The Role of Work Characteristics in Differentiating Trajectories of Health in Later Life

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September 26, 2014

Abstract

This study characterizes heterogeneous trajectories of health among older Americans and investigates how employment histories differentiate them. Using the Health and Retirement Study, we examine the impact of occupations on patterns of limitations in activities of daily living for women and men between 1996-2010. Preliminary results from Growth Mixture Models depict four trajectory classes that change non-linearly: one with no baseline limitations but a subsequent sharp increase, a second with few and steadily rising limitations, a third with individuals who do not develop limitations, and a fourth characterized by some baseline limitations and subsequent recovery. HRS Men engaged in managerial, professional, and sales occupations were least likely to be in the trajectory class with a high number of limitations. Our next steps are to add detailed data on job characteristics from the O*NET repository, incorporate time-varying covariates into the models, and compare results across genders and HRS cohorts.

Background

Recent and projected increases in the absolute and relative size of the older population have raised concerns about the level of pension spending and its sustainability into the future. Advocates for raising the pension eligibility age note that life expectancy in the US was less than 61 years in 1935 (when the eligibility age was set at 65), and point to improvements in life expectancy to argue that older Americans are living longer, healthier lives, and are thus capable of working longer. In response to these trends and concerns about fiscal viability, the full retirement age for Social Security benefits has been rising: it is scheduled to reach 67 for individuals born in and after 1960 (Kingson and Altman, 2011), and there are proposals to further increase it to 70 (Office, 2010).

However, life expectancy alone does not capture all the health information that would be relevant for assessing the capacity of American workers to stay on the job beyond traditional retirement ages. Trajectories of physical and mental health in later life are known to vary greatly across individuals and sociodemographic groups (Liang et al., 2010, 2011, Xu et al., 2010, Quiñones et al., 2011), reflecting the dynamic influence of innate endowments and the cumulative impact of lived experiences in specific environmental and socioeconomic contexts. Thus, though people tend to live longer, the additional years are not always healthy ones: they may also be burdened by health problems that lower their quality of life and limit their ability to continue working.

While limitations in physical activities become increasingly common with age, the nature and pattern of health declines in later life may be associated with particular prior exposures in early and mid-life. A substantial literature documents higher levels and earlier onset of disability and impaired physical function among minorities and individuals of lower socioeconomic status (Deaton and Paxson, 1998, Geronimus et al., 2001, Zajacova et al., 2014). While survival to and health in older ages have been linked to measures of socioeconomic position, the specific mechanisms that predispose individuals to particular impairment patterns are not well understood. Occupation, as a nearly universal adult experience, is an exposure of special interest both for life-course researchers and for those engaged in retirement age policy debates. In this paper, we ask how individuals exposed to particular occupations (with their concomitant physical and psychosocial working conditions) vary in their likelihood of following differing physical health trajectories in later life.

Past research has postulated that individuals who have held jobs characterized by lower socioeconomic position and poor physical or psychosocial working conditions will tend to have worse physical and psychosocial health in later life and shorter life expectancies (Marmot et al., 1997, Case and Deaton, 2005). However, longitudinal studies (often relying on limited data on past occupational exposures) have found mixed evidence on how occupations may influence health of older adults (Pietiläinen et al., 2011, Gueorguieva et al., 2009).

By linking detailed, newly-available occupational information to the rich individual data available in the Health and Retirement Study (HRS), this research will contribute to current knowledge in several respects. The HRS offers an opportunity to examine the association between work and health in a nationally representative sample, including both men and women (who have been less studied) with varied backgrounds. Linking the HRS with detailed occupational information from O*NET (an online occupational data repository) will enable us to construct detailed psychosocial working conditions variables that facilitate the analysis of cumulative exposures to specific job characteristics and their impact on health. Finally, a latent class approach to modeling health trajectories will provide a nuanced analysis of differences in baseline health as well as impairment progression patterns, linking them to occupations and working conditions. Our findings will improve our understanding of differentiation processes and factors that promote or hinder compression of morbidity (and need for support) in later life and inform policy debates regarding the pension eligibility age and post-retirement health and survival.

Research Questions and Hypotheses

Our project seeks to answer two broad questions:

- **Question 1** How do past occupational exposures affect older Americans' physical health?
- **Hypothesis 1** We expect that individuals who previously held jobs with poor physical or psychosocial conditions will have worse physical health outcomes later in life.
- **Question 2** Do past occupational exposures have different effects on the health trajectories of older Americans depending on their birth cohort and sex?
- **Hypothesis 2** We hypothesize that past occupational exposures will be more varied and have a greater influence on the health trajectories of older men than of older women because men in these cohorts

spent more time in the formal labor force. We further expect that the effect of physically or psychologically demanding occupations on health trajectories may be most manifest among older cohorts based on their greater exposure to physically and psychologically stressful working conditions.

Data and Methods

Data

This analysis is based on the Health and Retirement Study (HRS), a longitudinal survey of community-dwelling middle-aged and older Americans with extensive information on both socioeconomic conditions and health status (Juster and Suzman 1995, National Institute on Aging 2007).

In the present study, baseline data were obtained from responses in 1996 for the HRS cohort. Follow-up data were gathered every two years up to 2010. HRS data collected in 1992 and 1994 were excluded because several key questions about health and occupations, as well as their response options, were worded differently in those waves, rendering comparisons difficult. We additionally exclude individuals who were part of the HRS military subsample because their past occupational exposures were quite different from the general sample. We use the RAND data file, and the final analytical sample consisted of 27,628 individuals at baseline, with 17,721 (64% of the initial sample) surviving to the last wave of the survey in 2010.

In order to study how current and past occupational exposures and stressors may contribute to health as individuals enter older ages, we plan to combine longitudinal occupational data available in the HRS with detailed information on occupational characteristics available in the O*NET database (an online repository that has updated the Dictionary of Occupational Titles used in previous research on aging and retirement and occupational epidemiology: http://www.onetonline.org/). The O*NET data will add information on specific working conditions (e.g. work control, psychological job demands, social support, physical demands, and job hazards) to the rich personal health and employment data in the HRS.

Outcomes

Our primary outcome of interest in this analysis was the number of Activities of Daily Living (ADLs) with which respondents reported having difficulty. The six ADLs include dressing, walking, bathing or showering, eating, getting in or out of bed, and using the toilet. Self-reported ADL difficulties have been shown to be comparable to objective performance measures in predicting functional capacity (Idler and Benyamini, 1997, Fried et al., 2001) and to be accurate for the majority of men and women across a range of socio-economic contexts (Merrill et al., 1997, Wray and Blaum, 2001). **Figure 1** displays the average number of ADL limitations across survey waves for each sex and cohort grouping. As expected, members of older cohorts have a higher prevalence of limitations than members of younger cohorts, and women report higher levels of ADL limitations than males in the same age cohort.

In future analyses to be added to this paper, we may also consider other measures of physical impairment including trajectories of limitations in activities of daily living and number of chronic diseases. Through additional analyses, we will examine how sensitive our estimated trajectories are to the specific measure of physical health impairment used.

Independent Variables

The HRS includes information on all respondents' current job as well as their longest-held one. Research has shown that health is sensitive to working conditions, and understanding the structure of a career – not merely the circumstances most proximate to retirement – is essential for understanding the long-term influence of job characteristics on later life health (Moore and Hayward, 1990, Gueorguieva et al., 2009)

The first 7 waves of the HRS used the 1980 Census occupation codes, with 17 categories. In wave 8 (2002), the HRS changed its occupational coding to include 25 categories, in accordance with the 2000 Census. In this analysis these categories are collapsed into eight mutually exclusive categories based on similarities in required education and income. The final categories are (1) professional and technical support (reference); (2) managerial; (3) clerical and administrative support; (4) sales; (5) mechanical construction, and precision Production Longest Occ; (6) service (including private household services, protective services, food preparation, health service, and personal service); (7) operators, fabricators, and laborers; and (8) farming, forestry, and fishing. Fewer than 10 respondents who reported being in the armed forces were dropped from the analysis.

In addition to these broad occupational categories, we are currently in the process of constructing detailed measures of occupational strain by linking each individual's longest-held and current occupation to the physical and psychological strain score associated with that specific occupation as measured in O*NET, an online dictionary of occupations and their associated qualifications, physical and social work environments, and job characteristics (including physical and psychological job demands and hazards).

Controls

We hypothesize that there may be significant variation in health trajectories and occupational exposures by sex and cohort. Consequently, we run separate models by gender and birth cohort. We divide cohorts according to HRS administrative standards AHEAD, HRS, CODA, Additionally, we expect that health trajectories may be shaped by sociodemographic and life style factors. Thus, we include time-invariant factors like race and ethnicity (black, white, hispanicity), educational attainment (less than high school, ged, high school graduate, some college, 4 year college degree and more than college), health insurance type, and wealth measured in 1998. We also examine time varying factors like marital status (single, married, separated, divorced, widowed) smoking status, and retirement status (not retired/retired). More information on select covariates is shown in **Table 1**.

Methods

To capture how individuals' health changes over time and information about differences in individual trajectories of change while accounting for heterogeneity in the larger population, we use growth mixture modelling (GMM). GMM is a person-centered analysis strategy in that the focus is on relationships among individuals with the goal of classifying individuals into distinct groups based on individual patterns of health limitation, onset, and progression. The analysis then assigns an individual a probability of being a member of each identified group, where the likelihood of an individual's group membership may be influenced by other model covariates – e.g. past occupational strain.

ADL limitations are treated as a zero-inflated count variable and estimated using a Poisson model (consistent with the patterns of limitations shown in Figure 1). For each sex and cohort group, we sequentially build models to test the influence of past occupational exposures on the pattern of ADL limitations. We first construct growth mixture models with health outcomes modelled only as a linear function of time. Next, we estimate models that estimate these models as a linear function of time but including the time invariant characteristics described in **Controls** as well as information on the longest held occupation a respondent held at the baseline wave. Then we explore whether model fit can be improved by incorporating polynomial terms. Finally, we add time varying covariates, again allowing for potential non-linearity in the trajectories over time. The final models will also include dropout due to mortality and dropout due to other or unknown reasons as covariates. All trajectory analyses are done using Mplus 7.11 (Muthen and Muthen 2013). Following suggested practice (Jung and Wickrama, 2008), we determine the best fitting model based on the smallest BIC value combined with a significant Lo, Mendell, and Rubin likelihood ratio test. .

To test our first hypothesis, we determine if there are distinctly different trajectories of health within each HRS gender-specific cohort and whether a person's expected trajectory is related to prior occupation exposures. We address our second hypothesis by comparing the number of trajectories and their shapes across cohorts and sexes.

Preliminary Results

Below, we present the results of preliminary models describing trajectories of ADL difficulties among members of the main HRS male cohort. The models incorporate time invariant factors including educational attainment, race, and longest held occupation at baseline and test for non-linearity in the health trajectory as a function of time.

Based on LMRT and BIC values (shown in **Table 2**), we find that the best fitting model for the cohort of HRS men has four distinct classes of health trajectories and health is a non-linear function of time; we include a quadratic term in models. The estimated trends in ADLs across survey rounds is shown in **Figure 2** [1]. Class 1 characterizes individuals who start at the baseline with no health limitations but experience a sharp rise in limitations across survey rounds. Class 2 consists of individuals who start with some limitations at the base line survey round and experience a steady rise in health limitations over time. Class 3 Consists of persons who started without a health limitation and did not develop one over followed survey rounds. Finally, class 4 has individuals who had some limitation at baseline but recovered across survey rounds.

In addition to finding distinct classes of health trajectories, we also find that a person's longest-held occupation is predictive of their most likely class. Compared to persons without any longest held occupation, respondents whose longest held occupation had been in managerial, professional, or sales work were significantly less likely to be in Class 2, the class characterized by significant health limitations that increased across survey rounds. **Table 3** shows the full relations of race, education, and occupational categories to an individual's predicted class.

[1] Due to limitations in software, these trends represent approximate trajectories based on a model without covariates. In most cases, this provides an good approximate of the fitted trajectories with covariates.

Next Steps

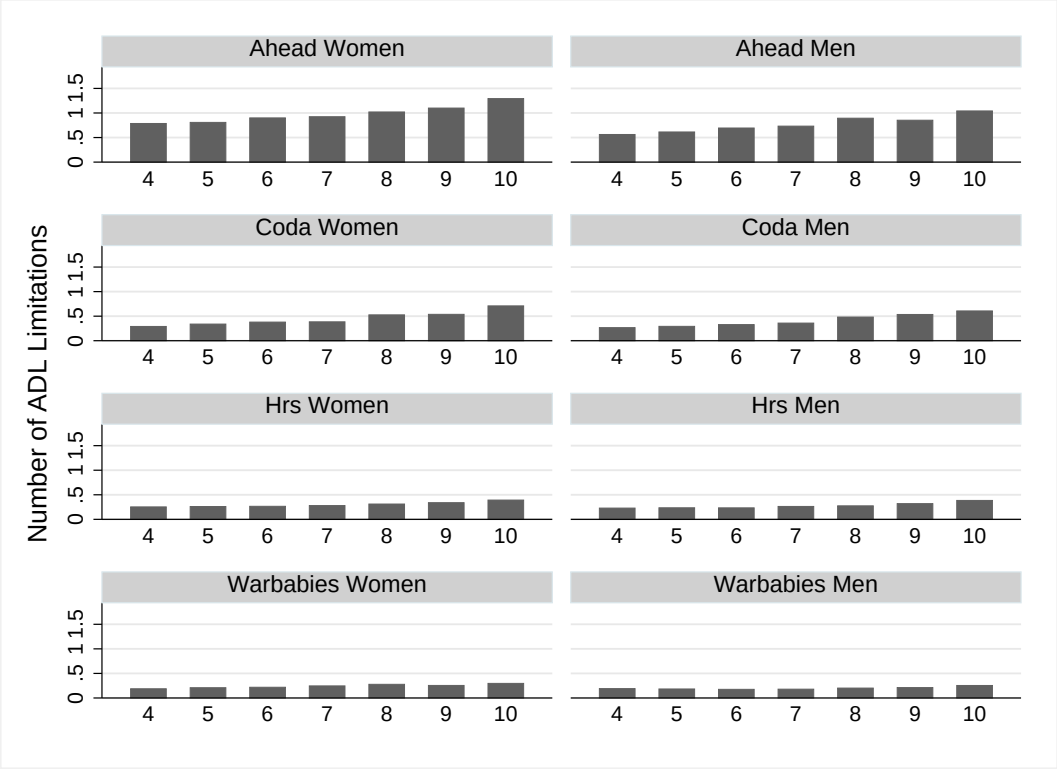
Early estimates have shown that past occupation does significantly affect the health trajectories of men in the HRS cohort. While we currently employ a crude measure of occupational exposures, we are in the process of developing more nuanced measures of occupational exposures by linking the O*NET data with three digit specific occupation codes found in restricted HRS data files. The linkage will allow us to incorporate more nuanced information on the physical and mental strain associated with particular jobs into our models. Subsequent work will also incorporate additional time-varying covariates, and expand comparisons by gender and across HRS study cohorts.

Acknowledgments

Michal Engelman acknowledges support from the Steven H. Sandell Grant Program for Junior Scholars in Retirement Research, funded by the Social Security Administration and administered by the Center for Retirement Research at Boston College. Heide Jackson acknowledges funding provided by the Robert Wood Johnson Foundation Health and Society Scholars program at the University of Wisconsin-Madison. Engelman and Jackson are also supported by the Center for Demography and Ecology (NICHD R24 HD047873) and Center for Demography of Health and Aging (NIA P30 AG17266) at the University of Wisconsin-Madison.

Tables and Figures

Figure 1: Trends in Activities of Daily Living (ADL) Limitations by Cohort and Gender, 1996-2010



Note: Data on ADL limitations come from study waves 4-10.

Table 1: Descriptive Statistics by cohort and sex

	Ahead Women	Ahead Men	Coda Women	Coda Men	HRS Women	HRS Men	Warbabies Women	Warbabies Men
Less than HS Diploma	0.445	0.475	0.312	0.368	0.307	0.334	0.179	0.192
Completed HS	0.310	0.242	0.354	0.243	0.350	0.284	0.316	0.277
Some College	0.157	0.141	0.196	0.178	0.198	0.184	0.270	0.227
Completed College Degree	0.088	0.143	0.138	0.210	0.143	0.194	0.234	0.302
White	0.835	0.858	0.853	0.872	0.776	0.808	0.774	0.814
Black	0.143	0.121	0.097	0.082	0.179	0.150	0.174	0.132
Other	0.022	0.020	0.050	0.044	0.045	0.040	0.052	0.054
Respondent Smokes at Round 4	0.068	0.085	0.143	0.154	0.202	0.210	0.223	0.261
Respondent Ever Smoked Round 4	0.386	0.763	0.478	0.754	0.536	0.734	0.525	0.676
Respondent Currently Married Round 4	0.354	0.683	0.520	0.748	0.673	0.816	0.722	0.810
Respondent Partnered at Round 4	0.008	0.015	0.008	0.012	0.031	0.039	0.036	0.041
Respondent Separated/Divorced at Round 4	0.049	0.047	0.116	0.093	0.132	0.085	0.156	0.111
Respondent Widowed at Round 4	0.561	0.232	0.327	0.100	0.135	0.035	0.043	0.008
Respondent Never Married Round 4	0.028	0.023	0.029	0.045	0.027	0.025	0.043	0.030
Longest Occ Professional Round 4	0.026	0.026	0.125	0.137	0.114	0.098	0.168	0.147
Longest Occ Manager Round 4	0.013	0.036	0.071	0.145	0.081	0.122	0.124	0.148
Longest Occ Clerical Round 4	0.044	0.012	0.180	0.048	0.179	0.036	0.190	0.041
Longest Occ Sales Round 4	0.022	0.018	0.082	0.087	0.071	0.059	0.071	0.076
Longest Occ Production Round 4	0.004	0.047	0.019	0.188	0.020	0.149	0.025	0.180
Longest Occ Service Round 4	0.039	0.015	0.135	0.063	0.155	0.049	0.133	0.059
Longest Occ Operations Round 4	0.013	0.051	0.070	0.153	0.078	0.155	0.084	0.173
Longest Occ Farming Round 4	0.002	0.022	0.008	0.047	0.008	0.036	0.005	0.034
Longest Occ Not Given Round 4	0.836	0.772	0.311	0.132	0.294	0.295	0.200	0.143
Sample Size	5293	3041	1423	995	7215	6188	1464	1281

Table 2: Model Fit Statistics

Model	Adjusted BIC	Entropy	LMR Value	LMR P
2 Class	26989.103	0.707	908.368	0
2 Class Quadratic	26926.055	0.703	1939.642	0
3 Class	27048.137	0.779	26.79	0.03
3 Class Quadratic	26753.093	0.699	632.731	0
4 Class	26650.369	0.609	198.717	0.0025
4 Class Quadratic	**26617.778**	**0.628**	**225.324**	0
5 Class	26648.166	0.693	35.085	0.0739
5 Class Quadratic	26584.518	0.671	100.316	0.7334

Note: The best-fitting model based on the adjusted Bayesian Information Criterion and the Lo-Mendel-Rubin likelihood ratio test is the 4 class quadratic model.

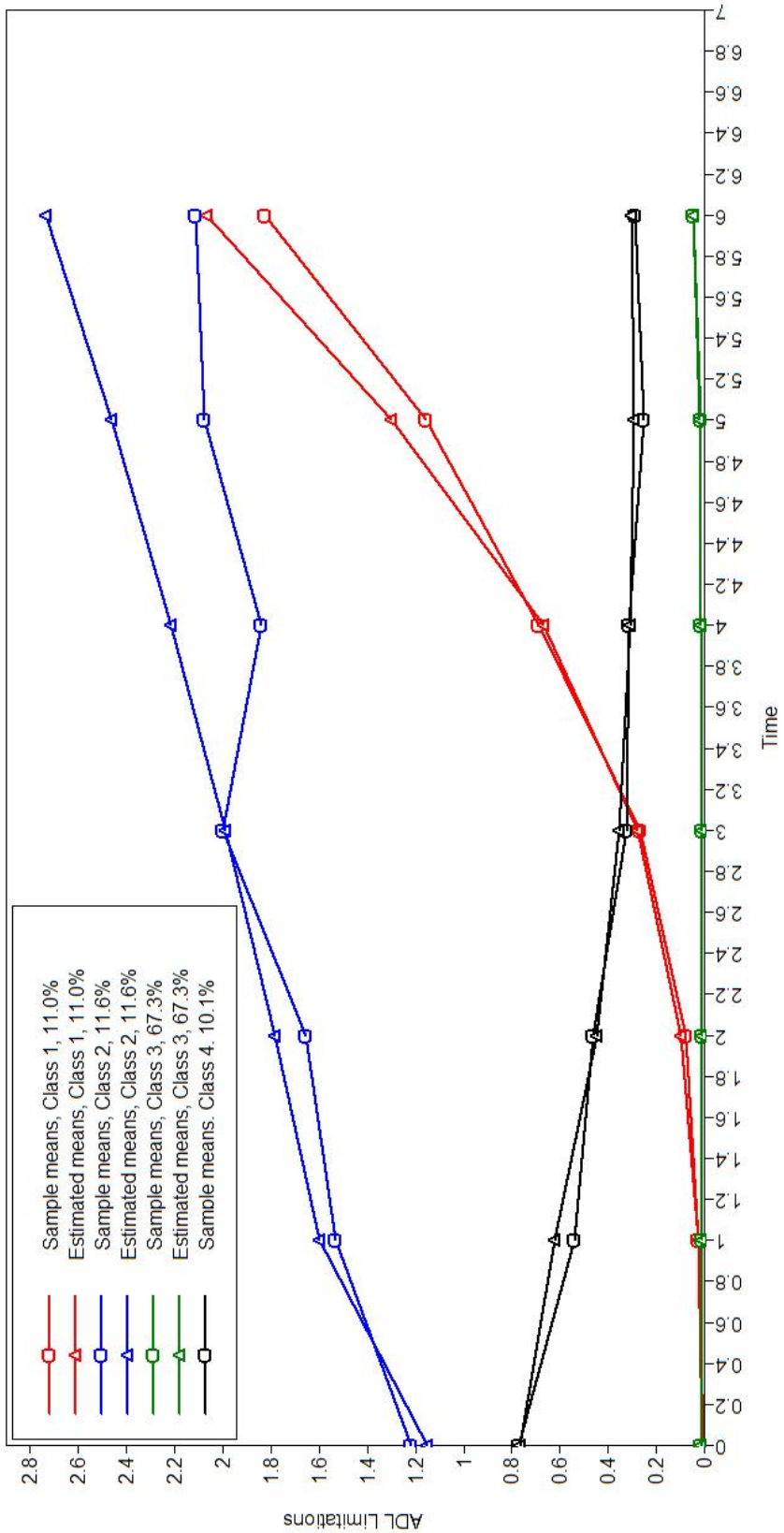
Table 3: Factors Predicting Class Membership

C#1 ON	BETA	SE	T-STAT	P VALUE
RACE-BLACK	-0.272	0.219	-1.239	0.215
RACE-OTHER	0.306	0.309	0.99	0.322
LESS THAN HS	**0.828**	**0.232**	**3.575**	**0**
HIGH SCHOOL	**0.534**	**0.215**	**2.483**	**0.013**
SOME COLLEGE	0.757	0.224	3.389	0.001
PROFESSIONAL LONGEST OCC	-0.035	0.285	-0.123	0.902
MANAGER LONGEST OCC	**-0.465**	**0.268**	**-1.738**	**0.082**
CLERICAL LONGEST OCC	0.231	0.339	0.683	0.495
SALES LONGEST OCC	-0.502	0.342	-1.466	0.143
PRODUCTION LONGEST OCC	0.216	0.246	0.879	0.38
SERVICE LONGEST OCC	0.185	0.336	0.552	0.581
OPERATIONS LONGEST OCC	0.093	0.252	0.368	0.713
FARMING LONGEST OCC	0.222	0.369	0.603	0.547

C#2 ON	BETA	SE	T-STAT	P VALUE
RACE-BLACK	**0.485**	**0.133**	**3.654**	**0**
RACE-OTHER	0.303	0.232	1.308	0.191
LESS THAN HS	**1.412**	**0.194**	**7.295**	**0**
HIGH SCHOOL	**0.5**	**0.204**	**2.451**	**0.014**
SOME COLLEGE	**0.655**	**0.205**	**3.189**	**0.001**
PROFESSIONAL LONGEST OCC	**-0.5**	**0.243**	**-2.053**	**0.04**
MANAGER LONGEST OCC	**-0.521**	**0.2**	**-2.604**	**0.009**
CLERICAL LONGEST OCC	-0.336	0.294	-1.144	0.253
SALES LONGEST OCC	**-0.457**	**0.255**	**-1.793**	**0.073**
PRODUCTION LONGEST OCC	-0.231	0.174	-1.33	0.183
SERVICE LONGEST OCC	0.244	0.211	1.16	0.246
OPERATIONS LONGEST OCC	-0.03	0.16	-0.187	0.851
FARMING LONGEST OCC	-0.036	0.258	-0.139	0.889

C#4 ON	BETA	SE	T-STAT	P VALUE
RACE-BLACK	0.02	0.227	0.089	0.929
RACE-OTHER	-0.57	0.506	-1.127	0.26
LESS THAN HS	**0.761**	**0.237**	**3.214**	**0.001**
HIGH SCHOOL	0.022	0.238	0.093	0.926
SOME COLLEGE	0.226	0.245	0.926	0.354
PROFESSIONAL LONGEST OCC	-0.119	0.299	-0.396	0.692
MANAGER LONGEST OCC	-0.264	0.291	-0.908	0.364
CLERICAL LONGEST OCC	-0.117	0.447	-0.262	0.793
SALES LONGEST OCC	0.181	0.317	0.573	0.567
PRODUCTION LONGEST OCC	-0.053	0.268	-0.199	0.842
SERVICE LONGEST OCC	0.231	0.352	0.656	0.512
OPERATIONS LONGEST OCC	0.007	0.266	0.025	0.98
FARMING LONGEST OCC	0.44	0.357	1.232	0.218

Figure 2: Limitation in ADL Trajectories by Health Class



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