Summary of CHS Cognition/Dementia Data

COGNITIVE TESTING

Mini-Mental Tests

In CHS, the 30-point Mini-Mental State Exam was administered at baseline for the original cohort (1989-90) and the 100-point modified version (3MSE) was administered in Years 3-11 and 18.

During follow-up, it became apparent that mean 3MSE scores were not declining over time, suggesting that participants whose cognitive function was declining were not participating in clinic visits. Investigators looked for alternatives to the 3MSE that could be completed over the phone or by a proxy. Two instruments were identified, the Telephone Instrument of Cognitive Status (TICS) and the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE). The TICS is administered over the phone to the participant and the questions are similar to those on the 3MSE. The IQCODE is administered to a proxy to assess participant decline in cognitive function over the past decade. In Years 7-8, a comparability study was done to assess the validity of the TICS and IQCODE as estimates of the 3MSE. The results of that study are described in *Arnold AM, Newman AB, Dermond N, Haan M, Fitzpatrick A. Using telephone and informant assessments to estimate missing Modified Mini-Mental State Exam scores and rates of cognitive decline: The Cardiovascular Health Study. Neuroepidemiology 2009;33:55-65. PMID 19407461 PMC: 2826441.*

Briefly, the 3MSE is well estimated from the TICS; adding IQCODE slightly improves the estimate. The IQCODE alone is not as good an estimate, but analysts may find it preferable to missing data. After the comparability study, the TICS and IQCODE were not administered at the same time.

TICS and IQCODE assessments

Following the comparability study, the TICS or IQCODE were collected through year 11, in Year 18 and from Year 20 on (during the 6th month visit). The version of the TICS questionnaire used in the comparability study did not ask the participant what state they lived in. When the TICS was resumed in Year 18, the version of the questionnaire did include that question, so scores needed to be reduced by 1 point if a participant answered that question correctly to use the formula to estimate the 3MSE from the TICS.

In the later years of the study, proxy contacts were common, and the IQCODE took a long time to administer. To address concerns regarding length of the call, the IQCODE was shortened, and a decision was made to no longer administer the questionnaire if a score >=3.6 had been reached, indicating significant decline. The short version was scaled to the original version.

Digit Symbol Substitution Test (DSST)

The DSST is a timed test that was administered annually from 1989-1999. It requires the participant to fill in a series of symbols correctly coded within 90 seconds. The analytic variable is the number of items coded correctly.

Trail Making Test Parts A&B

The Trails tests consist of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 to 25, and the participant is asked to draw lines connecting them in order. In part B, the circles include both numbers and letters, and the participant is asked to connect them in order alternating numbers and letters (1-A-2-B, etc.) The tests were administered in CHS Years 10 and 11 (1997-99) only. Variables include time to complete the test, number of errors and number of points connected for each of parts A and B.

Table. Number of participants with main cognitive tests by CHS year

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CHS YEAR | DSST | MMSE | 3MSE | TICS | IQCODE1 | 3MSE Estimated2 |
| 2 | 5093 | 5193 |  |  |  |  |
| 3 | 4740 |  | 4865 |  |  |  |
| 4 | 4432 |  | 4584 |  |  |  |
| 5 | 4774 |  | 4971 |  |  |  |
| 6 | 4233 |  | 4485 |  |  |  |
| 7 | 3969 |  | 4274 |  |  |  |
| 8 | 3661 |  | 3984 | 179 | 30 | 4152 |
| 9 | 3334 |  | 3620 | 577 | 342 | 4017 |
| 10 | 3075 |  | 3356 | 597 | 325 | 3932 |
| 11 | 2859 |  | 3131 | 392 | 137 | 3639 |
| 18 | 1118 |  | 1135 | 388 | 147 | 1662 |
| 20.5 |  |  | 0 | 1159 | 310 | 1466 |
| 21.5 |  |  | 0 | 994 | 273 | 1267 |
| 22.5 |  |  | 0 | 853 | 251 | 1104 |
| 23.5 |  |  | 0 | 707 | 260 | 967 |
| 24.5 |  |  | 0 | 578 | 74 | 766 |
| 25.5 |  |  | 0 | 409 | 54 | 555 |
| 26.5 |  |  | 0 | 292 | 35 | 389 |
| 27.5 |  |  | 0 | 155 | 39 | 240 |

1 Protocol change after Year 23.5. See textfor more information.

2 Estimated from TICS and/or IQCODE representing the maximum possible.

Abbreviations:

DSST Digit Symbol Substitution Test

MMSE Mini-Mental State Exam

3MSE Modified Mini-Mental State Exam

TICS Telephone Interview for Cognitive Status

IQCODE Informant Questionnaire on Cognitive Decline in the Elderly

Longitudinal Data sets (Y:\Projects\CHS\Data\clinic\Longitudinal data\cognitive function\)

1. digcor.dta (DSST by year)

2. mmse estimated through year 27.dta

Variable list and definitions:

msescore Observed 3MSE

tics\_original TICS score without the question about state (see above)

tics\_new TICS score with the question about state

iqscore IQCODE through Year 23

iqscore\_short IQCODE, shortened, used after Year 23

mmsetics 3MSE if observed; otherwise estimated from TICS

mmseticsiq 3MSE if observed; otherwise estimated from TICS and IQCODE (during comparability study only) or TICS only if no IQCODE

mmsiqcod 3MSE estimated from original IQCODE

anyiq iqscore prior to year 23, iqscore\_short after year 23

iqfill variable “anyiq” with scores >=3.6 carried forward after year 23 IF a proxy was contacted (see above regarding protocol change)

mmsiqcodfill 3MSE estimated from “iqfill”

cogscore 3MSE if observed; if not estimated from TICS+IQCODE when available, or from just TICS or just “iqfill”

cogdate Julian date of the cognitive function assessment. IQCODES that were completed after a participant’s death were assigned the death date. (3 participants had a valid TICS within a couple of months of their death and an IQCODE following death. For those participants, their final TICS was used and not the IQCODE.)

Analysis suggestions

By providing all the variables, it will be possible to perform some sensitivity analyses. Suggestions include using “mmseticsiq” instead of “cogscore” since the IQCODE alone is not a very reliable estimate of the 3MSE, or ending follow-up at Year 23, after which the IQCODE form and protocol changed.

ADJUDICATED DEMENTIA

CHS Cognition Study (PI: Dr. Lew Kuller)

Included 3608 CHS participants who had an MRI of the brain in 1991-94 and a cognitive test in the same year. The diagnosis of dementia was based on an examination of data collected in CHS between 1989 and 1999 to identify those at high risk of dementia. In 3 of the clinics, surviving high-risk white participants and all surviving African American participants were brought into the clinic for neuropsychological testing. In Pittsburgh, all surviving participants were evaluated, regardless of risk status or race. Deficits in 2 cognitive domains were required. All information was sent to Pittsburgh for adjudication and classification as normal, prevalent dementia or MCI, incident dementia and dementia type. The study identified 2318 as normal, 577 with MCI, 227 with prevalent dementia and 480 with incident dementia. (*Kuller LH, Lopez OL, Newman A, Beauchamp NJ, Burke G, Dulberg C, Fitzpatrick A, Fried L, Haan MN. Risk Factors for Dementia in the Cardiovascular Health Cognition Study. Neuroepidem 2003:22:13-22.*)

CHS Cognition Study follow-up (PI: Dr. Oscar Lopez)

Included 532 participants from the Pittsburgh cohort who were included in the CHS Cognition Study and who were not demented in 1998-99 and had either a second MRI or a detailed cognitive evaluation in 1998-99. Participants were followed through 2013. Diagnosis of dementia was based on a deficit in performance in 2 or more cognitive domains severe enough to affect Instrumental Activities of Daily Living. 324 participants were classified with dementia. (*Kuller LH, Lopez OL, Becker JT, Chang Y, Newman AB. Risk of dementia and death in the long-term follow-up of the Pittsburgh Cardiovascular Health Study-Cognition Study. Alzheimers Dement 2016 Feb.*)

OTHER DATA SOURCES

ICD-9 codes from hospitalization, out-patient visits, and skilled nursing facilities

Annual medication inventory for medications prescribed for dementia

Proxy or clinic staff reports of cognitive or memory problems

Instrumental Activities of Daily Living

Adjudicated cause of death