Rush Alzheimer's Disease Center

Codebook for data set 791
Generated: 06-15-2020

This codebook contains 52 variables.

Longitudinal cycle explanation

All longitudinal data sets are organized by projid + visit or fu_year

visit	fu_year	explanation
00	0.0	Baseline
01	1.0	1st year follow-up
02	2.0	2nd year follow-up
03	3.0	3rd year follow-up
04	4.0	4th year follow-up
XX	XX.0	XXth year follow-up

variable suffix	type	explanation
_bl	cross-sectional	baseline cycle score; for medical history questions, the score may cover the period from prior to study participation to baseline visit.
_ever	cross-sectional	reported in any cycle at least one time
_l	cross-sectional	last cycle score
_lv	cross-sectional	last valid score
_cum	longitudinal	reported in past history or in at least one follow-up cycle up to this cycle

Affect and Personality

Affect and Personality > NEO

Extraversion : extraversion_6

Extraversion from NEO Five-Factor Inventory - Sum of 6 items

This variable is only available in ROS, MAP, and LATC.

Extraversion is the tendency to be sociable, active, and optimistic. The variable is measured using 6 items from the NEO Five-Factor Inventory. Participants rate agreement with each item on a 5-point Likert rating scale. Items that

are negatively worded are flipped so that higher scores on all individual items indicate greater extraversion. Item scores range from 0 to 4 and are summed to yield a composite score ranging from 0 to 24, where higher score indicates greater extraversion.

Participants are presented the following items:

Item no.	Item	Flipped (f)
1	I like to have a lot of people around me.	
2	I laugh easily.	
3	I really enjoy talking to people.	
4	I usually prefer to do things alone.	(f)
5	I am a cheerful, high-spirited person.	
6	I am a very active person.	

Response choices for each item:

Response	Response code	Value	Flipped value
Strongly disagree	1	0	4
Disagree	2	1	3
Neutral	3	2	2
Agree	4	3	1
Strongly agree	5	4	0

Note: In preliminary analyses, the Cronbach coefficient alpha, an indicator of internal consistency reliability, was 0.8 for extraversion. These values are comparable to those reported in the normative cohort and indicate adequate levels of internal consistency.

References

Neuroticism, extraversion, and motor function in community-dwelling older persons.
Buchman AS, Boyle PA, Wilson RS, Leurgans SE, Arnold SE, Bennett DA
Journal: The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry 2013 Feb; 21(2) 145-54

Neuroticism : neuroticism_12

Neuroticism from NEO Five-Factor Inventory - Sum of 12 items

Neuroticism indicates proneness to experiencing psychological distress. The variable is measured using 12 items from the NEO Five-Factor Inventory. Participants rate agreement with each item on a 5-point Likert rating scale. Items that are negatively worded are flipped so that higher scores on all individual items indicate greater neuroticism. Item scores range from 0 to 4 and are summed to yield a composite score ranging from 0 to 48, where higher score indicates greater neuroticism.

Participants are presented the following items:

Item no.	Item	Flipped (f)
1	I often feel inferior to others.	
2	When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.	
3	I often feel tense and jittery.	

Item no.	Item	Flipped (f)
4	Sometimes I feel completely worthless.	
5	I often get angry at the way people treat me.	
6	Too often, when things go wrong, I get discouraged and feel like giving up.	
7	I often feel helpless and want someone else to solve my problems.	
8	At times I have been so ashamed I just want to hide.	
9	I am not a worrier.	(f)
10	I rarely feel lonely or blue.	(f)
11	I rarely feel fearful or anxious.	(f)
12	I am seldom sad or depressed.	(f)

Response choices for each item:

Response	Response code	Value	Flipped value
Strongly disagree	1	0	4
Disagree	2	1	3
Neutral	3	2	2
Agree	4	3	1
Strongly agree	5	4	0

Notes: In preliminary analysis, the Cronbach coefficient alpha, an indicator of internal consistency reliability was 0.8 for neuroticism. These values are comparable to those reported in the normative cohort and indicate adequate levels of internal consistency.

ROS and MARS items are collected at baseline. MAP personality data collection started after initial baselines were completed, so only about 50% were collected at baseline. Approximately 20% were completed at follow-up 1, and 20% completed at follow-up 2.

References

Personality and incident disability in older persons.
Krueger KR, Wilson RS, Shah RC, Tang Y, Bennett DA
Journal: Age and ageing 2006 Jul; 35(4) 428-33

Neuroticism, extraversion, and mortality in a defined population of older persons.
Wilson RS, Krueger KR, Gu L, Bienias JL, Mendes de Leon CF, Evans DA
Journal: Psychosomatic medicine 2005 Nov-Dec; 67(6) 841-5

ApoE and TOMM40

ApoE and TOMM40 > ApoE

anye4

Any E4

ApoE

Apolipoprotein E genotyping was done blinded to all other study data using methods adapted from Hixson and Vernier, as previously described. In all analyses, individuals were dichotomized into those with at least one copy of the ε4 allele (i.e., ε2/4, ε3/4, or ε4/4) versus those without a copy (i.e., ε2/2, ε2/3, or ε3/3).

value	coding
1	E2E4, E3E4, or E4E4
0	noE4 allele

Data updated 6/23/2015

All APOE data were generated by Polymorphic DNA Technologies as part of a collaboration with Allan
http://www.polymorphicdna.com/

References

Apolipoprotein E e4 allele is associated with more rapid motor decline in older persons.
Buchman AS, Boyle PA, Wilson RS, Beck TL, Kelly JF, Bennett DA
Journal: Alzheimer disease and associated disorders 2009 Jan-Mar; 23(1) 63-9

The APOE epsilon4 allele is associated with incident mild cognitive impairment among community-dwelling older persons.
Boyle PA, Buchman AS, Wilson RS, Kelly JF, Bennett DA
Journal: Neuroepidemiology 2010; 34(1) 43-9

Analysis of postmortem ventricular cerebrospinal fluid from patients with and without dementia indicates association of vitamin E with neuritic plaques and specific measures of cognitive performance.
Hensley K, Barnes LL, Christov A, Tangney C, Honer WG, Schneider JA, Bennett DA, Morris MC
Journal: Journal of Alzheimer's disease : JAD 2011; 24(4) 767-74

ApoE genotype : apoe_genotype

Apolipoprotein E genotype

Apolipoprotein E (APOE) genotype

value	coding
22	E2E2
23	E2E3
24	E2E4
33	E3E3
34	E3E4
44	E4E4

DNA was extracted from PBMCs or brain. Genotyping was performed by Agencourt Bioscience Corporation utilizing high-throughput sequencing of codon 112 (position 3937) and codon 158 (position 4075) of exon 4 of the APOE gene on chromosome 19.

Data updated 6/23/2015

Participants were genotyped for APOE alleles by Polymorphic DNA Technologies.

All APOE data were generated by Polymorphic DNA Technologies as part of a collaboration with Allan Roses and Zinfandel. http://www.polymorphicdna.com/ (http://www.polymorphicdna.com/)

References

TOMM40'523 variant and cognitive decline in older persons with APOE ?3/3 genotype.
Yu L, Lutz MW, Wilson RS, Burns DK, Roses AD, Saunders AM, Gaiteri C, De Jager PL, Barnes LL, Bennett DA
Journal: Neurology 2017 Feb 14; 88(7) 661-668

ApoE and TOMM40 > TOMM40

TOMM40 genotype : tomm40_hap

Translocase of outer mitochondrial membrane 40 genotype

TOMM40 (translocase of outer mitochondrial membrane, 40kD) encodes a membrane-bound mitochondrial protein that is adjacent to, and in linkage disequilibrium with, the apolipoprotein E gene. Genotyping is performed by Polymorphic DNA Technologies, Inc. (Alameda, California), blinded to all clinical and pathologic data. The TOMM40’523 genotypes are determined by rs10524523 (chr19:44,899,792-44,899,826, human genome reference assembly GRCh38/hg38), a homopolymer length polymorphism (poly-T), at intron 6 of the TOMM40 gene, as described by Roses et al., 2014. Allele lengths are then categorized based on the number of the poly-T repeats: a short allele [’523-S] is defined by poly-T repeat≤19, a long [’523-L] allele by 20≤poly-T repeat≤ 29;, and a very long allele [’523-VL] by poly-T repeat≥30.

TOMM40’523 genotypes:

Value	Code
1	S/S
2	S/L
3	S/VL
4	L/L
5	L/VL
6	VL/VL

References

TOMM40'523 variant and cognitive decline in older persons with APOE ?3/3 genotype.
Yu L, Lutz MW, Wilson RS, Burns DK, Roses AD, Saunders AM, Gaiteri C, De Jager PL, Barnes LL, Bennett DA
Journal: Neurology 2017 Feb 14; 88(7) 661-668

Clinical Diagnosis

cpd

Clinical Parkinson's Disease

```
                              clinical Parkinson's disease


value
0    clinical PD not present
1    self-report history of PD including L-dopa treatment at any time prior to death
     Baseline (parks and medicate = YES), FU (parksfu and medicafu = YES)



table1
value   coding
  1     Yes
  2     Suspect or possible
  3     No
  8     REFUSAL (blaise code)
  9     DON'T KNOW (blaise code)

Baseline
variable   coding    question
parks      table1    Have you been told by a doctor, nurse or therapist that you had
                        PARKINSONISM or PARKINSON S DISEASE?
medicate   table1    Are you currently taking any medication for your parkinsonism or Parkinson s
                        disease (some examples are Sinemet, Symmetrel, Parlodel, Bromocriptine,etc.

Follow-up
variable   coding    question
parksfu    table1    Since your last evaluation on (MM-DD-YYYY), have you been told by a doctor,
                        nurse or therapist that you had PARKINSONISM or PARKINSON S DISEASE?
medicafu   table1    Are you currently taking any medication for your parkinsonism or Parkinson s
                        disease (some examples are Sinemet, Symmetrel, Parlodel, Bromocriptine,etc.
```

Other Forms : _l, _lv, _bl, _ever

Clinical Diagnosis > Final consensus diagnosis

Final consensus cognitive diagnosis : cogdx

Clinical consensus diagnosis of cognitive status at time of death

Physician’s overall cognitive diagnostic category

At the time of death, all available clinical data were reviewed by a neurologist with expertise in dementia, and a summary diagnostic opinion was rendered regarding the most likely clinical diagnosis at the time of death. Summary diagnoses were made blinded to all postmortem data. Case conferences including one or more neurologists and a neuropsychologist were used for consensus on selected cases.

Value	Coding

Value	Coding
1	NCI: No cognitive impairment (No impaired domains)
2	MCI: Mild cognitive impairment (One impaired domain) and NO other cause of CI
3	MCI: Mild cognitive impairment (One impaired domain) AND another cause of CI
4	AD: Alzheimer's dementia and NO other cause of CI (NINCDS PROB AD)
5	AD: Alzheimer's dementia AND another cause of CI (NINCDS POSS AD)
6	Other dementia: Other primary cause of dementia

References

Mixed brain pathologies account for most dementia cases in community-dwelling older persons.
Schneider JA, Arvanitakis Z, Bang W, Bennett DA
Journal: Neurology 2007 Dec 11; 69(24) 2197-204

Clinical Diagnosis > Stroke

Stroke diagnosis : r_stroke

Diagnosis of stroke made by clinician

A **clinical stroke diagnosis** is made by a clinician through review of self report questions, neurological exam (when available), cognitive testing, and interview of participant. The clinician is first presented with algorithmic diagnosis and has the ability to modify if necessary.

value	coding
1	Highly Probable
2	Probable
3	Possible
4	Not Present

Other Forms : _l, _lv, _bl

References

Secular trends in stroke incidence and survival, and the occurrence of dementia.
Bennett DA
Journal: Stroke 2006 May; 37(5) 1144-5

Cognition

Cognition > Domains

Episodic memory : cogn_ep

Episodic memory domain - Average of 7 tests

We formed a composite measure of the cognitive domain **episodic memory** by converting raw scores on each cognitive test to z scores, using the mean and standard deviation of the cohort(s) at baseline visit, and then averaging the z scores to yield the composite.

The following 7 cognitive tests are used to compute this score:

test score	z-score	cognitive test
cts_wli	z_WLI	word list
cts_wlii	z_WLII	word list recall
cts_wliii	z_WLIII	word list recognition
cts_ebmt	z_EBMT	East Boston immediate recall
cts_ebdr	z_EBDR	East Boston delayed recall
cts_story	z_Story	Logical memory I (immediate recall)
cts_delay	z_Delay	Logical memory II (delayed recall)

Item level variables are available upon request.

NOTE: Every time a new participant completes a study baseline, values for ALL participants change slightly. therefore it is essential that if participants are added to a data set, ALL values must be updated.

The variable is calculated if more than half the z-scores are non-missing.

Other Forms : _l, _lv, _bl

References

Temporal course and pathologic basis of unawareness of memory loss in dementia.
Wilson RS, Boyle PA, Yu L, Barnes LL, Sytsma J, Buchman AS, Bennett DA, Schneider JA
Journal: Neurology 2015 Aug 26; 85(11) 984-91

Perceptual orientation : cogn_po

Perceptual orientation/visuospatial ability domain - Average of 2 tests

Perceptual Orientation Domain

We formed a composite measure of the cognitive domain **perceptual orientation**, aka visuospatial ability, by converting raw scores on each cognitive test to z scores, using the mean and standard deviation of the cohort, and then averaging the z scores to yield the composite.

The following 2 cognitive tests are used to compute this score:

test score	z-score	cognitive test
cts_lopair	z_LOpair	line orientation
cts_pmat	z_PMat	progressive matrices (16 items)

Item level variables are available upon request.

Note: The variable is calculated if more than half the z-scores are non-missing.

Other Forms : _l, _lv, _bl

References

Temporal course and pathologic basis of unawareness of memory loss in dementia.
Wilson RS, Boyle PA, Yu L, Barnes LL, Sytsma J, Buchman AS, Bennett DA, Schneider JA
Journal: Neurology 2015 Aug 26; 85(11) 984-91

Perceptual speed : cogn_ps

Perceptual speed domain - Average of 4 tests

We formed a composite measure of the cognitive domain **perceptual speed** by converting raw scores on each cognitive test to z scores, using the mean and standard deviation of the cohort, and then averaging the z scores to yield the composite.

The following 4 cognitive tests are used to compute this score:

test score	z-score	cognitive test
cts_sdmt	z_SDMT	symbol digits modality test (oral)
cts_nccrtd	z_NCcrtd	number comparison
cts_stroop_cname	z_cname	stroop color naming
cts_stroop_wread	z_wread	stroop word reading

Item level variables are available upon request.

Note: The variable is calculated if more than half the z-scores are non-missing.

Other Forms : _l, _lv, _bl

References

Temporal course and pathologic basis of unawareness of memory loss in dementia.
Wilson RS, Boyle PA, Yu L, Barnes LL, Sytsma J, Buchman AS, Bennett DA, Schneider JA
Journal: Neurology 2015 Aug 26; 85(11) 984-91

Semantic memory : cogn_se

Semantic memory domain - Average of 3 tests

Semantic Memory Domain

We formed a composite measure of the cognitive domain **semantic memory** by converting raw scores on each cognitive test to z scores, using the mean and standard deviation of the cohort, and then averaging the z scores to yield the composite.

The following 3 cognitive tests are used to compute this score:

test score	z-score	cognitive test
cts_bname	z_BName	Boston naming (15 items)
cts_catflu	z_CatFlu	category fluency (animals - fruits/vegetables)
cts_read_nart*	z_read_nart*	reading test - (10 items)

*For the MARS study, the NART reading test is replaced with the 15-item WRAT reading test

Item level variables are available upon request.

Note: The variable is calculated if more than half the z-scores are non-missing.

Other Forms : _l, _lv, _bl

References

Temporal course and pathologic basis of unawareness of memory loss in dementia.
Wilson RS, Boyle PA, Yu L, Barnes LL, Sytsma J, Buchman AS, Bennett DA, Schneider JA
Journal: Neurology 2015 Aug 26; 85(11) 984-91

Working memory : cogn_wo

Working memory domain - Average of 3 tests

Working Memory Domain

We formed a composite measure of of the cognitive domain **working memory** by converting raw scores on each cognitive test to z scores, using the mean and standard deviation of the cohort, and then averaging the z scores to yield the composite.

The following 3 cognitive tests are used to compute this score:

test score	z-score	cognitive test
cts_df	z_DF	digits forward
cts_db	z_DB	digits backward
cts_doperf	z_DOperf	digit ordering

Item level variables are available upon request.

Note: The variable is calculated if more than half the z-scores are non-missing.

Other Forms : _l, _lv, _bl

References

Temporal course and pathologic basis of unawareness of memory loss in dementia.
Wilson RS, Boyle PA, Yu L, Barnes LL, Sytsma J, Buchman AS, Bennett DA, Schneider JA
Journal: Neurology 2015 Aug 26; 85(11) 984-91

Cognition > Global cognition

Global cognitive function : cogn_global

Global cognitive function - Average of 19 tests

Cogn_global is the main variable for overall (i.e. global) cognitive function. This variable replaces GLOBCOG.

Raw scores from a battery of cognitive tests were converted to Z scores and averaged to yield a **global cognitive function** summary. Mean and standard deviation at baseline were used to compute the z-scores. Z-score has mean 0 and standard deviation of 1. Each z-score corresponds to a point in a normal distribution. z-score describes how much a point deviates from a mean or specific point. A negative z-score simply means that someone has an overall score that is lower than the average of the entire cohort at baseline.

The following 19 tests are used to compute the global cognitive function score

test score	z-score	cognitive test	calculated domain
cts_wli	z_WLI	word list	episodic memory (cogn_ep)
cts_wlii	z_WLII	word list recall	episodic memory (cogn_ep)
cts_wliii	z_WLIII	word list recognition	episodic memory (cogn_ep)
cts_ebmt	z_EBMT	East Boston immediate recall	episodic memory (cogn_ep)
cts_ebdr	z_EBDR	East Boston delayed recall	episodic memory (cogn_ep)
cts_story	z_Story	Logical memory I (immediate)	episodic memory (cogn_ep)
cts_delay	z_Delay	Logical memory II (delayed)	episodic memory (cogn_ep)

test score	z-score	cognitive test	calculated domain
cts_bname	z_BName	Boston naming (15 items)	semantic memory (cogn_se)
cts_catflu	z_CatFlu	category fluency	semantic memory (cogn_se)
cts_read_nart	z_read_nart	reading test - (10 items)	semantic memory (cogn_se)
cts_df	z_DF	digits forward	working memory (cogn_wo)
cts_db	z_DB	digits backward	working memory (cogn_wo)
cts_doperf	z_DOperf	digit ordering	working memory (cogn_wo)
cts_lopair	z_LOpair	line orientation	perceptual orientation (cogn_po)
cts_pmat	z_PMat	progressive matrices (16 items)	perceptual orientation (cogn_po)
cts_sdmt	z_SDMT	symbol digits modality-oral	perceptual speed (cogn_ps)
cts_nccrtd	z_NCcrtd	number comparison	perceptual speed (cogn_ps)
cts_stroop_cname	z_cname	stroop color naming	perceptual speed (cogn_ps)
cts_stroop_wread	z_wread	stroop word reading	perceptual speed (cogn_ps)

Item level variables are available upon request.

Note: This variable is calculated if more than half of the z-scores are non-missing. Since the variable is calculated based on the number of valid test scores independent of the domain score calculations, participants may have a valid global score but be missing one or more domain scores.

The number of tests used to compute the global cognitive function score may vary based on the combination of studies used in analysis.

Other Forms : _l, _lv, _bl

References

Temporal course and pathologic basis of unawareness of memory loss in dementia.
Wilson RS, Boyle PA, Yu L, Barnes LL, Sytsma J, Buchman AS, Bennett DA, Schneider JA
Journal: Neurology 2015 Aug 26; 85(11) 984-91

Cognition > Test scores

MMSE : cts_mmse30

Mini-Mental State Exam, 30 item

The **Mini Mental State Examination (MMSE)** is a widely used, 30 item, standardized screening measure of dementia severity. It has previously been used in many epidemiologic studies and is a component of the CERAD protocol. Short term temporal stability is excellent and scores are highly correlated with those on other scales of severity of dementia. This test provides a global measure of cognitive function useful for descriptive purposes. The initial ten items provide a psychometric measure of orientation.

Participants are asked a series of questions to assess orientation to time and place, recall ability, short-term memory, and arithmetic ability.

The MMSE form includes the test of spelling WORLD backwards.

Other Forms : _l, _lv, _bl

References

"Mini-mental state". A practical method for grading the cognitive state of patients for the clinician.

Folstein MF, Folstein SE, McHugh PR
Journal: Journal of psychiatric research 1975 Nov; 12(3) 189-98

Deceased

time_lvgcog2dod

time from last valid cogn_global to death

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                                Time since last valid cogn_global visit to death (Years)

Date of last valid cogn_global is determined by selecting the last visit with valid cogn_global.

We also have time_lastce2dod= "Time since last clinical evaluation to death (Years) (in COMP:DECEAS
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Decision Making and Behavioral Economics

Decision Making and Behavioral Economics > Decision making ability

Decision making (Total) : finuctot

Decision making ability, Total - Sum of 12 items

Financial and healthcare decision making ability is measured using a modified 12-item version of the Decision-Making Competence Assessment Tool by Finucane, which was specifically designed to measure decision making in older adults.

Participants are presented with a healthcare module (/radc/var/displayVariable.htm?id=754) that provides information about health maintenance organization (HMO) plans and a financial module (/radc /var/displayVariable.htm?id=585) that includes financial information about mutual funds. The information presented in the modules is designed to simulate materials used in financial and healthcare settings in the real world.

Participants are asked 6 questions of varying difficulty level (3 simple and 3 complex) for each sub-scale that assess comprehension and integration of the information in the modules. The total decision making score ranges from 0 to 12 and represents the number of items answered correctly. If 6 or more questions are missing, then the score cannot be calculated. The sub-scale scores for health and financial decision making range from 0 to 6.

Participants are asked the following questions for the financial module:

1. What is the account management fee for this fund?
2. What is the gross annual return on the minimum investment?
3. Suppose you want a mutual fund that has a management fee of less than 1% AND a gross annual return of over 6.5%. Based on the information in this table, which fund should you choose?
4. What is the lowest available account management fee?
5. Which mutual fund provides the best net rate of return, after subtracting management fees?
6. Look at this table and suppose you have $2,000 to invest. You want a mutual fund that has a management fee of less than 1.5%, one that has been active for at least 5 years, and one that has a gross annual return of at least 6.0%. Based on the information in this table, which fund should you choose?

Participants are asked the following questions for the healthcare module.

1. Look at the information provided and tell me, what percentage of members are very satisfied with physician access?

2. Now, in one year, what will this HMO's monthly premium be?
3. Suppose you don't want any HMO that is below average on member satisfaction OR below average on access to specialists. Based on the information in this table, which HMO should you choose?
4. What is the lowest copayment for a visit with a primary care doctor?
5. And which HMO provides the best overall treatment quality according to members' ratings?
6. Based on the information in this table, which HMO should you choose?

Note: In previous research, the decision-making measure has been shown to have adequate psychometric properties including high inter-rater reliability and short-term temporal stability.

References

Risk Aversion is Associated with Decision Making among Community-Based Older Persons.
Boyle PA, Yu L, Buchman AS, Bennett DA
Journal: Frontiers in psychology 2012; 3205

Decision Making and Behavioral Economics > Decision making style

Risk aversion : gamma

Risk aversion tendency coefficient

The **risk aversion coefficient** is a measure of the tendency to prefer a sure but less lucrative payout over an unknown but possibly greater one. Risk aversion is assessed with 10 questions used in standard behavioral economics approaches.

Participants are asked if they would prefer $15 for sure OR a coin toss in which they could get $[an amount greater than $15] if they flip heads or nothing if they flipped tails. Possible gains range from $20 to $300 and gain amounts are varied across questions. Questions are developed in such a manner that any gamble that offers a potential gain of $30 results in the same long run average or expected utility, and any gamble that is over $30 results in a greater than expected utility. Therefore, any gamble over $30 is a "preferred" choice.

We estimate the risk aversion coefficient using a well-established behavioral economics approach based on participants' odds of choosing the gamble over the safe option and the expected utility of the gamble for each question. See reference for further details on the equation used to calculate this coefficient.

Participants are asked the following questions:

Would you prefer $15 for sure, OR a coin toss in which you will get [insert 1-10 from below] if you flip heads or nothing if you flip tails?

1. $65
2. $45
3. $90
4. $150
5. $20
6. $300
7. $35
8. $110
9. $230
10. $30

References

Cognitive function is associated with risk aversion in community-based older persons.

Boyle PA, Yu L, Buchman AS, Laibson DI, Bennett DA
Journal: BMC geriatrics 2011; 1153

Risk tolerance : risk

Willingness to take risks in general

General willingness to take risks is measured using the following 3 items:

1. What is your willingness to take risks, in general?
2. What is or has been over your lifetime your willingness to take risks in financial matters?
3. What is or has been over your lifetime your willingness to take risks in career decisions?

Participants are asked to rate each questions on a scale from 1 to 10 with 1 indicating to a complete unwillingness to take risks and 10 indicating a complete willingness to take risks. The total score ranges from 3 to 30 and is the sum of the item responses. A higher score relates to greater willingness to take risks.

Note: If more than one question is missing, a score is not calculated.

Demographics

Age at death : age_death

Age at death

Age of death is calculated from subtracting date of birth from date of death and dividing the difference by days per year (365.25).

For participants in autopsy cohorts, the exact date of death is known for most participants as it is the day an autopsy was performed. In all cohorts, in addition to annual evaluations, participants are also contacted quarterly to determine vital status and changes in health, and death is occasionally learned of during quarterly contacts.

Education : educ

Years of education

The **years of education** variable is based on the number of years of regular school reported at baseline cognitive testing.

References

Education modifies the association of amyloid but not tangles with cognitive function.
Bennett DA, Schneider JA, Wilson RS, Bienias JL, Arnold SE
Journal: Neurology 2005 Sep 27; 65(6) 953-5

Sex : msex

Sex

Self-reported **sex**, with “1” indicating male sex.

Allowable codes

1 = Male
0 = Female

Race : race7

Racial group

As of 10/16/2018, the race variable was updated to reflect the revised NIH categories. Please use this variable in place of the old race variable (race).

Race is based on self-report at baseline using the following question:

What is your race?

Value	Coding
1	White
2	Black or African American
3	American Indian or Alaska Native
4	Native Hawaiian or Other Pacific Islander
5	Asian
6	Other
7	Unknown

Spanish ethnicity : spanish

Spanish/Hispanic/Latino origin

Are you of **Spanish**/Hispanic/Latino origin?

value	coding
1	Yes
2	No

Depression

cesdsum_lv

CESD - Measure of depressive symptoms - last valid

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                                CES-D is a self reported depression scale to identify depression
in the general population. Number of 10 CES-D (Center of
Epidemiologic Study-Depression scale). It is a measure of
current level of depressive symptoms. The score is the number
of depressive symptoms (out of 10) reported.

If there are items with a missing value and the number of missing items is less than
5, then the score is equal to the average of the nonmissing item values multiplied by 10.

Range: 0-10

Codebook                        Codebook
variable   Coding  Calc         question
-------------------------------------------------------------------
Q1md       Yes/No  yes = +1     1. I felt that everything I did was an effort
Q2md       Yes/No  yes = +1     2. My sleep was restless
Q3md       Yes/No  yes = +1     3. I felt depressed
Q4md       Yes/No  no = +1      4. I was happy
Q5md       Yes/No  yes = +1     5. I felt lonely
Q6md       Yes/No  yes = +1     6. People were unfriendly
Q7md       Yes/No  no = +1      7. I enjoyed life
Q8md       Yes/No  yes = +1     8. I felt sad
Q9md       Yes/No  yes = +1     9. I felt that people disliked me
Q10md      Yes/No  yes = +1    10. I could not get going
```

References

Cerebral infarctions and the relationship of depression symptoms to level of cognitive functioning in older persons.
Bennett DA, Wilson RS, Schneider JA, Bienias JL, Arnold SE
Journal: The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry 2004 Mar-Apr; 12(2) 211-9

Association of anxiety and depression with microtubule-associated protein 2- and synaptopodin-immunolabeled dendrite and spine densities in hippocampal CA3 of older humans.
Soetanto A, Wilson RS, Talbot K, Un A, Schneider JA, Sobiesk M, Kelly J, Leurgans S, Bennett DA, Arnold SE
Journal: Archives of general psychiatry 2010 May; 67(5) 448-57

Clinical depression : r_depres

Diagnosis of major depressive disorder made by clinician based on clinical review

A **clinical diagnosis of major depressive disorder** is rendered by an examining physician at each evaluation. The diagnosis is based on criteria of the Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition, Revised (DSM-III-R), clinical interview with the participant, and review of responses to a series of questions adapted from the Diagnostic Interview Schedule. The clinician is first presented with an algorithmic diagnosis and has the ability to modify if necessary.

Value	Coding
1	Highly probable

Value	Coding
2	Probable
3	Possible
4	Not present

Note: Most RADC publications have analyzed depressive symptoms using a 10-item version of the Center for Epidemiologic Studies Depression (CES-D) scale.

Other Forms : _l, _lv, _bl

References

Cerebral infarctions and the relationship of depression symptoms to level of cognitive functioning in older persons.
Bennett DA, Wilson RS, Schneider JA, Bienias JL, Arnold SE
Journal: The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry 2004 Mar-Apr; 12(2) 211-9

Lifestyle

Lifestyle > Cognitive activity

Cognitive activity - late life : late_life_cogact_freq

Frequency of participation in cognitively stimulating activity in late life - Average of 7 items

Late life cognitive activity is a composite measure of frequency of participation in 7 cognitively stimulating activities during the past year. Activities include reading, writing letters, visiting a library, and playing games such as chess or checkers. These items involve information processing or retention and have relatively few barriers to participation.

Participants are asked to rate each item on a 5-point scale. Values for items 2-7 are flipped so that higher values indicate more frequent participation (see table below). The variable ranges from 1 to 5 and is calculated by averaging the individual item scores.

Participants are asked the following questions:

1. About how much time do you spend reading each day?
2. In the last year, how often did you visit a library?
3. Thinking of the last year, how often do you read newspapers?
4. During the past year, how often did you read magazines?
5. During the past year, how often did you read books?
6. During the past year, how often did you write letters?
7. During the past year, how often did you play games like checkers or other board games, cards, puzzles, etc.?

Response choices for each item:

Value	Item 1	Items 2-7 (flipped)
1	None	Once a year
2	Less than one hour	Several times a year
3	One to less than two hours	Several times a month
4	Two to less than three hours	Several times a week

Value	Item 1	Items 2-7 (flipped)
5	Three or more hours	Every day/almost every day

Note: At baseline interview, item #2 reads, “In the last ten years, how often did you visit a library?”

The variable is calculated if at least half of the items are non-missing.

The baseline version of this variable is available upon request.

References

Influence of late-life cognitive activity on cognitive health.
Wilson RS, Segawa E, Boyle PA, Bennett DA
Journal: Neurology 2012 Apr 10; 78(15) 1123-9

Lifestyle > Physical activity and BMI

Physical activity (5 items) : phys5itemsum

Hours of physical activity in late life - Sum of 5 items

Physical activity (5 items) is assessed using questions adapted from the 1985 National Health Interview Survey. The variable measures the sum of hours per week that the participant engages in 5 categories of activities:

1. Walking for exercise
2. Gardening or yard work
3. Calisthenics or general exercise
4. Bicycle riding (including stationary bikes)
5. Swimming or water exercises

Participants are asked if they have engaged in any of the 5 activities within the past 2 weeks and if so, the number of occasions and average minutes per occasion. Minutes in each activity are summed and divided by 120 to yield a composite measure of participation in physical activity expressed as hours per week.

NOTE: MARS only collects information on 3 items (walk, garden, exercise). To include MARS, see phys3itemsum (Physical activity (3 items)).

Other Forms : _lv, _bl

References

Participation in cognitively stimulating activities and risk of incident Alzheimer disease.
Wilson RS, Mendes De Leon CF, Barnes LL, Schneider JA, Bienias JL, Evans DA, Bennett DA
Journal: JAMA 2002 Feb 13; 287(6) 742-8

Physical activity and motor decline in older persons.
Buchman AS, Boyle PA, Wilson RS, Bienias JL, Bennett DA
Journal: Muscle & nerve 2007 Mar; 35(3) 354-62

Lifestyle > Social engagement

Social activity - late life : late_life_soc_act

Frequency of participation in social activity in late life

Frequency of **late-life social activity** is assessed using a 6-item scale that asks how often during the past year

participants engaged in common types of activities that involve social interaction.

Participants are asked to rate the items on a 5-point scale, with higher values indicating more frequent participation (see below). Item scores are averaged to yield the composite measure, with higher scores indicating greater social activity.

Participants are asked to rate the following six items:

During the past year, how often did you…
1. go to restaurants, sporting events or teletract, or play bingo?
2. go on day trips or overnight trips?
3. do unpaid community/volunteer work?
4. visit at relatives' or friends' houses?
5. participate in groups (such as senior center, VFW, Knights of Columbus, Rosary Society or something similar)?
6. attend church or religious services?

Response choices for each item:

Value	Response
1	Once a year or less
2	Several times a year
3	Several times a month
4	Several times a week
5	Every day or almost every day

References

Association between late-life social activity and motor decline in older adults.
Buchman AS, Boyle PA, Wilson RS, Fleischman DA, Leurgans S, Bennett DA
Journal: Archives of internal medicine 2009 Jun 22; 169(12) 1139-46

Medical Conditions

Medical Conditions > Summary measures

med_con_sum_cum

History of medical condition - cumulative

```
                                This variable is the number of conditions reported
   1. hypertension
   2. diabetes
   3. heart disease
   4. cancer
   5. thyroid disease
   6. head injury with loss of consciousness.
   7. stroke

value  coding
0      No conditions present
1      1 condition present
2      2 conditions present
3      3 conditions present
4      4 conditions present
5      5 conditions present
6      6 conditions present
7      7 conditions present


Seven medical conditions were present in at least 5 percent of persons
at baseline. We classified hypertension, diabetes, heart disease, cancer,
thyroid disease, and head injury with loss of consciousness based on
self-report that a physician previously identified the condition. A clinical
diagnosis of stroke was based on the history plus the neurologic examination.
We used the total number of conditions present at baseline as an index of
chronic illness, as previously described.


This variables covers the time period from prior to current cycle.
```

References

Participation in cognitively stimulating activities and risk of incident Alzheimer disease.
Wilson RS, Mendes De Leon CF, Barnes LL, Schneider JA, Bienias JL, Evans DA, Bennett DA
Journal: JAMA 2002 Feb 13; 287(6) 742-8

Depressive symptoms, cognitive decline, and risk of AD in older persons.
Wilson RS, Barnes LL, Mendes de Leon CF, Aggarwal NT, Schneider JS, Bach J, Pilat J, Beckett LA, Arnold SE, Evans DA, Bennett DA
Journal: Neurology 2002 Aug 13; 59(3) 364-70

Negative affect and mortality in older persons.
Wilson RS, Bienias JL, Mendes de Leon CF, Evans DA, Bennett DA
Journal: American journal of epidemiology 2003 Nov 1; 158(9) 827-35

Medical Conditions > Vascular

Vascular disease burden - 3 items : vasc_3dis_sum

Cumulative vascular disease burden - Average of 3 items

Vascular disease burden is computed using self-report questions for the following 3 items*:

1. Claudication (/radc/var/displayVariable.htm?id=547)
2. Stroke (/radc/var/displayVariable.htm?id=549)*
3. Heart conditions (/radc/var/displayVariable.htm?id=546)

Each item is given a value of 0 or 1 (see response options below). The cumulative score for vascular disease burden ranges from 0 to 3 and is the mean of the 3 individual scores multiplied by 3. Higher scores indicate greater vascular disease burden. The score for vascular disease burden is calculated if at least 2/3 of the questions are answered.

*In addition to self-report, evaluation of stroke is also based on neurological exam (when available), cognitive testing, and interview of participant, with which the physician may render a diagnosis of stroke.

Response values for each item:

Claudication

Value	Response
0	Never reported pain in legs or any reported pain that did not include the calves, from baseline to this cycle
1	Reported pain in legs while walking which includes calves, in at least one cycle from baseline to this cycle

Stroke

Value	Response
0	Stroke not present (Possible stroke dx or stroke not present), in all cycles, from baseline to this cycle
1	Stroke present (Highly probable or probable stroke dx) reported in at least one cycle from baseline to this cycle

Heart condition

Value	Response
0	Never reported in past history or in follow-up cycle up to this cycle (includes suspect or possible)
1	Reported in past history or in at least 1 follow-up cycle up to this cycle

Note: A 4-item version (/radc/var/displayVariable.htm?id=507) of this variable includes CHF questions and is available for MAP/MARS only.

References

Association of muscle strength with the risk of Alzheimer disease and the rate of cognitive decline in community-dwelling older persons.
Boyle PA, Buchman AS, Wilson RS, Leurgans SE, Bennett DA
Journal: Archives of neurology 2009 Nov; 66(11) 1339-44

Vascular disease risk factors : vasc_risks_sum

Cumulative vascular disease risk factors - Average of 3 items

Vascular Disease Risk Factors is a composite measure of vascular risk burden. The variable is computed using self-report questions on the following 3 items:

1. Hypertension (/radc/var/displayVariable.htm?id=545)
2. Diabetes (/radc/var/displayVariable.htm?id=544)*

3. Smoking history**

Each item is given a value of 0 or 1 (see response options below). The score covers a time frame from baseline, including any past history, to the current cycle (i.e., cumulative). The cumulative score for vascular disease risk factors ranges from 0 to 3 and is the mean of the 3 individual scores multiplied by 3. Higher scores indicate higher vascular risk burden.

Response values for each item:

Hypertension

Value	Response
0	Never reported in past history or in follow-up cycle up to this cycle (includes suspect or possible)
1	Reported in past history or in at least 1 follow-up cycle up to this cycle

Diabetes

Value	Response
0	Never reported in past history or in follow-up cycle up to this cycle (includes suspect or possible)
1	Reported in past history or in at least 1 follow-up cycle up to this cycle

History of smoking

Value	Response
0	Never smoked
1	Former or current smoker

*Diabetes is based on self-report of diabetes or taking diabetes medication.
**Smoking history (smoke_hx) is based off smoking (/radc/var/displayVariable.htm?id=405) (never smoked vs. former smoker vs. current smoker) at baseline only.

References

The relation of cigarette smoking to incident Alzheimer's disease in a biracial urban community population.
Aggarwal NT, Bienias JL, Bennett DA, Wilson RS, Morris MC, Schneider JA, Shah RC, Evans DA
Journal: Neuroepidemiology 2006; 26(3) 140-6

Motor and Gait

Motor and Gait > Motor function measures

Motor function : motor10

Motor function composite - Average of 10 tests

Motor and gait is a composite measure of global motor function calculated using the following items:

1. Purdue Pegboard Test (no. of pegs)
2. Finger-tapping test (taps/10 seconds)
3. Time to cover a distance of 8 feet (seconds)
4. Number of steps required to cover 8 feet (steps)
5. 360 degree turn time (seconds)
6. Number of steps to complete a 360 degree turn (steps)
7. Leg stand (seconds)

8. Toe stand (seconds)
9. Grip strength (kilograms)
10. Pinch strength (kilograms)

The composite measure is constructed by converting the performance score for each motor measure to a score using the mean from all participants at baseline and averaging all the motor tests together.

Notes: The listed reference (Buchman et al., J Experimental Gerontology, 2015) includes a tandem walk test which is not included in this version of the motor function composite variable.

The individual components of this variable are available upon request.

Other Forms : _l, _lv, _bl

References

Change in motor function and adverse health outcomes in older African-Americans.
Buchman AS, Wilson RS, Leurgans SE, Bennett DA, Barnes LL
Journal: Experimental gerontology 2015 Jul 21; 7071-77

Motor and Gait > UPDRS

Bradykinesia score : bradysc

Parkinsonian signs domain: Bradykinesia

Bradykinesia score is a measure of arm and leg agility and is a domain of the global parkinsonian summary score. The bradykinesia score is determined using a modified version of the motor portion of the United Parkinson's Disease Rating Scale (mUPDRS). A trained nurse clinician scores bradykinesia based on 8 items:

1. Right finger taps
2. Left finger taps
3. Right fist clench
4. Left fist clench
5. Right pronation-supination
6. Left pronation-supination
7. Right heel tap
8. Left heel tap

Participants are asked to tap their thumb and index finger in rapid succession with the widest possible amplitude for 10 seconds. The nurse clinician observes amplitude and speed of movement for both hands. Next, participants are asked to open and close fists as widely and rapidly as possible for 10 seconds. Pronation-supination is assessed by asking participants to alternately tap the front and back of hand on their knee for 10 seconds. Speed, amplitude, and rhythmicity of movement are observed. Participants are lastly asked to tap each heel on the ground in rapid succession for 10 seconds by picking up the entire leg.

Each item is scored on a 6-point scale. The bradykinesia domain score is calculated by adding the ratings for the individual items, dividing by the maximum possible score for the domain, then multiplying by 100. The domain score ranges from 0 to 100, with higher scores reflecting more bradykinesia.

Rate responses for each item:

Value	Coding
0	Normal
1	Slowing OR reduction in amplitude which could be normal

Value	Coding
2	Mild slowing and reduction in amplitude
3	Moderately impaired. Definitely early fatiguing and may have occasional arrests in movement
4	Severely impaired. Frequent hesitation in initiating movements
5	Can barely perform task

Note: This variable is not calculated if more than half of the items are missing.

Other Forms : _l, _lv, _bl

References

Nigral pathology and parkinsonian signs in elders without Parkinson disease.
Buchman AS, Shulman JM, Nag S, Leurgans SE, Arnold SE, Morris MC, Schneider JA, Bennett DA
Journal: Annals of neurology 2012 Feb; 71(2) 258-66

Gait score : gaitsc

Parkinsonian signs domain: Gait

Gait score is a domain of the global parkinsonian summary score. The gait score is calculated using a modified version of the motor portion of the United Parkinson's Disease Rating Scale (mUPDRS). A trained nurse clinician scores gait based on the following 6 items:

1. Turning
2. Posture
3. Postural stability
4. Arising from a chair
5. Shuffling gait
6. Body bradykinesia/hypokinesia

Turning is assessed by asking participants to turn 360 degrees. Posture is examined from the front and side. Postural stability is assessed by asking participants to stand with feet 6 inches apart and instructing them to "try not to fall" while the nurse clinician pulls on participants' shoulders with increasing strength until participants lose balance. The number of steps required to correct balance as well as the strength of the pull are recorded. To assess ability to rise from a chair, participants are asked to sit in a straight-backed chair with armrests, with their arms crossed over their chest. They are then asked to stand without using arms. Those who are unable to do so are prompted to stand with the help of their hands. Shuffling gait is assessed by asking participants to walk as fast as possible for about 10 feet, turn around and walk back. The nurse clinician observes speed, movement, and base. Body bradykinesia/hypokinesia represents a global view of the slowness and deliberateness of movement and is assessed by observing rapidity of movements, decrease in arm swing and spontaneous movements.

Each item is scored according to the respective scale below. The gait domain score is calculated by adding the ratings for the individual items, dividing by the maximum possible score for the domain, then multiplying by 100. The domain score ranges from 0 to 100, with higher scores reflecting more gait disturbance.

Rater responses for each item:

Item 1: Turning

Value	Coding
0	Pivots on narrow base
1	Hesitates or widens base, but steady

Value	Coding
2	Turns slowly and awkwardly
3	Would likely fall without aid
4	Cannot turn

Item 2: Posture

Value	Coding
0	Normal erect
1	Slightly stooped posture, could be normal
2	Moderately stooped, can be leaning slightly to one side
3	Severely stooped with kyphosis, can be moderately leaning to one side
4	Marked flexion with extreme abnormality of posture

Item 3: Postural stability

Value	Coding
0	Normal, takes 1 step to correct balance
1	Possible retropulsion, takes 2 steps back to correct balance
2	Definite retropulsion, takes 3 or more steps, but recovers unaided
3	Would fall if not caught
4	Unstable, tends to lose balance spontaneously
5	Unable to stand without assistance

Item 4: Arising from a chair

Value	Coding
0	Normal
1	Slow, could be normal
2	Needs more than 1 attempt, but does not push with arms
3	Pushes self up from arms of chair
4	Using arms, tends to fall back or requires more than one attempt, but able to stand without help
5	Unable to arise without help

Item 5: Shuffling gait

Value	Coding
0	None
1	Walks slowly, may take short steps, could be normal
2	Walks slowly, shuffles, no festination or propulsion
3	Walks with difficulty, shuffles, may festinate or propulse, requires no assistance
4	Severe disturbance of gait, shuffles, may festinate or propulse, unable to ambulate without assistance
5	Cannot walk at all due to shuffling gait, not even with assistance

Item 6: Body bradykinesia/hypokinesia

Value	Coding

Value	Coding
0	None
1	Minimal slowness, giving movement a deliberate character, possibly reduced amplitude
2	Mild degree of slowness and poverty of movement which is definitely abnormal, alternatively, some reduced amplitude
3	Moderate slowness, poverty or small amplitude of movement
4	Marked slowness, poverty or small amplitude of movement

Note: This variable is not calculated if more than half of the items are missing.

Other Forms : _l, _lv, _bl

References

Nigral pathology and parkinsonian signs in elders without Parkinson disease.
Buchman AS, Shulman JM, Nag S, Leurgans SE, Arnold SE, Morris MC, Schneider JA, Bennett DA
Journal: Annals of neurology 2012 Feb; 71(2) 258-66

Parkinsonian signs : parksc

Global parkinsonian summary score

The **global parkinsonian summary score** is a composite measure of parkinsonian signs. The score is the average of 4 separate domains calculated from a 26-item modified version of the motor portion of the United Parkinson's Disease Rating Scale (mUPDRS)*:

1. Bradykinesia (/radc/var/displayVariable.htm?id=429)
2. Gait (/radc/var/displayVariable.htm?id=426)
3. Rigidity (/radc/var/displayVariable.htm?id=428)
4. Tremor (/radc/var/displayVariable.htm?id=431)

A trained nurse clinician administers the modified motor portion of the mUPDRS. Bradykinesia is based on 8 items: right and left finger taps, fist clench, pronation-supination, and leg agility. Parkinsonian gait is based on 6 items: arising from a chair, shuffling gait, body bradykinesia, turning, posture, and postural stability. Rigidity is based on 5 items, one for neck and each of the four extremities. Tremor is based on 7 items: resting tremor of chin-jaw and all four extremities, and action-postural tremor of both hands.

The nurse clinician rates each item (see individual domains for scales). The domain score for each sign is calculated by adding the ratings for the individual items within each domain, dividing by the maximum possible score for the domain, then multiplying by 100. The global parkinsonian summary score ranges from 0 to 100 and is calculated by averaging the four domain scores. A higher summary score reflects expression of more severe Parkinsonian signs.

Notes: The modifications to the mUPDRS are minor and are intended to make the scale more applicable to persons without PD and easier for non-physicians to administer and score.

These measures have high inter-rater reliability and short-term temporal stability and are reproducible in men and women in aging and dementia from a variety of cohorts.

Other Forms : _l, _lv, _bl

References

Nigral pathology and parkinsonian signs in elders without Parkinson disease.
Buchman AS, Shulman JM, Nag S, Leurgans SE, Arnold SE, Morris MC, Schneider JA, Bennett DA
Journal: Annals of neurology 2012 Feb; 71(2) 258-66

Rigidity score : rigidsc

Parkinsonian signs domain: Rigidity

Rigidity score is a domain of the global parkinsonian summary score. The rigidity score is determined using a modified version of the motor portion of the United Parkinson's Disease Rating Scale (mUPDRS). A trained nurse clinician scores rigidity based on the following 5 items:

1. Neck rigidity
2. Right arm rigidity
3. Left arm rigidity
4. Right leg rigidity
5. Left leg rigidity

Rigidity is scored based on the passive movement of extremities when participants are in a relaxed sitting position.

Each item is scored on a 5-point scale. The rigidity domain score is calculated by adding the ratings for the individual items, dividing my the maximum possible score for the domain, then multiplying by 100. The domain score ranges from 0 to 100, with higher scores reflecting more rigidity.

Rater responses for each item:

Value	Coding
0	Absent
1	Slight, questionably present
2	Mild to moderate
3	Marked, but full range of motion achieved easily
4	Severe, full range of motion achieved with difficulty

Note: This variable is not calculated if more than half of the items are missing.

Other Forms : _l, _lv, _bl

References

Nigral pathology and parkinsonian signs in elders without Parkinson disease.
Buchman AS, Shulman JM, Nag S, Leurgans SE, Arnold SE, Morris MC, Schneider JA, Bennett DA
Journal: Annals of neurology 2012 Feb; 71(2) 258-66

Tremor score : tremsc

Parkinsonian signs domain: Tremor

Tremor score is a domain of the global parkinsonian summary score. The tremor score is determined using a modified version of the motor portion of the United Parkinson's Disease Rating Scale (mUPDRS). A trained nurse clinician scores tremor based on 7 items:

1. Right arm resting tremor
2. Left arm resting tremor
3. Right leg resting tremor
4. Left leg resting tremor
5. Chin/jaw resting tremor
6. Right hand postural tremor
7. Left hand postural tremor

To assess resting tremor of the right and left arms and legs as well as the chin/jaw, participants are asked to sit completely relaxed and to count aloud backwards from 10. The nurse clinician observes the participant for rhythmic tremor. Participants are then instructed to hold their arms perpendicular to their body with palms down and fingers spread apart for 10 seconds. The nurse clinician observes for action and postural tremors.

Each item is scored using the respective scale below. The tremor domain score is calculated by adding the ratings for the individual items, dividing by the maximum possible score for the domain, then multiplying by 100. The domain score ranges from 0 to 100, with higher scores reflecting more tremor.

Rater responses for each item:

Items 1-5: Resting tremor

Value	Coding
0	Absent
1	Possible rest tremor
2	Slight and infrequently present
3	Mild in amplitude and persistent, or moderate in amplitude but only intermittently present
4	Moderate in amplitude and present most of the time
5	Marked in amplitude and present most of the time

Items 6-7: Postural tremor

Value	Coding
0	Tremor absent or tremor with fast frequency
1	Tremor present with slow/moderate frequency and slight amplitude
2	Tremor present with slow/moderate frequency and mild amplitude
3	Tremor present with slow/moderate frequency and moderate amplitude
4	Tremor present with slow/moderate frequency and marked amplitude

Note: This variable is not calculated if more than half of the items are missing.

Other Forms : _l, _lv, _bl

References

Nigral pathology and parkinsonian signs in elders without Parkinson disease.
Buchman AS, Shulman JM, Nag S, Leurgans SE, Arnold SE, Morris MC, Schneider JA, Bennett DA
Journal: Annals of neurology 2012 Feb; 71(2) 258-66

Pathology

Pathology > Alzheimer's disease

NIA-Reagan diagnosis of AD (dichotomous) : ad_reagan

Presence of AD based on NIA-Reagan diagnosis criteria - dichotomous

This variable is the **dichotomized version of the modified NIA-Reagan diagnosis of Alzheimer's disease**. The criteria rely on both neurofibrillary tangles (Braak) and neuritic plaques (CERAD). See NIA-Reagan diagnosis of AD - 4 levels (/radc/var/displayVariable.htm?id=213) for more information.

Value	Coding
1	AD present by NIA-Reagan pathology criteria (high or intermediate likelihood)
0	AD not present by NIA-Reagan pathology criteria (low likelihood or no AD)

Global AD pathology burden : gpath

Global burden of AD pathology based on 5 regions

Global AD pathology burden is a quantitative summary of AD pathology derived from counts of three AD pathologies: neuritic plaques (n), diffuse plaques (d), and neurofibrillary tangles (nft), as determined by microscopic examination of silver-stained slides from 5 regions: midfrontal cortex (midfrontal), midtemporal cortex (midtemp), inferior parietal cortex (infparietal), entorhinal cortex (ento), and hippocampus (ca1hip). The resulting 15 regional counts are shown in the Table. Each regional count is scaled by dividing by the corresponding standard deviation. The 5 scaled regional measures for each type of pathology are then averaged to obtain summary measures (plaq_d, plaq_n, and nft) . The 3 summary measures are then averaged to obtain the measure of global AD pathology.

Table of AD pathology counts by region

Region	Diffuse Plaques	Neuritic Plaques	Neurofibrillary tangles
Entorhinal cortex	plaq_d_ec	plaq_n_ec	nft_ec
Hippocampus (CA1)	plaq_d_hip	plaq_n_hip	nft_hip
Midtemporal cortex	plaq_d_mt	plaq_n_mt	nft_mt
Inferior parietal cortex	plaq_d_ag	plaq_n_ag	nft_ag
Midfrontal cortex	plaq_d_mf	plaq_n_mf	nft_mf
Burden across region	plaq_d	plaq_n	nft

gpath = mean of (plaq_d (/radc/var/displayVariable.htm?id=1344), plaq_n (/radc/var/displayVariable.htm?id=1381), nft (/radc/var/displayVariable.htm?id=631))

Notes on missing data and computation of measures: Counts may be missing for regions (e.g., due to damage from infarct). If data are present for at least 2 of 5 regions, the burden summary for a specific pathology is computed. The global AD pathology burden is only computed if all 3 of the pathology-specific summaries are valid (and nonmissing).

Item level variables are available upon request.

References

Religious Orders Study and Rush Memory and Aging Project.
Bennett DA, Buchman AS, Boyle PA, Barnes LL, Wilson RS, Schneider JA
Journal: Journal of Alzheimer's disease : JAD 2018 May 26; 64(s1) S161-S189

Pathology > Autopsy - General

Post-mortem interval : pmi

Time interval in hours from time of death to autopsy

Post-mortem interval (PMI) refers to the interval between death and tissue preservation in hours

References

Religious Orders Study and Rush Memory and Aging Project.
Bennett DA, Buchman AS, Boyle PA, Barnes LL, Wilson RS, Schneider JA
Journal: Journal of Alzheimer's disease : JAD 2018 May 26; 64(s1) S161-S189

Pathology > Beta-Amyloid

Amyloid : amyloid

Overall amyloid level - Mean of 8 brain regions

Amyloid beta protein identified by molecularly-specific immunohistochemistry and quantified by image analysis. Value is percent area of cortex oocupied by amyloid beta. Mean of amyloid beta score in 8 regions (4 or more regions are needed to calculate).

8 regions used
amyloid_hip - hippocampus
amyloid_ec - entorhinal cortex
amyloid_mf - midfrontal cortex
amyloid_it - inferior temporal
amyloid_ag - angular gyrus
amyloid_calc - calcarine cortex
amyloid_cg - anterior cingulate cortex
amyloid_sf - superior frontal cortex

RADC recommendation: use AMYLSQRT when using as outcome variable in models. (mean of the square-root; has better statistical properties)

Item level variables are available upon request.

References

Religious Orders Study and Rush Memory and Aging Project.
Bennett DA, Buchman AS, Boyle PA, Barnes LL, Wilson RS, Schneider JA
Journal: Journal of Alzheimer's disease : JAD 2018 May 26; 64(s1) S161-S189

Pathology > Hippocampal sclerosis

Hippocampal sclerosis : hspath_any

Definite presence of Hippocampal Sclerosis

Presence of **hippocampal Sclerosis**.

Coding
0 = not present or possible
1 = Hippocampal Sclerosis was rated as definitely present, whether typical (with CA1 affected) or atypical.

Pathology > Lewy body/PD

Lewy Body disease : dlbdx

Pathologic diagnosis of Lewy body diseases - 4 stages

Pathologic diagnosis of Lewy Body disease describes 4 stages of distribution of α-synuclein in the brain based on algorithm and neuropathologist's opinion. Sections (6 µm) of paraffin-embedded brain tissue (from midfrontal, midtemporal, inferior parietal, anterior cingulate, entorhinal and hippocampal cortices, basal ganglia and midbrain) were stained for α-synuclein immunostain (Zymed; 1:50). Immunohistochemistry was performed using the VECTASTAIN ABC method with alkaline phosphatase as the colour developer. McKeith criteria (McKeith et al., 1996) were modified to assess the following categories of Lewy body disease:

value	coding
0	not present
1	nigral-predominant
2	limbic-type
3	neocortical-type

Nigral Lewy bodies were identified as round, intracytoplasmic structures with a darker halo. In the cortex, Lewy bodies were identified as round intracytoplasmic structures, often lacking any halo and with an eccentric nucleus. Only intracytoplasmic Lewy bodies were used as an indicator of positive staining.

Note: Both limbic type and neocortical lewy body disease - are considered "cortical" Lewy body disease; however in our study (and others) only neocortical are related to dementia.

References

Cognitive impairment, decline and fluctuations in older community-dwelling subjects with Lewy bodies.
Schneider JA, Arvanitakis Z, Yu L, Boyle PA, Leurgans SE, Bennett DA
Journal: Brain : a journal of neurology 2012 Oct; 135(Pt 10) 3005-14

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henl_4gp

Nigral Neuronal Loss

substantia nigra - neuronal loss - 4 levels

value	coding
0	None/Rare/Scattered
1	Mild
2	Moderate
3	Severe

A variable HENL_YN is also available for internal use.

Pathology > PHF tau tangles

Tangles : tangles

Tangle density - Mean of 8 brain regions

Neuronal neurofibrillary **tangles** are identified by molecularly specific immunohistochemistry (antibodies to abnormally phosphorylated Tau protein, AT8). Cortical density (per mm2) is determined using systematic sampling. Mean of tangle score in 8 regions (4 or more regions are needed to calculate).

8 regions used
tangles_hip - hippocampus

tangles_ec - entorhinal cortex
tangles_mf - midfrontal cortex
tangles_it - inferior temporal
tangles_ag - angular gyrus
tangles_calc - calcarine cortex
tangles_cg - anterior cingulate cortex
tangles_sf - superior frontal cortex

Item level variables are available upon request.

References

Religious Orders Study and Rush Memory and Aging Project.
Bennett DA, Buchman AS, Boyle PA, Barnes LL, Wilson RS, Schneider JA
Journal: Journal of Alzheimer's disease : JAD 2018 May 26; 64(s1) S161-S189

Pathology > TDP-43

TDP-43 stage : tdp_st4

TDP-43 pathology - 4 stages (8 regions)

As of 03/2019, this variable replaces tdp_stage4.

TDP-43 immunohistochemistry was performed on 8 brain regions using phosphorylated monoclonal TAR5P-1D3 (pS409/410; 1:100, Ascenion, Munich, Germany) TDP-43 antibody. Since 2015, this antibody has been obtained from MilliporeSigma, Burlington, MA.

1. Amygdala
2. Entorhinal cortex
3. Hippocampus CA1
4. Hippocampus dentate gyrus
5. Anterior temporal pole cortex
6. Midtemporal cortex
7. Orbital frontal cortex
8. Midfrontal cortex

Presence of TDP-43 cytoplasmic inclusions in neurons and glia are determined for each region (yes vs. no), and four stages of TDP-43 distribution are recognized:

Value	Coding	Regions (see above)
0	None	None
1	Amygdala	#1
2	Amygdala + Limbic	#1-4
3	Amygdala + Limbic + Neocortical	#1-8

If creating a dichotomized version of this variable, RADC recommends the following:

Value	Coding
0	No TDP-43 pathology or TDP-43 pathology in amygdala only (Stages 0 and 1)
1	TDP-43 pathology extending beyond amygdala (Stages 2 and 3)

Pathology > Vascular - General measures

Arteriolosclerosis : arteriol_scler

Arteriolosclerosis - 4 stages

Arteriolosclerosis

We used the term arteriolosclerosis to describe the histological changes commonly found in the small vessels of the brain in aging. Histological changes include intimal deterioration, smooth muscle degeneration, and fibrohyalinotic thickening of arterioles with consequent narrowing of the vascular lumen. Lipohyalinosis is sometimes used to describe this change but was originally used to describe vessels that had first undergone fibrinoid change. Because there are no standard guidelines to grade severity of arteriolosclerosis (or lipohylalinosis), we evaluated the vessels of the anterior basal ganglia with a semiquantitative grading system from 0 (none) to 7 (occluded). These levels were compressed into the 4 levels listed below.

value	coding
0	None
1	Mild
2	Moderate
3	Severe

Note: The listed reference describes a 6-stage grading system.

References

Cerebrovascular disease pathology and parkinsonian signs in old age.
Buchman AS, Leurgans SE, Nag S, Bennett DA, Schneider JA
Journal: Stroke 2011 Nov; 42(11) 3183-9

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caa_mods

Moderate/Severe CAA

The variable is a dummy variable to denote Moderate or Severe Cerebral Amyloid Angiopahty. main categorical (and or continuous version CAA_NEO4, CAA_4GP) would ideally indicate that this is the categorization we use when we publish binary.

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cvda_mods

Pathology > Vascular - Infarcts (Presence of)

Presence of one or more gross chronic infarcts : ci_num2_gct

Cerebral Infarctions - Binary - Gross-Chronic-Any Location

Presence of one or more **gross chronic cerebral infarctions**, determined by neuropathologic evaluations performed at Rush, blinded to clinical data, and reviewed by a board-certified neuropathologist.

Examination of infarcts documents age (acute/subacute/chronic), size, and location (side and region) of infarcts visible to the naked eye on fixed slabs. All grossly visualized and suspected macroscopic infarcts are dissected for histologic confirmation.

Value	Coding
0	No gross chronic Infarctions
1	One or more gross chronic infarctions (regardless of location)

Total gross infarcts (acute + subacute +chronic) are available upon request.
Counts (as opposed to presence of 1 or more) are available upon request.

References

The apolipoprotein E epsilon4 allele increases the odds of chronic cerebral infarction [corrected] detected at autopsy in older persons.
Schneider JA, Bienias JL, Wilson RS, Berry-Kravis E, Evans DA, Bennett DA
Journal: Stroke 2005 May; 36(5) 954-9

Microinfarct pathology, dementia, and cognitive systems.
Arvanitakis Z, Leurgans SE, Barnes LL, Bennett DA, Schneider JA
Journal: Stroke 2011 Mar; 42(3) 722-7

Presence of one or more chronic microinfarcts : ci_num2_mct

Cerebral Infarctions - Binary - Micro-Chronic-Any Location

Presence of one or more **chronic microinfarcts** (i.e., chronic microscopic infarctions) as determined by neuropathologic evaluations performed at Rush, blinded to clinical data, and reviewed by a board-certified neuropathologist.

A minimum of nine regions in one hemisphere are examined for microinfarcts on 6µm paraffin-embedded sections, stained with hematoxylin/eosin. We examine six cortical regions (midfrontal, middle temporal, entorhinal, hippocampal, inferior parietal, and anterior cingulate cortices), two subcortical regions (anterior basal ganglia, thalamus), and midbrain. Age (acute/subacute/chronic) and location (side and region) of microinfarcts are recorded.

Value	Coding
0	No chronic microinfarcts
1	One or more chronic microinfarcts (regardless of location)

Total microinfarcts (acute + subacute +chronic) are available upon request.
Counts (as opposed to presence of 1 or more) are available upon request.

References

Microinfarct pathology, dementia, and cognitive systems.
Arvanitakis Z, Leurgans SE, Barnes LL, Bennett DA, Schneider JA
Journal: Stroke 2011 Mar; 42(3) 722-7
