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Adverse Childhood Experiences and Cardiovascular Health: An Exploration of Protective Social Determinants Among Young Adult Black Women

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Abstract

This study sought to advance the literature on Black women's cardiovascular health (CVH) by examining maternal relationship, religion and spirituality, and social connections as potential protective social determinants that buffer the stress of adverse childhood experiences (ACEs). The outcome was the American Heart Association's ideal CVH score. Neither maternal relationship nor religion/spirituality were able to buffer the stress of ACEs on ideal CVH. Findings are discussed in terms of cultural aspects of potential protective factors which are critical for future research. Identifying protective factors that may buffer the influence of ACEs on CVH remains a priority to promote health equity.

INTRODUCTION

Adverse childhood experiences (ACEs), such as child maltreatment and parental incarceration, are associated with earlier cardiovascular disease (CVD) onset in young adulthood [1]. ACEs are common in the U.S. with at least 50% of people experiencing at least one childhood adversity [1–3]. Women, young adults, and historically minoritized

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racial and ethnic communities (e.g., Black) report the highest prevalence [4, 5]. With slowing improvements in CVD mortality among women younger than 44 [6], and a growing appreciation of the role of ACEs and other psychosocial stressors on cardiovascular health (CVH) [1, 3, 7], investigating protective factors for CVH among young Black women is a priority.

BACKGROUND AND SIGNIFICANCE

The 1998 landmark ACEs study found that individuals who experienced severe childhood adversity (i.e., ≥4 ACEs) had over twice the odds of ischemic heart disease [2, 8]. Since 1998, the association between ACEs and CVH has been examined in more diverse populations and in population-representative samples. A 2016 analysis of national data demonstrated that experiencing multiple ACEs was associated with smoking, diabetes, and coronary heart disease [4].

The mechanism through which chronic exposure to adversity affects CVH is through dysregulation of stress physiology. Stressful events activate the sympathetic nervous system (SNS), resulting in a faster heart rate and rise in blood pressure, which serve to rapidly perfuse the muscles in preparation for “fight or flight.” Afterwards, the parasympathetic nervous system should take over to allow for recovery, or “rest and digest.” However, among individuals who experience ACEs, the SNS remains activated. To maintain activation of the SNS, the hypothalamic-pituitary-adrenal axis stimulates the production of stress hormones, such as cortisol, and the release of inflammatory factors. Over time, the chronic overactivation of the HPA axis and associated inflammation leads to multiple risk factors for CVD, including obesity, insulin resistance, atherosclerosis, and ischemic heart disease [3, 9]. Factors that reduce stress, or possibly the appraisal of stress, may interrupt the overactivated stress response system.

Nurturing relationships are among the most solidly evidence-backed factor for promoting health among individuals who have experienced childhood adversity [10–12]. Nurturing family relationships have demonstrated benefits for protecting mental health and promoting general health [10]. However, few studies have examined how nurturing parental relationships may promote CVH [11, 12]. A secondary data analysis from the Coronary Artery Risk Development in Young Adults (CARDIA) study assessed parental warmth with two retrospective questions about physical affection and feeling loved as a child. The authors reported an inverse relationship between parental warmth and multi-system biomarkers (e.g., blood pressure, heart rate variability), and a significant interaction showed that the impact of child abuse on physical health was worse in the absence of nurturing parents [11]. Data from the Longitudinal Adolescent to Adult Health Study (Add Health) also were used to study the relationships among parenting, ACEs, and CVH [12]. Results indicated maternal support in adolescence was protective against long-term cardiovascular risk, and African-American young adults were most sensitive to its effects [12]. Whether parental relationships are protective for CVH remains understudied, especially in the context of the Black mother-daughter relationships. Black mothers socialize their daughters “to build emotional strength, but not at the cost of physical survival” [13]. Further, the evolving parenting relationship from

adolescence into young adulthood is an important developmental stage, but we know very little about if and how a change in the quality of that relationship may affect CVH.

Social connectedness has a positive relationship with CVH on par with, but in the opposite direction of, smoking and other known cardiovascular risk factors [14, 15], and connectedness in adolescence can benefit *adult* CVH [15, 16]. Many studies of the cardiovascular benefits of childhood social relationships are from non-U.S. cohorts [16, 17]. A longitudinal study in New Zealand found that when children and adolescents are not well connected (i.e., socially isolated), they have increased risk for elevated blood pressure and cholesterol in adulthood, and chronic isolation has compounded effects on CVH [16]. In another longitudinal study in Sweden, women, but not men, who reported difficult peer relationships at school experienced more metabolic syndrome [17], underscoring the importance of investigating sex differences in these relationships. Few studies have examined the longitudinal effects of social connections on CVH in historically minoritized populations, and to our knowledge, even fewer, if any, focus on young Black women and their relationships with peers, family, and religious or spiritual representations. A within-group study of Black women centers the experiences of women who have been historically underrepresented or decentered in health sciences research.

Religion and spirituality may provide a way of feeling connected to a higher, nurturant power or a larger force in the universe. Black women identify religion and spirituality as important in their lives, more so than any other subpopulation in the U.S. [18, 19]. Regular attendance at religious gatherings is associated with reduced hypertension and mortality [20, 21], although some aspects of religion and spirituality are associated with worse CVH [20, 22]. For example, researchers from the Black Women's Health Study found that prayer was associated with a higher incidence of hypertension [20]. In a related study, the researchers posited that individuals who are sicker, experiencing pain (e.g., headache), or experiencing emotional distress may be inclined to pray more. Religious and spiritual practices and beliefs are complex, multi-dimensional, and frequently evolve as a person matures, thus making it important to examine religious practices at different points across the lifespan [21, 23, 24]. Further, strong parental relationships may moderate whether someone who grew up exposed to religion remains attached to their spiritual beliefs, partly through parental modeling of a spiritual connection[25]. Religion and spirituality are common and powerful forces in the lives of Black women [18, 19], thus, it is important to understand whether it has a role in protecting and promoting CVH.

Although social determinants of health (SDOH) are often conceptualized as *risk* factors, a more expansive view may be useful for addressing health inequities and identifying opportunities for intervention. A comprehensive view of SDOH recognizes that "the conditions in which people are born, grow, live, work, and age" exist on a continuum and can be health-promoting (e.g., strong social connections, access to healthcare) or health limiting (e.g., social isolation, no health insurance). In the context of ACEs, supportive relationships, such as the maternal relationship and social connections, may be protective SDOH that can buffer against the chronic activation of the SNS. It is important to understand how these potentially protective SDOH present for young women of color. Investigating

factors such as positive maternal relationship, social connectedness, and religion/spirituality illuminate their potential to prevent or mitigate the CVH consequences of ACEs.

Theoretical Frameworks

The Superwoman Schema informs this study by contextualizing the stress experience of Black women.[26] For example, the Black mother-daughter relationship is heavily influenced by Black mother's felt need to prepare their daughters for the racial, sex-based, and intersectional stressors they will face in society.[13, 27] In addition, many Black women endorse a strong spiritual connection as a way to endure many stressors and still manifest strength and a determination to succeed. Contextual theories are essential frames for health equity research to avoid the mistake of analyzing and interpreting data devoid of the context in which the experiences occurred. In addition, the multidisciplinary authorship team is composed of a racial and ethnic diverse group of nurses and researchers, including scholars who identify as Black. We have drawn on the research literature and our lived experiences to inform the design, interpretations, and conclusions reported in this article.

The Life Course Health Development framework synthesizes several key premises that are essential to considering early life influences on later life health. These include the ideas that: (1) the context in which health develops is important; (2) the development of adult health begins early in life; and (3) health is the result of adaptive processes [28, 29]. Adaptive processes include physiological changes that elevate blood pressure or increase susceptibility to mental health disorders and adaptive behaviors (e.g., food-based coping). Although the body is exceptionally susceptible to stress during childhood and adolescence, exposure to stressors, such as ACEs, are not deterministic [28, 29]. Focusing on the experiences of adolescents and young adults can yield improvements in long-term health and help maintain homeostasis or balance, possibly through healthy relationships and spiritual connections.

Identifying protective factors for CVH at different developmental stages is an important next step to inform future clinical, behavioral, and policy interventions. Thus, the purpose of this study was to examine the extent to which protective SDOH may counter the negative effects of ACEs on ideal CVH. This study aimed to: (1) develop protective SDOH subscale scores during adolescence and young adulthood, consisting of measures of spirituality, maternal relationship, and social connectedness; and (2) determine the influence of protective SDOH subscale scores, severity of ACEs, and their interactions on ideal CVH in young adulthood.

METHODS

Study Design and Participants

This descriptive, correlative study uses existing data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) to examine ideal CVH in young adulthood. A sample representative of the geographic, economic, racial, and ethnic diversity of the United States was recruited from 132 middle and high schools in 1994 when the students were between 12 and 20 years of age (Harris, 2013). Four waves of in-home data collection occurred between 1994 and 2008. Cardiovascular biomarkers (e.g., blood

pressure, cholesterol) were gathered for the first time at wave 4 in 2006–2008 when the participants were between 24 and 32 years of age. From a CVH perspective, young adulthood is defined as ages 18 – 39[30].

The sample included Add Health participants who self-identified their sex as female and race as non-Hispanic Black at wave 1 and were not pregnant at the wave 4 interview. Complete cardiovascular and ACEs data at wave 4 were also inclusion criteria. As recommended in Add Health documentation, young adults missing sample weights at Wave 4 were excluded [31]. Supplemental figure 1 details how the sample of 1,203 Black women was derived. The Institutional Review Board determined that this secondary analysis was exempt from review.

Measures

Protective Social Determinants of Health—We measured the following three domains of protective SDOH in adolescence and young adulthood: (1) centrality of religious and spiritual beliefs, (2) strength of the maternal relationship, and (3) social connectedness. The strength of the maternal relationship was measured with three items assessing maternal warmth, communication, and closeness. Social connectedness was assessed with three questions about friendships, feelings of isolation, and involvement in social activities. Paternal relationship was considered but not included due to a missingness rate exceeding 50%. Religious/spiritual beliefs were assessed with three questions measuring the frequency of prayer, regularity of attendance at faith gatherings, and personal importance of religious beliefs. Most items are from validated questionnaires, however with large national studies, selected questions may be used in place of the full instrument. For example, some items to assess religion/spirituality are from the Duke University Religion Index[32].

Three questions were used to assess each social factor for a total of 18 items, nine each per developmental period in adolescence and young adulthood. Protective SDOH scores were created using a principal components analysis detailed in the statistical analysis section.

Adverse Childhood Experiences. The following domains of childhood adversity were measured: (a) child abuse (physical, sexual, emotional), (b) access to drugs in the home, (c) parental incarceration, (d) interpersonal violence, and (e) witnessing violence. In adolescence, participants were asked about access to illegal drugs in the home, witnessing someone shot or stabbed, and personal experiences being threatened with a weapon, shot, or stabbed. In young adulthood, participants were asked retrospectively about experiences of physical, sexual, or emotional abuse that occurred in childhood, with questions such as, “Prior to age 18, how often did a parent or caregiver hit you with a fist, or kick you?” Any yes response was counted as an ACE. An ACEs total score was calculated by summing the yes responses to seven questions, with higher scores indicating greater severity of ACEs (Supplemental Table 1).

Ideal Cardiovascular Health—The concept of ideal CVH uses positive language to identify four health behaviors (smoking, diet, physical activity, and BMI) and 3 clinical indicators (total cholesterol, fasting glucose, and blood pressure), collectively called Life’s Simple 7 [33]. Researchers have used data from The Jackson Heart Study, a prospective

cohort of African-Americans, to demonstrate significant concordance of the ideal CVH score with CVD morbidity and mortality [34]. At wave 4, height, weight and blood pressure were measured, and blood was analyzed for cholesterol, hemoglobin A1c, and random glucose levels. Data collectors used a structured protocol for the blood pressure assessment, which included measuring the upper arm circumference to guide selection of the appropriate sized cuff [35]. Participants rested in a seated position for five minutes before blood pressure measurements were collected using an automatic monitor approved by the British Hypertension Society [35]. Diet, physical activity, and smoking were all self-reported. Performance on each measure was ranked as poor (0), intermediate (1), or ideal (2) (Table 1). Consistent with previous studies using Add Health data, an ideal CVH total score (ranging from 0 to 14) was calculated by summing the rankings for each of the seven performance measures, with higher scores representing better CVH [36]. Consistent with Lawrence, Hummer, Domingue and Harris [36], we accounted for prior diagnoses and medication use by adjusting the ranking, e.g., normal systolic and diastolic blood pressure result on medication was assigned intermediate for blood pressure and not ideal.

Covariates—Age, depression, and indicators of economic well-being are powerful predictors of cardiovascular health so they were included as covariates [37]. Depression was measured with a modified, 19-item Center for Epidemiologic Studies-Depression (CES-D) scale [38]. The CES-D has been validated for use with Black women [39, 40], and demonstrated strong reliability in the current study (alpha = 0.87). Covariates during young adulthood were age, depression, education, and annual household income. At wave 4, a shorter, 9-item version of the CES-D was used [38, 39], and had strong reliability (alpha = 0.84). Participants self-reported their highest level of education attained and household annual income.

Statistical Analysis—Descriptive statistics were used to detail sample characteristics and key study variables. Non-directional statistical tests were performed with the level of significance set 0.05 for each test. Effect sizes and their 95% confidence interval (CI) were estimated to address clinical relevance. Sampling weights were used to account for the non-probability, school-based clustered sampling design, and for oversampling of Black adolescents [31, 41]. All analyses were conducted using SAS version 9.4 statistical software (SAS Institute, Cary, N.C.).

A Principal Components Analysis (PCA) was employed to derive protective SDOH subscale scores (factor-weighted SDOH composite scores) during adolescence and young adulthood. First, the raw score for the nine items included in the PCA (three questions to assess each social factor -religious/spiritual beliefs, maternal relationship, and social connections) was transformed to a z-score with a mean of 0 and standard deviation of 1 due to variation in item rating scales. Next, a PCA was conducted on the item z-scores with an orthogonal varimax rotation applied to facilitate identification of independent components of protective SDOH[42, 43]. A minimum eigenvalue criterion of 1.0 was used to determine the number of components to be extracted. Loadings on the components reflected the relative contribution of each item to each component. The factor loading criterion set for each component was a factor loading of 0.45 or greater. Items with a factor loading of less than 0.45 were omitted one at a time in an iterative fashion. The Kaiser-Meyer-Olkin test (KMO ≥ 0.6) and measure

of sampling adequacy (MSA ≥ 0.5) were also used to evaluate suitability of individual variables for PCA[42, 43]. Using these criteria, a final PCA factor structure was determined and components were identified.

As a final step, factor-weighted z-scores were derived for the items comprising each subscale. Specifically, z-scores for an item associated with the subscale were multiplied by the item's factor loading for that component. For each subscale, the factor-weighted z-score for each item of the subscale was summed to derive a factor-weighted composite score, which was used as the protective SDOH variable in the regression analysis. We assessed the reliability of the subscales using Cronbach's α values. Two sets of protective SDOH subscales scores were created based on items assessed during (a) adolescence and (b) adulthood.

A multiple regression model approach was used to determine the relationship between protective SDOH subscales, severity of early life stress (ACEs) and their interactions on ideal CVH, adjusting for covariates. A separate multiple regression analysis was conducted for each developmental period of SDOH subscale scores and period-specific covariates (adolescence or young adulthood).

The sample size of 1203 provided at least 80% power to detect main and interaction effects of key predictors and covariates with the outcome of ideal CVH for the regression model with 10 predictor terms, assuming: (a) small effect sizes, and (b) two-tailed significance set at 0.05.

RESULTS

Sample Characteristics—The mean age of the 1203 Black women was 29.1 (SE 0.21), 24.2% were college graduates and 28.9% had household incomes above 50,000 (Table 2). In adolescence, 37.6% reported significant depression symptoms, compared with 29.5% in young adulthood. ACEs were common with 58.6% reporting at least one form of childhood adversity.

Of the four health behaviors, tobacco use had the greatest proportion of women achieving the ideal standard (59.4% were nonsmoking). BMI had the lowest proportion of women achieving the ideal benchmark (24.9% had normal BMI between 18 and 24.9). Of the three clinical indicators, more women met ideal criteria for cholesterol (77.7%), than blood sugar (A1c < 5.7 and random blood glucose of < 200, 44.6%) or normal blood pressure of < 120/80 (36.8%). The mean ideal CVH total score was 8.2 (SE=0.12), with observed scores ranging from 0 to 14.

PCA Components: Protective SDOH Subscales—The initial nine items were determined to be suitable for PCA based on individual item measures of sampling adequacy > 0.55 and the Kaiser-Meyer-Olkin test (KMO values = 0.72). The initial rotated PCA suggested two components (subscales) based on scree plots and a minimum eigenvalue of 1. The factor pattern loadings for the items are provided in Table 2. Of the nine items, the following three items did not have loadings >0.45 on either factor: (1) "feeling socially

accepted," (2) "feeling part of the school," and (3) "feeling close to people at school." The three items were removed based on their factor loadings to obtain the final PCA model.

The final PCA contained six items, and all were determined to be suitable for PCA based on individual item measures of sampling adequacy > 0.65 and the Kaiser-Meyer-Olkin test (KMO values = 0.73). The final rotated PCA suggested two components or factors based on scree plots and minimum eigenvalues of 1 (Factor 1: 2.28; Factor 2: 1.60 eigenvalues). The factor pattern loadings are provided in Table 3. The two components that emerged corresponded with our hypothesis of a religion/spirituality component and maternal relationship component, but a social connectedness component was not identified.

The two PCA subscales were labeled (1) religion/spirituality, and (2) maternal relationship. Descriptive statistics for the religion/spirituality and maternal relationship subscales during adolescence and young adulthood are presented in Supplemental Table 2. Higher scores indicated stronger (higher degree of) religion/spirituality or maternal relationship. The Cronbach α values for the religion/spirituality subscale in adolescence and young adulthood were 0.89 and 0.65, respectively. The Cronbach α for the maternal relationship subscale in adolescence and young adulthood was 0.77 and 0.60, respectively.

Protective SDOH, ACEs, and Ideal CVH in Young Adulthood—Table 4 presents the multiple regression results for the adolescent and young adulthood protective SDOH. In adolescence, religion/spirituality (Religion/Spirituality × ACEs β=0.104, p =0.060) and maternal relationship (maternal relationship × ACEs β=0.053, p =0.409) were not protective for cardiovascular health. Fewer depressive symptoms in adolescence and greater maternal education were significantly related to better ideal CVH scores (p=0.0011 and p=0.017, respectively).

The results of the model examining young adulthood protective SDOHs and ideal CVH were similar to the findings in adolescence. Interactions to test whether the protective SDOH components in young adulthood moderated the effect of ACEs on ideal CVH were not statistically significant (Religion/Spirituality × ACEs β=0.086, p =0.068; Maternal relationship × ACEs β= −0.099, p =0.067). In young adulthood, higher educational attainment and greater household income were significantly associated with better ideal CVH (p< 0.001 and p=0.040 and respectively), but depression was not (p=0.504).

Discussion

The current study examined the role of protective SDOH, childhood adversity, and their interactions on ideal CVH among young adult Black women. Using population-representative data, we described two of three hypothesized protective factors. Maternal relationship did not have a significant direct influence on CVH, and its interaction with ACEs only approached significance in young adulthood, but not adolescence. The findings for the second proposed protective factor, religion/spirituality, also demonstrated no significant direct influence on CVH, and its interaction with ACEs did not reach statistical significance. Despite the negative findings, this study is innovative for its rejection of a deficits approach and a focus on strengths that may be protective for CVH in young adult Black women. The findings add important insights about the relative impact of the tested

protective factors in relation to other known cardiovascular risk factors (e.g., education and income), and provides possible directions for culturally and developmentally informed approaches to future research.

The expectation that a strong maternal relationship would positively benefit young adult CVH was not supported. This may be because of the age of the women, unknown source of ACEs reported (e.g., the maternal-child relationship could be abusive), unique aspects of the Black mother-daughter relationship, and/or the overall measurement of maternal relationship. In previous research that found the maternal relationship buffered the impact of childhood adversity on CVH, the participants' mean age was 40 [11], 11 years older than the mean age of 29 in our study. In another study, the outcome variable was the predicted risk of developing CVD in the next 30 years, placing the participants in middle age [12]. One possibility is that the CVH benefits of maternal relationship may not manifest until later in life. In fact, in our analysis the ACEs and maternal relationship interaction in adolescence was insignificant, but as the women aged (young adulthood), we observed the ACEs and maternal relationship interaction approaching significance.

The absence of a protective effect of the maternal relationship may be related to measurement, and the ways in which cultural differences between and within groups are historically not reflected in measurement tools. Indeed, the low alpha coefficient of the maternal relationship variable may reflect the lack of attention to cultural differences. Black women of all ages rely on the maternal relationship as a model for how to cope and manage various forms of stress [13, 27], but Black adolescent girls may not always recognize their mother's "tough love" as nurturing. Rather, they may only realize and appreciate the lessons their mother instilled as they grow, mature, experience life as an adult Black woman, and possibly begin to raise their own daughters. Black mothers begin preparing their daughters in childhood for hard work, systems of oppression (e.g. racism, sexism), and the need to be self-reliant [13], values often summed up in the strong Black woman archetype and formally conceptualized in the Superwoman Schema [26]. Black mothers are supportive, *and* they may also serve as a reminder of the expectation to be tough, and a "Strong Black Woman". Future research could examine what Black adolescents and young adults describe as a nurturing relationship with their mother, what language is used, and how is it appraised as an adolescent and young adult. Other avenues for future research should also include exploring the mother-daughter relationship in infancy and early childhood. The combined approach of examining the pivotal mother-daughter relationship across the lifecourse and collecting data on the mother's trauma history will be informative for understanding the transgenerational transmission of stress and health and may point to optimal timing of future interventions[44, 45].

This study may be the first to explore religion and spirituality as buffers for childhood adversity with an objective cardiovascular measure. We presented a strong, multi-dimensional measure of religion and spirituality based on three commonly used questions that assess different domains of religion and spirituality and used a principal components analysis that weighted each question differently based on its contribution to the larger construct[42, 43]. Our findings reflect the inconsistencies in the literature about the contribution of religion and spirituality to health, but specifically for CVH. It is also

important to consider that the women in this study are in young adulthood; the positive health benefits of religion and spirituality may become more evident in middle adulthood [23]. Future research should investigate this hypothesis using longitudinal approaches.

Also, future research will need to consider the growing heterogeneity in religion and spirituality in the Black community. In the U.S., Black adults continue to rank among the most religiously affiliated [18, 19], but young adults in Generation Z are less likely to attend religious services and more likely to be religiously 'unaffiliated' than previous generations [46]. However, Pew research found that even unaffiliated Black adults are likely to believe in God or a higher power and to pray regularly [46]. We appreciated this nuance in the Black community and conceptualized religion and spirituality focused on the frequency of prayer and personal importance of religious beliefs in addition to regular church attendance. Even so, we found very little support for a moderation effect of religion and spirituality. One way that religion and spirituality may exert a protective effect is through social ties and connectedness. However, this aspect may be less prominent in the lives of the younger generation of Black Americans[47]. In contrast, older generations often relied on their faith and connections to the "Black church" for a place of belonging, safety, and self-worth to counter the experiences of adversity, segregation, and legalized racism[48]. Researchers will need to continue to examine the potential health benefits of religion and spirituality for Black adults, and develop measurement approaches that are consistent with the changing experience of these faith traditions.

The contribution of adolescent mental health to CVH in young adulthood is an important finding. We observed an inverse relationship between ideal CVH scores and depression symptoms in adolescence, but not in young adulthood. Our findings add to a growing body of literature identifying adolescent mental health as an important driver of later CVH [49, 50]. Some proposed mechanisms relate to health behaviors associated with increased energy intake or decreased movement, both of which may contribute to obesity [50, 51]. Other studies suggest that depression contributes to physiological dysregulation, including subclinical changes in vasculature (e.g., endothelial dysfunction) and decreases in nighttime blood pressure dipping [49, 51]. However, the physiologic response to depression and the relationship between depression and mechanisms of CVH remain poorly understood and warrant further investigation, preferably with longitudinal studies that can examine trajectories of mood and clinical indicators of health.

Study Strengths and Limitations—This study is one of very few to examine CVH in a population representative sample of young adult Black women, a group that experiences disparate rates of CVD compared to other women in the U.S. However, as a cross-sectional study, no inferences can be made about causality. Also, the study excluded women missing complete data on the outcome variable.

Some measurement concerns include the low Cronbach alpha on the maternal relationship score. The measure we created may not capture important elements of the Black mother-daughter relationship [13]. Also, the measurement of ACEs is primarily a retrospective measure, consistent with most research in this area [52]. Some research suggests a small risk for measurement bias related to recall differences and selection bias since abuse

survivors may be more likely to complete surveys. However, research suggests this would underestimate the relationship rather than inflate it [53]. Moreover, ACEs are measured by summing the number of childhood adversities experienced, a method used by many, if not most, other researchers studying ACEs [2, 4]. However, we recognize that the individual types of adversity may have differential impacts on health [54]. Future work could explore latent subgroups or patterns of childhood adversity that may relate differently to young adult CVH. Likewise, tobacco use, diet, and physical activity were self-reported and subject to recall and social desirability bias. Physical activity was assessed as the number of different activities done in a week, rather than the number of minutes of activity, a more commonly used metric. As a secondary analysis of existing data, we were limited to what data was previously recorded. Future studies could consider objective activity trackers.

Despite these limitations, this study remains innovative for its timely and specific focus on the CVH of young Black women, its exploration of culturally relevant protective factors, and the use of a rigorous measure of CVH that incorporates objective measurement of key clinical indicators. Also, it is critical to recognize and appreciate the significance that this study is only generalizable to other young Black women. This within-group study allowed exploration of stressors and potential buffers that were relevant to the lived experiences of many young, Black women. The current study challenges power relationships involving race by foregoing a comparison group. Often Black women are compared to a White ‘reference’ group, reinforcing a race hierarchy with White as the ideal or standard. Future research should prioritize within-group studies to address the prominent, culturally specific role of social context on CVH and aid personalization of health care.

Future Implications—Also, more research is needed to identify culturally relevant protective factors. We found marginal support for the role of religion/spirituality but future research could explore if and how current young adults engage in religious or spiritual practices. Also, more research is needed to understand trajectories of depression in young Black women. Adolescence is a turbulent time. For young Black women, there may be the added stress that comes with increasing awareness of the challenges related to being both Black and female in a society that is highly stratified and views both identities as subordinate, and even more so when considered jointly. In this study, social connectedness variables did not form a factor that could be analyzed. However, given the literature that highlights the harms of social isolation, future research should explore the social networks of Black women, including more accurate or culturally congruent measures and ways that social connections may temper or amplify the CVH consequences of stress [55].

Understanding social contributors to health at the level of the individual, family, and community levels will be essential for advancing CVH equity. Multilevel interventions move beyond exclusively focusing on the individual to intervening on the family, community, and societal factors that affect the individual [56]. Educational attainment and income are proxy indicators for social and economic position in US society, and they continue to be unsurpassed indicators of CVH. Changes in social and economic indicators likely require nurses becoming more involved in policy at all levels. Nurse-led school-based health centers could improve educational attainment by providing onsite access to physical and mental health care, and ultimately decrease absences related to illness.

Conclusion—Early life factors are an important consideration for CVH and health disparities among young Black women. While we did not find evidence for a direct association between ACEs and CVH, findings do suggest that ACEs may contribute to poor CVH in young adulthood through a pathway of poor mental health. Given the young age of the adult women in this study, researchers should focus on longitudinal studies that examine CVH when the women are approaching middle age. This line of research may inform future health interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Measurement of Ideal Cardiovascular Health

CVH Metrics	Ideal [2]	Intermediate [1]	Poor [0]
Tobacco Use	Never smoked	Former smoker	Current
Diet	≤4 Sugary beverage/week	5 – 7 sugary beverages/ week	8+ sugary beverages / week
Physical Activity	5+ activities weekly	1 – 4 activities/week	No physical activity
BMI	< 25 kg/m^2	25 – 29.9 kg/m^2	≥ 30 kg/m^2
Blood Pressure	SBP < 120, DBP < 80, no HTN med, and no prior history of HTN	SBP 120–139 or DBP 80–89, or prior history of hypertension	SBP ≥ 140 or DBP ≥ 90
Blood Sugar	HbA1c < 5.7, fasting glucose < 126 or random glucose < 200, and no prior history of DM	HbA1c 5.8 – 6.4, or fasting glucose 100 – 125, or prior history of DM	HbA1c ≥ 6.5, or random glucose ≥ 200
Cholesterol	0–7th decile	8–9th decile or prior history of high cholesterol	10th decile

CVH = Cardiovascular Health, HTN = hypertension, SBP = Systolic blood pressure, DBP = Diastolic blood pressure, DM = Diabetes Mellitus

Table 2

Weighted Sample Characteristics

Sample characteristics	N	Mean	SE
Age	1203	29.1	0.21
		%	SE
Education	1203		
≤ High School		25.8%	2.55
Some college		50.0%	2.14
College or greater		24.2%	3.15
Household Income (Young adulthood)	1132		
< $20K		32.6%	2.70
$20,000 – $49,999		38.5%	1.72
$50,000+		28.9%	2.52
Mother's education	1133		
< High school		23.2%	2.19
High school/GED		38.1%	2.47
Some college		19.6%	1.95
College or greater		19.1%	2.17
Household income (adolescence)	841		
< $20K		42.0%	4.09
$20,000 – $49,999		42.2%	3.05
$50,000+		15.8%	2.35
Adolescent depression CESD ≥ 16	1201	37.6%	2.64
Young Adult depression CESD ≥ 10	1203	29.5%	2.06
Adverse Childhood Experiences (ACEs)	1203		
1 ACE		29.0%	2.08
2 ACEs		17.1%	1.57
3+ ACEs		12.5%	1.44
Ideal CVH Metrics	1203		
Never used tobacco		59.4%	3.60
Diet – Sugary beverages < 4/week		27.7%	1.78
Physical Activity 5+ activities/week		39.7%	1.97
BMI ≤ 24.9		24.9%	1.62
Blood Pressure SBP < 120 and DBP < 80		36.8%	1.86
Blood sugar a1c < 5.7 and glucose < 200		44.6%	2.48
Cholesterol – 7th decile and lower		77.7%	1.56

SE = Standard Error; ACEs = Adverse Childhood Experiences; GED = General Education Development; CESD = Center for Epidemiologic Studies – Depression; Adolescent depression was assessed with a 19-item version of the CESD; Young Adult depression was assessed with a 9-item CESD; ACEs = adverse childhood experiences; CVH = Cardiovascular Health; SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure

Table 3

PCA Factor Structure for Protective Social Determinants of Health (N=1203)

	Initial PCA 2 components retained		Final PCA 2 components retained	
Item	**Religion/Spirituality**	**Maternal Relationship**	**Religion/Spirituality**	**Maternal Relationship**
Importance	**0.857**	0.062	**0.857**	0.066
Prayer	**0.837**	0.042	**0.836**	0.039
Attendance	**0.812**	0.041	**0.811**	0.039
Mom communication	0.049	**0.714**	0.047	**0.746**
Mom closeness	0.026	**0.637**	0.048	**0.666**
Mom warmth	0.051	**0.641**	0.025	**0.665**
Socially accepted	0.035	0.343		
Part of the school	0.049	0.327		
Close to peers at school	−0.027	0.308		

PCA = Principal Components Analysis

Table 4

Relationship Between Protective SDOH, ACEs and Ideal Cardiovascular Health (N=1132)

	Adolescence				Young Adulthood			
Explanatory Variable	**β**	**SE**	***p***	**R^2**	**β**	**SE**	***p***	**R^2**
				0.048				0.089
Religion/Spirituality (RS)	−0.027	0.057	0.638		−0.021	0.053	0.661	
Maternal relationship	−0.025	0.076	0.682		0.030	0.064	0.510	
RS*Maternal relationship	0.065	0.018	0.064		0.070	0.027	0.080	
ACEs severity	−0.014	0.077	0.698		−0.017	0.080	0.644	
ACEs*Religion/Spirituality	0.104	0.035	0.060		0.086	0.036	0.068	
ACEs*Maternal Relationship	0.053	0.050	0.409		−0.099	0.042	0.067	
Age	0.083	0.056	0.067		0.058	0.050	0.163	
Depression symptoms	−0.129	0.010	0.001*		−0.025	0.016	0.504	
Education	0.093	0.082	0.017*		0.220	0.133	<.0001*	
YA household income					0.071	0.080	0.040*	

* $p < .05$

SDOH = Social Determinants of Health; ACEs = adverse childhood experiences; β = standardized beta

SE = Standard error; RS = Religion/spirituality; YA = young adulthood; Education in adolescence = maternal education, Education in young adulthood = the participant's highest level of education