A 130-Gram Moderate-Carbohydrate Diet with Self-Monitoring Approach for Obesity

Submitted by

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Abstract

Obesity is a complex disorder that disproportionately affects rural communities and the African American population. The purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. The social cognitive theory and self-regulation theory addressed the participants' biopsychosocial factors and self-awareness. A quantitative one-group pretest-posttest design by manual extraction was used to collect data and answer the clinical question. A convenience sample of 19 (n = 19) participants included African Americans, males, and females, ages 18 to 60 years, with a BMI of 30 kg/m^2 or higher. The paired-samples t-test was used to analyze the data. Results showed a significant difference in the pretest-posttest mean body weight (M = 1.42 kg, SD = 2.82); t (18) = 2.19, (p = 0.042) and carbohydrate intake (M = 43.76 g, SD = 85.68); t (18) = 2.23, (p = 0.039). The results were statistically significant and suggest that a moderate-carbohydrate diet and self-monitoring intervention may be an effective approach to reduce body weight in obese African American adults. Findings from this project enabled the health center to evaluate their treatment approach to obesity management. Future recommendations should focus on training and utilizing alternative support staff (i.e., medical assistant, community care coordinator, diabetes educators) to provide the educational session to patients.

Keywords: obesity, weight, low carbohydrate, moderate carbohydrate diet, food tracking, self-monitoring, self-regulation, African American, rural, Dietary Guidelines.

Dedication

The completion of this doctoral degree would not have been possible without the help of God. I have held on to God's promise of Jeremiah 29:11 (New International Version), For I know the plans I have for you," declares the LORD, "plans to prosper you and not to harm you, plans to give you hope and a future." A deep appreciation to my husband, James Staten, Jr., and children, Des'Monae Anderson and Justus Staten, who has endured this educational journey with me. To my husband, James, you have been my "rock," and I thank God for providing me with my "help meet." You have indeed endured the test of time, and I will be forever grateful. To my daughter, Des'Monae, you have been a part of my educational pursuit since conception. Now, eighteen years later, you have helped me birth my dreams. To my son, Justus, you have been my stability when I felt I could not hold steady to life's imbalances. You have amazing strength and love, which I will always cherish. Finally, to my family and friends, I know it was hard at times, but like my father, Kenneth Anderson would say, "If it were easy, everybody would be doing it." I can now say to all my loved ones, "It is finished." Thank you all for your patience, support, and love throughout the many years of my educational journey.

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Chapter 1: Introduction to the Project

Obesity remains one of the leading health problems in society today, affecting more than one out of three adults in the United States (National Institute of Diabetes and Digestive and Kidney Disease [NIDDK], 2017). In 2015, obesity and its associated diseases affected North Carolina, where medical expenditures were more than double, compared to other states (Cornwell University, 2018). Obesity predisposes the population to significant health threats, such as type II diabetes mellitus (T2DM) and cardiovascular disease (CVD) (NIDDK, 2015). Rural communities, the economically disadvantaged persons, and communities of color are unduly affected by this chronic disorder (Centers for Disease Control and Prevention [CDC], 2018a), especially for African American adults (46.8%) compared to White adults (37.9%) (Hales, Carroll, Fryar, & Ogden, 2017). The obesity epidemic presents a health hazard to communities and a financial burden on the economy. Development and implementation of a culturally tailored weight-loss intervention were necessary to improve obesity outcomes in the rural-residing, African American participants in this direct practice improvement project (Goode, Styn, Mendez, & Gary-Webb, 2017). Additionally, the intervention was accessible and provided educational instruction to obese participants within this project (Barnidge et al., 2015).

The principal investigator performed a quantitative one-group pretest-posttest by manual data extraction to determine if adherence to a 130 to 225 g per day of dietary carbohydrates with dietary self-monitoring would improve the body weights of obese African American adults attending a rural health center in North Carolina. The project aimed to provide project participants with a single 30-minute educational, face-to-face nutritional session on the reduction of dietary sugar and starches, and food tracking to result in a decreased body weight and improvement of their obesity. This project was worthy of conducting because it may improve clinical health outcomes, reduce public spending, and decrease the rates of obesity in similar demographic populations.

Chapter 1 depicts a general overview of the project. It details the background of the project, its purpose, problem, and clinical question to help the reader identify the extent of the situation and understand its intention. It further presents potential steps in advancing scientific knowledge, the significance of this project, rationale for the chosen methodology, and the nature of the project. A list of key terms, assumptions, limitations, and delimitations follows, concluded by a summary of the project's overall organization.

Background of the Project

Obesity is a persistent medical disorder attributed to a disproportionate or excessive amount of body fat, linked with added risk factors including, T2DM, heart disease, and cancer (World Health Organization, 2014). Biological, psychological, and social (biopsychosocial) factors have contributed to the obesity epidemic (CDC, 2019). Many fast-food restaurants and advertisements endorse high sugary beverages, snacks, and candy within the African American community (Warren, Beck, & Rayburn, 2018), thus promoting energy imbalance within the human's biological system, furthering weight gain (Gahagan, 2012). Additionally, rural areas frequently lack vital resources that aid in weight loss promotion, such as nutrition specialists and accessibility to healthy affordable food options (Rural Health Information Hub, 2018), resulting in perceived psychological barriers and social disadvantages (Baruth, Sharpe, Parra-Medina, & Wilcox, 2014; Pechey & Monsivais, 2016). Given these limited resources, the rural health clinic plays an imperative role in choosing culturally tailored and effective obesity management approaches for their specific population (Rural Health Information Hub, 2018).

Present weight loss recommendations, by the 2015-2020 Dietary Guidelines, suggests consuming a high-carbohydrate (high-carb) diet between 225 to 325 g per day, a variety of all five food groups, and a reduction of 500 to 750 kcal of energy (Lo-Cal) from baseline intake (United States Department of Health and Human Services and United States Department of Agriculture [HHS & USDA], 2015). Health care providers at the rural health center commonly prescribed a high-carb, Lo-Cal diet to their obese patients. These guidelines are commonly used in clinical practice to standardize care and often recognized as best practices for obesity management. Nevertheless, the rate of obesity has continuously increased in the state of North Carolina, 12.3% in 1990, 20.9% in 2000, and 32.1% in 2017 (Robert Wood Johnson Foundation, 2018b).

Evidence-based research has shown low-carb diets that contained 20 to 130 g per day to produce more significant weight loss results compared to the standard low-calorie (Lo-Cal), high-carb diet (Bazzano et al., 2014; Bueno et al., 2013; Snorgaard et al., 2017). While the 2015-2020 Dietary Guidelines suggest a daily carbohydrate intake between 225 to 325 g per day for adults, they have listed the lowest recommended daily allowance (RDA) of carbohydrates as 130 g per day, yet this is rarely publicized to promote weight loss in the obese population. Additionally, poor nutritional compliance was noted in several low-carbohydrate (low-carb) studies as a limiting factor that contributed to participants’ failure to achieve successful weight loss outcomes (Bueno, de Melo, de Oliveira, & da Rocha Ataide, 2013; Mansoor, Vinknes, Veierød, & Retterstøl, 2016; Sackner-Bernstein, Kanter, & Kaul, 2015; Snorgaard, Poulsen, Andersen, & Astrup, 2017). However, within the literature, dietary journals to measure food intake was shown to improve dietary adherence (Sato et al., 2017; Tay et al., 2014). For this project, participants used a dietary journal to track all foods and beverages consumed to promote self-awareness and improve their dietary adherence. Based on the evidence from the literature review, the 130-g moderate-carbohydrate diet with self-monitoring instruction was a practical approach for weight loss in the obese African American adults who attended the rural health center.

Problem Statement

Recommending dietary restriction of carbohydrates, rather than calories, may result in better long-term weight management (Ludwig, Willett, Volek, & Neuhouser, 2018). Moreover, dietary adherence plays a critical role in obtaining successful weight loss to the prescribed diet (Gibson & Sainsbury, 2017). While the literature indicated, low-carb diets between 20 to 130 g per day from carbohydrates, and self-monitoring by dietary records to be effective in weight loss (Gibson & Sainsbury, 2017; Saslow et al., 2017a; Saslow et al., 2017b; Snorgaard et al., 2017), it was not known if and to what extent, weight loss would occur in 19 obese African American adults that attended a rural health center when they adhered to a moderate-carbohydrate restricted diet of 130 to 225 g per day with dietary self-monitoring intervention.

Obesity has affected more than 37.9% of the United States adult population (Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016) and poses further health risks in addition to increasing medical expenditures. It is a complex, multifactorial disease that requires various approaches to improve its outcomes. Obesity is more prevalent amongst African American adults (46.8%) compared to White adults (32%) (Rural Health Information Hub, 2018) and higher in rural counties (34.2%), compared to urban counties (28.7%) (CDC, 2018a). Likewise, African Americans living in rural areas tend to consume a diet high in carbohydrates and fatty foods (Lee, 2018). There was a great need to educate the African American obese adults attending the rural health center on effective strategies to reduce their carbohydrate, improve their dietary behaviors, and prevent future obesity-related diseases. The principal investigator sought to address the obesity problem within the health center by implementing a single-session 30-minute, face-to-face education intervention that focused on the reduction of carbohydrates and dietary tracking; based on evidence provided from the low-carb, self-monitoring, and 2015-2020 Dietary Guidelines literature (HHS & USDA, 2015). Project participants recorded their dietary consumption, using a food journal to improve their self-regulatory behaviors, enhance their self-awareness of eating patterns, and improve dietary adherence (Saslow et al., 2017b). This direct practice improvement project may help reduce obesity rates within rural health centers because it incorporates nutritional teaching and self-regulatory behaviors, which aids the obese individual in making better food choices to promote healthy eating habits and weight loss.

Purpose of the Project

The purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. The independent variable, dietary adherence, was determined by the reduction of total carbohydrates between 130 to 225 g per day. The dependent variable, body weight, was determined by the change in pretest-posttest body weight.

The principal investigator and rural health center collaborated on this direct practice improvement project to improve the obesity outcome measures within the center.

The principal investigator conducted a PowerPoint presentation and several training sessions with the centers' staff to familiarize them with the purpose of this project, educational materials, instrumentation, consent forms, and organizational operation. On their initial visit, project participants attended one 30-minute nurse-practitioner (NP)-led educational session, which included a discussion on making healthy food choices, portion control, reading food labels, reducing carbohydrate consumption, and dietary self-monitoring. The NP obtained participants' body weights and nutritional intake on their initial visit and at four weeks post-intervention.

Findings from this project are significant to society, as it introduced an alternative nutritional approach that may improve the rates of obesity and health outcomes, decrease future public spending, and reduce medical costs. Policymakers can use these findings to better guide decision-making and recommendations regarding dietary and self-regulatory interventions. Researchers may develop further insights and considerations when conducting future projects in rural-residing African American populations. For health care providers, this project may unveil new approaches or modifications to obesity management for their specific demographics. Additionally, the obese adult may apply the recommendations of this project to achieve weight loss, improve CVD risks, prevent or improve T2DM, and impart healthy eating behaviors. The rural health center can use this direct practice improvement project as a clinical quality initiative in their ongoing efforts with the development and implementation of policies and programs to improve obesity outcomes within their center and community.

Clinical Question

There is a body of evidence in favor of carbohydrate-restrictive diets that contain 20 to 130 g per day and dietary self-monitoring, to be a successful approach to weight loss (Gibson & Sainsbury, 2017; Saslow et al., 2017a; Snorgaard et al., 2017). Although the 2015-2020 Dietary Guidelines promote a high-carb, Lo-Cal diet (225 to 325 g per day from carbohydrates and a reduced baseline of 500 to 750 kcal from energy) for weight loss, they have also established the minimum RDA of carbohydrates as 130 g per day. However, there has been little research conducted on the dietary range of 130 to 225 g per day to determine if weight loss will occur in obese African American adults. Nevertheless, it is recommended that a carbohydrate-restrictive diet is prescribed over the calorie-restricted diet to promote long-term weight loss (Ludwig et al., 2018). This project used a quantitative one-group pretest-posttest design to guide and answer the following clinical question: Among obese African American adults (18 to 60 years) with a body mass index (BMI) ≥ 30 kg/m^2, attending a rural health center in what effect does dietary adherence to a single session 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention, have on post-intervention body weight, compared to pre-intervention body weight (kilograms) over a 4-week period?

The independent variable, dietary adherence, was a 30-minute face-to-face educational instruction focused on a carbohydrate restriction of 130 to 225 g per day and daily self-monitoring of food and beverage intake. Dietary adherence was measured from a one-day 24-hr food recall, pre and post-intervention, collected from the Automated Self-Administered 24-Hour (ASA24) Dietary Assessment Tool (Appendix B) and determined by the reduction of total carbohydrates between 130 to 225 g per day. The dependent variable, body weight, was measured from pre and post-intervention calibrated scaled body weight measurements collected by manual data extraction from the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet and determined by the change in body weight.

Advancing Scientific Knowledge

Obesity is associated with T2DM, CVD, sleep apnea, stroke, and fatty liver disease (NIDDK, 2015), and has affected more than 37.9% of the United States' adult population in 2015-2016 (NIDDK, 2017). Although obesity is a complex disease, the simple answer to its solution is weight loss. Even the slightest body weight reduction of 5 to 10% can offer tremendous benefits to the obese individual, including improvement of blood glucose, blood pressure, and cholesterol (CDC, 2018b). Considering that high carbohydrate consumption produces weight gain (Rosinger, Herrick, Gahche, & Park, 2017), it was appropriate to conclude that a reduction of carbohydrate consumption would yield weight loss in the participants. Research findings showed that carbohydrate-restricted diets improved glycemic control, body weight reduction, and CVD risks (Saslow et al., 2017a; Sato et al., 2017; Snorgaard et al., 2017). This project utilized information from the 2015-2020 Dietary Guidelines' lowest RDA of carbohydrates to bridge the gap in the body of knowledge between the low carb diets (20 to 130 g per day) and high-carb diets (225 to 325 g per day) to translate into clinical practice the moderate-carbohydrate diet (130 to 225 g per day) to offer the cardiovascular and metabolic benefits of both diets, while minimizing their associated risks.

This project supplemented the body of knowledge by integrating scientific knowledge into clinical practice to enhance the health care provider's treatment approach to obesity management amongst obese African American adults residing in rural communities. Health care providers and program developers may gain insight into the potential weight loss barriers and motivators specific to this population, to develop culturally appropriate interventions for obesity (Burton, White, & Knowlden, 2017; Goode et al., 2017). Given the lack of healthy food options in rural areas, weight loss interventions must relate to the societal factors that influence the obese individual's outcomes. Therefore, this project may enhance the health professional's demographic-specific education instruction regarding food choices. The health center may use the results of this project to improve quality initiatives within their clinical setting. Project participants learned dietary self-monitoring skills and received educational instruction to increase their self-awareness and knowledge of nutritional intake.

The social cognitive theory (Bandura, 1989) and self-regulation theory (Baumeister, Schmeichel, & Vohs, 2007) founded the theoretical underpinnings for this direct practice improvement project. The social cognitive theory posits that an individual's behavior is influenced by their personal factors, behaviors, and environmental conditions (Bandura, 1989). This project focused on the participants' biopsychosocial factors that often influence obesity. For obese adults attending the rural health center, the various elements that contributed to their weight gain were poor dietary habits, lack of healthy food options, and little education on nutrition (Rural Health Information Hub, 2018). Therefore, it was essential to educate the participants on ways to manage these behaviors to make better food choices. Bandura (1989) and Baumeister et al. (2007) explained self-regulation theory as the gradual ability to override or replace one's unfavorable behaviors with their favored response when provided with appropriate guidance. The three primary determinants of the self-regulation theory were; commitment to standards, self-monitoring, and motivation (Baumeister et al., 2007). Based on the primary determinants of the self-regulation theory, this project theorized that obese adults would be able to achieve successful weight loss results when: they committed or adhered to the dietary recommendation and were given a set standard carbohydrate range of 130 to 225 grams per day (commitment to standards); utilized self-monitoring skills by daily dietary tracking (self-monitoring); and received the resources necessary to improve their self-efficacy and evoke change to their dietary behaviors (motivation) (Baumeister et al., 2007). This theory was valuable to the participants, as it brought recognition to their food choices and behavioral responses. Since obese individuals encounter many social and psychological struggles with dietary choices, interventions to assist with their ability to self-regulate was essential for the promotion of weight loss.

Significance of the Project

Obesity poses significant health and financial threats to society owing to its high costs in medical expenditures and associated comorbid conditions (Cornwell University, 2018). This project was significant because it combined knowledge from the evidence-based research on the efficacy and advantages of low-carb diets and the 2015-2020 Dietary Guidelines, to formulate an alternative 130-g moderate-carbohydrate dietary approach to obesity management. Additionally, it utilized dietary self-monitoring to bring greater self-awareness and self-accountability to the project participants.

Current literature has shown low-carb diets between 20 to 130 g per day to promote more significant body weight reduction, reduce CVD risks factors, and improve blood sugar control compared to the standard diet (Bazzano et al., 2014; Bueno et al., 2013; Sackner-Bernstein et al., 2015; Snorgaard et al., 2017). Nevertheless, debate over the elevated low-density lipoprotein cholesterol (LDL-C) biomarker and its associated risk in CVD has been questioned (Bueno et al., 2013; Mansoor et al., 2016). Conversely, an LDL-C increase was not seen within several studies, mainly when carbohydrate intake was between 70 to 130 g per day or when unsaturated fats were recommended (Bazzano et al., 2014; Meng et al., 2017; Sato et al., 2017; Snorgaard et al., 2017; Tay et al., 2014; Yamada et al., 2014). Research studies have revealed some weight loss resulted in the standard diet (Lo-Cal, high-carb), although not significant when compared to the low-carb diet, and there was no effect noted to participants' LDL-C (Saslow et al., 2017a; Sato et al., 2017). Today, the standard and most commonly prescribed diet for weight loss includes a high carbohydrate intake of 225 to 325 g per day or 45 to 65% kcal, based on a 2,000-calorie diet (United States Department of Health and Human Services and United States Department of Agriculture [HHS & USDA], 2015). Given this knowledge, the principal investigator addressed the gap in the literature by utilizing a 130 to 225 g per day moderate-carbohydrate diet with an emphasis on unsaturated fat. This dietary option was used to produce successful weight loss outcomes in the obese project participants while avoiding the potential risk of an elevated LDL-C, noted within the literature.

Good dietary adherence is necessary to achieve effective weight loss. Several studies showed self-monitoring techniques to be successful in producing weight loss outcomes (Hays, Finch, Saha, Marrero, & Ackermann, 2014; Zheng et al., 2015). Concern for recall bias due to poor memory was frequently noted as a limitation within the research (Bazzano et al., 2014; Mansoor et al., 2016; Sackner-Bernstein et al., 2015). Therefore, project participants integrated the use of daily dietary journals. Participants received a composition book to log all food and beverages and were advised to bring this on their 4-week follow-up visit to assist with entry of their one-day 24-hr food recall, to reduce recall bias.

This project was necessary as it taught project participants self-accountability through mindfulness of their nutritional habits. The self-regulation theory taught project participants how to change their undesired weight-producing behaviors into desired weight-loss-promoting behaviors (Baumeister et al., 2007). Subsequently, the results from this project may assist policymakers, researchers, and program developers with future planning, implementation, and improvement of obesity interventions within similar demographics. Finally, the rural health center and similar entities may apply this direct improvement project to develop programs and services to assist their specific population in improving obesity-related health outcomes.

Rationale for Methodology

This project used a quantitative methodology to best answer the clinical question. Quantitative methods are guided by evidence-based research and incorporate a distinct set of rules and procedures to gain precise measurements to ensure the reliability and validity of its processes (Frey, 2018). Quantitative methods attempt to explain a phenomenon by gathering numerical data and is examined by using statistical approaches (Aliaga & Gunderson, as cited in Muijs, 2011). Qualitative data is not typically numerical, and therefore cannot be statistically analyzed (Aliaga & Gunderson, as cited in Muijs, 2011). This quantitative project employed the knowledge found within the evidence-based research to guide strategic data collection methods and statistical analyses interpretation to improve the project's strength and dependability.

This quantitative project used a one-day 24-hr food recall, pre-intervention, and post-intervention, to measure the participants' dietary adherence of carbohydrates. The ASA24 system automatically coded the participants' food entries to obtain analytic output data (National Cancer Institute, 2019). Additionally, numerical data were collected on the participants' pre and post-intervention body weight. The quantitative methodology was most appropriate to determine the effectiveness of the project participants' dietary adherence (independent variable) to the educational intervention on their body weight change (dependent variable) by collecting numerical data (Frey, 2018). The quantitative design allowed the principal investigator to obtain objective statistical information while reducing subjectivity within the collection of data and analyses process.

Nature of the Project Design

The one-group pretest-posttest design was used to determine the effectiveness of the 130-g moderate-carbohydrate diet with self-monitoring intervention in one group of 19 obese African American adult participants. This design supported the intervention as all participants were assigned to the same group and received the same educational intervention (Allen, 2017). Additionally, the one-group pretest-posttest design allowed the investigator to assess the participants' body weights (dependent variable) before and after implementation of the educational intervention to determine its impact (Allen, 2017). This project aimed to improve the obesity rates within the rural health center. Therefore, the one-group pretest-posttest design was preferred because it did not require a comparison or control group to evaluate the intervention's effects. This design was appropriate given the busy demands of the health center, availability of participants, and short duration of the project; while addressing the clinical question. The quantitative one-group pretest-posttest design enabled the investigator to strategically gather objective data on the independent variable (dietary adherence) and dependent variable (body weight) to determine the intervention's effectivity.

A total of 19 project participants was obtained through convenience sampling from the rural health center, as this afforded accessibility, was simple to carry out, and had less restrictive regulations (Shantikumar, 2018). The sample consisted of African Americans, males, and females, ages 18 to 60 years old, with a BMI of 30 kg/m^2 or higher, who desired to lose weight by reducing their dietary intake of sugars and starches and were willing to track their foods and beverages daily. All 19 participants were allocated to the same group to complete the education session and instrumentation.

The evidence-based intervention spanned over four weeks at the rural health center in Rocky Mount. Participants attended a total of two visits; on their initial visit, the intervention team NP obtained their body weight, height, and administered the NP guided ASA24 dietary assessment tool. Next, participants received a one-on-one, NP-led 30-minute educational instruction on the 130 to 225-gram moderate-carbohydrate diet and self-monitoring. The intervention team NP utilized the participants' one-day 24-hr recall, based on their typical eating pattern, to assist the participant in reducing their carbohydrate intake. Additionally, all participants were advised to track their foods and body weight daily in the composition book provided to them. The Planning Healthy Meals (Appendix D) educational handout was used to guide the educational session (Novo Nordisk, 2018).

On their 4-week follow-up visit, the intervention team NP collected the participants' body weights and nutrient intake. The intervention team NP measured the participants' body weights using a calibrated electronic scale and documented it on the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet. The principal investigator used manual data extraction from the Excel Data Collection for Nurse Practitioner spreadsheet to collect the participants' pretest and posttest body weight (dependent variable) measurements. Carbohydrate intake was measured using the Automated Self-Administered 24-Hour (ASA24) Dietary Assessment Tool from participants' one-day 24-hr food recall (National Cancer Institute, 2019). The principal investigator used manual data extraction from the ASA24 dietary assessment tool to collect participants' pretest and posttest carbohydrate levels to measure dietary adherence (independent variable).

Definition of Terms

The following terms were used operationally in this project and may benefit the reader's understanding of the literature:

130-g moderate-carbohydrate diet. A diet based on the 2015-2020 Dietary Guidelines and RDA minimum carbohydrate allowance (HHS & USDA, 2015). For weight loss to occur, this project recommended 130 to 225 g per day from carbohydrates to project participants. The daily acceptable macronutrient distribution range was as follows: carbohydrates 26 to 45% kcal, total fats 20 to 35% kcal, and protein 10 to 35% kcal, based on a 2,000-calorie diet. When converted to grams per day, this consisted of carbohydrates 130 to 225 g, fats 44 to 78 g, and protein 50 to 175 g (HHS & USDA, 2015). Emphasis was given to unsaturated fat consumption (Sato et al., 2017; Snorgaard et al., 2017) and less saturated fats. The 130-g moderate-carbohydrate diet was part of the educational intervention along with dietary self-monitoring.

2015-2020 Dietary Guidelines. Considered gold standard for dietary recommendations, also known as Healthy Eating Patterns, it consists of the five food groups (vegetables, fruits, grains, dairy, and protein) with minimal allowance for the intake of oils and a recommended energy level of 1,600 to 3,000 kcal per day in adult men and women. It suggests a baseline reduction of 500 to 750 kcal from energy to produce 1 to 1 ½ lb per week of weight loss (HHS & USDA, 2015). The daily macronutrient profile is as follows: carbohydrates 45 to 65% kcal, total fats 20 to 35% kcal, and protein 10 to 35% kcal, based on a 2,000-calorie diet. When converted to grams per day, this consists of carbohydrates 225 to 325 g, fats 44 to 78 g, and protein 50 to 175 g, based on a 2,000-calorie diet (HHS & USDA, 2015). This diet within the research literature is known as a low-fat diet, a high-carbohydrate diet, a normal diet, standard diet, and Lo-Cal diet.

African American. People who reside in the United States with ancestries in any of the black inhabitants of Africa and are the largest racial minority group (Data Access and Dissemination Systems, 2017).

Body weight. A healthy body weight (measured in kilograms) is defined by a healthy BMI (18.5 to 29.9 kg/m^2) relative to one's height (measured in meters) (National Heart, Lung, and Blood Institute, 2013).

Body Mass Index (BMI). A calculation of weight in kilograms divided by the square of height in meters (kg/m^2). May indicate high body fat if elevated. Used as a measurement tool for the diagnosis of obesity (CDC, 2015).

Carbohydrates. One of the macronutrients and a source of energy, sugars, starches, and fiber (HHS & USDA, 2015).

Dietary adherence. The independent variable measured by the project participants' compliance of the 130 to 225 g per day from total carbohydrates and self-monitoring intervention. Project participants used self-regulatory skills such as self-monitoring, mindfulness, and self-awareness, by keeping daily records of all foods and beverages they consumed (Saslow et al., 2017b).

Dietary self-monitoring. Synonymous with dietary tracking, food logs, food journals, and dietary records. It is a form of self-monitoring (Baumeister et al., 2007), and entailed daily recording of all food and beverages consumed to bring awareness to the project participants' dietary behaviors to improve their adherence. Dietary self-monitoring was part of the educational intervention in addition to the 130-g moderate-carbohydrate diet.

Low-calorie (Lo-Cal) diet. A calorie-restriction of 500 to 750 kcal of energy per day from baseline. It is recommended for weight loss by the 2015-2020 Dietary Guidelines (Finkler, Heymsfield, & St-Onge, 2011).

Low-carbohydrate (low-carb) diet. A low-carbohydrate diet consists of daily carbohydrate intake of 20 to 130 g per day. Very low-carbohydrate ketogenic diets (VLCKD) carbohydrates range from 20 to 50 g per day (also known as the ketogenic diet). These diets typically contain high saturated fat content (Noakes & Windt, 2017).

Obesity. A chronic multifactorial disease accompanied by excess amounts of body fat and classified by a BMI of 30 kg/m^2 or higher (Hruby & Hu, 2015).

Rural counties. A population of 250 people per square mile or less. The North Carolina Rural Center (2014) recognized Nash and Edgecombe County as rural counties.

Self-regulation theory. Self-regulation refers to one's ability to override unwanted behavior and replace it with the intended outcome (Bandura, 1989; Baumeister et al., 2007). The three primary determinants of self-regulation are a commitment to standards, self-monitoring, and motivation (Bandura, 1989; Baumeister et al., 2007). This project used the determinants of self-regulation theory to propose that the obese project participants would produce weight loss results when: they committed to the set standard carbohydrate recommendations (130 to 225 g per day) and weight loss goal (one to two pounds per week); employed self-monitoring behaviors through the use of dietary tracking; and when they received the motivation and resources to change their unwanted dietary behaviors (Baumeister et al., 2007).

Weight loss. A body weight reduction of one to two pounds (0.5 to 0.9 kg) per week is most advantageous to long-term weight maintenance (CDC, 2018b). Weight loss was the dependent variable measured in kilograms.

Assumptions, Limitations, Delimitations

Assumptions were the beliefs within this project that are considered to be true (Simon, 2011). Limitations were the restrictions of this project due to its methodology or the project's design (Simon, 2011). Delimitations were the restrictions that resulted due to the project's limitations and were based on inclusions and exclusions (Simon, 2011).

The assumptions for this quantitative one-group pretest-posttest project was as follows:

1. All project participants provided factual and accurate information when they entered their food and beverage intake into the ASA24 dietary assessment tool for the 24-hour recalls, and when they answered any questions. This was assumed to be true given project participants were assured confidentiality and security of their private health information. Also, a notebook was provided to project participants to record their daily dietary intake, as this would increase accuracy in their dietary records and decrease limitations to memory recall.
2. All project participants adhered to the treatment plan to the best of their ability. This was assumed to be accurate, given that all project participants were willing partakers and were not coerced or involuntarily subjected to participate in this project. All project participants were advised that they may withdraw from the project at any time and without any penalties.
3. The project participants were representative of the obese African American adult population residing in rural North Carolina, and were able to make

inferences to this specific group. This was assumed to be true based on the Nash and Edgecombe County needs assessment survey, which was utilized to obtain knowledge of residents' obesity rates, economic status, and health needs (Hill & Johnson, 2016). Also, the North Carolina Rural Center, (2014), listed Nash and Edgecombe as rural counties. The sample size was calculated using a margin of error and confidence level (methodological).

4. Based on the self-regulation theory, the project participants required specific instructions with a set goal to work towards the desired weight loss objective (Baumeister et al., 2007). This was assumed to be true, in theory, given project participants received dietary instruction with self-monitoring recommendations. Participants were given a set goal of 130 to 225 g per day of carbohydrates and one to two pounds (0.5 to 0.9 kg) per week as the set standard. According to the self-regulation theory, the project participants would achieve the desired outcome (weight loss) given these standards.
5. Based on the self-regulation theory, the project participants would need resources to strengthen their self-efficacy to make a continued change towards the desired weight loss goal (Bandura, 1989; Baumeister et al., 2007). This was assumed to be true; in theory, therefore, participants received educational resource handouts and recommendations to help them overcome barriers and improve their self-efficacy.

The limitations of this quantitative one-group pretest-posttest project were as follows:

1. The one-group pretest-posttest design had weak internal validity due to its failure to account for several confounding variables, which threatened the

accuracy of this project's conclusion (Allen, 2017). However, internal validity was strengthened due to this project's short 4-week duration; therefore, history and maturation effects were minimized. Additionally, the instrumentation effect was decreased, given project participants' pretest were based on a one-day 24-hr food recall. Although this same instrumentation was used to assess participants' post-intervention dietary behaviors, there were no preset questions for them to remember.

2. Convenience samples resulted in sampling bias and may not be representative of the general population, thus exhibiting low external validity (Explorable.com, 2009). Generalization of this project was limited to the obese, African American adult population residing in rural communities. Also, given the short, 4-week duration of this project, the results may not be representative of an individual's weight loss results longer than this period.
3. Small sample size may result in a lack of generalizability. Increasing the sample population may improve this bias. Nevertheless, the purpose of this project was to evaluate the effects of the intervention amongst the obese African American adults that attended the rural health center. Therefore, one should consider the characteristics that affect the sample size for this direct improvement project when making generalizations.
4. There was no control or comparison group. The principal investigator chose the quantitative one-group pretest-posttest design due to practicability, ease of use, time constraint, and ability to answer the clinical question.

The delimitations of this quantitative one-group pretest-posttest project were as follows:

1. The project was conducted at a rural health center in North Carolina. The population was primarily underserved, minorities, with chronic health conditions and government-assisted recipients. The use of the ASA24 dietary assessment tool was used based on its ease of use in low-literacy groups. It was evident that utilizing the intervention team NP to assist the participants with the ASA24 dietary tool provided a more time-efficient and detailed food recall. Additionally, there was no cost to use the ASA24 tool.

2. This project was delimited to a sample selection of obese African American adults. The health center serviced a large population of obese African American adults and was an ideal location to reach the target population for this project.
3. This project was delimited to English-speaking participants due to the intervention team NP's limited ability to interpret additional languages and availability of an interpreter at all times.
4. This project was delimited to a 4-week duration due to the time constraints within the academic institution. An initial, 4-week, and 12-week data collection points would be more representative of the literature. However, this was not practicable for the principal investigator.

Summary and Organization of the Remainder of the Project

In summary, obesity is a complex disease that contributes to excess amounts of body fat and requires multiple factors to control and prevent. The impact of obesity and its comorbid conditions has been experienced within local communities, statewide, and nationally. With no proclivity towards repression in rates, obesity management is in dire need of practical alternative approaches. For years dietary standards have favored high-carb, Lo-Cal diets (225 to 325 g per day and 500 to 750 kcal of reduced baseline energy) for weight loss, yet obesity rates have not improved.

Studies have shown reduced-carbohydrate diets, between 20 to 130 g per day from carbohydrates, and dietary self-monitoring to be successful in producing weight loss results (Gibson & Sainsbury, 2017; Saslow et al., 2017a), yet little research has been conducted to determine if reduction of body weight will occur amongst obese African Americans when prescribed a moderate-carbohydrate diet of 130 to 225 g per day with dietary self-monitoring. Therefore, the purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. A body weight reduction of one to two pounds per week was shown to be beneficial in long-term weight maintenance (CDC, 2018b). The principal investigator conducted a thorough review of the literature to address the gap between the low-carb and high-carb diet to best answer the clinical question and support this 130-g moderate-carbohydrate diet with self-monitoring intervention.

Chapter 2 presents a detailed overview of the most current evidence-based literature and provides details on the theoretical framework based on the social cognitive theory and self-regulation theory. It further outlines the three main themes of the literature, including biological, psychological, and social factors that influence and improve weight loss outcomes in rural-residing obese African American adults. Additionally, chapter 2 is divided into subthemes to depict a more in-depth outline of the literature. Chapter 3 will describe the methodology, designs, and procedures used in this project. Chapter 4 will provide written and visual details on the data analysis procedures and results. Chapter 5 will discuss the interpretation of results and how it relates to existing research knowledge of obesity management.

Chapter 2: Literature Review

The purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. The independent variable, dietary adherence, was determined by the reduction of total carbohydrates between 130 to 225 g per day. The dependent variable, body weight, was determined by the change in pretest-posttest body weight. The literature was thoroughly reviewed to obtain current, evidence-based research on dietary self-monitoring, low-carb diets, and high-carb diets to support the gap in knowledge of the moderate-carbohydrate diet. Findings on the moderate-carbohydrate diets (130 to 225 g per day of carbohydrates) were highly limited or outdated.

The following databases were searched to retrieve current, empirical articles: Cumulative Index to Nursing and Allied Health Literature Complete, Cochrane Library, EBSCO Host, Joanna Briggs Institute EBP, Google Scholar, Natural Medicines, Nursing & Allied Health Database, Ovid Nursing Essential Collection, and PubMed. Keywords include obesity, diet, weight loss, low carbohydrate diet, moderate carbohydrate diet, low-calorie diet, restricted carbohydrate, low-fat, food tracking, self-monitoring, self-regulation, African American, Black, rural areas, community, culturally sensitive, Dietary Guidelines, adults, and underserved.

Chapter 2 introduces the purpose of this project and proceeds with a discussion on the background of the obesity problem, relevant to the clinical question. Next, the theoretical foundation provides a conceptual overview of how the social cognitive theory and self-regulation theory was used to explain the obesity problem, guide the clinical question, and justify the variables measured. Finally, the review of the literature provides an exhaustive assessment and analysis of current, evidence-based studies used to support this project. The review of the literature is structured to address three main themes. The first main theme is biological factors of the low carbohydrate diet; its subthemes are low carbohydrate diets and body weight biomarkers, low carbohydrate diets and glycemic control biomarkers, and low carbohydrate diets and lipid biomarkers. The second main theme is psychological factors of obesity; its subthemes include perceived barriers of obesity, low carbohydrate diets and adherence, and mindfulness and dietary self-monitoring. The third main theme is social factors of society; its subthemes include culturally tailored programs, socioeconomically disadvantaged, and the complexity within the rural communities.

Background

Obesity is a widespread epidemic that has affected more than one-third of the United States adult population (Flegal et al., 2016). This disease is characterized by an abnormal amount of body fat and associated with additional comorbid health risks, such as T2DM, CVD, and cancer (World Health Organization, 2014). These health risks are even higher in adults residing in rural counties, compared to those living in urban counties (CDC, 2018a). In 2013, the town of Rocky Mount (composed of two counties), North Carolina reported an estimated 31.3% and 40.7% adult obesity rate among residents of Nash and Edgecombe County, respectively (Hill & Johnson, 2016), compared to the state's average of 29.4% (Robert Wood Johnson Foundation, 2018a). Additionally, there is a higher prevalence of obesity among African American adults (46.8%) compared to White adults (37.9%), 2015-2016 (Hales et al., 2017).

Several biopsychosocial factors contribute to the development of obesity, including one's dietary patterns, perceived psychological barriers, and societal influences (CDC, 2019). However, poor dietary behaviors are recognized as one major causative factor in weight gain. These dietary choices are often more difficult in African American communities where fast food establishments are prevalent, and advertisers promote high sugary beverages and unhealthy snacks (Warren et al., 2018); thus, requiring the obese adult to use self-regulatory behaviors to control their unhealthy food choices.

The 2015-2020 Dietary Guidelines are the standard diet most often prescribed in clinical practice (HHS &USDA, 2015). It incorporates a variety of all five food groups and recommends a reduction of energy between 500 to 750 kcal per day of baseline intake for weight loss. Although the 2015-2020 Dietary Guidelines has published an RDA of 130 g from carbohydrates to be the safest minimum amount, this is rarely promoted for weight loss in the literature and clinical practice (HHS & USDA, 2015). Likewise, given most Americans exceed the recommended dietary amounts of sugars, saturated fats, sodium, and calories (HHS & USDA, 2015), it was appropriate to prescribe the 130 to 225 g carbohydrate diet for this obese adult population.

There is a body of evidence in favor of carbohydrate-restricted diets between 20 to 130 g per day to be more effective in the reduction of body weight and triglycerides (TG), while improving high-density lipoprotein cholesterol (HDL-C) and other health obesity-related conditions (Bazzano et al., 2014; Bueno et al., 2013; Mansoor et al., 2016; Snorgaard et al., 2017). Bazzano et al. (2014) conducted a randomized, parallel-group trial to compare the effects of a low-carb (less than 40 g per day) diet to a low-fat, high-carb diet (less than 30% kcal from total fat; less than 7% kcal from saturated fat; 55% kcal from carbohydrates), on body weight and CVD risks in 148 obese adults. The analysis revealed the low-carb group produced substantial weight loss, fat mass reduction, lean body mass, and improved CVD risk factors at 12 months, in comparison to the low-fat group (Bazzano et al., 2014). Additionally, studies have shown low-carb diets to improve glycemic control (Meng et al., 2017; Snorgaard et al., 2017; Yamada et al., 2014).

Adherence to dietary prescription is necessary to achieve improved weight loss outcomes. Poor nutritional compliance or intervention adherence was noted as a limitation in several studies when participants consumed less than 130 g per day of carbohydrates (Bueno et al., 2013; Mansoor et al., 2016; Sackner-Bernstein et al., 2015; Snorgaard et al., 2017). However, dietary journals to measure food intake was noted within the literature to improve adherence (Sato et al., 2017; Tay et al., 2014;); especially with high frequency and high consistency self-monitoring, there was better long-term weight loss (Burke, Wang, & Sevick, 2011; Peterson et al., 2014). Therefore, project participants were encouraged to track all foods and beverages they consumed on a daily frequency, using a composition notebook, for improvement of intervention compliance (Saslow et al., 2017a; Saslow et al., 2017b).

Based on evidence from the literature review, the principal investigator recommended a 130-g moderate-carbohydrate diet with dietary self-monitoring intervention to be a suitable approach for obesity management in the project participants at the rural health center, to guide this project and answer the clinical question. The underpinnings were developed using the social cognitive theory and self-regulation theory to address the obese individual’s thoughts and behaviors, to cause the desired action in favor of improved weight loss. The project was aimed to find out if dietary adherence to a moderate-carbohydrate diet and self-monitoring intervention would improve the obesity outcomes of African American adults attending the rural health center.

Theoretical Foundations

The theoretical underpinnings for this direct practice improvement project were founded on Bandura's (1989) seminal work of social cognitive theory and the later contributions of self-regulation by Baumeister et al. (2007). These theories supported, predicted, and identified the obesity phenomena; while challenging and advancing existing knowledge. The theoretical foundation presents and describes the concepts, explaining why the obesity problem existed (Abend, 2008).

Social cognitive theory. The social cognitive theory (SCT), previously known as the social learning theory in the 1960s, was created by Albert Bandura in 1986 (LaMorte, 2018). The SCT supported the belief that human behavior is mutually shared through three subsystems of influence, which included personal factors, behavior, and environmental conditions (Bandura, 1989). For this direct practice improvement project, the SCT reinforced the biopsychosocial factors that contributed to obesity in the project participants. Bandura (1991) described the personal factors as the biological components and cognition of the human organism. This project addressed the biological factors of the low-carb diet in context to its cardiometabolic influences and its impact on the obese adult; while, the psychological factors were represented from the participants' cognitive perceptions. Bandura (1991) described the link between behavior and environmental influences as bidirectional, allowing people to create their environment through social interactions and selection of situations. The principal investigator examined the social factors that influenced the environmental and societal needs of obese African American minority adults residing in rural areas, which often hindered their success to effective weight loss.

Self-regulation theory. Albert Bandura and Roy Baumeister were two theorists identified in contributing to the self-regulation theory (SRT). Bandura (1989) posited that successful self-regulation required the gradual replacement of one's internal controls with external guidance of approvals and directives. Baumeister et al. (2007) suggested that self-regulation referred to one's ability to self-alter or override an unwanted behavior and replace it with the desired response. Bandura and Baumeister identified similar determinants of the SRT, in which three primary determinants were used for this project including, commitment to standards, self-monitoring, and motivation (Bandura, 1989; Baumeister et al., 2007).

The first self-regulation determinant, commitment to standards, emphasized the obese participants' having a set, favorable standard of the recommended 130 to 225 g per day carbohydrates and a weight loss goal of one to two pounds per week (Baumeister et al., 2007). The participants were encouraged to perform a self-evaluation (through dietary self-monitoring) of their dietary actions and to improve their efforts when the standard carbohydrate level or weight loss goal was not met (Bandura, 1989). Finally, project participants attempted to alter their unfavorable behavior to meet a more favored behavior (Baumeister et al., 2007). For example, the participant would choose a lower carbohydrate snack or a diet drink, instead of their previous high carbohydrate snack and high sugary beverage.

The second self-regulation determinant, self-monitoring, involved the project participants' ability to monitor their behaviors through self-awareness to evoke a favorable change in their dietary behavior (Baumeister et al., 2007). Bandura (1989) described self-monitoring as a self-reflection of thought processes in which individuals can predict, take action, and evaluate the results of their decision, and make necessary changes. Project participants incorporated self-monitoring skills by keeping a journal of all foods and beverages they consumed to bring mindfulness of their dietary habits to effect the change in their body weight. Several quantitative studies incorporating self-monitoring skills were shown to be effective in improving dietary adherence (Sato et al., 2017; Tay et al., 2014); especially with high frequency and high consistency self-monitoring, there was better long-term weight loss (Burke et al., 2011; Peterson et al., 2014).

The third self-regulation determinant, motivation, focused on the participants' mental capacity to change their behavior when provided with resources (Baumeister et al., 2007). It began with the participants' perception of having limited educational or societal resources, which resulted in their overuse of self-regulating acts, subsequently affecting their ability to self-regulate their daily activities (Baumeister et al., 2007). Conversely, when project participants replenished these resources, they could effectively self-regulate their dietary behaviors (Baumeister et al., 2007). Saslow et al. (2017b) conducted a quantitative parallel-group randomized study on participants with T2DM using an online Mindfulness-Based Eating Awareness Training program. The low-carb group received the mindfulness-based eating program and positive affect regulation, while the Lo-Cal comparison group did not receive the mindfulness-based eating program. However, the Lo-Cal group did receive educational handouts, short videos, and online resources. Although not statistically different, both groups achieved great weight loss and reported fewer cravings for carbohydrates and sweets and reduced stress eating (Saslow et al., 2017b). This project provided the participants with nutritional resources, dietary journals, and motivational encouragement to promote mindful-eating, improve dietary adherence, and to help them reach their weight loss goal.

Burke et al. (2011) performed a systematic review of literature on self-monitoring amongst behavioral weight loss studies utilizing the SRT as a theoretical foundation. Burke et al. (2011) suggested there was a strong conceptual basis associated with the use of self-monitoring and behavior changes. The review included 22 studies on three main components of self-monitoring: diet, exercise, and self-weighing. Findings showed a substantial relationship between self-monitoring and body weight reduction. According to SRT, the researchers believed, to change behaviors, one must become aware of their actions, the circumstances in which they occur, and its effects. Additionally, honesty, consistency, and timeliness of self-monitoring were critical to successful self-regulation. Burke et al. (2011) noted self-reporting as a limitation in several studies, which questioned the strength of their findings. Also, many studies failed to provide a recommended dose of self-monitoring to support consistency and frequency for weight loss recommendation. Researchers concluded it was necessary to determine the frequency and duration of self-monitoring and objective measures of self-reporting to strengthen the methods of behavioral treatment for weight management (Burke et al., 2011).

Morgan et al. (2014) conducted a randomized controlled trial in 159 overweight and obese men. The intervention consisted of Bandura’s SCT, utilizing goal setting, reward provisions, and self-monitoring of weight, exercise, and nutrition. To evoke behavior change according to the SCT, the SHED-IT intervention focused on educating participants about the personal benefits of weight loss through increased exercise and a healthy diet. Resources were tailored to improve the participants' capability of performing the behavior to aid in the progression of their self-regulatory skills and help them overcome potential barriers. Finally, to assist with social-cultural dynamics, participants were given social networks, strategies, resources, and online support. Results from the SHED-IT intervention group revealed more significant weight loss compared to the control group. Morgan et al. (2014) suggested that further studies with men should emphasize self-monitoring and setting goals to improve behavior change and weight loss outcomes.

McKee and Ntoumanis (2014) conducted a pragmatic randomized quantitative study in 55 overweight and obese participants to evaluate a self-regulatory skills intervention on weight loss outcomes. Participants were randomized into the self-regulation intervention or the advice intervention. Both groups received two educational sessions and weekly tasks. The self-regulation group received information on delayed gratification, cognitive control, setting goals, self-monitoring, mindfulness, and coping (McKee & Ntoumanis, 2014). The advice group was counseled on diet and exercise. Participants' results at 12-week follow-up revealed improved body weight reduction, self-regulatory behaviors, and psychological outcomes in both groups. McKee and Ntoumanis (2014) concluded that self-regulatory education might be just as effective as providing advice on diet and exercise for weight loss.

Kitsantas (2000) conducted a double-blinded qualitative study in a group of 33 individuals who were divided into three groups: (a) overweight and failed to lose weight, (b) previously overweight and maintaining weight for at least six months, and (c) ideal body weight. The study purposed to recognize the self-regulatory skills used to sustain, lose, or control their weight, and to gain insight into their self-efficacy perceptions (Kitsantas, 2000). All participants received structured interviews with questionnaires. Results indicated that participants who applied self-regulatory skills such as setting goals, self-monitoring, self-evaluation, and social resources were able to sustain or lose weight. The study revealed that overweight participants reported using fewer skills and had lower self-efficacy perceptions towards skills implementation when compared to participants of a healthy weight or who had successfully lost weight. Kitsantas (2000) reported that a higher self-efficacy was perceived in participants who applied their self-regulatory skills consistently when faced with difficulties and were more successful in managing their weight.

Based on this theoretical review of the literature, the principal investigator utilized the SCT and SRT to increase the project participants' self-awareness about their food habits using dietary journals to help them make necessary changes towards achieving their weight loss goal. Many rural African American adults face societal barriers when presented with dietary choices (Lee, 2018; Woodruff, Schauer, Addison, Gehlot, & Kegler, 2016). Therefore, it was necessary to integrate skills that would assist the project participants with their ability to self-regulate. To answer the clinical question, this project used the SRT to set a weight loss *standard* that would assist in quantifying the dependent variable, body weight. In addition, *self-monitoring* was used to evaluate the independent variable, dietary adherence, using two non-consecutive day food records. Finally, *motivation* was provided to participants during the educational intervention along with resources to improve their self-efficacy and self-regulatory skills.

Review of the Literature

Obesity is a complex, chronic multifactorial disease (Castelnuovo et al., 2017) caused by various biopsychosocial factors. This review of the literature was structured to address three main themes to support this quantitative one-group pretest-posttest project which includes, biological factors of the low-carbohydrate diet, psychological factors of obesity, and social factors of society; as it relates to managing and overcoming obesity in the rural-residing African American adult.

Biological factors of the low carbohydrate diet. Biology is the study of life and its vital processes (Biology, 2019). The subthemes identified include low-carbohydrate diets and body weight biomarkers, low-carbohydrate diets and glycemic control biomarkers, and low-carbohydrate diets and lipid biomarkers. Biological factors were significant to this project as it addressed the cardiometabolic components of a low-carb diet and its impact on obesity and obesity-related diseases.

Low-carbohydrate diet and body weight biomarkers. To sustain life, one must maintain adequate nutrition. However, this has posed to be a challenge to many Americans in society today. Therefore, it was important to examine the low-carb diet against the body weight biomarker to conclude its overall efficacy in the obese adult.

Bueno et al. (2013) performed a quantitative meta-analysis on 1,577 overweight and obese adults to evaluate the effects of a very low-carb ketogenic diet (VLCKD) (less than 50 g per day or 10% kcal from carbohydrates) compared to a Lo-Cal, low-fat diet (calorie-restricted and less than 30% kcal per day from fats), on body weight. Studies included randomized controlled trials (RCT), ages 18 years and older, a 12-month or more follow-up, average BMI of 27.5 kg/m^2, and calorie restrictions. Secondary outcomes included TG, LDL-C, and HDL-C. Bueno et al. (2013) resulted in 12 months; participants in the VLCKD group achieved a significant reduction in their body weight, TG, and improved HDL-C, compared to the Lo-Cal, low-fat group. Additionally, the VLCKD group exhibited a significantly greater increase in LDL-C compared to the low-fat group, in which researchers contributed to an increase in saturated fat consumption (Bueno et al., 2013).

Johnston et al. (2014) conducted a quantitative meta-analysis of 48 studies (7,286 participants), to examine the effects of popular diets on the body weight and BMI of overweight and obese adults compared to no-named diets. The popular diets were categorized into three categories; low-carb (less than 40% kcal from carbohydrates, 30% kcal from protein, and 30 to 55% kcal from fats per day); moderate macronutrients (55 to 60% kcal from carbohydrates, 15% kcal from protein, and 21 to 30% kcal from fats per day); and low-fat (60% kcal from carbohydrates; 10 to 15% kcal from protein, and less than 20% kcal from fats per day). The meta-analysis included trials of 3-month follow-up or more, with or without physical activity, behavioral counseling, and meal replacements. Johnston et al. (2014) measured calorie restriction, exercise, and behavioral support as modifiers to weight loss. Johnston et al. (2014) findings revealed that the low-carb diet class resulted in the most significant weight loss amongst the other groups.

Anton et al. (2017) recognized the popularity in commercial diets of 2016 and performed a systematic quantitative review to examine the efficacy of these popular diets on body weight reduction in overweight and obese adults. In this review, Anton et al. (2017) included adults 18 years and older, interventional trials of 12 weeks or longer, with sample groups of 15 or more, BMI of 25 kg/m^2 or higher and body weight measurements using pre and post-intervention body weight. Interventions did not include a specified calorie requirement, meal replacement or supplementation, and structured physical fitness program. A total of 16 articles met inclusion; Atkins, Dietary Approaches to Stop Hypertension (DASH), Glycemic-Index, Mediterranean, Ornish, Paleolithic, and Zone diet (Anton et al., 2017). Researchers established if diets were clinically meaningful or successful by participants' body weight reduction of 5% or greater than their baseline weight. Anton et al. (2017) results showed the Atkins diet (10% to 42% kcal from carbohydrates, 18% to 30% kcal from protein, and 38% to 59% kcal from fats per day) produced the greatest clinically meaningful weight loss in less than six months and greater than one year.

In summary, these meta-analysis and systematic reviews support the use of low-carb diets as an effective approach to decreasing the body weight biomarker in the obese adult population (Anton et al., 2017; Bueno et al., 2013; Johnston et al., 2014). Bueno et al. (2013) concluded, the VLCKD achieved a significant reduction in body weight, TG, and diastolic blood pressure, while exhibiting an increase in LDL-C and HDL-C levels. Although LDL-C increased, researchers believed there were some advantageous effects on cardiovascular risk and could be a good alternative to obesity management (Bueno et al., 2013). Anton et al. (2017) concluded, popular low-carb diets, such as Atkins and Paleolithic diet, were associated with the most significant weight loss amongst all other diet classes at less than six months and greater than one year. Johnston et al. (2014) also concluded that the low-carb diet group was associated with the greatest weight loss at six months. These studies had similar limitations in which adherence towards the prescribed macronutrient profile was not defined, and high attrition rates (Anton et al., 2017; Bueno et al., 2013; Johnston et al., 2014). Diet is a fundamental component for any weight loss intervention, and a low-carb macronutrient distribution should be considered as an effective approach to reducing body weight (Anton et al., 2017; Bueno et al., 2013; Johnston et al., 2014). Based on the review of literature, the principal investigator concluded, the daily moderate-macronutrient distribution: 130 to 225 g (26 to 45% kcal) from carbohydrates, 44 to 78 g (20 to 35% kcal) from fats, and 50 to 175 g (10 to 35% kcal) from protein; based on a 2,000-calorie diet, to be a useful dietary recommendation for body weight reduction in the participants for this project.

Low-carbohydrate diets and lipid biomarkers. Cardiovascular disease poses a significant threat to many obese adults. Furthermore, given the controversy over low-carb diets effects on LDL-C, it was important to examine the literature. Measurement of the lipid biomarkers that suggest the underlying biological processes for the increased CVD risk may be significant as treatment with the low-carb diet may be an effective alternative approach.

Bazzano et al. (2014) performed a 12-month quantitative parallel-group, RCT to compare the findings of a VLCKD (40 g per day from carbohydrates) to a low-fat, high-carb diet (less than 30% kcal from fat, less than 7% from saturated fat, and 55% kcal from carbohydrates), on body weight and CVD risks, in a large percentage of African Americans (51%). The sample consisted of 148 adults, with an average age of 46.8 years, BMI 30 to 45 kg/m^2, and with no clinical comorbidities present. There was no calorie restriction in either group, and physical activity was to remain as usual. Participants met with a dietitian and were provided a handbook with recipes, menu samples, food lists, and meal planner guide on macronutrient counting and nutritional labels. Both groups received similar instruction on eliminating trans fats and emphasis on monounsaturated fats. Overall results at 3, 6, and 12-months revealed, the VLCKD group significantly reduced their body weight, fat mass, lean mass, total cholesterol (TC) to HDL-C ratio, and TG level, compared to the low-fat group. Additionally, the VLCKD group showed more significant improvement in HDL-C and their 10-Year Framingham Cardiovascular Heart Disease risk scores; at 12 months, no significant increase was noted to LDL-C levels. Waist circumference decreased significantly in both groups at three and six months. The daily dietary composition at 12-month follow-up in the VLCKD group was noted as 1448 calories; 127 g or 34% kcal from carbohydrates; 69 g from fats; and 23.6% kcal from protein (Bazzano et al., 2014).

Sackner-Bernstein et al. (2015) conducted a quantitative trial-level meta-analysis to evaluate the effects of low-carb diets (120 g per day or less from carbohydrates) compared to a low-fat diet (less than 30% kcal per from fat), on weight loss and CVD risks in strictly adherent adults. The analysis included 17 research studies (1,797), from an 8-week to 24-month duration in overweight and obese participants, ages 18 or older, and without comorbidities, other than dyslipidemia. The Pooled Cohort Equations were used to determine the risk of atherosclerotic cardiovascular disease (ASCVD) events. Statistical analyses were synthesized with conventional frequentist and Bayesian methods. The average daily macronutrient profile range within the low-fat group was 36 g lower in protein, 53 g lower in fats, and 145 g higher in carbohydrates, compared to the low-carb group. Results revealed a statistically significant greater reduction of body weight and TG and increased HDL-C of participants within the low-carb group. The low-fat group improved significantly in body weight, TC, and LDL-C. Sackner-Bernstein et al. (2015) revealed no statistically significant increase in LDL-C within the low-carb group. Sackner-Bernstein et al. (2015) LDL-C findings were comparable to Bazzano et al. (2014) but contradicted the results from the Bueno et al. (2013) study. Both groups showed a decrease in the estimated 10-year risk score for ASCVD. The Bayesian model indicated a high likelihood of a more considerable improvement in the predicted risk of ASCVD in the low-carb group.

Mansoor et al. (2016) performed a quantitative meta-analysis to compare the effects of VLCKDs (20 to 40 g per day or 20% kcal of carbohydrates), against the traditional low-fat diet (30% kcal or less per day of fat), to determine its impact on weight loss and CVD, among healthy individuals. Researchers included RCTs on VLCKD diets consistent with phase one of Atkins (20% kcal per day of carbohydrates), to the traditional low-fat diet, in healthy participants of 20 or more per group, and six months or greater trial periods. Calorie restriction within the low-fat diet group was noted in nine out of the eleven studies. Most studies incorporated supportive counseling on a diet, maintaining dietary journals, 24-hour food recalls, and were advised to maintain a baseline physical activity. Mansoor et al. (2016) retrieved 11 studies (1,369 participants), noting those in the VLCKD group achieved a greater reduction in body weight and TG and increased HDL-C and LDL-C, compared to the low-fat group. Mansoor et al. (2016) concluded, notwithstanding an increased LDL-C, reduction of body weight indicated beneficial changes of a VLCKD and should be evaluated against the effects of an elevated LDL-C. These findings were consistent with Bueno et al. (2013) meta-analysis and suggested researchers were still uncertain of the effects regarding the elevated LDL-C versus an increased HDL-C on CVD risk, signifying further research was needed (Mansoor et al., 2016).

Mente et al. (2017) conducted a cross-sectional, observational analysis of 125,287 participants from 18 countries to determine the outcomes of nutritional intake on blood lipids and blood pressure in low, middle, and high-income countries. Methods included the use of food frequency questionnaires (FFQ) and the United States Department of Agriculture (USDA) food composition database to measure food consumption (including carbohydrates, fats, and protein) (Mente et al., 2017). Additionally, a nutrient-dense simulation model was used to analyze the overall and individual effect on participants' consumption levels when saturated fatty acids (SFA) were replaced with other fats and carbohydrates in an isocaloric (moderate carbohydrate, moderate fat) diet. The findings revealed, fat consumption was linked with higher levels of TC, LDL-C, HDL-C, and apolipoprotein (ApoA1) and decreased TG levels, TC to HDL-C ratio, TG to HDL-C ratio, and apolipoprotein B (ApoB) to ApoA1 ratio. Higher levels of carbohydrates consumption resulted in lower TC, LDL-C, ApoB, HDL-C, and ApoA1, and increased TC to HDL-C ratio, TG to HDL-C ratio, and ApoB-to-ApoA ratio. Additionally, high blood pressure was related to a higher intake of carbohydrates, total fat, and SFA, while higher protein consumption resulted in lower blood pressure. Finally, the substitution of SFA with carbohydrates was linked to the most adverse outcomes on lipids, while substitution of SFA with un-SFA improved LDL-C and blood pressure, but worsened HDL-C and TG. Mente et al. (2017) determined that findings from the data did not favor the reduction of total and saturated fats or their substitution with carbohydrates, due to the negative effect on blood lipids. Researchers further noted that replacing SFA with unsaturated fat may result in improved cardiovascular risk biomarkers, although it may worsen others.

In summary, these studies support the reduction of dietary carbohydrates as an effective approach to lowering the lipid biomarker in the obese adult population for this direct improvement project (Bazzano et al., 2014; Mansoor et al., 2016; Mente et al., 2017; Sackner-Bernstein et al., 2015). Bazzano et al. (2014) concluded, a low-carb diet caused more significant body weight reduction and decreased cardiovascular risk factors when compared to a low-fat, high-carb diet. Sackner-Bernstein et al. (2015) determined although both diets were effective in the reduction of the participants' body weight, the low-carb diet may yield a more significant reduction in predicted risk of ASCVD events when compared to the low-fat diet. Mansoor et al. (2016) concluded that the low-carb diet resulted in significantly higher body weight reduction, TG, and increased HDL-C and should be weighed against the increased LDL-C risk. However, Mente et al. (2017) concluded, ApoB-to-ApoA1 ratio may be the best indication for outcomes of SFA on cardiovascular disease risk, with the biomarkers used in the study, rather than concentrating on a single lipid marker, such as LDL-C, as this does not depict the overall effect of nutrients to disease risk. Obesity in adults increases the risk of developing CVD (NIDDK, 2015). Based on the literature, the principal investigator advised project participants to reduce their dietary carbohydrates, substitute saturated fats with unsaturated fats, and to maintain their usual physical activity, as a safe and effective approach to reduce their cardiovascular risk factors and body weight (Bazzano et al., 2014; Mente et al., 2017). Additionally, participants were provided educational handouts to aid in their understanding of food groups, carbohydrate counting, nutritional labels, meal planning, and portion control (Bazzano et al., 2014) (Appendix D).

Low-carbohydrate diets on glycemic control biomarkers. Type II diabetes is a comorbidity related to obesity. It was important to examine the glycemic control biomarker to evaluate the effects of the low-carb diet on the obese adults' biological system. The participants in this project were advised to reduce their carbohydrate intake, similar that of a diabetic diet, therefore, it was important to determine the safety and efficacy of the diet within this population and on the glycemic biomarker.

Yamada et al. (2014) conducted a 6-month, quantitative comparative two-arm, study in 24 Japanese overweight and obese adults with T2DM to examine the effects of a low-carb diet (70 to 130 g per day from carbohydrates), to a Lo-Cal diet (50 to 60% kcal per day of carbohydrates, 1.0 to 1.2 g/kg per day of protein, and less than 25% kcal per day from fat), on body weight and glycosylated hemoglobin (HbA1c). The Lo-Cal group adhered to the ideal body weight, calorie-restricted diet. Both groups received counseling from four different registered dieticians on meal instruction. Results indicated a significant reduction in HbA1c at six months in the low-carb group compared to the Lo-Cal group. There was no substantial reduction of body weight, TG, and LDL-C in either group, and the Lo-Cal group showed no change in HbA1c. However, correlation analysis was performed in 10 participants and concluded, body weight and HbA1c was significantly correlated to the change in carbohydrate consumption, but there was no correlation to HbA1c and calorie consumption. Researchers suggested that increasing the number of participants may have shown significant effectiveness within the parameters (Yamada et al., 2014).

Meng et al. (2017) performed a quantitative meta-analysis of nine studies, of 734 obese and non-obese adults with T2DM, to compare low-carb diets (l30 g per day or less or 26% kcal of carbohydrates) to standard or high carb diets (45% kcal per day or higher of carbohydrates), on body weight, blood glucose, and lipid levels, over a three to 24-month duration. The analysis included RCT, with outcome measures of body weight, fasting plasma glucose, HbA1c, TC, TG, HDL-C, and LDL-C. The findings revealed that low-carb diets significantly reduced HbA1c and TG and increased HDL-C when compared to high-carb diets. There were no significant effects on body weight, fasting plasma glucose, TC, and LDL-C, in either group (Meng et al., 2017).

Snorgaard et al. (2017) conducted a quantitative systematic review and meta-analysis of 10 RCT (1376 participants) to compare low to moderate-carbohydrate diets (less than 45% kcal per day from carbohydrates) to high-carb diets (45% to 60% kcal per day of carbohydrates) in obese, adults with T2DM. The primary outcomes were HbA1c and BMI after 12 months or longer. Secondary measures were, HbA1c and BMI prior to year one, LDL-C, quality of life, and retention rates. Most RCTs received nutritional counseling by trained dieticians, with similar follow-up frequency, and 1 to 7-day food journals. Trials were included if combined with a high fat and protein intake or both. In most low-carb interventions, participants were advised to increase their protein to substitute their low carbohydrate consumption (Snorgaard et al., 2017). The low-carb diet averaged 25% kcal of carbohydrates, 30% at 3 and 6 months, and 38% kcal of carbohydrates at 12 months. The analysis revealed a reduction in HbA1c in the low-carb group within the first year but was not significant in comparison to the high-carb group. There was no change to body weight, BMI, quality of life, and retention rate between the groups. Researchers noted an increase in the glucose-lowering effects when there was a higher carbohydrate restriction. After year one, HbA1c was similar between the two diet groups (Snorgaard et al., 2017).

In summary, these studies favor the low-carb diet as an effective approach to improve glycemic control in obese adults with T2DM (Meng et al., 2017; Snorgaard et al., 2017; Yamada et al., 2014). Yamada et al. (2014) concluded that a low-carb diet consisting of 70 to 130 g per day could significantly reduce HbA1c and is a safe dietary option for adults with T2DM. Meng et al. (2017) concluded that T2DM adults may benefit from the effects of a low-carb diet on HbA1c for the management of their disease and may improve some CVD risk factors. Snorgaard et al. (2017) concluded that low to moderate-carbohydrate diets may have more significant results on glycemic control in the T2DM adult within the first 12 months and should be considered an appropriate alternative. Yamada et al. (2014) noted that the number of participants enrolled in the study was too small to determine statistically significant results, thus increasing the sample population would improve this constraint. Adults with obesity are at higher risk of developing T2DM (NIDDK, 2015). Based on the literature, the principal investigator recommended a dietary carbohydrate range of 130 to 225 g per day as a safe and effective approach to lowering HbA1c in the obese adult with T2DM, while maintaining adequate glycemic control in the non-T2DM adult, for this project (Meng et al., 2017; Snorgaard et al., 2017; Yamada et al., 2014).

Psychological factors of obesity. In this section, the psychological factors of obesity were examined from the cognitive-behavioral perspective of outcome improvement and treatment management. The subthemes in this section include perceived barriers of obesity, low carbohydrate diets and adherence, and mindfulness and dietary self-monitoring. To effectively treat the obese adult, it was essential to understand the psychological perceptions of the project participants by recognizing the factors that may influence their dietary adherence. Additionally, understanding the health care provider's perception was valuable in identifying their perspective on participants overcoming weight loss barriers.

Perceived barriers of obesity.

Baruth et al. (2014) conducted a qualitative focus group of 28 overweight and obese women, residing in disadvantaged communities to understand their barriers to exercise and eating healthy. The researchers' goal was to develop a culturally sensitive weight loss intervention. The barriers of the focus group were personal, social, and environmental. Baruth et al. (2014) findings from this qualitative study inferred that disadvantaged African American women might face challenges in eating healthy due to role strain, lack of employment or multiple jobs, single-parent homes, financial strains, and lack of healthy food supply. Additionally, topics of concern included food addictions, comfort and stress eating, depression, and eating for unknown reasons (Baruth et al., 2014).

Woodruff et al. (2016) performed a qualitative semi-structured study in 30 health care practitioners to explore the perceived barriers that contributed to their obese patients' difficulties in maintaining healthy body weights. Researchers conducted detailed, informal interviews with physicians (*n* = 14), physician assistants (*n* = 11), and nurse practitioners (*n* = 5) from rural, community-based health centers, with 66.7% non-Hispanic White, 16.7% non-Hispanic Black, 10% non-Hispanic Asian and 6.7% Hispanic. The interviews were numerically recorded and documented, as spoken, to develop a thematic analysis (Woodruff et al., 2016). The study showed that health care practitioners perceived their patients struggled with three significant barriers, first being patients' individual barriers, such as poverty and lack of motivation to lose weight. The second theme was perceived interpersonal barriers, such as the patients' culture and social customs. For example, patients may have a negative connotation to smaller body types, while having a more desirable belief about larger body size. Also, the patients' lack of recognition regarding their obesity, and generalized beliefs about body structures were noted. The third theme was community barriers to weight loss, such as the lack of healthy food choices and food norms of the South (Woodruff et al., 2016).

A qualitative study by McVay, Yancy, Bennett, Jung, and Voils (2018) was conducted in 58 obese adults (65% African Americans and 37.5% Whites) to gather insight on why they seek or do not seek behavioral weight-loss interventions. Researchers divided focus groups with people who recently enrolled in a behavioral weight loss program (initiators) and those who chose not to enroll in a behavioral weight loss program (non-initiators). Participants were recruited from primary care clinics, commercial weight-loss programs, and military weight loss programs. The initiator's group was predominately White, while non-initiators were mainly African Americans.

Both groups received separate interviews to discuss barriers and facilitators to starting a weight loss program (McVay et al., 2018). Methods used to collect data included, audio-recording and transcribing of conversations, qualitative content data analysis, and open coding for theme development. The study revealed three main themes; (1) practical factors, with subthemes related to cost practicality and scheduling agreements; (2) projected effects of the intervention, with subthemes; program information addressing specific needs, effects of social influences on outcomes, and assessing indications of effectiveness, and (3) expected satisfaction of the intervention, with subthemes; enjoyment from social influences, anticipated food tracking prescriptions, and identity and self-sufficiency factors (McVay et al., 2018).

In summary, these studies provided insight into the perceived barriers of obesity and supported this project's intervention by understanding the cognitive-behavioral perceptions of the participants (Baruth et al., 2014; McVay et al., 2018; Woodruff et al., 2016). Woodruff et al. (2016) concluded that their findings might be used to bring awareness of the difficulties within the obese population and applied towards treatment improvement. McVay et al. (2018) concluded that their results could be used to develop strategies and engage the obese person in evidenced-based weight loss programs for the targeted populations. Baruth et al. (2014) qualitative study focused predominately on African American women from disadvantaged neighborhoods and noted their psychological barriers to healthy eating as the following: food addictions, eating for unknown reasons, and comfort eating. Woodruff et al. (2016) recommended providing educational information that is simple, efficient, effective in promoting dietary change, more graphics, fewer texts, behavior modification suggestions, and a food list to eat and to avoid. The McVay et al. (2018) study proposed non-initiators were more likely to seek weight loss programs when they: were able to afford the program, were compatible with their schedule, learned behavioral skills, incorporated physical activity, and were individualized. Based on the literature, the principal investigator utilized the Planning Healthy Meals (Appendix D) to instruct project participants in a simplified, efficient manner, which consisted of little text and plenty of graphics (Woodruff et al., 2016). Additionally, the principal investigator utilized the findings from the evidence-based research to target the psychological barriers of obesity specific to the population at the rural health center (Baruth et al., 2014; McVay et al., 2018; Woodruff et al., 2016).

Low-carbohydrate diets and adherence. No diet will work unless the individual adheres to the recommendations. Therefore, it was important to review the literature on the obese adult's adherence to the low-carb diet. Dietary journaling was commonly seen within the literature to help assist participants with better dietary compliance.

Tay et al. (2014) completed a 24-week randomized parallel pretest-posttest study, to compare the effects of a Lo-Cal, very low-carb ketogenic, high-unsaturated/low-saturated fat diet (Lo-Cal-VLKCD) diet to a high-unrefined carbohydrate, low-fat diet (HCLF), on glycemic control and CVD risk factors, in 115 overweight and obese adults with T2DM. The Lo-Cal-VLCKD group was advised to consume less than 50 g or 14% kcal from carbohydrates, 28% kcal from protein, and 58% kcal from fat (35% monounsaturated fat and 13% polyunsaturated fat), per day. The HCLF group was advised to consume 53% kcal from low glycemic index carbohydrates, 17% kcal from protein, and 30% kcal from total fat (15% monounsaturated fat and 9% polyunsaturated fat), per day. Both groups were advised to consume a calorie restriction of 500 to 1,000 kcal per day. Participants' daily weighed food journals evaluated dietary intake and adherence, urine samples evaluated urea-to-creatinine ratio for protein consumption, and plasma B-hydroxybutyrate to assess low carbohydrate intake. Data were analyzed using Foodworks Professional Edition Version 7 software to measure the mean nutrient consumption. Tay et al. (2014) findings noted that both groups exhibited good adherence to daily calorie restriction (1500 calorie average), measured by plasma B-hydroxybutyrate and urinary urea-to-creatinine biomarkers. Although not statistically different, both the groups had comparable retention rates and weight loss. HbA1c and HDL-C significantly improved within the Lo-Cal-VLCKD group, and no significant increase in LDL-C (Tay et al., 2014).

Hu et al. (2016) conducted a 12-month, quantitative parallel study to compare the behavioral, nutritional, and biochemical indicators of dietary adherence, in 148 obese African Americans adults consuming a VLCKD (40 g per day or less carbohydrates) versus a low-fat diet (30% kcal per day less of fat and 7% saturated fat). The intervention included 20 dietary sessions on behavior and nutrition, no calorie restriction, and maintenance of baseline physical activity; in both groups. The researchers focused on several indicators to determine adherence, including attendance of dietary counseling sessions, macronutrient prescription versus actual consumed, and the presence of urinary ketones. Two 24-hour dietary recalls were collected, and nutrient composition was calculated using the Nutrition Data System for Research software. Although not statistically different, similar rates of adherence were noted in both the VLCKD group and the low-fat diet group. However, the VLCKD group showed statistically more significant body weight reduction compared to the low-fat group (Hu et al., 2016).

Sato et al. (2017) addressed adherence in a quantitative prospective, comparative trial of 66 Japanese adults with T2DM and a BMI > 23 kg/m^2, who previously had difficulty sustaining a Lo-Cal diet. The study evaluated the effects of a low-carb diet (130 g per day of carbohydrates) against a Lo-Cal diet (50 to 60% kcal from carbohydrates, 1.0 to 1.2 g/kg from protein, and the remaining percentage from fats; per day), on HbA1c over six months. The intervention included 1, 2, 4, and 6-month follow-up visits with their previous physician and a nutritionist, and 3-day dietary recalls were used to measure food intake. Three-day dietary records were collected, and nutrient composition was calculated using the analysis software, Super Nutrition Calculation System, Healthy Maker Pro 501 Series. The results indicated significant improvement in HbA1c, BMI, and body weight reduction in the low-carb group compared to the Lo-Cal group. There were no significant changes to HDL-C, LDL-C, microalbumin, and blood creatinine levels between the groups. The carbohydrate consumption at the end of the trial was approximately 149 g per day, in the low-carb group compared to 198 g per day, in the Lo-Cal group. A compliance questionnaire revealed that less than 60% of the time, participants were able to adhere to a low-carb diet (Sato et al., 2017).

In summary, the studies provided evidence to support dietary adherence as an effective method to improve weight loss outcomes (Hu et al., 2016; Sato et al., 2017; Tay et al., 2014). Tay et al. (2014) concluded that a Lo-Cal-VLKCD diet intervention might be successful in treating and managing obese T2DM adults if adherence was maintained beyond 24 weeks. Hu et al. (2016) concluded, adherence rates may not influence the outcomes of different macronutrient distributions; however, given the greater weight loss in the VLCKD group, it should be prescribed over the low-fat diet. Sato et al. (2017) concluded a 130 g per day carbohydrate diet was effective in reducing HbA1c, body weight, and BMI in overweight and obese adults with T2DM who previously had poor adherence to a Lo-Cal diet. Based on the review of literature, the principal investigator determined the one-day 24-hr food recall and ASA24 nutrient database system to be an appropriate tool to collect quantitative data on participants' nutrient intake and to improve their dietary adherence (Hu et al., 2016; Sato et al., 2017; Tay et al., 2014).

Mindfulness and dietary self-monitoring. Mindfulness often increases one's awareness of their eating patterns. Dietary journals were used in many studies as a form of mindfulness and self-monitoring. The effects of dietary self-monitoring has been shown to produce weight loss in the obese population.

Burke et al. (2011) performed a systematic review of the literature to determine the effects of self-monitoring on body weight change. A total of 15 studies on dietary self-monitoring was retrieved, with paper journaling as the most frequently used method. Adherence was evaluated by the number of days logged or completed journals. Descriptive designs and prospective studies were noted in most studies. Findings revealed a significant correlation between self-monitoring and body weight reduction. Due to methodological limitations such as homogenous samples and the reliability of self-reporting, researchers questioned the strength of their findings (Burke et al., 2011).

Peterson et al. (2014) conducted a quantitative study on 234 obese women, from an underserved rural community, who completed a weight loss intervention with self-monitoring. Researchers in this prospective study purposed to determine the impact on body weight change based on their dietary self-monitoring efforts. In the first six to twelve months, all participants attended group-based behavioral modification sessions; received extended support by phone, mail, and in-person, consumed a Lo-Cal, low-fat diet, incorporated exercise, and attended bi-monthly group sessions. After twelve months, the in-person group maintained bi-monthly group sessions, the telephone group received bi-monthly behavioral modification sessions, via phone, and the mail group was provided similar instruction, via mail. Results revealed participants who consistently and frequently tracked their dietary habits produced lower weight regain. Additionally, higher dietary self-monitoring resulted in greater body weight reduction only when participants tracked at a higher consistency (more than three days per week). There was no effect of comprehensiveness on weight change (Peterson et al., 2014).

Saslow et al. (2017a) conducted a follow-up, quantitative parallel-group study to determine the effects of a Lo-Cal, high-carb diet compared to a VLCKD on HbA1c, in 34 overweight and obese adults with prediabetes and T2DM. The Lo-Cal group was advised to consume 500 fewer calories, 45 to 50% kcal of carbohydrates, maintain baseline protein levels, and reduce their fat intake; per day. The VLCKD group was to consume 20 to 50 g of carbohydrates, maintain baseline protein, and to obtain the remaining calories from fats; per day. The secondary outcomes Saslow et al. (2017a) measured included lipid levels, insulin resistance, and body weight. Both groups attended 19 psychological sessions, over 12 months, on proper rest, behavior modifications, and mindful eating to improve adherence with a skilled psychologist addressing topics on mindfulness and health behavior change. The Automated Self-Administered 24-Hour Dietary Recall (ASA24) tool was used to record the participants' dietary intake. Results at six months showed that the VLCKD group significantly decreased HbA1c, BMI, and body weight, and increased LDL compared to Lo-Cal group. At 12 months, results showed that the VLCKD group significantly improved their BMI and body weight. Saslow et al. (2017a) noted that although the Lo-Cal group had a substantial weight loss, it was not statistically higher than the VLCKD group.

Saslow et al. (2017b) conducted a quantitative parallel-group, pilot feasibility study on 25 adults with uncontrolled T2DM (HbA1c 6.5 to 9%), and a BMI of 25 kg/m^2 or higher, to determine the effects of a 32-week online VLCKD with mindful eating program, compared to the ADAs “Create Your Plate” low-fat diet. The intervention recommended daily carbohydrate intake of 20 to 50 g of non-fiber carbohydrates to produce ketones. The Mindfulness-Based Eating Awareness Training program was implemented via email, to assist in behavioral adherence and to increase positive affect regulation. The VLCKD group received urinary acetoacetate test kits to assist in dietary adherence. The low-fat diet group used the guidelines with the “Create Your Plate” method due to previous concerns on counting carbohydrates; they did not receive information on positive affect regulation and mindful eating. However, participants received educational handouts, short videos, and online resources. At 32 weeks, the VLCKD with mindful eating group reduced their HbA1c levels, body weight, and TG levels, significantly, in comparison to the low-fat diet group; there was no effect on HDL-C and LDL-C within either group (Saslow et al., 2017b).

In summary, the literature provided evidence to support mindfulness and dietary self-monitoring to improve the cognitive and behavioral factors associated with obesity (Burke et al., 2011; Peterson et al., 2014; Saslow et al., 2017a; Saslow et al., 2017b). Burke et al. (2011) concluded that, although limitations were noted in the studies reviewed, there was significant evidence in favor of self-monitoring related to successful weight loss outcomes. Peterson et al. (2014) concluded that the use of high frequent and high consistent dietary self-monitoring improved long-term weight loss. Saslow et al. (2017a) concluded good retention and adherence were noted in both groups, most likely due to supportive psychological interventions of mindful eating and positive motivation (Saslow et al., 2017a). Saslow et al. (2017b) concluded that online VLCKD with psychological behavior changes intervention might improve self-management of T2DM. According to the SRT, self-monitoring is one’s ability to recognize a behavior through self-awareness to bring an improved change of that behavior (Baumeister et al., 2007). Based on the review of literature, the principal investigator utilized daily dietary records, educational resources, and mindful eating techniques as a practical approach to promote positive cognitive and behavioral changes within the project participants (Burke et al., 2011; Peterson et al., 2014; Saslow et al., 2017a; Saslow et al., 2017b).

Social factors of society. The social factors gave special consideration to the societal needs within the rural-residing African American minority population and its effect on health outcomes in obese adults. The subthemes are culturally tailored programs, socioeconomically disadvantaged, and complexity within the rural community. African Americans are more susceptible to obesity and obesity-related diseases. Even more so, living in a rural socioeconomically disadvantaged area minimizes the accessibility to health care services, further worsening these conditions.

Culturally tailored programs. African Americans represent a disproportionate rate of obesity in society. To decrease this high rate, weight loss programs should be culturally tailored. Programs should be accessible, feasible, and include people of similar cultures.

Barnidge et al. (2015) conducted a cross-sectional evaluation on the mid-intervention results of a quasi-experimental, rural community-based nutrition and food education program in African American adults, to a comparison County. The intervention-county included community partners, nutritional and behavioral counseling, and access to fruits and vegetables from a local community garden. The SCT guided participants with a focus on self-regulation and behavior change to control their dietary habits and social environment. Culturally appropriate dietary instruction and activities such as REACH was incorporated to promote the consumption of more fruits and vegetables and less sodium and fat intake. Barnidge et al. (2015) measured the effects of the intervention on blood pressure, BMI, fruit and vegetable intake, and accessibility of individual and environmental-level program components. Results showed a reduction of blood pressure and BMI in the intervention-county participants. Additionally, adherence to dietary education and accessibility of fruit and vegetables were independently correlated with participants' perception of fruit and vegetable intake. Researchers concluded that participants with access but lack of education on dietary intake were less likely to consume the recommended servings of fruits and vegetables (Barnidge et al., 2015).

African American women have the highest rates of obesity amongst any other group in the U.S. (National Center for Health Statistics, 2016). Burton et al. (2017) performed a systematic qualitative review of culturally sensitive, weight loss programs for African American adults. The researchers included peer-reviewed articles that consisted of obesity-related interventions in ages 18 and older and evidence-based statistics. This systematic review evaluated eight articles. The primary outcomes in the studies were body weight reduction, promotion of increased exercise, and consumption of fruits and vegetables. Burton et al. (2017), recommended tailoring interventions to reach women in the faith-based community, as this was emphasized within most studies. Although many of the interventions were three months or less, researchers recommended implementing programs for long-term evaluation. Many interventions integrated a theory such as SCT, transtheoretical, health belief, and socio-ecological model to guide concepts of the program. Most programs were designed using a form of community-based participatory research. Burton et al. (2017) questioned the feasibility of the RCTs, given that most interventions occurred within the community setting.

Goode et al. (2017) performed a qualitative narrative review of 23 randomized prospective trials on the standard behavioral treatment (SBT) for obesity management, reported from 2001-2015. The study purposed to identify the inclusion rates of African Americans within these studies and to recognize intervention strategies that may improve health outcomes. Most trials contained 69.6 % or more African Americans in the United States, yet only ten trials reported on racial outcomes. Additional criteria included interventions that used a standard behavioral treatment approach to include, group sessions on lifestyle modifications, a calorie-restricted diet, and increased physical activity; weight change variable; a sample size of 75 or more; greater than 16 weeks duration; and overweight or obese without major comorbid conditions. Goode et al. (2017) concluded that African American participants did not lose as much weight as White participants in standard behavioral weight-loss interventions. Methods that may improve body weight reduction in African Americans included in-person recruitment efforts, African American investigators and research staff, and building relationships with other medical sites. Goode et al. (2017) noted, connecting with other community resources may be beneficial to recruitment efforts in minority groups. Additionally, participants showed improved results when personal contact was added, such as enrolling in programs with friends and family members for support. Finally, two behavioral interventions that were aimed to prevent weight regain in primary care incorporated biweekly or monthly coaching calls resulting in significantly improved outcomes on weight regain (Goode et al., 2017).

In summary, culturally tailored programs were necessary to target the specific needs of the African American community (Barnidge et al., 2015; Burton et al., 2017; Goode et al., 2017). Barnidge et al. (2015) concluded that weight-loss interventions that incorporated dietary education and accessibility to fruit and vegetables could promote healthy behavior changes in the rural-residing African American community. Burton et al. (2017) concluded, studies culturally specific to the African American population were minimal but suggested tailoring programs to focus on ways to access affordable, healthy foods, and safe areas for exercise. Goode et al. (2017) suggested tailoring weight loss programs to incorporate African American representation within the staff and include friends and family members to support participants' behaviors while including behavioral interventions with biweekly or monthly coaching calls (Goode et al., 2017). Based on the literature, the principal investigator recruited a predominantly African American project team to provide a more culturally sensitive environment for the project participants (Goode et al., 2017). Additionally, participants were given dietary instruction to replace present high-carb foods with lower or equivalent cost, low-carb foods, and to eat fruits and vegetables with each meal or as a snack (Burton et al., 2017; Goode et al., 2017).

Socioeconomically disadvantaged. The socioeconomically disadvantaged person usually lacks vital resources necessary for them to attain and maintain a healthy diet. In many rural areas, the African American population suffer with multiple comorbidities. Understanding some of the societal influences of the socioeconomical disadvantaged persons was necessary to explore, as this group was representative of the project's target population.

Bennett et al. (2012) performed a two-arm, quantitative RCT in 365, obese hypertensive adults, attending a community-based health center to compare the effects of a behavioral weight loss, hypertensive self-management program (Be Fit, Be Well) against the usual care. Participants were 71.2% African Americans, 68.5% female, and 32.9% had less than high school education. The intervention included culturally tailored behavior modification goals, community resources, self-monitoring, and accessible online or voice response. Additionally, health care practitioners provided 18 telephone sessions in which participants had an option of 12 group support classes. Results revealed modest body weight and BMI reduction; reduced worsening of systolic blood pressure in the intervention group, although not statistically significant; and improved medication self-management and medication adherence in this at-risk, socioeconomically disadvantaged population (Bennett et al., 2012).

A qualitative study by Pechey and Monsivais (2016) was conducted to determine the role of food costs as a determinant of socioeconomic differences to healthy food choices. The researchers began by evaluating the actual amount spent on food in 24,879 households within the United Kingdom. Next, Pechey and Monsivais (2016) explored ways to reverse the effects of cost and healthy food choices. Finally, the study reviewed the correlation between socioeconomic status (SES), food cost, and healthiness of food choices in conjunction with the chosen supermarket. Results showed that higher SES significantly correlated with higher food costs, which resulted in healthier food buying behaviors. Mediation analyses revealed, food cost, influenced 63% of the low SES participants' decision to consume less nutritious foods. However, nutritious food options influenced 10% of the low SES participants' food costs (Pechey & Monsivais, 2016).

Vogel et al. (2019) conducted a cross-sectional study to examine the combined effects correlated between food environment and psychological factors on dietary habits in socioeconomically disadvantaged women and children. The study used a conceptual framework to determine the level of importance between these variables. Participants were recruited from childcare centers and questioned about their demographics, cognitive resources, dietary habits, and thoughts on accessibility and affordability of food.

Researchers evaluated participants' responses on three constructs of local food environments. The first construct, in-store environment of markets, addressed diversity, cost, quality, marketing, food placement, store location, dietary information, healthier option availability, and single item fruit purchases. The second construct, psychological resources of the individual, addressed cost and food placement and marketing of healthy foods. The third construct, nutritional environment within the child center, in which participants frequently visited. The results from 753 female participants suggest the environment of the participants' primary supermarket was not a direct cause for their diet habits through psychological constructs and their perceived food cost. Additionally, when participants shopped in healthy supermarket environments, there was an association in having more psychological resources with eating a healthy diet and fewer cost concerns, yielding healthy dietary patterns (Vogel et al., 2019).

In summary, these studies supported efforts to tailor weight-loss interventions that addressed the challenges of the socioeconomically disadvantaged population to improve health outcomes (Bennett et al., 2012; Pechey & Monsivais, 2016; Vogel et al., 2019). Bennett et al. (2012) concluded, the Be Fit, Be Well intervention yielded a modest reduction in body weight and improved or slowed systolic blood pressure in the high-risk, socioeconomically disadvantaged population. Pechey and Monsivais (2016) concluded that lower-priced foods were likely the main contributor to less nutritious food decisions among lower SES. Vogel et al. (2019) suggested developing interventions to address, thinking, reasoning, societal, and financial aspects to target the individual’s psychological resources, combined with low-cost supermarket resources to achieve more significant health outcomes, on dietary behaviors. Socioeconomically disadvantaged patients have an unduly high-risk of obesity and obesity-related health conditions (CDC, 2018a). Based on the literature, the principal investigator incorporated teaching about healthy eating on a budget within the dietary intervention.

Complexity within the rural community. The rural community often lack accessibility to resources. However, there are several other societal factors of the rural community that may influence an individual's dietary behaviors. Transportation, education, lack of healthy food options in corner stores, and cultural beliefs regarding health were a few identified within the literature. Further investigation into the complexities within the rural community was necessary to overcome potential barriers within their weight loss program.

Byker-Shanks, Haack, Tarabochia, Bates, and Christenson (2017) performed a qualitative study to determine the factors of food influences in older adults living in rural communities. The study included 33 participants that resided in rural Montana. Their sociodemographic information included a sample of all White adults, with a mean age of 73.6 years, 50% were married, all participants had received a high school diploma or higher, 90% had obesity, 93.9% did not receive food assistance, and 97% had personal transportation. Participants were divided into focus groups to answer questions regarding their food choices and preferences, community food options, budget, accessibility, and food community public programs. All interviews were conducted in a senior center, recorded, and lasted 45 to 60 minutes. The study concluded several recommendations to improve societal barriers such as improve public transportation, offer quality and affordable foods in convenience stores, and provide dietary education for seniors that reside in rural communities (Byker-Shanks et al., 2017).

Haynes-Maslow et al. (2018) conducted a grounded theory qualitative study with 32 corner store owners, in six states, to gain insight regarding their perceptions about stocking healthier food options. Researchers also sought to understand the barriers and motivators when considering the implementation of the Supplemental Nutrition Assistance Program (SNAP) in the rural, low-income community. Most corner store owners were from North Carolina (31.3%). Additional demographics included 78.3% of owners resided in the store's rural community, 73.9% of the owners were White, and 65.9% of customer-base used SNAP (Haynes-Maslow et al., 2018). The results indicated six main themes, with the top four discussed here. The first theme addressed the SNAP definition, with major subthemes to include the store owners' concerns about food perishing and the required minimum depth of stock. Theme two addressed the challenges to implementation of SNAP, such as having adequate or lack of distributors for the required foods. Theme three discussed the facilitators to implementation to include assistance with marketing, waivers for small rural stores, and price discounts. The fourth theme, customer's perception, addressed concerns regarding the purchase patterns of SNAP customers. Haynes-Maslow et al. (2018) determined that rural corner store owners need assistance when employing healthy, perishable food options in the low-income rural community.

Morgan, Graham, Folta, and Seguin (2016) conducted a focused-group qualitative study in 54 sedentary overweight and obese men residing in the rural western United States to identify their perceptions associated with heart health and motivators to reduce their risk of cardiometabolic disease. Researchers assessed participants' knowledge of their heart and metabolic risk factors and explored their personal, societal, and community-level effect on cardiac health behaviors. The study was conducted with seven focus groups, all White males with an average BMI of 31.3 kg/m^2, residing in a rural medically underserved community (Morgan et al., 2016). Sessions were audio-recorded and transcribed verbatim, and focused on participants' dietary behaviors, physical activity, and tobacco consumption. Recordings were coded and evaluated to develop common themes, and questionnaires were completed by participants to assess their health behaviors. Morgan et al. (2016) determined that most men related health to their independence and ability to participate in outdoor activities. Furthermore, men associated health concerns to their age. Most participants had a general understanding of heart health behaviors but perceived their risk as determined by fate. Participants' motivators for behavioral changes included experiencing a severe medical event in the home and attempting to decrease the progression of age-related functions. Participants' barriers to conform and maintain healthy eating and exercise behaviors, and quit tobacco use included, the general belief of what was considered masculine and their personal rights, minimal social environments of rural towns, cold weather conditions, lack of time, and unhealthy food preferences. Facilitators included self-monitoring of behaviors, exercising with another person, options for preferred activities, such as group sports (Morgan et al., 2016).

In summary, the studies supported this project's effort to tailor the weight-loss intervention specifically to the participants attending the rural health center (Byker-Shanks et al., 2017; Haynes-Maslow et al., 2018; Morgan et al., 2016). Byker-Shanks et al. (2017) recommended the following societal interventions to improve barriers, in elderly rural-residing residents: improve the public transportation system, offer quality and affordable foods in grocery stores, and offer dietary education in the senior population. Haynes-Maslow et al. (2018) concluded that rural corner store owners require financial assistance when implementing healthy, perishable food options. Morgan et al. (2016) concluded that tailoring interventions from the insight of men's personal, societal, and community-level motivators and perceptions might assist with intervention strategies to promote better heart and metabolic health. Rural areas often lack resources that promote weight loss efforts in the obese population. Based on the literature, the principal investigator incorporated discussion about community food options, budget, and accessibility, related to the rural-residing participants (Byker-Shanks et al., 2017; Morgan et al., 2016). Additionally, project participants were instructed on ways to choose healthy food alternatives within their local corner store in place of their previously unhealthy purchases (Haynes-Maslow et al., 2018).

Summary

The obesity epidemic has afflicted more than one-third of the United States adult population (Flegal et al., 2016). The prevalence of obesity is even higher amongst African American adults (Hales et al., 2017) and rural county residents (CDC, 2018a). Obesity has been linked to several comorbid health conditions, including CVD, T2DM, and stroke (World Health Organization, 2014). Obesity is an abnormal amount of body fat and a BMI of 30 kg/m^2 or higher (Hruby & Hu, 2015). This project aimed to determine if adherence to a 130-g moderate-carbohydrate diet with self-monitoring educational intervention would improve the body weight amongst obese African American adults, attending a rural community-based health center.

The SCT and SRT were used to develop the theoretical framework for this project. The SCT recognized that obese individuals were influenced by their personal factors, behaviors, and environment, and was applied in a thematic structure for the literature review (Bandura, 1989). Self-regulation was the primary theory used to construct the weight loss intervention, as it was most appropriate for project participants who often struggled with their internal behaviors from poor dietary decision-making.

However, when the project participants were given the appropriate guidance, standards, self-monitoring tools, and motivation, they were able to overcome these poor dietary choices and make healthier ones, resulting in successful weight loss and reduced future health risks (Baumeister et al., 2007).

Many biopsychosocial factors have contributed to the development of obesity. Nevertheless, poor nutritional habits are known to be a key contributing factor to weight gain, while a nutrient-balanced diet is a vital biological process necessary to achieve and maintain healthy body weight. Therefore, the 130-g moderate-carbohydrate diet was an essential educational component in this project's treatment intervention. The macronutrient distribution (mainly focused on carbohydrate level) was a necessary standard to discuss with the project participants in order to improve their dietary adherence and produce successful weight loss outcomes. Sackner-Bernstein et al. (2015) and Mansoor et al. (2016) noted one limitation in their meta-analyses as studies' failure to report specific macronutrient data and the nutrient and reference ranges to achieve improved weight loss outcomes. To address the gap in literature, the principal investigator recommended the daily macronutrient distribution consumption of 130 to 225 g (26 to 45% kcal) from carbohydrates; 50 to 175 g (10 to 35% kcal) from protein; and 44 to 78g (20 to 35% kcal) from fats (calculations based on 2,000 calories per day), to be effective in promoting weight loss (Anton et al., 2017; HHS & USDA, 2015; Johnston et al., 2014), and improving obesity-related diseases such as CVD (Bueno et al., 2013; Bazzano et al., 2014) and T2DM (Mente et al., 2017; Yamada et al., 2014). Additionally, the substitution of saturated fats with unsaturated fats was recommended in project participants to be a safe and effective approach for reducing cardiovascular risk factors in the obese adult population (Bazzano et al., 2014; Mente et al., 2017).

A review of the psychological factors of obesity was influential in the participants to bring awareness and accountability to their disease and dietary behaviors, overcome barriers, and transform their thoughts. Based on the literature, this project provided teaching to assist participants in overcoming their perceived barriers that contributed to obesity (Baruth et al., 2014; McVay et al., 2018; Woodruff et al., 2016). Additionally, participants were given dietary journals to promote self-regulatory skills, improve their cognitive and behavioral patterns, and to assist with data collection for their one-day food record (Burke et al., 2011; Peterson et al., 2014; Saslow et al., 2017a; Saslow et al., 2017b). Nutrient database systems were noted throughout several studies as a valid tool to calculate nutrition composition and measure adherence (Hu et al., 2016; Sato et al., 2017; Tay et al., 2014). Therefore, the principal investigator utilized the Automated Self-Administered 24-hour (ASA24®) nutrient database system to collect participants' nutritional intake levels.

The African American, obese adult, residing in a rural community, may experience social factors within society that contribute to their obesity and oppose weight loss efforts. Therefore, programs should be appropriately tailored to address the needs of the specific demographic group (Goode et al., 2017). African American representation was noted to improve weight loss outcomes in the African American community (Goode et al., 2017). Therefore, this project addressed participants' social factors by recruiting a predominately African American project team. Additionally, dietary education on healthy, affordable meals was necessary for the socioeconomically disadvantaged to achieve successful weight loss (Burton et al., 2017; Byker-Shanks et al., 2017; Morgan et al., 2016; Pechey & Monsivais, 2016; Vogel et al., 2019).

This review of the literature was primarily quantitative studies that utilized a pretest-posttest. Although most studies applied a control group, the investigator implemented a one-group design based on its practical approach and to better understand the variability that affected this group of participants at the health center. A quantitative one-group pretest-posttest design was chosen to be most appropriate based on the review of literature, practicability, and expertise level of the investigator.

Chapter 2 provided a thorough review of the literature to support the 130-g moderate-carbohydrate diet with dietary self-monitoring intervention to appropriately answer the clinical question. Chapter 3 will detail the conduction of this direct improvement project by describing the methodology, design, and sample population. It will provide a discussion on the instrumentation and describe the validity and reliability of its procedures. Additionally, the chapter will address data collection procedures, data analysis procedures, and ethical considerations. It concludes with a discussion on the limitations of this project and a summary of chapter 3.

Chapter 3: Methodology

Obesity is a severe medical condition that has impacted the health of more than one out of every three United States adults (NIDDK, 2017). The risk factors of obesity are even higher in rural areas, the socioeconomically disadvantaged, and minority communities, predisposing this population to further comorbid conditions (CDC, 2018a; NIDDK, 2015). The focus of this project was to improve the rates of obesity amongst African American adults who attended the rural health center in Rocky Mount by providing a single 30-minute one-on-one educational session focused on the reduction of carbohydrates. The purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. The independent variable, dietary adherence, was determined by the reduction of total carbohydrates between 130 to 225 g per day. The dependent variable, body weight, was determined by the change in pretest-posttest body weight.

Chapter 3 will detail the methodology, design, and sample population used for this quantitative one-group pretest-posttest project. It will discuss the instrumentation and describe the validity and reliability of its procedures. Additionally, this chapter will address the data collection procedures, data analysis procedures, and ethical considerations. It concludes with a discussion on the limitations of this project and a summary of the chapter.

Statement of the Problem

Unhealthy dietary behaviors have been recognized as a significant contributor to obesity (Schwartz et al., 2017). The recommendation of carbohydrate-restricted diets, instead of low-calorie diets, may result in better long-term weight management (Ludwig et al., 2018). Likewise, it is equally essential for the obese individual to adhere to the prescribed diet to produce successful weight loss results (Gibson & Sainsbury, 2017). Although research has shown carbohydrate-restrictive diets between 20 to 130 g per day and dietary tracking to be effective in weight loss (Gibson & Sainsbury, 2017; Saslow et al., 2017a; Saslow et al., 2017b; Snorgaard et al., 2017), it is not known to what extent a 130 to 225 g per day moderate-carbohydrate diet and self-monitoring intervention will produce these same results amongst obese African American adults. Project participants incorporated daily dietary tracking of all foods and beverages they consumed to self-monitor their carbohydrate intake to increase their self-awareness and improve their dietary adherence (Baumeister et al., 2007).

Clinical Question

The following Population (P), Intervention (I), Comparison (C), Outcome (O), Time (T), PICOT format was used to thoroughly review the literature and guide this quantitative one-group pretest-posttest project to answer the clinical question: Among obese African American adults attending a rural health center in North Carolina, what effect does dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring educational intervention, have on post-intervention body weight, compared to pre-intervention body weight over four weeks?

The independent variable, dietary adherence, was a single-session 30-minute educational instruction focused on the reduction of dietary sugars and starches to achieve the recommended 130 to 225 g per day of carbohydrates and daily self-monitoring of food and beverage intake. Dietary adherence was measured from a one-day 24-hour dietary recall collected pre and post-intervention using the ASA24 nutritional database system (Appendix B) and determined by 130 to 225 g per day from carbohydrates. The dependent variable, body weight, was collected pre and post-intervention using a calibrated scale and retrieved by manual data extraction from the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet and determined by the change in pretest-posttest body weight. The principal investigator deemed a quantitative one-group pretest-posttest design through manual data extraction to be most appropriate for this project to determine the effectiveness of the intervention and to answer the clinical question (Allen, 2017).

Project Methodology

The principal investigator used a quantitative methodology for this project based on the review of the literature and its ability to answer the clinical question. Quantitative methods attempt to explain an event by collecting measurable data to be examined through statistical methods (Aliaga & Gunderson, as cited in Muijs, 2011). These methods direct evidence-based research and use well-defined guidelines and procedures to obtain precise measurements to ensure the reliability and validity of the research (Frey, 2018). A qualitative design was not appropriate for this project as the clinical question did not seek to understand why or how the obesity phenomenon occurred (Claerbaut, 2016). The quantifiable data used to assess the variables for this project included pre and post-intervention carbohydrate levels to measure dietary adherence (independent variable) and pre and post-intervention body weight (dependent variable) measurements. The quantitative methodology was most suited for this project to determine the effectiveness of dietary adherence on the project participants' body weight change through the collection of numerical data (Aliaga & Gunderson, as cited in Muijs, 2011).

Project Design

This project used a quantitative one-group pretest-posttest design to guide strategic data collection methods, perform statistical analyses interpretation, and answer the clinical question. The quantitative methodology addressed the clinical question by collecting numerical data on the participants' carbohydrate intake levels and body weight measurements (Aliaga & Gunderson, as cited in Muijs, 2011). The one-group pretest-posttest design allowed the investigator to examine the changes in the participants' body weights (dependent variable) before the implementation of the educational intervention and after the intervention (Allen, 2017).

Upon review of the literature, it was noted that most researchers used a quantitative pretest-posttest design to evaluate the effects of an intervention (Anton et al., 2017; Bennett et al., 2012; Saslow et al., 2017a; Saslow et al., 2017b; Sato et al., 2017). Although many studies used a comparison or control group, it was most appropriate to use the one-group pretest-posttest design due to the health center's high operational demands and the poor history of the patient follow-up. The health center provided culturally sensitive, primary health care services to many at-risk groups. The principal investigator chose the one-group pretest-posttest design given the simplistic nature of its implementation and analysis procedures, and feasibility (Allen, 2017).

This quantitative one-group pretest-posttest design was used to collect numerical data on the project participants' body weight and nutrition composition levels using manual data extraction from the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet and the ASA24 dietary assessment tool (Appendix B) (respectively). The investigator used the ASA24 dietary assessment tool to collect the participants' one-day 24-hr dietary recall, before and after the intervention, and measured their nutrient intake of total carbohydrates to evaluate dietary adherence (independent variable). Participants' pre and post-intervention body weights (dependent variable) were collected from the Excel spreadsheet to determine the effectiveness of the educational intervention on their body weight.

Population and Sample Selection

The city of Rocky Mount consists of Edgecombe and Nash County. There was noted to be a significant number of obese adults that attended the rural health center and who also resided within the community. In 2013, Nash county reported an adult obesity rate of 31.3% and 40.7% for Edgecombe County (Hill & Johnson, 2016), compared to the state's average of 29.4% (Robert Wood Johnson Foundation, 2018a). Additionally, the rural health center reported 3,459 cases of adult obesity within their organization, from June 2018 to February 2019 (Health Center, 2019). Recognizing the dire need to improve the obesity rates within the community, the health center's lead administrative personnel approved the implementation of this direct project improvement project.

The health center is a community-based corporation that provided primary care services to an underserved population. There were many obese African American adults, government-assisted recipients, and individuals with chronic medical conditions, within the health center's population. Convenience sampling was used to obtain the potential sample participants from the health center's population. Based on the demographics of the rural health center, a convenience sample was most appropriate given its ease of use, limited budget requirements, and the short project duration, in addition to the limitations in participants' availability (Shantikumar, 2018). The sample population consisted of African American males and females, ages 18 to 60 years, with a BMI of 30 kg/m^2 or higher, and in general stable health. Individuals were excluded from this project if they had renal failure, mental impairment, current pregnancy or breastfeeding, prescribed weight loss medications, severe health conditions, or any condition that was not suitable for this project. The G* Power 3.1.9.4 statistical calculator was used to calculate a priori power analysis to obtain a sample population necessary to detect some level of effect (Faul, Erdfelder, Lang, & Buchner, 2007). A total sample population size of 19 was needed to yield a statistical significance of alpha level 0.05, power of 0.80, effect size *d* of 0.70, and to complete instrumentation.

The health center staff and principal investigator recruited potential sample participants through word of mouth and announcements. Recruitment materials detailed the recommended dietary changes, including the reduction of dietary sugars and starch consumption, the expected maintenance of daily food records, and a description of the baseline and follow-up assessment visits. If interested, potential sample participants contacted the investigator or intervention team nurse practitioner (NP) from the health center to discuss eligibility. The intervention team NP used the inclusion-exclusion eligibility checklist (Appendix F) to screen potential sample participants. A total of 19 sample participants took part in this project and completed instrumentation.

Instrumentation or Sources of Data

Automated Self-Administered 24-Hour (ASA24®) Dietary Assessment Tool. The Automated Self-Administered 24-hour (ASA24®) Dietary Assessment Tool (Appendix B) was a computerized nutrient database system that allowed the intervention team NP to assist project participants with their pre and post-intervention dietary intake (National Cancer Institute, 2019). The principal investigator accessed the ASA24 dietary system to collect the participants' pre and post-intervention carbohydrates, fats, protein, and energy levels. Afterward, a report was generated to evaluate their dietary adherence to the 130 to 225 g per day carbohydrate recommendation. The National Cancer Institute

(2019) developed the ASA24 tool to be used in small and large-scale nutritional projects, and it is freely accessible to investigators, clinicians, and educators. It has an interactive platform that used images to assist the project participants with selecting appropriate food options and portion sizes (National Cancer Institute, 2017) and is especially beneficial for a low literacy population (National Cancer Institute, 2019). The intervention team NP assisted participants with the ASA24 dietary assessment tool to ensure a complete and detailed account of all food and beverages were entered for analyses and to guide their one-on-one educational session.

Microsoft Excel spreadsheets. Excel spreadsheets were useful to the investigator for organization and data entry and were used to later convert data into a statistical software package for analysis (Social Science Computing Cooperative, 2012). The principal investigator chose the Microsoft Excel spreadsheet due to its ease of use, convenience, organization capabilities, and affordability (Rose, Spinks, & Canhoto, 2015).

Excel Data Collection for Nurse Practitioner. The intervention team NP used the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet to collect data on participants within this project. The spreadsheet assisted with tracking, organizing, and collecting the project participants' actual name, coded username, age, date of birth, gender, race, height, visit dates, contact information, and pre and post-intervention BMI and body weight. This spreadsheet was created to provide the intervention team NP with a source of paper documentation to be used in collaboration with the principal investigator due to a lack of EHR access by the investigator.

Excel Data Collection for Principal Investigator. The Excel Data Collection for Principal Investigator (Appendix E) spreadsheet was used as a data collection instrument for the principal investigator. The spreadsheet assisted the principal investigator with organizing and collecting the project participants' de-identified demographic data, pre and post-intervention body weights (dependent variable), and nutrient measurements (Rose et al., 2015). Additional information included the participants' coded username, age, gender, race, date of birth, visit dates, and height.

Validity

Validity signified the exactness to which the clinical question was answered or the dependability of the project's findings (Sullivan, 2011). It refers to the precision of measurement and soundness of the assessment tool to measure the outcome of interest (Sullivan, 2011). This quantitative one-group pretest-posttest project used the ASA24 dietary assessment tool to measure the participants' dietary adherence (independent variable) to the 130 to 225 g per day recommended carbohydrate level. The ASA24 system was constructed upon the USDA's Automated Multiple-Pass Method, which has shown to be valid and result in precise estimates of mean total energy and protein intake, compared to recovery biomarkers (Kipnis et al., 2003; Moshfegh et al., 2008). Several cognitive and usability tests have been performed on previous versions of the ASA24 dietary instrument and considered a valid tool (National Cancer Institute, 2017). Furthermore, a preliminary examination of output from dietary recalls using ASA24 suggested acceptable face validity (i.e., energy, nutrient, and food group estimates) consistent with data from the National Health and Nutrition Examination Survey (Kirkpatrick et al., 2014).

Dietary records and recalls are commonly used instruments within nutritional research. Validation studies have substantiated these instruments, and through recovery biomarkers, as this reflects the nutritional components being measured, thus providing an unbiased evaluation of accurate dietary intake (National Cancer Institute, 2017). Project participants were advised to bring their dietary records at their 4-week follow-up visit to assist with their food recall entry into the nutritional database system. The ASA24 nutritional database and dietary records depicted an accurate representation of the measured data and were, therefore, a valid instrument in this project.

Reliability

Reliability is the process of evaluating the quality of an instrument used for data collection (Lund Research Ltd., 2012). Instruments must be credible, having the ability to produce consistent measurements amongst users, when under the same conditions (Payne & Payne, 2004). The ASA24 dietary assessment tool captured the participants' pre and post-intervention nutrient composition levels to compare against their prescribed dietary recommendations (National Cancer Institute, 2017). The intervention team NP assisted project participants with the ASA24 system to enter their one-day 24-hr dietary recall. Dietary records were subjective to the participants' interpretation of their eating; therefore, using recovery biomarkers, such as the doubly labeled water biomarker, could improve its reliability to accurately assesses energy consumption. However, such testing was not financially feasible for the project participants at the health center. Dietary records are reliable instruments based on their estimation of nutrient consumption, and they have shown not to yield a statistical difference when provided to the same participants over time (Pears et al., 2012).

Data Collection Procedures

The principal investigator obtained site authorization from the health center before starting the data collection process. This direct practice improvement project received approval from Grand Canyon's Institutional Review Board (IRB) (Appendix A) to ensure that standards, with the university and the United States federal regulations, were met. The data collection process began after the IRB's approval. This section provides a detailed description of the procedures used for data collection in this direct practice improvement project.

Participants were recruited from the health center through various word of mouth and fliers using convenience sampling. Participants were screened using an inclusion-exclusion criteria checklist (Appendix F) to ensure they met the eligibility criteria. Nineteen project participants completed the educational intervention and instrumentation. On the initial visit, the principal investigator ensured project participants received adequate time to read and sign the written informed consent before beginning the intervention. Participants' protection of health information, rights, and well-being were protected throughout the entire project. Participants' names were removed and replaced with a coded alphanumeric username that was provided to the participant to maintain their anonymity. The principal investigator secured the participants' protected health information and any data collected on a password-protected laptop, under lock and key, only accessible to the investigator. This information will be maintained for up to three years, after which the investigator will destroy by erasing the data from the hard drive. Also, all original signed informed consent forms and documents that contained participants' confidential personal health information was maintained, accessible, and secured by the guidelines established at the health center.

Nineteen project participants took part in the one-on-one NP-led 30-minute educational session and received the Planning Healthy Meals material handouts (Appendix D) during their initial visit (Novo Nordisk, 2018). The participants were taught how to reduce their sugar and starch intake based on their typical one-day 24-hr dietary recall entry and given a composition notebook to track their foods and beverages. The educational session provided a guided discussion on making healthy food choices, healthy eating, portion control, reading food labels, carbohydrate consumption, and dietary self-monitoring. The intervention team NP measured participants' body weight, height, and BMI on their initial visit. At 4-week follow-up, the intervention team NP assisted project participants with their one-day 24-hr dietary recall into the ASA24 system, body weight measurements, and BMI. The intervention team NP documented the pre and post-intervention body weights, BMI, and height onto the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet.

For this quantitative one-group pretest-posttest project, the principal investigator collected the participants' de-identified pre and post-intervention nutrient composition levels (total carbohydrates, fats, protein, and energy) by manual data extraction from the ASA24 system to evaluate their adherence (independent variable) to the recommended carbohydrate intake of 130 to 225 g per day and self-monitoring intervention. The principal investigator collected the participants' pre and post-intervention body weights (dependent variable) by manual data extraction from the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet to evaluate their change in body weight. The investigator had no access to the health center's EHR; therefore, participants' actual names were removed from Excel Data Collection for Nurse Practitioner's spreadsheet and matched with the corresponding coded alphanumeric username on the Excel Data Collection for Principal Investigator spreadsheet.

Data Analysis Procedures

Data analysis started after completion of the dietary intervention and data collection process. The principal investigator collected participants' pre and post-intervention body weights (continuous level, dependent variable) by manual data extraction from the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet. To ensure proper transfer of information, the investigator and intervention team NP performed two inspections, matching the coded alphanumeric username and date of birth as identifiers. The principal investigator collected participants' pre and post-intervention total carbohydrates (continuous level, independent variable) and nutrient composition levels (protein, fats, and energy totals) by manual data extraction from the ASA24 dietary assessment tool (Appendix B). The raw data was entered in the Statistical Package for Social Sciences (SPSS) Statistics Software Version 25.0 (IBM Corp., 2017) for statistical analyses. The SPSS software allowed the investigator to manage and confirm data and perform descriptive and inferential statistical examinations (Boston College, 2018). The SPSS software combined various sources of quantitative analysis software and is widely used amongst social science investigators (Boston College, 2018).

The principal investigator used descriptive and inferential statistics to evaluate the results and draw conclusions from the collected data. The primary measure was the participants' change in body weight (continuous level, dependent variable) from baseline to four weeks. Nineteen project participants completed instrumentation using a convenience sample to determine the statistical significance of alpha level 0.05, power of 0.80, and effect size *d* of 0.70. Descriptive statistics were used to analyze the project participants' raw data to report the mean, minimum, maximum, percentage, and standard deviation (Lund Research Ltd., 2018a). Inferential statistics (paired-samples *t*-test) was used to draw conclusions about the obese African American adult attending the rural health center (Lund Research Ltd., 2018b).

The paired-samples *t*-test compared the means between two matched groups using the same continuous, dependent variable (Lund Research Ltd., 2018a). For this quantitative one-group, pretest-posttest project, the paired-samples *t*-test compared the means between the project participants' pre and post-intervention body weight (continuous, dependent variable) to their pre and post-intervention carbohydrate levels (in grams) (continuous level, independent variable) to determine if there was a statistical significance. The paired samples *t*-test was chosen as all the following assumptions were met to perform the data analysis: 1) the dependent variable (body weight) was measured on a continuous level; 2) the independent variable (adherence to 130 to 225 g per day from carbohydrates) consisted of two categorical matched pair observations (pre and post-intervention nutrient composition measurements); 3) there were no significant outliers between the pre and post-intervention data amongst the matched observations; and 4) the distribution difference in the dependent variable (body weight) was approximately normally distributed between the matched observations (Lund Research Ltd., 2018a). The Shapiro-Wilk test was used to test for normality, as this was proper for a small sample size (Lund Research Ltd., 2018a).

The principal investigator answered the clinical question using the raw data collected by manual data extraction to compare the effects of the participants' dietary adherence to their body weight. The clinical question was, among obese African American adults, what effect does adherence (independent variable) to a 130 to 225 g per day carbohydrate diet with self-monitoring educational instruction have on pre and post-intervention body weight (dependent variable), over four weeks? The quantitative method numerically measured participants' carbohydrate intake levels (grams) and body weights (kilograms); both were continuous level data. The one-group pretest-posttest design permitted the investigator to analyze the mean and standard deviation of the participants' carbohydrate levels, using deferential statistics. Finally, inferential statistics were used to make conclusions about the independent and dependent variables with a significance level of 0.05.

Ethical Considerations

The principal investigator reviewed the Office of Human Research Protections (OHRP) policies and procedures before receiving informed consent from project participants. Additionally, the investigator conducted recruitment efforts from the intervention team through the health center. To reduce ethical issues, project participants were given explicit details of the project's purpose and assured that participation was voluntary and that they could withdraw from the project at any time without penalties. Participants were not coerced to take part in this project. The principal investigator attempted to minimize any potential harm that might have resulted from the project by recommending a 130 to 225 g per day carbohydrate diet as this is the minimum RDA of carbohydrates to sustain normal brain function (HHS & USDA, 2015). Also, an emphasis was placed on the reduction of saturated fats and refined carbohydrates to minimize undesired changes in lipid biomarkers (Sato et al., 2017).

Several patients attending the health center were African American, minority, government-assisted recipients, or disabled. Participants were not excluded from participating in this project based on their culture, physical characteristics, personal beliefs, or financial status. The principal investigator ensured the ethical principles, of all participants were maintained by showing respect, impartiality, and beneficence according to the key principles of the Belmont Report (National Commission for the Protection of

Human Subjects of Biomedical & Behavioral Research, 1978). The principal investigator attests to no financial or personal gains because of this project. A professional collaborative relationship existed between the health center for laboratory consulting services and the investigator. There were no other conflicts of interest.

Project participants were advised that efforts would be taken to protect their privacy while collecting their personal information. If a situation occurred in which the principal investigator recognized a participant, every attempt was made to avoid any personal communication, not in line with the project. The safety of the participants' health information, rights, and well-being were preserved throughout the project. The participants' actual names were removed and replaced with a coded alphanumeric username and provided to participants to maintain their protected health information (PHI) and identity. Private health information was secured in a password-protected laptop, under lock and key, only accessible to the principal investigator conducting the project. This information was safeguarded for up to three years, after which it was destroyed by erasing the information from the principal investigator's hard drive. The human resources department at the health center kept all original signed consent forms and confidential health information secured and maintained per the health center's policy guidelines.

The health center did not have an IRB; therefore, the principal investigator obtained approval through the IRB at Grand Canyon University (GCU) (Appendix A). However, the principal investigator obtained site authorization from the health center. Official documentation allowing the principal investigator permission to collect data at the health center was provided to GCUs IRB (Appendix A). The IRB training modules with certification completion assisted in the application of this project.

Limitations

There were limitations to this quantitative one-group pretest-posttest project related to its methodology and approach. This one-group pretest-posttest had weak internal validity due to its inability to account for several confounding variables, which may threaten this project's conclusion (Allen, 2017). One cannot guarantee that the participants' post-intervention body weight reduction resulted exclusively from the dietary intervention. However, history and maturation are two confounding variables that might not have posed a significant threat to this project, given its short 4-week duration. Additionally, the instrumentation effect was minimized, thus strengthening internal validity. The project participants' pretest was based on a one-day 24-hr food recall assisted by the intervention team NP. Although this same instrumentation was used to assess participants' post-intervention dietary intake, there were no preset questions for them to remember.

This project used a convenience sample and had no control or comparison group, which resulted in concerns of bias and may not be representative of the general population, thus exhibiting low external validity (Explorable.com., 2009). Adding a control group and randomization would have helped to alleviate this issue regarding internal validity. However, given the nature of this project, the principal investigator deemed the quantitative one-group pretest-posttest design appropriate based on its ability to answer the clinical question, practicality, and principal investigator's level of expertise. This project contained a small sample size and was generalized to the obese, African American adults attending a rural health center, which may result in bias. While increasing the sample population could have improved this bias, this was not feasible nor necessary to measure quality improvement outcomes for the targeted audience in this direct practice improvement project.

Participants in this project were asked to maintain daily dietary records. This presented as a challenge due to low literacy levels, over-estimation or under-estimation of foods consumed, and difficulty with memory recall. Nevertheless, the ASA24 system was especially beneficial for a low literacy population (National Cancer Institute, 2019). The ASA24 dietary recall system was based on the participant's own ability to recall their food intake; therefore, bias recall might have resulted. Nonetheless, participants brought in their dietary records on their 4-week follow-up visit to assist with the entry of their one-day 24-hour dietary recall.

Summary

In summary, Chapter 3 provided an overview of the methods used for this direct practice improvement project. Poor dietary habits are related to obesity. Carbohydrate-restrictive diets and dietary self-monitoring have been shown to be effective in producing weight loss. Because it was unknown if weight loss would occur in a group of obese African American adults. This project sought to answer the clinical question: Among obese African American adults attending a rural health center in North Carolina, what effect does dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring educational intervention, have on post-intervention body weight, compared to pre-intervention body weight over four weeks? A quantitative one-group pretest-posttest design was used to collect numerical data on the participants to answer the clinical question. Data was collected by manual extraction from the Excel spreadsheet and the ASA24 dietary assessment tool. The ASA24 dietary assessment tool was used to collect the participants' one-day 24-hr dietary recall, pre and post-intervention and their nutrient composition levels to evaluate dietary adherence (independent variable). Dietary records and the ASA24 dietary assessment have been validated and are reliable tools.

Descriptive and inferential statistics were used to assess the findings and draw conclusions from the data. A total of 19 project participants completed instrumentation. The paired-samples t-test was used to compare the means between the participants' pretest and posttest body weight before and after completing the intervention. Participants were recruited from the health center and were not coerced. The principal investigator ensured the protection of all participants' private health information throughout the course of the project. This project had limitations due to confounding variables, posing a threat to its internal validity. Nevertheless, these limitations were addressed given this project's short duration of four weeks and decreased instrumentation effect. Additionally, bias was a limitation because of convenience sampling, lack of randomization, and no comparison group. However, this was a quality improvement project within a rural health center that purposed to target their specific demographics and therefore this was an acceptable limitation. Chapter 4 will provide written and visual details on the data analysis procedures and results. Chapter 5 will discuss the interpretation of results and how it relates to existing research knowledge of obesity management.

Chapter 4: Data Analysis and Results

There was a high number of obese, African American minority adults who attended the rural health center in North Carolina. The purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. The independent variable, dietary adherence, was determined by the reduction of total carbohydrates between 130 to 225 g per day. The dependent variable, body weight, was determined by the change in pretest-posttest body weight.

The consumption of high-sugar beverages and snacks, lack of healthy food options, and little understanding of nutritional knowledge were common factors associated with weight gain in this population (Barnidge et al., 2015; Warren et al., 2018). Given these factors and the high prevalence of adult African American obesity rates within the health center, it was necessary to evaluate alternative methods to promote weight loss. This project used a quantitative one-group pretest-posttest design to answer the clinical question.

This chapter provides an overview of the data collected and presents a visual representation of the results used for the data analysis methods. It discusses the descriptive data and outlines the characteristics of the participants within the project. It provides a detailed account of the data analysis procedures, justifies the chosen methodological approach, describes the methods of data collection and analyses, and discusses the project's results.

Descriptive Data

Potential participants were recruited from the health center through convenience sampling. A total sample of 19 (*n* = 19) participants took part in the intervention and completed the pretest and posttest instrumentation for this data analysis. A power analysis was performed and indicated that a sample size of 19 was needed to detect a significance level of 0.05. The principal investigator collected raw data from October 2019 to December 2019. The sample population was representative of the demographics of the rural health center. All 19 participants identified as African American (100%), of which 16 were females (84.2%), and 3 were males (15.8%) (Figure 1).

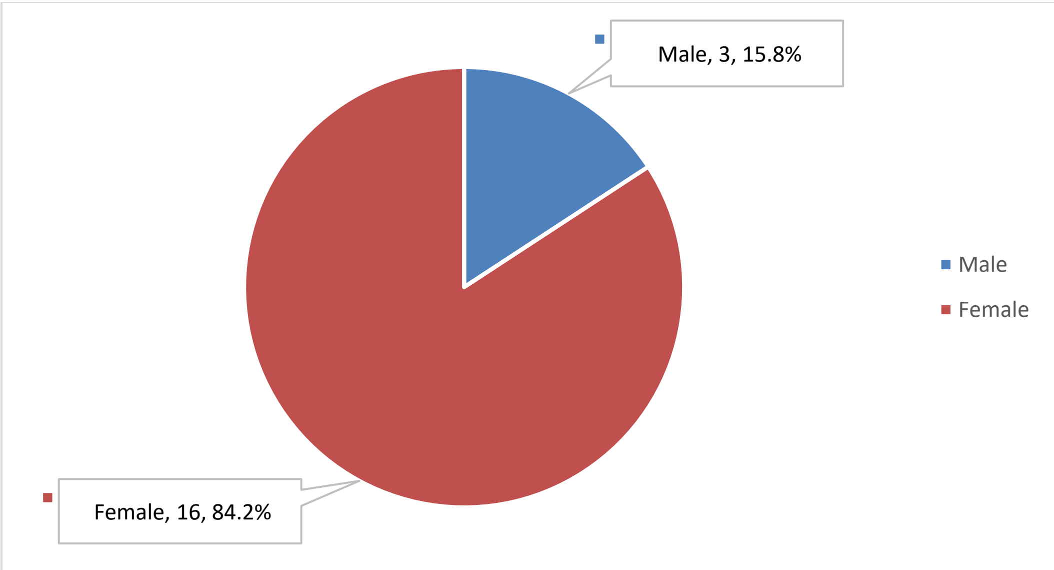

Figure 1. Descriptive Demographics of Participants by Gender

The participants were all obese adults with an average baseline BMI of 40.1 kg/m^2 (*SD* ± 7.14), body weight 110.4 kg (*SD* ± 28.75), and age 39.5 years (*SD* ± 12.13) (Table 1). Their baseline carbohydrate intake was 298.8 g per day (*SD* ± 136.63). Protein intake was 106.8 g per day (*SD* ± 47.48), fat 119.2 g per day (*SD* ± 46.97), and energy 2807.4 g per day (*SD* ± 994.63) at baseline (Table 1).

Table 1

Descriptive Data of Participants' Baseline Characteristics (n = 19)

Variable	Mean ± Std.	Min	Max
Age (years)	39.5 ± 12.13	18	59
Height (cm)	164.9 ± 9.21	152.0	183.0
Body weight (kg)	110.4 ± 28.75	70.2	168.6
Body Mass Index (kg/m^2)	40.1 ± 7.14	30.0	56.7
Carbohydrates (g/day)	298.8 ± 136.63	143.0	586.3
Protein (g/day)	106.8 ± 47.48	48.3	218.8
Fat (g/day)	119.2 ± 46.97	49.6	215.2
Energy (kcal/day)	2807.4 ± 994.63	1712.2	5398.9

Note. Data is expressed as mean ± std. (standard deviation). *n* = total number of participants included in the sample. Min = minimum. Max = maximum. cm = centimeters. kg/m^2 = kg per meter squared. kg = kilograms. kcal = kilocalories. g/day = grams per day.

Data Analysis Procedures

Methodological approach. The clinical question that led this direct practice improvement project was: Among obese African American adults seeking to lose weight, what effect does adherence to a carbohydrate-restriction of 130 to 225 g per day with dietary self-monitoring educational intervention, have on post-intervention body weight, compared to pre-intervention body weight over four weeks? The project used a quantitative one-group pretest-posttest design to answer the clinical question. The design allowed the investigator to quantify and analyze the single group of participants' adherence to the prescribed 130 to 225 g per day dietary carbohydrate intervention (continuous level data, independent variable), by measuring their total carbohydrate intake, in grams, against their pre and post-intervention body weights, in kilograms, (continuous level data, dependent variable) to make valid causal inferences.

A quantitative methodology guided this evidence-based practice improvement project to ensure quality measures were maintained, procedures strategically followed, and to obtain accurate, reliable, and valid data (Frey, 2018). The one-group pretest-posttest design supported the project by allowing the investigator to draw conclusions about the intervention from one group of 19 participants' pre and post-intervention body weight without requiring the use of a comparison or contrast group (Allen, 2017). This design was particularly helpful to the investigator because it was a cost-effective approach with the allowance of novice level implementation and analysis methods (Allen, 2017). These factors justified the use of the quantitative one-group pretest-posttest design. Furthermore, this design aligned with the clinical question; thus, it was appropriate to use for this direct practice improvement project.

Methods of data collection. The Automated Self-Administered 24-Hour (ASA24®) Dietary Assessment Tool was used to collect data on the participants' dietary adherence (independent variable) by analyzing their carbohydrate intake and nutrient composition levels (National Cancer Institute, 2019) (Appendix B). The ASA24 computerized system displayed images of food options and portion sizes to assist the participants and NP in choosing the appropriate food selections (National Cancer Institute, 2017). The intervention team NP assisted participants with their one-day 24-hr dietary recall of all the foods and beverages they consumed; on their initial assessment and four weeks after receiving the educational intervention. The ASA24 system was created from the USDA's Automated Multiple-Pass Method, a valid tool shown to reduce the under-estimation of participants' nutrient intake (Kipnis et al., 2003; Moshfegh et al., 2008). The intervention team NP measured participants' body weight (dependent variable) using a calibrated scale, wearing minimal clothing, and without shoes. Body weights were obtained on initial assessment and 4-week follow-up and measured in kilograms, rounded to the nearest tenth. Participants' height measurements were obtained on their initial assessment using a stadiometer, without shoes, and rounded to the nearest tenth in centimeters. The intervention team NP documented the data onto the Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet.

Excel spreadsheets were created by the investigator to assist with the data collection process. The principal investigator did not have access to the participants' EHR at the health center; therefore, the development of spreadsheets was useful to track, record, and organize data. The Excel Data Collection for Nurse Practitioner (Appendix C) spreadsheet was used by the intervention team NP to obtain participants' actual name, coded username, age, date of birth, gender, race, height, visit dates, contact information, pre, and post-intervention BMI and body weight measurements. Before the intervention, participants received an alphanumeric username. This process of de-identification was used to ensure the privacy of participants' health information.

To evaluate the independent variable, dietary adherence, the principal investigator performed manual data extraction from the ASA24 website to retrieve the participants' pre and post-intervention nutrient composition levels. The ASA24 system converted participants' dietary entries into quantifiable data for analyses (National Cancer Institute, 2017). The reduction of total carbohydrates between 130 to 225 g per day determined participants' dietary adherence. The investigator recorded the participants' nutritional raw data on the Excel Data Collection for Principal Investigator spreadsheet (Appendix E). To evaluate the dependent variable, body weight, the principal investigator performed manual data extraction from the Excel Data Collection for Nurse Practitioner spreadsheet to retrieve the participants' pre and post-intervention body weights. Additionally, the principal investigator collected participants' visit dates, height, and BMI from the Excel Data Collection for Nurse Practitioner spreadsheet.

To ensure proper transposing of information, the principal investigator and intervention team NP performed double-checks of all data. Participants' names were removed from the Excel Data Collection for Nurse Practitioner spreadsheet before the principal investigator's collection of data. Participants' nutrient composition data were coded in the ASA24 system using the same alphanumeric username given to them previously. The investigator maintained the participants' privacy of health information throughout the data collection process. The principal investigator recorded all raw data onto the Excel Data Collection for Principal Investigator spreadsheet to be later entered in the Statistical Package for Social Sciences (SPSS) Statistics Software Version 25.0 (IBM Corp., 2017) for statistical analyses.

Methods of data analysis. Data analysis began upon completion of the dietary intervention and data collection process. Before analysis, datasets were evaluated for missing values and outliers to identify potential errors and impact on data. Participants' raw data was then entered into the SPSS statistics software to be analyzed. The principal investigator performed two additional visual inspections to ensure the correct entry of data into the SPSS system.

Descriptive and inferential statistics were used to evaluate the findings and make conclusions from the collected data. Descriptive statistics were reported as mean, minimum, maximum, standard error, and standard deviation (Lund Research Ltd., 2018a). There was no randomization and no control group. All participants received the same one-group pretest-posttest educational intervention. Inferential statistics included the paired-samples *t*-test to analyze the data and answer the clinical question. The dataset met all assumptions of the paired-samples *t*-test for data analysis. Shapiro-Wilk's test was applied to verify normality (see Table 2). There were no significant outliers between the pre and post-intervention matched body weight and carbohydrate intake pairs. Participants' pre and posttest body weights (continuous level data, dependent variable) were compared to their pre and posttest carbohydrate levels (continuous level, independent variable). Statistical significance was determined if $p < 0.05$. The paired-samples *t*-test allowed the investigator to make interpretations about the group of obese African American adults attending the rural health center (Lund Research Ltd., 2018b).

Table 2 *Shiparo-Wilk's Test for Normality*

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre-weight (kg)	.229	19	.010	.913	19	.083
Post-weight (kg)	.242	19	.005	.923	19	.131

Note. Sig = Significance level: considered significant if *p*-value less than or equal to 0.05. df = degrees of freedom.

Results

In this section, the data were summarized and analyzed in a logically organized and unbiased manner to avoid the investigator's subjective judgments while addressing the clinical question. The quantity and quality of the data were sufficient to answer the following clinical question: Among obese African American adults, what effect does dietary adherence to a 130 to 225 g per day carbohydrate diet with self-monitoring intervention have on post-intervention body weight, compared to their pre-intervention body weight?

Table 3 presents the participants' pre-intervention and post-intervention paired samples test descriptive statistics. The results showed a reduction in participants' pre-intervention body weight (*M* = 110.4 kg, *SD* = 28.75) compared to their post-intervention body weight (*M* = 109.0 kg, *SD* = 27.85) and a BMI reduction before (*M* = 40.1 kg/m^2, *SD* = 7.14) and after (*M* = 39.6 kg/m^2, *SD* = 6.98) the intervention. Findings further indicated participants consumed a high-carbohydrate intake (225 g or more) prior to the intervention (*M* = 298.8 g, *SD* = 136.63). Although participants' average post-intervention carbohydrate intake decreased, the results indicated that most participants consumed a high-carbohydrate level (*M* = 255.0 g, *SD* = 75.50). Protein intake decreased slightly from baseline (*M* = 106.8 g, *SD* = 47.48) to post-intervention (*M* = 106.4 g, *SD* = 39.06). Participants' average fat intake was high (78 g or more) prior to the intervention (*M* = 119.2 g, *SD* = 46.97) and decreased slightly post-intervention (*M* = 108.6 g, *SD* = 30.89). Participants' pre-intervention energy consumption decreased (*M* = 2807.4 kcal, *SD* = 994.63) after the intervention (*M* = 2639.7 kcal, *SD* = 760.62).

Table 3

Paired Samples Test Descriptive Statistics

	Variable	*N*	Min	Max	*M*	*SE*	*SD*
Pair 1	Pre-Weight (kg)	19	70.2	168.6	110.4	6.60	28.75
	Post-Weight (kg)	19	70.5	170.0	109.0	6.39	27.85
Pair 2	Pre-BMI (kg/m^2)	19	30.0	56.7	40.1	1.64	7.14
	Post-BMI (kg/m^2)	19	30.1	57.1	39.6	1.60	6.98
Pair 3	Pre-Carbohydrates (g)	19	143.0	586.3	298.8	31.35	136.63
	Post-Carbohydrates (g)	19	150.7	374.7	255.0	17.32	75.50
Pair 4	Pre-Protein (g)	19	48.3	218.8	106.8	10.89	47.48
	Post-Protein (g)	19	60.0	210.1	106.4	8.96	39.06
Pair 5	Pre-Fats (g)	19	49.6	215.2	119.2	10.78	46.97
	Post-Fats (g)	19	67.0	178.0	108.6	7.09	30.89
Pair 6	Pre-Energy (kcal)	19	1712.2	5398.9	2807.4	228.18	994.63
	Post-Energy (kcal)	19	1876.9	4738.4	2639.7	174.50	760.62

Note. *n* = total number of participants. M = mean. Min = minimum. Max = maximum. SE = standard error. SD = standard deviation. Nutrient intake represented as per day.

Table 4 contains the inferential *t*-test statistics for the paired-samples test differences. The paired-samples *t*-test was used to compare the participants' body weight before and after they received the 130 g moderate-carbohydrate intervention. Overall, there was a significant reduction in the pre and post-intervention body weight (*M* = 1.42 kg, *SD* = 2.82); *t* (18) = 2.19, (*p* = 0.042). Likewise, pre and post-intervention BMI significantly decreased (*M* = 0.48 kg/m^2, *SD* = 0.89); *t* (18) = 2.34, (*p* = 0.031). There was a significant reduction in participants' pre and post-intervention carbohydrate intake (*M* = 43.76 g, *SD* = 85.68; *t* (18) = 2.23, (*p* = 0.039). Post-intervention protein intake decreased slightly from pre-intervention (*M* = 0.42 g, *SD* = 21.61); t (18) = 0.09, (*p* = 0.933), although not significant. Post-intervention fat intake decreased slightly from pre-intervention (*M* = 10.65, *SD* = 25.29); *t* (18) = 1.84, (*p* = 0.083), however, it was not significant. There was a reduction in the pre and post-intervention energy intake (*M* = 167.70 kcal, *SD* = 354.58); *t* (18) =2.06, (*p* = 0.054), this was not significant.

Table 4

Paired Samples Test – Paired Differences

					95% CI				
	Variable	*M*	*SD*	*SE*	Lower	Upper	*t*	*df*	*Sig*
Pair 1	Pre/Post-Weight (kg)	1.42	2.82	0.65	.06	2.78	2.19	18	.042
Pair 2	Pre/Post-BMI (kg/m^2)	0.48	0.89	0.20	0.05	0.91	2.34	18	.031
Pair 3	Pre/Post-Carbs (g)	43.76	85.68	19.66	2.47	85.06	2.23	18	.039
Pair 4	Pre/Post-Protein (g)	0.42	21.61	4.96	-9.99	10.84	0.09	18	.933
Pair 5	Pre/Post-Fat (g)	10.65	25.29	5.80	-1.54	22.84	1.84	18	.083
Pair 6	Pre/Post-Energy (kcal)	167.70	354.58	81.35	-3.20	338.60	2.06	18	.054

Note: M = mean. SD = standard deviation. SE = standard error. CI = 95% Confidence Interval of the Difference. *t* = test statistic. *df* = degrees of freedom. *Sig* = Significance level: considered significant if *p*-value less than or equal to 0.05. Carbs = carbohydrates.

Summary

The purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. The independent variable, dietary adherence, was determined by the reduction of total carbohydrates between 130 to 225 g per day. The dependent variable, body weight, was determined by the change in pretest-posttest body weight. The clinical question was: Among obese African American adults seeking to lose weight, what effect does adherence to a carbohydrate-restriction of 130 to 225 g per day with dietary self-monitoring educational intervention have on post-intervention body weight, compared to pre-intervention body weight over four weeks? This project used a quantitative one-group, pretest-posttest design to answer the clinical question.

A total of 19 participants (n = 19) took part in the intervention and completed the instrumentation for data analysis. The investigator collected raw data from October 2019 to December 2019. The ASA24 Dietary Assessment Tool (Appendix B) was used to collect data on the participants’ carbohydrate intake levels (independent variable) and additional nutrient intake. A calibrated scale was used to collect participants’ body weight (dependent variable). The principal investigator performed manual data extraction from the ASA24 website to retrieve the participants’ pre and post-intervention nutrient intake levels to evaluate the independent variable, dietary adherence. Manual data extraction from the Excel Data Collection for Medical Assistant (Appendix C) spreadsheet was performed to retrieve the participants’ pre and post-intervention body weight and evaluate the dependent variable. All raw data was transcribed on the Excel

Data Collection for Principal Investigator spreadsheet (Appendix E) and entered in the SPSS software for statistical analyses.

Descriptive statistics were used to report the measures of central tendency and variability within the dataset. A total of 19 participants (n = 19) were included in this sample for data analysis, of which all were African American (100%), 16 were females (84.2%), and 3 were males (15.8%) (Figure 1). The participants' body weights ranged from 70.2 to 168.6 kg, with an average baseline body weight of 110.4 kg (*SD* ± 28.75). Their BMI ranged from 30.0 to 56.7 kg/m^2, with an average baseline BMI of 40.1 kg/m^2 (*SD* ± 7.14). The participants' ages ranged from 18 to 59 years, with a mean age of 39.5 years (*SD* ± 12.13) (Table 1). Their baseline average carbohydrate intake was 298.8 g (*SD* ± 136.63), energy 2807.4 g (*SD* ± 994.63), protein 106.8 g (*SD* ± 47.48), and fat 119.2 g (*SD* ± 46.97) (Table 1).

Inferential statistics were used to describe the data and make conclusions. The paired-samples *t*-test was used to evaluate the participants' pre and posttest body weights (continuous level data, dependent variable) before and after receiving the dietary intervention. Statistical significance was determined if $p < 0.05$. The results from baseline to 4-weeks in one group of 19 obese African American adults showed an overall average of 1.42 kg ($p = 0.042$) of body weight lost and represented a significant difference.

Chapter 5 presents a broad summation of this direct practice improvement project. It is intended to prompt the reader of the importance of the obesity epidemic and to concisely justify how this project contributes to the body of knowledge on obesity and carbohydrate-restricted diets. It will further provide conclusions, implications, and recommendations.

Chapter 5: Summary, Conclusions, and Recommendations

This project was important because it applied underutilized, evidence-based knowledge into clinical practice to develop an alternative approach to overcoming obesity. The principal investigator conducted a direct practice improvement project in 19 obese African American men and women, ages 18 to 60 years within an underserved rural health center. The purpose of this quantitative one-group pretest-posttest project was to evaluate the effects of dietary adherence to a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring intervention on body weight reduction, in one group of obese African American adults, that attended a rural health center in North Carolina. The independent variable, dietary adherence, was determined by the reduction of total carbohydrates between 130 to 225 g per day. The dependent variable, body weight, was determined by the change in pretest-posttest body weight.

The social cognitive theory established the theoretical foundations which reinforced the biopsychosocial factors that contributed to the participants' obesity (Bandura, 1989). The self-regulation theory developed the underpinnings of the project by allowing the participants to self-alter their unwanted dietary behavior and replace it with the desired response through self-monitoring skills (Baumeister et., 2007). The local health center recruited participants from there population of potential patients that attended the center. The principal investigator used the Automated Self-Administered 24-Hour (ASA24®) Dietary Assessment Tool (Appendix B) to collect data on the participants' pre and post-intervention nutrition intake levels to assess their dietary adherence to the 130 to 225 grams of carbohydrates per day. A calibrated scale was used to collect data on participants' pre and post-intervention body weight to assess their body weight change. Data was collected at the initial assessment before the intervention, and on a 4-week follow-up. Data analysis included descriptive and inferential statistics. The paired-samples *t*-test was used to complete the data analysis. Overall, the results revealed a significant reduction in the participants' body weight (*M* = 1.42 kg, *SD* = 2.82) from their pre-intervention body weight (*M* = 110.4 kg, *SD* = 28.75) to their post-intervention body weight (*M* = 109.0 kg, *SD* = 27.85); *t* (18) = 2.19, (*p* = 0.042). The participants' exhibited a significant difference in their overall carbohydrate intake (*M* = 43.76 g, *SD* = 85.68) from pre-intervention carbohydrate intake (*M* = 298.8 g, *SD* = 136.63) to post-intervention carbohydrate intake (*M* = 255.0 g, *SD* = 75.50); *t* (18) = 2.23, (*p* = 0.039).

Chapter 5 provides a comprehensive review of this project and its significance. It presents summaries of the overall project, its findings, and conclusions. It discusses theoretical, practical, and future implications. The chapter concludes with recommendations for future projects and practice.

Summary of the Project

The obesity epidemic has affected over one-third of the United States adult population, 2015-2016 (NIDDK, 2017), and poses additional health risks such as T2DM, h and CVD (World Health Organization, 2014). Rural communities and African American minorities are disproportionately affected by this chronic disease (CDC, 2018a, Hales et al., 2017). The city of Rocky Mount was reported to have a 31.3% (Nash County) and 40.7% (Edgecombe County) obesity rate (Hill & Johnson, 2016), compared to North Carolina's state average of 29.4% (Robert Wood Johnson Foundation, 2018a).

In clinical practice, health care providers often recommended the 2015-2020 Dietary Guidelines' high-carbohydrate, Lo-Cal diet for weight loss (225 to 325 grams per day from carbohydrates and 500 to 750 kcal reduced baseline energy) (HHS & USDA, 2015). However, the recommendation of a carbohydrate-restricted diet, instead of reduced calories, may have better long-term weight management (Ludwig et al., 2018). Additionally, low-carb diets and dietary self-monitoring have shown to produce significant weight loss in obese adults (Gibson & Sainsbury, 2017; Saslow et al., 2017a; Saslow et al., 2017b; Snorgaard et al., 2017).

Recognizing the 2015-2020 Dietary Guidelines had established a minimum RDA for carbohydrates of 130 grams per day, the principal investigator utilized the evidence-based literature to develop and answer the clinical question: Among obese African American adults attending a rural health center in North Carolina, what effect does dietary adherence of a 130 to 225 g per day moderate-carbohydrate diet with self-monitoring educational intervention, have on post-intervention body weight, compared to pre-intervention body weight (kilograms) over four weeks?

Summary of Findings and Conclusion

Summary of descriptive data.

Demographic data. This project was aimed to reduce the body weight in obese African American adults by providing an intervention focused on dietary restriction of carbohydrates between 130 to 225 grams per day and dietary self-monitoring skills. The clinical question sought to determine the effects on the participants' body weight before and after the educational intervention. The project was implemented in a rural health center located in North Carolina. The findings showed baseline demographics for the group were all African American adults with an average BMI of 40.1 kg/m^2, body weight 110.4 kg, and a larger representation of females (n = 16) to males (n = 3) ratio. These findings favor the CDCs (2018a) report regarding the high prevalence of obesity amongst African American adults and rural residents. Additionally, the demographic results support the National Center for Health Statistics (2016) report that African American women have the highest rates of obesity amongst any other group in the United States. The rural health center facilitated access to the demographic population with a high prevalence of obesity.

Nutrient data. Participants' mean baseline nutrient intake was consistent with a high-carbohydrate, high-calorie, high-fat, and normal-protein diet. Results showed the mean baseline carbohydrate intake for the group was 298.8 g, a difference of 73.8 g above the Dietary Guideline's minimum 225-g standard (HHS & USDA, 2015). According to Rosinger et al. (2017), high carbohydrate consumption is linked to increased weight gain. The mean baseline intake of total fats was 119.2 g, a difference of 41.2 g higher than the Dietary Guidelines 78-g maximum standard. These findings were consistent with Lee (2018) in that African Americans living in rural areas tend to consume a diet high in carbohydrates and fatty food. Results further showed a participants' baseline energy intake was 2807.4 kcal. According to the Dietary Guidelines, sedentary adults need an energy intake of 1,600 to 2,000 kcal per day, a difference of 807.4 kcal above the guideline's standards (HHS & USDA, 2015). The high baseline carbohydrate, energy, and fat intake levels are consistent with the literature that most Americans exceed the recommended dietary amounts of sugars, fats, sodium, and energy (HHS & USDA, 2015). Participants' mean baseline protein intake was 106.8 g, within the Dietary Guideline's 50 to 175g per day standards.

The average baseline, daily macronutrient range of the one-group sample, was 42.6% kcal from carbohydrates, 38.2% from fats, and 15.2% from protein, based on average energy intake of 2807.4 kcal. The AMDR for the 2015-2020 Dietary Guidelines is carbohydrates 45 to 65% kcal, total fats 20 to 35% kcal, and protein 10 to 35% kcal, based on a 2,000-calorie diet (HHS & USDA, 2015). These findings revealed that participants were below the USDA's AMDR for carbohydrates but consumed an excessive amount of calories. However, the average BMI was 40.1 kg/m^2 for the group. Nevertheless, the principal investigator questioned the premise of lowering the Dietary Guidelines standard carbohydrate ranges to promote fewer sugars and starch consumption, thus resulting in the reduction of caloric intake.

Summary of data analysis.

Results. The paired-samples *t*-test was used to evaluate the participants' pre and post-intervention body weights (dependent variable) to their pre and post-intervention carbohydrate intake, dietary adherence, (independent variable) to determine if the intervention was effective. The results showed a significant reduction in the participants' post-intervention body weight and BMI compared to pre-intervention. Participants' baseline carbohydrate intake decreased significantly after receiving the intervention. The average post-intervention carbohydrate intake was 255.0 g, although not consistent with the recommended 130 to 225 g per day. Participants were advised not to focus on counting calories, protein, and fats. However, the intervention team NP instructed participants on practical ways to reduce their energy and fat intakes, based on their one-day 24-hour dietary recall. The results showed a decrease from their baseline energy, 2807.4 kcal, compared to their post-intervention energy, 2639.7 kcal, although this was not statistically significant ($p = 0.054$). The results showed a slight decrease in the post-intervention protein (106.4 g) and a decrease in fat (108.6 g) intake compared to the pre-intervention protein (106.8 g) and fat (119.2 g) intake; however, this too was not statistically significant.

The results indicated that successful weight loss could result from educating obese adults on dietary carbohydrate restriction and dietary self-monitoring. The participants were instructed to focus primarily on counting their carbohydrate intake with the use of daily tracking to ensure adherence to dietary recommendations. According to Baumeister et al. (2007) self-regulation theory, self-monitoring through dietary records enabled the participants to recognize their unfavorable eating behaviors to bring self-awareness and improved change of that behavior. The results are also consistent with Peterson et al. (2014) in that frequent dietary self-monitoring resulted in greater body weight reduction. Although the dietary records were not measured, participants were advised to track their foods and beverages on a daily frequency.

The results of this project are significant because it revealed that a significant reduction in body weight could result from a carbohydrate-restricted diet while placing less emphasis on the restriction of calories. This project attempted to advance scientific knowledge by combining the evidence-based research on low-carb diets between 20 to 130 g per day and the 2015-2020 Dietary Guidelines carbohydrate recommendation of 225 to 325 g per day to formulate the alternative 130 to 225 g moderate-carbohydrate diet for weight loss. The participants' final daily macronutrient profile was 38.6% kcal from carbohydrates, 37.0% from fats, and 16.1% from protein, based on the average energy intake of 2539.7 kcal. The findings from this project were closely related to Anton et al. (2017) in that results produced the greatest clinically meaningful weight loss in diets with the macronutrient profile of 10% to 42% kcal from carbohydrates, 18% to 30% kcal from protein, and 38% to 59% kcal from fats per day. The 2015-2020 Dietary Guidelines daily macronutrient recommendations were carbohydrates 45 to 65% kcal, total fats 20 to 35% kcal, and protein 10 to 35% kcal, based on a 2,000-calorie diet (HHS & USDA, 2015). The results from this project confirmed that participants adhered to the Acceptable

Macronutrient Distribution Range (AMDR) within the moderate-carbohydrate diet recommendations of 26 to 45% kcal.

Due to the limitations of healthy food options, the high consumption of sugary beverages and snacks and limited knowledge about nutrition, there was a great need to educate and address the high rates of obesity within the African American adult who attended the rural health center (Barnidge et al., 2015; Warren et al., 2018). The literature review supported the conclusion that a carbohydrate-restricted diet of 130 to 225 g per day with dietary self-monitoring was effective in reducing the body weight of obese African American adults who reside in a rural community. This project was consistent with findings of the literature review in that participants resulted in improved weight loss because the intervention was culturally tailored, the educational material was easy to read and understand, and they utilized self-monitoring skills.

Implications

This section will describe the possible outcomes related to this direct practice improvement project. It will provide insight into the theoretical, practical, and future implications of this project. It offers a reflective assessment of the theoretical framework considering this project's findings. This section provides a critical evaluation of the project's strengths and weaknesses and the level of the conclusion's creditability based on the methodology, project design, and data. It further delineates applications of new insights because of this project that could solve actual problems.

There were several limitations to this project that is worth mentioning. First, the project had a short duration of four weeks. Most studies that compared carbohydrate-restricted diets against body weight were between 6 to 12-month duration Sato et al., 2017; Snorgaard et al., 2017; Yamada et al., 2014). Findings are not representative of long-term weight loss results and will need further investigation to conclude. Second, the sample was African American adults from a rural community and is, therefore, unable to make generalizations outside of the demographics outlined within this project. A strength of this project was its quantitative methodology. This methodology directed the evidence-based project and used defined guidelines and procedures to obtain accurate measurements to ensure the reliability and validity of the investigation (Frey, 2018).

Theoretical implications.

This project used the social cognitive theory (SCT) and self-regulation theory (SRT) to develop its theoretical framework. Bandura's (1989) SCT acknowledged that individual's behaviors were influenced by their personal factors, behaviors, and environment. Therefore, the SCT was ideal in the structure of this intervention because it focused on the biopsychosocial factors that often-affected successful weight loss in obese adults. The biological factors were significant to this project’s findings because it addressed the cardiometabolic components (personal factors) of the dietary intervention and its impact on the obese adults’ body weight. The psychological factors addressed the participants’ cognitive-behavioral perspective (behavioral) to understand their thought processes. While the social factors addressed the participants’ societal needs (environment) as an African American, who resided in a rural community. Although there may be several approaches to produce weight loss, in theory, it appears that tailoring interventions to address the biological, psychological, social behaviors of the obese individual might be an effective strategy to promote weight loss. Participants in this project consumed a significant amount of high sugary beverages and were advised to switch to sugar-free drinks and to increase their water intake. This simple change required no additional cost to the participant and was easy to incorporate.

The self-regulation theory was the second theory essential in the development of this project, given that most participants struggled with their internal behaviors of making poor dietary decisions (Baumeister et al., 2007). The determinants were used to construct this project's intervention and resulted in the participants' producing a significant body weight reduction. According to the SRT, it was expected that participants would be able to overcome their poor dietary decisions and improve their weight loss when provided with appropriate guidance, standards, self-monitoring, and motivation (Baumeister et al., 2007). The project provided the participants with a set standard of 130 to 225 g per day and 1 to 1 ½ pound per week weight loss. The participants utilized daily dietary records and educational resources to keep them motivated towards their weight loss goals. The participants' average weight loss was 1.42 kg or 3.12 lbs. over four weeks (0.78 lbs. per week). Although lower than the set standard, findings of this project supported the theoretical implications of the SRT.

Practical implications.

The findings from this project have identified several practical implications that warrant future investigation. Given this project's short 4-week duration, it would be valuable to examine the effects of dietary adherence to a 130g moderate-carbohydrate diet and dietary self-monitoring intervention on body weight over several durations of time such as 1, 3, 6, and 12-month follow-up (Sato et al., 2017; Snorgaard et al., 2017; Yamada et al., 2014). The findings suggest that recommending a carbohydrate-restriction might consequently yield a reduction in energy consumption. Ludwig et al. (2018) recommended a carbohydrate-restricted diet over reduced calories for better long-term weight management. The participants in this project were not advised to restrict nor count their calories, but rather focus on their carbohydrate intake. The primary measure was body weight; however, it would be necessary, in clinical practice, to measure the blood pressure, waist circumference, HbA1c, and lipid panel given the cardiometabolic factors that might influence the obese person's weight loss outcomes.

Future implications.

It appears that successful weight loss resulted from the NP-led 30-minute dietary teaching session. However, future considerations to implement the 30-minute session by the medical assistant, community care coordinator, nurse, or diabetes educator might prove to be a more cost-effective and feasible approach, given the demanding schedules of the health care providers within the rural health centers and financial funding. It would also be essential to ensure the staff has received the proper training to articulate the 130g moderate-carbohydrate diet and self-monitoring session.

Recommendations

Great efforts have been implemented to combat the battle against obesity. However, effective approaches towards obesity management are forthcoming and slowly translating into clinical practice. This section contains recommendations for future direct practice improvement projects, an explanation for its recommendation, and the areas that warrant further investigation. It provides a discussion of how the rural health center may benefit from the findings of this project and recommendations for future practice, including an explanation.

Recommendations for future projects.

Based on the findings of this project, the principal investigator identified the following recommendations for future direct practice improvement projects. First, this quantitative project revealed significant body weight reduction in 19 participants who adhered to the recommended 130 to 225 moderate-carbohydrate diet and dietary self-monitoring intervention over four weeks. Future projects should consider evaluating the effects of the moderate-carbohydrate diet and self-monitoring intervention over a greater duration of time to determine if these effects are sustainable for more than four weeks. Based on the time-constraints of the project, a retrospective chart review may be required.

Second, participants received a one-day educational session during the 4-week project. In theory, if participants perceived they had limited educational or societal resources this affected their ability to self-regulate their dietary behaviors. However, when they received the appropriate amount of resources, they would effectively self-regulate their dietary behaviors (Baumeister et al., 2007). Based on the literature review, most educational sessions were provided to the participants on a weekly, monthly, or bi-monthly basis, based on the duration of the study. Future direct practice improvement projects should consider weekly or monthly group sessions to provide participants with the appropriate resources for them to effectively manage their dietary behaviors and improve their ability to self-regulate.

Third, although the primary measure for this project was body weight, there are significant biomarkers to consider for future projects. Future evaluation of the participants' lipid panel is significant, based on the debate within the literature review over the low-carb's increased LDL-C and possible associated CVD risks. This project addressed the gap in the literature by utilizing a 130 to 225 g per day carbohydrate diet with a focus on unsaturated fats. Based on the literature, the moderate-carbohydrate diet should not increase LDL-C. Therefore, future direct practice improvement projects may consider the fasting lipid panel to validate their findings further.

Fourth, participants in this project exhibited reduced body weight outcomes with reduced carbohydrate and dietary self-monitoring. Participants were provided with a composition book to track all their foods and beverages daily and advised to keep track of the number of carbohydrates they consumed. However, this project did not seek to determine if the participants' frequency and consistency of dietary self-monitoring affected their weight loss outcomes. Instead, it focused on the participants' dietary adherence to the moderate-carbohydrate diet. Therefore, future projects should consider developing clinical questions that evaluate the effects of dietary self-monitoring on the participants' body weight. For example, the clinical question may be: Amongst obese African American adults seeking weight loss at a rural health center, what are the effects of 4 to 7 days/week of dietary self-monitoring compared to 0 to 4 days/week of dietary self-monitoring, on body weight.

Recommendations for practice.

Based on the findings of this project, the principal investigator identified the following recommendations for future clinical practice. First, the participants in this project reduced their body weight significantly. These findings are important given that body weight reduction of 5 to 10% can afford great benefits to obese patients, such as improvement of blood glucose, blood pressure, and cholesterol (CDC, 2018b). There were a significant number of participants with T2DM and hypertension. Therefore, it is recommended to focus the obesity education on the reduction of carbohydrates between 130 to 225 grams per day and dietary self-monitoring.

Second, the project revealed that health care providers and staff were time-constrained within the center. Therefore, further exploration of how ancillary staff such as a medical assistant, community care coordinator, diabetes educator, or nurse's influence, as the primary administrator of the 30-minute dietary session and the effects on patients' weight loss measures, might be helpful. Medical assistants and nurses are qualified to deliver patient education as directed by the health care provider, and this may pose as a more feasible and cost-efficient approach for the health center.

Third, during the project, it was noted that the ASA24 dietary assessment tool consumed 30 or more minutes of the NP's and participants' time. In clinical practice, this may pose as a hindrance to the center's productivity or frustration to the patient. On this basis, health care providers may consider using the participants' dietary record and obtain a verbal one-day dietary recall to evaluate their nutrient composition intake, rather than utilizing the computerized system. This information can be later entered into the ASA24 dietary tool. Furthermore, this dietary recall provides the practitioner with a vivid representation of the patients' eating patterns and allows a critical moment for the practitioner to make simple, practical adjustments to the patient's dietary behaviors.

Fourth, dietary self-monitoring skills should be encouraged in patients who are seeking to lose weight. Dietary self-monitoring is significant because it brings greater self-awareness and self-accountability to the patient's behaviors. Additionally, several studies support the use of self-monitoring techniques in producing weight loss outcomes (Hays et al., 2014; Zheng et al., 2015). Health care providers, medical assistants, and nurses can recommend notebooks or food apps for patients to track their dietary intake.

Several groups may benefit from the reading and results of this direct practice improvement project. First, the participants in this project were able to produce a significant reduction in their body weight by adhering to a carbohydrate-restricted diet and dietary tracking. According to the literature review, carbohydrate-restricted diets improved blood sugar control, body weight reduction, and CVD risks (Saslow et al., 2017a; Sato et al., 2017; Snorgaard et al., 2017). Therefore, the obese participants that took part in this project were able to improve their obesity and improve or prevent the progression of diabetes and CVD. Additionally, participants learned an alternative method to weight loss that concentrated more on the underlying causes of obesity-related co-morbidities. They also learned how to monitor their dietary behaviors and become self-accountable through dietary tracking.

Investigators conducting direct practice improvement projects may benefit from this project's findings through the further advancement of knowledge. As with any project, the investigator should evaluate the measures used to conduct this project and proceed with their discretion. This project utilized evidence-based research and tools, yet its limitations need to be considered when evaluating the findings. Therefore, the investigator can utilize this project to advance future project methodology and design to strengthen their results and decrease bias.

Finally, the health care team can benefit from reading and implementing the findings of this project, including the medical assistant, nurse, nurse practitioner, physician assistant, and physician. The health care team plays a vital role in providing effective obesity education at the rural health center. Findings from this project may yield effective ways to assist the health care team in managing obesity in their similar demographics. Additionally, the health care team may learn of new insights, including potential barriers to implementation and formulate modifications based on these findings.

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Appendix A

Institutional Review Board Determination Letter

GRAND CANYON UNIVERSITY

3300 West Camelback Road | Phoenix, Arizona 85017 | 602.639.7500 | Toll Free 800.800.9776 | www.gcu.edu

DATE: October 04, 2019

TO: Keenya Staten

FROM: COLLEGE OF NURSING AND HEALTH CARE PROFESSIONALS

STUDY TITLE: A 130-Gram Moderate-Carbohydrate Diet with Self-Monitoring Approach to Obesity

ACTION: DETERMINATION OF QUALITY IMPROVEMENT/PROGRAM EVALUATION STATUS

DATE: October 04, 2019

REVIEW CATEGORY: QUALITY IMPROVEMENT/PROGRAM EVALUATION

In collaboration with the Institutional Review Board, The College of Nursing and Health Care Professions at Grand Canyon University has determined that this submission does not meet the definition of human subject research. The submission qualifies as Quality Improvement and/or Program Evaluation; therefore, further IRB review is not required. In future publications and/or presentations, please refer to this submission as Quality Improvement and/or Program Evaluation, not research. If the results of the project will not be published, presented, or disseminated outside of the institution, ensure that all those associated with the project are aware that the project is ongoing.

We will put a copy of this correspondence in your student file in our office. If you have any questions, please contact The DNP Program Lead Faculty, Dr. Amanda Ziemendorf in the College of Nursing and Health Care Professions, Amanda.ziemendorf@gcu.edu.

Please include your study title and reference number in all correspondence with this office, IRB@gcu.edu.

FIND YOUR PURPOSE

Appendix B

Automated Self-Administered 24-hour (ASA24®) Recall

Sample of Participants' Nutritient Composition Data from ASA 24 Dietary Assessment Tool								
UserName	Lang	NumFoods	NumCodes	AmtUsua	CARB	PROT	TFAT	KCAL
USER12	1	10	14	2	234.708	100.577	123.312	2425.06
USER34	1	12	16	2	432.535	83.6481	112.405	3014.47
USER56	1	10	12	2	258.637	48.2692	58.3984	1712.22
USER78	1	15	15	2	198.998	130.55	215.23	3127.86
USER90	1	19	22	2	264.379	126.304	100.703	2912.81

Appendix C

Excel Data Collection for Nurse Practitioner

Excel Data Collection for Nurse Practitioner Spreadsheet

Initial visit date	Name	Coded username	M/F	DOB	Age	Race	Initial Wt (kg)	Ht (cm)	Initial BMI (kg/m^2)	Final visit date	Final Wt (kg)	Final BMI (kg/m^2)	Consent	Phone
		CARBS1111												
		CARBS1222												
		CARBS1333												
		CARBS1444												
		CARBS1555												
		CARBS1666												
		CARBS1777												
		CARBS1888												
		CARBS1999												
		CARBS2010												
		CARBS2111												
		CARBS2212												
		CARBS2313												
		CARBS2414												
		CARBS2515												
		CARBS2616												
		CARBS2717												
		CARBS2818												
		CARBS2919												

Appendix D

Planning Healthy Meals Handout and Guide

Planning healthy meals

the Diabetes Education Program

novo nordisk®

Making healthy food choices

- Lots of nonstarchy vegetables
- Whole-grain foods
- Fish 2 to 3 times a week
- Lean cuts of beef and pork
- Remove skin from chicken and turkey
- Non-fat or low-fat dairy products
- Water, unsweetened tea, coffee, and calorie-free "diet" drinks instead of drinks with sugar
- Liquid oils for cooking instead of solid fats
  - Limit quantities

Ask your diabetes care team how many fruits a day are right for your meal plan

Diabetes and healthy eating

- Good diabetes self-care means following your meal plan and keeping track of what you eat and drink
- Eat a variety of foods in the right amounts
- Be sure to check food labels for calorie, carbohydrate, total fat, and sodium amounts
- Eat regularly (small portions several times a day)
- Match how much you eat with your activity level
- Eat fewer foods high in calories, cholesterol, saturated fat, *trans* fat, and sodium
- Talk with your diabetes care team if you have any questions about your meal plan

"It took some time but I made the decision to do the things I needed to do to manage my diabetes. I started exercising and thinking more carefully about my food choices. Before too long, I had gained a lot of confidence in my ability to manage this disease."

– Karen R., South Carolina

the Diabetes Education Program

Estimating portion sizes

When you can't measure, you can estimate!

A fist equals about 1 cup

A palm equals about 3 ounces

A thumb equals about 1 ounce

These are only general guides.

Finding the carb counts: Reading Nutrition Facts labels

Check serving size. Information on the label is based on 1 serving. Keep in mind that packages often contain more than 1 serving. This example shows that the package contains 8 servings. But the information provided is for only 1 serving.

Look at the amount of fat, especially saturated and trans fat, in each serving.

See how many grams of carbs are in each serving.

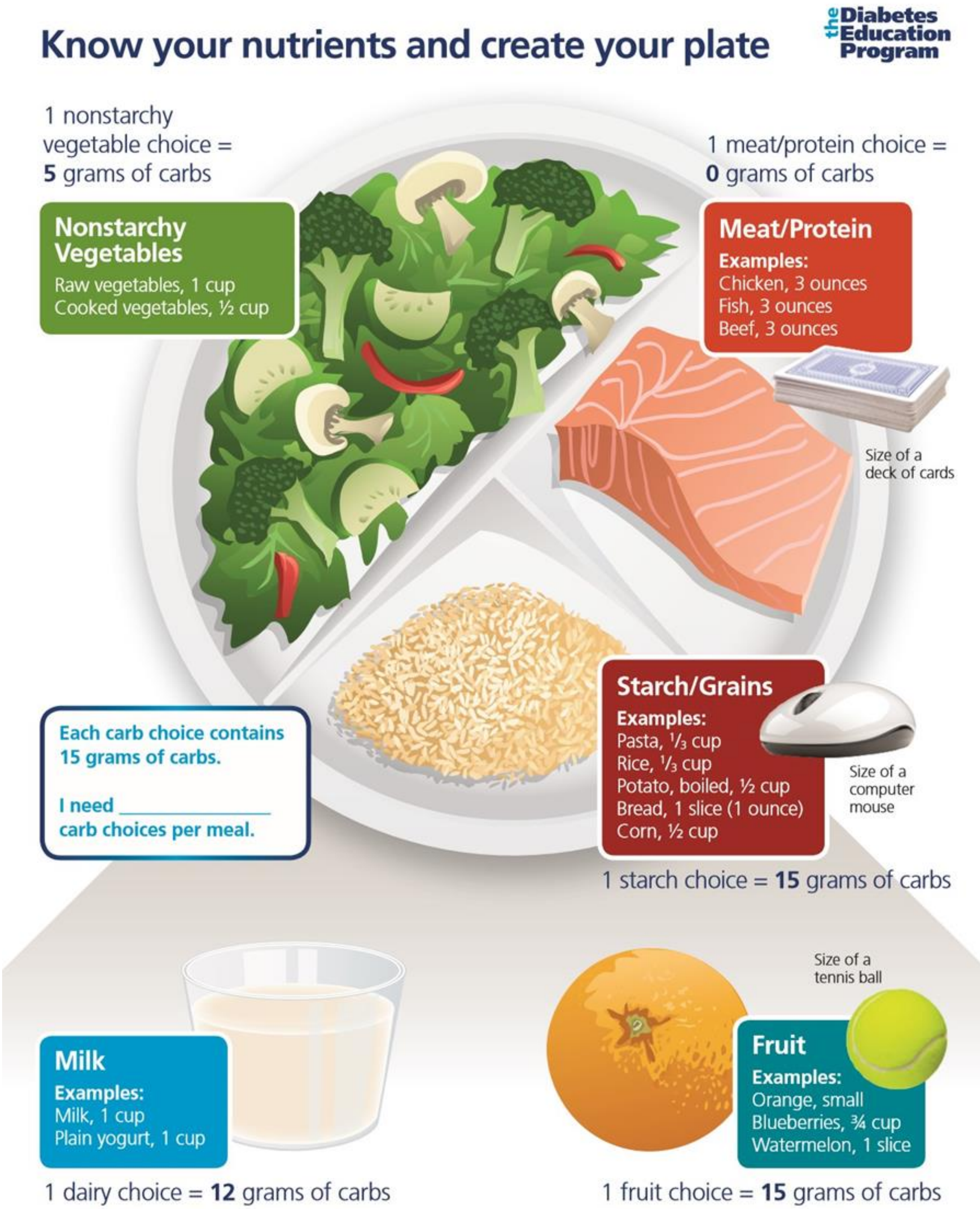
You can also see how many grams of Added Sugar the food contains. This is sugar that has been added as the food is made. Try to choose foods with less added sugar.

Decide whether the food fits into your plan.

Nutrition Facts

8 servings per container	
Serving size	**2/3 cup (55g)**
Amount per serving	
Calories	**230**
	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.


Know your nutrients and create your plate
the Diabetes Education Program
1 nonstarchy vegetable choice = 5 grams of carbs
Nonstarchy Vegetables
Raw vegetables, 1 cup
Cooked vegetables, ½ cup
1 meat/protein choice = 0 grams of carbs
Meat/Protein
Examples:
Chicken, 3 ounces
Fish, 3 ounces
Beef, 3 ounces
Size of a deck of cards
Starch/Grains
Examples:
Pasta, 1/3 cup
Rice, 1/3 cup
Potato, boiled, ½ cup
Bread, 1 slice (1 ounce)
Corn, ½ cup
Size of a computer mouse
Each carb choice contains 15 grams of carbs.
I need ______________ carb choices per meal.
1 starch choice = 15 grams of carbs
Size of a tennis ball
Milk
Examples:
Milk, 1 cup
Plain yogurt, 1 cup
Fruit
Examples:
Orange, small
Blueberries, ¾ cup
Watermelon, 1 slice
1 dairy choice = 12 grams of carbs
1 fruit choice = 15 grams of carbs

Noncarbohydrates

the Diabetes Education Program

Meat/Protein

- Meat and meat substitutes are a source of protein and do not raise blood sugar significantly
- Prepare meats without a batter. Bake, grill, or broil
- 3 oz cooked meat = deck of cards
- The following chart shows what 1 choice of meat and meat substitutes contains
- The number of servings per day varies by individual meal plan

	Protein	Fat
Lean meat	7	0–3
Medium-fat meat	7	4–7
High-fat meat	7	8+

Meat		1 CHOICE
Beef	Lean—Ground round, roast, round, sirloin, steak, tenderloin	1 oz
	Medium-fat—Corned beef, ground beef, prime rib, short ribs	1 oz
Chicken	Lean—Without skin	1 oz
	Medium-fat—With skin	1 oz
Fish	Lean—Smoked: herring or salmon (lox)	1 oz
	Medium-fat: Any fried product	1 oz
Lamb	Lean—Chop, leg, or roast	1 oz
	Medium-fat—Ground, rib roast	1 oz
Pork	Lean—Canadian bacon, rib or loin chop/roast, ham, tenderloin	1 oz
	Medium-fat—Cutlet, shoulder roast	1 oz
	High-fat—Ground, sausage, spareribs	1 oz
Sandwich meats	Lean—chipped beef, deli thin-sliced meats, turkey ham	1 oz
	High-fat—bologna, pastrami, hard salami	1 oz
Sausage	Medium-fat—With 4–7 grams of fat per oz	1 oz
	High-fat—bratwurst, chorizo, Italian, knockwurst, Polish, smoked	1 oz
Shellfish	Lean—Clams, crab, imitation shellfish, lobster, scallops, shrimp	1 oz
Veal	Lean—Loin chop, roast	1 oz
	Medium-fat—Cutlet (no breading)	1 oz

Meat Substitutes	1 CHOICE
Beef jerky (lean)	½ oz
Cheese	
Lean—cottage cheese	¼ cup
Medium-fat—feta, mozzarella, reduced-fat cheeses, string	1 oz
High-fat—American, bleu, brie, cheddar, queso, and Swiss	1 oz
Egg (medium-fat)	1
Egg substitutes, plain (lean)	¼ cup
Egg whites (lean)	2
Hot dog	
Lean—3 grams of fat or less per oz	1
High-fat—Beef or pork	1
Sardines, canned (lean)	2 small
Tofu	½ cup

Nonstarchy Vegetables

- Do not raise blood sugar as much as starchy vegetables
- 1 cup raw or ½ cup cooked = 5 grams of carbohydrates

Artichoke hearts
Asparagus
Baby corn
Bamboo shoots
Bean sprouts
Beans (green, wax, Italian)
Broccoli
Brussels sprouts
Cabbage (green, bok choy, Chinese)
Carrots
Cauliflower
Celery
Cucumber
Eggplant
Green onions or scallions
Greens (collard, kale, mustard, turnip)
Leeks
Mixed vegetables (without corn, peas, or pasta)
Mushrooms, all kinds, fresh
Okra
Onions
Pea pods
Peppers (all varieties)
Radishes
Sauerkraut
Soybean sprouts
Spinach
Squash (summer, crookneck, zucchini)
Tomato
Turnips
Water chestnuts

Noncarbohydrates

Fats

- Do not raise blood sugar significantly
- Should be used sparingly
- Will help slow the rise of blood sugar after meals
- A serving size of fats listed = 5 grams of fat

Unsaturated Fats (Monounsaturated)	SERVING SIZE
Avocado	2 Tbsp
Nut butters (*trans* fat-free):	1½ tsp
Nuts	
Almonds	6
Cashews	6
Peanuts	10
Pecans	4 halves
Pistachios	16
Oil: canola, olive, peanut	1 tsp
Olives, Black	8 large
Olives, Green, stuffed	10 large

Polyunsaturated Fats	SERVING SIZE
Margarine	
Lower fat spread (30%–50% vegetable oil, *trans* fat-free)	1 Tbsp
Stick, tub (*trans* fat-free), or squeeze (*trans* fat-free)	1 tsp
Mayonnaise	
Reduced-fat	1 Tbsp
Regular	1 tsp
Oil: corn, cottonseed, flaxseed, grape seed, safflower, soybean, sunflower	1 tsp
Salad dressing	
Reduced-fat	2 Tbsp
Regular	1 Tbsp
Seeds: flaxseed (whole), pumpkin, sunflower, sesame	1 Tbsp
Walnuts	4 halves

Saturated Fats	SERVING SIZE
Bacon	1 slice
Butter	
Reduced-fat	1 Tbsp
Stick	1 tsp
Whipped	2 tsp
Cream	
Half and half	2 Tbsp
Heavy	1 Tbsp
Light	1½ Tbsp
Whipped, pressurized	¼ cup
Cream cheese	
Reduced-fat	1½ Tbsp
Regular	1 Tbsp
Lard	1 tsp
Oil: coconut, palm, palm kernel	1 tsp
Shortening, solid	1 tsp
Sour cream	
Reduced-fat or light	3 Tbsp
Regular	2 Tbsp

Tips for dining out with diabetes

- If you don't know what's in a dish or how it's prepared, ask
- Ask for salad dressing, sauces, and gravy on the side
- Estimate your normal portion and put the extra in a container to go
- Try to limit alcohol and sugary drinks, or avoid them
- Don't rush! Eat slowly and really enjoy your meal

the Diabetes Education Program

Carbohydrates

- Most of the carbohydrates we eat quickly turn into blood sugar
- Each carb choice contains 15 grams of carbs

Milk

Milk and Yogurts	SERVING SIZE OR PORTION
Chocolate milk, fat-free or whole	½ cup
Evaporated milk (all kinds)	½ cup
Ice cream, light, no sugar added, or regular	½ cup
Milk or buttermilk, fat-free, low-fat (1%), reduced-fat (2%), or whole	1 cup
Soy milk, light or regular, plain	1 cup
Yogurt, plain, whole	1 cup

Starch/Grains

Bread	SERVING SIZE OR PORTION
Bagel, large (about 4 oz)	¼ (1 oz)
Bread, reduced-calorie	2 slices
Bread, white, whole-grain, pumpernickel, rye	1 slice (1 oz)
English muffin	½
Hot dog or hamburger bun	½ (1 oz)
Pancake, 4 inches across	1
Pita, 6 inches across	½
Roll, plain, small	1 (1 oz)
Taco shell, 5 inches across	2
Tortilla, corn or flour, 6 inches	1
Waffle, 4-inch square	1

Crackers and Snacks	SERVING SIZE OR PORTION
Animal crackers	8
Cookies, Chocolate chip	2 cookies
Crackers	
Round, butter type	6
Saltine-type	6
Sandwich-style, cheese or peanut butter filling	3
Whole-wheat	2–5
Graham cracker, 2½-inch square	3
Oyster crackers	20
Popcorn	3 cups
Pretzels	¾ oz
Rice cakes, 4 inches across	2
Snack chips	
Fat-free or baked (tortilla, potato, pita)	15–20
Regular (tortilla, potato)	9–13

Cereals and Grains	SERVING SIZE OR PORTION
Bran, dry, wheat	½ cup
Cereals	
Cooked (oats, oatmeal)	½ cup
Puffed	1½ cups
Shredded wheat, plain	½ cup
Sugar-coated	½ cup
Unsweetened, ready-to-eat	¾ cup
Couscous	⅓ cup
Granola, low-fat or regular	¼ cup
Grits, cooked	½ cup
Pasta, cooked	⅓ cup
Rice, white or brown, cooked	⅓ cup
Wild rice, cooked	⅓ cup

Starchy Vegetables	SERVING SIZE OR PORTION
Baked beans	⅓ cup
Beans, cooked (black, garbanzo, kidney, lima, navy, pinto, white)	½ cup
Corn on cob, large	½ cup
Lentils, cooked	½ cup
Mixed vegetables with corn, peas, or pasta	1 cup
Peas, green	½ cup
Potato	
Baked with skin	¼ large (3 oz)
Boiled, all kinds	½ cup
Mashed, with milk and fat	½ cup
French fried (oven-baked)	1 cup (2 oz)
Pumpkin, canned, no sugar added	1 cup
Squash, winter (acorn, butternut)	1 cup
Yam, sweet potato, plain	½ cup

Fruit

Fruits	SERVING SIZE OR PORTION
Apple, unpeeled, small	1 (4 oz)
Applesauce, unsweetened	½ cup
Apricots	4 whole (5½ oz)
Banana	½ (4 oz)
Blackberries	¾ cup
Blueberries	¾ cup
Cantaloupe, small	⅓ melon or 1 cup
Cherries	12 (3 oz)
Dates	3
Dried fruits	2 Tbsp
Figs (fresh or dried)	1½
Fruit juice	½ cup
Grapefruit, large	½ (11 oz)
Grapes, small	17 (3 oz)
Honeydew melon	1 slice or 1 cup
Kiwi	1 (3½ oz)
Mango, small	½ fruit (5½ oz) or ½ cup
Nectarine, small	1 (5 oz)
Orange, small	1 (6½ oz)
Papaya	½ fruit or 1 cup
Peaches, medium	1 (6 oz)
Pears	½ cup (4 oz)
Pineapple	¾ cup
Plums, small	3
Prunes	2 (5 oz)
Raspberries	1 cup
Strawberries	1¼ cups whole
Tangerines, small	2 (8 oz)
Watermelon	1 slice or 1¼ cups

Planning Healthy Meals Guide

The invention team nurse practitioner wil this script to guide the 130-gram moderate carbohydrate diet and self-monitoring session.

Give each participant the 7-page handout and one composition notebook.

Making Healthy Food Choices

Making healthy food choices can be hard at times. This lesson will help you reduce your carbohydrates (starches and sugars) and teach you how to recognize and control your eating habits. First, let us discuss the important features of the diet.

1. *Eat lots of non-starchy vegetables.*
2. *Choose whole-grain foods.*
3. *Eat fish 2 to 3 times a week.*
4. *Eat lean cuts of beef and pork. Avoid fatty cuts of meat.*
5. *Remove the skin from chicken and turkey.*
6. *Non-fat or low-fat dairy products*
7. *Drink 2 liters or 8 glasses of water daily. Drink unsweetened tea, coffee, and calorie-free "diet" drinks instead of drinks with sugar.*
8. *Use a limited amount of liquid oils for cooking instead of solid fats.*
9. *Eat regularly (small portions several times a day).*
10. *Be sure to check food labels for carbohydrate amounts. Your goal is to stay between 130 to 225 grams per day.*

Give the participant the notebook at this time.

Tell the participant: *Use this notebook to write down your daily foods and beverages. Next to the foods list, the carbohydrate amount it contains. Remember your daily goal of carbohydrates is to stay between 130 to 225 grams per day. Your weight loss goal is to lose at least 1 to 2 pounds every week if you stay within the carbohydrate range and track your foods and beverages daily. Writing your foods down will help you become aware of your eating habits and allows you to make changes to your diet because you recognize the areas that need changing.*

Now let's review serving sizes and how to read food labels.

When you don't have a food measure handy, you can estimate your serving size. Look at the pictures on your handout. The size of your fist equals about 1 cup. The palm of your hand equals about 3 ounces. Your thumb is equal to about 1 ounce. This is only a general guide, but you may find it useful at times.

Reading Nutrition Facts Labels

When reading food labels there are important steps to take. Make sure you:

1. *Check the serving size.*
2. *Notice that information on the label is based on 1 serving.*
3. *Notice that packages may contain more than 1 serving.*
4. *Look at the amount of fat, especially saturated and trans-fat, in each serving. Avoid foods with saturated and trans-fats.*
5. *See how many grams of carbs are in each serving. Your daily goal of carbohydrate intake is 130 to 225 grams per day.*
6. *See how many grams of added sugar. Try to choose foods with less added sugar.*

Appendix E

Excel Data Collection for Principal Investigator

Excel Data Collection for Principal Investigator Spreadsheet

Coded username	DOB	Age	M/F	Race	Date of initial visit	Ht (cm)	Pre body wt. (kgs)	Pre BMI (kg/m^2)	Pre Carb (g)	Pre Pro (g)	Pre Fat (g)	Pre Energy (kcal)	Date of final visit	Post BMI (kg/m^2)	Post body wt. (lbs)	Post Total Carb (g)	Post Total Pro (g)	Post Total fat (g)	Post Total Energy (kcal)
CARBS1111																			
CARBS1222																			
CARBS1333																			
CARBS1444																			
CARBS1555																			
CARBS1666																			
CARBS1777																			
CARBS1888																			
CARBS1999																			
CARBS2010																			
CARBS2111																			
CARBS2212																			
CARBS2313																			
CARBS2414																			
CARBS2515																			
CARBS2616																			
CARBS2717																			
CARBS2818																			
CARBS2919																			

Appendix F

Inclusion-Exclusion Criteria Checklist

Inclusion criteria (IC): African American, male and female, ages 18 to 60 years old, with a BMI of 30 kg/m2 or greater. They are eligible if they have type II diabetes, hypertension, and/or high cholesterol. Must be in stable health condition. Must be willing to reduce their intake of carbohydrates (sugars, bread, rice, pasta, etc.). Must be willing to track their foods and beverages daily. Must be able to attend one initial visit and a final visit 3-4 weeks after. Will be required to give a one-day diet recall on both visits. Exclusion criteria (EC): kidney failure, mental disability, currently pregnant or breastfeeding, prescribed weight loss medications, serious health condition, and any condition not suitable for this project.

INCLUSION & EXCLUSION CRITERIA CHECKLIST

Name	M/F	DOB	Age	Race	Weight (kg)	Height (cm)	BMI (kg/m²)	Meet all IC (Y/N)	There are EC (Y/N)	Code number	Date for initial visit	Date of f/u visit	Phone number	Consent Y/N
										CARBS1111				
										CARBS1222				
										CARBS1333				
										CARBS1444				
										CARBS1555				
										CARBS1666				
										CARBS1999				
										CARBS2010				
										CARBS2111				
										CARBS2212				
										CARBS1777				
										CARBS1888				
										CARBS2313				
										CARBS2414				
										CARBS2515				
										CARBS2616				
										CARBS2717				
										CARBS2818				
										CARBS2919				