THE INFLUENCE OF FAMILY FUNCTION ON DIETARY INTAKE AND GLUCOSE CONTROL IN AFRICAN AMERICAN WOMEN WITH TYPE 2 DIABETES

Natasha Greene

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the School of Nursing.

Chapel Hill
2009

Approved by:

Dr. Margaret Miles, Advisor

Dr. Alice Ammerman, Reader

Dr. Barbara Germino, Reader

Dr. Sandra Picot, Reader

Dr. Anne Skelly, Reader

ABSTRACT

NATASHA GREENE: The Influence of Family Function on Dietary Intake and Glucose Control in African American Women with Type 2 Diabetes
(Under the direction of Dr. Margaret Miles)

African American women disproportionately suffer from type 2 diabetes prevalence, morbidity, and mortality. Maintaining optimal nutrition for physiological function and normalizing body mass index in order to decrease glucose levels and insulin resistance prevents morbidity and mortality. Thus, following the recommended daily food allowances is the most important life-style modification for diabetes. Unfortunately, African American women with type 2 diabetes find dietary adherence difficult to maintain due to challenges with changing life-long dietary habits, lack of family and spousal support, multi-caregiver roles, and difficulty with portion control. Most of these factors occur in the family home, but there is still little information exploring how a spouse and the family influence dietary intake.

Therefore, the overall purpose of this study was to explore the influence of family function on the quality of dietary intake and, ultimately, glucose control for African American women with type 2 diabetes. The conceptual model for the study was based on empirical evidence related to factors affecting dietary intake and glucose control and Turner's theory of family function. The specific aims were to: (a) explore whether family function (roles, problem solving, and communication) mediates the relationship between female and male characteristics (diabetes knowledge and health status) and dietary intake, (b) test a preliminary model for

explaining how characteristics of the women and men, family function, and dietary intake related to glucose control, and (c) explore from the woman's perspective, other family factors affecting her dietary intake. Data were collected using self-report questionnaires and a brief semi-structured interview.

The convenience sample consisted of 22 African American females with type 2 diabetes and 18 male spouses and 1 male cohabitating partner from rural counties in the Mid-Atlantic region of the U.S. Family function was not related to dietary intake and therefore, was not a mediator. Dietary intake was not related to fasting glucose. In the final model using stepwise multiple regression analyses, the woman's assessment of healthier family role behavior and her lower general health perceptions were associated with higher fasting glucose. Therefore, women have poorer glucose control when their general health is poorer and family role behaviors are clearly defined. Qualitative analyses suggested that women with normal glucose control obtained support in maintaining their diet from a variety of sources (family, God, spouse, and themselves), while women with poorer glucose control identified more challenges from a variety of sources (motherhood, themselves, spouse/partner, family, and work). Findings have implications for providing family focused education and interventions to African American women with type 2 diabetes.

Dedication

I dedicate my dissertation to Charlie & Gladys Greene, who are my loving parents,

and Tonia Greene Jefferson, my little sister.

Mom and Dad: You are my inspiration and role models. You have always moved me forward when I can't see my way. Your prayers, your patience, your encouragement, your money, your time, and love have always been the light in my life's pathway. Listening to your stories about overcoming obstacles and doing your best kept me going for so long. When I would almost surrender, I thought about my father being the first African American apprentice to complete the program at Local 87. I knew that if he could withstand the turmoil of that experience, I should be able to withstand anything. One day, I will tell the story to my Elizabeth Paige, so that she may pick up her bootstraps with pride and walk forward. I also remember my mom doing whatever it took to keep our house a loving home. The routine was homework, dinner, play, and lots of love. Even today, she maintains the heart of our home and reminds me of her pride in everything I do.

Tonia: Thank you for encouraging me to start this PhD journey. You and my brother-in-law Clinton provided the initial financial support. Tonia, you have been my best friend, an occasional thorn in my side, my confidante, and the one person who always said, "I will be glad when you finish that PhD. Hurry up, it is taking too long." It is finally over!

ACKNOWLEDGEMENTS

I would like to express my sincerest appreciation to the study subjects and their partners. Also, a special thank you to **Dr. Rayette Jones** of Gates Medical Center, her nurse **Sylvia Boone**, **Esther Lassiter** of Healthy Carolinians, and Nurse **Shannon** of Elizabeth City State University for their recruitment help. Without their participation, my research would not have been possible.

I wish to thank **Margaret Mangan** and **Dr. Anna Maria Siega-Riz** of the University of North Carolina Nutrition Epidemiology Core (CNRU grant number NIH DK56350) for collecting the NDS-R recalls for my subjects.

The expertise, patience, encouragement, and guidance of **Dr. Margaret S. Miles**, my chairperson, is greatly appreciated. I could not have completed this dissertation without your support. I will never be able to thank you enough!

To my committee members – **Drs. Alice Ammerman, Barbara Germino, Sandra Picot, and Anne Skelly** – your patience and guidance continued to move me through this process.

Thank you **National Institute of Diabetes and Digestive and Kidney Diseases** for honoring me with a Ruth Kirschtein National Research Scientist Award.

TABLE OF CONTENTS

LIST OF TABLES

Tables

LIST OF FIGURES

Figures

Chapter 1

INTRODUCTION

Diabetes has become epidemic throughout the world with estimates of 194 million people living with diabetes (Colagiuri, Borch-Johnsen, Glumer, & Vistisen, 2005). In the United States, there are approximately 17.9 million people diagnosed with diabetes, and 90% to 95% of these diagnosed cases are type 2 diabetes (Centers for Disease Control and Prevention, 2008). Diabetes is the seventh leading cause of mortality in the United States, the fifth leading cause of mortality in North Carolina (Valeriano, Reaves, Porterfield, & Munoz-Plaza, 2002), and the fourth leading cause of mortality among African American women aged 45 to 64 years (CDC, 2001).

African Americans disproportionately represent 3.7 million diabetes cases (CDC, 2008), although they only represent 13% of the United States population (U.S. Census Bureau, 2003). African Americans are 1.8 times as likely to have diabetes than non-Hispanic whites, and more likely to have diabetes than Hispanic Americans (13.3% and 9.5%, respectively; CDC, 2005). Moreover, approximately one in four African American women older than age 55 has diabetes.

Diabetes Pathophysiology

Type 2 diabetes (T2D) is an endocrine disorder characterized by hyperglycemia. The process of developing T2D is still partly unknown, however, investigators agree that the process occurs over many years. Many researchers

agree that approximately 60% to 90% of T2D is directly related to insulin resistance caused by obesity (Kasuga, 2006). Mice observations show a direct link between insulin resistance in the liver to the pathogenesis of T2D (Kasuga, 2006). A link has also been shown between a lack of insulin receptors in the muscle, tissue, and brain to the development of insulin resistance.

Insulin resistance causes the pancreatic β cells to secrete more insulin for maintenance of normal glycemia. This compensation causes pancreatic β cell mass expansion which is accomplished through increased nutrient supply, increased sensitivity to incretin hormones, insulin, and other growth factor signaling (Prentki & Nolan, 2006). The pancreatic β cells continue to compensate until there is failure and a loss of volume. Researchers report a 40% to 60% loss of pancreatic β cell volume in obese participants with impaired fasting glucose and T2D, respectively, while lean participants with T2D had a 41% loss when compared to weight-matched controls (Butler et al., 2003). These results suggest that β cell failure initiates glucose intolerance and the progressive pathogenesis of T2D (Prentki & Nolan, 2006).

Consequences of Type 2 Diabetes

Persons with diabetes are twice as likely to experience death as persons without diabetes of similar age (CDC, 2005). Among North Carolinians with diabetes, the age adjusted mortality rate is 2.5 times higher in minority groups than European Americans (Valeriano et al., 2002). With these increased mortality rates, diabetes related morbidity is common.

One of the most common and fatal diabetes complications is cardiovascular disease. Heart disease accounts for approximately 68% of deaths in persons with diabetes (CDC, 2005). Stroke risk is 2 to 4 times higher in adults with diabetes than in adults without diabetes. Diabetes is also the leading cause of kidney failure, blindness, and non-traumatic lower limb amputations. However, in African Americans the consequences of diabetes is more severe. African Americans experience higher rates of renal failure, cardiovascular disease, and diabetic retinopathy than European Americans (National Institute of Diabetes and Digestive and Kidney Diseases, 1998; Summerson, Bell, Konen, & Spangler, 2002; Summerson, Spangler, Bell, Shelton, & Konen, 1999; Young, Maynard, & Boyko, 2003). They experience diabetic retinopathy at a rate that is 40 to 50% higher (NIDDK, 1998). Researchers also report that African Americans with diabetes have a significantly higher incidence of clinical proteinuria, a symptom of renal failure, than non-Hispanic Caucasians and Mexican Americans, 13.6%, 5.2%, and 11.2%, respectively; (Harris, 2001).

Moreover, there are significant gender differences among women with diabetes. Women are more likely to have a lower survival rate and quality of life than men after suffering diabetes related myocardial infarction (CDC, 2003). African American women with diabetes are significantly more likely to have higher diastolic and mean arterial blood pressures than European American women with diabetes (Summerson, Bell, & Konen, 1996). In addition, women with diabetes are more likely than men with diabetes to experience symptoms that interfere with family functioning, such as polydispia, headaches, cataracts, polyphagia, fatigue, and

palpitations (Summerson et al., 1999). Therefore, the impact of diabetes on the African American woman may be more mentally and physically debilitating than as experienced in men.

In summary, the pathogenesis of T2D occurs over time and concludes with pancreatic beta cell failure. African American women experience higher rates of morbidity and mortality in comparison to European Americans. As such, it is important to learn more about factors that affect morbidity and mortality in African American women who have T2D.

The cornerstone of treatment and prevention of complications involves medications, exercise, and diet. Medications are designed to either delay the onset of T2D or manage hyperglycemia by decreasing insulin resistance and heptaglucogenesis, or increasing circulating insulin. Exercise is important in decreasing glucose. Following the recommended dietary allowances, which focuses on maintaining a healthy diet and reducing caloric intake, decreases glucose levels, insulin resistance, and obesity. These involve self-care management and lifestyle modifications which are critical to improve health and reduce morbidity and mortality associated with T2D.

Dietary Intake: A Cornerstone of Management of Type 2 Diabetes

The most important aspect of self-care management is continual monitoring and adjusting dietary intake to fulfill individual nutritional requirement to decrease glucose levels and insulin resistance and to promote normal body mass index (BMI). Unfortunately, many persons with T2D find dietary adherence difficult to maintain. In fact, diet, along with exercise, has the highest rate of non-adherence across all

ethnic groups despite the fact that dietary behavior is controlled by the individual (Glasgow, Hampson, Strycker, & Ruggiero, 1997; Nelson, Reiber, & Boyko, 2002). Approximately one-third of persons with T2D do not regularly follow a meal plan or exercise (Connell, 1991). African Americans report less adherence to the five recommended servings of fruits and vegetables than European Americans and Mexican Americans (Berrigan, Dodd, Troiano, Krebs-Smith, & Barbash, 2003; Nelson et al., 2002). More specifically, African American women with T2D have a higher intake of saturated fat than European Americans and Hispanics (Strain, Champagne, & Roman, 1998), and are less likely to limit high fat foods, soft drinks, candy, red meat, or desserts (Savoca & Miller, 2001). Poor dietary management ultimately leads to inadequate glucose control, a key factor in morbidity.

Dietary Intake and Glucose Control: What are the influences?

In order to intervene to improve adherence to dietary intake, it is important to understand the factors that influence dietary intake and glucose control, particularly among African American women with T2D. Researchers have investigated variables that may influence dietary intake. One of the most studied variables is socioeconomic status (SES). SES, which is measured by income, employment, or education, is most consistent in predicting variance in dietary intake (Berrigan et al., 2003; Everson, Maty, Lynch, & Kaplan, 2002; Lantz et al., 2001; Lu, Samuels, & Huang, 2002). However, other variables such as diabetes knowledge and health status have shown less consistency.

Investigators report that greater diabetes knowledge is associated with lower HgA1C (Miller, Edwards, Kissling, & Sanville, 2002), healthier eating and increased

vegetable consumption (Two Feathers et al., 2005). However, researchers found that knowledge alone does not reliably change dietary intake quality (Heisler, Piette, Spencer, Kieffer, & Vijan, 2005). In addition, researchers know even less about how the health status of the person with T2D and their spouse affect dietary intake. There is some evidence of a positive association between spouses' health status and their healthy behaviors (Cox, Carpenter, Bruce, Poole, & Gaylord, 2004) and dietary intake (Macken, Yates, & Blancher, 2000; Speers, Kasl, & Ostfeld, 1986, 1989; Venters, Jacobs, Luepker, Maiman, & Gillum, 1984; Wood, Roberts, & Campbell, 1997), but these studies are not usually focused on African Americans or persons with T2D, and the quantity of researchers examining these variables are few. Thus, studies on the relationship of diabetes knowledge and health status of the woman with T2D and her spouse on her dietary adherence are inconsistent or not studied.

Difficulties in maintaining healthy dietary intake behaviors for African American women with T2D may also originate in the family setting. Cultural aspects of diet in African American families and ways families function in terms of roles, communication, and problem solving have mostly not been studied. However, it may be postulated that a woman with T2D may be knowledgeable about her dietary needs, but her ability to eat healthier may be influenced by her role in the family, family communication patterns, and the family's ability to problem-solve related to changes needed to move from past preferences for certain foods they have been eating for years to a more healthy diet (Devine, Connors, Bisogni, & Sobal, 1998). Therefore, investigators need to explore the role of family function in predicting dietary intake quality and glucose control.

Family function is conceptualized as a family's interactions to achieve common goals for the success and maintenance of the family unit (Friedman, 1998). Turner's theory of Family Interaction (1970) focuses assumptions on the small family unit (members of an individual household), rather than extended family and the exterior influences of the social environment. Turner emphasizes the view that individuals often initiate behavior as a result of daily internal family interactions and the context in which they occur and views the nuclear family interactions as complete, in and of themselves. Of particular note in Turner's theory is that family function is hypothesized to encompass three important components: roles, communication, and problem solving.

Purpose and Specific Aims

Therefore, the overall purpose of this study was to explore the influence of family function on the quality of dietary intake and, ultimately, glucose control for African American women with T2D. The conceptual model for the study is based on empirical evidence related to factors affecting dietary intake and glucose control and Turner's theory of family function (see Figure 1). In the model, family function is viewed as a mediator between the woman's diabetes knowledge and her health status and the health status of her husband/partner and the quality of her daily dietary intake. Dietary intake, in turn, affects glucose control.

Based on this model, the specific aims were to:

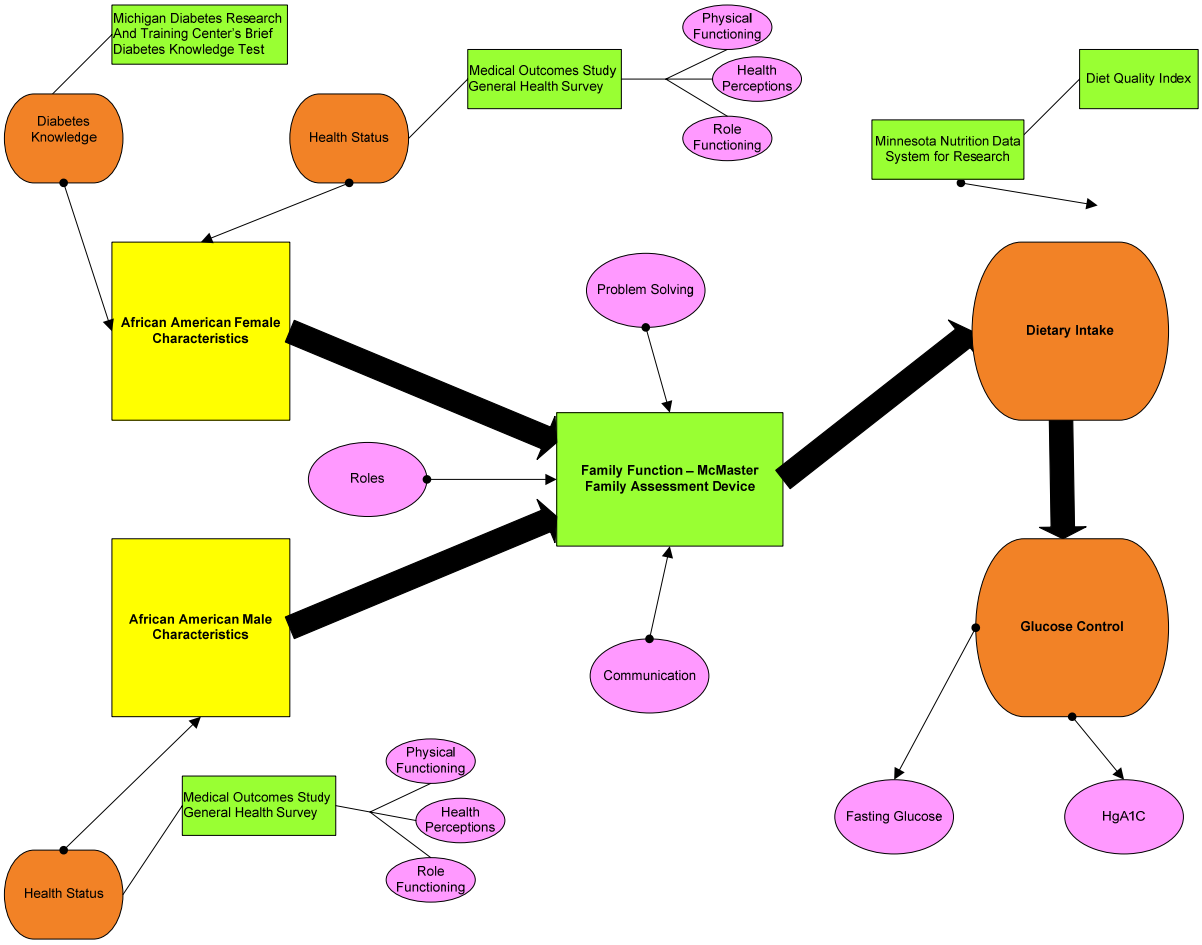
Aim 1. To explore whether family function (roles, problem solving, and communication) mediates the relationship between female and male characteristics (diabetes knowledge and health status) and dietary intake.

Aim 2. To test a preliminary model for explaining how characteristics of the women and men, family function, and dietary intake relate to glucose control.

Aim 3. To explore from the woman's perspective, other family factors affecting her dietary intake.

Figure 1.

Family Function & Dietary Intake Conceptual Model



CHAPTER 2

REVIEW OF THE LITERATURE

Because T2D has become epidemic in the United States with associated mortality and increased morbidity, especially among minorities, it is essential to explore factors that contribute to morbidity. Dietary adherence is one of the most problematic self-management factors contributing to diabetes associated morbidity (Hill-Briggs, Cooper, Loman, Brancati, & Cooper, 2003). Therefore, this chapter focuses on (a) American Diabetes Association's (ADA) recommendations for dietary intake and related issues, (b) Americans and Southern African American dietary lifestyle (c) factors affecting dietary intake and glucose control, and (d) family function and dietary intake.

American Diabetes Association's Recommendations for Dietary Intake

Recommendations for dietary intake for persons with T2D are annually updated by the ADA. The dietary guidelines may include a few changes or multiple recommendations for changes in fat, carbohydrate, and glycemic index intake. Regardless of the amount of recommended changes, persons with T2D may find that guidelines are difficult to maintain and have difficulty keeping abreast of annual recommendations.

In 2008, the ADA provided a consensus statement on the dietary guidelines for individuals with T2D. Most of the guidelines are focused on the largest contributors to postprandial glucose: carbohydrates and fat. The position statement

recommends a carbohydrate intake of 45% to 65% of the daily caloric intake (American Diabetes Association, 2006), but not less than 130g/day (ADA, 2008). Total fat intake is recommended at 25% to 35% of the daily caloric intake (ADA, 2006) with less than 7% of calories from saturated fats and cholesterol intake less than 200mg/day (ADA, 2008). Carbohydrates should include a variety of fruits, milk, vegetables, and whole grains, while fat intake should mainly consist of polyunsaturated and monounsaturated fats. Thus, fish are recommended at two servings per week, in order to provide n-3 polyunsaturated fatty acids and trans fat intake should be limited (ADA, 2008). Other recommendations include a protein recommendation of .8g/kg per day, which is approximately 15% to 20% of the daily caloric intake, and recommendations related to calories.

Calories

Because obtaining normal weight has been shown to improve insulin resistance, overweight and obese individuals (Body Mass Index > 25kg/m^2) are advised to restrict total daily caloric intake by 500 to 1000 kcal per day for a weight loss of 1 to 2 pounds per week until normalization of body mass index (ADA, 2006). Individuals may follow a low carbohydrate or low fat calorie restricted diet to achieve weight loss (ADA, 2008). However, women should ingest a minimum of 1000 to 1200 kcal/day and men should ingest a minimum of 1200 to 1600 kcal/day to maintain optimal physiological functioning.

In addition to the above recommendations, the ADA also included intensive suggestions related to glycemic index and fat that are not mandated guidelines. Their addition to the mandates is still being debated among diabetes researchers.

More specifically, researchers question if the additional monitoring is essential for glucose control.

Glycemic Index and Dietary Control

Glycemic index is a measure of blood glucose change in response to dietary intake of carbohydrate-containing foods (foods that contain sugars, starch, or fiber). It provides a standardized comparison of two hour post-prandrial glucose response to carbohydrates with that of glucose or white bread (Sheard et al., 2004). Carbohydrates are important, because they represent 45% to 65% of the recommended total daily caloric intake and have the greatest influence on blood glucose.

Historically, the glycemic index was exclusively researched by nutritionists. One of the earlier articles written in 1939 identified differing glycemic responses of carbohydrate-containing foods with similar macronutrient composition (Frost & Dornhorst, 2000). For years, similar research continued in the field of glycemic index. However, glycemic index research changed with the World Health Organization's recommendation to classify carbohydrates according to their glycemic index in 1998. Since 1998, more non-nutritionists researchers have examined the effect of low-glycemic index diets versus high-glycemic index diets. Some studies show that low-glycemic index diets rather than higher glycemic index diets result in significant improvement in hyperglycemia or glycosylated hemoglobin (Anderson, Randles, Kendall, & Jenkins, 2004; Brand-Miller, Hayne, Petocz, & Colagiuri, 2003; Buyken et al., 2001; Gilbertson, Thorburn, Brand-Miller, Chondros, & Werther, 2003; Opperman, Venter, Oosthuizen, Thompson, & Vorster, 2004),

while other studies show no significant improvement (Heilbronn, Noakes, & Clifton, 2002; Luscombe, Noakes, & Clifton, 1999; Tsihlias, Gibbs, McBurney, & Wolever, 2000). Additional studies indicate that low-glycemic index diets improve lipid profiles (Heilbronn et al., 2002; Rizkalla et al., 2004; Sloth et al., 2004).

One of the most note-worthy studies is a meta-analysis of randomized controlled trials (Brand-Miller et al., 2003). In the meta-analysis of fourteen studies, researchers find that low glycemic index diets significantly reduce glycosylated hemoglobin by .43% points when compared to high-glycemic index diets. Consequently, the American Diabetes Association recommends low glycemic index diets as an additional benefit to other interventions in improving blood glucose control, but recognizes that total carbohydrate intake is a stronger predictor of glycemic control than glycemic index (ADA, 2006; Sheard et al., 2004).

Dietary Fat Intake

For many years, persons with diabetes were advised to follow a low-fat diet without distinction between the types of fat. Low-fat diets were primarily advised for weight loss and maintenance of a positive lipid profile. However, links between fat intake, plasma lipid profile, and cardiovascular complications of T2D have become more evident. Researchers find that diets consisting of high-monounsaturated fat (primarily using olive oil as dietary fat) are consistent with high carbohydrate low fat diets in their effect on glucose, insulin, and/or lipoprotein concentrations (Gerhard et al., 2004; Hung, Sievenpiper, Marchie, Kendall, & Jenkins, 2003; Rodriguez-Villar et al., 2000). Other researchers report no difference in glycosylated hemoglobin or fasting cholesterol in subjects who were assigned to one of three groups: 10% of

energy intake coming from low-glycemic index breakfast cereal, high-glycemic index breakfast cereal, or energy from oil or margarine containing monounsaturated fatty acids without breakfast cereal (Tsihlias et al., 2000). However, in this study, the monounsaturated group experienced significantly higher increases in HDL, than other groups.

Other researchers examined the effect of decreasing saturated fats for other fats or carbohydrates in daily energy intake. They report positive effects on insulin sensitivity when substituting monounsaturated fat for saturated fats (Gerhard et al., 2004; Vessby et al., 2001). Most notably, cardiovascular disease risk in women with T2D is decreased by 22% or 37%, when 5% of energy from saturated fat intake was replaced with equivalent energy from carbohydrates or monounsaturated fats, respectively (Tanasescu, Cho, Manson, & Hu, 2004). Researchers also find that increasing polyunsaturated fatty acids with thirty grams of walnuts per day significantly increased HDL and decreased LDL when compared to a low-fat diet group and a low-fat diet group using exchanges (Tapsell et al., 2004). Therefore, some experts report benefits with substituting energy intake from saturated fat with monounsaturated fats, carbohydrates, and polyunsaturated fats.

In summary, dietary intake recommendations for persons with T2D are annually updated to reflect current research findings. The dietary guidelines may include a few changes or multiple recommendations for changes in fat, carbohydrate, and glycemic index intake. Regardless of the amount of recommended changes, persons with T2D may find that guidelines are difficult to maintain and have difficulty keeping abreast of annual recommendations. For

example, there have been significant changes related to the recommended sources of carbohydrates over the years. Currently, the ADA recommends carbohydrates from a variety of sources; however, past guidelines included avoiding simple sugars and desserts. Other examples of changes included limiting fewer calories, restricting foods, appropriate fat substitutions, and too many other guidelines for listing within the confines of this paper. Therefore, one could view the dietary guidelines as a moving bulls-eye.

Table 1.

American Diabetes Association's Dietary Guidelines: 2000 and 2008

DIETARY NUTRIENTS	*YEAR 2000 RECOMMENDATIONS*	*YEAR 2008 RECOMMENDATIONS*
Calories	• Decrease daily caloric intake • 250 – 500 kcal if overweight	• Decrease daily caloric intake • 500 – 1000 kcal if overweight
Protein	• 10% – 20% of total caloric intake	• 15% - 20% of total caloric intake
Fat	• Saturated <10% of total caloric intake • Polyunsaturated <10% of total caloric intake • Monounsaturated 10% – 15% of total caloric intake	• Saturated <7% of total caloric intake • Trans fatty acid minimized • 2 or more fish servings per week
Cholesterol	• 300mg/d	• < 200mg/d
Fiber	• 14g/1000 kcal – same as general population	• 14g/1000 kcal – same as general population
Carbohydrates	• 45% - 60% of total caloric intake	• Do not restrict to less than 130g/d • Monitor carbohydrates by carbohydrate counting or exchanges • May monitor glycemic index of foods
Meal times	• Space meals throughout day	• Not specified

Note. Above recommendations do not include adjustments for an individual's co-morbidities

This moving bulls-eye may be more difficult for older individuals than younger, because their diabetes was likely diagnosed five to ten years ago, and dietary counseling usually occurs at initial diagnosis, if at all. Investigators report that as few as 63% of African Americans have received diabetes education (Cox et al., 2004), while another study reports that only 59% of participants attended at least one diabetes education group class (Murata et al., 2003). Other investigators report the average time since diabetes education was 22.0 ± 30.4 months (nutrition clinic) and 35.5 ± 40.4 months (group education class) in a male veteran population (Murata et al., 2003). Therefore, one may hypothesize that few individuals engage in formal dietary education annually, and older persons with diabetes may not be well-informed of annual guideline changes and thereby non-adherent solely due to lack of information. The lack of information may affect an individual's diabetes knowledge and glucose control.

Americans and Southern African American's Dietary Lifestyle

The American lifestyle may be another contributor to dietary intake, in that it is characterized as one of over-consumption, over-indulgence, and convenience with few people adhering to recommended healthy behaviors. In fact, only five percent of Americans adhere to recommendations related to regular exercise, tobacco cessation, limited alcohol consumption, and monitoring dietary fat, fruit and vegetable intake (Berrigan et al., 2003). In a nationally representative sample, researchers found that less than thirty percent of non-Hispanic blacks report adherence to five fruit and vegetable servings per day (Berrigan et al., 2003).

Among a nationally representative sample of persons with T2D, slightly more than twenty-eight percent met the unsaturated fat intake limitations, sixty-four percent met protein guidelines and slightly more than eighteen percent met fiber intake guidelines (Resnick, Foster, Bardsley, & Ratner, 2006). Moreover, researchers report that (a) 42% reported a daily consumption of 30% to 40% calories from fat, (b) 26% report greater than 40% consumption of calories from fat, and (c) 62% report eating less than the recommended servings of fruits and vegetables (Nelson et al., 2002). Researchers also report that food intake and portion sizes (except pizza) have significantly increased (Nielsen & Popkin, 2003), and more people are snacking throughout the day (Nielsen, Siega-Riz, & Popkin, 2002).

National trends show that energy intake from foods consumed in restaurants/fast food have significantly increased (Nielsen & Popkin, 2003; Nielsen et al., 2002). A mostly urban African American sample shows that North Carolinians who usually eat in fast food restaurants are significantly more likely to have decreased fruit and vegetable intake, greater total fat intake, and greater total saturated fat intake per day, than those who sometime or rarely eat in fast food restaurants (Satia, Galanko, & Siega-Riz, 2004). However, this trend differs among age groups and ethnicity. A nationally representative sample shows that approximately 66.8% and 78.7% of total energy intake is still consumed at home for adults aged 40 to 59 and elderly aged 60 and older, respectively (Nielsen et al., 2002). The national *Continuing Survey of Food Intakes of Individuals* (CSFII)

indicates that African Americans are more likely to eat at home than European Americans (Life Sciences Research Office, 1995).

The Southern African American Family Diet

Just as Americans, in general, have a culture of dietary intake which is not conducive to glucose control, southern African Americans have their own dietary intake culture subsumed within American food culture which is reflective of tradition, location, and ethnicity. African American southerners tend to eat traditional *soul food*, which consists of higher fat foods, spicier foods, pork products, candied yams, fried foods, green vegetables seasoned with animal fat, and prepared foods from scratch (Airhihenbuwa et al., 1996; Kumanyika, 1997). Moreover, African Americans in rural areas of the country, particularly North Carolina, consume diets that include regular snacks, fried foods, and a decreased variety of foods (Kolasa, Mitchell, & Jobe, 1995). On the other hand, European American southerners may have diets that are somewhat different from African American southerners due to food selection or food preparation.

Among a rural impoverished Mississippi sample, African Americans report more energy intake from fried chicken, fried fish, cornbread, and sausage, and less from salad dressing and cheese than white Americans (Tucker et al., 2005). African Americans report more carbohydrate intake from fruit drinks and candy, while whites report more carbohydrate intake from cakes, muffins, and sweetened tea. The top protein intake for African Americans were burgers, fried chicken, poultry, meatloaf, and fried fish, while for whites luncheon meats, roasts, and beefsteaks were included, but not fish (Tucker et al., 2005). Similar southern food culture has also

been noted among rural North Carolinians, in that, dietary intake includes regular snacks, fried foods, and a decreased variety of foods (Kolasa et al., 1995).

In spite of these differences in food selection, there are some similarities in food choices. For example, African Americans and whites have similar fiber intake from white bread and beans, and energy intake from soft drinks and salty snacks (Tucker et al., 2005). The similarity in bean consumption is particularly noteworthy, because it demonstrates the subtle difference in preparation, in that beans seasoned with pork products is a traditional *soul food* item, while beans without pork is a common dietary item among many Americans. Therefore, cultural differences in food can be preparation, rather than the food item.

Along with the tradition of *soul food*, there is a southern African American tradition of family centered eating. Family centered eating involves the socialization to *soul food,* and the verbal and non-verbal passage of family values and traditions. Some families prepare large evening meals and invite guests to partake in meals, especially on Sundays. There is great pride associated in offering tasty foods (mostly traditional) with multiple selections in food categories for other guests as well as family during the almost ceremonial gatherings (Kumanyika, 1997). The family gathers for meals and may utilize a large portion of this time for socializing (Kittler & Sucher, 2001). This process may lead to larger portion sizes and higher fat intake, which may be a function of the amount of time spent during socialization and eating rather than the selection of foods. Another important factor in eating behavior is that during the meals, there is a socialization to ideas (whether factual or “wives-tales”) and family traditions related to illness prevention and treatment, family, life, food and

food preferences. These discussion are often lively and may reinforce of unhealthy eating habits (Helman, 1990; Murcott, 1988) and behavior, which can transcend a lifetime and cause difficulty in late life.

Dietary Intake and Family Eating Habits

Researchers report that adult food intake patterns are associated with past eating habits, as remote as childhood (Devine, Connors, Bisogni, & Sobal, 1998). Subjects report that foods not incorporated during childhood, do not usually enter into their food choices during adulthood. Consequently, subjects report difficulty meshing eating habits with their spouse if the habits were not similar in childhood, because people tend to maintain eating habits over many years. Thus, an older couple who have been married or cohabitating for a lengthy time period, may have dietary intakes that would be relatively consistent from week to week after the initial negotiation of food choices. This consistency could become detrimental if the woman's dietary intake requirements change to accommodate a diagnosis of T2D. For example, a woman's new diagnosis of T2D involves a renegotiation of dietary intake among spouses. Therefore, drastically changing food choices and methods of food preparation in late-life for medical needs of the wife will involve considerable communication and problem solving skills with her spouse. The African American woman with diabetes may need to convince her spouse and other household members to change their eating habits; otherwise, she may need to prepare two different meals or continue to eat less healthy alternatives (El-Kebbi et al., 1996). This conflict is an interpersonal struggle, because African American females traditionally self-sacrifice to promote the resiliency and cohesive family functioning

(Hill, 2003). Thus, focusing on the relationship of family functioning and dietary intake in these women is critical.

Factors Affecting Dietary Intake and Glucose Control

Maintaining the recommended diet for diabetes management is essential to glucose control. However, individuals may have difficulty maintaining their diets for a variety of reasons. Two characteristics of women with T2D of interest in this study are diabetes knowledge of the woman and health status of the woman and her partner.

Diabetes Knowledge

Diabetes knowledge is thought to be an important influence on dietary intake. Diabetes knowledge is increased through diabetes education classes, which may be one-to-one counseling and/or group sessions. The educational components usually include dietary management, physical activity, medication knowledge, and complications of diabetes. Regardless of the educational components, researchers typically seek to improve diabetes knowledge because knowledge is necessary for behavioral change. Therefore, many investigators report that greater diabetes knowledge is associated with lower HgA1C (Miller et al., 2002), healthier eating and increased vegetable consumption (Two Feathers et al., 2005). However, researchers found that knowledge alone does not reliably change dietary intake (Heisler et al., 2005).

These conflicting results may be related to factors within the family environment. For example, a woman with T2D may be knowledgeable about her dietary needs, but her ability to eat healthier may be influenced by her past eating

behaviors and the eating behaviors of her family and friends. Unfortunately, the investigator could not find studies linking knowledge to family function and dietary intake. However, the theoretical framework provides a conceptual link. According to Turner (1970), change is often initiated with the identification of a problem. For example, a woman with type 2 diabetes may not recognize that her dietary intake is a problem until she attends a diabetes education class or becomes familiarized with treatment recommendations of type 2 diabetes. At that point, her dietary intake is identified as a problem and her new diabetes knowledge will open free dialogue to suggest solutions for healthier dietary intake. These solutions are then communicated to her spouse and hopefully followed by role adaptation for healthier eating. In this example, one can conceptualize the influences of diabetes education and family function on dietary intake. Therefore, it is essential to further explore Turner's model of family function.

Health Status

There only a few studies which examine the influence of health status influence on family function. One of these studies found that women's roles are specifically influenced by the number of household inhabitants, health status, and children living within a household, which in turn may influence the quality of dietary intake (Edstrom & Devine, 2001). Researchers found that women in good health, women with children in the home, and/or women employed full-time viewed healthy nutrition as an additional, often very time consuming, role obligation among many other competing obligations (Devine et al., 1998; Edstrom & Devine, 2001). Therefore, women were less likely to maintain a diet conducive to glucose control.

On the other hand, European American women were able to maintain their personal nutritional choices when their health status declined or they became widows (Edstrom & Devine, 2001). Additionally, African American women were able to prepare healthier foods, if they were required by their husband's medical needs, even though the men may be unwilling to assume responsibility for their changes and may be resistant to healthier food choices, because the needed change most became a role responsibility (James, 2004).

Along with the changes that occur as outlines above, there is evidence of a positive association between health status of spouses and their healthy behaviors. For example, a few researchers reported that a positive perceived health status, such as good or excellent health, was associated with higher meal plan adherence in persons with T2D (Cox et al., 2004). Other researchers have focused on the positive correlation between spouses and their health indicators, such as BMI, lipids, and fat intake. These researchers found that BMI, the amount of fat, and fiber intake had significant correlation among heterosexual spouses (Macken et al., 2000), while others found spousal correlation with lipids, B/P, and/or adding salt to foods (Speers et al., 1986, 1989; Venters et al., 1984; Wood et al., 1997).

Moreover, one group of researchers found correlations that highlight the importance of the dyadic relationship. These researchers found that a nationally representative sample of couples (men aged 51-61 years old with cardiovascular disease and their wives) had statistically significant positive associations of general health status and chronic disease with BMI (Wilson, 2002). Moreover, spouses of persons with T2D had higher risk for T2D or impaired glucose tolerance with

significantly higher BMI (Khan, Lasker, & Chowdhury, 2003). However, health status/behaviors and chronic disease of wives did not significantly predict their husband's health status/behaviors or chronic disease (Wilson, 2002). This suggests that wives may adjust their health behaviors to the needs of her husband, but husbands may not reciprocate. Not surprisingly, some investigators found that marriage is likely more beneficial to men than women (Hemstrom, 1996; Umberson, 1987). Therefore, investigators need to examine how the health status of the male influences the family environment and dietary intake, because his needs may be the priority for the family.

Family Function and Dietary Intake: Turner's Model

Family function may be a critical factor affecting dietary intake for African American women with T2D. In a typical African American family, most women have entered the workforce. African American marriages are characterized as either egalitarian, which is defined as shared dominance in decision-making and problem solving, or traditional with a patriarchal dominance (Hill, 2003; Pinkney, 2000). Despite the type of problem solving process, housework and childcare are usually performed by the woman (Bianchi, Milkie, Sayer, & Robinson, 2000; McLoyd, Cauce, Takeuchi, & Wilson, 2000; Pinderhughes, 2002). Investigators found that even though African American husbands assist with housework more than other men, African American men still prefer to maintain power over who will perform household duties and reinforce gender roles within the marriage (Pinderhughes, 2002). Thus, African American wives tend to derive their identities from their roles as

mother and wife, despite their increased participation and success within the work force (Allen & Britt, 1983).

One approach to the study of family influences is focusing on the construct of family function and its components: roles, communication, and problem solving. Exploration of family function may help identify influences of dietary intake and increase understanding of the interactions that occur when African American women with T2D, who are also wives, plan their meals, cook their meals, and communicate meal choices with their spouse.

Family function is conceptualized as a family's interactions to achieve common goals for the success and maintenance of the family unit (Friedman, 1998). Turner's theory of Family Interaction (1970) focuses assumptions on the small family unit (members of an individual household), rather than extended family and the exterior influences of the social environment. Turner emphasizes the view that individuals often initiate behavior as a result of daily internal family interactions and the context in which they occur and views the nuclear family interactions as complete, in and of themselves. Of particular note in Turner's theory is that family function is hypothesized to encompass three important components: roles, communication, and problem solving.

Roles. Families have a structural composition that is organized according to roles (Turner, 1970). Roles are enacted by the individual as a result of well-defined expectations, modeling, and experiences in their lifetime. Roles are interdependent, in that each family member is dependent upon another for facilitation in acting through their own role. In order for one individual to change their role, another family

member must also change some aspect of their role to accommodate the adjustment. Upon marriage, roles are negotiated between the male and female to accommodate newly acquired power, dominance, and culture as agreed upon by the couple. An individual is judged by their ability to adequately perform their role expectations. Fulfilling these roles involves reciprocity of activities and is assumed to be gratifying for the individual (Turner, 1970). However, there is often a need to replace cultural roles with unique roles specific to an individual as their life is influenced by other demands.

African American women adapt to multiple roles, such as being mothers, daughters, grandmothers, and/or the matriarchal leader within a household as well as adult partner, care-giver, sister, and wife (Hill, 2003; Jackson, Chatters, & Taylor, 1993; Sussman, Steinmetz, & Peterson, 1999). Moreover, they are also increasingly raising their grandchildren, and report that caring for grandchildren involve sacrifices related to time commitment for other activities and work responsibilities (Burton & Dilworth-Anderson, 1991; Pruchno, 1999). Approximately seventy percent of housework is completed by females (Willigen & Drentea, 2001). Married minority women spend an average of 5.3 hours weekly to cook meals, in comparison to 1.4 hours weekly by married minority men (Bianchi et al., 2000). Thus, women cook and perform the majority of the housework in their homes. These responsibilities to the husband and other household members often take precedence over the African American female's general health and well being (Samuel-Hodge et al., 2000). Most importantly, women were often expected and willing to prioritize their family's needs (Samuel-Hodge, Skelly, Headen, & Carter-Edwards, 2005) over their competing

nutritional requirements (Cagle, Appel, Skelly, & Carter-Edwards, 2002). Consequently, in order to satisfy their roles as wives and maintain responsibility for their families rather than shifting their major focus to maintaining healthy nutrition for themselves, women often cooked according to their husband's tastes and preferences (Charles & Kerr, 1988; Edstrom & Devine, 2001; James, 2004; Savoca & Miller, 2001). On the other hand, some mothers felt that being a role model for your children at home was important, so they prepared healthier foods (Edstrom & Devine, 2001; James, 2004).

Communication. Communication is the process in which persons exchange thoughts, feelings, and needs (Friedman, 1998). Family communication patterns affect the entire family as a unit and individually due to positive and negative reactions from its members. Family communication is free, without substantial reserve of feelings, but fully aware of the need to avoid misunderstandings and inability to empathize with another's feelings (Turner, 1970). Communication initiates change through feedback (Friedman, 1998). The feedback usually involves the reactions of the adult couple, since many decisions that affect the family are negotiated between them. Adults usually communicate more with each other, and children tend to communicate more amongst themselves, with the wife/mother performing the role of intermediary (Turner, 1970). Thus, it is essential that the couple dyad and especially the wife have exceptional communication skills for movement of the family to accept new food preparations and healthy food selections.

However, studies investigating communication about food and nutrition are evolving and scarce, therefore most studies are qualitative and only one study attempted to identify statistically significant relationships among communication, personal characteristics, and T2D. Researchers report that wives who have more food interactions (open communication about food and nutrition) have healthier diets in a Midwestern sample of mostly European Americans (Schafer, Shafer, Dunbar, & Keith, 1999) and African Americans (Anderson-Loftin & Moneyham, 2000; Savoca & Miller, 2001). In couples with one partner with T2D, who successfully managed their diets, communication was open and free of judgment (Miller & Brown, 2005). However, negative interactions involving frequent policing and nagging by their families resulted in binge eating for persons with diabetes (Maillet, Melkus, & Spollett, 1996; Miller & Brown, 2005). In addition, spousal requests to cook traditional African American foods and decreased socialization associated with eating different meals prepared according to diabetes guidelines caused some women with T2D to have difficulty maintaining their diets. However, it is difficult to determine if the above findings were attributable to the married or divorced women, single mothers, and/or single women because the study utilized focus groups that included subjects from each category (Cagle et al., 2002). Moreover, the nature of focus group techniques do not allow investigators to attribute comments to individual outcomes (Anderson-Loftin & Moneyham, 2000; Maillet et al., 1996; Savoca & Miller, 2001). In the one study that utilized quantitative methods, researchers found in a mostly European American sample that 63% of adult dietary behavior was predicted

by household discussion of diet, disease, and health promoting behaviors, as well as health knowledge, and other factors (Rimal, 2003).

Problem solving. Problem solving is a complex process within the family that involves understanding the role of each individual, power, and personalities (Friedman, 1998). A family's ability to identify problems and successfully manipulate resources for resolution allows the effective function of the family economically, socially, and medically. The optimal manner to problem solve is discussion of issues and differences in viewpoints, followed by a logical elimination of solutions until consensus is reached among the individuals. In a typical family, some individuals may give assent to speed the process of consensus or to recognize the dominant individual's opinion (Turner, 1970).

For example, children and other young adults may be allowed to express opinions, but their opinions may not be given serious consideration in resolving the problem. However, the family must be willing to take risks for problem solving, or solutions will continue along age-old traditions despite the existence of newer alternatives. Assuming risks as a family or individual involves being able to accept blame if the risks are later found to be unworthy. Risks may be employed when members of the family view an individual's alternative goals as functionally good for the nuclear family, or members find the solution to be within the parameters of the family's acceptable adjustment to an individual's unique needs (Turner, 1970). Therefore, a family's ability to problem solving may be essential for the adaptation of a healthier diet.

The studies which explored the influence of problem solving on dietary intake are scarce and their results are inconsistent. A few studies show no relationship between total problem solving ability (sometime conceptualized as unresolved conflict) and dietary intake (Chesla et al., 2004; Hill-Briggs et al., 2006), while other studies show that an increase in problem solving strategies was associated with a decrease in calories from saturated per day and glycosylated hemoglobin (Glasgow, Fisher, Skaff, Mullan, & Toobert, 2007) or with increased dietary self-care (Toobert & Glasgow, 1991). Moreover, higher unresolved conflict predicted calorie over-consumption, not glycosylated hemoglobin in European Americans but there were no significant results among Latinos (Chesla et al., 2003). Another researcher reports that only one aspect of ineffective problem solving (avoidant style) not total problem solving ability was associated with increased glycosylated hemoglobin (Hill-Briggs et al., 2006).

Thus, studies examining problem solving and dietary intake are inconclusive. One reason for the inconsistencies may be that the instruments do not adequately capture complex thought processes and they do not measure consistent aspects of problem solving. For example, Glasgow et al. (2007) operationalizes problem solving in relation to dietary behavior. Their instrument was specifically designed for persons with T2D, while other researchers rely on general problem solving or conflict instruments (Chesla et al., 2004; Hill-Briggs et al., 2006). These results indicate that problem solving may be an important predictor of dietary intake, but more study is needed to validate this, especially in African Americans with diabetes.

In summary, few researchers examined the conflicts between dietary recommendations and the Southern African American family culture. However, the conflicts have become more recognizable, in that researchers have found that Southern African American women tend to follow traditional southern food practices with larger portion intakes. Moreover, their roles as wife and mother may conflict with satisfying their own health needs and managing their husband's taste preferences to dictate meal choices. Family issues related to the woman's role in the family and to problem-solving and communication regarding dietary management, and other related needs may be major factors affecting the dietary intake of African American women with T2D. These women may need to communicate and problem solve in favor of an appropriate diet for diabetes. Therefore, it is important for researchers to explore the influence of family function on dietary intake and glucose control in married/partnered African American women with T2D.

Purpose

Because empirical evidence shows inconsistencies linking diabetes knowledge and personal characteristics to dietary intake, further research is needed to investigate the predictors of dietary intake and glucose control. This exploration should encompass a focus on family function, because eating behavior in African Americans is centered on the family and the woman's tradition of selflessness in providing for her family. Thus this study, based on Turner's model of family function, explored whether family function was a mediator between diabetes knowledge and health status of the women and her husband/partner and dietary intake and glucose control in African American women with T2D.

CHAPTER 3

DESIGN

The study used an exploratory correlational design. In addition, a qualitative descriptive component was added to identify, from the perspective of the woman with T2D, other family factors that influence management of dietary intake.

Participants

The convenience sample consisted of 22 African American females with T2D and 18 male spouses and 1 male cohabitating partner. Criteria for enrollment were that the woman: (a) be married or cohabitating with an African American man, (b) usually prepared and consumed her largest meal at home (whether pre-packaged or from scratch), (c) was between the ages of 35 to 80 years, (d) had diabetes for one year or more, (e) spoke English, and (f) had a working telephone. Couples who were married or cohabitating for less than one year and individuals who required supervised care or renal dialysis were excluded.

The average age of the women in this study was 58.22 (*SD* = 11.02; range = 37 to 80 years). The educational level of the women ranged from not completing high school to college graduation, with 29% completing high school or trade school (*n* = 6), and 33% completing some college (*n* = 7). The mean income was $20,000 to 24,999 (*SD* = 2.4); half of the women had annual incomes below $20,000. Only five subjects had minor children at home. The mean age of the children was 13 with a range from 6 to 18 years. Most of the women performed all or most of the home

cleaning (77%) and cooking (82%). All women were either overweight (*n* = 5) or obese (*n* = 17) with an average weight of 204 pounds (*SD* = 50.3) and mean BMI was 34.48 (*SD* = 6.5, range 25.60 to 54.60). Sixty-four percent of the women (*n* = 9) had HgA1Cs that were moderate or elevated (HgA1C ≥7.0) and 40% of the women (*n* = 8) had above normal fasting glucose (>120). Most women were not taking insulin (*n* =12), but were taking oral diabetes medications (*n* = 14). Only one woman reported not taking insulin or oral medications, but she reported following a diet and exercising. While most reported following a special diet (*n* = 16) and regular exercising (*n* = 16), others were not doing so. The two most commonly reported co-morbidities were hypertension (*n* = 17) and hypercholesterolemia (*n* = 12). Only two women reported no co-morbidity.

The average age of the spouses/partner was 60 years old (*SD* = 12.64). Thirty-two percent of the subjects (*n* = 6) completed high school and another 32% did not complete high school. Only 15% (*n* = 3) of the male subjects completed some college. Most of the men (*n* = 13) reported not often, rarely, or never performing household cleaning duties (68%) or household cooking duties (68%). The two most commonly reported co-morbidities were hypertension (*n* = 11) and diabetes (*n* = 7). Only one man reported no co-morbidity.

Study Variables

Data collection focused on self-report measures of characteristics of the women and male spouse/partner, family function, dietary intake, and glucose control (see Table 2). In addition, a semi-structured interview was conducted with a subset of participants. A copy of all instruments can be found in Appendix A.

Table 2.

Study Variables

Concept	Tools	Variables	Possible Ranges
Diabetes knowledge	BDKT	General diabetes knowledge	0 – 100
Health status	MOS[a]	Physical functioning	0 – 100
		Health perceptions	0 – 100
		Role functioning	0 – 100
Family function	FAD[a]	Problem solving	1 – 5
		Role behavior	1 – 5
		Communication	1 – 5
Dietary intake	NDS	DQI-R	0 – 100
	DQI-R		
Glucose control	Glucose	Glucose (self reported)	0 - >600
	HgA1C	HgA1C (self reported)	5.0 - >13.0

Note. BDKT = Brief Diabetes Knowledge Test; MOS = Medical Outcome Study General Health Survey; FAD = Family Assessment Device; NDS = Minnesota Nutrition Data System for Research; DQI-R = Diet Quality Index Revised; HgA1C = glycosylated hemoglobin.

[a]Collected from both women and men.

Characteristics of the Women and Their Male Partner

Characteristics of the women included diabetes knowledge and health status. The only characteristic of their male spouse/partner was health status.

Diabetes knowledge. The Michigan Diabetes Research and Training Center's Brief Diabetes Knowledge Test (BDKT) was used to assess diabetes knowledge in the women (Fitzgerald et al., 1998). It is a 23 item multiple choice questionnaire designed to assess general diabetes knowledge (14 items) and insulin use (9 items). There were four possible responses for each multiple choice question. This study's questionnaire examined nutrition knowledge (4 items), glucose monitoring (2 items), glycemic response to stressors (4 items), foot care (1 item), and complications of T2D (3 items). The insulin subscale was not used as most women were not on insulin. Higher scores indicated higher diabetes knowledge. Validity (content, item difficulty, item discrimination, and construct) and reliability for the questionnaire were tested in a community and health department population that included African American women with T2D (Fitzgerald et al., 1998). Cronbach's alphas were listed as .74, .76, and .75; however, the authors did not identify a test-retest method nor their process for using the Cronbach's alpha to determine reliability on this knowledge test.

Health status. The Medical Outcomes Study General Health Survey – Short Form (MOS) was used to measure health status of both the woman and her spouse/partner (Stewart, Hays, & Ware, 1988). The instrument was a 20-item survey designed to examine general health status by utilizing six measures of health status (Stewart et al., 1988). This study utilized the physical functioning (6 items), health perceptions (5 items), and role functioning (2 items) subscales. Items in the physical and role function subscales had three possible responses: *limited for more than three months*, *limited for three months or less*, and not limited at all. Items in the

health perceptions subscale had a choice of 5 responses: four items had responses which ranged from *definitely true* to *definitely false* and the other item had responses which ranged from *excellent* to *poor*. Two items in the health perceptions subscale were reverse scored for negatively phrased questions. All items were arranged so that higher values were given to healthier states (no limitations). Questions with three responses were given 0, 50, or 100 values and questions with five responses were given 0, 25, 50, 75, or 100 values as suggested by the Rand group scoring method (Rand Corportation & Ware, 1996). The item scores for each subscale were then totaled and individually averaged to represent the functioning level of each subscale. Validity (content, convergent and discriminant), and reliability were established in an ethnically diverse population and subjects with various chronic conditions (Brown et al., 2002). Cronbach's alphas for the selected subscales were reported to be from .81 to .87. Cronbach's alpha for the women in this sample was .84 (health perceptions), .86 (physical functioning), .96 (role functioning) and for the men was .94 (health perceptions), .94 (physical functioning), .98 (role functioning).

Family Function

The 60-item McMaster Family Assessment Device (FAD) questionnaire assessed seven aspects of family function: problem solving, communication, roles, affective responsiveness, affective involvement, behavior control, and general functioning (Epstein, Baldwin, & Bishop, 1983; Miller, Epstein, & Bishop, 1985). The instrument was based upon the *McMaster Model of Family Functioning* and was developed to assess family function in order to provide therapists with clinically relevant dimensions. It is used in a variety of studies of families coping with acute

and chronic illness (Miller, Ryan, Keitner, Bishop, & Epstein, 2000), including one African American sample of adolescent females (Harper & Robinson, 1999) and another sample composed of approximately 30% African American adult dyads (King et al., 2001).

For this study, three subscales from the instrument were used: role, communication, and problem solving with 8, 6, and 5 items, respectively. Respondents rated each question regarding level of agreement using a 4 point Likert scale with lower scores indicating healthier family function. Eight items required recoding on two subscales due to negatively phrased questions: communication (2 items) and roles (6 items). The Cronbach's alpha for the subscales were reported as .72, .75, and .74, respectively (Miller & Achterberg, 2000). However, there were no studies reporting Cronbach's alphas for the same subscales with an African American sample. Instead, Cronbach's alphas for African Americans in the aforementioned studies were reported for the general functioning subscale only, which is similar to reported alphas with majority European American study samples. In the African American adolescent study, it was .79 (Harper & Robinson, 1999); and in the African American adult dyad study, it was .88 and .87 (King et al., 2001). In this study, Cronbach's alphas for the women were .80 (role), .53 (communication), and .85 (problem solving), while the scores of the men had Cronbach's alphas of .73, .17, and .83, respectively. Therefore, the men's communication subscale was not used in the analysis due to low reliability.

Dietary Intake

Dietary intake for the women was assessed with three 24-hour dietary recalls using the *Minnesota Nutrition Data System for Research* (NDS-R). This tool was developed to establish a comprehensive database for standardized assessment and analysis of 24-hour dietary intake, food records, menus, and recipes. The NDS-R is a gold standard nutrition database for collection and analysis of dietary intake. It contains over 19,000 foods, 8,000 brand names, values for 130 nutrients that are inclusive of the proposed macronutrients, and many regional and ethnic foods (Nutrition Coordinating Center & Division of Epidemiology, 2001). For missing foods, the data system allows for entry of the core food items (mostly single ingredient foods), recipe ingredients, and food preparation methods in order to ensure accuracy. Food portion sizes were linked to the food items and the system continuously checked the data during entry to identify entry mistakes. The NDS-R is continuously maintained and updated by the *Nutrition Coordinating Center* at the University of Minnesota by maintaining connections with other databases, food manufacturers, and scientific literature reviews of food composition in order to increase the breadth and scope of the nutritional varieties of food especially for minority populations (Schakel, Sievert, & Buzzard, 1988). The NDS-R combined the NCC Food and Nutrition databases to recall dietary intake. Data were collected using an in-depth interview with the subject to identify foods eaten from midnight to midnight of the previous day (Willett, 1998).

Advantages of using dietary recall over other measures were that it: (a) provided usual dietary intake values based upon absolute intake (assuming subject

provides reliable data) rather than estimates, (b) allowed for recording of all foods and preparation rather than categories of foods to determine nutrient content for analysis, (c) was useful for ethnically diverse populations due to possibilities in including culturally relevant food, (d) presumably, did not usually alter day-to-day dietary intake, and (e) did not require literacy (Willett, 1998). A disadvantage of dietary recalls was the dependence on short-term memory as it required the subject to remember her previous day's intake and portion sizes. Another disadvantage was the respondent burden of repeated recalls, but this was minimized for the study because there were only three dietary recalls. Other dietary collection methods were less appropriate for this population due to respondent burden and increased skills required to complete a food record and diet history. Some researchers report that twenty-four hour recalls are superior to food frequencies in ethnically mixed samples that included African American women (Kumanyika et al., 2003; Subar et al., 2003). Thus, dietary recall was used for this study.

The dietary recalls were performed by research assistants, who were certified to perform recalls using NDS-R by the *University of North Carolina Nutrition Epidemiology Core.* The NDS-R was assessed using the multiple-pass methodology. The database system provided prompts throughout the interview with four distinct passes to obtain diet information. The distinct passes included (a) asking the subject to recall all foods consumed; (b) reviewing the quick list to recall missed foods and eating opportunities; (c) asking for food additives, such as butter, and all complete details of each food, preparation, and portion size; and (d) reviewing the final data to allow changes and confirmation (Nutrition Coordinating

Center & Division of Epidemiology, 2001). As the passes progressed , the food was recalled and data were entered into NDS-R on a laptop computer simultaneously as the program guided the interviewer through the various screens and prompts. This standardized procedure ensured accuracy in data collection. Moreover, a back-up copy of the data was saved to a CD after each interview.

Each subject was solicited for three 24 hour dietary recalls. The recalls were unannounced to decrease possible bias in meal intake (Willett, 1998). The telephone dietary recall included two weekdays and one weekend day, because usual dietary intake may be assessed with three dietary recalls for most nutrients (Willett, 1998). The data were entered into the system and output included automatic nutrient calculations, which were reported as 100 grams per nutrient, food reports, food and nutrient servings, and recommended daily allowance comparison (Nutrition Coordinating Center & Division of Epidemiology, 2001).

Next, NDS-R converted dietary intake into food and nutrient serving measures to allow for input into each subject's Diet Quality Index-Revised (DQI-R). The NDS-R results for this study showed that multiple women underestimated their intakes, because the total energy intake for 24 hours was less than 800 calories on 14 different recalls. It is also noted that some women may have overestimated their intakes, because three 24 hour recalls had calories reported at greater than 2300 calories. The underestimation and probable overestimation was random among the women.

The recall results were checked for entry errors and the average nutrient intake was inputted into the DQI-R. The DQI-R is an update of the original Diet

Quality Index with two additional components ultimately designed to differentiate individuals meeting daily dietary recommendations (Haines, 1999). The DQI-R examines ten dietary characteristics: total fat, saturated fat, calories, fruit, vegetables, grains, calcium, iron, diet diversity, and diet moderation (moderation = sugar, discretionary fat, sodium, and alcohol intake). Each dietary characteristic contributed 0 to 10 points to the total dietary score. Every woman received one score to reflect total dietary quality with higher scores indicating better quality diets as determined by closer adherence to dietary recommendations (Haines, 1999). The tool was validated with a subset of participants from the 1994 Continuing Survey of Food Intakes.

Glucose Control

Glucose control was included as an assessment of glucose control for the woman with diabetes. Two measures were used: HgA1C and fasting glucose. The women were asked to write their last HgA1C and fasting glucose on the demographic survey. The HgA1C was a self reported result of blood testing in their physician's office within the last three months. The results of the test are directly proportional to the average ambient glucose concentration for the previous 60-90 days. Results range from 4% to slightly greater than 12%. Normal levels (non-diabetic levels) are less than 6%. Moderate levels are 7% to 8%, while levels greater than 8% are elevated. The ADA position statement recommends a HgA1C goal of therapy at <7% (ADA, 2004).

Fasting glucose was also a self reported measure of the women's last fasting glucose measured with a glucometer in her home within the last week. Fasting

glucose revealed an immediate snap-shot of glucose control. A normal range for fasting glucose is 60 to 120.

Demographics

Demographic information included age, ages of persons living in household, highest level of education, income, time married, and employment status (unemployed vs retired vs employed). Health information for the women also included duration of diabetes disease, medications, and number of co-morbidities. Body mass index (BMI), a standardized measurement used to assess total body fat, was calculated using the height and weight, which were both self-reported by the women. Limitations to BMI are overestimation of body fat in persons with an athletic build and underestimation of body fat in elderly persons or those who have lost muscle mass.

Q*ualitative Interview*

All women with a reported HgA1C and a participating husband or partner were asked to participate in a semi-structured interview. Nine women completed the telephone interviews.

The interview questions were developed based on the Turner's family function theory in an effort to further describe family factors that influence the woman's management of dietary intake. Women were asked a broad question: "What else in your family makes it difficult to manage your diet?" Probes focused on roles in the family, family communication, especially as it relates to food preparation and eating, and problem-solving around eating and food choice. The interviews were tape-recorded and process notes were also taken during the interview. Interviews

were analyzed by listening to the audiotapes and expanding on the written notes taken during the interview to ensure accuracy.

Human Research Ethics

Approval from the integrated Institutional Review Board's behavioral committee was obtained prior to subject recruitment and data collection. Written consent was obtained from all subjects and each subject was given a copy of the consent form (see Appendix B). Participation was voluntary with minimal risks to the subject. All data were kept confidential using the following methods: (a) participant identification numbers were assigned after inclusion questions were asked and then written on corresponding questionnaires and other study material; (b) study material was kept in a locked container; (c) documents emailed from the investigator and the University of North Carolina Nutrition Epidemiology Core's research assistants were password protected; and (d) the laptop computers used for inputting data and analysis were password protected.

Data Collection Procedures

The convenience sample was initially recruited from African American churches in rural Southampton County, Virginia and Franklin, Virginia. In 2005, there were approximately 7,562 African Americans in Southampton County. In 2006, the African American population estimate was 4,576 for Franklin. Approximately 60% to 85% of all females (inclusive of all races) ages 35 to 70 were married. According to the 2006 Behavioral Risk Factor Surveillance System, approximately 16% of African Americans have been told they had diabetes in Virginia.

This southeastern Virginia area was chosen because the principal investigator had contacts within the community and among the African American churches. From multiple advertisements (short speeches during church service, brochures, and flyers) in these churches and assisting with health fairs, participants were recruited from Southampton county and nearby rural counties (see Appendix B). In fact, the investigator was speaking about the study during a church program and a visitor wanted a similar speech presented to her doctor in Gates County, North Carolina. The physician agreed to post flyers and send brochures to all her patients with T2D. Additionally, the visitor contacted another community member with contacts to a diabetes support group in a nearby county. Therefore, the recruitment efforts snowballed along rural southeastern Virginia and rural northeastern North Carolina. Participants in North Carolina resided in Gates, Hertford, Pasquotank, and Cambden Counties.

Interested participants completed a form indicating interest in the study and were then telephoned to assess eligibility. When eligibility was met, the investigator described the study (purpose and benefits to subjects). If they agreed to participate, they were encouraged to discuss the study with their significant other and/or the investigator spoke with the male spouse/partner, if available.

Participants were assigned a study identification number and then mailed the study questionnaires and were instructed to return them to the investigator in the large yellow investigator-addressed stamped envelope. A total of 176 questionnaire packets were mailed to interested participants who met the study criteria; 22 women completed their questionnaires and at least one dietary recall (14.2% response rate).

Only nineteen of these women had spouses or male partners who completed their questionnaires. Two couples completed questionnaires but no dietary recalls and one couple completed their surveys but not their consents. After the questionnaires were returned, the UNC Nutrition Epidemiology Core was notified and given the names and telephone numbers to complete dietary recalls. After the recalls were completed, the women were contacted for the qualitative phone interviews. The subjects received monetary incentives to compensate for study time commitment: women received a total of $30 and men received $10.

Sample Size

Since this study was exploratory and there were no prior studies on which to base effect size, a sample size of 20 was determined to be sufficient in order to examine trends. The final sample included 19 men and 22 women who completed their questionnaires and at least one dietary recall. This represented a slight change in the enrollment protocol, in that, the minimum number of completed dietary recalls was lowered to one and women were included regardless of their husband's participation in the study. The protocol change was implemented due to low enrollment.

Data Analysis

Quantitative Analysis

All quantitative data were managed and analyzed using SPSS 17.0. Data were entered twice, compared for errors, and corrected. Scores on the diabetes knowledge test (BDKT), health status questionnaire (MOS), and family function tool (FAD) were computed. Missing data was imputed in various ways. On the FAD, one

female and one male had a missing answer on the role subscale. Therefore, the investigator reviewed other answers on their respective role subscale and imputed the most frequent answer into the missing item before totaling each individual's subscale scores. Omitted items on the MOS were also imputed using the same procedure. On the BDTK, missing items and providing two answers on a question were scored as incorrect answers.

The HgA1C was not used in analysis as eight participants could not recall their HgA1C results. Therefore, the investigator only utilized the glucose variable for analysis (there were two women with missing values). Missing glucose values were imputed with the sample mean (M = 144; SD = 71.9). Along with the above missing items, there were four men who did not submit their surveys and they were not included in analysis.

Cook's D statistic, residual scatterplots, skewness & kurtosis statistics, descriptive statistics, and frequency tables were utilized to screen for outliers, multicollinearity, singularity, and normality for regression analysis assumptions. Means, ranges, and the standard deviations were computed and described for all variables. Screening results revealed normality for all variables and correlation among some variables.

Multiple regression was used to analyze the first two aims. Multiple regression is a statistical technique used to analyze the relationship between multiple independent variable sets and one dependent variable, which is an extension of the general linear equation ($\hat{Y} = a + b_1x_1 + b_2x_2 + \ldots b_kx_k$). The goal was to determine the best fit for model prediction. Thus, a series of simple and multiple regressions

were performed. Stepwise selection of independent variables was preferred to avoid over-fitting. As the analysis proceeded in steps, only variables which indicated statistically significant contribution, $p<.05$, to the variance of the dependent variable were retained in the model for parsimony. Unstandardized Beta coefficients and significance levels were used for determination of independent contribution (Tabachnick & Fidell, 2001).

Mixed Method Analysis

The major purpose of this mixed methods approach was to further clarify study variables that were not adequately explored with the questionnaires (Corner, 1991; Coyne, 1997). The mixed method process is often referred to as a triangulation method (Tashakkori & Teddlie, 1998). Triangulation of the data allowed the investigator to have a more detailed picture of the study variables. This was important because, while there is evidence supporting a relationship between the components of family function and dietary intake (Cagle et al., 2002; Chesla et al., 2004), the family function questionnaire in this study did not focus on eating behavior and was not designed for rural African Americans.

In this mixed approach, qualitative data from the semi-structured interviews were used to provide a greater depth in understanding contextual and cultural factors affecting dietary intake from a family perspective.

The first step was to analyze data from semi-structured interviews using a multi-step content analysis procedure, in which the goal was the subjective interpretation of text data and content through the systematic classification process of coding and identifying patterns or themes (Hsieh & Shannon, 2005). First, the

data were sorted into two groups, which were identified a priori: (a) factors that indicated diet support and (b) factors that indicated diet challenges (Morgan, 1997). Next, the investigator identified key themes under each grouping. Finally, a recursive process was used to cluster data under each theme into broader categories that guided further interpretation of the data (Tashakkori & Teddlie, 1998). Credibility was enhanced by having the advisor review the transcribed interview notes and render a judgment about the groupings and key themes (Patton, 2002).

The next step was to triangulate the data with glucose control levels. The women were grouped by HgA1C levels (normal, moderate, and high) and then patterns of data in the interviews were examined, as well as the quantitative data from the women measuring the key variables of interest in the study. The last step was to prepare two composite case descriptions depicting a woman in each of the normal and high HgA1C groups.

CHAPTER 4

RESULTS

This chapter presents the findings of the study. It begins with the descriptive statistics, followed by the regression analysis to answer Specific Aims 1 and 2. Content analysis of the interview data, which answers Specific Aim 3 is then presented. Finally, additional analyses to triangulate the qualitative analysis with the quantitative data are presented. Whenever possible, results are presented in the flow of the conceptual model, from left to right. For example, women's and men's personal characteristics are discussed first, and then family function variables are presented.

Descriptive Statistics

Table 3 depicts the means, standard deviations and ranges for all variables in the study. The women's general diabetes knowledge (BDKT) was moderate with an average of 65.58% answers correct; (*SD* = 18.78), but the range of correct answers were from a low of 22% to a high of 93%. Regarding health status (MOS), both women and men reported high physical functioning (*M* = 70.45 and 80.39; *SD* = 32.7 and 33.46, respectively) and role functioning (*M* = 75.00 and 80.88; *SD* = 40.82 and 39.06), but health perceptions were moderate (*M* = 50.23 and 67.65; *SD* = 26.57 and 33.82). On the family function tool (FAD), both women and men assessed their family's problem solving as high (*M* = 1.72 and 1.83; *SD* = .43 and .40). They also assessed their family's role behavior skills similarly (*M* = 2.36 and 2.27; *SD* = .51

and .45). In addition, the women's average assessment of her family's communication skills was 2.22 with a standard deviation of .31. Women had a moderate diet quality (M = 56.14; SD = 17.32) with diet quality scores on the DQI ranging from 25.00 to 85.00. The average fasting glucose of the women was elevated (M =144.35; SD = 71.93) and ranged from 80 to 398. Likewise, the average HgA1C was elevated (M = 7.24%; SD = 1.64) with participant HgA1Cs ranging from 5.00% to 11.70%.

Two-tailed Pearson correlations were performed on all study variables (see Table 4). General diabetes knowledge scores were moderately correlated with women's role functioning ($r(20) = .44$, $p < .05$), but none of the other variables. The three health status scores from the MOS showed significant correlations with

Table 3.

Means, Standard Deviations, and Ranges

Tools	Variables	Possible Ranges	Scores for women *M* (*SD*), Range	Scores for men *M* (*SD*), Range
BDKT[af]	General diabetes knowledge	0 – 100	65.58 (18.78), 21.43 – 92.86	
MOS[bg]	Physical functioning	0 – 100	70.45 (32.7), 8.33 – 100.00	80.39 (33.46), 16.67 – 100.00
	Health perceptions	0 – 100	50.23 (26.57), 5.00 – 90.00	67.65 (33.82), 10.00 – 100.00
	Role functioning	0 – 100	75.00 (40.82), 0 – 100.00	80.88 (39.06), 0 – 100.00
FAD[ch]	Problem solving	1 – 5	1.72 (.43), 1.00 - 2.60	1.83 (.40), 1.00 - 2.40
	Role behavior	1 – 5	2.36 (.51), 1.13 - 3.38	2.27 (.45), 1.13 - 2.88
	Communication	1 – 5	2.22 (.31), 1.67 – 2.67	
DQI-R[di]		0 – 100	56.14 (17.32), 25.00 – 85.00	
Glucose[j]		0 - >600	144.35 (71.93), 80.00 – 398.00	
HgA1C[ek]		5.0% - >13.0%	7.236% (1.64%), 5.00% -11.70%	

Note. [a]BDKT = Brief Diabetes Knowledge Test; [b]MOS = Medical Outcome Study General Health Survey; [c]FAD = Family Assessment Device; [d]DQI-R = Diet Quality Index Revised; [e]HgA1C = glycosylated hemoglobin.

[f]Higher scores indicate more correct answers. [g]Higher scores indicate better functioning. [h]Lower scores indicate healthier family function behaviors. [i]Higher scores indicate better diet quality. [j]Scores greater than 120 are elevated. [k]Scores greater than 7% are elevated.

Table 4.

Correlations Matrix Among Study Variables

Variable	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. BDKT - diabetes knowledge	.04	-.13	.44*	-.25	.10	-.07	.20	.26	-.11	-.14	.25	.15	.05	-.15
2. MOS physical functioning-women		.12	.56'	.13	.40	-.11	-.15	.14	-.34	-.10	.33	-.10	.13	-.07
3. MOS physical functioning-men			.39	.95'	.09	.84'	-.08	-.20	-.21	-.35	-.11	-.32	.16	.19
4. MOS role functioning-women				.30	.65'	.17	-.18	-.08	-.46*	-.47*	-.09	-.18	.18	.03
5. MOS role functioning-men					.11	.78'	-.18	-.24	-.20	-.32	-.15	-.31	.17	.18
6. MOS health perceptions-women						.01	-.19	.06	-.33	.03	-.01	.03	-.35	-.45
7. MOS health perceptions-men							-.09	-.30	-.34	-.36	-.26	-.06	.30	.28
8. FAD problem solving-women								.75'	.63'	.40	.49	-.06	-.29	-.35
9. FAD problem solving-men									.63'	.65'	.68'	.24	-.40	-.85'
10. FAD role behavior-women										.72'	.42	.03	-.51*	-.55*
11. FAD role behavior-men											.58*	.23	-52*	-.52
12. FAD communication-women												.00	-.27	-.50
13. DQI													-.29	-.50
14. Glucose														.89'
15. HgA1C														

Note. BDKT = Brief Diabetes Knowledge Test; MOS = Medical Outcome Study General Health Survey; FAD = Family Assessment Device; DQI-R = Diet Quality Index Revised; HgA1C = glycosylated hemoglobin. *$p < .05$. '$p < .01$.

gender. A strong positive correlation was found between men's MOS role functioning and physical functioning scores ($r(15) = .95$, $p = < .01$). Men with more limitations in physical functioning tended to also have lower role functioning due to limitations. Women's role functioning scores on the MOS were moderately correlated with their physical functioning ($r(20) = .56$, $p < .01$). Moreover, higher health perceptions in both women and men on the MOS were significantly associated with higher role functioning. Higher health perceptions in men were significantly associated with higher physical function in men. However, health status scores of the women were not correlated with any of the health status scores of the men on any subscale.

FAD subscale scores between women and men were significantly correlated. For example, scores of women and men were highly correlated on their assessment of the family's ability to problem solve for the maintenance of family function ($r(16) = .76$, $p < .05$). In addition, there were significant correlations across FAD variables. The men's assessment of healthier family problem solving ability was moderately associated with both men's and women's assessment of healthier family role behavior functioning (FAD).

As expected, higher fasting glucose was significantly associated with higher HgA1C ($r(11) = .89$, $p < .05$). There were significant correlations across variables in glucose control. Higher fasting glucose and higher HgA1C were significantly correlated with higher FAD role behavior skills assessed by women ($r(18) = -.51$, $p < .05$) and ($r(12) = -.55$, $p < .05$), respectively. Higher HgA1C was highly correlated with higher FAD problem solving skills assessed by men ($r(10) = -.85$, $p < .01$). However, fasting glucose was utilized for all regression analysis, because there

were eight women without HgA1C values and only two women without glucose values.

Multiple Regression Analysis

Multiple regression analyses were performed, using simple linear regression, then stepwise regression of all independent variables according to the hypothesized model. The first aim was to examine whether family function mediated the relationship between women's and men's characteristics and dietary quality.

Initially, three health status variables for both women and their partners and the woman's diabetes knowledge scores were entered, using stepwise selection to predict each family function score independently. The women's health status variable of role functioning (MOS) predicted the women's report of the family function variable—role behavior (FAD) ($F(1, 20) = 5.42$, $p<.05$), with an R^2 of .213 (see table 5). Women's role functioning scores increased as the women's assessment of the family's role behavior scores decreased, which suggest that higher role functioning is associated with the women's assessment of healthier family role behavior patterns (See Figure 2).

Table 5.

Stepwise Regression Analysis for Predictors of Women's Role Behavior

	Model	
	Beta	Standard Error
Intercept	2.84	.31
Women's role functioning (MOS)	-.01*	.00

*'p < .05

In addition, the women's general diabetes knowledge predicted the men's family function variable—problem solving (FAD) ($F(1,15) = 4.62$, $p<.05$) with an R^2 of .235 (see table 6). As general diabetes knowledge increased the men's view of the family's problem solving skills became unhealthier (see figure 3). However, there were no significant associations between the male partner's health status scores and family function subscales.

Figure 2.

Role (MOS) Predicting Women's Role (FAD)

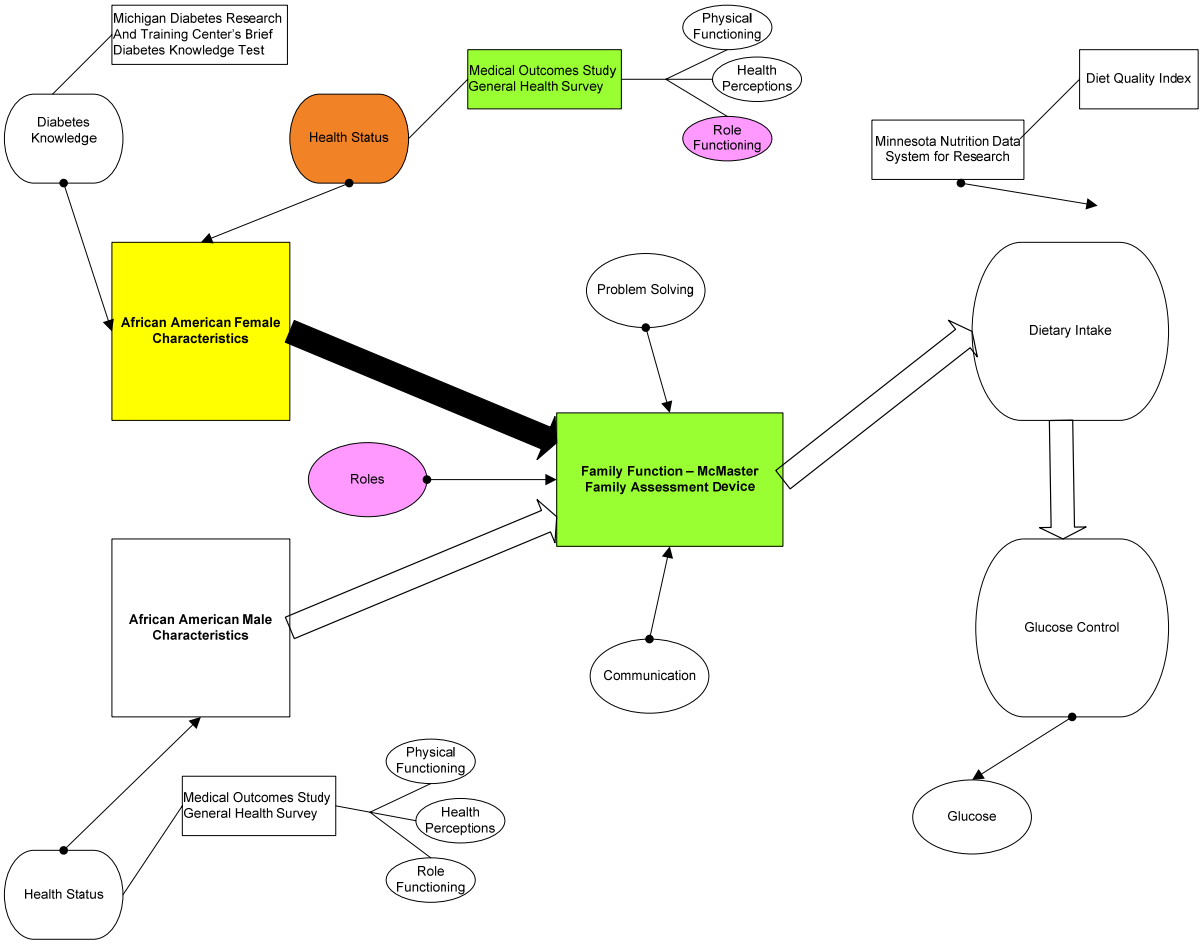


Table 6.

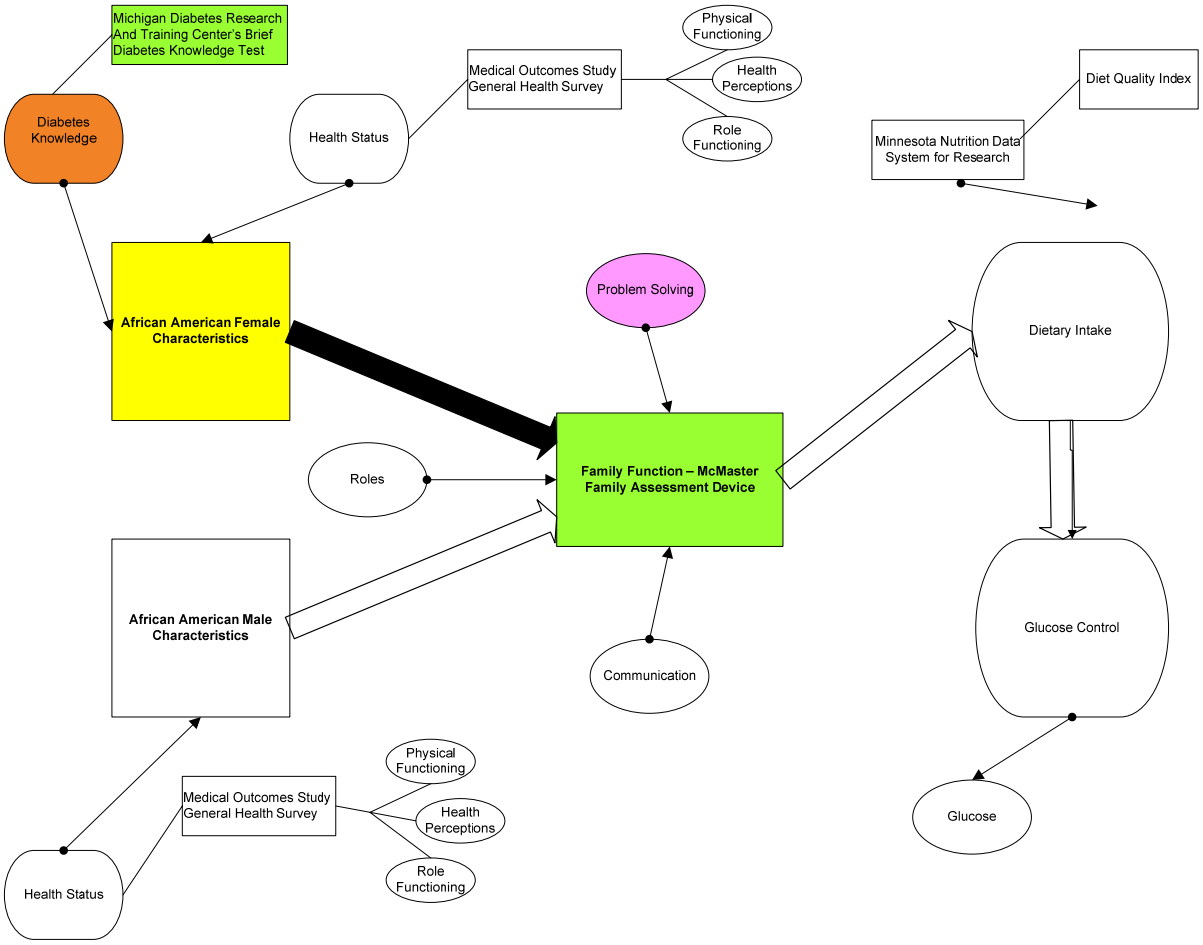
Stepwise Regression Analysis for Predictors of Men's Problem Solving

	Model	
	Beta	Standard Error
Intercept	.98	.40
Diabetes knowledge	-.01*	.00

'p < .05

Figure 3.

Diabetes Knowledge Predicting Men's Problem Solving



Regression analyses were then used to examine the relationship between characteristics of the women and their male partners and diet quality. There were no significant relationships. The next step was to enter the three family function subscale scores of the women and the two scores of their male partners to predict diet quality. There were no relationships between the FAD subscales and diet quality, therefore family function was not a mediator between women and men characteristics and diet quality.

The second aim was to explore the best model for predicting fasting glucose. The first step was to examine the influence of diet quality on fasting glucose. A simple linear regression was calculated to predict the influence of diet quality on fasting glucose. The equation was not significant ($F(1,18) = 1.95$, $p > .05$) with an R^2 of .10. Therefore, diet quality was not related to fasting glucose.

The next step was a stepwise multiple regression with all variables—women's characteristics (diabetes knowledge and health status-physical function, health perception, and role function), men's characteristics (health status variables), family function variables—role, problem solving, and communication (women only) on fasting glucose. Thus, all variables were entered into the model, and then removed one by one if there was no independent association with fasting glucose. The first significant association of variables to remain in the model was not originally hypothesized in the conceptual model. The family function variable--women's family role behavior scores (FAD) predicted fasting glucose ($F(1, 14) = 10.24$, $p<.05$), with an R^2 of .422 (see Table 7). The next variable to remain in the model was the health status variable--women's health perceptions (MOS). The health status variable--

women's health perceptions (MOS) and the family function variable--women's family role behavior (FAD) significantly predicted fasting glucose ($F(2, 13) = 16.79$, $p<.05$) with an R^2 of .721. No other variables remained in the model. Therefore, the best model suggests that the women's assessment of healthier family role behavior patterns and her lower health perceptions were associated with increasing fasting glucose (see Figure 3).

Table 7.

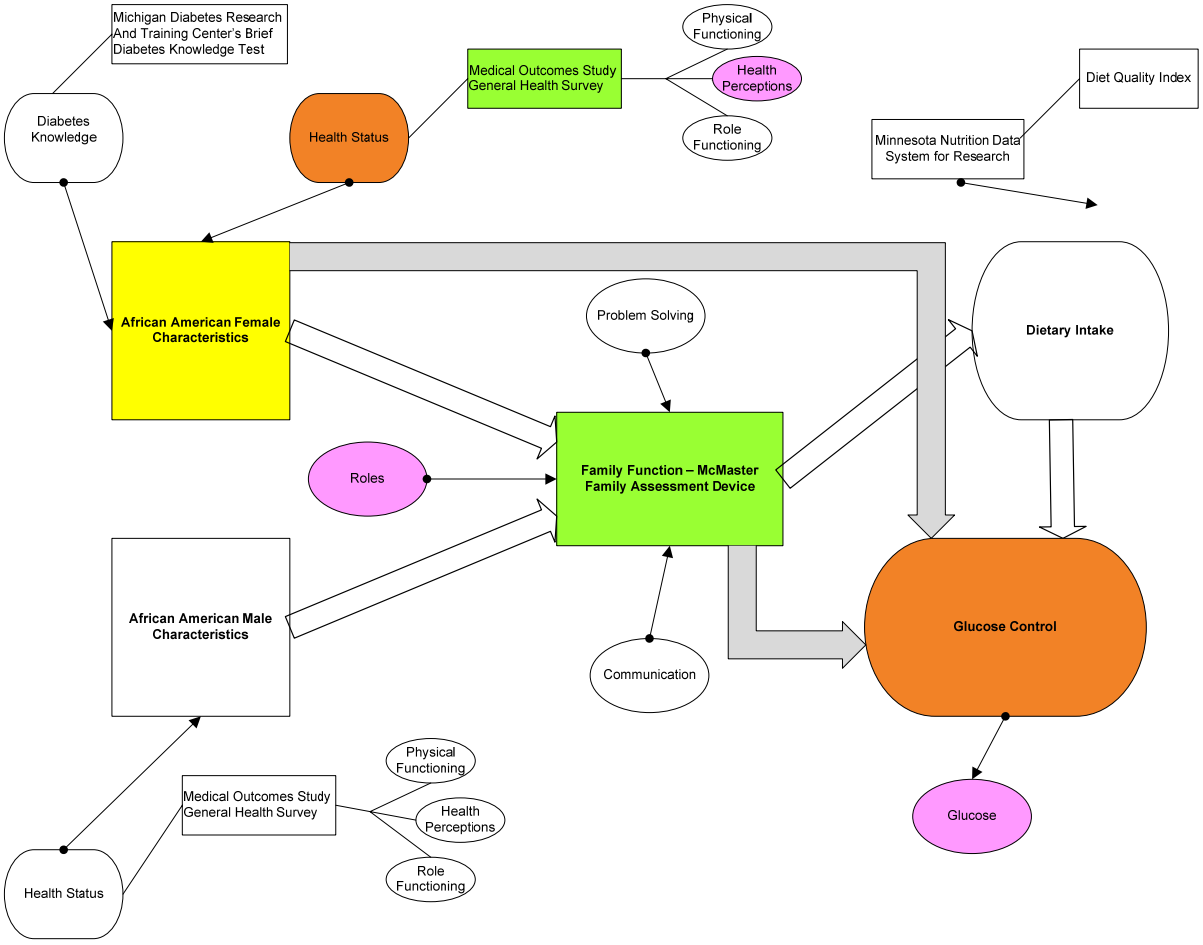
Stepwise Regression Analysis for Predictors of Fasting Glucose

	Best Model	
	Beta	Standard Error
Intercept	522.40	66.37
Women's role behavior	-123.67'	25.28
Women's health perceptions	-1.85'	.50

'p < .01

Figure 4.

Best Conceptual Model



Qualitative Analysis

The third aim was to identify, from the perspective of the woman with T2D, family factors that influence management of dietary intake. Methods of content analysis were used to analyze the interviews conducted with the nine women who participated in qualitative interviews. Data were first sorted into two groups: diet support themes and diet challenge themes. Then themes under each category were identified, clustered under broader constructs, and identified below.

Diet Support Themes

Participants reported multiple influences that supported them in their dietary management. Four themes emerged: (a) family support, (b) role support, (c) personal support, and (d) food preparation and eating behaviors.

Family support. The most common diet support theme was related to the multiple ways in which the women's spouse/male partner encouraged her dietary needs. Respondents mentioned their spouse's food agreement along with food selection was helpful. Some men agreed to eat the foods that were best for their wives' diabetes and purchased healthier foods by examining food labels. Other men supported their wives diet, because both of them required similar dietary regimens due to illness. Women also reported support when their husbands policed her food intake. "He tells me that I should not eat that when I am going to cheat."

On the other hand, a few women reported they had to verbally request support from their spouses/partner and families to eat foods conducive to managing diabetes. These women felt their diets were totally controlled by their family's support. One woman reported her plea for help from her family as "talked to partner and the three children at home and asked them to change their diet for me. They agreed."

Role support. Women reported that factors related to their roles as parent and caregiver were supportive to their diets. They felt that they owed it to their children and sick relatives to stay healthy, because "children need raising" and ill relatives require their care. Moreover, they were often so busy performing multiple roles that

there was limited time to snack or cheat. Women had to stay focused on performing their prioritized role tasks.

Personal support. Women identified various personal sources of diet support. The most common was related to the women's increasing disease severity. When women experienced a perceived detrimental change in their health status, their spouses/partner allowed them to initiate a healthier diet within the home. For example, one woman stated that starting insulin changed things: "family was making it hard, but now family has started to go along with diabetes diet after starting insulin." Another reported that her most recent hospitalization scared everyone and "after hospitalization, I started cooking for me and family was fine with it".

Personal supports were also found in spirituality, will power, and a desire to be physically attractive. One woman felt it was her divine duty to follow a diet for diabetes. Her belief in God and reading the bible "makes me do right," while another woman reported that wanting to "stay slim and trim for her husband" and being reminded by him when she became fat or her belly got bigger" was a support. Other women's support was drawn from their learned experience managing diabetes and information given during diabetes education.

Food preparation and eating behaviors. Many women reported the ability to maintain their diets through portion control, food control, and healthy food availability. Portion control helped with snacking and limiting calories to maintain dietary regimens, while food control allowed women to prepare their foods in a healthy manner. One example of food control was stated by a woman who explained how easily she followed her diet, "I am the boss of meals". She often ate alone,

because her husband worked long hours. Therefore, food preparation was solely determined by her diabetes. On the other hand, another woman felt the key to her diabetes regimen was “limit foods at home…control diet mainly through decreasing portion sizes and stopping snacks.” However, most women agreed that having healthier foods in the home was one of the biggest supports to their diet.

Diet Challenge Themes

Participants identified factors which precipitated difficulty maintaining a diet for diabetes management. These included: (a) family challenges, (b) role challenges, and (c) role challenges.

Family challenges. As stated above, the most common diet challenge was spouse/partner preferences. Most participants reported a desire to selfless in providing for her spouse and family. Thus, when the spousal food preferences were incongruent with the wife’s dietary needs, it was difficult to maintain diet quality. Therefore, multiple women cooked and ate foods that their husbands wanted regardless of their diabetes: “hard to control what I eat….because we are eating together.” Other women attempted to cook two meals, but found they could not continue the additional responsibility. It was “too hard to cook two separate meals.”

Women also identified stress as another family challenge. A couple of women felt that stress caused binge eating. One woman stated that “family stress wreaked havoc on my diet. I tended to eat to get rid of the stress.”

Role challenges. In general, the study women performed multiple tasks within their family. These tasks were either assigned by other members or self-imposed. One of the major challenges was the amount of housework performed by the study

women. Household chores competed with some women's ability to prepare and eat a healthy meal: "so busy doing chores that forget to eat."

Women also reported competing obligations associated with catering to children, spouses, and family rather than themselves. One selfless woman stated: "following a diet is hard…mothers are caretakers…unfair to make them eat what I eat". These women tended to prioritize their spouse and children over themselves.

In addition to the above role challenges, many women worked outside the home. They reported that work could be positive and negative. However, the most common complaint regarding work was the inability to control the foods offered on site. A woman, who works at a restaurant, was having difficulty managing her diet. She reported that "everything in the restaurant is fried. Need to skip lunch or eat something from home." Most often she skips lunch or partakes of the fried food. In her opinion, bringing food from home is not a desirable alternative, because it becomes another assigned task.

Personal challenges. Personal challenges represent feelings or a state of being that inhibit women's prescribed dietary requirements. The only reported personal challenge was related to a woman describing her initial diabetes diagnosis. She remembers sitting in her physician's office and being told that she was diabetic. The diagnosis was shocking and she began to remember stories about people who had diabetes. She felt alone and scared. She refused to think about diabetes or talk about it. She was in denial about her diabetes diagnosis. It took "two weeks before willing to talk to family about it or do something for my diabetes." Therefore, she did not change her diet for a while, because she could not accept her illness.

Additional Analyses

Additional analyses using a triangulation of data were conducted to examine patterns of differences among the women with differing glucose control levels. The 9 women were divided into three glucose control groups: normal group was HgA1c <7% (n = 4), moderate group was HgA1C 7% to 8% (n = 3), and the high group was HgA1C >8% (n = 2).

Differences in Content of Interviews

The first step in analysis was to identify subtheme differences in the three HgA1C groups (see Table 8). Overall, content analysis revealed that the normal HgA1C group identified more diet support themes (n = 12), while the high HgA1C group revealed the least (n = 6). Diet challenges were higher in the normal and high HgA1C groups (n = 4), while the moderate HgA1C group reported the least (n = 3). Another contrast was the reported sources of supports and challenges. Women in the normal HgA1C group reported support from a variety of entities: their family, God, spouse, and themselves. The high HgA1C group reported challenges from many sources (motherhood, themselves, spouse/partner, family, and work). Finally, the normal group reported more diet support subthemes related to themselves than any other group.

Association with Study Variables

In order to further explore the best model, study variables were compared across the three HgA1C groups (see Table 9). The association of women's general health perceptions with fasting glucose as seen in the best model, was partially observed among the HgA1C groups: women in the high HgA1C group reported the

lowest general health perceptions with an average of 17.5 (*SD* = 3.5) while the normal HgA1C group had an average of 46.26 (*SD* = 28.39) and the moderate HgA1C group had an average *of* 50.00 (*SD* = 27.84). Scores associated with the FAD's role behavior and glucose were similar to the best model. Women in the high HgA1C group had healthier family role behavior patterns than women in the moderate or normal HgA1C group. Moreover, women in the high HgA1C group reported healthier family function scores (FAD) overall.

The mean score for diabetes knowledge was lower for the high HgA1C group (61% correct) and moderate HgA1C group (64% correct), and higher for the normal HgA1C group (73% correct). The average score for diet quality was also related to HgA1C groups. The high HgA1C group had an average of 45 (*SD* 7.1), the moderate HgA1C group had an average of 53 (*SD* 2.9), and the normal HgA1C group had a 66 average (*SD* 14.9).

Table 8.

Themes Under Diet Support and Diet Challenges from Qualitative Analysis

HgA1C Groups	*Diet Support*	*Diet Challenges*
All Participants	Spousal/Partner food agreement	Spousal/Partner preferences
	Spousal/Partner food selection	Selflessness
	Increasing disease severity	
	Food availability	
Normal HgA1C Group	Spirituality	Stress
	Physical attractiveness	
	Spousal/Partner food policing	
	Caregiving	
	Food control	
	Portion control	
	Will power	
	Parenting	
Moderate HgA1C Group	Learned experience	Household responsibilities
	Spousal/Partner encouragement	
	Spousal/Partner illness	
	Alone	
High HgA1C Group	Request family support for diet	Work environment
	Diabetes education	Denial

Normal HgA1C Presentation

This is a 49 year old woman diagnosed with diabetes 1.5 years ago. She has been married for 19 years and lives with her husband and two children (ages 15 and 18). She and her husband completed high school with additional trade school for the wife and some college for the husband. Both work full-time with a household income >$36,000. She performs all the cooking and some of the cleaning, while her husband reports participating in none of either. She reports diabetes, joint disease, hypercholesterolemia, and hypertension, while her husband has no illnesses. Her diabetes is controlled with diet and exercise. She had 85.71% correct on the BDKT. Her MOS scores were moderate (physical function = 50 and health perception = 75) to high (role function = 100), while her family function scores (FAD) revealed similar family function scores-healthier family role behavior (2.50), communication (2.33), and problem solving (2.60). Her HgA1c is 6.0; glucose is 118; and BMI is 35.1 (obese). She identified raising children, portion control, food control, spousal preferences and work environment as her diet support subthemes, while lack of will power and spousal preferences were her only challenges. In accordance with the best model, her family's role behavior and high health perceptions were associated with normal fasting glucose.

High HgA1C Presentation

This is a 44 year old woman diagnosed with diabetes 3 years ago. She has been cohabitating for 3 years and lives with her male partner and 6 year old grandchild. She and her male partner graduated from high school. Both work full-

Table 9.

Means and Standard Deviations of the Qualitative HgA1C Groups

Variables	Normal HgA1C Group *M* (*SD*)	Moderate HgA1C Group *M* (*SD*)	High HgA1C Group *M* (*SD*)
General diabetes knowledge[a]	73.22 (8.98)	64.27 (37.79)	60.72 (5.06)
Physical functioning[b]	72.92 (26.68)	94.44 (9.62)	54.17 (64.82)
Health perceptions[b]	46.25 (28.39)	50.00 (27.84)	17.50 (3.54)
Role functioning[b]	75.00 (50.00)	66.67 (57.74)	75.00 (35.36)
Problem solving[c]	2.15 (.30)	1.73 (.46)	1.60 (.85)
Role behavior[c]	2.53 (.38)	2.29 (.40)	1.75 (.88)
Communication[c]	2.29 (.21)	2.22 (.25)	1.92 (.12)
Diet Quality Index Revised[d]	66.25 (14.93)	53.33 (2.89)	45 (7.07)
HgA1C	6.33 (.28)	7.07 (.12)	9.70 (1.41)
Fasting glucose	106.75 (18.28)	160.33 (41.40)	313.00 (120.21)

[a]Higher scores indicate more correct answers. [b]Higher scores indicate better functioning and health status.

[c]Lower scores indicate healthier family function assessment behaviors. [d]Higher scores indicate better diet quality.

time with a household income of <$10,000 annually. She performs all of the cooking and cleaning duties, while her male partner reported not performing either. She reported joint disease, hypercholesterolemia, and hypertension, while her male partner reports diabetes. Her diabetes is managed with insulin, exercise, and diet. She had 64.29% correct on the BDKT. Her MOS scores showed low health perception (20), high role functioning (100), and physical functioning (100), while her family function scores (FAD) revealed higher family communication skills (2), role behavior (1.13), and problem solving skills (1). Her HgA1C is 11.7; glucose is 398; BMI is 28.6 (overweight). She identified requesting help from her partner and family, increasing disease severity, food availability, and diabetes education as her diet support themes, while denial and partner preferences were her diet challenges. In accordance with the best model, her poor health perceptions and high family role behavior were associated with higher fasting glucose. Additionally, high role function (MOS) was associated with higher role behavior (FAD) in the high HgA1C group than in the normal HgA1C group.

CHAPTER 5

Discussion

The findings are discussed according to relationships found between key constructs for Aim 1 and Aim 2 and findings related to Aim 3. Limitations, of the study and need for further research as well as implications for clinical practice are also presented.

Aim 1

The primary aim was to explore whether family function (roles, problem solving, and communication) mediated the relationship between female and male characteristics (health status of the men and women, diabetes knowledge of the women) and dietary intake. Given the importance of family in the area of meal preparation and nutrition for Southern African American women, the investigator hypothesized that family function would mediate the relationship. In this study, only two significant associations occurred. The first was between the women's health status and family function, and the second was between diabetes knowledge and men's family function.

Personal Characteristics and Family Function

The first step in analysis was to examine the relationship between personal characteristics and family function. Only two significant associations with family function were found. The first was between women's health status and women's

perception of family function, and the second was between women's diabetes knowledge and men's perception of family function.

Women's higher role functioning (MOS) was associated with the women's assessment of healthier family role behavior (FAD). This finding seems intuitive, because role function is examining if someone is healthy enough to perform specified tasks, and role behavior is the family's performance of tasks that originate through culture and expectations. In fact, Turner (1970) stated that role behavior is specific to the individual's ability to perform the behavior and influenced by life's demands, which one may interpret that physical limitations would be congruent with one's *inability to perform*. Empirical evidence supported that women in good health viewed healthy nutrition as a role behavior obligation (Ahye, Devine, & Odoms-Young, 2006; Devine et al., 1998; Edstrom & Devine, 2001). Therefore, a healthy woman would be able be able to perform her role behaviors, which may assist other members to maintain their behaviors. This finding is important, because it illustrates that better health may facilitate healthier behaviors, such as shopping for quality foods, preparing healthier meals, and limiting portion sizes.

Men's health status did not predict family function. Empirical evidence is contrary to this finding. Researchers found that the husband's health status is predictive of the wife's behavior (Wilson, 2002). A reason for the inconsistency may be related to the issues related to the measurement of family function. For example, the empirical literature specifically examined the wife's behavior, while our measurement of family function examined an assessment of the family's behavior as reported by the women and men. In addition, the heterogeneity of the sample and

small sample size may have affected results. Men's health status in the sample was healthy with few limitations in physical and role functioning, on average. Perhaps, if the men were less healthy, similar to the men in the empirical literature, there would have been an association between their health status and the wife's behavior.

To the investigator's surprise, higher diabetes knowledge in women was associated with men's lower assessment of their family's problem solving skills. However, the investigator could not find literature to support a link between a person's knowledge and someone else's assessment of their family's function. Therefore, this result should be interpreted with caution and is most likely a spurious finding.

Personal Characteristics and Dietary Intake

There was no significant relationship between women's diabetes knowledge and health status and their spouse/partner's health status and dietary intake. The lack of significant relationships may be explained by the study's small sample and/or reliability of the Nutrition Data System for Research and Diet Quality Index-Revised.

Sample. This exploratory study had a sample of 22 women and 19 men, which was not adequately powered to detect most effects. At best, the sample size allowed for examination of large trends. In addition, the sample was fairly homogenous. The rural African American women and men, who all resided within a 100 mile radius of each other, tended to score from moderate to high on health status subscales and the women tended to have moderate scores on diabetes knowledge. Therefore, the scores may not have represented diabetes knowledge or health with enough variation to detect an effect.

Dietary intake. In addition, the NDS-R may have some reliability issues that impacted the DQI-R. Empirical evidence has shown that 24 hour recalls are superior in measuring dietary intake for African Americans (Kumanyika et al., 2003; Subar et al., 2003), but as in this study, other researchers have reported possible unreliable recalls that may have limited the study findings (Natarajan et al., 2006). In this study, seventeen of the sixty completed recalls (28%) had a possible overestimation or underestimation of total intake as represented by the reported caloric intake.

The possible inaccuracy could be the result of a person's inability to estimate their serving size, as well as social desirability. Regardless, inaccurate dietary reports significantly impact the DQI-R, because the 10 component weighted scores (total fat, saturated fat, cholesterol, fruit servings, vegetable servings, etc.) are based upon serving size and calories. Therefore, overestimation or underestimation of calories, as a whole, would alter the DQI-R total score and possibly obliterate otherwise significant results.

Family Function and Dietary Intake

The family function subscales of the FAD did not predict dietary intake. Therefore family function was not a mediator of the relationship between personal characteristics and dietary intake. The lack of significant results may be related to the family function tool's validity and reliability of the FAD. The FAD was validated with Canadians and European Americans (Epstein et al., 1983; Miller & Achterberg, 2000; Miller et al., 2000; Miller et al., 1985) and never validated with African Americans; therefore one cannot be certain that surveys with African Americans would demonstrate that the concept was congruent with the measure. Nevertheless,

researchers have used the general functioning subscale with African Americans and achieved similar reliability scores with European Americans (Harper & Robinson, 1999; King et al., 2001). In this study, reliability for the communication and role subscales were moderately high, but the communication subscale was only moderate for women and unreliable for men. No other studies have reported reliability for the same subscales, thereby eliminating comparisons and further probing as to possible issues discovered inherently within the measure.

Another cause for lack of significance may be related to the focus of the measure. The FAD was intended to differentiate families in distress from nonclinical well-functioning families. For the purposes of this study, the FAD likely did not reflect the aspects of family function that are critical to dietary intake in African American women with diabetes. Family function related to healthier food selection, availability, and agreement about diet was not measured. However, the qualitative portion of this study showed that these were aspects of family function that influenced dietary intake.

Aim 2

The second aim was to explore the best model for predicting fasting glucose. The first step was an examination of the bivariate relationships of the variables to fasting glucose.

Dietary Intake and Fasting Glucose

Dietary intake was not related to glucose control, despite strong empirical evidence for such a relationship. Many researchers have reported that dietary intake, specifically glycemic index, carbohydrates, and monounsaturated fat

influenced glucose and HgA1C (ADA, 2006; Brand-Miller et al., 2003; Gerhard et al., 2004; Sheard et al., 2004). The contradictory findings in this study may be related to the measurement of fasting glucose or to the dietary recall measure (see above discussion also).

The measure of glucose control was fasting glucose, which provides a snap-shot assessment. Unfortunately, the results only indicate what has occurred in the body over the last few hours, therefore it can be easily influenced by atypical behaviors or intake. For example, glucose can be influenced by activity, food, kidney and liver function, and medications. The instability of the measure is what may cause a non-significant relationship between dietary intake and glucose. Consequently, researchers have reported no relationship between dietary intake and glucose, while others report a significant relationship with either glucose or HgA1C (Chandalia et al., 2000; Garg, 1998; Kohnert et al., 2009). Therefore, many researchers successfully utilized dietary intake to predict HgA1C. In this study, the investigator could not use HgA1C due to the magnitude of missing values.

The lack of relationship between dietary intake and glucose may be due to a possible overestimation or underestimation of total intake in this sample. Another plausible reason may be that the reported recalls measured an atypical intake day and the reported fasting glucose did not represent any of the reported dietary recalls (typical or atypical). For example, a woman may have reported a normal fasting glucose of 85 and a dietary recall reflecting 2200 calories. Both of these values could be accurate, but the fasting glucose may reflect a skipped evening meal thereby providing a lower than usual result, and the recall may reflect an evening

celebrating a birthday (complete with cake and ice cream). Thus, the recalls and the glucose should both represent typical days to ensure consistency. One way to ensure typical days would be to collect multiple recalls and ask participant if the report represented a typical day. The investigator attempted to perform these reliability checks, but in this study, all recalls were accepted regardless of quantity, because the sample was small with approximately half of the subjects reporting all three dietary recalls.

Predictor of Fasting Glucose

The second step involved a stepwise regression with all variables—women's characteristics (diabetes knowledge and health status), men's characteristics (health status), family function subscales (role, communication, and problem solving), and dietary intake quality entered to predict fasting glucose.

The best model for the study variables indicated that lower health status of the woman (health perceptions) and higher family function (healthier family role behavior) were associated with higher fasting glucose. This finding is consistent with the literature, in that better family role behavior, especially role behavior that is traditionally male dominated, incorporated multiple female performed tasks for the maintenance of the family(Ahye et al., 2006). Additionally, it is not surprising that lower health perceptions are associated with higher fasting glucose, because lower health perceptions are indicative of physical limitations due to health. If a woman is not caring for herself because she is occupied with role behaviors that prioritize the spouse and family, her diabetes and any other disease will become progressively

worse. As her health deteriorates, her health perceptions may follow (Edstrom & Devine, 2001)

Therefore, the literature encourages the delineation and performance of roles, tasks, and expectations, as well as the promotion of health and health perceptions, because these variables have predicted healthier food choices (Edstrom & Devine, 2001). Moreover, researchers have suggested that marriage may be more beneficial for men than women due to the burdensome roles and tasks associated with being a wife, mother, and possibly a caregiver (Burton & Dilworth-Anderson, 1991; Hill, 2003; Pruchno, 1999). If this finding is indeed true, perhaps it would be better to focus on illness oriented interventions and family interventions that include the reorganization of family roles through role playing exercises.

Aim 3

The last aim was to identify, from the perspective of the woman with T2D, other family factors that influence management of dietary intake. Content analysis of interviews with 9 women identified numerous diet support and diet challenge themes. The most salient themes related to diet support were spouse/partner food agreement and selection, increasing disease severity, and food availability. The most salient diet challenge theme was spousal/partner preferences and motherhood.

In the qualitative data, it was obvious that the family is integral to dietary intake. Most participants reported factors related to family agreement with meals rather than their needs. The study is consistent with current literature on the African American woman's competing roles to care for herself versus her spouse/partner and family (Devine et al., 1998; Hill, 2003). Because role behavior, such as cooking

for the family, was passed down through culture and reiterated through conversation and daily life (Helman, 1990; Kittler & Sucher, 2001; Kumanyika, 1997), African American women found it difficult to change their diets. They reported the need to cook for their spouse's and children's preferences.

Control of the women's dietary intake shifted from her spouse/family role obligations to herself, only after a health status change, such as the progression of disease, her partner's acceptance of the diet for himself, or as healthier foods became more available in the home. Even with the addition of healthier foods, the woman may still be required to cook separate meals for her partner or children. It appears that the locus of control for dietary intake adherence is not initially within the realm of role behaviors of the women, but only assumed by the women through the consent of her partner and family. Once the consent is communicated, verbally or nonverbally, the family functions with her new role behaviors which may now include her previous demands plus the additional demands related to her health. The practice of adding role behaviors rather than substituting is not only illustrated in this qualitative data, but also reported in the literature (Ahye et al., 2006; Hill, 2003).

Additional analysis, using triangulation, illustrated links between the best model and the qualitative data. Women, who were in the high HgA1C group, suffered with poorer health perceptions and healthier family role behaviors. These behaviors were essentially associated with clear expectations of caring for spouses and children regardless of their needs. Their source of reprieve occurred with verbal communication of needing help in caring for oneself and the family's acceptance of the request. They also reported diet challenges from multiple entities, but most

challenges were related to maintaining the current family function. On the other hand, women in the normal HgA1C group reported more factors related to their control of the diet. Their health perceptions were higher and they were allowed to negotiate roles for themselves and their family.

Limitations and Need for Further Study

Limitations of the study were mostly related to three issues: sample size, use of the FAD, and reliability of dietary recall. The sample size did not provide enough power to detect most effects. However, the observed associations, for the most part, were consistent with current literature. On the other hand, the FAD did not focus participants on those family events that may be necessary to establish and maintain eating behaviors consistent with diabetes guidelines. Moreover, the tool was never validated with African Americans and there were no studies that allowed for reliability comparisons of the role, communication, and problem solving subscales in African Americans. As for the dietary recall, there was overestimation and underestimation in the 24 hour intake, as evidenced by the caloric intake. The underestimation and overestimation impacted the reliability of the Diet Quality Index – Revised, because data were collected from the dietary recalls.

In conclusion, the findings and limitations suggest multiple needs for further research. First, the investigator suggests studies to develop tools that focus on eating behavior and the African American's family function, because no tools currently exist. The tool should include measure the impact of spousal preferences, household obligations and roles, food discussions, and food availability. This tool would provide data on possible ways to intervene with an African American family.

Another suggestion would be the exploration of more illness based interventions, because disease progression and/or symptoms triggered changes in spousal and family support, dietary intake, and women's role behaviors. The qualitative analysis clearly demonstrated that a woman's need to start insulin, initiated dialogue with her spouse and family concerning her diet requirements, which in turn resulted in their support of a diet change for everyone.

Finally, a researcher may investigate the impact of children and grandchildren on family function of African American woman with T2D. The qualitative literature clearly suggested that children and grandchildren within the home influenced the woman's dietary intake and role behavior. At times, women reported that their husbands and children/grandchildren living within the home had equal rights to influence family function, specifically her role behavior, and the dietary intake of the entire family.

Clinical Practice Implications

Health care providers usually focus interventions on taking medications, diet education, exercise, general diabetes education and medication management. However, this study's best model suggests that glucose control was influenced by women's health perceptions and role behaviors. Thus, health care providers should shift interventions to focus on assessment of illness, the woman's and her spouse/male partner's view of her health and prognosis, and their roles in the home. Moreover, the education should include a focus on diabetes complications and the role change implications related to each diabetes complication. Interventions should include the dyad and perhaps the whole family. The reason for the shift in education

and interventions is that dietary control seems to remain with male partners and family preferences until a trigger is initiated by the family or her diabetes illness progresses.

Appendix A

Study Tools

Diabetes is a Family Affair: A real life study

Michigan Diabetes Research and Training Center's Brief Diabetes Knowledge Test

ID _____ Date _____

Instructions: Please circle correct answer.

Example: What color is the sky?
① Blue
2. Pink
3. Yellow
4. Green

1. The diabetes diet is:
    1. The way most American people eat
    2. A healthy diet for most people
    3. Too high in carbohydrate for most people
    4. Too high in protein for most people

2. Which of the following is highest in carbohydrate?
    1. Baked chicken
    2. Swiss cheese
    3. Baked potato
    4. Peanut butter

3. Which of the following is highest in fat?
    1. Low fat milk
    2. Orange juice
    3. Corn
    4. Honey

4. Which of the following is a "free food"?
    1. Any unsweetened food
    2. Any diabetic food
    3. Any food that say "sugar free" on the label
    4. Any food that has less than 20 calories per serving

5. Glycosylated hemoglobin (hemoglobin A1) is a test that is a measure of your average blood glucose level for the past:
    1. Day
    2. Week
    3. 60 – 90 days
    4. 6 months

6. Which is the best method for testing blood glucose?
    1. Urine testing
    2. Blood testing
    3. Both are equally good

7. What effect does unsweetened fruit juice have on blood glucose?
    1. Lowers it
    2. Raises it
    3. Has no effect

8. Which should not be used to treat low blood glucose?
    1. 3 hard candies
    2. ½ cup orange juice
    3. 1 cup diet soft drink
    4. 1 cup skim milk

9. For a person in good control, what effect does exercise have on blood glucose?
    1. Lowers it
    2. Raises it
    3. Has no effect

10. Infection is likely to cause:
    1. An increase in blood glucose
    2. A decrease in blood glucose
    3. No change in blood glucose

11. The best way to take care of your feet is to:
    1. Look at and wash them each day
    2. Massage them with alcohol each day
    3. Soak them for one hour each day
    4. Buy shoes a size larger than usual

12. Eating foods lower in fat decreases your risk for:
    1. Nerve disease
    2. Kidney disease
    3. Heart disease
    4. Eye disease

13. Numbness and tingling may be symptoms of:
    1. Kidney disease
    2. Nerve disease
    3. Eye disease
    4. Liver disease

14. Which of the following is usually not associated with diabetes
    1. Vision problems
    2. Kidney problems
    3. Nerve problems
    4. Lung problems

Diabetes is a Family Affair: A real life study

Medical Outcomes Study General Health Survey: Short form
ID number: _____ Date: _____ Female □ Male □

Instructions: Please place a check (✓) in the box for the one answer that comes closest to the way you feel.

Example: What color is the sky?

1. ☐ Purple 2☐ Yellow 3. ☑ Blue 4.☐ Green 5. ☐Orange

---

2. In general, would you say your health is:

1. ☐ Excellent 2. ☐Very good 3.☐ Good 4. ☐ Fair 5. ☐ Poor

16. For how long (if at all) has your health limited you in each of the following activities?
(Check One Box on Each Line)

	LIMITED FOR MORE THAN 3 MONTHS	LIMITED FOR 3 MONTHS OR LESS	NOT LIMITED AT ALL
	1	2	3
Example: Line 0. Lifting one piece of chocolate cake	☐	☐	☑
Line 1. The kinds or amounts of vigorous activities you can do, like lifting heavy objects, running or participating in strenuous sports	☐	☐	☐
Line 2. The kinds or amounts of moderate activities you can do, like moving a table, carrying groceries or bowling	☐	☐	☐
Line 3. Walking uphill or climbing a few flights of stairs	☐	☐	☐
Line 4. Bending, lifting, or stooping	☐	☐	☐
Line 5. Walking one block	☐	☐	☐
Line 6. Eating, dressing, bathing, or using the toilet	☐	☐	☐

18. Does your health keep you from working at a job, doing work around the house or going to school?

1. ☐ Yes, for more than 3 months 2. ☐ Yes, for 3 months or less 3. ☐ No

19. Have you been unable to do certain kinds or amounts of work, housework or schoolwork because of your health?

1. ☐ Yes, for more than 3 months 2. ☐ Yes, for 3 months or less 3. ☐ No

26. Please check the box that best describes whether each of the following statements is true or false for you.
(Check One Box on Each Line)

	DEFINITELY TRUE	MOSTLY TRUE	NOT SURE	MOSTLY FALSE	DEFINITELY FALSE
	1	2	3	4	5
Line 1. I am somewhat ill.	☐	☐	☐	☐	☐
Line 2. I am as healthy as anybody.	☐	☐	☐	☐	☐
Line 3. My health is excellent.	☐	☐	☐	☐	☐
Line 4. I have been feeling bad lately	☐	☐	☐	☐	☐

Diabetes is a Family Affair: A real life study

McMaster Assessment Device
ID: _____ Date: _____ Female: □ Male: □

Instructions: Rate your agreement or disagreement with how well an item describes your family. Place a check mark (✓) next to the one answer that comes closest to the way you feel.

1. We usually act on our decisions regarding problems.
    1. _____ Strongly Agree
    2. _____ Agree
    3. _____ Disagree
    4. _____ Strongly Disagree

2. After our family tries to solve a problem, we usually discuss whether it worked or not.
    1. _____ Strongly Agree
    2. _____ Agree
    3. _____ Disagree
    4. _____ Strongly Disagree

3. We resolve most emotional upset that come up.
    1. _____ Strongly Agree
    2. _____ Agree
    3. _____ Disagree
    4. _____ Strongly Disagree

4. We confront problems involving feelings.
    1. _____ Strongly Agree
    2. _____ Agree
    3. _____ Disagree
    4. _____ Strongly Disagree

5. We try to think of different ways to solve problems.
    1. _____ Strongly Agree
    2. _____ Agree
    3. _____ Disagree
    4. _____ Strongly Disagree

6. When someone is upset the others know why.
    1. _____ Strongly Agree
    2. _____ Agree
    3. _____ Disagree
    4. _____ Strongly Disagree

7. You can't tell how a person is feeling from what they are saying.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

8. People come right out and say things instead of hinting at them.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

9. We are frank with each other.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

10. We don't talk to each other when we are angry.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

11. When we don't like what someone has done, we tell them.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

12. When you ask someone to do something, you have to check that they did it.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

13. We make sure members meet their family responsibilities.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

14. Family tasks don't get spread around enough.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

15. We have trouble meeting our bills.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

16. There's little time to explore personal interests.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

17. We discuss who is to do household jobs.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

18. If people are asked to do something, they need reminding.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

19. We are generally dissatisfied with the family duties assigned to us.
   1. _____ Strongly Agree
   2. _____ Agree
   3. _____ Disagree
   4. _____ Strongly Disagree

24 hour recall script

Creating an Intake Record

Using the information provided about the participant by the site study staff, the interviewer will complete a Header tab to create an NDS-R dietary recall intake record

Introduction

The interviewer begins by introducing himself or herself to the participant. He/she should be friendly and relaxed. The interviewer should always give neutral responses to whatever the participant tells them.

Script for Activity Study Interview:

Hello, may I speak with (subject name). Hi, this is (interviewer) and I am calling from the Diabetes Is A Family Affair Study that (subject name) signed up for at church with nurse Natasha Greene. This study is located at the University of North Carolina and we thank you for agreeing to be in the study and taking time to do this interview. *(If person that answers is not the subject ask for a better time to reach participant).*

Now what your going to do is tell me everything you to eat and drink in the last 24 hours. This interview will take about 20-30 minutes. Let me remind you that your name and answers will be kept confidential. That means that your answers will be combined with other subjects' answers and your name will never be used in any report.

I would like to ask you to try to remember everything you ate and drank yesterday, which was (Day of the Week). Please start telling me about what you ate and drank yesterday beginning when you first woke up to when you went to sleep.

Entering the NDS-R Quick List

The interviewer proceeds by asking the participant to make a list of all the foods and beverages they had yesterday. Say: **First, we'll make a list in the computer of what you ate yesterday starting with when you got up. Then I will ask you some more questions and we'll figure out how much you had to eat. Do you have any questions?**

- Pause, wait for and respond to questions, and proceed: **What was the first time you had something to eat or drink?** Enter the response then as needed say: **What did you have at that time?**
- The interviewer enters the information reported by the participant on the NDS-R Quick List screen, not requiring the participant to give time, meal name, or meal location. The interviewer will use a slash to mark each eating occasion and NDS-R will prompt later for the time and meal name. Above all, the interviewer should let the child think and say what ever comes to mind about the previous day's intake, avoiding interruptions that may be distracting to the participant.

Reviewing the NDS-R Quick List

The interviewer verifies all of the entries on the Quick List and probes for missed items by reading the list back to the participant and asking: I am going to read back what you have told me. Let me know if I missed anything or you want to add or change anything. Can you think of anything else you ate or drank yesterday that we haven't put on the list? Do you remember if you got up during the night (after midnight) and had anything to eat or drink? Did you have any afternoon snacks or anything before bed?

- **Any errors should be corrected, and any additional foods the participant may report are added at this time.**

Collecting Meal Information Detail

The interviewer begins by saying: **Next we'll go over our list and I will ask you some questions about each food.**

- NDS-R will bring up the Meal Information window. The interviewer will use this opportunity to ask questions about meal time, meal name, and meal location if this information was not provided earlier during the Quick List.

Asking About Additions

The interviewer will be asking about additions to every food. An on-line prompt will remind you to say: **The first thing on your list is** *(NDS-R inserts the name of each food).*

- Then, reading from the NDS-R screen the interviewer will say**: Did you add anything to the** *(NDS-R inserts the name of the food)***?**
- Ask the additions question until you receive a "no" response.

Collecting Complete Food and Amount Detail

The NDS-R Food Search window prompts the interviewer for each available level of detail during this third pass. An on-line prompt will remind you to begin by saying: **What type of** *(insert name of food)* **was it?**

- The interviewer continues to define the food, selecting food variables as required on each screen. Unknown should be entered if the participant cannot describe food in detail (e.g., if it was prepared at a restaurant). An on-line prompt for the amount will remind you to say: **How much did you eat (drink)? How much did you eat (drink)?**
- Some foods require additional quantity details, with required fields indicated in yellow. After entering the amount provided by the participant, the NDS-R displays a conversion to a common unit. At this time, the interviewer must be able to visualize the amount reported and confirm as needed any questionable amounts, making reference to other familiar items or recognizable standards. For example, 1/16 of a hamburger should have a note saying, "ate only one bite" or 8 cups of popcorn should have a note saying, "ate entire **box** at the movies".
- Use the Food Amounts Booklet is optional. Copies of the Food Amounts Booklet can be made by the Core for a fee or assumed by the study.
- The interviewer should ask if the complete amount described was eaten: **Were you able to finish that?** or **the** *(insert name of food)***?**
- Note: Foods that do not have complete descriptive and/or complete amount information are indicated with a blue question mark to the left of the food. When the interviewer has completely described a food, NDS-R replaces the question mark with a green check mark to the left of each completed item.
- As the interviewer conducts the 24-hour dietary recall, he/she will provide positive reinforcement by stating "you are doing a good job, working hard, a big help" as appropriate. The interviewer should maintain a pleasant tone of voice and avoid responding to the participant in any negative ways. If it is necessary to ask the participant to repeat what he/she said, the interviewer should ask him/her to do so in a gentle way and take ownership by saying: **Sometimes it's hard for me to hear things. Could you please tell me that again?**

Reviewing the Recall

During the fourth and final pass of the NDS-R multiple-pass approach, the interviewer will probe for missed meals, beverages, and snacks, making sure no information was inadvertently omitted. The interviewer will try to get a mental picture of the day, looking especially for time gaps of more than four hours between eating. Notes should be made to indicate skipped meals or not consuming a beverage or condiments with food. During the review, the interviewer reads back each food and amount, asking for confirmation from the participant. For example: **Now we'll go over what I've put in the computer one last time. The first thing that I have is at** *(insert meal name and time)* **when you had** *(insert food name*).

- When the interviewer notices a large time gap he/she should asks: **Did you have anything to eat or drink after school? Anything before your** *(insert time e.g., evening meal)* **and** *(before bed)***?**

- Additional foods and meals are inserted at any time. If the participant hesitates and can't remember eating anything for a long period of time, the interviewer may say: **Can you think what you were doing** *(after school, at dinner/supper time, etc.)***? Sometimes if we think about where we were or whom we were with, it helps to remember what we ate.**

- The process continues until each food has been.

Completing the Trailer Tab

When complete, the system presents the Trailer tab and interviewer ends the recall saying: **Next** *(insert name of participant)***, in terms of the amount of food you ate, would you say this was close to the amount that you usually eat, a lot more than you usually eat, or a lot less than you usually eat?**

- This question refers to the overall amount of food for the day, not the type of food. The interviewer records the participant response to the last question on the Trailer tab. If the participant reports a lot more, check "considerably more than usual" or a lot less than usual, check "considerably less than usual". In either case, NDS-R requires the interviewer to provide a note that briefly states why the intake was not usual. For example, a celebration meal with lots of food or participant not feeling well and not eating much can result in eating a lot more or a lot less than usual. If needed the interviewer can say: **What makes you say it's** (*a lot more or a lot* less than usual)**?**
- The interviewer will determine the reliability of the data. If the dietary recall is unreliable because the participant was unable to recall one or more meals or for some other reason question the reliability, he/she will

click the appropriate NDS-R button and add the required NDS-R Note. The interviewer does not ask the participant this question, nor share their opinion with them.

Thank the Participant

- The interviewer thanks the participant and ends the recall: **Thanks so much for your help. Do you have any questions?**
- Pause, wait for and response to questions, and proceed: **You did a great job and I really enjoyed talking with you.**
- **Thanks. Bye.**

Editing the Recall

The interviewer should review and edit the 24-hour dietary recall as soon as possible after its administration. During editing, special attention is paid to NDS-R Missing Foods and NDS-R Notes.

1. Foods not found in the database will be indicated by NDS-R as missing with capital M instead of the green check. Complete detail about the missing food should be reviewed and edited to ensure that adequate information has been provided for the coordinator or the staff at NCC to make a resolution. Remember another person should be able to picture the reported food so information about the color, size, shape, ingredients, and preparations should be included in the note.
2. The NDS-R Note field provides on-line documentation to clarify or confirm contradictory, questionable or unusual food items. Notes serve as communication between the interviewer, the site coordinator and the QA interviewer when reviewing the data. Notes should be made to clarify unusual portion sizes, modifications to foods (e.g., not eating the crust of a piece of pizza), and eating foods without anticipated companion foods (e.g., hamburger without a bun or ketchup).

Diet Quality Index Revised

ID number: _____ Date: _____

DIETARY COMPONENTS	SCORE CRITERIA	PARTICIPANT SCORE
Total Fat ≤30% energy intake	≤30% =10 >30, ≤40 = 5 >40 = 0	
Saturate Fat ≤10% energy intake	≤10% = 10 >10, ≤13 = 5 >13% = 0	
Dietary Cholesterol <300 mg/day	≤300 mg = 10 >300, ≤400 mg = 5 >400 = 0	
Fruit Servings 2-4 servings per day, % recommended servings	≥100% = 10 99% - 50% = 5 <50% = 0	
Vegetables 3-5 servings per day, % recommended servings	≥100% = 10 99% - 50% = 5 <50% = 0	
Grains 6-11 servings per day, % recommended servings	≥100% = 10 99% - 50% = 5 <50% = 0	
Calcium intake as % Adequate intake value for age, % recommended servings	≥100% = 10 99% - 50% = 5 <50% = 0	
Iron intake as % Recommended dietary allowance for age	≥100% = 10 99% - 50% = 5 <50% = 0	
Dietary Diversity score	≥6 = 10 ≥3, <6 = 5 <3 = 0	
Dietary Moderation score	≥7 = 10 ≥4, <7 = 5 <4 = 0	

Diabetes is a Family Affair: A real life study

Demographic (Female)
ID: _____ Date: _____

Instructions: Fill in the blanks.

1. How many children do you still have alive? _____
2. How many children (under age 18) live in your home? _____
   What are their ages? _____
3. How many adults (age 18 and over) live in your home? _____
   What are their ages? _____
4. How tall are you? _____ feet _____ inches
5. How much do you weigh? _____ pounds
6. What was your last hemoglobin A1C laboratory blood test? _____ (This test is also called glycosylated hemoglobin, HgA1C, Hb1C, or HbA1C. This laboratory test is drawn from a vein in the arm. The result is usually 5 – 25. It measures an average of your blood sugar over the last few months.)
7. What was your last fasting blood sugar? _____ (This blood sugar is usually taken by you from your finger with a blood sugar machine. Fasting means that you took your blood sugar in the morning before you ate breakfast.)

Instructions: Place a check (✓) next to your best answer.

8. How much education have you had?
   1. _____ Did not complete high school
   2. _____ Graduated from high school (have GED)
   3. _____ Completed a trade or technical program
   4. _____ Completed some college
   5. _____ Graduated from college
   6. _____ Other (Specify) _____
9. What is your place of residence?
   1. _____ My own home
   2. _____ A rented home
   3. _____ Apartment (rented)
   4. _____ Senior Citizen residence
   5. _____ Other (Specify) _____

10. Which of the following best describes your total yearly family income?
    1. _____ Less than $10,000
    2. _____ $10,000 – 14,999
    3. _____ $15,000 - $19,999
    4. _____ $20,000 - $24,999
    5. _____ $25,000 - $29,999
    6. _____ $30,000 - $35,999
    7. _____ $36,000 or more

11. What is your employment status?
    1. _____ Currently working; _____ full-time or _____ part-time
    2. _____ Currently unemployed
    3. _____ Permanently Disabled and Not working
    4. _____ Retired and Not working

12. How much of the home cleaning is your responsibility?
    1. _____ All (100%)
    2. _____ Most (75% - 99%)
    3. _____ Some (50% - 74%)
    4. _____ Not often (25% - 49%)
    5. _____ Rarely (1% - 24%)
    6. _____ None (0%)

13. How much of the cooking at home is your responsibility?
    1. _____ All (100%)
    2. _____ Most (75% - 99%)
    3. _____ Some (50% - 74%)
    4. _____ Not often (25% - 49%)
    5. _____ Rarely (1% - 24%)
    6. _____ None (0%)

14. Have you ever been told that you have any of the following?
    1. _____ Heart disease (heart attack or heart failure)
    2. _____ Vascular disease (problems with leg veins or arteries, peripheral vascular disease)
    3. _____ Kidney disease
    4. _____ Lung disease (asthma, emphysema, or COPD)
    5. _____ Eye disease (blindness, glaucoma, or retinopathy)
    6. _____ Diabetes
    7. _____ Cancer
    8. _____ Joint problems (arthritis, degenerative joint disease, or osteoarthritis)
    9. _____ Cholesterol problems
    10. _____ High blood pressure

15. How do you take care of your diabetes? (You may check (✓) more than one answer)
    1._____Insulin Shots
    2._____Exercise
    3._____Diet
    4._____Diabetes Pills

Diabetes is a Family Affair: A real life study

Demographic (Male)

ID: _____ Date: _____

Instructions: Fill in the blanks.

1. Date of birth (month/day/year): _____/_____/_____

Instructions: Place a check (✓) next to your best answer.

2. How much education have you had?
   1. _____ Did not complete high school
   2. _____ Graduated from high school (have GED)
   3. _____ Completed a trade or technical program
   4. _____ Completed some college
   5. _____ Graduated from college
   6. _____ Other (Specify) _____

3. How do you presently pay for your health care?
   1. _____ Medicare
   2. _____ Medicaid
   3. _____ Other Insurance
   4. _____ Uninsured
   5. _____ Other (Specify) _____

4. What is your employment status?
   1. _____ Currently working; _____ full-time or _____ part-time
   2. _____ Currently unemployed
   3. _____ Permanently Disabled and Not working
   4. _____ Retired and Not working

5. How much of the home cleaning is your responsibility?
   1. _____ All (100%)
   2. _____ Most (75% - 99%)
   3. _____ Some (50% - 74%)
   4. _____ Not often (25% - 49%)
   5. _____ Rarely (1% - 24%)
   6. _____ None (0%)

6. How much of the cooking at home is your responsibility?
   1. _____ All (100%)
   2. _____ Most (75% - 99%)
   3. _____ Some (50% - 74%)
   4. _____ Not often (25% - 49%)
   5. _____ Rarely (1% - 24%)
   6. _____ None (0%)

7. Have you ever been told that you have any of the following?
   1. _____ Heart disease (heart attack or heart failure)
   2. _____ Vascular disease (problems with leg veins or arteries, peripheral vascular disease)
   3. _____ Kidney disease
   4. _____ Lung disease (asthma, emphysema, or COPD)
   5. _____ Eye disease (blindness, glaucoma, or retinopathy)
   6. _____ Diabetes
   7. _____ Cancer
   8. _____ Joint problems (arthritis, degenerative joint disease, or osteoarthritis)
   9. _____ Cholesterol problems
   10. _____ High blood pressure

Qualitative Interview Script

ID number: _____ Date: _____

State opening:

"We are interested in understanding more about family factors or issues that may influence your food intake."

Question:

What factors in your family make it hard to manage your diet?

Probes: What about communication with your male partner? What about your roles as a wife (or mother, if applicable)? How do you problem solve to in favor or your diet? What factors in your family make it hard to prepare and eat the recommended foods? Is there anything else you can think about that may influence your ability to follow your diet?

Notes:

Appendix B

IRB

Diabetes is a Family Affair: A Real Life Study

Are you an African American Woman with Diabetes?

Do you live with your husband or a male partner?

- If you answered yes, you may want to take part in our research study. You will receive $30.00 for your help and a nutritional analysis of your current diet.
- We want to understand what influences diet for African American women with diabetes.
- Ms. Greene will be at Bryant Baptist Church on Sunday, September 23, 2007 (after service) to get the names of volunteers or you may call 757-556-3670.

University of North Carolina
Attn: Natasha Greene, MSN, APRN, BC
School of Nursing, Carrington Hall
Chapel Hill, North Carolina 27599

Phone: 757-556-3670
Fax: 919-724-4372
E-mail: help@diabetesisafamilyaffair.com

This study has been reviewed and approved by the Institutional Review Board at the University of North Carolina, Chapel Hill. 07-0572

Helping Us Understand Families

Diabetes is a Family Affair: A Real Life Study

Diabetes is affecting more African American women and their families. Help us understand how your family influences diet and blood sugar.

Natasha Greene, MSN, APRN, BC
Family Nurse Practitioner

University of North Carolina
School of Nursing, Carrington Hall
CB#7460
Chapel Hill, NC 27599

Phone: 757-556-3670 (local)
Fax: 919-724-4372
Email: help@diabetesisafamilyaffair.com

Diabetes is a Family Affair: A Real Life Study

Natasha Greene, MSN, APRN, BC
Family Nurse Practitioner

University of North Carolina
School of Nursing

Telephone: 757-556-3670 (local)

Diabetes is a Family Affair: A Real Life Study

What is the Purpose?

African American women with diabetes are asked to follow a diet to help control their blood sugars. Some African American women report difficulty following a diet because of their family, while others have no problems with their diet. Thus, the purpose of this research study is to understand how family influences diet in African American women.

Who Can Participate?

African American women who have diabetes and live with their husband (or male partner). Women should be ages 35 –70, have diabetes for >1 year, be able to be contacted by phone, speak English, and women cannot be pregnant or taking on dialysis.

What Will I Need to Do?

Women will complete surveys, one interview, and answer questions about their diet.

Men will complete a survey.

Will This Cost Me Anything?

No.

What Will I Receive?

Women will receive $30.00 and information on the nutritional value of their current diet.

Men will receive $10.00.

Are There Any Health Risks?

There are no risks to your health, unless you are embarrassed by answering questions about your family or diet.

What if I Have Questions or I Am Not Sure?

Fill out the section on the next page and Ms. Greene will call you to answer your questions.

Are you interested in the study?

If yes, please complete the blanks below:

I want to receive a call from Ms. Greene about the study. My name is:

_____

{print your first and last name above}

She may call me at:

_(_____)_____—_____

{print your area code and phone number above}

Please call me on any of the following days: ? Monday

? Tuesday ? Wednesday ? Thursday

? Friday ? Saturday ? Sunday

I prefer to be called:

? 9:00am—12:00pm

? 12:00pm—5:00pm

? 5:00pm—8:00pm

{place a check mark (✓)in the boxes of the day(s) and time(s) that you prefer to be called}

****Tear along fold and give this brochure to Ms. Beverly Shannon or Ms. Greene****

Inclusion and Exclusion Screening Script

Name _____
(Last) (First) (Middle Initial)

Date: _____ **Date of Birth:** _____ (Must be born between 1937 and 1967)

Address:

_____
(Number and Street) (City) (Zip Code)

Assigned ID: _____

1. How many years have you had diabetes? _____ Years (must be greater than one)
2. Are you married or do you have a male partner? _____ Yes _____ No
3. Do you presently live with your husband? _____ Yes _____ No How many years living with husband? _____ years (must be greater than one)

   OR

   Do you presently live with your male partner? _____ Yes _____ No How many years living with partner? _____ years (must be greater than one)
4. Do you usually eat and prepare your largest meal of the day at home at least 75% of the time?
   _____ Yes _____ No
5. Do you have a working phone that we may use to contact you or collect study information? _____ Yes _____ No
6. Do you require assistance to perform daily activities such as bathing, grooming, or getting dressed? _____ Yes _____ No
7. Do you receive dialysis? _____ Yes _____ No
8. Are you pregnant? _____ Yes _____ No
9. Does your husband/male partner speak and understand English? _____ Yes _____ No

If any of the above answers are no, thank the interviewee for their time. “Thank you for answering our questions. Your answers have helped us understand more about families with diabetes. However, we are now looking for families with diabetes who match specific criteria for our research study. Again we thank you for your interest and if we should need additional information about your family we will contact you at the same number.”

If the above answers are yes, ask interviewee to participate in study. “Thank you for answering our questions. We would like for you to participate in our research study about African American women with diabetes and their families. In order for you to participate, your husband or male partner will also need to agree to be in the research study. Can you ask your husband or male partner if he would be willing to participate with you? I will call you back within a week to find out if he is willing and if yes, I will try to reach him later at the same number. Is this ok? Do you have any questions? I will mail a copy of our brochure to your home address for your partner. And, thank you again. I will be in touch soon.”

If African American female states, her partner is unwilling to participate: “Thank you for asking him about the research study. We would love to have your participation, but we must enroll couples into the study. If he changes his mind or he would like to speak with me, please call 919-208-7474.”

If African American females states, her partner is willing to participate: “That is wonderful. Ok, before I speak with him, what are convenient dates and times to meet with you so that you may complete your surveys and consents to participate?

Location: home □ office □

Monday: _____

Tuesday: _____

Wednesday: _____

Thursday: _____

Friday: _____

Saturday: _____

Sunday: _____

Ok. Is he available to talk about the research study now?
If no, “what would be a good time to call back?”
If yes, “may I speak with him?”

Script for Husband/Male Partner:

“On **_(date)_ ,** I spoke with **_(female’s name)_** about helping nurses at the University of North Carolina understand more about African American women with diabetes and their families. At that time, **_(female’s name)_** expressed interest in taking part in the Diabetes is a Family Affair research study and she said that you are interested in the research study also. In order for **_(female’s name)_** to

participate, we will need both of you to agree to be in the study. Your participation will include completing a few short surveys and we will give you $10.00 at the end of the study. Can we count on your participation?"

If no, "Thank you for your time. If you should change your mind about helping us learn more about African American women with diabetes and their families, please contact us at 208-7474. Thank you again and have a great day."

If yes, "Great. We look forward to you and **_(female's name)_** participation. Ok, before we finish I need to ask you a few questions:

Male Partner's Name: _____ Contact Number:_____
(last) (first)

Your preferred Location, Meeting Days, and Times:

Location: home □ office □

Monday: _____

Tuesday: _____

Wednesday: _____

Thursday: _____

Friday: _____

Saturday: _____

Sunday: _____

(female's name) prefers to meet at **_see above_**, so can I plan to meet with both of you at the same time? (If not, will meet with individuals separately).

Couple Meeting Date: _____ Couple Meeting Time: _____

Couple Meeting Location: _____ Reminder Call □

OR

Female Meeting Date: _____ Female Meeting Time: _____

Female Meeting Location: _____ Reminder Call □

Male Meeting Date: _____ Male Meeting Time: _____

Male Meeting Location: _____ Reminder Call □

Diabetes is a Family Affair: A real life study

IRB Study #___07-0572_____
Consent Form Version Date: 11-13-07_____

Title of Study: Diabetes is a Family Affair: A Real Life Study

Principal Investigator: Natasha Greene, MSN, APRN, BC
UNC-Chapel Hill Department: School of Nursing
UNC-Chapel Hill Phone number: 919-966-3620
Email Address: greenen@email.unc.edu
Faculty Advisor: Margaret Miles, PhD, RN, FAAN
Faculty Advisor Phone number: 919-966-3620

Study Contact telephone number: 1-866-405-1904
Study Contact email: help@diabetesisafamilyaffair.com

What are some general things you should know about research studies?
You are being asked to take part in a research study. To join the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Details about this study are discussed below. It is important that you understand this information so that you can make an informed choice about being in this research study.
You will be given a copy of this consent form. You should ask the researchers named above, or staff members who may assist them, any questions you have about this study at any time.

What is the purpose of this study?
Diabetes has become more common among African American women. African American women report more problems following a diabetes diet and maintaining glucose control than other women. Since family roles and responsibilities are an important part of an African American woman's life, it is important to know about how family factors affect diet and blood sugar control. Thus, the purpose of this study is to learn how family factors, along with your diabetes knowledge and health and the health of your husband or male partner affects your diet and blood sugar control.

Are there any reasons you should not be in this study?
You should not be in this study if you can not be directly contacted by telephone, you are receiving dialysis or supervised care, you are pregnant, you do not speak English, you have had diabetes for less than one year, you have been married or living with a male partner for less than one year, or if you are not age 35 – 70 years old.

How many people will take part in this study?
If you decide to be in this study, you will be one of approximately 65 African American couples in this research study.

How long will your part in this study last?
You will be contacted 4 times for data collection over a two month period. You may also receive telephone calls to remind you to mail or complete your study requirements. There is no follow-up after your participation.

What will happen if you take part in the study?
If you take part in this study, you will complete surveys, dietary recalls, and participate in an audio-recorded interview.

- Surveys – Your first activity will be to complete surveys about you and your family. The surveys may be read to you and your answers may be recorded for you, or you may read and record your answers. Completing the surveys will take approximately 45 – 60 minutes.
- Dietary Recalls - A dietary recall is answering verbal questions about what you have eaten in the last 24 hours. You will complete three recalls, which will take approximately 20-30 minutes each. All recalls will occur via telephone call. Your first contact for dietary recall will occur within two weeks of completing your surveys. The second and third recalls will occur within one month of the first recall. Your recalls will be performed by a staff member of the Clinical Nutrition Research Center at the University of North Carolina, Chapel Hill.
- Interview – The investigator will ask you some questions about factors that you feel make it difficult to manage your diet. Your interview will occur immediately after you have completed your surveys, during the same appointment or by telephone call. Your answers will be tape-recorded for accuracy; however you may decline tape recording at any time.
- We will also ask your husband or male partner to participate in the study.

What are the possible benefits from being in this study?
Research is designed to benefit society by gaining new knowledge. You may benefit personally from the study, however, by becoming more aware of factors affecting your dietary intake. Your participation in this study may help identify needed changes in diabetes education for African American women with diabetes.

What are the possible risks or discomforts involved from being in this study?
Risks to participating in this study are uncommon. Interviews are performed in private, so that no one can hear or see your responses. However, you may experience embarrassment if you are uncomfortable answering questions about your family. You may skip any question for any reason or stop at anytime, as well as report any problems to the researcher. While there could be a risk that your privacy is violated, steps indicated below are taken to ensure your data is known only to the researchers.

How will your privacy be protected?
The survey questionnaires that you complete will be coded with a number rather than your name. The tape-recorded interview will be typed up with your code number and no names will be used on the report. The staff at the Clinical Nutrition Research Center will receive a password protected document containing your name, telephone number, and study identification number in order to collect dietary recalls. All of this data will be kept at UNC-Chapel Hill in a locked storage container for five years, after which the transcripts, tapes, dietary recalls, and questionnaires will be permanently destroyed. The enrollment form that will contain your name and study identification number will be maintained in a locked cabinet. This will be used to contact you during the study and will be shredded when the study ends. Furthermore, your personal information will not be shared with other parties, organizations, or persons and you will not be identified in any report or publication about this study.

Although every effort will be made to keep research records private, there may be times when federal or state law requires the disclosure of such records, including personal information. This is very unlikely, but if disclosure is ever required, UNC-Chapel Hill will take steps allowable by law to protect the privacy of personal information. In some cases, your information in this research study could be reviewed by representatives of the University, research sponsors, or government agencies for purposes such as quality control or safety.

Will you receive anything for being in this study?
You will receive $30.00 for taking part in this study. It will be given after you have completed surveys, interview, and diet information.

Will it cost you anything to be in this study?
There will be no costs for being in the study

What if you have questions about this study?
You have the right to ask, and have answered, any questions you may have about this research. If you have questions, or concerns, you should contact the researchers listed on the first page of this form.

What if you have questions about your rights as a research participant?
All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

- -

Participant's Agreement:

I have read the information provided above. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study.

_____ _____
Signature of Research Participant Date

_____
Printed Name of Research Participant

_____ _____
Signature of Person Obtaining Consent Date

_____
Printed Name of Person Obtaining Consent

Diabetes is a Family Affair: A real life study

IRB Study # 07-0572
Consent Form Version Date: 11-13-07

Title of Study: Diabetes is a Family Affair: A Real Life Study

Principal Investigator: Natasha Greene, MSN, APRN, BC
UNC-Chapel Hill Department: School of Nursing
UNC-Chapel Hill Phone number: 919-966-3620
Email Address: greenen@email.unc.edu
Faculty Advisor: Margaret Miles, PhD, RN, FAAN
Faculty Advisor Phone number: 919-966-3620

Study Contact telephone number: 1-866-405-1904
Study Contact email: help@diabetesisafamilyaffair.com

What are some general things you should know about research studies?

You are being asked to take part in a research study. To join the study is voluntary. You may refuse to join, or you may withdraw your consent to be in the study, for any reason, without penalty.

Research studies are designed to obtain new knowledge. This new information may help people in the future. You may not receive any direct benefit from being in the research study. There also may be risks to being in research studies.

Details about this study are discussed below. It is important that you understand this information so that you can make an informed choice about being in this research study.
You will be given a copy of this consent form. You should ask the researchers named above, or staff members who may assist them, any questions you have about this study at any time.

What is the purpose of this study?

Diabetes has become more common among African American women. African American women report more problems following a diabetes diet and maintaining glucose control than other women. Since family roles and responsibilities are an important part of an African American woman's life, it is important to know how family factors affect diet and blood sugar control. Thus, the purpose of this study is to learn how family factors affect your wife's (or female partner) diet and blood sugar control.

Are there any reasons you should not be in this study?
You should not be in this study if you can not be directly contacted by telephone, if you do not speak English, or if you have been married or living with your African American female partner for less than one year.

How many people will take part in this study?
If you decide to be in this study, you will be one of approximately 65 African American couples in this research study.

How long will your part in this study last?
You will be contacted once for data collection. If you do not complete your surveys, you may have one other contact. There is no follow-up after your participation.

What will happen if you take part in the study?
If you take part in this study, you will complete surveys. The surveys will ask questions about you and your family. Surveys may be read to you and your answers may be recorded for you, or you may read and record your answers. Completing the surveys will take approximately 30-45 minutes.

What are the possible benefits from being in this study?
Research is designed to benefit society by gaining new knowledge. You may benefit personally from the study, however, by becoming more aware of factors which affect dietary intake. Your participation in this study may help identify needed changes in diabetes education for African American women with diabetes.

What are the possible risks or discomforts involved from being in this study?
Risks to participating in this study are uncommon. Interviews are performed in private, so that no one can hear or see your responses. However, you may experience embarrassment if you are uncomfortable answering questions about your family. You may skip any question for any reason or stop at anytime, as well as report any problems to the researcher. While there could be a risk that your privacy is violated, steps indicated below are taken to ensure your data is known only to the researchers.

How will your privacy be protected?
The survey questionnaires that you complete will be coded with a number rather than your name. All of this data will be kept at UNC-Chapel Hill in a locked storage container for five years, after which the questionnaires will be permanently destroyed. The enrollment form and computer that will contain your name and study identification number will be maintained in a locked cabinet. This will be used to contact you during the study and will be shredded when the study ends. Furthermore, your personal information will not be shared with other parties, organizations, or persons and you will not be identified in any report or publication about this study.

Although every effort will be made to keep research records private, there may be times when federal or state law requires the disclosure of such records, including

personal information. This is very unlikely, but if disclosure is ever required, UNC-Chapel Hill will take steps allowable by law to protect the privacy of personal information. In some cases, your information in this research study could be reviewed by representatives of the University, research sponsors, or government agencies for purposes such as quality control or safety.

Will you receive anything for being in this study?
You will receive a $10.00 for taking part in this study. It will be given after you have completed the surveys.

Will it cost you anything to be in this study?
There will be no costs for being in the study

What if you have questions about this study?
You have the right to ask, and have answered, any questions you may have about this research. If you have questions, or concerns, you should contact the researchers listed on the first page of this form.

What if you have questions about your rights as a research participant?
All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

- -

Participant's Agreement:

I have read the information provided above. I have asked all the questions I have at this time. I voluntarily agree to participate in this research study.

_____ _____
Signature of Research Participant Date

_____
Printed Name of Research Participant

_____ _____
Signature of Person Obtaining Consent Date

_____
Printed Name of Person Obtaining Consent

References

Ahye, B. A., Devine, C. M., & Odoms-Young, A. M. (2006). Values expressed through intergenerational family food and nutrition management systems among African American women. *Family and Community Health, 29*, 5-16.

Airhihenbuwa, C. O., Kumanyika, S., Agurs, T. D., Lowe, A., Saunders, D., & Morssink, C. B. (1996). Cultural aspects of African American eating patterns. *Ethnicity and Health, 1*, 245-260.

Allen, L. I., & Britt, D. W. (1983). Black women in American society: A resource development perspective. *Issues in Mental Health Nursing, 5*, 61-79.

American Diabetes Association. (2004). Standards of medical care in diabetes. *Diabetes Care, 27*, S15-S35.

American Diabetes Association. (2006). Standards of medical care in diabetes-2006: American Diabetes Association position statement. *Diabetes Care, 29*, S4-S42.

American Diabetes Association. (2008). Nutrition recommendations and interventions for diabetes: A position statement of the American Diabetes Association. *Diabetes Care, 31*, S61-S78.

Anderson-Loftin, W., & Moneyham, L. (2000). Long-term disease management needs of southern African Americans with diabetes. *Diabetes Educator, 26*, 821-832.

Anderson, J. W., Randles, K. M., Kendall, C. W., & Jenkins, D. J. (2004). Carbohydrate and fiber recommendations for individuals with diabetes: A quantitative assessment and meta-analysis of the evidence. *Journal of the American College of Nutrition, 23*, 5-17.

Berrigan, D., Dodd, K., Troiano, R. P., Krebs-Smith, S. M., & Barbash, R. B. (2003). Patterns of health behavior in U.S. adults. *Preventive Medicine, 36*, 615-623.

Bianchi, S., Milkie, M., Sayer, L., & Robinson, J. (2000). Is anyone doing the housework? Trends in the gender division of household labor. *Social Forces, 79*, 191-228.

Brand-Miller, J., Hayne, S., Petocz, P., & Colagiuri, S. (2003). Low-glycemic index diets in the management of diabetes: A meta-analysis of randomized controlled trials. *Diabetes Care, 26*, 2261-2267.

Brown, J. B., Harris, S. B., Webster-Bogaert, S., Wetmore, S., Faulds, C., & Stewart, M. (2002). The role of patient, physician and systemic factors in the management of type 2 diabetes mellitus. *Family Practice., 19*, 344-349.

Burton, L. M., & Dilworth-Anderson, P. (1991). The intergenerational family roles of aged black Americans. *Marriage and Family Review, 16*, 311-330.

Butler, A. E., Janson, J., Bonner-Weir, S., Ritzel, R., Rizza, R. A., & Butler, P. C. (2003). Beta-cell deficit and increased beta-cell apoptosis in humans with type 2 diabetes. *Diabetes, 53*, 102-110.

Buyken, A. E., Toeller, M., Heitkamp, G., Karamanos, B., Rottiers, R., Muggeo, M., et al. (2001). Glycemic index in the diet of European outpatients with type 1 diabetes: Relations to glycated hemoglobin and serum lipids. *American Jounal of Clinical Nutrition, 73*, 574-581.

Cagle, C. S., Appel, S., Skelly, A. H., & Carter-Edwards, L. (2002). Mid-life African-American women with type 2 diabetes: Influence on work and the multicaregiver role. *Ethnicity and Disease, 12*, 555-566.

Centers for Disease Control and Prevention. (2001). *Diabetes and women's health across the life stages: A public health perspective*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention. (2003). *National diabetes fact sheet: General information and national estimates on diabetes in the United States, 2003*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention. (2005). *National diabetes fact sheet: General information and national estimates on diabetes in the United States, 2005*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention. (2008). *National diabetes fact sheet: General information and national estimates on diabetes in the United States, 2007*. Atlanta, GA: U.S. Department of Health and Human Services.

Chandalia, M., Garg, A., Lutjohann, D., von Bergmann, K., Grundy, S. M., & Brinkley, L. J. (2000). Beneficial effects of high dietary fiber intake in patients with type 2 diabetes mellitus. *New England Journal of Medicine, 342*, 1392-1398.

Charles, N., & Kerr, M. (1988). Women and men. *Women, food, and families* (pp. 63-84). Manchester: Manchester University Press.

Chesla, C. A., Fisher, L., Mullan, J. T., Skaff, M. M., Gardiner, P., Chun, K., et al. (2004). Family and disease management in African-American patients with type 2 diabetes. *Diabetes Care, 27*, 2850-2855.

Chesla, C. A., Fisher, L., Skaff, M. M., Mullan, J. T., Gilliss, C. L., & Kanter, R. (2003). Family predictors of disease management over one year in Latino and European American patients with type 2 diabetes. *Family Process, 42*, 375-390.

Colagiuri, S., Borch-Johnsen, K., Glumer, C., & Vistisen, D. (2005). There really is an epidemic of type 2 diabetes. *Diabetologia, 48*, 1459-1463.

Connell, C. M. (1991). Psychosocial contexts of diabetes and older adulthood: Reciprocal effects. *Diabetes Educator, 17*, 364-371.

Corner, J. (1991). In search of more complete answers to research questions. Quantitative versus qualitative research methods: Is there a way forward? *Journal of Advanced Nursing, 16*, 718-727.

Cox, R. H., Carpenter, J. P., Bruce, F. A., Poole, K. P., & Gaylord, C. K. (2004). Characteristics of low-income African-American and Caucasian adults that are important in self-management of type 2 diabetes. *Journal of Community Health, 29*, 155-170.

Coyne, I. (1997). Sampling in qualitative research. Purposeful and theoretical sampling; merging or clear boundaries. *Journal of Advanced Nursing, 26*, 623-630.

Devine, C. M., Connors, M., Bisogni, C. A., & Sobal, J. (1998). Life-course influences on fruit and vegetable trajectories: Qualitative analysis of food choices. *Journal of Nutrition Education, 30*, 361-370.

Edstrom, K. M., & Devine, C. M. (2001). Consistency in women's orientations to food and nutrition in midlife and older age: A 10-year qualitative follow-up. *Journal of Nutrition Education, 33*, 215-223.

El-Kebbi, I. M., Bacha, G. A., Ziemer, D. C., Musey, V. C., Gallina, D. L., Dunbar, V., et al. (1996). Diabetes in urban African Americans. V. Use of discussion groups to identify barriers to dietary therapy among low-income individuals with non-insulin-dependent diabetes mellitus. *Diabetes Educator, 22*, 488-492.

Epstein, N. B., Baldwin, L. M., & Bishop, D. (1983). The McMaster Family Assessment Device. *Journal of Marital and Family Therapy, 9*, 171-180.

Everson, S. A., Maty, S. C., Lynch, J. W., & Kaplan, G. A. (2002). Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. *Journal of Psychosomatic Research, 53*, 891-895.

Fitzgerald, J. T., Andersen, R. M., Funnell, M. M., Hiss, R. G., Hess, G. E., Davis, W. K., et al. (1998). The reliability and validity of a brief diabetes knowledge test. *Diabetes Care, 21*, 706-710.

Friedman, M. (1998). *Family Nursing: Research, theory, and practice* (4th ed.). Stamford, CT: Appleton & Lange.

Frost, G., & Dornhorst, A. (2000). The relevance of the glycaemic index to our understanding of dietary carbohydrates. *Diabetic Medicine, 17*, 336-345.

Garg, A. (1998). High-monounsaturated-fat diets for patients with diabetes mellitus: A meta-analysis. *American Journal of Clinical Nutrition, 67,* 577S-582S.

Gerhard, G. T., Ahmann, A., Meeuws, K., McMurry, M. P., Duell, P. B., & Connor, W. E. (2004). Effects of a low-fat diet compared with those of a high-monounsaturated fat diet on body weight, plasma lipids and lipoproteins, and glycemic control in type 2 diabetes. *American Journal of Clinical Nutrition, 80*, 668-673.

Gilbertson, H. R., Thorburn, A. W., Brand-Miller, J. C., Chondros, P., & Werther, G. A. (2003). Effect of low-glycemic-index dietary advice on dietary quality and food choice in children with type 1 diabetes. *American Journal of Clinical Nutrition, 77*, 83-90.

Glasgow, R. E., Fisher, L., Skaff, M., Mullan, J., & Toobert, D. J. (2007). Problem Solving and Diabetes Self-Management: Investigation in a large, multiracial sample. *Diabetes Care, 30*, 33-37.

Glasgow, R. E., Hampson, S. E., Strycker, L. A., & Ruggiero, L. (1997). Personal-model beliefs and social-environmental barriers related to diabetes self-management. *Diabetes Care, 20*, 556-561.

Haines, P. S. (1999). The Diet Quality Index Revised: A measurement instrument for populations. *Journal of the American Dietetic Association, 99*, 697-704.

Harper, G. W., & Robinson, W. L. (1999). Pathways to risk among inner-city African-American adolescent females: The influence of gang membership. *American Journal of Community Psychology, 27*, 383-404.

Harris, M. I. (2001). Racial and ethnic differences in health care access and health outcomes for adults with type 2 diabetes. *Diabetes Care, 24*, 454-459.

Heilbronn, L. K., Noakes, M., & Clifton, P. M. (2002). The effect of high- and low-glycemic index energy restricted diets on plasma lipid and glucose profiles in type 2 diabetic subjects with varying glycemic control. *Journal of the American College of Nutrition, 21*, 120-127.

Heisler, M., Piette, J. D., Spencer, M., Kieffer, E., & Vijan, S. (2005). The relationship between knowledge of recent HbA1c values and diabetes care understanding and self-management. *Diabetes Care, 28*, 816-822.

Helman, C. F. (1990). *Culture, Health, and Illness: An introduction for health professionals*. Boston, MA: Wright.

Hemstrom, O. (1996). Is marriage dissolution linked to differences in mortality risks for men and women? *Journal of Marriage and Family, 58*, 366-378.

Hill-Briggs, F., Cooper, D. C., Loman, K., Brancati, F. L., & Cooper, L. A. (2003). A qualitative study of problem solving and diabetes control in type 2 diabetes self-management. *Diabetes Educator, 29*, 1018-1028.

Hill-Briggs, F., Gary, T. L., Yeh, H. C., Batts-Turner, M., Powe, N. R., Saudek, C. D., et al. (2006). Association of social problem solving with glycemic control in a sample of urban African Americans with type 2 diabetes. *Journal of Behavioral Medicine, 29*, 69-78.

Hill, R. B. (2003). *The Strengths of Black Families* (2nd ed.). Lanham, MD: University Press of America.

Hsieh, H., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*, 1277--1288.

Hung, T., Sievenpiper, J. L., Marchie, A., Kendall, C. W., & Jenkins, D. J. (2003). Fat versus carbohydrate in insulin resistance, obesity, diabetes and cardiovascular disease. *Current Opinion in Clinical Nutrition and Metabolic Care, 6*, 165-176.

Jackson, J. S., Chatters, L. M., & Taylor, R. J. (Eds.). (1993). *Aging in Black America*. Newbury Park, CA: SAGE.

James, D. C. (2004). Factors influencing food choices, dietary intake, and nutrition-related attitudes among African Americans: Application of a culturally sensitive model. *Ethnicity and Health, 9*, 349-367.

Kasuga, M. (2006). Insulin resistance and pancreatic beta cell failure. *Journal of Clinical Investigation, 116*, 1756-1760.

Khan, A., Lasker, S. S., & Chowdhury, T. A. (2003). Are spouses of patients with type 2 diabetes at increased risk of developing diabetes? *Diabetes Care, 26*, 710-712.

King, R. B., Carlson, C. E., Shade-Zeldow, Y., Bares, K. K., Roth, E. J., & Heinemann, A. W. (2001). Transition to home care after stroke: Depression, physical health, and adaptive processes in support persons. *Research in Nursing and Health, 24*, 307-323.

Kittler, P. G., & Sucher, K. P. (2001). Africans. *Food and Culture* (pp. 175-197). Belmont, CA: Wadsworth/Thomson Learning.

Kohnert, K., Augstein, P., Zander, E., Heinke, M., Perterson, K., Freyse, E., et al. (2009). Glycemic variability strongly correlates with postprandial beta cell dysfunction in a segment of type 2 diabetic patients using oral hypoglycemic agents. *Diabetes Care*, 32.6, 1058-1063.

Kolasa, K. M., Mitchell, J. P., & Jobe, A. C. (1995). Food behaviors of southern rural community-living elderly. *Archives of Family Medicine, 4*, 844-848.

Kumanyika, S. (1997). Aging, diet, and nutrition in African Americans. In K. S. Markides & M. R. Miranda (Eds.), *Minorities, Aging, and Health* (pp.205-234). Thousand Oaks, CA: SAGE.

Kumanyika, S. K., Mauger, D., Mitchell, D. C., Phillips, B., Smiciklas-Wright, H., & Palmer, J. R. (2003). Relative validity of food frequency questionnaire nutrient estimates in the Black Women's Health Study. *Annals of Epidemiology, 13*, 111-118.

Lantz, P. M., Lynch, J. W., House, J. S., Lepkowski, J. M., Mero, R. P., Musick, M. A., et al. (2001). Socioeconomic disparities in health change in a longitudinal study of US adults: The role of health-risk behaviors. *Social Science and Medicine, 53*, 29-40.

Life Sciences Research Office. (1995). *Third report on nutrition monitoring in the United States*. Washington DC: Government Printing Office.

Lu, N., Samuels, M. E., & Huang, K. C. (2002). Dietary behavior in relation to socioeconomic characteristics and self-perceived health status. *Journal of Health Care for the Poor and Underserved, 13*, 241-257.

Luscombe, N. D., Noakes, M., & Clifton, P. M. (1999). Diets high and low in glycemic index versus high monounsaturated fat diets: Effects on glucose and lipid metabolism in NIDDM. *European Journal of Clinical Nutrition, 53*, 473-478.

Macken, L. C., Yates, B., & Blancher, S. (2000). Concordance of risk factors in female spouses of male patients with coronary heart disease. *Journal of Cardiopulmonary Rehabilitation, 20*, 361-368.

Maillet, N. A., Melkus, G. D., & Spollett, G. (1996). Using focus groups to characterize the health beliefs and practices of black women with non-insulin-dependent diabetes. *Diabetes Educator, 22*, 39-46.

McLoyd, V. C., Cauce, A. M., Takeuchi, D., & Wilson, L. (2000). Marital Processes and Parental Socialization in Families of Color: A Decade Review of Research.

Miller, C. K., & Achterberg, C. L. (2000). Reliability and validity of a nutrition and food-label knowledge test for women with type 2 diabetes mellitus. *Journal of Nutrition Education, 32*, 43-48.

Miller, C. K., Edwards, L., Kissling, G., & Sanville, L. (2002). Nutrition education improves metabolic outcomes among older adults with diabetes mellitus: Results from a randomized controlled trial. *Preventive Medicine., 34*, 252-259.

Miller, D., & Brown, J. L. (2005). Marital interactions in the process of dietary change for type 2 diabetes. *Journal of Nutrition Education and Behavior, 37*, 226-234.

Miller, I., Ryan, C. E., Keitner, G. I., Bishop, D. S., & Epstein, N. B. (2000). The McMaster approach to families: Theory, assessment, treatment, and research. *Journal of Family Therapy, 22*, 168-189.

Miller, I. V., Epstein, N. B., & Bishop, D. S. (1985). The McMaster Family Assessment Device: Reliability and validity. *Journal of Marital and Family Therapy, 11*, 345-356.

Morgan, D. L. (1997). Qualitative content analysis: A guide to paths not taken. *Qualitative Health Research, 3*, 112-121.

Murata, G. H., Shah, J. H., Adam, K. D., Wendel, C. S., Bokhari, S. U., Solvas, P. A., et al. (2003). Factors affecting diabetes knowledge in type 2 diabetic veterans. *Diabetologia, 46*, 1170-1178.

Murcott, A. (1988). Sociological and social anthropological approaches to food and eating. *World Review of Nutrition and Dietetics, 55*, 1-40.

Natarajan, L., Flatt, S. W., Sun, X., Gamst, A. C., Major, J. M., Rock, C. L., et al. (2006). Validity and systematic error in measuring carotenoid consumption with dietary self-report instruments. *American Journal of Epidemiology, 163*, 770-778.

National Institute of Diabetes and Digestive and Kidney Diseases (1998). *Diabetes in African Americans fact sheet* (NIH Publication No 98-3266): National Diabetes Information Clearinghouse, National Institute of Diabetes and Digestive and Kidney Diseases.Washington, DC: U.S. Government Printing Office.

Nelson, K. M., Reiber, G., & Boyko, E. J. (2002). Diet and exercise among adults with type 2 diabetes. *Diabetes Care, 25*, 1722-1728.

Nielsen, S. J., & Popkin, B. M. (2003). Patterns and trends in food portion sizes, 1977-1998. *Journal of the American Medical Association, 289*, 450-453.

Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in energy intake in U.S. between 1977 and 1996: Similar shifts seen across age groups. *Obesity Research, 10*, 370-378.

Nutrition Coordinating Center & Division of Epidemiology (2001, July 26, 2001). Nutrition Data System Retrieved January 1, 2004, from http://www.ncc.umn.edu

Opperman, A. M., Venter, C. S., Oosthuizen, W., Thompson, R. L., & Vorster, H. H. (2004). Meta-analysis of the health effects of using the glycaemic index in meal-planning. *British Journal of Nutrition, 92*, 367-381.

Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods* (3rd ed.). Thousand Oaks, CA: SAGE.

Pinderhughes, E. (2002). African American marriage in the 20th century. *Family Process, 41*, 269-282.

Pinkney, A. (2000). Social institutions. *Black Americans*. Upper Saddle River, NJ: Prentice-Hall.

Prentki, M., & Nolan, C. J. (2006). Islet beta cell failure in type 2 diabetes. *Journal of Clinical Investigation, 116*, 1802-1812.

Pruchno, R. (1999). Raising grandchildren: the experiences of black and white grandmothers. *Gerontologist, 39*, 209-221.

Rand Corportation & Ware, J. E. (1996). The short form-36 health survey. In I. McDowell & C. Newell (Eds.), *Measuring Health* (2nd ed.). New York: Oxford University Press.

Resnick, H. E., Foster, G. L., Bardsley, J., & Ratner, R. E. (2006). Achievement of American Diabetes Association clinical practice recommendations among

U.S. adults with diabetes, 1999-2002: The National Health and Nutrition Examination Survey. *Diabetes Care, 29*, 531-537.

Rimal, R. N. (2003). Intergenerational transmission of health: The role of intrapersonal, interpersonal, and communicative factors. *Health Education and Behavior, 30*, 10-28.

Rizkalla, S. W., Taghrid, L., Laromiguiere, M., Huet, D., Boillot, J., Rigoir, A., et al. (2004). Improved plasma glucose control, whole-body glucose utilization, and lipid profile on a low-glycemic index diet in type 2 diabetic men: A randomized controlled trial. *Diabetes Care, 27*, 1866-1872.

Rodriguez-Villar, C., Manzanares, J. M., Casals, E., Perez-Heras, A., Zambon, D., Gomis, R., et al. (2000). High-monounsaturated fat, olive oil-rich diet has effects similar to a high-carbohydrate diet on fasting and postprandial state and metabolic profiles of patients with type 2 diabetes. *Metabolism: Clinical and Experimental, 49*, 1511-1517.

Samuel-Hodge, C. D., Headen, S. W., Skelly, A. H., Ingram, A. F., Keyserling, T. C., Jackson, E. J., et al. (2000). Influences on day-to-day self-management of type 2 diabetes among African-American women - Spirituality, the multi-caregiver role, and other social context factors. *Diabetes Care, 23*, 928-933.

Samuel-Hodge, C. D., Skelly, A. H., Headen, S., & Carter-Edwards, L. (2005). Familial roles of older African-American women with type 2 diabetes: Testing of a new multiple caregiving measure. *Ethnicity and Disease, 15*, 436-443.

Satia, J. A., Galanko, J. A., & Siega-Riz, A. M. (2004). Eating at fast-food restaurants is associated with dietary intake, demographic, psychosocial and behavioural factors among African Americans in North Carolina. *Public Health Nutrition, 7*, 1089-1096.

Savoca, M., & Miller, C. (2001). Food selection and eating patterns: Themes found among people with type 2 diabetes mellitus. *Journal of Nutrition Education, 33*, 224-233.

Schafer, R. B., Shafer, E., Dunbar, M., & Keith, P. M. (1999). Marital food interaction and dietary behavior. *Social Science & Medicine, 48*, 787-796.

Schakel, S. F., Sievert, Y. A., & Buzzard, I. M. (1988). Sources of data for developing and maintaining a nutrient database. *Journal of the American Dietetic Association, 88*, 1268-1271.

Sheard, N. F., Clark, N. G., Brand-Miller, J. C., Franz, M. J., Pi-Sunyer, F. X., Mayer-Davis, E., et al. (2004). Dietary carbohydrate (amount and type) in the

prevention and management of diabetes: A statement by the American Diabetes Association. *Diabetes Care, 27*, 2266-2271.

Sloth, B., Krog-Mikkelsen, I., Flint, A., Tetens, I., Bjorck, I., Vinoy, S., et al. (2004). No difference in body weight decrease between a low-glycemic-index and a high-glycemic-index diet but reduced LDL cholesterol after 10-wk ad libitum intake of the low-glycemic-index diet. *American Journal of Clinical Nutrition, 80*, 337-347.

Speers, M. A., Kasl, S. V., & Ostfeld, A. M. (1986). Blood pressure concordance between spouses. *American Journal of Epidemiology, 123*, 818-829.

Speers, M. A., Kasl, S. V., & Ostfeld, A. M. (1989). Marital correlates of blood pressure. *American Journal of Epidemiology, 129*, 956-972.

Stewart, A. L., Hays, R. D., & Ware, J. E. (1988). The MOS Short-Form General Health Survey. *Medical Care, 26*, 724-732.

Strain, G. W., Champagne, C., & Roman, S. H. (1998). An ethnic comparison of nutritional patterns and health habits in elderly patients with diabetes. *Journal of Nutrition for the Elderly, 18*, 37-47.

Subar, A. F., Kipnis, V., Troiano, R. P., Midthune, D., Schoeller, D. A., Bingham, S., et al. (2003). Using intake biomarkers to evaluate the extent of dietary misreporting in a large sample of adults: the OPEN study. *American Journal of Epidemiology, 158*, 1-13.

Summerson, J. H., Bell, R. A., & Konen, J. C. (1996). Coronary heart disease risk factors in black and white patients with non-insulin-dependent diabetes mellitus. *Ethnicity and Health, 1*, 9-20.

Summerson, J. H., Bell, R. A., Konen, J. C., & Spangler, J. (2002). Differential impact of cardiovascular disease (CVD) risk factor clustering on CVD and renal disease among African-American and white patients with type 2 diabetes mellitus. *Ethnicity & Disease., 12*, 530-534.

Summerson, J. H., Spangler, J. G., Bell, R. A., Shelton, B. J., & Konen, J. C. (1999). Association of gender with symptoms and complications in type II diabetes mellitus. *Womens Health Issues, 9*, 176-182.

Sussman, M. B., Steinmetz, S. K., & Peterson, G. W. (Eds.). (1999). *Handbook of Marriage and the Family* (2nd ed.). NY: Plenum Press.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics*. Needham Heights, MA: A Pearson Education Company.

Tanasescu, M., Cho, E., Manson, J. E., & Hu, F. B. (2004). Dietary fat and cholesterol and the risk of cardiovascular disease among women with type 2 diabetes. *American Journal of Clinical Nutrition, 79*, 999-1005.

Tapsell, L. C., LGillen, L. J., Patch, C. S., Batterham, M., Owen, A., Bare, M., et al. (2004). Including walnuts in a low-fat/modified-fat diet improves HDL cholesterol-to-total cholesterol ratios in patients with type 2 diabetes. *Diabetes Care, 27*, 2777-2783.

Tashakkori, A., & Teddlie, C. (1998). *Mixed Methodology: Combining qualitative and quantitative approaches* (Vol. 46). Thousand Oaks, CA: SAGE.

Toobert, D. J., & Glasgow, R. E. (1991). Problem solving and diabetes self-care. *Journal of Behavioral Medicine, 14*, 71-86.

Tsihlias, E. B., Gibbs, A. L., McBurney, M. I., & Wolever, T. M. (2000). Comparison of high- and low-glycemic-index breakfast cereals with monounsaturated fat in the long-term dietary management of type 2 diabetes. *American Journal of Clinical Nutrition, 72*, 439-449.

Tucker, K. L., Maras, J., Champagne, C., Connell, C., Goolsby, S., Weber, J., et al. (2005). A regional food-frequency questionnaire for the US Mississippi Delta. *Public Health Nutrition, 8*, 87-96.

Turner, R. H. (1970). *Family Interaction*. New York, NY: John Wiley & Sons.

Two Feathers, J., Kieffer, E. C., Palmisano, G., Anderson, M., Sinco, B., Janz, N., et al. (2005). Racial and Ethnic Approaches to Community Health (REACH) Detroit partnership: Improving diabetes-related outcomes among African American and Latino adults. *American Journal of Public Health, 95*, 1552-1560.

U.S. Census Bureau. (2003). Race and Hispanic origin in 2003. *The population profile of the United States: Dynamic version (internet release)* Retrieved December 5, 2005.

Umberson, D. (1987). Family status and health behaviors: Social control as a dimension of social integration. *Journal of Health and Social Behavior, 28*, 306-319.

Valeriano, E., Reaves, J., Porterfield, D., & Munoz-Plaza, C. (2002). Diabetes in North Carolina: A summary report - 2002 Retrieved March 15, from http://www.ncdiabetes.org/Facts_Figures/pdf/NCSummarryreport.pdf

Venters, M. H., Jacobs, D. R., Luepker, R. V., Maiman, L. A., & Gillum, R. F. (1984). Spouse concordance of smoking patterns: The Minnesota Heart Survey. *American Journal of Epidemiology, 120*, 608-616.

Vessby, B., Uusitupa, M., Hermansen, K., Ricardi, G., Rivellese, A. A., Tapsell, L. C., et al. (2001). Substituting dietary saturated for monosaturated fat impairs insulin sensitivity in healthy men and women. *Diabetologia, 44*, 312-319.

Willett, W. (1998). *Nutrition Epidemiology* (2nd ed.). New York, NY: Oxford University.

Willigen, M., & Drentea, P. (2001). Benefits of equitable relationships: The impact of sense of fairness, household division of labor, and decision making power on perceived social support. *Sex Roles, 44*, 571-596.

Wilson, S. E. (2002). The health capital of families: an investigation of the inter-spousal correlation in health status. *Social Science and Medicine, 55*, 1157-1172.

Wood, D. A., Roberts, T. L., & Campbell, M. (1997). Women married to men with myocardial infarction are at increased risk of coronary heart disease. *Journal of Cardiovascular Risk, 4*, 7-11.

Young, B., Maynard, C., & Boyko, E. J. (2003). Racial differences in diabetic nephropathy, cardiovascular disease, and mortality in a national population of veterans. *Diabetes Care, 26*, 2392-2399