



Atherosclerosis Risk in Communities Study

---

**Cohort Exam Visit 9 NCS**  
**V2\_V9\_CNFA\_NP Derived Variable Dictionary**  
**(v2.0)**  
**August 2023**

Prepared by the Collaborative Studies Coordinating Center

# ARIC V2\_V9\_CNFA\_NP Derived Variable Dictionary

---

## Table of Contents

New or Changed from PREVIOUS Distribution .....	5
1. Overview .....	6
2. Administrative.....	6
2.1    SUBJECTID (ARIC Subject ID (CIR) .....	6
2.2    ID (ARIC ID - same as SUBJECTID).....	6
2.3    VTYPE (Visit type).....	7
2.4    INPERSONTESTS (Indicator for one or more cognitive tests administered in person).....	8
2.5    PHONETESTS (Indicator for one or more cognitive tests administered by phone).....	8
2.6    INPERSONDATE_FollowUpDays (Days of follow up from visit 1 to In-person cognitive assessment date) .....	9
2.7    INPERSONDATE_year (Year of In-person cognitive assessment date) .....	11
2.8    PHONEDATE_FollowUpDays (Days of follow up from visit 1 to Telephone cognitive assessment date) .....	13
2.9    PHONEDATE_year (Year of Telephone cognitive assessment date) .....	13
2.10   VDATE_FollowUpDays (Days of follow up from visit 1 to Cognitive assessment date) .....	13
2.11   VDATE_year (Year of Cognitive assessment date) .....	14
3. Neurocognitive Z Scores.....	14
3.1    ZSCORE_DWR (Z score of delayed word recall) .....	14
3.2    ZSCORE_DSS (Z score of digit symbol substitution) .....	15
3.3    ZSCORE_WFT (Z score of word fluency) .....	16
3.4    MISSINGTESTS (Number of missing neurocognitive tests) .....	17
3.5    GLOBZ_NCTS (Mean of DWR, DSS, and WFT z scores).....	17
4. Neurocognitive Factor Scores.....	17
4.1    GLOBALFS1 (Global cognition factor score (in person) from categorical indicators (ver1)) .....	18
4.2    GLOBALFS2 (Global cognition factor score (co-calibrated) from continuous indicators and invariant tests (ver2)).....	19
4.3    GLOBALFS3 (Global cognition factor score (co-calibrated) from continuous indicators and invariant subsample cognition (ver3)) .....	20

4.4	GLOBALFS4 (Global cognition factor score (co-calibrated) from categorical indicators and invariant tests (ver4)).....	21
4.5	GLOBALFS5 (Global cognition factor score (co-calibrated) from categorical indicators and invariant subsample cognition (ver5)) .....	21
4.6	GLOBALFS6 (Global cognition factor score (phone) from continuous indicators (ver6)) .....	22
4.7	GLOBALFS7 (Global cognition factor score (phone) from categorical indicators (ver7)) .....	23
4.8	GLOBALFS8 (Global cognition factor score (in person) from continuous indicators (ver8))	23
4.9	LANGUAGEFS1 (Language domain factor score (in person) from categorical indicators (ver1)) .....	24
4.10	LANGUAGEFS2 (Language domain factor score (co-calibrated) from continuous indicators and invariant tests (ver2)).....	24
4.11	LANGUAGEFS3 (Language domain factor score (co-calibrated) from continuous indicators and invariant subsample cognition (ver3)) .....	24
4.12	LANGUAGEFS4 (Language domain factor score (co-calibrated) from categorical indicators and invariant tests (ver4)).....	25
4.13	LANGUAGEFS5 (Language domain factor score (co-calibrated) from categorical indicators and invariant subsample cognition (ver5)) .....	25
4.14	LANGUAGEFS6 (Language domain factor score (phone) from continuous indicators (ver6)) .....	26
4.15	LANGUAGEFS7 (Language domain factor score (phone) from categorical indicators (ver7)) .....	26
4.16	EXECFUNCFS1 (Executive functioning domain factor score (in person) from categorical indicators (ver1)).....	27
4.17	EXECFUNCFS6 (Executive functioning domain factor score (phone) from continuous indicators (ver6)).....	27
4.18	EXECFUNCFS7 (Executive functioning domain factor score (phone) from categorical indicators (ver7)).....	27
4.19	MEMORYFS1 (Memory domain factor score (in person) from categorical indicators (ver1)) .....	28
4.20	MEMORYFS6 (Memory domain factor score (phone) from continuous indicators (ver6)) ...	28
4.21	MEMORYFS7 (Memory domain factor score (phone) from categorical indicators (ver7)) ...	29
5.	Supplemental Semi-Annual Follow-Up Assessments.....	29
5.1	SIS (Six-item cognitive screener closest to cognitive assessment date) .....	29
5.2	SISDATE_FollowUpDays (Days of follow up from visit 1 to Date of six-item cognitive screener closest to cognitive assessment date).....	30
5.3	SISDATE_year (Year of Date of six-item cognitive screener closest to cognitive assessment date).....	30
5.4	ADS (Eight-item informant questionnaire closest to cognitive assessment date).....	30

5.5	ADSDATE_FollowUpDays (Days of follow up from visit 1 to Date of eight item informant questionnaire closest to cognitive assessment date) .....	31
5.6	ADSDATE_year (Year of Date of eight item informant questionnaire closest to cognitive assessment date) .....	31
6.	References .....	31

**NEW OR CHANGED FROM PREVIOUS DISTRIBUTION**

This table describes the changes to the last published V2\_V9\_CNFA\_NP dictionary.

<b>Modification Date</b>	<b>Variable Name</b>	<b>Reason(s) for Change</b>
8/9/2023	<u>Administrative</u> INPERSONDATE_year PHONEDATE_year VDATE_year  <u>Neurocognitive Factor Scores</u> GLOBALFS8  <u>Supplemental Semi-Annual Follow-Up Assessments</u> SISDATE_year ADSDATE_year	Cognitive assessment and semi-annual follow-up assessment dates are replaced with variables indicating year and number of follow up days after visit 1.  Additional factor score for global cognition (in person) from continuous indicators has been added.

## 1. OVERVIEW

The V2\_V9\_CNFA\_NP dataset contains 61,719 records from 14,676 participants who completed one or more neurocognitive tests between Visit 2 (1990-1992) and Visit 9 (2021-2022). The dataset utilizes a long format in which each participant has multiple records. Each record represents a specific visit or sub-study during which the participant completed an assessment. The purpose of this dataset is to provide ARIC collaborators with a set of variables that can be used to examine risk and protective factors associated with cognitive change over time.

The dataset naming conventions are as follows: The dataset name retains the retrieval date (ex: V2\_V9\_CNFA\_NP\_220511) until the dataset is considered final and frozen. After a dataset is frozen, the retrieval date is dropped from the dataset name (ex: V2\_V9\_CNFA\_NP). Datasets with “NP” in the name have dates removed; instead, dates are replaced with the number of follow up days after the Visit 1 date and the year of the original date variable. The first two characters refer to the earliest visit included in the dataset. The next two characters indicate the last visit in the dataset. The variable naming convention is similar. Across-visit variables have identical names. The last digit in the variable name identifies the definition version of a variable.

Details about the administration of neurocognitive tests can be found in ARIC Manual 17. The construction of factor scores based on these neurocognitive tests is described in ARIC Manual 30.

## 2. ADMINISTRATIVE

Administrative variables are used to identify specific participants, the visit and date on which the participant completed one or more neurocognitive tests, and whether the assessment was conducted in-person or by phone.

### 2.1 SUBJECTID (ARIC Subject ID (CIR))

Type: Character; length: \$7.

### 2.2 ID (ARIC ID - same as SUBJECTID)

Description: The historical participant identifier from visits 1-4 is ID. The value of ID is the same value as SUBJECTID. Use ID when merging visit 9/NCS stage 1 data with datasets from previous visits necessary for longitudinal analyses.

Type: Character; length: \$7.

Algorithm: ID=SUBJECTID.

Source variable(s): SUBJECTID

### 2.3 VTYPE (Visit type)

Description: A variable created to indicate the specific visit at which an assessment was administered. Neurocognitive tests were administered at Visit 2 (1990-1992), Visit 3 (1993-1995), Visit 4 (1996-1998), Visit 5 (2011-2013), Visit 6 (2016-2017), Visit 7 (2018-2019), Visit 8 (2020), and Visit 9 (2021-2022). Neurocognitive tests were also administered during two MRI sub-studies ('BRAIN' from 2004 to 2006 and 'CarMRI' from 2005 to 2006) as well as during the baseline ('ACHY0'), one-year follow-up ('ACHY1'), two-year follow-up ('ACHY2'), three-year follow-up ('ACHY3') of the ACHIEVE randomized controlled trial and the subsequent ACHIEVE-HIFU ancillary study ('ACHY4').

Type: Character; length: \$6.

Algorithm:  
If ID is in [CNFA] then VTYPE='V2'.  
If ID is in [CNFB04] then VTYPE='V3'.  
If ID is in [CNFC04] then VTYPE='V4'.  
If ID is in [NCS Visit 5] then VTYPE='V5NCS'.  
If ID is in [NCS Visit 6] then VTYPE='V6NCS'.  
If ID is in [NCS Visit 7] then VTYPE='V7NCS'.  
If ID is in [NCS or NCST Visit 8] then VTYPE='V8NCS'.  
If ID is in [NCS Visit 9] then VTYPE='V9NCS'.  
If ID is in [NCS ACHIEVE] and EventName='Screen and Baseline' and ID, NCS date, and NCST date are not present in [NCS Visit 7, NCS Visit 8, NCST Visit 8, or NCS Visit 9] then VTYPE='ACHY0'.  
If ID is in [NCS ACHIEVE] and EventName='Year 1' and ID, NCS date, and NCST date are not present in [NCS Visit 7, NCS Visit 8, NCST Visit 8, or NCS Visit 9] then VTYPE='ACHY1'.  
If ID is in [NCS ACHIEVE] and EventName='Year 2' and ID, NCS date, and NCST date are not present in [NCS Visit 7, NCS Visit 8, NCST Visit 8, or NCS Visit 9] then VTYPE='ACHY2'.  
If ID is in [NCS ACHIEVE] and EventName='Y3 CLINIC' and ID, NCS date, and NCST date are not present in [NCS Visit 7, NCS Visit 8, NCST Visit 8, or NCS Visit 9] then VTYPE='ACHY3'.  
If ID is in [NCS ACHIEVE ANX] and EventName='ANX Year 1' and ID and NCS date are not present in [NCS Visit 9] then VTYPE='ACHY4'.  
If ID is in [CNF\_IA1] then VTYPE='BRAIN'.  
If ID is in [CNFF] then VTYPE='CarMRI'.

Source variable(s): ID, EventName, NCS date, NCST date

## 2.4 INPERSONTESTS (Indicator for one or more cognitive tests administered in person)

Description: A variable created to denote whether an in-person neurocognitive assessment was administered. 0 indicates that an in-person neurocognitive assessment *was not* administered. 1 indicates that an in-person neurocognitive assessment *was* administered.

Type: Numeric

Algorithm: INPERSONTESTS=0.  
If ID is in [CNFA] then INPERSONTESTS=1.  
If ID is in [CNFB04] then INPERSONTESTS=1.  
If ID is in [CNFC04] then INPERSONTESTS=1.  
If ID is in [NCS Visit 5], [MME Visit 5], or [CDP Visit 5] then INPERSONTESTS=1.  
If ID is in [NCS Visit 6], [MME6 Visit 6], or [CDP Visit 6] then INPERSONTESTS=1.  
If ID is in [NCS Visit 7], [MME6 Visit 7], or [CDP Visit 7] then INPERSONTESTS=1.  
If ID is in [NCS Visit 8], [MME6 Visit 8], or [CDP Visit 8] then INPERSONTESTS=1.  
If ID is in [NCS Visit 9], [MME6 Visit 9], or [CDP Visit 9] then INPERSONTESTS=1.  
If ID is in [NCS ACHIEVE] or [NCS ACHIEVE ANX] then INPERSONTESTS=1.  
If ID is in [CNF\_IA1] then INPERSONTESTS=1.  
If ID is in [CNFF] then INPERSONTESTS=1.

Source variable(s): ID

## 2.5 PHONETESTS (Indicator for one or more cognitive tests administered by phone)

Description: A variable created to denote whether a phone-based neurocognitive assessment was administered. 0 indicates that a phone-based neurocognitive assessment *was not* administered. 1 indicates that a phone-based neurocognitive assessment *was* administered. 2 indicates that a phone-based neurocognitive assessment *was not* administered but the Six Item Cognitive Screener or the Ascertain Dementia Eight Item Informant Questionnaire was administered over the phone.



Type: Numeric

Algorithm: PHONETESTS=0.  
Else if ID is in [NCST Visit 8] or [MCHT Visit 8] then  
PHONETESTS=1.  
Else if ID is in [NCST ACHIEVE] or [MCHT ACHIEVE] then  
PHONETESTS=1.  
Else if ID is in [SISALL], VTYPE='V6NCS', and [SISALL]SIS date is  
between 1/1/2016 and 12/31/2017 then PHONETESTS=2.  
Else if ID is in [SISALL], VTYPE='V7NCS', and [SISALL]SIS date is  
between 1/1/2018 and 12/31/2019 then PHONETESTS=2.  
Else if ID is in [SISALL], VTYPE='V8NCS', and [SISALL]SIS date is  
between 1/1/2020 and 12/31/2020 then PHONETESTS=2.  
Else if ID is in [SISALL], VTYPE='V9NCS', and [SISALL]SIS date is  
between 1/1/2021 and 12/31/2022 then PHONETESTS=2.  
Else if ID is in [ADS], VTYPE='V6NCS', and [ADS]ADS date is  
between 1/1/2016 and 12/31/2017 then PHONETESTS=2.  
Else if ID is in [ADS], VTYPE='V7NCS', and [ADS]ADS date is  
between 1/1/2018 and 12/31/2019 then PHONETESTS=2.  
Else if ID is in [ADS], VTYPE='V8NCS', and [ADS]ADS date is  
between 1/1/2020 and 12/31/2020 then PHONETESTS=2.  
Else if ID is in [ADS], VTYPE='V9NCS', and [ADS]ADS date is  
between 1/1/2021 and 12/31/2022 then PHONETESTS=2.

Source variable(s): ID, SIS date, ADS date

## **2.6 INPERSONDATE\_FollowUpDays (Days of follow up from visit 1 to In-person cognitive assessment date)**

Description: A variable created to indicate the days of follow up from visit 1 to the date an in-person neurocognitive test was administered.

Type: Numeric

Algorithm: If VTYPE='V2' then INPERSONDATE\_FollowUpDays is the  
number of days between visit 1 and visit 2.  
If VTYPE='V3' then INPERSONDATE\_FollowUpDays is the  
number of days between visit 1 and visit 3.  
If VTYPE='V4' then INPERSONDATE\_FollowUpDays is the  
number of days between visit 1 and visit 4.  
If VTYPE='V5NCS' then INPERSONDATE\_FollowUpDays is the  
number of days between visit 1 and visit 5 NCS date.

Else if VTYPE='V5NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 5 MMSE date.

Else if VTYPE='V5NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 5 CDP date.

Else if VTYPE='V5NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 5.

If VTYPE='V6NCS' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 6 NCS date

Else if VTYPE='V6NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 6 MMSE date.

Else if VTYPE='V6NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 6 CDP date.

Else if VTYPE='V6NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 6.

If VTYPE='V7NCS' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 7 NCS date.

Else if VTYPE='V7NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 7 MMSE date.

Else if VTYPE='V7NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 7 CDP date.

Else if VTYPE='V7NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 7.

If VTYPE='V8NCS' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 8 NCS date.

Else if VTYPE='V8NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 8 MMSE date.

Else if VTYPE='V8NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 8 CDP date.

Else if VTYPE='V8NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 8.

If VTYPE='V9NCS' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 9 NCS date.

Else if VTYPE='V9NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 9 MMSE date.  
 Else if VTYPE='V9NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 9 CDP date.  
 Else if VTYPE='V9NCS' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and visit 9.  
 If VTYPE='ACHY0', 'ACHY1', 'ACHY2', or 'ACHY3' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and ACHIEVE NCS date.  
 If VTYPE='ACHY4' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and ACHIEVE ANX NCS date.  
 If VTYPE='Brain' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and [CNF\_IA1] CNF date.  
 Else if VTYPE='Brain' and INPERSONDATE\_FollowUpDays is missing then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and [ANT\_IA1] ANT date.  
 If VTYPE='CarMRI' then INPERSONDATE\_FollowUpDays is the number of days between visit 1 and [CNFF] CNF date.

Source variable(s): VTYPE, visit 1 date, visit 2 date, visit 3 date, visit 4 date, NCS date, MME date, CDP date, visit 5 date, visit 6 date, visit 7 date, visit 8 date, visit 9 date, [CNF\_IA1] CNF date, [ANT\_IA1] ANT date, [CNFF] CNF date

## 2.7 INPERSONDATE\_year (Year of In-person cognitive assessment date)

Description: A variable created to indicate the year an in-person neurocognitive test was administered.

Type: Numeric

Algorithm: If VTYPE='V2' then INPERSONDATE\_year is the year of visit 2.  
 If VTYPE='V3' then INPERSONDATE\_year is the year of visit 3.  
 If VTYPE='V4' then INPERSONDATE\_year is the year of visit 4.  
 If VTYPE='V5NCS' then INPERSONDATE\_year is the year of visit 5 NCS date.  
 Else if VTYPE='V5NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 5 MMSE date.  
 Else if VTYPE='V5NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 5 CDP date.  
 Else if VTYPE='V5NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 5.

If VTYPE='V6NCS' then INPERSONDATE\_year is the year of visit 6 NCS date  
 Else if VTYPE='V6NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 6 MMSE date.  
 Else if VTYPE='V6NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 6 CDP date.  
 Else if VTYPE='V6NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 6.  
 If VTYPE='V7NCS' then INPERSONDATE\_year is the year of visit 7 NCS date.  
 Else if VTYPE='V7NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 7 MMSE date.  
 Else if VTYPE='V7NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 7 CDP date.  
 Else if VTYPE='V7NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 7.  
 If VTYPE='V8NCS' then INPERSONDATE\_year is the year of visit 8 NCS date.  
 Else if VTYPE='V8NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 8 MMSE date.  
 Else if VTYPE='V8NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 8 CDP date.  
 Else if VTYPE='V8NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 8.  
 If VTYPE='V9NCS' then INPERSONDATE\_year is the year of visit 9 NCS date.  
 Else if VTYPE='V9NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 9 MMSE date.  
 Else if VTYPE='V9NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 9 CDP date.  
 Else if VTYPE='V9NCS' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of visit 9.  
 If VTYPE='ACHY0', 'ACHY1', 'ACHY2', or 'ACHY3' then INPERSONDATE\_year is the year of ACHIEVE NCS date.  
 If VTYPE='ACHY4' then INPERSONDATE\_year is the year of ACHIEVE ANX NCS date.  
 If VTYPE='Brain' then INPERSONDATE\_year is the year of [CNF\_IA1] CNF date.  
 Else if VTYPE='Brain' and INPERSONDATE\_year is missing then INPERSONDATE\_year is the year of [ANT\_IA1] ANT date.  
 If VTYPE='CarMRI' then INPERSONDATE\_year is the year of [CNFF] CNF date.

Source variable(s): VTYPE, visit 2 date, visit 3 date, visit 4 date, NCS date, MME date, CDP date, visit 5 date, visit 6 date, visit 7 date, visit 8 date, visit 9 date, [CNF\_IA1] CNF date, [ANT\_IA1] ANT date, [CNFF] CNF date

## **2.8 PHONEDATE\_FollowUpDays (Days of follow up from visit 1 to Telephone cognitive assessment date)**

Description: A variable created to indicate the days of follow up from visit 1 to the date a phone-based neurocognitive test was administered.

Type: Numeric

Algorithm: If VTYPE='V8NCS' then PHONEDATE\_FollowUpDays is the number of days between visit 1 and visit 8 NCST date.  
Else if VTYPE='V8NCS' and PHONEDATE\_FollowUpDays is missing then PHONEDATE\_FollowUpDays is the number of days between visit 1 and visit 8 MCHT date.  
Else if PHONEDATE\_FollowUpDays is missing and PHONETESTS=2 then PHONEDATE\_FollowUpDays is the number of days between visit 1 and SIS date.  
Else if PHONEDATE\_FollowUpDays is missing and PHONETESTS=2 then PHONEDATE\_FollowUpDays is the number of days between visit 1 and ADS date.

## **2.9 PHONEDATE\_year (Year of Telephone cognitive assessment date)**

Description: A variable created to indicate the year a phone-based neurocognitive test was administered.

Type: Numeric

Algorithm: If VTYPE='V8NCS' then PHONEDATE\_year is the year of visit 8 NCST date.  
Else if VTYPE='V8NCS' and PHONEDATE\_year is missing then PHONEDATE\_year is the year of visit 8 MCHT date.  
Else if PHONEDATE\_year is missing and PHONETESTS=2 then PHONEDATE\_year is the year of SIS date.  
Else if PHONEDATE\_year is missing and PHONETESTS=2 then PHONEDATE\_year is the year of ADS date.

Source variable(s): NCST date, MCHT date, SIS date, ADS date, PHONETESTS

## **2.10 VDATE\_FollowUpDays (Days of follow up from visit 1 to Cognitive assessment date)**

Description: A variable created to indicate the days of follow up from visit 1 to the date a neurocognitive test was administered.

Type: Numeric

Algorithm: VDATE\_FollowUpDays is the mean of INPERSONDATE\_FollowUpDays and PHONEDATE\_FollowUpDays.

Source variable(s): INPERSONDATE\_FollowUpDays, PHONEDATE\_FollowUpDays

### **2.11 VDATE\_year (Year of Cognitive assessment date)**

Description: A variable created to indicate the year a neurocognitive test was administered.

Type: Numeric

Algorithm: VDATE\_year is the mean of INPERSONDATE\_year and PHONEDATE\_year.

Source variable(s): INPERSONDATE\_year, PHONEDATE\_year

## **3. NEUROCOGNITIVE Z SCORES**

During Visit 2, three neurocognitive tests were administered in-person to each participant. These tests included the Delayed Word Recall, Digit Symbol Substitution, and Word Fluency. The tests were re-administered at Visits 3 through 9 as well as during two MRI sub-studies (VTYPE='BRAIN' and VTYPE='CarMRI') and the ACHIEVE randomized controlled trial and subsequent ACHIEVE-HIFU ancillary study. The raw scores of these tests were standardized to Visit 2 by calculating the mean ( $mean_{v2}$ ) and standard deviation ( $sd_{v2}$ ) at Visit 2, subtracting  $mean_{v2}$  from all values, and dividing by  $sd_{v2}$ .

### **3.1 ZSCORE\_DWR (Z score of delayed word recall)**

Description: A z score version of the Delayed Word Recall standardized to Visit 2.

Type: Numeric

Algorithm: If VTYPE='V2' then DWRSCORE=[CNFA]CNFA01.  
If VTYPE='V3' then DWRSCORE=[CNFB04]CNFB1.  
If VTYPE='V4' then DWRSCORE=[CNFC04]CNFC1.

If VTYPE='V5NCS' then DWRSCORE=[NCS Visit 5]NCS3B.  
 If VTYPE='V6NCS' then DWRSCORE=[NCS Visit 6]NCS3B.  
 If VTYPE='V7NCS' then DWRSCORE=[NCS Visit 7]NCS3B.  
 If VTYPE='V8NCS' then DWRSCORE=[NCS Visit 8]NCS3B.  
 If VTYPE='V9NCS' then DWRSCORE=[NCS Visit 9]NCS3B.  
 If VTYPE='ACHY0', 'ACHY1', 'ACHY2', or 'ACHY3' then  
 DWRSCORE=[NCS ACHIEVE]NCS3B.  
 If VTYPE='ACHY4' then DWRSCORE=[NCS ACHIEVE  
 ANX]NCS3B.  
 If VTYPE='Brain' then DWRSCORE=[CNF\_IA1]CNFD5.  
 If VTYPE='CarMRI' then DWRSCORE=[CNFF]CNFF2.  
 If DWRSCORE <0 or >10 then DWRSCORE is set to missing.

If VTYPE='V2' then calculate the mean of DWRSCORE as  
 DWRSCORE<sub>meanV2</sub> and the standard deviation of DWRSCORE as  
 DWRSCORE<sub>sdV2</sub>. Calculate ZSCORE\_DWR for all visits as  

$$ZSCORE\_DWR = \frac{DWRSCORE - DWRSCORE_{meanV2}}{DWRSCORE_{sdV2}}$$

Source variable(s): VTYPE, CNFA01, CNFB1, CNFC1, NCS3B, CNFD5, CNFF2

### 3.2 ZSCORE\_DSS (Z score of digit symbol substitution)

Description: A z score version of the Digit Symbol Substitution standardized to Visit 2.

Type: Numeric

Algorithm:  
 If VTYPE='V2' then DSSSCORE=[CNFA]CNFA02.  
 If VTYPE='V3' then DSSSCORE=[CNFB04]CNFB2.  
 If VTYPE='V4' then DSSSCORE=[CNFC04]CNFC2.  
 If VTYPE='V5NCS' then DSSSCORE=[NCS Visit 5]NCS2B.  
 If VTYPE='V6NCS' then DSSSCORE=[NCS Visit 6]NCS2B.  
 If VTYPE='V7NCS' then DSSSCORE=[NCS Visit 7]NCS2B.  
 If VTYPE='V8NCS' then DSSSCORE=[NCS Visit 8]NCS2B.  
 If VTYPE='V9NCS' then DSSSCORE=[NCS Visit 9]NCS2B.  
 If VTYPE='ACHY0', 'ACHY1', 'ACHY2', or 'ACHY3' then  
 DSSSCORE=[NCS ACHIEVE]NCS2B.  
 If VTYPE='ACHY4' then DSSSCORE=[NCS ACHIEVE  
 ANX]NCS2B  
 If VTYPE='Brain' then DSSSCORE=[CNF\_IA1]CNFD3.  
 If VTYPE='CarMRI' then DSSSCORE=[CNFF]CNFF3.

If VTYPE='V2' then calculate the mean of DSSSCORE as  
 DSSSCORE<sub>meanV2</sub> and the standard deviation of DSSSCORE as

DSSSCORE<sub>sdv2</sub>. Calculate ZSCORE\_DSS for all visits as  
 $ZSCORE\_DSS = (DSSSCORE - DSSSCORE_{meanv2}) / DSSSCORE_{sdv2}$ .

Source variable(s): VTYPE, CNFA02, CNFB2, CNFC2, NCS2B, CNFD3, CNFF3

### 3.3 ZSCORE\_WFT (Z score of word fluency)

Description: A z score version of the Word Fluency standardized to Visit 2.

Type: Numeric

Algorithm:  
If VTYPE='V2' then WFTSCORE=[CNFA]CNFA04.  
If VTYPE='V3' then WFTSCORE=[CNFB04]CNFB4.  
If VTYPE='V4' then WFTSCORE=[CNFC04]CNFC4.  
If VTYPE='V5NCS' then WFTSCORE=[NCS Visit 5]NCS5E.  
If VTYPE='V6NCS' then WFTSCORE=[NCS Visit 6]NCS5E.  
If VTYPE='V7NCS' then WFTSCORE=sum([NCS Visit 7]  
NCS5B, NCS5C, NCS5D).  
If VTYPE='V8NCS' then WFTSCORE=sum([NCS Visit 8]  
NCS5B, NCS5C, NCS5D).  
If VTYPE='V9NCS' then WFTSCORE=sum([NCS Visit 9]  
NCS5B, NCS5C, NCS5D).  
If VTYPE='ACHY0', 'ACHY1', 'ACHY2', or 'ACHY3' then  
WFTSCORE=sum([NCS ACHIEVE]  
NCS5B, NCS5C, NCS5D).  
If VTYPE='ACHY4' then WFTSCORE=sum([NCS ACHIEVE ANX]  
NCS5B, NCS5C, NCS5D).  
If VTYPE='Brain' then WFTSCORE=sum([CNF\_IA1]  
(CNFD7A, CNFD7B, CNFD7C, CNFD9A, CNFD9B, CNFD9C,  
CNFD11A, CNFD11B, CNFD11C).  
If VTYPE='CarMRI' then WFTSCORE=[CNFF]CNFF4.  
If WFTSCORE <0 or >75 then WFTSCORE is set to missing.  
  
If VTYPE='V2' then calculate the mean of WFTSCORE as  
WFTSCORE<sub>meanv2</sub> and the standard deviation of WFTSCORE as  
WFTSCORE<sub>sdv2</sub>. Calculate ZSCORE\_WFT for all visits as  
 $ZSCORE\_WFT = (WFTSCORE - WFTSCORE_{meanv2}) / WFTSCORE_{sdv2}$ .

Source variable(s): VTYPE, CNFA04, CNFB4, CNFC4, NCS5B, NCS5C, NCS5D,  
NCS5E, CNFD7A, CNFD7B, CNFD7C, CNFD9A, CNFD9B,  
CNFD9C, CNFD11A, CNFD11B, CNFD11C, CNFF4



### 3.4 MISSINGTESTS (Number of missing neurocognitive tests)

Description: A variable created to indicate whether the Delayed Word Recall, Digit Symbol Substitution, or Word Fluency were missing from a specific visit or sub-study. The count ranges from 0 to 3.

Type: Numeric

Algorithm: Count of missing from ZSCORE\_DWR, ZSCORE\_DSS, and ZSCORE\_WFT.

Source variable(s): ZSCORE\_DWR, ZSCORE\_DSS, ZSCORE\_WFT

### 3.5 GLOBZ\_NCTS (Mean of DWR, DSS, and WFT z scores)

Description: A 3-test combined score of cognition calculated by computing the mean from the z score versions of the Delayed Word Recall, Digit Symbol Substitution, and Word Fluency administered during a specific visit or sub-study.

Type: Numeric

Algorithm: If MISSINGTESTS=0 then GLOBZ\_NCTS=mean(ZSCORE\_DWR, ZSCORE\_DSS, ZSCORE\_WFT).

Source variable(s): MISSINGTESTS, ZSCORE\_DWR, ZSCORE\_DSS, ZSCORE\_WFT

## 4. NEUROCOGNITIVE FACTOR SCORES

At Visit 2 and Visit 4, three neurocognitive tests were administered in-person. These included the Delayed Word Recall, Digit Symbol Substitution, and Word Fluency. During one of the MRI sub-studies (VTYPE='BRAIN'), eight neurocognitive tests were administered. The five additional tests were Logical Memory (Wechsler, 1987), Incidental Learning (Ryan & Lopez, 2001), Animal Naming (Benton & Hamsher, 1976), and Trail Making Tests A and B (Reitan, 1958). At Visits 5 through 7, Boston Naming (Williams, Mack, & Henderson, 1989) and the Digit Span Backwards (Wechsler, 1987) were added to the test battery. All ten tests were administered during Visit 9, as well as the ACHIEVE randomized controlled trial and ACHIEVE-HIFU ancillary study.

The initial test battery for Visit 8 was comprised of the Delayed Word Recall, Digit Symbol Substitution, Word Fluency, Incidental Learning, and Animal Naming. Due to the outbreak of COVID-19, in-person neurocognitive testing was halted in March of 2020. Four months later, a modified six-test battery was administered over the phone. The modified battery included Digit Span Backwards, Animal Naming, and a truncated Word Fluency limited to the letters F and A. Three additional tests were incorporated

into the battery for the first time. These tests included the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) Word List (Morris, Mohs, Rogers, Fillenbaum, & Heyman, 1988) and oral versions of Trail Making Tests A and B.

Raw scores from each in-person neurocognitive test were discretized into ten or fewer categories. A confirmatory factor analysis with categorical indicators (Gross, et al., 2015) was employed to compute a global cognition factor score (ver1) for each participant. Separate factor scores for the cognitive domains of language, executive function, and memory (Rawlings, et al., 2016) were generated by applying the same methodology. Factor scores were standardized to Visit 5.

In 2020, additional iterations of the global cognition factor score were developed that harmonized in-person and phone-based neurocognitive tests through co-calibration (Gross, Jones, Fong, Tommet, & Inouye, 2014). Co-calibration can be performed when one of two assumptions are met. The first assumption is that one or more tests are psychometrically equivalent regardless of modality. These tests are used as linking items to produce scores that are comparable even if the battery of tests varies over time. The second, alternative assumption is that the underlying construct of global cognition has not changed in a representative subsample of individuals who complete both in-person and phone-based tests. Test and modality specific measurement error is estimated in this subsample and the resulting measurement model is applied to the remaining sample. Co-calibration was utilized to compute factor scores from models with continuous indicators harmonized under the assumption of invariant tests (ver2), continuous indicators harmonized under the assumption of invariant global cognition in a representative subsample (ver3), categorical indicators harmonized under the assumption of invariant tests (ver4), and categorical indicators harmonized under the assumption of invariant global cognition in a representative subsample (ver5). Factor scores computed from only phone-based neurocognitive tests were generated from models with continuous indicators (ver6) and categorical indicators (ver7). Factor scores computed from in-person neurocognitive tests using continuous indicators were also generated (ver8). Separate factor scores for the cognitive domains of language, executive function, and memory were generated by applying the same methodology. However, co-calibrated factor scores (Ver2-Ver5) for the domains of executive function and memory exhibited poor between-visit reliability and consequently will not be distributed until an improved model is developed. Factor scores computed from in-person and phone-based neurocognitive tests were standardized to Visit 5. Factor scores computed from only phone-based neurocognitive tests were standardized to Visit 8. Additional details about the factor scores and which to use for specific analyses can be found in ARIC Manual 30.

#### **4.1 GLOBALFS1 (Global cognition factor score (in person) from categorical indicators (ver1))**

Description: A factor score of global cognition computed based on discretized versions of neurocognitive tests from Visits 2, 4, 5, 6, 7, 8, and 9, plus one of the MRI sub-studies (VTYPE='BRAIN'), the ACHIEVE randomized controlled trial, and ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person assessment.

Source variable(s): DWRC2, DSSC2, WFTTC2, DWRCM, ILRPCM, DSSCM, LMTTCM, TMTACM, TMTBCM, WFTTCM, ANSCM, DWRC4, DSSC4, WFTTC4, DWRC5, WFTTC5, DSSC5, ILRPC5, ANSC5, DSBC5, BNTC5, LMTTC5, TMTAC5, TMTBC5, DWRC6, WFTTC6, DSSC6, ILRPC6, ANSC6, DSBC6, BNTC6, LMTTC6, TMTAC6, TMTBC6, DWRC7, WFTTC7, DSSC7, ILRPC7, ANSC7, DSBC7, BNTC7, LMTTC7, TMTAC7, TMTBC7, DWRC8, WFTTC8, DSSC8, ILRPC8, ANSC8, DSBC8, BNTC8, LMTTC8, TMTAC8, TMTBC8, DWRC9, WFTTC9, DSSC9, ILRPC9, ANSC9, DSBC9, BNTC9, LMTTC9, TMTAC9, TMTBC9

#### **4.2 GLOBALFS2 (Global cognition factor score (co-calibrated) from continuous indicators and invariant tests (ver2))**

Description: A factor score of global cognition computed based on standardized versions of neurocognitive tests from Visits 2, 4, 5, 6, 7, 8, and 9, plus one of the MRI sub-studies (VTYPE='BRAIN'), the ACHIEVE randomized controlled trial, and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): DWRS2, DSSS2, WFTTS2, DWRSM, ILRPSM, ILRSSM, DSSSM, LMTASM, LMTBSM, LMTCSM, LMTDSM, TMTASM, TMTBSM, WFTFSM, WFTASM, WFTSSM, ANSSM, DWRS4, DSSS4, WFTTS4, DWRS5, DSSS5, WFTFS5, WFTAS5, WFTSS5, ILRPS5, ILRSS5, ANSS5, LMTAS5, LMTBS5, LMTCS5, LMTDS5, DSBS5, BNTS5, TMTAS5, TMTBS5, DWRS6, DSSS6, WFTFS6, WFTAS6, WFTSS6, ILRPS6, ILRSS6, ANSS6, LMTAS6, LMTBS6, LMTCS6, LMTDS6, DSBS6, BNTS6, TMTAS6, TMTBS6, DWRS7, DSSS7, WFTFS7, WFTAS7, WFTSS7, ILRPS7, ILRSS7, ANSS7, LMTAS7, LMTBS7, LMTCS7, LMTDS7, DSBS7, BNTS7, TMTAS7, TMTBS7, DWRS8, DSSS8, WFTFS8, WFTAS8, WFTSS8,

ILRPS8, ILRSS8, ANSS8, LMTAS8, LMTBS8, LMTCS8, LMTDS8, DSBS8, BNTS8, TMTAS8, TMTBS8, TCRDAS8, TCRDBS8, TCRDCS8, TCRDDS8, TWFTFS8, TWFTAS8, TANSS8, TDSBS8, TTMTAS8, TTMTBS8, DWRS9, DSSS9, WFTFS9, WFTAS9, WFTSS9, ILRPS9, ILRSS9, ANSS9, LMTAS9, LMTBS9, LMTCS9, LMTDS9, DSBS9, BNTS9, TMTAS9, TMTBS9, TCRDAS9, TCRDBS9, TCRDCS9, TCRDDS9, TWFTFS9, TWFTAS9, TANSS9, TDSBS9, TTMTAS9, TTMTBS9

#### **4.3 GLOBALFS3 (Global cognition factor score (co-calibrated) from continuous indicators and invariant subsample cognition (ver3))**

Description: A factor score of global cognition computed based on standardized versions of neurocognitive tests from Visits 2, 4, 5, 6, 7, 8, and 9, plus one of the MRI sub-studies (VTYPE='BRAIN'), the ACHIEVE randomized controlled trial, and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): DWRS2, DSSS2, WFTTS2, DWRS4, DSSS4, WFTTS4, DWRS5, DSSS5, WFTFS5, WFTAS5, WFTSS5, ILRPS5, ILRSS5, ANSS5, LMTAS5, LMTBS5, LMTCS5, LMTDS5, DSBS5, BNTS5, TMTAS5, TMTBS5, DWRS6, DSSS6, WFTFS6, WFTAS6, WFTSS6, ILRPS6, ILRSS6, ANSS6, LMTAS6, LMTBS6, LMTCS6, LMTDS6, DSBS6, BNTS6, TMTAS6, TMTBS6, DWRS7, DSSS7, WFTFS7, WFTAS7, WFTSS7, ILRPS7, ILRSS7, ANSS7, LMTAS7, LMTBS7, LMTCS7, LMTDS7, DSBS7, BNTS7, TMTAS7, TMTBS7, DWRS8, DSSS8, WFTFS8, WFTAS8, WFTSS8, ILRPS8, ILRSS8, ANSS8, LMTAS8, LMTBS8, LMTCS8, LMTDS8, DSBS8, BNTS8, TMTAS8, TMTBS8, TCRDAS8, TCRDBS8, TCRDCS8, TCRDDS8, TWFTFS8, TWFTAS8, TANSS8, TDSBS8, TTMTAS8, TTMTBS8, DWRS9, DSSS9, WFTFS9, WFTAS9, WFTSS9, ILRPS9, ILRSS9, ANSS9, LMTAS9, LMTBS9, LMTCS9, LMTDS9, DSBS9, BNTS9, TMTAS9, TMTBS9, TCRDAS9, TCRDBS9, TCRDCS9, TCRDDS9, TWFTFS9, TWFTAS9, TANSS9, TDSBS9, TTMTAS9, TTMTBS9

#### 4.4 GLOBALFS4 (Global cognition factor score (co-calibrated) from categorical indicators and invariant tests (ver4))

Description: A factor score of global cognition computed based on discretized versions of neurocognitive tests from Visits 2, 4, 5, 6, 7, 8, and 9, plus one of the MRI sub-studies (VTYPE='BRAIN'), the ACHIEVE randomized controlled trial, and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): DWRC2, DSSC2, WFTTC2, DWRCM, ILRPCM, DSSCM, TMTACM, TMTBCM, ANSCM, ILRSCM, LMTACM, LMTBCM, LMTCCM, LMTDCM, WFTFCM, WFTACM, WFTSCM, DWRC4, DSSC4, WFTTC4, DWRC5, DSSC5, ILRPC5, ANSC5, DSBC5, BNTC5, TMTAC5, TMTBC5, ILRSC5, LMTAC5, LMTBC5, LMTCC5, LMTDC5, WFTFC5, WFTAC5, WFTSC5, DWRC6, DSSC6, ILRPC6, ANSC6, DSBC6, BNTC6, TMTAC6, TMTBC6, ILRSC6, LMTAC6, LMTBC6, LMTCC6, LMTDC6, WFTFC6, WFTAC6, WFTSC6, DWRC7, DSSC7, ILRPC7, ANSC7, DSBC7, BNTC7, TMTAC7, TMTBC7, ILRSC7, LMTAC7, LMTBC7, LMTCC7, LMTDC7, WFTFC7, WFTAC7, WFTSC7, DWRC8, DSSC8, ILRPC8, ANSC8, DSBC8, BNTC8, TMTAC8, TMTBC8, ILRSC8, LMTAC8, LMTBC8, LMTCC8, LMTDC8, WFTFC8, WFTAC8, WFTSC8, TTMTAC8, TTMTBC8, TANSC8, TDSBC8, TWFTAC8, TWFTFC8, TCRDAC8, TCRDBC8, TCRDCC8, TCRDDC8, DWRC9, DSSC9, ILRPC9, ANSC9, DSBC9, BNTC9, TMTAC9, TMTBC9, ILRSC9, LMTAC9, LMTBC9, LMTCC9, LMTDC9, WFTFC9, WFTAC9, WFTSC9, TTMTAC9, TTMTBC9, TANSC9, TDSBC9, TWFTAC9, TWFTFC9

#### 4.5 GLOBALFS5 (Global cognition factor score (co-calibrated) from categorical indicators and invariant subsample cognition (ver5))

Description: A factor score of global cognition computed based on discretized versions of neurocognitive tests from Visits 2, 4, 5, 6, 7, 8, and 9, plus one of the MRI sub-studies (VTYPE='BRAIN'), the ACHIEVE randomized controlled trial, and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): DWRC2, DSSC2, WFTTC2, DWRCM, ILRPCM, DSSCM, TMTACM, TMTBCM, ANSCM, ILRSCM, LMTACM, LMTBCM, LMTCCM, LMTDCM, WFTFCM, WFTACM, WFTSCM, DWRC4, DSSC4, WFTTC4, DWRC5, DSSC5, ILRPC5, ANSC5, DSBC5, BNTC5, TMTAC5, TMTBC5, ILRSC5, LMTAC5, LMTBC5, LMTCC5, LMTDC5, WFTFC5, WFTAC5, WFTSC5, DWRC6, DSSC6, ILRPC6, ANSC6, DSBC6, BNTC6, TMTAC6, TMTBC6, ILRSC6, LMTAC6, LMTBC6, LMTCC6, LMTDC6, WFTFC6, WFTAC6, WFTSC6, DWRC7, DSSC7, ILRPC7, ANSC7, DSBC7, BNTC7, TMTAC7, TMTBC7, ILRSC7, LMTAC7, LMTBC7, LMTCC7, LMTDC7, WFTFC7, WFTAC7, WFTSC7, DWRC8, DSSC8, ILRPC8, ANSC8, DSBC8, BNTC8, TMTAC8, TMTBC8, ILRSC8, LMTAC8, LMTBC8, LMTCC8, LMTDC8, WFTFC8, WFTAC8, WFTSC8, TTMTAC8, TTMTBC8, TANSC8, TDSBC8, TWFTAC8, TWFTFC8, TCRDAC8, TCRDBC8, TCRDCC8, TCRDDC8, DWRC9, DSSC9, ILRPC9, ANSC9, DSBC9, BNTC9, TMTAC9, TMTBC9, ILRSC9, LMTAC9, LMTBC9, LMTCC9, LMTDC9, WFTFC9, WFTAC9, WFTSC9, TTMTAC9, TTMTBC9, TANSC9, TDSBC9, TWFTAC9, TWFTFC9

#### **4.6 GLOBALFS6 (Global cognition factor score (phone) from continuous indicators (ver6))**

Description: A factor score of global cognition computed based on standardized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TCRDAS8, TCRDBS8, TCRDCS8, TCRDDS8, TWFTFS8, TWFTAS8, TANSS8, TDSBS8, TTMTAS8, TTMTBS8, TCRDAS9, TCRDBS9, TCRDCS9, TCRDDS9, TWFTFS9, TWFTAS9, TANSS9, TDSBS9, TTMTAS9, TTMTBS9

#### **4.7 GLOBALFS7 (Global cognition factor score (phone) from categorical indicators (ver7))**

Description: A factor score of global cognition computed based on discretized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TTMTAC8, TTMTBC8, TANSC8, TDSBC8, TWFTAC8, TWFTFC8, TCRDAC8, TCRDBC8, TCRDCC8, TCRDDC8, TTMTAC9, TTMTBC9, TANSC9, TDSBC9, TWFTAC9, TWFTFC9, TCRDAC9, TCRDBC9, TCRDCC9, TCRDDC9

#### **4.8 GLOBALFS8 (Global cognition factor score (in person) from continuous indicators (ver8))**

Description: A factor score of global cognition computed based on standardized versions of neurocognitive tests from Visits 2, 4, 5, 6, 7, 8, and 9, plus one of the MRI sub-studies (VTYPE='BRAIN'), the ACHIEVE randomized controlled trial, and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person assessment.

Source variable(s): DWRS2, DSSS2, WFTTS2, DWRS5, ILRPS5, ANSS5, DSBS5, BNTS5, LMTS5, TMTAS5, TMTBS5, DWRS6, WFTTS6, DSSS6, ILRPS6, ANSS6, DSBS6, BNTS6, LMTS6, TMTAS6, TMTBS6, DWRS7, WFTTS7, DSSS7, ILRPS7, ANSS7, DSBS7, BNTS7, LMTS7, TMTAS7, TMTBS7, DWRS8, WFTTS8, DSSS8, ILRPS8, ANSS8, DSBS8, BNTS8, LMTS8, TMTAS8, TMTBS8, DWRS9, WFTTS9, DSSS9, ILRPS9, ANSS9, DSBS9, BNTS9, LMTS9, TMTAS9, TMTBS9

#### **4.9 LANGUAGEFS1 (Language domain factor score (in person) from categorical indicators (ver1))**

Description: A language domain factor score computed based on discretized versions of neurocognitive tests from Visits 5, 6, 7, 8, and 9 plus the ACHIEVE randomized controlled trial and ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person assessment.

Source variable(s): WFTTC5, ANSC5, BNTC5, WFTTC6, ANSC6, BNTC6, WFTTC7, ANSC7, BNTC7, WFTTC8, ANSC8, BNTC8, WFTTC9, ANSC9, BNTC9

#### **4.10 LANGUAGEFS2 (Language domain factor score (co-calibrated) from continuous indicators and invariant tests (ver2))**

Description: A language domain factor score computed based on standardized versions of neurocognitive tests from Visits 5, 6, 7, 8, and 9 plus the ACHIEVE randomized controlled trial and ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): WFTFS5, WFTAS5, WFTSS5, ANSS5, BNTS5, WFTFS6, WFTAS6, WFTSS6, ANSS6, BNTS6, WFTFS7, WFTAS7, WFTSS7, ANSS7, BNTS7, WFTFS8, WFTAS8, WFTSS8, ANSS8, BNTS8, TWFTFS8, TWFTAS8, TANSS8, WFTFS9, WFTAS9, WFTSS9, ANSS9, BNTS9, TWFTFS9, TWFTAS9, TANSS9

#### **4.11 LANGUAGEFS3 (Language domain factor score (co-calibrated) from continuous indicators and invariant subsample cognition (ver3))**



Description: A language domain factor score computed based on standardized versions of neurocognitive tests from Visits 5, 6, 7, 8, and 9 plus the ACHIEVE randomized controlled trial and ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): WFTFS5, WFTAS5, WFTSS5, ANSS5, BNTS5, WFTFS6, WFTAS6, WFTSS6, ANSS6, BNTS6, WFTFS7, WFTAS7, WFTSS7, ANSS7, BNTS7, WFTFS8, WFTAS8, WFTSS8, ANSS8, BNTS8, TWFTFS8, TWFTAS8, TANSS8, WFTFS9, WFTAS9, WFTSS9, ANSS9, BNTS9, TWFTFS9, TWFTAS9, TANSS9

#### **4.12 LANGUAGEFS4 (Language domain factor score (co-calibrated) from categorical indicators and invariant tests (ver4))**

Description: A language domain factor score computed based on discretized versions of neurocognitive tests from Visits 5, 6, 7, 8, and 9 plus the ACHIEVE randomized controlled trial and ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): WFTFC5, WFTAC5, WFTSC5, ANSC5, BNTC5, WFTFC6, WFTAC6, WFTSC6, ANSC6, BNTC6, WFTFC7, WFTAC7, WFTSC7, ANSC7, BNTC7, WFTFC8, WFTAC8, WFTSC8, ANSC8, BNTC8, TWFTFC8, TWFTAC8, TANSC8, WFTFC9, WFTAC9, WFTSC9, ANSC9, BNTC9, TWFTFC9, TWFTAC9, TANSC9

#### **4.13 LANGUAGEFS5 (Language domain factor score (co-calibrated) from categorical indicators and invariant subsample cognition (ver5))**

Description: A language domain factor score computed based on discretized versions of neurocognitive tests from Visits 5, 6, 7, 8, and 9 plus the

ACHIEVE randomized controlled trial and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person or phone-based assessment.

Source variable(s): WFTFC5, WFTAC5, WFTSC5, ANSC5, BNTC5, WFTFC6, WFTAC6, WFTSC6, ANSC6, BNTC6, WFTFC7, WFTAC7, WFTSC7, ANSC7, BNTC7, WFTFC8, WFTAC8, WFTSC8, ANSC8, BNTC8, TWFTFC8, TWFTAC8, TANSC8, WFTFC9, WFTAC9, WFTSC9, ANSC9, BNTC9, TWFTFC9, TWFTAC9, TANSC9

#### **4.14 LANGUAGEFS6 (Language domain factor score (phone) from continuous indicators (ver6))**

Description: A language domain factor score computed based on standardized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TWFTFS8, TWFTAS8, TANSS8, TWFTFS9, TWFTAS9, TANSS9

#### **4.15 LANGUAGEFS7 (Language domain factor score (phone) from categorical indicators (ver7))**

Description: A language domain factor score computed based on discretized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A

factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TWFTFC8, TWFTAC8, TANSC8, TWFTFC9, TWFTAC9, TANSC9

#### **4.16 EXECFUNCFS1 (Executive functioning domain factor score (in person) from categorical indicators (ver1))**

Description: An executive function domain factor score computed based on discretized versions of neurocognitive tests from Visits 5, 6, 7, 8, and 9 plus the ACHIEVE randomized controlled trial and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person assessment.

Source variable(s): DSSC5, TMTAC5, TMTBC5, DSSC6, TMTAC6, TMTBC6, DSSC7, TMTAC7, TMTBC7, DSSC8, TMTAC8, TMTBC8, DSSC9, TMTAC9, TMTBC9

#### **4.17 EXECFUNCFS6 (Executive functioning domain factor score (phone) from continuous indicators (ver6))**

Description: An executive function domain factor score computed based on standardized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TTMTAS8, TTMTBS8, TTMTAS9, TTMTBS9

#### **4.18 EXECFUNCFS7 (Executive functioning domain factor score (phone) from categorical indicators (ver7))**

Description: An executive function domain factor score computed based on discretized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TTMTAC8, TTMTBC8, TTMTAC9, TTMTBC9

#### **4.19 MEMORYFS1 (Memory domain factor score (in person) from categorical indicators (ver1))**

Description: A memory domain factor score computed based on discretized versions of neurocognitive tests from Visits 5, 6, 7, 8, and 9 plus the ACHIEVE randomized controlled trial and the ACHIEVE-HIFU ancillary study.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a model documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during an in-person assessment.

Source variable(s): DWRC5, ILRPC5, LMTTC5, DWRC6, ILRPC6, LMTTC6, DWRC7, ILRPC7, LMTTC7, DWRC8, ILRPC8, LMTTC8, DWRC9, ILRPC9, LMTTC9

#### **4.20 MEMORYFS6 (Memory domain factor score (phone) from continuous indicators (ver6))**

Description: A memory domain factor score computed based on standardized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A

factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TCRDAS8, TCRDBS8, TCRDCS8, TCRDDS8, TCRDAS9, TCRDBS9, TCRDCS9, TCRDDS9

#### **4.21 MEMORYFS7 (Memory domain factor score (phone) from categorical indicators (ver7))**

Description: A memory domain factor score computed based on discretized versions of neurocognitive tests from Visit 8 plus the ACHIEVE randomized controlled trial.

Type: Numeric

Algorithm: Factor scores were computed from the source variables listed below utilizing a methodology documented in ARIC Manual 30. A factor score was computed if one or more tests were completed during a phone-based assessment.

Source variable(s): TCRDAC8, TCRDBC8, TCRDCC8, TCRDDC8, TCRDAC9, TCRDBC9, TCRDCC9, TCRDDC9

## **5. SUPPLEMENTAL SEMI-ANNUAL FOLLOW-UP ASSESSMENTS**

During semi-annual follow-up assessments, participants were administered a phone-based version of the Six Item Cognitive Screener (SIS) (Callahan, Unverzagt, Hui, Perkins, & Hendrie, 2002). If the participant did not have the cognitive capacity to complete the SIS, an Ascertain Dementia Eight Item Informant Questionnaire (AD8) (Galvin, et al., 2005) was conducted. Both the SIS and AD8 are frequently used by analysts as auxiliary variables when imputing missing neurocognitive z scores and factor scores. Consequently, SIS and AD8 assessments completed during or after Visit 6 have been provided to aid analysts. If the SIS or AD8 was administered multiple times during a specific visit, then the assessment closest to the completion of neurocognitive tests was selected. If neither in-person nor phone-based neurocognitive tests were completed but the SIS or AD8 was administered, then the last measurement performed during a visit was selected. For additional details about the use of these variables when performing multiple imputation, please refer to Manual 30.

### **5.1 SIS (Six-item cognitive screener closest to cognitive assessment date)**

Description: A prorated version of participant responses from the Six Item Cognitive Screener.

Type: Numeric

Algorithm: The sum of correct responses from SIS3 through SIS8. The sum is then multiplied by six and divided by the number of non-missing responses.

Source variable(s): [SISALL]SIS3, SIS4, SIS5, SIS6, SIS7, SIS8

## **5.2 SISDATE\_FollowUpDays (Days of follow up from visit 1 to Date of six-item cognitive screener closest to cognitive assessment date)**

Description: A variable reflecting the days of follow up from visit 1 to the date the Six Item Cognitive Screener was administered.

Type: Numeric

Algorithm: SISDATE\_FollowUpDays is the number of days between visit 1 and SIS date.

Source variable(s): visit 1 date, SIS date

## **5.3 SISDATE\_year (Year of Date of six-item cognitive screener closest to cognitive assessment date)**

Description: A variable reflecting the year the Six Item Cognitive Screener was administered.

Type: Numeric

Algorithm: SISDATE\_year is the year of the SIS date.

Source variable(s): SIS date

## **5.4 ADS (Eight-item informant questionnaire closest to cognitive assessment date)**

Description: A rating of the participant based on informant responses from the Ascertain Dementia Eight Item Informant Questionnaire.

Type: Numeric

Algorithm: Equal to ADS11.

Source variable(s): [ADS]ADS11

### **5.5 ADSDATE\_FollowUpDays (Days of follow up from visit 1 to Date of eight item informant questionnaire closest to cognitive assessment date)**

Description: A variable reflecting the days of follow up from visit 1 to the date the Ascertain Dementia Eight Item Informant Questionnaire was administered.

Type: Numeric

Algorithm: ADSDATE\_FollowUpDays is the number of days between visit 1 and ADS date.

Source variable(s): visit 1 date, ADS date

### **5.6 ADSDATE\_year (Year of Date of eight item informant questionnaire closest to cognitive assessment date)**

Description: A variable reflecting the year the Ascertain Dementia Eight Item Informant Questionnaire was administered.

Type: Numeric

Algorithm: ADSDATE\_year is the year of the ADS date.

Source variable(s): ADS date

## **6. REFERENCES**

- Benton, A., & Hamsher, K. (1976). *Multilingual Aphasia Examination*. Iowa City, IA: University of Iowa.
- Callahan, C., Unverzagt, F., Hui, S., Perkins, A., & Hendrie, H. (2002). Six-item screener to identify cognitive impairment among potential subjects for clinical research. *Medical Care*, 40(9), 771-781. doi:10.1097/00005650-200209000-00007
- Galvin, J., Roe, C., Powlishta, K., Coats, M., Muich, S., Grant, E., . . . Morris, J. (2005). The AD8: a brief informant interview to detect dementia. *Neurology*, 65(4), 559-564. doi:10.1212/01.wnl.0000172958.95282.2a
- Gross, A., Jones, R., Fong, T., Tommet, D., & Inouye, S. (2014). Calibration and validation of an innovative approach for estimating general cognitive performance. *Neuroepidemiology*, 42(3), 144-153. doi:10.1159/000357647

- Gross, A., Power, M., Albert, M., Deal, J., Gottesman, R., Griswold, M., . . . Bandeen-Roche, K. (2015). Application of latent variable methods to the study of cognitive decline when tests change over time. *Epidemiology, 26*(6), 878-887.
- Morris, J., Mohs, R., Rogers, H., Fillenbaum, G., & Heyman, A. (1988). Consortium to establish a registry for Alzheimer's disease (CERAD) clinical and neuropsychological assessment of Alzheimer's disease. *Psychopharmacology Bulletin, 24*(4), 641-652.
- Rawlings, A., Bandeen-Roche, K., Gross, A., Gottesman, R., Coker, L., Penman, A., . . . Mosley, T. (2016). Factor structure of the ARIC-NCS Neuropsychological Battery: An evaluation of invariance across vascular factors and demographic characteristics. *Psychological Assessment, 28*(12), 1674-1683.
- Reitan, R. (1958). Validity of the trail making test as an indicator of organic brain damage. *Perceptual and Motor Skills, 8*, 271-276.
- Ryan, J., & Lopez, S. (2001). Wechsler adult intelligence scale-III. In W. Dorfman, & M. Hersen, *Understanding psychological assessment. Perspectives on individual differences*. New York, NY: Kluwer Academic/Plenum Publishers.
- Wechsler, D. (1987). *Wechsler Memory Scale-Revised*. San Antonio, Texas: Psychological Corporation.
- Williams, B., Mack, W., & Henderson, V. (1989). Boston naming test in Alzheimer's disease. *Neuropsychologia, 27*(8), 1073-1079.