

## SUPPLEMENTARY MATERIAL

### SUPPLEMENTARY METHODS

#### *Additional details on eligibility and selection criteria for the CHDS DISPAR sample*

For a subset of the CHDS, follow-up exams and in-person interviews were conducted among offspring and mothers of offspring at offspring ages 5, 9-11 and 15-17. The Adolescent Study includes participants with the maximum number of time points with available data from birth to adolescent age 15-17. To create the CHDS DISPAR sample (i.e. CHDS offspring now in mid-adulthood), an eligibility pool of 3,196 was created that comprised of 1) a 50% random sample of non-Black male and female participants in the CHDS Adolescent Study; 2) 100% of Black male and female participants in the CHDS Adolescent Study; and 3) a supplementary sample of 100% of Black male and female participants in CHDS follow-up studies at age 5 or ages 9-11. Eligibility requirements were expanded beyond the Adolescent Study for Blacks in order to meet sampling targets. As an additional eligibility criteria, participants had to be California residents at time of recruitment, due to difficulty and cost of conducting home visits across the entire US.

#### *Measures of Adolescent Cognitive Function*

The Peabody Picture Vocabulary Test (PPVT) was administered to participants both at the age 9-11 and 15-17 examinations. The PPVT is a test of receptive vocabulary and language processing, suitable for assessing language-based cognition or crystallized intelligence. Participants are shown a series of sheets, each with 4 pictures displayed. The examiner says a target word aloud, and the participant is asked to indicate which of the 4 pictures best represents the said word. The entire PPVT test includes a graduated series of 150 sheets (with ascending difficulty), however the test is administered only over a critical range of sheets determined for each participant (according to participant's calendar age), thus the test is usually completed within 10-15 minutes. The critical range for each participant is determined by establishing a basal (starting point) and ceiling (end point); and the participant is only presented with sheets within this range. The raw score is then obtained as the number of sheets preceding the basal, in addition to the number of correctly answered sheets tested within the critical range.<sup>1</sup> Standardized PPVT scores were derived based on instructions and conversion tables provided in the 1965 manual.<sup>1</sup> Briefly, the raw scores were converted to standardized scores based on standard score norms provided for pre-specified age groups. Thus the standardized score for a given person provides an index of performance in comparison with individuals within the same age group, giving an indication how a person compared with others his/her own age.

In addition to PPVT, the Raven Coloured Progressive Matrices (RCPM)<sup>2</sup> test was administered but only at the age 9-11 examination. The Raven test was given in its complete form according to instructions in the manual for the book form of the test. The test consists of series of items, each containing a matrix display of 12 graphical patterns from which one element is missing. The participants are provided with six alternative patterns and must choose which of the six best fits the missing element. The items gradually increase in difficulty. The raw score is obtained by tallying the number of correctly completed matrices across all items. The Raven test measures logical and perceptual reasoning, and is typically used to assess fluid intelligence.

### *Childhood SES*

A composite Childhood socioeconomic status (SES) index has been previously introduced and described for this population by Link *et al.*,<sup>3</sup> and combines assessments of maternal education at birth, and paternal occupation and family income at birth, 9–11 and 15–17 follow ups. This measure was constructed to vary continuously between 0 and 3, equally weighting maternal education at birth (0=less than high school; 1=high school graduate; 2=some college; 3=college or more), paternal occupation averaged across the three time points (0= service and laborer; 1.5= sales and skilled labor; 3= professional, technical and managerial), and family income averaged across the three time points (0=lowest average income; 3=highest average income; all others arrayed proportionally between 0 and 3).

### *Midlife occupational standing*

A midlife occupational standing score was created using data from the 2010 US Bureau of Labor Statistics. Each participant's occupational standing score reflects the average yearly income and the minimum education of people in the category corresponding to his or her occupation category. Occupational standing scores (OSS) are a census-based occupational measure of SES, and were computed for participants' current or most recent job based on the Nam-Powers-Boyd OSS calculations.<sup>4</sup> In brief, OSS are calculated using data gathered from the US Bureau of Labor Statistics (USBLS) on the average yearly income and minimum education level for various occupations. For a given occupation, OSS reflect both the number of people who have an income less than the average income for that occupation and the number of people who have an education level less than the minimum required for employment into that occupation; scores are calculated by taking the average of these two components. Once OSS are created, participant self-reported occupation is matched as closely as possible to the detailed occupation list in the USBLS database and participants are assigned the OSS for that occupation. Scores range from 0 to 100 (low to high), and can be used as a socioeconomic dimension of occupation.

**Supplementary Table 1.** Association of Peabody Picture Vocabulary Test age 9 (PPVT-9) with *z-scored versions* of midlife Wechsler Test of Adult Reading (WTAR), Verbal Fluency test (VF), and Digit Symbol test (DS)

	Adjusted for age, sex, race, marital status, childhood SES index	Further adjusted for Age 9 Raven Test scores	Further adjusted for education and occupation
$\beta$ (95% CIs) from linear regression models			
<b>WTAR</b>	0.040 (0.032,0.049)	0.029 (0.02,0.038)	0.026 (0.018,0.035)
<b>VF</b>	0.036 (0.025,0.046)	0.029 (0.018,0.041)	0.028 (0.017,0.04)
<b>DS</b>	0.010 (-0.001,0.021)	0.006 (-0.006,0.018)	0.003 (-0.008,0.015)

**Supplementary Table 2.** Association of Peabody Picture Vocabulary Test (PPVT) change-score† with z-scored versions of midlife Wechsler Test of Adult Reading (WTAR), Verbal Fluency test (VF), and Digit Symbol test (DS)

	Adjusted* for race, marital status, childhood SES index	Further adjusted for Age 9 Raven Test scores	Further adjusted for education and occupation
β (95% CIs) from linear regression models			
<b>WTAR</b>	0.342 (0.252,0.432)	0.271 (0.189,0.353)	0.209 (0.130,0.288)
<b>VF</b>	0.075 (-0.033,0.182)	0.020 (-0.085,0.125)	-0.001 (-0.109,0.107)
<b>DS</b>	0.075 (-0.030,0.181)	0.047 (-0.059,0.153)	0.000 (-0.107,0.106)

† Change-score was generated in 2 steps: 1) a prediction regression equation, with PPVT age 15 as dependent variable and PPVT age 9, midlife age, and sex as predictors, was used to derive predicted PPVT 15 scores; 2) the change-score is created as (actual PPVT 15 score minus predicted PPVT score) divided by the standard error of the estimate from the prediction regression equation.

\* Age and sex were adjusted for in the prediction equation for deriving the change-score, thus they were not additionally adjusted for in this initial regression model, in order to avoid double-adjustment.

**Supplementary Table 3.** Association of *standardized* Peabody Picture Vocabulary Test age 9 with midlife Wechsler Test of Adult Reading (WTAR), Verbal Fluency test (VF), and Digit Symbol test (DS)

	Adjusted for age, sex, race, marital status, childhood SES index	Further adjusted for Age 9 Raven Test scores	Further adjusted for education and occupation
$\beta$ (95% CIs) from linear regression models			
<b>WTAR</b>	0.28 (0.23,0.34)	0.22 (0.17,0.28)	0.20 (0.14,0.25)
<b>VF</b>	0.15 (0.11,0.19)	0.12 (0.08,0.17)	0.12 (0.07,0.17)
<b>DS</b>	0.17 (0.04,0.31)	0.14 (-0.00,0.28)	0.09 (-0.05,0.23)

**Supplementary Table 4.** Association of Peabody Picture Vocabulary Test (PPVT) change-score† (created using *standardized* PPVT measures) with midlife Wechsler Test of Adult Reading (WTAR), Verbal Fluency test (VF), and Digit Symbol test (DS)

	Adjusted* for race, marital status, childhood SES index	Further adjusted for Age 9 Raven Test scores	Further adjusted for education and occupation
β (95% CIs) from linear regression models			
<b>WTAR</b>	2.79 (1.84,3.74)	1.84 (0.96,2.73)	1.41 (0.58,2.23)
<b>VF</b>	0.37 (-0.34,1.08)	-0.10 (-0.80,0.61)	-0.18 (-0.89,0.53)
<b>DS</b>	0.68 (-1.41,2.77)	-0.07 (-2.20,2.05)	-0.61 (-2.69,1.48)

† Change-score was generated in 2 steps: 1) a prediction regression equation, with PPVT age 15 as dependent variable and PPVT age 9, midlife age, and sex as predictors, was used to derive predicted PPVT 15 scores; 2) the change-score is created as (actual PPVT 15 score minus predicted PPVT score) divided by the standard error of the estimate from the prediction regression equation.

\* Age and sex were adjusted for in the prediction equation for deriving the change-score, thus they were not additionally adjusted for in this initial regression model, in order to avoid double-adjustment.

**Supplementary Table 5.** Association of adolescent PPVT difference score (PPVT-15 – PPVT-9) with midlife Wechsler Test of Adult Reading (WTAR), Verbal Fluency test (VF), and Digit Symbol test (DS)

	Adjusted for age, sex, race, marital status, childhood SES index, PPVT-9	Further adjusted for Age 9 Raven Test scores	Further adjusted for education and occupation
β (95% CIs) from linear regression models			
<b>WTAR</b>	0.38 (0.32,0.45)	0.35 (0.29,0.42)	0.31 (0.24,0.37)

<b><i>VF</i></b>	0.07(0.01,0.13)	0.05 (-0.01,0.11)	0.05 (-0.02,0.11)
<b><i>DS</i></b>	0.18 (0.00,0.36)	0.15 (-0.04,0.34)	0.05 (-0.15,0.24)

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1. Dunn LM. *Expanded Manual for the Peabody Picture Vocabulary Test*. American Guidance Service, Inc., Circle Pines, Minn; 1965.
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3. Link BG, Susser ES, Factor-Litvak P, et al. Disparities in self-rated health across generations and through the life course. *Social science & medicine*. 2017;174:17-25.
4. Nam CB, Boyd M. Occupational Status in 2000; Over a Century of Census-Based Measurement. *Population Research and Policy Review*. 2004;23(4):327-358.