

Working Hours and Alzheimer's Disease: Evidence from a Nationally Representative Dataset

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Abstract

Ageing population is a demographic shift that requires adaptations in social and economic sphere. In this respect, many of the older adults is expected to extend their working life. Considering projected increase in the number of older age adults and their raising presence in the labor force as well as higher prevalence of many health conditions among older population, there is an urgent need for more research on working conditions and health among older populations. This article responds to this need and constitutes a first attempt to uncover the relationship between working hours and the probability of developing Alzheimer's disease (AD) among older adults in the US. Using Health and Retirement Study (HRS), a nationally representative longitudinal panel dataset for the US, we applied Cox regression method and probit. We found that for male older workers an increase in working hours decreases the probability of developing AD or onset of Alzheimer's dementia thereof. In this respect, working long hours might play a protective role against AD. This might be because of engagement in some sort of intellectual activity through employment and socialization.

JEL classification numbers: J01, J14, I12

Key words: cognitive reserve hypothesis, elderly, working conditions, health economics, aging

1 Introduction

Ageing population is a demographic shift and has been product of changing political, economic and social conditions and scientific advances. Experiences and knowledge of older contribute to society and economic life, be it through paid or unpaid work [1]. On the other hand, present and potential future pressures on healthcare and social security systems, require many adaptations. In fact, the world will witness many adaptations, some of which will be related to economic life. Many of the older adults will extend their working life for either institutional changes or personal motivations, or both [2]. In any case, age diversity has already increased and successful ageing at work has been a prominent research topic [3]. Accordingly, understanding effects of various working conditions on older worker's health is

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both central to successfully ageing workforce and quality of life of seniors. In this respect, relationship between working hours and Alzheimer's disease (AD) is an undertaking in this direction.

Alzheimer's disease is a pressing public health concern [4] in a world where the number of people with AD is increasing rapidly. By 2050, the number of people with Alzheimer's is expected to quadruple and exceed 100 million [5]. Being a degenerative brain disease [6], Alzheimer's is the leading cause of dementia [7], which generally surfaces at older ages. The disease, which begins long before the appearance of clinical symptoms, demonstrates slow and gradual progress [8]. In addition, it creates an enormous burden on society beyond medical costs [9], taking into account years of life lost due to premature mortality and years lived with disability [10] as well as paid and unpaid caregiving provided [11]. There are several different identified factors associated with the risk of developing of AD; for instance, genetic [12] and environmental and lifestyle factors [13-15], such as occupation type or education. [16-20].

This article investigates the effect of one environmental factor, namely, working hours, on the development of AD. Working long hours may affect the probability of having AD for several reasons. First, work conditions affect the probability of having AD. According to the cognitive reserve hypothesis, high occupational attainment may lower the probability of having AD [21]. Main argument behind the reserve hypothesis, is that higher cognitive reserve, involving alternate neural connections as well as higher efficiency in brain [22], postpones the onset of Alzheimer's dementia [23]. Moreover, job stress may affect the probability of having AD because there is a positive relationship between job stress and dementia risk [24].

On the other hand, various health effects of working hours have been investigated in literature. Some of the investigated health related conditions include coronary heart diseases [25], occupational injuries [26], type 2 diabetes [27], sleep disorders [28], depression [29] and obesity[30]. However, as far as we know, no previous studies explored AD in the context of working hours.

In this paper, we fill this gap and analyze the relationship between working hours and the probability of having AD among older workers. Using Health and Retirement Study's (HRS) panel data, we applied the Cox regression method and probit. We found that an increase in working hours decreased the probability of having AD for just men.

2 Methods and Data

2.1 Data

This study relies on Health and Retirement Study (HRS) conducted by University of Michigan and supported by National Institute on Aging as well as Social Security Administration in the US. HRS includes data of approximately 20,000 Americans, who are 50 years and older. This longitudinal panel dataset is a nationally representative dataset for older population in the US. The multidisciplinary dataset for which information collected biennially since 1992 contain information on socio-economic status, detailed work histories, retirement, health as well as family structure. The article uses RAND user-friendly version of HRS and is based on three waves of the study from 2010 to 2014, as AD variable only exists for these waves.

2.2 Outcomes and analytical approach

The study makes use of two statistical approaches, namely survival analysis and probit. Survival analysis is especially convenient for this study, as it is suitable to explain the factors that contribute to AD. In the Cox proportional hazards regression model, the hazard ratio for the j^{th} subject in the data is

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

As the Cox model does not make untenable distributional assumptions about the hazard ratio, it is appropriate for the analysis undertaken. Furthermore, a positive Cox regression coefficient for an independent variable expresses a higher hazard.

In the survival analysis, the dependent variable is the risk that a subject is diagnosed as a probable AD or possible AD patient. Main independent variable in the analysis is the number of working hours during the period between 2010 and 2014. The covariates include age, smoking history, alcohol use, education level, a dummy for white subjects, a dummy for obesity (body mass index higher than 30), self-reported health (1 = excellent and 5 = poor), and the personal history for eight diseases (high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric problems, and arthritis).

The regression form for the probit is

$$D_{AD} = \alpha + \beta \text{WH} + \gamma \text{A} + \varepsilon. \quad (2)$$

D_{AD} is a binary variable. If the subject is diagnosed with AD the binary variable takes the value of 1. WH is a continuous variable for working hours. A are the above-mentioned covariates.

3 Results

Table1: The Summary Statistics

MEN				
	Mean	S.D.	Min	Max
Workhours	38.61	15.53	0	168
Age	61.49	7.76	50	100
Self-reported Health ¹	2.54	0.96	1	5
Number of Disease ²	1.47	1.27	0	7
White	0.72	0.45	0	1
Years of Education	13.45	3.14	0	17
Alcohol Consumption ³	0.72	0.45	0	1
Smoking History ⁴	0.15	0.36	0	1
Obese Dummy ⁵	0.35	0.48	0	1
N	9,861			
WOMEN				
	Mean	S.D.	Min	Max

Workhours	34.00	14.76	0	168
Age	60.48	6.91	50	93
Self-reported Health ¹	2.56	0.97	1	5
Number of Disease ²	1.58	1.28	0	7
White	0.67	0.47	0	1
Years of Education	13.36	2.87	0	17
Alcohol Consumption ³	0.61	0.49	0	1
Smoking History ⁴	0.14	0.34	0	1
Obese Dummy ⁵	0.41	0.49	0	1
N	10,595			

¹ 1 means excellent and 5 means poor

² How many out of eight diseases the individual has? (High blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric problems, and arthritis)

⁴ Have you ever smoked cigarettes? 1 means yes.

⁵ It equals to 1, if the individual's BMI ≥ 30 .

The sample is divided by gender because women and men have different probabilities of having AD [31]. Summary statistics for the data sets in the Cox model are displayed in Table 1. The average number of working hours is 38.6 and 34 hours for men and women, respectively. This figure is largely in line with 2014 OECD statistics, which put forth that an average American worker worked 34.35 hours per week (1,786 hours/52 weeks). In addition, 72 percent of the men were white and 67 percent of the women were white. Moreover, men's average age was slightly higher than that of women. There are some extreme numbers in the sample, like 168 working hours. Deleting these extreme values does not change the results.

Table 2: The Results

	Cox Model				Probit Model			
	Men		Women		Men		Women	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Workhours	0.91***	0.02	1.04	0.03	-0.16**	0.07	-0.01	0.05
Age	1.06***	0.02	1.01	0.07	0.11	0.13	0.14	0.11
Self-reported Health ¹	2.30*	1.04	7.06**	6.12	-0.04	0.65	2.27**	1.12
Number of Disease ²	0.62	0.50	1.19	0.25	0.82	0.59	0.61	0.51
White	2.41	3.23	0.53	0.57	0.94	2.71	-1.50	1.85
Years of Education	1.07	0.16	0.92	0.08	0.00	0.29	-0.02	0.30
Alcohol Consumption ³	1.59	1.13	0.66	0.72	0.31	1.78	0.17	1.31
Smoking History ⁴	0.00***	0.00	0.93	1.15	1.23	2.20	2.76	1.89
Obese Dummy ⁵	0.25	0.22	0.11	0.18	-0.17	1.63	-2.22	2.05
Constant								
					-30.41***	13.19	-34.69***	12.29
n	9,861		10,595		10,572		10,572	

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

Table 2 shows the results for men and women separately. For men, the coefficient of the Cox model on the number of working hours indicates that for 1-hour increase in working hours, the hazard ratio for AD decreases by a factor of 0.91. If all workers who are older than 49 years are included in the Cox proportional regression analysis, working one more hour per week at a job produces a 9% (95% confidence interval: [5%, 13%]) lower hazard ratio for AD. For women, the coefficient of the Cox model is not statistically significant at the usual levels.

Furthermore, the probit model reveals similar results. For men, the coefficient of the probit model on the number of working hours is equal to -0.16 [S.E.:0.07]. This suggests that working more hours reduces the probability of having AD. Again, the coefficient of the probit model is not statistically significant at the usual levels for female workers.

4 Discussion

According to US Bureau of Labor Statistics, the number of workers aged 65 years or older increased by 101% between 1977 and 2007, while total employment-age population (aged 16 years or older) increased by only 59%, demonstrating the increasing weight of older age workers. Taking into account projected increase in the number of older age adults and their rising presence in the labor force as well as higher prevalence of dementia among older population, there is an urgent need for more research on working conditions and dementia among older populations.

This article responds to this need and constitutes a first attempt to uncover the relationship between working hours and the probability of developing Alzheimer's dementia among older adults in the US. We found that long working hours are associated with a lower probability of having AD among older male workers. This result, in a way, renders support for the findings of Lupton, Stahl [23] and Grotz, Letenneur [32], which found association between late retirement age and delayed onset of AD.

Even though it is not straight forward from the results that working long hours is protective of onset of Alzheimer's dementia, it might well be that engagement in some sort of intellectual activity through employment or socialization delays disease's prevalence. Indeed, cognitively complex environments mitigate risks concerning AD [22]. Furthermore, as Adam, Bonsang [33] put it, occupational activity is positively associated with cognitive reserve. Accordingly, more studies from different countries are needed to check if our results hold for different contexts. Furthermore, mechanisms behind long working hours and lower risk of AD should be investigated.

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