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Literature Review

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Assessment of cardiovascular health, Sleep habits, and diets among college students by utilizing public health screening tools

Keywords: cardiovascular disease, centers for disease control and prevention, CVD, food frequency questionnaire, coronary heart disease, cardiovascular disease risk calculators, C-reactive protein

Abbreviations: HHS, health and human services; HBCU, historically black college university; CVD, cardiovascular disease; CDC, centers for disease control and prevention; CHD, coronary heart disease; SSHS, school sleep habits survey; PSQI, pittsburgh sleep quality index; MEQ, morningness-eveningnes questionnaire; NIH, national institutes of health; ASCVD, atherosclerotic cardiovascular disease

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Introduction

The purpose of this study was to create a public health screening tool to conduct academic research in the areas of sleep habits, cardiovascular disease risk, physical activity and sedentary behavior, and dietary habits in an African American collegiate population.

Public health significance: Many racial health disparities exist in this country, and a primary goal of public health, as a whole, is to decrease these disparities (U.S. Department of Health and Human Services [HHS].[1] Public health professionals have worked tirelessly in low-income areas and those with residents of racial minorities in an attempt to decrease the health disparities between these populations and the healthier people within higher socioeconomic groups. One opportunity that public health has yet to take advantage of is the Historically Black College University (HBCU); a high population of resident African American students at H.B. is the best, convenient way to access public health study. These students are at higher risk of morbidity and mortality from cardiovascular disease (CVD), diabetes, and other lifestyle-associated diseases. These young African-Americans are taking the first steps in establishing themselves as independent adults. Providing evidence-based health promotion recommendations and education for HBCU students could help them develop healthier lifestyles during an essential stage of their adult lives and have lasting benefits.

The questionnaire we have created will provide researchers with a tool based not only on validated research tools for conducting scholarly research but also on determining how to focus on future educational efforts to decrease health disparities.

Healthy People 2020 initiative defines a *health disparity* as "a particular type of health difference is closely linked with social, economic, and environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion".[1] More than just race often affect the differences in health status between African Americans and Caucasians; socioeconomic and geographic factors often play a role. A typical example of this is the lack of access to healthy food supplies in areas of high-density racial minorities. These factors contribute to the higher mortality rate in African Americans than Caucasians, especially for diseases and risk factors considered behavioral. According to the Centers for Disease Control and Prevention (CDC) National Vital Statistics Report,[2] life expectancy at birth is four years shorter for black individuals than white individuals, 74.7years versus 78.8 years, respectively. According to the National Health Interview Survey (CDC/NCHS, 2013),[3] 11.8% (95% CI 10.55-13.11) of black adults 18years or older have been diagnosed with diabetes while only 7.4% (95% CI 6.88-7.89) of white adults have been diagnosed with the disease.

Moreover, while obesity between white and black adult males is very similar, black females have much higher obesity prevalence, with almost half of black women, 44%, being obese. In comparison, only 25.2% of white women are obese. One of the four overarching goals of Healthy People 2020 was to achieve health equity, eliminate disparities, and improve the health of all groups. Health disparities are complex issues that are usually affected by many factors simultaneously, and to decrease these disparities, addressing these issues is beneficial. This work will focus on behavioral determinants of health, their effect on an individual's health status, and the most effective ways to assess and improve these determinants. Since lifestyle-associated chronic diseases develop over time, the prevention of these diseases is predicated on the earliest possible detection of risk factors in individuals without the disease. A great environment to detect these risk factors is at HBCUs. Despite the increased risk of African Americans, there has been little research done in this environment. Conducting academic research at the college level could provide public health and health care providers with more information for this high-risk population. The proper screening tools could also serve as the first line of detection for chronic disease. Therefore, it could be the first place to prevent these life-changing diseases, decreasing morbidity, and mortality associated with these diseases and racial health disparities.

Many behaviors affect human health. This research's commonly studied actions include diet, physical activity, cardiovascular disease risk, and sleep habits. There are many behavioral determinants of health. However, we selected these four categories for the creation of this survey. Getting the appropriate amount of sleep is essential for many reasons. First, not getting enough sleep results in excessive daytime drowsiness, which affects their health and academic performance in college. Cardiovascular disease is undoubtedly much more common in populations older than college students are. However, early detection of these diseases' risk factors is paramount in their prevention. Assessing these risk factors in seemingly healthy college students could be the first step in preventing these chronic diseases. Physical activity and sedentary behavior are closely related and often studied together. Biological activity decreases risk factors for many conditions, including CVD's and sedentary behavior, like watching T.V. or, in the case of college students reading a textbook, is believed to be associated with lower amounts of physical activity. According to the National Health Interview Survey (CDC/NCHS, 2013),[3] only 20.8% of adults met the federally recommended amount of physical activity in 2011. Lastly, diet is the other half of the calories in versus calories out, an equation that determines a person's weight gain or loss. However, the number of calories is significant, but its quality also affects a person's health. Healthy People 2020 included goals to increase the contribution of fruits and vegetables to diets, and increasing vegetable consumption is considered a leading health indicator. Moreover, there is a general lack of information specific to African American college students in all categories. It is essential to study this population so that interventions for developing high-risk individuals provide necessary data particular to that population.

Methods

A literature review was conducted to find and validated screening surveys for evaluation in four categories: sleep habits, cardiovascular disease risk, physical activity, sedentary behavior, and dietary habits. We evaluated surveys based on their ability to measure the desired variable, length, and ease of use, both for the study subject and the researcher. We assessed each category separately. This project aims to create a useful tool for future studies done at HBCU's in the United States, so each survey selected combined to make a single research tool to be used for these studies.

The first category to be evaluated was sleep habits. We search these terms in PubMed college OR university AND sleep AND habits AND academic performance. The search returned thirty-one articles when limited to the last ten years, and seventeen articles were relevant to this project. Among these articles, different questionnaires we identified to be useful, 1. The Epworth Sleepiness Scale, 2. Athens Insomnia Scale, 3.School Sleep Habits Survey, 4. Pittsburgh Sleep Quality Index, 5. Horne-Ostberg Morningness-Eveningnes Questionnaire, 6.The Munich Chronotype Questionnaire.

We searched three times in PubMed for Questionnaires for evaluating diet. We used the keywords questionnaire AND College in all searches, and all investigations were limited to publish dates within the last five years. The first search also included the term "diet," the second had the phrase "food," and the third included the words "eating habits." The first search identified two tools, the Food Frequency Questionnaire (FFQ) and the Healthy Eating Index (HEI). The second search also found many articles using the FFQ. However, we did identify no more tools were successfully useful through this search, and we identified the third search using the **Rate Your Plate** (RYP) survey.

The calculation of cardiovascular disease risk has been studied for many decades now, and numerous CVD risk calculators are available. For that reason, it was necessary to create more stringent inclusion criteria for this category. We developed CVD risk calculators designed from longitudinal epidemiological studies; we then completed the CVD risk calculator in the United States from data collected in the United States. That would be most representative of the population we are targeting to study. While none of the risk, calculators are specific to African Americans, American data calculators are the most representative alternative. The other criterion was that the tool must calculate cardiovascular disease risk, not coronary heart disease (CHD) risk. With these requirements, we conducted PubMed's search to identify CVD risk calculators using the search terms "cardiovascular disease risk calculators." From this, we identified three American CVD risk calculators, 1.Reynolds Risk Score, 2.Framingham Heart Study CVD Risk Calculator, 3. American Heart Association CVD Risk calculator

We conducted A PubMed search using the keywords "physical AND activity AND questionnaire AND college" and narrow results within the last five years. This search identified a few questionnaires; we used the International Physical Activity questionnaire in almost all literature. We used the internet search to determine more tools such as cardiovascular disease risk calculators. There were numerous tools for collecting physical activity data found via an Internet search. This search again made the creation of exclusion criteria necessary. We did not consider any tools that included logging physical activity for any amount of time. Since studying this tool only possessed a single encounter with the subjects, we did not have any opportunity to give the subject any type of physical activity log and then collect it later. We did not exclude any questionnaires that do not include a self-administered version. The PubMed search identified five tools, the International Physical Activity Questionnaire, CHAMPS Physical Activity Questionnaire, 7-day Physical Activity Recall Questionnaire, College Alumnus Physical Activity Questionnaire, and the Yale Physical Activity Survey. Of these five, we excluded the Yale Physical Activity Survey because it does not have a self-administered version. The Internet search of the same key words produced four results. However, it was not available in the PubMed search, the Aerobic Center Longitudinal Study Physical Activity Questionnaire, CARDIA Physical Activity History Questionnaire, Framingham Physical Activity Index, and Minnesota Leisure-Time Physical Activity Questionnaire. Both the Framingham Physical Activity Index and the Minnesota Leisure-time Physical Activity Questionnaires are interviewer-administered and therefore excluded. The six tools included in the evaluation were the International Physical Activity Questionnaire, CHAMPS Physical Activity Questionnaire, 7-day Physical Activity Recall Questionnaire, College Alumnus Physical Activity Questionnaire, Aerobic Center Longitudinal Study Physical Activity Questionnaire, and CARDIA Physical Activity History Questionnaire.

Literature review

Sleep

Many researchers used their sleep questionnaires in the articles reviewed, often adapted from validated tools. Others used a combination of instruments. Multiple researchers chose to use the Epworth Sleepiness Scale (ESS) to identify individuals with poor sleep habits in general, in variety with another device that gathered more specific information about sleep habits. However, since this project seeks to create a tool that is a compilation of surveys from

various categories, the length of the surveys used must be taken into consideration. Because size was going to be a known obstacle, we decided to use only one study from each category. Therefore, we evaluated each survey separately for individual use in the final product.

The Epworth Sleepiness Scale was created in 1990 and first published in 1991.[4] It measures daytime sleepiness by asking the subject to rate on a four-point scale (0-3) their likelihood of dozing in eight situations. The score is the sum of the ratings for each of the eight conditions. It ranges from zero to twenty-four, with any score above ten considered clinically significant daytime sleepiness. The eight requirements differ in specificity or sleep-inducing potential. The score for each of the eight categories considered that conditions specific sleep propensity, and the total score viewed as that subject's average sleep propensity ("The Epworth Sleepiness Scale"). For use in the clinical setting, the ESS we created to identify patients with a sleep disorder, such as obstructive sleep apnea and narcolepsy, can be done further. The ESS measures daytime sleepiness and gives no specific data about sleep quality or quantity or habits. While excess daytime sleepiness is associated with low sleep quality and quantity, it does not measure either. When used for academic purposes, paired with another survey, it provides the researcher with specific information about the subject's sleep habits. It can only put subjects into excessive daytime sleepiness and no excess daytime sleepiness. It is straightforward to use for both the subject and researcher since it is only eight questions long and only requires the researcher to add the eight subject scores together. It is also concise, so the length is not an obstacle. However, the ESS does not provide the specific sleep habit data, like average sleep duration and sleep latency, that we would like to measure; therefore, we did not use it.

The Athens Insomnia Scale has two versions, the full eight-item version (AIS-8) and the shorter five-item version (AIS-5), that simply leaves off the last three questions. Questions one through five asks the subject about sleep characteristics, like sleep duration and night awakenings. In contrast, the final three questions inquire about daytime symptoms of poor sleep, like daytime sleepiness and daytime functioning.[5] Like the ESS, the AIS is theoretical or subjective in the way it asks questions. For example, question two asks the subject to rate how much of a problem awakening during the night is for them, not a more objective measure like the average number of times the subject wakes up any given night. This situation makes the scale very objective since two people who awaken the same number of times during the night can rate whether or not they see that as a problem very differently. The AIS was explicitly created based on ICD-10 criteria for insomnia, which means it was built specifically for clinical use. However, this version means that its utility for research purposes was not the focus, which is evident in its information. The AIS only measures the likelihood of a person having insomnia. Like the ESS, it does not provide any data specific to sleep habits; it merely provides clinicians with information on whether their patient requires further testing. While it is straightforward to use for both the subject and researcher, with only eight items and requiring the researcher to compile the item scores, it does not provide the necessary information to the research we are conducting, so we decided to exclude use.

The School Sleep Habits Survey (SSHS) was created in 1994 by researchers at the Bradley Hospital/Brown University Sleep Research Lab. While the SSHS gathers incredible amounts of information, the survey has multiple characteristics that make it not optimal for the current project. The first problem is the length of the survey. The SSHS is eight pages long and contains 63 items, many of which have multiple parts. When added to the other surveys we intended to use; the resulting tool would be much longer than we would consider.

Secondly, the survey was explicitly for fourth through twelfth-grade students, not for collegiate students. It would have to be modified for a college study group to remove options like "my parents have set my bedtime," which means that the validation studies were specific to this population. Hence, validity in a college population after modification is unknown. Since it was for gathering data, it does not have any particular scoring system, not put subjects into clinically relevant categories. While these two issues make this survey less than optimal for our purposes, it does have numerous advantages.

Primarily, with 63 items, it gathers an immense amount of information about sleep and parent demographics, academic performance, and substance use. While this survey gathers all[6] of the required information for the current research, the extensive modification and shortening required means that this survey is not useful.

The Pittsburgh Sleep Quality Index (PSQI) was the second most commonly used tool behind only the reviewed articles' ESS. First published by researchers at the University of Pittsburgh in 1989, it is now one of the most common tools used to measure sleep quality. It contains 19 items whose responses combine to create seven component scores; subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleeping medication, and daytime dysfunction.[7] Unlike the previous surveys, the PSQI is not theoretical, asking the subject to respond based on their actual behavior within the last month. In addition, while created to measure sleep quality precisely, it includes sleep quantity measures and asks about sleep medication use. The length of the survey is also appropriate for the current project. While not as simple as necessary, calculating the subjects' overall scores like the ESS and AIS is not tricky. This tool is one of the most commonly used in current research because it efficiently collects multiple sleep aspects. It has been used for decades and is widely accepted as the standard for measuring retrospective sleep quality via questionnaires. However, it was not useful because it does not include information to differentiate between weekdays and weekends.

The Horne-Ostberg Morningness-Eveningnes Questionnaire (MEQ) has been used to determine a person's time of peak alertness during the day since 1976. It comprises 19 items that each contains four to six options, each corresponding with a point value added together to determine the subject's total score. The questionnaire places subjects into five categories; definite morning, moderate morning, intermediate, mild evening, and definite evening.[8] This questionnaire is also theoretical, asking subjects to respond based on what they would do if they had no other commitments, not what they do. The MEQ was designed this way on purpose to determine what the subject's biological preference was without the outside influence of social or work-related schedules. However, this means that it provides only a biological morningness or eveningness preference, not data for sleep duration or quality or differences between weekdays and weekends. While the questionnaire is of an appropriate length and is very easy to use, it does not provide the desired data, and we decided not to consider it.

Finally, the Munich Chrono type Questionnaire had first published in 2003, and its ability to measure its creators, termed "social jet lag,"[9] set it apart from any other questionnaire available. In their article, the questionnaire's creators explain that through industrialization and the regular business hours of 9:00 am to 5:00 pm, humans have

forced themselves into a morning preference, though not all humans are suited for that schedule. Because of this, genetic evening types build considerable sleep debt throughout the week since they tend to go to bed later and then make up for it by sleeping many later on free days. This drastic difference between sleep midpoints during the week versus the weekend spurred them to create a questionnaire that could measure this difference.

The questionnaire asks subjects objectively, although still self-reported, when they go to sleep and wake up. It also asks about alarm clock use, sun exposure, medication use, and substance use, like tobacco and alcohol. The questionnaire places subjects into one of seven Chrono type categories and measures the degree of social jet lag that the subject experiences.[10] The questionnaire is short and computer-based, making it very easy to take; however, the complicated algorithms used to calculate sleep debt and social jet lag require analysis by the team that created the questionnaire to obtain data for these variables. This questionnaire is part of the agreement when obtaining permission to use the instrument, so it is not a serious obstacle. Because of its ability to measure sleep during the week and weekend and the novel measure of social jet lag, this questionnaire was useful to adopt for this research (Tables 1&2).

Table 1 Criteria for Evaluation

Criterion	Positive characteristic
Ability to measure variable	Evidence-based, Known association with health behavior.
Time needed to complete	As short as possible while maintaining the ability to measure the desired variable.
Ease of use	Minimal literacy/numeracy needed by the participant, Result given as a single number, Result categorized.

Table 2 Summary of Sleep Questionnaires

Name	Selected (yes/no)	Reason
Epworth Sleepiness Scale	No	Only measures daytime sleepiness, Created to be a clinical tool
Athens Insomnia Scale	No	Only measures the likelihood of having insomnia, Created to be a clinical tool
School Sleep Habits Survey	No	Length (completion time ~15-20mins) Needs significant modification
Pittsburgh Sleep Quality Index	No	Does not measure the difference in sleep between weekdays and weekend days
Horne-Ostberg Morningness Eveningness Questionnaire	No	Only measures chronotype, Provides no data on sleep behavior
Munich Chronotype Questionnaire	Yes	Provides data for both sleep duration and social jet lag

Diet

There were only three possible diet assessment tools identified in the literature search because many researchers used the Food Frequency Questionnaire. There are many forms of FFQ. Each assesses dietary habits by asking with what frequency (daily) various food items are consumed. The length of the FFQ varies greatly depending on the goal of the researcher. Most range from at least 20 food items to over one hundred. The shorter versions to evaluate the intake of specific nutrients, such as studying taurine intake in college students, have been a popular topic of recent research. The more extended versions seek to obtain a complete picture of the subject's food intake. Some versions are also semi quantitative. These versions ask subjects to indicate the usual portion size for the food items they have eaten to calculate an estimate of both calories and various nutrients. Two very well known versions of the FFQ are the Block and Harvard FFQ's. Both of these versions are semi quantitative and gather detailed information on the subject's total diet. To do this, both contain well over 100 food items.[11,12] This length is the most damaging feature of the food frequency questionnaire. To respond to all the items, each with multiple parts takes a significant amount of time. Besides, there is evidence that suggests that correct reporting on FFQ's could be highly biased. Numerous studies show the underreporting of total energy intake. This report is likely due to subjects underreporting the frequency with which they ate or serving size of food items that they know to be high in calories or "unhealthy," and over-reporting of foods consumed highly infrequently and foods are known to be of healthy choices.[13,14] FFQ's are effective at ranking groups of subjects, but when determining absolute intake in individuals, it is much less accurate.[14] The FFQ's retrospective nature is necessary for our study design; however, its length makes it impossible to use in our survey (Table 3).

Another tool for assessing dietary habits is the Healthy Eating Index (HEI). The latest update to the HEI occurred in 2010 (HEI-2010). The HEI is a measure of diet quality that rates the subject's conformance to federal dietary guidelines. It is a scoring metric used to assess any defined group of foods. It contains nine adequacy categories in which it rates whether the subject has eaten enough of foods considered healthy and three moderation categories. It ranks how well the subject has a limited intake of foods that are considered unhealthy.[15] The maximum score for the metric is one hundred. This instrument is very useful in assessing individuals' diets, and it even uses federal guidelines as its benchmark, which was appropriate for our study. However, the HEI requires specific food measurements, which would either need a food diary or recall interview to determine what they had eaten in a particular period. Since our study includes only one encounter with the subjects and no interview considered, all of the instruments chosen for our research must be retrospective, self-administered questionnaires. It means the HEI, despite its significant advantages, cannot be used.[16]

The final tool identified by the literature search is a recent tool called the Rate Your Plate (RYP) questionnaire. The RYP questionnaire is a simplified, 27-item, food frequency questionnaire that focuses on food items that contribute high fat, saturated fat, and cholesterol to the American diet.[17] Each item has three response options (score 1-3), three being the group's healthiest option. The sum of the item scores

S2Q'category (score 60-75) represents making the healthiest choices; the next category (score 40-59) includes subjects that could make some changes to their diet to improve their health.

Furthermore, the final category (score 25-39) includes subjects who need to make significant changes to their diet to have healthy eating habits.[17] It also includes a goal-setting section that helps the subject improve their diet in the future; however, we did not consider it in our studies. This tool measures little details as c HEI or the Block

or Harvard versions of the FFQ. It does not determine if the person has met the federal standard for a healthy diet, nor can it determine the subject's intake of any specific nutrients. However, it compromises detail for a manageable length. It also gives results as a total score. It puts that score into a category, so the results can be analyzed using the continuous variable of the subject's item total or the categorical variable of the subject's score category. Because of its retrospective nature, shorter length, and ease of analysis, we considered the Rate Your Plate questionnaire for our final questionnaire's diet assessment portion.

Cardiovascular disease

Cardiovascular disease risk calculators are very different from the other questionnaires we searched because they require data from laboratory blood tests. All three of the identified calculators require cholesterol and blood pressure data, and the Reynolds Risk Score requires a high sensitivity C-reactive protein value. While objective data is usually less biased than self-report questionnaires, it also requires more resources and necessary to have staff with the training needed to use the instruments required to obtain these values. Different risk calculators can give significantly different results based on the same input variables (i.e., for the same person), so using the same risk calculator is essential since comparison of risk estimates across multiple calculators is not reliable.[18] While this is especially important for physicians using these calculators as tools for patient assessment, it is essential and beneficial using a risk calculator in their research. We also considered the risk calculators using data from extensive epidemiological studies of American adults. Due to this reason, many calculators do not give results for any individual below a certain age, often 20. Since many of the college students are under the age of 20, our research faced severe obstacles. We have addressed these problems, and their possible solutions.

In the literature search, the most commonly used risk calculator is the Framingham Risk Calculator. The National Institutes of Health (NIH) use this calculator for their study and research. The equation used to assess this calculator's risk is derived from data collected from the Framingham Heart Study.[19] The Framingham Heart Study is now in its third generation, and as it has grown and added data with an improved calculator. In its current form, it requires seven pieces of data, age, gender, total cholesterol, HDL cholesterol, systolic blood pressure, whether or not the individual smokes, and whether or not the individual takes medication for high blood pressure. This calculator is not meant for use by anyone with Type II Diabetes. This calculator gives the percentage chance of having a heart attack in the next ten years. The minimum age for this calculator is 20 years of age. Because this calculator gives only a ten-year heart attack risk and will not even provide results for any subject under 20, we did not recommend this for research use.

The Reynolds Risk Score is a new calculator created to incorporate partial family history and C-reactive protein value into a CVD risk calculator. Ridker, et al.[20] stated that C-reactive protein and family history are independently associated with future cardiac events. However, no cardiovascular risk prediction algorithm incorporating these indicators existed. They followed two cohorts, 24,558 women and 10,724 men, for ten years to create the calculator. The subjects were all 45 years or older, so this calculator is suitable for individuals between the ages of 45 and 80.[21] If the subject is under 45, the calculator still gives the risk results for a 45-year-old individual with the same values. This calculator is also not meant for use by people with Type II Diabetes. Unlike the Framingham Risk Score, the results as the individual's percentage chance of having a "heart attack, stroke, or another major heart disease in the next ten years" (Reynolds Risk Score), not just a heart attack. C-reactive protein and family history are new additions to traditional CVD risk calculators that will likely lead to more accurate results. We do not have a way to obtain the C-reactive protein value, and all of the subjects will be under the age of 45, so this calculator was not useful (Table 4).[22]

Table 3 Summary of Diet Questionnaires

Name	Selected (yes/no)	Reason
Food Frequency Questionnaire	No	Length (over 100 items) Time to complete greater than 20 in.
Healthy Eating Index	No	Requires either food diary or recall an interview
Rate Your Plate Questionnaire	Yes	Appropriate length (25 items) Focus on foods that contribute most calories & fat to the American diet

Table 4 Summary of CVD Risk Tools

Name	Selected (yes/no)	Reason
Framingham Risk Score	No	No results if under the age of 20
Reynolds Risk Score	No	No results if under the age of 45
AHA Heart Disease Risk Calculator	No	Only lifetime risk if under the age of 40 No results if under the age of 20

The final risk calculator found comes from the American College of Cardiology/ American Heart Association. It also uses data from the Framingham Heart Study to create the prediction algorithm. Unlike the other two calculators, individuals with Type II Diabetes can use this calculator since one of the algorithm's variables is whether or not the subject has Type II Diabetes. This calculator gives two different results: percentage chances of having an atherosclerotic cardiovascular disease (ASCVD) event. The first is within the next ten years. However, this data is only available for people between the ages of 40 and 79 and validated in the same population of 45 to 79-year-olds.[23] The other value is lifetime ASCVD risk, which is available for anyone between 20 and 79. Since our subject population has many subjects in our research under 20years, this calculator will not work either.

None of the cardiovascular disease risk calculators identified will be practical tools for our research. None of the tools provides a result for subjects under the age of 20. Although none of these

risk calculators will give a single overall percentage risk based on a subject's combined risk factors, it is still important to collect it. Instead of an available CVD risk calculator, a combination of the CVD calculators' objective values, like systolic blood pressure and cholesterol, and family history, will be collected to analyze each variable independently. The collection of family history data will be based on the work of Hall et al.[24] and will include both first and second-degree relatives. Subjects can answer if any of these relatives have experienced the premature cardiovascular disease. Premature CVD includes myocardial infarction, angina pectoris, percutaneous coronary intervention, or coronary artery bypass surgery occurring in male relatives before age 55 and female relatives before age 65—subjects with three risk categories, 1. Individuals, as defined having a significantly elevated risk if two first-degree relatives have experienced premature CVD, 2. Individuals are defined as having a somewhat elevated risk if either one first-degree relative or two second-degree relatives have experienced premature CVD, 3. Individuals designated as having no high risk or insufficient information is known.

Physical activity

Evaluating physical activity is complicated for several reasons. Physical activity often varies depending on the time of year and the same type of physical activity, done at different intensity levels. For example, running for one hour at nine miles per hour is not metabolically equivalent to running for the same amount of time at only five miles per hour, even though both people ran for one hour. Most physical activity questionnaires estimate the number of metabolic equivalents of task (MET's). MET's are used to measure the energy required to do a specific activity. Metabolic equivalents are like an index value of intensity for physical activity, ranging from 0.9 MET's for sleeping up to about 23 MET's for running at a 4:17 minute mile pace. These values are all predetermined and recorded in the "Compendium of Physical Activities".[25] It is important to note that physical activity and physical fitness are not the same. A higher total number of MET's completed by an individual does not necessarily lead to higher values of physical fitness, usually measured by VO_2max. Research has repeatedly shown that only high-intensity exercise correlates with higher VO_2max levels.[26] Physical activity also displays seasonal variation across all age groups.[27–29] To accurately capture yearly physical activity patterns, questionnaires should either designed to determine the difference in seasons or data obtained at multiple points throughout the year (Table 5).

Table 5 Summary of Physical Activity Questionnaires

Name	Selected (yes/no)	Reason
College Alumnus Physical Activity Questionnaire	No	Focus on stair climbing and walking, the possibility of significant recall bias • No sedentary time
CHAMPS Physical Activity Questionnaire	No	Created specifically for seniors
Aerobics Center Longitudinal Study Physical Activity Questionnaire	No	Designed to predict physical fitness • No sedentary time
CARDIA Physical Activity History Questionnaire	No	Year-long period increases recall bias • No sedentary behavior
International Physical Activity Questionnaire	Yes	Quickly determines if an individual has met federal guidelines • Includes sedentary behavior

Our goal in this research is to create a public health screening questionnaire to assess young African American adults' behavioral habits. For that reason, the questionnaires we evaluated on their ability to determine whether or not the subject is engaging in the recommended amount of physical activity, as set forth by the "Physical Activity Guidelines for Americans." The recommendations state that healthy adults should engage in at least 150 minutes of moderate-intensity or 75minutes of vigorous-intensity aerobic exercise per week, or an equivalent combination of the two and that aerobic exercise performed in episodes of at least ten minutes at a time.[30] While it is not required, we are interested in assessing sedentism in the African American collegiate population. To do this, sedentary behavior would have to be part of the physical activities questionnaire.

The College Alumnus Physical Activity Questionnaire (CAQ) asks subjects to report the number of sets of stairs climbed and city blocks walked in the past week and described the type, frequency, and duration of any leisure-time physical activity over the same time- period in an 8-item questionnaire. It then uses an equation to convert these values into a MET value, given the Physical Activity Index score (PAI-CAQ).[31] The CAQ attempts to evaluate energy expenditure in transportation by measuring the number of city blocks walked and the flights of stairs climbed. However, this can be difficult to estimate when the subject is not walking in the city or climbs stairs on an irregular basis, as shown by the underestimation of energy expenditure from walking and stair climbing in the validation study of the instrument.[26] The same survey found little correlation between the recreational activities in the long-term (9months) test-retest validation (Pearson product-moment correlation ranged from 0.01 for sports and recreation to 0.63 for flights of stairs climbed). The authors state that this could be due to the seasonal.

Variation of physical activity, but it could also be due to recall bias. In addition, the College Alumnus Questionnaire and accelerometer (used as the standard against which the questionnaire was measured) had a correlation coefficient of 0.29. The amount of time to complete the questionnaire can vary depending on the number of recreational activities the subject must record but should take no more than 5-10minutes. This questionnaire would determine whether subjects met the Physical Activity Guidelines for Americans since it does assess frequency and duration for at least a week. It does differentiate levels of intensity. However, the possibility of significant recall bias calls into question the validity of the instrument.

The Community Healthy Activities Model Program for Seniors (CHAMPS) created a questionnaire to measure physical activity in older adults.[32] The questionnaire has 40 different activities, and the option for other activities not included in those 40. The subject must report how many times in a typical week they have done the activities. If they have done the physical activity, it is recorded for how many

total hours a week. Each activity has a corresponding MET value used to convert the reported frequencies into weekly energy expenditure.[33] The authors distinguish between light physical activity and moderate, but no vigorous activity category included since the physical activity guidelines for older adults do not include vigorous physical activity (Office of Disease Prevention and Health Promotion, 2008).[30] The questionnaire was validated, but only in a population of 65-90-year-old, subjects (mean age 74yrs.). This questionnaire found in the literature search was a modified version for African Americans; however, it was still for older adults.[34] The CHAMPS Physical Activity Questionnaire (CHAMPS-PAQ) takes between 5-10minutes to complete. While the CHAMPS-PAQ provides information on a wide variety of physical activities, many are explicitly meant for seniors, like question 2, which asks if the subject has been to the senior center. For this reason, it is not recommended that this questionnaire be used in a population of college students.

The Aerobics Center Longitudinal Study Physical Activity Questionnaire (ACLS-PAQ) measures leisure-time and household physical activity over the last three months. It includes nine recreational activities, two categories of moderate to vigorous physical activity, and two household activities. The subjects were asked to report weekly participation in the recreational activities, and those who report doing moderate to vigorous and household activities were asked the number of times per week they engage in those activities.[35] The reported exercise participation is then converted into energy expenditure. This questionnaire aimed not to estimate total physical activity or determine if subjects met physical activity recommendations but to predict physical fitness measures. The validation criterion used in the validation of the ACLS-PAQ was VO_2max, and the population used in the validation was 375 men with a mean age of 47.1years. The questionnaire's validity in determining total MET's per week is unknown, as is the test-retest reliability. The questionnaire is not lengthy; it takes about 5minutes to complete. Due to the focus of the ACLS-PAQ on fitness instead of total activity, it is not recommended to be used.

The CARDIA Physical Activity History Questionnaire is another questionnaire created for use in a longitudinal study; in this case, the Coronary Artery Risk Development in Young Adults study. The CARDIA researchers tested two different physical activity questionnaires, a 7-day Physical Activity Recall questionnaire and a Physical Activity History questionnaire that quantified physical activity over the past year. The study determined that the Physical Activity History questionnaire was more valid in the population it was tested in.[36] The history questionnaire asks subjects to report their participation in 13 specific activities; including leisure, job, and household activities, in the last year, where the frequency is times participated per week (with a minimum duration of 60min per week). The subject is then asked how many months out of the last twelve participated in that activity, but not which months, so seasonal variability of physical activity is not measured. The activity-specific participation is then converted into MET values and summed to determine the person's physical activity level. Activities are divided into moderate and vigorous categories, and participation in the activities is averaged across an entire year, so the researcher can determine, on average, whether the person has fulfilled the recommended amount of physical activity. The validation study for the Physical Activity History questionnaire was done in a population of 78 young adults from the CARDIA study group. The authors' mention that the questionnaire's validity may not extend outside of the young adult population, but since that is the population we wish to study, this is not a concern. They found stronger correlations between the vigorous activity category and physical fitness, as measured by both VO_2max (correlation coefficient 0.63) and accelerometer data (correlation coefficient 0.31), which is consistent with other literature.[37] The test-retest reliability was found to have a correlation coefficient of 0.88 and performed with at least a one-month interval. The CARDIA Physical Activity History Questionnaire provides data on various physical activities over an extended period. Still, it does not include sedentary behavior, not recommended for our study.[38]

The International Physical Activity Questionnaire (IPAQ) was created and validated by a multinational research group that included 12 countries. It has two forms, a long and short, both of which self-administered and interviewer-administered forms. The long-form has 27 items and can take more than 10minutes to complete, so only the short form will be evaluated for use in our study. The IPAQ short form asks subjects to report their physical activity from the last week and has only four items. Physical activity, grouped into four categories, vigorous, moderate, walking, and sedentary behavior. Definitions and examples for each category are provided. Each item asks the subject to report how many days a week they participate in each category for at least ten minutes. If the subject said they participated in that category, activity duration was also noted for consideration—this frequency-converted into MET values. The IPAQ may not provide the most accurate MET values because it groups many physical activities into categories. The IPAQ validity study used accelerometer data as the criterion standard, and the correlation coefficient for total energy expenditure between the IPAQ short form and accelerometer was 0.3.[39,40] The test-retest reliability was between 0.46 and 0.96, depending on the country, with an average of 0.8. While the grouping of physical activity may decrease the total MET value's accuracy, it provides data on time spent doing moderate and vigorous physical exercise each week. This information is needed to determine whether the individual has met the Physical Activity Guidelines' recommendations for Americans. The IPAQ short form also provides weekly sedentary time, the other variable of interest in our study. Finally, the IPAQ short form has only four items and takes less than five minutes to complete. Because of its simplicity and its ability to provide the data that we are most interested in, it is my recommendation to use the IPAQ short version.[41]

Discussion

To create a general screening tool to assess behavioral Health in African American college students for longitudinal epidemiological study, we decided to use previously validated questionnaires from multiple behavioral health categories together as a single behavioral health profile. The categories we wish to investigate are sleep habits, diet, cardiovascular disease risk, and physical activity/sedentary behavior.[42–44]

We wished to examine the sleep habits and differences in sleep midpoint and duration between weekdays and weekends. The questionnaire that I recommend for analyzing these variables is the Munich Chrono type Questionnaire. The MCTQ measures sleep duration separately for both weekdays and weekends and use differences in sleep midpoints between weekdays and weekends to measure social jet lag. The MCTQ also provides data for variables such as sun exposure, sleep latency, smoking, and alcohol use. Limitations of the MCTQ are that it does not provide sleep quality data and does not identify individuals who may have a sleep disorder. The MCTQ was validated in a population that included university students in Germany, but validity specific to the African American population is unknown.[45–47]

We recommend the use of the Rate Your Plate questionnaire for the evaluation of diet choices. The RYP questionnaire's most significant advantage is its length, 25 items. Many full food frequency questionnaires include over 100 items. The RYP questionnaire's focus on foods that contribute the most fat and cholesterol in the American diet identifies poor eating habits in less time than a full FFQ. The RYP questionnaire's limitation is that it does not capture the individual's complete diet. Its focus on excess fat intake means that it provides researchers with less information on other essential nutrients.

Due to our study subjects' young age, no cardiovascular disease risk calculator would provide all participants' results. While there are no tools to provide a single risk score, analysis of known CVD risk factors is still essential. We recommend collecting the data required for the CVD risk calculators such as (systolic blood pressure, total cholesterol, HDL cholesterol, smoking status, gender, age, type II diabetes status, and use of cholesterol medication) as well as information on family history of premature cardiovascular disease as described previously. These data would then be used as independent indicators of CVD risk to be analyzed separately.

For the category of physical activity and sedentary behavior, we want to determine if the participants meet or exceed the recommendations for moderate and vigorous physical exercise set forth by the "Physical Activity Guidelines for Americans." The International Physical Activity Questionnaire short form groups physical activity into moderate and vigorous activity categories. We categorized participants who did not meet the physical activity recommendations in a separate group without any calculation. The IPAQ also provides the amount of time spent sedentary each week and weekly MET values. Limitations of the IPAQ short form are that the broad physical activity categories leave room for interpretation, although definitions and examples for each category were useful. We validated The IPAQ short form in multiple countries, but not specifically with African American students.

We validated all of the selected instruments, but a standard limitation is that their validity in an African American college student population is unknown. For that reason, we recommend that validation studies for each questionnaire before using any of them in a longitudinal epidemiological study is beneficial. Once the instruments are validated, we recommend that at least twice every school year to appropriately study the students' changing behavior with a survey administered.

Conclusion

There is no single questionnaire that can collect all of the data that we wish to investigate. Therefore, we endeavored to find a combination of questionnaires that would create participants' public health profile. We chose behavioral categories, and therefore modifiable, and are areas of concern for either college students or African Americans. Those categories were sleep habits, diet habits, cardiovascular disease risk, and physical activity/sedentary behavior. The recommended questionnaires are the Munich, Questionnaire for sleep habits, the Rate Your Plate food frequency questionnaire for diet habits, and the self-administered short form of the International Physical Activity Questionnaire physical activity. We did not use cardiovascular disease risk calculators because many participants would be below the minimum age calculators.

We suggest that validity studies, done for each questionnaire within the specific population of African American college students before proceeding to a longitudinal study.

Several objectives initiated for healthy people 2030 are in these categories. Developmental objectives: These objectives are core and measurable and associated with targets that reflect high priority issues. These objectives are also related to evidence-based intervention, all to represent the baseline data from 2015.2. Research objectives, represents mainly the public health issues ,house and economic status and disparities between population groups not associated with evidence-based interventions.3.Health conditions, this includes several health conditions such as addictions, blood disorders, cancer, chronic kidney disease, chronic pain, dementia, diabetes, food borne illness, healthcare-associated infections, heart disease and stroke, infectious disease, Mental Health mental disorders, order conditions, osteoporosis, overweight and obesity, pregnancy and childbirth, respiratory diseases, sensory and contagious disorders, sexually transmitted disease. 4.Health behaviors: Child and adolescent development, drug and alcohol use, emergency preparedness, family planning, house communications, injury prevention, nutrition, healthy eating, physical activity, preventive care, safe food handling, sleep, tobacco use, vaccinations, violence prevention.5: Settings and systems

Community, environmental health, global health, health care, health insurance, policy, hospital in emergency services, housing and homes, public health infrastructure, schools, transportation, workplace.6. Social determinants of health: Economic stability, education access, quality Healthcare access, quality, neighborhood and dogs environment, social and community context.

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Conflicts of interest

Author declares that there are no conflicts of interest

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