

**Codebook for Data Set: GWAS Autopsy Yu 0714****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
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_bl	cross-sectional	baseline cycle score, for medical history questions, it 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 1 follow-up cycle up to this cyclev

**Total variables: 13****Clinical Diagnosis(count: 2)****Clinical Diagnosis - Dementia**

Variable	age_first_ad_dx	Age - First Dx of AD	Cross-sectional																								
Description	<p>Float variable for age at cycle where first Alzheimer's disease dx was given.</p> <p>A variable which calculates age at each cycle (see age_at_visit) is utilized to locate the age at the first cycle where a Alzheimer's disease dx was rendered via the variable, dcfdx (ad = dcfdx = 4 or 5). Most participants are seen on a yearly basis, so this is the best approximation of age at onset of AD. This measure is not available for participants that were demented at baseline cycle.</p> <p>dcfdx - Clinical Dx by cycle</p> <table><tr><td>dementia</td><td>value</td><td>coding</td></tr><tr><td>NO</td><td>1</td><td>NCI - No cognitive impairment</td></tr><tr><td>NO</td><td>2</td><td>MCI - Mild cognitive impairment</td></tr><tr><td>NO</td><td>3</td><td>MCI+ - Mild cognitive impairment and other Dx</td></tr><tr><td>YES</td><td>4</td><td>AD - Alzheimer's disease</td></tr><tr><td>YES</td><td>5</td><td>AD+ - Alzheimer's disease and other Dx</td></tr><tr><td>YES</td><td>6</td><td>Other - Other Dx</td></tr><tr><td></td><td>Other</td><td>Unknown</td></tr></table> <p>age_at_visit - Float variable for age at cycle</p> <p>date_ce is used to computed this age which is determined by the first date found for a valid form in the following hierarchy:</p> <ol style="list-style-type: none"><li>1. cognitive date</li><li>2. clinical evaluation date (neurological exam, med hx, meds)</li><li>3. interview date</li><li>4. dcf date (diagnostic classification form)</li><li>5. neuropsychologist impression date</li></ol>			dementia	value	coding	NO	1	NCI - No cognitive impairment	NO	2	MCI - Mild cognitive impairment	NO	3	MCI+ - Mild cognitive impairment and other Dx	YES	4	AD - Alzheimer's disease	YES	5	AD+ - Alzheimer's disease and other Dx	YES	6	Other - Other Dx		Other	Unknown
dementia	value	coding																									
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YES	4	AD - Alzheimer's disease																									
YES	5	AD+ - Alzheimer's disease and other Dx																									
YES	6	Other - Other Dx																									
	Other	Unknown																									

**Clinical Diagnosis - Final Judgement**

Variable	cogdx	Final Clinical Dx - Clinical Consensus Diagnosis	Cross-sectional														
References	<p><b>Mixed brain pathologies account for most dementia cases in community-dwelling older persons.</b></p> <p>Schneider JA, Arvanitakis Z, Bang W, Bennett DA</p> <p>Journal: Neurology 2007 Dec 11; 69(24) 2197-204</p>																
Description	<p>Physician's overall cognitive diagnostic category</p> <p>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.</p> <table><tr><td>value</td><td>coding</td></tr><tr><td>1</td><td>NCI, No cognitive impairment (No impaired domains)</td></tr><tr><td>2</td><td>MCI, Mild cognitive impairment (One impaired domain) and NO other cause of CI</td></tr><tr><td>3</td><td>MCI, Mild cognitive impairment (One impaired domain) AND another cause of CI</td></tr><tr><td>4</td><td>AD, Alzheimer's disease and NO other cause of CI (NINCDS PROB AD)</td></tr><tr><td>5</td><td>AD, Alzheimer's disease AND another cause of CI (NINCDS POSS AD)</td></tr><tr><td>6</td><td>Other dementia. Other primary cause of dementia</td></tr></table>			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 disease and NO other cause of CI (NINCDS PROB AD)	5	AD, Alzheimer's disease AND another cause of CI (NINCDS POSS AD)	6	Other dementia. Other primary cause of dementia
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**Cognitive**(count: 1)**Cognitive - Test Scores**

Variable	cts_mmse30	MMSE - 2014	Cross-sectional																																																																																																									
Other Forms	_l, _lv, _bl																																																																																																											
Description	<p>The Mini Mental State Examination is a widely used, 30 item, standardized screening measure of dementia severity. It has previously been used in 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.</p> <p>Participants are asked a series of questions to assess orientation to time and place, recall ability, short-term memory, and arithmetic ability.</p> <p>Data is available at baseline (_bl), last (_l) and last valid (_lv) levels.</p> <p>*see below for reference.</p> <table><tr><td>table1</td><td></td><td></td></tr><tr><td>value</td><td>coding</td><td></td></tr><tr><td>0</td><td>Error</td><td></td></tr><tr><td>1</td><td>Correct</td><td></td></tr><tr><td>7</td><td>Not applicable</td><td></td></tr><tr><td>8</td><td>REFUSAL</td><td></td></tr><tr><td>9</td><td>DON'T KNOW</td><td></td></tr></table> <p>Code book variables:</p> <table><tr><th>Variables</th><th>Coding</th><th>Question</th></tr><tr><td>q1mme</td><td>table1</td><td>1. What is the year?</td></tr><tr><td>q2mme</td><td>table1</td><td>2. What is the season of the year?</td></tr><tr><td>q3mme</td><td>table1</td><td>3. What is the date?</td></tr><tr><td>q4mme</td><td>table1</td><td>4. What is the day of the week?</td></tr><tr><td>q5mme</td><td>table1</td><td>5. What is the month?</td></tr><tr><td>q6mme</td><td>table1</td><td>6. What state are we in?</td></tr><tr><td>q7mme</td><td>table1</td><td>7. What county are we in?</td></tr><tr><td>q8mme</td><td>table1</td><td>8. What city are we in?</td></tr><tr><td>q9mme</td><td>table1</td><td>9. What room are we in?</td></tr><tr><td>q10amme*</td><td>table1</td><td>10a. What is the address of this place? (Street Number)</td></tr><tr><td>q10bmme*</td><td>table1</td><td>10b. What is the address of this place? (Street Name)</td></tr></table> <p>*Note: both q10a and q10b have to be correct to get a point</p> <table><tr><td>apple</td><td>table1</td><td>11a. I am going to name 3 objects. After I have said them, I want you to repeat them. Apple (repeated successfully).</td></tr><tr><td>tabl</td><td>table1</td><td>11b. Table (repeated successfully).</td></tr><tr><td>penny</td><td>table1</td><td>11c. Penny (repeated successfully).</td></tr><tr><td>q12bmme</td><td>0-5</td><td>12. WORLD spelled backwards</td></tr><tr><td>q13amme</td><td>table1</td><td>13a. What were the three objects I asked you to remember? Apple.</td></tr><tr><td>q13bmme</td><td>table1</td><td>13a. What were the three objects I asked you to remember? Table.</td></tr><tr><td>q13cmme</td><td>table1</td><td>13a. What were the three objects I asked you to remember? Penny.</td></tr><tr><td>q14mme</td><td>table1</td><td>14.[SHOW WRIST WATCH] What is this called?</td></tr><tr><td>q15mme</td><td>table1</td><td>15.[SHOW PENCIL] What is this called?</td></tr><tr><td>q16mme</td><td>table1</td><td>16.Repeating the phrase -No if s, and s or but s.</td></tr><tr><td>q17mme</td><td>table1</td><td>17. Read the words on this card, then do what it says.</td></tr><tr><td>paper</td><td>table1</td><td>18a. I'm going to give you a piece of paper. When I do, take the paper in your right hand, fold the paper in half with both hands, and put the paper down on your lap.(1 pt for each completed portion of command) Takes paper in right hand.</td></tr><tr><td>folds</td><td>table1</td><td>18b. Folds in half</td></tr><tr><td>places</td><td>table1</td><td>18c. Places in lap</td></tr><tr><td>q19mme</td><td>table1</td><td>19. Write any complete sentence on this piece of paper for me.</td></tr><tr><td>q20mme</td><td>table1</td><td>20.Please copy the drawing on this piece of paper.</td></tr></table> <p>Folstein MF, Folstein SE, McHugh PR. Mini-mental state. A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975 Nov;12(3):189-98</p>			table1			value	coding		0	Error		1	Correct		7	Not applicable		8	REFUSAL		9	DON'T KNOW		Variables	Coding	Question	q1mme	table1	1. What is the year?	q2mme	table1	2. What is the season of the year?	q3mme	table1	3. What is the date?	q4mme	table1	4. 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**Demographics(count: 6)**

Variable	age_at_visit	Age at Cycle - Fractional	Longitudinal
References	<p><b>Purpose in Life Is Associated With a Reduced Risk of Incident Disability Among Community-Dwelling Older Persons.</b></p> <p>Boyle PA, Buchman AS, Bennett DA</p> <p>Journal: The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry 2010 Jun 10 ; 18(12) 1093-102</p>		
Description	<p>Float variable for age at cycle.</p> <p>date_ce is used to computed this age which is determined by the first date found for a valid form in the following heirarchy:</p> <ol style="list-style-type: none"> <li>1. cognitive date</li> <li>2. clinical evaluation date (neurological exam, med hx, meds)</li> <li>3. interview date</li> <li>4. dcf date (diagnostic classification form)</li> <li>5. neuropsychologist impression date</li> </ol>		

Variable	age_death	Age at death	Cross-sectional
References	<p><b>Purpose in Life Is Associated With a Reduced Risk of Incident Disability Among Community-Dwelling Older Persons.</b></p> <p>Boyle PA, Buchman AS, Bennett DA</p> <p>Journal: The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry 2010 Jun 10 ; 18(12) 1093-102</p>		
Description	<p>age of death is calculated from subtracting date of birth from date of death and dividing the difference by days per year (365.25).</p> <p>The autopsy rate of the Rush MAP exceeds 80%. Thus, for most participants from the MAP, the exact date of death is known by being the day an autopsy was performed. In addition to their annual evaluations, participants from both cohorts (MAP and the MARS) also are contacted quarterly to determine vital status and changes in health, and death is occasionally learned of during quarterly contacts. Finally, research assistants for both studies regularly search the Social Security Death Index via the internet for the small number of persons we are unable to contact.</p>		

Variable	educ	Years of education	Cross-sectional
References	<p><b>Education modifies the association of amyloid but not tangles with cognitive function.</b></p> <p>Bennett DA, Schneider JA, Wilson RS, Bienias JL, Arnold SE</p> <p>Journal: Neurology 2005 Sep 27 ; 65(6) 953-5</p> <p><b>Educational attainment and cognitive decline in old age.</b></p> <p>Wilson RS, Hebert LE, Scherr PA, Barnes LL, Mendes de Leon CF, Evans DA</p> <p>Journal: Neurology 2009 Feb 3 ; 72(5) 460-5</p>		
Description	<p>Education level-</p> <p>Highest grade or year of regular school as recorded during the baseline cognitive testing.</p> <p>Elementary      0 1 2 3 4 5 6 7 8</p> <p>High School    9 10 11 12</p> <p>College        13 14 15 16</p> <p>Graduate\Professional 17 18 19 20 21 ...</p> <p>98 = REFUSAL (blaise code)</p> <p>99 = DON'T KNOW (blaise code)</p> <p>Years of formal education was determined with the education question from the 1990 US Census.</p>		

Variable	msex	Gender	Cross-sectional
Description	Gender  Allowable codes: 1 = Male 0 = Female		

Variable	race	Participant's Race	Cross-sectional																		
References	<p><b>Biracial population study of mortality in mild cognitive impairment and Alzheimer disease.</b> Wilson RS, Aggarwal NT, Barnes LL, Bienias JL, Mendes de Leon CF, Evans DA Journal: Archives of neurology 2009 Jun ; 66(6) 767-72</p> <p><b>A population-based study of hemoglobin, race, and mortality in elderly persons.</b> Dong X, Mendes de Leon C, Artz A, Tang Y, Shah R, Evans D Journal: The journals of gerontology. Series A, Biological sciences and medical sciences 2008 Aug; 63(8) 873-8</p>																				
Description	<p>With which group do you most closely identify yourself?</p> <table><tr><td>value</td><td>coding:</td></tr><tr><td>1</td><td>White</td></tr><tr><td>2</td><td>Black, Negro, African-American</td></tr><tr><td>3</td><td>Native American, Indian</td></tr><tr><td>4</td><td>Eskimo</td></tr><tr><td>5</td><td>Aleut</td></tr><tr><td>6</td><td>Asian or Pacific Island</td></tr><tr><td>8</td><td>REFUSAL</td></tr><tr><td>9</td><td>DON'T KNOW</td></tr></table>			value	coding:	1	White	2	Black, Negro, African-American	3	Native American, Indian	4	Eskimo	5	Aleut	6	Asian or Pacific Island	8	REFUSAL	9	DON'T KNOW
value	coding:																				
1	White																				
2	Black, Negro, African-American																				
3	Native American, Indian																				
4	Eskimo																				
5	Aleut																				
6	Asian or Pacific Island																				
8	REFUSAL																				
9	DON'T KNOW																				

Variable	spanish	Spanish/Hispanic origin	Cross-sectional
Description	Are you of Spanish/Hispanic/Latino origin?		
	value	coding:	
	1	Yes	
	2	No	
	8	REFUSAL	
	9	DON'T KNOW	

**Genetics**(count: 1)

Variable	apoe_genotype	ApoE genotype	Cross-sectional														
References	<p><b>Apolipoprotein E genotype in diverse neurodegenerative disorders.</b> Schneider JA, Gearing M, Robbins RS, de l'Aune W, Mirra SS Journal: Annals of neurology 1995 Jul; 38(1) 131-5</p> <p><b>The APOE epsilon4 allele is associated with incident mild cognitive impairment among community-dwelling older persons.</b> Boyle PA, Buchman AS, Wilson RS, Kelly JF, Bennett DA Journal: Neuroepidemiology 2010 ; 34(1) 43-9</p> <p><b>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.</b> 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</p>																
Description	<p>apolipoprotein E (APOE)</p> <table><tr><td>value</td><td>coding</td></tr><tr><td>22.00</td><td>E2E2</td></tr><tr><td>23.00</td><td>E2E3</td></tr><tr><td>24.00</td><td>E2E4</td></tr><tr><td>33.00</td><td>E3E3</td></tr><tr><td>34.00</td><td>E3E4</td></tr><tr><td>44.00</td><td>E4E4</td></tr></table> <p>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.</p>			value	coding	22.00	E2E2	23.00	E2E3	24.00	E2E4	33.00	E3E3	34.00	E3E4	44.00	E4E4
value	coding																
22.00	E2E2																
23.00	E2E3																
24.00	E2E4																
33.00	E3E3																
34.00	E3E4																
44.00	E4E4																

**Pathology**(count: 3)**Pathology - Alzheimer's Disease**

Variable	braaksc	Braak Stage	Cross-sectional																				
References	<p><b>Neuropathology of older persons without cognitive impairment from two community-based studies.</b> Bennett DA, Schneider JA, Arvanitakis Z, Kelly JF, Aggarwal NT, Shah RC, Wilson RS Journal: Neurology 2006 Jun 27 ; 66(12) 1837-44</p> <p><b>Cholinergic plasticity in hippocampus of individuals with mild cognitive impairment: correlation with Alzheimer's neuropathology.</b> Ikonomic MD, Mufson EJ, Wu J, Cochran EJ, Bennett DA, DeKosky ST Journal: Journal of Alzheimer's disease : JAD 2003 Feb; 5(1) 39-48</p> <p><b>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.</b> 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</p>																						
Description	<p>Braak Stage</p> <p>This assessment is a semiquantitative measure of neurofibrillary tangles.</p> <p>Diagnosis includes algorithm and neuropathologist's opinion.</p> <table><tr><td>value</td><td>coding</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>I</td></tr><tr><td>2</td><td>II</td></tr><tr><td>3</td><td>III</td></tr><tr><td>4</td><td>IV</td></tr><tr><td>5</td><td>V</td></tr><tr><td>6</td><td>VI</td></tr><tr><td>8</td><td>DK</td></tr><tr><td>9</td><td>Missing</td></tr></table> <p>Braak H, Braak E. Neuropathological staging of Alzheimer related changes. Acta Neuropathol (Berl). 1991;82:239-259. PMID: 175955.</p>			value	coding	0	0	1	I	2	II	3	III	4	IV	5	V	6	VI	8	DK	9	Missing
value	coding																						
0	0																						
1	I																						
2	II																						
3	III																						
4	IV																						
5	V																						
6	VI																						
8	DK																						
9	Missing																						

Variable	ceradsc	Assessment of neuritic plaques	Cross-sectional												
References	<b>Chronic distress, age-related neuropathology, and late-life dementia.</b> Wilson RS, Arnold SE, Schneider JA, Li Y, Bennett DA Journal: Psychosomatic medicine 2007 Jan ; 69(1) 47-53														
Description	CERAD AD  This assessment is a semiquantitative measure of neuritic plaques.  Diagnosis includes algorithm and neuropathologist's opinion.  <table><tr><td>value</td><td>coding</td></tr><tr><td>1</td><td>Definite</td></tr><tr><td>2</td><td>Probable</td></tr><tr><td>3</td><td>Possible</td></tr><tr><td>4</td><td>No AD</td></tr><tr><td>9</td><td>Missing</td></tr></table>			value	coding	1	Definite	2	Probable	3	Possible	4	No AD	9	Missing
value	coding														
1	Definite														
2	Probable														
3	Possible														
4	No AD														
9	Missing														

## Pathology - Autopsy - General

Variable	pmi	Post-mortem interval in hours.	Cross-sectional
References	<p><b>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.</b></p> <p>Hensley K, Barnes LL, Christov A, Tangney C, Honer WG, Schneider JA, Bennett DA, Morris MC</p> <p>Journal: Journal of Alzheimer's disease : JAD 2011 ; 24(4) 767-74</p>		
Description	Interval between death and tissue preservation in hours.		