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Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease (UPSTREAM CVD): African American Emerging Adults

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UNLOCKING POPULATION-SPECIFIC TREATMENTS TO RENDER EQUITABLE APPROACHES AND MANAGEMENT IN CARDIOVASCULAR DISEASE (UPSTREAM CVD): AFRICAN AMERICAN EMERGING ADULTS

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DEDICATION

This dissertation is dedicated to the loving memory of my parents, Bishop C. Edwin and Mother Ruth Heyward Bright. Their love and guidance greatly influenced who I have become. Thank you, Dad, for telling me that "can't was killed" when you were a boy, and for making me believe I could do anything! Mom thanks for being the lover of laughter that kept our family happy. I am forever grateful for the life you lived before me.

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ABSTRACT

Cardiovascular disease (CVD) is the leading cause of death in America. African American people have disparate CVD outcomes, and African American emerging adults (AAEAs) aged 18-25 have CVD risk factors. This study aimed to examine the state of CVD risk factors in AAEAs, assess upstream and population factors in AAEAs attending a southeastern historically black college/university (HBCU), compare their perceived and objective CVD risk, explore their level of CVD knowledge, and examine responses when they learn their objective CVD risk.

Chapter 1 presents background literature on CVD in AAEAs and the research plan. Chapter 2 presents a newly synthesized situation-specific theory (SST), Unlocking Population Specific Treatments to Render Equitable Approaches and Management in Nursing for Cardiovascular Disease (UPSTREAM CVD), to guide future research and clinical practice for AAEAs.

Chapters 3 and 4 are data-based manuscripts of studies that include an assessment of CVD upstream factors and population factors (constructs of the UPSTREAM CVD SST) in a cohort of AAEAs, and a comparison of CVD risk perception and objective CVD risk in AAEAs. Chapter 5 presents the conclusions of the research, a discussion of the implications for nursing research, education, and practice, and future research directions.

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μg	Microgram
µg/m3	Micrograms per Cubic Meter

LIST OF ABBREVIATIONS

AAEA .....African American Emerging Adult

AAP.....African American People

ACA .....Affordable Care Act

AHA ..... American Heart Association

ANS..... Autonomic Nervous System

BMI ..... Body Mass Index

BP..... Blood Pressure

CMNPH .....Conceptual Model of Nursing and Population Health

CVD .....Cardiovascular Disease

CVH .....Cardiovascular Health

DOH.....Determinants of Health

LE8.....Life's Essential Eight

NHB .....non-Hispanic Black

NHBP.....non-Hispanic Black people

NHW ..... non-Hispanic White

NHWP.....non-Hispanic White people

OR..... Odds Ratio

PA .....Physical Activity

PPB ..... Parts per Billion

SDOH.....Social Determinants of Health

SES.....Socioeconomic Status

SST..... Situation-Specific Theory

UPSTREAM ..... ……. Unlocking Population-Specific Treatments to Render Equitable Approaches and Management

US ..... United States

CHAPTER 1

INFLUENCES OF CARDIOVASCULAR DISEASE IN AFRICAN AMERICAN EMERGING ADULTS

BACKGROUND

Cardiovascular disease (CVD) remains the leading cause of death worldwide and claims more lives each year in the United States (U.S.) than all forms of cancer and chronic lower respiratory disease combined.[1] Cardiovascular disease and associated risk factors account for the 5.3-year shorter life expectancy for African American people (AAP) than White American people.[1,2] Despite healthcare innovations and successes, the color of a person's skin considerably determines prospects of wellness, cardiovascular disease risk, and the quality of care received.[3]

Furthermore, CVD is increasingly affecting younger populations, particularly AAP in the southern U.S..[4] Cardiovascular health (CVH) in African American emerging adults (AAEAs) aged 18-25 is linked to midlife CVD morbidity and mortality.[5] Emerging adulthood[6] is, therefore, a propitious time to improve CVH. Emerging adults are developmentally transitioning from adolescent parental dependency to gaining independence as adults. They are forming lifelong behaviors, and adding good heart health practices should be among them.

The American Heart Association (AHA) established heart health measures using Life's Essential 8 (LE8) components grouped into two domains of health behaviors (diet, physical activity [PA], nicotine exposure, and sleep) and health factors (body mass index [BMI], blood lipids, blood glucose, and blood pressure [BP]) as a broader, more positive construct than disease absence.[7] However, few studies have explored heart health in AAEAs; hence, risk factors are presented as a means of ultimately transitioning to heart health.

African American emerging adults have risk factors identified in LE8 that relate to health behaviors (diet,.[8-12] PA,[13,14]nicotine exposure,[15-24] and sleep health[25-27]) and health factors (BMI,[28-30] blood lipids,[7] blood glucose[31-34], and BP.[35-37]). Other biological factors that influence CVD risk in AAEAs include metabolic syndrome[38-40], the presence of biomarkers[41-46] (i.e., triglycerides, large artery stiffness, waist/hip circumference ratios, and neck circumference), and the physical effects of individual (including both internalized and interpersonal),[47] systemic, structural,[48] institutional,[47] and cultural racism,[12,49-57] and stress.[58-60] Additionally, health behaviors in AAEAs are impacted by perception of physical and mental health, and culture.[61-63]

Furthermore, AAEAs encounter a unique combination of financial, academic, and social challenges that increase their stress levels and may increase the incidence of hypertension. For example, twice as many AAP live in poverty than non-Hispanic White people (NHWP).[4] African American college students are more likely to face stress related to their racial and ethnic background.[64] On average, educational attainment is lower in AAP and mortality can be attributed to limited education.[65] Moreover, the lack of social and environmental supports that promote PA to reduce obesity (i.e., infrastructure for walking, access to services, and crime prevention) are often negative influences in underserved African American neighborhoods.[66] Together, abnormal biological factors and adverse social determinants of health (SDOH) (i.e., economic instability, lack of education access and quality or health care access and quality, negative neighborhood and built environment, and poor social and community context)[13,67-73] exacerbate health inequities in AAEAs and their resultant disparities in morbidity and mortality.

Education Access and Quality

Education is the most used indicator of socioeconomic position in the U.S. and provides the most consistent results concerning CVD outcomes.[70] Education is inversely associated with coronary artery disease risk.[74] Lower levels of educational attainment are associated with a higher prevalence of CV risk factors, higher incidence of CV events, and higher CV mortality, independent of sociodemographic factors.[70] Higher educational attainment is also associated with CVH. Those with at least a college degree had 4.12 times the odds of having an ideal CVH score.[75]

However, AAP may not experience the same protective benefits of educational attainment as NHWP.[75] Increased educational attainment increases odds of having better CVH within each racial and ethnic group but with significant differences in the strength of association between racial and ethnic groups with NHWP having an odds ratio (OR) 2 points higher than non-Hispanic Black people (NHBP), OR 4.5 versus 2.5, respectively 2.5.[75]

Disparities associated with educational attainment have widened over time and disproportionately affect AAP. For example, in 2016 35% of NHWP had completed a bachelor's degree compared to 21% of NHBP (a 14-point gap).[70] However, in 2022 the gap widened to 20 points (45% in NHWP versus 25% in NHBP).[76] The Supreme Court's recent ruling to restrict race as a factor in college admission may further widen the gap in educational access and quality.[77] Poor educational attainment predicts poor employment prospects, and economic instability, acting as barriers to healthy living, food security, and health care.[3] These strong determinants of CVD manifests as poor health literacy, lack of

access to relevant information on CVD risk factors, and provider-patient communication barriers.[3,78]

Economic Stability

Economic stability means that a person or family has financial resources that are essential to a healthy life. Economic stability indicators include income, wealth, employment status, and occupational category, and are determinants of access to care, safe housing, and many other factors that directly or indirectly affect CVD.[3] Despite the abolishment of slavery over a century ago and the Civil Rights Act of 1964, people of color continue to lack access to lucrative employment opportunities.[3]

College students from disadvantaged socioeconomic statuses (SES) often use education loans to finance college and the amount of loans are negatively related to net worth and nonfinancial assets at age 30.[69] The combination of lower paying employment opportunities and educational debt contribute to a wider gap in income by race.

Lower financial resources influence healthy food intake which directly affects CVH.[1] Lower socio-economic status has also been linked to food access challenges[79] and may result in even higher food costs for lower income families. Income, wealth, and other socioeconomic determinants are consistently linked to poor CVH and lower quality of life; and are major drivers of racial/ ethnic disparities in CVD.[3]

Health Care Access and Quality

Health access and quality is the extent to which people have affordable (whether through insurance use or out-of-pocket costs), equitable, and available access needed for healthcare services.[80] The Affordable Care Act (ACA) decreased the number of African American adults without insurance from 20% in 2011 to 13% in 2019.[80,81] However,

NHW young adults experienced a significantly greater reduction in the uninsured rate (-4.9 percentage points) than NHB (-2.9; $p = 0.01$) and Hispanic (-1.7; $p < 0.001$) young adults.[85] The number of AAEAs without access due to insurance coverage may be even higher given the transition from parental insurance policies to self-support. Regardless of having insurance coverage, hospitals with disproportionate shares of AAP have high readmission and mortality rates for CVD than those caring for a mostly White population.[3] Other care access issues may be linked to negative socioeconomic factors such as unavailable transportation,[78] lack of sufficient income, or remote housing location inaccessible to healthcare services.[82]

Racial inequities in health outcomes are affected by prejudiced state and federal policies that are deeply rooted within the health care system.[3] For example, some majority-Republican states refused Medicaid expansion citing federal government overstep.[86] However, the Medicaid refusal policy decision impacts the poorest, with 21% of AAP living in poverty and having only ten cents for every dollar of wealth as NHW families.[83] The U.S. News and World Report presents health care access in subcategories of child wellness visits, health insurance enrollment, adult wellness visits, adult dental visits, child dental visits and health care affordability.[87] South Carolina, the research site for this dissertation research, ranks 27ath overall in the U.S. for health care access, 43rd for health care affordability, 32nd for child wellness visits, and 40th for health insurance enrollment. Adult wellness, and adult and child dental visits rank in the top 15 (10th and 15th, respectively).[87]

The median age of African American people in 2021 was 33 years[83] two years younger than 2019.[84] The slightly larger population of AAEAs suggests that the younger

population may be growing quicker than the aging population (roughly 45% below age 30)[83]. Ensuring access to quality care for AAEAs may be one of the most impactful influences on future CVD morbidity and mortality.

Social and Community Context

Social relationships and support are among the key elements of the social environment that influences health-related behavior changes.[88] The social environment includes belonging, life and work stress, marginalization, deprivation, economic status, and community well-being. Racial socialization messages encouraging participants to engage in productive cross-racial interactions with different races are also positively predictive of spiritual-centered and collective coping.[90]

Racial socialization messages, as well as specific messages to value cultural legacy, moderated the relationship between racial discrimination and resilience among AAEAs.[89] African American emerging adult college students' childhood racial-ethnic socialization experiences identified culture and race-specific coping styles different from other races,[90] such as the benefits of valuing high standards and hard work.[91] The downward effects of the sociopolitical and economic setting shape social position and subsequent lived experiences of marginalized groups through the application of laws and policies within the social and community context.[92]

Neighborhood and Physical Environment

Adverse health risks that contribute to a greater burden of disease often result from individual behavioral and lifestyle choices, institutional, socioeconomic, policy, and environmental influences contribute to health outcomes.[93] However, neighborhood disadvantage and unhealthy or unsafe physical environments have been documented to

increase the risk of CVD and/or worsen CV outcomes with a 12% increased risk in AAP compared to White people.[3] Community violence exposure (witnessing and direct victimization) is negatively related to psychosocial well-being; however, the effects of community violence may be mitigated by racial socialization, cultural socialization, and preparation for bias.[71] Community violence exposure for AAEAs has been reported as high as 83%.[94] When AAEAs do not have access to fitness facilities in their neighborhoods, they are less likely to be physically active and subsequently experience an increased incidence of overweight and obesity.[13] Other community or neighborhood influences include joblessness, poverty, educational attainment, housing quality, environmental pollution, availability of nutritious foods, neighborhood walkability, neighborhood violence, access to green spaces, social connectedness, other social and environmental determinants of health, and access to quality health care.[93]

Racism and Stress

Racism is a multilevel fundamental cause of health inequities, and includes individual, interpersonal, institutional, structural, systemic, and cultural levels.[47,48] Individual racism is reflected in personal beliefs and/or attitudes toward other races that affects how one treats them.[47] An example would include telling or laughing at a racist joke, or sharing racist posts on social media.[47] Southern states have had more negative racial sentiment tweets than other states in America.[95]

Interpersonal racism, racial discrimination enacted by individuals,[96] and institutional racism, discriminatory policies and practices occurring within social institutions[96] influence health outcomes. Studies have shown cardiovascular reactivity to racial stress as a contributor to hypertension development in AAP.[60,64] African American

emerging adults showed a prominent vascular hemodynamic profile and a significant compensation deficit in response to anger recall during a verbal description of a past racially perceived event.[60] African American and other racial minority emerging adults enter college aware of being in an underrepresented group and how stereotypes and discrimination can shape the college experience of themselves and students like them.[97] Exposure to adverse psychosocial factors (e.g. racism, discrimination, neighborhood stress, anxiety) was found to be related to increased CVD risk (e.g. BMI, blood pressure, diabetes) in AAEA women aged 19-24.[98]

Institutional racism occurs when policies or organizational behaviors are in place that discriminate against people of color.[47] For example, a hiring manager might disqualify candidates based on their names, citing a "cultural fit" that's actually discriminatory.[47] in a study exploring traditionally White-sounding names and distinctively Black-sounding names, researchers found that applicants with Black names were called back 10% fewer times.[99] Institutional racism widens the gap in socioeconomic opportunity.

Structural racism, "the normalization and legitimization of an array of dynamics–historical, cultural, institutional and interpersonal–that routinely advantage White people while producing cumulative and chronic adverse outcomes for people of color,[100]" is also a fundamental driver of health disparities.[96] Recent American events (i.e., COVID-19 pandemic and police killings of African American people), have reflected the structural racism that persists and restricts the opportunities for long, healthy lives of AAP and other historically disenfranchised groups.[96] The leading indicators of structural racism are inequalities in power, access, opportunities, treatment, and policy impacts and outcomes,

whether they are intentional or not.[100] These have been seen in three interrelated domains: redlining and racialized residential segregation, mass incarceration and police violence, and unequal medical care.[101] As AAEAs transition to adult independence, their lives may be negatively impacted by these structural influences. For example, the everyday encounter of discrimination, implicit bias, and stigma stems from structural determinants that shape social risk and an individual's perception.[92] The effect of anger recall on the vascular hemodynamic profile is another example.[60]

Systemic racism is continued discrimination within a system that was founded on racist principles and practices.[47] One of the well-known examples is the treatment of AAEA men and women by law enforcement in America.[102] Interventions to address systemic racism mitigation requires extension beyond health care solutions to multi-sector and multi-policy approaches to achieve future population health improvement.[102]

Cultural racism results in the ideology of inferiority being instilled in the values, language, symbols, and unstated assumptions of the larger society.[103] Cultural racism is also the conduit in which views regarding stereotype and limitations associated with racial/ethnic minority groups are presented to society-at-large; and result in subconscious (or conscious) normalization of institutional racism, the resultant inequitable distribution of resources, and tolerance of interpersonal level racism.[95,103-105] For example, in comments that characterized sentiment towards races, there was clustering of higher proportion of negative tweets in the southeastern region of the U.S.[95] The south has had a long-standing unresolved racial divide.

All forms of racism may lead to psychosocial stress and physiological dysregulation. Heightened vigilance in anticipation of institutional or interpersonal racial

discrimination may also influence CVD outcomes in AAEAs.[95,106] The chronic effects of these experiences influence human biology and subsequent CVD outcomes through psychosocial and environmental stressors.[92]

Health Perception

Health perceptions are subjective ratings by the affected person(s) regarding their health status. Health perceptions influence the rationalization of and motivation for health behavior changes. For example, some people perceive themselves as healthy despite suffering from one or more chronic diseases, whereas others perceive themselves as ill when no objective evidence of disease can be found. Key CVD-related health perceptions in AAEAs include physical and mental health, smoking, body image, and general CVD risk.

African American college students may be aware of how eating choices affect health and that cultural factors (history, culture**,** convenience) influenced health behavioral decisions.[61] However, AAEAs equated physical health to "running a marathon" or "eating at Wholefoods".[61] Most AAEAs are not aware of their CVD risk, do not perceive they are at risk, and hold false beliefs about CVD complications.[107,108] Personal heritage, culture, ethnic identity, and the psychological stressors in campus environments have all been cited as influences on personal overall health assessment of AAEAs.[61] Higher risk perception equated to greater health responsibility.[62] In an exploration of the perceived risk of CVD and health behavior, Robinson et al.[62] found that AAEAs at an HBCU who had higher risk perception also had greater health responsibility.[62] Likewise, low risk perception was correlated with less health responsibility.[63]

African American Culture

Culture is a "set of shared and socially transmitted ideas about the world that are passed down from generation to generation"[109 p277] or "an internalized and shared schema or framework that is used by group (or subgroup) members as a refracted lens to "see" reality, and in which both the individual and the collective experience the world."[110 p.242] Culture can also be defined as all ways of life, including the arts, beliefs, and habits of a population that are passed down from generation to generation. Culture has been called the way of life for an entire society.[111]

The reflection of culture in AAEAs is noted in terms of religiosity and religious coping.[112] Religious involvement was found to promote social engagement.[112] Religiosity was shown to have a stronger positive effect on sleep quality among AAEAs who reported a higher perceived social status. Conversely, religion may be viewed as a source of blood pressure risk and resilience for AAEA women because of the odds of hypertension being higher in Pentecostal women compared to Baptist and Catholic women. Frequent use of religious coping predicted higher odds of having hypertension than seldom or never using religious coping.[113]

Interventions to Improve CVD Risk in AAEAs

Studies that implemented interventions to improve CVD outcomes for AAEAs had an overall CVD focus, however, more specific topics included education,[64,108,114,115] education, risk perception and perceived competence,[107,116] education, PA and nutrition,[117] psychosocial or social (i.e., self-efficacy and social support),[97]social cognitive and PA,[88,118-121] nutrition and PA,[122,123] PA alone,[119-121] and PA and sleep.[124]

Educational interventions included topics related to BP or hypertension[107,108,114,116], cholesterol[64,108,114], increasing PA[108,117], not smoking and reducing intake of sodium and transfat,[108] diet,[117] diabetes,[114] stroke risk reduction,[107,114,116] and obesity.[114,115] Participant improvements noted after interventions included improved knowledge and perception of stroke risk[107,116] and increased knowledge of fruits and vegetables,[108] overall CVD risk, and family history.[114] Structured classroom educational interventions proved promising in the studies reviewed.

Studies examining PA have implemented accelerometer PA monitoring with app tracking,[88,122,123] website engagement,[118-121] app tracking to improve fruit and vegetable consumption and increase PA, [108,123,124] and an e-mail-based intervention to improve nutrition and PA behaviors, and prevent excess weight gain.[117] Studies have not had long-term results.

Studies have integrated social and psychosocial attributes. [88,97,119,120] Brady et al.[97] capitalized on student mentoring regarding social belonging to decrease racial stress. Students developed authentic, significant relationships that lasted beyond college. In a seven to 10-year follow-up, study participants reported that the intervention reinforced confidence in their belonging and supported better life outcomes later. Other studies integrated self-efficacy, social support, and motivation to improve PA performance in participants.[88,119,120] The studies showed improved self-efficacy, social support, and motivation, but sustained PA was not realized.[88,119,120]

Interventions that included both PA and dietary components with PA trackers[117,122] did not report successful results: participants had approximately 6 hours of

sedentary time daily with almost no vigorous PA,[117] and there was a correlation between increased PA steps and increased unhealthy food choices.[122]

In studies exploring health perceptions, changing participants' knowledge about their actual stroke risk changed their risk perceptions and subsequent behaviors regarding diet and PA.[107,116] For examples, Aycock et al.[107] reported a 24% higher change in perceived stroke risk between intervention and control groups (42% and 18%, respectively). Both studies were nurse-led, and the participants received stroke counseling from a nurse or nurse practitioner. [107,116]

Cardiovascular disease prevention studies in AAEAs have integrated the Health Belief Model[107,114,125] and Social Cognitive Theory but have not had lasting efficacy. [117,119,120,126] Health behaviors in AAEAs have been influenced by perceptions of health, culture, and risk.[61-63] Self-efficacy in changing CVD risk has also positively affected behaviors.

Significance to Nursing Science

Cardiovascular disease in AAEAs is multifactorial and complex but can often be prevented by lifestyle modifications. Early identification of risk factors with appropriate interventions may help AAEAs develop healthier lifestyles and improve CVD outcomes.

Disease prevention is predicated on identifying risk factors in asymptomatic individuals.[41] Building a comprehensive body of evidence for primordial prevention in AAEAs is critical for eliminating health disparities and improving population health. Failure to generate new knowledge to inform effective strategies for equitable CVD prevention approaches will result in AAEAs experiencing disparate CVD outcomes in the future.

Gaps in the Literature

Gaps exist in the SDOH and built environment research in AAEAs and their influence on health perceptions and behaviors. There are also gaps in long-term prevention strategies and interventions in AAEAs. Another gap exists in the research which integrates behavioral theoretical frameworks and long-term results on AAEAs.

Effective health promotion depends on integrating the most appropriate theory and practice strategies for a given situation, recognizing that the strongest interventions may be built from multiple theories.[127] Additionally, successful multilevel interventions are needed which are available, accessible, and affordable.[92]

Innovation

Emerging adulthood is a distinct period between the ages of 18 and 25, where adolescents become more independent, explore life possibilities, and form lifelong habits. The Conceptual Model of Nursing and Population Health (CMNPH) is an effective model for designing general population-based nursing activities. The CMNPH emphasizes the integration of nursing activities with upstream, population, and health care system factors to attain positive health outcomes, and thus captures many aspects of CVD risk factors in AAEAs.[128] However, integrating behavioral theory creates an innovative opportunity to assess how upstream, population, and health system factors impact health behaviors. A merger of the CMNPH with the Theory of Planned Behavior (TPB) is a novel approach. The TPB captures the cultural relevance of the attitude toward a behavior, subjective norms (or beliefs) about the impact of one's social circle, and the perceived ability to complete a behavior. However, variables that reflect the social and structural determinants of health and health behaviors (included in CMNPH)

are necessary to address CVD risk in AAEAs. The resultant new theory, Unlocking Population Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease (UPSTREAM CVD), represents a potential comprehensive tool for understanding population-specific attributes and developing appropriate interventions.[129] Knowledge gained from this explanatory sequential mixed methods study will bring the needed insights and improved practices in culturally appropriate CVD prevention for AAEAs.

Study Purpose

There is a critical need to integrate theory driven CVH exploration and interventions for AAEAs. The primary purpose of this study was to ascertain the relationships among multiple factors that influence CVH in AAEAs to inform the development of efficacious nursing activities that foster positive population outcomes.

Research Aims

Aim 1: To assess upstream and population factors in AAEAs.

Aim 2: To compare AAEAs' perceptions with objective CVD risk.

Aim 3: Interview AAEAs to examine their responses when they learn their objective CVD risk.

To address these research aims, we began by synthesizing a situation-specific theory aligned with the factors that influence CV population health outcomes for AAEAs. Research aim one is addressed in Chapter 3, as we present an assessment of the upstream and population factors in AAEAs. In Chapter 4, we compare AAEA CVD risk perceptions with objective CVD risk and assess CVD knowledge. A subset of participant

interviews was used to examine how knowledge of their objective CVD risk affected their thoughts about objective CVD risk.

Guiding Theoretical Framework

Given the complexity of cardiovascular risks that impact health outcomes for AAEAs, a comprehensive theory is needed to guide care planning and implementation that will result in improved health outcomes. With an emphasis on the integration of nursing activities with population factors to attain positive health outcomes, the Conceptual Model of Nursing and Population Health (CMNPH) captures many aspects of CVD risk factors in AAEAs.[128] However, many cultural factors (i.e., attitudes, perceived behavioral control, and social norms) are not explained by the model. A situation-specific theory is needed to guide research and clinical practice in CVD risk prevention for AAEAs.

Chapter two presents a newly synthesized situation-specific theory for AAEAs, Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease (UPSTREAM CVD SST). The chapter explains why UPSTREAM CVD SST was formulated, and specifies the context in which it should be applied.[130] An argument for considering the Theory of Planned Behavior (TPB) and the Conceptual Model of Nursing and Population Health (CMNPH) as a theoretical foundation to guide population health nursing care is also presented.

METHODS

Protection of Human Subjects and Ethical Considerations

This study was approved by the Institutional Review Boards (IRBs) of two universities. The first university was the data collection site and the second was affiliated with the lead author's Ph.D. program.

Design, Sample, and Setting

An explanatory sequential mixed methods study[131] was conducted, which began with quantitative data collection of upstream and population factors in AAEAs, CVD risk perception, objective CVD risk, CVD knowledge, and CVH. The purpose of this mixed methods explanatory sequential mixed methods study was to identify factors contributing to participants' CVD risk factors by obtaining quantitative results from a survey and then following up with purposefully selected individuals to explore those results in more depth through a qualitative interview. Our goal in using an explanatory sequential mixed methods design was to complete quantitative data collection and analysis, and then follow up with qualitative data collection and analysis with subsequent interpretation. The explanatory sequential mixed methods design also aided in identification of results that need further explanation.

Our approach integrated the following procedure: establishing an approach to inquiry, quantitative data collection, quantitative data analysis, connection of quantitative and qualitative phases, qualitative data collection, qualitative data analysis, integration and reporting of results.[132,133]

Establishment of Approach to Inquiry

We sought to explain and contextualize quantitative findings with the qualitative data. The rationale for mixing quantitative or qualitative data within the study is grounded in the fact that neither quantitative nor qualitative methods are sufficient, by themselves, to capture the upstream and population factors, CVD risk perception, objective CVD risk, and reasons participants perceived risk as they did.[133] While priority was given to the quantitative phase of the study because of the need for objective measurement of upstream and population factors, the qualitative phase was critical in providing more meaningful data for future studies and practice interventions.

Quantitative Data Collection

The research team assembled a quantitative survey to collect data on demographics, upstream and population factors, CVD knowledge, CVD risk perception, and self-reported behavior using LE8 metrics.[7] Health factors (BMI, BP, Glucose, and lipid profiles) were collected by the 1st author or research assistant and a national clinical laboratory.

Study data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at the University of South Carolina.[134,135] REDCap is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources.

Participants completed the surveys via desktop computers, laptops, smartphones, or tablet devices. After completion of the survey, anthropometric measurements were collected by the 1st author or research assistant, a registered nurse, and a Ph.D. student.

Data from the Environmental Protection Agency (EPA) Environmental Justice (EJ) screening tool and CrimeGrade.org were used to assess physical environmental risks (air quality, lead exposure, geographic location, and crime rate).[136] The EJ screening tool provides the EPA with a nationally consistent dataset and an approach for combining environmental and demographic socioeconomic indicators. The EPA integrates data from the U.S. Census Bureau, including the American Community Survey.

The CVD knowledge questionnaire (Cronbach's α =.72) contained 29 multiple-choice questions (5.1 Flesch-Kincaid Grade level) with content areas including exercise, weight loss, nutrition, hypertension, smoking, diabetes, and cholesterol (4 or more questions in each area).[137] Scores were generated based on the percentage of correct answers (0-100%).

We used the AHA LE8 definitions[7] to score each of the eight CVH metrics. The unweighted average of the eight scores was used to categorize CVH as high (80-100), moderate (50-79), or low ($\leq$ 49). The online survey embedded in REDcap[134,135] was available to the participants via desktop computers, laptops, smartphones, or tablet devices. A detailed description of the measures and instruments used to assess the upstream and population factors is listed in Appendix A. Appendix B includes questions for the CVD Knowledge quiz, and Appendix C include prompts for the 16-item Mediterranean Eating Pattern for Americans (MEPA).

Quantitative Data Analysis

Descriptive statistics were computed for all variables. For categorical variables, the univariate construction included a frequency distribution. For continuous variables, the statistics included measures of central tendency (mean and median) and measures of dispersion (standard deviation and range). Spearman and Pearson's correlations were used to examine the relationship between continuous and ordinal variables and to check for potential multicollinearity. The Chi-Square test was used to examine the association between categorical outcomes, groups, and other categorical variables. The outcomes were continuous, ordinal, and discrete variables, and we examined the relationship between outcomes and sets of independent variables (predictors) using several methods. The goal of the quantitative phase was to assess upstream and population factors, CVD knowledge, CVD risk perception, and objective CVD risk; and identify results that needed clarification or explanation and explore those results in more depth through qualitative interviews.

Connecting Quantitative and Qualitative Phases

In this explanatory sequential mixed methods cross-sectional study, the quantitative and qualitative phases of the study were connected during the intermediate stage in the research process while selecting the participants who completed the quantitative phase for the qualitative interviews based on their CVD risk perception vs objective CVD risk category.[138] The second connecting point included developing the interview questions for the qualitative data collection based on the results of the CVD risk perception accuracy.[138]

Qualitative Data Collection

In the second, qualitative phase, we used findings from the quantitative data analysis to develop a semi-structured interview guide to conduct interviews to better understand quantitative findings. For this phase, we purposefully selected participants, inviting at least one participant from each of the pre-identified categories of perceived CVD risk versus objective CVD risk. We completed interviews using © Zoom Video Communications, Inc.[139] (Zoom) without video, audio recorded each, and transcribed each interview verbatim.[140]

Qualitative Data Analysis

We conducted a thematic analysis of the text data at two levels, within each case and across the cases. The frequency of common responses with correlated demographic information was tabulated to help facilitate the identification of themes.

Integration and Reporting of Results

We mixed the quantitative and qualitative approaches by integrating the results from the quantitative and qualitative phases during the interpretation of the outcomes of the entire study.

Study Sample

A convenience sample was selected based on the following inclusion criteria: African American adults ages 18-25 enrolled at a southeastern HBCU regardless of housing status (on-campus or off-campus). Pregnant women were excluded from this study.

Major Study Variables

The major study variables included upstream and population factors (including CVD knowledge), CVD risk perception, and objective CVD risk. A detailed description of study variables, prompts, and sources is included in Appendix A, Measures, Prompts, and Sources for Upstream and Population Factors.

Summary

This dissertation examines the multilevel factors that influence CVH in AAEAs and explores the relationships between these factors. Chapter 2 presents a newly synthesized situation-specific theory to address CVD in AAEAs. This manuscript has been accepted for publication in *The Journal of Cardiovascular Nursing.* Chapter 3 is an assessment of upstream and population factors in a cohort of AAEAs attending a southeastern HBCU. This manuscript was prepared for submission to *the Public Health Nursing* Journal*.* Chapter 4 presents the manuscript prepared for submission to *The Journal of the American Heart Association.* The manuscript explores AAEA's perceived CVD risk compared to objective CVD risk and their responses to learning their actual risk. Chapter 5 summarizes the dissertation and presents future research directions.

CHAPTER 2

UNLOCKING POPULATION-SPECIFIC TREATMENTS TO RENDER EQUITABLE APPROACHES AND MANAGEMENT IN CARDIOVASCULAR DISEASE: DEVELOPMENT OF A SITUATION-SPECIFIC THEORY FOR AFRICAN AMERICAN EMERGING ADULTS[1]

[1] Smith, S. B., Abshire, D. A., Magwood, G. S., Herbert, L. L., Tavakoli, A. S., & Jenerette, C. (2023). Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease: Development of a Situation-Specific Theory for African American Emerging Adults. *Journal of Cardiovascular Nursing*. https://doi.org/10.1097/jcn.0000000000000986

ABSTRACT

Background: Emerging adulthood (18–25 years old) is a distinct developmental period in which multiple life transitions pose barriers to engaging in healthy lifestyle behaviors that reduce cardiovascular disease risk. There is limited theory-based research on African American emerging adults.

Objective: This article introduces a synthesized empirically testable situation-specific theory for cardiovascular disease prevention in African American emerging adults.

Methodology: Im and Meleis' integrative approach was used to develop the situation-specific theory.

Results: Unlocking Population-Specific Treatments to Render Equitable Approach and Management in Cardiovascular Disease is a situation-specific theory developed based on theoretical and empirical evidence and theorists' research and clinical practice experiences.

Discussion: African American emerging adults have multifaceted factors that influence health behaviors and healthcare needs. Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease has the potential to inform theory-guided clinical practice and nursing research. Recommendations for integration in nursing practice, research, and policy advocacy are presented. Further critique and testing of the theory are required.

KEY WORDS: African American emerging adults, cardiovascular disease, population health, prevention research

INTRODUCTION

The American Heart Association estimates that approximately 60% of African American people have cardiovascular disease (CVD)—the highest in the U.S..[1] Cardiovascular disease is the primary reason for a 5.3-year shorter life expectancy for African American compared with White people[2] and accounts for 30% to 40% of the difference in mortality.[141] Despite CVD prevention and treatment improvements, racial and ethnic disparities occur across socioeconomic status, age, geography, language, gender, and sexual identity and orientation.[142]

Upstream factors are major contributors to CVD development. Upstream factors are conditions related to social and structural determinants of health (economic, social, educational, and physical health) that occur in communities where people live and affect patient behaviors (i.e., smoking, diet choices, violence, low PA, and substance use).[143] Cardiovascular disease risk factors include hypertension, diabetes mellitus, lipid disorders, obesity, poor diet quality, physical inactivity, cigarette smoking, sleep inadequacy, sociocultural environment, and psychosocial factors (i.e., levels of social support, social network, socioeconomic deprivation, poor health literacy, occupational stress, personality type, and stress).[144] African American emerging adults (AAEAs) have a high prevalence of many CVD risk factors.[4,145-149]

Emerging adulthood is a critical period for CVD prevention in African Americans. Arnett[6] introduced the concept of emerging adulthood (ages 18–25 years) as a developmental period in which identity formation and increased autonomy occur while maintaining dependence on family units. Emerging adulthood is when young people form lifelong habits that affect health and disease status throughout their lives. During

emerging adulthood, young people begin to identify with the role of adulthood, refine their personal goals, and initiate their independence from parents (i.e., seek a partner, find suitable education, and make individual life-impactful choices).[6] Because of the intersection of CVD risks and AAEAs, a theory-driven approach is needed to prevent CVD in AAEAs and eliminate CVD health disparities. Integrating an upstream approach that includes CVD prevention and the early identification of risk factors is warranted.

Nursing theory provides a framework for understanding phenomena. Phenomena related to patient care are becoming more complex with increased patient diversity and multiple influential factors such as socioeconomic status, health literacy, family history, and health beliefs. Therefore, situation-specific theories are necessary. Situation-specific theories are "coherent representations and descriptions of concepts, an explanation of the relationships between those concepts, and the prediction of outcomes related to these relationships. Representation is grounded in clinical, teaching, policy, or administrative situations."[150(p.390)] Situation-specific theory "focus[es] on specific nursing phenomena that reflect clinical practice and that are limited to specific populations or particular fields of practice."[151(p.13)]

Currently, there is no published situation-specific theory to guide CVD research and clinical care of AAEAs. A situation-specific theory is needed to aid in developing strategies for promoting healthy habits among AAEAs that persist into adulthood, thereby reducing CVD risk among African American people. Promoting positive changes to health behaviors in emerging adulthood may impact future CVD risk behaviors as young people transition to adult independence.

The purpose of this article is to present a newly synthesized theory to guide nurse-led culturally appropriate clinical practice and nursing research in CVD prevention for AAEAs. This article describes how the theory was formulated and specifies the context in which it should be applied.

METHOD

Im and Meleis'[150] integrative approach to situation-specific theory development was used. This approach includes (1) checking assumptions for theory development, (2) exploring the phenomenon through multiple sources, (3) theorizing, and (4) reporting, sharing, and validating the developed theory.[150] The steps are presented to promote readability but are not always linear because conceptualization and theory may happen simultaneously.[152]

Step 1: Checking Assumptions for Theory Development

Im and Meleis[150] recommend that theorists check assumptions of situation-specific theory before starting the theorizing process in the integrative approach. The assumptions for developing a theory appropriate for CVD prevention in AAEAs include the following:

1. At a population level, preventing CVD in AAEAs is a diverse and complex phenomenon with multifaceted factors that influence how AAEAs perceive health and health behaviors, form health beliefs and attitudes toward health behaviors from culture and life experiences, weigh internal and external social influences, and determine whether a behavior change is warranted.
2. The theory development process assumes epistemological pluralism.[151] Thus, we agree with theoretical, philosophical, and methodological plurality and accept the

existence of multiple truths instead of one universal scientific truth.

3. Although presented linearly, the theory development process is a cyclical and evolutionary process with explanations, descriptions, and understanding that CVD prevention in AAEAs is current and may change in the future.[153]

Step 2: Exploring the Phenomenon Through Multiple Sources

Im[154] suggests that multiple sources such as literature reviews, non-nursing and nursing theories, research findings, experiences, and collaborative efforts can be used to develop a situation-specific theory. To develop the Unlocking Population-Specific Treatments to Render Equitable Approach and Management in Cardiovascular Disease (UPSTREAM CVD) situation-specific theory, we investigated the sources discussed hereinafter.

Review of Literature

A literature review was conducted to ascertain the available evidence related to AAEAs and CVD risk factors. The complex background of CVD in African American people reflects disparate outcomes, health inequity, and the need for upstream approaches to prevent CVD. Evidence exists that many AAEAs already have biological and behavioral risk factors, social and structural determinants of health, psychosocial environment, stress, and cultural practices that influence their health behaviors.

Biological risk factors for AAEAs include hypertension,[4,35-37] diabetes,[31-34,155] obesity,[28,29,156] metabolic syndrome,[38-40,157,158] and CVD biomarkers (i.e., hyperlipidemia, triglycerides, large artery stiffness, waist/hip circumference ratios, and neck circumference,[41,42,44,46,159] carotid artery intima-media thickness[44-46]). Behavioral CVD risk factors in AAEAs include inadequate diet/nutrition,[8-12,160] inadequate PA,[13,14,160]

smoking, [15-24] and insufficient or ineffective sleep[25-27]. Other factors that influence health behaviors include health perceptions,[61-63,161], social determinants of health; specifically, socioeconomic status,[68,69] education,[70,162] and race/ethnicity,[13,70,72,73] and psychosocial environment (i.e., social support,[89-91] racial discrimination,[12,49-57,60,163,164] and culture[107,110,114,119,120,126]). Together, these factors form structural racism that promotes inequitable access to goods, services, and opportunities in society by race.[96] Furthermore, structural racism results in uneven access to quality schools, better-paying jobs, wealth accumulation, better neighborhoods, health insurance, and quality healthcare.[96] Given the multidimensional nature of CVD risk factors in AAEAs, a situation-specific theory is needed that includes a comprehensive assessment of these factors with intervention development that considers the diverse factors that may impact health behaviors.

Existing Nursing and Non-Nursing Theories

The proposed theory is derived from the theory of planned behavior, a middle-range theory, and the Conceptual Model of Nursing and Population Health, a population health conceptual model. The UPSTREAM CVD situation-specific theory narrows the scope of specificity of these theories. The rationale for the synthesis of these 2 theories follows.

The theory of planned behavior based on the theory of reasoned action, incorporates cognitive and affective factors as determinants of behavior. The theory of planned behavior posits that attitude, subjective norms, and perceived behavioral control predict intention and that intention, along with perceived behavioral control, predicts actual health behaviors (see Figure 2.1).[165] The theory of planned behavior captures the diverse experiences of AAEAs that form their attitudes toward health behaviors, cultural

support system that provides scaffolding for behaviors, and empowerment to achieve overall health.

The proximal determinants of the theory of planned behavior are amenable to change and can be used as the basis for health promotion.[166] A person's intention to complete a behavior is the direct determinant and greatest predictor of that behavior.[165] Attitude toward a behavior is a perceived positive or negative evaluation of the behavior's consequences or outcomes. Perceived desirable outcome results in a positive attitude. By contrast, a perceived negative attitude results when the perceived outcome is undesirable.

Subjective norms are individual beliefs about whether significant people in their lives would approve or disapprove of engaging in a behavior and compliance motivation based on others' expectations. One assumption of the theory is that attitude and subjective norms are amenable to change. Perceived behavioral control is an individual's belief that he/she can perform a behavior and has the opportunity and power to do it.[166]

When people form a positive attitude toward a behavior, experience positive subjective norms to complete the behavior, and perceive that they have behavioral control, they have a greater likelihood of forming a behavioral intention to complete the behavior. Included in the formation of behavioral, normative, and control beliefs are background factors: individual (personality, mood, emotion, intelligence, values, stereotypes, general attitude, and experience), social (education, age, gender, income, relation, race, ethnicity, and culture), and information (knowledge, media, and intervention).[166]

African Americans have identified behaviors as “passed from generation to generation” and a sense of being “accountable” to others in the culture.[167] These phrases

reflect how generational attitudes may be developed and the power of subjective norms. The theory of planned behavior has been used extensively in research to explain health behaviors such as PA, healthy eating, beverage consumption, blood pressure control, diet, and smoking (all key in CVD prevention).[166,168-170] The theory has also been reported to be effective in explaining and predicting cancer and sexual disease preventive behaviors in African American people.[171-174] The theory of planned behavior could be used as part of a comprehensive CVD assessment to understand attitudes (advantages/ disadvantages), social norms (approve/disapprove), and perceived behavioral control (enablers/barriers) in AAEAs to promote CVD risk prevention.

The theory of planned behavior was selected for its potential usefulness in AAEAs because it captures the cultural relevance of the attitude toward a behavior, subjective norms (or beliefs) about the impact of one's social circle, and the perceived ability to complete a behavior. However, given the complexity of these phenomena, variables that reflect the social and structural determinants of health and health behaviors are necessary to address CVD risk in AAEAs.

The Conceptual Model of Nursing and Population Health

Nursing theories provide a framework and structure for understanding phenomena from a holistic, health, wellness, and person-centered perspective. Non-nursing theory (i.e., theory of planned behavior) has attributes that can be integrated into nursing theoretical frameworks to advance science and improve health. The CMNPH reflects the variables that, combined with the theory of planned behavior, are needed for a situation-specific theory in AAEAs.

Many public health models present methods for providing population-centered care; however, the Conceptual Model of Nursing and Population Health describes the intersection of nursing and population health, as well as social, cultural, and economic factors that impact health behaviors. The Conceptual Model of Nursing and Population Health primary focus is to restore and promote wellness and disease prevention, making it relevant to population health and nursing practice. Fawcett and Ellenbecker[128] define population health as "lifespan wellness and disease experiences of aggregate groups of people residing in local, state, national, or international geographic regions or those populations with common characteristics." (p. 290)

The concepts of the Conceptual Model of Nursing and Population Health capture the diversity of factors that impact CVD risk, health behaviors, and population health outcomes for AAEAs: upstream factors, population factors, healthcare factors, and nursing activities (Figure 2.2).[128] Each of these 4 concepts has multiple dimensions. The upstream factors or social determinants of health dimensions are socioeconomic environment (income, education, employment, social support, and culture) and the physical environment or surroundings of the population related to where they live (i.e., air quality, smoke, weather conditions, geographic location, housing, pollution).[128]

In the Conceptual Model of Nursing and Population Health upstream factors influence population health outcomes and directly influence nursing activities. Population factors directly influence health outcomes. Healthcare system factors directly influence nursing activities and indirectly influence health outcomes. Nursing activities are coordinated to directly impact population health outcomes.

The Conceptual Model of Nursing and Population Health has relational and nonrelational propositions. The relational propositions are (1) the interrelation of upstream factors, population health factors, and healthcare system factors; (2) the relationship of upstream factors, population factors, and healthcare system factors to nursing activities; (3) the relationship of healthcare system factors to population health outcomes; (4) nursing activities' mediation of the relations of upstream factors, population factors, and healthcare system factors to population health outcomes; and (5) the relationship of nursing activities to population health outcomes.[128] The overall model purports that when relevant factors (upstream, population, and healthcare system) are considered in developing and implementing population-focused nursing activities, positive population health outcomes can be achieved. The emphasis of the Conceptual Model of Nursing and Population Health is the integration of nursing activities to attain the highest possible quality of life for populations, promote or restore and maintain the life span, and prevent diseases.[128]

Theorists' Experiences from Research and Practice.

In addition to empirical and theoretical evidence, theorists' experiences from research and practice were integrated into the process of theory development. The first author has extensive hospital case management experience and has observed the sequela of ineffective disease prevention firsthand. In her PhD program, she completed several literature reviews on AAEAs' CVD risk factors, interventions to prevent CVD in AAEAs, and theory integration into CVD prevention studies for AAEAs. The second author has completed research on obesity, PA, nutrition, and psychosocial determinants of health among emerging adults in college. The third author has extensive experience in

community-based participatory research and community engagement, cardiometabolic risk and prevention, health equity, health disparities, and biobehavioral research. The fourth author is a family nurse practitioner with clinical experience in cardiopulmonary rehabilitation and diabetes education. The senior author's program of research aims to enhance self-care and family management in vulnerable populations. Several authors are from minoritized groups and have lived experiences of the social and structural determinants of health. Taken together, input from varied experiences shaped the formation of a situation-specific theory.

RESULTS

Theorizing (Step 3)

We developed the UPSTREAM CVD situation-specific theory based on theoretical and empirical evidence and theorists' experiences in research and practice. A conceptual model (Figure 2.3) was developed and refined throughout the theory development process. The definitions of these concepts are presented in Table 2.1.

The UPSTREAM CVD situation-specific theory has 6 properties described as characteristics of a situation-specific theory: "1) a lower level of abstraction, 2) reflection of a specific nursing phenomenon, 3) context, 4) readily accessible connection to nursing research and practice, 5) reflection of diversities in nursing phenomena, and 6) limitation of generalization."[151(p.16)] Similarly, UPSTREAM CVD is designed to:

1. answer coherent questions about CVD nursing care in AAEAs to promote positive patient outcomes in health promotion, wellness, and disease prevention;
2. aid nurses and other healthcare providers in providing equitable CVD care in AAEAs through population health nursing;

3. describe and explain the interrelatedness of upstream, population, and healthcare system factors to behavioral intention as mediated by nursing activities toward population cardiovascular health outcomes;
4. link research strategies with practice activities;
5. reflect awareness of CVD clinical issues created by the diversity of being African American (culture, educational background, socioeconomic status, etc.); and
6. be limited in generalization because it is geared to a very specific population (AAEAs).

The UPSTREAM CVD situation-specific theory is more clinically precise and reflects a specific context that may include blueprints for action.[13] The synthesized model reflects culturally tailored care that promotes a healthy lifestyle, considers family/community social support, and improves CVD knowledge and the use of technology.[175] UPSTREAM CVD addresses known CVD risks: social and structural determinants of health, population factors, healthcare system factors, and the complexity of health behaviors.

Part 1: Upstream Factors

Assessment of upstream factors is part of the nursing process and is necessary to identify factors to consider when forming actions to promote, restore, and maintain wellness.[128] African American emerging adults have complex upstream factors: social and structural determinants of health, specifically socioeconomic status,[68,69] education,[70,162] race/ethnicity,[13,70,72,73] and psychosocial environment (i.e., social support,[89-91] racial discrimination,[12,49-57,60,163,164] and culture[107,110,114,119,120,126]). The concept of upstream factors includes socioeconomic and physical environment. An

assessment of the social and structural determinants of health for AAEAs will better inform nurses' understanding and consideration of the factors that contribute to patients' ability to adhere to a CVD risk prevention plan, for example, in the outpatient setting, a nurse who identifies that a low-income patient may need to integrate interprofessional collaboration with a social worker to identify resources that might promote healthy eating (ie, supplemental nutrition assistance programs). In addition, recognizing that a patient lives in a physical environment unsafe for outdoor PA, the nurse might help the patient identify indoor aerobic PA (ie, exercise with a fitness tape or an online exercise class). Long-term advocacy for safe housing should also be a priority for nurses. Finally, assessing that a patient lives with a supportive family allows nurses to engage the family in more effective prevention strategies, creating a solid social support structure for the patient. Overall, the goal of assessing upstream factors is to identify resources that can be integrated into a prevention plan and eliminate barriers to plan implementation.

Part 2: Population Factors

Population factors for AAEAs include hypertension,[4,35-37] diabetes,[31-34,155] obesity,[28,29,156] metabolic syndrome,[38-40,157,158] and CVD biomarkers (i.e., hyperlipidemia, triglycerides, large artery stiffness, waist/hip circumference ratios, neck circumference,[41,42,44,46,159] and carotid artery intima-media thickness[44-46]). Although not all risk factors are present in every AAEA, assessment is critical. Understanding that AAEAs are at risk for hypertension, diabetes, or metabolic syndrome should lead the nurse to assess areas that might not be considered necessary for otherwise healthy emerging adults. For example, a thorough family history assessment might uncover CVD risk factors such as hypertension and diabetes. In addition, measuring blood pressure in

AAEAs who may not otherwise seem at risk could help nurses identify early-stage hypertension. Further anthropometric measures such as height, weight, and waist circumference could be key in identifying the risk factors for diabetes and recommending appropriate weight loss or PA. Finally, resilience should be assessed to identify maladaptive coping strategies that require nursing intervention. Overall, AAEAs should have tailored care plans based on identified population factors.

Part 3: Healthcare System Factors

Healthcare system factors may pose challenges to AAEAs. Although insurance coverage has been extended to older emerging adults while in college, many AAEAs are not enrolled and may be unable to navigate the Affordable Care Act to obtain health insurance coverage.[176] Lack of insurance coverage is a structural barrier that could directly impact the patient's health outcome by preventing access to care. Nurses should mobilize help for AAEAs to obtain insurance coverage.

Healthcare system factors also allow nurses to advocate for those living in neighborhoods with poor access to care. In addition, nurses must strive to build trusting relationships with AAEA patients to promote the use of the healthcare system. Unfortunately, some AAEAs may be influenced by mistrusts and historical misdeeds within the healthcare system (i.e., the Tuskegee syphilis study, Henrietta Lacks research, and Sims' bladder transplant mistreatment of Black women).[177-179] Foremost, understanding their current and history-related concerns can be the beginning of building trustworthy relationships.

Part 4: Behavioral Intention

Behavioral CVD risk factors in AAEAs include inadequate diet/nutrition,[8-12,160] inadequate PA,[13,14,160] smoking, [15-24] and insufficient or ineffective sleep[25-27]. Health perceptions also influence behaviors.[61-63,161] Behavioral intention directly affects health outcomes. Understanding health behaviors begins with understanding intentions to perform behaviors and how these intentions are formed. Behavioral intention is significantly affected by factors that impact belief and attitude formation.[165]

Cultural factors also influence psychological and behavioral outcomes.[109] African American emerging adults have observable and inferred beliefs, and most stem from cultural experiences. Culture is a "set of shared and socially transmitted ideas about the world that are passed down from generation to generation"[109p277] or "an internalized and shared schema or framework that is used by group (or subgroup) members as a refracted lens to 'see' reality, and in which both the individual and the collective experience the world.[110p.242] Culture helps people integrate beliefs, attitudes, spirituality, emotions, and traditions to interpret and understand the world. African American people have been characterized by values such as interdependence and collective responsibility, present temporal orientation, and spirituality.[109] Nurses should ascertain the cultural factors that patients believe impact their health decisions, develop a plan that integrates those beliefs, and help patients connect their beliefs to positive health outcomes. For example, a patient with strong cultural religious beliefs who is struggling to eat healthy meals may be directed to the biblical belief that God desires believers to be in good health (3 John 1:2). Patients may also be taught how to prepare cultural meals with healthier ingredients that still taste good.

Beliefs about a behavior and whether one perceives that one can complete a behavior also directly impact the attitude or affective evaluation of a behavior[165] and the outcomes associated with the behavior.[180] Whereas behavioral intention may change over time, a person's beliefs may change as new information becomes available.[109] Building a provider-patient relationship may allow nurses to shape informational beliefs by being a trusted source of additional information necessary to promote behavioral intention and ultimately change behavior.

In addition, social pressure (positive or negative) to complete a behavior is perceived.[109] Therefore, understanding a patient's support system is key for nurses to develop an appropriate plan. For example, when a nurse learns that a patient is motivated by a significant other to change health behaviors, that person should be integrated into the care plan. Nurses may occasionally remind the AAEA that the significant others would be very proud of their progress. Alternatively, the nurse may use this information in a motivational interviewing session to aid the patient in concluding the value of completing a behavior.

Part 5: Nursing Activities

By using assessment data from upstream factors, population factors, healthcare systems, and behavioral intention strategies, nurses and other healthcare providers can create patient-centered prevention strategies, implement prevention strategies, and develop culturally appropriate care. A comprehensive assessment aids nurses in conducting the nursing process—determining needs, planning care, implementing appropriate care, and evaluating patient outcomes. For example, a nurse may learn about

an AAEA patient's family history of hypertension and implement primordial prevention strategies to maintain the patient's blood pressure within reference range.

Nurse researchers could design research studies to better understand how these factors are interrelated or impact AAEAs' behavioral intentions to complete health behaviors. Integrating what is known about a population and specific phenomena, UPSTREAM CVD promotes a greater understanding of AAEAs and CVD prevention. Figure 2.3 depicts sample variables that can be assessed in a study to promote risk reduction in AAEAs.

Part 6: Health Outcomes

The evaluation of health outcomes is essential for determining the efficacy of nursing interventions. Nurses should evaluate patient wellness, disease burden, functional status, life expectancy, mortality, and quality of life. For example, nurses may evaluate whether the CVD health status based on LE8[110] has improved after AAEAs have been taught about diet, PA, nicotine exposure, sleep health, BMI, blood lipids, blood glucose, and/or blood pressure. Outcome evaluation methods could include diet and exercise recall, report of nicotine use or sleep hours and quality, and objective measures of blood lipids, glucose, and/or blood pressure. Evaluation data should be used to inform modifications to intervention and/or be the basis for new research studies.

DISCUSSION

Cardiovascular disease in African American people remains a significant problem. Creating a situation-specific theory for AAEAs was inspired by disparate CVD outcomes in older African American people, the complexity of CVD risks factors in AAEAs, and the need for theory-based upstream interventions. The UPSTREAM CVD

situation-specific theory provides a theoretical framework to guide nursing practice in developing and integrating evidence-based CVD risk prevention, health promotion, and wellness strategies for AAEAs. The UPSTREAM CVD situation-specific theory can also guide research to support the development of disease prevention strategies for AAEAs. The impact of interventions that would prevent poor CVD outcomes and improve population health could also enhance AAEAs' quality of life and decrease the cost of healthcare for the population.

Step 4: Reporting, Sharing, and Validating

The last step in the integrative approach of situation-specific theory development is reporting, sharing, and validating.[15] This step is presented in the Discussion section to articulate the theorizing process through manuscript dissemination. Future work for validation is required.

Implications for Practice

The UPSTREAM CVD situation-specific theory can help guide clinical practice and prevention interventions for AAEAs. In contrast to grand or middle-range theories, situation-specific theory is easily applied to nursing practice and research on a phenomenon. The COVID-19 pandemic has emphasized the magnitude of health disparities and how comorbid conditions such as CVD can change patient outcomes. Primordial interventions have implications in reducing CVD disparities in older adulthood. A key element of the theory is to engage AAEAs in deciding which strategies to implement and mobilize culturally appropriate resources (e.g., family, friends, or religious beliefs). Nurses can use motivational interviews to help patients identify how their culture impacts their health choices and establish priorities for health improvement.

Implications for Research

Researchers can use UPSTREAM CVD to guide the development of studies on CVD risk in AAEAs by targeting factors in multiple dimensions of this theory. For example, researchers could examine how aspects of social and physical environment affect behavioral intention and behavioral outcomes. Researchers could also examine whether certain factors moderate associations between other variables (e.g., AAEA's perception of CVD risk based on family history [i.e., genetics or subjective norms] may moderate the relationships between the social and physical environment with behavioral intentions and behavioral outcomes.). Researchers could also use mixed methods designs to provide greater insight into how the various factors in the model function increase or decrease CVD risk in AAEAs.

In addition, it is important to tailor these interventions to design nursing interventions that help AAEAs reduce CVD risk and improve CV health. The first step might include surveying AAEAs to determine their preferred modalities for successful engagement and long-term adherence to CVD risk strategies (e.g., multimedia, mobile apps, or workshops). Researchers and clinicians should collaborate using patient-centered approaches to combine empirical evidence and expert clinical experience. These efforts may result in interventions to best address upstream, population, and healthcare factors that influence behavioral intention and subsequently influence CVD health behaviors in AAEAs.

Implications for Policy Advocacy

Public policy advocacy is necessary to improve the upstream factors. Nurses should advocate for socioecological changes at federal, state, and local levels. National

advocacy campaigns might include improving nutrition standards and healthy school meals, investment in transportation infrastructure, or affordable, equitable, and adequate access to health insurance. On the state level, nurses may advocate for Medicaid expansion and coverage programs (i.e., self-measurement of blood pressure or telehealth expansion). At the local level, increasing access to care early, providing education, or implementing sugar-sweetened beverage taxes are viable options. Nurses can also advocate for public health programs such as the AHA's Go Red for Women, faith-based interventions, or community partnerships to implement prevention strategies. Ideally, each nurse should see a niche and advocate for equitable healthcare.

Limitations

It may be challenging to obtain upstream, population, and healthcare system factors and behavioral intention data in 1 study or patient encounter. Researchers and clinicians should consider integrating measures to attain a comprehensive assessment of factors relevant to addressing CVD risk in AAEA. Alternately, researchers may elect to study 1 section of the theory (i.e., upstream factors) and proceed to other elements in subsequent studies.

Conclusion

The overall goals of UPSTREAM CVD are to provide a tool to raise the priority of CVD prevention in AAEAs, empower them to change behaviors, aid healthcare stakeholders in developing culturally appropriate prevention strategies, and reinforce social norms that encourage healthy cardiovascular health behaviors. Nurses and other healthcare providers can use this theory to improve care delivery through effective assessments and patient-centered care plans, foster patient/provider relations, educate

patients and other providers, and seek to understand how culture impacts health behaviors. In addition, healthcare providers should advocate for policies that may affect the social and structural determinants of health in AAEAs, such as housing, access to care, insurance, access to affordable education, and fair wages.

Table 2.1**. Concept Definitions for UPSTREAM CVD Situation-Specific Theory**

Concepts	Dimensions	Definitions[128,165]
Upstream Factors		Social determinants of health that directly influence nursing activities and indirectly influence population health outcomes.
	Socioeconomic environment	Distribution of income, education, employment, social support, and culture that shapes how communities and individuals can attain resources needed for basic human needs.
	Physical environment	Surroundings of a population from activities or natural substances that may pose a threat to health (i.e., pollutants, smokes, weather conditions, water, housing, urban and rural design and resources, and the built environment).
Population Factors		Determinants of population health that directly influence nursing activities and indirectly influence population health outcomes.
	Genetic factors	Characteristics inherited by a population.
	Behavioral factors	Behavioral smoking, alcohol consumption, dietary habits, physical activity, and sexual behaviors
	Physiologic factors	Biological variables within a population (i.e., vital signs, body mass index, cholesterol, and glucose levels)
	Resilience	Ability to bounce back from difficulty or hard times.
	Health state	The overall bodily and mental wellbeing of a population characterized by soundness or wholeness of the body – both physically and mentally.
Healthcare Systems Factors		Provider related health determinants that directly influence nursing activities and population health outcomes; and indirectly influence population health outcomes.
	Providers	Persons who provide health-related services to populations (i.e., nurses, physicians, pharmacist, therapists).
	Organizations & Institutions	Healthcare system organizations (i.e., hospitals, health departments, clinics, home health agencies, and community health centers)
	Payers	Health insurance companies or other sources for reimbursement of health-related services rendered.
	Policies	Guidelines and regulations that address availability and access to care.
Nursing Activities		Coordinated actions by the nurse directed to populations that influence population health outcomes directly and mediate the relations of upstream factors, population factors, and healthcare system factors to population health outcomes.
	Population-based nursing practice	Formalized nursing actions which create environments that encompass wellness promotion, restoration, maintenance, and disease prevention. Includes all phases of the nursing process.
	Culturally appropriate care	Providing nursing practice that enhances an optimal level of the populations overall valued goals and strengths.
Population Health Outcomes		A population's health status represented as wellness, disease burden, functional status, life expectancy, mortality, and

		quality of life. It results directly from healthcare system factors and nursing activities provide; and indirectly from upstream, population, and healthcare system factors mediated by nursing activities.
Behavioral Intention		Subjective determination to complete an action that is a function of the positive or negative evaluation of completing the act, perception of social pressures to complete the act, and the perceived ability to complete the act.
	Attitude	Positive or negative evaluation of completing a behavior.
	Subjective Norm	Perceived social pressures to complete or not complete a behavior.
	Perceived Behavioral Control	Subjective assessment of whether one has the ability to complete a behavior.

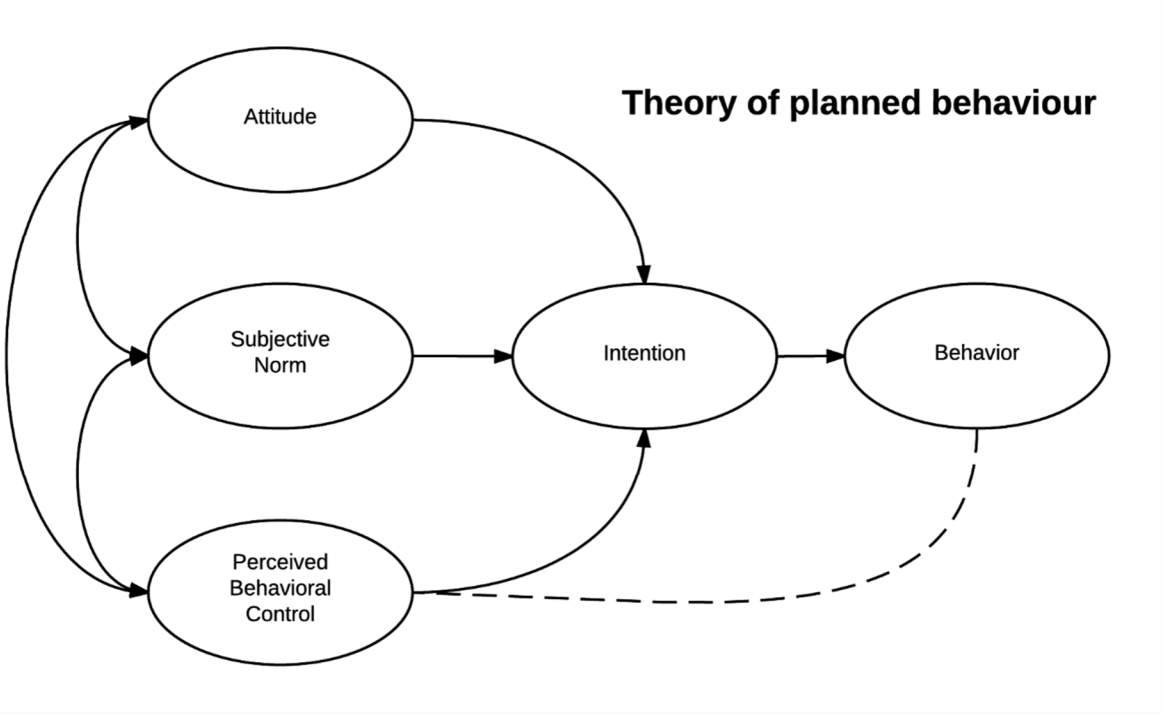


Figure 2.1 The Theory of Planned Behavior[181]

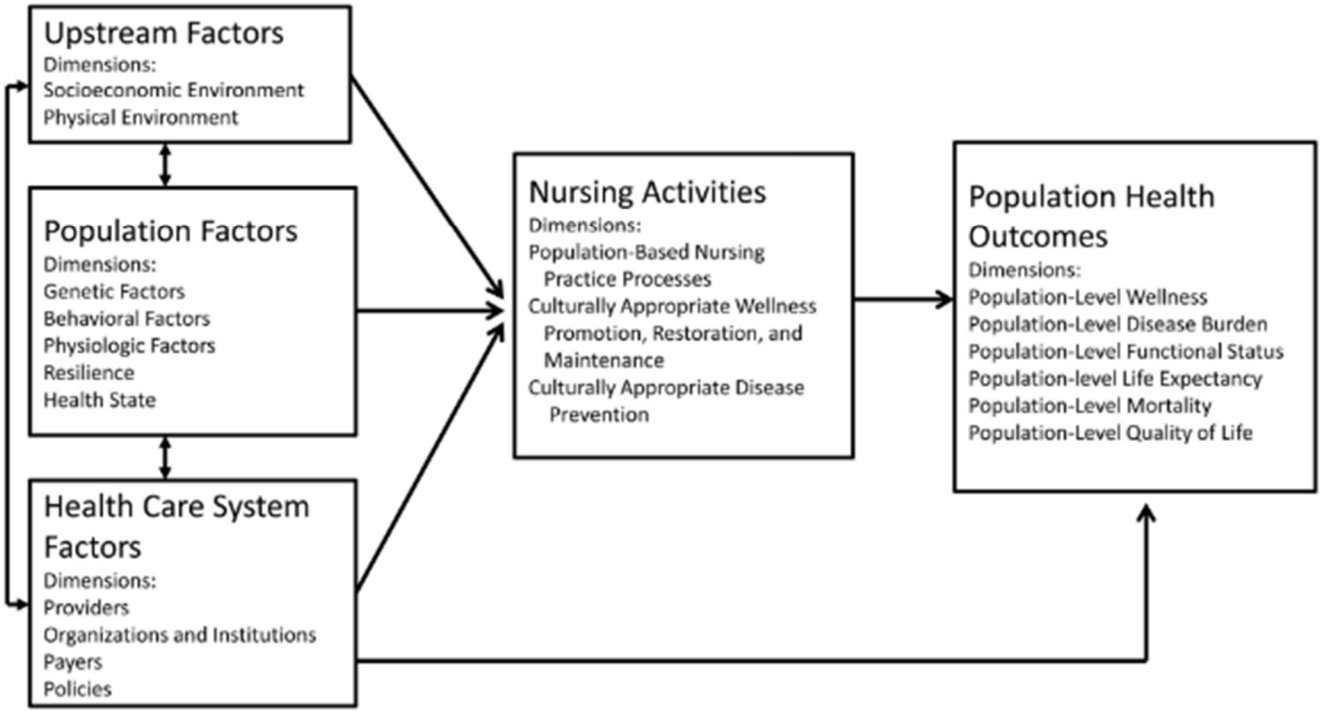
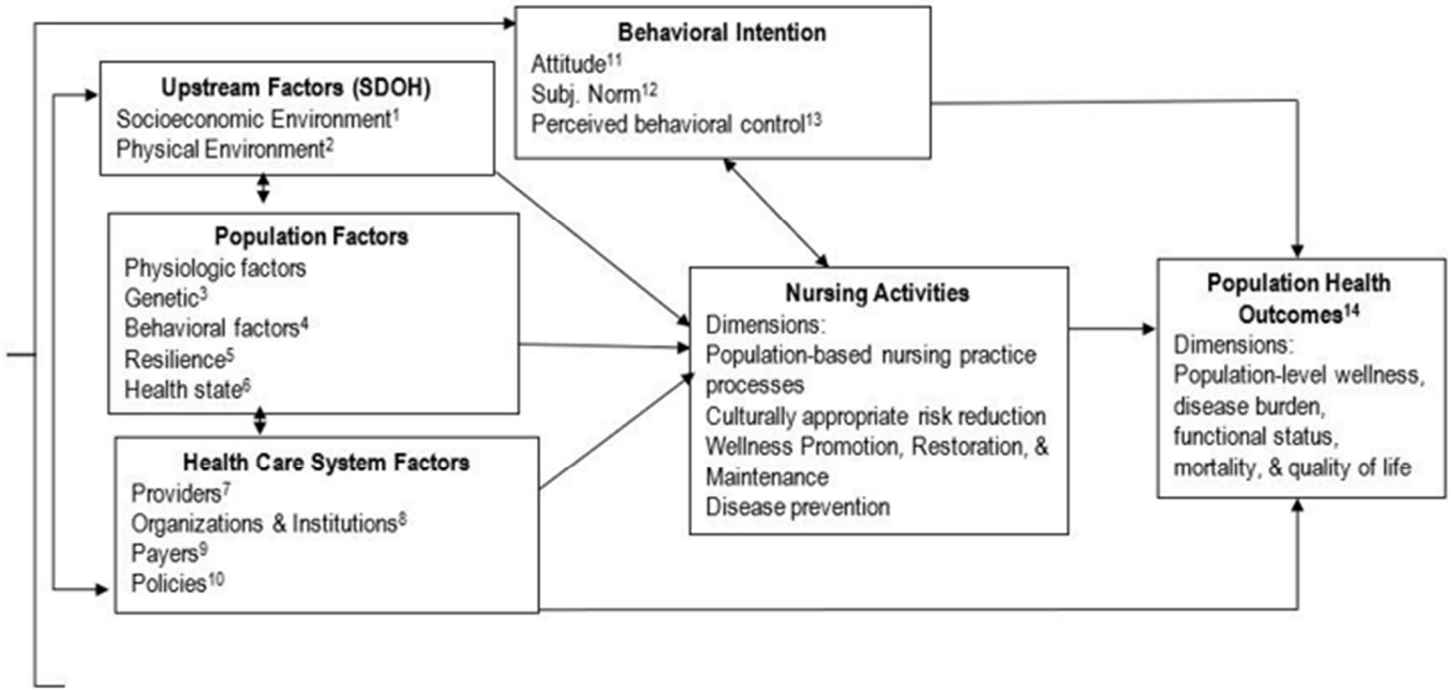


Figure 2.2 The Conceptual Model of Nursing and Population Health[128]



[1] Education, family income, employment status, food security, health insurance coverage, access to health services, access to health technology, health literacy, everyday discrimination
[2] zip code (air quality, smoke, location), assess food desert, environmental hazards, household roster
[3] Salt Sensitivity, diabetes, obesity, family CVD history, race/ethnicity
[4] diet, exercise patterns, age-bound risky behaviors, smoking status, and family smoking status.
[5] bounce back history, challenges, perceived racism, stress.
[6] vital signs, BMI, cholesterol, glucose,Life's Essential 8 score, CVD risk knowledge
[7] Access to care, perceived racism, communication, disparate health care quality
[8] availability of healthcare systems (inpatient & outpatient), community health resources
[9] insurance providers & other pay sources
[10] access to care, population use of health care system
[11] toward improving CVD risk factors and prevention behaviors, CVD risk perception
[12] culture, religion, beliefs, psychosocial environment, social support
[13] about adhering to CVD prevention programs/strategies
[14] CVD-specific outcomes

Figure 2.3 UPSTREAM CVD Situation-Specific Theory

CHAPTER 3

CARDIOVASCULAR DISEASE IS MORE THAN JUST THE HEART: AN ASSESSMENT OF UPSTREAM AND POPULATION FACTORS IN AFRICAN AMERICAN EMERGING ADULTS[2]

[2] Smith, S.B., Abshire, D.A., Magwood, G.S., Tavakoli, A., McCutcheon, G.S., Jenerette, C.M. To be submitted to *Public Health Nursing*

ABSTRACT

Objective: Cardiovascular disease (CVD) accounts for 20% of deaths in the U.S., and African American people (AAP) experience disparities in several CVD-related outcomes. African American emerging adults (AAEAs) are at a critical developmental stage for identifying and addressing CVD risk factors during the transition to adulthood. This study aimed to identify the upstream and population factors that may influence CVD outcomes in AAEAs and explore the relationships between these factors.

Design: We conducted a cross-sectional quantitative descriptive study guided by the Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease situation-specific theory (UPSTREAM CVD SST) to identify CVD-related upstream and population factors in AAEAs.

Sample: Fifty-six AAEAs ages 18-25 attending a southeastern U.S. historically black college/university (HBCU).

Measurement: A quantitative survey was designed to collect demographics, upstream factors (socioeconomic and physical environments), and population factors (health state, behaviors, and cardiovascular health). Tools from the Environmental Protection Agency were used to obtain physical environment data (air quality, lead exposure, crime, household income, food access, educational attainment, and unemployment rates).

Results: There were statistically significant (p <.01) correlations between neighborhoods with a higher percentage of AAP and unemployment rates (.64), populations with bachelor's degrees (-.51), low life expectancy (.45), households with an annual income less than $15,000 (.71) and incomes greater than $75,000 (-.67). A significant correlation between CVH and upstream or population factors was not observed; however,

participants had CVH scores that were considerably lower than those of AAEAs in other studies.

Conclusions: We identified upstream and population factors in AAEAs and found an interconnectedness predicted by the UPSTREAM CVD SST, which should be the impetus for further population-focused research and the development of clinical strategies for AAEAs. More research is needed to understand how these upstream factors affect CVH in AAEA. Additionally, research is needed to explore protective factors that may affect the relationship between upstream factors and CVH.

BACKGROUND

Cardiovascular disease (CVD) accounts for 20% of the deaths in the U.S. and African American people (AAP) experience disparities in various CVD-related outcomes such higher prevalence of obesity in AA female (56.4% compared to 39.4% NHW females), hypertension (57.5% NHB male, 58.4% NHB females, 48.9% NHW male, 42.6%NHW females), and diabetes (11.8% NHB male, 13.3% NHB females, 11.5% NHW male, 7.7%NHW females); and disproportionate CVD mortality (7.8% NHB males and 6.6% NHB females [13.8% total NHB], despite being about 13% of the US population.[1] The 5.2-year shorter life expectancy for African American people compared to White people is partially due to CVD.[1,2] The current CVD prevalence in African American emerging adults (AAEAs) ages 18-25 is 7.5%; however, the CVD prevalence in African American people (AAP) increases with age to 33.2% in ages 40-59.[182] Emerging adults are transitioning to independent living and forming behaviors that may continue throughout their lives. Therefore, it is critical to identify and address the CVD risk factors in AAEAs during their transition to adulthood.

In the Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease situation-specific theory (UPSTREAM CVD SST), Smith et al.[129] suggest that the key to unlocking population-specific strategies for CVD prevention and risk reduction in AAEAS is improving the understanding of upstream, population, and healthcare factors; and how these factors affect behavioral intention and subsequent health behaviors (Figure 2.3). Upstream factors or social determinants of health include social and structural barriers that underlie inequitable access to services, goods, and opportunities, as well as access to quality schools, good

jobs, premiere neighborhoods, quality health care and health technology, and wealth accumulation.[4,129] Higher income, educational attainment, occupational status, and fewer racial discrimination experiences are favorable individual-level socioeconomic and social indicators associated with higher cardiovascular health (CVH).[183] The built environment or physical parts of where people live and work (e.g., homes, buildings, streets, open spaces, and infrastructure) may also be favorable neighborhood-level factors associated with higher CVH.[7]

Population factors related to CVD include health state (e.g., body mass index [BMI], elevated blood pressure, blood glucose and lipids, and knowledge about CVD), and behavioral factors (diet, physical activity [PA], nicotine exposure, and sleep. Smith et al.[129] suggest that a better understanding of the interrelatedness of upstream and population factors in AAEAs may improve the response to their impact on and influence by behavioral intention and healthcare system factors. This information is needed for effective nursing activities to influence positive CVD health outcomes.

In this study, we aimed to use the UPSTREAM CVD SST as a framework to identify the presence of upstream and population factors in AAEAs attending a southeastern historically Black college/university (HBCU). Understanding these factors may provide insight into CVD prevention strategies for AAEAs.

METHODS

Protection of Human Subjects and Ethical Considerations

This study was approved by the Institutional Review Boards of the two universities. The first was where the research was conducted and the second was where the first author was enrolled as a PhD student.

Design, Sample, and Setting

We used the UPSTREAM CVD situation-specific theory to guide a cross-sectional quantitative descriptive study to assess upstream and population factors in 56 AAEAs (ages 18-25) attending a southeastern HBCU. Pregnant women were excluded from this study. If age and race requirements were met, eligible students could live on or off campus and be undergraduates or graduates. Participants were recruited via university-wide emails and handouts distributed across university 101 classes (a required class for all first-year and transfer students). A $50 gift card was provided to those who had completed the study. Data were collected between August and December 2022.

Measures

A demographic survey was conducted using the PhenX Toolkit.[137] Demographic data included race/ethnicity, age, sex, gender, birthplace, years lived in the birthplace, education, household income, employment status, and insurance coverage.

The research team designed a quantitative survey instrument using the PhenX Toolkit for recommended standard data collection protocols and a 29-item CVD education questionnaire.[137] The PhenX Toolkit measurement protocols are widely validated and reliable.[184,185]

Data from the Environmental Protection Agency (EPA) Environmental Justice (EJ) screening tool (air quality, lead exposure, unemployment rates, food access, household income ranges, and percentages of households with a college graduate, low life expectancy, low income, and no high school diploma) and CrimeGrade.org (neighborhood crime rate) were used to assess physical environmental risks.[136] The EJ screening tool provides the EPA with a nationally consistent dataset and an approach for

combining environmental and demographic socioeconomic indicators (e.g., income, unemployment, educational attainment, food access). The EPA integrates data from the U.S. Census Bureau, including the American Community Survey.

The CVD knowledge questionnaire (Cronbach's α =.72) contained 29 multiple-choice questions (5.1 Flesch-Kincaid Grade level) with content areas including exercise, weight loss, nutrition, hypertension, smoking, diabetes, and cholesterol (4 or more questions in each area).[137] Scores were generated based on the percentage of correct answers (0-100%). To categorize scores, we used the AHA's metrics (high [80-100], moderate [50-79], or low [$\leq$ 49]).

We used the AHA definitions[7] to score each of the eight CVH metrics. The unweighted average of the eight scores was used to categorize CVH as high (80-100), moderate (50-79), or low ($\leq$ 49). For participants who did not complete anthropometric and lab measures (BMI, BP, blood glucose, and lipid testing) a four-dimension heart score was calculated using the unweighted average of diet, PA, nicotine exposure, and sleep scores. The online survey embedded in REDcap[134,135] was available to the participants via desktop computers, laptops, smartphones, or tablet devices. A detailed description of the measures and instruments used to assess the upstream and population factors is listed in Appendix A. Appendix B includes questions for the CVD Knowledge quiz, and Appendix C include prompts for the 16-item Mediterranean Eating Pattern for Americans (MEPA).

Data Analysis

Descriptive statistics were computed for demographic, upstream factors (socioeconomic and physical environment), and population factors (health state, health

behaviors, and CVD knowledge quiz accuracy). For categorical variables, the univariate construction included a frequency distribution. For continuous variables, the statistics included measures of central tendency (mean and median) and measures of dispersion (standard deviation and range). Spearman and Pearson's correlations were used to examine the relationship between upstream and population factors. The T-test was used to examine group differences by sex and state of residence. SAS 9.4 was used to analyze quantitative data.

RESULTS

Fifty-six participants completed the study. Twenty-eight participants did not complete their health state, which includes anthropometric measurements and laboratory blood collection. The CVH score for the cohort was reported as an 8-dimension score, as well as a 4-dimension score.

Demographics

The sample of AAEAs was 85.5% female and the average age 20.82 years (range 18-25). For sexual orientation, none of the participants were identified as gay. Most participants lived in households with their mothers (85.5%) and 58.2% had mothers and fathers living in the household. Approximately 15% of the participants lived in multigenerational homes. These categories were not mutually exclusive. See Table 3.1 for a full description of the demographic characteristics.

Upstream Factors - Socioeconomic Environment

Socioeconomic data included demographic information, household income, educational attainment, food security, employment status, job security, health insurance coverage, access to health services and technology, and perception of prejudice,

stereotyping, or discrimination. Table 3.1 includes descriptive statistics for the socioeconomic and upstream factors. Participants were evenly distributed across college class level. Over half of the participants reported a household income of less than $75,000 (50.9%). At least 81.8% of participants reported food insecurity at some point in the last 12 months. Just over 47% reported working at least part-time and most (96.2%) thought that in the event of a job loss, they could easily find another job.

Insurance coverage was reported by 85.2% of participants and 90.9% reported being seen by a healthcare provider within the last 12 months. Over half (61.8%) reported prejudice, stereotyping, or discrimination by gender, race, age, weight, or physical appearance related to unfair termination, unfair police stop, living in racially charged neighborhoods, bank loan denial, poor customer service, or being unfairly treated because of stereotypes. The full results of the perceived prejudice, stereotyping, and discrimination questions are presented in Table 3.2.

Upstream Factors - Physical Environment

Data from the Environmental Protection Agency (EPA), Environmental Justice (EJ) screening tool, and CrimeGrade.org were used to assess physical environmental risks.[136] The physical environment included populations in census tracks, percentage of African American people, air quality, lead exposure, crime – home security, food security, educational attainment in the community, high school incompletion rates, unemployment rates, percentage of low life expectancy, household roster, and social support. The mean population of the group blocks in a one-mile radius of the participants' permanent home address was 7,509.6 people. The mean, standard deviation, and range of physical environment upstream factors are listed in Table 3.3.

There were statistically significant (p <.01) correlations between the percentage of AAP and the percentage of low life expectancy (.45), low-income (.60), bachelor's degree (-.51), annual income less than $15,000 (.71), annual income more than $75,000 (-.67) and unemployment rate (.64). There were also statistically significant (p<.01) correlations between completion of a bachelor's degree with no high school diploma (-.63), low life expectancy (-.59), income less than $15,000/year (-.55), income $15,001 to $25,000 (-.60), and incomes greater than $75,000 (.72). Other correlations among key upstream and population factors are presented in Table 3.4.

Population Factors

Health state. Health state factors included BMI, blood pressure, blood glucose, and lipid levels. Table 3.5 includes the descriptive statistics for all population factors. Additionally, Table 3.6 includes a comparison of BMI, blood pressure, and blood glucose and lipid scores with a national sample of emerging adults.[5] Significant differences between females and males, and participants who reside in other states and those in S.C. are recorded in Table 3.7.

For each health state factor, participants reported trying different strategies to improve the component. Strategies to change weight to a healthy range included nothing (24.5%), exercising to gain weight (5.7%), exercise (24.5%), exercise and diet (22.6%), and drinking more water (1.9%). Strategies to lower blood pressure or to keep it in the healthy range included nothing (34.5%), making diet changes (17.2%), not smoking (3.5%), exercising (13.8%), exercising and making diet changes (5.2%), taking hot showers and relaxing (1.7%), trying not to stress, drinking water, and relaxing (1.7%), watching sodium intake (1.7%), trying not to stress (6.90%), reducing sodium and stress

levels (3.5%), drinking water (3.5%), and going to bed on time to reduce stress (1.7%). Regarding strategies to control diabetes or avoid it, 55.4% reported not doing anything, 23% reported diet changes, 16% reported diet and exercise, and 1.7% continued healthy habits. Strategies reported to change cholesterol and lipid levels included doing nothing (49.1%), changing their diet to healthy eating (17%), starting a weight-loss journey by wearing a waist trainer (1.9%), sleeping and vitamin D (1.9%), exercising (5.7%), exercising, and eating properly (18.9%), cutting sugar (1.9%), and increasing water intake (3.8%).

The results of the CVD knowledge questionnaire varied according to the content. Just over three percent (3.6%) scored high (23 or greater items correct), 69.1% scored moderate (14-22 items correct), and 27.3% scored low (less than 14 items correct). Knowledge by category is shown in Table 3.8.

Behavioral factors. Behavioral factors include diet, PA, sleep, and nicotine exposure. The mean MEPA diet score was 31.64 and ranged from 0 to 80 on a 100-point scale. Participants met a mean criterion of 5.73/16 and ranged from 2 to 10. Participants had a mean physical activity score of 42.55. The mean number of minutes of vigorous and moderate exercise reported was 85.69 and 155.60, respectively. The average number of sleep hours per night was 6.20 hours and ranged from 0 to 8 and had a mean sleep score of 74.7. The mean nicotine exposure score was 96.4 with 3.6% participants reportedly using inhaled nicotine delivery systems. Table 3.5 includes the descriptive statistics for all population factors. Score categories are shown in Table 3.6 for a comparison of behavioral factor scores between other emerging adults and AAEAs in our study by race and sex.

DISCUSSION

In this study, we identified upstream and population factors in AAEAs that may influence CVH and found an interconnectedness that should be considered in future population-focused research and the development of clinical strategies for AAEAs guided by the UPSTREAM CVD situation-specific theory. Given that AAEAs are in a developmental period in which they gain autonomy and form their identities, emerging adulthood is critical for upstream interventions.[6,186] Upstream factors included both socioeconomic and physical environment. We had many correlations (especially in the physical environment). While none of these correlated with CVH, there were key relationships between SDOH factors.

Our findings suggest that our population of AAEAs are at increased risk for CVD. Perak et al. [5] conducted a study using data from 4836 participants from the CARDIA study to compare CVH in emerging adults. While the Life Simple 7 (LS7) tool was used to calculate CVH (with no sleep score included), we aligned the LS7 ideal rating with high, intermediate to moderate, and poor to low CVH scores in our study for comparison. When compared to the total sample, White emerging adults, and AAEAs in Perak et al.[5] our population had more low scores in all components except nicotine exposure and glucose. For glucose, our participants had lower high and more moderate scores. Similarly, Egan et al.[187] found that AAEAs were least likely to have optimal CVH scores.

These data also suggest a need for CVH promotion in our group. Cardiovascular health in young adults is associated with future CVD manifestations.[5] Higher CVH in EA was associated with very low rates of premature CVD.[5] Conversely, lower CVH was associated with CVD events and deaths.[5] With less than 10% of the participants

categorized as having high CVH, our participants may be at increased risk of adverse CVD outcomes later in life. However, Lie et al.[188] found that maintaining a healthy lifestyle from young adulthood into the 40s was strongly associated with a low CVD risk in middle-aged individuals. Most who maintained five healthy lifestyle factors (normal BMI, no excess alcohol intake, no smoking, a healthy diet, and regular PA) from young adulthood could remain at low risk in their middle-aged years.[188]

Our findings support propositions in the UPSTREAM CVD SST.[129] More specifically, our cohort of AAEAs has upstream and population factors that influence CVD outcomes. While there were no significant correlations between CVH and upstream or population factors, adverse upstream and population factors were present (e.g., lower income, CVH scores, and negative health behaviors). First, being in the African American race in America is correlated with socioeconomic class, with approximately 26% of the AAPs living in poverty. African American people living in areas with higher African American segregation had a 12% higher risk of incident CVD, independent of individual SES, CVD risk factors, and neighborhood characteristics.[189] And when adjusted for neighborhood characteristics, the association of higher incident CVD with segregation in African American populations still implies there are factors outside of neighborhood poverty also affecting cardiovascular health in segregated African American populations.[92] Our participants' neighborhoods had a significantly lower life expectancy when the percentage of AAP was higher. Life expectancy in the US has declined from 77 in 2020 to 76.1 in 2021. For non-Hispanic Black people, the decline was 71.5 years in 2020 and 70.8 in 2021.[2] While much of the decline was driven by the COVID-19 pandemic, heart disease contributed to about 4% of the decline. Furthermore,

the gap in shorter life expectancy rose to 5.3 years, up from the 3.4-year shorter life expectancy for AAP in 2019.[1,190] Second, our participants lived in neighborhoods where the percentage of AAP was higher, with more people with income less than $15,000 per year and fewer with income greater than $75,000. These findings may increase the CVD risk for our AAEAs.

Crime related to home security in our cohort neighborhoods was low compared to that in other cities. For example, a city that rated a grade of A had a crime occurring every 32 minutes, and an F-graded city had a crime occurring every 7 minutes.[191] The average time between crime occurrences in our cohorts' neighborhoods was three hours and 18 min. The intervals between the crimes were one hour, 48 min, and two days, six hours. This information bodes well for the participants' potential for outside PA near their permanent residences. On campus, participants are exposed to a D-graded environment, which could likely limit their off-campus physical activity. PA. There was a statistically significant correlation between crime interval and physical activity score (.311), with physical activity increasing as the crime interval increased. Our findings support the need for social and environmental supports for increase PA in AAEAs.[66]

At least 81.8% of participants reported food insecurity at some point in the last 12 months and resulted in food not lasting and there was no money to purchase more food, inability to afford to eat balanced meals or cut the size of meals to stretch food or skipped meals because of insufficient money. Additionally, some participants reported that this happened almost every month. Food insecurity is linked negative health outcomes.[67] Food insecurity also impacts college students via failing grades, depression, and social disconnection.[192]

Likewise, food insecurity was problematic in the group blocks where our participants lived. Access to food was a challenge because most participants lived in rural areas with populations of less than 10,000. While about 25% of U.S. households in America receive food assistance, an estimated 11% still experience food insecurity [193]. Inequitable access to healthy food and limited transportation are a portion of the historical disinvestment in communities of color.[194] When food access is limited, many may be forced to spend more on community mom-and-pop stores or may not have the money to purchase healthy foods, perpetuating the cycle of inequitable access to goods. The Healthy People 2030 goal targets consistency with national programs, regulations, policies, or laws. Expanding food and nutrition assistance policies is imperative.[193]

Educational attainment is a significant indicator of income.[195] In our participants' neighborhoods, educational attainment was also significantly linked to food access, with higher levels of education correlated with increased access, and conversely. Education, both bachelor's degrees (inversely) and high school incompletion (positively) were also significantly linked to the percentage of AAP in the population. In communities with larger percentages of AAP, the number of households with someone with a bachelor's degree decreased, and there were more who did not complete high school. However, the long-term outlook of the benefits of educational attainment for our population may be positive since they are enrolled in college.

Our population was enrolled in college; however, based on family income reported and reported behaviors such as skipping meals because of cost, they may be burdened by the challenges of paying for college at a private university (i.e., student loans, working while attending school, or making sacrifices in other areas). Providing

financial support for AAEAs and advocating for policy changes, such as free colleges, may help them complete college degrees. Degree completion increases opportunities to leverage access to resources.

Participants in our study who wanted to be employed were employed. Although the type of job may be limited because of the school schedule, most participants had favorable opinions about job security. However, unemployment rates in communities with higher numbers of AAP were significantly higher than those in communities with lower percentages of AAP, which directly influences the ability to obtain resources (i.e., health care, food, and sometimes education).

The participants in our study had some knowledge of CVD, but also showed opportunities for improvement in content related to effective weight loss strategies, risk factors for type 2 diabetes, risk factors for type 2 diabetes, activities to burn more calories, diseases or conditions affected by smoking, smoking risk related to heart disease, the effects of high blood pressure, the effect of unsweetened fruit juice and other simple sugars on blood sugar levels, and the benefits of consuming complex carbohydrates. Reflected knowledge deficits should be used as a baseline for patient education. With an understanding of the population's educational needs, nursing activities can be developed to enhance wellness promotion, restoration, and maintenance.[129]

Educational interventions for CVD have improved CVD knowledge in AAEAs. Wright et al.[64] had a comprehensive "heart-healthy education" course that was statistically significantly improved participant CVD knowledge. Aycock et al. (2017) and Aycock et al. (2023) also reported a statistically significant improvement in knowledge

after CVD risk intervention. Evaluation of baseline CVD knowledge is essential before designing and implementing health promotion strategies. Understanding participants' knowledge deficits can help practitioners devise patient-centered teaching plans.

Perceived prejudice, stereotyping, and discrimination are upstream factors that influence CVD outcomes.[129] More racial discrimination experiences are unfavorable individual-level socioeconomic and social indicators associated with higher CVH.[7] Cardiovascular health was not correlated with any of the perceived prejudice, stereotyping, and discrimination variables. However, many of the participants in our study reported experiencing prejudice, stereotyping, or discrimination based on how others made them feel. For example, approximately 10% of the participants reported negative actions against them (i.e., unfair termination, promotion denial, unfair police stop, etc.). However, two-thirds expressed that they were treated with less courtesy, had received poorer service, were thought of by others as "not smart" or "dishonest," or had been insulted. The latter suggests expressions of how others make them feel. Internalized emotions are linked to physical manifestations. The physical effects of racial discrimination included autonomic nervous system (ANS) arousal, BMI increase, increased stress, elevated blood pressure, and overall CVH. Bell et al.[56] examined the effect of perceived racism on ANS arousal (which is usually attenuated during sleep) and the compromise of the shift and its association with adverse CV outcomes.[56] AAP with higher levels of multiple stress measures are less likely to achieve intermediate or ideal levels of overall cardiovascular health.[196] Multilevel advocacy for equity in all facets of life is needed to eliminate stress from prejudice, stereotyping, and discrimination.

As expected, race, life expectancy (i.e., population health outcomes), income, food access, education, and employment were significantly correlated. However, CVH scores, CVD knowledge, prejudice, stereotyping, and discrimination did not correlate with upstream or population factors. One reason for this may be the larger dataset accessible through Environmental Justice that links our participants to their group block and thus provides more comparative data. Future studies with larger populations of AAEAs are recommended to assess the relationship between CVH scores and prejudice, stereotyping, and discrimination with upstream and population factors in AAEAs.

The three socioeconomic upstream factors that need to be explored in the future are social support, health insurance, and access to care. Participants in our study identified people in their circle who they believed could help them achieve heart health. Racial socialization, parental involvement, and perceived supportive behaviors from family have provided indirect protective effects through their negative associations with depressive symptoms.[197] Those identified were the church community, family, friends, roommates, sister, and no one. However, those completing the social support question were much lower than those completing the other survey items. A free-form response (in lieu of checking boxes) may have deterred the completion of the question. Many (92.7%) of the participants reported (via checking a box) that they used social media for socialization. Future surveys should include boxes with the most frequently anticipated responses and optional text boxes for other options.

The Affordable Care Act (ACA) has significantly changed healthcare in the U.S., but there are still AAEAs that are not covered by health insurance. However, over 60% of Americans have attributed their lack of coverage to costs.[198] While most participants in

our study had insurance coverage, some do not have access to coverage because they live in states that did not expand Medicaid.[198] The ACA Medicaid expansion appeared to reduce the socioeconomic gap regarding financial access to care,[199] but the expansion not being adopted by all states proved problematic for AAP in those states. Metzger et al.[200]examined statewide hospital discharges of 18–44-year-old trauma patients in five states that adopted the expansion and five that did not. Medicaid expansion adoption was associated with a decrease in the percentage of uninsured patients, and for AAP the decrease was larger.[200] With about half of the participants being from S.C., a state without Medicaid expansion[201] and ranks 40th for health insurance enrollment,[87] advocacy is needed with state legislators to expand Medicaid coverage.

Some participants in our study without insurance coverage may also lack money or do not understand the appropriate utilization of healthcare resources. Emergency room utilization was high, and some reported delaying or not receiving healthcare because of the cost. In our study, the technology savvy Generation Z people used healthcare technology to access health records and communicate with a provider. Plans of care that integrate technology may help engage AAEAs. Activating programs that help reduce the cost of coverage or copays may be required. Additionally, educating AAEAs on how to access available resources may improve the utilization of emergency rooms and urgent care facilities. Furthermore, examining health insurance and access to care in the context of health care system factors may provide rich information on decisions about the utilization of services.

Summary

The UPSTREAM CVD SST guided our study. Our population had lower CVH scores in seven of the LE8 categories. Additionally, statistics on the socioeconomic and physical environments in which our participants lived demonstrated social and structural barriers to CVH. Our population also did not possess adequate knowledge of CVH to integrate appropriate health behavior changes.

Smith et al.[129] purport that upstream factors, population factors, healthcare system factors, behavioral intention, and nursing activities work together to affect population health outcomes. This study examined the relationships between upstream and population factors and identified significant correlations among the variables that are well studied influences CVH. These findings should be combined with further assessments of healthcare system factors, behavioral intentions, and nursing activities to devise a nursing care plan to optimize CVH in AAEAs. A significant improvement in AAEA CVH cannot be accomplished without a comprehensive strategy considering multiple factors affecting CVH in AAEAs.[129]

Nursing Implications

Diverse nursing roles that extend beyond direct care in clinical settings may be required to engage AAEAs. Given the upstream and population factors that exist in AAEAs, nurses must seek to understand the patients' perspective of their experiences and CVD risk. Patient-provider racial concordance has been a source of comfort in interactive patient encounters.[202] Population-focused nursing interventions that reach patients in their environment through trust-building relationships may be key to caring for vulnerable patients. For example, after engaging key population stakeholders, building relationships, and identifying their health priorities, a nurse might implement an educational

intervention in a rural community setting to improve cardiovascular knowledge and promote healthier lifestyle choices and behaviors.

Organizations and healthcare systems should also build nursing knowledge of health equity, integrate innovative nursing models to address the needs of historically marginalized groups, and work to transform systems culture in meaningful ways.[203] It is essential that nursing leaders distinguish health care disparities from health disparities, and social needs from SDOH.[203] Better prepared nurses will be better able to help eliminate challenges and barriers to patient education (i.e., motivation, literacy, caregiver engagement, nurse teaching skills),[204] and advocate for policy changes that influence SDOH, recognizing that education alone will not improve outcomes. For example, conditions such as housing, income, access to food, and other social parameters influence a patient's ability to adhere to education received.[92] Nurses must find ways to address SDOH barriers by linking patients with resources, advocate for programs to improve access to resources to enhance adherence to treatment plans.

Policy Advocacy Implications

Socioeconomic and social indicators associated with high CVH include higher income, educational attainment, occupational status, subjective social status, less social isolation, fewer racial discrimination experiences, and less incarceration.[7] These social determinants of health are systemic, population-based, cyclical, and intergenerational, requiring extension beyond healthcare solutions to multi-sector and multi-policy approaches to achieve future population health improvements.[102] The upstream factors in our study population were negatively associated with being an AAP. Nurses should make recommendations to policymakers to implement stabilizers for AAEAs, such as

affordable education, equitable and accessible paying jobs, affordable housing and health care access, and additional neighborhood resources (e.g., grocery stores, community education centers).

Implications for HBCUs

Historically, Black Colleges and Universities have already enacted a strong mission to educate underserved populations. The AAEA population is a captive audience for most HBCUs. School-based programs, such as health education and screening designed to promote positive CVH behaviors, retain their influence after emerging adults leave college. Additionally, HBCUs must intervene to determine the occurrence of food insecurity within the study population and implement creative strategies to alleviate hunger (i.e., community gardens, farmers' markets, or grant funding for healthier food choices on campus). Lastly, HBCUs are a trusting environment for many AAEAs, and they must capitalize on their relationships with AAEAs. HBCUs should use their influence to improve attitudes towards behaviors that promote healthy lifestyles and prevent disease.

Research Implications

The social and cultural environments where AAPs live provide a context that influences health perceptions.[4] Most participants' ancestral birthplaces were in southeastern U.S. states, so cultural considerations must be explored before developing screening strategies and evidence-based therapies. Previous research has shown that combining social and cultural environments complicates CVD prevention and management in AAP.[4] However, increased awareness of such barriers by researchers creates opportunities to improve research studies that integrate assessment strategies,

such as those that account for social and cultural impacts. Additionally, studies should explore the population's CVD risk perception and examine how knowledge of objective CVD risk might influence their thoughts on their perceptions and plans for risk reduction.

Further research using the UPSTREAM CVD situation-specific theory is needed to explore the relationships between upstream factors, population factors, behavioral intention, healthcare factors, and nursing activities. Although small, our study provides evidence for the upstream and population factors in AAEAs that can be used to conduct further studies. Using our data, researchers could design future studies to explore how health perceptions impact participants' intentions to complete health behaviors. Based on our findings on low sleep duration, there is a need to examine the reasons for insufficient sleep. Additionally, studies could explore how nurses can integrate these findings into the development of CVD risk prevention strategies.

Limitations

Although this study provides important contributions to literature, it has some limitations. This study had a convenience small sample size and missing data; not all participants completed anthropometric measurements and laboratory collection. Laboratory services were unavailable on campus. Known challenges for anthropometric measures and laboratory collection were transportation and University closure. Students who did not have transportation services were challenged to meet these requirements. The university also closed at Thanksgiving because of continued COVID-19 protocols, which interrupted our limited data collection period. In addition, we enrolled only a small percentage of men in our study. We may need to oversample for males with targeted recruitment in future studies.

CONCLUSIONS

This study aimed to use the UPSTREAM CVD situation-specific theory as a framework to identify and better understand the upstream and population factors in AAEAs, which may help develop appropriate nursing interventions. While the AHA score did not correlate with upstream and population factors, these structural and systemic barriers may influence AAEA's future CVD morbidity and mortality of AAEA. AA race was positively correlated with the percentage of low-income households, unemployment rates, life expectancy, and more households earning less than $15,000; and negatively correlated with percentages of people with a bachelor's degree and those earning over $75,000 per year. Evidence regarding upstream and population factors in AAEAs may be useful for nursing, policymakers, HBCUs, and researchers in CVD prevention.

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Table 3.1 **Summary of Demographics and Socioeconomic Environment Upstream Factors**

Sex	**N**	**%**	**Household Size & Income**	**N**	**%**
F	47.0	86.0	1.0	3.0	5.5
M	8.0	15.0	2.0	9.0	16.4
Gender			3.0	10.0	35.7
Woman	46.0	8.4	4.0	15.0	27.3
Man	9.0	16.0	5.0	10.0	18.2
Sexual Orientation			6.0	2.0	7.1
Gay	0.0	0.0	7.0	1.0	1.8
Lesbian	2.0	3.6	8.0	3.0	5.5
Heterosexual	44.0	80.0	Less than $25,000	8.0	14.5
Bisexual	9.0	16.0	$25,001 to $75,000	20.0	36.4
Permanent Residence Location			$75,001 to $100,000	7.0	12.7
South Carolina	32.0	57.0	$100,001 to $150,000	2.0	3.6
Other State	14.0	25.0	$150,001 to $200,000	3.0	5.5
Other southern states	10.0	18.0	$300,001 to $400,000	1.0	1.8
Birthplace			More than $400,000	2.0	3.6
In the U.S.	49.0	89.0	I do not know	12.0	21.8
Outside the U.S.	6.0	11.0	**Insurance Coverage (n=27)**		
Employment (n=1,1.8% other)			Employer Coverage	19.0	35.2
Working	26.0	47.0	Insurance Company	**13.0**	24.1
Unemployed, seeking	13.0	24.0	Medicaid/Medicare	**5.0**	8.9
Unemployed, not seeking	15.0	27.0	Tricare	3.0	5.7
College Class			Other	6.0	11.8
Freshman	18.0	33.0	No Health Insurance	8.0	14.3
Sophomore	12.0	22.0	**Job Security**		
Junior	11.0	20.0	Likely to lose a job in 12 months.	2.0	3.8
Senior	13.0	24.0	It would be easy to find a new job	25.0	46.3
Graduate	1.0	1.8	Not easy to find a new job	7.0	13.0

Food Insecurity		
Food did not last, and money was not available to get more	17.0	30.9
Could not afford to eat balanced meals or cut the size of meals	15.0	27.2
Skipped meals because there was not enough money for food	45.0	81.8
Cut the size of meals or skipped meals because there was not enough money.	45.0	81.8
Ate less food than satiety because there wasn't enough money to buy more	51.0	92.6
Was hungry but didn't eat because couldn't afford enough food.	51.0	92.6
SNAP Recipient	7.0	58.3

Health Care Access		**Health Care Technology**	
Doctor's office or health center	73.0	Used EHR	67.0

Urgent care or retail pharmacy	25.0	Tracked health goal in EHR	75.0
Emergency room	2.1	Decided how to treat illness	61.1
Delayed care because of cost	14.0	Used electronic monitoring device	33.0
Didn't get care because of cost	9.3	Confidence in EHR safeguards	89.1

Table 3.2 **Perception of Prejudice, Stereotyping, and Discrimination**

At any time in your life, have you ever been unfairly fired. N=3 (5.5%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (2, 66.7%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (1, 33.3%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color ((0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
How many times has this happened during your lifetime?							
For unfair reasons, have you ever not been hired for a job? N=3 (5.5%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (0, 0.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (0, 0.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
Have you ever been unfairly denied a promotion? N=3 (5.5%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (1,33.3%)	Your race (0, 0.0%)	Your age (1,33.3%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (1,33.3%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
Have you ever been unfairly stopped, searched, questioned, physically threatened, or abused by the police? N=3 (5.5%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (3,100%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (0, 0.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
Have you ever been unfairly discouraged by a teacher or advisor from continuing your education? N=7 (12.7%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (1,14.3%)	Your race (3, 42.9%)	Your age (1, 14.3%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)

	Some other aspect of your physical appearance (2, 28.6%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
Have you ever been unfairly prevented from moving into a neighborhood because the landlord or a realtor refused to sell or rent you a house or apartment? N=0							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (0, 0.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (0, 0.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
Have you ever moved into a neighborhood where neighbors made life difficult for you or your family? N=5 (9.1%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (4, 80.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (1, 20.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
Have you ever been unfairly denied a bank loan? N=1 (1.8%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (1, 100.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (0, 0.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
Have you ever received service from someone such as a plumber or car mechanic that was worse than what other people get? N=4 (7.3%)							
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (1, 25%)	Your race (2, 50.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (0, 0.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (1, 25%)
In your day-to-day life, how often do any of the following things happen to you?							
You are treated with less courtesy than other people are. N=33 (60%)							

Occurrence	Almost every day (2, 3.6%)	At least once a week (4, 7.3%)	A few times a month (3, 5.5%)	A few times a year (18, 32.7%)	Less than once a year (6, 10.9%),	Never (22, 40.0%)	
Main Reason	Your ancestry or national origin (1, 3.7%)	Your gender (1, 3.7%)	Your race (9, 33.3%)	Your age (2, 7.4%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (1, 3.7%),
	Some other aspect of your physical appearance (2, 7.4%)	Your sexual orientation (1, 3.7%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (4, 14.8%)	Your tribe (0, 0.0%)	Other (6, 22.2%)
You are treated with less respect than other people are. N=34 (61.8%)							
Occurrence	Almost every day (2, 3.6%)	At least once a week (3, 5.5%)	A few times a month (3, 5.5%)	A few times a year (17, 30.9%)	Less than once a year (9, 16.4%)	Never (21, 38.2%)	
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (3, 12.0%)	Your race (12, 48.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%)	Your weight (1, 4.0%),
	Some other aspect of your physical appearance (4, 16.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (2, 8.0%)	Your tribe (0, 0.0%)	Other (3, 12.0%)
You receive poorer service than other people at restaurants or stores. N=27 (49.1%)							
Occurrence	Almost every day (0, 0.0%),	At least once a week (1, 1.8%),	A few times a month (4, 7.3%)	A few times a year (9, 16.4%)	Less than once a year (13, 23.6%,	Never (28, 50.9%)	
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (10, 71.4%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%)	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (1, 1.8%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0%)	Your tribe (0, 0.0%)	Other (2, 14.3%)
People act as if they think you are not smart. N=27 (49.1%)							
Occurrence	Almost every day (0, 0.0%),	At least once a week (1, 1.8%),	A few times a month (4, 7.3%)	A few times a year (9, 16.4%)	Less than once a year (13, 23.6%,	Never (28, 50.9%)	
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (10, 71.4%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%)	Your weight (0, 0.0%)

	Some other aspect of your physical appearance (1, 1.8%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0%)	Your tribe (0, 0.0%)	Other (2, 14.3%)
	People act as if they are afraid of you. N=17 (30.9%)						
Occurrence	Almost every day (2, 3.6%),	At least once a week (1, 1.8%)	A few times a month (1, 1.8%)	A few times a year (8, 14.5%)	Less than once a year (5, 9.1%)	Never (38, 69.1%)	
Main Reason	Your ancestry or national origin (1, 8.3%)	Your gender (0, 0.0%)	Your race (4, 33.3%)	Your age (1, 8.3%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (1, 8.3%)
	Some other aspect of your physical appearance (2, 16.7%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (2, 16.7%)	Your tribe (0, 0.0%)	Other (1, 8.3%)
	People act as if they think you are dishonest. N=17 (30.9%)						
Occurrence	Almost every day (0, 0.0%),	At least once a week (2, 3.6%)	A few times a month (1, 1.8%)	A few times a year (9, 16.4%)	Less than once a year (6, 10.9%)	Never (37, 67.3%)	
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (3, 25.0%)	Your race (5, 41.7%)	Your age (2, 16.7%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (2, 16.7%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
	People act as if they are better than you. N=33 (70%)						
Occurrence	Almost every day (0, 0.0%),	At least once a week (0, 0.0%)	A few times a month (0, 0.0%)	A few times a year (0, 0.0%)	Less than once a year (0, 0.0%)	Never (0, 0.0%)	
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (0, 0.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (0, 0.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
	You are called names or insulted. N=20 (36.4%)						

Occurrence	Almost every day (2, 3.6%),	At least once a week (0, 0.0%)	A few times a month (0, 0.0%)	A few times a year (6, 10.9%)	Less than once a year (7, 12.7%)	Never (0, 0.0%)	
Main Reason	Your ancestry or national origin (1, 3.8%)	Your gender (5, 19.2%)	Your race (7, 26.9%)	Your age (1, 3.8%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (1, 3.8%)
	Some other aspect of your physical appearance (4, 15.4%)	Your sexual orientation (1, 3.8%)	Your education or income level (4, 15.4%)	A physical disability (0, 0.0%)	Your shade of skin color (2, 7.7%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
	You are threatened or harassed. N=11 (20%)						
Occurrence	Almost every day (2, 3.6%),	At least once a week (0, 0.0%)	A few times a month (6, 10.9%)	A few times a year (0, 0.0%)	Less than once a year (12, 21.8%)	Never (35, 63.6%)	
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (0, 0.0%)	Your race (3, 100.0%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (0, 0.0%)
	Some other aspect of your physical appearance (0, 0.0%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (0, 0.0%)	Your tribe (0, 0.0%)	Other (0, 0.0%)
	You are followed around in stores. N=19 (34.5%)						
Occurrence	Almost every day (0, 0.0%),	At least once a week (0, 0.0%)	A few times a month (4, 7.3%)	A few times a year (8, 14.5%)	Less than once a year (7, 12.7%)	Never (36, 65.5%)	
Main Reason	Your ancestry or national origin (0, 0.0%)	Your gender (2, 16.7%)	Your race (7, 58.3%)	Your age (0, 0.0%)	Your religion (0, 0.0%)	Your height (0, 0.0%),	Your weight (1, 8.3%)
	Some other aspect of your physical appearance (1, 8.3%)	Your sexual orientation (0, 0.0%)	Your education or income level (0, 0.0%)	A physical disability (0, 0.0%)	Your shade of skin color (1, 8.3%)	Your tribe (0, 0.0%)	Other (0, 0.0%)

Table 3.3 **Physical Environment Upstream Factors Descriptive Statistics**

Variable	N	Mean	Std Dev	Min	Max
Populations in Group Block	56	7510	13430	124	74152
Percentage of African American People	56	50.25	26.05	6.0	93.0
Air Quality Particulate Matter 2.5 (µg/m3)	56	8.14	1.08	6.78	12.5
Air Quality Ozone (ppb)	56	37.06	3.86	31.30	48.10
Lead Paint (% Pre-1960 Housing)	56	12.21	14.02	0	54.00
Crime – Home Security (days, hours, min)	56	00:13:18	00:00:56	00:01:48	02:06:00
Percentage of College Graduates	56	26.05	13.48	4.0	72.0
Percentage without a high school diploma	56	13.25	8.37	10.0	33.0
Unemployment Rate	56	8.88	6.76	1.00	28.00
Annual Income < $15,000	56	17.86	12.86	2.0	48.0
Annual Income $15,001 - $25,000	56	10.16	5.51	0	25.0
Annual Income $25,001 - $50,000	56	26.14	7.95	10.0	45.0
Annual Income $50,001 - $75,000	56	17.59	4.99	9.00	27.00
Annual Income > $75,000	56	28.18	16.70	3.00	69.00
Low-Income %	56	41.00	16.84	11.00	80.00
Low Life Expectancy %	56	21.21	4.06	6.0	26.0
Supplemental Demographic Index %	56	17.50	6.30	7.00	31.00
People of Color %	56	63.95	20.22	21.00	98.00
Food Security (Urban and Rural)	**n**	**%**			
Low Access at .5 and 10 miles	9	16.1			
Low Access at 1 and 10	5	8.9			
Low Access at 1 and 20 miles	11	19.6			
Low Access using vehicle access	14	25.0			
Low access at 1 and 20 + vehicle access	1	1.8			
Low access in all categories	8	14.3			
No Low Food Access	8	14.3			
Source of Social Support					
Boyfriend	1	6.25			
Church Community	1	6.25			
Family	2	12.5			
Friends	8	50.0			
No one (Loner)	1	6.25			
Roommate(s)	2	12.5			
Sister	1	6.25			
Social Media Socialization (yes)	51	92.7			

Table 3.4 Descriptive Statistics and Correlations for Study Variables

	Variable	*N*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	% AAP	56	0.503	0.26																		
2.	CVH Score	55	61.32	12.14	0.00																	
3.	CVD Risk Perception	55	-1.05	1.64	0.02	-0.09																
4.	CVD Knowledge	56	15.63	4.77	0.20	0.01	0.12															
5.	MEPA Criterion Met	56	5.73	1.912	-0.25	0.20	0.21	0.02														
6.	Moderate Exercise/Week	55	155.60	302.16	0.27*	.42**	0.05	0.01	-0.02													
7.	Vigorous Exercise/Week	55	85.69	153.18	-0.12	.45**	-0.14	-0.08	-0.06	0.24												
8.	Total Exercise/Week	55	241.29	370.44	0.17	.52**	-0.02	-0.02	-0.04	.92**	.61**											
9.	Sleep Hours/Night	55	6.200	1.45	0.08	.45**	-0.14	0.24	-0.10	0.02	0.11	0.06										
10.	% Low-income Households	56	0.41	0.17	0.60**	-0.01	-0.06	0.12	-.33*	0.21	-0.07	0.14	0.01									
11.	Unemployment Rate	56	0.09	0.07	0.64**	-0.09	-0.10	0.15	-0.26	0.04	-0.01	0.03	0.03	.56**								
12.	% bachelor's degree	56	0.26	0.14	-.54**	-0.03	-0.03	0.02	0.23	-0.09	0.01	-0.07	-0.07	-.75**	-.48**							
13.	% with no High School Diploma	56	0.13	0.08	.28*	-0.03	-0.08	0.06	-.35**	0.07	-0.00	0.06	0.03	.72**	.40**	-.63**						
14.	% Low Life Expectancy	56	0.21	0.04	.045**	-0.16	-0.12	-0.05	-0.16	-0.04	-0.04	-0.05	-0.03	.61**	.40**	-.59**	.50**					
15.	Income <$15,000	56	0.18	0.13	.071**	0.01	-0.14	0.22	-0.17	0.05	-0.07	0.01	0.09	.75**	.80**	-.55**	.49**	.58**				
16.	$15,001-$25,000	56	0.10	0.06	0.37**	0.06	-0.16	0.11	-0.21	.44**	0.09	.40**	0.04	.71**	.45**	-.60**	.55**	.40**	.49**			
17.	$25,001-$50,000	56	0.26	0.08	0.12	0.06	0.17	-0.19	0.04	0.13	0.03	0.12	0.06	.23*	0.06	-.45**	.27*	0.24	0.03	0.247		
18.	$50,001-$75,000	56	0.18	0.05	-0.22	-0.01	0.24	-0.08	0.06	-0.16	0.06	-0.11	0.03	-.40**	-.45**	.39**	-.29*	-0.16	-.54**	-.50	-0.12	
19.	>$75,000	56	0.28	0.17	-.67**	-0.06	0.01	-0.08	0.17	-0.20	-0.01	-0.17	-0.12	-.85**	-.66**	.72**	-.60**	-.64**	-.79**	-.67**	-.54**	.33*

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3.5 Population Health State Factors Descriptive Statistics

Variable	N	Mean	Std Dev	Min	Max	
CVD Risk Knowledge Score	56	15.63	4.77	0	23.00	#
Essential 8 CVH score – 4 Dimension	55	61.32	12.13	25.00	85.00	#
Essential CVH score – 8 Dimension	28	71.96	10.07	46.88	88.13	#
Physical Activity Score	55	42.55	29.58	0	100.00	#
Total exercise minutes/week	55	241.29	370.44	0.00	2160.00	#
Moderate exercise/week	55	155.60	302.16	0.00	2100.00	#
Vigorous exercise/week	55	85.69	153.18	0.00	720.00	#
Sleep Health Score	55	74.73	28.09	0	100.00	#
Sleep hours per night	55	6.20	1.45	0.00	8.00	
Nicotine Exposure Score	55	96.36	18.89	0	100.00	#
Blood Pressure Score	27	88.89	20.02	50.00	100.00	
Systolic Blood Pressure	27	114.04	13.02	90.00	138.00	
Diastolic Blood Pressure	27	71.93	9.44	50.00	86.00	
Blood Glucose Score	28	100.00	0	100.00	100.00	
Blood glucose	28	85.89	6.39	74.00	97.00	
Blood Lipid Score	28	100.00	0	100.00	100.00	
Total Cholesterol (mg/dL)	28	155.79	18.52	120.00	202.00	
HDL - Cholesterol (mg/dL)	28	54.04	12.43	38.00	82.00	
Non-HDL – Cholesterol (mg/dL)	28	101.75	6.09	82.00	120.00	
BMI Scores	27	59.63	41.69	0	100.00	
BMI	27	29.42	9.30	17.58	46.96	
Height (inches)	27	65.11	3.39	60.00	73.00	
Weight (lbs.)	27	177.16	56.48	102.40	280.20	
MEPA diet score	55	31.64	19.44	0	80.00	
MEPA criterion met	56	5.73	1.91	2.00	10.00	

Table 3.6: **Comparison of CVH Between Emerging Adults Perak et al. and Our Study**

	Overall		**Sex**				**Race**	
	Perak et al.,2020	**Our Study**	**Men**		**Women**		**Perak et al.**	
			Perak et al.	**Our Study**	**Perak et al.**	**Our Study**	**Black**	**White**
Diet								
Ideal (High)	97 (2.0)	**3 (5.5)**	10 (0.5)	**0**	87 (3.3)	**3 (6.4)**	21 (0.9)	76 (3.2)
Intermediate (Moderate)	3644 (75.4)	**15 (27.2)**	1548(70.8)	**6 (75.0)**	2096 (79.1)	**31 (66.0)**	1704 (69.8)	1940 (81.0)
Poor (Low)	1095 (22.6)	**37 (67.3)**	628 (28.7)	**2 (25.0)**	467 (17.6)	**13 (27.6)**	716 (29.3)	379 (15.8)
Physical Activity								
Ideal	1820 (37.6)	**11 (20)**	1046 (47.9)	**1 (12.5)**	774 (29.2)	**10 (21.2)**	877 (35.9)	943 (39.4)
Intermediate	2361 (48.8)	**3 (5.5)**	954 (43.6)	**6 (75)**	1407 (53.1)	**35 (74.5)**	1165 (47.7)	1196 (49.9)
Poor	655 (13.5)	**41 (74.5)**	186 (8.5)	**1 (12.5)**	469 (17.7)	**2 (4.3)**	399 (16.4)	256 (10.7)
Smoking								
Ideal	3125 (64.6)	**53 (96.4)**	13294 (63.8)	**8(100)**	1731 (65.3)	**45 (95.7)**	1530 (62.7)	1595 (66.6)
Intermediate	280 (5.8)	**0**	121 (5.5)	**0**	159 (6.0)	**0**	114 (4.7)	166 (6.9)
Poor	1431 (29.6)	**2 (3.6)**	671 (30.7)	**0**	760 (28.7)	**2 (4.3%)**	797 (32.7)	634 (26.5)
Body Mass Index								
Ideal	3157 (65.3)	**11 (40.8)**	1406 (64.3)	**1 (20.0)**	1751 (66.1)	**10 (45.4)**	1431 (58.6)	1726 (72.1)
Intermediate	1111 (23.0)	**6 (22.2)**	603 (27.6)	**4 (80.0)**	508 (19.2)	**6 (27.3)**	602 (24.7)	509 (21.3)
Poor	568 (11.8)	**10 (37)**	177 (8.1)	**0**	391 (14.8)	**6 (27.3)**	408 (16.7)	160 (6.7)
Blood Pressure								
Ideal	3648 (75.4)	**24 (85.7)**	1365 (62.4)	**2 (40.0)**	2283 (86.2)	**18 (81.8)**	1775 (72.7)	1873 (78.2)
Intermediate	1083 (22.4)	**3 (10.7)**	748 (34.2)	**3 (60.0)**	335 (12.6)	**4 (18.2)**	600 (24.6)	483 (20.2)
Poor	105 (2.2)	**1 (3.6)**	73 (3.3)	**0**	32 (1.2)	**0**	66 (2.7)	39 (1.6)
Total Cholesterol*								
Ideal	3727 (77.1)	**28 (100)**	1693 (77.5)	**5 (100)**	2034 (76.8)	**23 (100)**	1839 (75.3)	1888(78.8)

Intermediate	898 (18.6)	**0**	388 (17.8)	**0**	510 (19.3)	**0**	488 (20.0)	410 (17.1)
Poor	211 (4.4)	**0**	105 (4.8)	**0**	106 (4.0)	**0**	114 (4.7)	97 (4.1)
Glucose								
Ideal	4684 (96.9)	**20 (74.1)**	2114 (96.7)	**5 (100)**	2570 (97.0)	**23 (100)**	2362 (96.8)	2322 (97.0)
Intermediate	123 (2.5)	**7 (25.9)**	61 (2.8)	**0**	62 (2.3)	**0**	62 (2.5)	61 (2.6)
Poor	29 (0.6)	**0**	11 (0.5)	**0**	18 (0.7)	**0**	17 (0.7)	12 (0.5)
Sleep								
High	N/A	**25 (46.5)**	N/A	**4 (50)**	N/A	**21 (44.7)**	N/A	N/A
Moderate	N/A	**17 (30.1)**	N/A	**0**	N/A	**17 (36.2)**	N/A	N/A
Low	N/A	**13 (23.6)**	N/A	**4 (50)**	N/A	**9 (19.1)**	N/A	N/A
Mean CVH Scores* (SD)	10.3 (1.8)	**71.96 (10.0)**	10.3 (1.7)	**69.9(13.7)**	10.4 (1.8)	**72.42 (9.5)**	10.0 (1.8)	10.7 (1.7)
CVH Category								
Ideal	1391 (28.8)	**5 (9.1%)**	590 (27.0)	**2 (25.0)**	801 (30.2)	**5 (9.1)**	505 (20.7)	886 (37.0)
Intermediate	3141 (65.0)	**42 (76.4%)**	1463 (66.9)	**0**	1678 (63.3)	**42 (76.4)**	1739 (71.2)	1402 (58.02)
Poor	304 (6.3)	**8 (14.5%)**	209 (7.7)	**6(75.0)**	133 (6.1)	**8 (14.5)**	197 (8.1)	107 (4.5)

*Total cholesterol was used to calculate lipid score in AHA Simple 7, LE8 used nonHDL cholesterol for lipid score. Points for each component of AHA Simple 7 were rated as 2 – Ideal, 1 – Intermediate, and 0 – Poor. CVH scores ranged from 0–14-points. CVH scores were categorized as high (12–14 points), moderate (8–11) or low (0–7). Mean CVH Scores (SD).

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Table 3.7 **Group Differences by Sex**

Evaluation Variable	Female Mean	SD	Min	Max	Male Mean	SD	Min	Max	*P* Value T-test	Non-parametric
CVD Risk Knowledge	16.51	4.101	5	23	12.38	3.96	8	12	2.72	0.02
BMI	29.84	9.89	17.58	46.96	27.57	6.59	21.26	36.96	0.63	0.93
SBP	113.00	12.80	90.00	138.00	118.60	14.48	100.00	138.00	0.40	0.45
DBP	70.73	9.79	50.00	86.00	77.20	5.76	70.00	82.00	0.17	0.10
Glucose (mg/dL)	85.57	6.09	74.00	97.00	87.40	8.26	77.00	97.00	0.57	0.65
TC (mg/dL)	156.00	18.84	120.00	202.00	154.80	19.04	137.00	186.00	0.90	0.74
HDL (mg/dL)	55.74	12.95	38.00	82.00	46.20	5.17	38.00	51.00	0.12	0.12
Olive Oil Tbsp	3.12	3.71	0	20	0.71	0.95	0	2	3.70	0.00
Green Veg.	1.47	1.67	0	7	0.57	0.54	0	1	2.84	0.01
Butter	2.38	2.74	0	14	0.79	0.70	0	2	3.34	0.00
Alcohol	0.75	1.45	0	5	0	0	0	0	3.52	0.00
	Outside of S.C.				**South Carolina**				***P* Value**	
Evaluation Variable	**Mean**	**SD**	**Min**	**Max**	**Mean**	**SD**	**Min**	**Max**	**T-test**	**Non-parametric**
MEPA	6.32	1.75	3	10	5.26	1.93	2	9	2.16	0.04
Household	4.042	1.55	1	8	3.19	1.11	1	5	2.27	0.03
12-mo.ER	0.60	0.88	0	3	0.15	0.37	0	1	2.12	0.04
Fast Food	2	1.53	0	5	3.13	2.24	0	9	-2.20	0.03

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Table 3.8 **CVD Knowledge Quiz Accuracy**

Topic	% Correct
Cholesterol	
Target cholesterol level	22.2
The effect of saturated fats on cholesterol	49.1
Difference between low-density and high-density cholesterol	33.3
Recognition of high cholesterol foods	47.3
Weight Management	
BMI prevalence by sex	43.6
Effective weight loss strategy of decreasing food intake and increasing physical activity	76.4
The appropriate rate of weight loss of one–two pounds per week	85.5
The effects of excess weight on the heart	85.5
Glucose control	
Normal hemoglobin A1C level	72.7
Fasting glucose normal level	65.5
Increased metabolic risks associated with diabetes	81.8
Risk factors for type 2 diabetes	27.3
Attaining 150 minutes per week of moderate physical activity for CVH	58.2
Benefits of physical activity	83.6
Recognition of types of aerobic activity	80.0
Activities to burn more calories	52.7
Smoking	
Myth of 25-pound weight gain after smoking cessation	52.7
Diseases or conditions affected by smoking	44.4
Smoking risk related to heart disease	52.7
Steps to quit smoking	94.4
Blood Pressure	
Hypertension as the name for high blood pressure	76.4
Ideal blood pressure	94.5
Sodium intake recommendations for people with hypertension	69.1
Effects of high blood pressure	32.7
Nutrition	
Foods high in saturated fats	76.4
Effect of unsweetened fruit juice on blood sugar levels	12.7
Recognition of carbohydrate foods	67.3
Benefits of eating complex carbohydrates	20.0
Sugar content in sodas and fruit juices	63.6

CHAPTER 4

PERCEIVED VERSUS ACTUAL CARDIOVASCULAR DISEASE RISK IN AFRICAN AMERICAN EMERGING ADULTS AT AN HISTORICALLY BLACK COLLEGE OR UNIVERSITY[3]

[3] Smith, S.B., Magwood, G.S., Tavakoli, A., Abshire, D.A., McCutcheon, G.S., Jenerette, C.M. to be submitted to the *Journal of the American Heart Association*

ABSTRACT

BACKGROUND: Cardiovascular disease (CVD) is increasingly affecting younger populations, especially African Americans in the southern U.S. The perception of disease risk influences health behaviors, and young adults are known to underestimate their disease risk. A greater understanding of CVD risk perception accuracy among African American emerging adults (AAEA) may aid in developing strategies to improve CVD health behaviors in this population.

METHODS: Twenty-eight AAEAs enrolled at a southeastern historical Black college/university (HBCU) participated in an explanatory sequential mixed methods study guided by Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease, a situation-specific theory for AAEAs. CVD risk perception, objective CVD risk using the AHA's Essential 8 metrics, and CVD knowledge were analyzed using descriptive (frequency tables, means, SD, and ranges) and inferential (bivariate and multivariate) statistics. Sixteen participants, purposefully selected based on CVD risk perception accuracy, participated in a follow-up interview to ascertain their reasons for perceptions and thoughts on objective CVD risk.

RESULTS. Most participants (57.14%) perceived their CVD risk as low; however, their objective risk was moderate (67.86%) to high (3.57%). Three prominent themes were identified in participants' responses to learning about their actual CVD risk: emotional awareness, personal analysis, and planned action.

CONCLUSIONS: The results of this study support the integration of awareness of CVD risk factors into the development of personalized prevention strategies for AAEA. HBCUs represent optimal settings for integrating CVD awareness and AAEA prevention.

These findings support the need for additional studies with larger AAEA samples to explore CVD risk prevention.

BACKGROUND

Cardiovascular disease (CVD) primarily manifests in older age groups; however, its pathogenesis begins early in life [147]. Emerging adulthood is an important period for addressing CVD risk factors among young people ages 18-25 because of the critical development occurring as they form their self-identity, increase autonomy, and adopt life-long behaviors.[6,129] African American emerging adults have documented CVD health risk factors[4,28-30,32-34] and health behaviors.[1,8,9,129]

In the Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease (UPSTREAM CVD) situation-specific theory, Smith et al.[129] proposed that upstream factors, which include the social determinants of health, socioeconomic, and physical environment, and population factors (i.e., physiological and behavioral factors) are interrelated factors that influence attitudes, subjective norms, and perceived behavioral control to complete health behaviors. Health behaviors, specifically factors related to CVD risk, include inappropriate diet habits, low PA, nicotine exposure, and insufficient or ineffective sleep.[129] African American emerging adults have documented challenges meeting dietary guidelines (i.e., total calorie intake, total calories from fat, and monounsaturated fats).[8,9] AAEA women were found to have a decline in PA in emerging adulthood which increases the odds of hypertension by 4%.[88,161] Dysfunctional sleep patterns have been documented in EAs compared to other age groups[205] and racial/ethnic sleep disparities between AAEAs and White emerging adults exist.[25]

Population cardiovascular health (CVH) factors include body mass index (BMI), blood lipids, blood glucose, and blood pressure (BP). In addition, metabolic syndrome

and CVD biomarkers (i.e., hyperlipidemia, triglycerides, large artery stiffness, waist/hip circumference ratios, neck circumference, and carotid artery intima-media thickness) have been documented in AAEAs.[4,28-30,32-34] Furthermore, CVD risk sex differences exist with a higher prevalence of hypertension, lower (<40 mg/dL) high-density lipoprotein (HD), and perception of current body image as larger than actual in AAEA men. [10] For AAEA women, differences include lower PA, a higher percentage of total calories from fat,[8,13] higher rates of obesity,[13,30] perception of body image as ideal or healthy despite being overweight.[10] and an association between perceived stress, insomnia, and sleep quality.[41]

The population factors of AAEAs include health risk perceptions. Cardiovascular health risk perceptions influence CVD health outcomes.[4,128,129] An individual's health risk perception is formed by personal education on the risk, analysis, and interpretation of the risk of contracting a disease, susceptibility or potential disease severity, and the benefits and barriers of health behaviors.[206] However, perceived CVD risk integrated with knowledge of objective CVD risk may help AAEAs form the accurate health perceptions needed to change health behaviors. Therefore, it is[62] critical to assess perceived and objective CVD risk and improve the accuracy of perceived risk in AAEAs.

To assess CVH and CVD risk, the American Heart Association (AHA) created Life's Simple 7 to define ideal CVH using seven risk factors: health behaviors (diet, PA, and nicotine exposure) and health factors (BMI, blood pressure, blood glucose, and blood lipids).[207] In 2022, the AHA added sleep health to the previous seven elements of Life's Simple 7 to advance ongoing efforts to improve cardiovascular health (CVH) in

populations.[7]The AHA's writing group recommends assessments using the Essential 8 metrics and using findings to predict future CVD risk in younger populations. [7]

Evidence suggests that interventions that engage and change risk perceptions produce increased health behaviors.[208] In this study, we aimed to compare participants' perceived risk with their objective CVD risk, explore their level of CVD knowledge, which may influence their perception, and examine whether knowledge of their objective CVD risk affected their thoughts about their results. This is the first published study measuring CVD risk perception versus actual CVD risk in AAEAs at a historically Black college or university (HBCU) using the AHA's Essential 8 metrics.

METHODS

Protection of Human Subjects and Ethical Considerations

This study was approved by the Institutional Review Boards (IRBs) of two universities. The first university was the data collection site and the second was affiliated with the lead author's Ph.D. program.

Design, Sample, and Setting

An explanatory sequential mixed methods study[131] was conducted, which began with quantitative data collection of demographic data, CVD risk perception, and objective CVD risk. Our approach integrated the following steps: establishment of approach to inquiry, quantitative data collection, quantitative data analysis, qualitative data collection, qualitative data analysis, integration and reporting of results.[132,133] Figure 4.1 displays a visual model of the explanatory sequential mixed methods design procedures.

Establishment of Approach to Inquiry

We sought to explain and contextualize quantitative findings with the qualitative data. Specifically, what were the reasons participants perceived their CVD risk as low, average, or high? And what were their responses after learning their objective CVD risk? The rationale for mixing quantitative or qualitative data within the study is grounded in the fact that neither quantitative nor qualitative methods are sufficient, by themselves, to capture the upstream and population factors, CVD risk perception, objective CVD risk, and reasons participants perceived risk as they did.[133] While priority was given to the quantitative phase of the study because of the need for objective measurement of upstream and population factors, the qualitative phase was critical in providing more meaningful data for future studies and practice interventions.

Quantitative Data Collection and Measurements

The research team assembled a quantitative survey to collect data on demographics, CVD risk perception, and self-reported behavior using LE8 metrics.[7] Health factors (BMI, BP, Glucose, and lipid profiles) were collected by the 1st author or research assistant and a national clinical laboratory. The demographic survey was developed using the PhenX Toolkit.[185] Demographic data included race/ethnicity, age, sex, gender, birthplace, years lived in the birthplace, education, household income, employment status, and insurance coverage.

CVD Risk Perception

Cardiovascular disease risk perception was assessed using the Schwarzer, Renner [209] scale (Cronbach's α =.78). Risk perception was defined as the participant's perception of the likelihood, compared with their peers, of developing heart disease, high blood

pressure, or stroke. The AHA's cardiovascular health (CVH) metrics measured the actual CVD risk.[7] The scale included three questions that focused on the participants' perception of the likelihood of experiencing heart disease, high blood pressure, and stroke compared to their peers.[22] Ratings were measured using a Likert scale from -3 (much below average) to +3 (much above average). The participants' perceptions of heart disease, hypertension, and stroke were averaged to obtain an overall risk rating. The participants were grouped into three categories: high-risk perception (>0 to 3 rating), average risk perception (0 rating), and low-risk perception (<0 to -3).

CVD Risk

The AHA Life Essential 8 CVH guide calculated participants' CVD risk.[7] Self-report data were collected for diet, PA, nicotine exposure, and sleep hours. Dietary intake was self-reported using the Mediterranean Eating Pattern for Americans (MEPA). The 16-question survey assessed the participants' intake of fruits, vegetables, meat, fish, poultry, legumes, fats, whole grains, sweets and pastries, nuts, fast food, and alcohol. Participants' responses were compared to MEPA-recommended servings for each item and scored as one point if the scoring condition was met and 0 if the scoring condition was not met. To obtain the total diet score, the number of scoring conditions met was divided by 16 (the total number of components) to determine the percentage of 100 points earned.

Weekly PA was measured using the self-reported number of moderate and vigorous exercise minutes per week. The final score was obtained using AHA's[7] PA metric, ranging from 0 to 100 points.

Nicotine exposure from cigarettes or inhaled nicotine delivery systems was measured using the Essential 8 rating, which distributed points based on whether the individual ever smoked, how much time had passed since they quit smoking, etc. The participants were asked how many hours they slept each night to measure their sleep. Points were distributed based on whether the participant met the recommended 7-9 hours per night of sleep or, if not, what percentage of the recommendations was achieved.

Body mass index was measured using an Adam MDW – 250 L electric scale, with the participants' shoes removed. Weight was measured to the nearest 0.1 pound and height to the nearest inch. Body mass index points were allocated for ideal (18.5 – 24.9) 100 points, overweight (25.0 – 29.9) 70 points, obese (30.0 – 34.9) 30 points, obese (35.0 – 39.9) 15 points, and severe obesity (≥40) 0 points.

A national clinical laboratory service company collected blood samples for fasting blood lipid and glucose levels. The participants were seated in a quiet office with a closed door for blood pressure measurements. Blood pressure was measured in the participant's right arm using the auscultatory method with a Graham-Field Labton aneroid sphygmomanometer and a Littman Classic III stethoscope placed over the brachial artery. Table 4.1 includes domain, CVD health metric, method of measurement, and quantification for the Essential 8 measures.[7]

Using the AHA Essential 8 writing group's recommendations, a cardiovascular health (CVH) score was calculated by a 100-point unweighted average scoring algorithm.[7] Participants were categorized with overall CVH scores of 80 to 100 as high CVH (low risk); 50 to 79, moderate CVH (moderate risk); and 0 to 49 points, low CVH (high risk).[7]

Accuracy of Perceived CVD Risk

The accuracy of the perceived CVD risk for each participant was determined by comparing perceived CVD risk and CVD risk categories. Perceived risk metrics and CVD risk categories were cross tabulated to assign perceived risk accuracy categories. For example, participants who perceived their CVD risk as low but had a high CVD risk were placed in the perceived minimal risk and high CVD risk categories. Participants were grouped into one of nine perceived risks: actual risk categories: perceived low risk vs low CVD risk, perceived low risk vs moderate CVD risk, perceived low risk vs high CVD risk, perceived average risk vs low CVD risk, perceived average risk vs moderate CVD risk, perceived average risk vs high CVD risk, perceived high risk vs low CVD risk, perceived high risk vs moderate CVD risk and perceived high risk vs high CVD risk.

Study data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at the University of South Carolina.[134,135] REDCap is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources. Participants completed the surveys via desktop computers, laptops, smartphones, or tablet devices. After completion of the survey, anthropometric measurements were collected by the 1st author or research assistant, a registered nurse, and a Ph.D. student.

We used the AHA LE8 definitions[7] to score each of the eight CVH metrics. The unweighted average of the eight scores was used to categorize CVH as high (80-100), moderate (50-79), or low (≤ 49). Appendix C include prompts for the 16-item Mediterranean Eating Pattern for Americans (MEPA).

Quantitative Data Analysis

Descriptive statistics were computed for all variables. For categorical variables, the univariate construction included a frequency distribution. For continuous variables, the statistics included measures of central tendency (mean and median) and measures of dispersion (standard deviation and range). Spearman and Pearson's correlations were used to examine the relationships within MEPA diet components, between CVD risk perception and CVH, within LE8 components, and within CVD risk perception components. The Chi-Square test was used to examine the association between the risk perception categories high, average, and low with CVD risk categories high, moderate, and low. Multiple regression will be used to examine the relationships between a set of the independent variables on the overall CVH score. Several techniques will be used to check the four major assumptions (linearity, independence, homoscedasticity, and normality) in the regression models. Statistical significance will be set at 0.05 for each of the three following research questions. Values that will be reported include the adjusted R-square value, beta coefficients, standard error of beta, and *P* value. SAS 9.4 was used to analyze quantitative data.

The goal of the quantitative phase was to identify participants who perceived their CVD risk was high, average, or low and determine objective CVD risk (high, moderate, or low). Cross-tabulation of these categories would result in participants being placed in

one of nine categories: actual risk categories: perceived low risk vs low CVD risk, perceived low risk vs moderate CVD risk, perceived low risk vs high CVD risk, perceived average risk vs low CVD risk, perceived average risk vs moderate CVD risk, perceived average risk vs high CVD risk, perceived high risk vs low CVD risk, perceived high risk vs moderate CVD risk and perceived high risk vs high CVD risk.

Connecting Quantitative and Qualitative Phases

In this cross-sectional study using explanatory sequential mixed methods, the quantitative and qualitative phases of the study were connected during the intermediate stage in the research process by selecting the participants who completed the quantitative phase for the qualitative interviews based on their CVD risk perception and objective CVD risk category.[138] The second connecting point included developing the interview questions for the qualitative data collection based on the results of the CVD risk perception accuracy.[138]

Qualitative Data Collection and Measurement

In the second, qualitative phase, we used findings from the quantitative data analysis to purposefully select participants, inviting percentages of participants aligned with percentages in each of the nine pre-identified categories of perceived CVD risk vs objective CVD risk. We also used quantitative results to develop a semi-structured interview guide to conduct the interviews. We aimed to understand why participants accurately or inaccurately perceived their CVD risk, and their thoughts when learning about their CVD risk. For this phase,

The interviews were conducted by the first author or a research assistant. For privacy and to decrease the stress associated with a one-on-one interview, participants

were instructed to leave their cameras off and change their name to the study identification number before entering the Zoom session. The interviewers used a scripted guide to inform the participants about their CVD risk perception and actual CVD risk and elicit a response. For example, a participant who perceived risk to be low but had high CVD risk received the prompt, "Based on your responses to the survey, the measurements taken by the study nurse, and your lab work results, you perceived your heart disease risk to be low, but you have low heart health score. This means you thought you had a minimal risk of developing heart disease but have a high or increased risk of developing heart disease." Participants were then prompted to respond to the following, "After hearing your results, please tell me what you think about the information I shared." Similarly, those who perceived low risk but had moderate or high risk were also prompted to respond to the following: "Tell me what made you think you were not at risk for developing heart disease." Interviews were recorded, and the interviewers logged field notes during the interviews. Data from the participants' responses to this information were used to identify the themes. Interviews were recorded and transcribed verbatim.[140]

Qualitative Analysis

A total of sixteen interviews were conducted. The first author and research assistant reviewed each transcript for accuracy. In the initial steps of the content analysis, an Excel table that included participant risk perception, CVD risk category, response to the question, and columns to record the identified themes was constructed. Each transcript was coded independently to identify themes. The frequency of common responses related to the study's aims was tabulated in an Excel spreadsheet. The findings

of the analysis were consolidated and presented to the research team. All coding decisions were reviewed and agreed upon by the last author.

Strategies to improve validity included reviewing coding among coders and refining coding until agreement was reached. Furthermore, the research team had extensive experience in qualitative research on cardiovascular and other chronic conditions. Two researchers on the team also had established trustworthy relationships and were respected by the population through long-term faculty and leadership roles at the university.

Integration and Reporting of Results

We mixed the quantitative and qualitative approaches by integrating the results from the quantitative and qualitative phases during the interpretation of the outcomes of the entire study.[133] See Figure 4.1 for a visual model of the explanatory sequential mixed methods design procedures we used.

Study Sample

The study sample was selected based on the following inclusion criteria: African American adults ages 18-25 enrolled at a southeastern HBCU regardless of housing status (on-campus or off-campus). Exclusion criteria included pregnancy and not identifying as African American. Participants were recruited via university-wide emails, flyers posted in prominent student gathering areas, handouts provided in university 101 classes, a required class for all first-year students, and transfer students. Fifty-six participants entered the study and provided baseline data; however, complete data (including anthropometric and laboratory data) were obtained from 28 subjects. A group of participants representative of each CVD risk perception and objective CVD risk category

was invited to complete follow-up individual interviews. Participants who completed the quantitative measurements received a $50 gift card, and interviewees received a $100 gift card. Quantitative data were collected from August to December 2022. Follow-up interviews were conducted in March 2023.

RESULTS

The participants were 28.6% first-year college students, 21% sophomores, 25% juniors, and 25% seniors. The average family size was 3.64 people per household, ranging from 1 to 8. Most families were comprised of 3-4 people (57.1%). The household income distribution for the group varied: seven less than $25,000 per year (25%), 5 between $25,001 and $75,000 (17.86%), 5 between $75,001 and $100,000 (17.86%), and the remaining 4 (14.28%) were above $100,000. The respondents' demographic characteristics, frequency distributions, and percentages are summarized in Table 4.2.

Most of the participants (64.3%) were employed at least part-time. Eleven percent of participants reported not having health insurance. The remaining participants reported coverage through employers (including parents), the exchange or marketplace, Medicaid, Tricare, or something else.

On average, the participants were 20.29 years of age (range 18.07 – 24.09) and predominantly female (82.1%). No men were identified as gay, while 3.6% of the women were identified as lesbian, 82.1% as straight, and 14.3% as bisexual. Just over 89% of participants were born in the US, and the remaining 10.7% were born in a US territory (i.e., Puerto Rico, US Virgin Islands, Guam) and lived an average of 16.5 years in their birthplace (SD 6.58). Most (60%) lived in South Carolina, and 84% lived in a southern state.

CVD Risk Perception

Participants had a mean overall risk perception score of -0.96, slightly below the average risk. Overall perceived risk categories were high (21.4%), average (21.4%), and low 57.1%). Most participants rated their perceived risk on the three individual risk perception measures as slightly below, moderately below, or much below average: heart disease, 57%; high blood pressure, 46.4%; and stroke, 54.6%. The distribution of participants according to their perceived risk is shown in Table 4.3.

CVD Risk

The participants had a mean CVH score of 71.96, with scores ranging from 46.88 to 88.13. CVD risk distribution was 3.57 % high, 67.9 % moderate, and 28.6% low. Table 4.4 shows the mean, standard deviation, and range for each component of the Essential 8 Assessment. Pearson's correlations were used to evaluate the relationships between variables of interest. The Pearson Correlation between CVD risk perception and actual CVD risk was -0.09 and was not significant. Significant correlations were noted between CVH and income (0.47), sleep and diet (0.46), and BMI and blood pressure (0.70). Correlations between the MEPA variables are reported in Table 4.5. There were significant correlations between age and diet (-0.48), nicotine exposure (-0.62), and cholesterol (.50).

Table 4.6 presents the regression models for CVH. According to the R-squared, 9.0 % of the variation in the CVH score (outcome) was explained by sex, state of residency, average CVD risk perception, and MEPA. There was no significant association between the independent variables and outcome ($F_{5,49}=0.70$, $p = 0.6251$).

Table 4.7 displays the screener item, question asked, scoring criteria, and mean and standard deviation for the MEPA diet recall results.

Perceived versus Actual CVD Risk

Participants were represented in seven of nine CVD risk perception vs objective CVD risk categories. There were 14.3%: perceived low risk vs low CVD risk, 39.3% perceived low risk vs moderate CVD risk, 3.6% perceived low risk vs high CVD risk, 10.7% perceived average risk vs low CVD risk, 10.7% perceived average risk vs moderate CVD risk, 3.6% perceived high risk vs low CVD risk, and 17.9% perceived high risk vs moderate CVD risk.

Overall, participants perceived their CVD risk as slightly below average at -0.96 but had a mean CVH score of 72.0 (moderate risk). Of the 43% of those who perceived having an average or high CVD risk, none had a high CVD risk, and 21.5% had a moderate CVD risk. Of the 57% of those who perceived their CVD risk to be low, 14.3% had low CVD risk, 39.3% had moderate risk, and 3.6% had high risk. Table 4.8 reports the cross-tabulation of the perceived risk vs CVD risk categories. There were no statistically significant correlations between perceived risk, CVH, LE8 components in any category.

Participants' Perspective on Actual CVD Risk

Sixteen participants participated in qualitative interviews and represented the following perceived risk vs. CVD risk categories: low perceived risk vs. low CVD risk (6.3%), low perceived risk vs. moderate CVD risk (37.5%), average perceived risk vs. moderate CVD risk (12.5%), average perceived risk vs low CVD risk (12.5%), high perceived risk vs low CVD risk (6.3%), and high perceived risk vs. moderate CVD risk

(18.8%) completed the follow-up interview. No participant who rated low perceived risk vs. high CVD risk responded to the invitation for a follow-up interview. These participants were originally 3.57%, 10.71%, and 3.57% of survey completers, respectively. Table 4.9 reflects purposeful selection of participants comparing percentages in categories for the whole group and participants in the qualitative phase.

Participants' responses to learning about their CVD risk revealed three core themes: Emotional Awareness, Personal Analysis, and Planned Actions. Those who did not perceive they were at risk also expressed reasons for their perception. Pseudonyms were used to ensure participants' privacy. Emotional awareness was primarily expressed by participants who perceived their CVD risk as low but learned that their CVD risk was high. Expressions included scared, shocked, and "crazy." Ellie expressed multiple emotions when learning she was at risk for CVD, "This is very scary. This is serious. It stressed me." Likewise, Brenda expressed, "I am a pretty shocked because I wasn't thinking about that I would could be at risk. I feel like, maybe in the back of my head, I thought, you know, I could possibly possibly be at risk because of, like my weight and whatnot. But I mean, it wasn't at the forefront." One participant who had a high perception of CVD risk reflected, "Oh. I remember thinking I had a high risk of, for heart disease again, because there's issues in my family and quite a bit of heart disease- quite a quite a few bit of history, and also (pause) I don't know, I don't know how to feel." Twelve of the sixteen interviewees reflected an emotional awareness of a need for change. Examples include, "But you know I think it's still possible for me. So that's why it's important to like, you know, stay healthy. You have to develop habits. But so that way I don't develop heart disease."; "I mean, I think it lines up with what I was thinking.

I need to be very proactive in my heart health because I do have increased risk & I'm trying to avoid going through difficulties later in life. This is scary. Yes, it is."; and "I feel like it's a great source that I know now that I'm at a great risk of a heart disease. Now I need to know what I need to do in order to prevent it, stay or try to not towards prevent it."

The comments of the sixteen participants also reflected a personal analysis of their situation, which was displayed by citing reasons, bargaining, or rationalization. One participant provided a reason for her high CVD risk as, "I probably do have a high risk, especially being an African American woman and my family history." Five of the 16 participants cited "stress" as a risk factor for CVD. Emily stated, "I think it could just tie into the stress or lack of sleep. Like I have assignments from classes, and I also have a day job." Another participant connected stress to blood pressure: "I stress really, really bad. So I know that, like, cause your like your blood pressure to go up, and all the but not, but well, it comes like a lot of increase in things that create heart disease." An AAEA male was hopeful that CVD would wait until he was older, appearing to accept vulnerability for CVD in his elder years: "I don't know how to feel. I don't know what I think. I don't. I hope it comes around when I'm older and doesn't hinder my current goals." Another participant sought a rationalization for her results while denying the actual risk: "I think that sometimes with high blood pressure, it's calculating the stress and how you were feeling at that moment. And maybe that can play a part in it. My weight doesn't have anything to do with high blood pressure. But I do consider myself like healthy."

Planned actions expressed by participants included both vague and recognizing the need for change and specific actions. Ten participants recognized the need to change or reported that they would change. For example, Priscilla said, “Um, I'm thinking that if I don't change what I do, everything my mom told me I should do, I need to start right now, because (pause) I do have people on my side that do have a lot of heart problems, diabetes and stuff like that. So. I really do need to change what I do my everyday life.” Penelope’s reflection demonstrated deep thought but without specific action, “I need a…(pause). I need to fix you know, my living/lifestyle”. One participant who reported a family history of heart disease stated, “I think it’s still possible for me to stay healthy. You have to develop habits. So, I don't develop heart disease.” Only three participants articulated a plan for specific CVD risk-reduction activities. These specific actions included “eating more healthy,” “exercising more and everything,” and “need to exercise.”

Overall, participants who perceived their risk as average but had a high CVD risk expressed fear and recognized the need for change. Participants who accurately perceived their CVD risk as high acknowledged fear, shock, and the need for change. However, most participants did not express the specific actions they would take to improve their CVD risk. Finally, participants who inaccurately perceived their CVD risk as low varied in their reactions, and their responses ranged from “not a surprise” and “I know. My family has a lot of conditions” to great surprise: “I am a pretty shocked because I wasn't thinking about that I would could be at risk.” None of the participants with low perception: high CVD risk cited a specific action they would take to improve their CVD risk.

Each of the 25% with high perceived CVD risk had a family history of CVD or CVD risk factors (i.e., DM, hypertension, stents, heart attack, or obesity). One perceived high-risk participant described his family history as "grandfather had a fanny pack filled with medications and eventually died of a stroke". Another participant linked her high risk perception to, "I have a lot of stress, my whole family has a lot of stress. My mother has depression and things like that". In the 43.8% who perceived their risk as low but had moderate risk, common themes emerged of "feeling fine", "I'm young", and "I feel pretty healthy." One participant said, "I thought my weight was fine. The only thing I could say was that I don't exercise as much anymore, and I don't eat as good anymore. But I look fine. I've never had any issues like that."

DISCUSSION

This study aimed to compare CVD risk perception with actual risk in AAEAs and explore their thoughts and feelings after learning about their actual CVD risk. The findings of this study suggest that AAEAs may not have congruent CVD risk perceptions or actual CVD risks. However, our findings also suggest that when participants learn about their CVD risk, their responses indicate that awareness may lead to intentions to change their behavior. Imes et al.[210] reported significant associations between post intervention risk perception and post intervention intention to exercise in emerging adults. Awareness and accurate perceptions are relevant attributes of the attitudes and beliefs needed to form favorable behaviors.

The UPSTREAM CVD situation-specific theory is a synthesized theory that reflects culturally tailored care to promote a healthy lifestyle.[129] UPSTREAM CVD addresses known CVD risks, SDOH, structural DOH, population factors, healthcare

system factors, and the complexity of health behaviors. Additionally, the theory addresses the effect of the lived experiences of AAEAs that influence their attitudes, beliefs, and social norms that ultimately form their intentions to engage in healthy behaviors. Hence, our study may aid student health professionals, practitioners, and researchers in helping patients objectively understand their CVD risk to change inaccurate health perceptions and subsequent health behaviors.

This study collected relevant foundational data to substantiate and initiate the exploration of CVD risk mitigation in AAEAs, specifically HBCUs. Given that nearly half of the AAP are under 30 years of age,[83] creating strategies to maintain the population's health is key to decreasing or eliminating CVD health.

Income and CVH were moderately correlated in our study. Findings by Tietler et al. Teitler, Wood, Zeng, Martinson, Plaza, Reichman [211] suggest that racial-ethnic disparities in CV conditions likely originate early in the life course, and do not mirror socioeconomic disparities. However, other evidence suggests a link between and CVD outcomes.[4,92,96] Lower SES serves a source of chronic stress that promotes a proinflammatory state and atherogenesis.[92] Socioeconomic status has also been associated with longer sleep duration, with shorter sleep duration and poorer sleep quality linked to neighborhoods with violence.[4] Despite education level, AAP are more likely to experience unemployment and have lower wealth at every level of income than White people.[96] And this income gap contributes negatively to CVD outcomes.[96]

CVD Risk Perception

Most participants in our study perceived their CVD risk to be lower than the actual risk. The perceived risk and willingness to change must exist for individuals to

alter behaviors.[161] Individuals are more likely to engage in health-related behavior if they perceive they are at risk or susceptible to developing a negative health condition.[212] In an exploration of the perceived risk of CVD and health behavior, Robinson et al.[62]found that AAEAs at an HBCU who had higher risk perception also had greater health responsibility.[62] Likewise, low risk perception was correlated with less health responsibility.[62]

Barnett et al. explored AAEAs' perception of physical and mental health, and findings suggest that AAEA college students were aware of how eating choices affect health.[61] However, AAEAs equated physical health to running a marathon or eating at Whole Foods.[61] The AAEAs in our study saw themselves as more likely to develop high blood pressure than heart disease or stroke (57%, 46.4%, and 53.6%, respectively). Such perceptions may be related to casual exposure to high blood pressure, education about CVD variables, lack of consideration of the severity of heart disease and stroke, or other factors. While not statistically significant, there was a noticeable sex difference in CVD risk perception, with females rating themselves slightly more likely to have CVD, high blood pressure, and stroke (-0.8986 vs. -1.2667, respectively).

CVD Risk

Overall, the participants in our study had a moderate CVD risk. Similar results were found in other studies that reflected an increased risk for health behaviors (diet,[8-12]PA,[13,14]nicotine exposure,[15-24] sleep health,[18,50,5]) and health factors (BMI,[28-30] blood lipids,[7] blood glucose,[31-34]and blood pressure[35-37]). Additionally, our findings were similar to other studies in that LE8 components diet (MEPA), PA, sleep, and BMI had much lower scores than the other categories (nicotine exposure, blood lipids, blood

glucose, and blood pressure). The MEPA diet screening results indicated that most participants were deficient in consuming green leafy and other vegetables, berries, beans, whole grains, and nuts. The majority also reported overconsumption of fast food, sweets, and pastries. Savoca and colleagues[9] also found decreased vegetable, fruit, and dairy intakes among AAEAs. In other studies, AAEA men have been found to have high dietary fat intake and unhealthy food preferences.[8,9] However, this was not the case in our population of men, although only 18% of the study sample. AAEA females were also found to exhibit at-risk dietary behaviors in a study examining the percentage of energy from dietary fat.[8] These findings may suggest that participants do not know which foods to eat, do not have access to these foods, or because their overall low-risk perception may not see the importance of including these foods in their diet. Food access may have also been challenging for our participants, given that they were college students at a university situated in a food desert. Food choices on college campuses may be limited.

The recommended level of aerobic PA is 150 min/week of moderate or vigorous PA. The participants had less than the recommended minutes of exercise in moderate and vigorous PA per week. Studies have found that AAEA females have the lowest PA among all races from emerging adulthood to middle age.[53,5] The decrease in PA levels occurs most notably during the transition from high school to college compared to their nonminority counterparts.[88] However, the AAEA females in our study had lower vigorous exercise than the males but more moderate exercise. Women with AAEA may be more amenable to moderate-intensity PA.

Two participants reported using a vaping system, and none were smokers. These results are markedly better than those reported in previous studies (42% and 54% for

AAEAs, respectively).[17,23] Given this incidence in AAEA males, our results may be low because there were fewer AAEA male participants. Of note, however, vaping surpassed cigarette smoking in young adults aged 18-30.[213]

Dysfunctional sleep patterns are more likely in emerging adults than in other age groups,[205] and racial/ethnic sleep disparities exist between AAEAs and European American emerging adults.[25,27] African American adults aged 18-30 reported sleeping for 7.0 fewer minutes than their White counterparts.[27,214] Disruption of the circadian rhythm due to the sleep irregularity experienced by many AAEAs in college is associated with an increased risk for diabetes, obesity, and hypertension.[215] Recent trends toward decreased sleep health in the population appear to account for some variances in changing cardiometabolic risk prevalence.[7] Evidence suggests that sleep metrics add independent predictive value to CVD events above the AHA's original Simple 7 CVH metrics.[7] Participants in our study slept less than the recommended 7-9 hours of sleep nightly, with women sleeping about an hour more than men. In AAEA women, perceived stress was significantly associated with insomnia and sleep quality.[27] We noted that the female participants in our qualitative interviews related their lack of sleep to stress.

Sleep was moderately correlated with diet. Poor sleep quality was associated with greater food intake and lower-quality diet, which can increase cardiovascular disease risk.[216] Foods rich in tryptophan or melatonin such as fruits, vegetables, and legumes, can improve sleep quality.[217] Overall sleep quality was associated with consumption of certain nutrients and foods associated with disease risk [216,218] A MEPA diet was associated with better sleep quality, higher sleep efficiency, and fewer sleep disturbances.

Fruit and vegetable consumption also predicted higher sleep efficiency and fewer sleep disturbances, and higher legume intake predicted better sleep efficiency.[219]

Approximately 35% of emerging adult college students are overweight or obese. For AAEAs in college, the percentage rises to 40.[117,220] Another study indicated that AAEAs had overweight/obesity rates that were four percentage points higher than European American students (38.3% and 34.1%, respectively).[156] Likewise, most participants in our study were overweight. Blood pressure and BMI correlation may be associated with insulin resistance and could be targeted for preventing hypertension among populations who were overweight or obesity.[221]

Overall, the lipid measurement in our cohort was within normal limits, with a mean non-HDL of 101.75 (less than the recommended 130 or below range) and the average total cholesterol normal at 155.79, below the two hundred recommended limit. Racial disparities have been noted in college-aged African American females.[222] However, when considering primary causes of elevated non-HDL cholesterol, all causes have been documented in AAEAs (i.e., dietary intake of trans fats, saturated fats, added sugars, and foods with high salt content).[8,9,11,160] The lack of supporting evidence may be due to blood lipid panel changes that occur with accumulated time and are more often measured in adults older than emerging adulthood.[223]

The prevalence of type 2 diabetes in younger people is increasing but has not been well documented in AAEAs.[224] The participants in our study had fasting blood glucose levels below 100. However, when considering risk factors, obesity was a significant predictor of type 2 diabetes.[1] Our participants had a mean BMI of 29.42 and were at

increased risk of developing diabetes. However, lifestyle modifications, particularly weight loss, can decrease the risk of diabetes when BMI is within the normal range.

While not statistically significant, on average, systolic and diastolic blood pressure was higher in males than females (118.60 vs. 113 and 77.2 vs. 70.73, respectively). The clinical significance supports other studies that found AAEA men have higher blood pressure than AAEA women. Hypertension prevalence in AAEAs was 5 percentage points higher than in European American emerging adults.[225,226]

Perceived versus Objective CVD Risk

Inaccuracy in perceived risk hinders the formation of health behavior changes.[227] Our study paralleled existing literature suggesting that most individuals perceive their level of risk as lower than objective risk measures indicate.[228] Most participants in our study perceived their CVD risk as lower than the actual risk. The correlation between CVD risk perception and actual CVD risk was not significant; however, clinical implications were observed. Robinson et al.[3] found that higher risk perception was correlated with greater health responsibility, and low-risk perception was correlated with less health responsibility. Aycock and colleagues[116] found that participants with improved stroke perception accuracy had a greater change in perceived competence to live healthy and a greater increase in dietary components. Identifying the discrepancies between the perceived and objective CVD risks may help researchers and clinicians initiate interventions in this population to reduce the potential adverse events of CVD. Aiding patients to accurately perceive CVD risk may be an impetus to implement changes in CVD prevention behavior.

Participants' Perspective on Actual CVD Risk

Health behaviors in AAEAs are influenced by perceptions of physical and mental health and culture.[61,62] Understanding health behaviors begins with understanding the intentions to perform behaviors and how these intentions are formed. Perceived risk combined with self-efficacy affects behavioral intention and subsequent behavior.[229] Therefore, without the perception of self-risk, there is little motivation for change.

While most participants in our study initially perceived a low CVD risk, learning their actual CVD risk resulted in emotional awareness, planned actions, and personal analysis. Many described their initial thoughts and reactions as "shocked" or "scary." The immediacy of the newly discovered CVD risk prompted a plan to correct this situation by changing lifestyle. Most of them contemplated their situation and began identifying the reasons for CVD risk, as a means of adding perspectives. Many participants recognized the need for lifestyle changes, but few were able to identify specific actions (e.g., exercise and eating better). This lack of specificity may suggest a knowledge deficit related to CVD risk factors and mitigation strategies, or their immediate reaction to learning their results.

Implications for HBCUs

Historically Black Colleges and Universities provide a culturally rich learning environment sought by many AAEAs. Therefore, HBCUs should be integral to preparing AAEAs to prevent CVD. During their transformation into emerging adulthood, young adults are the prime targets of CVD awareness. HBCUs are positioned to help AAEAs understand CVD risks and develop lifelong habits to prevent CVD.

Because AAEAs may perceive their CVD risk as low inaccurately, HBCUs should offer CVD risk assessments. Student health professionals should implement CVD risk screening at Student Health Centers. Students must understand their risks and be informed about the long-term CVD ramifications of current health behaviors to influence changes in health behaviors. Campus-based wellness initiatives should be evidence-based and population-focused. For example, schools could develop a one-credit-hour semester course with weekly Essential 8 modules, healthy eating food selections, cooking demonstrations, exercise competitions, etc. Schools in rural areas could collaborate with local farmers to increase access to healthy fruits and vegetables and integrate a reward system for healthy behaviors. Partnerships with farmers may also provide an opportunity to educate students about farming to grow fruit and vegetables.

Interventions for AAEAs during emerging adulthood may significantly influence future cardiovascular disease outcomes. Sustained CVD awareness with appropriate behavioral changes may decrease CVD health disparities in African American people. Furthermore, emerging adults with sustained changes may implement these measures within their families to improve generational CVD outcomes.

Practice Implications

Individualized assessment is a critical first step in devising clinical care plans to effectively address the CVD risk factors in AAEAs. Using the Essential 8 assessment and providing patients with their CVH scores may be critical initial awareness activities for AAEAs. A thorough assessment may also aid providers in understanding food choices and patients' healthy eating habits.

In addition to assessment strategies to learn about patient risks, practitioners should also provide time to schedule one-on-one counseling and use the results of motivational interviews to facilitate behavioral change. Increasing patient awareness of CVD and its actual risk is a good starting point for preventing CVD in AAEAs. Other strategies suggested by our study may be helpful to providers, including moderate versus vigorous exercise recommendations for AAEA females, educating patients on time management that may promote more sleep and mindfulness to promote sleep quality, and educating patients about the Essential 8 metrics and ways of attaining ratings within the optimal CVH range.

Research Implications

Our study provides new insights for future CVD studies of AAEAs. First, repeating this study with a larger and more generalizable sample could produce more reliable results. Further studies are needed to explore the causal relationships between perceptions and differences by sex. Studies examining why participants had a greater perception of high blood pressure versus heart disease or stroke may provide empirical evidence to better understand CVD risk perception.

Studies should also be designed to explore all the variables of the UPSTREAM CVD theory. This theory includes the interactions of upstream factors (social determinants of health), population factors (physiological, genetic, and behavioral factors), healthcare system factors, behavioral intentions, and nursing activities that influence population outcomes. Empirical evidence is needed to support the relationships between these variables, test the theory's propositions on how they affect population health outcomes, and determine how nurses can optimize care plans using these data.

Limitations

First, we used a small convenience sample. Participants had to leave the campus to have their blood plasma drawn for labs, which may have contributed to lower participation, missing or incomplete data. Although the PI offered transportation through the university, the lack of personal transportation or the inconvenience of leaving the campus was a barrier.

Our study also enrolled a small number of AAEA males. The female-to-male ratio in the study (82.1% to 18.9%) closely represented the university's ratio of 71% to 29%; however, we aimed to closely represent the 50/50 ratio in the U.S. AAEA population of African American people (11.4% and 11.2%, respectively).[83]

Another limitation was that data collection ended because of the university closure for a holiday break, and participants left the university. We also invited participants who were representative of the perceived risk vs objective risk categories, however, participants from each category were not willing to participate in the follow-up interviews and hence, perspectives of persons in each category could not be presented. Despite these limitations, this study contributes to the limited number of studies on CVD in AAEAs enrolled in HBCUs.

CONCLUSIONS

Our findings suggest that receiving information about actual CVD risk compared to perceived risk may motivate behavioral change. In our study, most participants expressed in their interviews that they would make changes. This finding supports that the theoretical concept of perceived risk may be important for behavior change.[36] The notion of perception as a driver of health actions makes this concept of particular

importance to nurses as they attempt to manage health outcomes by encouraging positive actions. Appreciating the uniqueness of an individual's perceptions and understanding how perceptions are formed is critical. Although our sample was small, our results add to the empirical evidence regarding CVD risk perception and the objective CVD risk in AAEAs. These findings may be the basis for future studies involving larger populations in different settings.

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Table 4.1: **Life's Essential 8 Measures**

Domain	CVH Metric	Method of Measurement	Quantification
Health Behaviors	Diet	Self-reported daily intake of the Mediterranean Eating Pattern for Americans	Points / MEPA Score 100 / 15 - 16 80 / 12 - 14 50 / 8 - 11 25 / 4 - 7 0 / 3 or less
	Physical Activity	Self-reported minutes of moderate or vigorous physical activity per week. Metric: Minutes of moderate- (or greater) intensity activity per week Scoring:	Points / Minutes 100 / >/= 150 90 / 120-149 80 / 90-119 60 / 60-89 40 / 30-59 20 / 1-29 0 / 0
	Nicotine exposure	Self-reported use of cigarettes (combustible tobacco) or inhaled nicotine-delivery system (NDS)	Points / Status 100 Never smoked 75 Former smoker, quit ≥5 yrs 50 Former smoker, quit 1 ≤5 yrs 25 Former smoker, quit <1 yrs, or currently using inhaled NDS 0 Current smoker - Subtract 20 points (unless score is 0) for living with active indoor smoker in home
	Sleep Health	Self-reported average hours of sleep per night "On average, how many hours of sleep do you get per night?"	Points / Status (Average Sleep/Night) 100 / 7 ≤9 90 / 9 ≤ 10 70 / 6 ≤ 7 40 / 5 ≤ 6 or ≥ 10 20 / 4 ≤ 5 0 / <4
Health Factors	Body Mass Index (BMI)	Body weight (kilograms) divided by height squared (meters squared).	Points / Level (BMI in kg/m^2) 100 / <25 (ideal 18.5 – 24.9) 70 / 25.0 – 29.9 (overweight) 30 / 30.0 – 34.9 (obese) 15 / 35.0 – 39.9 (obese) 0 / ≥40 (severe obesity)
	Blood Lipids	Plasma total and HDL cholesterol with calculation of non–HDL cholesterol	Points / Level 100 / <130 60 / 130 – 159 40 / 160 - 189 20 / 190 – 219 0 / ≥220

Blood Glucose	Fasting blood glucose (FBG)	Points	Level
		100 and	No history of diabetes FBG <100
		60 –	No diabetes and FBG 100 125
		40	Diabetes w/ HbA1c <7.0
		30	Diabetes w/ HbA1c 7.0–7.9
		20	Diabetes w/ HbA1c 8.0–8.9
		10	Diabetes w/ Hb A1c 9.0–9.9
		0	Diabetes w/ HbA1c ≥10.0
Blood pressure	Appropriately measured systolic and diastolic blood pressure. Tools: Littman Classic III and Graham-Field Labton sphygmomanometer	Points	Level
		100	<120/<80 (optimal)
		75	120–129/<80 (elevated)
		50	130–139 or 80–89 (stage 1 hypertension)
		25	140–159 or 90–99
		0	≥160 or ≥100
		Subtract 20 points if treated level	

Table 4.2 **Summary of Demographic Characteristics**

Sex	**N**	**%**	**Household Size & Income**	**N**	**%**
F	23	82.14	1	2	7.14
M	5	17.86	2	3	10.71
Gender			3	10	35.71
Woman	22	78.57	4	6	21.43
Man	6	21.43	5	4	14.29
Sexual Orientation			6	2	7.14
Gay	0	0	7	1	3.57
Lesbian	1	3.6	8	0	0
Heterosexual	23	82.1	Less than $25,000	7	25
Bisexual	4	14.3	$25,001 to $75,000	9	32.14
Residence Location			$75,001 to $100,000	5	17.86
S.C.	15	60	$100,001 to $150,000	1	3.57
Other Southeastern state	4	16	$150,001 to $200,000	2	7.14
State other than southeastern	6	24	$300,001 to $400,000	1	3.57
Birthplace			More than $400,000	0	0
In the U.S.	25	89.29	I do not know	3	10.71
Outside the U.S. - (U.S. Territory (e.g., Puerto Rico, U.S. Virgin Islands, Guam)	3	10.71			
Employment			**Insurance Coverage (n=27)**		
Working	13	46.43	Employer Coverage (Including parental coverage)	11	40.74
Unemployed, Seeking Employment	3	10.71			
Unemployed, not seeking employment	12	42.86	Insurance Company (including exchange or marketplace)	6	22.22
College Class					
Freshman	8	28.57	Medicaid	5	18.52
Sophomore	6	21.43	Tricare	1	3.7
Junior	7	25	Other	1	3.7
Senior	7	25	No Health Insurance	3	11

Table 4.3 - CVD Risk Perception [Average (avg) – n (%)]

Risk Perception Prompt	Much Below Avg (-3)	Moderately Below Avg (-2)	Slightly Below Avg (-1)	Avg (0)	Slightly Above Avg (+1)	Moderately Above Avg (+2)	Much Above Avg (+3)
If I compare myself with others my age and gender, I estimate the likelihood of experiencing heart disease is	9 (32.14)	5 (17.86)	2 (7.14)	7 (25.0)	4 (14.29)	0	1 (3.57)
If I compare myself with others my age and gender, I estimate the likelihood of experiencing high blood pressure is	7 (25.0)	4 (14.29)	2 (7.14)	7 (25.0)	5 (17.86)	1 (3.57)	2 (7.14)
If I compare myself with others my age and gender, I estimate the likelihood of experiencing a stroke is	9 (32.14)	3 (10.71)	3 (10.71)	10 (35.71)	2 (7.14)	0	1 (3.57)

Table 4.4 **- Essential 8 CVH Components Descriptive Statistics**

Component	Mean	SD	Min	Max
MEPA Diet Score	32.32	18.285	0	80.00
Physical Activity Score	37.86	26.30	0	100.00
Physical Activity in Minutes (Moderate)	114.5	118.47	0	500.00
Physical Activity in Minutes (Vigorous)	32.46	44.55	0	180.00
Nicotine Exposure Score	92.86	26.23	0	100.00
Sleep Health Score	72.50	31.46	0	100.00
Sleep Average Hours	6.04	1.75	0	8.00
Body Mass Index	29.50	9.30	17.58	46.96
BMI Score	59.63	41.69	0	100.00
Blood Lipids Score	98.62	7.43	60	100.00
Total Cholesterol (mg/dL)	155.79	18.52	120.00	202.00
HDL-Cholesterol (mg/dL)	54.04	12.43	38.00	82.00
LDL Cholesterol (mg/dL)	89.50	19.71	61.00	137.00
Non-HDL Cholesterol (mg/dL)	100.5	20.72	67.00	148.00
Blood Glucose Score	100.00	0	0	100.00
Blood Glucose	85.89	6.39	74.00	97.00
Blood Pressure Score	88.89	20.02	50.00	100.00
Systolic	114.04	13.02	90.00	138.00
Diastolic	71.93	9.44	50.00	86.00
Total CVH Score	66.43	9.84	44.38	80.63

Table 4.5 – **MEPA Variables Correlations**

Variables	*r*	*P* value
Beans and Grains	0.66	0.00
Beans and Fast food	0.34	0.04
Berries and Nuts	0.41	0.03
Blood pressure and AHA heart score	0.61	0.00
BMI and Blood pressure	0.70	<.001
BMI and AHA heart score	0.70	<.001
Fast food and Butter	0.63	0.00
Fish and Nuts	0.45	0.02
Fruit and Olive Oil	0.62	0.00
Grains and Fast food	0.63	0.00
Green leafy and other vegetables	0.66	0.00
Meat and Sweets	0.55	0.00
Meat and Fast food	0.49	0.01
MEPA and Diet	0.69	<.001
Nuts and Beans	0.63	0.00
Physical Activity and AHA heart score	0.45	0.02
Sleep and Diet	0.46	0.01
Sleep and AHA heart score	0.52	0.00
Sweets and Olive Oil	-0.61	0.00
Sweets and Cheese	0.74	<.001
Total Cholesterol and LDL Cholesterol	-0.77	<.001

Table 4.6. **Regression Model for CVH**

Variables	Parameter	Standard Error	*P* value
Intercept	51.98074	14.35	0.0015
Sex	0.65704	5.50	0.9060
State	1.26701	4.47	0.7794
Average of CVD risk perception	-1.02381	1.32	0.4448
Mediterranean Eating Pattern for Americans	0.59593	1.06	0.5788

Note: R-square = 0.0990

Table 4.7: **Mediterranean Eating Pattern for Americans Criteria and Descriptive Statistics**

Screener Item	Question	Scoring Criteria (1 point per met criteria*)	Mean	SD
Olive oil	How many cups of vegetables do you eat in an average day?	>2 servings of olive oil per day	2.87	4.33
Green leafy vegetables	How many servings of green leafy vegetables do you consume per day?	>7 servings of green leafy vegetables per week	1.22	1.48
Other vegetables	How many servings of other vegetables do you consume per day?	>2 servings of other leafy vegetables per day	1.44	1.67
Berries	How many servings of berries do you consume per week?	>2 servings of berries per week	1.20	1.70
Other fruit	How many servings of other fruit do you consume per week?	>1 serving of other fruit per day	2.57	3.21
Meat	How many servings of red meat, hamburger, bacon, or sausage do you consume per week?	<3 servings of red meat, hamburger, bacon, or sausage per week	2.93	2.4
Fish	How many servings of fish or shellfish/seafood do you consume per week?	>1 serving of fish per week <5 servings of chicken per week	1.48	1.45
Chicken	How many servings of chicken do you consume per week?	<5 servings of chicken per week	4.22	2.87
Cheese	How many servings of full fat or regular cheese or cream cheese do you consume per week?	<4 servings of full fat or regular cheese or cream cheese per week	1.94	2.34
Butter/cream	How many servings of butter or cream do you consume per week?	<5 servings of butter or cream per week	1.94	2.84
Beans	How many servings of beans do you consume per week?	>3 servings of beans per week	1.44	1.76
Whole grains	How many servings of whole grains do you consume per day?	>3 servings of whole grains per day	2.22	2.33
Sweets and Pastries	How many servings of commercial sweets, candy bars, pastries, cookies, or cakes do you consume per week?	<4 servings of commercial sweets, candy bars, pastries, cookies, or cakes per week	4.00	3.79

Nuts	How many servings of nuts do you consume per week?	>4 servings of nuts per week	0.78	1.60
Fast Food	How many times per week do you consume meals from fast food restaurants?	< 1 meal at a fast-food restaurant per week	2.56	2.21
Alcohol	How much alcohol do you drink per week?	>0 or <2 servings of alcohol per day for men and >0 or <1 servings of alcohol per day for women.	0.48	1.25

*Score calculated by dividing total available points by total points earned (ex. 15 met divided by 16 = 93.75)

Table 4.8 **Cardiovascular Risk Perception compared to CVD Risk**

CVD Risk

CVD Risk Perception	Low	Moderate	High	Total
Low	4 (14.3%)	11 (39.3%)	1 (3.6%)	16 (57.1%)
Avg	3 (10.7%)	3 (10.7%)	0	6 (21.4%)
High	1 (3.6%)	5 (17.9%)	0	6 (21.4%)
Total	8 (28.6)	19 (67.9%)	1 (3.57%)	28 (100%)

CVD Risk

CVD Risk Perception

Table 4.9 Purposeful Selection of Participants for Qualitative Phase

CVD Risk Perception Vs Risk Category	**% (n=28)**	**% (n=16)**
Perceived low risk vs low CVD risk	14.3	6.3
Perceived low risk vs moderate CVD risk	39.3	39.3
Perceived low risk vs high CVD risk	3.6	0*
Perceived average risk vs low CVD risk	10.7	12.5
Perceived average risk vs moderate CVD risk,	10.7	12.5
Perceived high risk vs low CVD risk	3.6	6.3
Perceived high risk vs moderate CVD risk	17.9	18.8

*Participant invited but declined follow up interview

Table 4.10 **Correlation of Risk Perception with LE8 Categories**

	N	M	SD	1	2	3	4	5	6	7	8	9	10
1. Risk Perception	28	-0.96	1.6										
2. Age	28	20.9	1.4	0.077									
				0.696									
3. Diet	28	32.3	18.3	0.175	-.477*								
				0.374	0.010								
4. Physical Activity	28	37.9	26.3	-0.142	-0.152	-0.043							
				0.472	0.439	0.827							
5. Nicotine Exposure	28	92.9	26.2	-0.138	-.622**	0.306	0.192						
				0.485	0.000	0.113	0.328						
6. Sleep	28	72.5	31.5	-0.083	0.340	-.461*	0.114	-0.112					
				0.673	0.077	0.013	0.563	0.570					
7. BMI	27	59.6	41.7	-0.079	-0.124	0.107	0.072	-0.279	0.182				
				0.694	0.538	0.596	0.723	0.159	0.365				
8. Non-HDL Cholesterol	28	98.6	7.4	-0.032	.501**	-0.298	-0.058	-0.110	.416*	-0.115			
				0.871	0.007	0.124	0.768	0.578	0.028	0.569			
9. Blood Pressure	27	88.9	20.0	-0.277	0.021	-0.152	0.060	-0.160	0.149	.703**	0.029		
				0.162	0.916	0.448	0.767	0.425	0.459	0.000	0.888		
10. CVH Score	28	71.96	10.1	-0.201	-0.149	0.067	.459*	0.204	.529**	.678**	0.264	.602**	
				0.305	0.449	0.736	0.014	0.298	0.004	0.000	0.175	0.001	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Glucose not included because all scores were 100

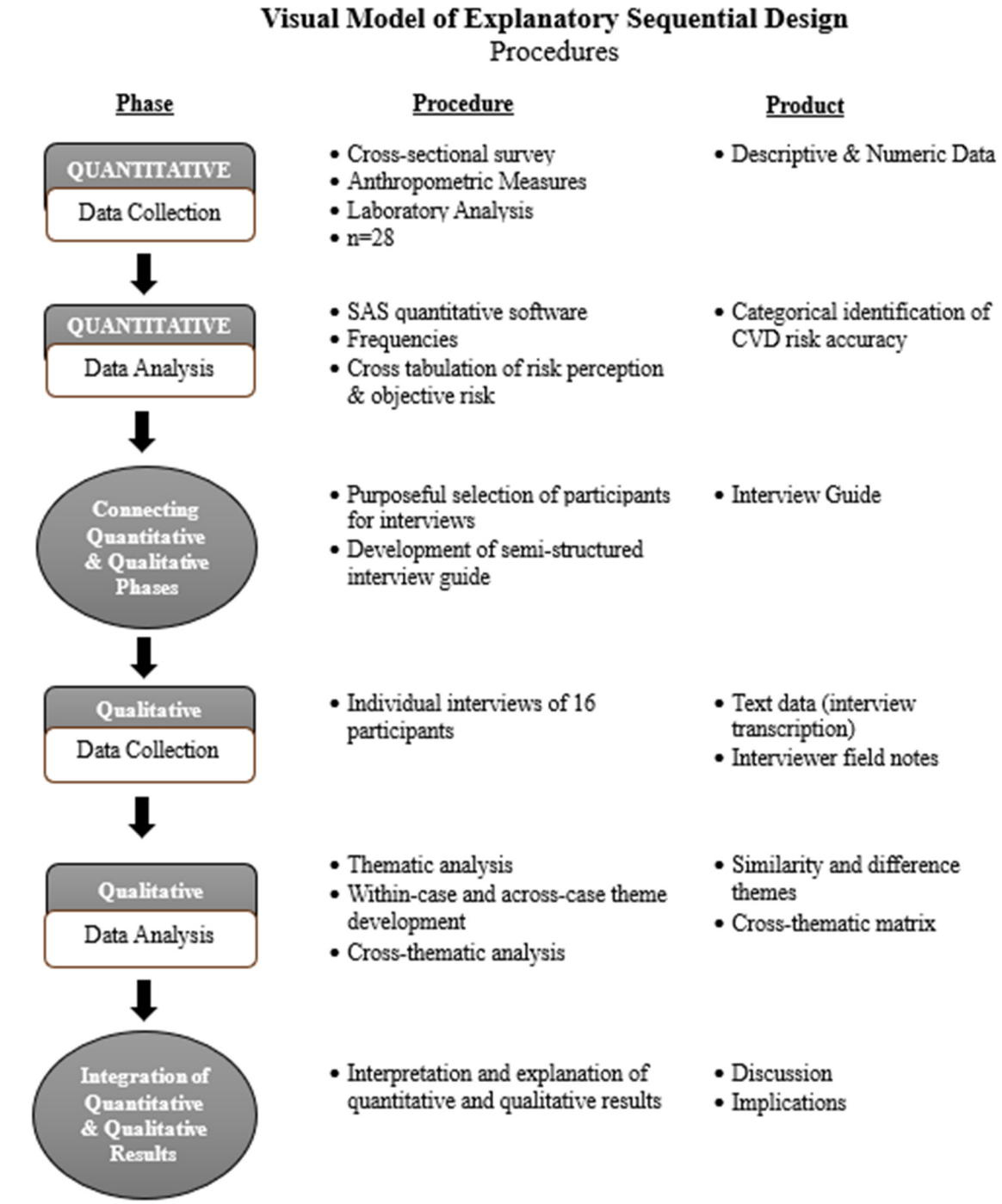
Visual Model of Explanatory Sequential Design
Procedures
Phase
Procedure
Product
QUANTITATIVE
Data Collection
• Cross-sectional survey
• Anthropometric Measures
• Laboratory Analysis
• n=28
• Descriptive & Numeric Data
QUANTITATIVE
Data Analysis
• SAS quantitative software
• Frequencies
• Cross tabulation of risk perception & objective risk
• Categorical identification of CVD risk accuracy
Connecting Quantitative & Qualitative Phases
• Purposeful selection of participants for interviews
• Development of semi-structured interview guide
• Interview Guide
Qualitative
Data Collection
• Individual interviews of 16 participants
• Text data (interview transcription)
• Interviewer field notes
Qualitative
Data Analysis
• Thematic analysis
• Within-case and across-case theme development
• Cross-thematic analysis
• Similarity and difference themes
• Cross-thematic matrix
Integration of Quantitative & Qualitative Results
• Interpretation and explanation of quantitative and qualitative results
• Discussion
• Implications

Figure 4.1

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This study, guided by the Unlocking Population-Specific Treatments to Render Equitable Approaches and Management in Cardiovascular Disease (UPSTREAM CVD) situation-specific theory (SST), is embedded in the investigation of factors that impact cardiovascular health (CVH) in African American emerging adults (AAEAs). We stress the role of multiple factors that influence AAEA's CVD outcomes. The findings from this study add to our understanding of the presence and associations of CVD-related upstream and population factors, and the accuracy of perceived CVD risk in AAEAs.

Upstream Factors

Upstream factors are conditions related to social and structural determinants of health (economic, social, educational, and physical health) that exists in communities where people live and affect patient behaviors (i.e., smoking, diet choices, violence, low PA, and substance use).[143] The physical environment (air quality, weather conditions, food access, environmental hazards, neighborhood crime, household roster, and social support) are also upstream factors.[129]

We developed the UPSTREAM CVD SST to guide nursing research, clinical practice, and preventive interventions for AAEAs. The theory's proposition for upstream factors or social determinants of health includes the complexity of interactions between socioeconomic and physical environments, and that these factors may influence health perceptions and behaviors.

Most participants in our study had a combination of adverse individual upstream and population factors (e.g., family incomes of less than $75,000 annually, job insecurity, food insecurity, experiences of prejudice, stereotyping, and discrimination, lack of access to health services, and low CVH scores, etc.). Additionally, the EPA's EJ statistics on the

socioeconomic and physical environments where our participants lived reflected the social and structural barriers to CVH. In our study, communities with greater percentages of AAP had disparities in socioeconomic status (i.e., more household incomes <$15,000, and fewer >$75,000; fewer college graduates and greater percentages of people who did not complete high school) and access to resources (i.e., food desserts, lack of money to pay for food).

The significant correlations in the EJ data may be contributed to the large database available through the EPA compared to our small convenience sample. However, these environmental findings demonstrate an important part of the lived experiences for the study participants and may have further relevance. Though their educational attainment will be higher after completing college, some may return to these same communities to live. Educational attainment modifies the relationship between race and CVH, however in AAP, education does not overcome the impact of race.[75] It is therefore, important to understand all the influences for AAEAs.

Although there was no significant correlation in our study, perhaps due to limitations, the association between socioeconomic status and CVH has been established in other studies.[1,7,70] Upstream interventions that address upstream factors are needed in addition to population-level CVD risk prevention strategies. Until large-scale interventions are achieved, assessments of the social and structural determinants of health in AAEAs will better inform nursing activities aimed at reducing CVD risk.

Population Factors

Population factors include physiological factors, genetics, behavioral factors, resilience, and health state.[128] Our population of 18–25-year-old emerging adults had

lower CVH scores in seven of the eight categories than AAEAs in a large sample of emerging adults.[5] Most participants had normal BP, blood glucose and non-HDL cholesterol levels, and nicotine exposure was low in the cohort. However, the BMI was elevated in most patients. Additionally, health behaviors (appropriate dietary selection, adequate PA, and sufficient sleep hours) were subpar for most participants. The participants also did not possess adequate knowledge of CVH to integrate appropriate health behavior changes. The participants' CVH scores did not correlate with upstream factors; however, these structural and systemic barriers may influence AAEA's future CVD morbidity and mortality. Further research is needed to better understand the mechanisms of adverse biologic sequelae of structural inequalities, long-standing discrimination, and adverse social and environmental conditions to identify key biologic markers associated with SDOH that may serve as effective CVD risk prediction tools and interventions to reduce CVD risk.[230] Significant progress in AAEA CVH must include a comprehensive strategy to help AAEAs understand their CVD risk and actions they can implement to improve CVH.[129]

Perceived CVD Risk Accuracy

Health perceptions are subjective ratings by the affected person(s) regarding their health status, which influences the rationalization of and motivation for health behavior changes. Our findings suggest that receiving information about objective CVD risk compared to perceived risk may motivate behavioral change. Most participants learning their objective risk experienced emotional awareness, reflected a personal analysis of their results, and communicated planned actions they would take. This finding supports the theoretical concept of perceived risk, which may be important for behavior change.[36]

Higher risk perception equated to greater health responsibility.[62] Likewise, low risk perception was correlated with less health responsibility.[63] The notion of perception as a driver of health actions makes this concept of particular importance to nurses as they attempt to manage health outcomes by promoting positive health behaviors. Appreciating the uniqueness of an individual's perceptions and understanding how perceptions are formed is critical.

Implications for Nursing Research

Researchers can use UPSTREAM CVD to guide the development of studies on CVD risk in AAEAs by targeting factors in multiple dimensions of this theory. Research could begin by repeating this study with a larger, more generalizable sample, which may aid researchers in gaining further insight into preventing CVD in AAEAs.

Additionally, studies are needed that explore the chronic effects of structural determinants of health from the participants' point of view. For example, The Centers for Disease Control and Prevention and the World Health Organization define SDOH as the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality of life outcomes and risks, [231,232]however, key social processes, such as stigmatization, discrimination, and marginalization, that facilitate social exclusion in vulnerable populations are not emphasized. The everyday experience of othering stems from structural determinants that influence social risk, and the chronic effects of these experiences influence human biology and subsequent cardiovascular disease (CVD) outcomes through psychosocial and environmental stressors.[92] Studies should seek evidence to expand the definition of

SDOH that greater dissemination of the full scope of determinants can be integrated into healthcare systems.

Studies should also be designed to explore all the variables of the UPSTREAM CVD theory. This theory includes the interactions of upstream factors (social determinants of health), population factors (physiological, genetic, and behavioral factors), healthcare system factors, behavioral intentions, and nursing activities that influence population outcomes. Empirical evidence is needed to support the relationships between these variables, test the theory's propositions on how they affect population health outcomes, and determine how nurses can optimize care plans using these data.

Further research using the UPSTREAM CVD situation-specific theory to explore the relationships among upstream factors, population factors, behavioral intention, healthcare factors, and nursing activities is needed. Studies should also explore the efficacy of CVD prevention strategies for AAEAs designed using this theory.

Implications for Nursing Education

Nursing schools teach future nurses how to complete and apply the nursing process. The UPSTREAM CVD SST emphasizes the importance of nursing assessment of multifactorial constructs that influence cardiovascular health outcomes in AAEAs. Nursing schools should teach students how to integrate UPSTREAM CVD SST into their population assessments and develop patient center plans of care. The faculty should stress that the constructs in the theory may be dynamic, and continuous assessment is, therefore, a relevant nursing activity. Most importantly, UPSTREAM CVD should guide faculty teaching that no population has textbook solutions; therefore, critical thinking for which nurses are well known should be implemented with all populations to devise the

best approaches and management for patients. Lastly, nursing students should be taught that heart disease is not just about the heart, but that upstream, population, and healthcare system factors and how people process related experiences to form health behaviors, influence health outcomes. Nursing is uniquely positioned to develop multilevel plans of care to engage AAEAs in planning life-long prevention strategies.

Implications for Nursing Practice

The UPSTREAM CVD SST can help guide clinical practice and preventive interventions for AAEAs. In contrast to grand or mid-range theories, the UPSTREAM CVD SST can be easily applied to nursing practice. Individualized assessment is critical step in effectively devising clinical care plans to address the CVD risk factors in AAEAs. Using the AHA LE8 assessment and providing patients with CVH scores may be a significant initial awareness activity for some AAEAs. Increasing patient awareness regarding CVD risk is a good starting point for CVD prevention. Awareness may change CVD risk perception or susceptibility. Individuals are more likely to engage in health-related behavior if they perceive they are at risk or susceptible to developing a negative health condition.[212] In an exploration of the perceived risk of CVD and health behavior, Robinson et al.[62]found that AAEAs at an HBCU who had higher risk perception also had greater health responsibility.[62] Likewise, low risk perception was correlated with less health responsibility.[62]

A key element of the theory is to engage AAEAs in deciding which strategies to implement and mobilize culturally appropriate resources (e.g., family, friends, or religious beliefs). Additionally, given that emerging adults are in Erikson's of intimacy versus isolation, nurses should ascertain positive social norms that exist for the patient

and integrate suggest activities that may capitalize on the relationships (i.e., competitions such as group exercise or weight loss challenges, or ways of seeking support in social circles), Tailoring nursing interventions with input from AAEAs can improve engagement and adherence.

Community engagement and neighborhood social cohesion may also be important targets for promotion of healthy behaviors and cardiovascular disease prevention.[233] Recommendations included having extended, more in-depth sessions, targeting the younger generation, smaller cohort sizes, and more community-based health programming. Community-engaged health promotion using a cohort model can be effective in increasing knowledge, enhancing self-efficacy, and providing much-needed social support.[234,235] These can influence health-related behaviors and thus contribute to improving health outcomes.[235] Community health education and promotion programs that increase awareness about the risk associated with overweight, and improve the motivation for PA and maintenance of optimal body weight are needed.[236]

Implication for Policy

The social determinants of health are systemic, population-based, cyclical, and intergenerational, requiring extension beyond healthcare solutions to multi-sector and multi-policy approaches to achieve future population health improvements.[102] Public policy advocacy is necessary to improve upstream and population factors. Nurses can advocate for socio-ecological changes at the federal, state, and local levels. National advocacy campaigns might include improving nutrition standards and healthy school meals, investment in transportation infrastructure, or affordable, equitable, and adequate access to health insurance. On the state level, nurses may advocate for Medicaid

expansion and coverage programs (i.e., self-measurement of blood pressure or telehealth expansion). At the local level, increasing access to care early, providing education, or implementing sugar-sweetened beverage taxes are viable options.

There is also a need to reform structural racism factors such as laws, policies, and practices that were borne out of a history of discrimination and are now embedded within economic, cultural, and societal norms.[101] Policies are needed that support access to quality and equitable health care early, education, and affordable housing. Discriminatory practices that deny access to quality neighborhoods perpetuates health disparities because residential segregation has been shown to reduce employment opportunities and economic status, restrict access to quality education, and increase levels of neighborhood violence, crime, and poverty.[103] Ideally, each nurse should see a niche and advocate for equity in socioeconomic, physical environment, population, and healthcare system factors.

Implication for HBCUs

Historically Black Colleges and Universities provide a culturally rich learning environment sought by many AAEAs. Additionally, HBCUs have already enacted a strong mission to educate the underserved population. Therefore, HBCUs should be integral to preparing AAEAs to prevent CVD. During their transformation into emerging adulthood, young adults are the prime targets of CVD awareness. HBCUs are positioned to help AAEAs understand CVD risks and develop lifelong habits to prevent CVD.

School-based programs, such as health education and screening designed to promote positive CVH behaviors, retain their influence after emerging adults leave college. Student health professionals should implement CVD risk screening at Student

Health Centers to aid students' understanding of their objective CVD risk and the long-term CVD ramifications of current health behaviors. Including such activities as a normal part of campus-life may help AAEAs adopt the behaviors.

Future Research Directions

To include the multiple levels of influence purported in the UPSTREAM CVD SST, future research plans include an examination of the other factors (healthcare, behavioral intention [attitudes, social norms, and perceived behavioral control] related CVD) and nursing interventions (integrating population ideas about what activities they believe will be helpful in decreasing CVD). Engaging AAEAs from diverse settings (HBCUs, technical colleges, majority universities, and communities) to devise mitigation strategies for prevention programs is another future research direction. It may also be important to explore UPSTREAM CVD SST to younger populations such as those in high school. Finally, collaboratively developing and implementing AAEA-centered intervention(s) focused on upstream prevention is a priority.

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APPENDIX A

QUANTITATIVE MEASURES, PROMPTS, AND SOURCES FOR UPSTREAM AND POPULATION FACTORS

Table A.1 **Quantitative Measures, Prompts, and Source for Upstream and Population Factors**

Measures	Prompt	Source
Upstream Factors – Socioeconomic Environment		
Demographic Data	Race/ethnicity, address, birthdate, biological sex assigned at birth, self-identified gender and sexual orientation, marital status, ancestral origin (place of birth, birthplace of parents and grandparents), and residence where participant lived for three months or longer	P11901, p10801, P10101, P11801, P11701, P11601, P10903, P10201, P10201, P10301, P10401, P60301 (PhenX protocol)
Household Income	"What is your best estimate of the total income of all family members from all sources, before taxes, in the last calendar year? When answering this question, please remember to include your income PLUS the income of all family members living in this household." Income ranges provided for participant selection were 1) less than $25,000, 2) $25,001 to $75,000, 3) 75,001 to $100,000, 4) $100,001 to $150,000, 5) $200,001 to $300,000, 7) $300,001 to $400,00, and 9) I do not know.	P11102
Educational Attainment - Individual	Individual educational attainment was recorded using participant-identified college classification.	P11002
Food insecurity	To determine food security, participants selected among the following choices based on the last 12 months: 1) the food they bought did not last, and they did not have money to get more; 2) they could not afford to eat balanced meals; 3) they or other adults in their household cut the size of meals or skip meals because there was not enough money for food; 4) they ate less than they felt they should because there was not enough money to buy food; and 5) they were ever hungry but did not eat because they could not afford enough food. They could also respond to how often the issue occurred. Participants were also asked if they had received the Supplemental Nutrition Assistance Program (SNAP), Medicaid, Women Infants and Children (WIC) assistance, supplemental security income (SSI), Federal Public Housing Assistance, or Pell Grant this year.	P270301
Employment Status	Selection of full-time, part-time, or unemployed by choice.	P11301

Job Insecurity	Job security was measured by asking participants if they were currently working, unemployed, and looking for work, not working, and not looking for work. Using branching logic, employed participants were asked how easy it would be to find a job with another employer with about the same income and fringe benefits. Participants were then asked to consider the next 12 months and answer how likely they thought they would lose their jobs or be laid off (*very likely, fairly likely, not too likely,* or *not at all likely*).	P280301
Health Insurance Coverage	Health insurance coverage was assessed by asking participants if they were covered by insurance through a current or former employer or union (including theirs or another family member's), insurance purchased directly from an insurance company, Medicare, Medicaid, Medical Assistance, the Children's Health Insurance Program, or any state- or government-sponsored assistance plan based on income or disability, Tricare or other military health care, Indian Health Service, or any other type of health insurance coverage or health coverage plan. If participants reported health insurance, a text box was provided to describe their coverage.	PX011502
Access to Health Services	Participants were asked how long it had been since they saw a healthcare professional and whether the visit was a wellness, physical, or general-purpose checkup. Participants were also asked if when they were sick and needed care, whether they used a doctor's office or health center, walk-in clinic, urgent care center, a retail clinic in a pharmacy or grocery store, emergency room, VA medical center or VA outpatient clinic, and some other place. They were also prompted to provide information on the number of times they had visited these facilities in the last 12 months. Finally, participants were asked if they had been hospitalized overnight in the last 12 months, delayed getting medical care because of the cost, or needed medical care but did not get it because of the cost.	P270101
Access to Health Technology	For the health technology assessment, participants were asked if they had used their tablet or smartphone to 1) track progress on a health-related goal (i.e., quitting smoking, losing weight, or increasing physical activity), 2) help them decide how to treat an illness or condition, or 3) help them in discussions with their healthcare provider. Participants were asked if they used other devices, such as Fitbit, blood glucose meter, or blood pressure monitors, and whether any of these devices had been used to share information with health professionals in the last 12 months. Other assessed technologies included viewing health information on social networking sites, participating in online forums or support groups, sending a text message to a health care provider, and viewing health-related videos online or on YouTube. Finally, participants were asked if their health care providers	PX280401

	used electronic medical records and provided their confidence level in the security of their health information.	
Perception of prejudice, stereotyping, or discrimination	Seventeen scenarios were used to rate the participants' perceptions of prejudice, stereotyping, and discrimination. For each item, participants were asked how often (almost daily, at least once a week, a few times a year, less than once a year, or never) and what they believed the main reason for the experience was (their ancestry or national origin, gender, race, age, religion, height, weight, some other aspects of their physical appearance, sexual orientation, education or income level, physical disability, shade of skin color, tribe, or other). Prompts asked participants whether they believe that they 1) would have received better medical care if they belonged to a different race or ethnic group, 2) had ever been unfairly fired , 3) were hired for a job for unfair reasons, 4) were unfairly denied a promotion, 5) were unfairly stopped, searched, questioned, physically threatened or been abused by the police, 6) were unfairly discouraged by a teacher or advisor from continuing your education, 7) were unfairly prevented from moving into a neighborhood because the landlord or a realtor refused to sell or rent you a house or apartment, 8) moved into a neighborhood where neighbors made life difficult for you or your family, 9) were unfairly denied a bank loan, 10) received service from someone such as a plumber or ca mechanic that was worse than what other people get, 11) were treated with less courtesy than other people are, 12) were treated with less respect than other people are, 13) received poorer service than other people at restaurants or stores, 14) had a time where people act as if they think you are not smart., 15) had people act as if they think you are dishonest, 16) had people act as if they are better than they are, 16) were called names or insulted, or 17) were followed around in stores.	P280101
Upstream Factors – Physical Environment		
Population in Census Track	The total population for a group block was based on American community survey data.[136]	EJ Screen
Percentage of African American People	The EJ Screen Census summary report was used to collect the percentage of African American people in the group block.	EJ Screen

Air Quality	Air quality was measured using particulate matter (PM 2.5) and ozone levels. The PM 2.5 standard for a long-term standard (annual average) was 12 μg per cubic meter of air ($\mu g/m^3$), and the ozone standard was 70 parts per billion (ppb).[237]	EJ Screen
Lead Exposure	The EPA estimates lead levels based on the percentage of homes in a community built before 1960. Pre-1960 construction did not confirm lead but signified the need to verify lead levels. Lead levels above 10 μg in dust per square foot for floor dust and 100 $\mu g/ft^2$ were EPA-established thresholds.	EJ Screen
Crime – Home Security	Crime data were generated using participants' zip codes through CrimeGrade.org, which uses a complex process of statistical computation and machine learning to find the safest and most dangerous areas. Crime is reported as the average time between crime occurrences per capita.	CrimeGrade.org
Food Security	Low food access was measured using metrics from the U.S. Department of Agriculture (USDA) metrics. The USDA identifies low access to food stores by the number (at least 500) and share (at least 33 percent) of people at different distances from the nearest supermarket, supercenter, or large grocery store, as well as the number of housing units in the area without access to a vehicle, which is more than one-half miles from one of these stores [79]. A one-mile radius (block group) of the participants' home addresses was used as the data point.	P290501
Educational Attainment - Community	Community (identifies percentage of people with a college degree living in a geographic area). The college attainment statistic was measured as the percentage of people in a block group with at least a bachelor's degree.[136]	P290301, EJ Screen
High School Incompletion Rates	The percentage of people aged 25 years or older in a block group whose education is short of a high school diploma was used to identify high school incompletion rates. [136]	EJ Screen
Unemployment Rates	The unemployment rate was determined by the percentage of a block group's population that did not have a job at all during the reporting period, made at least one specific active effort to find a job during the previous four weeks, and was available for work (unless temporarily ill).[136]	EJ Screen
Income ranges	Household income was determined by the number of households in a block group with income within the following ranges: less than $15,000, $15,001 –$25,000, $25,001–$50,000, $50,001–$75,000, and over $75,000 per year.[136]	P29201, EJ Screen

Low-Income	Low-income was considered the percentage of a block group's population in households where the household income is less than or equal to twice the federal poverty level.[136]	EJ Screen
Percentage of low life expectancy	Life expectancy data were retrieved using the EJ Screen tool. This is based on the average life expectancy at the track level. The data were developed as a collaboration between the National Center for Health Statistics, the National Association for Public Health Statistics and Information Systems, and the Robert Wood Johnson Foundation.[136]	EJ Screen
Supplemental Demographic Index	The supplemental demographic index (SDI), or community-level vulnerability, is based on percentages of low-income (households with incomes less than or equal to twice the poverty level), unemployed, limited English speaking (households in which no one aged 14 and over speak only English), high school non-graduates, and low life expectancy [136]. The SDI offers a different perspective on community-level vulnerability to display areas with the highest intersection between socioeconomic factors and environmental indicators.[136]	EJ Screen
Household Roster	Roster-Relationships (list of all living in home and relationship).	P11402
Social Support	Participants were asked to identify people in their circle who could help them achieve their heart health goals. Social support was also assessed using the PhenX social media question which asks participants if they used the internet to connect with other people online through social networks like Facebook or Twitter.	P280401 and direct query
Population Factors		
	Health State	
Body Mass Index (Height & Weight)	Height and weight were measured to calculate BMI with participants' shoes removed using an Adam MDW – 250 L electric scale. Height was measured to the nearest inch, and weight to the nearest 0.01 pound. Points — Level (BMI in kg/m^2) 100 — <25 (ideal 18.5 – 24.9) 70 — 25.0 – 29.9 (overweight) 30 — 30.0 – 34.9 (obese) 15 — 35.0 – 39.9 (obese) 0 — ≥40 (severe obesity)	LE8 [7]

Blood Glucose	Fasting blood glucose levels were measured in a national laboratory. Points for blood glucose were rated based on laboratory values and whether the participant had a history of diabetes. Points Level 100 No history of diabetes and FBG <100 60 No diabetes and FBG 100 – 125 40 Diabetes w/ HbA1c <7.0 30 Diabetes w/ HbA1c 7.0–7.9 20 Diabetes w/ HbA1c 8.0–8.9 10 Diabetes w/ Hb A1c 9.0–9.9 0 Diabetes w/ HbA1c ≥10.0	LE8 [7]
Blood Lipids	Blood lipid levels were measured in a national laboratory. The high-density lipoprotein (HDL) level was subtracted from the total cholesterol level to calculate the non-high-density lipoprotein (non-HDL) level. Point values were given based on non-HDL levels, ranging from less than 130 (preferred) to ≥ 220. Points Level 100 <130 60 130 – 159 40 160 - 189 20 190 – 219 0 ≥220	LE8 [7]
Blood Pressure	The participants were seated in a quiet room for blood pressure measurements. A Graham-Field Labton aneroid sphygmomanometer and Littman Classic III stethoscope were used to assess the blood pressure in the right arm using the auscultatory method. The normal blood pressure was less than 120/80 mmHg. Blood pressure and BMI were measured by a research assistant or the first author. Points Level 100 <120/<80 (optimal) 75 120–129/<80 (elevated) 50 130–139 or 80–89 (stage 1	LE8 [7]

		hypertension) 25 140–159 or 90–99 0 ≥160 or ≥100 Subtract 20 points if treated level.	
	CVD Knowledge	The CVD knowledge questionnaire (Cronbach's α =.72) contained 29 multiple-choice questions (5.1 Flesch-Kincaid Grade level) with content areas including exercise, weight loss, nutrition, hypertension, smoking, diabetes, and cholesterol (4 or more questions each area) [137]. Scores were generated based on 0-100% of correct answers. The questionnaire contained four questions assessing knowledge of cholesterol, four on weight management, four on physical activity, four on blood pressure, and five on nutrition. The CVD knowledge questions were administered after the CVD risk and health behavior questions to avoid influencing the participants' risk perception or health behavior responses. The total number of correct answers was divided by 29 (total questions) and multiplied by 100 to calculate the CVD knowledge score.	Homko et al. [137]
		Health Behaviors	
	Diet	Diet was measured using the 16-item Mediterranean Eating Pattern for Americans (MEPA) was positively associated with healthy nutrient intake [238]. The MEPA measures the self-reported intake of fruits, vegetables, fish, meat, dairy, nuts, and whole grains (Appendix C). In addition, MEPA includes the consumption of fast food and alcohol. Participants received one point for each criterion met, and their total score was calculated by dividing the points earned by 16 (total available points) to determine the percentage. Points MEPA Score 100 15 - 16 80 12 - 14 50 8 - 11 25 4 - 7 0 3 or less	LE8 [7]
	Physical Activity	Points Minutes 100 >/= 150 90 120-149 80 90-119	LE8 [7]

	60 60-89 40 30-59 20 1-29 0 0	
Nicotine Exposure	Nicotine exposure was the self-reported use of cigarettes or nicotine delivery systems such as vaping. Points were earned based on whether the participant never smoked, was a former smoker, quit from less than one year to more than five years, or was a current smoker. Points Status 100 Never smoked 75 Former smoker, quit ≥5 yrs 50 Former smoker, quit 1 ≤5 yrs 25 Former smoker, quit <1 yrs, or currently using inhaled NDS 1 Current smoker - Subtract 20 points (unless score is 0) for living with active indoor smoker in home.	LE8 [7]
Sleep Health	The participants self-reported sleep hours as the total sleep they achieved nightly. Points were allocated based on whether the participant obtained the ideal seven to nine hours of sleep nightly. Points Status (Average Hours of Sleep/Night) 100 7 ≤9 90 9 ≤ 10 70 6 ≤ 7 40 5 ≤ 6 or ≥ 10 20 4 ≤ 5 0 <4	LE8 [7]
Cardiovascular Health	Cardiovascular health was assessed using the AHA LE8 metric [7]. The CVH score was calculated using a 100-point unweighted average of the LE8 scores on diet, physical activity, nicotine exposure, sleep, BMI, non-HDL, blood glucose, and blood pressure [7]. CVH scores of 80–100 was categorized as high, 50–79 as moderate, and 0–49 as low Lloyd-Jones, Allen, Anderson, Black, Brewer, Foraker, Grandner, Lavretsky, Perak, Sharma, Rosamond [7].	LE8 [7]

APPENDIX B

BASELINE QUESTIONNAIRE

RATINGS OF CARDIOVASCULAR HEALTH KNOWLEDGE AND BEHAVIORS

Code ID _____

BASELINE QUESTIONNAIRE

Ratings of Cardiovascular Health Knowledge and Behaviors

The following questions ask about various health conditions and the way they affect your cardiac (heart) health. I will start by asking you to tell me what things you are currently doing to affect that part of your health. Please describe what effort you are making **currently** to address this aspect of your cardiac health, including the use of medications, changes in your diet or exercise, and any other things you are doing to change that part of your health. For each condition, I will ask you to rate your knowledge about the way the conditions influence the chance of your cardiovascular health getting better or worse and whether you believe you can change this aspect of your health. I will also ask you some multiple-choice questions to see what information you already have about this area of your health and what information would be useful for you to learn.

LIPID LEVELS (cholesterol levels)

What are you doing now to try to change your cholesterol/lipid levels? (**Please write below**)

Please answer the following questions by circling the correct answer.

1. Target levels (or goal levels) for total cholesterol are:
   A. Less than 100 mg/dl
   B. Less than 200 mg/dl
   C. Greater than 200 mg/dl
   D. Varies with age.

2. A diet that is higher in polyunsaturated (vegetable) fats than saturated (animal) fats is usually recommended because:
   A. Polyunsaturated fats are solid at room temperature.
   B. Polyunsaturated fats have more nutrients than saturated fats.
   C. Saturated fats increase the likelihood of vascular (blood & cardiac) problems.
   D. Saturated fats cause more weight gain.

3. Which of the following is true?

   A. A high level of low-density lipoprotein (LDL) is better than a high level of high-density lipoprotein (HDL) because it lowers the risk of heart disease.
   B. As long as the fats you eat are not animal fats (things like coconut oil and palm oil), this is safe and will not affect your LDL and HDL.
   C. HDL tends to remain in the bloodstream while LDL creates plaques that build up in the blood vessels.
   D. Target levels for HDL are less than 40 mg/dl

Code ID _____

4. Which of the following is a high-cholesterol food?
   A. Banana
   B. Sirloin steak
   C. Tuna steak
   D. Olive and canola oils

WEIGHT

What are you doing now to try to change your weight? (**Please write below**.)

Please answer the following questions by circling the correct answer.

5. Which of the following statements about body mass index is **incorrect**?
   A. Overweight is defined as a BMI of 25 to 29.
   B. Obesity is defined as a BMI of 30 or more.
   C. BMI's greater than 30 are more common in men than women.
   D. BMI is a measure of weight compared to height.

6. The best way to lose weight and keep it off is to
   A. Fast (avoid all foods) for one day per week.
   B. Cut portion sizes of food and exercise moderately at least three times a week.
   C. Jog (or do another strenuous exercise) for at least an hour per day.
   D. Take diet pills.

7. Which of the following statements about weight loss is true?
   A. Weight loss is best achieved by skipping meals.
   B. Weight loss should be done gradually, no more than 1 or 2 pounds a week.
   C. Weight loss will lead to muscle weakness.
   D. Weight loss is not recommended in people over 60 years of age.

8. If you are overweight
   A. Your heart works harder to pump more blood and raises your risk of heart attack.
   B. The only real risk factor is the level of cholesterol in your bloodstream
   C. Even moderate exercise can cause a heart attack.
   D. Your chances of developing cancer are reduced (lowered).

DIABETES (Blood sugar levels)

Do you have Diabetes Mellitus? **Y** **N**

What are you doing now to control your Diabetes if you have it, or to avoid getting it if you don't have it?

Code ID _____

Please answer the following questions by circling the correct answer.

9. The Alc goal for people with diabetes is:
   A. <3%
   B. <7%
   C. 8-10%
   D. >10%

10. What should your blood glucose read first thing in the morning or before a meal? (source CDC)
   A. 99 mg/dl or lower
   B. 100mg/dl to 125 mg/dl
   C. 126 to 180 mg/dl
   D. under 200 mg/dl

11. People with diabetes are at increased risk of developing which of the following:
   A. heart disease and stroke
   B. eye problems
   C. kidney problems
   D. all of the above

12. Which of the following is **NOT** a risk factor for Type 2 diabetes? (Mayo clinic)
   A. family history of diabetes
   B. obesity
   C. physical inactivity
   D. heart disease

EXERCISE

What are you doing for exercise currently? (**Please write below**)

Please answer the following questions by circling the correct answer.

13. To get enough exercise to improve your heart health, you must: (CDC)
   A. exercise strenuously (enough to get your heart rate above 200) 5 times a week.
   B. jog 3 miles a day.
   C. 150 minutes of moderate-intensity physical activity per week
   D. engage in everyday activities in your home.

14. Exercise can help you do all of the following **EXCEPT**
   A. improve your mood.
   B. control your blood pressure.
   C. increase your good cholesterol (HDL).
   D. decrease the amount of sleep needed

Code ID_____

15. Which of the following is **NOT** a form of aerobic (heart and lung health) exercise?
    A. jogging
    B. swimming
    C. dancing
    D. weight lifting

16. Which burns more calories?
    A. walking one mile
    B. jogging one mile
    C. running one mile
    D. all the same

SMOKING

Do you smoke? **Y** **N**

If you smoke, are you trying to stop, and how? (If you smoked before, how long ago did you stop?) **(Please write below).**

Please answer the following questions by circling the correct answer.

17. Which of the following is **false**?
    A. After 10 years of not smoking, the risk for having a heart attack will be close to normal
    B. Carbon monoxide is a poisonous gas found in cigarette smoke.
    C. Smoking is a drug addiction.
    D. Most people who stop smoking gain 25 pounds or more. [5-10 pounds]

18. Which of the following is **not** true? Smoking can cause the following problem(s):
    A. Heart disease
    B. Breathing difficulties
    C. Ulcerative colitis
    D. Glaucoma

19. Cigarette smoking
    A. is healthier than smoking cigars or using chewing tobacco.
    B. is not harmful if you smoke less than a pack a day.
    C. doubles your risk of heart attack.
    D. raises your risk for lung cancer, not heart disease.

Code ID _____

20. You can take steps to quit smoking by:
    A. determining why you smoke.
    B. asking your friends and family for their support.
    C. using a substitute for smoking such as gum or fruit.
    D. all of the above.

High Blood Pressure

What are you doing to try to lower your blood pressure or to keep it in the healthy range? (**Please write below**).
Please answer the following questions by circling the correct answer.

21. The medical term for high blood pressure is:
    A. Hyperglycemia
    B. Hypothermia
    C. Hypertension
    D. Hypoglycemia

22. The ideal blood pressure is
    A. 90/30 or below
    B. 120/80 or below
    C. 150/100 or below
    D. 200/190 or below

23. Those with high blood pressure should limit their sodium to: [heart.org]
    A. 1500 mg/day
    B. 2000 mg/day
    C. 2400 mg/day
    D. 4000 mg/day

24. Which of the following is **not** true? High blood pressure can cause:
    A. Stroke
    B. Heart attack
    C. Kidney problems
    D. Diabetes

NUTRITION

25. Which of the following foods are high in saturated fat?
    A. Red meat such as beef
    B. Seafood
    C. Olive and canola oil
    D. Walnuts, pecans, and cashews

Code ID _____

26. What effect does unsweetened fruit juice have on blood sugar levels?
    A. Lowers it
    B. Raises it
    C. Has no effect
    D. Stabilizes it

27. Which of the following is highest in carbohydrates?
    A. Baked chicken / fish
    B. Swiss cheese / cheddar cheese
    C. Baked potato / bread
    D. Peanut butter / margarine

28. Foods that are high in complex carbohydrates (fibers and starches)
    A. are good choices when trying to lose weight because they are filling.
    B. are likely to cause significantly more weight gain than foods of the same calorie level.
    C. are more likely to promote diabetes than simple carbohydrates.
    D. are foods like eggs and butter.

29. Which of the following is true?
    A. Sodas and fruit juices have similar levels of sugar.
    B. Most processed foods are safe to eat because they have little sodium.
    C. The typical fast food chicken sandwich is a good choice when watching levels of fat and sodium in your diet.
    D. Eating five servings of fruit and vegetables a day is likely to add weight.

Thank you very much for completing this questionnaire. Your responses are very important to us.

APPENDIX C

SCORING CRITERIA FOR THE MEDITARRANEAN EATING PATTERN FOR AMERICANS

Table C.1 **Scoring Criteria for the Mediterranean Eating Pattern for Americans**

Score: 1: If scoring condition met 0: If scoring condition not met (Range: 0-16)

Screener Item	Question	Scoring Criteria	Score
Olive oil	How much olive oil do you consume per day (including that used in frying, meals eaten away from home, salads, etc.)?	>2 servings of olive oil per day	
Green leafy vegetables	How many servings of green leafy vegetables do you consume per day?	>7 servings of green leafy vegetables per **week**	
Other vegetables	How many servings of other vegetables do you consume per day?	>2 servings of other leafy vegetables per day	
Berries	How many servings of berries do you consume per week?	>2 servings of berries per **week**	
Other fruit	How many servings of other fruit do you consume per week?	>1 serving of other fruit per day	
Meat	How many servings of red meat, hamburger, bacon or sausage do you consume per week?	<3 servings of red meat, hamburger, bacon or sausage per week	
Fish	How many servings of fish or shellfish/seafood do you consume per week?	>1 serving of fish per week <5 servings of chicken per week	
Chicken	How many servings of chicken do you consume per week?	<5 servings of chicken per week	
Cheese	How many servings of full-fat or regular cheese or cream cheese do you consume per week?	<4 servings of full fat or regular cheese or cream cheese per week	
Butter/cream	How many servings of butter or cream do you consume per week?	<5 servings of butter or cream per week	
Beans	How many servings of beans do you consume per week?	>3 servings of beans per week	
Whole grains	How many servings of whole grains do you consume per day?	>3 servings of whole grains per day	
Sweets and Pastries	How many servings of commercial sweets, candy bars, pastries, cookies, or cakes do you consume per week?	<4 servings of commercial sweets, candy bars, pastries, cookies, or cakes per week	
Nuts	How many servings of nuts do you consume per week?	>4 servings of nuts per week	
Fast Food	How many times per week do you consume meals from fast food restaurants?	< 1 meal at a fast-food restaurant per week	
Alcohol	How much alcohol do you drink per **week**?	>0 or <2 servings of alcohol per day for men and >0 or <1 servings of alcohol per day for women	

Total points earned/total points available (16) x 100 = MEPA Score