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Cognitive Performance in Adults Aged 60 and Over: National Health and Nutrition Examination Survey, 2011–2014

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Abstract

Objective—This report describes cognitive performance in the U.S. noninstitutionalized population of older adults. The association of sociodemographic factors and self-reported cognitive and health status with low cognitive performance is also investigated.

Methods—During 2011–2014, the cognitive performance of participants aged 60 and over was assessed during the National Health and Nutrition Examination Survey (NHANES). Cognitive assessment was based on scores from established objective cognitive tests (word list learning with immediate and delayed recall, animal naming, and a digit symbol substitution test). Mean scores and percentile distributions were described by sociodemographic characteristics. Logistic regression modeling was conducted to evaluate the relationship of sociodemographic and self-reported health factors with low cognitive performance, defined by scores in the lowest 25th percentile. The relationship between objective cognitive functioning measures and subjective cognitive decline also was evaluated by calculating sensitivity and specificity measures.

Results—A total of 3,181 adults completed at least one of four objective cognitive tests. Mean scores for men were lower than for women in three of four assessments. Mean scores decreased with increasing age and with decreasing level of income and education. Persons reporting poorer health status and subjective cognitive decline were more likely to have low performance on the four assessments. The subjective cognitive decline question had low sensitivity (22.9%–26.7%) in identifying low cognitive performers, but had high specificity in identifying those who did not score low on the cognitive assessments (89.3%–90.9%).

Conclusions—Cognitive performance has important implications for the U.S. aging population. Subjective cognitive decline along with older age, low income, low educational attainment, and fair or poor self-reported health were independently associated with lower cognitive performance in a representative sample of U.S. older adults.

Keywords: older adults • cognitive impairment • cognitive function • memory

Introduction

Cognitive health has emerged as an important public health concern for America's aging population (1). Although much variability occurs in cognitive performance and the rate of change throughout the aging process in healthy older adults (2), impaired cognitive functioning can be associated with a decline in quality of life, personal relationships, and independence. These changes in language, memory, learning, attention, and executive function ability often result in increased health care needs as well as major caregiving and financial challenges (3). In addition, cognitive difficulties frequently co-exist with other health conditions that affect well-being at older ages (4).

In older adults, measurement of cognitive impairment is most often conducted in a clinical setting with physical and neuropsychological examinations as well as laboratory tests. At times, adults with mild impairments are aware of cognitive problems, so changes in cognitive performance, acknowledged by patients or caregivers, can be beneficial to the assessment (5). Health studies that measure cognitive status and impairment in a population have greater measurement and analytic

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challenges than a clinical examination. Validated global screening instruments are numerous, yet no single instrument fits the needs of all studies, nor is there a consensus on a set of uniform assessments (6). Tests designed for clinical examinations may not be appropriate for participants with the range of ages, educational levels, and linguistic and cultural backgrounds found in large, nationally representative surveys (5). Testing duration, ease of administration, and cost are also important factors in choosing the appropriate cognitive assessment instrument. Because of these constraints, some studies evaluate a particular cognitive domain, such as memory, orientation, or visual-spatial ability, rather than using a global screening instrument that encompasses multiple domains.

Several ongoing population-based studies of aging adults measure cognitive performance, including the Health and Retirement Study (7), National Health and Aging Trends Study (8), and National Social Life Health and Aging Project (9). These studies, with both cross-sectional and longitudinal sample designs as well as questionnaire and limited physical measurements, have enabled researchers to examine trends in cognitive functioning and its relationship with other important social and health conditions in older adults. In other U.S. national health surveys that examine noninstitutionalized persons of all ages, cognitive health has been assessed within the context of a larger portrait of health; for example, as part of questionnaire modules on disability in the National Health Interview Survey (NHIS) (10), or as questions designed to estimate the prevalence of subjective cognitive decline (SCD) and functional impairment in the Behavioral Risk Factor Surveillance Survey (BRFSS) (11). Cognitive information from these surveys has proved useful for surveillance, to explore associations, and as covariates in studies of health outcomes in aging adults.

Cognitive performance also has been measured, periodically, in the National Health and Nutrition Examination Survey (NHANES). A cross-sectional, nationally representative survey of persons of all ages, NHANES includes an in-depth home interview and an examination consisting of medical, dental, and dietary components, and laboratory tests (12), many of which are not featured in other population-based studies. Objective cognitive performance assessments, primarily focused on memory, have been administered both in the home and in its unique mobile examination center (MEC). These data have been used to examine the relationship of cognitive performance with other health conditions, ranging from periodontitis (13), to insulin resistance (14), to toxoplasmosis (15). The most recent available cognitive performance data from NHANES were collected during the examination in 2011–2012 and 2013–2014 of adults aged 60 and over (16). Cognitive performance was evaluated for a limited number of cognitive subdomains, primarily those related to working memory, language, processing speed, and executive functioning. These subdomains are some of the cognitive processes linked with health and independent living (17). Questions on SCD and self-reported cognitive functioning, similar to questions found in BRFSS and NHIS, were also administered to older adults during these survey cycles.

Diagnosing the causes of cognitive impairment, such as delirium or dementia, is complex. A self-perceived rating about cognitive decline and cognitive assessments conducted in a survey cannot replace a diagnosis based on a clinical examination, although both can be used as part of a comprehensive evaluation. Because NHANES data measure cognitive performance only at one point in time and in selected domains, these measures are not diagnostic. Nevertheless, identifying low cognitive performers in a representative survey is useful for describing the relationship between cognitive functioning, risk factors, and other health conditions.

Using NHANES cognitive functioning data from 2011–2014, this report describes the spectrum of cognitive performance of the U.S. noninstitutionalized population of adults aged 60 and over. It also examines the association of sociodemographic factors with low cognitive performance and investigates the relationship between subjective cognitive decline and measured cognitive performance.

Methods

Study populations and sample design

NHANES is a series of surveys conducted by the National Center for Health Statistics (NCHS) to assess the health and nutritional status of a representative sample of the noninstitutionalized civilian U.S. population. A complex, multistage probability cluster design was used to select the sample. The surveys consist of household interviews and direct standardized physical examinations conducted in a specially equipped MEC. During 2011–2012 and 2013–2014, non-Hispanic black persons, non-Hispanic Asian persons, Hispanic persons, and persons aged 80 and over were sampled in higher proportions to obtain more reliable and precise estimates for these population subgroups. Overall response rates were 71.8% for the interview and 68.8% for the examination. For adults aged 60 and over, response rates were 58.4% and 55.1%, respectively. Further details on the design and implementation of these surveys have been described elsewhere (18,19). NHANES procedures and protocols were approved by the NCHS Research Ethics Review Board. All adult participants provided written informed consent.

Cognitive assessments

Selection of the assessments for NHANES was based on input from experts on cognition, recognizing that the measures should be brief, understandable to diverse populations, and both easy to administer and score. A MEC was the preferred setting for administration of these assessments because it maximizes control over situational variations, distractions, or aids that may be present during the household interview. The assessments included word list learning trials with a delayed recall from the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) battery to assess new verbal learning and both

immediate and delayed memory (20); the Animal Fluency (AF) test to examine verbal semantic fluency (21); and the Digit Symbol Substitution Test (DSST) to evaluate attention and processing speed (22).

The module from CERAD (20) consisted of word list learning trials of 10 words. Words were read aloud by the participant from a computer screen, followed by an immediate recall. The 10-item word list (CERAD–WL) was the same for each of three consecutive trials. The delayed recall (CERAD–DR) of all 10 words, without review of the word list, occurred after the AF and DSST assessments.

AF, a test of category verbal fluency (21), required participants to name aloud as many animals as possible in 1 minute. As a pretest, participants first were asked to name three articles of clothing. Participants who were unable to correctly name articles of clothing did not continue with the animal naming exercise.

DSST, a subtest of the Wechsler Adult Intelligence Scale, Third Edition (WAIS–III) (22), was conducted using a paper form with a key at the top containing numbers 1–9 paired with corresponding symbols. Beneath the key were rows of 130 adjoining boxes, with a number in the top portion of each box. Using the key, participants had 2 minutes to copy the matching symbol below each number. Before the test, the interviewer showed the participant how to perform the task and then asked the participant to fill in several practice boxes. Participants who were unable to complete the short practice exercise did not attempt the full DSST.

Cognitive assessments were administered during the MEC private interview in Spanish and English by trained bilingual interviewers, and were available in a translated format for participants who spoke Korean, Vietnamese, or Chinese. For the Asian language assessments, an interpreter was present throughout the interview. Participants were asked for consent to audio-record the administration and responses to assessments for quality control and scoring purposes. The order of the assessments was fixed (CERAD–WL, AF, DSST, CERAD–DR), except when consent to record was refused, and then only DSST, a paper and pencil instrument, was administered.

During NHANES 2011–2012, the assessments were administered after questions were asked on alcohol use, tobacco use, reproductive history (women only), and urologic conditions. During NHANES 2013–2014, the assessments were administered at the beginning of the private interview to improve the response rate. The response rates for completing at least one cognitive assessment were 89.5% in 2011–2012 and 94.4% in 2013–2014. Additional information on the administration and completion of the assessments is available in the NHANES documentation (16).

Scoring was conducted separately by two interviewers, post-administration, based on review of the CERAD–WL, CERAD–DR, and AF audio recordings, and the DSST forms. Scores were calculated for each assessment: 1 point was given for each word recalled for a possible total score of 30 for three CERAD–WL trials and 10 for CERAD–DR, 1 point for each unique animal (AF), and 1 point for each correctly matched symbol–number pair (DSST). A test administrator adjudicated any differences in scores between the two interviewers. Agreement was approximately 94%.

Subjective assessment of cognitive functioning

In the home interview, a question on self-perceived memory (SCD question) was asked:

"During the past 12 months, have you experienced confusion or memory loss that is happening more often or is getting worse?" Response categories were yes or no.

The SCD question is part of a module on cognitive health from BRFSS, developed to determine the need for public health activities among cognitively impaired persons living in the community (11).

Covariates

Demographic characteristics and other covariates used in this analysis included age at time of household interview, sex, race and Hispanic origin, whether the respondent was born in the United States, poverty level based on family income, education, marital status, living arrangements, language of the cognitive functioning assessment, and self-reported health status. All demographic characteristics, except for the language of the cognitive functioning assessment, are based on self-reported responses to questions administered during the household interview. Self-reported health status is included as an overall measure of physical, emotional, and social aspects of health and well-being.

Age was categorized in three groups: 60–69, 70–79, and 80 and over. All persons aged 80 and over were coded as "80" in NHANES public data files to protect confidentiality. Race and Hispanic origin were categorized as non-Hispanic white, non-Hispanic black, non-Hispanic Asian, and Hispanic. Non-Hispanic persons of other or multiple races are not shown separately due to insufficient sample sizes but were included in the estimates for the total population. The percentage of the federal poverty level (FPL)—the ratio of family income to the poverty threshold multiplied by 100—was used to define income. FPL was categorized as less than 100%, 100% to less than 200%, 200% to less than 400%, and 400% or more. The U.S. Department of Health and Human Services poverty guidelines are derived from the U.S. Census Bureau's current official poverty thresholds, and are designated based on family size and the year issued (23). Education was defined as having less than a high school education, having completed high school or a GED (high school equivalency diploma), having some college, or being a college graduate or higher. Marital status was classified as married or living with partner, divorced or separated, widowed, or never married. Living arrangements categorized participants as living alone or living with others. Language of cognitive assessment was English, Spanish, or Asian languages (Chinese, Korean, or Vietnamese). Individual Asian languages are not identified due to confidentiality concerns. Responses to the question on self-reported health status were grouped in three categories: excellent or very good, good, and fair or poor.

Analytic sample, exclusion criteria

Of the 3,472 adults aged 60 and over who participated in the MEC examination during NHANES 2011–2014, persons who did not speak English, Spanish, Korean, Vietnamese, traditional or simplified Mandarin, or Cantonese (n = 49) or who needed a proxy informant (n = 25) were not eligible for the assessments. An additional 202 persons were not administered any cognitive assessment due to refusal, time limitation, or health-related problem during their MEC examination visit. A small number of participants (n = 15) began the cognitive tests but failed a pretest, quit or gave up during the test, had difficulty communicating, incurred a computer or audio-recording problem, or experienced another factor that resulted in the absence of a complete score for at least one assessment. See the NHANES Cognitive Functioning data documentation (16) for more details.

The analysis for this report is based on 3,181 adults who had one or more cognitive assessment scores, defined as having completed at least one of the following: three CERAD–WL trials (n = 3,131), CERAD–DR (n = 3,126), AF (n = 3,110), or DSST (n = 3,014). Analysis was conducted separately for each assessment.

Low cognitive performers

In this study, low cognitive performers are described separately by test. They are identified as scoring in the lowest 25th percentile of each cognitive assessment, calculated from the sample with complete scores on that assessment. This method has been used previously in studies with data from national surveys (24,25). Those who score in the lowest 25th percentile likely include some respondents with cognitive impairment, either due to normative aging or dementia or delirium, along with respondents who would have been in the lowest 25th percentile throughout their lives (24,26). The 25th percentile cut-off point is estimated from the full analytic sample for each test, not conditioned on age, sex, or education.

Statistical analysis

Statistical analyses were conducted using SAS System for Windows (release 9.4; SAS Institute Inc., Cary, N.C.) and SUDAAN (release 11.1; RTI International, Research Triangle Park, N.C.).

For each of the four assessments, mean and percentile scores are presented by sociodemographic variables, self-reported health status, and self-reported cognitive functioning status. T tests for two-level variables and analysis of variance for multilevel responses were conducted to test for differences in mean scores by population characteristics. P values less than 0.05 as assessed by the two-sided t test and Satterthwaite adjusted F test were considered statistically significant. Because education levels differ by age cohort, a sensitivity analysis was conducted to determine whether the effect of education on mean scores was similar across age groups. Differences between low cognitive performers (those scoring in the lowest 25th percentile of a cognitive assessment) and not low cognitive performers (those scoring above the 25th percentile) were evaluated by two-sided t tests at the 0.05 level. The associations between SCD, sociodemographic variables, and low cognitive performance were explored with logistic regression models (PROC RLOGIST in SUDAAN). Models were adjusted simultaneously for all of the sociodemographic variables evaluated.

Examination sample weights, which account for the differential probabilities of selection, nonresponse, and noncoverage, were incorporated into the estimation process. The standard errors of the percentages were estimated using Taylor linearization, a method that incorporates the sample weights and sample design. The Survey package in R (https://www.r-project.org) was used to create smoothed density estimate graphs (27) of the cognitive performance scores by age.

Estimates of sensitivity and specificity and predicted values (positive and negative) were calculated for the association between the SCD question and the four cognitive assessments. These measures have been reported in other studies of self-reported health (28–30). The gold standard was defined as scoring in the lowest 25th percentile on the assessment. In this analysis, sensitivity quantifies the proportion of respondents with a positive response to the SCD question among those who scored in the lowest 25th percentile for a particular cognitive assessment (true positives). Specificity reflects the proportion of respondents who replied "no" to the SCD question among those who did not score in the lowest 25th percentile (true negatives). The positive predictive value indicates the proportion of those in the lowest 25th percentile among those who answered "yes" to the SCD question. Similarly, the negative predictive value is the proportion of those who did not score in the lowest 25th percentile among those who answered "no" to the SCD question. In addition, for each assessment the mean score among the low performers is presented by the response category (yes or no) of the SCD question.

Nonresponse bias analysis

To assess potential nonresponse bias in these study results for the 291 persons (8.4%) who were excluded from all cognitive assessments, descriptive characteristics and risk factors were compared between those who completed at least one test and excluded respondents. Persons who were missing all cognitive assessment scores were more likely to be older (aged 80 and over), to have less than a high school education, and to be non-Hispanic black or non-Hispanic Asian. They were also more likely to self-report fair or poor health and memory problems (Technical Notes Table I).

The impact of nonresponse on the mean scores of the cognitive assessments was further evaluated by adjusting the original sample examination weights using the SAS-callable PROC WTADJUST procedure in SUDAAN with an approach described elsewhere (31). Weighting adjustments with three auxiliary variables (sex, age, and race and ethnicity) were conducted separately for each of four scores, because test score completion rates for 2011–2014 combined ranged from 86.3% for DSST to 90.2% for CERAD–WL. The adjusted

sample weights overall yielded similar estimates and conclusions for most scores. Notably, DSST scores using the adjusted weights were 2 to 4 points lower for some subgroups. For this report, the publicly available examination sample weights were used to allow for the reproducibility of estimates.

Results

Characteristics of study population and descriptive statistics

Among the 3,181 NHANES participants who completed at least one cognitive performance test, 54.7% were between the ages of 60 and 69, and 54.8% were women. Almost 80% were non-Hispanic white persons (78.7%), and 60.7% completed some college or more. Nearly 65% were married or living with a partner (64.5%), and 88.7% were born in the United States. Most participants (94.9%) were administered their assessments in English (Table 1).

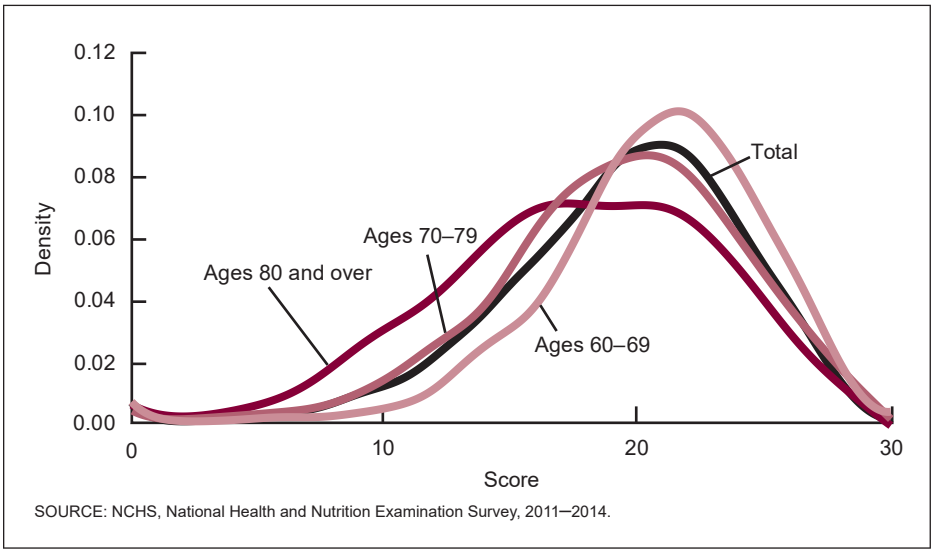
Figures 1–4 show the distribution of scores by age for four cognitive performance assessments. For all assessments, higher scores are associated with better cognitive performance. Scores consistently decreased with increasing age ($p < 0.001$).

Mean scores and selected quartiles are presented in Tables 2–5 for the four tests by the characteristics of the survey participants. The overall mean and median scores for CERAD–WL were both 19.5 where the highest possible score was 30 for naming all 10 words at each of three trials. The interquartile range (IQR) was 6.1 points (Table 2). The mean score for CERAD–DR was 6.1; the median was 5.9 with an IQR of 3.2 points (Table 3). Overall, the mean number of animals named (AF) was 17.9; the median score was 17.1 and IQR was 7.4 points (Table 4). The mean score for DSST was 51.8; the median was 52.3 and IQR was 23.4 points (Table 5).

In the bivariate analyses, mean scores for men were lower ($p < 0.001$) than for women in three tests (CERAD–WL, CERAD–DR, and DSST). Mean scores differed by race and Hispanic origin in the CERAD–WL and AF assessments but not in the CERAD–DR or DSST tests. Across all cognitive assessments, mean scores increased with increasing level of income as measured by FPL ($p < 0.001$). Similarly, mean scores were higher among participants with greater attainment of education ($p < 0.001$). The relation of increased scores with lower age and higher level of education also was evident when age was stratified by educational level (Technical Notes Table II). Within all age groups and across all four cognitive assessments, with the exception of those aged 80 and over for CERAD–DR, a pattern of higher scores with increasing years of education was observed.

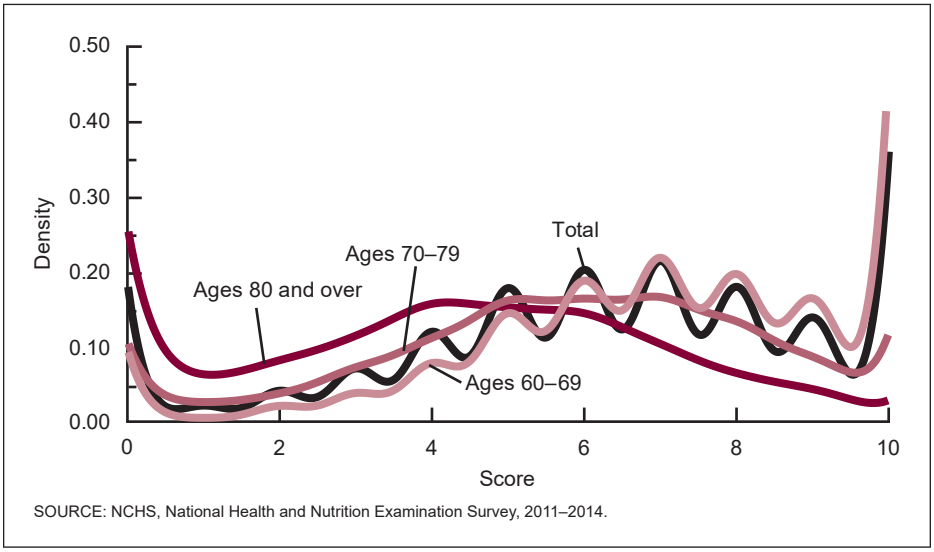
Scores according to the three assessment languages did not show a consistent pattern of association across all tests, but were generally higher among persons who were administered the tests in English compared with another language. Mean scores did not differ by participant living arrangements (living alone compared with living with others) in any of the four tests, and little variability according to marital status was observed, except for mean AF and DSST test scores.

Mean scores for persons reporting affirmatively to lower self-reported health status (fair and poor health) and to a change in memory performance were lower across all four tests ($p < 0.001$).



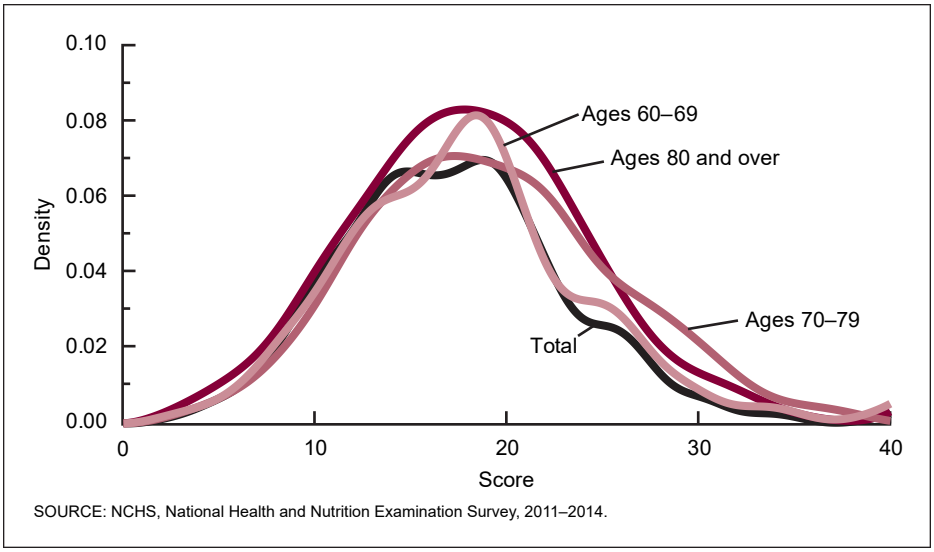
SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Figure 1. Distribution of CERAD word list—immediate recall scores



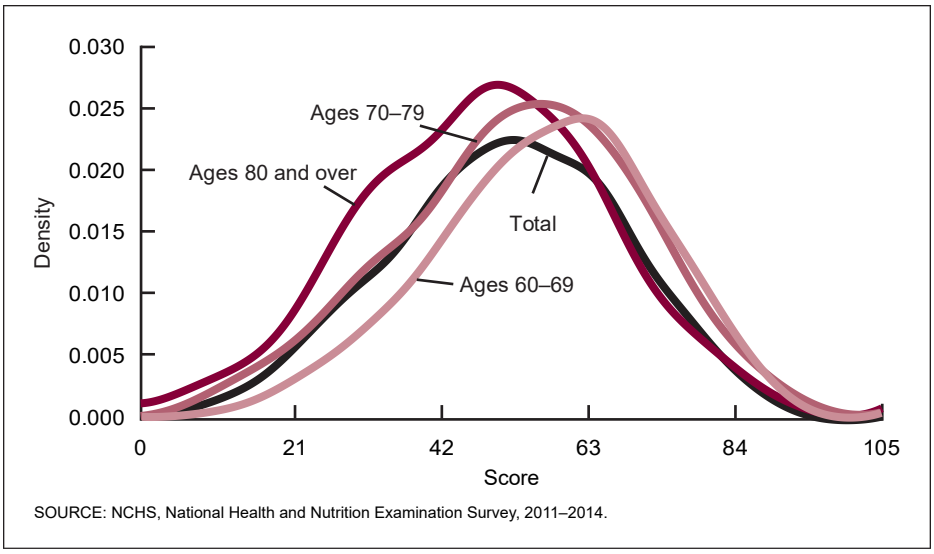
SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Figure 2. Distribution of CERAD word list—delayed recall scores



SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Figure 3. Distribution of Animal Fluency scores



SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Figure 4. Distribution of Digit Symbol Substitution Test scores

Persons who reported confusion or memory loss that was getting worse in the past 12 months (SCD) had mean scores that were 4.2 points lower on CERAD–WL, 1.9 points lower on CERAD–DR, 4.1 points lower on AF, and 15.3 points lower on DSST, compared with persons who did not report positively to this question.

Characteristics of low cognitive performers

Table 6 presents descriptive statistics of low performers on the four cognitive assessments in the NHANES cognitive functioning supplement. Overall, among respondents who had scores on all four tests (n = 2,934), 20% of the sample scored low on one test only, 12% on two tests, 7% on three tests, and 6% on each of the four tests (data not shown). Compared with respondents who did not score in the lowest 25th percentile, low performers on each of the four tests were older and more likely not to have graduated from high school and to be in the lowest poverty category. A higher proportion of men scored in the lowest 25th percentile in all cognitive assessments except AF. The proportion of respondents who were non-Hispanic white persons was higher among those who did not score in the lowest 25th percentile compared with the lowest 25th percentile on all four tests. Respondents not born in the United States were more likely to score in the lowest 25th percentile for each test. For example, 23.1% of respondents who scored in the lowest 25th percentile for the DSST were not born in the United States, compared with 6.9% of respondents whose scores were greater than the 25th percentile. Among respondents who lived alone, a higher proportion scored in the lowest 25th percentile for CERAD–WL and DSST. Among respondents who took the assessments in Spanish, a higher proportion scored in the lowest 25th percentile than in the greater than 25th percentile category. Respondents who scored in the lowest 25th percentile on the cognitive tests were more likely to report fair or poor health and SCD compared with respondents who did not score low.

Logistic regression models

Table 7 presents adjusted odds ratios from logistic regression models of the association between scoring in the lowest 25th percentile of the cognitive tests and the covariates, including the SCD question. The models controlled for all covariates simultaneously. Replying yes to the SCD question was positively associated with scoring in the lowest 25th percentile for all four assessments (odds ratios range from 1.8 [95th CI: 1.3–2.6] for AF to 2.9 [95th CI: 2.3–3.7] for CERAD–DR). Increasing age was significantly associated with low performance for all tests. Compared with age group 60–69, being aged 80 and over increased the odds of scoring in the lowest 25th percentile by 6.0 (95th CI: 3.9–9.1) for CERAD–WL, 6.2 (95th CI: 4.1–9.3) for CERAD–DR, 4.5 (95th CI: 3.1–6.4) for AF, and 9.1 (95th CI: 6.2–13.4) for DSST. Women had lower odds than men of scoring in the lowest 25th percentile for all tests except AF. Compared with non-Hispanic white persons, non-Hispanic black persons had higher odds of being low performers on all the tests except CERAD–WL. Compared with high school graduates, persons with less than a high school education had higher odds of scoring low on CERAD–WL and DSST (1.6 with 95th CI: 1.1–2.3, and 2.2 with 95th CI: 1.6–2.9, respectively), while persons with a college degree or higher were less likely to score low on AF (0.4 with 95th

CI: 0.2–0.6) and DSST (0.4 with 95th CI: 0.2–0.6). Being in the lowest income group (below FPL) compared with being in the group of 400% or more above FPL was associated with scoring in the lowest 25th percentile on CERAD–WL (2.1 with 95th CI: 1.4–3.2), CERAD–DR (1.5 with 95th percentile 1.0–2.3), and DSST (2.4 with 95th CI: 1.5–4.0). Being born outside the United States was positively associated with low performance for AF (3.4 with 95th CI 2.1–5.3) and DSST (2.6 with 95th CI 1.5–4.6). Having the assessment tests conducted in Spanish compared with English was associated with lower odds of being a low performer for the AF test (0.4 with 95th CI: 0.3–0.7), but higher odds for DSST (2.2 with 95th CI: 1.1–4.3). Being in fair or poor health compared with excellent or very good health was significantly associated with scoring in the lowest 25th percentile for three of the four cognitive tests (1.4 with 95th CI: 1.1–1.8 for CERAD–WL; 2.3 with 95th CI: 1.6–3.4 for AF; and 3.1 with 95th CI: 2.1–4.7 for DSST).

Sensitivity, specificity, and predictive values

The SCD question was significantly associated with low cognitive performance in a multivariate framework. However, a positive response to this question does not identify all low performers on the cognitive tests. Estimates of sensitivity, specificity, and positive and negative predictive values are reported in Table 8. Sensitivity (the proportion of respondents with a positive response to the SCD question among those who scored in the lowest 25th percentile) ranged from 22.9% to 26.7%. That is, approximately one-fourth of respondents who scored in the lowest 25th percentile of the four cognitive tests also answered "yes" to the SCD question. This question was more likely to identify respondents who were not low performers. Specificity values (the proportion of respondents who replied "no" to the SCD question among those who did not score in the lowest 25th percentile) ranged from 89.3% to 90.9%. For example, 90.9% of respondents who did not score in the lowest 25th percentile of DSST did not report SCD.

The positive predictive values ranged from 38.7% to 47.0% for the SCD question. For example, 38.7% of those who reported SCD also scored low on the AF test, while 47.0% of those who reported SCD scored in the lowest 25th percentile of DSST. The negative predictive values ranged from 78.2% to 80.9% for the SCD question.

Although the sensitivity of the self-reported question to identify low cognitive performers was relatively low (from 22.9% to 26.7% for the four tests), this question did capture differences in mean scores within the group of low performers. Table 9 shows the mean scores among low performers by whether the respondent answered yes or no to the self-reported cognitive question. Among participants who scored in the lowest 25th percentile on the cognitive tests, mean scores for each test were lower among those who answered "yes" to the SCD question compared with respondents who reported "no" to the question. For example, the mean CERAD–WL score was 13.3 for those who answered "no" to the SCD question compared with 11.6 for those who answered "yes."

Discussion

This report describes cognitive performance among U.S adults aged 60 and over according to their sociodemographic characteristics, self-rated general health status, and self-perceived memory change. This analysis identified many similarities in the sociodemographic predictors of lower performance across four objective cognitive measurements, including older age, male sex, lower education and income, and birthplace outside of the United States, as well as self-reported health status and subjective cognitive decline. Objective measurements of cognitive performance in health surveys add information on an important component of health and functioning that is often overlooked in many national studies of general health and well-being. The cognitive tests administered in NHANES 2011–2014 measure aspects of memory (immediate and delayed learning ability with CERAD–WL and CERAD–DR), executive functioning (verbal fluency with AF), and processing speed (sustained attention and working memory with DSST). Analysis of these test scores cannot provide a comprehensive evaluation of cognitive functioning or clinical diagnosis of dementia, but it can describe the variation in cognitive ability by certain domains and in relation to other measured health outcomes and behaviors. Although not considered in this report, medical conditions, psychological factors, and sensory deficits, such as vision and hearing impairment, can accelerate age-related cognitive decline (2,4).

Comparing the results presented in this report with other nationally representative surveys is difficult. The cognitive assessments administered in NHANES 2011–2014 cover only selected domains of cognitive functioning, and scores from these assessments were not combined to create a composite score with a cutoff to characterize cognitive impairment, as in other studies (32–34). In this report, the 25th percentile was used to distinguish low cognitive performers from performers in the remaining score distribution for each assessment individually. An analysis using the lowest 10th percentile to identify low cognitive performers yielded similar results, but with less precision of the estimates due to small sample sizes.

In the current analysis, the results of the tests are presented separately, and the range of scores and differences by sociodemographic characteristics generally align with published results from other studies, some cross-sectional and some longitudinal, using the same tests (35–37). In this report, low performers are defined by score cut points that are not conditional on age or education, but there other ways to define low cognitive performance. Some studies use age- and education-specific cut points when identifying low cognitive performers (38). Because people with more years of education generally score higher on cognitive tests than people with fewer years of education, an average score on a cognitive assessment for a highly educated person may represent cognitive decline for that respondent. However, this impairment would be missed if the cut-point score for the lowest 25th percentile is calculated without considering educational level.

Conversely, a lower score for a person with less education may be considered cognitive impairment when, in fact, it does not represent a decline from previous levels. Similarly, because cognitive performance on average declines with age, a lower score for an older person could be considered impairment when, in fact, it is within the normal range of performance for people of that age (26). Establishing cut points by age and education when identifying low cognitive performers may lead to both over- and under-identification (39). Depending on the objective of a study, researchers may choose to control for various factors and use different cut points.

There is growing evidence that self-rated cognitive difficulties may be a precursor to cognitive decline (40–44). The SCD question was positively related to scoring in the lowest 25th percentile of each of the tests, controlling for other sociodemographic variables and self-reported health. However, this question positively predicts only between 38.7% and 47.0% of the respondents who score low on the tests. This finding indicates that concerns about memory decline are not always reflected in lower performance on tests that involve episodic memory, such as CERAD–WL or CERAD–DR. Rickenbach et al. (45), in an analysis of Health and Retirement Study participants, also found that self-perceived change in memory was not always indicative of actual memory ability, as measured by objective assessment.

The SCD question performed better at ruling out low cognitive performers (e.g., specificity ranged from 89.3% to 90.9%) compared with validating low cognitive performers (e.g., sensitivity ranged from 22.9% to 26.7%). Nonetheless, mean test scores were lower among low cognitive performers who also reported an increase or worsening of memory loss or confusion within the past 12 months of the survey than among those who did not perceive this change. The lower scores may indicate a difference in severity in cognitive performance among the true positives, but they may also be related to the cut point used to determine low performance, to interpretation of the question, or to other factors related to a health condition or impairment not evaluated in this analysis. A different question on self-reported cognitive functioning from NHIS, also asked in the NHANES household interview of persons aged 60 and over ("Are you limited in any way because of difficulty remembering or because you experience periods of confusion"), had similar levels of sensitivity and specificity and performed similarly to the SCD question in the multivariate models (data not shown). These questions may be useful in adding information on cognitive performance in combination with other measures of functional impairment and health conditions.

This analysis has several limitations. First, participants with hearing or visual deficits, who had mental or physical conditions that could influence performance, or used medications that may be associated with cognitive performance were not excluded from this analysis. Second, the cognitive functioning tests, chosen for ease of administration, availability, and use in other surveys, do not cover all domains of cognition. Adults who perform well in one domain may not perform well in another domain. Third, because of the cross-sectional nature of NHANES, there is no way to ascertain if measured low cognitive performance represents a change in cognitive functioning for an individual respondent. Fourth, participants with proxy informants were not eligible for the cognitive assessments; however, the reason for proxy designation was not always ascertained and could have been for reasons other than cognitive impairment. Similarly, the reasons why participants failed the AF and DSST pretests and were unable to continue with these tests are not known and may have been for reasons other than cognitive impairment. The fifth limitation is the possible effect of the survey language or cultural factors on the scores. The presence of interpreters for non-Hispanic Asian participants who chose to have the tests administered in their native languages may have impacted performance and, as in other studies, the Hispanic race and ethnicity category may mask differences in cognitive functioning among subgroups of the Hispanic population (46). Finally, the findings from this report were gathered from community-dwelling adults who were able to take part in the examination at locations away from their homes, and do not include populations who may have a higher prevalence of cognitive impairment, such as those living in nursing homes or other institutions (47).

Strengths of the study include the large sample of older adults representing four primary race and Hispanic-origin subgroups in the community-dwelling United States. Second, the objective cognitive assessments were administered in a private, standardized environment, which is more similar to a clinical than a household setting. Third, the survey included a concurrent question on self-perceived change in memory loss over a 12-month perspective.

This report presents the variability in cognitive performance based on selective assessments by sociodemographic factors among older adults. These data on cognitive performance, together with NHANES data on medical conditions, physical functioning, and lifestyle factors, may offer researchers an opportunity to explore many aspects of an aging population.

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Table 1. Characteristics of participants with one or more cognitive functioning test scores: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	Sample size	Percent (weighted)	Standard error
Total	3,181	…	…
Age group (years)			
60–69	1,675	54.7	1.3
70–79	951	29.6	1.1
80 and over	555	15.7	0.9
Sex			
Men	1,543	45.2	1.0
Women	1,638	54.8	1.0
Race and Hispanic origin[1]			
Hispanic	589	7.4	1.2
Non-Hispanic white	1,423	78.7	1.9
Non-Hispanic black	738	8.8	1.3
Non-Hispanic Asian	249	3.4	0.5
Education			
Less than high school	872	17.2	1.5
High school graduate or GED	732	22.2	1.4
Some college	869	30.9	1.3
College graduate or higher	704	29.8	2.0
Federal poverty level			
Less than 100%	529	9.8	0.8
100% to below 200%	871	24.0	1.9
200% to below 400%	765	29.0	1.6
400% or more	739	37.2	2.1
Born in United States			
Yes	2,376	88.7	3.6
No	803	11.3	1.0
Living arrangements			
Living alone	816	24.1	1.1
Living with others	2,365	75.9	1.1
Marital status			
Never married	176	4.4	0.5
Married or living with partner	1,743	64.5	1.1
Separated or divorced	508	13.8	0.6
Widowed	610	17.3	0.8
Assessment language			
English	2,775	94.9	0.7
Spanish	332	4.2	0.7
Asian language[2]	74	0.9	0.2
Self-reported health			
Excellent or very good	1,040	42.8	1.7
Good	1,194	36.0	0.9
Fair or poor	945	21.2	1.2
Subjective cognitive decline[3]			
Yes	424	10.0	0.7
No	2,755	90.0	0.7

… Category not applicable.
[1]Total includes other races and multiple race.
[2]Language of assessment was Chinese, Korean, or Vietnamese.
[3]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 2. Mean and percentiles of CERAD word list—immediate recall scores: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	Sample size	Mean	Standard error	*p* value[1]	Percentile				
					10th	25th	50th	75th	90th
Total	3,131	19.5	0.2	…	12.8	16.2	19.5	22.3	24.7
Age group (years)	…	…	…	Less than 0.001	…	…	…	…	…
60-69	1,648	20.7	0.2	…	14.7	18.0	20.6	23.2	25.3
70-79	937	18.7	0.2	…	12.0	15.4	18.5	21.4	23.9
80 and over	546	16.6	0.4	…	9.2	12.8	16.3	19.8	22.4
Sex	…	…	…	Less than 0.001	…	…	…	…	…
Men	1,519	18.8	0.3	…	12.5	15.6	18.7	21.4	23.7
Women	1,612	20.0	0.2	…	13.1	16.8	20.3	22.9	25.2
Race and Hispanic origin[2]	…	…	…	Less than 0.001	…	…	…	…	…
Hispanic	608	17.5	0.3	…	10.7	14.0	17.1	20.4	23.4
Non-Hispanic white	1,454	19.8	0.3	…	13.3	16.6	19.8	22.6	24.9
Non-Hispanic black	763	18.6	0.3	…	11.4	15.1	18.9	21.6	23.9
Non-Hispanic Asian	260	18.7	0.6	…	9.8	15.7	19.3	21.8	24.3
Education	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	853	16.9	0.3	…	10.2	13.7	16.4	19.8	22.5
High school graduate or GED	722	19.1	0.3	…	12.0	15.7	19.1	21.7	24.0
Some college	861	20.0	0.3	…	14.1	17.0	19.9	22.7	24.8
College graduate or higher	691	20.7	0.2	…	14.3	18.0	20.8	23.2	25.4
Federal poverty level	…	…	…	Less than 0.001	…	…	…	…	…
Less than 100%	516	17.4	0.3	…	10.3	13.5	17.0	20.7	23.3
100% to below 200%	858	18.5	0.2	…	12.1	15.0	18.2	21.1	23.8
200% to below 400%	750	19.6	0.3	…	13.0	16.4	19.8	22.5	24.4
400% or more	734	20.6	0.3	…	14.6	18.0	20.6	23.1	25.3
Born in United States	…	…	…	Less than 0.001	…	…	…	…	…
Yes	2,349	19.7	0.2	…	13.1	16.5	19.7	22.5	24.6
No	780	17.9	0.2	…	10.5	14.2	17.9	21.1	23.6
Living arrangements	…	…	…	0.101	…	…	…	…	…
Living alone	803	19.2	0.2	…	12.7	15.7	19.2	22.2	24.5
Living with others	2,328	19.6	0.2	…	12.8	16.4	19.6	22.4	24.7
Marital status	…	…	…	0.117	…	…	…	…	…
Never married	183	19.6	0.5	…	12.8	15.9	19.5	22.5	25.0
Married or living with partner	1,777	19.8	0.3	…	13.2	16.7	19.8	22.8	24.9
Separated or divorced	520	19.7	0.3	…	13.5	16.4	20.0	22.6	24.9
Widowed	646	18.0	0.2	…	10.6	14.3	17.9	20.9	23.6
Assessment language	…	…	…	Less than 0.001	…	…	…	…	…
English	2,737	19.6	0.2	…	13.0	16.4	19.7	22.4	24.8
Spanish	324	16.5	0.3	…	10.2	13.3	16.3	19.2	21.8
Asian language[3]	70	17.2	1.5	…	5.7	13.7	17.8	21.8	24.2
Self-reported health	…	…	…	Less than 0.001	…	…	…	…	…
Excellent or very good	1,023	20.4	0.3	…	13.8	17.5	20.5	23.0	25.1
Good	1,178	19.4	0.2	…	12.9	16.1	19.4	22.2	24.7
Fair or poor	928	17.8	0.2	…	11.0	14.5	17.5	20.5	23.2
Subjective cognitive decline[4]	…	…	…	Less than 0.001	…	…	…	…	…
Yes	413	15.7	0.4	…	7.8	11.5	15.4	19.3	22.5
No	2,716	19.9	0.2	…	13.6	16.7	19.8	22.5	24.8

… Category not applicable.
[1]*P* value based on *t* test (two-level variables) or Saitterthwaite adjusted *F* test (multilevel variables).
[2]Total includes other races and multiple race.
[3]Language of assessment was Chinese, Korean, or Vietnamese.
[4]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 3. Mean and percentiles of CERAD word list—delayed recall scores: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	Sample size	Mean	Standard error	*p* value[1]	Percentile				
					10th	25th	50th	75th	90th
Total	3,126	6.1	0.1	…	2.4	4.2	5.9	7.4	8.6
Age group (years)	…	…	…	Less than 0.001	…	…	…	…	…
60–69	1,647	6.8	0.1	…	3.5	4.9	6.4	7.8	8.9
70–79	934	5.8	0.1	…	2.3	3.9	5.5	7.0	8.2
80 and over	545	4.6	0.2	…	0.5	2.4	4.1	5.8	7.3
Sex	…	…	…	Less than 0.001	…	…	…	…	…
Men	1,516	5.8	0.1	…	2.2	3.9	5.4	7.0	8.3
Women	1,610	6.4	0.1	…	2.6	4.5	6.2	7.7	8.8
Race and Hispanic origin[2]	…	…	…	0.538	…	…	…	…	…
Hispanic	605	5.4	0.1	…	1.8	3.3	5.1	6.7	7.9
Non-Hispanic white	1,452	6.3	0.1	…	2.6	4.3	6.0	7.5	8.7
Non-Hispanic black	765	5.6	0.1	…	1.6	3.6	5.3	7.0	8.0
Non-Hispanic Asian	258	6.5	0.2	…	2.8	4.6	6.4	7.8	8.9
Education	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	849	5.2	0.1	…	1.6	3.2	4.7	6.3	7.7
High school graduate or GED	720	5.9	0.1	…	2.2	3.9	5.5	7.0	8.3
Some college	861	6.5	0.1	…	2.9	4.6	6.3	7.7	8.7
College graduate or higher	692	6.5	0.1	…	3.2	4.6	6.3	7.8	9.0
Federal poverty level	…	…	…	Less than 0.001	…	…	…	…	…
Less than 100%	513	5.4	0.1	…	1.6	3.3	5.0	6.8	8.1
100% to below 200%	857	5.6	0.1	…	2.0	3.5	5.2	6.9	8.3
200% to below 400%	749	6.2	0.1	…	2.6	4.4	5.9	7.4	8.5
400% or more	734	6.6	0.1	…	3.2	4.8	6.4	7.8	8.9
Born in United States	…	…	…	Less than 0.001	…	…	…	…	…
Yes	2,349	6.2	0.1	…	2.5	4.3	5.9	7.5	8.6
No	775	5.6	0.1	…	1.8	3.5	5.2	6.9	8.2
Living arrangements	…	…	…	0.394	…	…	…	…	…
Living alone	803	6.1	0.1	…	2.4	4.1	5.7	7.3	8.6
Living with others	2,323	6.2	0.1	…	2.4	4.2	5.9	7.4	8.6
Marital status	…	…	…	0.261	…	…	…	…	…
Never married	182	6.2	0.3	…	1.9	4.2	6.0	7.5	8.7
Married or living with partner	1,773	6.3	0.1	…	2.7	4.3	6.0	7.5	8.7
Separated or divorced	521	6.3	0.1	…	2.8	4.3	6.0	7.6	8.8
Widowed	645	5.5	0.1	…	1.4	3.5	5.2	6.9	8.0
Assessment language	…	…	…	Less than 0.001	…	…	…	…	…
English	2,734	6.2	0.1	…	2.5	4.2	5.9	7.5	8.6
Spanish	323	4.9	0.2	…	1.5	2.8	4.6	5.8	6.8
Asian language[3]	69	6.3	0.5	…	2.2	3.8	5.9	7.8	8.9
Self-reported health	…	…	…	Less than 0.001	…	…	…	…	…
Excellent or very good	1,024	6.5	0.1	…	3.1	4.7	6.3	7.7	8.8
Good	1,176	6.1	0.1	…	2.4	4.2	5.7	7.5	8.6
Fair or poor	924	5.4	0.1	…	1.8	3.4	5.1	6.5	7.7
Subjective cognitive decline[4]	…	…	…	Less than 0.001	…	…	…	…	…
Yes	410	4.3	0.2	…	†	1.8	3.9	5.8	7.3
No	2,714	6.2	0.1	…	2.9	4.4	6.0	7.5	8.7

… Category not applicable.
† Unable to calculate.
[1]*P* value based on *t* test (two-level variables) or Satterthwaite adjusted *F* test (multilevel variables).
[2]Total includes other races and multiple race.
[3]Language of assessment was Chinese, Korean, or Vietnamese.
[4]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 4. Mean and percentiles of Animal Fluency scores: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	Sample size	Mean	Standard error	*p* value[1]	Percentile				
					10th	25th	50th	75th	90th
Total	3,110	17.9	0.2	…	10.3	13.4	17.1	20.8	25.1
Age group (years)	…	…	…	Less than 0.001	…	…	…	…	…
60–69	1,642	19.4	0.2	…	12.0	15.0	19.0	22.0	26.4
70–79	923	16.8	0.2	…	9.6	12.4	16.0	19.7	23.8
80 and over	545	14.5	0.2	…	8.1	11.0	14.0	16.9	19.7
Sex	…	…	…	0.204	…	…	…	…	…
Men	1,505	18.2	0.2	…	10.6	13.6	17.5	21.0	25.6
Women	1,605	17.6	0.2	…	10.0	13.2	16.9	20.6	24.7
Race and Hispanic origin[2]	…	…	…	0.003	…	…	…	…	…
Hispanic	601	15.7	0.3	…	8.9	11.6	14.9	18.2	21.7
Non-Hispanic white	1,452	18.6	0.2	…	11.1	14.1	18.0	21.4	25.7
Non-Hispanic black	757	14.6	0.3	…	8.1	10.2	13.8	17.5	20.6
Non-Hispanic Asian	255	14.6	0.3	…	8.6	11.1	13.7	16.8	20.3
Education	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	841	14.4	0.3	…	7.9	10.6	13.9	16.9	19.7
High school graduate or GED	719	16.2	0.2	…	9.7	12.3	15.7	19.1	21.4
Some college	853	18.4	0.2	…	11.3	14.1	17.9	21.1	25.2
College graduate or higher	693	20.6	0.4	…	12.5	15.8	19.9	24.3	27.4
Federal poverty level	…	…	…	Less than 0.001	…	…	…	…	…
Less than 100%	508	15.1	0.3	…	7.9	10.6	14.3	18.4	21.4
100% to less than 200%	854	16.5	0.3	…	9.5	12.1	15.6	19.2	23.4
200% to less than 400%	742	17.7	0.3	…	10.4	13.4	17.0	20.5	24.6
400% or more	735	20.0	0.4	…	12.4	15.5	19.5	22.9	26.6
Born in United States	…	…	…	Less than 0.001	…	…	…	…	…
Yes	2,338	18.3	0.2	…	10.7	13.8	17.6	21.1	25.4
No	770	14.8	0.4	…	8.0	10.7	13.8	17.7	20.7
Living arrangements	…	…	…	0.195	…	…	…	…	…
Living alone	800	17.5	0.3	…	9.9	13.1	16.7	20.3	24.8
Living with others	2,300	18.0	0.2	…	10.4	13.4	17.3	20.9	25.2
Marital status	…	…	…	Less than 0.001	…	…	…	…	…
Never married	183	17.7	0.7	…	9.6	12.6	16.4	21.7	26.3
Married or living with partner	1,766	18.4	0.2	…	11.0	13.9	17.9	21.2	25.4
Separated or divorced	517	18.5	0.4	…	10.3	13.9	17.7	21.3	26.8
Widowed	639	15.6	0.2	…	8.8	11.3	15.2	18.2	22.0
Assessment language	…	…	…	Less than 0.001	…	…	…	…	…
English	2,722	18.0	0.2	…	10.4	13.5	17.3	20.9	25.3
Spanish	320	15.5	0.5	…	9.2	11.5	14.6	18.3	20.8
Asian language[3]	68	13.6	0.6	…	8.2	10.6	12.6	15.7	18.3
Self-reported health	…	…	…	Less than 0.001	…	…	…	…	…
Excellent or very good	1,022	19.6	0.3	…	12.0	14.9	19.0	22.5	26.6
Good	1,172	17.3	0.2	…	10.3	13.1	16.7	19.8	24.0
Fair or poor	914	15.3	0.3	…	8.1	10.8	14.6	18.5	22.2
Subjective cognitive decline[4]	…	…	…	Less than 0.001	…	…	…	…	…
Yes	409	14.2	0.4	…	6.4	9.5	13.7	17.1	21.2
No	2,699	18.3	0.2	…	10.9	13.8	17.6	21.1	25.4

… Category not applicable.
[1]*P* value based on *t* test (two-level variables) or Saitterthwaite adjusted *F* test (multilevel variables).
[2]Total includes other races and multiple race.
[3]Language of assessment was Chinese, Korean, or Vietnamese.
[4]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 5. Mean and percentiles of Digit Symbol Substitution Test scores: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	Sample size	Mean	Standard error	*p* value[1]	Percentile				
					10th	25th	50th	75th	90th
Total	3,014	51.8	0.6	…	28.5	40.0	52.3	63.4	73.1
Age group (years)	…	…	…	Less than 0.001	…	…	…	…	…
60–69	1,628	57.1	0.7	…	34.1	46.3	57.9	67.5	76.8
70–79	894	47.9	0.6	…	26.5	37.9	48.3	58.2	66.2
80 and over	492	39.9	0.7	…	21.4	29.1	39.6	49.4	57.7
Sex	…	…	…	Less than 0.001	…	…	…	…	…
Men	1,469	50.0	0.6	…	28.6	39.1	50.0	60.4	67.9
Women	1,545	53.4	0.6	…	28.2	41.4	53.7	66.2	75.6
Race and Hispanic origin[2]	…	…	…	0.536	…	…	…	…	…
Hispanic	569	37.8	1.0	…	15.0	24.1	35.9	50.8	61.2
Non-Hispanic white	1,421	54.5	0.6	…	32.6	43.0	54.0	65.3	74.4
Non-Hispanic black	723	39.8	1.0	…	18.8	27.7	38.8	50.9	61.1
Non-Hispanic Asian	259	50.1	1.1	…	24.2	38.4	50.8	62.4	72.0
Education	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	774	36.0	1.0	…	15.6	25.1	34.4	45.3	55.2
High school graduate or GED	702	48.5	0.9	…	28.2	38.2	47.9	57.7	68.4
Some college	843	55.0	0.6	…	34.7	44.5	54.3	64.9	75.3
College graduate or higher	692	59.4	0.8	…	40.0	49.6	60.2	67.9	76.8
Federal poverty level	…	…	…	Less than 0.001	…	…	…	…	…
Less than 100%	478	38.4	1.3	…	15.7	24.9	37.8	50.7	61.3
100% to below 200%	821	44.7	0.8	…	24.3	32.4	43.4	55.0	64.2
200% to below 400%	736	52.3	0.7	…	32.2	41.9	53.1	61.8	69.7
400% or more	723	59.5	0.8	…	40.0	49.1	60.3	68.8	77.5
Born in United States	…	…	…	Less than 0.001	…	…	…	…	…
Yes	2,267	53.2	0.5	…	30.7	41.9	53.3	64.2	73.7
No	745	40.5	1.0	…	15.9	28.2	39.0	53.0	64.2
Living arrangements	…	…	…	0.177	…	…	…	…	…
Living alone	766	50.6	1.0	…	26.9	38.1	50.4	63.3	72.5
Living with others	2,248	52.2	0.6	…	29.0	41.0	52.7	63.4	73.2
Marital status	…	…	…	0.002	…	…	…	…	…
Never married	173	50.8	2.3	…	25.2	36.0	50.4	64.1	75.2
Married or living with partner	1,732	53.7	0.6	…	32.2	42.6	53.6	64.4	73.9
Separated or divorced	509	52.0	1.1	…	26.6	39.8	53.1	63.8	71.7
Widowed	596	44.8	0.9	…	21.7	31.4	44.4	56.3	67.7
Assessment language	…	…	…	Less than 0.001	…	…	…	…	…
English	2,649	52.7	0.5	…	29.9	41.4	53.0	63.8	73.4
Spanish	295	32.0	1.8	…	12.6	19.9	29.0	41.2	53.5
Asian language[3]	70	41.5	2.4	…	12.5	27.0	41.0	58.2	65.0
Self-reported health	…	…	…	Less than 0.001	…	…	…	…	…
Excellent or very good	1,013	58.3	0.6	…	38.1	47.8	58.9	68.0	76.9
Good	1,134	50.1	0.7	…	29.1	39.4	49.6	61.1	69.3
Fair or poor	865	41.0	0.8	…	19.9	28.7	40.2	51.5	61.2
Subjective cognitive decline[4]	…	…	…	Less than 0.001	…	…	…	…	…
Yes	367	37.9	1.1	…	17.9	25.4	37.7	47.2	58.1
No	2,645	53.2	0.5	…	30.7	41.8	53.4	64.2	73.6

… Category not applicable.
[1]*P* value based on *t* test (two-level variables) or Saitterthwaite adjusted *F* test (multilevel variables).
[2]Total includes other races and multiple race.
[3]Language of assessment was Chinese, Korean, or Vietnamese.
[4]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 6. Characteristics of participants, by cognitive functioning test and cognitive performance category: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	CERAD–WL				CERAD–DR				AF				DSST			
	Less than or equal to 25th percentile		Greater than 25th percentile		Less than or equal to 25th percentile		Greater than 25th percentile		Less than or equal to 25th percentile		Greater than 25th percentile		Less than or equal to 25th percentile		Greater than 25th percentile	
	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error
Sample size	966	…	2,165	…	859	…	2,267	…	1,001	…	2,109	…	1,192	…	1,822	…
Age group (years)																
60–69	31.5	2.1	62.0	1.6	33.6	2.6	61.3	1.6	34.3	1.9	60.9	1.3	35.3	2.1	62.6	1.5
70–79	36.6	1.8	27.4	1.3	33.9	2.1	28.3	1.3	36.8	2.2	27.4	1.2	34.5	1.7	27.9	1.4
80 and over	31.9	2.8	10.6	0.7	33.5	2.3	10.4	0.7	28.8	1.8	11.8	0.8	30.2	2.1	9.6	0.7
Sex																
Men	52.6	2.0	43.0	1.2	53.5	2.0	42.9	1.3	†42.7	2.2	46.1	1.2	49.5	2.0	44.2	1.2
Women	47.4	2.0	57.0	1.2	46.5	2.0	57.1	1.3	†57.4	2.2	53.9	1.2	50.5	2.0	55.8	1.2
Race and Hispanic origin[1]																
Hispanic	12.6	2.3	5.9	0.9	10.8	2.2	6.5	1.0	11.3	2.0	6.3	1.0	16.4	2.4	4.1	0.7
Non-Hispanic white	70.3	4.1	80.9	1.6	73.7	3.6	79.8	1.7	62.9	3.7	83.3	1.5	60.7	3.9	85.2	1.3
Non-Hispanic black	11.5	2.1	8.1	1.2	11.4	1.9	8.2	1.2	17.4	2.5	6.3	0.9	18.2	2.6	5.4	0.8
Non-Hispanic Asian	†3.9	0.8	3.3	0.5	†2.7	0.6	3.6	0.5	6.7	1.0	2.4	0.4	†4.0	0.8	3.3	0.5
Education																
Less than high school	33.6	3.4	12.0	1.1	27.4	3.3	14.0	1.3	31.9	2.6	12.5	1.4	39.7	2.7	8.3	1.0
High school graduate or GED	†24.7	2.1	21.4	1.5	25.3	2.5	21.3	1.6	28.9	2.3	20.2	1.5	27.2	2.2	20.5	1.6
Some college	23.8	2.3	33.1	1.5	23.8	2.4	33.0	1.4	24.1	2.0	32.9	1.5	21.0	1.8	34.7	1.6
College graduate or higher	18.0	2.5	33.4	1.9	23.4	3.2	31.6	2.1	15.1	1.9	34.4	2.2	12.1	1.6	36.6	2.3
Federal poverty level																
Less than 100%	18.0	1.6	7.2	0.7	14.3	1.7	8.4	0.8	17.8	2.1	7.3	0.7	20.5	1.7	5.6	0.7
100% to less than 200%	33.3	2.6	21.2	1.9	34.2	2.4	21.1	2.0	31.3	2.1	21.9	2.2	37.8	1.9	18.9	2.1
200% to less than 400%	†26.9	2.4	29.5	1.7	24.7	2.8	30.0	1.7	†29.4	2.1	28.7	1.8	†26.5	2.3	30.3	1.9
400% or more	21.8	1.8	42.1	2.5	26.8	2.1	40.6	2.4	21.5	2.3	42.1	2.6	15.2	1.8	45.2	2.8
Born in United States																
Yes	83.2	2.3	90.6	0.9	85.0	2.0	90.1	0.9	78.2	2.3	92.1	0.8	76.9	2.2	93.1	0.7
No	16.8	2.3	9.4	0.9	15.0	2.0	10.0	0.9	21.9	2.3	7.9	0.8	23.1	2.2	6.9	0.7
Living arrangements																
Living alone	27.6	1.9	23.0	1.2	†25.6	2.1	23.7	1.2	†25.9	2.3	23.6	1.1	27.9	2.3	22.6	1.1
Living with others	72.4	1.9	77.0	1.2	†74.4	2.1	76.3	1.2	†74.1	2.3	76.4	1.1	72.1	2.3	77.4	1.1
Marital status																
Never married	†4.8	0.8	4.3	0.6	†4.3	0.8	4.5	0.6	†5.5	0.8	4.1	0.6	†5.5	0.9	4.1	0.6
Married or living with partner	55.3	2.1	66.7	1.2	58.5	2.3	65.6	1.2	54.8	2.9	66.9	1.0	52.2	2.5	68.8	1.0
Separated or divorced	†13.1	1.5	13.9	0.7	†12.6	1.3	14.1	0.6	†12.3	1.7	14.2	0.8	†14.1	1.5	13.8	0.7
Widowed	26.8	1.7	15.1	0.8	24.6	1.8	15.8	0.9	27.4	1.8	14.9	0.8	28.2	1.8	13.4	0.8
Assessment language																
English	90.3	1.8	96.4	0.5	91.6	1.6	96.0	0.5	91.7	1.3	96.0	0.6	87.2	1.7	98.0	0.4
Spanish	8.4	1.7	2.9	0.4	7.4	1.6	3.2	0.5	6.3	1.2	3.5	0.6	11.2	1.7	1.4	0.4
Asian language[2]	†1.3	0.4	0.7	0.2	†1.0	0.3	0.8	0.2	2.0	0.6	0.5	0.1	1.6	0.4	0.6	0.2

Table 6. Characteristics of participants by cognitive functioning test and cognitive performance category: National Health and Nutrition Examination Survey, 2011–2014—Con.

Characteristic	CERAD–WL				CERAD–DR				AF				DSST			
	Less than or equal to 25th percentile		Greater than 25th percentile		Less than or equal to 25th percentile		Greater than 25th percentile		Less than or equal to 25th percentile		Greater than 25th percentile		Less than or equal to 25th percentile		Greater than 25th percentile	
	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error	Percent (weighted)	Standard error
Self-reported health																
Excellent or very good	29.7	2.3	46.8	1.8	33.2	2.1	45.6	2.0	25.6	2.5	47.9	1.9	21.0	2.0	51.2	1.8
Good	†37.6	2.3	35.7	1.1	†35.4	2.3	36.3	1.3	†38.2	2.2	35.6	1.1	†38.8	1.8	35.2	1.1
Fair or poor	32.7	1.9	17.6	1.1	31.4	2.0	18.0	1.1	36.2	2.1	16.6	1.3	40.3	1.6	13.6	1.2
Subjective cognitive decline[3]																
Yes	24.8	1.6	10.1	0.7	26.7	2.0	9.6	0.7	22.9	2.2	10.7	0.8	24.2	1.4	9.1	0.8
No	75.2	1.6	89.9	0.7	73.3	2.0	90.4	0.7	77.1	2.2	89.3	0.8	75.9	1.4	90.9	0.8

† The percentages for less than or equal to the 25th percentile estimates are significantly different from the percentages for greater than the 25th percentile for all estimates except those noted.
[1]Total includes other races and multiple race.
[2]Language of assessment was Chinese, Korean, or Vietnamese.
[3]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

NOTES: CERAD–WL is CERAD word list—immediate recall score. CERAD–DR is CERAD word list—delayed recall score. AF is Animal Fluency score. DSST is Digit Symbol Substitution Test score.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 7. Adjusted odds ratios and 95% confidence intervals for scoring in the lowest 25th percentile of cognitive functioning tests: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	CERAD–WL		CERAD–DR		AF		DSST	
	Odds ratio	Confidence interval	Odds ratio	Confidence interval	Odds ratio	Confidence interval	Odds ratio	Confidence interval
Subjective cognitive decline[1]								
Yes	2.2	1.7–2.7	2.9	2.3–3.7	1.8	1.3–2.6	2.7	1.6–4.3
No	1.0	…	1.0	…	1.0	…	1.0	…
Age group								
60–69	1.0	…	1.0	…	1.0	…	1.0	…
70–79	2.6	2.1–3.3	2.3	1.6–3.3	2.2	1.6–3.1	2.9	2.1–4.0
80 and over	6.0	3.9–9.1	6.2	4.1–9.3	4.5	3.1–6.4	9.1	6.2–13.4
Sex								
Male	1.0	…	1.0	…	1.0	…	1.0	…
Female	0.5	0.4–0.6	0.5	0.4–0.6	1.0	0.7–1.3	0.5	0.4–0.6
Race and Hispanic origin[2]								
Hispanic	1.5	1.0–2.4	1.1	0.7–1.8	1.2	0.9–1.7	1.7	1.1–2.6
Non-Hispanic white	1.0	…	1.0	…	1.0	…	1.0	…
Non-Hispanic black	1.3	0.9–2.0	1.5	1.1–2.2	3.1	2.2–4.3	4.8	3.7–6.2
Non-Hispanic Asian	1.5	0.8–2.9	0.6	0.3–1.1	1.7	0.8–3.5	0.9	0.4–1.8
Education								
Less than high school	1.6	1.1–2.3	1.0	0.7–1.6	1.0	0.7–1.5	2.2	1.6–2.9
High school graduate or GED	1.0	…	1.0	…	1.0	…	1.0	…
Some college	0.7	0.5–1.0	0.7	0.4–1.1	0.6	0.4–0.8	0.6	0.4–0.8
College graduate or higher	0.6	0.4–1.0	0.8	0.5–1.3	0.4	0.2–0.6	0.4	0.2–0.6
Federal poverty level								
Less than 100%	2.1	1.4–3.2	1.5	1.0–2.3	1.4	0.8–2.3	2.4	1.5–4.0
100% to below 200%	1.5	1.0–2.2	1.5	1.1–2.2	1.1	0.7–1.6	2.2	1.3–3.6
200% to below 400%	1.1	0.8–1.6	0.9	0.6–1.2	1.2	0.8–1.6	1.4	0.9–2.1
400% or more	1.0	…	1.0	…	1.0	…	1.0	…
Born in United States								
Yes	1.0	…	1.0	…	1.0	…	1.0	…
No	0.9	0.6–1.4	1.3	0.8–2.1	3.4	2.1–5.3	2.6	1.5–4.6
Living arrangements								
Living alone	1.0	…	1.0	…	1.0	…	1.0	…
Living with others	1.2	0.8–1.8	1.4	0.8–2.2	1.5	0.9–2.2	1.4	0.9–2.0
Marital status								
Never married	1.5	0.8–2.7	1.0	0.5–2.0	1.7	0.8–3.4	1.6	0.9–3.1
Married or living with partner	1.0	…	1.0	…	1.0	…	1.0	…
Separated or divorced	1.5	0.8–2.5	1.4	0.8–2.3	1.2	0.7–2.1	1.4	1.0–2.1
Widowed	1.4	1.0–2.1	1.2	0.7–2.0	1.5	0.9–2.5	1.8	1.2–2.7
Assessment language								
English	1.0	…	1.0	…	1.0	…	1.0	…
Spanish	1.6	1.0–2.8	1.6	1.0–2.5	0.4	0.3–0.7	2.2	1.1–4.3
Asian language[3]	1.1	0.6–2.1	1.0	0.4–2.4	0.9	0.3–2.5	0.9	0.6–1.5
Self-reported health								
Excellent or very good	1.0	…	1.0	…	1.0	…	1.0	…
Good	1.3	0.9–1.7	1.0	0.7–1.4	1.5	1.1–2.1	1.9	1.3–2.8
Fair or poor	1.4	1.1–1.8	1.2	0.9–1.6	2.3	1.6–3.4	3.1	2.1–4.7

… Category not applicable.
[1]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.
[2]Models include other races and multiple race.
[3]Language of assessment was Chinese, Korean, or Vietnamese.

NOTES: CERAD–WL is CERAD word list—immediate recall score. CERAD–DR is CERAD word list—delayed recall score. AF is Animal Fluency score. DSST is Digit Symbol Substitution Test score. Models were adjusted simultaneously for all covariates.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 8. Sensitivity, specificity, and predictive values of subjective cognitive decline question: National Health and Nutrition Examination Survey, 2011–2014

	CERAD–WL Sample size: 3,131		CERAD–DR Sample size: 3,126		AF Sample size: 3,110		DSST Sample size: 3,014	
Subjective cognitive decline[1]	Percent	Confidence interval	Percent	Confidence interval	Percent	Confidence interval	Percent	Confidence interval
Sensitivity	24.8	21.7–28.3	26.7	22.9–30.9	22.9	18.8–27.5	24.2	21.3–27.2
Specificity	89.9	88.4–91.3	90.4	88.9–91.7	89.3	87.5–90.8	90.9	89.2–92.4
Positive predictive value	43.1	38.5–47.8	44.7	39.1–50.5	38.7	32.0–45.9	47.0	41.2–52.9
Negative predictive value	79.6	76.5–82.4	80.9	78.4–83.2	79.6	77.6–81.5	78.2	75.7–80.5

[1]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

NOTES: CERAD–WL is CERAD word list—immediate recall score. CERAD–DR is CERAD word list—delayed recall score. AF is Animal Fluency score. DSST is Digit Symbol Substitution Test score. All values are based on weighted data.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table 9. Mean scores on cognitive tests among participants scoring in the lowest 25th percentile, by self-reported cognitive status: National Health and Nutrition Examination Survey, 2011–2014

Test	Subjective cognitive decline[1]						Difference in means	
	No			Yes				
	Mean	Confidence interval	Sample size	Mean	Confidence interval	Sample size	*t* test	*p* value
CERAD–WL	13.3	13.0–13.6	727	11.6	11.0–12.3	239	5.7	Less than 0.001
CERAD–DR	2.9	2.8–3.1	627	2.3	2.1–2.4	232	5.5	Less than 0.001
AF	10.9	10.7–11.1	784	9.6	9.2–10.1	217	5.0	Less than 0.001
DSST	29.9	29.0–30.9	944	28.5	27.0–30.0	248	2.5	0.016

[1]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

NOTES: CERAD–WL is CERAD word list—immediate recall score. CERAD–DR is CERAD word list—delayed recall score. AF is Animal Fluency score. DSST is Digit Symbol Substitution Test score. All values are based on weighted data.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Technical Notes

Table I. Characteristics of respondents and nonrespondents: National Health and Nutrition Examination Survey, 2011–2014

Characteristic	One or more test scores			No test scores			*p* value
	Sample size	Percent	Standard error	Sample size	Percent	Standard error	
Age group (years)	…	…	…	…	…	…	Less than 0.001
60–69	1,675	54.7	1.3	111	31.9	1.3	…
70–79	951	29.6	1.1	77	26.3	1.0	…
80 and over	555	15.7	0.9	103	41.8	3.5	…
Sex	…	…	…	…	…	…	0.636
Men	1,543	45.2	1.0	144	43.0	4.1	…
Women	1,638	54.8	1.0	147	57.0	4.1	…
Race and hispanic origin[1]	…	…	…	…	…	…	Less than 0.001
Hispanic	589	7.4	1.2	82	11.1	2.3	…
Non-Hispanic white	1,423	78.7	1.9	157	63.7	3.2	…
Non-Hispanic black	738	8.8	1.3	99	11.9	1.6	…
Non-Hispanic Asian	249	3.4	0.5	82	11.1	1.8	…
Education[2]	…	…	…	…	…	…	Less than 0.001
Less than high school	872	17.1	1.5	146	45.7	4.2	…
High school graduate or GED	732	22.2	1.4	65	23.4	3.2	…
More than high school	1,650	59.0	1.7	77	32.0	1.7	…
Federal poverty level[2]	…	…	…	…	…	…	Less than 0.001
Less than 150%	983	21.8	1.5	197	45.7	4.7	…
150% to 299%	734	26.9	1.7	100	28.4	3.3	…
300% or more	1,061	51.3	2.5	75	25.9	3.3	…
Born in United States	…	…	…	…	…	…	Less than 0.001
Yes	2,376	87.5	3.6	160	69.1	3.6	…
No	803	11.3	1.0	130	30.9	3.6	…
Living arrangements	…	…	…	…	…	…	0.302
Living alone	816	24.1	1.1	61	21.1	2.9	…
Living with others	2,365	75.9	1.1	230	78.9	2.9	…
Marital status	…	…	…	…	…	…	Less than 0.001
Never married	176	4.4	0.5	31	5.1	1.1	…
Married or living with partner	1,743	64.5	1.1	200	50.2	3.8	…
Separated or divorced	508	13.8	0.6	53	11.0	2.5	…
Widowed	610	17.3	0.8	145	33.7	3.2	…
Self-reported health	…	…	…	…	…	…	Less than 0.001
Excellent or very good	1,040	42.8	1.7	51	20.7	2.8	…
Good	1,194	36.0	0.9	113	39.0	3.5	…
Fair or poor	945	21.2	1.2	127	40.3	3.2	…
Subjective cognitive decline[3]	…	…	…	…	…	…	Less than 0.001
Yes	424	10.0	0.7	115	38.4	3.4	…
No	2,755	90.0	0.7	176	61.6	3.4	…

… Category not applicable.
[1]Total includes other races and multiple race.
[2]The categories for this variable are different than shown in other tables in this report because of the small sample size of nonrespondents.
[3]Defined as experiencing confusion or memory loss that is happening more often or getting worse in the past 12 months.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table II. Mean and percentiles of cognitive functioning test scores, by age group and education: National Health and Nutrition Examination Survey, 2011–2014

Age group and education	CERAD word list—immediate recall									CERAD word list—delayed recall								
	Sample size	Mean	Standard error	*p* value	Percentile					Sample size	Mean	Standard error	*p* value	Percentile				
					10th	25th	50th	75th	90th					10th	25th	50th	75th	90th
60–69 years	…	…	…	Less than 0.001	…	…	…	…	…	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	433	18.4	0.5	…	12.2	14.8	18.2	21.4	23.8	430	5.9	0.2	…	2.4	3.8	5.4	7.0	8.4
High school graduate or GED	375	20.3	0.4	…	14.4	17.4	19.9	22.6	25.1	374	6.3	0.2	…	2.9	4.5	5.8	7.4	8.5
Some college	478	21.0	0.3	…	16.0	18.3	20.8	23.3	25.2	478	7.0	0.2	…	4.2	5.3	6.8	8.0	8.9
College graduate or higher	361	21.7	0.3	…	16.7	19.2	21.6	23.7	25.8	364	7.1	0.2	…	3.8	5.3	6.8	8.2	†
70–79 years	…	…	…	Less than 0.001	…	…	…	…	…	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	275	16.4	0.3	…	10.0	13.9	16.2	19.1	21.3	274	4.9	0.1	…	1.6	2.9	4.5	6.0	7.1
High school graduate or GED	212	16.7	0.3	…	11.6	15.3	18.7	21.1	23.4	212	5.8	0.1	…	2.4	3.8	5.5	6.9	8.1
Some college	248	19.4	0.3	…	13.8	16.1	18.8	22.2	24.4	248	6.2	0.1	…	2.5	4.2	6.0	7.4	8.5
College graduate or higher	200	19.6	0.3	…	12.7	16.8	19.7	22.6	24.8	198	6.2	0.2	…	3.0	4.4	5.8	7.4	8.5
80 years and over	…	…	…	Less than 0.001	…	…	…	…	…	…	…	…	0.138	…	…	…	…	…
Less than high school	145	14.6	0.4	…	8.5	11.6	14.3	16.3	19.9	145	4.0	0.2	…	0.4	2.0	3.8	5.0	6.1
High school graduate or GED	135	16.2	0.5	…	9.3	11.7	16.2	19.1	22.0	134	4.6	0.3	…	0.9	2.2	4.0	5.9	7.6
Some college	135	17.2	0.8	…	8.7	13.7	17.5	20.3	22.7	135	4.7	0.2	…	†	2.8	4.4	5.9	7.3
College graduate or higher	130	18.1	0.6	…	11.5	14.1	18.0	21.1	23.4	130	4.8	0.3	…	0.6	2.5	4.4	6.3	7.7

Age group and education	Animal fluency									Digit symbol substitution test								
	Sample size	Mean	Standard error	*p* value	Percentile					Sample size	Mean	Standard error	*p* value	Percentile				
					10th	25th	50th	75th	90th					10th	25th	50th	75th	90th
60–69 years	…	…	…	Less than 0.001	…	…	…	…	…	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	430	15.7	0.5	…	9.5	12.0	15.2	18.0	21.0	410	39.1	1.4	…	19.2	27.7	37.3	50.7	59.6
High school graduate or GED	372	17.0	0.4	…	10.6	13.3	16.6	19.6	22.0	372	52.1	1.3	…	32.7	41.4	51.1	61.8	73.4
Some college	474	19.7	0.3	…	12.9	15.6	19.3	21.7	26.4	478	59.7	0.8	…	41.4	49.4	58.9	68.5	78.5
College graduate or higher	365	22.2	0.5	…	14.6	18.1	21.1	25.4	28.7	367	64.7	0.8	…	48.9	55.8	64.6	72.3	80.1
70–79 years	…	…	…	Less than 0.001	…	…	…	…	…	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	267	13.9	0.4	…	7.8	10.5	12.8	16.6	19.5	249	35.3	1.2	…	14.8	24.8	34.2	45.4	53.0
High school graduate or GED	213	16.2	0.4	…	9.4	12.0	15.8	19.0	22.1	206	47.7	1.3	…	27.4	38.6	48.6	56.4	64.8
Some college	243	17.4	0.3	…	10.8	13.2	16.3	20.5	24.1	239	51.2	1.1	…	31.2	41.4	50.8	61.2	68.3
College graduate or higher	198	18.8	0.5	…	10.3	14.4	18.2	22.7	25.7	198	53.5	0.9	…	35.7	44.0	54.2	61.1	68.8
80 years and over	…	…	…	Less than 0.001	…	…	…	…	…	…	…	…	Less than 0.001	…	…	…	…	…
Less than high school	144	12.4	0.3	…	6.9	8.7	11.8	14.8	16.8	115	29.5	1.3	…	8.9	21.1	29.6	39.0	44.1
High school graduate or GED	134	14.0	0.6	…	8.0	11.1	13.4	16.4	19.3	124	39.2	1.0	…	24.3	29.6	38.9	47.4	53.1
Some college	136	15.4	0.4	…	9.0	11.6	14.7	17.8	20.3	126	42.1	0.9	…	22.2	32.0	43.3	49.9	60.0
College graduate or higher	130	15.9	0.4	…	9.6	12.3	15.5	18.6	21.4	126	46.0	1.2	…	26.6	35.3	46.7	54.3	63.6

… Category not applicable.
† Unable to calculate.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

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