand the risk of arthritis in an elderly workforce because of its policy implications on ideas such as restricting weekly working hours. Therefore, this study's findings may raise questions about the need for initiatives in the European Union and other countries that regulate the permitted length of work schedules.

Working long hours brings pecuniary benefits but also causes health problems. There are several studies that show that working long hours might be associated with some cardiovascular diseases [1, 2]. In addition, other studies have reported an effect on the blood concentration of glycosylated hemoglobin (HbA1c) and blood pressure [3, 4]. Besides this, long working hours can cause arm/hand discomfort and affect workers' physical and mental health [5, 6].

However, the findings of many studies are limited because small samples were used; few were conducted using nationally representative data sets. There are a few exceptions, one of which used the National Longitudinal Survey of Youth (NLSY) dataset, a nationally representative dataset for the United States [7]. Their analysis depended on Cox regression analysis, and they found that working at least 60 hours per week significantly increased the probability of injury. Other exceptions measured the relationship between working hours and obesity [8, 9]. Both found a positive relationship between obesity and working hours.

Another health problem associated with long working hours might be arthritis. A study using the U.S. National Health Interview Survey–Occupational Health Supplement (NHIS-OHS) survey found that there is a relationship between occupations and general arthritis prevalence [10]. Therefore, we might expect that working hours affects the probability of developing arthritis.

According to one study, the number of people over the age of 60 is projected to reach one billion by 2020 and almost two billion by 2050 (22% of the world's population) [11]. Therefore, we need to improve our understanding of arthritis among the elderly. Although many studies have investigated arthritis among older people [12, 13], no previous study has focused on the relationship between arthritis and long working hours among older workers, even though the risk of arthritis is high among this population.

This study bridges this gap in the literature by examining the relationship between working hours and the probability of developing arthritis among older workers in the United States. We applied Cox regression to panel data taken from the Health and Retirement Survey (HRS) and found that increasing a person's working hours reduces their probability of developing arthritis.

This paper proceeds as follows. Section II describes the previous literature that examined the effects of working hours on health. The dataset is described and the methodology used in the study is presented in Section III. Section IV describes the main results, and Section V summarizes and discusses the findings.

Literature Review

The effects of working hours on employee health have gained a lot of attention; for instance, some studies have focused on the relationship between obesity and working hours. One study focused on the effects of sleeping time on body/mass index (BMI) in Hong Kong [14]. They point out that working more hours may lead to fewer sleeping hours, and found that increased working hours lead to an increased BMI. Other studies have estimated the effect of long working hours on obesity in Australia [15, 16]. According to their results, female workers who work longer hours are more likely to gain more weight. Meanwhile, a few studies have investigated the effect of working hours on health in the United States. For example, a study examined the relationship between US working hours and weight gain, and used NLSY data to determine that increasing an individual's working hours increases their BMI [8]. Another study

that investigated the relationship between obesity and working hours found the same effect for older workers in the US [9].

In addition, many studies have focused on osteoarthritis and occupations [17-21]. They highlight that there exists an association between osteoarthritis and occupational activities. However, one study showed that hand/wrist arthritis is most common among workers in mining, agriculture, construction, and manufacturing occupations [10]. In addition, only one study has investigated the relationship between working hours and the probability of developing arthritis for a whole population [22]. They used the NLSY dataset and a logistic regression model. They divided working hours into four categories: 30–40, 41–50, 51–60, and 60+ hours per week. They concluded that working more than 60 hours per week carried the highest arthritis risk.

Furthermore, many health studies have focused on arthritis among older workers [12, 13, 23, 24]; however, no previous study has focused on working hours and the probability of arthritis among old people. Therefore, the present study contributes to the literature because it investigates the effect of working hours on the probability of arthritis for older people and is the first to address this topic.

Methodology

This study relies on the RAND user-friendly version of the HRS, which was conducted by the University of Michigan. The HRS's original cohort comprised more than 26,000 Americans older than 50 years old, and includes information about respondents such as their sociodemographic characteristics and detailed work histories and began in 1992; the most recent available survey was conducted in 2014.

Our statistical analysis depends on survival analysis, which is suitable for explaining the factors that can contribute to the risk of developing arthritis. The Cox proportional hazards regression model states that the hazard rate for the j^{th} subject in the data is

$$h(t|x_{1j},x_{2j},\ldots x_{kj}) = h_0(t) \exp(\beta_1 x_{1j} + \beta_2 x_{2j} + \ldots + \beta_k x_{kj}) \quad (1)$$

The Cox model has the important advantage that it does not make potentially untenable distributional assumptions about the hazard rate. In addition, a positive Cox regression coefficient for an independent variable means that the hazard probability is higher.

The dependent variable in the survival analysis carried out in this study was the risk that a subject is diagnosed with arthritis in a given year. Our main independent variable was the person's working hours. The covariates included their age, history of smoking, alcohol use, level of education, gender, white dummy, obese dummy, self-reported health (1 = excellent and 5 = poor) , and 16 occupations.

According to Table 1, which shows the summarized statistics of the dataset, 84% and 79% of the sample were white, for men and women respectively. According to the census, 77.9% of the people who reported membership of only one racial group were white. The respective average ages for men and women were approximately 61 and 60 years old. In addition, the respective average weekly working hours for men and women in our sample were approximately 41 and 35 hours. According to the OECD, the average American worker worked 34.4 hours per week in 2012 (1,790 hours/52 weeks).

Results

Table 2 shows the results of the Cox regressions that depend on Equation (1). The table shows that the coefficient of working hours is 0.99 (standard error: 0.00) for both men and women, suggesting that working more is associated with a lower probability of developing arthritis. Upon looking at the occupations, we can observe that being classed as "Prof specialty opr/tech sup," "Sales," "Health svc," and "Clerical/admin sup" reduces the probability of developing arthritis for men, while being classed as a member of the "Health svc" or "Svc:protection" occupation groups increased the probability of developing arthritis for men. Meanwhile, "Prof specialty opr/tech sup," "Clerical/admin sup," "Constr trade/extractors," and "Operators: handlers" reduced the probability of developing arthritis for women, while "Svc:prv hhld/clean/bldg svc," "Svc:food prep," "Health svc," "Precision production," and "Operators: machine" significantly increased their probability of developing arthritis.

Discussion

The proportion of older workers in the United States has increased over time in line with global trends. Therefore, further studies should investigate the relationship between health problems and the aging workforce. This study was a first attempt to investigate the relationship between long working hours and the probability of developing arthritis among older adults in the United States. This analysis of 12 biennial surveys based on HRS data suggests that working more hours is associated with a lower probability of developing arthritis for older workers.

Although this is the first study that has examined the US population in the literature, it has some shortcomings. First, the sample only examines older people. The results might differ when all age groups are considered. Second, our results depend on self-reported variables, which may have caused measurement errors.

It is important to understand the risk of arthritis in an elderly workforce because of its policy implications on ideas such as restricting weekly working hours. Therefore, this study's findings may raise questions about the need for initiatives in the European Union and other countries that regulate the permitted length of work schedules.

In conclusion, we strongly believe that we require further studies on this topic. We think that there are two areas upon which studies should focus. First, we need studies for different countries to determine this study's robustness. Future research must also focus on the mechanism behind the relationship, because we need to understand what specific aspect causes this relationship between arthritis and working hours.

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Table-1: Summary statistics

Men	Mean	S.D.	Min	Max
Arthritis Dummy	0.35	0.48	0	1
Workhours	40.61	15	0	168
Obese[1]	0.27	0	0	1
Age	60.67	7	22	100
Self-reported Health[2]	2.43	1	1	5
White	0.84	0	0	1
Education	13.05	3	0	17
Drink[3]	0.66	0	0	1
Smoke[4]	0.19	0	0	1
n		28,617		

Women	Mean	S.D.	Min	Max
Arthritis Dummy	0.46	0.50	0	1
Workhours	34.69	14.06	0	168
Obese[1]	0.30	0.46	0	1
Age	59.69	6.28	23	95
Self-reported Health[2]	2.43	0.99	1	5
White	0.79	0.41	0	1
Education	12.97	2.68	0	17
Drink[3]	0.54	0.50	0	1
Smoke[4]	0.17	0.38	0	1
n		27,326		

[1] *BMI≥30*

[2] 1 means excellent and 5 means poor

[3] Have you ever drunk alcohol? 1 means yes.

[4] Have you ever smoked cigarettes? 1 means yes.

Table-2: Cox regression results

	Men		Women	
	Coefficient	S.E.	Coefficient	S.E.
Workhours	0.99***	0.00	0.99***	0.00
Obese[1]	1.06**	0.03	1.03	0.02
Age	0.98***	0.00	0.98***	0.00
Self-reported Health[2]	1.22***	0.02	1.28***	0.02
White	1.55***	0.06	1.21***	0.03
Education	0.94***	0.00	0.97***	0.01
Drink[3]	0.86***	0.03	0.90***	0.02
Smoke[4]	1.01	0.04	1.21***	0.04
Occupations[5]				
Prof specialty opr/tech sup	0.87***	0.04	0.89***	0.04
Sales	0.85***	0.04	1.00	0.05
Clerical/admin supp	0.90*	0.05	0.90***	0.03
Svc:prv hhld/clean/bldg svc	0.98	0.18	1.42***	0.10
Svc:protection	1.31***	0.09	1.06	0.12
Svc:food prep	1.02	0.10	1.21***	0.07
Health svc	1.44***	0.20	1.12**	0.06
Personal svc	0.90	0.06	0.92*	0.05
Farming/forestry/fishing	1.06	0.06	0.84	0.11
Mechanics/repair	0.94	0.05	0.84	0.19
Constr trade/extractors	0.97	0.05	0.63**	0.13
Precision production	1.12	0.07	1.23**	0.10
Operators: machine	1.09	0.07	1.19***	0.08
Operators: transport	1.05	0.05	1.10	0.11
Operators: handlers	0.98	0.06	0.84**	0.07
n	28,617		27,326	

**** p<0.01 ** p<0.05 * p<0.10*

[1] *BMI≥30*

[2] 1 means excellent and 5 means poor

[3] Have you ever drunk alcohol? 1 means yes.

[4] Have you ever smoked cigarettes? 1 means yes.

[5] The reference group is "Managerial specialty oper."