



**The Mexican Health and Aging Study:
Cognitive Function Measures
Scoring and Classification Across Waves
2018-2021
Version 1**

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Product of the MHAS Working Group

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1. Introduction

The Mexican Health and Aging Study (MHAS, or *Estudio Nacional de Salud y Envejecimiento en México*, ENASEM in Spanish) is a national longitudinal study of adults over the age of 50. The survey was designed to capture a broad range of health, functional, and socioeconomic data from this demographic. The MHAS baseline survey was completed in 2001 targeting a nationally representative sample of individuals born in 1951 or earlier to represent adults aged 50 years and older. In 2012, the sample was refreshed adding a new cohort of those born between 1952 and 1962. Every two waves, the study adds a refresher sample to yield a representative sample of these 50 years and older.

As of 2021, six waves of data collection have been completed, allowing for an in-depth understanding of aging over time in the Mexican context. The MHAS protocols and survey instruments are highly comparable to the U.S. Health and Retirement Study (HRS), allowing for cross-country comparisons on a wide range of aging-related issues.

For more information about the MHAS, we recommend that you read the cohort profile by Wong, Michaels-Obregón, and Palloni¹ and visit the study website www.MHASweb.org (www.ENASEM.org for the Spanish-language website).

2. Overall Description

The main goals of the current MHAS document are:

- To describe application and scoring of the different cognitive function tasks included in Waves 5 and 6 (2018 and 2021) and the comparability across the six waves of the study.
- To provide the updated normative standards and z-scores for each task as well as the composite score specifically constructed for Waves 5 and 6 of the study.
- To distribute the STATA program codes used for the following constructed variables:
 - individual task score, corresponding z-scores and classification as normal or impaired (see Table 4 for all variables names).
 - composite score for direct interviews and corresponding z-scores (see Table 4 for all variables names).
 - score for proxy interviews and classification as normal or impaired (see Table 6 for all variables names).
 - classification of subjects as normal, CIND, dementia (`cognitive_status_xx` and `cognitive_status_v01_xx`).

¹ Wong R, Michaels-Obregon A, Palloni A. Cohort Profile: The Mexican Health and Aging Study (MHAS). *Int J Epidemiol*. 2017 Apr 1;46(2):e2. doi: 10.1093/ije/dyu263. PMID: 25626437; PMCID: [PMC5837398](https://pubmed.ncbi.nlm.nih.gov/25626437/).

This descriptive document accompanies the databases that contain the 2018 and 2021 constructed variables for the MHAS users. For more information on the cognitive function tasks, application and scoring instruction, and the process to classify subjects and normal, CIND, dementia, please refer to the 2001-2015 document “The Mexican Health and Aging Study: Cognitive Function Measures Scoring and Classification Across Waves 2001-2015” available [here](#).

3. MHAS 2018 and 2021 Cognitive Function Measures

a. Direct Interview

Since the MHAS baseline in 2001, measuring cognitive function has been part of the study. Cognitive function has been assessed using the screening portion² of the Cross-Cultural Cognitive Examination (CCCE) for direct interviews and the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) for proxy interviews.

The CCCE was created as a brief and sensitive tool for diagnosing dementia in community settings. It includes an initial screening section designed for use by individuals without medical training in surveys. The second section of the CCCE, intended to enhance the tool's specificity, is to be administered by trained medical professionals. However, this second section is not part of the MHAS study. All tasks in the CCCE are recognized as indicators of cognitive function, and the influence of literacy and education level is considered negligible (Glosser et al. 1993).

The IQCODE is a short screening tool designed to detect cognitive changes in older populations based on reports from informants. The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) was used for proxy interviews (Glosser et al. 1993; Jorm 1994).

Differences in 2018-2021 with the previous waves

The study aims to maintain comparability across waves to enable cross-wave comparisons and allow for the analysis of cognitive function trajectories. Most of the battery has been kept consistent across waves, though some changes have been made to incorporate new tasks.

This is especially important for longitudinal analysis using the MHAS data, as it enables users to identify items that are consistent across all waves, ensuring reliable comparisons. By including these common items throughout the study, researchers can track cognitive changes using the same set of tasks, which is essential for assessing individual trajectories over time. This consistency helps reduce the impact of variations in the test battery.

² The CCCE has been modified over the MHAS waves to include a more comprehensive cognitive evaluation.

Table 1 below lists the items included in each wave from 2001 and 2021.

In 2001, five tasks were included as part of the direct interview. In 2003, an additional task was included to measure orientation (marked in green in the list below). In 2012, semantic verbal fluency and backward counting tasks were added (marked in purple in the list below). In 2015, an additional task – serial 7 – was added (marked in red in the list below). In 2018, the backwards counting task was removed. Finally, in 2021, the serial 7 task was replaced with the serial 3 task (marked in blue in the list below).

The different tasks to measure cognitive function are briefly described below.

1. Constructional Praxis (visuo-constructional): measured by presenting two geometrical figures and asking respondents to copy the figures. Respondents were given 90 seconds to complete both figures.
2. Verbal Fluency: measured by asking respondents to list all the animals they can think of in the next 60 seconds.
3. Serial 7s: measured by asking the respondent to sequentially subtract 7 starting from 100, until they complete five successive subtractions.
4. Verbal learning: measured by asking respondents to listen to a list of eight words and to repeat them. Three consecutive trials are administered and the number of recalled words in each trial is recorded.
5. Visual scanning: measured by asking respondents to circle all figures that are identical to a specific stimulus shown previously within an array of different stimuli. Respondents are given 60 seconds for this task.
6. Backward Counting: measured by asking respondents to count backwards from 20 to 0 as fast as possible. Respondents are given 60 seconds (max) to complete this task.
7. Constructional Praxis Recall: measured by asking respondents to remember the figures they copied and to draw them from memory on a blank piece of paper; three minutes are allowed to complete this task.
8. Delayed Verbal recall: measured by asking respondents to repeat as many of the words they remember from the list provided in the verbal learning task; verbal recall was administered after the visual scanning task to allow a time delay.
9. Day, Month and Year: This task asks respondents to indicate the day, month and year of the interview.
10. Serial 3s: measured by asking the respondent to sequentially subtract 3 starting from 20, until they complete five successive subtractions.

Table 1. MHAS 2001-2021 Cognitive Measures Variable Names by Task

Cognitive Domain	Task	MHAS Variables					
		2001	2003	2012	2015	2018	2021
Executive Function	Constructional Praxis	e8_e9_01	e6_e7_03	e8_12	e8_15	e8a_c_18	e8a_c_21
	Verbal Fluency			e9b_12	e9b_15	e9a_c_18	e9a_c_21
	Serial 7s				e15a_15 e15b_15 e15c_15 e15d_15 e15e_15	e15a_18 e15b_18 e15c_18 e15d_18 e15e_18	e15a_21 e15b_21 e15c_21 e15d_21 e15e_21
Immediate Memory	Verbal Learning	List A: e11_1i_01 e11_2i_01 e11_3i_01	List A: e9_a1_9_03 e9_a2_9_03 e9_a3_9_03	List A: e7a_1_12 e7a_2_12 e7a_3_12	List A: e7a_1_15 e7a_2_15 e7a_3_15	List A: e7a1_tot_18 e7a2_tot_18 e7a3_tot_18	List A: e7a1_tot_21 e7a2_tot_21 e7a3_tot_21
		List B: e11_4i_01 e11_5i_01 e11_6i_01	List B: e9_b1_9_03 e9_b2_9_03 e9_b3_9_03	List B: e7b_1_12 e7b_2_12 e7b_3_12	List B: e7b_1_15 e7b_2_15 e7b_3_15	List B: e7b1_tot_18 e7b2_tot_18 e7b3_tot_18	List B: e7b1_tot_21 e7b2_tot_21 e7b3_tot_21
Attention	Visual Scanning	e12_01	e10_03	e10_12	e10_15	e10_c_18	e10_c_21
	Backward Counting (time)			Trial 1 e12a_12 Trial 2 e12b_12 Time e12c_12	Trial 1 e12a_15 Trial 2 e12b_15 Time e12c_15		
Delayed Memory	Constructional Praxis Recall	e13_01	e11_03	e13_12	e13_15	e13a_c_18	e13_c_21
	Delayed Verbal Recall	List A: e14_1i_01	List A: e12a_9_03	List A: e14a_12	List A: e14a_15	List A: e14a_tot_18	List A: e14a_tot_21
		List B: e14_2i_01	List B: e12b_9_03	List B: e14b_12	List B: e14b_15	List B: e14b_tot_18	List B: e14b_tot_21
Orientation	Orientation		Day e13a_03 Month e13b_03 Year e13c_03	Day e11a_12 Month e11b_12 Year e11c_12	Day e11a_15 Month e11b_15 Year e11c_15	Day e11a_18 Month e11b_18 Year e11c_18	Day e11a_21 Month e11b_21 Year e11c_21

Constructed variables and composite scores

The differences across waves described above are mostly due to the addition or deletion of tasks. However, in some instances the tasks have been modified in a way that it impacts the calculation of individual task scores as well as composites. For example, the constructional praxis tasks were changed in 2012 impacting the new scoring for constructional praxis and constructional praxis recall from 0 to 6 points instead of 0 to 2. It is important to note that despite this change, it is still possible to compare the score between waves. More information about this change and how to compare the scores across waves can be found in the 2001-2015 document “The Mexican Health and Aging Study: Cognitive Function Measures Scoring and Classification Across Waves 2001-2015” available [here](#).

Table 2 lists the names of the constructed variables included in the datafiles, the possible score for each task, and how these variables are added to calculate the total composite score which varies across waves. The datafile includes multiple composite scores to facilitate the comparison across waves.

1) Total Composite Score (ccce_xx)

Constructed using all the items available at each wave. As illustrated in Table 2 below the number of tasks and total scores varies across waves. This score is usually used only when analyzing a cross-section.

2) Total Composite Score Comparable to 2001 (ccce_v01_xx)

Constructed using only the five items included in 2001, that is: constructional praxis, constructional praxis recall, verbal learning (immediate word recall), delayed verbal recall (delayed verbal recall), and visual scanning (visual route)³. In 2015, a composite score was constructed including those that were in 2012 to allow for comparisons between these two waves. Since, the backwards counting task was deleted starting in 2018, it is not possible to construct this variable.

These composite scores facilitate longitudinal analysis.

³ We added in parenthesis alternative names that are used interchangeably for these tasks.

Table 3. Names of Constructed Variables and Scores by Task, and Total Composite Score for each Wave

Task	Constructed Variables Names						Notes on Calculation	Score					
	2001	2003	2012	2015	2018	2021		2001	2003	2012	2015	2018	2021
Constructional Praxis	construction_xx						Total score	0-2		0-6			
	construction_v01_xx						Total score (comparable)			0-2			
Verbal Fluency			verbal_fluency_xx				Categorical variable: 1=0-8 animals 2=9-18 animals 3=19-24 animals 4=25-60 animals			1-4 ^a			
Serial 7s				serial7_xx			Total 5 subtractions scores: 0=Incorrect 1=Correct				0-5		
Serial 3s						serial3_xx	Total 5 subtractions scores: 0=Incorrect 1=Correct				0-5		
Verbal Learning	iwr_xx						Average 3 Trials (including both lists)	0-8					
Visual Scanning	visual_scan_xx						Total score	0-60					
Backward Counting (time)			bwc_xx				Categorical variable (time): 0=Incorrect 1=31-60 sec 2=21-30 sec 3=11-20 sec 4=3-10 sec			0-4 ^b			
Constructional Praxis Recall	construction_m_xx						Total score (see Table 2)	0-2		0-6	0-6		
Delayed Verbal Recall	dwr_xx						Total of both lists	0-8					
Orientation		orientation_xx					Sum of 3 items 0=Incorrect 1=Correct		0-3				
Total Composite Score	ccce_xx						Sum of all tasks ^c	0-80	0-83	0-99	0-104	0-99	0-99
Number of tasks missing	ccce_miss_xx						Counts of tasks missing	0-5	0-6	0-8	0-9	0-8	0-8
Total Composite Score Comparable to 2001		ccce_v01_xx					Sum of 5 tasks included since 2001 ^c	0-80					
Number of tasks missing		ccce_miss_v01_xx					Counts of tasks missing	0-5					

Notes: "xx" refers to the year of the corresponding wave, where "01" indicates 2001;

^a The verbal fluency categorical variable was constructed following previous work by Mejia et al. 2015;

^b The backward counting categorical variable was constructed using in combination the correct/incorrect variable from trial 1 and 2, and the time variable, following previous work by (Mejia-Arango et al. 2015).

^c Composite scores are constructed adding the tasks if at least one task is non-missing.

Constructed norms and z-scores

While the study aims to maintain the comparability across waves, changes in scores as well as the new cohorts added to the sample, introduce a complexity to longitudinal analysis. Norms and z-scores eliminate this issue and allow researchers to compare standardized scores across waves and different cohorts or demographic groups. The norms are used to classify the subjects into Normal, Mild, or Severe cognitive function for each task.

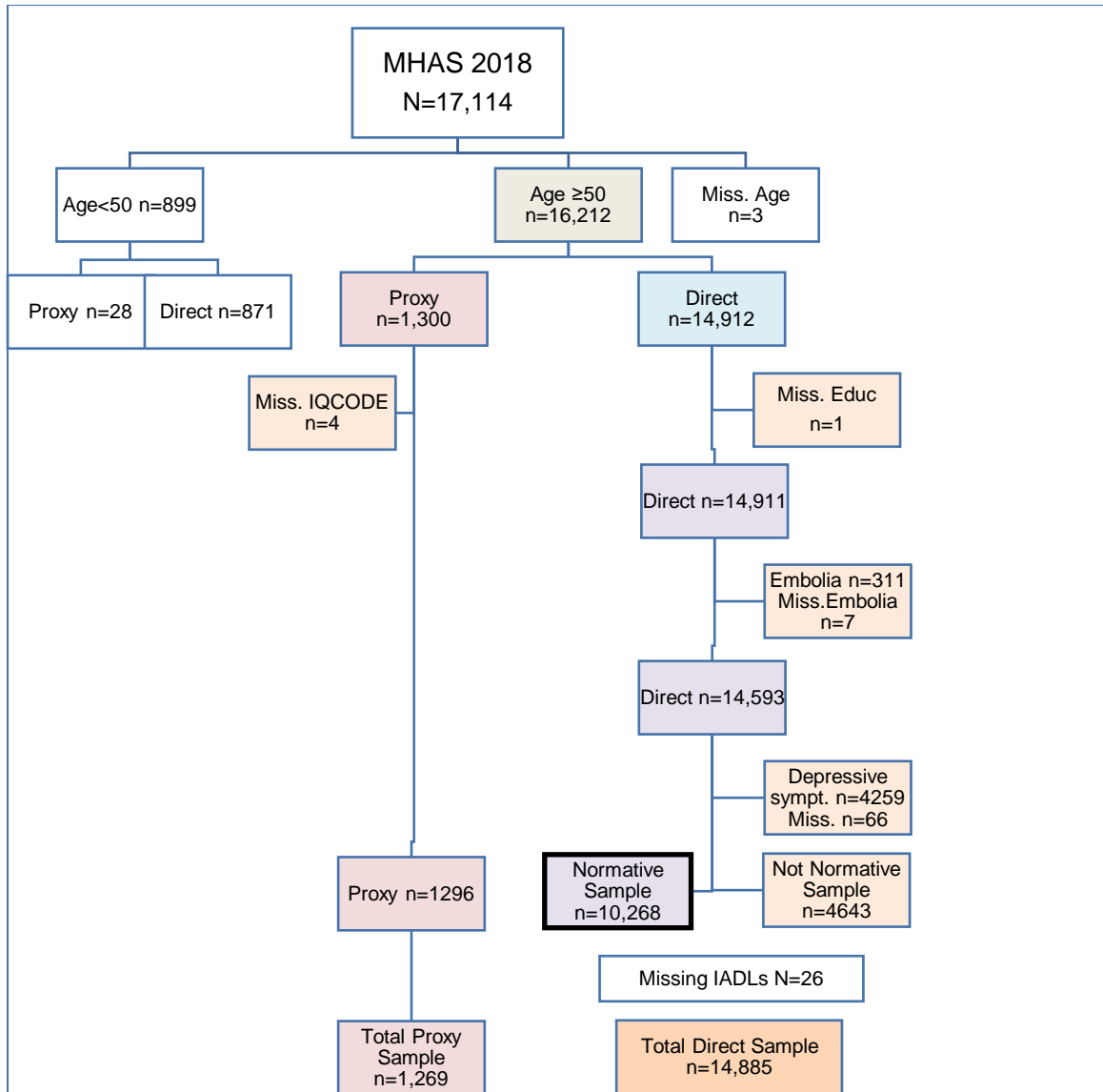
The main motivation to review norms previously used in the MHAS resides in the addition of new samples from different birth years to the cohort every two waves. As expected, younger cohorts are more educated and will need new norms that reflect a new distribution of scores.

For the first time in 2022, we published normative standardized data (z-scores) by age and education for each task in the cognitive function battery and for total cognition score. A previous version of the norms and z-scores was also described in the manuscript “Normative and Standardized data for Cognition measures in the MHAS” (Mejia-Arango, Wong and Michaels-Obregon 2015). While the manuscript referred to only three waves of the data, the 2022 document provided a revised version of the z-scores for 2001, 2003 and 2012 and we add the 2015 data.

The current document provides an update to the previously published document, to include the 2018 and 2021 data. The new norms were constructed with the entire 2018 sample and using the same methodology as in the previous waves, as described in the manuscript Mejia-Arango et al. 2015. In a similar way, the norms are the same for both Waves 5 and 6 with one exception: Serial 7. As explained above, in 2021 the Serial 7 was replaced with the Serial 3 task. **Norms for Serial 3 and Composite Score Norms specific to 2021 will be calculated and added to the next version this document (please contact the MHAS team at admin@MHASWeb.org for questions or updates).**

Norms were calculated following the same procedures as in the previous waves. More details about the methodology can be found in Mejia-Arango et al. 2015. Figure 1 illustrate how we selected a sample for the constructions of these norms.

Figure 1. Flowchart for selection of MHAS 2018 Normative sample and Classification of Cognitive Status



In addition to the constructed variables, we also provide the norms and z-scores for individual tasks (Table 3) and for the total composite score (all tasks included) for each wave in Table 4. Note that norms are the same for 2018 and 2021 for all individual tasks except for Serial 7.

Table 3. MHAS 2018 and 2021 Norms and Z-Scores for each Task, by Age Group and Education Level

Z-Score	ORIENTATION (Score 0-3)			VISUAL SCANNING (Score 0-60)			VERBAL LEARNING (Score 0-8)			VERBAL RECALL (Score 0-8)			CONSTRUCTIONAL PRAXIS 2001 & 2003 (Score 0-2) 2012-2021 (Score 0-6)						CONSTRUCTIONAL PRAXIS RECALL 2001 & 2003 (Score 0-2) 2012-2021 (Score 0-6)						VERBAL FLUENCY (Score 0-50)			SERIAL 7 (Score 0-5)								
	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+	0	1 to 6	7+						
Age <=59 years old																																				
Normal	3.0		2 - 3	1 - 3	51 - 60			8	8																					24 - 40	27 - 40					
	2.0	3			42 - 50	55 - 60		7	7	8	8	8	8																	20 - 23	23 - 26	27 - 40				
	1.5		1		38 - 41	50 - 54				7	7	7	7																	19	22	26				
	1.0	2			28 - 37	38 - 49	50 - 60	6	6		5 - 6	5 - 6	7																	15 - 18	18 - 21	22 - 25	4	5	5	
	0.0	1	0		17 - 27	26 - 37	38 - 49	4 - 5	5	5 - 6	3 - 4	4	5 - 6	2	2	2	5	6	6	1	2	2	4 - 5	5 - 6	5 - 6					12 - 14	14 - 17	17 - 21	2 - 3	3 - 4	4	
Mild	-1.0	0			8 - 16	14 - 25	27 - 37	3	3 - 4		2	3	4	1			4	5				1	3	4	4					8 - 11	10 - 13	13 - 16	1	2	3	
	-1.5				3 - 7	10 - 13	23 - 26			4	1	2	3				3						2	3						7	9	11 - 12			1	2
Severe	-2.0			0	0 - 2	0 - 9	13 - 22	2	2	3	0	1	2				2	4	5	0		1	1	2	3					4 - 6	5 - 8	7 - 10	0	0	1	
	-3.0						0 - 12	0 - 1	0 - 1	0 - 2		0	0 - 1	0	0 - 1	0 - 1	0 - 3	0 - 4				0	0	0	0 - 1	0 - 2				0 - 3	0 - 4	0 - 6				0
Age 60-69 years old																																				
Normal	3.0	3	2 - 3	1 - 3	47 - 60	60	7 - 8	8																						24 - 40	27 - 40	31 - 40				
	2.0				38 - 46	50 - 59	59 - 60	6	7	8	8	7 - 8	8																	20 - 23	24 - 26	27 - 30	5			
	1.5	2			34 - 37	46 - 49				7	7																			19	22 - 23	25 - 26			5	
	1.0		1		23 - 33	34 - 45	47 - 58	5	6	7	5 - 6	6	7																	15 - 18	18 - 21	21 - 24	3 - 4	4	5	
	0.0	1	0	0	13 - 22	23 - 33	35 - 46	4	5	5 - 6	4 - 3	4 - 5	5 - 6	2	2	2	4 - 5	6	6	1	2	2	4 - 6	5 - 6	5 - 6					11 - 14	14 - 17	16 - 20	2	3	4	
Mild	-1.0	0			2 - 12	11 - 22	23 - 34	3	4		2	3	4	1	1		3	5				1	2 - 3	4	4					8 - 10	10 - 13	12 - 15	1	2	3	
	-1.5				0 - 1	8 - 10	19 - 22	2		4	1	2	3						5				1	3						7	8 - 9	11			0	1
Severe	-2.0					0 - 7	8 - 18		3	3	0	0 - 1	2				2	4				0		2	3					4 - 6	5 - 7	7 - 10			0	1
	-3.0						0 - 7	0 - 1	0 - 2	0 - 2		0 - 1		0	0	0 - 1	0 - 1	0 - 3	0 - 4				0	0	0 - 1	0 - 2				0 - 3	0 - 4	0 - 6				0
Age 70-79 years old																																				
Normal	3.0		2 - 3	2 - 3	38 - 60	53 - 60	7 - 8	8																						23 - 40	25 - 40	30 - 40				
	2.0	3			30 - 37	44 - 52	59 - 60	6	7	8	7	8	8																	20 - 22	22 - 24	26 - 29	5			
	1.5				27 - 29	40 - 43	55 - 58			6	7	6	7																	19	21	25	4	5		
	1.0	2	1		19 - 26	29 - 39	43 - 54	5	5	6	5	5 - 6	6 - 7	2			6													15 - 18	16 - 20	20 - 24	3	4	5	
	0.0	1	0	0	10 - 18	18 - 28	31 - 42	3 - 4	4	5	3 - 4	3 - 4	4 - 5				2	2	6	1	2	2	3 - 4	4 - 6	4 - 6					11 - 14	12 - 15	16 - 19	2	2 - 3	3 - 4	
Mild	-1.0	0			2 - 9	7 - 17	19 - 30	2	3	4	1 - 2	2	3	1			3	5				1	1	2	3					7 - 10	8 - 11	11 - 15	1	1	2	
	-1.5				0 - 1	3 - 6	15 - 18	1	2		0	1	2						4				1	3						6	7	10			0	
Severe	-2.0					0 - 2	5 - 14	0		3		0	0 - 1	0	1		2	3	4			0		1 - 2	2					3 - 5	4 - 6	6 - 9			0	1
	-3.0						0 - 4	0 - 1	0 - 2		0 - 1			0	0 - 1	0 - 1	0 - 2	0 - 3				0	0	0	0 - 1	0 - 2				0 - 2	0 - 3	1 - 5				0
Age 80 or more years old																																				
Normal	3.0		3	3	28 - 60	42 - 60	7 - 8	8	8	8	8																			21 - 40	21 - 40	27 - 40				
	2.0			2	26 - 27	34 - 41	49 - 60	6	7	7	6 - 7	7	7 - 8																	18 - 20	18 - 20	23 - 26	5			
	1.5	3	2		24 - 25	31 - 33	44 - 48			6	5	6																		17	17	21 - 22	4	5		
	1.0	2		1	15 - 23	21 - 30	31 - 43	5	5	6	4	5	5 - 6	2			6													13 - 16	13 - 16	18 - 20	3	4	5	
	0.0	1		0	7 - 14	12 - 20	19 - 30	3 - 4	4	4 - 5	3	2 - 4	3 - 4	1	2	2	4 - 5	5 - 6	5 - 6	1	1	1	2 - 4	3 - 5	4 - 5					9 - 12	9 - 12	17	2	2 - 3	3 - 4	
Mild	-1.0	0	0 - 1		0 - 6	3 - 11	6 - 18	2	3	3	1 - 2	1	1 - 2				1	2	3	4			1	2	3					5 - 8	5 - 8	8 - 16	0 - 1	1	2	
	-1.5					0 - 2	2 - 5	1	2		0	0	0						4					2	3					4	4	7			0	1
Severe	-2.0						0 - 1	0		2		0		0		1	2					0	0	0	0 - 1	1				1 - 3	1 - 3	3 - 6				0
	-3.0							0 - 1	0 - 1					0	0	0 - 1	0 - 1	0 - 3				0	0	0	0	0				0	0	0 - 2				

Table 4. Composite Score Norms and Z-Scores, by Age Group and Education Level

		2018					
		5 measures (CCCE Score Range 0-80)			8 measures (CCCE Score Range 0-100)		
Z-Score	Education (years)						
	0	1 to 6	7+	0	1 to 6	7+	
Age =<59 years old							
Normal	3.0	66 - 80			81 - 100		
	2.0	55 - 65	69 - 80		71 - 80	85 - 100	99 - 100
	1.5	51 - 54	65 - 68	77 - 80	66 - 70	81 - 84	95 - 98
	1.0	40 - 50	52 - 64	65 - 76	57 - 65	67 - 80	81 - 94
	0.0	28 - 39	39 - 51	53 - 64	37 - 56	53 - 66	67 - 80
	-1.0	16 - 27	26 - 38	40 - 52	27 - 36	41 - 52	54 - 66
Mild	-1.5	12 - 15	22 - 25	36 - 39	23 - 26	35 - 40	50 - 53
Severe	-2.0	0 - 11	10 - 21	25 - 35	14 - 22	23 - 34	38 - 49
	-3.0		0 - 9	0 - 24	0 - 13	0 - 22	0 - 37
Age 60-69 years old							
Normal	3.0	63 - 80	75 - 80		76 - 100	92 - 100	
	2.0	51 - 62	64 - 74	80	64 - 75	81 - 91	98 - 100
	1.5	47 - 50	60 - 63	75 - 79	60 - 63	76 - 80	93 - 97
	1.0	35 - 46	48 - 59	62 - 74	47 - 59	62 - 75	79 - 92
	0.0	23 - 34	35 - 47	49 - 61	34 - 46	48 - 61	64 - 78
	-1.0	11 - 22	23 - 34	36 - 48	21 - 33	35 - 47	50 - 63
Mild	-1.5	7 - 10	18 - 22	32 - 35	17 - 20	30 - 34	45 - 49
Severe	-2.0	0 - 6	7 - 17	21 - 31	0 - 16	19 - 29	33 - 44
	-3.0		0 - 6	0 - 20		0 - 18	0 - 32
Age 70-79 years old							
Normal	3.0	51 - 80	68 - 80		65 - 100	85 - 100	
	2.0	42 - 50	57 - 67	74 - 80	56 - 64	73 - 84	92 - 100
	1.5	39 - 41	53 - 56	70 - 73	52 - 55	68 - 72	87 - 91
	1.0	29 - 38	41 - 52	57 - 69	41 - 51	55 - 67	73 - 86
	0.0	19 - 28	29 - 40	44 - 56	29 - 40	41 - 54	58 - 72
	-1.0	9 - 18	17 - 28	31 - 43	18 - 28	28 - 40	44 - 57
Mild	-1.5	5 - 8	13 - 16	27 - 30	15 - 17	23 - 27	39 - 43
Severe	-2.0	0 - 4	0 - 12	15 - 26	0 - 14	12 - 22	26 - 38
	-3.0			0 - 14		0 - 11	0 - 25
Age 80 or more years old							
Normal	3.0	45 - 80	56 - 80	75 - 80	53 - 100	71 - 100	80 - 100
	2.0	37 - 44	46 - 55	62 - 74	46 - 52	60 - 70	71 - 79
	1.5	33 - 36	43 - 45	58 - 61	44 - 45	56 - 59	68 - 70
	1.0	24 - 32	32 - 42	44 - 57	34 - 43	44 - 55	59 - 67
	0.0	14 - 23	26 - 31	36 - 43	23 - 33	32 - 43	49 - 58
	-1.0	5 - 13	10 - 25	15 - 35	13 - 22	20 - 31	42 - 48
Mild	-1.5	0 - 4	7 - 9	10 - 14	10 - 12	16 - 19	26 - 41
Severe	-2.0		0 - 6	0 - 9	0 - 9	0 - 15	0 - 25
	-3.0						

b. Proxy Interviews

The MHAS uses a proxy-cognitive section (Section PC) for participants unable to complete the Cognitive Function in Direct Interviews (Section E). This section includes questions on daily functioning based on the IQCODE (Jorm, 1994) and relies on the proxy respondent's observations to assess the participant's cognitive status compared to two years prior. The MHAS utilizes a brief 16-item version of the IQCODE, focusing on observed changes in behavior and functionality, as cognitive decline often manifests gradually across various activities. While some questions may seem repetitive, they provide different indicators of cognitive deterioration.

The questions cover general cognitive areas such as memory, judgment, organization, and daily activities, as well as more specific aspects like family memory, spatial orientation, and the ability to use new devices. Other cognitive function measures were included in this section, including global ratings on behavioral problems. These assess the frequency with which the proxy informant rates the presence of different psychiatric symptoms: aggressive and self-harm behavior, sleeping disorders, wandering behavior and paranoid symptoms.

More information about the proxy interview cognitive section please refer to the 2001-2015 document "The Mexican Health and Aging Study: Cognitive Function Measures Scoring and Classification Across Waves 2001-2015" available [here](#).

Different from the Cognitive function battery used during direct interviews (Section E), the proxy-cognitive section (Section PC) has not changed across waves.

There is a total of 16 items that are used to calculate a composite score as the average score of all these items, and that ranges from 1 to 5. To calculate the score for each item, three variables need to be accounted to determine the presence of each symptom: 1 "Much Improved", 2 "A bit improved", 3 "Not much changed", 4 "A bit worse", 5 "Much worse". In Table 6, we provide notes on the calculation of the scores using as an example the first item "Remembering things about family & friends" which uses questions pc5, pc6, pc7. The resulting constructed variable is 'iqcode1'. The same algorithm is applied for the other items.

We adopted a cut-off point 3.4 and above in the IQCODE Composite Score proposed by (Cherbuin and Jorm 2017), for community settings with a sensitivity of 84% and specificity of 80%, to classify subjects as "Normal" (below 3.4) or "Impaired" (3.4 and above).

4. References

- Cherbuin, N. and A.F. Jorm. 2017. "The IQCODE: Using Informant Reports to Assess Cognitive Change in the Clinic and in Older Individuals Living in the Community." Pp. 275-295 in *Cognitive Screening Instruments*.
- Glosser, G., N. Wolfe, M. Albert, L. Lavine, J. Steele, D. Calne, and B. Schoenberg. 1993. "Cross-cultural cognitive examination: validation of a dementia screening instrument for neuroepidemiological research." *Journal of the American Geriatrics Society* 41(9):931-939.
- Jorm, A. 1994. "A short form of the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE): development and cross-validation." *Psychological medicine* 24(01):145-153.
- Mejia-Arango, S., R. Wong, and A. Michaels-Obregon. 2015. "Normative and standardized data for cognitive measures in the Mexican Health and Aging Study." *Salud Publica Mex* 57 Suppl 1:S90-96.

5. Appendix I. STATA Codes for the Creation of Cognitive Function Variables (Direct and Proxy Interviews)

The following STATA codes can be used to construct the score variable for each task included in the 2018 wave.

```
*****
**** MHAS 2018 COGNITIVE EXERCISES - CCCE (SECTION E) ****
*****

**** CREATING VARIABLES BY TASK AND DOMAIN ****

* NOTE: Special missing values were assigned as follows:
* .p indicates proxy interview, .d don't know, .skip, .r refusal and .v
indicates visual limination, and .l physical limitation

*** IMMEDIATE MEMORY ***
*** Repeat 8 words (score 0-8) ***
recode e7a1_tot_18 e7a2_tot_18 e7a3_tot_18 e7b1_tot_18 e7b2_tot_18
e7b3_tot_18 (9=0)
egen iwr_18=rowmean (e7a1_tot_18 e7a2_tot_18 e7a3_tot_18 e7b1_tot_18
e7b2_tot_18 e7b3_tot_18) if [inrange(e7a1_tot_18,0,8) |
inrange(e7a2_tot_18,0,8) | inrange(e7a3_tot_18,0,8) |
inrange(e7b1_tot_18,0,8) | inrange(e7b2_tot_18,0,8) |
inrange(e7b3_tot_18,0,8)] & inlist(tipent_18,1,2)
replace iwr_18 = .r if resul_ec_18 == 4 | e6_18 == 8
replace iwr_18 = .i if resul_ec_18 == 3
replace iwr_18 = .p if inlist(tipent_18,3,4)
label variable iwr_18 "MHAS 2018 Immediate Memory - Repeat 8 words (0-8)"

*** ATTENTION ***
*** Visual Scan (score 0-60) ***
```

```

gen visual_scan_18=.
replace visual_scan_18 = .s if e10_c_18 == .s
replace visual_scan_18 = .l if e10_c_18 == 80
replace visual_scan_18 = .d if e10_c_18 == 99
replace visual_scan_18 = .r if resul_ec_18 == 4 | e10_c_18 == 88
replace visual_scan_18 = .i if resul_ec_18 == 3
replace visual_scan_18 = .p if inlist(tipent_18,3,4)
replace visual_scan_18 = e10_c_18 if inrange(e10_c_18, 0,60)
replace visual_scan_18 = 0 if e10a_18 == 2
label variable visual_scan_18 "MHAS 2018 Attention - Visual Scan (0-60)"

```

```

*** ORIENTATION ***

```

```

*** Day of the month (score 0-1) ***

```

```

gen name_day_18=.
replace name_day_18 = .d if e11a_18 == 9
replace name_day_18 = .r if resul_ec_18 == 4 | e11a_18 == 8
replace name_day_18 = .i if resul_ec_18 == 3
replace name_day_18 = .p if inlist(tipent_18,3,4)
replace name_day_18 = 1 if e11a_18 == 1
replace name_day_18 = 0 if e11a_18 == 2

```

```

*** Month (score 0-1) ***

```

```

gen name_month_18=.
replace name_month_18 = .d if e11b_18 == 9
replace name_month_18 = .r if resul_ec_18 == 4 | e11b_18 == 8
replace name_month_18 = .i if resul_ec_18 == 3
replace name_month_18 = .p if inlist(tipent_18,3,4)
replace name_month_18 = 1 if e11b_18 == 1
replace name_month_18 = 0 if e11b_18 == 2

```

```

*** Year (score 0-1) ***

```

```

gen name_year_18=.
replace name_year_18 = .d if e11c_18 == 9
replace name_year_18 = .r if resul_ec_18 == 4 | e11c_18 == 8
replace name_year_18 = .i if resul_ec_18 == 3

```



```

replace name_year_18 = .p if inlist(tipent_18,3,4)
replace name_year_18 = 1 if e11c_18 == 1
replace name_year_18 = 0 if e11c_18 == 2

*** Orientation (score 0-3)
egen orientation_18= rowtotal(name_day_18 name_month_18 name_year_18) if
inlist(tipent_18,1,2)
replace orientation_18 = .d if e11a_18 == 9 & e11b_18 == 9 & e11c_18 == 9
replace orientation_18 = .r if resul_ec_18 == 4 | e11a_18 == 8 | e11b_18 ==
8 | e11c_18 == 8
replace orientation_18 = .i if resul_ec_18 == 3
replace orientation_18 = .p if inlist(tipent_18,3,4)
label variable orientation_18 "MHAS 2018 Orientation (0-3)"

*** EXECUTIVE FUNCTION ***
*** Verbal fluency (score 0-4) ***
** Number of repeated animals
gen verbal_fluency_rep_18= e9b_c_18 if inrange(e9b_c_18,0,60)
replace verbal_fluency_rep_18 = .s if e9a_18 == 2
replace verbal_fluency_rep_18 = .d if e9b_c_18 == 88
replace verbal_fluency_rep_18 = .r if resul_ec_18 == 4 | e9b_c_18==99
replace verbal_fluency_rep_18 = .i if resul_ec_18 == 3
replace verbal_fluency_rep_18 = .p if inlist(tipent_18,3,4)
label variable verbal_fluency_rep_18 "MHAS 2018 Executive function - Verbal
Fluency: number of repeted animals (0-50)"

** Number of different animals (88 "No response" recorded as a missing)
gen verbal_fluency_num_18=e9a_c_18
replace verbal_fluency_num_18 = 0 if e9a_18 == 2
replace verbal_fluency_num_18 = .d if e9a_c_18 == 88
replace verbal_fluency_num_18 = .r if resul_ec_18 == 4 | e9a_c_18==99
replace verbal_fluency_num_18 = .i if resul_ec_18 == 3
replace verbal_fluency_num_18 = .p if inlist(tipent_18,3,4)
label variable verbal_fluency_num_18 "MHAS 2018 Executive function - Verbal
Fluency: number of animals (0-50)"

```

```

** Categorical variable (using S. Mejia 2014 SPM)
gen verbal_fluency_18=.
replace verbal_fluency_18 = 0 if e9a_18 == 2
replace verbal_fluency_18=1 if inrange(verbal_fluency_num_18,0,8)
replace verbal_fluency_18=2 if inrange(verbal_fluency_num_18,9,18)
replace verbal_fluency_18=3 if inrange(verbal_fluency_num_18,19,24)
replace verbal_fluency_18=4 if inrange(verbal_fluency_num_18,25,50)
replace verbal_fluency_18=.r if resul_ec_18 == 4 | e9a_c_18 == 88
replace verbal_fluency_18=.i if resul_ec_18 == 3
replace verbal_fluency_18=.p if inlist(tipent_18,3,4)
label variable verbal_fluency_18 "MHAS 2018 Executive function - Verbal
Fluency (0-4)"

```

```

*** Serial 7 (score 0-5) ***

```

```

** Correct/Incorrect

```

```

gen serial7_1=.
replace serial7_1=1 if inlist(e15a_18,93,100)
replace serial7_1=0 if !inlist(e15a_18,93,100,.) | e15a_18==999
replace serial7_1=.i if e15a_18==.i
replace serial7_1=.p if inlist(tipent_18,3,4)
replace serial7_1=.r if e15a_18==888

```

```

gen serial7_2=.
replace serial7_2=1 if e15b_18==e15a_18-7 & e15b_18!=.
replace serial7_2=0 if !inlist(e15b_18,e15a_18-7,.) | e15b_18==999
replace serial7_2=.p if inlist(tipent_18,3,4)
replace serial7_2=.i if e15b_18==.i
replace serial7_2=.r if e15b_18==888

```

```

gen serial7_3=.
replace serial7_3=1 if e15c_18==e15b_18-7 & e15c_18!=.
replace serial7_3=0 if !inlist(e15c_18,e15b_18-7,.) | e15c_18==999
replace serial7_3=.p if inlist(tipent_18,3,4)

```

```
replace serial7_3=.i if e15c_18==.i
replace serial7_3=.r if e15c_18==888
```

```
gen serial7_4=.
replace serial7_4=1 if e15d_18==e15c_18-7 & e15d_18!=.
replace serial7_4=0 if !inlist(e15d_18,e15c_18-7,.) | e15d_18==999
replace serial7_4=.p if inlist(tipent_18,3,4)
replace serial7_4=.i if e15d_18==.i
replace serial7_4=.r if e15d_18==888
```

```
gen serial7_5=.
replace serial7_5=1 if e15e_18==e15d_18-7 & e15e_18!=.
replace serial7_5=0 if !inlist(e15e_18,e15d_18-7,.) | e15e_18==999
replace serial7_5=.p if inlist(tipent_18,3,4)
replace serial7_5=.i if e15e_18==.i
replace serial7_5=.r if e15e_18==888
```

** Serial 7 score variable

```
egen serial7_18 = rowtotal(serial7_1 serial7_2 serial7_3 serial7_4
serial7_5) if inlist(serial7_1,0,1) | inlist(serial7_2,0,1) |
inlist(serial7_3,0,1) | inlist(serial7_4,0,1) | inlist(serial7_5,0,1)
replace serial7_18=.r if e15a_18==888 | resul_ec_18 == 4
replace serial7_18=.p if inlist(tipent_18,3,4)
replace serial7_18=.i if resul_ec_18 == 3
label variable serial7_18 "MHAS Executive Function - Series of subtractions
7 from 100 (0-5)"
```

*** CONSTRUCTIONAL PRAXIS ***

*** Copy one figure (score 0-6) ***

```
gen construction_18= .
replace construction_18 = .s if e8a_c_18==.s
replace construction_18 = .r if e8a_c_18 == 8 | resul_ec_18 == 4
replace construction_18 = .d if e8a_c_18 == 9
```

```
replace construction_18 = .i if resul_ec_18 == 3
replace construction_18 = .p if inlist(tipent_18,3,4)
replace construction_18 = e8a_c_18 if inrange(e8a_c_18,0,6)
replace construction_18 = 0 if e8a_18 == 2
label variable construction_18 "MHAS 2018 Constructional Praxis (0-6)"
```

```
*** Copy one figure comparable to 2018 & 2003 (score 0-2) ***
```

```
gen construction_v01_18= .
replace construction_v01_18 = .s if e8a_c_18==.s
replace construction_v01_18 = .r if e8a_c_18 == 8 | resul_ec_18 == 4
replace construction_v01_18 = .d if e8a_c_18 == 9
replace construction_v01_18 = .i if resul_ec_18 == 3
replace construction_v01_18 = .p if inlist(tipent_18,3,4)
replace construction_v01_18 = 0 if inrange(e8a_c_18,0,2)
replace construction_v01_18 = 0 if e8a_18 == 2
replace construction_v01_18 = 1 if inrange(e8a_c_18,3,4)
replace construction_v01_18 = 2 if inrange(e8a_c_18,5,6)
label variable construction_v01_18 "MHAS 2018 Constructional Praxis v2001-
2003 (0-2)"
```

```
*** DELAYED MEMORY ***
```

```
*** Repeat 8 words (score 0-8) ***
```

```
egen dwr_18=rowtotal (e14a_tot_18 e14b_tot_18) if inlist(tipent_18,1,2)
replace dwr_18 = 0 if e14a_tot_18 == 9 | e14b_tot_18 ==9
replace dwr_18 = .r if resul_ec_18 == 4 | e6_18 == 8
replace dwr_18 = .i if resul_ec_18 == 3
replace dwr_18 = .p if inlist(tipent_18,3,4)
label variable dwr_18 "MHAS 2018 Delayed Memory - Repeat 8 words (0-8)"
```

```
*** Delayed recall/copy of figure (score 0-6) ***
```

```
gen construction_m_18= .
replace construction_m_18 = .s if e13a_c_18==.s
replace construction_m_18 = .d if e13a_c_18 == 9
replace construction_m_18 = .r if e13a_c_18 == 8 | resul_ec_18 == 4
```

```
replace construction_m_18 = .i if resul_ec_18 == 3
replace construction_m_18 = .p if inlist(tipent_18,3,4)
replace construction_m_18 = e13a_c_18 if inrange(e13a_c_18,0,6)
replace construction_m_18 = 0 if e13a_18==2
label variable construction_m_18 "MHAS 2018 Delayed Memory - Delayed recall
of figure (0-6)"
```

```
*** Delayed recall/copy of figure comparable to 2001 & 2003 (score 0-2) ***
gen construction_m_v01_18= .
replace construction_m_v01_18 = .s if e13a_c_18==.s
replace construction_m_v01_18 = .d if e13a_c_18 == 9
replace construction_m_v01_18 = .r if e13a_c_18 == 8 | resul_ec_18 == 4
replace construction_m_v01_18 = .i if resul_ec_18 == 3
replace construction_m_v01_18 = .i if e13a_c_18 == .i & resul_ec_18 == 2
replace construction_m_v01_18 = .p if inlist(tipent_18,3,4)
replace construction_m_v01_18 = 0 if inrange(e13a_c_18,0,2)
replace construction_m_v01_18 = 0 if e13a_18==2
replace construction_m_v01_18 = 1 if inrange(e13a_c_18,3,4)
replace construction_m_v01_18 = 2 if inrange(e13a_c_18,5,6)
label variable construction_m_v01_18 "MHAS 2018 Delayed Memory - Delayed
recall of figure v2001-2003 (0-2)"
```

```
*** TOTAL CCCE SCORE ***
```

```
*** NUMBER of Tasks missing (out of 8 tasks) ***
```

```
egen ccce_miss_18=rowmiss(iwr_18 dwr_18 visual_scan_18 orientation_18
verbal_fluency_18 construction_18 construction_m_18 serial7_18) ///
                        if inlist(tipent_18,1,2)
```

```
replace ccce_miss_18=.p if inlist(tipent_18,3,4)
```

```
label variable ccce_miss_18 "MHAS 2018 Number of CCCE Tasks missing (0-8)"
```

```
*** TOTAL MHAS 2018 CCCE SCORE (score 0-99) - Including all 2018 Items ***
```

```

egen ccce_18 = rowtotal(iwr_18 dwr_18 visual_scan_18 orientation_18
verbal_fluency_18 construction_18 construction_m_18 serial7_18) if
inlist(tipent_18,1,2)
replace ccce_18 = .d if [iwr_18==.d ///
| dwr_18==.d ///
| visual_scan_18==.d ///
| orientation_18==.d ///
| verbal_fluency_18==.d ///
| construction_18==.d ///
| construction_m_18==.d ///
| serial7_18==.d] & ccce_18==.

replace ccce_18 = .r if [iwr_18==.r ///
| dwr_18==.r ///
| visual_scan_18==.r ///
| orientation_18==.r ///
| verbal_fluency_18==.r ///
| construction_18==.r ///
| construction_m_18==.r ///
| serial7_18==.r] & ccce_18==.

replace ccce_18 = .s if [e3a_18 == 2 | inlist(e5_18,1,2,3) |
inlist(e8a_18,2)] & ccce_18==.
replace ccce_18 = .r if resul_ec_18==4 & ccce_18==.
replace ccce_18 = .i if resul_ec_18==3 & ccce_18==.
replace ccce_18 = .p if inlist(tipent_18,3,4)
replace ccce_18 = .m if ccce_miss_18 == 8

label variable ccce_18 "MHAS 2018 CCCE Score (0-99)"

*** NUMBER of Tasks missing (out of 5 tasks) ***
egen ccce_miss_v01_18=rowmiss(iwr_18 dwr_18 visual_scan_18
construction_v01_18 construction_m_v01_18) if inlist(tipent_18,1,2)
replace ccce_miss_v01_18=.p if inlist(tipent_18,3,4)
label variable ccce_miss_v01_18 "MHAS 2018 Number of CCCE Tasks missing -
Comparable to 2001 (0-5)"

```

*** TOTAL MHAS 2018 CCCE SCORE (score 0-80) - With only the 5 items included since 2001***

```
egen ccce_v01_18 = rowtotal(iwr_18 dwr_18 visual_scan_18 construction_v01_18  
construction_m_v01_18) ///
```

```
if inlist(tipent_18,1,2)
```

```
replace ccce_v01_18 = .d if [iwr_18==.d ///
```

```
| dwr_18==.d ///
```

```
| visual_scan_18==.d ///
```

```
| construction_v01_18==.d ///
```

```
| construction_m_v01_18==.d] &
```

```
ccce_v01_18==.
```

```
replace ccce_v01_18 = .r if [iwr_18==.r ///
```

```
| dwr_18==.r ///
```

```
| visual_scan_18==.r ///
```

```
| construction_v01_18==.r ///
```

```
| construction_m_v01_18==.r] &
```

```
ccce_v01_18==.
```

```
replace ccce_v01_18 = .s if [e3a_18 == 2 | inlist(e5_18,1,2,3) |
```

```
inlist(e8a_18,2)] & ccce_v01_18==.
```

```
replace ccce_v01_18 = .r if resul_ec_18==4 & ccce_v01_18==.
```

```
replace ccce_v01_18 = .i if resul_ec_18==3 & ccce_v01_18==.
```

```
replace ccce_v01_18 = .p if inlist(tipent_18,3,4)
```

```
replace ccce_v01_18 = .m if ccce_miss_v01_18 == 5
```

```
label variable ccce_v01_18 "MHAS 2018 CCCE Score - Comparable to 2001 (0-  
80) "
```

```
*****  
***** MHAS 2018 IQCODE SHORT -Jorm (SECTION PC) *****  
*****
```

```
* Remembering things about family & friends
```

```
gen iqcode1_18=.
replace iqcode1_18=.r if pc5_18==8 | pc6_18==8 | pc7_18==8
replace iqcode1_18=.d if pc5_18==9 | pc6_18==9 | pc7_18==9
replace iqcode1_18=3 if pc5_18==2
replace iqcode1_18=pc6_18 if inlist(pc6_18,1,2)
replace iqcode1_18=4 if pc7_18==2
replace iqcode1_18=5 if pc7_18==1
```

* Remembering things that happened recently

```
gen iqcode2_18=.
replace iqcode2_18=.r if pc8_18==8 | pc9_18==8 | pc10_18==8
replace iqcode2_18=.d if pc8_18==9 | pc9_18==9 | pc10_18==9
replace iqcode2_18=3 if pc8_18==2
replace iqcode2_18=pc9_18 if inlist(pc9_18,1,2)
replace iqcode2_18=4 if pc10_18==2
replace iqcode2_18=5 if pc10_18==1
```

* Recalling conversations a few name_day_18s later

```
gen iqcode3_18=.
replace iqcode3_18=.r if pc11_18==8 | pc12_18==8 | pc13_18==8
replace iqcode3_18=.d if pc11_18==9 | pc12_18==9 | pc13_18==9
replace iqcode3_18=3 if pc11_18==2
replace iqcode3_18=pc12_18 if inlist(pc12_18,1,2)
replace iqcode3_18=4 if pc13_18==2
replace iqcode3_18=5 if pc13_18==1
```

* Remembering his/her address & phone number

```
gen iqcode4_18=.
replace iqcode4_18=.r if pc14_18==8 | pc15_18==8 | pc16_18==8
replace iqcode4_18=.d if pc14_18==9 | pc15_18==9 | pc16_18==9
replace iqcode4_18=3 if pc14_18==2
replace iqcode4_18=pc15_18 if inlist(pc15_18,1,2)
replace iqcode4_18=4 if pc16_18==2
replace iqcode4_18=5 if pc16_18==1
```


* Remembering what name_day_18 and name_month_18 it is

```
gen iqcode5_18=.
```

```
replace iqcode5_18=.r if pc17_18==8 | pc18_18==8 | pc19_18==8
```

```
replace iqcode5_18=.d if pc17_18==9 | pc18_18==9 | pc19_18==9
```

```
replace iqcode5_18=3 if pc17_18==2
```

```
replace iqcode5_18=pc18_18 if inlist(pc18_18,1,2)
```

```
replace iqcode5_18=4 if pc19_18==2
```

```
replace iqcode5_18=5 if pc19_18==1
```

* Remembering where things are usually kept

```
gen iqcode6_18=.
```

```
replace iqcode6_18=.r if pc20_18==8 | pc21_18==8 | pc22_18==8
```

```
replace iqcode6_18=.d if pc20_18==9 | pc21_18==9 | pc22_18==9
```

```
replace iqcode6_18=3 if pc20_18==2
```

```
replace iqcode6_18=pc21_18 if inlist(pc21_18,1,2)
```

```
replace iqcode6_18=4 if pc22_18==2
```

```
replace iqcode6_18=5 if pc22_18==1
```

* Remembering where to find things which have been put in a different place from usual

```
gen iqcode7_18=.
```

```
replace iqcode7_18=.r if pc23_18==8 | pc24_18==8 | pc25_18==8
```

```
replace iqcode7_18=.d if pc23_18==9 | pc24_18==9 | pc25_18==9
```

```
replace iqcode7_18=3 if pc23_18==2
```

```
replace iqcode7_18=pc24_18 if inlist(pc24_18,1,2)
```

```
replace iqcode7_18=4 if pc25_18==2
```

```
replace iqcode7_18=5 if pc25_18==1
```

* Knowing how to work familiar machines around the house

```
gen iqcode8a_c_18=.
```

```
replace iqcode8a_c_18=.r if pc26_18==8 | pc27_18==8 | pc28_18==8
```

```
replace iqcode8a_c_18=.d if pc26_18==9 | pc27_18==9 | pc28_18==9
```

```
replace iqcode8a_c_18=3 if pc26_18==2
```

```
replace iqcode8a_c_18=pc27_18 if inlist(pc27_18,1,2)
```

```
replace iqcode8a_c_18=4 if pc28_18==2
```

```
replace iqcode8a_c_18=5 if pc28_18==1
```

```
* Learning to use a new gadget or machine around the house
```

```
gen iqcode9_18=.
```

```
replace iqcode9_18=.r if pc29_18==8 | pc30_18==8 | pc31_18==8
```

```
replace iqcode9_18=.d if pc29_18==9 | pc30_18==9 | pc31_18==9
```

```
replace iqcode9_18=3 if pc29_18==2
```

```
replace iqcode9_18=pc30_18 if inlist(pc30_18,1,2)
```

```
replace iqcode9_18=4 if pc31_18==2
```

```
replace iqcode9_18=5 if pc31_18==1
```

```
* Learning new things in general
```

```
gen iqcode10_c_18=.
```

```
replace iqcode10_c_18=.r if pc32_18==8 | pc33_18==8 | pc34_18==8
```

```
replace iqcode10_c_18=.d if pc32_18==9 | pc33_18==9 | pc34_18==9
```

```
replace iqcode10_c_18=3 if pc32_18==2
```

```
replace iqcode10_c_18=pc33_18 if inlist(pc33_18,1,2)
```

```
replace iqcode10_c_18=4 if pc34_18==2
```

```
replace iqcode10_c_18=5 if pc34_18==1
```

```
* Following a story in a book or TV
```

```
gen iqcode11_18=.
```

```
replace iqcode11_18=.r if pc35_18==8 | pc36_18==8 | pc37_18==8
```

```
replace iqcode11_18=.d if pc35_18==9 | pc36_18==9 | pc37_18==9
```

```
replace iqcode11_18=3 if pc35_18==2
```

```
replace iqcode11_18=pc36_18 if inlist(pc36_18,1,2)
```

```
replace iqcode11_18=4 if pc37_18==2
```

```
replace iqcode11_18=5 if pc37_18==1
```

```
* Making decision on everyname_day_18 matters
```

```
gen iqcode12_18=.
```

```
replace iqcode12_18=.r if pc38_18==8 | pc39_18==8 | pc40_18==8
```

```
replace iqcode12_18=.d if pc38_18==9 | pc39_18==9 | pc40_18==9
```

```
replace iqcode12_18=3 if pc38_18==2
```

```
replace iqcode12_18=pc39_18 if inlist(pc39_18,1,2)
```

```
replace iqcode12_18=4 if pc40_18==2
replace iqcode12_18=5 if pc40_18==1
```

* Handling money for shopping

```
gen iqcode13a_c_18=.
replace iqcode13a_c_18=.r if pc41_18==8 | pc42_18==8 | pc43_18==8
replace iqcode13a_c_18=.d if pc41_18==9 | pc42_18==9 | pc43_18==9
replace iqcode13a_c_18=3 if pc41_18==2
replace iqcode13a_c_18=pc42_18 if inlist(pc42_18,1,2)
replace iqcode13a_c_18=4 if pc43_18==2
replace iqcode13a_c_18=5 if pc43_18==1
```

* Handling financial matters

```
gen iqcode14_18=.
replace iqcode14_18=.r if pc44_18==8 | pc45_18==8 | pc46_18==8
replace iqcode14_18=.d if pc44_18==9 | pc45_18==9 | pc46_18==9
replace iqcode14_18=3 if pc44_18==2
replace iqcode14_18=pc45_18 if inlist(pc45_18,1,2)
replace iqcode14_18=4 if pc46_18==2
replace iqcode14_18=5 if pc46_18==1
```

* Handling other everyname_day_18 arithmetic problems

```
gen iqcode15_18=.
replace iqcode15_18=.r if pc47_18==8 | pc48_18==8 | pc49_18==8
replace iqcode15_18=.d if pc47_18==9 | pc48_18==9 | pc49_18==9
replace iqcode15_18=3 if pc47_18==2
replace iqcode15_18=pc48_18 if inlist(pc48_18,1,2)
replace iqcode15_18=4 if pc49_18==2
replace iqcode15_18=5 if pc49_18==1
```

* Using his/her intelligence to understand what's going on and to reason things through

```
gen iqcode16_18=.
replace iqcode16_18=.r if pc50_18==8 | pc51_18==8 | pc52_18==8
replace iqcode16_18=.d if pc50_18==9 | pc51_18==9 | pc52_18==9
```



```

iqcode6_18==.r | ///
iqcode7_18==.r | ///
iqcode8a_c_18==.r | ///
iqcode9_18==.r | ///
iqcode10_c_18==.r | ///
iqcode11_18==.r | ///
iqcode12_18==.r | ///
iqcode13a_c_18==.r | ///
iqcode14_18==.r | ///
iqcode15_18==.r | ///
iqcode16_18==.r]

replace iqcode_18 = .p if inlist(tipent_18,1,2)
label variable iqcode_18 "MHAS 2018 IQCODE Score (1-5)"

*** COGNITIVE IMPAIRMENT - IQCODE (only proxy interviews) ***
gen cog_imp_iqcode_18 = .
replace cog_imp_iqcode_18=0 if inrange(iqcode_18,1,3.4)
replace cog_imp_iqcode_18=1 if inrange(iqcode_18,3.4,5)
replace cog_imp_iqcode_18 = .d if iqcode_18==.d
replace cog_imp_iqcode_18 = .r if iqcode_18==.r
replace cog_imp_iqcode_18 = .n if inlist(tipent_18,1,2)
replace cog_imp_iqcode_18 = .i if inlist(tipent_18,3,4) & pcl_18==.i
label variable cog_imp_iqcode_18 "MHAS 2018 IQ CODE Cognitive Impairment -
Normal, Impaired"
label define imp_iqcode 0 "Normal" 1 "Impaired", replace
label values cog_imp_iqcode_18 imp_iqcode

drop name_day_18 name_month_18 name_year_18 serial7_1-serial7_5 iqcode*_18
iqcode

```

6. Appendix II. STATA Codes for the Creation of Z-Scores and the Classification of Subjects

The following STATA codes can be used to construct the z-scores for each task and total cognition score included in the 2018 wave. In addition, we provide the code for the cognitive function classification (categories Normal, CIND, Dementia).

```
*****
*** MHAS 2018 COGNITIVE EXERCISES - CCCE (SECTION E) ***
*****

label data "Version 1. January 2025"

*** CREATING Z-SCORES & IMPAIREMENT STATUS VARIABLES ***
***          BY TOTAL SCORE, TASK & DOMAIN          ***

*** CCCE Total Score (0-80) - Including only the items in 2001 ***
***

** Z-SCORES **
gen ccce_z_score_v01_18=.
replace      ccce_z_score_v01_18=-3.0  if [
[inrange(ccce_v01_18,0,10) &
inrange(yrschool,1,6)] | [inrange(ccce_v01_18,0,25) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace      ccce_z_score_v01_18=-2.0  if
[[inrange(ccce_v01_18,0,12) & yrschool==0] |
[inrange(ccce_v01_18,10,22) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,25,36) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace      ccce_z_score_v01_18=-1.5  if
[[inrange(ccce_v01_18,12,16) & yrschool==0] |
[inrange(ccce_v01_18,22,26) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,36,40) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace      ccce_z_score_v01_18=-1.0  if [[inrange(ccce_v01_18,16,28) &
yrschool==0] | [inrange(ccce_v01_18,26,39) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,40,53) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace      ccce_z_score_v01_18=0.0    if
[[inrange(ccce_v01_18,28,40) & yrschool==0] |
[inrange(ccce_v01_18,39,52) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,53,65) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace      ccce_z_score_v01_18=1.0    if
[[inrange(ccce_v01_18,40,51) & yrschool==0] |
```

```

[inrange(ccce_v01_18,52,65) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,65,77) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_v01_18=1.5 if
[[inrange(ccce_v01_18,51,55) & yrschool==0] |
[inrange(ccce_v01_18,65,69) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,77,80) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_v01_18=2.0 if
[[inrange(ccce_v01_18,55,66) & yrschool==0] |
[inrange(ccce_v01_18,69,80) & inrange(yrschool,1,6)]
] &
inrange(age_18,17,59)
replace ccce_z_score_v01_18=3.0 if
[[inrange(ccce_v01_18,66,80) & yrschool==0]
] & inrange(age_18,17,59)

replace ccce_z_score_v01_18=-3.0 if [
[inrange(ccce_v01_18,0,7) &
inrange(yrschool,1,6)] | [inrange(ccce_v01_18,0,21) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace ccce_z_score_v01_18=-2.0 if [[inrange(ccce_v01_18,0,7)
& yrschool==0] | [inrange(ccce_v01_18,7,18) & inrange(yrschool,1,6)]
| [inrange(ccce_v01_18,21,32) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_v01_18=-1.5 if
[[inrange(ccce_v01_18,7,11) & yrschool==0] |
[inrange(ccce_v01_18,18,23) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,32,36) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_v01_18=-1.0 if [[inrange(ccce_v01_18,11,23) &
yrschool==0] | [inrange(ccce_v01_18,23,35) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,36,49) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_v01_18=0.0 if
[[inrange(ccce_v01_18,23,35) & yrschool==0] |
[inrange(ccce_v01_18,35,48) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,49,62) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_v01_18=1.0 if
[[inrange(ccce_v01_18,35,47) & yrschool==0] |
[inrange(ccce_v01_18,48,60) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,62,75) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_v01_18=1.5 if
[[inrange(ccce_v01_18,47,51) & yrschool==0] |

```

```

[inrange(ccce_v01_18,60,64) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,75,80) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_v01_18=2.0 if
[[inrange(ccce_v01_18,51,63) & yrschool==0] |
[inrange(ccce_v01_18,64,75) & inrange(yrschool,1,6)] |
[inlist(ccce_v01_18,80) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_v01_18=3.0 if
[[inrange(ccce_v01_18,63,80) & yrschool==0] |
[inrange(ccce_v01_18,75,80) & inrange(yrschool,1,6)]
] &
inrange(age_18,60,69)

//replace ccce_z_score_v01_18=-3.0 if [

] & inrange(age_18,70,79)
replace ccce_z_score_v01_18=-2.0 if [[inrange(ccce_v01_18,0,5)
& yrschool==0] | [inrange(ccce_v01_18,0,7) & inrange(yrschool,1,6)]
| [inrange(ccce_v01_18,0,10) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_v01_18=-1.5 if [[inrange(ccce_v01_18,5,9)
& yrschool==0] | [inrange(ccce_v01_18,7,10) & inrange(yrschool,1,6)]
| [inrange(ccce_v01_18,10,15) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_v01_18=-1.0 if [[inrange(ccce_v01_18,9,19) &
yrschool==0] | [inrange(ccce_v01_18,10,26) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,15,36) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_v01_18=0.0 if
[[inrange(ccce_v01_18,19,29) & yrschool==0] |
[inrange(ccce_v01_18,26,32) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,36,44) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_v01_18=1.0 if
[[inrange(ccce_v01_18,29,39) & yrschool==0] |
[inrange(ccce_v01_18,32,43) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,44,58) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_v01_18=1.5 if
[[inrange(ccce_v01_18,39,42) & yrschool==0] |
[inrange(ccce_v01_18,43,46) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,58,61) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_v01_18=2.0 if
[[inrange(ccce_v01_18,42,51) & yrschool==0] |

```



```

[inrange(ccce_v01_18,46,56) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,61,80) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_v01_18=3.0 if
[[inrange(ccce_v01_18,51,80) & yrschool==0] |
[inrange(ccce_v01_18,56,80) & inrange(yrschool,1,6)]
] &
inrange(age_18,70,79)

//replace ccce_z_score_v01_18=-3.0 if [
] & inrange(age_18,80,120)
replace ccce_z_score_v01_18=-2.0 if [
[inrange(ccce_v01_18,0,7) &
inrange(yrschool,1,6)] | [inrange(ccce_v01_18,0,10) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace ccce_z_score_v01_18=-1.5 if [[inrange(ccce_v01_18,0,5)
& yrschool==0] | [inrange(ccce_v01_18,7,10) & inrange(yrschool,1,6)]
| [inrange(ccce_v01_18,10,15) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_v01_18=-1.0 if [[inrange(ccce_v01_18,5,14) &
yrschool==0] | [inrange(ccce_v01_18,10,26) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,15,36) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_v01_18=0.0 if
[[inrange(ccce_v01_18,14,24) & yrschool==0] |
[inrange(ccce_v01_18,26,32) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,36,44) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_v01_18=1.0 if
[[inrange(ccce_v01_18,24,33) & yrschool==0] |
[inrange(ccce_v01_18,32,43) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,44,58) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_v01_18=1.5 if
[[inrange(ccce_v01_18,33,37) & yrschool==0] |
[inrange(ccce_v01_18,43,46) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,58,62) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_v01_18=2.0 if
[[inrange(ccce_v01_18,37,45) & yrschool==0] |
[inrange(ccce_v01_18,46,56) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,62,75) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_v01_18=3.0 if
[[inrange(ccce_v01_18,45,80) & yrschool==0] |

```

```
[inrange(ccce_v01_18,56,80) & inrange(yrschool,1,6)] |
[inrange(ccce_v01_18,75,80) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
```

```
replace ccce_z_score_v01_18= ccce_v01_18 if mi(ccce_v01_18) &
ccce_z_score_v01_18==.
replace ccce_z_score_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & ccce_z_score_v01_18==.
replace ccce_z_score_v01_18= .p if inlist(tipent_18,3,4)
label variable ccce_z_score_v01_18 "MHAS 2018 CCCE Z-Scores -
Comparable to 2001"
```

```
** Impairment Status **
```

```
gen cognitive_imp_v01_18 = .
label variable cognitive_imp_v01_18 "MHAS 2018 Cognitive Impairment -
Normal, MCI, Impaired Comparable to 2001"
```

```
** Age <59 & Years of Education=0
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,17,59) & yrschool==0
& inrange(ccce_v01_18,0,12)
replace cognitive_imp_v01_18=1 if inrange(age_18,17,59) & yrschool==0
& inrange(ccce_v01_18,12,16)
replace cognitive_imp_v01_18=0 if inrange(age_18,17,59) & yrschool==0
& inrange(ccce_v01_18,16,80)
```

```
** Age <59 & Years of Education 1-6
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,0,22)
replace cognitive_imp_v01_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,22,26)
replace cognitive_imp_v01_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,26,80)
```

```
** Age <59 & Years of Education 7+
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,0,36)
replace cognitive_imp_v01_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,36,40)
replace cognitive_imp_v01_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,40,80)
```

```
** Age 60-69 & Years of Education=0
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,60,69) & yrschool==0
& inrange(ccce_v01_18,0,7)
replace cognitive_imp_v01_18=1 if inrange(age_18,60,69) & yrschool==0
& inrange(ccce_v01_18,7,11)
```

```
replace cognitive_imp_v01_18=0 if inrange(age_18,60,69) & yrschool==0
& inrange(ccce_v01_18,11,80)
```

```
** Age 60-69 & Years of Education 1-6
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,0,18)
replace cognitive_imp_v01_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,18,23)
replace cognitive_imp_v01_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,23,80)
```

```
** Age 60-69 & Years of Education 7+
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,0,32)
replace cognitive_imp_v01_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,32,36)
replace cognitive_imp_v01_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,36,80)
```

```
** Age 70-79 & Years of Education=0
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,70,79) & yrschool==0
& inrange(ccce_v01_18,0,5)
replace cognitive_imp_v01_18=1 if inrange(age_18,70,79) & yrschool==0
& inrange(ccce_v01_18,5,9)
replace cognitive_imp_v01_18=0 if inrange(age_18,70,79) & yrschool==0
& inrange(ccce_v01_18,9,80)
```

```
** Age 70-79 & Years of Education 1-6
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,0,13)
replace cognitive_imp_v01_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,13,17)
replace cognitive_imp_v01_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,17,80)
```

```
** Age 70-79 & Years of Education 7+
```

```
replace cognitive_imp_v01_18=2 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,0,27)
replace cognitive_imp_v01_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,27,31)
replace cognitive_imp_v01_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,31,80)
```

```
** Age 80+ & Years of Education=0
```

```

//replace cognitive_imp_v01_18=2 if inrange(age_18,80,120) &
yrschool==0 & inrange(ccce_v01_18,,)
replace cognitive_imp_v01_18=1 if inrange(age_18,80,120) &
yrschool==0 & inrange(ccce_v01_18,0,5)
replace cognitive_imp_v01_18=0 if inrange(age_18,80,120) &
yrschool==0 & inrange(ccce_v01_18,5,80)

** Age 80+ & Years of Education 1-6
replace cognitive_imp_v01_18=2 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,0,7)
replace cognitive_imp_v01_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,7,10)
replace cognitive_imp_v01_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(ccce_v01_18,10,80)

** Age 80+ & Years of Education 7+
replace cognitive_imp_v01_18=2 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,0,10)
replace cognitive_imp_v01_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,10,15)
replace cognitive_imp_v01_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(ccce_v01_18,15,80)

replace cognitive_imp_v01_18= ccce_v01_18 if mi(ccce_v01_18) &
cognitive_imp_v01_18==.
replace cognitive_imp_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & cognitive_imp_v01_18==.
replace cognitive_imp_v01_18= .p if inlist(tipent_18,3,4)
label define cognitive_imp_v01_18 0 "0.Normal" 1 "1.MCI" 2
"2.Impaired", replace
label values cognitive_imp_v01_18 cognitive_imp_v01_18

*** CCCE Total Score (0-100) ***
** Z-SCORES **
gen ccce_z_score_18=.
replace ccce_z_score_18=-3.0 if [[inrange(ccce_18,0,14) &
yrschool==0] | [inrange(ccce_18,0,23) & inrange(yrschool,1,6)] |
[inrange(ccce_18,0,38) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_18=-2.0 if [[inrange(ccce_18,14,23) &
yrschool==0] | [inrange(ccce_18,23,35) & inrange(yrschool,1,6)] |
[inrange(ccce_18,38,50) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_18=-1.5 if [[inrange(ccce_18,23,27) &
yrschool==0] | [inrange(ccce_18,35,41) & inrange(yrschool,1,6)] |

```

```

[inrange(ccce_18,50,54) & inrange(yrschool,7,25)] &
inrange(age_18,17,59)
replace ccce_z_score_18=-1.0 if [[inrange(ccce_18,27,37) &
yrschool==0] | [inrange(ccce_18,41,53) & inrange(yrschool,1,6)] |
[inrange(ccce_18,54,67) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_18=0.0 if [[inrange(ccce_18,37,57) &
yrschool==0] | [inrange(ccce_18,53,67) & inrange(yrschool,1,6)] |
[inrange(ccce_18,67,81) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_18=1.0 if [[inrange(ccce_18,57,66) &
yrschool==0] | [inrange(ccce_18,67,81) & inrange(yrschool,1,6)] |
[inrange(ccce_18,81,95) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_18=1.5 if [[inrange(ccce_18,66,71) &
yrschool==0] | [inrange(ccce_18,81,85) & inrange(yrschool,1,6)] |
[inrange(ccce_18,95,99) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_18=2.0 if [[inrange(ccce_18,71,81) &
yrschool==0] | [inrange(ccce_18,85,100) & inrange(yrschool,1,6)] |
[inrange(ccce_18,99,100) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace ccce_z_score_18=3.0 if [[inrange(ccce_18,81,100) &
yrschool==0]

```

```

] & inrange(age_18,17,59)

```

```

replace ccce_z_score_18=-3.0 if [
[inrange(ccce_18,0,19) & inrange(yrschool,1,6)] |
[inrange(ccce_18,0,33) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_18=-2.0 if [[inrange(ccce_18,0,17) &
yrschool==0] | [inrange(ccce_18,19,30) & inrange(yrschool,1,6)] |
[inrange(ccce_18,33,45) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_18=-1.5 if [[inrange(ccce_18,17,21) &
yrschool==0] | [inrange(ccce_18,30,35) & inrange(yrschool,1,6)] |
[inrange(ccce_18,45,50) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_18=-1.0 if [[inrange(ccce_18,21,34) &
yrschool==0] | [inrange(ccce_18,35,48) & inrange(yrschool,1,6)] |
[inrange(ccce_18,50,64) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace ccce_z_score_18=0.0 if [[inrange(ccce_18,34,47) &
yrschool==0] | [inrange(ccce_18,48,62) & inrange(yrschool,1,6)] |
[inrange(ccce_18,64,79) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)

```

```

replace  ccce_z_score_18=1.0      if [[inrange(ccce_18,47,60) &
yrschool==0] | [inrange(ccce_18,62,76) & inrange(yrschool,1,6)] |
[inrange(ccce_18,79,93) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace  ccce_z_score_18=1.5      if [[inrange(ccce_18,60,64) &
yrschool==0] | [inrange(ccce_18,76,81) & inrange(yrschool,1,6)] |
[inrange(ccce_18,93,98) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace  ccce_z_score_18=2.0      if [[inrange(ccce_18,64,76) &
yrschool==0] | [inrange(ccce_18,81,92) & inrange(yrschool,1,6)] |
[inrange(ccce_18,98,100) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace  ccce_z_score_18=3.0      if [[inrange(ccce_18,76,100) &
yrschool==0] | [inrange(ccce_18,92,100) & inrange(yrschool,1,6)]
] &
inrange(age_18,60,69)

replace  ccce_z_score_18=-3.0 if [
[inrange(ccce_18,0,12) & inrange(yrschool,1,6)] |
[inrange(ccce_18,0,26) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  ccce_z_score_18=-2.0 if [[inrange(ccce_18,0,15) &
yrschool==0] | [inrange(ccce_18,12,23) & inrange(yrschool,1,6)] |
[inrange(ccce_18,26,39) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  ccce_z_score_18=-1.5 if [[inrange(ccce_18,15,18) &
yrschool==0] | [inrange(ccce_18,23,28) & inrange(yrschool,1,6)] |
[inrange(ccce_18,39,44) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  ccce_z_score_18=-1.0      if [[inrange(ccce_18,18,29) &
yrschool==0] | [inrange(ccce_18,28,41) & inrange(yrschool,1,6)] |
[inrange(ccce_18,44,58) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  ccce_z_score_18=0.0      if [[inrange(ccce_18,29,41) &
yrschool==0] | [inrange(ccce_18,41,55) & inrange(yrschool,1,6)] |
[inrange(ccce_18,58,73) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  ccce_z_score_18=1.0      if [[inrange(ccce_18,41,52) &
yrschool==0] | [inrange(ccce_18,55,68) & inrange(yrschool,1,6)] |
[inrange(ccce_18,73,87) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  ccce_z_score_18=1.5      if [[inrange(ccce_18,52,56) &
yrschool==0] | [inrange(ccce_18,68,73) & inrange(yrschool,1,6)] |
[inrange(ccce_18,87,92) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  ccce_z_score_18=2.0      if [[inrange(ccce_18,56,65) &
yrschool==0] | [inrange(ccce_18,73,85) & inrange(yrschool,1,6)] |

```

```

[inrange(ccce_18,92,100) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace ccce_z_score_18=3.0 if [[inrange(ccce_18,65,100) &
yrschool==0] | [inrange(ccce_18,85,100) & inrange(yrschool,1,6)]
] &
inrange(age_18,70,79)

//replace ccce_z_score_18=-3.0 if [

] & inrange(age_18,80,120)
replace ccce_z_score_18=-2.0 if [[inrange(ccce_18,0,10) &
yrschool==0] | [inrange(ccce_18,0,16) & inrange(yrschool,1,6)] |
[inrange(ccce_18,0,26) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_18=-1.5 if [[inrange(ccce_18,10,13) &
yrschool==0] | [inrange(ccce_18,16,20) & inrange(yrschool,1,6)] |
[inrange(ccce_18,26,42) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_18=-1.0 if [[inrange(ccce_18,13,23) &
yrschool==0] | [inrange(ccce_18,20,32) & inrange(yrschool,1,6)] |
[inrange(ccce_18,42,49) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_18=0.0 if [[inrange(ccce_18,23,34) &
yrschool==0] | [inrange(ccce_18,32,44) & inrange(yrschool,1,6)] |
[inrange(ccce_18,49,59) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_18=1.0 if [[inrange(ccce_18,34,44) &
yrschool==0] | [inrange(ccce_18,44,56) & inrange(yrschool,1,6)] |
[inrange(ccce_18,59,68) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_18=1.5 if [[inrange(ccce_18,44,46) &
yrschool==0] | [inrange(ccce_18,56,60) & inrange(yrschool,1,6)] |
[inrange(ccce_18,68,71) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_18=2.0 if [[inrange(ccce_18,46,53) &
yrschool==0] | [inrange(ccce_18,60,71) & inrange(yrschool,1,6)] |
[inrange(ccce_18,71,80) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace ccce_z_score_18=3.0 if [[inrange(ccce_18,53,100) &
yrschool==0] | [inrange(ccce_18,71,100) & inrange(yrschool,1,6)] |
[inrange(ccce_18,80,100) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)

replace ccce_z_score_18= ccce_18 if mi(ccce_18) &
ccce_z_score_18==.

```

```

replace ccce_z_score_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & ccce_z_score_18==.
replace ccce_z_score_18= .p if inlist(tipent_18,3,4)
label variable ccce_z_score_18 "MHAS 2018 CCCE Z-Scores"

** Impairment Status **
gen cognitive_imp_18 = .
label variable cognitive_imp_18 "MHAS 2018 Cognitive Impairment -
Normal, MCI, Impaired"
** Age <59 & Years of Education=0
replace cognitive_imp_18=2 if inrange(age_18,17,59) & yrschool==0 &
inrange(ccce_18,0,23)
replace cognitive_imp_18=1 if inrange(age_18,17,59) & yrschool==0 &
inrange(ccce_18,23,27)
replace cognitive_imp_18=0 if inrange(age_18,17,59) & yrschool==0 &
inrange(ccce_18,27,100)

** Age <59 & Years of Education 1-6
replace cognitive_imp_18=2 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(ccce_18,0,35)
replace cognitive_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(ccce_18,35,41)
replace cognitive_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(ccce_18,41,100)

** Age <59 & Years of Education 7+
replace cognitive_imp_18=2 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(ccce_18,0,50)
replace cognitive_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(ccce_18,50,54)
replace cognitive_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(ccce_18,54,100)

** Age 60-69 & Years of Education=0
replace cognitive_imp_18=2 if inrange(age_18,60,69) & yrschool==0 &
inrange(ccce_18,0,17)
replace cognitive_imp_18=1 if inrange(age_18,60,69) & yrschool==0 &
inrange(ccce_18,17,21)
replace cognitive_imp_18=0 if inrange(age_18,60,69) & yrschool==0 &
inrange(ccce_18,21,100)

** Age 60-69 & Years of Education 1-6
replace cognitive_imp_18=2 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(ccce_18,0,30)
replace cognitive_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(ccce_18,30,35)

```



```
replace cognitive_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(ccce_18,35,100)
```

```
** Age 60-69 & Years of Education 7+
```

```
replace cognitive_imp_18=2 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(ccce_18,0,39)
```

```
replace cognitive_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(ccce_18,39,44)
```

```
replace cognitive_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(ccce_18,44,100)
```

```
** Age 70-79 & Years of Education=0
```

```
replace cognitive_imp_18=2 if inrange(age_18,70,79) & yrschool==0 &
inrange(ccce_18,0,15)
```

```
replace cognitive_imp_18=1 if inrange(age_18,70,79) & yrschool==0 &
inrange(ccce_18,15,18)
```

```
replace cognitive_imp_18=0 if inrange(age_18,70,79) & yrschool==0 &
inrange(ccce_18,18,100)
```

```
** Age 70-79 & Years of Education 1-6
```

```
replace cognitive_imp_18=2 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(ccce_18,0,23)
```

```
replace cognitive_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(ccce_18,23,28)
```

```
replace cognitive_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(ccce_18,28,100)
```

```
** Age 70-79 & Years of Education 7+
```

```
replace cognitive_imp_18=2 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(ccce_18,0,39)
```

```
replace cognitive_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(ccce_18,39,44)
```

```
replace cognitive_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(ccce_18,44,100)
```

```
** Age 80+ & Years of Education=0
```

```
replace cognitive_imp_18=2 if inrange(age_18,80,120) & yrschool==0 &
inrange(ccce_18,0,10)
```

```
replace cognitive_imp_18=1 if inrange(age_18,80,120) & yrschool==0 &
inrange(ccce_18,10,13)
```

```
replace cognitive_imp_18=0 if inrange(age_18,80,120) & yrschool==0 &
inrange(ccce_18,13,100)
```

```
** Age 80+ & Years of Education 1-6
```

```

replace cognitive_imp_18=2 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(ccce_18,0,16)
replace cognitive_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(ccce_18,16,20)
replace cognitive_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(ccce_18,20,100)

** Age 80+ & Years of Education 7+
replace cognitive_imp_18=2 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(ccce_18,0,26)
replace cognitive_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(ccce_18,26,42)
replace cognitive_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(ccce_18,42,100)

replace cognitive_imp_18= ccce_18 if mi(ccce_18) &
cognitive_imp_18==.
replace cognitive_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & cognitive_imp_18==.
replace cognitive_imp_18= .p if inlist(tipent_18,3,4)
label define cognitive_imp_18 0 "0.Normal" 1 "1.MCI" 2 "2.Impaired",
replace
label values cognitive_imp_18 cognitive_imp_18

```

```

*** IMMEDIATE MEMORY Z-SCORES ***

```

```

** Z-SCORES **

```

```

gen iwr_z_18=.

```

```

replace iwr_z_18=-3.0 if [[inrange(iwr_18,0,2) & yrschool==0] |
[inrange(iwr_18,0,2) & inrange(yrschool,1,6)] | [inrange(iwr_18,0,3)
& inrange(yrschool,7,25)]] & inrange(age_18,17,59)

```

```

replace iwr_z_18=-2.0 if [[inrange(iwr_18,2,3) & yrschool==0] |
[inrange(iwr_18,2,3) & inrange(yrschool,1,6)] | [inrange(iwr_18,3,4)
& inrange(yrschool,7,25)]] & inrange(age_18,17,59)

```

```

replace iwr_z_18=-1.5 if [

```

```

[inrange(iwr_18,4,5) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)

```

```

replace iwr_z_18=-1.0 if [[inrange(iwr_18,3,4) & yrschool==0] |
[inrange(iwr_18,3,5) & inrange(yrschool,1,6)]
] & inrange(age_18,17,59)

```

```

replace iwr_z_18= 0.0 if [[inrange(iwr_18,4,6) & yrschool==0] |
[inrange(iwr_18,5,6) & inrange(yrschool,1,6)] | [inrange(iwr_18,5,7)
& inrange(yrschool,7,25)]] & inrange(age_18,17,59)

```

```

replace iwr_z_18= 1.0 if [[inrange(iwr_18,6,7) & yrschool==0] |
[inrange(iwr_18,6,7) & inrange(yrschool,1,6)]
] & inrange(age_18,17,59)

```

```

replace iwr_z_18= 1.5    if [
[inrange(iwr_18,7,8) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace iwr_z_18= 2.0    if [[inrange(iwr_18,7,8) & yrschool==0] |
[inrange(iwr_18,7,8) & inrange(yrschool,1,6)] | [ inlist(iwr_18,8)
& inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace iwr_z_18= 3.0    if [[ inlist(iwr_18,8)    & yrschool==0] | [
inlist(iwr_18,8)    & inrange(yrschool,1,6)]
] & inrange(age_18,17,59)

replace iwr_z_18=-3.0    if [[inrange(iwr_18,0,2) & yrschool==0] |
[inrange(iwr_18,0,3) & inrange(yrschool,1,6)] | [inrange(iwr_18,0,3)
& inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace iwr_z_18=-2.0    if [
[inrange(iwr_18,3,4) & inrange(yrschool,1,6)] | [inrange(iwr_18,3,4)
& inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace iwr_z_18=-1.5    if [[inrange(iwr_18,2,3) & yrschool==0] |

[inrange(iwr_18,4,5) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace iwr_z_18=-1.0    if [[inrange(iwr_18,3,4) & yrschool==0] |
[inrange(iwr_18,4,5) & inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace iwr_z_18= 0.0    if [[inrange(iwr_18,4,5) & yrschool==0] |
[inrange(iwr_18,5,6) & inrange(yrschool,1,6)] | [inrange(iwr_18,5,7)
& inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace iwr_z_18= 1.0    if [[inrange(iwr_18,5,6) & yrschool==0] |
[inrange(iwr_18,6,7) & inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace iwr_z_18= 1.5    if [

[inrange(iwr_18,7,8) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace iwr_z_18= 2.0    if [[inrange(iwr_18,6,7) & yrschool==0] |
[inrange(iwr_18,7,8) & inrange(yrschool,1,6)] | [inlist(iwr_18,8)
& inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace iwr_z_18= 3.0    if [[inrange(iwr_18,7,8) & yrschool==0] |
[inlist(iwr_18,8)    & inrange(yrschool,1,6)]
] & inrange(age_18,60,69)

replace iwr_z_18=-3.0    if [
[inrange(iwr_18,0,2) & inrange(yrschool,1,6)] | [inrange(iwr_18,0,3)
& inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace iwr_z_18=-2.0    if [[inrange(iwr_18,0,1) & yrschool==0] |

```



```
replace iwr_z_18= 2.0    if [[inrange(iwr_18,6,7) & yrschool==0] |
[inrange(iwr_18,7,8) & inrange(yrschool,1,6)] | [inrange(iwr_18,7,8)
& inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace iwr_z_18= 3.0    if [[inrange(iwr_18,7,8) & yrschool==0] | [
inlist(iwr_18,8)    & inrange(yrschool,1,6)] | [ inlist(iwr_18,8)    &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
```

```
replace iwr_z_18= iwr_18 if mi(iwr_18) & iwr_z_18==.
replace iwr_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & iwr_z_18==.
replace iwr_z_18= .p if inlist(tipent_18,3,4)
label variable iwr_z_18 "MHAS 2018 Immediate Memory Z-Scores"
```

```
** Impairment Status **
```

```
gen iwr_imp_18 = .
label variable iwr_imp_18 "MHAS 2018 Immediate Memory Impairment"
```

```
* age_18 <59 & Years of Education=0
```

```
replace iwr_imp_18=1 if inrange(age_18,17,59) & yrschool==0 &
inrange(iwr_18,0,3)
```

```
replace iwr_imp_18=0 if inrange(age_18,17,59) & yrschool==0 &
inrange(iwr_18,3,8)
```

```
* age_18 <59 & Years of Education 1-6
```

```
replace iwr_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(iwr_18,0,3)
```

```
replace iwr_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(iwr_18,3,8)
```

```
* age_18 <59 & Years of Education 7+
```

```
replace iwr_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(iwr_18,0,5)
```

```
replace iwr_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(iwr_18,5,8)
```

```
* age_18 60-69 & Years of Education=0
```

```
replace iwr_imp_18=1 if inrange(age_18,60,69) & yrschool==0 &
inrange(iwr_18,0,3)
```

```
replace iwr_imp_18=0 if inrange(age_18,60,69) & yrschool==0 &
inrange(iwr_18,3,8)
```

```
* age_18 60-69 & Years of Education 1-6
```

```
replace iwr_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(iwr_18,0,4)
```

```
replace iwr_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(iwr_18,4,8)
```

```
* age_18 60-69 & Years of Education 7+
```

```
replace iwr_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(iwr_18,0,5)
```

```
replace iwr_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(iwr_18,5,8)
```

```

* age_18 70-79 & Years of Education=0
replace iwr_imp_18=1 if inrange(age_18,70,79) & yrschool==0 &
inrange(iwr_18,0,2)
replace iwr_imp_18=0 if inrange(age_18,70,79) & yrschool==0 &
inrange(iwr_18,2,8)
* age_18 70-79 & Years of Education 1-6
replace iwr_imp_18=1 if inrange(age_18,70,79) & inrange(yrschool,1,6)
& inrange(iwr_18,0,3)
replace iwr_imp_18=0 if inrange(age_18,70,79) & inrange(yrschool,1,6)
& inrange(iwr_18,3,8)
* age_18 70-79 & Years of Education 7+
replace iwr_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(iwr_18,0,4)
replace iwr_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(iwr_18,4,8)

* age_18 80+ & Years of Education=0
replace iwr_imp_18=1 if inrange(age_18,80,120) & yrschool==0 &
inrange(iwr_18,0,2)
replace iwr_imp_18=0 if inrange(age_18,80,120) & yrschool==0 &
inrange(iwr_18,2,8)
* age_18 80+ & Years of Education 1-6
replace iwr_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(iwr_18,0,3)
replace iwr_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(iwr_18,3,8)
* age_18 80+ & Years of Education 7+
replace iwr_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(iwr_18,0,3)
replace iwr_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(iwr_18,3,8)

replace iwr_imp_18= iwr_18 if mi(iwr_18) & iwr_imp_18==.
replace iwr_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & iwr_imp_18==.
replace iwr_imp_18= .p if inlist(tipent_18,3,4)
label define cognitive_18 0 "0.Normal" 1 "1.Impaired", replace
label values iwr_imp_18 cognitive_18

```

```

*** DELAYED MEMORY Z-SCORES ***
*** Repeat 8 words ***
** Z-SCORES **
gen dwr_z_18=.

```

```

replace dwr_z_18= 2.0    if [[inlist(dwr_18,8)    & yrschool==0] |
[inlist(dwr_18,8)    & inrange(yrschool,1,6)] | [inlist(dwr_18,8)    &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace dwr_z_18= 1.5    if [[inlist(dwr_18,7)    & yrschool==0] |
[inlist(dwr_18,7)    & inrange(yrschool,1,6)]
                                ] & inrange(age_18,17,59)
replace dwr_z_18= 1.0    if [[inlist(dwr_18,5,6) & yrschool==0] |
[inlist(dwr_18,5,6) & inrange(yrschool,1,6)] | [inlist(dwr_18,7)    &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace dwr_z_18= 0.0    if [[inlist(dwr_18,3,4) & yrschool==0] |
[inlist(dwr_18,4)    & inrange(yrschool,1,6)] | [inlist(dwr_18,5,6) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace dwr_z_18=-1.0    if [[inlist(dwr_18,2) & yrschool==0] |
[inlist(dwr_18,3)    & inrange(yrschool,1,6)] | [inlist(dwr_18,4)    &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace dwr_z_18=-1.5    if [[inlist(dwr_18,1) & yrschool==0] |
[inlist(dwr_18,2)    & inrange(yrschool,1,6)] | [inlist(dwr_18,3)    &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace dwr_z_18=-2.0    if [[inlist(dwr_18,0) & yrschool==0] |
[inlist(dwr_18,1)    & inrange(yrschool,1,6)] | [inlist(dwr_18,2)    &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace dwr_z_18=-3.0    if [
[inlist(dwr_18,0)    & inrange(yrschool,1,6)] | [inlist(dwr_18,0,1) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)

replace dwr_z_18= 2.0    if [[inlist(dwr_18,8)    & yrschool==0] |
[inlist(dwr_18,7,8) & inrange(yrschool,1,6)] | [inlist(dwr_18,8)
    & inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace dwr_z_18= 1.5    if [[inlist(dwr_18,7)    & yrschool==0]
                                ] & inrange(age_18,60,69)
replace dwr_z_18= 1.0    if [[inlist(dwr_18,5,6) & yrschool==0] |
[inlist(dwr_18,6)    & inrange(yrschool,1,6)] | [inlist(dwr_18,7)    &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace dwr_z_18= 0.0    if [[inlist(dwr_18,3,4) & yrschool==0] |
[inlist(dwr_18,4,5) & inrange(yrschool,1,6)] | [inlist(dwr_18,5,6) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace dwr_z_18=-1.0    if [[inlist(dwr_18,2)    & yrschool==0] |
[inlist(dwr_18,3)    & inrange(yrschool,1,6)] | [inlist(dwr_18,4)    &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace dwr_z_18=-1.5    if [[inlist(dwr_18,1)    & yrschool==0] |
[inlist(dwr_18,2)    & inrange(yrschool,1,6)] | [inlist(dwr_18,3)    &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace dwr_z_18=-2.0    if [[inlist(dwr_18,0)    & yrschool==0] |
[inlist(dwr_18,0,1) & inrange(yrschool,1,6)] | [inlist(dwr_18,2)    &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)

```

```

replace dwr_z_18=-3.0    if [
    [inlist(dwr_18,0,1) & inrange(yrschool,7,25)] &
inrange(age_18,60,69)

replace dwr_z_18= 3.0    if [[inlist(dwr_18,8)    & yrschool==0]
                                ] & inrange(age_18,70,79)
replace dwr_z_18= 2.0    if [[inlist(dwr_18,7)    & yrschool==0] |
[inlist(dwr_18,8)    & inrange(yrschool,1,6)] | [inlist(dwr_18,8)
    & inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace dwr_z_18= 1.5    if [[inlist(dwr_18,6)    & yrschool==0] |
[inlist(dwr_18,7)    & inrange(yrschool,1,6)]
                                ] & inrange(age_18,70,79)
replace dwr_z_18= 1.0    if [[inlist(dwr_18,5)    & yrschool==0] |
[inlist(dwr_18,5,6) & inrange(yrschool,1,6)] | [inlist(dwr_18,6,7) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace dwr_z_18= 0.0    if [[inlist(dwr_18,3,4) & yrschool==0] |
[inlist(dwr_18,3,4) & inrange(yrschool,1,6)] | [inlist(dwr_18,4,5) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace dwr_z_18=-1.0    if [[inlist(dwr_18,1,2) & yrschool==0] |
[inlist(dwr_18,2)    & inrange(yrschool,1,6)] | [inlist(dwr_18,3)    &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace dwr_z_18=-1.5    if [[inlist(dwr_18,0)    & yrschool==0] |
[inlist(dwr_18,1)    & inrange(yrschool,1,6)] | [inlist(dwr_18,2)    &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace dwr_z_18=-2.0    if [
    [inlist(dwr_18,0)    & inrange(yrschool,1,6)] |
[inlist(dwr_18,0,1) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)

replace dwr_z_18= 3.0    if [[inlist(dwr_18,8)    & yrschool==0] |
[inlist(dwr_18,8)    & inrange(yrschool,1,6)]
                                ] & inrange(age_18,80,120)
replace dwr_z_18= 2.0    if [[inlist(dwr_18,6,7) & yrschool==0] |
[inlist(dwr_18,7)    & inrange(yrschool,1,6)] | [inlist(dwr_18,7,8)
& inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace dwr_z_18= 1.5    if [[inlist(dwr_18,5)    & yrschool==0] |
[inlist(dwr_18,6)    & inrange(yrschool,1,6)]
                                ] & inrange(age_18,80,120)
replace dwr_z_18= 1.0    if [[inlist(dwr_18,4)    & yrschool==0] |
[inlist(dwr_18,5)    & inrange(yrschool,1,6)] | [inlist(dwr_18,5,6)
& inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace dwr_z_18= 0.0    if [[inlist(dwr_18,3)    & yrschool==0] |
[inlist(dwr_18,2,3,4) & inrange(yrschool,1,6)] | [inlist(dwr_18,3,4)
& inrange(yrschool,7,25)]] & inrange(age_18,80,120)

```



```

replace dwr_z_18=-1.0    if [[inlist(dwr_18,1,2) & yrschool==0] |
[inlist(dwr_18,1)      & inrange(yrschool,1,6)] | [inlist(dwr_18,1,2)
& inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace dwr_z_18=-1.5    if [[inlist(dwr_18,0)      & yrschool==0] |
[inlist(dwr_18,0)      & inrange(yrschool,1,6)] | [inlist(dwr_18,0)
& inrange(yrschool,7,25)]] & inrange(age_18,80,120)

replace dwr_z_18= dwr_18 if mi(dwr_18) & dwr_z_18==.
replace dwr_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & dwr_z_18==.
replace dwr_z_18= .p if inlist(tipent_18,3,4)
label variable dwr_z_18 "MHAS 2018 Delayed Memory - Repeat 8 words Z-
Scores"

** Impairment Status **
gen dwr_imp_18 = .
label variable dwr_imp_18 "MHAS 2018 Delayed Memory - Repeat 8 words
Impairment"
* age_18 <59 & Years of Education=0
replace dwr_imp_18=1 if inrange(age_18,17,59) & yrschool==0 &
inrange(dwr_18,0,1)
replace dwr_imp_18=0 if inrange(age_18,17,59) & yrschool==0 &
inrange(dwr_18,2,8)
* age_18 <59 & Years of Education 1-6
replace dwr_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(dwr_18,0,2)
replace dwr_imp_18=0 if inrange(age_18,17,659) &
inrange(yrschool,1,6) & inrange(dwr_18,3,8)
* age_18 <59 & Years of Education 7+
replace dwr_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(dwr_18,0,3)
replace dwr_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(dwr_18,4,8)

* age_18 60-69 & Years of Education=0
replace dwr_imp_18=1 if inrange(age_18,60,69) & yrschool==0 &
inrange(dwr_18,0,1)
replace dwr_imp_18=0 if inrange(age_18,60,69) & yrschool==0 &
inrange(dwr_18,2,8)
* age_18 60-69 & Years of Education 1-6
replace dwr_imp_18=1 if inrange(age_18,60,69) & inrange(yrschool,1,6)
& inrange(dwr_18,0,2)
replace dwr_imp_18=0 if inrange(age_18,60,69) & inrange(yrschool,1,6)
& inrange(dwr_18,3,8)
* age_18 60-69 & Years of Education 7+
replace dwr_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(dwr_18,0,3)

```

```

replace dwr_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(dwr_18,4,8)

* age_18 70-79 & Years of Education=0
replace dwr_imp_18=1 if inrange(age_18,70,79) & yrschool==0 &
inlist(dwr_18,0)
replace dwr_imp_18=0 if inrange(age_18,70,79) & yrschool==0 &
inrange(dwr_18,1,8)
* age_18 70-79 & Years of Education 1-6
replace dwr_imp_18=1 if inrange(age_18,70,79) & inrange(yrschool,1,6)
& inrange(dwr_18,0,1)
replace dwr_imp_18=0 if inrange(age_18,70,79) & inrange(yrschool,1,6)
& inrange(dwr_18,2,8)
* age_18 70-79 & Years of Education 7+
replace dwr_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(dwr_18,0,2)
replace dwr_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(dwr_18,3,8)

* age_18 80+ & Years of Education=0
replace dwr_imp_18=1 if inrange(age_18,80,120) & yrschool==0 &
inlist(dwr_18,0)
replace dwr_imp_18=0 if inrange(age_18,80,120) & yrschool==0 &
inrange(dwr_18,1,8)
* age_18 80+ & Years of Education 1-6
replace dwr_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inlist(dwr_18,0)
replace dwr_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(dwr_18,1,8)
* age_18 80+ & Years of Education 7+
replace dwr_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inlist(dwr_18,0)
replace dwr_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(dwr_18,1,8)

replace dwr_imp_18= dwr_18 if mi(dwr_18) & dwr_imp_18==.
replace dwr_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & dwr_imp_18==.
replace dwr_imp_18= .p if inlist(tipent_18,3,4)
label values dwr_imp_18 cognitive_18

```

*** ATTENTION Z-SCORES ***

*** Visual Scan ***

** Z-SCORES **

gen visual_scan_z_18=.

```

replace visual_scan_z_18= 3.0 if [[inrange(visual_scan_18,51,60) &
yrschool==0]
] & inrange(age_18,17,59)
replace visual_scan_z_18= 2.0 if [[inrange(visual_scan_18,42,50) &
yrschool==0] | [inrange(visual_scan_18,55,60) &
inrange(yrschool,1,6)]
] & inrange(age_18,17,59)
replace visual_scan_z_18= 1.5 if [[inrange(visual_scan_18,38,41) &
yrschool==0] | [inrange(visual_scan_18,50,54) &
inrange(yrschool,1,6)]
] & inrange(age_18,17,59)
replace visual_scan_z_18= 1.0 if [[inrange(visual_scan_18,28,37) &
yrschool==0] | [inrange(visual_scan_18,38,49) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,50,60) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace visual_scan_z_18= 0.0 if [[inrange(visual_scan_18,17,27) &
yrschool==0] | [inrange(visual_scan_18,26,37) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,38,49) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace visual_scan_z_18=-1.0 if [[inrange(visual_scan_18,8,16) &
yrschool==0] | [inrange(visual_scan_18,14,25) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,27,37) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace visual_scan_z_18=-1.5 if [[inrange(visual_scan_18,3,7) &
yrschool==0] | [inrange(visual_scan_18,10,13) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,23,26) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace visual_scan_z_18=-2.0 if [[inrange(visual_scan_18,0,2) &
yrschool==0] | [inrange(visual_scan_18,0,9) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,13,22) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace visual_scan_z_18=-3.0 if [
[inrange(visual_scan_18,0,12) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)

replace visual_scan_z_18= 3.0 if [[inrange(visual_scan_18,47,60) &
yrschool==0] | [inlist(visual_scan_18,60) &
inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace visual_scan_z_18= 2.0 if [[inrange(visual_scan_18,38,46) &
yrschool==0] | [inrange(visual_scan_18,50,59) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,59,60) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace visual_scan_z_18= 1.5 if [[inrange(visual_scan_18,34,37) &
yrschool==0] | [inrange(visual_scan_18,46,49) &

```

```

inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace visual_scan_z_18= 1.0 if [[inrange(visual_scan_18,23,33) &
yrschool==0] | [inrange(visual_scan_18,34,45) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,47,58) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace visual_scan_z_18= 0.0 if [[inrange(visual_scan_18,13,22) &
yrschool==0] | [inrange(visual_scan_18,23,33) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,35,46) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace visual_scan_z_18=-1.0 if [[inrange(visual_scan_18,2,12) &
yrschool==0] | [inrange(visual_scan_18,11,22) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,23,34) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace visual_scan_z_18=-1.5 if [[inrange(visual_scan_18,0,1) &
yrschool==0] | [inrange(visual_scan_18,8,10) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,19,22) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace visual_scan_z_18=-2.0 if [
[inrange(visual_scan_18,0,7) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,8,18) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace visual_scan_z_18=-3.0 if [
[inrange(visual_scan_18,0,7) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)

replace visual_scan_z_18= 3.0 if [[inrange(visual_scan_18,38,60) &
yrschool==0] | [inrange(visual_scan_18,53,60) &
inrange(yrschool,1,6)]
] & inrange(age_18,70,79)
replace visual_scan_z_18= 2.0 if [[inrange(visual_scan_18,30,38) &
yrschool==0] | [inrange(visual_scan_18,44,52) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,59,60) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace visual_scan_z_18= 1.5 if [[inrange(visual_scan_18,27,31) &
yrschool==0] | [inrange(visual_scan_18,40,43) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,55,58) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace visual_scan_z_18= 1.0 if [[inrange(visual_scan_18,19,27) &
yrschool==0] | [inrange(visual_scan_18,29,39) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,43,54) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace visual_scan_z_18= 0.0 if [[inrange(visual_scan_18,10,21) &
yrschool==0] | [inrange(visual_scan_18,18,28) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,31,42) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)

```

```

replace visual_scan_z_18=-1.0 if [[inrange(visual_scan_18,2,9) &
yrschool==0] | [inrange(visual_scan_18,7,17) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,19,30) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace visual_scan_z_18=-1.5 if [[inrange(visual_scan_18,0,3) &
yrschool==0] | [inrange(visual_scan_18,3,6) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,15,18) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace visual_scan_z_18=-2.0 if [
[inrange(visual_scan_18,0,2) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,5,14) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace visual_scan_z_18=-3.0 if [
[inrange(visual_scan_18,0,4) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)

replace visual_scan_z_18= 3.0 if [[inrange(visual_scan_18,28,60) &
yrschool==0] | [inrange(visual_scan_18,42,60) &
inrange(yrschool,1,6)
] & inrange(age_18,80,120)
replace visual_scan_z_18= 2.0 if [[inrange(visual_scan_18,26,27) &
yrschool==0] | [inrange(visual_scan_18,34,41) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,49,60) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace visual_scan_z_18= 1.5 if [[inrange(visual_scan_18,24,25) &
yrschool==0] | [inrange(visual_scan_18,31,33) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,44,48) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace visual_scan_z_18= 1.0 if [[inrange(visual_scan_18,15,23) &
yrschool==0] | [inrange(visual_scan_18,21,30) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,31,43) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace visual_scan_z_18= 0.0 if [[inrange(visual_scan_18,7,14) &
yrschool==0] | [inrange(visual_scan_18,12,20) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,19,30) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace visual_scan_z_18=-1.0 if [[inrange(visual_scan_18,0,6) &
yrschool==0] | [inrange(visual_scan_18,3,11) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,6,18) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace visual_scan_z_18=-1.5 if [
[inrange(visual_scan_18,0,2) &
inrange(yrschool,1,6)] | [inrange(visual_scan_18,2,5) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace visual_scan_z_18=-2.0 if [

```

```

[inrange(visual_scan_18,0,1) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)

replace visual_scan_z_18= visual_scan_18 if mi(visual_scan_18) &
visual_scan_z_18==.
replace visual_scan_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & visual_scan_z_18==.
replace visual_scan_z_18= .p if inlist(tipent_18,3,4)
label variable visual_scan_z_18 "MHAS 2018 Attention - Visual Scan Z-
Scores"

** Impairment Status **
gen visual_scan_imp_18 = .
label variable visual_scan_imp_18 "MHAS 2018 Attention - Visual Scan
Impairment"

* age_18 <59 & Years of Education=0
replace visual_scan_imp_18=1 if inrange(age_18,17,69) & yrschool==0 &
inrange(visual_scan_18,0,7)
replace visual_scan_imp_18=0 if inrange(age_18,17,69) & yrschool==0 &
inrange(visual_scan_18,8,60)
* age_18 <59 & Years of Education 1-6
replace visual_scan_imp_18=1 if inrange(age_18,17,69) &
inrange(yrschool,1,6) & inrange(visual_scan_18,0,13)
replace visual_scan_imp_18=0 if inrange(age_18,17,69) &
inrange(yrschool,1,6) & inrange(visual_scan_18,14,60)
* age_18 <59 & Years of Education 7+
replace visual_scan_imp_18=1 if inrange(age_18,17,69) &
inrange(yrschool,7,25) & inrange(visual_scan_18,0,26)
replace visual_scan_imp_18=0 if inrange(age_18,17,69) &
inrange(yrschool,7,25) & inrange(visual_scan_18,27,60)

* age_18 60-69 & Years of Education=0
replace visual_scan_imp_18=1 if inrange(age_18,17,69) & yrschool==0 &
inrange(visual_scan_18,0,1)
replace visual_scan_imp_18=0 if inrange(age_18,17,69) & yrschool==0 &
inrange(visual_scan_18,2,60)
* age_18 60-69 & Years of Education 1-6
replace visual_scan_imp_18=1 if inrange(age_18,17,69) &
inrange(yrschool,1,6) & inrange(visual_scan_18,0,10)
replace visual_scan_imp_18=0 if inrange(age_18,17,69) &
inrange(yrschool,1,6) & inrange(visual_scan_18,11,60)
* age_18 60-69 & Years of Education 7+
replace visual_scan_imp_18=1 if inrange(age_18,17,69) &
inrange(yrschool,7,25) & inrange(visual_scan_18,0,22)
replace visual_scan_imp_18=0 if inrange(age_18,17,69) &
inrange(yrschool,7,25) & inrange(visual_scan_18,23,60)

```

```

* age_18 70-79 & Years of Education=0
replace visual_scan_imp_18=1 if inrange(age_18,70,79) & yrschool==0 &
inrange(visual_scan_18,0,1)
replace visual_scan_imp_18=0 if inrange(age_18,70,79) & yrschool==0 &
inrange(visual_scan_18,2,60)
* age_18 70-79 & Years of Education 1-6
replace visual_scan_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(visual_scan_18,0,6)
replace visual_scan_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(visual_scan_18,7,60)
* age_18 70-79 & Years of Education 7+
replace visual_scan_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(visual_scan_18,0,18)
replace visual_scan_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(visual_scan_18,19,60)

* age_18 80+ & Years of Education=0
//replace visual_scan_imp_18=1 if inrange(age_18,80,120) &
yrschool==0 & inrange(visual_scan_18,)
replace visual_scan_imp_18=0 if inrange(age_18,80,120) & yrschool==0
& inrange(visual_scan_18,0,60)
* age_18 80+ & Years of Education 1-6
replace visual_scan_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(visual_scan_18,0,2)
replace visual_scan_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(visual_scan_18,3,60)
* age_18 80+ & Years of Education 7+
replace visual_scan_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(visual_scan_18,0,5)
replace visual_scan_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(visual_scan_18,6,60)

replace visual_scan_imp_18= visual_scan_18 if mi(visual_scan_18) &
visual_scan_imp_18==.
replace visual_scan_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & visual_scan_imp_18==.
replace visual_scan_imp_18= .p if inlist(tipent_18,3,4)
label values visual_scan_imp_18 cognitive_18

*** ORIENTATION Z-SCORES ***
gen orientation_z_18=.
replace orientation_z_18= 3.0 if [
[inlist(orientation_18,2,3) &
inrange(yrschool,1,6)] | [inlist(orientation_18,1,2,3) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)

```

```

replace orientation_z_18= 2.0 if [[inlist(orientation_18,3) &
yrschool==0]

] & inrange(age_18,17,59)
replace orientation_z_18= 1.5 if [
[inlist(orientation_18,1) &
inrange(yrschool,1,6)]
] & inrange(age_18,17,59)
replace orientation_z_18= 1.0 if [[inlist(orientation_18,2) &
yrschool==0]

] & inrange(age_18,17,59)
replace orientation_z_18= 0.0 if [[inlist(orientation_18,1) &
yrschool==0] | [inlist(orientation_18,0) & inrange(yrschool,1,6)]
] &
inrange(age_18,17,59)
replace orientation_z_18=-1.0 if [[inlist(orientation_18,0) &
yrschool==0]

] & inrange(age_18,17,59)
replace orientation_z_18=-2.0 if [
[inlist(orientation_18,0) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)

replace orientation_z_18= 3.0 if [[inlist(orientation_18,3) &
yrschool==0] | [inlist(orientation_18,2,3) & inrange(yrschool,1,6)] |
[inlist(orientation_18,1,2,3) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace orientation_z_18= 1.5 if [[inlist(orientation_18,2) &
yrschool==0]

] & inrange(age_18,60,69)
replace orientation_z_18= 1.0 if [
[inlist(orientation_18,1) &
inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace orientation_z_18= 0.0 if [[inlist(orientation_18,1) &
yrschool==0] | [inlist(orientation_18,0) & inrange(yrschool,1,6)] |
[inlist(orientation_18,0) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace orientation_z_18=-1.0 if [[inlist(orientation_18,0) &
yrschool==0]

] & inrange(age_18,60,69)

```



```

replace  orientation_z_18= 3.0    if [
                [inlist(orientation_18,2,3) &
inrange(yrschool,1,6)] | [inlist(orientation_18,2,3) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace  orientation_z_18= 2.0    if [[inlist(orientation_18,3) &
yrschool==0] |
                [inlist(orientation_18,1) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace  orientation_z_18= 1.0    if [[inlist(orientation_18,2) &
yrschool==0] | [inlist(orientation_18,1) & inrange(yrschool,1,6)]
                ] &
inrange(age_18,70,79)
replace  orientation_z_18= 0.0    if [[inlist(orientation_18,1) &
yrschool==0] | [inlist(orientation_18,0) & inrange(yrschool,1,6)] |
[inlist(orientation_18,0) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace  orientation_z_18=-1.0   if [[inlist(orientation_18,0) &
yrschool==0]
                ] & inrange(age_18,70,79)

replace  orientation_z_18= 3.0    if [
                [inlist(orientation_18,3) &
inrange(yrschool,1,6)] | [inlist(orientation_18,3) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace  orientation_z_18= 2.0    if [
                [inlist(orientation_18,2) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace  orientation_z_18= 1.5    if [[inlist(orientation_18,3) &
yrschool==0] | [inlist(orientation_18,2) & inrange(yrschool,1,6)]
                ] &
inrange(age_18,80,120)
replace  orientation_z_18= 1.0    if [[inlist(orientation_18,2) &
yrschool==0] |
                [inlist(orientation_18,1) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace  orientation_z_18= 0.0    if [[inlist(orientation_18,1) &
yrschool==0] |
                [inlist(orientation_18,0) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace  orientation_z_18=-1.0   if [[inlist(orientation_18,0) &
yrschool==0] | [inlist(orientation_18,0,1) & inrange(yrschool,1,6)]
                ] & inrange(age_18,80,120)

```

```
replace orientation_z_18= orientation_18 if mi(orientation_18) &
orientation_z_18==.
replace orientation_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & orientation_z_18==.
replace orientation_z_18= .p if inlist(tipent_18,3,4)
label variable orientation_z_18 "MHAS 2018 Attention - Orientation Z-
Scores"
```

```
** Impairment Status **
gen orientation_imp_18 = .
label variable orientation_imp_18 "MHAS 2018 Attention - Orientation
Impairment"
```

```
* age_18 <59 & Years of Education=0
//replace orientation_imp_18=1 if inrange(age_18,17,59) & yrschool==0
& inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,17,59) & yrschool==0 &
inrange(orientation_18,0,3)
```

```
* age_18 <59 & Years of Education 1-6
//replace orientation_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(orientation_18,0,3)
```

```
* age_18 <59 & Years of Education 7+
replace orientation_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inlist(orientation_18,0)
replace orientation_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(orientation_18,1,3)
```

```
* age_18 60-69 & Years of Education=0
//replace orientation_imp_18=1 if inrange(age_18,60,69) & yrschool==0
& inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,60,69) & yrschool==0 &
inrange(orientation_18,0,3)
```

```
* age_18 60-69 & Years of Education 1-6
//replace orientation_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(orientation_18,0,3)
```

```
* age_18 60-69 & Years of Education 7+
//replace orientation_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(orientation_18,0,3)
```

```
* age_18 70-79 & Years of Education=0
```

```

//replace orientation_imp_18=1 if inrange(age_18,70,79) & yrschool==0
& inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,70,79) & yrschool==0 &
inrange(orientation_18,0,3)
* age_18 70-79 & Years of Education 1-6
//replace orientation_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(orientation_18,0,3)
* age_18 70-79 & Years of Education 7+
//replace orientation_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(orientation_18,0,3)

* age_18 80+ & Years of Education=0
//replace orientation_imp_18=1 if inrange(age_18,80,120) &
yrschool==0 & inlist(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,80,120) & yrschool==0
& inrange(orientation_18,0,3)
* age_18 80+ & Years of Education 1-6
//replace orientation_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(orientation_18,0,3)
* age_18 80+ & Years of Education 7+
//replace orientation_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(orientation_18,)
replace orientation_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(orientation_18,0,3)

replace orientation_imp_18= orientation_18 if mi(orientation_18) &
orientation_imp_18==.
replace orientation_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & orientation_imp_18==.
replace orientation_imp_18= .p if inlist(tipent_18,3,4)
label values orientation_imp_18 cognitive_18

```

*** EXECUTIVE FUNCTION Z-SCORES ***

** Verbal fluency z-scores **

gen verbal_fluency_z_18=.

replace verbal_fluency_z_18= 3.0 if

[[inrange(verbal_fluency_num_18,24,40) & yrschool==0] |

[inrange(verbal_fluency_num_18,27,40) & inrange(yrschool,1,6)] |

[inrange(verbal_fluency_num_18,27,40) & inrange(yrschool,7,25)]] &

inrange(age_18,17,59)

```

replace verbal_fluency_z_18= 2.0 if
[[inrange(verbal_fluency_num_18,20,23) & yrschool==0] |
[inrange(verbal_fluency_num_18,23,26) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,27,40) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace verbal_fluency_z_18= 1.5 if [[
inlist(verbal_fluency_num_18,19)      & yrschool==0] | [
inlist(verbal_fluency_num_18,22)      & inrange(yrschool,1,6)] | [
inlist(verbal_fluency_num_18,26)      & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace verbal_fluency_z_18= 1.0 if
[[inrange(verbal_fluency_num_18,15,18) & yrschool==0] |
[inrange(verbal_fluency_num_18,18,21) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,22,25) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace verbal_fluency_z_18= 0.0 if
[[inrange(verbal_fluency_num_18,12,14) & yrschool==0] |
[inrange(verbal_fluency_num_18,14,17) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,17,21) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace verbal_fluency_z_18=-1.0 if
[[inrange(verbal_fluency_num_18,8,11)  & yrschool==0] |
[inrange(verbal_fluency_num_18,10,13) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,13,16) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace verbal_fluency_z_18=-1.5 if [[
inlist(verbal_fluency_num_18,7)        & yrschool==0] | [
inlist(verbal_fluency_num_18,9)        & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,11,12) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace verbal_fluency_z_18=-2.0 if
[[inrange(verbal_fluency_num_18,4,6)    & yrschool==0] |
[inrange(verbal_fluency_num_18,5,8)    & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,7,10)   & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace verbal_fluency_z_18=-3.0 if
[[inrange(verbal_fluency_num_18,0,3)    & yrschool==0] |
[inrange(verbal_fluency_num_18,0,4)    & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,0,6)    & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)

replace verbal_fluency_z_18= 3.0 if
[[inrange(verbal_fluency_num_18,24,40) & yrschool==0] |
[inrange(verbal_fluency_num_18,27,40) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,31,40) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)

```

```

replace verbal_fluency_z_18= 2.0 if
[[inrange(verbal_fluency_num_18,20,23) & yrschool==0] |
[inrange(verbal_fluency_num_18,24,26) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,27,30) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace verbal_fluency_z_18= 1.5 if [[
inlist(verbal_fluency_num_18,19)      & yrschool==0] |
[inrange(verbal_fluency_num_18,22,23) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,25,26) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace verbal_fluency_z_18= 1.0 if
[[inrange(verbal_fluency_num_18,15,18) & yrschool==0] |
[inrange(verbal_fluency_num_18,18,21) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,21,24) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace verbal_fluency_z_18= 0.0 if
[[inrange(verbal_fluency_num_18,11,14) & yrschool==0] |
[inrange(verbal_fluency_num_18,14,17) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,16,20) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace verbal_fluency_z_18=-1.0 if
[[inrange(verbal_fluency_num_18,8,10)  & yrschool==0] |
[inrange(verbal_fluency_num_18,10,13) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,12,15) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace verbal_fluency_z_18=-1.5 if [[
inlist(verbal_fluency_num_18,7)      & yrschool==0] |
[inrange(verbal_fluency_num_18,8,9)  & inrange(yrschool,1,6)] | [
inlist(verbal_fluency_num_18,11)    & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace verbal_fluency_z_18=-2.0 if
[[inrange(verbal_fluency_num_18,4,6)   & yrschool==0] |
[inrange(verbal_fluency_num_18,5,7)   & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,7,10)  & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace verbal_fluency_z_18=-3.0 if
[[inrange(verbal_fluency_num_18,0,3)   & yrschool==0] |
[inrange(verbal_fluency_num_18,0,4)   & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,0,6)   & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)

replace verbal_fluency_z_18= 3.0 if
[[inrange(verbal_fluency_num_18,23,50) & yrschool==0] |
[inrange(verbal_fluency_num_18,25,40) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,30,40) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)

```

```

replace verbal_fluency_z_18= 2.0 if
[[inrange(verbal_fluency_num_18,20,22) & yrschool==0] |
[inrange(verbal_fluency_num_18,22,24) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,26,29) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace verbal_fluency_z_18= 1.5 if [[
inlist(verbal_fluency_num_18,19)      & yrschool==0] | [
inlist(verbal_fluency_num_18,21)      & inrange(yrschool,1,6)] | [
inlist(verbal_fluency_num_18,25)      & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace verbal_fluency_z_18= 1.0 if
[[inrange(verbal_fluency_num_18,15,18) & yrschool==0] |
[inrange(verbal_fluency_num_18,16,20) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,20,24) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace verbal_fluency_z_18= 0.0 if
[[inrange(verbal_fluency_num_18,11,14) & yrschool==0] |
[inrange(verbal_fluency_num_18,12,15) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,16,19) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace verbal_fluency_z_18=-1.0 if
[[inrange(verbal_fluency_num_18,7,10)  & yrschool==0] |
[inrange(verbal_fluency_num_18,8,11)   & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,11,15)  & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace verbal_fluency_z_18=-1.5 if [[
inlist(verbal_fluency_num_18,6)        & yrschool==0] | [
inlist(verbal_fluency_num_18,7)        & inrange(yrschool,1,6)] | [
inlist(verbal_fluency_num_18,10)       & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace verbal_fluency_z_18=-2.0 if
[[inrange(verbal_fluency_num_18,3,5)    & yrschool==0] |
[inrange(verbal_fluency_num_18,4,6)     & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,6,9)     & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace verbal_fluency_z_18=-3.0 if
[[inrange(verbal_fluency_num_18,0,2)    & yrschool==0] |
[inrange(verbal_fluency_num_18,0,3)     & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,0,5)     & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)

replace verbal_fluency_z_18= 3.0 if
[[inrange(verbal_fluency_num_18,21,40) & yrschool==0] |
[inrange(verbal_fluency_num_18,21,40) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,27,40) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)

```

```

replace verbal_fluency_z_18= 2.0 if
[[inrange(verbal_fluency_num_18,18,20) & yrschool==0] |
[inrange(verbal_fluency_num_18,18,20) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,23,26) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace verbal_fluency_z_18= 1.5 if [[
inlist(verbal_fluency_num_18,17)      & yrschool==0] | [
inlist(verbal_fluency_num_18,17)      & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,21,22) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace verbal_fluency_z_18= 1.0 if
[[inrange(verbal_fluency_num_18,13,16) & yrschool==0] |
[inrange(verbal_fluency_num_18,13,16) & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,18,20) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace verbal_fluency_z_18= 0.0 if
[[inrange(verbal_fluency_num_18,9,12)  & yrschool==0] |
[inrange(verbal_fluency_num_18,9,12)  & inrange(yrschool,1,6)] | [
inlist(verbal_fluency_num_18,17)      & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace verbal_fluency_z_18=-1.0 if
[[inrange(verbal_fluency_num_18,5,8)   & yrschool==0] |
[inrange(verbal_fluency_num_18,5,8)   & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,8,16)  & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace verbal_fluency_z_18=-1.5 if [[
inlist(verbal_fluency_num_18,4)        & yrschool==0] | [
inlist(verbal_fluency_num_18,4)        & inrange(yrschool,1,6)] | [
inlist(verbal_fluency_num_18,7)        & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace verbal_fluency_z_18=-2.0 if
[[inrange(verbal_fluency_num_18,1,3)   & yrschool==0] |
[inrange(verbal_fluency_num_18,1,3)   & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,3,6)   & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace verbal_fluency_z_18=-3.0 if [[
inlist(verbal_fluency_num_18,0)        & yrschool==0] | [
inlist(verbal_fluency_num_18,0)        & inrange(yrschool,1,6)] |
[inrange(verbal_fluency_num_18,0,2)   & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)

replace verbal_fluency_z_18= verbal_fluency_num_18 if
mi(verbal_fluency_num_18) & verbal_fluency_z_18==.
replace verbal_fluency_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & verbal_fluency_z_18==.
replace verbal_fluency_z_18= .p if inlist(tipent_18,3,4)

```

```

label variable verbal_fluency_z_18 "MHAS 2018 Executive function -
Verbal Fluency Z-Scores"

** Impairment Status **
gen verbal_fluency_imp_18 = .
label variable verbal_fluency_imp_18 "MHAS 2018 Executive function -
Verbal Fluency Impairment"

* age_18 <59 & Years of Education=0
replace verbal_fluency_imp_18=1 if inrange(age_18,17,59) &
yrschool==0 & inrange(verbal_fluency_num_18,0,7)
replace verbal_fluency_imp_18=0 if inrange(age_18,17,59) &
yrschool==0 & inrange(verbal_fluency_num_18,8,40)
* age_18 <59 & Years of Education 1-6
replace verbal_fluency_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,0,9)
replace verbal_fluency_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,10,40)
* age_18 <59 & Years of Education 7+
replace verbal_fluency_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,0,12)
replace verbal_fluency_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,13,50)

* age_18 60-69 & Years of Education=0
replace verbal_fluency_imp_18=1 if inrange(age_18,60,69) &
yrschool==0 & inrange(verbal_fluency_num_18,0,7)
replace verbal_fluency_imp_18=0 if inrange(age_18,60,69) &
yrschool==0 & inrange(verbal_fluency_num_18,8,40)
* age_18 60-69 & Years of Education 1-6
replace verbal_fluency_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,0,9)
replace verbal_fluency_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,10,40)
* age_18 60-69 & Years of Education 7+
replace verbal_fluency_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,0,11)
replace verbal_fluency_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,12,50)

* age_18 70-79 & Years of Education=0
replace verbal_fluency_imp_18=1 if inrange(age_18,70,79) &
yrschool==0 & inrange(verbal_fluency_num_18,0,6)
replace verbal_fluency_imp_18=0 if inrange(age_18,70,79) &
yrschool==0 & inrange(verbal_fluency_num_18,7,50)
* age_18 70-79 & Years of Education 1-6

```



```

replace verbal_fluency_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,0,7)
replace verbal_fluency_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,8,50)
* age_18 70-79 & Years of Education 7+
replace verbal_fluency_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,0,10)
replace verbal_fluency_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,11,50)

```

```

* age_18 80+ & Years of Education=0
replace verbal_fluency_imp_18=1 if inrange(age_18,80,120) &
yrschool==0 & inrange(verbal_fluency_num_18,0,4)
replace verbal_fluency_imp_18=0 if inrange(age_18,80,120) &
yrschool==0 & inrange(verbal_fluency_num_18,5,50)
* age_18 80+ & Years of Education 1-6
replace verbal_fluency_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,0,4)
replace verbal_fluency_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(verbal_fluency_num_18,5,50)
* age_18 80+ & Years of Education 7+
replace verbal_fluency_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,0,7)
replace verbal_fluency_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(verbal_fluency_num_18,8,50)

```

```

replace verbal_fluency_imp_18= verbal_fluency_num_18 if
mi(verbal_fluency_num_18) & verbal_fluency_imp_18==.
replace verbal_fluency_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & verbal_fluency_imp_18==.
replace verbal_fluency_imp_18= .p if inlist(tipent_18,3,4)
label values verbal_fluency_imp_18 cognitive_18

```

```

** Serial 7 z-scores **

```

```

gen serial7_z_18=.
//replace serial7_z_18= 3.0    if [
                                                                    ] &

```

```

inrange(age_18,17,59)
//replace serial7_z_18= 2.0    if [

```

```

                                                                    ] &

```

```

inrange(age_18,17,59)
replace serial7_z_18= 1.5      if [[inlist(serial7_18,5)    &
yrschool==0]

```

```

]
& inrange(age_18,17,59)
replace serial7_z_18= 1.0      if [[inlist(serial7_18,4)    &
yrschool==0] | [inlist(serial7_18,5)    & inrange(yrschool,1,6)] |
[inlist(serial7_18,5) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace serial7_z_18= 0.0      if [[inlist(serial7_18,2,3) &
yrschool==0] | [inlist(serial7_18,3,4) & inrange(yrschool,1,6)] |
[inlist(serial7_18,4) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace serial7_z_18=-1.0     if [[inlist(serial7_18,1)    &
yrschool==0] | [inlist(serial7_18,2)    & inrange(yrschool,1,6)] |
[inlist(serial7_18,3) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace serial7_z_18=-1.5     if [
[inlist(serial7_18,1)    & inrange(yrschool,1,6)] |
[inlist(serial7_18,2) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace serial7_z_18=-2.0     if [[inlist(serial7_18,0)    &
yrschool==0] | [inlist(serial7_18,0)    & inrange(yrschool,1,6)] |
[inlist(serial7_18,1) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace serial7_z_18=-3.0     if [
[inlist(serial7_18,0) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)

//replace serial7_z_18= 3.0    if [
] &
inrange(age_18,60,69)
replace serial7_z_18= 2.0      if [[inlist(serial7_18,5)    &
yrschool==0]
] &
& inrange(age_18,60,69)
replace serial7_z_18= 1.5      if [
[inlist(serial7_18,5) & inrange(yrschool,1,6)]
] &
inrange(age_18,60,69)
replace serial7_z_18= 1.0      if [[inlist(serial7_18,3,4) &
yrschool==0] | [inlist(serial7_18,4) & inrange(yrschool,1,6)] |
[inlist(serial7_18,5)    & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace serial7_z_18= 0.0      if [[inlist(serial7_18,2)    &
yrschool==0] | [inlist(serial7_18,3) & inrange(yrschool,1,6)] |
[inlist(serial7_18,4)    & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)

```

```

replace serial7_z_18=-1.0      if [[inlist(serial7_18,1) &
yrschool==0] | [inlist(serial7_18,2) & inrange(yrschool,1,6)] |
[inlist(serial7_18,3) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace serial7_z_18=-1.5      if [[inlist(serial7_18,0) &
yrschool==0] | [inlist(serial7_18,1) & inrange(yrschool,1,6)] |
[inlist(serial7_18,2) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace serial7_z_18=-2.0      if [
[inlist(serial7_18,0) & inrange(yrschool,1,6)] |
[inlist(serial7_18,1) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace serial7_z_18=-3.0      if [

[inlist(serial7_18,0) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)

//replace serial7_z_18= 3.0    if [

& inrange(age_18,70,79)
replace serial7_z_18= 2.0      if [[inlist(serial7_18,5) &
yrschool==0]

& inrange(age_18,70,79)
replace serial7_z_18= 1.5      if [[inlist(serial7_18,4) &
yrschool==0] | [inlist(serial7_18,5) & inrange(yrschool,1,6)]
] &
inrange(age_18,70,79)
replace serial7_z_18= 1.0      if [[inlist(serial7_18,3) &
yrschool==0] | [inlist(serial7_18,4) & inrange(yrschool,1,6)] |
[inlist(serial7_18,5) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace serial7_z_18= 0.0      if [[inlist(serial7_18,2) &
yrschool==0] | [inlist(serial7_18,2,3) & inrange(yrschool,1,6)] |
[inlist(serial7_18,3,4) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace serial7_z_18=-1.0      if [[inlist(serial7_18,1) &
yrschool==0] | [inlist(serial7_18,1) & inrange(yrschool,1,6)] |
[inlist(serial7_18,2) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace serial7_z_18=-1.5      if [[inlist(serial7_18,0) &
yrschool==0]

& inrange(age_18,70,79)
replace serial7_z_18=-2.0      if [
[inlist(serial7_18,0) & inrange(yrschool,1,6)] |

```

```

[inlist(serial7_18,1) & inrange(yrschool,7,25)] &
inrange(age_18,70,79)
replace serial7_z_18=-3.0 if [

[inlist(serial7_18,0) & inrange(yrschool,7,25)] &
inrange(age_18,70,79)

//replace serial7_z_18= 3.0 if [

] &

inrange(age_18,80,120)
replace serial7_z_18= 2.0 if [[inlist(serial7_18,5) &
yrschool==0]

] & inrange(age_18,80,120)
replace serial7_z_18= 1.5 if [[inlist(serial7_18,4) &
yrschool==0] | [inlist(serial7_18,5) & inrange(yrschool,1,6)]
] &

inrange(age_18,80,120)
replace serial7_z_18= 1.0 if [[inlist(serial7_18,3) &
yrschool==0] | [inlist(serial7_18,4) & inrange(yrschool,1,6)] |
[inlist(serial7_18,5) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace serial7_z_18= 0.0 if [[inlist(serial7_18,2) &
yrschool==0] | [inlist(serial7_18,2,3) & inrange(yrschool,1,6)] |
[inlist(serial7_18,3,4) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace serial7_z_18=-1.0 if [[inlist(serial7_18,0,1) &
yrschool==0] | [inlist(serial7_18,1) & inrange(yrschool,1,6)] |
[inlist(serial7_18,2) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace serial7_z_18=-1.5 if [
[inlist(serial7_18,0) & inrange(yrschool,1,6)] |
[inlist(serial7_18,1) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace serial7_z_18=-2.0 if [

[inlist(serial7_18,0) & inrange(yrschool,7,25)] &
inrange(age_18,80,120)
//replace serial7_z_18=-3.0 if [

] &

inrange(age_18,80,120)

replace serial7_z_18= serial7_18 if mi(serial7_18) & serial7_z_18==.
replace serial7_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & serial7_z_18==.

```

```

replace serial7_z_18= .p if inlist(tipent_18,3,4)
label variable serial7_z_18 "MHAS Executive Function - Series of
subtractions Z-Scores"

** Impairment Status **
gen serial7_imp_18 = .
label variable serial7_imp_18 "MHAS 2018 Executive function - Verbal
Fluency Impairment"

* age_18 <59 & Years of Education=0
replace serial7_imp_18=1 if inrange(age_18,17,59) & yrschool==0 &
inlist(serial7_18,0)
replace serial7_imp_18=0 if inrange(age_18,17,59) & yrschool==0 &
inrange(serial7_18,1,5)
* age_18 <59 & Years of Education 1-6
replace serial7_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(serial7_18,0,1)
replace serial7_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(serial7_18,2,5)
* age_18 <59 & Years of Education 7+
replace serial7_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(serial7_18,0,2)
replace serial7_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(serial7_18,3,5)

* age_18 60-69 & Years of Education=0
replace serial7_imp_18=1 if inrange(age_18,60,69) & yrschool==0 &
inlist(serial7_18,0)
replace serial7_imp_18=0 if inrange(age_18,60,69) & yrschool==0 &
inrange(serial7_18,1,5)
* age_18 60-69 Years of Education 1-6
replace serial7_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(serial7_18,0,1)
replace serial7_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(serial7_18,2,5)
* age_18 60-69 & Years of Education 7+
replace serial7_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(serial7_18,0,2)
replace serial7_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(serial7_18,3,5)

* age_18 70-79 & Years of Education=0
replace serial7_imp_18=1 if inrange(age_18,70,79) & yrschool==0 &
inlist(serial7_18,0)
replace serial7_imp_18=0 if inrange(age_18,70,79) & yrschool==0 &
inrange(serial7_18,1,5)
* age_18 70-79 & Years of Education 1-6

```

```

replace serial7_imp_18=1  if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inlist(serial7_18,0)
replace serial7_imp_18=0  if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(serial7_18,1,5)
* age_18 70-79 & Years of Education 7+
replace serial7_imp_18=1  if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(serial7_18,0,1)
replace serial7_imp_18=0  if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(serial7_18,2,5)

* age_18 80+ & Years of Education=0
//replace serial7_imp_18=1  if inrange(age_18,80,120) & yrschool==0 &
inlist(serial7_18,)
replace serial7_imp_18=0  if inrange(age_18,80,120) & yrschool==0 &
inrange(serial7_18,0,5)
* age_18 80+ & Years of Education 1-6
replace serial7_imp_18=1  if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inlist(serial7_18,0)
replace serial7_imp_18=0  if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(serial7_18,1,5)
* age_18 80+ & Years of Education 7+
replace serial7_imp_18=1  if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(serial7_18,0,1)
replace serial7_imp_18=0  if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(serial7_18,2,5)

replace serial7_imp_18= serial7_18 if mi(serial7_18) &
serial7_imp_18==.
replace serial7_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & serial7_imp_18==.
replace serial7_imp_18= .p if inlist(tipent_18,3,4)
label values serial7_imp_18 cognitive_18

***CONSTRUCTIONAL PRAXIS Z-SCORES ***
** Copy one figure z-scores **
gen construction_z_18=.
//replace construction_z_18= 3.0    if [

                                ] & inrange(age_18,17,59)
//replace construction_z_18= 2.0    if [

                                ] & inrange(age_18,17,59)
//replace construction_z_18= 1.5    if [

```

```

] & inrange(age_18,17,59)
replace construction_z_18= 1.0      if [[inlist(construction_18,6)    &
yrschool==0]

] & inrange(age_18,17,59)
replace construction_z_18= 0.0      if [[inlist(construction_18,5)    &
yrschool==0] | [ inlist(construction_18,6)    & inrange(yrschool,1,6)]
| [inlist(construction_18,6)    & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace construction_z_18=-1.0      if [[inlist(construction_18,4)    &
yrschool==0] | [ inlist(construction_18,5)    & inrange(yrschool,1,6)]

] & inrange(age_18,17,59)
replace construction_z_18=-1.5      if [[inlist(construction_18,3)    &
yrschool==0]

] & inrange(age_18,17,59)
replace construction_z_18=-2.0      if [[inlist(construction_18,2)    &
yrschool==0] | [ inlist(construction_18,4)    & inrange(yrschool,1,6)]
| [inlist(construction_18,5)    & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace construction_z_18=-3.0      if [[inlist(construction_18,0,1) &
yrschool==0] | [inrange(construction_18,0,3) & inrange(yrschool,1,6)]
| [inrange(construction_18,0,4) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)

//replace construction_z_18= 3.0    if [

] & inrange(age_18,60,69)
//replace construction_z_18= 2.0    if [

] & inrange(age_18,60,69)
//replace construction_z_18= 1.5    if [

] & inrange(age_18,60,69)
replace construction_z_18= 1.0      if [[inlist(construction_18,6)    &
yrschool==0]

] & inrange(age_18,60,69)
replace construction_z_18= 0.0      if [[inlist(construction_18,4,5) &
yrschool==0] | [ inlist(construction_18,6)    & inrange(yrschool,1,6)]
| [ inlist(construction_18,6)    & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)

```

```

replace construction_z_18=-1.0      if [[inlist(construction_18,3)  &
yrschool==0] | [ inlist(construction_18,5)    & inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace construction_z_18=-1.5      if [
                                [ inlist(construction_18,5)    &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace construction_z_18=-2.0      if [[inlist(construction_18,2)  &
yrschool==0] | [ inlist(construction_18,4)    & inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace construction_z_18=-3.0      if [[inlist(construction_18,0,1) &
yrschool==0] | [inrange(construction_18,0,3) & inrange(yrschool,1,6)]
| [inrange(construction_18,0,4) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)

//replace construction_z_18= 3.0    if [

                                ] & inrange(age_18,70,79)
//replace construction_z_18= 2.0    if [

                                ] & inrange(age_18,70,79)
//replace construction_z_18= 1.5    if [

                                ] & inrange(age_18,70,79)
replace construction_z_18= 1.0      if [[inlist(construction_18,6)  &
yrschool==0]

                                ] & inrange(age_18,70,79)
replace construction_z_18= 0.0      if [[inlist(construction_18,4,5) &
yrschool==0] | [ inlist(construction_18,5,6) & inrange(yrschool,1,6)]
| [ inlist(construction_18,6)    & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace construction_z_18=-1.0      if [[inlist(construction_18,3)  &
yrschool==0] |
                                [ inlist(construction_18,5)    &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace construction_z_18=-1.5      if [
                                [ inlist(construction_18,4)    &
inrange(yrschool,1,6)]
                                ] & inrange(age_18,70,79)
replace construction_z_18=-2.0      if [[inlist(construction_18,2)  &
yrschool==0] | [ inlist(construction_18,3)    & inrange(yrschool,1,6)]

```



```

| [ inlist(construction_18,4) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace construction_z_18=-3.0 if [[inlist(construction_18,0,1) &
yrschool==0] | [inrange(construction_18,0,2) & inrange(yrschool,1,6)]
| [inrange(construction_18,0,3) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)

//replace construction_z_18= 3.0 if [

] & inrange(age_18,80,120)
//replace construction_z_18= 2.0 if [

] & inrange(age_18,80,120)
//replace construction_z_18= 1.5 if [

] & inrange(age_18,80,120)
replace construction_z_18= 1.0 if [[inlist(construction_18,6) &
yrschool==0]

] & inrange(age_18,80,120)
replace construction_z_18= 0.0 if [[inlist(construction_18,4,5) &
yrschool==0] | [inlist(construction_18,5,6) & inrange(yrschool,1,6)]
| [ inlist(construction_18,5,6) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace construction_z_18=-1.0 if [[inlist(construction_18,2,3) &
yrschool==0] | [inlist(construction_18,4) & inrange(yrschool,1,6)]
] &
inrange(age_18,80,120)
replace construction_z_18=-1.5 if [
[inlist(construction_18,3) &
inrange(yrschool,1,6)] | [ inlist(construction_18,4) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_z_18=-2.0 if [
[inlist(construction_18,2) &
inrange(yrschool,1,6)]
] & inrange(age_18,80,120)
replace construction_z_18=-3.0 if [[inlist(construction_18,0,1) &
yrschool==0] | [inlist(construction_18,0,1) & inrange(yrschool,1,6)]
| [inrange(construction_18,0,3) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)

replace construction_z_18= construction_18 if mi(construction_18) &
construction_z_18==.

```

```
replace construction_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_z_18==.
replace construction_z_18= .p if inlist(tipent_18,3,4)
label variable construction_z_18 "MHAS 2018 Constructional Praxis Z-
Scores"
```

```
** Impairment Status (using 0-6 score) **
gen construction_imp_18 = .
label variable construction_imp_18 "MHAS 2018 Constructional Praxis
Impairment"
```

```
* age_18 <59 & Years of Education=0
replace construction_imp_18=1 if inrange(age_18,17,59) & yrschool==0
& inrange(construction_18,0,3)
replace construction_imp_18=0 if inrange(age_18,17,59) & yrschool==0
& inrange(construction_18,4,6)
* age_18 <59 & Years of Education 1-6
replace construction_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(construction_18,0,4)
replace construction_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(construction_18,5,6)
* age_18 <59 & Years of Education 7+
replace construction_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(construction_18,0,5)
replace construction_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inlist(construction_18,6)
```

```
* age_18 60-69 & Years of Education=0
replace construction_imp_18=1 if inrange(age_18,60,69) & yrschool==0
& inrange(construction_18,0,2)
replace construction_imp_18=0 if inrange(age_18,60,69) & yrschool==0
& inrange(construction_18,3,6)
* age_18 60-69 & Years of Education 1-6
replace construction_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(construction_18,0,4)
replace construction_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(construction_18,5,6)
* age_18 60-69 & Years of Education 7+
replace construction_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(construction_18,0,5)
replace construction_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inlist(construction_18,6)
```

```
* age_18 70-79 & Years of Education=0
replace construction_imp_18=1 if inrange(age_18,70,79) & yrschool==0
& inrange(construction_18,0,2)
```

```

replace construction_imp_18=0 if inrange(age_18,70,79) & yrschool==0
& inrange(construction_18,3,6)
* age_18 70-79 & Years of Education 1-6
replace construction_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(construction_18,0,4)
replace construction_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(construction_18,5,6)
* age_18 70-79 & Years of Education 7+
replace construction_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(construction_18,0,4)
replace construction_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(construction_18,5,6)

* age_18 80+ & Years of Education=0
replace construction_imp_18=1 if inrange(age_18,80,120) & yrschool==0
& inrange(construction_18,0,1)
replace construction_imp_18=0 if inrange(age_18,80,120) & yrschool==0
& inrange(construction_18,2,6)
* age_18 80+ & Years of Education 1-6
replace construction_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(construction_18,0,3)
replace construction_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(construction_18,4,6)
* age_18 80+ & Years of Education 7+
replace construction_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(construction_18,0,4)
replace construction_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(construction_18,5,6)

replace construction_imp_18= construction_18 if mi(construction_18) &
construction_imp_18==.
replace construction_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_imp_18==.
replace construction_imp_18= .p if inlist(tipent_18,3,4)
label values construction_imp_18 cognitive_18

** Copy one figure z-scores comparable with 2001 & 2003 **
gen construction_z_v01_18=.
replace construction_z_v01_18= 0.0 if [[inlist(construction_v01_18,2)
& yrschool==0] | [inlist(construction_v01_18,2) &
inrange(yrschool,1,6)] | [inlist(construction_v01_18,2) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace construction_z_v01_18=-1.0 if [[inlist(construction_v01_18,1)
& yrschool==0]
] & inrange(age_18,17,59)

```



```

//replace construction_z_v01_18=-1.5    if [
                                     ] & inrange(age_18,70,79)
replace construction_z_v01_18=-2.0 if [[inlist(construction_v01_18,0)
& yrschool==0] | [inlist(construction_v01_18,1) &
inrange(yrschool,1,6)]
                                     ] & inrange(age_18,70,79)
replace construction_z_v01_18=-3.0 if [
                                     [inlist(construction_v01_18,0) &
inrange(yrschool,1,6)] | [inlist(construction_v01_18,0,1) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)

replace construction_z_v01_18= 1.0 if [[inlist(construction_v01_18,2)
& yrschool==0]
                                     ] & inrange(age_18,80,120)
replace construction_z_v01_18= 0.0 if [[inlist(construction_v01_18,1)
& yrschool==0] | [inlist(construction_v01_18,2) &
inrange(yrschool,1,6)] | [inlist(construction_v01_18,2) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_z_v01_18=-1.0 if [
                                     [inlist(construction_v01_18,1) &
inrange(yrschool,1,6)]
                                     ] & inrange(age_18,80,120)
//replace construction_z_v01_18=-1.5    if [
                                     ] & inrange(age_18,80,120)
replace construction_z_v01_18=-2.0 if [[inlist(construction_v01_18,0)
& yrschool==0] |
                                     [inlist(construction_v01_18,1) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_z_v01_18=-3.0 if [
                                     [inlist(construction_v01_18,0) &
inrange(yrschool,1,6)] | [inlist(construction_v01_18,0) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)

replace construction_z_v01_18= construction_v01_18 if
mi(construction_v01_18) & construction_z_v01_18==.
replace construction_z_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_z_v01_18==.
replace construction_z_v01_18= .p if inlist(tipent_18,3,4)
label variable construction_z_v01_18 "MHAS 2018 Constructional Praxis
Z-Scores v2001-2003"

```

** Impairment Status (using 0-2 score comparable to 2001 and 2003) **

```
gen construction_imp_v01_18 = .
label variable construction_imp_v01_18 "MHAS 2018 Constructional
Praxis Impairment v2001-2003"
```

```
* age_18 69< & Years of Education=0
replace construction_imp_v01_18=1 if inrange(age_18,17,69) &
yrschool==0 & inlist(construction_v01_18,0)
replace construction_imp_v01_18=0 if inrange(age_18,17,69) &
yrschool==0 & inlist(construction_v01_18,1,2)
```

```
* age_18 69< & Years of Education 1-6
replace construction_imp_v01_18=1 if inrange(age_18,17,69) &
inrange(yrschool,1,6) & inlist(construction_v01_18,0,1)
replace construction_imp_v01_18=0 if inrange(age_18,17,69) &
inrange(yrschool,1,6) & inlist(construction_v01_18,2)
```

```
* age_18 69< & Years of Education 7+
replace construction_imp_v01_18=1 if inrange(age_18,17,69) &
inrange(yrschool,7,25) & inlist(construction_v01_18,0,1)
replace construction_imp_v01_18=0 if inrange(age_18,17,69) &
inrange(yrschool,7,25) & inlist(construction_v01_18,2)
```

```
* age_18 70-79 & Years of Education=0
replace construction_imp_v01_18=1 if inrange(age_18,70,79) &
yrschool==0 & inlist(construction_v01_18,0)
replace construction_imp_v01_18=0 if inrange(age_18,70,79) &
yrschool==0 & inlist(construction_v01_18,1,2)
```

```
* age_18 70-79 & Years of Education 1-6
replace construction_imp_v01_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inlist(construction_v01_18,0,1)
replace construction_imp_v01_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inlist(construction_v01_18,2)
```

```
* age_18 70-79 & Years of Education 7+
replace construction_imp_v01_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inlist(construction_v01_18,0,1)
replace construction_imp_v01_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inlist(construction_v01_18,2)
```

```
* age_18 80+ & Years of Education=0
replace construction_imp_v01_18=1 if inrange(age_18,80,120) &
yrschool==0 & inlist(construction_v01_18,0)
replace construction_imp_v01_18=0 if inrange(age_18,80,120) &
yrschool==0 & inlist(construction_v01_18,1,2)
```

```
* age_18 80+ & Years of Education 1-6
replace construction_imp_v01_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inlist(construction_v01_18,0)
replace construction_imp_v01_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inlist(construction_v01_18,1,2)
```

```
* age_18 80+ & Years of Education 7+
```

```
replace construction_imp_v01_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inlist(construction_v01_18,0,1)
replace construction_imp_v01_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inlist(construction_v01_18,2)
```

```
replace construction_imp_v01_18= construction_v01_18 if
mi(construction_v01_18) & construction_imp_v01_18==.
replace construction_imp_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_imp_v01_18==.
replace construction_imp_v01_18= .p if inlist(tipent_18,3,4)
label values construction_imp_v01_18 cognitive_18
```

```
*** Delayed recall/copy of figure ***
```

```
** Z-SCORES **
```

```
gen construction_m_z_18=.
```

```
//replace construction_m_z_18= 3.0 if [
```

```
                                ] & inrange(age_18,17,59)
```

```
//replace construction_m_z_18= 2.0 if [
```

```
                                ] & inrange(age_18,17,59)
```

```
//replace construction_m_z_18= 1.5 if [
```

```
                                ] & inrange(age_18,17,59)
```

```
replace construction_m_z_18= 1.0    if [[inlist(construction_m_18,6)
& yrschool==0]
```

```
                                ] & inrange(age_18,17,59)
```

```
replace construction_m_z_18= 0.0    if [[inlist(construction_m_18,4,5)
& yrschool==0] | [inlist(construction_m_18,5,6) &
inrange(yrschool,1,6)] | [inlist(construction_m_18,5,6) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
```

```
replace construction_m_z_18=-1.0    if [[inlist(construction_m_18,3)
& yrschool==0] | [inlist(construction_m_18,4) &
inrange(yrschool,1,6)] | [inlist(construction_m_18,4) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
```

```
replace construction_m_z_18=-1.5    if [[inlist(construction_m_18,2)
& yrschool==0] | [inlist(construction_m_18,3) &
inrange(yrschool,1,6)]
```

```
                                ] & inrange(age_18,17,59)
```

```
replace construction_m_z_18=-2.0    if [[inlist(construction_m_18,1)
& yrschool==0] | [inlist(construction_m_18,2) &
```

```

inrange(yrschool,1,6)] | [inlist(construction_m_18,3)      &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)
replace construction_m_z_18=-3.0  if [[inlist(construction_m_18,0)
& yrschool==0] | [inlist(construction_m_18,0,1) &
inrange(yrschool,1,6)] | [inrange(construction_m_18,0,2) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)

//replace construction_m_z_18= 3.0 if [

                                ] & inrange(age_18,60,69)
//replace construction_m_z_18= 2.0 if [

                                ] & inrange(age_18,60,69)
//replace construction_m_z_18= 1.5 if [

                                ] & inrange(age_18,60,69)
//replace construction_m_z_18= 1.0 if [

                                ] & inrange(age_18,60,69)

replace construction_m_z_18= 0.0  if
[[inlist(construction_m_18,4,5,6) & yrschool==0] |
[inlist(construction_m_18,5,6) & inrange(yrschool,1,6)] |
[inlist(construction_m_18,5,6)  & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace construction_m_z_18=-1.0  if [[inlist(construction_m_18,2,3)
& yrschool==0] | [inlist(construction_m_18,4)      &
inrange(yrschool,1,6)] | [inlist(construction_m_18,4)      &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace construction_m_z_18=-1.5  if [
                                [inlist(construction_m_18,3)  &
inrange(yrschool,1,6)]
                                ] & inrange(age_18,60,69)
replace construction_m_z_18=-2.0  if [[inlist(construction_m_18,0,1)
& yrschool==0] | [inlist(construction_m_18,2)      &
inrange(yrschool,1,6)] | [inlist(construction_m_18,3)      &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace construction_m_z_18=-3.0  if [
                                [inlist(construction_m_18,0,1) &
inrange(yrschool,1,6)] | [inrange(construction_m_18,0,2) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)

//replace construction_m_z_18= 3.0 if [

```



```

] & inrange(age_18,70,79)
//replace construction_m_z_18= 2.0 if [

] & inrange(age_18,70,79)
//replace construction_m_z_18= 1.5 if [

] & inrange(age_18,70,79)
replace construction_m_z_18= 1.0 if [[inlist(construction_m_18,5,6)
& yrschool==0]

] & inrange(age_18,70,79)
replace construction_m_z_18= 0.0 if [[inlist(construction_m_18,3,4)
& yrschool==0] | [inlist(construction_m_18,4,5,6) &
inrange(yrschool,1,6)] | [inlist(construction_m_18,4,5,6) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace construction_m_z_18=-1.0 if [[inlist(construction_m_18,2)
& yrschool==0] | [inlist(construction_m_18,3) &
inrange(yrschool,1,6)]

] & inrange(age_18,70,79)
replace construction_m_z_18=-1.5 if [[inlist(construction_m_18,1)
& yrschool==0]

| [inlist(construction_m_18,3) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace construction_m_z_18=-2.0 if [[inlist(construction_m_18,0)
& yrschool==0] | [inlist(construction_m_18,1,2) &
inrange(yrschool,1,6)] | [inlist(construction_m_18,2) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace construction_m_z_18=-3.0 if [
[inlist(construction_m_18,0) &
inrange(yrschool,1,6)] | [inlist(construction_m_18,0,1) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)

//replace construction_m_z_18= 3.0 if [

] & inrange(age_18,80,120)
//replace construction_m_z_18= 2.0 if [

] & inrange(age_18,80,120)
replace construction_m_z_18= 1.5 if [[inlist(construction_m_18,6)
& yrschool==0]

] & inrange(age_18,80,120)

```

```

replace construction_m_z_18= 1.0   if [[inlist(construction_m_18,5)
& yrschool==0] | [inlist(construction_m_18,6)      &
inrange(yrschool,1,6)] | [inlist(construction_m_18,6)      &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_m_z_18= 0.0   if
[[inlist(construction_m_18,2,3,4) & yrschool==0] |
[inlist(construction_m_18,3,4,5) & inrange(yrschool,1,6)] |
[inlist(construction_m_18,4,5) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace construction_m_z_18=-1.0   if [[inlist(construction_m_18,1)
& yrschool==0] | [inlist(construction_m_18,2)      &
inrange(yrschool,1,6)] | [inlist(construction_m_18,3)      &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_m_z_18=-1.5   if [
                                     [inlist(construction_m_18,2)      &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_m_z_18=-2.0   if [[inlist(construction_m_18,0)
& yrschool==0] | [inlist(construction_m_18,0,1)      &
inrange(yrschool,1,6)] | [inlist(construction_m_18,1)      &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_m_z_18=-3.0   if [
                                     [inlist(construction_m_18,0)      &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)

replace construction_m_z_18= construction_m_18 if
mi(construction_m_18) & construction_m_z_18==.
replace construction_m_z_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_m_z_18==.
replace construction_m_z_18= .p if inlist(tipent_18,3,4)
label variable construction_m_z_18 "MHAS 2018 Delayed Memory -
Delayed recall of figure Z-Scores"

** Impairment Status **
gen construction_m_imp_18 = .
label variable construction_m_imp_18 "MHAS 2018 Delayed Memory -
Delayed recall of figure Impairment"

* age_18 <59 & Years of Education=0
replace construction_m_imp_18=1 if inrange(age_18,17,59) &
yrschool==0 & inrange(construction_m_18,0,2)
replace construction_m_imp_18=0 if inrange(age_18,17,69) &
yrschool==0 & inrange(construction_m_18,3,6)
* age_18 <59 & Years of Education 1-6
replace construction_m_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(construction_m_18,0,3)

```

```

replace construction_m_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inrange(construction_m_18,4,6)
* age_18 <59 & Years of Education 7+
replace construction_m_imp_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(construction_m_18,0,3)
replace construction_m_imp_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inrange(construction_m_18,4,6)

* age_18 60-69 & Years of Education=0
replace construction_m_imp_18=1 if inrange(age_18,60,69) &
yrschool==0 & inrange(construction_m_18,0,1)
replace construction_m_imp_18=0 if inrange(age_18,60,69) &
yrschool==0 & inrange(construction_m_18,2,6)
* age_18 60-69 & Years of Education 1-6
replace construction_m_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(construction_m_18,0,3)
replace construction_m_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inrange(construction_m_18,4,6)
* age_18 60-69 & Years of Education 7+
replace construction_m_imp_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(construction_m_18,0,3)
replace construction_m_imp_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inrange(construction_m_18,4,6)

* age_18 70-79 & Years of Education=0
replace construction_m_imp_18=1 if inrange(age_18,70,79) &
yrschool==0 & inrange(construction_m_18,0,1)
replace construction_m_imp_18=0 if inrange(age_18,70,79) &
yrschool==0 & inrange(construction_m_18,2,6)
* age_18 70-79 & Years of Education 1-6
replace construction_m_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(construction_m_18,0,2)
replace construction_m_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inrange(construction_m_18,3,6)
* age_18 70-79 & Years of Education 7+
replace construction_m_imp_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(construction_m_18,0,3)
replace construction_m_imp_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inrange(construction_m_18,4,6)

* age_18 80+ & Years of Education=0
replace construction_m_imp_18=1 if inrange(age_18,80,120) &
yrschool==0 & inlist(construction_m_18,0)
replace construction_m_imp_18=0 if inrange(age_18,80,120) &
yrschool==0 & inrange(construction_m_18,1,6)
* age_18 80+ & Years of Education 1-6

```

```

replace construction_m_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(construction_m_18,0,1)
replace construction_m_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inrange(construction_m_18,2,6)
* age_18 80+ & Years of Education 7+
replace construction_m_imp_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(construction_m_18,0,2)
replace construction_m_imp_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inrange(construction_m_18,3,6)

replace construction_m_imp_18= construction_m_18 if
mi(construction_m_18) & construction_m_imp_18==.
replace construction_m_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_m_imp_18==.
replace construction_m_imp_18= .p if inlist(tipent_18,3,4)
label values construction_m_imp_18 cognitive_18

```

** Delayed recall/copy of figure z-scores comparable with 2001 & 2003
**

```

gen construction_m_z_v01_18=.
replace construction_m_z_v01_18= 1.0    if
[[inlist(construction_m_v01_18,2) & yrschool==0]
] &
inrange(age_18,17,59)
replace construction_m_z_v01_18= 0.0    if
[[inlist(construction_m_v01_18,1) & yrschool==0] |
[inlist(construction_m_v01_18,2) & inrange(yrschool,1,6)] |
[inlist(construction_m_v01_18,2) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace construction_m_z_v01_18=-1.0    if [
[inlist(construction_m_v01_18,1) &
inrange(yrschool,1,6)]
] & inrange(age_18,17,59)
replace construction_m_z_v01_18=-2.0    if
[[inlist(construction_m_v01_18,0) & yrschool==0] |
[inlist(construction_m_v01_18,1) & inrange(yrschool,7,25)]] &
inrange(age_18,17,59)
replace construction_m_z_v01_18=-3.0    if [
[inlist(construction_m_v01_18,0) &
inrange(yrschool,1,6)] | [inlist(construction_m_v01_18,0) &
inrange(yrschool,7,25)]] & inrange(age_18,17,59)

replace construction_m_z_v01_18= 1.0    if
[[inlist(construction_m_v01_18,2) & yrschool==0]

```

```

] &
inrange(age_18,60,69)
replace construction_m_z_v01_18= 0.0    if
[[inlist(construction_m_v01_18,1) & yrschool==0] |
[inlist(construction_m_v01_18,2) & inrange(yrschool,1,6)] |
[inlist(construction_m_v01_18,2) & inrange(yrschool,7,25)]] &
inrange(age_18,60,69)
replace construction_m_z_v01_18=-1.0    if [
[inlist(construction_m_v01_18,1) &
inrange(yrschool,1,6)]
] & inrange(age_18,60,69)
replace construction_m_z_v01_18=-1.5    if [
[inlist(construction_m_v01_18,1)
& inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace construction_m_z_v01_18=-2.0    if
[[inlist(construction_m_v01_18,0) & yrschool==0]
] &
inrange(age_18,60,69)
replace construction_m_z_v01_18=-3.0    if [
[inlist(construction_m_v01_18,0) &
inrange(yrschool,1,6)] | [inlist(construction_m_v01_18,0) &
inrange(yrschool,7,25)]] & inrange(age_18,60,69)
replace construction_m_z_v01_18= 1.0    if
[[inlist(construction_m_v01_18,2) & yrschool==0]
] &
inrange(age_18,70,79)
replace construction_m_z_v01_18= 0.0    if
[[inlist(construction_m_v01_18,1) & yrschool==0] |
[inlist(construction_m_v01_18,2) & inrange(yrschool,1,6)] |
[inlist(construction_m_v01_18,2) & inrange(yrschool,7,25)]] &
inrange(age_18,70,79)
replace construction_m_z_v01_18=-1.0    if [
[inlist(construction_m_v01_18,1) &
inrange(yrschool,1,6)] | [inlist(construction_m_v01_18,1) &
inrange(yrschool,7,25)]] & inrange(age_18,70,79)
replace construction_m_z_v01_18=-1.5    if
[[inlist(construction_m_v01_18,0) & yrschool==0]
] &
inrange(age_18,70,79)
replace construction_m_z_v01_18=-2.0    if [
[inlist(construction_m_v01_18,0) &

```

```

inrange(yrschool,1,6)]
] & inrange(age_18,70,79)
replace construction_m_z_v01_18=-3.0 if [
[inlist(construction_m_v01_18,0)
& inrange(yrschool,7,25)]] & inrange(age_18,70,79)

replace construction_m_z_v01_18= 1.5 if
[[inlist(construction_m_v01_18,2) & yrschool==0]
] &

inrange(age_18,80,120)
replace construction_m_z_v01_18= 1.0 if [
[inlist(construction_m_v01_18,2) &
inrange(yrschool,1,6)] | [inlist(construction_m_v01_18,2) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)
replace construction_m_z_v01_18= 0.0 if
[[inlist(construction_m_v01_18,1) & yrschool==0] |
[inlist(construction_m_v01_18,1) & inrange(yrschool,1,6)] |
[inlist(construction_m_v01_18,1) & inrange(yrschool,7,25)]] &
inrange(age_18,80,120)
replace construction_m_z_v01_18=-1.0 if
[[inlist(construction_m_v01_18,0) & yrschool==0]
] &

inrange(age_18,80,120)
replace construction_m_z_v01_18=-2.0 if [
[inlist(construction_m_v01_18,0) &
inrange(yrschool,1,6)] | [inlist(construction_m_v01_18,0) &
inrange(yrschool,7,25)]] & inrange(age_18,80,120)

replace construction_m_z_v01_18= construction_m_v01_18 if
mi(construction_m_v01_18) & construction_m_z_v01_18==.
replace construction_m_z_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_m_z_v01_18==.
replace construction_m_z_v01_18= .p if inlist(tipent_18,3,4)
label variable construction_m_z_v01_18 "MHAS 2018 Delayed Memory -
Delayed recall of figure Z-Scores v2001-2003"

** Impairment Status **
gen construction_m_imp_v01_18 = .
label variable construction_m_imp_v01_18 "MHAS 2018 Delayed Memory -
Delayed recall of figure Impairment v2001-2003"

* age_18 <59 & Years of Education=0
replace construction_m_imp_v01_18=1 if inrange(age_18,17,59) &
yrschool==0 & inlist(construction_m_v01_18,0)

```

```

replace construction_m_imp_v01_18=0 if inrange(age_18,17,59) &
yrschool==0 & inlist(construction_m_v01_18,1,2)
* age_18 <59 & Years of Education 1-6
replace construction_m_imp_v01_18=1 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,17,59) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,1,2)
* age_18 <59 & Years of Education 7+
replace construction_m_imp_v01_18=1 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,0,1)
replace construction_m_imp_v01_18=0 if inrange(age_18,17,59) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,2)

* age_18 60-69 & Years of Education=0
replace construction_m_imp_v01_18=1 if inrange(age_18,60,69) &
yrschool==0 & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,60,69) &
yrschool==0 & inlist(construction_m_v01_18,1,2)
* age_18 60-69 & Years of Education 1-6
replace construction_m_imp_v01_18=1 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,60,69) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,1,2)
* age_18 60-69 & Years of Education 7+
replace construction_m_imp_v01_18=1 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,0,1)
replace construction_m_imp_v01_18=0 if inrange(age_18,60,69) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,2)

* age_18 70-79 & Years of Education=0
replace construction_m_imp_v01_18=1 if inrange(age_18,70,79) &
yrschool==0 & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,70,79) &
yrschool==0 & inlist(construction_m_v01_18,1,2)
* age_18 70-79 & Years of Education 1-6
replace construction_m_imp_v01_18=1 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,70,79) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,1,2)
* age_18 70-79 & Years of Education 7+
replace construction_m_imp_v01_18=1 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,70,79) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,1,2)

* age_18 80+ & Years of Education=0

```

```

//replace construction_m_imp_v01_18=1 if inrange(age_18,80,120) &
yrschool==0 & inlist(construction_m_v01_18,)
replace construction_m_imp_v01_18=0 if inrange(age_18,80,120) &
yrschool==0 & inlist(construction_m_v01_18,0,1,2)
* age_18 80+ & Years of Education 1-6
replace construction_m_imp_v01_18=1 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,80,120) &
inrange(yrschool,1,6) & inlist(construction_m_v01_18,1,2)
* age_18 80+ & Years of Education 7+
replace construction_m_imp_v01_18=1 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,0)
replace construction_m_imp_v01_18=0 if inrange(age_18,80,120) &
inrange(yrschool,7,25) & inlist(construction_m_v01_18,1,2)

replace construction_m_imp_v01_18= construction_m_v01_18 if
mi(construction_m_v01_18) & construction_m_imp_v01_18==.
replace construction_m_imp_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & construction_m_imp_v01_18==.
replace construction_m_imp_v01_18= .p if inlist(tipent_18,3,4)
label values construction_m_imp_v01_18 cognitive_18

```

```

*** TOTAL NUMBER OF TASKS COMPLETED (max. 5) ***
egen numb_tasks_miss_v01_18= rowmiss(iwr_18 dwr_18 construction_m_18
visual_scan_18 construction_18) if inlist(tipent_18,1,2)

```

```

gen numb_tasks_comp_v01_18= 5-numb_tasks_miss_v01_18 if
inlist(tipent_18,1,2)
replace numb_tasks_comp_v01_18= .p if inlist(tipent_18,3,4)
label variable numb_tasks_comp_v01_18 "MHAS 2018 Number of Tasks
Completed (0-5)"

```

```

drop numb_tasks_miss_v01_18

```

```

*** TOTAL NUMBER OF TASKS WITH IMPAIRMENT IF COMPLETED 2 OR MORE
TASKS (max. 5) ***
egen numb_tasks_imp_v01_18= rowtotal(iwr_imp_18 dwr_imp_18
construction_m_imp_v01_18 visual_scan_imp_18 construction_imp_v01_18)
if inrange(numb_tasks_comp_v01_18,2,5)
replace numb_tasks_imp_v01_18= .i if
inrange(numb_tasks_comp_v01_18,0,1)
replace numb_tasks_imp_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & mi(numb_tasks_imp_v01_18)
replace numb_tasks_imp_v01_18= .s if [iwr_imp_18==.s ///
& dwr_imp_18==.s ///

```



```

&
construction_m_imp_v01_18==.s ///
& visual_scan_imp_18==.s
///
&
construction_imp_v01_18==.s] ///
&
mi(numb_tasks_imp_v01_18)
replace numb_tasks_imp_v01_18= .p if inlist(tipent_18,3,4)
label variable numb_tasks_imp_v01_18 "MHAS 2018 Number of Tasks with
Impairment if completed 2+ (0-5)"

gen two_more_tasks_imp_v01_18=.
replace two_more_tasks_imp_v01_18=0 if
inrange(numb_tasks_imp_v01_18,0,1)
replace two_more_tasks_imp_v01_18=1 if
inrange(numb_tasks_imp_v01_18,2,5)
replace two_more_tasks_imp_v01_18= .i if
inrange(numb_tasks_comp_v01_18,0,1)
replace two_more_tasks_imp_v01_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & mi(two_more_tasks_imp_v01_18)
replace two_more_tasks_imp_v01_18= .s if [iwr_imp_18==.s ///
& dwr_imp_18==.s
///
&
construction_m_imp_v01_18==.s ///
&
visual_scan_imp_18==.s ///
&
construction_imp_v01_18==.s] ///
&
mi(two_more_tasks_imp_v01_18)
replace two_more_tasks_imp_v01_18= .p if inlist(tipent_18,3,4)
label variable two_more_tasks_imp_v01_18 "MHAS 2018 Dummy of 2+/5
Tasks with Impairment if completed 2+ (0-1)"

*** TOTAL NUMER OF TASKS COMPLETED (max. 8) ***
egen numb_tasks_miss_18= rowmiss(iwr_18 dwr_18 construction_m_18
visual_scan_18 construction_18 orientation_18 verbal_fluency_18
serial7_18) if inlist(tipent_18,1,2)

gen numb_tasks_comp_18= 8-numb_tasks_miss_18 if inlist(tipent_18,1,2)
replace numb_tasks_comp_18= .p if inlist(tipent_18,3,4)
label variable numb_tasks_comp_18 "MHAS 2018 Number of Tasks
Completed (0-7)"

```

```

drop numb_tasks_miss_18

*** TOTAL NUMBER OF TASKS WITH IMPAIRMENT IF COMPLETED 2 OR MORE
TASKS(max. 8) ***
egen numb_tasks_imp_18= rowtotal(iwr_imp_18 dwr_imp_18
construction_m_imp_18 visual_scan_imp_18 construction_imp_18
orientation_imp_18 verbal_fluency_imp_18 serial7_imp_18) ///
if
inrange(numb_tasks_comp_18,2,8)
replace numb_tasks_imp_18= .i if inrange(numb_tasks_comp_18,0,1)
replace numb_tasks_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)]
replace numb_tasks_imp_18= .s if [iwr_imp_18==.s ///
& dwr_imp_18==.s ///
& construction_m_imp_18==.s
///
& visual_scan_imp_18==.s ///
& construction_imp_18==.s ///
& orientation_imp_18==.s ///
& verbal_fluency_imp_18==.s]
///
& mi(numb_tasks_imp_18)
replace numb_tasks_imp_18= .p if inlist(tipent_18,3,4)
label variable numb_tasks_imp_18 "MHAS 2012 Number of Tasks with
Impairment if completed 2+ (0-8)"

gen two_more_tasks_imp_18=.
replace two_more_tasks_imp_18=0 if inrange(numb_tasks_imp_18,0,1)
replace two_more_tasks_imp_18=1 if inrange(numb_tasks_imp_18,2,8)
replace two_more_tasks_imp_18= .i if inrange(numb_tasks_comp_18,0,1)
replace two_more_tasks_imp_18= .m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m)] & mi(two_more_tasks_imp_18)
replace two_more_tasks_imp_18= .s if [iwr_imp_18==.s ///
& dwr_imp_18==.s ///
&
construction_m_imp_18==.s ///
& visual_scan_imp_18==.s
///
&
construction_imp_18==.s ///
& orientation_imp_18==.s
///
&
verbal_fluency_imp_18==.s] ///
&
mi(two_more_tasks_imp_18)
replace two_more_tasks_imp_18= .p if inlist(tipent_18,3,4)

```

```
label variable two_more_tasks_imp_18 "MHAS 2018 Dummy of 2+/8 Tasks  
with Impairment if completed 2+ (0-1)"
```

```
*****  
***** MHAS 2018 INSTRUMENTAL ACTIVITIES OF DAILY LIVING *****  
*****
```

```
*** IADL ***
```

```
** Managing money **
```

```
gen iadl_money_18 =.  
replace iadl_money_18 = .m if inlist(tipent_18,1,2,3,4) & h29a_18 ==  
.i  
replace iadl_money_18 = .d if h29a_18 == 9  
replace iadl_money_18 = .r if h29a_18 == 8  
replace iadl_money_18 = .p if inlist(tipent_18,3,4)  
replace iadl_money_18 = .x if h29a_18 == 7 & inlist(h29b_18,8,9)  
replace iadl_money_18 = 0 if h29a_18 == 2 | (h29a_18 == 7 & h29b_18  
== 2)  
replace iadl_money_18 = 1 if inlist(h29a_18,1,6) | (h29a_18 == 7 &  
h29b_18 == 1)  
label variable iadl_money_18 "IADLs: Difficulty Managing Money 2018"
```

```
** Taking medicines **
```

```
gen iadl_medicines_18 =.  
replace iadl_medicines_18 = .m if inlist(tipent_18,1,2,3,4) & h28a_18  
== .i  
replace iadl_medicines_18 = .d if h28a_18 == 9  
replace iadl_medicines_18 = .r if h28a_18 == 8  
replace iadl_medicines_18 = .p if inlist(tipent_18,3,4)  
replace iadl_medicines_18 = .x if h28a_18 == 7 & inlist(h28b_18,8,9)  
replace iadl_medicines_18 = 0 if h28a_18 == 2 | (h28a_18 == 7 &  
h28b_18 == 2)  
replace iadl_medicines_18 = 1 if inlist(h28a_18,1,6) | (h28a_18 == 7  
& h28b_18 == 1)  
label variable iadl_medicines_18 "IADLs: Difficulty Taking Medicines  
2018"
```

```
** Shopping for groceries **
```

```
gen iadl_shopping_18 =.  
replace iadl_shopping_18 = .m if inlist(tipent_18,1,2,3,4) & h27a_18  
== .i  
replace iadl_shopping_18 = .d if h27a_18 == 9  
replace iadl_shopping_18 = .r if h27a_18 == 8  
replace iadl_shopping_18 = .p if inlist(tipent_18,3,4)  
replace iadl_shopping_18 = .x if h27a_18 == 7 & inlist(h27b_18,8,9)
```

```

replace iadl_shopping_18 = 0 if h27a_18 == 2 | (h27a_18 == 7 &
h27b_18 == 2)
replace iadl_shopping_18 = 1 if inlist(h27a_18,1,6) | (h27a_18 == 7 &
h27b_18 == 1)
label variable iadl_shopping_18 "IADLs: Difficulty Shopping for
Groceries 2018"

** Cooking a hot meal **
gen iadl_cooking_18 = .
replace iadl_cooking_18 = .m if inlist(tipent_18,1,2,3,4) & h26a_18
== .i
replace iadl_cooking_18 = .d if h26a_18 == 9
replace iadl_cooking_18 = .r if h26a_18 == 8
replace iadl_cooking_18 = .p if inlist(tipent_18,3,4)
replace iadl_cooking_18 = .x if h26a_18 == 7 & inlist(h26b_18,8,9)
replace iadl_cooking_18 = 0 if h26a_18 == 2 | (h26a_18 == 7 & h26b_18
== 2)
replace iadl_cooking_18 = 1 if inlist(h26a_18,1,6) | (h26a_18 == 7 &
h26b_18 == 1)
label variable iadl_cooking_18 "IADLs: Difficulty Cooking a Meal
2018"
label values iadl_cooking_18 adls

** Number of Limitations with IADLs (0-4) **
egen iadls_18 = rowtotal(iadl_money_18 iadl_medicines_18
iadl_shopping_18 iadl_cooking_18) if inlist(tipent_18,1,2)
replace iadls_18 = .m if inlist(tipent_18,1,2,3,4) & h26a_18 == .i &
h27a_18 == .i & h28a_18 == .i & h29a_18 == .i & iadls_18==.
replace iadls_18 = .d if iadl_money_18 == .d & iadl_medicines_18 ==
.d & iadl_shopping_18 == .d & iadl_cooking_18 == .d
replace iadls_18 = .r if iadl_money_18 == .r & iadl_medicines_18 ==
.r & iadl_shopping_18 == .r & iadl_cooking_18 == .r
replace iadls_18 = .x if iadl_money_18 == .x & iadl_medicines_18 ==
.x & iadl_shopping_18 == .x & iadl_cooking_18 == .x
replace iadls_18 = .x if iadl_money_18 == .x & iadl_medicines_18 ==
.x & iadl_shopping_18 == .x & iadl_cooking_18 == .x
replace iadls_18 = .p if inlist(tipent_18,3,4)
label variable iadls_18 "Number of Limitations with IADLs 2018 (0-4)"

```

```

*****
***** MHAS 2018 COGNITIVE STATUS ASSESSMENT *****
*****

```

```

* COGNITIVE STATUS CLASIFICACION: 1) CIND: impairment in 2+ cognitive
tasks and NO IADLs difficulties

```

```

                /// 2) Dementia: 2a) Proxy subjects who
had a score equal or above 3.4 in the IQCODE
                ///                               2b) Direct
interview subjects impaired in 2+ cognitive tasks and
                ///                               had
difficulty in one or more IADLS
                /// 3) Normal with IADLS:
                ///                               3a) Direct
interview subjects with no impairment
                ///                               or with
impairment in only one cognitive task and who had difficulty in one
or more IADLS
                /// 4) Normal NO IADLS:
                ///                               4a) Proxy
respondents with a score below 3.4 in the IQCODE
                ///                               4b) Direct
interview subjects with no impairment
                ///                               or with
impairment in only one cognitive task and who did not have difficulty
with IADLS

```

** Cognitive Status Classification using 8 tasks (if 2 or more completed) **

```

gen cognitive_status_18=.
replace cognitive_status_18=3 if cog_imp_iqcode_18==1 |
[inrange(numb_tasks_imp_18,2,8) & inrange(iadls_18,1,4)]
replace cognitive_status_18=2 if inrange(numb_tasks_imp_18,2,8) &
iadls_18==0
replace cognitive_status_18=1 if inrange(numb_tasks_imp_18,0,1) &
inrange(iadls_18,1,4)
replace cognitive_status_18=0 if cog_imp_iqcode_18==0 |
[inrange(numb_tasks_imp_18,0,1) & iadls_18==0]
replace cognitive_status_18=.i if [inrange(numb_tasks_comp_18,0,1) |
cog_imp_iqcode_18==.i] & cognitive_status_18==.
replace cognitive_status_18=.d if [iadls_18==.d |
cog_imp_iqcode_18==.d] & cognitive_status_18==.
replace cognitive_status_18=.r if [iadls_18==.r |
cog_imp_iqcode_18==.r] & cognitive_status_18==.
replace cognitive_status_18=.m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m) | inlist(iadls_18,.m,.)] &
cognitive_status_18==.
label variable cognitive_status_18 "MHAS 2018 Cognitive Status (using
8 tasks)"
label define cognitive_status_18 0 "0.Normal" 1 "1.Normal with
Instrumental Impairment" 2 "2.CIND" 3 "3.Dementia", replace
label values cognitive_status_18 cognitive_status_18

```

```

** Cognitive Status Classification using 5 tasks (if 2 or more
completed) **
gen cognitive_status_v01_18=.
replace cognitive_status_v01_18=3 if cog_imp_iqcode_18==1 |
[inrange(numb_tasks_imp_v01_18,2,5) & inrange(iadls_18,1,4)]
replace cognitive_status_v01_18=2 if
inrange(numb_tasks_imp_v01_18,2,5) & iadls_18==0
replace cognitive_status_v01_18=1 if
inrange(numb_tasks_imp_v01_18,0,1) & inrange(iadls_18,1,4)
replace cognitive_status_v01_18=0 if cog_imp_iqcode_18==0 |
[inrange(numb_tasks_imp_v01_18,0,1) & iadls_18==0]
replace cognitive_status_v01_18=.i if
[inrange(numb_tasks_comp_v01_18,0,1) | cog_imp_iqcode_18==.i] &
cognitive_status_v01_18==.
replace cognitive_status_v01_18=.d if [iadls_18==.d |
cog_imp_iqcode_18==.d] & cognitive_status_v01_18==.
replace cognitive_status_v01_18=.r if [iadls_18==.r |
cog_imp_iqcode_18==.r] & cognitive_status_v01_18==.
replace cognitive_status_v01_18=.m if [inlist(age_18,888,999) |
inlist(yrschool,.d,.r,.m) | inlist(iadls_18,.m,.)] &
cognitive_status_v01_18==.
label variable cognitive_status_v01_18 "MHAS 2018 Cognitive Status
v2001-2003"
label values cognitive_status_v01_18 cognitive_status_18

```