Insights from a New Data Collection Effort into Social Determinants of Cardiovascular Health among Young Adults: Do Neighborhoods Matter?

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Noreen Goldman,[1] Boriana Pratt,[2] Heeju Sohn,[3] Stephanie Enkel,[4] Norrina Bai Allen,[5] Hongyan Ning,[5] Donald Lloyd-Jones,[6] and Daniel Notterman[7]

[1] Princeton School of Public and International Affairs and Office of Population Research, Princeton University, USA. Presenting author.
[2] Office of Population Research, Princeton University, USA
[3] Department of Sociology, Emory University, USA
[4] The Kids Research Institute and University of Western Australia, Australia
[5] Department of Preventive Medicine, Feinberg School of Medicine, Northwestern University, USA
[6] Framingham Center for Population & Prevention Research and Section of Preventive Medicine & Epidemiology, Boston University School of Medicine, USA
[7] Department of Molecular Biology, Princeton University, USA

ABSTRACT

We explore the socioeconomic and environmental determinants of cardiovascular health among young adults, considering characteristics of the young adults, their parents, and the communities in which they resided during childhood. Our primary objective is to examine the associations between characteristics of the young adults' communities during childhood and their cardiovascular health in early adulthood. Young adult cardiovascular health (CVH) is assessed by a set of eight factors encompassing both health-related behaviors and clinical metrics. We analyze a new data collection effort fielded during 2021-2023: The Fragile Families – Cardiovascular Health Among Young Adults (FF-CHAYA) study, which is designed to examine the social determinants of cardiovascular health and subclinical cardiovascular disease among young adults. Participants were subsampled from a longitudinal survey of about 5000 births in large cities in the US that has conducted seven waves of interviews since 1998-2000. A total of 1421 young adults, average age 23, participated in 33 "pop-up" clinics across the US. We use latent class analysis (LCA) based on a rich set of variables at the level of the census tract or county to uncover four profiles of geographic areas of childhood residence. We find significant relationships between young adult CVH and their level of schooling, their racial/ethnic identity, the socioeconomic characteristics of their parental households, and their neighborhood environments. At this early stage of adulthood, these associations are driven largely by health-related behaviors, particularly physical activity and diet, but associations with clinical metrics of cardiovascular risk are likely to appear in the coming years and decades.

INTRODUCTION

In this paper, we explore the socioeconomic and environmental determinants of cardiovascular health among young adults, considering characteristics of the young adults, their parents, and the communities in which they resided during childhood. Socioeconomic status (SES) is among the strongest determinants of cardiovascular disease, including heart disease and stroke, and is the leading cause of death in the US and in most of the world (Javed et al., 2022). Our primary objective is to consider the associations between characteristics of the young adults' communities during childhood – including social and economic aspects of the neighborhood – and cardiovascular health (CVH) in early adulthood, accounting for measures of socioeconomic status of both the young adults and their parental households. Young adult cardiovascular health is quantified by a set of eight factors encompassing both health-related behaviors and clinical metrics, as formally defined by the American Heart Association in 2022 (Lloyd-Jones et al., 2022).

A large literature has investigated the associations of neighborhood environments with CVH. Neighborhood influences on cardiovascular risk factors are believed to operate through many potential pathways including both physical and social characteristics of the local environment. These pathways include access to quality healthcare, healthy food, and physical activity spaces; exposure to crime, toxic substances, air pollution, neighborhood disorder, and discrimination; social interactions, cohesion and support; and, more broadly, access to employment, education, housing, and transport (Chaix, 2009; Diez Roux et al, 2008; Kershaw et al., 2024). Residential environments are thought to affect both health-related behaviors, such as diet and physical activity, and clinical risk factors, such as hypertension and blood sugar levels. Stressful experiences, which are more likely to occur in disadvantaged than in well-off neighborhoods, can lead to a wide range of pathologies related to cardiovascuar disease (Kivimaki and Steptoe, 2018).

Much of our knowledge about neighborhood associations with cardiovascular health comes from analyses of survey data. The Multi-Ethnic Study of Atherosclerosis Neighborhood Study (MESA), a longitudinal study initiated in 2000 with participants aged 45-84 across six study sites, has been a particularly rich source of data for examining neighborhood influences on both cardiovascular risk and incident cardiovascular events (Diez Roux et al. 2016a, 2016b; Merkin et al., 2020; Xiao and Graham, 2018). Other data sets in the US, including the Coronary Artery Risk Development in Young Adults Study, the Cardiovascular Health Study, the Jackson Heart Study, the Atherosclerosis Risk in Community Study, and the Midlife in the United States Study, have also contributed to our understanding about linkages between neighborhoods and CVH-related risk factors (see, for example, Boyland and Robert, 2017; Diez Roux et al., 2001; Foraker et al., 2019; Nordstrom et al., 2004; Shishehbor et al., 2008). Participants in many of these studies are middle-aged or older adults, and most analyses have been limited to a small number of geographic locations. In addition, much of the existing research has focused specifically on the effects of neighborhoods on obesity or on its main underlying mechanisms, namely diet and physical activity, rather than on a broader set of established cardiovascular risks (see Tamura et al., 2019 for a review).

We add to existing research by analyzing newly collected data that have several advantages over many of the earlier surveys. These include a comprehensive set of CVH-related behaviors and metrics, many of which are measured rather than self-reported, an extensive set of indicators of socioeconomic status at the level of the individual, family and

neighborhood, and, in contrast to most earlier studies, a focus on young adults. Of considerable importance is that these data were collected from 20 cities in the US, permitting examination of many distinct residential areas. Moreover, the data followed young adults from birth in an oversample of never-married mothers, and thus, the data set comprises relatively large proportions of disadvantaged individuals. The main objective of this analysis is to identify whether the neighborhoods in which the young adults resided as children are associated with their cardiovascular health in early adulthood and to identify the components of CVH that reveal the strongest associations with neighborhood residence.

DATA

The Future of Families – Cardiovascular Health Among Young Adults (FF-CHAYA) study is a new demographic, clinical and molecular data collection effort fielded between September 2021 and December 2023. The study is designed to examine the social determinants of cardiovascular health and subclinical cardiovascular disease among young adults, as well as potential mediation by DNA methylation (Lloyd-Jones et al., under review).

The sample for FF-CHAYA comprises participants in the Future of Families and Child Wellbeing Study (FFCWS). FFCWS is a longitudinal survey of births that began with interviews of about 5000 mothers who gave birth during the period 1998 to 2000 in 20 US cities with a population of at least 200,000 (Reichman et al., 2001). To date, there have been seven waves of FFCWS: baseline (child's birth) and when the children were ages 1, 3, 5, 9, 15 and 22 (https://ffcws.princeton.edu/about). The seventh wave of FFCWS (referred to as Y22) took place during 2020-2023, when the focal child was about age 22. After this interview, participants were invited to attend "pop-up" clinics that were set up in the original FFCWS cities as well as several nearby locations, most often in hotel ballrooms. A given city typically had one or two clinic visits during the fieldwork period, each lasting two or three days. A total of 1421 young adults participated in 33 FF-CHAYA clinics between 2021 and 2023.[1] On average, the clinic visits took place nine months after the Y22 FFCWS interview. Because of an oversampling of births to never-married couples at baseline in FFCWS, children from poor families and Black children were overrepresented at Y22 of FFCWS and in FF-CHAYA.

After providing informed consent at the clinic visit and watching a short video describing the study, participants completed a series of self-administered questionnaires on iPads about their medical history, current health status and health-related behaviors (diet, exercise, drinking, smoking, and prescription medications). They subsequently underwent blood pressure measurement; anthropometry measurement (height, weight, and waist and hip circumference), and phlebotomy (e.g., lipid panel, metabolic panel, complete blood count, hemoglobin A1c, high-sensitivity C-reactive protein and other inflammatory markers, and COVID-19 antibodies). Saliva was collected for epigenetic measures. Participants also received a 30-minute ultrasound scan of the carotid artery, performed by one of two

[1] A total of 2507 young adults were eligible and invited to participate in the clinics. Among these, 1857 scheduled a clinic appointment and 1421 attended the clinics. The overall clinic participation rate was 56.7% of those eligible. FF-CHAYA participants show similar characteristics to participants in Y22 of FFCWS that did not take part in FF-CHAYA: FF-CHAYA participants are slightly more likely to be female and to be Black and to have lower incomes than non-participants.

experienced sonographers, to detect early arterial injury and accelerated atherosclerosis via measures of intima-media thickening and carotid artery distensibility that are strongly predictive of future atherosclerotic disease. On average, the clinic visits lasted for about two hours.

Extensive longitudinal social, economic, and environmental information for participants, their parents, and their neighborhoods is available from FFCWS. In addition to the inclusion of individual and parental SES measures when the young adult was about age nine, we include characteristics of the census tract and counties in which these individuals resided at that time. These contextual data come from the 2000 U.S. Census and from Opportunity Insights at Harvard University (https://opportunityinsights.org/neighborhoods/).

METHODS

Outcome and Explanatory Variables

Our key outcome variable is a measure of CVH developed by the American Heart Association to encompass cardiovascular disease prevention and health promotion. This measure, known as LE8, was developed in 2022 and comprises eight metrics — diet, physical activity, nicotine exposure, sleep, body mass index, blood lipids, blood glucose and blood pressure (Lloyd-Jones et al., 2022). Each metric has a scoring algorithm ranging from 0 to 100 to cover the spectrum of possible values ranging from least to most healthy; the LE8 score is the unweighted average of these eight metrics and thus also ranges from 0 to 100, with higher values indicating *better* cardiovascular health. Information for calculating seven of these metrics is obtained from standardized protocols for clinical measures and from validated questionnaire items obtained during the FF-CHAYA clinic visit, as described in more detail in Table 1. The eighth metric (sleep) is derived from responses to the FFCWS core questionnaire at Y22, based on the average duration of sleep during work/school days and non-work/non-school days. A total of 1160 young adults had complete LE8 scores. In this paper, we refer to the LE8 score as the CVH score and the eight metrics as subscores.

Explanatory variables in models of the CVH score and its components include several demographic measures of the young adults and their households: age of the young adult (21 to 25); sex (male, female); and race/ethnicity (White, Black, Hispanic, Other). The racial/ethnic distribution for the 1421 young adults in FF-CHAYA is as follows: 17.1% non-Hispanic White (hereafter White), 51.4% non-Hispanic Black (hereafter Black), 27.3% Hispanic, and 4.2% Other.[2] Three SES variables were also included: years of schooling of the young adults and their mothers (derived from completed levels of education) and a score of economic hardship. The economic hardship score, which ranges between zero and four and was assessed when the young adult was age 9, is based on multiple questions within each of four types of hardship: food insecurity, difficulty paying household bills, housing hardship and healthcare hardship (Goldman et al., 2025). In contrast to the education variables, higher

[2] Classification of race is based primarily on responses to two questions asked of young adults in Y22 of FFCWS: (1) racial identity, permitting multiple responses (White; African American/Black; Asian/Pacific Islander; Native American/Alaskan Native; and Other); and (2) Hispanic/Latino origin. If respondents indicated Hispanic ethnicity, they were classified as “Hispanic” regardless of their indicated race(s). For the 9.6% of participants who provided more than one race in Y22 or were missing responses, information from earlier waves was used to identify a single race. The composition of the “Other” group (N=60) is as follows: 7 – White and Asian; 2 – Black and Asian; 1 – Black and American Indian; 22 – Asian; 4 – American Indian; 22 – Other; 1 – Asian and Other; 1 – refused.

values indicate more hardship. Preliminary analyses also included the ratio of the income of the mother's household to the poverty level, but the association of this variable with the CVH score was weak in the presence of the other social and demographic variables. After excluding persons with missing values on these predictors, the sample size was reduced to 1118, which comprised 96% of those with a complete CVH score and 79% of those who participated in the clinical visit.

The models also included characteristics of the area of residence of the young adults at about age nine, about midway through their childhood and adolescence. As described below, these contextual variables, based mostly on census tracts but also counties of residence, were analyzed in the form of latent classes. A total of 16 contextual variables were included, reflecting a wide range of characteristics of the area: income and poverty levels; education; housing; racial/ethnic composition and segregation; occupation and employment; crime; and female-headed households. The variables are presented in Table 2.

Analytic Strategy

We began the analysis by performing latent class analysis (LCA) using the *gsem* command in STATA (version 18.0). LCA is a statistical technique, specifically a finite mixture model, that identifies a modest number of qualitatively different unobserved groups or classes within the total sample based on a potentially large set of shared observed measures that are typically intercorrelated (Weller et al., 2020). In this paper, LCA is used to define several distinct classes based on the 16 contextual variables shown in Table 2 and the full sample of 1421 young adults. All contextual variables were dichotomized at the median prior to estimation, with variables assigned the value 1 in the direction (above or below the median) that denoted expected vulnerability or risk for health outcomes (e.g., higher poverty and unemployment, lower education, a higher proportion of minorities, as shown in Table 2). Following standard procedure for LCA, we estimated a series of models, increasing the number of latent classes one at a time, to determine the optimal number of groups. The objective here was to use a rich set of variables at the level of the census tract or county to provide a small number of distinct and meaningful profiles of geographic areas.

We subsequently fit three linear regression models on the 1118 respondents with complete information on the CVH score and predictors. The first model included only the individual/household demographic and socioeconomic variables, whereas the second model included only the four latent classes. The third model combined both sets of variables. We then estimated the third model separately for each of the eight CVH subscores to examine how neighborhoods were differentially associated with the components of cardiovascular health.

RESULTS

We estimated models for two, three, four, and five latent classes. Determination of the appropriate number of classes is typically based on a combination of statistical metrics and subjective criteria such as interpretability and parsimony. Based on these factors, we decided

to use four latent classes.[3] Following estimation of the latent classes, we assigned individuals to a single class according to the highest predicted probability of being in each class (derived from their measurements on the contextual variables).

The composition of the four estimated classes is presented in Appendix Table 1 where the values in each column denote the mean item-response probabilities (mean probability that a FF-CHAYA young adult is in the more vulnerable half of the sample) for each contextual variable, conditional on being in that latent class. Higher values for each characteristic indicate greater potential vulnerability or risk for worse cardiovascular health. Figure 1 presents these results graphically. Appendix Table 2 presents the average values of the explanatory and outcome variables in each of the four classes. In subsequent sections, we refer to the four latent classes as neighborhood archetypes or simply neighborhoods for convenience, although we recognize that the geographical areas underlying the data are considerably larger than what many people would refer to as neighborhoods.

The values in Appendix Table 1 and Figure 1 indicate that the first neighborhood has the most favorable characteristics (indicated by smaller values) related to the level of schooling, average income, and unemployment, for example, and is less racially segregated than the other three classes. The second neighborhood, in turn, generally has more favorable socioeconomic characteristics than the third and especially the fourth, including higher levels of schooling and lower use of public assistance, but it has more female-headed households, crime, and racial segregation than the third class, along with a higher proportion of Black residents. The third neighborhood is most distinct from the other groups in terms of ethnic composition. It has a relatively large Hispanic population and the lowest levels of schooling and the lowest presence of a managerial/professional workforce. The fourth neighborhood generally has the least favorable socioeconomic characteristics as well as a large Black population and high racial and income segregation. The classes can be succinctly described as follows with brief labels provided in parentheses: Class 1: socioeconomically advantaged, low crime (“advantaged”); Class 2: mixed levels of income, educational attainment and employment (“mixed income”); Class 3; working class, lower educational attainment, Hispanic population (“low education“); Class 4: high poverty, high public assistance, high unemployment, high female-headed household, Black population (“vulnerable”). The predicted proportions of young adults assigned to these latent classes are 30%, 18.6%, 17.6% and 33.8% respectively.

Estimates in Appendix Table 2, which show the mean values of the analytic sample in each of the four neighborhood archetypes, underscore the large racial differences: the first neighborhood has a majority of White young adult respondents, the third has a majority of Hispanic young adult respondents and the fourth has a majority of Black young adult respondents. Classes 2, 3, and 4 all have lower levels of schooling among the young adults and their mothers and higher values of economic hardship, on average, than young adults in the first group, as well as lower (poorer) values of CVH, particularly for the physical activity and BMI subscores.

[3] The Akaike information criterion (AIC), the Bayes information criterion (BIC), the Chi-square goodness of fit, and the likelihood ratio/deviance statistic indicated a preference for four rather than three latent classes, although some of the differences were minor.

Table 3 presents descriptive statistics for the individual and household variables used in the models as well as for the outcome variables i.e., the CVH score and its components. The average racial/ethnic composition reflects the oversampling of Black and Hispanic young adults. The outcome measures reveal the large differences across the CVH subscores (where higher scores indicate better health), from a low of 39.3 for the diet subscore and an only slightly higher value of 43.2 for physical activity, to a high of 94.6 for the blood glucose subscore.

Table 4 shows the estimated coefficients and standard errors from the three linear regression models described above. Not surprisingly, variables reflecting the race/ethnicity and socioeconomic status of the young adults and their households are significantly related to the CVH score (Model 1) and are often sizeable. For example, each additional year of schooling of the young adult is associated with about a 2.5 point higher (better) value on the CVH score. In Model 2, which includes only the latent classes, the advantaged neighborhood has a significantly higher CVH score (by between 3.7 and 5.7 points) than the remaining three neighborhoods. Also, not surprisingly, the coefficients for neighborhoods are substantially reduced in the presence of the other variables in Model 3, but the CVH score for the third neighborhood (low education) remains significantly lower by about 2.3 points than that for the advantaged neighborhood (neighborhood 1). In contrast, the demographic and socioeconomic variables at the individual and household levels generally remain significant with about the same magnitude in Models 1 and 3.

Table 5 presents estimated coefficients and standard errors from Model 3 but with each of the eight subscores rather than the total CVH score as outcomes. Overall, statistically significant estimates were observed more often with health-related behaviors rather than with clinical health factors. The significant finding for the low education neighborhood (neighborhood 3) in Table 4 is driven largely by significant negative associations for diet and physical activity as well as BMI. The largest coefficients (in absolute value) among the neighborhood archetypes are those for physical activity, which vary between about -10 and -12 points for neighborhoods 2, 3, and 4 compared to the most advantaged neighborhood (neighborhood 1). The coefficients for physical activity are similarly large and negative for Black and Hispanic young adults, and for females. Note also that there is a large and positive association for young adult education where each year of schooling is associated with a higher physical activity score of almost 8 points; young adult schooling is significantly and positively associated with more components of the CVH score (diet, physical activity, BMI, smoking and sleep) than any other variable in the model.

CONCLUSION

This analysis underscores the relationships between cardiovascular health among young adults and their levels of schooling, their racial/ethnic identity, the socioeconomic characteristics of their parental households and their residential environments. At this early stage of life, the association with overall CVH is driven largely by health-related behaviors, particularly physical activity and diet, but associations with clinical metrics of cardiovascular risk are likely to appear in the coming years and decades. Indeed, ongoing analyses of the carotid artery measurements in FF-CHAYA participants have already revealed some evidence of early cardiovascular disease. The importance of CVH at young ages for subsequent health has been shown repeatedly. For example, data from several major surveys in the US have demonstrated that higher values of the CVH score through young

adulthood are associated with lower rates of premature cardiovascular disease events in midlife as well as lower mortality (Perak et al., 2020; Walker, 2025).

An intriguing finding of our study is that the coefficients associated with neighborhood archetypes for the overall CVH score and for the physical activity subscore are roughly similar across the three relatively distinct disadvantaged neighborhoods, despite large differences pertaining to education, income, female-headed households, and racial/ethnic composition across these residential areas. Moreover, the finding that the coefficient for the "low education" neighborhood remains significant with controls for individual and household characteristics suggests that the educational and occupational distributions of the geographic area may indirectly influence behaviors related to cardiovascular health among young adults.

There are two important limitations that affect this study as well as almost all research related to neighborhood effects on health. One is that there is no generally acceptable definition of a neighborhood. Researchers typically use administrative, census or postal boundaries to define residential areas, i.e., zipcodes, census tracts and counties in the US, although these are often poor proxies of what most individuals would consider their neighborhood. As a result, estimates of neighborhood effects are likely downwardly biased. A second concern is that experimental and quasi-experimental designs are rarely feasible in this area of research. The types of observational studies that are employed do not permit direct causal inference of whether and how a neighborhood leads to the development of cardiovascular risk factors or cardiovascular disease (Merlo et al., 2013; Oakes, 2004).

Another drawback of the present analysis is that the contextual variables were defined approximately midway through the young adult's life. However, neighborhood characteristics often change between birth and early adulthood either because individuals move to different areas or because the characteristics of a given neighborhood worsen or improve over time. Because we have contextual data at each wave of the parent survery, future analyses will take into account changing neighborhood characteristics within the constraints of our modest sample size.[4]

[4] In future analyses, we will add contextual variables pertaining to access to physical spaces and facilities, food stores, and physicians, along with measures of segregation between specific racial/ethnic groups and the Gini index of inequality.

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Table 1. Construction of CVH Metrics from FF-CHAYA (2021-2023)

Metric	Description
Diet	Information was based on the Dietary Screener Questionnaire from the National Health and Nutrition Examination Survey (NHANES). Questions pertain to the frequency of consumption of selected foods and beverages in the last month. The CVH metric (0-100) focuses on adequate intakes of fruits and vegetables, fiber, whole grains, dairy, calcium and limited intake of sugar-sweetened beverages with values categorized into quintiles.
Physical Activity	Information was based on the PAQ-K questionnaire, used by NHANES and other studies. The CVH metric (0-100) is based on minutes per week of moderate and vigorous physical activity.
Sleep	Based on responses in the FFCWS core questionnaire at Y22. The CVH metric (0-100) is based on the average duration of sleep during work/school days and non-work/non-school days, calculated from reported bedtimes and wake times.
Nicotine Exposure	The CVH metric (0-100) is based on use of cigarettes during the past 30 days, the use of e-cigarette and other tobacco in the last week, and hours of secondhand exposure within the household.
Body Mass Index (BMI)	The CVH metric (0-100) is based on the BMI (weight in kilograms divided by the square of the height in meters) obtained from directly measured height (calibrated stadiometers) and weight (electronic scales) with the participants wearing light clothing and no shoes.
Blood Lipids	The CVH metric (0-100) is based on non-HDL cholesterol levels obtained from non-fasting venous blood (plasma).
Blood Pressure	The CVH metric (0-100) is based on the average of diastolic and systolic blood pressures (average of the second and third readings for each), along with the use of antihypertensive medication.
Blood Glucose	The CVH metric (0-100) is based on the measure of hemoglobin A1C.

Table 2. Contextual variables used in the latent class analysis and direction of vulnerability.

Variable description	Tract/county level*	Above/below median
Percent of families below poverty level in 1999	tract	above
Percent of families with 1999 income $100K+ income	tract	below
Percent of ages 16+ professional/managerial workforce	tract	below
Percent of ages 25+ with bachelor's or higher	tract	below
Percent of ages 25+ with HS+ educ	tract	below
Percent of households with kids <18 headed by females	tract	above
Percent of housing units vacant	tract	above
Percent of households on public assistance	tract	above
Percent of civilian labor force (16+) unemployed	tract	above
Percent of population non-Hispanic Black	tract	above
Percent of population Hispanic	tract	above
Student teacher ratio	county	above
Total crime rate	county	above
Household income per capita	county	below
Racial segregation index#	county	above
Income segregation index	county	above

* Tract-level variables are from the 2000 Census. County-level variables are from Opportunity Insights (https://ffcws.princeton.edu/sites/g/files/toruqf4356/files/documents/ff_opim_b_9y_res1.pdf)

This measure is the multi-group Theil segregation index using census-tract level data for four racial/ethnic groups: non-Hispanic White, non-Hispanic Black, Hispanic, and Other.

Table 3. Mean values (standard deviation) of explanatory and outcome variables in the analytic sample, FF-CHAYA (2021-2023).

Explanatory Variables	**Mean/%**	**Outcome Variables**	**Mean**
Female	54.2	CVH score (0-100)	69.2 (12.9)
White	17.4	Diet	39.3 (31.0)
Black	50.5	Physical activity	43.2 (48.0)
Hispanic	27.9	Body Mass Index	61.9 (37.2)
Other	4.1	Nicotine exposure	67.9 (39.1)
Age	22.9 (0.7)	Sleep	77.8 (26.9)
Young adult schooling (yrs.)	13.0 (1.4)	Blood glucose	94.6 (15.6)
Mother schooling (yrs.)	13.2 (2.3)	Blood pressure	83.4 (24.0)
Economic hardship	0.5 (0.6)	Blood lipids	85.8 (23.4)
Number of young adults	1118		

Table 4. Coefficients (t-statistics) for linear regression models of the CVH score

	Model 1	**Model 2**	**Model 3**
Female	-1.92** (-2.60)		-1.87* (-2.52)
White	Reference		Reference
Black	-3.85*** (-3.68)		-3.27** (-2.86)
Hispanic	-3.13** (-2.71)		-2.52* (-2.10)
Other	1.14 (0.58)		1.31 (0.67)
Age	-0.12 (-0.22)		-0.14 (-0.26)
Young adult schooling (yrs.)	2.45*** (8.83)		2.43*** (8.74)
Mother schooling (yrs.)	0.45** (2.66)		0.37* (2.10)
Economic hardship	-1.67** (-2.68)		-1.56* (-2.48)
Advantaged (Neighborhood 1)		Reference	Reference
Mixed income (Neighborhood 2)		-3.67** (-3.21)	-1.26 (-1.11)
Low education (Neighborhood 3)		-5.52*** (-4.88)	-2.34* (-1.99)
Vulnerable (Neighborhood 4)		-5.73*** (-6.12)	-1.54 (-1.48)
Constant	38.69** (2.96)	72.75*** (108.72)	41.16** (3.10)
Number of young adults	1118	1118	1118

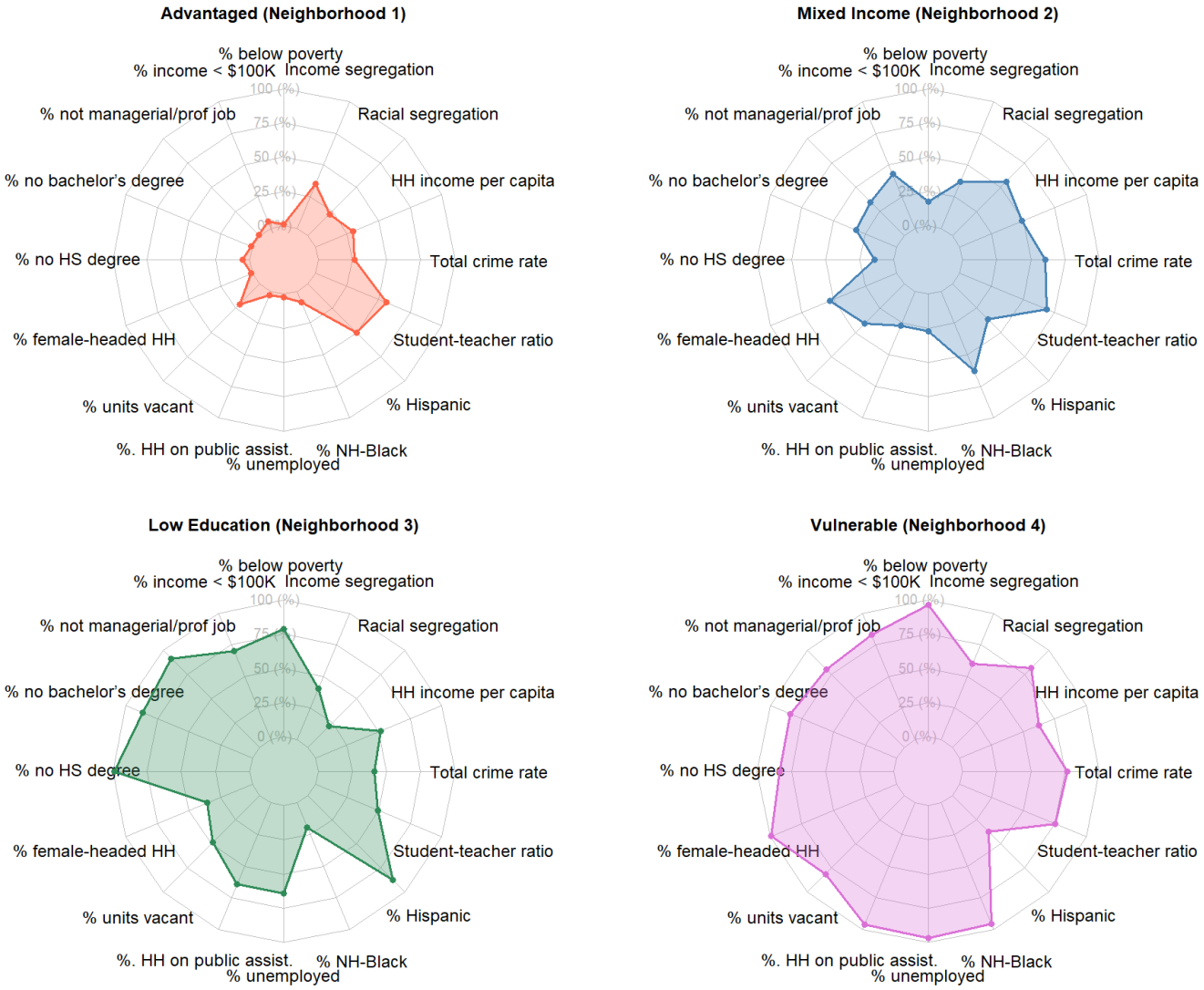
t-statistics in parentheses; * p<0.05 ** p<0.01 *** p<0.001
Omitted categories are in italics

Table 5. Coefficients (t-statistics) for linear regression models of the eight CVH subscores

	Diet	**Physical activity**	**Body Mass Index**	**Nicotine exposure**	**Sleep**	**Blood glucose**	**Blood pressure**	**Blood lipids**
Female	-1.34 (-0.71)	-17.72*** (-6.42)	-10.00*** (-4.48)	4.21 (1.79)	-2.35 (-1.44)	-0.43 (-0.45)	9.98*** (6.90)	2.72 (1.89)
White	Ref	Ref	Ref	Ref	Ref	Ref	Ref	RefIn
Black	-1.24 (-0.42)	-14.07** (-3.29)	-7.43* (-2.15)	7.72* (2.11)	-4.81 (-1.91)	-5.11*** (-3.45)	-1.40 (-0.63)	0.17 (0.07)
Hispanic	-3.34 (-1.09)	-10.31* (-2.30)	-8.16* (-2.26)	10.55** (2.76)	-6.46* (-2.45)	-2.71 (-1.75)	3.29 (1.40)	-2.99 (-1.28)
Other	4.63 (0.92)	-6.08 (-0.82)	8.66 (1.45)	4.10 (0.65)	-6.26 (-1.44)	-0.16 (-0.06)	3.68 (0.95)	1.92 (0.50)
Age	-0.01 (-0.01)	-0.16 (-0.08)	-2.98 (-1.77)	0.99 (0.55)	1.32 (1.07)	-0.00 (-0.01)	-0.16 (-0.15)	-0.13 (-0.12)
Young adult schooling (yrs.)	2.26** (3.17)	7.75*** (7.45)	1.95* (2.32)	4.83*** (5.43)	2.68*** (4.38)	0.56 (1.55)	-0.06 (-0.10)	-0.53 (-0.98)
Mother schooling (yrs.)	-0.03 (-0.07)	0.59 (0.90)	0.45 (0.85)	0.52 (0.93)	0.78* (2.02)	0.07 (0.29)	0.10 (0.29)	0.46 (1.35)
Economic hardship	-0.31 (-0.19)	-2.10 (-0.90)	-3.69 (-1.95)	-4.11* (-2.05)	-0.49 (-0.35)	-1.00 (-1.23)	-1.65 (-1.35)	0.91 (0.74)
Advantaged (Neighborhood 1)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Mixed income (Neighborhood 2)	-2.98 (-1.03)	-12.26** (-2.90)	-3.89 (-1.14)	2.00 (0.55)	1.42 (0.57)	1.47 (1.01)	1.11 (0.50)	3.06 (1.39)
Low education (Neighborhood 3)	-7.26* (-2.41)	-10.39* (-2.37)	-7.13* (-2.01)	-1.05 (-0.28)	4.65 (1.80)	1.02 (0.67)	-0.59 (-0.25)	2.06 (0.90)
Vulnerable (Neighborhood 4)	-3.37 (-1.27)	-10.47** (-2.70)	-0.87 (-0.28)	-0.93 (-0.28)	-1.74 (-0.76)	0.51 (0.38)	1.04 (0.51)	3.53 (1.75)
Constant	15.47 (0.45)	-33.62 (-0.68)	113.88** (2.84)	-31.76 (-0.75)	7.92 (0.27)	90.01*** (5.25)	81.05** (3.12)	86.32*** (3.34)
Number of young adults	1118	1118	1118	1118	1118	1118	1118	1118

t-statistics in parentheses; * p<0.05 ** p<0.01 *** p<0.001
Omitted categories are in italics

Figure 1. Percentages of FF-CHAYA respondents in the given neighborhood archetype that live in vulnerable tracts/counties for each contextual variable*



* See Table 2 for more complete descriptions of the contextual variables.

Appendix Table 1. Mean proportion of FF-CHAYA respondents in the given neighborhood archetype that live in the more vulnerable half of the sample for each contextual variable.*

Variable[1]	Above/below Median	Advantaged (Neighborhood 1)	Mixed Income (Neighborhood 2)	Low Education (Neighborhood 3)	Vulnerable (Neighborhood 4)
Prop. families below poverty	above	0.008	0.173	0.789	0.964
Prop. families with income $100K+	below	0.053	0.428	0.698	0.830
Prop. 16+ managerial/prof workforce	below	0.008	0.347	0.915	0.801
Prop. 25+ with bachelor's degree	below	0.008	0.320	0.868	0.839
Prop. 25+ with at least HS degree	below	0.051	0.143	0.987	0.836
Prop. female-headed households	above	0.009	0.530	0.356	0.991
Prop. housing units vacant	above	0.207	0.410	0.484	0.813
Prop. households on public assist.	above	0.028	0.273	0.642	0.963
Prop. labor force unemployed	above	0.023	0.273	0.640	0.969
Prop. pop. Non-Hispanic Black	above	0.085	0.627	0.194	0.954
Prop. pop. Hispanic	above	0.501	0.364	0.874	0.377
Student teacher ratio	above	0.561	0.689	0.493	0.757
Total crime rate	above	0.265	0.605	0.412	0.764
Household income per capita	below	0.297	0.491	0.519	0.626
Racial segregation index	above	0.222	0.555	0.218	0.814
Income segregation index	above	0.351	0.365	0.405	0.598

*These are post-estimation item-response probabilities from the latent class analysis, based on 1421 young adults. See Table 2 for more complete descriptions of the contextual variables.

Appendix Table 2. Mean values of explanatory and outcome variables among young adult respondents in each neighborhood archetype.

	Advantaged (Neighborhood 1)	**Mixed Income (Neighborhood 2)**	**Low Education (Neighborhood 3)**	**Vulnerable (Neighborhood 4)**
Female (%)	51.1	54.3	52.6	58.0
White (%)	67.7	19.0	9.2	4.1
Black (%)	18.2	19.3	7.8	54.7
Hispanic (%)	32.1	9.6	40.7	17.6
Other (%)	54.4	26.1	10.9	8.7
Age (yrs.)	22.9	22.8	23.0	22.8
Young adult schooling (yrs.)	13.4	13.0	12.9	12.7
Mother schooling (yrs.)	14.2	13.2	12.0	12.8
Economic hardship	0.3	0.6	0.5	0.5
CVH score (0-100)	72.8	69.1	67.2	67.0
Diet	43.5	39.6	33.7	37.9
Physical activity	58.0	38.3	39.0	33.7
Body Mass Index	68.0	60.7	54.7	60.5
Nicotine exposure	69.4	69.0	67.5	66.2
Sleep	80.2	78.9	79.9	73.7
Blood glucose	95.6	95.3	95.3	93.0
Blood pressure	83.4	83.5	83.6	83.3
Blood lipids	83.8	87.3	84.1	87.8
Number of young adults	360	188	194	376