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Association of Chronic Diseases and Impairments with Disability in Older Adults: A Decade of Change?

William W Hung, MD, MPH[1,2], **Joseph S Ross, MD, MHS**[3], **Kenneth S Boockvar, MD, MS**[1,2], and **Albert L Siu, MD, MSPH**[1,2]

[1]Department of Geriatrics and Palliative Medicine, Mount Sinai School of Medicine, New York, NY

[2]Health Services Research and Development Research Enhancement Award Program and the Geriatrics Research, Education, and Clinical Center, James J. Peters Veterans Affairs Medical Center, Bronx, NY

[3]Section of General Internal Medicine, Department of Medicine, Yale University School of Medicine and Center for Outcomes Research and Evaluation, Yale-New Haven Hospital, New Haven, CT

Abstract

Background—Little is known about how the relationship between chronic disease, impairment, and disability has changed over time among older adults.

Objective—To examine how the associations of chronic disease and impairment with specific disability have changed over time.

Research Design—Repeated cross-sectional analysis, followed by examining the collated sample using time interaction variables, of 3 recent waves of the Health and Retirement Study.

Subjects—10390, 10621 and 10557 community dwelling adults aged 65+ in 1998, 2004, 2008

Measurements—Survey-based history of chronic diseases including hypertension, heart disease, heart failure, stroke, diabetes, cancer, chronic lung disease and arthritis; impairments, including cognition, vision and hearing; and disability, including mobility, complex activities of daily living (ADL) and self-care ADL.

Results—Over time, the relationship of chronic diseases and impairments with disability were largely unchanged; however, the association between hypertension and complex ADL disability weakened from 1998, to 2004 and 2008 (OR=1.24, 99% CI, 1.06–1.46; OR=1.07, 99% CI, 0.90–1.27; OR=1.00, 99%CI, 0.83–1.19 respectively), as it did for hypertension and self-care disability (OR=1.32, 99%CI, 1.13–1.54; OR=0.97, 99% CI, 0.82–1.14; OR=0.99, 99%CI, 0.83–1.17). The association between diabetes and self-care disability strengthened from 1998 to 2004 and 2008 (OR=1.21, 99% CI, 1.01–1.46; OR=1.37, 99% CI, 1.15–1.64; OR=1.52, 99% CI, 1.29–1.79), as it also did for lung disease and self-care disability (OR=1.64, 99%CI, 1.33–2.03; OR=1.63, 99% CI, 1.32–2.01; OR=2.11, 99% CI, 1.73–2.57).

Corresponding author: William W. Hung MD, MPH, Mount Sinai School of Medicine, One Gustave L Levy Place, Box 1070, New York, NY 10029; william.hung@mssm.edu; Fax: (212) 860 9737; Phone: (212) 241 9210. Alternate Corresponding author: Joseph S Ross, MD MHS, Section of General Internal Medicine, Yale University School of Medicine, PO Box 208093, New Haven, CT 06520; joseph.ross@yale.edu; Fax: (203) 737 3306; Phone: (203) 785 2987.

Conclusions—While relationships between diseases, impairments and disability were largely unchanged, disability became less associated with hypertension and more with diabetes and lung disease.

Keywords

chronic disease; impairment; disability; prevalence trends

INTRODUCTION

Disability prevalence among older adults has declined despite an increase in chronic disease prevalence in the past 20 years. [1–4] Chronic conditions including diseases such as diabetes and congestive heart failure, and impairments, such as cognitive and visual impairment, are common precursors for developing disability. [5–7] Prior research has shown that certain diseases may increase the likelihood of developing certain disabilities, for example arthritis may lead to the disability due to difficulties in mobility, [8] and stroke may lead to disability through different mechanisms. [9] For diabetes, disability may arise from secondary consequences of diabetes such as diabetic retinopathy and other complications of diabetes. [10–11] Using a physiological framework of understanding disability, [12–13] Fried et al. examined the cross sectional relationship between chronic diseases and impairments and disabilities, and found that certain diseases were associated with disability of different types of tasks, such as arthritis with mobility tasks and stroke with complex instrumental activities of daily activities (ADL) tasks. [14]

Although there has been a large body of literature on trends of chronic disease and disability, little has been done examining how the association of specific chronic disease and specific domains of disability has changed over time. The relationship of chronic diseases, impairments and disability on a population level may have changed over time, considering that (1) prevalence of chronic diseases and obesity have been rising; (2) changes have occurred in the diagnosis of diseases such as changes in diagnostic criteria and improvements in diagnostic tools; [15–17] and (3) management of chronic diseases have occurred such as changes in treatment thresholds and targets in diabetes and hypertension, [15–17] and improved treatment of cancer. [18] If specific chronic diseases are found to be more likely to lead to disability over time, strategies to target disability prevention can focus on determining the underlying mechanisms that lead to increased risk among these patients. Further understanding of how diseases and impairments have changed in its relationship to disability may improve targeted efforts to prevent disability caused by specific diseases and impairments.

Therefore, our objectives were to use a nationally representative sample aged 65 and over and examine if the association of diseases and impairment with disability has changed over time. This information could provide insight into the changing trends of diseases and disability and how they are related to one another. The Health and Retirement Study (HRS), [19] which is a nationally representative survey of older adults in the US, surveys adults on multiple impairments and disability, and thus, offers a unique opportunity to examine their associations with chronic diseases.

METHODS

The Health and Retirement Study (HRS) [19] is a national longitudinal survey of U.S. adults at or near retirement age sponsored by the National Institute on Aging and conducted by the Institute for Social Research at the University of Michigan. The study was designed to investigate the experience of aging among older adults as they advance from work to

retirement with emphasis on the trajectories of economic and physical well-being. The initial wave of the HRS conducted in 1992 comprised the core sample of the HRS and included 12,652 communitydwelling adults between the ages of 51 and 61 or their spouses, regardless of age, collected via inhome interviews. The sample was combined in 1998 with the Asset and Health Dynamics among the Oldest-Old Study (AHEAD), [20, 21] which is a survey of a nationally representative sample of persons who were born in 1923 or before, and supplemented by a birth cohort between original HRS and AHEAD cohorts to fully represent all age groups of the US older adult population. Subsequent waves were supplemented with new birth cohorts every 6 years. A full description of the procedures used in the HRS surveys has been published previously. [19] The survey data are publicly available and do not contain any unique identifiers. Because certain impairments related to aging were only asked among adults over 65 years, we only included older adults who were at least 65 years of age at the times of the interview. Data from three waves of interviews were collated for the present analysis: 1998, 2004 and 2008.

Chronic Disease and Impairment Definition

In each wave, respondents were asked to self-report whether they had ever been told by their physician that they had any of several chronic diseases and impairments. Proxy respondents were surveyed if the respondents were not able to participate in the survey. Chronic diseases surveyed in all three waves of the HRS studied included hypertension, heart conditions (which included coronary heart diseases, arrhythmias, and other diseases of the heart), congestive heart failure (CHF), chronic lung disease (such as chronic bronchitis or emphysema, but not asthma), diabetes, stroke (which included transient ischemic attack), cancer (or a malignant tumor of any kind except skin cancer), and arthritis. Regarding the categorization of CHF, respondents were first asked if they had any heart conditions, and they were asked whether they had CHF if they reported “yes”. For impairments, the HRS measures impairments using self report for vision and hearing, whereas cognitive impairment is measured through a 35-item cognition instrument, similar to Telephone Interview of Cognitive Status (TICS), which has been validated and used for measuring cognition.[22] To define severe cognitive impairment, we used a cutoff score of 8 or below, which has been previously used for prior studies because it was consistent with other estimates of the prevalence of dementia. [23] In addition, for respondents who were unable to complete the survey and had proxy respondents, proxy reports of fair or poor memory were considered to be indicative of cognitive impairment of the respondent, as has been done in prior research.[24] The measure for visual and hearing impairment is a question which asked respondents to self rate their vision on a scale of excellent, very good, good, fair or poor. We used a similar approach as prior studies [25] in defining visual impairment as fair or poor eyesight or blindness despite the use of glasses or corrective lenses as usual, and hearing impairment as fair or poor hearing despite the use of a hearing aid as usual.

Disability Definition

In each wave, respondents were asked to self-report whether they had difficulty with any of several activities of daily living (ADL) and instrumental activities of daily living (IADL). The following ADLs were surveyed in each of the three survey waves: bathing, dressing, eating, toileting and transferring; and the following IADLs were surveyed: using the telephone, managing money, managing medications, grocery shopping and preparation of meals. In addition, respondents were asked if they have difficulty walking 1 block, climbing 1 flight of steps, and lifting and carrying 10 pounds. We characterized respondents as having disability in a task if they reported difficulty. In addition, respondents who reported that they could not or did not perform the task due to health or memory problem were also characterized as disabled in the task. We categorized disability into separate domains—disability related to mobility, complex tasks or self-care tasks—according to Fried et al.

using a physiological approach.[13] Each disability measure was dichotomized to the presence or absence of disability in each domain. Disability in mobility tasks were present if a respondent had difficulty in walking 1 block, walking across the room, climbing 1 flight of stairs, lifting and carrying 10 pounds and transfer. Disability in complex tasks included using the telephone, managing money and medications, grocery shopping and meal preparation. Disability in self-care tasks included bathing, dressing, eating and using the toilet. We did not include disability in upper extremity tasks because the question on upper extremity function in HRS was not similar in construct to Fried's framework, and the availability of only 1 question on upper extremity function limits the robustness of the measure.

Other Variables

Several other socio-demographic variables were included in our analyses which included age, sex, race, marital status and education. We categorized race into categories of non Hispanic white, blacks, Hispanic and other; marital status into categories of married and not married; and education into categories of under 8^{th} grade education, 8^{th} to 11^{th} grade education, high school education, and beyond high school education. We also included obesity, defined by body mass index at or above 30, and current smoking status as indicators of body size and health behaviors.

Statistical Analysis

Respondent characteristics were summarized for each wave of the HRS: 1998, 2004, and 2008. Next we described the prevalence of chronic diseases, impairments and disability in each wave. We then used weighted chi square test with Wald distribution to test group differences in proportions and one way ANOVA F-test for continuous variables applying sampling weights. We then examined the association of chronic diseases and impairments with each disability (mobility, complex tasks and self-care) in each wave using logistic regression models, adjusting for socio-demographic factors. We also tested for collinearity among variables by examining correlation between variables and calculating variation inflation factors; we did not find significant collinearity. To adjust for multiple comparisons, we constructed 99% confidence intervals around each point estimate of odds ratios. We then analyzed the data as a collated sample when examining time interactions. We tested for time interaction across waves using hierarchical logistic regression models with random intercept accounting for repeated measures to determine if relationships between dependent and independent variables have changed over time. All analyses were performed using Stata version 11.0 (Stata Corp LP, College Station, TX). Because the HRS is a publicly available anonymous data source, our study was exempted from review by the Mount Sinai Institutional Review Board.

RESULTS

A total of 10,390, 10,621 and 10,557 respondents were included in 1998, 2004 and 2008, respectively. These included 17,723 unique individuals who participated in any of the 3 waves in the sample—4866 of which participated in all 3 waves, 5772 participated in 2 of 3 waves and 7085 participated in 1 wave. Among all three survey waves, the average age was 74.6, 57.3% were female, 89.5% were white, and 55.1% were married and there were no substantial differences in age, sex, race, marital status across these 3 waves. 10.9% of respondents were smoking in 1998, which changed to 9.3% in 2004 and 10.1% in 2008. Education levels and obesity rate rose in subsequent survey years, from 33.1% completing an education above high school in 1998 to 40.3% in 2008, and for obesity, from 18.2% in 1998 to 26.0% in 2008. Chronic disease prevalence, including hypertension, diabetes, heart failure, chronic lung disease, arthritis and cancer, rose from 1998 in 2008 except for heart

conditions and stroke which remained stable (Table 1). For impairments, both cognitive and visual impairment declined in prevalence whereas prevalence of hearing impairment increased initially before declining as of 2008. Prevalence of mobility disability remained stable throughout the 3 waves. Disability in complex tasks showed a trend towards a decline from 17.8% in 1998 to 16.6% in 2008 (p=0.06). For self-care ADL, prevalence declined initially from 1998 to 2004, but rose again in 2008.

Association of disability with chronic disease and impairment

Mobility disability was associated with all chronic diseases and impairments included in our sample, although to different degrees. Among chronic diseases, stroke was most strongly associated with mobility disability in 1998—respondents with stroke were 2.6 times (99%CI (2.1, 3.2)) more likely to have mobility disability compared with those who did not (Table 2). This was followed by congestive heart failure (OR 2.5, 95% CI (1.7, 3.6)), chronic lung disease (OR 2.4, 99% CI (1.9, 2.9)) and arthritis (OR 2.2, 99% CI (1.9, 2.5)). Among impairments, cognitive impairment was most strongly associated with mobility disability (OR 2.5, 99% CI (1.8, 3.3)), followed by visual impairment (OR 1.9, 99% CI (1.6, 2.1)). No association between any of the chronic diseases or impairments examined and mobility disability were significantly different over the study period (p values > 0.14).

For disability in complex tasks in 1998, chronic diseases most strongly associated were stroke (OR 3.0, 99% CI (2.5, 3.7)), followed by chronic lung disease (OR 1.7, 99% CI (1.4, 2.1)) and congestive heart failure (OR 1.6, 99% CI (1.1, 2.2)) (Table 2). Cognitive impairment was most associated with disability in complex tasks (OR 9.2, 95% CI (6.9, 12.2)), followed by visual impairment (OR 2.0, 95% CI (1.7, 2.4)). No association between any of the chronic diseases or impairments examined and disability in complex tasks were significantly different over the study period (p values > 0.27), except for the association between hypertension and disability in complex tasks, which weakened from an OR of 1.2 in 1998 to 1.0 in 2008 (p=0.02).

For disability in self-care ADL, chronic diseases most associated with it followed a similar pattern in complex tasks, where stroke (OR 2.6, 99% CI (2.1, 3.2) was most associated, followed by arthritis (OR 2.4, 99% CI (2.0, 2.8)) and congestive heart failure (OR 1.7, 99% CI (1.2, 2.3)) (Table 2). Cognitive and visual impairment were both strongly associated with selfcare disability with odds ratios of 3.2 (99% CI (2.5, 4.2)) and 2.1 (99% CI (1.8, 2.4)) respectively. Although no association between any of the impairments examined and self-care disability were significantly different over the study period (p values > 0.13), the association between several chronic diseases and self-care disability were significantly different. The association between hypertension and self-care disability weakened over time, from an OR of 1.3 to 1.0 (p=0.03). In contrast, the association between diabetes and chronic lung disease and self-care disability both strengthened over time, from 1.2 to 1.5 (p=0.03) and 1.6 to 2.1 (p=0.02) respectively.

DISCUSSION

Our analysis of recent concurrent trends in chronic disease, impairment and disability suggest that changes in the relationship between disease and disability were not uniform. Rather certain diseases such as diabetes and lung disease have become more strongly associated with disability whereas hypertension has become less associated. Our findings suggest that different diseases may have varying effects on disability and that the effects may have changed in different ways over time.

Categorizing disability into different domains based on types of tasks allowed us to examine the differential effects of chronic diseases and impairments on disability. Prior studies using

different populations [13, 14, 26–28] have highlighted the contributions of different diseases to disability, although the relative contributions of each disease may vary based on the disease conditions included and population variations. In our study, multiple chronic diseases including stroke and congestive heart failure, were consistently associated with multiple domains of disability. As expected, arthritis was also a significant contributor to mobility disability and self-care ADL. The strongest effect observed in our sample was between cognitive impairment and complex ADL disability, which was consistent throughout the period.

Our work adds to prior literature about disease and disability by examining whether changes have occurred over time. Although it could be argued that based on previous literature that disability has declined over time and that diseases have increased and thus association between diseases and disability should have weakened, it has not been examined directly and under a framework to understand how the association of specific domains of disability and chronic conditions have changed over time. Our finding that different diseases have different changes in their association with disability over time suggests that these changes may be disease specific and multifactorial. Indolent conditions such as hypertension likely have a time lag between disease onset and clinical consequences and may not lead to impairment in most cases; thus, it is not surprising that the recent increase in the prevalence of disease is associated with a weakened relationship with disability. Of note, the association between hypertension and disability may or may not be causal. The association may be driven by other diseases associated with hypertension or by other factors, such as increased diagnosis of hypertension because of increased utilization among disabled persons. However, for diseases which may have stronger and more immediate relationships with impairments and symptoms, increasing prevalence may be associated with increasing disease burden in the form of disability. Specifically, the increase in the association of diabetes and lung disease with self-care disability may warrant further examination into what underlying factors have contributed to these trends. These factors may include changes in diagnosis, management and health behaviors not captured by variables included in our analysis. Although our analyses have accounted for certain demographic characteristics, there may be other characteristics such as issues related to access to care and health behaviors which may not be completely accounted for. Nonetheless, this current examination allowed us to use our observations to generate further hypothesis about what drives the changes in the association of specific chronic disease and disability.

Our study has several strengths. First, we used a nationally representative database which contains data on chronic diseases, impairments, and disability, allowing for the most up-to-date examination of trends and associations. The use of a large sample allowed for the examination of independent effects of diseases and impairments on disability. However, our study has limitations as well. First, in order to utilize sampling weights to estimate nationally-representative prevalence rates for all 3 survey waves, we limited our study to community-dwelling respondents and excluded respondents residing in nursing homes. Second, a limitation of the study given the observational design is that we are unable to determine cause and effect among the relationships between chronic diseases, impairments and disability. In our models, we examined the independent effects of multiple different individual chronic diseases on disability. We did not, however, include interaction variables or test for effect modification of multiple different combinations of diseases and conditions, because for this examination to be clinically relevant, it needs to be based on additional conceptual frameworks to categorize multiple chronic diseases, especially since disability was examined in separate domains based on a physiological approach. This is an area of interest for future research. Third, because questions on different chronic diseases included no indication of severity or had different severity scales which could not be standardized, we were limited to using self reported personal history as a marker of disease. Fourth, for

chronic diseases that increase mortality risk, our calculations may underestimate the magnitude of any association between these conditions and disability, making our estimates conservative. Fifth, we did not include psychiatric diseases in our analysis because the self report of this condition included a heterogeneous array of diseases which can include general anxiety, depression, and schizophrenia, and thus the variable is less well defined. We acknowledge that this is a limitation particularly as we consider that certain psychiatric diseases can be related to disability. Finally, our measures of chronic disease, impairment, and disability were based on self-report of conditions. The HRS provides unique longitudinal survey data to identify population health trends. Although the specific survey items on HRS have not been directly compared to other methods of measurement such as physician documentation, prevalence estimates using these items have been benchmarked against other national survey such as the National Health Interview Survey [29] and have been shown to be good correlates for symptoms and health status. [30] Furthermore, in population-based cohorts, self-reporting of health conditions is an accepted methodology for large, nationally representative survey for which detailed chart review is not feasible and the concordance between self report and medical record review is generally good ($\kappa = 0.60$).[31] Although the survey is limited by its use of self report to ascertain chronic disease, impairment and disability, prior studies have suggested that self-report provides accurate prevalence estimates for all three.[32–35]

An important goal of managing chronic diseases is maximizing longevity with less disability. Disability, despite declines in prevalence for certain domains, continues to be a substantial burden among older adults. Chronic diseases continue to be strongly associated with disability and some associations have strengthened over time. As care for older adults with chronic diseases are changing rapidly in the nation with emerging models of care, it is important to highlight the relative importance of specific chronic diseases in relation to disability and its changes over time such that transformations in care can be designed to be in concordance with the needs of the population. Further studies are needed to examine in detail the mechanisms behind these changes, so that we can further understand how to reduce disability through targeted interventions for diseases and impairments.

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Table 1

Descriptive statistics of adults aged 65 and over in the Health and Retirement Study (HRS) in 1998, 2004 and 2008.

	1998 (n=10390)	2004 (n=10621)	2008 (n=10557)	p-value
Demographic characteristics				
Mean age, y	74.4	74.9	74.5	<0.001
Female sex, %	58.1	57.1	56.9	0.26
Non-Hispanic White, % Hispanic, % Black, % Other, %	85.0 4.9 8.3 1.8	85.1 5.1 7.8 2.0	84.2 5.7 8.0 2.0	0.08
Married, %	55.3	55.9	54.1	0.05
Education, % Under 8th grade 8–11 grade High school Above high school	9.6 24.2 33.1 33.1	7.1 20.2 35.8 36.9	6.0 18.0 35.7 40.3	<0.001
Current Smoker, %	10.9	9.3	10.1	0.002
Obesity (BMI≥30), %	18.2	22.2	26.0	<0.001
Comorbidities, % Hypertension Heart conditions Congestive heart failure Stroke Diabetes Cancer Chronic lung disease Arthritis	52.5 30.7 4.0 9.8 15.2 14.6 10.8 59.1	60.5 31.9 4.4 8.9 19.3 18.1 11.6 67.7	65.0 31.6 4.9 9.2 22.7 19.1 12.3 68.8	<0.001 0.20 0.01 0.15 <0.001 <0.001 0.01 <0.001
Impairments, % Severe Cognitive Impairment Visual Impairment Hearing Impairment	4.9 25.4 25.4	4.2 23.6 27.2	4.0 22.4 25.0	0.01 <0.001 0.003
Disability, % Mobility Complex ADL Self Care ADL	40.8 17.8 17.9	41.4 17.7 16.2	40.0 16.6 17.2	0.14 0.06 0.01

Abbreviations: CI, confidence interval; ADL, activities of daily living.

Note: All estimates used sampling weights to account for survey design; p- values were derived from the Wald chi-square tests for categorical variables and ANOVA F-test for continuous variables for association between the proportion or characteristics of respondents and year of survey

Table 2

Odds ratios showing association of chronic diseases, impairments with disability in 1998, 2004 and 2008. To demonstrate if the association has changed over time, multivariate models including all variables was used while introducing time-interaction term for each variable and accounting for repeated measures. P-value indicates the level of significance of the time-interaction term.

Year	1998	2004	2008	p-value	1998	2004	2008	p-value	1998	2004	2008	p-value
Outcome	**Mobility Disability**				**Disability in Complex Tasks**				**Disability in Self Care Tasks**			
Comorbidities	1.25	1.19	1.18	0.32	1.24	1.07	1.00	0.02	1.32	0.97	0.99	0.03
Hypertension	(1.10, 1.41)	(1.05, 1.35)	(1.03, 1.35)	0.61	(1.06, 1.46)	(0.90, 1.27)	(0.83, 1.19)	0.41	(1.13, 1.54)	(0.82, 1.14)	(0.83, 1.17)	0.96
(99% CI)	1.64	1.63	1.56	0.51	1.28	1.15	1.42	0.91	1.24	1.20	1.29	0.66
Heart	(1.43, 1.89)	(1.43, 1.87)	(1.36, 1.79)	0.35	(1.08, 1.52)	(0.97, 1.36)	(1.19, 1.69)	0.27	(1.06, 1.46)	(1.02, 1.42)	(1.10, 1.52)	0.30
conditions	2.49	2.21	2.42	0.92	1.60	2.26	1.71	0.73	1.70	1.57	1.50	0.03
Congestive	(1.71, 3.62)	(1.57, 3.12)	(1.75, 3.34)	0.70	(1.14, 2.24)	(1.65, 3.10)	(1.27, 2.30)	0.66	(1.23, 2.34)	(1.15, 2.14)	(1.12, 2.01)	0.81
heart failure	2.62	2.24	2.28	0.14	3.03	2.72	2.58	0.93	2.60	2.51	2.42	0.01
Stroke	(2.11, 3.24)	(1.80, 2.78)	(1.85, 2.82)	0.82	(2.45, 3.74)	(2.18, 3.38)	(2.08, 3.19)	0.54	(2.12, 3.18)	(2.03, 3.11)	(1.97, 2.98)	0.50
Diabetes	1.57	1.29	1.47		1.34	1.29	1.33		1.21	1.37	1.52	
Cancer	(1.33, 1.86)	(1.10, 1.50)	(1.27, 1.70)		(1.10, 1.63)	(1.07, 1.55)	(1.11, 1.59)		(1.01, 1.46)	(1.15, 1.64)	(1.29, 1.79)	
Chronic lung	1.23	1.19	1.12		1.09	1.17	1.11		1.10	1.19	1.02	
disease	(1.04, 1.46)	(1.02, 1.39)	(0.96, 1.31)		(0.89, 1.35)	(0.96, 1.42)	(0.92, 1.34)		(0.90, 1.35)	(0.98, 1.43)	(0.85, 1.23)	
Arthritis	2.36	2.47	2.73		1.71	1.69	1.64		1.64	1.63	2.11	
	(1.94, 2.89)	(2.04, 2.99)	(2.26, 3.29)		(1.37, 2.13)	(1.36, 2.10)	(1.33, 2.03)		(1.33, 2.03)	(1.32, 2.01)	(1.73, 2.57)	
	2.18	2.21	2.22		1.52	1.45	1.40		2.36	2.04	2.29	
	(1.92, 2.48)	(1.93, 2.53)	(1.93, 2.55)		(1.29, 1.80)	(1.21, 1.74)	(1.16, 1.68)		(2.00, 2.80)	(1.69, 2.46)	(1.89, 2.77)	
Impairments	2.45	3.06	2.93	0.42	9.19	8.91	11.21	0.84	3.21	3.60	3.67	0.27
Cognitive	(1.83, 3.29)	(2.22, 4.21)	(2.12, 4.05)	0.63	(6.92,12.22)	(6.56,12.09)	(8.15,15.41)	0.51	(2.47, 4.16)	(2.72, 4.77)	(2.75, 4.92)	0.14
Impairment	1.87	1.86	1.89	0.97	2.05	2.67	2.10	0.73	2.07	1.86	1.71	0.13
Visual	(1.62, 2.15)	(1.61, 2.14)	(1.64, 2.19)		(1.74, 2.40)	(2.27, 3.13)	(1.78, 2.48)		(1.77, 2.41)	(1.58, 2.18)	(1.45, 2.01)	
Impairment	1.40	1.41	1.34		1.53	1.59	1.60		1.16	1.37	1.37	
Hearing	(1.21, 1.62)	(1.23, 1.62)	(1.16, 1.55)		(1.30, 1.81)	(1.35, 1.87)	(1.35, 1.90)		(0.98, 1.36)	(1.16, 1.61)	(1.17, 1.61)	
Impairment												

Note: The analysis was adjusted for age, gender, race, education, marital status, smoking status and obesity.