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Cover Page Footnote

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Overweight and Obesity Challenges Among African Americans in Rural Alabama Black Belt

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Abstract. This study aimed at averting challenges of overweight and obesity among African Americans in rural Alabama. Focus group discussions and surveys were used to design a 12-week nutrition education and physical activity program. Results showed a significant improvement ($p < 0.05$) in participants' knowledge scores. Values for systolic blood pressure significantly reduced ($p < 0.00$). There was an increase in number of participants with normal blood pressure and a reduction in number of participants with stage 2 hypertension. The study highlights that nutrition education and physical activity can lead to improved health outcomes among African Americans in rural Alabama.

INTRODUCTION

Obesity is characterized by excessive accumulation of fat in the body and is a risk factor for various chronic conditions, including diabetes, heart diseases, and certain types of cancer (World Health Organization, 2020). From 1999 to 2018, the prevalence of adult age-adjusted obesity in the United States increased by more than 10%, from 30.5% to 42.4% (Fryar et al., 2018; National Center for Chronic Disease Prevention and Health Promotion, 2020c). Notable disparities in obesity prevalence exist by race, ethnicity, education, age, and geographical distribution (Behavioral Risk Factor Surveillance System, 2020). In 2018, the obesity prevalence among African Americans was 49.6%, 44.8% among Hispanics, and 42.2% among Caucasians (Hales et al., 2020).

Geographically, southern states have the highest percentage of African Americans, and the average prevalence of obesity in the southern states was 33.6% in 2018 (Centers for Disease Control and Prevention [CDC], 2018). Alabama, a southern state whose population is approximately 25% African Americans, had the fifth highest (36.3%) adult obesity rate in 2018 and spends more than \$5 billion dollars annually on obesity-related health conditions (Alabama Department of Public Health, 2020). Although there is limited literature on the prevalence of obesity in individual counties in Alabama, obesity rates in the Alabama Black Belt region exceed 40% for several counties, including Bullock County (National Center for Chronic Disease Prevention and Health Promotion, 2016; University of Wisconsin Population Health Institute, 2014).

According to the CDC, dietary lifestyle and physical activity continue to be the leading preventable risk factors for obesity (National Center for Chronic Disease Prevention and Health Promotion, 2020a). For instance, 32 % of adults in Alabama engaged in no physical activity during leisure time in 2020 compared to the national average of 26.6% (National Center for Chronic Disease Prevention and Health Promotion, 2020). Additionally, the percentage of adults in Alabama consuming fruits less than once per day in 2017 was 44.9%, a figure higher than the national average of 36% (National Center for Chronic Disease Prevention and Health Promotion, 2019). In Alabama, Bullock County has consistently exhibited poor health indicators such as adult obesity, low food environment index, physical inactivity, and socioeconomic factors such as poverty and poor education.

Several state and local programs have been instituted to improve physical activity and dietary lifestyles across the United States. These include the State Physical Activity and Nutrition (SPAN) Program, Racial and Ethnic Approaches to Community Health (REACH), and The High Obesity Program (Kahin et al., 2020; National Center for Chronic Disease Prevention and Health Promotion, 2020d). However, even with the interventions of such programs, the rates of overweight and obesity among African American communities remain high, indicating a need for more research.

Therefore, to determine and implement county-specific interventions needed to reduce overweight and improve nutrition among African Americans in Bullock County, Alabama, we (1) used healthy knowledge surveys and focus

group discussions to identify barriers to healthy lifestyles and to identify content for nutrition education and physical activity modules and (2) determined the success of nutrition education and physical activity interventions using pre- and post-knowledge assessments and anthropometric data.

METHOD

RECRUITMENT OF PARTICIPANTS

A schematic summary of the study is represented in Figure 1 and expounded throughout the methods, results, and discussion sections that follow. The study received approval from the Institutional Review Board of Tuskegee University for use of human subjects. Participants were recruited from Union Springs, in Bullock County. Bullock County has among the highest percentage of obese adults, adults with diabetes, obese preschoolers, children in poverty, low-income families, and fast-food restaurants compared to other Alabama counties (University of Wisconsin Population Health Institute, 2021). Participants were recruited using flyers distributed to community centers, churches, and health centers by Tuskegee University Cooperative Extension agents through the snowballing technique. Snowball sampling is a method of recruiting participants where researchers do not

sample from a list of members of the population (known as a sampling frame). Instead, the recruited participant gives the researcher the name of at least one more potential participant, who in turn provides the name of at least one more potential participant, and so on, until the researcher obtains the required sample size (Bhattacharjee, 2012). Snowball sampling was used for our study because the rural population was hard to reach through other means of sample recruiting.

The criteria for eligibility included being African American, a resident of Bullock County, and between 18 and 65 years of age. Participants received an incentive of \$10 for participating in the health knowledge surveys and focus group discussions and an incentive of \$100 for participating in the nutrition education and physical activity program. The focus group discussions and health knowledge surveys were used to determine the content for the nutrition education and physical activity modules.

HEALTH KNOWLEDGE SURVEYS

One hundred ninety-two participants who consented to participate in the study were given health knowledge surveys, which they were requested to complete and drop at the Bullock County Extension office. We used a 33-item,

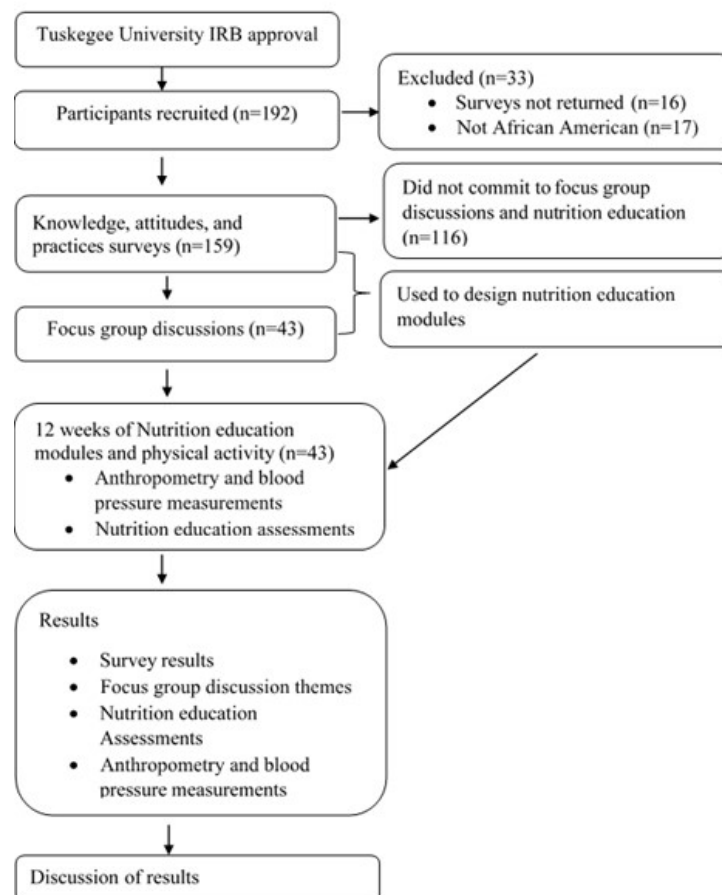


Figure 1. Schematic representation of the study.

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self-administered survey adapted from Dawkins et al. (2010) that consisted of three sections: knowledge, attitudes, and perception. The knowledge section was comprised of closed-ended questions that assessed the participants' understanding of obesity, its prevalence, and its consequences. The perception and attitudes sections collected information on perceived strategies to fight obesity, perceived importance of obesity in relation to other diseases, and perceived roles of various stakeholders in preventing obesity.

A Likert-type four-point scale (strongly disagree, disagree, agree, and strongly agree) was used to determine participants' desire to learn more about obesity, various obesity prevention strategies, and the relationship between obesity and chronic diseases. This section also assessed participants' understandings of the roles played by the government, schools, employers, and healthcare providers in preventing obesity.

The survey was reviewed by Tuskegee University professors from the departments of psychology, nutrition, and education with knowledge in human behavior, human physiology, and human nutrition. After review, the survey was pretested for appropriateness in format, ethical considerations, logical order, and content using individuals from Bullock County. Subsequent tests for internal consistency reliability yielded a Cronbach's coefficient alpha of 0.85. Cronbach's coefficient measures how reliable the responses of a survey are, and it ranges from zero to one, with higher values indicating that surveys are measuring in the same dimension (Bujang et al., 2018). Participants who were given the surveys were requested to attend a focus group discussion one month after the survey was administered.

FOCUS GROUP DISCUSSIONS

Six focus group discussions consisting of a total of 43 participants were done to supplement the health knowledge surveys in determining barriers and opportunities for healthy lifestyles. The content of the focus group discussions was derived from participants' responses to the health knowledge surveys. Focus group discussions included 12 open-ended questions relating to participants' understandings of what constitutes a healthy lifestyle, the importance of physical activity, how social relationships relate to health, the role of community health programs, barriers and motivations to healthy lifestyles, and willingness to participate in nutrition education programs. The questions for the focus group discussions were pretested with five individuals from Bullock County who were not included in the study. After pretesting, the questions were formatted to ensure content comprehensiveness and ethical appropriateness.

All six focus group discussions were held in Bullock County, Alabama on separate weekdays in September 2019. Prior to the focus group discussions, the researchers explained the study to the participants and answered questions raised by

the participants. Researchers then obtained written informed consent, and a copy of the signed consent form was given to each of the 43 participants. The six focus group discussions were delivered in English, moderated by a researcher, and lasted for 40 minutes. The discussions started with an icebreaker where each participant shared their name, favorite food, and for how long they had lived in Bullock County. The discussions were audio-recorded and supplemented with hand-written notes made by the research assistants.

NUTRITION EDUCATION MODULES AND PHYSICAL ACTIVITY

Using the barriers and opportunities for healthy lifestyles identified based on responses from the health knowledge surveys and focus group discussions, we developed content for the nutrition education and physical activity modules. Once a week for 12 weeks, researchers led participants through 60 minutes of nutrition education materials with topics including food nutrients, nutrient-disease interactions, food labeling, physical exercise, and strategies for behavior modification. Eight nutrition education modules were stretched out to cover the 12 weeks of the program.

After each day's nutrition education lesson, a licensed physical trainer led participants through 25 to 30 minutes of moderate intensity physical activities following guidelines from the American Heart Association (Piercy & Troiano, 2018; U.S. Department of Health and Human Services, 2018). In addition, participants were encouraged to continue physical activity at home for the 12-week duration of the program.

NUTRITION KNOWLEDGE AND ANTHROPOMETRY STATUS ASSESSMENTS

Nutrition Knowledge Assessments

At the beginning of each of the eight nutrition education and physical activity modules, participants were given a pre-knowledge assessment with 20 multiple-choice questions derived from content for that day. After the day's module, a post-knowledge assessment with the same questions as the pre-knowledge assessment was administered. The pre- and post-knowledge assessments were graded out of 100% and compared to determine the change in knowledge following the class.

Anthropometry and Blood Pressure Measures

Similarly, on the first and last days of the nutrition education and physical activity modules, anthropometry and blood pressure measurements were done and compared to determine changes in health status following the program. Procedures for measuring height, weight, hips, waist, and blood pressure were adapted from the Anthropometry Procedures Manual of the National Health and Nutrition Examination Survey (NHANES) (CDC, 2017). All measures were done by two research team members.

Height (cm) was measured using a portable stadiometer (Seca 213). Body weight (kg) was measured using a Detecto SlimPRO digital floor scale. Body mass index (BMI), an indirect measure of body fat, was calculated as a ratio of weight in kilograms to height in square meters. Waist and hip circumferences were measured in centimeters (cm) to the nearest 0.1 cm using a retractable measuring tape. The waist circumference was divided by the hip circumference to determine the waist to hip ratio (WHR).

Blood pressure was determined based on the method described by Muntner et al. (2019). For this method, we used an Omron blood pressure monitor (BP742N). Participants were required to sit up straight in a relaxed position while the researcher measured their blood pressure. Values of less than 120 mmHg for systolic and less than 80 mmHg for diastolic readings were used as a reference for normal blood pressure (Carey & Whelton, 2018; National Center for Chronic Disease Prevention and Health Promotion, 2020b).

STATISTICAL ANALYSIS

Quantitative Data Analysis

Researchers checked surveys for completion, coded them, and entered the responses into a Microsoft Excel database. Then, they imported data into Statistical Package for Social Sciences (SPSS). Descriptive statistics—including means, frequencies, percentages, and t-tests—were determined for the participants' survey responses. Researchers also analyzed data from nutrition education and anthropometry using Statistical Analysis Software (SAS). They then classified the participants' anthropometric and blood pressure measurements based on categorizations by the Centers for Disease Control and Prevention and the American Heart Association (National Center for Chronic Disease Prevention and Health Promotion, 2020a). Frequencies and percentages for anthropometry measures were determined, and the difference between means was compared using a paired t-test. All tests for quantitative data were done at a significance level of 0.05.

Qualitative Data Analysis

Audio recordings for focus group discussions were transcribed verbatim by the researchers. Using ATLAS.ti software (Version 8.4), researchers coded and analyzed the transcripts to reveal major themes arising from participants' responses.

RESULTS

PARTICIPANT RECRUITMENT

Out of the 192 surveys that were distributed to the recruited participants, 159 surveys were returned. Forty-three of the 159 participants who returned the surveys consented to participate in the focus group discussions, nutrition education, physical activities, and assessments.

HEALTH KNOWLEDGE SURVEYS

Results for the health knowledge surveys are presented in Tables 1 through 4. From the 192 total surveys given to the recruited participants, we excluded 33 surveys for participants who did not return the surveys and for participants who did not identify as African American.

Responses to general knowledge questions on obesity are presented as frequencies and percentages in Table 1. The results showed that a majority of the participants understood that the prevalence of obesity was high and that it was caused by lifestyle and genetic factors. Additionally, the data revealed that a majority of participants had some knowledge on ways to prevent or reduce obesity. Most participants (89.3%) regarded obesity as reaching epidemic levels, viewed obesity as the result of an abundance of caloric intake (83%), and observed that there were multiple risk factors for obesity including genetic, socioeconomic, environmental, and behavioral factors (84.3%).

Similarly, survey results showed that a majority of participants were knowledgeable about obesity being a serious public health problem (90.6%) and a risk factor for chronic health conditions (Table 2). Furthermore, 88.1% agreed that the prevalence of obesity among children was increasing, as was their vulnerability to type 2 diabetes (80.5%).

We cross tabulated participants' views on the different obesity prevention and reduction programs with their education level (Table 3). This was done to determine whether education influences participants' views on obesity and whether nutrition education was necessary. Participants were asked whether they supported or opposed various efforts (table 5) to fight obesity in children. Results showed that education level had an impact on participants' views on interventions to reduce obesity. There was a significant difference in the views of college and high school graduate participants pertaining to the prohibition of selling unhealthy foods in vending machines ($p < 0.00$), limiting unhealthy food ads to children ($p < 0.02$), and providing more physical activity in schools ($p < 0.00$).

Similarly, the annual incomes of participants were cross tabulated against participants' views on obesity reduction programs. Generally, annual income did not affect participants' views of obesity reduction programs (Table 4). However, support for "limit[ing] TV ads for unhealthy foods and drinks" was more significantly ($p > 0.04$) supported by participants who earned more than \$40,000 compared to those who earned less.

Survey results show that education may be used to increase participants' knowledge of obesity reduction strategies. Increasing participants' incomes may not be a suitable intervention for improving participants' perceptions of obesity and obesity reduction strategies.

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Table 1. Participants' Responses to General Knowledge Statements on Overweight and Obesity

Statement	True n (%)	False n (%)	No opinion n (%)
Obesity and overweight are reaching epidemic levels.	142 (89.3)	16 (10.1)	1 (0.6)
Obesity and overweight affect approximately 72% of US adults.	132 (83.0)	22 (13.8)	5 (3.2)
Obesity and overweight are primarily due to people consuming more calories than they burn through physical activity.	141 (88.7)	18 (11.3)	–
The problem of obesity is a combination of genetic, metabolic, behavioral, environmental, and socioeconomic factors.	134 (84.3)	22 (13.8)	3 (1.9)
Adding a moderate amount of exercise five or more times a week can lead to substantial weight loss.	131 (82.4)	28 (17.6)	–
Low carbohydrate diets and weight loss pills are the fastest ways to lose weight.	34 (21.4)	120 (75.5)	5 (3.1)
Obesity and overweight are the second leading causes of preventable death in the United States, close behind tobacco use.	109 (68.6)	46 (28.9)	4 (2.5)
Setting nutritional goals alone will help one lose weight.	91 (57.2)	66 (41.5)	2 (1.3)
“Understanding what and why you eat” is a major factor for implementing weight control.	150 (94.3)	7 (4.4)	2 (1.3)
Eating a snack before bedtime is a good way to implement weight control.	19 (11.9)	137 (86.2)	3 (1.9)
At age 21, males and females stop growing and no longer need to implement weight control.	14 (8.8)	142 (89.3)	3 (1.9)
Knowing your BMI is important in predicting whether you are overweight or obese.	135 (84.9)	22 (13.8)	2 (1.3)
It is easier to lose weight when overweight than when morbidly obese.	55 (34.6)	94 (59.1)	10 (6.3)
Overeating and inadequate physical activity are the main causes of obesity.	131 (82.4)	20 (12.6)	8 (5.0)

Note. n = 159. *Numbers in parenthesis indicate percentages of participants for each category.

Table 2. Knowledge on Association of Obesity and Chronic Disease

Statement	Participant responses, n (%)		
	Yes	No	No opinion
Overweight and obesity are risk factors for other diseases.	144 (90.6)	11 (6.9)	4 (2.5)
There is an increased rate of type 2 diabetes among children and teenagers.	128 (80.5)	25 (15.7)	6 (3.8)
The rate of overweight and obesity is greater in children than in adults.	76 (47.8)	73 (45.9)	10 (6.3)
Overweight and obesity are a potential health problem.	144 (90.6)	12 (7.5)	3 (1.9)
The CDC estimates that about 6 out of 10 Americans are overweight and obese.	115 (72.3)	37 (23.3)	7 (4.4)
Overweight and obesity in children is higher than in previous years.	140 (88.1)	14 (8.8)	5 (3.1)

Note. n = 159. *Numbers in parenthesis indicate percentages for each category.

Table 3. Effect of Education Level on Participants' Support for Obesity Reduction

Statement	High School	College	t-test	p-value
Prohibit the sale of soda, chips, and candy in school vending machines.	2.58±1.14	3.19±0.88	-3.07	0.00*
Limit TV ads for unhealthy foods and drinks (soda, chips, candy) that are targeted at children.	2.77±1.08	3.21±0.86	-2.28	0.02*
Educate parents about childhood obesity and healthier eating and exercise habits for children.	3.69±0.47	3.85±0.46	-1.53	0.13
More physical activities in schools.	3.56±0.51	3.89±0.39	-3.65	0.00*
Provide healthier school lunches.	3.48±0.71	3.69±0.58	-1.56	0.12

Note. n = 159. Responses were ranked in a Likert scale where 4 = *strongly support*, 3 = *somewhat support*, 2 = *somewhat oppose*, and 1 = *strongly oppose*. Statistically significant differences exist at $p \leq 0.05$.

Table 4. Effect of Income on Participants' Support for Obesity Reduction

Statement	< \$40,000	> \$40,000	t-test	p-value
Prohibit the sale of soda, chips, and candy in school vending machines.	3.08±0.94	3.22±0.94	-0.87	0.39
Limit TV ads for unhealthy foods and drinks (soda, chips, candy) that are targeted at children.	3.02±0.98	3.36±0.78	-2.11	0.04*
Educate parents about childhood obesity and healthier eating and exercise habits for children.	3.79±0.44	3.86±0.47	-0.82	0.42
More physical activities in schools.	3.86±0.35	3.86±0.47	-0.07	0.95
Provide healthier school lunches.	3.66±0.54	3.75±0.54	-0.91	0.36

Note. n = 159. Responses were ranked in a Likert scale where 4 = *strongly support*, 3 = *somewhat support*, 2 = *somewhat oppose*, and 1 = *strongly oppose*. Statistically significant differences exist at $p \leq 0.05$.

FOCUS GROUP DISCUSSIONS

Participants who took part in the surveys were invited to be part of focus group discussions and the nutrition education course. Of the 159 participants who completed the health knowledge surveys, 43 participants consented to take part in focus group discussions, and they were divided into six groups. Through the discussions, six themes were identified which represented barriers and opportunities for designing health interventions. The six themes (barriers and opportunities) are summarized in Table 5 and discussed below.

Physical Activity

Participants mentioned that regular physical exercise regimens such as walking and swimming were necessary for managing body weight, strengthening the immune system, reducing emotional stress, strengthening muscles, minimizing pain in body joints, attaining good sleep, and maintaining physical fitness, youthfulness, and vitality. However, participants reported that maintaining a physically active lifestyle in Bullock County was hampered by limited environments for physical activities, including walking and biking trails, parks, and gyms. Additionally, in areas where walking trails and parks were available, participants felt unsafe to exercise without a group. On an individual

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basis, barriers to regular physical activity included physical disabilities, tight work schedules, lack of commitment, limited social support, and lack of motivation.

Dietary Intake

Participants expressed that establishing good dietary habits involves minimizing the consumption of refined foods. Some explained that working multiple jobs for long hours made planning and making homemade meals difficult. Instead, participants reported depending on convenience foods that require little or no preparation, including already prepared fast foods, canned foods, and sugar-sweetened beverages.

Food Access

Limited access to fresh produce was cited as a barrier to making healthy choices. This was partly due to the absence of large, chain grocery stores like Walmart, Publix, and Costco in their communities. As such, participants reported that residents in need of fresh groceries drive long distances to neighboring cities—a costly practice in terms of transportation and time. As a result, residents relied on convenience stores within their communities shelved with high sodium canned foods, high calorie refined snacks, and a limited selection of fruits.

Social Influence

Participants reported that social networks influenced their dietary and lifestyle choices. It was mentioned that the cohesiveness of a family played an important role in developing and maintaining healthy living habits, especially for the children. Additionally, they emphasized that depression promotes unhealthy eating habits, but friends and family provide the motivation and social support necessary for managing or preventing depression.

Attitudes, Cultures, and Beliefs

Participants expressed that they believed their health was determined by the quality of their diet. Their responses revealed that healthy mindsets were greatly influenced by social relations, especially relationships with their family and friends. Participants explained that most of the foods and methods of cooking they used were passed down from their parents and grandparents. They mentioned that African American cuisine grew out of the resourcefulness of their ancestors during slavery as they learned to combine their traditional cuisines with that of their masters. One respondent explained how their ancestors were creative to use parts of the food that would otherwise be discarded such as the snout, stomach, and small intestines of pigs, which,

Table 5. Quotes From Focus Group Discussions in Bullock County, 2019

Theme	Sample quotes from focus group discussions
Physical activity	<p>“When you start routine exercise, it really helps. I exercise twice a day: mornings and evenings. I believe that staying on a routine exercise regime will help me live longer.”</p> <p>“Working out is hard at our age, but I was told that I can exercise in my couch while seated, and this can be good for the strength of my upper body and mind.”</p> <p>“I need to have a stronger memory.”</p>
Dietary habits	<p>“Changing dietary habits is a concern to me today since there is a lot of consumption of fast foods.”</p> <p>“Somebody from a community program led by Tuskegee University came here and cautioned us on how to eat right. She said, ‘Take that soda off your table.’ And since then, I have kept it off my table.”</p>
Food access	<p>“There is limited access to large grocery stores like Walmart, Publix, and Costco, making it difficult to get fresh and quality fruits and vegetables.”</p>
Social relations	<p>“Hanging out with friends affects our lives—for the good or bad. For example, hanging out around smokers may lead to smoking.”</p> <p>“If you have a lazy partner, you may be discouraged from carrying out any form of exercise.”</p>
Attitudes, perceptions, and beliefs	<p>“Some people bring negativity, and so it is best to cut them out of your circle even if they are family.”</p> <p>“It is highly perceived that eating fresh and healthy foods is expensive, especially for people in my community.”</p>
Healthcare and healthy lifestyle interventions	<p>“I regularly have medical checkups to monitor my blood pressure, cholesterol, and blood sugar levels.”</p> <p>“Our representatives should ask for the establishment of fresh produce grocery stores, improving the support environment for physical activities, and continued support through nutrition education and physical activity extension services.”</p> <p>“We need to do routine medical screening for blood pressure and diabetes, but insurance is another issue here in our community.”</p>

when boiled, are referred to as chitterlings—a commonly used food in rural African American communities.

Healthcare and Healthy Lifestyle Interventions

Several of the participants reported that they were conversant with the harmful effects of overconsumption of certain nutrients as well as the benefits of eating in moderation. Participants reported that they had regular medical checkups and that they monitored their blood pressure, cholesterol, and blood sugar levels. However, some participants reported that they needed to have an expensive health insurance to keep up with medical checkups. Participants suggested interventions that would lead to attaining and maintaining healthy lifestyles. These interventions included asking their government leaders to lobby for the establishment of fresh produce grocery stores, improving the support environment for physical activities, and continuing the availability of nutrition education and physical activity extension services. Participants reported that the community should have more health and wellness services for the retired elderly and more physical activity programs for school children. In addition, participants suggested the need for engaging more local stakeholders, such as schools, churches, and community centers, in health awareness services.

NUTRITION EDUCATION AND ASSESSMENTS

The barriers and opportunities identified through the health knowledge surveys were supplemented with themes from the focus group discussions to design content for eight nutrition education modules. All participants that took part in the focus group discussions (n = 43) participated in the 12 weeks of nutrition education and the corresponding nutrition education and physical activity assessments. The percentage change in scores from assessments done before and after

each interactive module represented change in nutrition knowledge. Results showed significant changes in nutrition knowledge for all modules except the food labeling module (p = 0.32) (Table 6). The percentage change in knowledge nearly doubled for the vitamins module (45.8%) but was lowest for the food labeling module (6.6%).

ANTHROPOMETRY AND BLOOD PRESSURE MEASUREMENTS

Anthropometry and blood pressure measurements were done at the beginning of the first module and at the end of the last module. These were done to determine the effectiveness of the nutrition education and physical activities. Results showed a decrease in average weight, waist circumference, and hip circumference at post-study. However, there were no significant differences (p > 0.05). The number of participants in the normal, overweight, and obese BMI categories remained unchanged from baseline to post-study. The average systolic pressure of participants significantly reduced (p < 0.00) from 135.7±16.7 mmHg at baseline to 123.1±26.0 mmHg at post study (Table 7). However, there was no significant difference in participants’ diastolic pressure (p < 0.13).

DISCUSSION

FOCUS GROUP DISCUSSIONS AND HEALTH KNOWLEDGE SURVEYS

It is not clear why only 27% of the participants that took part in the health knowledge surveys consented to focus group discussions, nutrition education, physical activities, and the corresponding assessments. From both the focus group discussions and the health knowledge surveys, most participants recognized obesity as an epidemic with negative health consequences and observed that obesity could be averted through diet management practices and

Table 6. Pre- and Post-Test Scores for Nutrition Education Module Assessments

Nutrition module	Pre-test (%)	Post-test (%)	% Change	p-value
Carbohydrates	67.4±15.4	75.9±19.6	12.6	0.03
Proteins	59.1±17.5	73.4±17.9	24.2	0.00
Lipids	70.0±21.7	92.1±9.8	31.6	0.00
Fruits and vegetables	68.5±9.4	81.7±9.7	19.3	0.00
Vitamins	58.5±19.7	85.3±14.8	45.8	0.00
Minerals	59.3±19.6	76.3±20.0	28.7	0.00
Food labeling	80.7±34.6	86.0±22.4	6.6	0.32
Physical activity	54.1±20.1	74.4±18.5	37.5	0.00

Note. Values represent Mean±SD (n = 50). Statistical significance considered at p ≤ 0.05.

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Table 7. Anthropometry and Blood Pressure Characteristics of Participants

Characteristic	Baseline	Post-study	p-value
Weight (kg)	95.3±21.1	94.2±20.7	0.39
Waist circumference (cm)	109.7±15.2	108.3±13.8	0.09
Hip circumference (cm)	121.3±16.5	120.3±16.7	0.16
Waist Hip Ratio (WHR)	0.905±0.07	0.901±0.06	0.69
Body Mass Index (BMI)			
BMI (kg/m ²)	36.1±8.5	36.4±8.5	0.28
Blood Pressure (BP) mmHg			
Systolic BP (mmHg)	135.7±16.7	123.1±26.0	0.00
Diastolic BP (mmHg)	78.8±10.3	84.2±17.6	0.13

regular physical activities. Diet management and physical activity have been identified to promote individual health and wellbeing in the Black Belt region by other researchers (Carter et al., 2015; Scarinci et al., 2014). The knowledge on obesity displayed by the participants is important because, being African Americans, all our participants are genetically predisposed to obesity and its underlying chronic conditions, including certain types of cancer, diabetes, and cardiovascular diseases (Kumanyika et al., 2014).

The high levels of knowledge about obesity observed among participants may be due to higher prevalence of the condition in the Alabama Black Belt region and previous efforts to increase obesity awareness among these communities (Carter et al., 2010; Carter et al., 2015; CDC, 2018). Studies have shown that the possibility of ill health due to advanced age and having ample knowledge may be motivational factors for behavior change. As such, the advanced age (63.5±8.9) of participants in the present study and the high knowledge of obesity they displayed may have been motivational factors for participation. This logic is supported by the health belief model, which highlights that a person's perceived risk of developing a health condition and its consequences may be motivational factors for behavioral change (Janz & Becker, 1984).

Responses further revealed that participants' food choices were influenced by dietary habits passed down through generations of African American descendants. Participants reported the consumption of soul food—a traditional African American cuisine commonly characterized by the centrality of pork and developed due to racial stigma, resourcefulness, ingenuity, and communal spirit (Miller, 2013; Smith et al., 2006). Other researchers have identified pork-based meals, salted meats, and adding butter during vegetable preparation as common components of cooking an African American diet (Bovell-Benjamin et al., 2009). Due to the specific diet identified in our study, strategies used to promote healthy

lifestyles in other geographical areas may not be applicable in the Alabama Black Belt counties. Other researchers have recommended strategies to implement dietary practices that are geographically and culturally specific (Bovell-Benjamin et al., 2009; Scarinci et al., 2014).

The barriers and recommendations identified through the focus group discussions and health knowledge surveys in this study led to the development of nutrition education modules tailored to the participants. Among other topics, the developed modules focused on cooking methods, the importance of fruits and vegetables in the diet, and the harmful effects of high sodium and saturated fat in the diet.

NUTRITION EDUCATION ASSESSMENT CONSIDERATIONS

The average pre-test scores for all nutrition education assessments were over 50%, indicating that participants had an average understanding of the topics presented, including food nutrients, food choices, physical activity, and food preparation. However, on average, pre-test scores for food labeling were higher than those from other modules.

The higher scores for food labeling compared to other modules at baseline may be attributed to participants' interests in sodium and calories, as they relate to blood pressure and obesity, respectively. During focus group discussions, participants were concerned about the intake of excess sodium and calories from refined foods and convenience foods readily available at grocery stores in their community. On most nutrition facts labels, especially labels of canned and convenient foods, information about calories and sodium is more pronounced. This may be the reason why participants were more knowledgeable about food labels.

Even though changes in scores for carbohydrates, proteins, minerals, and physical activity were significant, the average post-score value was 70%. Participants performed worst on questions that required quantitative skills, including calorie counting, understanding daily values, and interpreting

serving size. For example, most of the incorrect responses on the assessments for the food labeling, fruits and vegetables, and proteins modules required quantitative responses. There was a greater change in knowledge scores for modules that required qualitative responses—such as the functions of different vitamins, types of physical exercises, and types and sources of nutrients—compared to quantitative responses. Other researchers reported that participants had difficulty comprehending quantitative information displayed on food labels, including serving sizes and recommended daily values (Campos et al., 2011). Researchers explained that most consumers could easily locate caloric content information on nutrition labels (Sinclair et al., 2013), but fewer consumers reported using percentage daily values and serving sizes to estimate their required daily nutrient intake (Levy & Fein, 1998; Moore et al., 2018).

Understanding numerical values on food labels may be a key factor for ensuring recommended nutrient intakes. For our study, understanding quantitative information was crucial given that during focus group discussions, participants in our study reported consumption of fast foods and convenient foods. However, it was important that we obtained significant improvement in nutrition knowledge scores. Educational interventions have led to improvement in nutrition knowledge; in 2018, Moore et al. reported that all 17 studies included in a systematic review showed a statistically significant improvement in participants' understanding of nutrition labels.

ANTHROPOMETRY CONSIDERATIONS

Participants' overall reduction in weight during this study, although non-significant, may signal that a longer intervention duration could lead to more weight reductions and possibly a decline in BMI. Carter et al. (2015) reported significant reductions in weight and BMI after delivering nutrition education and physical activity interventions in a similar population for a longer period with multiple focused physical activities. The rate of obesity reported in our study is consistent with that reported by the Centers for Disease Control and Prevention (CDC, 2018; Tumwebaze et al., 2021). Although this similarity in results demonstrates reproducibility, it unfortunately shows that the rate of obesity remained unchanged between 2018 and 2019. On a positive side, the unchanged rate of weight gain may signal an end to the rising trend in obesity that has been consistent for this population in the last two decades.

However, some researchers found African Americans (specifically, women) to be more self-accepting of weight, body shape, and appearance than white women (Abrams et al., 1993; Akan & Grilo, 1995; Befort et al., 2008; Parham-Payne, 2013). As such, African American women may have beliefs that perpetuate a cultural preference for heavier figures. This may be a reason for the non-significant changes

in BMI for our study. Therefore, strategies that do not focus on weight loss but rather on healthy eating and physical activity may be a more promising approach for promoting a healthy lifestyle (Befort et al., 2008; Willett & Stampfer, 2013; Woll et al., 2013).

BLOOD PRESSURE

Race is among the risk factors for high blood pressure reported by several researchers (Carey & Whelton, 2018; Willett & Stampfer, 2013). Because participants in our study were African Americans, a race associated with a risk for high blood pressure, this may partially explain why the blood pressure values from our study were elevated.

A significant decline in systolic blood pressure, a decline in number of participants with stage 2 hypertension, and an increase in number of participants with normal blood pressure was seen during this study. Results from our study showed that the mean blood pressure value was within the elevated blood pressure category, an interesting finding given that over 25% of African Americans were reported by other researchers to have high blood pressure (National Center for Chronic Disease Prevention and Health Promotion, 2010). Topics from our nutrition education modules such as monitoring sodium, cholesterol, and water intake along with having regular medical checkups could have directly influenced the observed blood pressure results.

LIMITATIONS

The sample size for focus group discussions, nutrition education, and physical activities in this study is generally considered small for statistical purposes. Similarly, the snowballing method of sampling may not present a representative sample. Based on population trends, Bullock County has seen negative population growth over recent years, with fewer individuals available and willing to participate in community development studies. Thus, snowball sampling was required to recruit available participants. Our study involved qualitative research, so it is possible that during focus group interviews, participants could have aligned their responses with those that are socially acceptable rather than what they thought was the truth. However, we minimized the possibility of social desirability bias at the beginning of the focus group interviews and nutrition education modules by establishing rapport with the participants and by following their responses with clarifying questions.

CONCLUSION

The present study used information from focus group discussions and healthy knowledge surveys to design nutrition education modules and physical activities for residents in Bullock County, Alabama. The significant change in knowledge scores is important because African Americans

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are more genetically predisposed to obesity-related chronic diseases; strategies aimed at increasing knowledge and changes in lifestyle are likely to reduce the risk for chronic diseases. Low scores from the nutrition labeling assessments may present an opportunity for researchers to develop a simplified way to teach how to understand the food labels or to develop a simplified food labels.

The high levels of obesity observed by the present study and by similar studies in the Alabama Black Belt region highlight a need to reevaluate current obesity prevention interventions. To develop effective overweight and obesity reduction strategies, researchers and policy makers may need to understand the knowledge, attitudes, practices, barriers, and opportunities that are specific to members in the targeted community. It is thought that a longer study duration would result in significant changes in weight and, thus, in BMI. Long term weight reduction and maintenance may require multiple continued nutritional, educational, and environmental interventions. Although the United States has several state and local programs to tackle obesity, our study highlights the need for culturally and geographically specific interventions.

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