

Supplemental Online Content

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eTable 1. Associations between covariates within each childhood domain

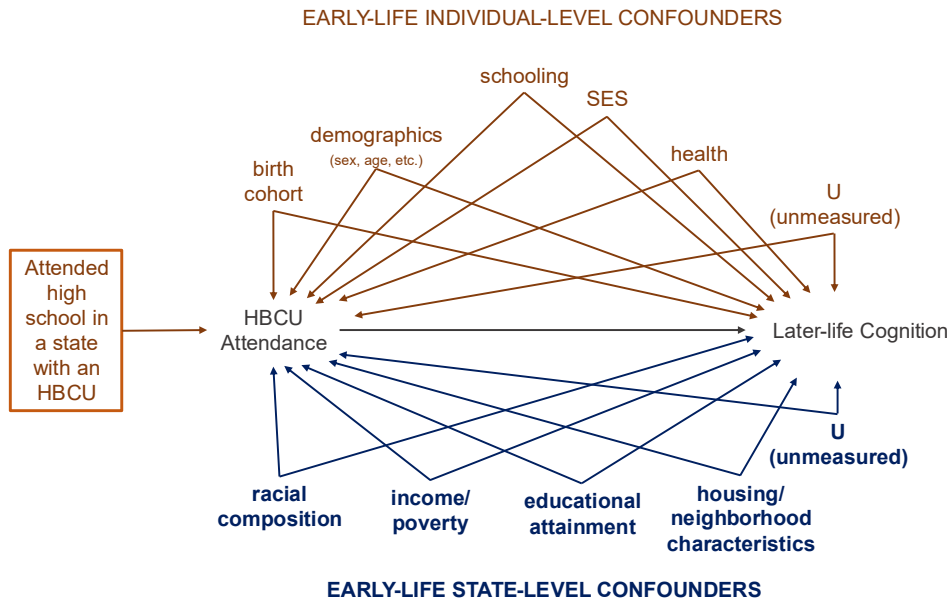
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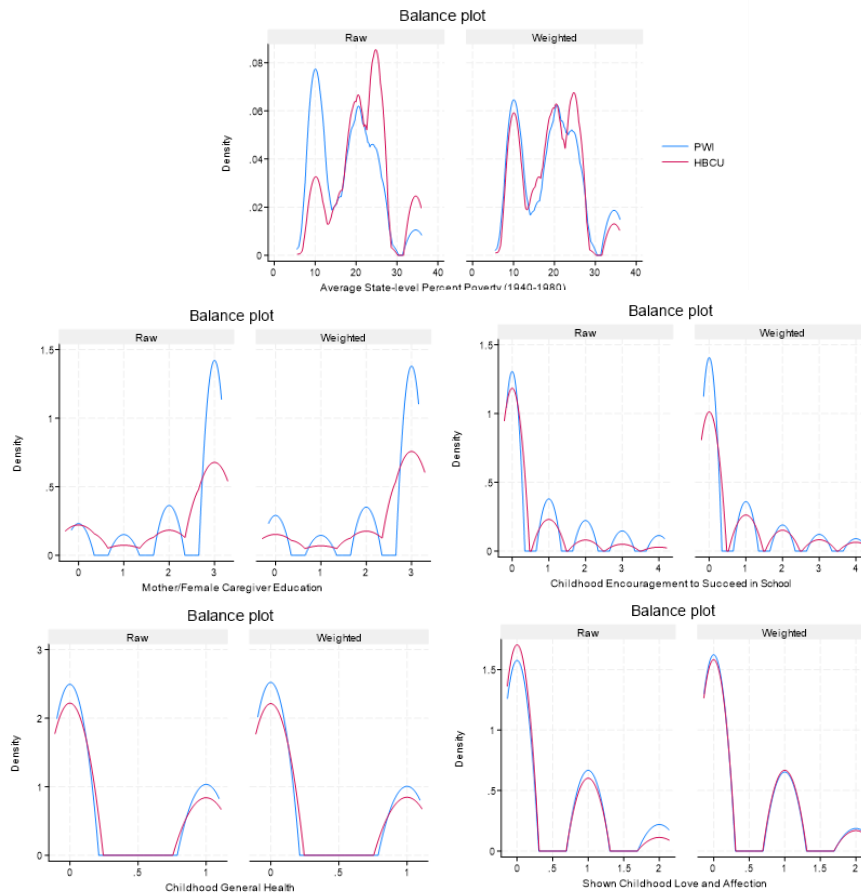
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This supplemental material has been provided by the authors to give readers additional information about their work.



eFigure 1. Directed acyclic graph representing working knowledge of potential confounders linking attendance at an Historically Black College or University (HBCU) and later-life cognition, which included demographics, birth cohort, and early-life schooling, socioeconomic status (SES), health, and area-level exposures. To ensure that exposure groups had similar probabilities of attending an HBCU, the primary analysis was conditioned on those who attended high school in a state with an HBCU.



eFigure 2a. The distribution of selected covariates between treatment groups in the reweighted population. The x-axis represents the categorical or numeric covariate values. The y-axis represents kernel density estimates. Each plot shows the raw distribution on the left and the weighted distribution on the right. PWI attendees are shown in blue. HBCU are shown in red.

	Memory				Language			
	Raw		Weighted		Raw		Weighted	
	Treated Observations	Control Observations	Treated Observations	Control Observations	Treated Observations	Control Observations	Treated Observations	Control Observations
Total Observations	2133	1476	2133	1075	2154	1491	2154	1088
	857	1476	1057	1075	903	1491	1067	1088
	Standardized Difference		Variance Ratio		Standardized Difference		Variance Ratio	
	Raw	Weighted	Raw	Weighted	Raw	Weighted	Raw	Weighted
Assessment Age	0.140	0.001	0.939	0.890	0.130	0.002	0.960	0.950
Gender	-0.030	-0.028	1.024	1.021	-0.028	-0.030	1.022	1.022
College Age								
East-Brown/Pre-CRA (1955 - 1964)	0.014	-0.001	1.003	1.000	0.027	-0.002	1.005	1.000
Post-CRA (> 1964)	-0.128	-0.003	0.871	0.997	-0.130	0.000	0.868	1.000
Community size at birth	0.085	0.006	0.965	0.997	0.081	0.006	0.967	0.998
Mother's/Caregiver's education								
Post HS Vocational/Professional	-0.023	-0.028	0.923	0.903	-0.026	-0.030	0.915	0.898
HS/GED	-0.032	-0.027	0.943	0.960	-0.025	-0.027	0.966	0.951
<HS/None/Unknown	-0.140	0.039	1.074	0.977	-0.143	0.040	1.075	0.976
Childhood encouragement to succeed in school								
Most of the time	-0.078	0.002	0.866	1.003	-0.078	0.002	0.866	1.004
Some of the time	-0.193	0.031	0.832	1.093	-0.193	0.032	0.829	1.094
Little of the time	-0.168	-0.017	0.486	0.937	-0.166	-0.016	0.486	0.939
None of the time	-0.185	-0.002	0.363	0.993	-0.186	-0.004	0.369	0.981
Childhood general health	-0.040	-0.022	0.964	0.979	-0.041	-0.019	0.962	0.982
Shown childhood love and affection								
Some/Most of the time	-0.055	0.024	0.943	1.024	-0.050	0.024	0.947	1.025
Little/None/Unknown time	-0.161	-0.020	0.564	0.935	-0.169	-0.022	0.549	0.930
% Poverty	0.565	0.012	0.915	0.834	0.558	0.013	0.908	0.825

Abbreviations: CRA = Civil Rights Act, HS = high school, GED = general education diploma

eFigure 2b. The estimates for covariate balance by treatment group after estimation of the inverse probability-weighted estimator. The table on the left was generated using memory as the outcome. The table on the right was generated using language as the outcome.

eFigure 2. Postestimation covariate balance results prior to multiple imputation.

eTable 1. Associations between covariates within each childhood domain

Associations by Covariate Domain	chi-square value	p-value
Socioeconomic Status		
male and female caregivers' education	1100.000	<0.001
female caregivers' education and house type	37.554	<0.001
female caregivers' education and home ownership	238.645	<0.001
female caregivers' education and land ownership	95.349	<0.001
male caregivers' education and house type	31.001	<0.001
male caregivers' education and home ownership	155.545	<0.001
male caregivers' education and land ownership	40.963	<0.001
Academics		
homework help and encouragement to succeed	1900.000	<0.001
Health		
general health and birth weight	31.969	<0.001
general health and days of hunger	100.547	<0.001
birth weight and days of hunger	0.447	0.978
Social Support		
parent in jail and death of a parent	13.627	<0.001
parent in jail and witnessed domestic violence	349.202	<0.001
shown love/affection and witnessed domestic violence	247.689	<0.001
shown love/affection and death of parent	25.407	<0.001
shown love/affection and parent in jail	61.771	<0.001
	Pearson correlation value	p-value
Area-level (%)		
Black population - Hispanic population	-0.387	<0.10
Black population - foreign born	-0.470	<0.10
Black population - below federal poverty	0.701	<0.10
Hispanic population - foreign born	0.591	<0.10
Hispanic population - below federal poverty	-0.319	<0.10
below federal poverty - foreign born	-0.675	<0.10

eTable 2. Bivariable associations of covariates with memory, language, and HBCU status

Variable	Memory-Covariate Association		Language-Covariate Association		HBCU-Covariate Association	
	F † or T statistic	p-value	F † or T statistic	p-value	chi-square value	p-value
Socioeconomic Status						
dad/male caregiver education †	24.210	<0.001	18.890	<0.001	31.502	<0.001
mom/female caregiver education †	19.320	<0.001	15.130	<0.001	82.379	<0.001
type of housing †	2.610	0.740	0.010	0.985	39.624	<0.001
land ownership	0.859	0.390	-0.827	0.409	25.760	<0.001
home ownership †	13.320	<0.001	9.560	0.001	64.760	<0.001
Academics						
homework help †	8.260	0.000	1.990	0.137	56.732	<0.001
encouragement to succeed †	4.960	0.001	2.710	0.137	118.640	<0.001
Health						
general health †	33.510	< 0.001	0.480	0.487	0.619	0.432
birth weight †	3.160	0.042	2.140	0.118	0.596	0.742
days of hunger †	8.420	0.000	0.260	0.773	20.708	< 0.001
Social Support						
shown love and affection †	2.370	0.005	0.290	0.750	23.728	< 0.001
parental death	3.961	< 0.001	3.011	0.003	4.219	0.040
witnessed domestic violence	-1.318	0.188	-1.779	0.076	28.077	< 0.001
	Pearson Correlation	p-value	Pearson Correlation	p-value	T-statistic	p-value
State-level						
Black population	-0.009	> 0.10	-0.065	< 0.10	-16.219	< 0.001
Hispanic population	0.004	> 0.10	0.007	> 0.10	10.091	< 0.001
foreign born	0.062	< 0.10	0.058	< 0.10	16.626	< 0.001
below federal poverty	-0.063	< 0.10	0.093	< 0.10	-17.059	< 0.001

Abbreviations: HBCU = historically Black College or University

eTable 3. State or region with a historically Black college or university (HBCU)

Alabama
Arkansas
Delaware
District of Columbia
Florida
Georgia
Kentucky
Louisiana
Maryland
Mississippi
Missouri
North Carolina
Ohio
Oklahoma
Pennsylvania
South Carolina
Tennessee
Texas
U.S. Virgin Islands
Virginia
West Virginia

Source: https://nces.ed.gov/programs/digest/d23/tables/dt23_313.10.asp

eTable 4 (Illustrated in Figures 3 & 4): Primary estimates of differences between HBCU versus PWI attendees on cognition at mean age 62 among Black adults in REGARDS, and estimates stratified by college-aged exposure to legal racial segregation (Pre-Brown) and Civil Rights Act (CRA)

Outcome	N	ATE	95% CI	p-value
MEMORY				
Primary Analysis	1952	0.13	(0.05, 0.21)	0.001
Stratified by College-aged Cohort				
Pre-Brown (< 1955)	513	0.12	(-0.05, 0.28)	0.164
Post-Brown/Pre-CRA (1955 - 1964)	884	0.10	(0.02, 0.17)	0.010
Post-CRA (> 1964)	555	0.13	(-0.05, 0.31)	0.162
LANGUAGE				
Primary Analysis	1970	0.19	(0.08, 0.29)	< 0.001
Stratified by College-aged Cohort				
Pre-Brown (< 1955)	516	0.20	(-0.01, 0.41)	0.065
Post-Brown/Pre-CRA (1955 - 1964)	894	0.20	(0.07, 0.33)	0.003
Post-CRA (> 1964)	560	0.14	(0.03, 0.26)	0.017
GLOBAL COGNITION				
Primary Analysis	530	0.22	(0.09, 0.34)	0.001
Stratified by College-aged Cohort				
Pre-Brown (< 1955)	103	0.23	(0.00, 0.58)	0.050
Post-Brown/Pre-CRA (1955 - 1964)	221	0.12	(-0.02, 0.26)	0.083
Post-CRA (> 1964)	206	0.33	(0.16, 0.51)	< 0.001

Abbreviations: ATE = average treatment effect using inverse of probability of treatment weighting, CI = confidence interval, CRA = Civil Rights Act

Notes: Cognitive measures are z-score transformed (i.e., standardized). Linear regression models estimate the average treatment effect of HBCU attendance as differences in standard deviation using inverse probability of treatment weighting. Primary analysis models are adjusted for college-age birth cohort, age at assessment, gender, community size at birth, mom's/caregiver's education, and childhood encouragement to succeed in school, general health, love and affection shown, and state percent in federal poverty. Effect modification models are adjusted for the same covariates except within strata of birth cohort.

eTable 5 (Sensitivity Results). Estimates of the association between HBCU versus PWI Attendance on Cognition among Black Adults at Mean Age 62 in REGARDS

MODEL	N	ATE	95% CI	p-value
MEMORY				
IPTW				
HBCU states (Primary Analysis)	1952	0.13	(0.05, 0.21)	0.001
All states	2712	0.12	(0.05, 0.19)	0.001
HBCU states, add state fixed effects	1952	0.13	(0.06, 0.21)	0.001
HBCU states, adjust for % Black pop	1690	0.10	(0.02, 0.18)	0.019
HBCU states, adjust for % Black pop and % poverty	1690	0.11	(0.03, 0.19)	0.006
HBCU states, not adjusted for state-level variables	1952	0.13	(0.04, 0.21)	0.004
HBCU states, outliers removed	1952	0.13	(0.05, 0.21)	0.001
Linear Regression				
HBCU states	1952	0.15	(0.07, 0.23)	0.001
All States	2712	0.13	(0.06, 0.20)	0.000
HBCU states, add state fixed effects	1952	0.14	(0.06, 0.23)	0.003
LANGUAGE				
IPTW				
HBCU states (Primary Analysis)	1970	0.19	(0.08, 0.29)	< 0.001
All states	2738	0.16	(0.07, 0.25)	< 0.001
HBCU states, add state fixed effects	1970	0.20	(0.09, 0.30)	< 0.001
HBCU states, adjust for % Black pop	1705	0.18	(0.07, 0.28)	0.001
HBCU states, adjust for % Black pop and % poverty	1705	0.19	(0.08, 0.30)	0.001
HBCU states, not adjusted for state-level variables	1970	0.17	(0.07, 0.27)	0.001
HBCU states, outliers removed	1947	0.17	(0.09, 0.25)	< 0.001
Linear Regression				
HBCU states	1970	0.21	(0.08, 0.34)	0.003
All States	2738	0.18	(0.09, 0.28)	0.001
HBCU states, add state fixed effects	1970	0.22	(0.09, 0.35)	0.003

GLOBAL COGNITION

IPTW

HBCU states (Primary Analysis)	530	0.22	(0.09, 0.34)	< 0.001
All states	720	0.18	(0.06, 0.29)	0.002
HBCU states, add state fixed effects	530	0.24	(0.11, 0.36)	< 0.001
HBCU states, adjust for % Black pop	462	0.18	(0.06, 0.29)	0.002
HBCU states, adjust for % Black pop and % poverty	462	0.19	(0.07, 0.30)	0.001
HBCU states, not adjusted for state-level variables	530	0.21	(0.09, 0.34)	0.001
HBCU states, outliers removed	525	0.21	(0.10, 0.32)	< 0.001

Linear Regression

HBCU states	530	0.21	(0.03, 0.38)	0.024
All States	720	0.17	(0.03, 0.30)	0.020
HBCU states, add state fixed effects	530	0.21	(0.04, 0.39)	0.022

Abbreviations: HBCU = historically Black college or university, PWI = predominantly White institution, CI = confidence interval, ATE = average treatment effect using inverse of probability of treatment weighting, IPTW = inverse probability of treatment weighting, Pop = population

Notes: Notes: Cognitive measures are z-score transformed (i.e., standardized). Linear regression models estimate the average treatment effect of HBCU attendance as differences in standard deviation using inverse probability of treatment weighting. Models are adjusted for college-age birth cohort, age at assessment, gender, community size at birth, mom's/caregiver's education, and childhood encouragement to succeed in school, general health, love and affection shown, and state percent in federal poverty (except the average treatment effect model adjusting or percent Black population does not adjust for poverty).