The Prevalence of Dementia and Mild Cognitive Impairment in the United States: Findings from the Health and Retirement Study (HRS) Harmonized Cognitive Assessment Protocol (HCAP) Project

Numerical contributions

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### Participants

The sample for the HCAP study were randomly selected from HRS panel respondents who were age 65 or older, born in 1952 or earlier, and who completed their 2016 HRS core interview. If 2 eligible people were found within one household, one was randomly selected to participate in HCAP. For every participant, an informant who was one of up to three individuals nominated by the respondent. Informant relationships with the respondent included spouse/partner (41%), child (25%), friend (11%), sibling (4%), grandchild (2%), parent (1%), neighbor (1%), guardian (0.1%), or other relationship (6%). The mean number of years an informant reported knowing the respondent was 30 (SD = 21; Range = 1 – 87). The HCAP was administered either in English (95%), in Spanish (5%), or both (0.1%).

Of 4,425 eligible cases, 3,496 completed the HCAP interview between June 2016 and October 2017 for a final response rate of 79%. There were 149 cases where only an informant interview was collected when the HCAP respondent was not able to conduct an interview, but an informant was nominated and enrolled. A total of 313 cases were respondent only cases where an informant was not nominated by the respondent or where a nominated informant was not enrolled. Overall, 87% of HCAP cases included both a respondent and informant interview.

### Determination of dementia prevalence in HCAP involved three phases.

Our analysis begins with estimates of cognitive performance based on the HCAP battery, calibrated using latent variable models and described previously 2. Briefly, we subjected HCAP cognitive performance (N = 3,347) data to a series of factor analysis models, and derived factors and factor score estimates based on HCAP performance in five domains: memory, executive functioning, language, visuospatial, and orientation. The factor scores are described in Table 2. In this project, we normalize the estimated factor scores, standardize with respect to demographic variables, and derive a classification algorithm for mild cognitive impairment and probable dementia using informant report of cognitive or functional impairment or self-report of subjective memory worsening. The three phases summarized in this manuscript include (i) selecting the robust normative sample (N = 1,787), (ii) standardizing within the normative sample with respect to sociodemographic characteristics, and (iii) developing an algorithm for the classification of dementia status using additional informant and self-report information using all participants in the HCAP study (N = 3,496). All statistical analyses were conducted with Stata (version 16.1, Stata Corp., College Station, Texas) and R (version 4.1.1, R Foundation for Statistical Computing, Vienna, Austria). Sampling weights were used in statistical analyses, and summary statistics that reflect the use of sampling weights are highlighted in the results. Missing data for cognitive performance data or informant data were singly imputed as Bayesian plausible values using Mplus software (version 8.6, Muthén & Muthén, Los Angeles, CA).

Table X. Selection of robust normative sample from HCAP Participants

Rich leaving for Ryan

The final robust normative sample included N = 1,787 participants in the HCAP field study. Of HCAP participants, N = 1,560 persons who participated in the HCAP cognitive assessment, and an additional N = 149 people who did not complete the cognitive testing, were excluded from the normative sample.

**Table X. Participant Characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
| Characteristic | Overall | Robust norms sample | Not in robust norms sample |
| Total (N, %) | 3,496 (100) | 1,787 (100) | 1,709 (100) |
| Age (years; mean, SD) | 76.4 (7.6) | 73.9 (6.3) | 79 (7.9) |
| Female sex (N, %) | 2,095 (60) | 1,074 (60) | 1,021 (60) |
| Black or African American (N, %) | 551 (16) | 265 (15) | 286 (17) |
| Hispanic ethnicity (N, %) | 382 (11) | 178 (10) | 204 (12) |
| Years of education (years; mean SD) | 12.7 (3.2) | 13.3 (2.8) | 12 (3.4) |
| MMSE score (0-30, higher better; mean SD) | 26.6 (3.9) | 27.9 (2.1) | 25.1 (4.8) |

Notes: MMSE, Mini-Mental State Examination; SD, standard deviation;

The results of the classification algorithm are displayed in Figure X and the criteria are described in more detail in Table X. A total of 381 individuals [mean (SD) age, 81.8 (7.7); 235 women (62%) and 146 men (38%)] were classified as having dementia, and 846 individuals were classified as having MCI [mean (SD) age, 77.1 ( 8) years, 235 women (62%) and 146 men (38%)]. Numbers and weighted estimates are presented for the classification of dementia (Table X) and MCI (Table Y) among all persons recruited to HCAP. People with dementia were more likely to be older (weighted odds ratio (OR) 3.5 per 10-year age difference, (95% confidence interval (CI): 2.89 – 4.24)), had fewer years of school (weighted and age-adjusted OR 0.91 per year of school, 95% CI 0.86 – 0.95), and were more likely to be Black (weighted and age-adjusted OR 1.73 for Black or African-American vs white, 95% CI 1.65 – 1.82) or Hispanic (weighted and age-adjusted OR 1.51 for Hispanic vs white, 95% CI 1.43 – 1.58) than White. MCI was more frequent in people who were older (weighted OR 1.54 per 10-year age difference, 95% CI 1.35 – 1.76)), had fewer years of school (weighted and age-adjusted OR 0.95 per year of school, 95% CI 0.92 – 0.98), and Black (weighted and age-adjusted OR 1.3 for Black or African-American vs white, 95% CI 1.26 – 1.35) or Hispanic (weighted and age-adjusted OR 1.6 for Hispanic vs white, 95% CI 1.55 – 1.66).

**Table 2. Details for HCAP dementia and MCI classification algorithm (N=3,496)**

|  |  |  |  |
| --- | --- | --- | --- |
| Category | Criteria | Total N | Weighted Prevalence (%) |
| **Dementia** | **A.** Performance in the impaired range (a score of 35 or less on standardized and normalized cognitive domains) in 2 or more domains, and **B.** Informant-rated functional impairment (IQCODE score ≥ 3.4 or Blessed Part I score ≥ 2) | 381 | 9.7 |
| **Mild cognitive impairment (1)** | **A.** Performance in the impaired range (35 or less) on 2 or more of 5 cognitive domains, and**B.** No informant-rated functional impairment (IQCODE score < 3.4 and Blessed Part 1 score <2) | 216 | 5.7 |
| **Mild cognitive impairment (2)** | **A.** Performance in the impaired range (35 or less) on 1 of 5 cognitive domains, and one of the following:**B1.** Informant-rated cognitive concerns (IQCODE score > 3, or Blessed Dementia Rating Scale (Part I) > 0), or**B2.** Self-reported worsening memory over the previous 2 years [HRS Core PD102 = 3] | 630 | 16.9 |
| **Normal (1)** | **A.** Performance in the impaired range (35 or less) on 1 of 5 cognitive domains, and**B1.** No informant-rated cognitive concerns (IQCODE score ≤ 3, and Blessed Dementia Rating Scale (Part I) = 0), and **B2.** No self-reported worsening memory over the previous 2 years [HRS Core PD102 ≠ 3] | 156 | 4.2 |
| **Normal (2)** | **A.** Performance in the impaired range (35 or less) on 0 of 5 cognitive domains | 2113 | 63.5 |

Notes: 4 of 5 cognitive domains are standardized to a T score distribution, scores of 35 or less represent performance 1.5 standard deviation units, or worse, from the mean expected in a sample people assumed to be free from dementia and with the same age, sex, race/ethnicity and educational background as the tested person. The orientation domain, which is measured by 10 items from the Mini-Mental State Examination, is not standardized or adjusted for demographics. Two or more errors on these 10 orientation questions is the definition of impairment. Abbreviations: IQCODE, Informant Questionnaire on Cognitive Decline in the Elderly 6; Blessed Dementia Rating Scale (Part I) 7; PD102 is a single question assessed in the HRS 2016 Core Interview: Compared to two years ago, would you say your memory is better now, about the same, or worse now than it was then? Responses of 3 code for worse.

**Table X. Group differences in prevalence of dementia among HCAP participants (N=3,496)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Total | N | % | 95% CI | OR (95% CI) | N | % | 95% CI | OR (95% CI) |
| **Age group (years)** |  |  |  |  |  |  |  |  |  |
| 65 - 74 | 1488 | 64 | 5 | (4, 6) | ref | 340 | 22 | (19, 24) | ref |
| 75 - 84 | 1455 | 174 | 16 | (13, 19) | 3.7 (2.6, 5.3) | 344 | 25 | (23, 28) | 1.2 (1.0, 1.5) |
| 85+ | 553 | 143 | 40 | (34, 46) | 12.8 (8.7, 18.9) | 162 | 42 | (36, 48) | 2.6 (2.0, 3.4) |
| **Sex** |  |  |  |  |  |  |  |  |  |
| Men | 1401 | 146 | 12 | (10, 15) | ref | 353 | 27 | (24, 30) | ref |
| Women | 2095 | 235 | 13 | (11, 14) | 1.0 (.8, 1.4) | 493 | 24 | (21, 26) | .9 (.7, 1.0) |
| **Race and Ethnicity** |  |  |  |  |  |  |  |  |  |
| Black/African American | 551 | 60 | 18 | (12, 23) | 1.7 (1.1, 2.7) | 143 | 29 | (23, 34) | 1.3 (1.0, 1.8) |
| Hispanic or Latino | 382 | 45 | 16 | (11, 21) | 1.5 (.9, 2.4) | 117 | 33 | (27, 40) | 1.6 (1.2, 2.2) |
| White | 2563 | 276 | 12 | (10, 13) | ref | 586 | 24 | (22, 26) | ref |
| **Educational attainment** |  |  |  |  |  |  |  |  |  |
| Less than HS | 715 | 119 | 20 | (16, 24) | 2.0 (1.3, 3.0) | 215 | 33 | (28, 37) | 1.5 (1.1, 2.1) |
| High school | 1166 | 116 | 10 | (8, 12) | .8 (.6, 1.2) | 255 | 21 | (18, 24) | .8 (.6, 1.1) |
| Some college | 764 | 59 | 11 | (8, 14) | .8 (.5, 1.3) | 188 | 26 | (22, 30) | 1.1 (.8, 1.5) |
| College degree or more | 851 | 87 | 12 | (10, 15) | ref | 188 | 24 | (21, 28) | ref |

Notes: N, observed number in variable category with AD or MCI; %, prevalence of dementia or MCI in variable category, estimated with sampling weights; CI, confidence interval; OR, odds ratio estimated with sampling weights; Marginal prevalence estimates for sex, race and ethnicity, and educational attainment reflect adjustment for age.

**Prevalence of dementia and MCI limiting to persons with age 71 and older**

To compare prevalence estimates more directly to those obtained in HRS/ADAMS, we restrict to those aged at least 71 years at the time of HCAP Interview (N = 2537).

Among these participants, 622 were classified as having MCI (weighted prevalence 23.6%, 95% CI: 21.7,25.7), and 343 were classified as having dementia (weighted prevalence 13.4%, 95% CI: 11.8,15).

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