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Baseline 10-Year Cardiovascular Risk Scores Predict Cognitive Function in Older Persons, and Particularly Women, Living With Human Immunodeficiency Virus Infection

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(See the Editorial Commentary by Galaviz et al on pages 3086–7.)

Background. Cardiovascular disease (CVD) and associated comorbidities increase the risk of cognitive impairment in persons living with human immunodeficiency virus (PLWH). Given the potential composite effect of multiple cardiovascular risk factors on cognition, we examined the ability of the Atherosclerotic Cardiovascular Disease (ASCVD) risk score and the Framingham Heart Study Global CVD risk score (FRS) to predict future cognitive function in older PLWH.

Methods. We constructed linear regression models evaluating the association between baseline 10-year cardiovascular risk scores and cognitive function (measured by a summary z-score, the NPZ-4) at a year 4 follow-up visit.

Results. Among 988 participants (mean age, 52 years; 20% women), mean 10-year ASCVD risk score at entry into the cohort was 6.8% (standard deviation [SD], 7.1%) and FRS was 13.1% (SD, 10.7%). In models adjusted only for cognitive function at entry, the ASCVD risk score significantly predicted year 4 NPZ-4 in the entire cohort and after stratification by sex (for every 1% higher ASCVD risk, year 4 NPZ-4 was lower by 0.84 [SD, 0.28] overall, $P = .003$; lower by 2.17 [SD, 0.67] in women, $P = .001$; lower by 0.78 [SD, 0.32] in men, $P = .016$). A similar relationship was observed between FRS and year 4 NPZ-4. In multivariable models, higher 10-year ASCVD risk and FRS predicted lower NPZ-4 in women.

Conclusions. Baseline 10-year ASCVD risk and FRS predicted future cognitive function in older PLWH with well-controlled infection. Cardiovascular risk scores may help to identify PLWH, especially women, who are at risk for worse cognition over time.

Keywords. HIV infection; cardiovascular risk; CVD; risk prediction; cognitive function.

Cardiovascular disease (CVD) and associated risk factors have been consistently linked to cognitive impairment in persons living with human immunodeficiency virus infection (PLWH). A history of CVD, subclinical CVD (eg, carotid intima media thickness), diabetes mellitus–related variables (eg, insulin resistance), and abdominal obesity, for example, have all been associated with measures of cognitive function in PLWH [1–7]. While these individual cardiovascular (CV) risk factors or markers of CVD have been shown to correlate with cognitive impairment in human immunodeficiency virus (HIV) infection, results have varied from study to study, most of which have been cross-sectional, without 1 risk factor or combination of risk factors emerging as the single most important CV indicator of poor cognitive function.

Cardiovascular risk prediction scores, which take into account the collective importance of several risk factors, are designed to calculate absolute 10-year risk of CV events. Given the potential composite effect of multiple CV risk factors on cognition, we examined the utility of 2 commonly used CV risk scores—the Atherosclerotic Cardiovascular Disease (ASCVD) risk score [8] and the Framingham Heart Study Global CVD risk score (FRS) [9]—to predict future cognitive function [10] in a cohort of older PLWH. Based on our recent cross-sectional analyses from this same cohort demonstrating differences between women and men in the cardiometabolic risk factors associated with cognitive impairment [11], we evaluated the ability of the ASCVD risk score and FRS to predict cognitive performance in women and men separately.

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METHODS

We analyzed data collected from participants in the AIDS Clinical Trials Group (ACTG) Protocol A5322. A5322, also known as the HIV Infection, Aging, and Immune Function Long-term Observational Study (HAILO), is an ongoing, prospective, multicenter observational study of older PLWH who initiated antiretroviral therapy (ART) through an ACTG clinical trial and were subsequently followed in the observational ACTG Longitudinal Linked Randomized Trial (ALLRT) study. In 2013, a subset of ALLRT participants 40 years of age and older (n = 1035) rolled over into HAILO for continued longitudinal follow-up of clinical, behavioral, and immunologic parameters. At semiannual visits, data are collected through medical chart abstraction, questionnaires, anthropometric measurements, neurocognitive evaluation, and laboratory testing. All HAILO participants who underwent neurocognitive evaluation at entry and at year 4 were included in this analysis.

Study Measurements

Neurocognitive performance in HAILO is assessed using the Brief Neurocognitive Screen, which consists of a battery of 4 neuropsychological tests: Trail Making Tests A and B, the Wechsler Adult Intelligence Scale–Revised Digit Symbol subtest, and the Hopkins Verbal Learning Test–Revised. The raw score for each test is standardized using demographic-adjusted normative means and combined in a summary *z* score, termed the NPZ-4. Participants undergo neurocognitive testing at entry into HAILO and every 48 weeks thereafter. The NPZ-4 in year 4 of follow-up was the primary outcome of interest.

Predictors

Baseline 10-year ASCVD risk score and FRS were the primary predictors. The ASCVD risk score was calculated using these variables collected at entry into HAILO: age, sex, self-reported race/ethnicity, systolic blood pressure, antihypertensive medication use, smoking (current vs past/never), diabetes (established diagnosis or hemoglobin A1c ≥6.5%), total cholesterol, and high-density lipoprotein (HDL) cholesterol. The FRS was calculated using the same variables at entry with the exception of race/ethnicity.

Covariates

In addition to the components of the CV risk prediction scores, we accessed baseline data collected at entry into HAILO for body mass index, waist circumference, statin use, injection drug use (current vs past/never), antidepressant medication use, hepatitis C virus (HCV) infection, current and nadir CD4 count, plasma HIV RNA load, ART duration, and efavirenz and integrase inhibitor use. The International Physical Activity Questionnaire, which includes questions about vigorous (eg, heavy lifting, fast bicycling) and moderate (eg, carrying light loads, bicycling at a regular pace) physical activity in the preceding week, is administered annually in HAILO. We dichotomized the questionnaire results as follows: ≥3 vs <3 days of vigorous or moderate physical activity in the preceding week.

Statistical Analysis

Descriptive statistics were generated, presenting mean and standard deviation (SD) for the continuous variables and counts for the categorical variables by sex. We then assessed if baseline ASCVD risk score and FRS predicted NPZ-4 at year 4 in linear regression models. We constructed multivariable models predicting year 4 NPZ-4 with the ASCVD risk score and FRS adjusting for covariates. Covariates of interest were grouped into demographics (age, sex, race, education), clinical variables (body mass index, waist circumference, physical activity, statin use, injection drug use, antidepressant use, HCV status), and HIV-related factors (CD4 cell count, nadir CD4 cell count, HIV RNA dichotomized as detectable [≥400 copies/mL] vs undetectable [<400 copies/mL], years of ART use, integrase inhibitor use, and efavirenz use). For each group of variables, we ran simple linear regression models predicting year 4 NPZ-4 with each covariate. Covariates that were significant at the level of .10 within each group were included in a stepwise linear regression model, with NPZ-4 as the outcome, using entry and stay cutoffs of $P = .10$. This approach yielded a set of covariates within each category that was significantly related to NPZ-4 at the level of $P = .10$. From here, the overall models were run, using stepwise linear regression to predict year 4 NPZ-4 with either baseline ASCVD risk score or baseline FRS, adjusting for all selected covariates from each category as described above, using the entry and stay cutoffs of .10. Because of the strong association between education and cognitive performance, education was forced into the final models. In addition, to account for the relationship between NPZ-4 performance at entry into HAILO and at year 4, all models were adjusted for entry NPZ-4. The analyses were then repeated stratified by sex. We also examined the associations between individual components of the risk scores and year 4 NPZ-4 to evaluate how well they predicted cognitive performance compared with the risk scores.

RESULTS

Baseline demographic and clinical characteristics for the 988 participants are shown in Table 1. The mean age in the cohort was 52 years. Twenty percent were women. Approximately half of participants were white (49%), and 30% were black, although the race/ethnicity distribution differed between women and men. The mean CD4 count was 661 cells/μL, and the majority of participants (96%) had an undetectable viral load. The mean duration of ART use at entry into HAILO was 8.1 years. Sex differences in baseline characteristics in this cohort have been published previously [11] and are shown in Table 1.

Table 1. Baseline Demographic and Clinical Characteristics of Participants in the Human Immunodeficiency Virus Infection, Aging, and Immune Function Long-term Observational (HAILO) Study

Characteristic	All (N = 988)	Women (n = 195)	Men (n = 793)
Sociodemographic characteristics			
Age, y, mean (SD)	52 (8)	51 (8)	52 (8)
Race/ethnicity			
White	485 (49)	42 (22)	443 (56)
Black	299 (30)	102 (52)	197 (25)
Hispanic/Latino	204 (21)	51 (26)	153 (19)
Years of education, mean (SD)	14 (4)	12 (4)	14 (3)
Cardiometabolic and other risk factors			
Antihypertensive medication use	359 (36)	82 (42)	277 (35)
Statin use	267 (27)	45 (23)	222 (28)
Diabetes mellitus	125 (13)	32 (16)	93 (12)
Total cholesterol, mg/dL, mean (SD)	188 (44)	194 (59)	186 (40)
LDL cholesterol, mg/dL, mean (SD)	109 (39)	111 (56)	108 (33)
HDL cholesterol, mg/dL, mean (SD)	49 (16)	58 (17)	47 (15)
Body mass index, kg/m^2, mean (SD)	28.1 (5.5)	30.8 (7.5)	27.4 (4.7)
Waist circumference, cm, mean (SD)	97 (14)	100 (17)	97 (13)
≥3 d of vigorous or moderate physical activity in past wk	491 (53)	78 (43)	413 (55)
Smoking			
Never	396 (41)	87 (45)	309 (40)
Current	252 (26)	55 (29)	197 (25)
Prior	321 (33)	51 (26)	270 (35)
Intravenous drug use			
Never	917 (93)	182 (93)	735 (93)
Current/prior	71 (7)	13 (7)	58 (7)
Antidepressant medication use	212 (21)	45 (23)	167 (21)
HIV-related factors			
CD4 count, cells/μL, mean (SD)	661 (308)	747 (361)	639 (289)
Nadir CD4 count, cells/μL, mean (SD)	205 (164)	209 (178)	204 (160)
HIV RNA undetectable (<400 copies/mL)	944 (96)	181 (93)	763 (96)
ART duration, y, mean (SD)	8.1 (3.9)	7.6 (3.9)	8.3 (3.9)
Current efavirenz use	323 (33)	50 (26)	273 (34)
Current integrase inhibitor use	219 (22)	54 (28)	165 (21)
Hepatitis C coinfection	123 (12)	20 (10)	103 (13)

Data are presented as no. (%) unless otherwise indicated.
Abbreviations: ART, antiretroviral therapy; HDL, high-density lipoprotein; HIV, human immunodeficiency virus; LDL, low-density lipoprotein; SD, standard deviation.

Baseline Cardiovascular Risk Scores

The mean 10-year ASCVD risk in the cohort was 6.8% (SD, 7.1%) and mean FRS was 13.1% (SD, 10.7%). Both CV risk scores were significantly lower in women than in men (Table 2).

Baseline and Year 4 Cognitive Performance

The mean NPZ-4 at entry into HAILO was 0.11 (SD, 1.00). Women had a lower mean NPZ-4 compared with men (−0.20 [SD, 0.99] vs 0.18 [SD, 0.99], $P < .001$). At year 4, the mean NPZ-4 score was 0.13 (SD, 0.99), with a mean score of −0.15 (SD, 0.96) for women and 0.20 (SD, 1.01) for men ($P < .001$).

Baseline 10-Year Cardiovascular Risk Scores Predict Year 4 Cognitive Performance

Our first objective was to evaluate the association between baseline CV risk and NPZ-4 at year 4 adjusted only for entry NPZ-4. We found that the 10-year ASCVD risk score significantly predicted NPZ-4 at year 4. For every 1% higher baseline ASCVD

Table 2. Baseline 10-Year Cardiovascular Risk at Entry Into the Human Immunodeficiency Virus Infection, Aging, and Immune Function Long-term Observational (HAILO) Study

Risk Score	All (N = 988)	Women (n = 195)	Men (n = 793)	*P* Value[a]
ASCVD risk score, %, mean (SD)	6.8 (7.1)	4.1 (5.9)	7.5 (7.3)	< .001
FRS, %, mean (SD)	13.1 (10.7)	8.1 (8.6)	14.3 (10.8)	< .001

Abbreviations: ASCVD, Atherosclerotic Cardiovascular Disease; FRS, Framingham Heart Study Global Cardiovascular Disease risk score; SD, standard deviation.
[a]Comparisons by sex were made using 2-sample *t* test.

risk, the NPZ-4 at year 4 was lower by 0.84 (SD, 0.28) ($P = .003$). Findings were similar when women and men were evaluated separately, with higher baseline ASCVD risk having a more marked effect on NPZ-4 for women (−2.17 [SD, 0.67], $P = .001$) than men (−0.78 [SD, 0.32], $P = .016$). A higher baseline FRS was also significantly predictive of worse cognitive performance at year 4, although the effect was not as pronounced (Table 3).

In bivariate models evaluating the relationships between individual components of the CV risk scores and cognitive performance adjusted only for entry NPZ-4, diabetes mellitus and HDL cholesterol were the only modifiable CV risk factors significantly associated with year 4 NPZ-4, while there was a trend toward an association between smoking and year 4 NPZ-4 (Table 3). Older age and race were also predictive of lower NPZ-4 although, like the modifiable CV risk factors, the observed associations with cognitive performance at year 4 were considerably smaller for these individual variables than for the CV risk scores (Table 3).

In a multivariable model adjusted for age, sex, race/ethnicity, education, physical activity, HCV infection, and duration of ART use, higher baseline 10-year ASCVD risk was not significantly associated with year 4 NPZ-4 (−0.29 [SD, .39] per 1% higher risk, $P = .46$). In sex-stratified multivariable models (Table 4), higher 10-year ASCVD risk predicted lower NPZ-4 in women (−2.29 [SD, 0.67], $P < .001$) but not in men (−0.002 [SD, 0.46], $P = 1.00$). A similar pattern, albeit with smaller effect sizes, was observed for the association of baseline FRS with year 4 NPZ-4; higher FRS was significantly predictive of lower NPZ-4 at year 4 among women but not in the overall cohort nor in men (Table 4).

In a sensitivity analysis, we removed age and sex from the multivariable models, as both are taken into account when calculating the ASCVD risk score and FRS. After removing age and sex, the size of the effect of both risk scores on year 4 NPZ-4 was larger and became statistically significant (−0.83 [SD, 0.29] per 1% higher ASCVD risk, $P = .005$; −0.44 [SD, 0.20] per 1% higher FRS, $P = .026$) compared with the models that included age and sex (−0.29 [SD, 0.39] per 1% higher ASCVD risk, $P = .46$; −0.09 [SD, 0.23] per 1% higher FRS, $P = .70$).

DISCUSSION

In this prospective observational cohort, baseline 10-year ASCVD risk and FRS predicted future cognitive function in older PLWH, with higher CV risk having a more marked effect on cognitive function in women than men. These findings suggest that CV risk scores designed to predict 10-year risk of CV events may also identify PLWH, especially women, who are at risk for future cognitive impairment.

Of the modifiable components of the ASCVD risk score and FRS, only diabetes mellitus and HDL cholesterol were significantly associated with lower year 4 cognitive function, with a trend toward an association for current smoking. Furthermore, the size of the association between the CV risk scores and cognitive function

Table 3. Association Between Baseline 10-Year Cardiovascular Risk Scores and Cognitive Function at Year 4 Adjusted for Baseline NPZ-4 Score

Risk Score	All (N = 988)		Women (n = 195)		Men (n = 793)	
	Effect on NPZ-4[a] (SE)	*P* Value	Effect on NPZ-4[a] (SE)	*P* Value	Effect on NPZ-4[a] (SE)	*P* Value
Cardiovascular risk score						
ASCVD risk score (per 1% higher risk)	−0.84 (0.28)	.003	−2.17 (0.67)	.001	−0.78 (0.32)	.016
FRS (per 1% higher risk)	−0.44 (0.19)	.020	−1.25 (0.48)	.011	−0.44 (0.22)	.044
Individual components of cardiovascular risk scores						
Age (per 10 years)	−0.01 (0.003)	< .001	−0.10 (0.005)	.16	−0.01 (0.003)	.001
Female sex	−0.05 (0.05)	.34	…	…	…	
Race/ethnicity						
Black (vs all others)	0.08 (0.04)	.054	0.16 (0.07)	.031	0.08 (0.05)	.14
White (vs all others)	0.03 (0.04)	.46	0.06 (0.09)	.50	0.01 (0.05)	.76
Systolic blood pressure (per 1 mm Hg increase)	−0.0001 (0.001)	.97	−0.003 (0.002)	.15	0.001 (0.002)	.59
On antihypertensive medication	−0.04 (0.04)	.38	0.03 (0.07)	.72	−0.05 (0.05)	.27
Total cholesterol (per 10 mg/dL increase)	−0.0005 (0.0004)	.30	−0.0004 (0.001)	.49	−0.0004 (0.001)	.44
HDL cholesterol (per 10 mg/dL increase)	−0.003 (0.001)	.010	−0.002 (0.002)	.25	−0.003 (0.002)	.027
Diabetes mellitus	−0.17 (0.06)	.004	−0.19 (0.10)	.057	−0.16 (0.07)	.022
Current smoker	−0.09 (0.04)	.052	−0.04 (0.08)	.57	−0.10 (0.05)	.069

Abbreviations: ASCVD, Atherosclerotic Cardiovascular Disease; FRS, Framingham Heart Study Global Cardiovascular Disease risk score; HDL, high-density lipoprotein; SE, standard error.

[a]β-coefficients represent effect of 1% higher cardiovascular risk on year 4 NPZ-4 score.

Table 4. Adjusted Association Between Baseline 10-Year Cardiovascular Risk Scores and Cognitive Function at Year 4

	All[a] (N = 988)		Women[b] (n = 195)		Men[c] (n = 793)	
Risk Score	Effect on NPZ-4 (SE)[d]	*P* Value	Effect on NPZ-4 (SE)[d]	*P* Value	Effect on NPZ-4 (SE)[d]	*P* Value
ASCVD risk score (per 1% higher risk)	−0.29 (0.39)	.46	−2.29 (0.67)	< .001	−0.002 (0.46)	1.00
FRS (per 1% higher risk)	−0.09 (0.23)	.70	−1.45 (0.49)	.003	0.02 (0.27)	.93

Abbreviations: ASCVD, Atherosclerotic Cardiovascular Disease; FRS, Framingham Heart Study Global Cardiovascular Disease risk score; SE, standard error.

[a]Adjusted for age, sex, race/ethnicity, education, physical activity, hepatitis C infection, duration of antiretroviral therapy use, baseline NPZ-4.

[b]Adjusted for race/ethnicity, education, physical activity, baseline NPZ-4.

[c]Adjusted for age, race/ethnicity, education, antidepressant medication use, baseline NPZ-4.

[d]Beta-coefficients represent effect of 1% higher cardiovascular risk on year 4 NPZ-4 score.

at year 4 was greater than between any individual risk factor and cognitive function. These results support the hypothesis that the cumulative effect of multiple CV risk factors on cognition may be greater than the effect of any 1 risk factor alone and that, when taken into account individually, risk factors may not reach the required threshold to impact cognitive function.

Our findings are in line with studies from the general population that have demonstrated that the presence of a combination of CV risk factors increases the risk of dementia. In a study of nearly 9000 participants from Kaiser Permanente Northern California, midlife smoking, hypertension, high cholesterol, and diabetes were associated with an increased risk of dementia in late life. When evaluated in combination, the presence of all 4 of these factors—which closely mirror the variables included in the ASCVD risk score and FRS—nearly doubled the associated risk of dementia [12]. In a population-based Finnish study, midlife systolic blood pressure and cholesterol, and in particular the 2 risk factors in combination, were associated with increased risk of Alzheimer disease in late life [13]. These studies in the general population have focused on midlife CV risk and dementia typically diagnosed 10–30 years later. In our study of PLWH, CV risk scores predicted future cognitive impairment at just 4 years. HIV infection may accentuate the effect of CV risk on the development of cognitive impairment, similar to its effect on CV disease in which observed CV risk in PLWH exceeds predicted risk [14], leading to earlier or more severe cognitive dysfunction for a given level of CV risk.

In models investigating the association between baseline 10-year CV risk and year 4 cognitive function, which were intended to simulate a real-world setting in which providers calculate CV risk scores for patients without adjusting for other variables, higher ASCVD risk and FRS were significantly associated with worse cognition at year 4 in the overall cohort and in women and men evaluated separately. The negative effect of higher ASCVD risk and FRS on cognitive function, however, was greater for women than for men. One potential explanation for this differential effect is that, because baseline CV risk is lower for women, a 1% increase in CV risk represents a greater relative increase for women compared with men, and thus has a greater impact on cognitive function in women [15].

In multivariable models, the association between higher ASCVD risk and FRS and worse cognitive function at year 4 was present only for women. We previously performed a cross-sectional analysis in this same cohort, which identified sex differences in the association between CV risk factors and baseline cognitive function [11]. In this prior analysis, no CV risk factor was significantly associated with cognition among men, whereas for women, a significant association was present between cognitive impairment and less physical activity, and a trend toward an association between cognitive impairment and lower HDL cholesterol and diabetes mellitus. A greater negative impact of CV risk on cognition in women compared with men has also been observed in the general population. In a study of 985 community-dwelling elders, women with an FRS >7% had a higher rate of cognitive decline compared with women with lower risk, whereas CV risk was not associated with the rate of cognitive decline in men [16]. Similarly, in the Sacramento Area Latino Study on Aging, a higher FRS was associated with greater decline in verbal learning in women but not men [10]. The mechanisms underlying the observed sex differences in the relationship between CV risk and cognitive function are unknown. The contribution of CV risk to cognitive health may be overshadowed in men by other critical factors that play an important role in cognition, such as comorbid depression, although why this would differ between women and men is unclear. In our prior cross-sectional analysis, use of an antidepressant medication was a risk factor for cognitive impairment; in sex-stratified analyses, however, antidepressant use was associated with cognitive impairment in men but not in women.

Biological differences in vascular physiology by sex may also affect the association between CV and cognitive health. In several large population-based cohort studies, cerebral small vessel disease (eg, white matter hyperintensities), which is linked to cognitive impairment in the general population and PLWH [17–19], was more prevalent, severe, and/or progressive in women compared with men, even after accounting for age [20–24]. If women have a greater predisposition to develop cerebral small vessel disease, which may be due to smaller arterial size and more frequent vascular remodeling in women [25], then

the presence of multiple CV risk factors may be more likely to result in microvascular brain injury and negatively impact cognitive function in women compared with men.

This study was not specifically designed to compare the predictive value of the ASCVD risk score vs the FRS for cognitive function. Overall, the ASCVD risk score better predicted cognitive function at year 4 compared with the FRS, both in terms of the size of the associations with NPZ-4 and the significance level. The greater predictive value of the ASCVD risk score compared with the FRS may reflect the fact that the ASCVD risk equations were derived from more diverse cohorts and factor in race. Just as the prevalence and control of CV risk factors differ by race, as do the associations of these factors with CVD [26], similar racial differences have been observed in the association between CV risk and cognitive impairment in the general population [27, 28] and may also exist in PLWH.

The ability of the ASCVD risk score and FRS to predict CV risk in HIV populations has been examined [14, 29] but not, to our knowledge, to predict risk of cognitive impairment. In the general population, the FRS has been associated with cognitive dysfunction and decline in several large prospective cohorts [15, 16]. Similarly, a higher Framingham Stroke Risk Profile, a validated stroke risk function that factors in history of CVD, atrial fibrillation, and left ventricular hypertrophy in addition to variables included in the FRS, has been associated with impaired cognition [30–32]. Cerebrovascular disease may be a critical link between HIV, CV risk, and cognitive impairment, with both clinical and subclinical cerebrovascular disease identified as risk factors for poor cognitive health and dementia [33–35].

As PLWH reach older age, the contribution of comorbid vascular disease to cognitive impairment will become increasingly relevant. Most prior studies examining CV risk and cognition in PLWH have been cross-sectional, and those that have evaluated longitudinal relationships have not considered the composite effect of multiple CV risk factors on cognition [36, 37]. The availability of yearly neuropsychological testing in HAILO allowed us to investigate the relationship between CV risk scores and future cognitive function. Because a relatively small proportion of participants had a year-over-year downward trajectory in cognitive function, we were not able to reliably test the association between baseline CV risk and cognitive decline, which is a limitation of the study. However, the ASCVD risk score and FRS were predictive of cognitive function at year 4 after adjusting for baseline cognitive performance, suggesting that CV risk may provide information about change in cognition over time. Another limitation of the study is that the majority of HAILO participants have maintained virologic suppression long-term and volunteered in research studies for years, and therefore may not represent the general population of PLWH in the United States.

In summary, baseline 10-year ASCVD risk and FRS predicted future cognitive function in this cohort of older PLWH with well-controlled infection, with higher CV risk having a more marked negative effect on cognitive function in women than in men. These CV risk scores may help to identify PLWH, particularly women, who are at risk for worse cognition over time. Our findings raise key questions regarding the mechanisms underpinning the observed associations between CV risk and cognition, including whether a critical window exists during which lowering CV risk may preserve cognitive health and prevent cognitive decline in PLWH.

Notes

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