Biosocial and Demographic Determinants of Beneficial Trends in Older Adult Cognition in the U.S. and England: The Role of Cohort Succession

Introduction/Background: The rapidly aging populations of the United States and England elicit increased concerns about the burden of age-related cognitive declines. However, the newest entrants to older adulthood in both countries differ substantially than their predecessor cohorts in their socioeconomic and health profiles. We investigate trends in older U.S. and English adults' cognition functioning from 2004 to 2018 related to changes in population composition changes : (1) age distribution, (2) socioeconomic status, and (3) chronic disease prevalence.

Methods: Using nationally representative data from the U.S. and England, we apply a statistical decomposition method within a causal inference framework to to identify and evaluate factors influencing gender-specific rates of cognitive functioning from 2004 to 2018.

Results: Older adults' cognitive functioning has improved in both countries in recent years, largely due to cohort succession increasing the average educational attainment of the older adult population. The negative influence of increases in the proportion of oldest adults (i.e., age distribution) was largely offset by the characteristics of new cohorts entering into older adulthood. However, increases in the prevalence of psychological conditions for US men and women and English women and increases in the prevalence of diabetes and divorce among US women emerge as specific risk factors detrimental to continued gains in cognitive functioning..

Conclusions: Population aging processes may have differential relationships with the burden of cognitive diseases when cohorts bring different socioeconomic and health protective and risk factors with them into older age. Evaluation of over-time trends in the health of older adult populations must take into account cohort succession processes and changes in population composition.

Keywords: cognition, older adults, population aging, SES, chronic diseases

BACKGROUND

The United States and England are both experiencing rapid population aging, resulting in widespread concerns from researchers, policymakers, and the public about the increasing burden of disease, particularly related to declines in cognitive and neurological functioning (e.g., Alzheimer's disease and related dementias). However, these concerns often do not account for the role of cohort succession in population health trends: in both countries, the sociodemographic characteristics of newest entrants to older adulthood differ substantially from those of their predecessor cohorts. Put simply, aggregate measures of a single age group over time will eventually measure different populations (Ryder, 1965). Multiple studies in both countries have found declines in declines in age-specific dementia prevalence from the early 2000s to late 2010s (Langa et al., 2017; Hudomiet et al., 2022; Ahmadi-Abhari et al., 2017; Matthews et al., 2013; Ahmadi-Abhari, S., & Kivimäki, 2024). In this study, we offer a comparative investigation about the extend to which trends in older adult cognition in the U.S. and England over a fourteen-year period are due to changes in the composition of the older adult population in three areas: (1) age distribution, (2) socioeconomic status, and (3) chronic disease prevalence. The U.S. and English populations are ideal comparators for this research topic: the similarities in key social structures such as educational attainment and economic development support construct reliability such that our measures of social resources are capturing the same phenomena in both places. The differences between the two countries in certain social structures (i.e., welfare generosity, health insurance system) and cultural-political orientations facilitate an exploration of the ways in which country contexts may influence the relationships between factors such as SES and age with cognitive functioning (Banks et al., 2006; Bridger Staatz et al., 2024).

Our study contributes to the literature on social determinants of population health in three important ways. First, the general focus on population aging often obscures the meaningful heterogeneity in the age composition of the older adult population. Exclusively focusing on increased numbers of older adults in both countries – rather than considering the age distribution within the older adult population – would lead to predictions about rising prevalence of dementia. However, as recent studies reported, it is declining in both countries. The population of adults aged 65 years and older in England grew by 2.7 million (approximately 34%) from 2000 to 2022. The distribution of that population across 5-year age groups remained similar for females but shifted towards older ages for males, from 8% to 11% of older English males aged at least 85 years (my calculations, not sure how to cite). In the U.S., the older adult population grew by almost 23 million (approximately 65%) from 2000 to 2022, largely driven by the influx of the Baby Boomer generation (born between 1946-1964). The age distribution of the older American population shifted towards younger ages over the two decades, from 27% to 32% of older adults aged 65-69 years and from 12% to 11% of older adults aged 85 years and older (my calculations, not sure how to cite).

Second, we highlight the role the cohort replacement process that underlies the temporal trends. Specifically, the newest American and English cohorts entering older adulthood differ markedly from their predecessors in their socioeconomic profiles, as they experienced the rapid expansion of higher education in the second half of the twentieth century (Schofer & Meyer, 2005; Frase & Bauldry, 2022; Soysal & Baltaru, 2021; Carpentier, 2018). This trend is reflected in our weighted samples: in 2004, 9% of older adults in England and 18% in the US had at least a college degree, compared to 18% and 29% respectively in 2018. Greater educational attainment and accumulation of other socioeconomic resources (e.g., wealth) offer well-documented protective effects against cognitive functioning declines and disease incidence in older ages (Hayward et al., 2021; Cobb et al., 1995; Wang et al., 2023).

Third, besides the overall improvements in socioeconomic status, we identified alarming health profiles that may increase population risk of cognitive impairment and dementia. For example, older English and American adults are experiencing increasingly higher rates of certain chronic health conditions that may adversely affect cognitive functioning. Physical and mental health conditions are strong predictors of cognitive decline in older adulthood (Köhler et al., 2012; Fiske et al., 2009; Frisoni et al., 2000; Dotson et al., 2010). More recent cohorts of older adults in the U.S. have shown elevated rates of chronic conditions and multimorbidity, with some evidence for diabetes and depressive symptoms as drivers of cohort differentiation (Bishop et al., 2022). The rates of cardiovascular diseases, heart disease, and stroke in older Americans have remained relatively stable or slightly declined since the mid-2000s, however (NCHS?, CDC, Abdalla et al., 2020). Trends in the health of the older English adult population over the past two decades have been mixed, with increases in the prevalence of diabetes (Zghebi et al., 2017) and antidepressant use (Arthur et al., 2020), and higher frailty among younger cohorts compared to their predecessors at the same ages (Marshall et al., 2015), but stabilization in cardiovascular disease incidence and prevalence at older ages (Bhatnagar et al., 2016; Conrad et al., 2024).

METHODS

Study Population and Data

We use data from the 2004 and 2018 survey waves of the U.S.-based Health and Retirement Study (HRS) and the same waves from English Longitudinal Study of Ageing (ELSA). While these datasets are longitudinal in nature, they are both weighted and have periodic refresher cohorts added to ensure they are representative of the older adult populations in their respective countries for a given year. Five refresher cohorts were added to the existing pool of ELSA participants between Waves 2 (2004) and Wave 9 (2018); 22% of respondents in the analytic sample participated in both waves. Two refresher cohorts were added to the existing pool of HRS participants between Waves 7 (2004) and Wave 14 (2018); 33% of respondents in the analytic sample participated in both waves. Such study designs allow creating and analyzing nationally representative cross-sections of the older adult population (aged 65+) at each time point. The resulting analytic samples include 13,170 person-year observations in 2004 (n=9,751 from HRS and n=3,419 from ELSA) and 11,692 observations in 2018 (n=7,554 from HRS and n=4,138 from ELSA).

Measures

Our primary outcome is a continuous measure of cognitive functioning based on survey measures assessing aspects of respondents' memory (immediate and delayed word recall tests) and cognitive awareness (orientation to the date and day of the week in which the interview was conducted), augmenting the recall-based measure used by Olaya et al (2019). The range of the variable is from 0 to 24. This outcome is consistently measured across all recent study waves in both ELSA and HRS, allowing us to compare cognitive functioning trends across country contexts and over time without concern about discrepancies or bias in measurement. We do not use rates of diagnoses of dementia or cognitive impairment as they may be confounded by access to health services and, in the case of the U.K., affected by policy interventions ongoing during the study period aiming to increase dementia diagnosis rates (Kolpashnikova, 2021). We further compare our main measure of cognitive functioning through with the Langa-Weir Cognitive Function Classifications (Crimmins et al., 2011; Langa et al., 2020). The results are consistent and reported in the Supplementary Materials.

We examine the influence of the changing sociodemographic composition of the population using the following factors: age group (65-74 years, 75-84 years, and 85 years and older); educational attainment (harmonized across both samples to the levels of less than high school, high school graduate, some college, and college graduate or beyond); marital status (married or partnered, separated or divorced, widowed, never married); and wealth, measured as total assets adjusted for inflation using the World Bank 2010 Consumer Price Index. We include three measures of health behaviors, notable for their modifiable nature and their links to a variety of chronic diseases and disabilities (Zaninotto et al., 2020): current smoker status (yes or no), days of drinking alcohol per week (continuous), and any moderate physical activity (yes or no). Finally, we include separate measures of self-reported history of stroke, hypertension, heart problems, diabetes, and psychological problems. We use the harmonized ELSA and HRS data files to ensure the measurement of these variables is consistent and comparable across both studies.

Analytic Strategy

For our main analysis, we use the Kitagawa-Oaxaca-Blinder two-fold decomposition to estimate the contributions of changes in each country's population composition to changes in overall cognitive functioning from 2004 (Time 1) to 2018 (Time 2) (Kitagawa, 1955; Blinder, 1973; Oaxaca, 1973). In the fully specified model, we include the sociodemographic, health behavior, and health conditions measures described above. Our analyses are separate by respondents' reported sex, as the existing literature suggests meaningful differentiation in both the trends and determinants of cognitive decline by sex (Levine et al., 2021; Avila et al., 2022). The changes in cognitive function from Time 1 (2004) to Time 2 (2018) in both the U.S. and U.K. groups are modeled as a function of an "explained" component (generated by changes in the levels of the included predictors, equivalent to changes in population composition) and an "unexplained" component, which captures potential effects of changes in unobserved variables or in the relationships between factors and the outcome variable (Jann, 2008). The "explained" component is the first term in the modeling equation:

$$\Delta\bar{Y} = (\bar{X}_{T2} - \bar{X}_{T1})^* \beta_R + \bar{X}_{T2}^*(\beta_{T2} - \beta_R) + \bar{X}_{T1}^*(\beta_R - \beta_{T1})$$

where T1 indicates values in 2004, T2 indicates values in 2018, $\bar{Y}$ represents the average cognitive functioning score, $\bar{X}$ represents a vector of the mean values of the factors included in the model, and β represents the vector of associated coefficients from the pooled model. Our approach aligns with the counterfactual-based framework of decomposition (Sudharsanan & Bijlsma, 2021; Jackson & VanderWeele, 2018) in that the effect of population composition changes on older adult cognitive health is assumed to be the difference between the observed changes in the outcome (when population composition changes to the 2018 profile) and the changes in a counterfactual model where population composition was held constant at 2004 levels. In essence, our model assumes that the 14-year time period creates changes in older adult cognitive health through the pathways of latent demographic processes – namely, population aging and cohort succession – which are captured by changes in the composition of the older adult population from Time 1 to Time 2.

We conduct multiple sensitivity analyses to test the robustness of the pattern of results to different outcome specifications. The pattern of findings is consistent for models using immediate and delayed recall as the only outcome measures. We additionally compare the findings from our main model of the U.S. sample to models using the Langa-Weir Classifications of Cognitive Function of 'cognitive impairment or dementia' and 'dementia' as separate outcomes (see Supplementary Materials). The main findings are qualitatively identical: increases in the educational attainment of U.S. men and women and decreases in the proportion of adults in the oldest age group drive the decreased prevalence in those two categories, while increased proportions of adults aged 75-84 stalled further declines in cognitive impairment and dementia. This comparison further validates our use of the recall and orientation-based cognitive score as a measure of population-level cognitive functioning in both the U.S. and English contexts.

RESULTS

To contextualize the findings from the decomposition analysis, we first present descriptive evidence about temporal trends in key variables. We observe notable changes over time in the sociodemographic and health profiles of the older adult populations for each sex-country grouping.

[Table 1 about here]

We find substantial improvements in cognitive function scores among the older adult populations of both the U.S. and the U.K. On the cognitive measures ranging from 0 to 20, the English older adult population had the highest increases in average scores from 2004 to 2018 at 1.51 points for women and 1.22 points for men, compared to 0.87 and 0.85 point increases for American women and men, respectively. These represent improvements of approximately 12% for English women, 10% for English men, and 7% for U.S. men and women.

Consistent with census estimates in the U.S., we find a U-shaped trend wherein the proportions of older American adults increased in both the youngest age group (65-74 years) and oldest age group (85 years and older) for both men and women, largely due to the recent influx of Baby Boomers and improvements in older adult life expectancy. In the English sample, we observe a substantial increase in the oldest age group for men (5.8% of men over age 65 in 2004 to 9.1% in 2018), with a smaller shift towards the youngest age group for women. All sex-country groups improved with respect to educational attainment, with particularly profound increases for women: the proportion of older English women with at least a college degree more than doubled from 6% to 12.7%, and the proportion of older American women in the same category increased from 13.7% to 23.9%. After adjusting for inflation, total assets declined slightly in the American sample and increased in the English sample. The proportion of widowed older adult women in both countries declined substantially, with increases in the proportion either currently or previously married.

Apart from declines across all sex-country groups in the proportion of current smokers, the health behavior patterns of older adults remained relatively stable in the aggregate. The proportion of older adults reporting any history of hypertension rose for all sex-country groups but especially among older Americans (increased by 13 percentage points for U.S. men, 8 for U.S. women, 6 for English men, and 1.6 for English women). Similar increases were found for all groups in self-reported history of diabetes (10 percentage point increase for U.S. men, 11 for U.S. women, 4 for English men, 5 for English women). The proportion of older adults reporting any psychological problems more than doubled for American men (6.9% to 15.6%), English men (4% to 8.7%), and English women (6.3% to 13.7%) while increasing 11 percentage points for American women (13.6% to 24.7%). The overall higher levels of chronic disease among older American adults compared to their English counterparts is well-documented in the literature (Banks et al., 2010; Pongiglione & Dowd, 2022).

[Table 2 about here]Table 2 shows the estimates from the model decomposing changes in the U.S. sample's cognitive scores. 43% and 22% of the total improvements in cognitive functioning scores were attributable to changes in population composition with respect to included factors among U.S. men and women, respectively ($p<.001$ for both).

[Figure 1 about here]

Figure 1 presents detailed decomposition results about the relative contribution of the considered biosocial factors. Greater proportions of the population with some college experience or at least a college degree contributed 0.432 (51%) and 0.375 points (43%) of the observed overall improvements in cognitive functioning, among older U.S. men and women, respectively. Greater proportions of adults in the oldest (85+) age group and rising rates of psychological problems had detrimental influences on cognitive functioning trends. The rising proportion of high school graduates in both groups— despite being part of a larger shift towards greater educational attainment overall—had a negative influence on cognition trends. For both groups, the decreased proportion of adults in the middle older age group (75-84) was positively associated with changes in the outcome. For U.S. women alone, decreases in the mean count of days drinking per week contributed to the positive trends in the outcome while increased rates of marital separation or divorce acted against these trends.

[Table 3 about here]

Table 3 shows the estimates from the model decomposing changes in the English sample's cognitive scores. 29% and 38% of the total improvements in cognitive functioning scores were attributable to changes in population composition with respect to included factors among English men and women, respectively ($p<.001$ for both).

[Figure 2 about here]

Similar to U.S. groups, the increases in educational attainment across the 'some college,' 'at least college,' *and* high school graduate groups (in comparison to the less than high school group) positively contributed 0.256 point (21%) and 0.266 points (18%) of the observed overall improvements in cognitive functioning among older English men and women, respectively. Increases in average amount of total assets (adjusted for inflation) for both English men and women were also positively associated with the cognitive functioning trends. Two unique gender-specific factors emerged as negative influences on cognition: the proportion of men in the oldest age group ($p<.001$) and the proportion of women reporting psychological problems ($p<.05$). For English women but not men, decreased proportions of adults in the middle older age group (75-84) positively contributed to trends in cognition.

DISCUSSION

In this study, we find that approximately one-quarter to one-third of the improvements in older English and American adults' cognitive functioning over the 14-year period are attributable to changes in population composition in sociodemographic and biopsychosocial factors. The greatest contributions came from improvements in population-level educational attainment, with the increased proportions of adults with at least some college experience or at least a college degree positively influencing cognitive scores in later life for all gender-country groups. Shifts in the age distribution of the older adult population generally counteracted one another, with greater proportions of young older adults improving and greater proportions of oldest older adults lowering gains in population-level cognitive functioning scores over time. For women in both countries and U.S. men, rising rates of psychological problems negatively impacted cognition trends. U.S. women were also uniquely affected by detrimental increases in rates of marital separation or divorce.

Our analyses highlight the crucial role of population composition and cohort succession in driving trends in the health of the older adult population. Studies of social determinants of older adult health and well-being often take a longitudinal within-person approach to highlight how differences in socioeconomic resources and identity characteristics manifest in differences in health outcomes over the lifespan. Our study emphasizes the contribution of demographic processes to the measurement of population health trends: populations change because the people who comprise them change, whether through aging processes or cohort replacement. The impacts of population composition are inextricably linked to the life experiences of cohorts decades before they enter adulthood, as shown by the impacts of education expansion manifesting in improvements in the cognitive health of the older adult population decades after the fact. While the 'long arm of childhood' framework elucidates the relationship between early life experiences and life course outcomes (Hayward & Gorman, 2004), the cohort succession framework can elucidate the relationship between cohorts' differentiated early life experiences (e.g., becoming young adults in an age of educational expansion) and trends in population health at the oldest ages.

Our findings also highlight the complex interplay of sociodemographic, biosocial and biological factors influencing population-level trends in older adults' cognitive functioning. While population aging in both the U.S. and U.K. has raised concerns about increased burden of cognitive diseases, our study shows that the influx of new cohorts into older adulthood – who also on average bring more socioeconomic resources than their predecessors – has had positive influences on trends in cognitive functioning. We add further evidence of the beneficial nature of higher education, even on cognitive functioning measured decades after education is completed. Additionally, we identify several rising rates of psychological problems as a risk factor that poses a threat to continued gains in cognitive functioning in later life among American men and women and English women. Interestingly, notable increases in other chronic health conditions – particularly in rates of diabetes and hypertensions – largely did not significantly influence cognition trends except for diabetes in U.S. women, suggesting that the impact of chronic conditions on cognitive outcomes may be less severe than expected as the population ages.

Figure 1. Contributions of Factor Composition Change to Improvements in Cognitive Functioning in Older U.S. Men and Women.

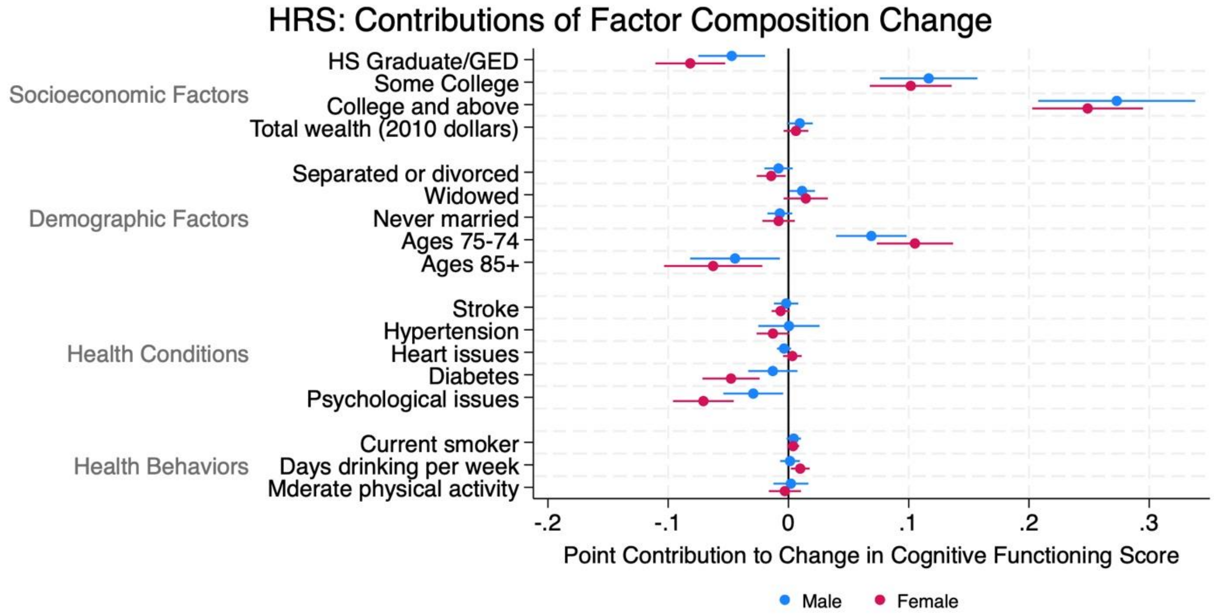

Figure 2. Contributions of Factor Composition Change to Improvements in Cognitive Functioning in Older English Men and Women.

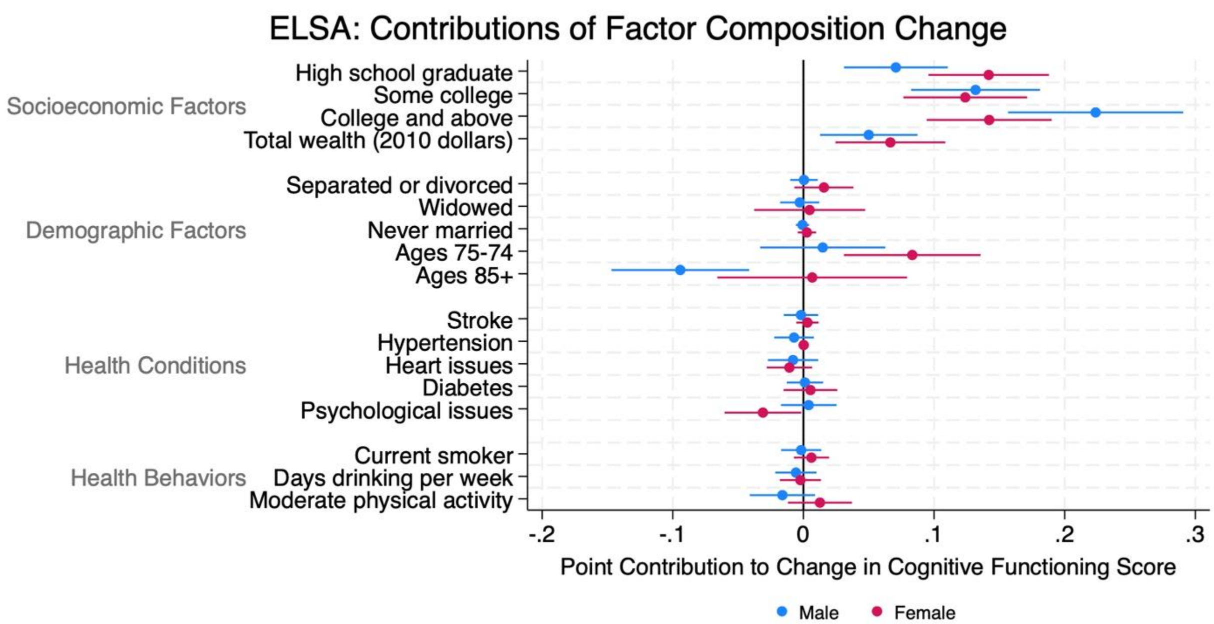

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Table 1. Descriptive characteristics of analytic samples in the U.S. and England in 2004 and 2018.

	United States				England			
	2004		2018		2004		2018	
	Men (n=4015)	**Women** (n=5736)	**Men** (n=3045)	**Women** (n=4509)	**Men** (n=1606)	**Women** (n=1813)	**Men** (n=1945)	**Women** (n=2193)
Cognition score	12.20 (3.50)	12.97 (3.83)	13.05 (3.66)	13.84 (3.88)	12.29 (3.51)	12.75 (3.80)	13.50 (3.60)	14.26 (3.97)
Age group								
65-74	.5712	.5150	.6099	.5610	.6228	.5188	.5990	.5770
75-84	.3475	.3758	.2925	.3101	.3196	.3706	.3098	.3212
85+	.0812	.1092	.0976	.1289	.0576	.1106	.0912	.1088
Education								
Less than HS	.2374	.2431	.1171	.1461	.5502	.6578	.3108	.4187
HS grad	.3329	.4180	.2936	.3594	.1404	.1457	.1895	.2448
Some college	.1766	.2021	.2370	.2552	.1791	.1366	.2692	.2091
College+	.2530	.1368	.3522	.2394	.1302	.0600	.2305	.1273
Median total assets, inflation-adjusted	$295,612	$198,614	$279,514	$196,181	£224,218	£190,904	£323,129	£271,259
Marital status								
Married/partnered	.7564	.4585	.7395	.4915	.7559	.4814	.7726	.5859
Separated/divorced	.0745	.0958	.1089	.1425	.0519	.0572	.0745	.1158
Widowed	.1396	.4189	.1050	.3153	.1418	.4101	.1001	.2567
Never married	.0295	.0269	.0466	.0507	.0504	.0513	.0526	.0416
Current smoker	.0992	.0905	.0861	.0767	.1211	.1052	.0822	.0724
Days drinking per week	1.54 (2.43)	0.80 (1.87)	1.56 (2.31)	0.94 (1.85)	2.73 (2.61)	1.69 (2.34)	2.67 (2.51)	1.67 (2.21)
Any moderate activity	.8077	.7176	.8103	.7137	.8407	.7258	.8240	.7405
Ever had stroke	.1013	.0866	.1041	.0973	.0706	.0626	.0732	.0568
Ever had hypertension	.5461	.5850	.6813	.6656	.4622	.5011	.5257	.5175
Ever had heart problems	.3460	.2438	.3628	.2883	.2474	.2158	.3190	.2762
Ever had diabetes	.2069	.1593	.3098	.2758	.1213	.0804	.1651	.1311
Ever had psychological problems	.0689	.1356	.1555	.2470	.0404	.0633	.0867	.1371

Table 2. Decomposition of changes in the cognitive functioning of the older American population (2004 to 2018).

	U.S. Men			U.S. Women		
	Estimate	Robust std. error	P-value	Estimate	Robust std. error	P-value
Difference in mean cognitive functioning score	<u>0.852</u>	0.112	<0.001	<u>0.869</u>	0.094	<0.001
Explained by endowments	<u>0.364</u>	0.052	<0.001	<u>0.191</u>	0.047	<0.001
Age group (ref. 65-74)						
75-84 years	<u>0.073</u>	0.016	<0.001	<u>0.114</u>	0.018	<0.001
85+ years	<u>-0.050</u>	0.021	0.020	<u>-0.069</u>	0.023	0.003
Education (ref. less than HS)						
HS grad	<u>-0.054</u>	0.016	0.001	<u>-0.090</u>	0.016	<0.001
Some college	<u>0.131</u>	0.023	<0.001	<u>0.110</u>	0.019	<0.001
College+	<u>0.301</u>	0.037	<0.001	<u>0.265</u>	0.025	<0.001
Total assets	0.010	0.006	0.087	0.007	0.006	0.201
Marital status (ref. married)						
Separated/divorced	-0.006	0.006	0.310	<u>-0.015</u>	0.006	0.022
Widowed	0.010	0.006	0.073	0.014	0.010	0.162
Never married	-0.006	0.005	0.242	-0.009	0.007	0.226
Current smoker	0.006	0.004	0.125	0.004	0.003	0.132
Days per week drinking	0.001	0.005	0.753	<u>0.010</u>	0.004	0.016
Any moderate activity	0.002	0.009	0.786	-0.003	0.008	0.665
Stroke	-0.002	0.006	0.706	-0.008	0.005	0.086
Hypertension	<-0.001	0.014	0.972	-0.013	0.0077	0.080
Heart issues	-0.004	0.003	0.212	0.004	0.004	0.381
Diabetes	-0.012	0.011	0.278	<u>-0.046</u>	0.013	<0.001
Psychological issues	<u>-0.035</u>	0.013	0.010	<u>-0.084</u>	0.014	<0.001

**Note*: Underlined estimates are statistically significant at the p<.05 threshold.

Table 3. Decomposition of changes in the cognitive functioning of the older English population (2004 to 2018).

	English Men			English Women		
	Estimate	Robust std. error	P-value	Estimate	Robust std. error	P-value
Difference in mean cognitive functioning score	1.215	0.129	<0.001	1.509	0.134	<0.001
Explained by endowments	0.358	0.070	<0.001	0.571	0.074	<0.001
Age group (ref. 65-74)						
75-84 years	0.015	0.024	0.545	0.083	0.027	0.002
85+ years	-0.094	0.027	<0.001	0.007	0.037	0.856
Education (ref. less than HS)						
HS grad	0.071	0.020	<0.001	0.142	0.024	<0.001
Some college	0.132	0.025	<0.001	0.124	0.024	<0.001
College+	0.224	0.034	<0.001	0.142	0.024	<0.001
Total assets	0.050	0.019	0.009	0.067	0.021	0.002
Marital status (ref. married)						
Separated/divorced	<0.001	0.005	0.935	0.016	0.012	0.174
Widowed	-0.003	0.008	0.709	0.005	0.022	0.827
Never married	-0.001	0.003	0.782	0.003	0.004	0.461
Current smoker	-0.002	0.008	0.827	0.006	0.007	0.371
Days per week drinking	-0.006	0.008	0.475	-0.002	0.008	0.773
Any moderate activity	-0.016	0.013	0.207	0.013	0.012	0.311
Stroke	-0.002	0.007	0.780	0.003	0.004	0.481
Hypertension	-0.007	0.008	0.355	<0.001	0.002	0.919
Heart issues	-0.008	0.010	0.419	-0.011	0.009	0.225
Diabetes	0.001	0.007	0.870	0.005	0.01	0.608
Psychological issues	0.004	0.011	0.712	-0.0310	0.015	0.038

**Note*: Underlined estimates are statistically significant at the p<.05 threshold.