

CHERRY, CARINTHIA A., Ph.D. The Implementation and Evaluation of a Church-Based, Peer-Delivered Nutrition and Lifestyle Education Program for African American Women at Risk for Type 2 Diabetes. (2011)
Directed by Dr. Martha Taylor. 143 pp.

Diet, physical activity, and body weight are modifiable lifestyle factors for which modest improvements have been shown to reduce risk for development of Type 2 diabetes mellitus. However, increasing rates of disease suggest that large segments of the population remain unaware of the impact of lifestyle practices on overall health and quality of life. This pilot feasibility study was designed to implement and evaluate a peer-educator delivered 8-week nutrition and lifestyle education intervention for African American women ages 45 years and over and at risk for Type 2 diabetes their church setting. This 2 x 3 repeated measures study (usual care (UC), intervention (INT); baseline, endpoint, follow-up) used a convenience sample of 41 women (average age = 61 ± 8.92 years) at risk for diabetes from two predominantly African American churches in Greensboro, NC (N = 21, UC; N = 20, INT).

Significant changes in fiber intake occurred over time, with no between group differences (INT = 10.9 to 12.5 g; UC = 12.7 to 9.6 g, $p = 0.031$). Group by time differences occurred for total fat ($p = 0.013$), monounsaturated fat ($p = 0.045$), and percent of energy from fat ($p = 0.022$), with the intervention group significantly decreasing fat intake. When age and total number of chronic conditions were added as covariates, total carbohydrate (grams) differed over time ($p = 0.025$, age and 0.007, chronic conditions), with INT reporting an increase and UC reporting a decrease. Limiting or restricting high sugar foods and limiting portion sizes significantly differed

between groups at endpoint and follow up ($p = 0.04$). UC received the same education handouts, but not the classes and also reported some significant dietary changes over time, suggesting the benefits of targeted messages for this audience. The peer educator consistently and accurately delivered the curriculum as designed. Attendance rates indicated high exposure to the intervention, and participants were engaged and willing to participate in the program. Further development of more intensive intervention strategies focused on targeted behavior changes to reduce of Type 2 diabetes risk among African American women is needed.

THE IMPLEMENTATION AND EVALUATION OF A CHURCH-BASED,
PEER-DELIVERED NUTRITION AND LIFESTYLE EDUCATION
PROGRAM FOR AFRICAN AMERICAN WOMEN
AT RISK FOR TYPE 2 DIABETES

by

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A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro
2011

Approved by

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To my mother, for your unconditional love, unwavering support, and undeniable
sacrifice.

APPROVAL PAGE

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ACKNOWLEDGEMENTS

First and foremost, I give honor and praise to God for the many blessings bestowed upon me during this journey. I would also like to acknowledge my advisor, Dr. Martha Taylor. I could not have completed this journey without your advice, guidance, encouragement, support, and patience both professionally and personally. I would also like to acknowledge my committee members, Drs. Carolyn Blue, Lauren Haldeman, and Margaret Savoca for their guidance and support.

A special thanks to Ioana Scripa for your assistance with this research project but also for your friendship. I would also like to thank Yvonne Mc Laughlin, undergraduate research assistant, for your hard work and dedication.

I could not have completed this project without the 44 women who were willing to participate in this effort, the peer educators, Bettye Hill and Dianne Chang, who delivered the program, and the Moses Cone Congregational Nursing Program, especially Marian Whiteside and Sandra Blaha. I also extend thanks to the leadership at both Grace Lutheran Church and Gethsemane Missionary Baptist Church for welcoming me into your congregations and allowing me access to your members.

I am also grateful for the financial support received from the UNCG School of Nursing Triad Grant (NCMHD/NIH 1P20MD002289-01; PI: Debra Wallace).

Lastly, many thanks to my family and friends for all the love, prayers, and words of encouragement. I would especially like to acknowledge a few very special people, my mother, my Aunt Rickie, Jordan, Jay (my inspiration), Nikki, and Crystal.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	viii
 CHAPTER	
I. INTRODUCTION	1
Primary Aims	3
Secondary Aims	4
II. REVIEW OF LITERATURE.....	6
Diabetes is increasing in epidemic proportions	6
Older adults are increasing in number	6
Health disparities exist in minority populations	8
Diet and exercise are modifiable risk factors.....	9
Healthy eating can reduce risk factors for chronic disease	11
Diabetes is prevalent in older adults	13
Older adult African American women are at increased risk.....	14
Diabetes prevention has been successful	15
Church-based health interventions are effective.....	16
Peer Educators can be an effective delivery tool	19
Summary	21
References.....	24
III. DEVELOPMENT OF A NUTRITION EDUCATION AND LIFESTYLE INTERVENTION FOR AFRICAN AMERICAN WOMEN AT RISK FOR TYPE 2 DIABETES	30
Introduction.....	30
Methods.....	31
Summary	42
Acknowledgements.....	43
References.....	45
IV. PROJECT D.R.E.A.M. (DIABETES RISK- EDUCATING AFRICAN AMERICAN MATRIARCHS): A PROCESS EVALUATION	47
Abstract.....	47

Introduction.....	48
Methods.....	50
Results & Discussion	52
Conclusions.....	57
Acknowledgments.....	59
References.....	63
 V. RESULTS OF A PILOT FEASIBILITY STUDY: PROJECT D.R.E.A.M. (DIABETES RISK: EDUCATING AFRICAN AMERICAN MATRIARCHS).....	65
Abstract.....	65
Introduction.....	68
Methods.....	71
Statistical Analysis.....	77
Results	78
Discussion	83
Conclusions.....	87
Acknowledgments.....	88
References.....	97
 EPILOGUE	101
 APPENDIX A. RECRUITMENT FLYER.....	104
 APPENDIX B. DIABETES RISK SCREENING	106
 APPENDIX C. CONSENT FORM (INTERVENTION GROUP).....	108
 APPENDIX D. CONSENT FORM (USUAL CARE GROUP).....	114
 APPENDIX E. GENERAL HEALTH QUESTIONNAIRE	120
 APPENDIX F. STAGES OF CHANGE ASSESSMENT	126
 APPENDIX G. FOOD HABITS QUESTIONNAIRE	128
 APPENDIX H. PHYSICAL ACTIVITY RECALL.....	131
 APPENDIX I. PROGRAM EVALUATION -INTERVENTION.....	136
 APPENDIX J. PROGRAM EVALUATION- USUAL CARE	138

APPENDIX H. SUPPLEMENTAL TABLES.....	140
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LIST OF TABLES

	Page
Table 1. Project D.R.E.A.M. Intervention Group Program Description	44
Table 2. Project D.R.E.A.M. Intervention Group Program Description	60
Table 3. Project D.R.E.A.M. Participant Demographic Characteristics (Baseline)	61
Table 4. Project D.R.E.A.M. Participant Enrollment	62
Table 5. Project D.R.E.A.M. Intervention Group Program Description	89
Table 6. Project D.R.E.A.M. Participant Demographic Characteristics (Baseline)	90
Table 7. Energy and Nutrient Intake by Group and Time (Mean \pm SE).....	91
Table 8. Reported Food Habits for Project D.R.E.A.M. Participants.....	92
Table 9. Reported Food Habits for Project D.R.E.A.M. Usual Care Group Participants.....	93
Table 10. Reported Food Habits for Project D.R.E.A.M. Intervention Group Participants.....	94
Table 11. Stages of Change for Project D.R.E.A.M. Participants	95
Table 12. Physical Activity Recall (Mean Hours \pm SE)	96
Table 13. Body Composition (Mean \pm SE) for Project D.R.E.A.M. Participants	141
Table 14. Clinical Indicators (Mean \pm SE) for Project D.R.E.A.M. Participants.....	142
Table 15. Meal Patterns for Project D.R.E.A.M. Participants	143

CHAPTER I

INTRODUCTION

The incidence of Type 2 diabetes mellitus in the United States (US) is rising in epidemic proportions. Over the past two decades (1980-2004), the number of people with Type 2 diabetes in the US population has more than doubled, increasing from 5.8 million to 14.7 million (1). Moreover, an additional 6.2 million individuals remain undiagnosed and 54 million people are diagnosed with the diabetes precursor conditions of impaired fasting glucose (IFG), pre-diabetes or cardiometabolic risk (metabolic syndrome). Additionally, seven million adults aged 65 years or older (20.1%) have diabetes accounting for approximately 40% of the population with diabetes (1, 2). Data also indicate that minority populations, specifically African Americans and Hispanics, are disproportionately affected by diabetes. According to data from the American Diabetes Association (ADA), 3.2 million African Americans over the age of 20 have diabetes. Compared to their Caucasian counterparts, these individuals are almost twice as likely to suffer from this condition. Similarly, reports indicate that 25% of African Americans between the ages of 65 and 74 have diabetes and one in every four African American women over age 55 also suffer from diabetes (3). Given these alarming indicators, development and identification of effective intervention strategies to prevent diabetes is

necessary. Dietary changes, physical activity, and body weight are modifiable lifestyle factors for which modest improvements have been shown to reduce risk for development of Type 2 diabetes mellitus and cardiovascular disease (4, 5). The proposed study assessed the dietary practices, health and weight status, and selected blood markers of diabetes risk of African American women ages 45 years and older residing in Guilford County, North Carolina. More specifically the overall aim of the study was to implement and evaluate an 8-week nutrition and lifestyle education program delivered by trained peer educators in decreasing the risk of Type 2 diabetes mellitus among African American women ages 45 years and over. Findings of this study will be used for the further development of culturally relevant intervention strategies to prevent Type 2 diabetes mellitus among African American women in community-based settings.

The overall goal of this pilot feasibility study was to implement and evaluate a peer-led nutrition and lifestyle education intervention based on the Diabetes Prevention Program and the National Institutes of Health's (NIH) Small Steps Big Rewards campaign in African American women ages 45 and older at risk for Type 2 diabetes. This study was a two condition (treatment and control) repeated measures (pretest, posttest, and follow-up) design. The 8-week intervention was designed to educate African American women ages 45 and older regarding how dietary practices and physical activity can reduce risk of Type 2 diabetes by altering body weight and diabetes-related clinical indicators (total cholesterol, LDL-cholesterol, fasting blood glucose, and glycosylated hemoglobin (HbA_{1c})). We hypothesized that women who receive the peer-led nutrition and lifestyle education will improve dietary practices (decrease total energy

and dietary fat intakes and percent of total energy from fat) and increase physical activity (number of steps walked each day), resulting in a decreased risk profile for Type 2 diabetes from baseline to follow-up (12 weeks from baseline) compared to individuals not receiving the education intervention. We also examined the meal patterns and evaluated specific food habit factors of African American women at risk for diabetes.

Primary Aims

Aim 1: Evaluate process measures for this pilot intervention.

Research Question: Will this design provide an effective intervention for African American women at risk for diabetes?

Process evaluation involves the use of indicators that reflect how well interventions are delivered and received, and provides data on what, how, why, and for whom intervention programs work (6, 7). Results of process evaluation can provide essential information about how an intervention leads to successful behavior change. The project process components were examined for dose, fidelity, exposure, and barriers.

Aim 2: Compare dietary practices and evaluate meal pattern changes between baseline, post-intervention (week 8) and follow-up (week 12). *Hypothesis:* Women participating in the 8-week nutrition and lifestyle education intervention will demonstrate improved dietary practices in comparison to controls, indicated by reduced total energy intake, reduced dietary fat intake, and reduced percent of total energy from fat. In addition, women in the intervention group will exhibit more defined eating patterns, as measured by reporting consistent consumption of three meals and a snack or other healthy meal consumption combinations (i.e. five to six small meals per day), decreased

fast food consumption, and increased adherence to the Recommended Dietary Allowances (RDA) and Adequate Intakes (AI). Food habits previously identified as related to glycemic control were examined to determine their utility as possible risk reduction strategies.

Aim 3: Evaluate the amount of physical activity reported between baseline, post-intervention (week 8) and follow-up (week 12). *Hypothesis:* There will be a positive change (increase) in the amount of activity reported for the women participating in the intervention compared to controls. Physical activity was assessed by a pedometer to indicate number of steps walked per day.

Secondary Aims

Aim 4: Examine changes in body composition between baseline, post intervention (week 8) and follow-up (week 12). *Hypothesis:* Women participating in the 8-week intervention will exhibit decreases in body weight and total body fat percentage (determined by waist circumference and sagittal diameter) as compared to controls.

Aim 5: Examine changes in selected diabetes-related clinical indicators between baseline, post-intervention (week 8) and follow-up (week 12). *Hypothesis:* There will be a decrease in total cholesterol, LDL-cholesterol, fasting blood glucose, and HbA_{1c} for the intervention group as compared to controls.

This project utilized trained peer educators in a community church setting to deliver an eight-week nutrition and lifestyle education program to help reduce risk factors of Type 2 diabetes mellitus among African American women in Guilford County. We developed a program based on the National Diabetes Education Program as it contains

information about multiple lifestyle components important to reducing risk for Type 2 diabetes mellitus. Risk was determined using a validated risk assessment tool (8). Peer educators have been used as health care extenders for multiple programs in primarily non-profit settings. The use of peer educators for community-based programs designed to reach minority populations such as African Americans offer numerous benefits that include: targeted community members are more likely to participate in such programs, participants rate programs as culturally relevant, and satisfaction ratings of the programs are high (5, 9). Health care programs have been offered in church settings; however, these have been limited to primarily screening activities, with few focusing on long-term lifestyle intervention programs (5, 9, 10).

According to recent reports, Guilford County has a high percentage of adults who are overweight or obese (64%), indicating a need for interventions that emphasize healthy lifestyle practices to improve quality and quantity of life and to reduce health care expenditures. Also, older adult African Americans comprise approximately 20% of the elderly population in Guilford County; however few community-based interventions that specifically target the lifestyle practices of this population are offered (11). Findings from this research will be used to compare the effectiveness of two methods of delivering the nutrition and lifestyle education program to African American women in a community setting. These data also serve as pilot data for a larger scale church-based intervention targeted to reduce the risk of Type 2 diabetes mellitus among African American women in central North Carolina.

CHAPTER II

REVIEW OF LITERATURE

Diabetes is increasing in epidemic proportions

The epidemic of diabetes in the United States is an increasingly alarming area of concern. In 2007, an estimated 23.6 million persons, or about 7 percent of the population (US), had diabetes (1, 2). As the seventh leading cause of death by disease in the US, diabetes also contributes to higher rates of morbidity for heart disease, blindness, kidney failure, extremity amputations, and other chronic conditions. The burden to society resulting from this condition is quite substantial. For example, current estimates reveal that approximately 174 billion US dollars can be attributed to direct and indirect diabetes-related costs (12).

Further, the prevalence of diabetes increases with age with certain racial and ethnic minority populations exhibiting increased prevalence rates. The aging and increasing racial and ethnic diversity of the U.S. population implies a sizeable increase in the population with diabetes over the next several decades (12).

Older adults are increasing in number

According to the Federal Interagency Forum on Aging, life expectancy is a summary measure of the overall health of a population (13). It represents the average number of years of life remaining to a person at a given age if death rates were to remain constant. Reports indicate that life expectancy is increasing throughout the world. This

increase is accompanied by a similar increase in the occurrence of age-associated diseases (14). The World Health Organization reports 605 million persons (20%) worldwide are currently aged ≥ 60 years and population estimates suggest that in the year 2025 this number will have reached 1.2 billion, or 29%. (15). In the United States (US), improvements in health care have contributed to the linear increase in life expectancy and influenced growth of the older adult population (13,15). The US ranks second among all countries in the number of people 80 years of age or older, and the oldest-old population (age 85 and over) grew from 100,000 in 1900 to 4.2 million in 2000 (16,17). Over the 20th century, the older population in the US grew from 3 million to 35 million (16). In 2004, approximately 36.3 million people aged 65 and over lived in the United States, accounting for 12% of the total US population.

Older adults are North Carolina's (NC) fastest growing population. As of 2003, NC had a total of 1,016,241 residents over the age of 65. This age cohort (65 and older) experienced a 21% increase from 1990 to 2000 (18). For the same period, NC ranked twelfth among all states in the growth rate for residents over the age of 65 (19). While all other age cohorts are expected to decline in their proportions of the state total, the 65 and older cohort is expected to increase to 18% by 2030 (20). Additionally, the very old age cohort (85 and older) is expected to double, increasing approximately 150% (18).

The life expectancy of North Carolina residents is approximately 75.6 years compared to the national average of 77.2 years (21, 22). Minorities account for approximately 18% of older adults in NC. In addition, the state has a significantly higher proportion of older adult African Americans ages 65 and older (16%) than the U.S. (8%)

(23). Reports also indicate that in North Carolina, minority men and women do not live as long as their Caucasian counterparts; however, minorities still experience more years of poor health (24). Moreover, older adult women significantly outnumber older men representing 61% of the 65 and older population and 74% of the 85 and older population (23). The Federal Interagency Forum on Aging reports that the growth of the population age 65 and over affects many facets of our society, including policymaking and health care expenditures. By 2050, the forum also indicates that programs and services for older people will require greater flexibility to meet the needs of a more diverse population (17).

Health disparities exist in minority populations

One of the major goals of the Healthy People 2010 Initiative is to eliminate health disparities among different segments of the population, including differences that occur by race or ethnicity (25). The initiative defines health disparities as “the unequal burden in disease morbidity and mortality rates experienced by ethnic/racial groups as compared to the dominant group.” According to the U.S. Department of Health and Human Services (DHHS) (25), biologic and genetic variations among African Americans, Hispanics, American Indians, Alaska Natives, Asians, Native Hawaiians, and Pacific Islanders are not sufficient to rationalize the health disparities experienced by these groups compared to their white, non-Hispanic counterparts. A more plausible explanation is provided relating to the complex interaction among genetic variations, environmental or lifestyle factors, and health behaviors. The consequences of these disparities can range from greater financial burden, higher activity limitations, and greater years of poor health. Additionally, a higher proportion of older adult African Americans and Latinos,

compared to Caucasians, report that they have at least one of the seven most costly medical conditions in the US: asthma, cancer, heart disease, diabetes, high blood pressure, obesity, or depression (26, 27).

In 2001, cardiovascular disease (CVD), specifically coronary heart disease and stroke, was the leading cause of death for mature adult African Americans and Caucasians, accounting for 27% of deaths for these populations. However, African Americans appeared to be disproportionately affected with an 18% higher CVD death rate (28). Moreover, African Americans are twice as likely to be diagnosed with diabetes than non-Hispanic whites; are two times as likely to die from diabetes (2003); and have higher rates of diabetes-related complications (28). In North Carolina, African Americans are less likely than Caucasians to engage in physical exercise; only 24.5% of adults age 65 and over meet recommended levels of exercise, are less likely to eat the recommended amount of fruits and vegetables each day, and are more likely to be obese. (29). A recent report also confirms that 63% of adults in Guilford County, NC, are considered to be overweight or obese, and only 42% get enough physical activity (11), supporting the need for disease prevention/health promotion education programs.

Diet and exercise are modifiable risk factors

Kennedy (15) described healthy aging as the interaction between genes, environment, and lifestyle factors. Westendorp (14) reported that the most modifiable

lifestyle factors are diet and physical activity. Other researchers concur that dietary changes, physical activity, and body weight are modifiable lifestyle factors for which modest improvements have been shown to reduce risk for development of chronic diseases, such as Type 2 diabetes mellitus and cardiovascular disease (4, 5). The Centers for Disease Control and Prevention (CDCP) (30) report that three modifiable lifestyle behaviors (smoking, unhealthy diet, and physical inactivity) have been associated with the development of chronic diseases, specifically heart disease, cancer, stroke, and diabetes. Data from the CDCP also indicate that 80% of older adults in the US have at least one chronic condition, 50% have at least two, and approximately 95% of healthcare expenditures for older adults are used to treat chronic diseases (30, 31). Further, the Diabetes Prevention Program (DPP), a randomized clinical trial, established that modification of eating and exercise habits decreases the probability that individuals with impaired glucose tolerance will develop Type 2 diabetes (32). Participants in the trial (N = 3234) were 50% minority and 20% were 60 years of age or older. Results indicated that intensive lifestyle intervention was effective in all groups, decreasing the development of diabetes by 58%; however, for individuals aged 60 and over the intervention was significantly effective for reducing the development of diabetes by approximately 71%.

Pluijm et al. (33) examined the association between unhealthy lifestyle in young age, midlife and/or old age and physical decline in old age. The study (N = 1297) included participants in the Longitudinal Aging Study Amsterdam (LASA) and examined the following lifestyle factors: physical activity, body mass index (BMI), number of

alcohol drinks per week and smoking. Lifestyle in old age (55-85 years) was assessed at baseline, while lifestyle in young age (~25 years) and midlife (~40 years) was retrospectively determined. The authors reported that individuals reporting physical inactivity in both midlife and old age had an increased odds of physical decline in old age of 1.6 compared to those who were physically inactive in midlife and physically active in old age (95% CI 1.1-2.4).

Steyn et. al. (34) evaluated the literature for evidence regarding the relationship between diet and lifestyle and prevention of Type 2 diabetes. A number of clinical trials and cohort studies were examined including the Finnish Diabetes Prevention Study, the US Diabetes Prevention Program, Da Qing Study, Pima Indian Study, and the Iowa Women's Health Study. The authors found considerable evidence supporting the positive relationship between a healthy diet and lifestyle and prevention of diabetes. Results showed a decreased risk for diabetes in adults who were physically active and maintained a normal BMI throughout adulthood. Overweight adults with impaired glucose tolerance who voluntarily lost weight also exhibited a decreased risk for diabetes.

Healthy eating can reduce risk factors for chronic disease

Another key focus area of the Healthy People 2010 Initiative is nutrition and overweight. The goal is to promote health and reduce chronic disease associated with diet and weight. According to the American Dietetic Association (ADA), nutrition is a major determinant in successful aging, which the organization defines as the ability to maintain three key behaviors: (a) low risk of disease and disease-related disability, (b) high mental and physical function, and (c) active engagement of life (35). Dietary quality is noted for

its role in preventing or delaying the onset of chronic diseases such as Type 2 diabetes, coronary heart disease, certain cancers, and stroke (35). A healthy diet can also contribute to reduced risk for obesity, high blood pressure, and high blood cholesterol (36). Krinke (37) stated that along with other good health habits, nutrition can postpone functional disabilities in older adults. According to the 1999-2002 National Health and Nutrition Examination Survey (NHANES) data, dietary quality as determined by the Healthy Eating Index was rated “good” for a higher percentage of the population ages 65 and over (19%) than for people ages 45-64 (12%); however, a majority of older people still reported diets that needed improvement (67%) or were poor (14%) (17).

Dietary pattern has also been identified as a risk factor for chronic inflammation, thus increasing the risk of developing Type 2 diabetes in women (38). Results from a nested case-control study using the Nurses’ Health Study cohort (38) indicated that a diet high in sugar-sweetened soft drinks, refined grains, diet soft drinks, and processed meats while low in wine, coffee, cruciferous vegetables, and yellow vegetables was associated with an increased risk of diabetes (OR: 3.09; 95% CI: 1.99, 4.79).

Johnson (39) indicated that overweight and obesity are two of the most common nutrition-related chronic conditions experienced by older adults. Obesity can cause serious medical complications such as diabetes mellitus, impaired quality of life, and even cause premature death. In older adults, obesity can intensify age-related decline in physical function and cause frailty (40). The past four decades have seen a marked increase in overweight or obese for older adults. From 1960-1962, 18% of people ages 65-74 were obese and 55% were overweight. However, from 1999-2002, approximately

36 % were obese and 73% were overweight (17). Further, non-Hispanic black women ages 60 and over have a 14% prevalence for extreme obesity (BMI > 40) (41).

Diabetes is prevalent in older adults

Diabetes mellitus increased in the U.S. population by 61% from 1990 to 2001 (4.9% to 7.9%) and is highly prevalent in older adults (18.4% in those 65 years and older) and in ethnic populations such as African Americans and Hispanics (42). Also of concern is the large number of adult Americans with impaired fasting glucose (IFG), pre-diabetes, and cardiometabolic risk (13-14 M, 20+ M, and 40-50 M, respectively). Without lifestyle changes (dietary, physical activity, and body weight), these individuals are at increased risk for developing Type 2 diabetes and cardiovascular disease (CVD) over a 10-year period (42, 43).

Approximately 2.2 million African Americans have diabetes; 1.5 million have been diagnosed and an estimated 730,000 have yet to be diagnosed (44). This population is also four times more likely to be diagnosed with diabetes today compared to forty years ago. A ten to six ratio of African Americans to Caucasians exists for diagnosis of diabetes with Type 2 diabetes, accounting for 90% to 95% of all cases. Across all age groups, the prevalence of diabetes is higher among African-American women than among African-American men. Nearly one out of three African-American women aged 65 to 74 years has diabetes. The proportion of the African-American population that has diabetes rises from less than 1% for those younger than 20 years old to 32% for women aged 65 to 74 years old. Over the past decade, national health surveys have shown that the prevalence of diabetes for African Americans ages 40 to 74 has doubled from 8.9% in

1976-1980 to 18.2% in 1988-1994. NHANES III data (1988-1994) indicate that 11.2% of Caucasians aged 40 to 74 years had diabetes compared with 18.2% of African Americans. Death rates for people with diabetes were also significantly higher for African Americans when compared to Caucasian counterparts. Diabetes is the fifth leading cause of death for Americans aged 45 years or older. African Americans with diabetes are also more likely to develop diabetes complications and experience greater disability from the complications than Caucasians. For example, in 1994 there were 13,000 limb amputations among African Americans with diabetes, involving 155,000 days in the hospital (45).

Older adult African American women are at increased risk

Older adult African American women have specific health and nutrition needs that must be targeted in order to achieve an improved quality of life (46). These women also exhibit the highest prevalence of hypertension (> 75%) of any race/age subgroup. This group also exhibits an age-adjusted total mortality rate for heart disease that is two thirds higher than for Caucasian women (45). Additionally, African American women are twice as likely as both Caucasian women and African American men to be obese. The NHANES 1988-1994 survey showed that approximately 66% of African American women were either overweight or obese when compared to 45% for Caucasian counterparts (46).

Several intervention strategies targeting older women have been tested. Rainey and Cason (47) attempted to identify the determinants of dietary behaviors among the elderly in order to improve the effectiveness of nutrition interventions. The study

comprised a four-phase focus group research methodology. Approximately 92% of the women (N = 49) participating in the first phase were over the age of 65. The primary objective of this initial phase was to gain insight into the perceptions and attitudes of low-income older women towards nutrition practices. Results indicated that effective nutrition interventions involving low-income elderly women must use an ecological approach including behavioral and organizational changes, such as family structure and access and willingness to participate in food assistance programs.

Diabetes prevention has been successful

The aim of the Diabetes Prevention Program (DPP), a major US randomized clinical trial, was to determine whether either diet and exercise or metformin, an oral diabetes drug, could prevent or delay the onset of type 2 diabetes in people with impaired glucose tolerance (IGT) (32).

The trial included participants at high risk for developing type 2 diabetes from 27 clinical centers across the US. Participants (N = 2,324; 45% minority; 68% female; mean age = 51 years; average follow-up = 2.8 years) were randomly assigned to three treatment groups: lifestyle intervention, metformin, or placebo. The lifestyle intervention group received individualized, intensive one-on-one training with a case manager on diet, exercise, and behavior modification (16-lesson curriculum). Participants were encouraged to eat less fat and fewer calories and exercise for a total of 150 minutes a week with a goal of 7 percent loss of initial body weight.

The second group received 850 mg of metformin twice a day, while the third treatment group received a placebo drug. Additionally, the metformin and placebo

groups received information on diet and exercise; however, the intensive counseling received by the lifestyle intervention group was not provided to these groups. Results from the study indicated that the incidence of type 2 diabetes was 11.0, 7.8, and 4.8 cases per 100 person-years in the placebo, metformin, and lifestyle groups, respectively. Moreover, the lifestyle intervention group exhibited a 58 percent reduction in diabetes risk with participants aged 60 and older experiencing a greater decrease in risk of 71 percent.

Data from this study suggest that lifestyle interventions can have a profound impact on diabetes risk. These data also suggest that lifestyle interventions can be effective across gender and in minority populations. The findings from this study were also used to develop a diabetes prevention campaign, Small Steps, Big Rewards (48). The National Diabetes Education Program (NDEP) developed this campaign to target individuals at risk for diabetes, including those at high risk such as African Americans and older adults. The program encourages small steps such as modest weight loss, increased physical activity, and healthier eating habits that lead to big rewards such as diabetes prevention and prevention of diabetes related health complications (heart disease, stroke, blindness, kidney failure, and limb amputations) and increased quantity and quality of life.

Church-based health interventions are effective

A church-based obesity treatment for African American women using the Behavior Choice Treatment (BCT) approach was designed to promote weight loss and exercise. BCT is a 12 week obesity treatment that focuses on moderate behavior

changes, food choices, eating patterns and exercise in overweight women. The intervention was conducted in urban Maryland in two settings: university (N = 22 Caucasian women, N = 10 African American women) and church (N = 10 African American women).

Controlling for initial weight, the African-American church group experienced significantly greater weight change than either university group at post-treatment and all follow-up points and a significant difference was also seen among groups in total number of sessions attended with the African American church group attending more sessions (49). These results, though preliminary, indicate that treatment setting may play an important role in adherence rates, particularly in African American women.

Another church-based, 14-week weight loss intervention for African American women conducted in three urban African American churches (N = 39) found a mean weight loss of 4.5 kg in the intervention group (50). The National Heart, Lung, and Blood Institute Obesity Guidelines (51) recommends the implementation of culturally sensitive treatments including adapting treatment setting and staff and allowing modifications based on participant feedback and suggestions.

The North Carolina Black Churches United for Better Health project (52) was a four-year intervention trial that focused on fruit and vegetable consumption among rural African American adults in an effort to reduce the risk for certain cancers and chronic diseases. Fifty churches in rural, eastern NC were paired matched based on demographic and geographic characteristics and randomly assigned to either the 5-a-day intervention program or control. Both male and female African Americans (N = 2519) participated in

the study; however, participants were predominantly female, accounting for 73 percent of the study population. Individuals age 18 years and older participated with more than 52% of the population over the age of 50.

The researchers designed a 20-month multicomponent intervention using the Precede-Proceed model. The goals of the model are to explain health-related behaviors and environments and to design and evaluate the interventions needed to influence both the behaviors and the living conditions that influence them and their consequences. The Precede-Proceed framework is grounded in several disciplines of epidemiology; social, behavioral, and educational sciences; and health administration. The model emphasizes that health and health risks are determined by multiple factors, therefore efforts to effect behavioral, environmental, and social change must be multidimensional or multisectoral, and participatory (53).

Nutrition education materials were provided in monthly packets to each intervention church and included brochures, posters, banners, bulletin board materials, idea sheets, and church bulletin inserts. Lay health advisors or peer educators were used for social support purposes and to deliver portions of the program.

Analyses indicated that the intervention and control groups exhibited similar consumption of fruits and vegetables at baseline. However, at 2 year follow-up, the intervention group consumed 0.85 servings more than the control group ($P < .0001$). Also, the largest increases were observed in participants widowed or divorced (0.96 servings), 66 years and older (1 serving), and frequent church attendees (1.3

servings).The investigators authors concluded that women and older adults reported a greater impact of intervention activities.

Lighten Up, a 10 week church-based lifestyle program, (54) was developed in collaboration with a local African-American Christian community in South Carolina (N = 133). Participants were predominantly female (83%) and the program included a baseline health assessment, eight educational sessions that combined a scripture message and a health message, a short-term health check, and a long-term health check. At baseline, approximately three-quarters of the participants had two or more modifiable risk factors (overweight, hypertension, high cholesterol, or diabetes). Upon completion of the project, all participants had significant short-term reductions in weight (-2.3 pounds, $P<.01$), mean blood pressure (BP, -2.1 mm Hg, $P<.05$), and triglycerides (-11 mg/dl, $P<.05$). Additionally, participants who attended 75% or more of the educational sessions (N = 60) exhibited greater risk factor improvement than those attending fewer sessions.

Peer Educators can be an effective delivery tool

Research suggests that people are more likely to accept and personalize messages, and thus to change their attitudes and behaviors, if they believe the messenger is similar to them and faces the same concerns and pressures (55). Specific to minority populations, peer educators have been shown to be effective a delivery tool (a) targeted populations are more likely to participate and retention rates are increased in programs with lay health advisors or peer educators, (b) participants rate programs using peer educators as culturally relevant, and (c) satisfaction ratings of the programs are high (5, 9,

52). Williams et al. (9) report that peer education is one method of preparing a community to solve its own health problems.

Change for Life, or *Cambia tu vida*, is designed to encourage behavior modifications that reduce risk for diabetes and cardiovascular disease in minorities of African and Latino descent of both genders (N = 176; ages 40 year and over (46%)) (56). Preliminary results indicate that the intervention is effective and participant feedback suggests that the program is culturally appropriate and empowering through the train-the-trainer model. The train-the-trainer model essentially produces highly skilled peer educators. The model is based in part on the diffusion of innovation theory, which states that people tend to more readily adopt new information through their trusted social networks or peers (57).

A 6-month church-based weight loss pilot program using church members as health educators was developed to improve health of African-American adults (N = 40 participants; N = 2 health educators) (58). Participants were randomized to either an intervention delivered in the group setting or an intervention delivered in the individual setting. Two church members without any previous specialized training were trained to administer the program. The program retention rate was approximately 90%. The difference in weight loss and fat loss between the individual and group interventions was not statistically significant; however, at six months, a modest but significant mean weight loss was seen in all participants of 3.3 kg ($P < .05$). The authors concluded church members can be trained as health or peer educators to conduct lifestyle interventions in a church setting.

The Healthy Body/ Healthy Spirit trial examined the effectiveness of a culturally tailored, church-based fruit and vegetable and physical activity intervention compared to standard health education materials and also to examine the effectiveness of motivational interviewing (59). The multicomponent intervention included sixteen churches in Atlanta, GA (N = 906 individuals; ages 18 and over (mean 46 years); 74% female) randomly assigned to receive one of three treatment conditions: (1) standard education materials; (2) culturally-tailored self-help nutrition and physical activity materials; and (3) culturally-tailored self-help nutrition and physical activity materials with telephone based motivational interviewing.

At one-year follow-up, those individuals receiving the culturally-tailored materials (treatment conditions 1 and 3) exhibited significant changes between pretest and posttest scores in fruit and vegetable intake (1.13 servings for the culturally-tailored and motivational interviewing condition, 0.44 servings for the culturally tailored condition alone, and 0.17 servings for the standard materials condition). Total minutes of physical activity per week also increased significantly more for the culturally-tailored and motivational interviewing condition and the culturally-tailored condition alone compared to the standard materials condition.

Summary

Current literature shows that research programs to inform and educate the participants regarding healthy nutrition and lifestyle factors have been effective (11, 12, 28-33). However, despite these findings, increasing rates of disease and mortality suggest that large segments of the population remain uninformed and often misinformed

regarding the impact of lifestyle practices on overall health and quality of life. The fifth leading cause of death by disease in the US is diabetes which affects approximately 20.8 million individuals (1, 2). As the risk for Type 2 diabetes increases with age and among certain racial and ethnic groups, the growth of the older adult and minority populations contributes to the substantial burden to society resulting from this condition. More specifically, older adult African American women have specific health and nutrition needs that must be targeted in order to achieve an improved quality of life (46). Studies show that this population exhibits higher prevalence rates for hypertension, heart disease, obesity, and diabetes as compared to their Caucasian counterparts (45, 46). Moreover, one in every four African American women over the age of 55 has Type 2 diabetes (3). These data suggest that age, race, and, within race, gender are appropriate population criteria to target for reducing risk for Type 2 diabetes.

Additionally, peer educator and church-based approaches have been shown to be an effective delivery tool. In minority populations, peer educators offer numerous benefits that include: targeted populations that are more likely to participate, participants rate programs as culturally relevant, and satisfaction ratings of the programs are high. Also, health care programs have been offered in church settings; however, these have been limited to screening activities, with few focusing on lifestyle intervention programs (5, 9). Several studies employing the church-based approach found African American women were more likely to participate and exhibited higher rates for adherence to intervention when compared to studies conducted in other settings (49-50, 52).

This review highlights several areas that were investigated in this research. It is important to note that African American women 65 years and over were discussed as having an increased risk for diabetes; however this project targeted African American women 45 years and over because it is important to implement prevention strategies before an individual enters the risk category. The study explored the feasibility and efficacy of combining the use of peer educators and church settings to reduce the risk of diabetes in African American women.

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CHAPTER III

DEVELOPMENT OF A NUTRITION EDUCATION AND LIFESTYLE
INTERVENTION FOR AFRICAN AMERICAN WOMEN AT RISK
FOR TYPE 2 DIABETES

Introduction

Effective nutrition education interventions can enable individuals to improve their health and prevent diet-related chronic diseases. African Americans have higher rates of diet-related chronic conditions such as diabetes, hypertension, obesity, and certain cancers, and lag behind other Americans in meeting dietary recommendations, making it imperative that effective intervention strategies to prevent or delay morbidity and mortality are developed to specifically target this population (1). More specifically, a key focus area of Healthy People 2020 is the reduction of disease and economic burden of diabetes, and improved quality of life for all persons who have or are at risk for diabetes. (2). In the United States (US), nearly 24 million adults are affected by diabetes. Type 2 diabetes mellitus accounts for the majority of these cases (90-95%) and is one of the leading causes of death and disability, with total health care and related costs for the treatment of this condition exceeding \$170 billion annually (3). Moreover, minority populations in the US, specifically African Americans, exhibit a particularly high type 2 diabetes prevalence rate of approximately 15% compared to less than 10% for their Caucasian counterparts. According to data from the American Diabetes Association (ADA), 3.7 million African Americans over the age of 20 have diabetes. Compared to

their Caucasian counterparts, these individuals are almost twice as likely to suffer from diabetes. Similarly, reports indicate that 25% of African Americans between the ages of 65 and 74 have diabetes and one in every four African American women over age 55 also suffer from diabetes (4).

As Type 2 diabetes is almost completely preventable through lifestyle modification, the development of targeted messages and interventions is of great importance. Lifestyle modification is an effective prevention strategy for type 2 diabetes (5). This paper will describe the development and implementation of an 8-week nutrition and lifestyle education intervention delivered by trained peer educators in a church setting for African American women ages 45 years and older who are at risk for Type 2 diabetes. The intervention targeted this population because reports indicate that African American women (55 years and over) exhibit high rates of diabetes, consequently interventions must target individuals before they reach high risk status or have developed Type 2 diabetes (4).

Methods

Recruitment: In the early stages of project development, the researchers formed a community partnership with the Congregational Nurse Program at Moses Cone Health System (6) which provides registered nurses to local churches in Guilford County, NC. The primary function of the congregational nurse is to assist congregations with the development and implementation of a Health Ministry Program. We collaborated with the Congregational Nurse Program to identify potential churches to participate in our project. This partnership facilitated our access to church leadership whose support was

critical to our recruitment efforts. Additionally, the congregational nurse was familiar with the church membership and was able to direct potential participants to the research staff. The researchers were highly engaged not only with the Congregational Nurse Program, but also with the churches.

Participants were recruited from two predominantly African American churches in the same zip code of Guilford County, NC. Residents in this zip code are mainly African American (72%) with median household income of \$26,000, and 22% living below the poverty level (7). While the churches differed in denomination (Baptist and Lutheran), they were similar in size (less than 350 members), racial make-up (predominantly African American), and location (same zip code, less than three miles apart). Women were eligible if they were a resident of Guilford County, NC; self-identified as African American; aged 45 years and older; at risk for diabetes based on the American Diabetes Association risk test (8). Additional inclusion criteria included: (a) no significant or major illness that would prohibit or impede making dietary changes or participation in regular physical activity, and/or (b) willing to participate in an 8-week nutrition and lifestyle education intervention requiring weekly attendance at classes held in their church, (c) willing to receive only the nutrition and lifestyle education materials without the weekly classes.

Recruitment typically occurred during morning church services. A member of the research team attended several services and gave a brief presentation during the announcement portion of the service. Recruitment flyers were also distributed and posted throughout the church (**Appendix A**). Interested persons provided contact information

and were subsequently screened for eligibility. Eligible participants scheduled a baseline interview with the research assistants either in their home, at their church, in a research laboratory at UNCG, or at the local public library, as desired by the participants. During this 45- 60 minute interview, written informed consent was obtained (**Appendices C & D**). Recruitment was rolling for the duration of the study. All methods and materials were approved by the University of North Carolina at Greensboro Institutional Review Board for the protection of human subjects. All participants received a gift card to a local grocery store after completion of data collection at baseline, endpoint (8 weeks), and follow-up (12 weeks).

Measures

Diabetes Risk Test: All participants completed an initial screening to assess diabetes risk (**Appendix B**). The American Diabetes Association Risk Assessment is based on a 1995 study conducted by the Centers for Disease Control and Prevention using a representative sample of the US population through NHANES II data (8). The purpose of that study was to develop a simple questionnaire to “prospectively identify individuals at increased risk for undiagnosed diabetes.” The researchers were able to define “major historical risk factors” for undiagnosed Type 2 diabetes and develop classification trees to identify individuals at higher risk for previously undiagnosed diabetes. The classification tree developed incorporated age, sex, history of macrosomic infant, obesity, sedentary lifestyle, and family history of diabetes. Results indicated sensitivity, specificity, and predictive positive value as 79%, 65%, and 10%, respectively. For racial and ethnic

minority populations including non-Hispanic Blacks, sensitivity and specificity were 80% and 61% respectively.

Biochemical Assessment: Several studies have shown the importance of metabolic control of glucose, lipids, and blood pressure in individuals with diabetes (9). Research also supports the positive association between improved metabolic control and decreased risk of developing Type 2 diabetes (5). Biochemical assessment of selected diabetes-related clinical indicators (fasting concentrations of triglycerides (mg/dL), total cholesterol (mg/dL), low-density lipoprotein (LDL mg/dL)), high-density lipoprotein (HDL mg/dL), blood glucose (mg/dL), hemoglobin A1c (HbA1c %), and insulin (mg/dL)) were conducted by Spectrum Laboratory Network (Greensboro, NC). Blood was drawn by laboratory staff and analyzed at no cost to the participants. Participants were provided with a copy of results and encouraged to share the results with their personal physician.

General Health Questionnaire: All participants completed a general health questionnaire previously designed by our research group for use with older adults residing in central NC (10, 11). The questionnaire addressed socio-demographics (education, income, marital status), self-reported chronic conditions, and food security (**Appendix E**). Anthropometric measurements were also obtained as a part of this questionnaire. Height was measured without shoes to the nearest centimeter using a portable stadiometer (Seca, Hanover, MD) and weight was obtained using a digital scale (Tanita, Arlington Heights, IL). Waist and hip circumferences and sagittal diameter (Rosscraft, Surrey, BC, *Canada*) were also obtained. All anthropometric assessments,

except height which was obtained at baseline only, were taken at all three time points (baseline, endpoint (8 weeks), follow-up (12 weeks)).

Stages of Change for Healthy Eating: Participant stage of change for dietary change was addressed as the stages of change model states that behavior change does not happen in one step, rather, people tend to progress through different stages at their own rate (12). To assess stage, researchers administered a brief questionnaire to identify stage of change related to healthful eating (**Appendix F**). This assessment was conducted at baseline, endpoint (8 weeks), follow-up (12 weeks). The purpose was to develop a goal setting tool to inform future studies where individuals may receive individualized counseling. For example, a participant who is a precontemplator has no desire to change and should be provided with more basic information on the benefits of adopting better lifestyle habits and identifying any barriers and how to overcome or address them. Conversely, a participant who is in the action stage could be provided with maintenance strategies to aid them in continuing the healthy behaviors they are already practicing.

Food Habit Factors: Savoca et al. (13) derived 4 food habit factors and 15 associated habits related to glycemic control among adults with type 2 diabetes. Associated habits were categorized as: (a) basic eating practices including limiting the amount of high-sugar containing foods, limiting portions and eating low-fat foods for breakfast; (b) habits associated with challenges of eating include eating at buffets, fast-food and large chain restaurants, eating high-fat sources of protein; (c) meal planning habits including eating regularly, eating low-fat foods for lunch, and planning meals; and (d) carbohydrate and vegetable strategies habits including limiting specific carbohydrates and eating large

amounts of vegetables. The food habits of participants in this study were examined using a questionnaire derived from the 15 food habits identified by Savoca et al. (13) to be used as a goal setting tool and as markers of dietary behavior (**Appendix G**). This questionnaire was administered at baseline, endpoint, and follow-up.

Physical Activity Recall: Sallis et al. (14) developed a physical activity assessment to quantify and describe physical activity habits in community-based health education trials (**Appendix H**). According to the authors, the recall can quantify physical activity in populations, provide information on distribution of activity habits, and can detect changes over time. Subjects between the ages of 20 and 74 participated (N = 1,120 females; N = 1006 men; 17% minority) in the development of the assessment which examines work, sleep habits, and physical activity (moderate, hard, very hard). We administered the questionnaire at baseline, endpoint (8 weeks), and follow-up (12 weeks). All participants also received a pedometer (Omron, Warminster, PA) after the baseline interview as an additional physical activity monitoring tool. Participants were asked to record the number of steps walked per week using the pedometer which had a seven-day internal memory to assist in tracking. To further characterize self-reported physical activity, participants answered the MyPyramid.gov Plan assessment question which was addressed at baseline and follow-up (15).

Education Materials: The education materials were developed using the concepts of the Diabetes Prevention Program (DPP) and the National Diabetes Education Program's Small Steps, Big Rewards Program (5, 16). As we began planning and developing the intervention, we found that for the type of intervention that we wanted to deliver, limited

ready-to-use resources were available. The most seemingly appropriate materials were the DPP materials; however, they were not as culturally relevant as we would have liked, so we opted to develop materials using the same concepts. For example, using one of the concepts of the Small Steps, Big Rewards Program, and the researchers developed a CD featuring African American themed music to encourage physical activity (walking). While the DPP and Small Steps programs were used to inform conceptual development, the majority of the handouts were developed by the research team. The printed materials were colorful, used medium to large size font for ease of readability, and featured culturally appropriate images and messages.

The printed materials identified topics addressing lifestyle strategies relating to diet and exercise to prevent or delay the onset of Type 2 diabetes (including setting a short-term and long term goal related to the intervention, identifying daily energy and dietary fat needs, increasing physical activity, and making healthy food choices). The printed handout materials were not face validated; however, all printed materials were evaluated by two outside reviewers (community based registered dietitians working with patients with diabetes) for content and cultural validity. Their evaluations resulted in minor modifications of the intervention content and handout materials prior to the implementation of the project.

Project Description: This feasibility pilot study was an eight-week, two condition (treatment and control) repeated measures (pretest, posttest, and follow-up) design. The primary aim was to implement and evaluate a peer-led, nutrition, and lifestyle education intervention for African American women at risk for Type 2 diabetes. The project

utilized convenience sampling with a recruitment goal of 60 participants; however the actual target sample size was 50 women with the additional 10 participants allowing for dropouts at a rate of approximately 17%. The intervention phase of the study was eight weeks. While the literature indicates nutrition interventions of shorter and longer duration, including the DPP which was sixteen weeks, we chose eight weeks in consideration of the time burden for prospective participants. Recruitment for the intervention was designed so that participants were simultaneously enrolled in the intervention group and the usual care group. The intervention was also offered at different times of the day and days of the week to provide opportunity for participation by as many interested women as possible. The intervention was also held at the intervention church for convenience and familiarity of participants and the peer educator.

Intervention: Women in the intervention group met for eight weekly, peer-led, one-hour classes, held in a small education room and the social hall of the intervention church. The printed materials and class meetings identified topics to help participants prevent or delay the onset of Type 2 diabetes (including setting a short-term and long term goal related to the intervention, identifying daily energy and dietary fat needs, increasing physical activity, and making healthy food choices). Each class also consisted of a hands-on activity to reinforce the messages presented (**Table 1**). Goal setting and motivational activities were designed to help participants initiate realistic and sustainable lifestyle changes. The physical activity component of the intervention was designed to promote walking as a means of physical activity. Participants received detailed instruction during Week 1 of the intervention on how to develop and implement a walking program during

the eight week intervention. Each week the peer educator asked for updates on progress and participants were asked to report the number of steps walked using the pedometer that was provided. A music CD to encourage movement was also provided to each participant as a motivational tool. Retention efforts for the intervention group included weekly contacts with their peer educator through the education classes and access to the researchers to answer any questions about the intervention and the specific education materials being used.

Usual Care: The usual care control group received the same printed education materials used by the intervention group; however, the peer-educator led weekly classes to explain the materials and their usage to decrease the risk of diabetes were not provided.

Participants in the usual care control group received the education materials in a notebook after the initial data collection interview. This group also received the music CD and a pedometer to monitor number of steps walked. Retention efforts for the usual care control participants included a mailing of a general health newsletter at 3 and 6 weeks after their initial/pretest data collection and phone calls to schedule their appointments with a reminder phone call the day before their appointments for both the 8-week and 12-week follow-up interviews and blood drawing.

Peer Educators: Two African American women (age = 80 years and 50 years) from the intervention church were recruited with the assistance of the congregational nurse to serve as peer educators at that church. The peer educators had no formal training in diabetes; however, both were former public school elementary teachers. Prior to beginning the intervention, the peer educators received extensive training on

paraprofessionalism, or lay/peer education, from a Certified Health Educator at the university who regularly trains peer educators. The 6 hour training was based on the Bacchus Network's Certified Peer Educator Program (17). Along with the researchers, the peer educators were trained on several topics including Active listening; Audience Analysis; Facilitating Groups; Confrontation Skills; Stress Management; and the Peer Educator Code of Ethics. The training consisted of the traditional lecture style format in combination with more hands-on activities such as role playing and demonstrations. We also developed a detailed script to ensure adequate preparation of the peer educators. The script provided explicit, step by step instruction on content and how to deliver the intervention. Peer educators received intensive training from the researchers on the proper use, delivery, and content of all materials. Practice sessions were conducted to ensure adequate preparation and to evaluate readiness of the peer educators. The peer educators were compensated for their involvement in the intervention and received pay for training and preparation and delivery of all classes.

Process Measures: Process evaluation components were examined for dose, fidelity, exposure, and barriers. Dose refers to the amount of intervention the participants actually receive; while exposure encompasses dose received in addition to recall of messages, attendance and participation rates, awareness, and engagement. Potential barriers include impediments to the intervention, cultural relevancy, and overall satisfaction. Fidelity involves monitoring of delivery for completeness, accuracy, and adherence to intervention protocol (18, 19). Three researchers attended each class session and recorded information used for process evaluation, including attendance and delivery of

the intervention by the peer educator. The researchers sat away from the peer educator and class participants and did not participate in class instruction or discussion. Dose was measured as the researchers followed the delivery of each lesson, each time it was taught. The goal of this activity was to assess how accurately the peer educator delivered the intervention. To monitor exposure, another researcher made notes about the peer educator's techniques to engage the class participants and the responses she elicited from them regarding their use of the course information and examples of changes they were making, if any, based on the previous week's information and strategies. A third researcher noted the participant responses to questions asked by the peer educator as part of the script for each class.

Evaluation: Participants in both groups were asked to complete anonymous evaluations upon completion of the intervention. Each group received a different survey that was tailored to the group's experience (intervention or usual care) (**Appendices I & J**). Both surveys asked participants to rate the handouts for each week on a scale of 1-5, with 5 being excellent. Usual care participants were additionally asked to describe how many of the handouts were actually reviewed (i.e. some, few, all, none). This question was not asked of intervention participants as all handouts were reviewed in class. Questions related to satisfaction (i.e. most enjoyed and least enjoyed) were also addressed in the evaluation. Additionally, upon completion of the intervention, the peer educator completed an exit interview with the study coordinator to provide feedback on the intervention and recommendations for future studies.

Summary

This article describes the development and implementation of a nutrition and lifestyle education intervention for African American women at risk for type 2 diabetes. The study extends the body of literature on lifestyle interventions targeting minorities, specifically African American women. Findings of this study should be used for the further development of culturally relevant intervention strategies to prevent Type 2 diabetes mellitus among African American women in community-based settings.

Acknowledgements

The authors would like to acknowledge the Moses Cone Health System Congregational Nursing Program, Marian Whiteside (1932-2009) and Sandra Blaha; the women of Grace Lutheran Church and Gethsemane Missionary Baptist Church; and Ms. Bettye Hill and Ms. Diane Chang, peer educators. This study was supported by the TRIAD (Teamwork in Research and Intervention to Alleviate Disparities) Center (NCMHD/NIH 1P20MD002289-01).

Table 1. Project D.R.E.A.M. Intervention Group Program Description			
WEEK	TITLE	HANDOUTS*	ACTIVITY
1	Welcome/Introduction to Type 2 Diabetes/ How to Start a Walking Program	Let's Get Walking; How Do I Start A Walking Program; Walking the Right Way is Very Important; How Do I Stretch; Pedometer	Participants set one long-term and one short-term goal related to program
2	Fats & Food Labels	Types of fats; How to eat less fat; How to read a food label	Low fat versus high/regular fat taste challenge & reading food labels
3	Portion Control & Eating Out	Get A Grip on Portion Sizes; Serving Sizes: Everyday Objects; Serving Sizes are in Your Hand; Portion Distortion; Four Keys to Healthy Eating Out; What's on the Menu; Menu Make-Over; Restaurant Menu Glossary	Measuring MY Hand (portion size exercise)
4	My Pyramid	My Pyramid; Make Half Your Grains Whole Grains; Nutrition Fact Sheet- Whole Grains Made Easy; Vary Your Vegetables; Focus on Fruits; Calcium Rich Foods	My Pyramid website
5	Meal Planning	Traditional Breakfast & Building a Better Traditional Breakfast; Fast Food Breakfast & Building a Better Fast Food Breakfast; Building a Better Healthy Lunch & Building a Better Fast Food Lunch; Building a Better Dinner (What to Choose) & Building a Better Dinner; Guide to 50 Calorie Snacks	How to navigate the grocery store (powerpoint)
6	Recipe Modifications	Recipe Modifications; Modifying a Recipe to be Healthier; Nutrition Fact Sheet- Get Smart about Salt	Taste challenge modified recipe versus original recipe
7	Barrier Scenarios	None	Small group discussions to develop potential barrier scenarios and solutions
8	Completion & Evaluation	Completion Certificate	Potluck dinner with modified recipes provided by participants

*All handouts also provided to usual care (control) group in a notebook after their baseline data collection

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CHAPTER IV

PROJECT D.R.E.A.M. (DIABETES RISK- EDUCATING AFRICAN AMERICAN MATRIARCHS): A PROCESS EVALUATION

Abstract

This purpose of the article is to describe the process evaluation of Project D.R.E.A.M. (Diabetes Risk- Educating African American Matriarchs), a church-based pilot feasibility project targeting African American women at risk for Type 2 diabetes. Process evaluation involves the use of indicators that reflect how well interventions are delivered and received, and provides data on what, how, why, and for whom intervention programs work. It is an important component of development as results of process evaluation can provide essential information about how an intervention leads to successful behavior change. Additionally, process data allow for the characterization of pathways through which effective nutrition interventions operate, thus including process evaluation informs the development and implementation of future studies. Process evaluation components examined included dose, fidelity, exposure, and barriers. Several components of Project D.R.E.A.M. were successfully implemented as designed, while others were not. Classroom observations indicated that the peer educator did deliver the curriculum as designed (fidelity) and high attendance rates indicated high exposure to the intervention (dose). Two peer educators were trained to deliver the intervention classes; however, only one was able to remain for the duration of the intervention. Recruitment

and retention were recognized as potential barriers or impediments to intervention. To accommodate as many potential participants as possible, the intervention was offered at different times of the day and days of the week. The intervention was also held at the intervention church for convenience and familiarity of participants and the peer educator. Retention efforts included general health mailings for the usual care group and weekly peer educator contacts for the intervention group. Findings of this study can inform future development of more intensive, population specific intervention strategies to help prevent Type 2 diabetes mellitus among African American women in community-based settings.

Introduction

Program evaluation has been described as a systematic gathering, analysis and reporting of data about a program to inform decision-making not only about program effectiveness, but also program improvement. Reasons to conduct program evaluation include: (a) to ensure accountability to stakeholders (i.e. funding sources, volunteers, staff, or community); (b) to identify ways to improve a program; (c) to assess needs of target populations; (d) to improve the usefulness of program materials; (d) to conduct program comparisons; (f) to assess efficiency (i.e. cost-benefit analysis); and (g) to test research hypotheses (1).

A key component of program evaluation is process evaluation. This type of evaluation involves the use of indicators that reflect how well interventions are delivered and received, and provides data on what, how, why, and for whom intervention programs work. Results of process evaluation can provide essential information about how an

intervention leads to successful behavior change. Additionally, process data allow for the characterization of pathways through which effective nutrition interventions operate, thus including process evaluation informs the development and implementation of future studies (1-3). Campbell et al. used process evaluation for a church-based diet intervention to assess relationships between program exposure and implementation and study outcomes. Through process evaluation, the authors were able to characterize factors important for adoption, implementation, and maintenance of successful interventions (4).

Important process outcomes to consider are *dose*, *exposure*, *barriers* and *fidelity*. Dose refers to the amount of intervention the participants actually receive while exposure encompasses dose received in addition to recall of messages, attendance and participation rates, awareness, and engagement. Potential barriers include impediments to the intervention, cultural relevancy, and overall satisfaction. Fidelity involves monitoring delivery for completeness, accuracy, and adherence to intervention protocol (2, 3). Reports indicate that when process outcomes are considered at the onset of development, the likelihood of an intervention's success is greatly improved (5). This article describes the process evaluation of Project D.R.E.A.M. (Diabetes Risk- Educating African American Matriarchs), a church-based pilot feasibility study targeting African American women at risk for diabetes.

Methods

Research Design: Project D.R.E.A.M. was an eight-week, two condition (treatment and control) repeated measures (pretest, posttest, and follow-up) pilot feasibility study. The primary aim was to implement and evaluate a peer-led, church-based, nutrition and lifestyle education intervention for African American women at risk for Type 2 diabetes. A convenience sample of African American women aged 45 years and older was recruited from two predominantly African American churches in the same zip code of Guilford County, NC. Residents in this zip code are mainly African American (72%) with median household income of \$26,000, and 22% living below the poverty level (6). While the churches differed in denomination (Baptist and Lutheran), they were similar in size (less than 350 members), racial make-up (predominantly African American), and location (same zip code, less than three miles apart).

Using a simple coin toss method, one church was selected as the intervention site, while the other one church served as the usual care site. Participant selection criteria were categorized as follows: resident of Guilford County, NC; self-identified as African American; female aged 45 years and older; at risk for diabetes. Additional inclusion criteria included (a) no significant systemic or major illness that would prohibit or impede making dietary changes or participation in regular physical activity, and/or (b) willing to participate in an 8-week nutrition and lifestyle education intervention requiring weekly attendance at classes held in their church, (c) willing to receive only the nutrition and lifestyle education materials without the weekly classes.

Two women from the intervention church were trained to deliver the intervention (**Table 2**). The peer educators had no formal training in diabetes; however, both were former public school teachers. Prior to beginning the intervention, the peer educators received extensive training on paraprofessionalism, or lay/peer education, from a certified Health Educator at the university who regularly trains peer educators. The 6 hour training was based on the Bacchus Network's Certified Peer Educator Program (7). Along with the researchers, the peer educators were trained on several topics including Active listening; Audience Analysis; Facilitating Groups; Confrontation Skills; Stress Management; and the Peer Educator Code of Ethics. The training consisted of the traditional lecture style format in combination with more hands-on activities such as role playing and demonstrations. We also developed a detailed script to ensure adequate preparation of the peer educators. Peer educators received intensive training from the researchers on the proper use, delivery, and content of all materials. Practice sessions were conducted to ensure adequate preparation and to evaluate readiness of the peer educators. The peer educators received monetary compensation for participation in the intervention, including training sessions.

Researchers attended each class session and recorded information used for process evaluation, including attendance and intervention delivery. The delivery of each lesson was monitored to assess how accurately the peer educator delivered the intervention. To monitor exposure, another researcher made notes regarding the peer educator's techniques to engage the class participants and the responses she elicited from them regarding their use of the course information and examples of changes they were

making, if any, based on the previous week's information and strategies. A third researcher noted the participant responses to questions asked by the peer educator as part of the script for each class.

Evaluation: Participants in both groups were asked to complete anonymous evaluations upon completion of the intervention. Each group received a different survey that was tailored to the group's experience (intervention or usual care) (**Appendices I & J**). Both surveys asked participants to rate the handouts for each week on a scale of 1-5, with 5 being excellent. Usual care participants were additionally asked to describe how many of the handouts were actually reviewed (i.e. some, few, all, none). This question was not asked of intervention participants as all handouts were reviewed in class. Questions related to satisfaction (i.e. most enjoyed and least enjoyed) were also addressed in the evaluation. Additionally, upon completion of the intervention, the peer educator completed an exit interview with the study coordinator to provide feedback on the strengths and weaknesses of the intervention; training received, education materials and her recommendations for future studies. The open-ended interview was approximately two hours long and was not recorded.

Results & Discussion

Forty-nine women were screened for eligibility. However, five were excluded for the following reasons: one participant was excluded due to age (too young); one participant was excluded because she did not wish to provide blood samples; and three participants chose not to participate due to the time commitment involved. A convenience sample of 44 African American women (average age = 61 years \pm 8.93) at

risk for diabetes consented to participate in the study (N = 23, usual care (UC); N = 21, intervention (INT). A retention rate of 98% was achieved with one dropout in the intervention group. The dropout was unable to continue participation in the study due to personal reasons and was excluded from all analyses. While no dropouts occurred in the usual care group, two participants were excluded from analysis. One participant was missing some data at baseline and all endpoint data, and one participant was excluded because repeated blood analysis indicated questionable diabetes status. Therefore the total number of participants included in the analyses was 41 women (N = 21, UC and N = 20, INT). Participant diabetes risk was assessed for eligibility, with 36 of 41 categorized as high risk. Women in the intervention group were significantly older (UC = 58.1 ± 7.7 and INT = 64.2 ± 9.3 years) reported higher levels of education ($p = 0.018$ and 0.008 , respectively) (**Table 3**).

Eight groups of participants were enrolled between April 2008 and April 2009 (4 intervention groups; 4 usual care groups) (**Table 4**). Analysis revealed that of the 20 intervention participants; 8 participants attended all class sessions, 9 participants missed only 1 class session, 2 participants missed two class sessions, and 1 participant missed 4 class sessions. Eighty-five percent of intervention participants missed one or no classes and the participant who missed four class sessions did arrive earlier for subsequent classes to meet with the peer educator to go over the materials that were missed. Additionally, all four participants in the October 2008 – November 2008 class were present in all eight class sessions. The April 2008 – May 2008 and October 2008 – November 2008 classes both took place in the early evening (Thursday), while the June

2008 – August 2008 (Tuesday) and March 2009 – April 2009 (Wednesday) classes took place mid-morning.

Two peer educators were initially trained to deliver the intervention. However, after the initial class session, only one educator remained involved with the intervention. The second peer educator decided to discontinue involvement due to the extensive time commitment. Three researchers attended each class session and recorded information used for process evaluation, including attendance and delivery of the intervention by the peer educator. The researchers sat away from the peer educator and class participants and did not participate in class instruction or discussion. Dose was measured as the researchers followed the delivery of each lesson, each time it was taught (4 intervention groups). The goal of this activity was to assess how accurately the peer educator delivered the intervention. To monitor exposure, another researcher made notes regarding the peer educator's techniques to engage the class participants and the responses she elicited from them regarding their use of the course information and examples of changes they were making, if any, based on the previous week's information and strategies. A third researcher noted the participant responses to questions asked by the peer educator as part of the script for each class. While total script fidelity was not expected, the peer educator consistently followed the script very closely based on the researcher's monitoring of the delivery. No major deviations, deletions, or additions from or to the script were recorded. Additionally, the peer educator made significant efforts to engage all participants in the classroom discussion. To assess recall of messages, the script directed the peer educator to begin each class session with review

questions for the previous week's topics. Also, each class period ended with a review to reinforce the messages of the current session.

Intervention participants overwhelmingly reported that they most enjoyed the hands on activities that were incorporated into each class to reinforce messages. Usual care participants reported reviewing 'most' of the handouts. The majority of handouts were rated excellent; however, participants did indicate that some weeks contained an excessive number of handouts. In the exit interview at the completion of the study, the primary peer educator reported that she received adequate training and support from the researchers. However, she did report that her background in education was helpful and that if future studies used peer educators without an education background, additional training may be required. Other recommendations included having one and a half hour classes instead of one hour and removal of repetitive handouts.

Participants failed to consistently track their activity using the pedometer provided as a monitoring tool. Participant compliance was sporadic or nonexistent; therefore, we were unable to assess physical activity using the pedometer. Many participants reported repeated loss and difficulty remembering to use their pedometer despite our providing replacements and repeated training on use. Future studies may require more stringent monitoring efforts and motivation strategies to encourage consistent pedometer use. Additionally, the recall instrument that was used to quantify physical activity habits may not be the most suitable tool for use in this population. In the development stages, the researchers did consult an exercise physiologist on the most appropriate tool to use with this population and for the type of intervention we hoped to

implement. The instrument was previously validated in both genders and minorities were included; however, a different tool may be more appropriate, since the intervention group which was older and had fewer members who were still working.

Process evaluation data indicate that while several components of Project D.R.E.A.M. were successfully implemented, not all were executed as designed. Classroom observations by the researchers indicated that the peer educator did deliver the curriculum as designed. Attendance rates indicated high exposure to intervention and that participants were engaged and willing to participate in the intervention. Moreover, high attendance and retention rates indicate that the church setting appears to be an appropriate setting to recruit and intervene with this population. These findings parallel literature reports that indicate that the church setting promotes greater rates of adherence in African American populations and strengthen the argument that the church is an appropriate setting for nutrition education interventions targeting African American women (8-12). Additionally, research suggests that people are more likely to accept and personalize messages, and thus to change their attitudes and behaviors, if they believe the messenger is similar to them and faces the same concerns and pressures (13). Specific to minority populations, peer educators have been shown to be effective as a delivery tool and targeted populations are more likely to participate and retention rates are increased in interventions with lay health advisors or peer educators. (10, 14, 15). Williams et al. (15) report that peer education is one method of preparing a community to solve its own health problems. While the project was designed to be conducted by two peer educators

and two women were trained, only one educator conducted the majority of the classes for the first group, and was the only peer educator for the other three groups of classes.

Participants did not report dissatisfaction or lack of cultural relevancy as barriers. Similarly, the literature indicates that participants rate interventions using peer educators as culturally relevant, and satisfaction ratings of the interventions are high (10, 14, 15). However, our participants did report lack of support from family and friends; challenges of eating away from home and choosing healthier foods and smaller portions; food costs; recognizing that change takes time; and finding time and motivation to increase physical activity. Lack of social support has previously been reported by African American women as a common barrier to behavior change, especially physical activity (16). These barriers are problematic as they make instituting and maintaining diet and physical activity changes more challenging. Our project did contain a component designed to help participants develop strategies to overcome these types of barriers; however, a more significant amount of time may be required to more successfully address these concerns.

Conclusions

These process evaluation results illustrate the need for more formative research on how best to conduct this type of intervention. Suggestions for future studies include: (a) Conducting focus groups with the population of interest prior to beginning the intervention to obtain input on potential areas of concern related to diabetes prevention; and (b) face-to-face interviews at the conclusion of week 8 to elicit specific participant feedback about the intervention and their suggestions for improving the intervention. These data could be analyzed to determine suggestions for content, format, and delivery

that may enhance successful changes. Another method includes developing a more intensive education intervention that includes training a peer educator to meet weekly with each participant to provide additional support and motivation tailored to the individual's short term goals for nutrition and physical activity changes. In concert with the group support provided in the intervention classes, the individual counseling sessions would provide additional support which could intensify the intervention effects. The increasing incidence of Type 2 diabetes mellitus reveals a critical need for the development of efficacious, cost-effective intervention strategies that promote long-term lifestyle changes.

Acknowledgements

The authors would like to acknowledge the Moses Cone Health System Congregational Nursing Program, Marian Whiteside (1932-2009) and Sandra Blaha; the women of Grace Lutheran Church and Gethsemane Missionary Baptist Church; and Ms. Bettye Hill and Ms. Diane Chang, peer educators. This study was supported by the TRIAD (Teamwork in Research and Intervention to Alleviate Disparities) Center (NCMHD/NIH 1P20MD002289-01).

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4	My Pyramid	My Pyramid; Make Half Your Grains Whole Grains; Nutrition Fact Sheet- Whole Grains Made Easy; Vary Your Vegetables; Focus on Fruits; Calcium Rich Foods	My Pyramid website
5	Meal Planning	Traditional Breakfast & Building a Better Traditional Breakfast; Fast Food Breakfast & Building a Better Fast Food Breakfast; Building a Better Healthy Lunch & Building a Better Fast Food Lunch; Building a Better Dinner (What to Choose) & Building a Better Dinner; Guide to 50 Calorie Snacks	How to navigate the grocery store (powerpoint)
6	Recipe Modifications	Recipe Modifications; Modifying a Recipe to be Healthier; Nutrition Fact Sheet- Get Smart about Salt	Taste challenge modified recipe versus original recipe
7	Barrier Scenarios	None	Small group discussions to develop potential barrier scenarios and solutions
8	Completion & Evaluation	Completion Certificate	Potluck dinner with modified recipes provided by participants

*All handouts also provided to usual care (control) group in a notebook after their baseline data collection

Table 3. Project D.R.E.A.M. Participant Demographic Characteristics (Baseline)			
	Usual Care group	Intervention group	p value
Average age (y) (mean ± standard deviation)	(N=21) 58.1 ± 7.7	(N= 20) 64.2 ± 9.3	0.027¹
Age category			
45-50	3(14.3%)	4(20.0%)	0.088 ²
51-70	16(76.2%)	9(45.0%)	
≥ 71	2(9.5%)	7(35.0%)	
Education			
High school or GED	17(81.0%)	8(40.0%)	0.014²
Vocational training or associates degree	2(9.5%)	2(10.0%)	
BS degree or above	2(9.5%)	10 (50.0%)	
Monthly household income			
Dollars (mean ± standard deviation)	2725 ± 2158	3800 ± 3028	0.200 ¹
BMI (kg/m²) (mean ± standard deviation)	31.8 ± 7.4	34.0 ± 6.9	0.340 ¹
BMI category			
18.5-24.9 kg/m ²	3(14.3 %)	1 (5.0%)	0.437 ²
25-29.9 kg/m ²	8 (38.1%)	6(30.0%)	
≥30 kg/m ²	10 (47.6%)	13(65.0%)	
Reported physical activity			
<30 min	11 (52.4%)	15 (75%)	0.323 ²
30-60 min	4 (19.0%)	2 (10%)	
>60min	6 (28.6%)	3 (15%)	
Chronic conditions			
Number (mean ± standard deviation)	1.1 ± 1.0	2.1 ± 1.6	0.033¹
≤1	15 (71.4%)	9 (45.0%)	
≥2	6 (28.6.0%)	11 (55.0%)	
Diabetes risk			
Very Low 0-2	0 (0 %)	0 (0 %)	0.020²
Low to medium 3-9	5 (23.8%)	0 (0 %)	
High 10+	16 (76.2%)	20 (100%)	

¹ P value for t-test analyses

² P value for χ^2 analyses

Table 4. Project D.R.E.A.M. Participant Enrollment		
ENROLLMENT PERIOD	Intervention N = 20	Usual Care N = 23**
April 2008 – May 2008 (Thursdays, 6:00 pm)	6*	18
June 2008 – August 2008 (Tuesdays, 10:00 am)	6	1
October 2008 – November 2008 (Thursdays, 6:00 pm)	4	3
March 2009 – April 2009 (Wednesdays, 10:00 am)	4	1

**Seven (7) enrolled but 1 withdrew after week 2 due to increased caregiver responsibilities.*

***Two participants excluded from analyses (N= 21)*

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CHAPTER V

RESULTS OF A PILOT FEASIBILITY STUDY: PROJECT D.R.E.A.M. (DIABETES RISK: EDUCATING AFRICAN AMERICAN MATRIACHS)

Abstract

Objective: To determine whether a sample of African American women aged 45 years and older at risk for Type 2 diabetes who participate in an 8-week nutrition and lifestyle education intervention delivered by trained peer educators in a church setting improve their dietary practices and physical activity.

Design: A pilot feasibility study with a two (usual care (UC) and intervention (INT) by three (baseline, 8 weeks, and 12 weeks) repeated measures design.

Setting: The study was conducted at two predominantly African American churches in central North Carolina.

Participants: Forty one women ($61.1 \text{ years} \pm 8.92$) completed the study.

Main Outcome Measures: Outcome measures of interest were selected dietary practices (intakes of kilocalories, protein, carbohydrates, fats, sodium, cholesterol, and fiber), body composition (weight, waist circumference, and sagittal diameter), and selected blood lipid markers (total cholesterol, LDL, and triglycerides) associated with diabetes risk.

Results: Significant changes in fiber intake over time were found with the intervention group reporting an increase and the usual care group reporting a decrease, with no between group differences ($\text{INT} = 10.9 \text{ to } 12.5 \text{ g}$ and $\text{UC} = 12.7 \text{ to } 9.6 \text{ g}$, $p = 0.031$).

Group by time differences were found for total fat with the intervention group significantly decreasing intake ($p = 0.013$). When age and total number of chronic conditions were added as covariates, total carbohydrate intake was significantly different over time ($p = 0.025$, age 0.007, chronic conditions). The intervention group reported an increase, while the usual care group reported a decrease in the carbohydrate intake (grams). Group by time differences were also found for monounsaturated fat ($p = 0.045$) and percent of energy from fat ($p = 0.022$). At endpoint and follow-up, reported limiting or restricting high sugar foods and limiting portion sizes, was significantly different between groups ($p = 0.04$). There was also a significant difference for reported limiting or restricting high sugar foods and limiting portion sizes, with the treatment group reporting greater adherence to these food habits. Within group analysis showed that the usual care group also made significant changes in food habits including limiting or restricting high sugar foods ($p = 0.005$, limiting portion size ($p = 0.016$) and limiting high fat foods ($p = 0.016$). No significant differences were found for mean changes in weight, body composition, or physical activity for participants in either group throughout the study.

Conclusions: Significant dietary changes indicate that targeted messaging was successful for the both the intervention and usual care groups. African American women in this study were receptive to health messages and completed the intervention.

Additionally, based on attendance and retention rates, the church, appears to be an appropriate setting to deliver this type of intervention and, using trained peer educators, can be an effective delivery approach. Findings of this study can be used for the further

development of culturally relevant intervention strategies to prevent Type 2 diabetes mellitus among African American women in community-based settings.

Key Words: Diabetes, African American, Women, Church-based, Peer-educator

Introduction

Diabetes is a major public health problem that in conjunction with obesity and insulin resistance has been described as a worldwide epidemic. In 2000, it was projected that the number of individuals with diabetes worldwide would increase from 135 million to 300 million by 2025 (1). Moreover, minority populations in the US, specifically African Americans, exhibit a particularly high Type 2 diabetes prevalence rate of approximately 15% compared to less than 10% for their Caucasian counterparts. According to data from the American Diabetes Association (ADA), 3.7 million African Americans over the age of 20 have diabetes. Compared to their Caucasian counterparts, these individuals are almost twice as likely to suffer from diabetes. Similarly, reports indicate that 25% of African Americans between the ages of 65 and 74 have diabetes and one in every four African American women over age 55 also suffer from diabetes (3). Since the risk for type 2 diabetes increases with age and is higher for certain racial and ethnic groups, the growth of older adult and minority populations constitutes a substantial future burden to American society. While older adults have an increased risk for diabetes, implementing successful risk-reduction interventions before an individual develops Type 2 diabetes is important.

As type 2 diabetes is almost completely preventable through lifestyle modification, the development of targeted messages and interventions is of great importance. Reports indicate that lifestyle modification, including diet and physical activity is an effective prevention strategy for type 2 diabetes (4). Given that African Americans have higher rates of type 2 diabetes and other diet-related chronic conditions

such as hypertension, obesity, and certain cancers and fall behind other Americans in meeting dietary recommendations, it is imperative that effective intervention strategies to prevent or delay onset of diabetes are developed to specifically target this population (5). Hoerger et al. (6) found that screening overweight and obese adults for pre-diabetes and providing subsequent lifestyle intervention was not only cost-effective, but also improved quality of life. Dietary changes, physical activity, and body weight are modifiable lifestyle factors for which modest improvements have been shown to reduce risk for development of Type 2 diabetes mellitus and cardiovascular disease (7, 8). Data from the Diabetes Prevention Program (DPP) trial suggest that lifestyle interventions can have a profound impact on diabetes risk. These data also suggest that lifestyle interventions can be effective across gender and in minority populations (9).

Additionally across all populations, Americans experience health burdens that can be prevented or improved through physical activity. Physical inactivity has been associated with the occurrence of heart disease, hypertension, stroke, diabetes mellitus, and certain cancers, and African Americans are disproportionately affected by these conditions, yet rates of physical activity remain low in this population (10). More specifically, physical activity and exercise have been shown to positively impact health status in women; however, African American women in all age groups report less regular exercise than their Caucasian counterparts (11). Further, adults who were physically active and maintained a normal BMI throughout adulthood exhibit a decreased risk for diabetes (12).

Reports indicate that setting may be an important influence on the success of interventions. The church has been described as a potentially effective setting as its mission is usually closely aligned with the goals of health promotion programs/interventions. In addition, studies employing the church-based approach found African American women were more likely to participate and exhibited higher rates of adherence to interventions when compared to studies conducted in other settings (13-16). Further, in minority populations peer educators have been shown to be an effective delivery tool: (a) targeted populations are more likely to participate and retention rates are increased in interventions with lay health advisors or peer educators, (b) participants rate interventions using peer educators as culturally relevant, and (c) satisfaction ratings of the interventions are high (8, 13, 16). Williams et al. (13) report that peer education is one method of preparing a community to solve its own health problems.

While large scale interventions such as the DPP have reported benefits of diabetes education programs, there is a need to institute the strategies and lessons from these types of interventions on a smaller, more intimate, community level. The methods described in larger scale interventions are generally more expensive to conduct and are therefore, less practical at the community level. Feasibility is a major concern and must be explored before widespread, community-based interventions can be instituted. Therefore, the purpose of this pilot feasibility study was to implement and evaluate an 8-week nutrition and lifestyle education intervention delivered by trained peer educators in a church setting for a sample of African American women ages 45 years and older at risk for Type 2 diabetes mellitus by improving their dietary practices and physical activity.

Methods

A pilot feasibility study with a 2 x 3 usual care and treatment (baseline, 8 weeks, and 12 weeks) repeated measures design was developed. In partnership with the Congregational Nurse Program at Moses Cone Health System in Guilford County, NC, and the church leadership, two African American churches were recruited to participate in this project. Both churches reported a congregation size of less than 350 members and geographically the churches are in the same zip code, approximately three miles apart. Using a coin toss method, one church was randomly assigned to serve as the usual care (control) church and one was assigned to serve as the intervention (treatment) church. Participants were selected based on the following criteria: resident of Guilford County, NC; self-identified as African American; females aged 45 years and older; at risk for diabetes. Additional inclusion criteria included: (a) no significant systemic or major illness that would prohibit or impede making dietary changes or participation in regular physical activity, and/or (b) willing to participate in an 8-week nutrition and lifestyle education intervention requiring weekly attendance at classes held in their church, (c) willing to receive only the nutrition and lifestyle education materials without the weekly classes.

Participant Recruitment & Screening: Recruitment typically occurred during morning church services. A member of the research team attended several services and gave a brief presentation during the announcement portion of the service. Recruitment flyers were also distributed and posted throughout the church (**Appendix A**). Interested persons provided contact information and were screened for eligibility and diabetes risk.

Diabetes risk was assessed using the American Diabetes Association assessment which categorizes risk as very low, low to medium, or high risk (14). The assessment examines the following risk factors to determine risk: age, weight, family and gestational history, and exercise habits (**Appendix B**).

Data Collection: Eligible participants scheduled a baseline interview with the research assistants either in their home, at their church, in a research laboratory at UNCG, or at the local public library, as desired by the participants. During this 45- 60 minute interview written informed consent was obtained (**Appendices C & D**). All methods and materials were approved by the University of North Carolina at Greensboro Institution Review Board for the protection of human subjects.

Researchers trained by study coordinators conducted all interviews for data presented here which included: anthropometric assessments; General Health Questionnaire; 24 hour recall; Food Habits questionnaire; Stages of Change, and Physical Activity questionnaire.

Anthropometrics: Height was measured without shoes to the nearest centimeter using a portable stadiometer (Seca, Hanover, MD) and weight was obtained using a digital scale (Tanita, Arlington Heights, IL). Waist and hip circumferences and sagittal diameter (Rosscraft, Surrey, BC, Canada) were also obtained. All measurements, except height which was obtained at baseline only, were taken at all three time points (baseline, endpoint (8 weeks), follow-up (12 weeks)).

General Health Questionnaire: Previously designed by our research group for use with older adults residing in central NC, the questionnaire addressed socio-demographics (education, income, marital status), self-reported physical activity, self-reported chronic conditions, and food security (15, 16) (**Appendix E**). The questionnaire was administered at baseline only with the exception of a self-reported physical activity using the MyPyramid.gov Plan assessment question which was addressed at baseline and follow-up (17).

Biochemical Indicators: Biochemical assessment of fasting concentrations of triglycerides (mg/dL), total cholesterol (mg/dL), low-density lipoprotein (LDL mg/dL), high-density lipoprotein (HDL mg/dL), blood glucose (mg/dL), hemoglobin A1c (HbA1c %), and insulin (mg/dL) were conducted by Spectrum Laboratory Network (Greensboro, NC). Blood was drawn by laboratory staff and analyzed at no cost to the participants. Participants were provided with a copy of results and encouraged to share the results with their personal physician.

Dietary Intake: Dietary intake data from a single, face-to-face 24-hour dietary recall at 3 time points (baseline, endpoint, and follow-up) were coded and analyzed using the Nutrition Data System for Research (NDS-R) software version 2007, developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN.

Stage of Change: Participants completed a brief questionnaire developed by the researchers to identify stage of change related to healthful eating. This assessment was conducted at baseline, endpoint, and follow-up to further characterize participants (**Appendix F**).

Food Habits Questionnaire: Savoca et al. (18) derived 4 food habit factors and 15 associated habits related to glycemic control among people with type 2 diabetes. Associated habits were grouped as: (1) basic eating practices including limiting the amount of high-sugar containing foods, limiting portions and eating low-fat foods for breakfast; (2) habits associated with challenges of eating include eating at buffets, fast-food and large chain restaurants, eating high-fat sources of protein; (3) meal planning habits include eating regularly, eating low-fat foods for lunch, and planning meals; and (4) carbohydrate and vegetable strategies habits include limiting specific carbohydrates and eating large amounts of vegetables. The food habits of study participants were examined using a questionnaire derived from the 15 food habits identified by Savoca et al. (18) to determine possible risk reduction strategies, be used as a potential goal setting tool, and as markers of dietary behavior (**Appendix G**). The questionnaire was administered at each data collection point.

Physical Activity: In the development stages, the researchers consulted an exercise physiologist on the most appropriate tool to use with this population and for the type of intervention we hoped to implement. Sallis et al. (19) developed and validated in a population that was 17% minority and 53% female, a physical activity assessment to quantify and describe physical activity habits in community-based health education trials. The recall quantifies physical activity in a population, provides information on distribution of activity habits, and detects changes over time. The assessment examines work, sleep habits, and physical activity which are then classified into moderate, hard, very hard categories (**Appendix H**). We administered the questionnaire at baseline,

endpoint (8 weeks), and follow-up (12 weeks). All participants also received a pedometer (Omron, Warminster, PA) after the baseline interview as an additional physical activity monitoring tool. The researchers completed the initial set-up of pedometers. Detailed instruction was provided on proper use and the instruction manual was reviewed and given to the participant for future reference. Participants were asked to record the number of steps walked per week using the pedometer which had a seven-day internal memory to assist in tracking.

Peer Educator Training: Two African American women (age = 80 years and 50 years) from the intervention church were recruited with the assistance of the congregational nurse to serve as peer educators at that church. The peer educators had no formal training in diabetes education; however, both were former public school elementary teachers. Prior to beginning the intervention, the peer educators received extensive training on paraprofessionalism, or lay/peer education, from a Certified Health Educator at the university who regularly trains peer educators. The 6 hour training was based on the Bacchus Network's Certified Peer Educator Program (20). Along with the researchers, the peer educators were trained on several topics including Active listening; Audience Analysis; Facilitating Groups; Confrontation Skills; Stress Management; and the Peer Educator Code of Ethics. The training consisted of the traditional lecture style format in combination with more hands-on activities such as role playing and demonstrations. We also developed a detailed script to ensure adequate preparation of the peer educators for delivery. Peer educators received intensive training from the researchers on the proper use, delivery, and content of all materials. Practice sessions were conducted to ensure

adequate preparation and to evaluate readiness of the peer educators. The peer educators were compensated for their involvement in the intervention and received pay for training and all participation.

Intervention: A detailed script for the class sessions was developed by the researchers. The printed handout materials that were also developed by the researchers and the script were evaluated by two outside reviewers (community based registered dietitians (1 Caucasian and 1 African American) working with patients with diabetes) for content and cultural validity. Their evaluations resulted in minor modifications of the education content and handout materials. However, the materials were not face validated by the target audience prior to use in the intervention. The researchers attended each session and monitored the content delivery (completeness and accuracy) throughout the intervention. All participants received a small gift card to a local grocery store for completing each data collection period (baseline, 8 weeks, 12 weeks). Additionally, all participants received a pedometer (Omron) after the baseline interview to monitor physical activity (number of steps).

Women in the intervention group met for eight weekly, one-hour classes, held in a small education room and the social hall of the intervention church. The nutrition and lifestyle materials were developed using the concepts of the Diabetes Prevention Program and the National Diabetes Education Program's Small Steps, Big Rewards Program (9, 21). The printed materials and class meetings identified topics to help participants prevent or delay the onset of Type 2 diabetes (including setting a short-term and long term goal related to the intervention, identifying daily energy and dietary fat needs,

increasing physical activity, and making healthy food choices). Each class also consisted of a hands-on activity to reinforce the messages presented (**Table 5**). The physical activity component of the intervention was designed to promote walking as a means of physical activity. Participants received detailed instruction during Week 1 of the intervention on how to develop and implement a walking program during the duration of the eight week intervention. Each week the peer educator asked for updates on progress and participants were asked to report the number of steps walked using the pedometer that was provided. A music CD to encourage movement was also provided to each participant as a motivational tool.

Usual Care: The usual care control group received the same printed education materials used by the intervention group; however, the peer-educator led weekly classes to explain the materials and their usage to decrease the risk of diabetes were not provided.

Participants in the usual care control group received the education materials in a notebook after the initial data collection interview. This group also received the music CD and a pedometer to monitor number of steps. Retention efforts for the usual care control participants included a mailing of a general health newsletter at week 3 (healthy recipes) and week 6 (Fat and Calorie Tracker) after their initial/pretest data collection, a postcard mailing to remind them about their 8-week (posttest) and 12-week follow-up interviews/blood drawing, and phone calls to schedule their appointments.

Statistical Analysis

All analyses were conducted using SPSS for Windows version 15.0 (SPSS Inc., Chicago, IL). Differences in baseline characteristics were determined with t-test or Chi-

Square analysis ($p < .05$). Differences in intakes of energy, normalized based on 1000 kilocalories, (kcal); grams (g) of protein (PRO), fat (FAT), carbohydrate (CHO), saturated fatty acids (SFA), monounsaturated fatty acids (MFA), polyunsaturated fatty acids (PUFA) and fiber; milligrams (mg) of cholesterol and sodium; percent of total energy from protein, fat, and carbohydrate; body weight and composition; and physical activity between groups over time and by group were determined by repeated measures analysis of variance (RMANOVA). Age, education, total number of chronic conditions, and diabetes risk were added as covariates since differences occurred between groups at baseline.

Results

Forty-nine women were screened for eligibility. However five were excluded for the following reasons: one participant was excluded due to age; one participant was excluded because she did not wish to provide blood samples; and three participants chose not to participate due to the time commitment involved. A convenience sample of 44 African American women (average age = 61 years \pm 8.93) at risk for diabetes consented to participate in the study (N = 23, usual care (UC); N = 21, intervention (INT)). A retention rate of 98% was achieved with one dropout in the treatment group. The dropout was unable to continue participation in the study due to personal reasons and was excluded from all analyses. While no dropouts occurred in the usual care group, two participants were excluded from analysis. One participant was missing some baseline data and all endpoint data and one participant was excluded because repeated blood analysis indicated questionable diabetes status. Therefore, the total number of

participants included in analyses was 41 women (N = 21, UC and N = 20, INT).

Participant diabetes risk was screened for eligibility, with 36 of 41 categorized as high risk. Women in the INT group were significantly older (UC = 58.1 ± 7.7 and INT = 64.2 ± 9.3 years) reported higher levels of education ($p = 0.018$ and 0.008 , respectively). Age and education were subsequently treated as covariates, along with total number of chronic conditions and diabetes risk. Mean BMI was 32 kg/m^2 for the UC care group and 34 kg/m^2 for the INT group with approximately 85% of the UC group classified as overweight or obese and 95% of the INT group classified as overweight or obese (**Table 6**).

Body weight and body composition did not improve over time for participants in either group and no between group differences were found (Table 13, **Appendix K**).

No significant differences were found by time or by group for the clinical indicators of interest (total cholesterol, LDL, triglycerides). However, total cholesterol level for both groups was below ATP III guidelines for optimal total cholesterol of $< 200 \text{ mg/dL}$. Triglyceride levels were below recommended levels of $< 150 \text{ mg/dL}$ for both groups, while mean LDL cholesterol slightly exceeded recommended levels of $< 100 \text{ mg/dL}$ (Table 14, Appendix K) (22). Fasting blood glucose, insulin, and HbA1C were measured to confirm self-report of no Type 2 DM diagnosis and group means were within recommended ranges (Data not shown). As previously mentioned, one participant was excluded due to probable Type 2 DM as indicated by fasting glucose measures.

Energy and nutrient intake by group and time are summarized in **Table 7**.

Average overall energy intake for the usual care group was 1343 kcal and 1290 kcal for the intervention group. Reported intakes were assessed for underreporting and analysis did not reveal outliers using box-plot diagramming. To control for differences in total energy intake, selected nutrients were calculated per 1000 kcal prior to data analysis (**Table 7**). Significant changes in fiber intake over time were found with the intervention group reporting an increase and the usual care group reporting a decrease, with no between group differences (INT = 10.9 to 12.5 g and UC = 12.7 to 9.6 g, $p = 0.031$). Group by time differences were found for total fat with the intervention group significantly decreasing intake ($p = 0.013$), while the usual care group remained almost unchanged over time. When age and total number of chronic conditions were added as covariates, total carbohydrate intake was significantly different over time ($p = 0.025$ and 0.007 , respectively). The intervention group reported an increase, while the usual care group reported a decrease in carbohydrate intake (grams). Group by time differences were also found for monounsaturated fat ($p = 0.045$) and percent of energy from fat ($p = 0.022$).

Analysis of reported meals did not reveal any consistent eating patterns for participants in either group. Neither 24-hour recall (NDS-R) nor food habit questionnaires revealed consistent consumption of 3 meals plus a snack or other healthy meal combination (i.e. 5-6 small meals/day). In fact, the typical daily meal pattern reported by all participants was two meals a day, for both weekdays and weekends. (Table 15, **Appendix K**).

Analysis of participants' reported food habits using the food habit questionnaire revealed significant differences at baseline between groups for limiting eating at buffets, fast food, and large chain restaurants, and consumption of three meals per day, with the intervention group reporting a higher percentage of participants reporting these as regular food habits ($p = 0.050$ and 0.019 , respectively). However, this difference did not remain at endpoint or follow-up, as more usual care group members reported these behaviors than at baseline. At endpoint, there was a significant difference between groups for limiting or restricting high sugar foods and limiting portion size, with the intervention group reporting a significantly higher percentage who reported these as regular food habits ($p = 0.040$ and 0.020 , respectively). At follow-up, a significant difference remained for limiting or restricting high sugar foods ($p = 0.040$). At follow-up, more usual care respondents reported limiting portion size so that groups were no longer different for that behavior. Overall, both groups reported limiting portion sizes to a greater extent at follow-up compared to baseline. Additionally, at follow-up, there was a significant difference between groups for limiting high fat foods with the intervention group reporting greater numbers who report this a regular food habit ($p = 0.020$) (**Table 8**). Within group analyses revealed that at baseline a significantly greater proportion of usual care participants reported that they avoided red meat, fried meat, and sandwich meats ($p = 0.001$), compared to those who did not. Though not significant at endpoint, significance returned at follow-up ($p < 0.001$). Also at baseline, more usual care participants reported consumption of more than one vegetable at a meal ($p = 0.050$). This habit remained significant at endpoint and follow-up ($p = 0.016$ and 0.005 , respectively).

Other food habits for the usual care group that were significant at endpoint and remained at follow-up were: (a) limiting or restricting high sugar foods ($p = 0.005$, endpoint and follow-up); (b) limiting portion size ($p = 0.016$, endpoint and $p = 0.001$, follow-up); (c) limiting high fat foods ($p = 0.016$, endpoint and $p = 0.016$, follow-up); (d) eating low fat foods for breakfast ($p < 0.001$, endpoint and $p = 0.001$, follow-up); and (e) limiting starchy foods or breads ($p = 0.016$, endpoint and $p = 0.001$, follow-up) (**Table 9**). A higher proportion of intervention group participants reported limiting or restricting high sugar foods; limiting buffets, fast food, or large chain restaurants; avoiding red meat, fried meat, and sandwich meats; eating two vegetables or a combination of a vegetable and a salad; and eating more than one vegetable at a meal at baseline ($p = 0.007$; $p = 0.002$; $p < 0.001$; $p = 0.025$; and $p = 0.025$, respectively). Significance remained at endpoint and follow-up for all habits mentioned above ($p < 0.001$) except eating two vegetables or a combination of a vegetable and a salad which was significant at follow-up ($p = 0.002$), but not at endpoint. At endpoint only, a significantly greater proportion reported eating low fat foods for breakfast ($p < 0.001$) and limiting starchy foods or bread ($p < 0.001$). At follow-up only, a larger percentage of the intervention group reported choosing low fat menu items ($p = 0.007$) and eating low fat foods for lunch ($p = 0.025$) (**Table 10**).

Analysis of Stage of Change for diet behaviors revealed no significant differences at baseline or endpoint; however, at follow-up there was a statistically significant difference between groups with the intervention group reporting more participants in the action stage ($p = 0.028$) (**Table 11**).

At baseline, 52% of usual care participants and 75% of intervention participants reported less than 30 minutes of vigorous activity most days of the week when asked the MyPyramid.gov Plan physical activity assessment question (17). Using the Sallis et al. (19) physical activity recall, means for the two groups (usual care and intervention) were compared for total hours of physical activity categorized into the following groups: moderate; hard; and very hard (**Table 12**). No significant differences were found between groups for physical activity using the Sallis recall. This recall also revealed that most participants reported little to no physical activity that was not occupation or household related. Negligible leisure time physical activity was indicated and, when reported, was primarily limited to low-intensity walking. Results indicate that participants did not meet the American College of Sports Medicine (ACSM) and American Heart Association (AHA) recommendation of 60 to 90 minutes of daily physical activity for overweight or obese individuals trying to lose weight (23). Also, while pedometers were provided to each participant as an additional physical activity monitoring and tracking tool, pedometer use by participants was not consistent; therefore, we are not able to report these findings.

Discussion

The goal of this study was to determine whether a sample of African American women aged 45 years and older and at risk for Type 2 diabetes who participate in an 8-week nutrition and lifestyle education intervention delivered by trained peer educators in a church setting would improve their dietary practices and physical activity. In

comparison with similar studies, results indicate that our pilot project was modestly successful.

Significant differences were found for fiber intake with the intervention group exhibiting greater improvements. Total fat intake decreased significantly in the intervention group, while carbohydrate intake increased. This implies that targeted messages about fat intake were received. Other studies found similar results where a primary outcome measure was to improve fruit and vegetable consumption (26, 27, 28). In concert with our study, these studies utilized peer or lay health educators and found they were an effective delivery method. Additionally, more participants in the intervention group reported limiting intake of high sugar foods and portions sizes, at endpoint and follow-up. The usual care group did report making some changes in selected behaviors. This suggests that there may be some value in receiving the handouts only as the source of nutrition education information, which may be more cost-effective for some groups than providing the peer educator-led classes.

The literature indicates that adults who are physically active and maintain a normal BMI throughout adulthood exhibit a decreased risk for diabetes, and that physical activity and exercise can positively impact health status in women (29, 30). However, our intervention did not significantly improve reported physical activity habits. A report from the Centers on Disease Control indicates low rates of physical activity in African American populations (31). Similarly, only one third of our project participants reported at least 30 minutes of moderate or vigorous activity most days which is recommended by the ACSM and AHA (23). Additionally, we did not find that the use of pedometers was

an effective intervention tool. Participants failed to consistently track their activity using the pedometer. Participant compliance was sporadic or nonexistent; therefore, we were unable to assess physical activity using the pedometer. Many participants reported repeated loss and difficulty remembering to use their pedometer despite our providing replacements and repeated training on use. Future studies may require more stringent monitoring efforts and motivation strategies to encourage consistent pedometer use. There are data supporting the use of pedometers as an effective intervention tool in African Americans. Zoellner et al. (32) reported a significant increase in the number of steps walked and consistent use of pedometers in a sample that was primarily African American (98%) and female (94%). Compared to our 8 week intervention, their intervention was significantly longer at six months and provided individualized weekly goal setting sessions which our study did not.

As implemented, the physical activity components of our intervention were not effective in improving the physical activity habits of the women in either group. Several possible explanations exist for the lack of a strong effect. First, our intervention may not have been sufficiently intensive. Greater effects might have been achieved had a wider range of activities been encouraged and incorporated into the intervention classes. The intervention was designed to include light stretching activities prior to the beginning of each class period; however, due to space constraints at the intervention site this activity was discontinued in the early stages of the intervention. Additionally, while participants were provided with materials during Week 1 about how to begin a walking program and peer educators asked structured questions at the beginning of each session related to

physical activity, more intense motivational strategies may be required in future studies. Second, the lack of improvement in physical activity may be related to barriers and perceptions of physical activity such as lack of social support, safety concerns, and hair maintenance voiced by African American women who have been surveyed about their exercise habits (33). Our intervention may have lacked the intensity required to address these barriers. Third, the recall instrument that was used to quantify physical activity habits may not be the most suitable tool for use in this population. In the development stages, the researchers did consult an exercise physiologist on the most appropriate tool to use with this population and for the type of intervention we hoped to implement. The instrument was previously validated in both genders and minorities were included; however, a different tool may be more appropriate, since the intervention group which was older and had fewer members who were still working. In order to be more successful, future studies should incorporate and evaluate more intensive motivational techniques.

It has also been reported that the church setting promotes greater rates of adherence in African American populations (24-26; 34, 35). Our retention rate of 98% parallels these findings and strengthens the argument that the church is an appropriate setting for nutrition education interventions targeting African American women.

The sample size and non-random selection of participants limits the generalizability of our findings. This was a pilot feasibility project, thus findings from this study can be used to inform development of further research targeted for this high risk population. The risks of underreporting energy intake may also be considered a

limitation when using a self-reported 24-hour recall; however, the use of the NDS-R multiple pass interview process should have minimized this risk and a 24-hour was obtained at three different time points and no outliers were determined using box-plot analysis.

Additionally, the intervention phase of the study was 8 weeks. We chose 8 weeks in consideration of the time burden for prospective participants. The study design may not have provided sufficient time for some participants to adopt and incorporate changes, thus contributing to the limited number of significant findings.

Conclusions

We were able to show that church is an appropriate setting to deliver this type of intervention and that using trained peer educators can be an effective delivery approach. Additionally, our data indicate that African American women are receptive to the nutrition and health messages and willing to participate in this type of intervention. The significant dietary changes, including consuming more fiber and less total fat, limiting high sugar foods and portions, indicate that targeted messaging was successful. However, future studies may need to consider incorporating intensive, individualized dietary counseling and motivational techniques. Since physical activity was not significantly improved by our intervention, a more intensive motivational component is likely needed as well. Findings of this study should be used for the further development of culturally relevant intervention strategies to prevent Type 2 diabetes mellitus among African American women in community-based settings.

Acknowledgements

The authors would like to acknowledge the Moses Cone Health System Congregational Nursing Program, Marian Whiteside (1932-2009) and Sandra Blaha; the women of Grace Lutheran Church and Gethsemane Missionary Baptist Church; and Ms. Bettye Hill and Ms. Diane Chang, peer educators. This study was supported by the TRIAD (Teamwork in Research and Intervention to Alleviate Disparities) Center (NCMHD/NIH 1P20MD002289-01).

Table 5. Project D.R.E.A.M. Intervention Group Program Description			
WEEK	TITLE	HANDOUTS*	ACTIVITY
1	Welcome/Introduction to Type 2 Diabetes/ How to Start a Walking Program	Let's Get Walking; How Do I Start A Walking Program; Walking the Right Way is Very Important; How Do I Stretch; Pedometer	Participants set one long-term and one short-term goal related to program
2	Fats & Food Labels	Types of fats; How to eat less fat; How to read a food label	Low fat versus high/regular fat taste challenge & reading food labels
3	Portion Control & Eating Out	Get A Grip on Portion Sizes; Serving Sizes: Everyday Objects; Serving Sizes are in Your Hand; Portion Distortion; Four Keys to Healthy Eating Out; What's on the Menu; Menu Make-Over; Restaurant Menu Glossary	Measuring MY Hand (portion size exercise)
4	My Pyramid	My Pyramid; Make Half Your Grains Whole Grains; Nutrition Fact Sheet- Whole Grains Made Easy; Vary Your Vegetables; Focus on Fruits; Calcium Rich Foods	My Pyramid website
5	Meal Planning	Traditional Breakfast & Building a Better Traditional Breakfast; Fast Food Breakfast & Building a Better Fast Food Breakfast; Building a Better Healthy Lunch & Building a Better Fast Food Lunch; Building a Better Dinner (What to Choose) & Building a Better Dinner; Guide to 50 Calorie Snacks	How to navigate the grocery store (powerpoint)
6	Recipe Modifications	Recipe Modifications; Modifying a Recipe to be Healthier; Nutrition Fact Sheet- Get Smart about Salt	Taste challenge modified recipe versus original recipe
7	Barrier Scenarios	None	Small group discussions to develop potential barrier scenarios and solutions
8	Completion & Evaluation	Completion Certificate	Potluck dinner with modified recipes provided by participants

*All handouts also provided to usual care (control) group in a notebook after their baseline data collection

Table 6. Project D.R.E.A.M. Participant Demographic Characteristics (Baseline)			
	Usual Care group	Intervention group	p value
Average age (y) (mean ± standard deviation)	(N=21) 58.1 ± 7.7	(N= 20) 64.2 ± 9.3	0.027¹
Age category			
45-50	3(14.3%)	4(20.0%)	0.088 ²
51-70	16(76.2%)	9(45.0%)	
≥ 71	2(9.5%)	7(35.0%)	
Education			
High school or GED	17(81.0%)	8(40.0%)	0.014²
Vocational training or associates degree	2(9.5%)	2(10.0%)	
BS degree or above	2(9.5%)	10 (50.0%)	
Monthly household income			
Dollars (mean ± standard deviation)	2725 ± 2158	3800 ± 3028	0.200 ¹
BMI (kg/m²) (mean ± standard deviation)	31.8 ± 7.4	34.0 ± 6.9	0.340 ¹
BMI category			
18.5-24.9 kg/m ²	3(14.3 %)	1 (5.0%)	0.437 ²
25-29.9 kg/m ²	8 (38.1%)	6(30.0%)	
≥30 kg/m ²	10 (47.6%)	13(65.0%)	
Reported physical activity			
<30 min	11 (52.4%)	15 (75%)	0.323 ²
30-60 min	4 (19.0%)	2 (10%)	
>60min	6 (28.6%)	3 (15%)	
Chronic conditions			
Number (mean ± standard deviation)	1.1 ± 1.0	2.1 ± 1.6	0.033¹
≤1	15 (71.4%)	9 (45.0%)	
≥2	6 (28.6.0%)	11 (55.0%)	
Diabetes risk			
Very Low 0-2	0 (0 %)	0 (0 %)	0.020²
Low to medium 3-9	5 (23.8%)	0 (0 %)	
High 10+	16 (76.2%)	20 (100%)	

¹ P value for t-test analyses

² P value for χ^2 analyses

Table 7. Energy and Nutrient Intake by Group and Time (Mean \pm SE)						
	BASELINE		ENDPOINT (8 weeks)		FOLLOW-UP (12 weeks)	
	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20
Energy (kcal)	1359 \pm 109.0	1564 \pm 109.9	1339 \pm 141.9	1120 \pm 83.7	1331 \pm 144.3	1189 \pm 96.5
Protein (gm/1000 kcal)	43.9 \pm 3.55	44.3 \pm 4.00	45.8 \pm 2.69	49.1 \pm 2.71	44.8 \pm 3.18	45.3 \pm 3.07
Fat (gm/1000 kcal)²	35.3 \pm 2.88	46.5 \pm 2.12	38.9 \pm 1.48	36.9 \pm 2.47	39.2 \pm 2.48	36.0 \pm 2.16
Carbohydrate (gm/1000 kcal)¹	132 \pm 8.4	118 \pm 10.9	121 \pm 5.2	119 \pm 6.4	122 \pm 6.9	129 \pm 4.7
Saturated Fatty Acids (gm/1000 kcal)	11.6 \pm 1.23	13.2 \pm 0.61	11.5 \pm 0.83	11.1 \pm 0.96	13.1 \pm 1.21	10.1 \pm 0.89
Monounsaturated Fatty Acids (gm/1000 kcal)²	12.6 \pm 1.05	18.5 \pm 1.20	14.0 \pm 0.79	14.1 \pm 1.16	14.1 \pm 0.93	13.4 \pm 0.84
Polyunsaturated FA Fatty Acids (gm/1000 kcal)	7.9 \pm 0.84	10.8 \pm 1.03	9.8 \pm 0.80	8.4 \pm 0.88	8.7 \pm 1.12	9.3 \pm 0.94
Cholesterol (gm/1000 kcal)	136 \pm 23.4	180 \pm 29.2	191 \pm 25.6	166 \pm 21.5	146 \pm 18.2	189 \pm 32.6
Sodium (mg/1000 kcal)	1847 \pm 150.0	1853 \pm 216.2	1743 \pm 115.0	1404 \pm 69.9	1536 \pm 104.3	1608 \pm 174.2
Fiber (gm/1000 kcal)¹	12.7 \pm 1.44	10.9 \pm 1.15	10.2 \pm 1.28	12.4 \pm 1.09	9.6 \pm 1.40	12.5 \pm 0.96
Energy from PRO (% kcal)	17.6 \pm 1.42	16.4 \pm 1.24	18.3 \pm 1.08	19.6 \pm 1.08	17.9 \pm 1.27	18.1 \pm 1.23
Energy from CHO (% kcal)	52.9 \pm 3.37	44.1 \pm 2.04	48.6 \pm 2.08	47.4 \pm 2.55	48.6 \pm 2.78	51.7 \pm 1.87
Energy from fat (% kcal)²	31.8 \pm 2.60	41.2 \pm 1.90	35.1 \pm 1.39	33.2 \pm 2.22	35.2 \pm 2.22	32.4 \pm 1.94
Energy from alcohol (% kcal)	0.02 \pm 0.010	0.25 \pm 0.243	0.07 \pm 0.005	1.46 \pm 1.218	0.03 \pm 0.012	0.02 \pm 0.010
¹ p < 0.05 x time ² p < 0.05 group x time Repeated Measures Analysis of Variance (RMANOVA)						

Note: Covariates = Age, Education, Number of chronic conditions, and Diabetes risk

Table 8. Reported Food Habits for Project D.R.E.A.M. Participants*									
	BASELINE			ENDPOINT (8 weeks)			FOLLOW-UP (12 weeks)		
	Usual Care Intervention N = 21 N = 20			Usual Care Intervention N = 21 N = 20			Usual Care Intervention N = 21 N = 20		
	YES (%)		P-value	YES (%)		P-value	YES (%)		p-value
1. Limit or restrict high sugar foods	13 (62%)	16 (80%)	.203	17 (81%)	20 (100%)	.040	17 (81%)	20 (100%)	.040
2. Limit portion size	11 (52%)	12 (60%)	.623	16 (72%)	20 (100%)	.020	18 (86%)	18 (90%)	.675
3. Limit high fat foods	11 (52%)	14 (70%)	.248	16 (76%)	19 (95%)	.089	16 (76%)	20 (100%)	.020
4. Choose low fat menu items	9 (43%)	11 (55%)	.437	13 (62%)	11 (55%)	.654	13 (62%)	16 (80%)	.203
5. Eat low fat foods for breakfast	10 (48%)	11 (55%)	.636	19 (91%)	18 (90%)	.959	18 (86%)	16 (80%)	.627
6. Limit buffets, fast food, large chain	12 (57%)	17 (85%)	.050	17 (81%)	17 (85%)	.731	14 (68%)	17 (85%)	.172
7. Eating out, avoid high fat and high carb	11 (52%)	9 (45%)	.636	9 (43%)	12 (60%)	.272	12 (59%)	14 (70%)	.393
8. Avoid red meat, fried meat, seafood, sandwich meats	18 (86%)	18 (90%)	.675	14 (67%)	16 (80%)	.335	19 (91%)	19 (95%)	.578
9. Three meals a day	7 (33%)	14 (70%)	.019	11 (52%)	11 (55%)	.867	10 (48 %)	14 (70%)	.146
10. Eat low fat for lunch	9 (43%)	14 (70%)	.080	14 (67%)	14 (70%)	.819	12 (57%)	15 (75%)	.228
11. Plan meals	7 (33%)	8 (40%)	.658	12 (57%)	10 (50%)	.647	8 (38%)	7 (35%)	.837
12. Eat 2 vegetables or combination	13 (62%)	15 (75%)	.368	14 (67%)	13 (65%)	.910	17 (81%)	17(85%)	.731
13. Eat vegetables for lunch and dinner	12 (57%)	7 (35%)	.155	8 (38%)	11 (55%)	.278	8 (38%)	11 (55%)	.278
13a. Eat more than one vegetable a day	15 (71%)	15 (75%)	.796	16 (76%)	16 (80%)	.768	17 (81%)	16 (80%)	.939
14. Limit starchy foods or bread	12 (57%)	14 (70%)	.393	16 (76%)	19 (95%)	.089	18 (86%)	20 (100%)	.079

*Between Group

Data obtained using questionnaire derived from food habits in Savoca et al. (18) (Appendix G)

Table 9. Reported Food Habits for Project D.R.E.A.M. Usual Care Group Participants*						
	BASELINE		ENDPOINT (8 weeks)		FOLLOW-UP (12 weeks)	
	YES (%)	p-value	YES (%)	p-value	YES (%)	p-value
1. Limit or restrict high sugar foods	13 (62)	.275	17 (81)	.005	17 (81)	.005
2. Limit portion size	11 (53)	.827	16 (76)	.016	18 (86)	.001
3. Limit high fat foods	11 (53)	.827	16 (76)	.016	16 (76)	.016
4. Choose low fat menu items	9 (43)	.513	13 (62)	.275	13 (62)	.275
5. Eat low fat foods for breakfast	10 (47)	.827	19 (90)	.000	18 (86)	.001
6. Limit buffets, fast food, large chain	12 (57)	.513	17 (81)	.005	14 (67)	.127
7. Eating out eat high fat and high carb	11 (53)	.827	9 (43)	.513	12 (57)	.513
8. Avoid red meat, fried meat, seafood, sandwich meats	18 (86)	.001	14 (67)	.127	19 (90)	.000
9. Three meals a day	7 (33)	.127	11 (53)	.827	10 (47)	.827
10. Low fat for lunch	9 (43)	.513	14 (67)	.127	12 (57)	.513
11. Plan meals	7 (33)	.127	12 (57)	.513	8 (38)	.275
12. Eat 2 vegetables or combination	13 (62)	.275	14 (67)	.127	17 (81)	.005
13. Eat vegetables for lunch and dinner	12 (57)	.513	8 (38)	.275	8 (38)	.275
13a. More than one vegetable	15 (71)	.050	16 (76)	.016	17 (81)	.005
14. Limit starchy foods or bread	12 (57)	.513	16 (76)	.016	18 (86)	.001

*Within Group, N = 21

Data obtained using questionnaire derived from food habits in Savoca et al. (18) (Appendix G)

χ^2 analysis used to detect differences between percent YES or NO for each question at three different time points

Table 10. Reported Food Habits for Project D.R.E.A.M. Intervention Group Participants*						
	BASELINE		ENDPOINT (8 weeks)		FOLLOW-UP (12 weeks)	
	YES (%)	p-value	YES (%)	p-value	YES (%)	p-value
1. Limit or restrict high sugar foods	16 (80)	.007	20 (100)	-	20 (100)	-
2. Limit portion size	12 (60)	.371	20 (100)	-	18 (90)	.000
3. Limit high fat foods	14 (70)	.074	19 (95)	.000	20 (100)	-
4. Choose low fat menu items	11 (55)	.655	11 (55)	.655	16 (80)	.007
5. Eat low fat foods for breakfast	11 (55)	.655	18 (90)	.000	16 (80)	.007
6. Limit buffets, fast food, large chain	17 (85)	.002	17 (85)	.002	17 (85)	.002
7. Eating out eat high fat and high carb	9 (45)	.655	12 (60)	.371	14 (70)	.074
8. Avoid red meat, fried meat, seafood, sandwich meats	18 (90)	.000	16 (80)	.007	19 (95)	.000
9. Three meals a day	14 (70)	.074	11 (55)	.655	14 (70)	.074
10. Low fat for lunch	14 (70)	.074	14 (70)	.074	15 (75)	.025
11. Plan meals	8 (40)	.371	10 (50)	1.000	7 (35)	.180
12. Eat 2 vegetables or combination	15 (75)	.025	13 (65)	.180	17 (85)	.002
13. Eat vegetables for lunch and dinner	7 (35)	.180	11 (55)	.655	11 (55)	.655
13a. More than one vegetable	15 (75)	.025	16 (80)	.007	16 (80)	.007
14. Limit starchy foods or bread	14 (70)	.074	19 (95)	.000	20 (100)	-

*Within Group, N = 20

Data obtained using questionnaire derived from food habits in Savoca et al. (18) (Appendix G)

χ^2 analysis used to detect differences between percent YES or NO for each question at three different time

Table 11. Stages of Change for Project D.R.E.A.M. Participants*						
	BASELINE		ENDPOINT (8 weeks)		FOLLOW-UP (12 weeks)	
	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20
CONTEMPLATION I am thinking about changing my diet & I will begin in the next 6 months.	7 (33.0%)	1 (5.0%)	4 (19.0%)	1 (5.0%)	4 (19.0%)	1 (5.0%)
PREPARATION I am planning to change my diet in the next 30 days.	5 (24.0%)	9 (45.0%)	3 (14.0%)	4 (20.0%)	4 (19.0%)	1(5.0%)
ACTION I am eating a healthy diet & I made these changes in the past 6 months.	4 (19.0%)	4 (20.0%)	10 (48.0%)	13 (65.0%)	7 (33.0%)	16 (80.0%)
MAINTENANCE I am eating a healthy diet & I made these changes more than 6 months ago.	5 (24.0%)	6 (30.0%)	4 (19.0%)	2 (10.0%)	6 (29.0%)	2 (10.0%)
p-value χ^2	0.126		0.395		0.028	

*Appendix F

Table 12. Physical Activity Recall (Mean Hours \pm SE) ^a						
	BASELINE		ENDPOINT (8 weeks)		FOLLOW-UP (12 weeks)	
	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20
<i>What activities did you do and how many total hours did you spend during the last 5 weekdays doing these activities or others like them?</i> (Mean hours \pm SE)						
Moderate^b	10.3 \pm 2.56	4.6 \pm 2.01	10.3 \pm 2.72	5.2 \pm 1.85	5.3 \pm 1.80	2.2 \pm 0.54
Hard^c	4.9 \pm 2.41	0.2 \pm 0.11	3.2 \pm 2.03	0.4 \pm 0.23	5.1 \pm 3.05	0.1 \pm 0.03
Very Hard^d	0.7 \pm 0.45	0	0.4 \pm 0.36	0	0.8 \pm 0.65	.03 \pm 0.03
TOTAL (hours)	14.9 \pm 5.42	4.8 \pm 2.12	13.5 \pm 5.11	5.6 \pm 2.08	10.4 \pm 5.50	2.3 \pm 0.60
<i>What activities did you do and how many total hours did you spend during the last Saturday and Sunday (or “days off” if Saturday and Sunday are not days off) doing these activities or others like them?</i> (Mean hours \pm SE)						
Moderate^b	1.0 \pm 0.32	0.4 \pm 0.39	1.7 \pm 0.91	0.4 \pm 0.23	0.6 \pm 0.27	0.3 \pm 0.19
Hard^c	1.0 \pm 0.87	0.1 \pm 0.05	0.9 \pm 0.91	0.4 \pm 0.40	.03 \pm 0.03	0
Very Hard^d	0	0	.05 \pm 0.05	0.2 \pm 0.11	1.9 \pm 1.74	0
TOTAL (hours)	1.9 \pm 1.19	0.5 \pm 0.44	2.7 \pm 1.87	1.0 \pm 0.74	2.3 \pm 2.04	0.3 \pm 0.19

^a Data obtained using questionnaire by Sallis (19)

^b *Moderate activity* produces feelings similar to those accompanying brisk or fast walking (19).

^c *Hard activity* produces feelings that are between the feelings that go with moderate and very hard activities (19).

^d *Very hard activity* produces feelings similar to those of running and jogging (19).

Note: Covariates = Age, Education, Number of chronic conditions, and Diabetes risk

No significant differences detected by group or time.

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EPILOGUE

When I began my tenure as a graduate student at UNC-G, I spent countless hours in discussion with Dr. Taylor regarding the topic of my dissertation research. I conducted an exhaustive search of the literature to get a better idea of the kind of studies that had been conducted and what areas might be interesting to explore. I knew that I wanted to work with minority populations, so I focused my search around nutrition-related topics that were pertinent to these populations. During this same time I assisted with a funded research project titled “Assessment of Dietary Intake, Health Status, and Biomarkers of Nutritional Status of Older Adults.” My primary responsibilities included data collection, coding, and analysis. This research also provided training on the use of standardized interview protocols and obtaining dietary intakes and anthropometric measurements from older adults. This work helped me narrow my focus to older adults. My literature search revealed that the prevalence of diabetes increases with age, with certain racial and ethnic minority populations exhibiting increased prevalence rates. I also found that African American women are disproportionately affected by diabetes. Once I decided on the general topic of diabetes and older adult African American women then began the task of working out the details. Eventually, we decided to develop a nutrition and lifestyle education program that would target diabetes risk in African American women. Project D.R.E.A.M. (Diabetes Risk- Educating African American Matriarchs) grew into what I hope will be the beginning of a fruitful, satisfying career in community-based research.

The overall aim of this dissertation was to implement and evaluate the of an 8-week nutrition and lifestyle education intervention delivered by trained peer educators for African American women ages 45 years and older at risk of Type 2 diabetes mellitus. The results presented in this dissertation found that our intervention had no statistically significant impact on physical activity habits, weight status, or selected blood markers of diabetes risk; however, some positive results were determined.

For example, the intervention group significantly improved fiber and fat intakes. The intervention group also reported limiting or restricting high sugar foods and limiting portion sizes to a greater extent than the usual care group. Process evaluation revealed that the peer educator did deliver the curriculum as designed. Attendance rates indicated high exposure to intervention and that participants were engaged and willing to participate in the intervention. Moreover, high attendance and retention rates indicate that the church setting appears to be an appropriate setting to recruit this population. These findings parallel literature reports that indicate that the church setting promotes greater rates of adherence in African American populations and strengthen the argument that the church is an appropriate setting for nutrition education interventions targeting African American women.

The need for further work in this area is imperative as the incidence of Type 2 diabetes mellitus increases with the aging of the US population and increases in the proportion of minorities who are at higher risk for diabetes. To help alleviate health disparities among all age groups, increased federal funding for multidisciplinary projects, including nutrition, is required. Future research should incorporate the findings of this

study for further development of more intensive intervention strategies to prevent Type 2 diabetes mellitus in African American women in community-based settings.

This process of completing my Ph.D. has been one of the most difficult experiences of life. At times I couldn't see that light at the end of the tunnel that everyone kept telling me was there. I persevered and when I finally saw that proverbial light, it was one of the greatest experiences of my life. I have grown as a person and I am looking forward to many years as community-based researcher.

APPENDIX A: RECRUITMENT FLYER

Project (D.R.E.A.M)

(Diabetes Risk - Educating African American Matriarchs)

Did You know...

- One out of four African American women over the age of 55 has diabetes.
- Diabetes is the fifth leading cause of death among African Americans.
- Studies show that nutrition and lifestyle factors can reduce the risk developing diabetes.

Project (D.R.E.A.M) is a community based effort to explore the impact of lifestyle changes on the risk of diabetes in African American women. Your church has been selected to participate in our program. Please help us by taking part in our study focused on understanding the role that nutrition and exercise may have on the prevention of diabetes.

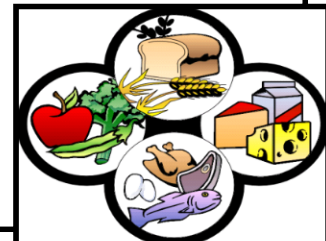
You may be eligible for this study if you are:

- An African American female
- At least 45 years old
- At risk for diabetes
- Willing to participate in an 8-week education program and provide small blood samples (2 TBSP, three different times)
- Able to walk for physical activity
- Willing to answer questions about diet and health
- Free of any major illness that prevents making dietary changes or walking for physical activity

You are *not* eligible if you:

- Are not an African American female
- Are younger than 45 years
- Currently have diabetes
- Are unwilling to answer questions about diet and health
- Not willing to provide a small blood sample
- Are unable to walk for physical activity
- Have a major illness that prevents making dietary changes or walking for physical activity

Please call:
Department of Nutrition
University of North Carolina at Greensboro
(336) 256.1382
Carinthia Cherry, M.S.
Dr. Martha Taylor, R.D., L.D.N.



APPENDIX B: DIABETES RISK SCREENING

Diabetes Risk Test

	<u>Yes</u>	<u>No</u>
1. My weight is equal to or above that listed in the chart below?	5pts	0pts
2. I am under 65 years of age and I get little or no exercise during a usual day?	5pts	0pts
3. I am between 45 and 64 years of age?	5pts	0pts
4. I am 65 years old or older?	9pts	0pts
5. I am a woman who has had a baby weighing more than nine pounds at birth?	1pt	0pts
6. I have a sister or brother with diabetes?	1pt	0pts
7. I have a parent with diabetes?	1pt	0pts

Total Points: _____

What your score means:

0-2 Very low risk **3-9** Low to medium risk **10+** High risk

At-Risk Weight Chart

Height in feet and inches without shoes	Weight in pounds without clothing
4'10"	129
4'11"	133
5'0"	138
5'1"	143
5'2"	147
5'3"	152
5'4"	157
5'5"	162
5'6"	167
5'7"	172
5'8"	177
5'9"	182
5'10"	188
5'11"	193
6'0"	199
6'1"	204
6'2"	210
6'3"	216
6'4"	221

Herman WH, Smith PJ, Thompson TJ, Engelgau MM and Aubert RE. (1995) A new and simple questionnaire to identify people at increased risk for undiagnosed diabetes. Diabetes Care 18(3):382-387.

APPENDIX C: CONSENT FORM
(INTERVENTION GROUP)

The University of North Carolina at Greensboro

CONSENT TO ACT AS A HUMAN SUBJECT

Long Form
(Intervention)

Project Title: Project D.R.E.A.M.
(Diabetes Risk: Educating African American Matriarchs)

Project Director: Martha Taylor, Ph.D., Associate Professor

Project Coordinator: Carinthia Cherry, Graduate Assistant

Participant's Name: _____

Date of Consent: _____

DESCRIPTION AND EXPLANATION OF PROCEDURES:

Project D.R.E.A.M. is a research study to educate older adult, African American women about nutrition and lifestyle factors that influence their risk for developing diabetes. This information will help nutrition and health educators develop programs for older adult, African American women to improve their nutritional health and quality of life and reduce their risk for developing diabetes. The study will take place over the course of 12 weeks. Women attending two different churches are participating in this study. At your church, participants are receiving education materials as part of eight weekly classes to help reduce diabetes risk. Everything else is the same for participants at both churches. Eligibility will be based on the following: attends the church assigned as the intervention church; African American; female aged 45 years and older; and not currently diagnosed with diabetes.

Additional eligibility requirements will include no major illness that would prohibit making dietary changes or participation in regular physical activity; willing to participate in an 8-week nutrition and lifestyle education program; willing to answer questions about diet and health; willing to provide a small blood sample at three different times; and willing and able to participate in walking as a means of physical activity. A total of 30 participants will be enrolled.

You will participate in a face-to-face interview at the beginning of the study (approximately 1 hour). During this interview you will complete a general health questionnaire with questions about your current family and health situation. You will receive the education program materials and attend weekly one-hour classes held at your church to further explain these materials and learn how to decrease your diabetes risk. You will be asked to give a small blood sample, approximately 2 tablespoons, taken by a trained professional. These samples will be drawn on three separate occasions over a 12-week period (at the beginning of the study, week 8, and week 12). You will complete three 24-hr dietary recalls that will take 45-60 minutes each. Results will be provided to you at no cost and you are encouraged to share them with your personal physician. You will be contacted for a follow-up interview (week 12) and a gift card will be given for each stage of the study that is completed (\$10 pretest; \$20 posttest; \$30 follow-up). Total time commitment is approximately 15 hours for the entire study.

RISKS AND DISCOMFORTS:

To the best of our knowledge, participation in this research activity poses no physical, psychological, or social harm to you. A short questionnaire will also be completed as a screening tool to determine your ability to participate in physical activity. If you answer YES to any one question, you will not be allowed to participate in this study without written permission from your primary care provider. Your name will appear on the blood analysis results. This information is considered protected health information and will require your signature on a separate release form. All of the information you give us will be identified by a code number rather than your name. You may refuse to answer any questions on the questionnaires. Taking blood samples can hurt. You may have some bruising around the place on your arm where the needle was placed. However, the people who take your blood are trained in how to do this to reduce the discomfort and bruising. Proper precautions for drawing blood from older adults taking anticoagulant drugs such as Coumadin® and Plavix® will be followed to prevent excess bleeding after the needle is removed. If blood analysis indicates you have diabetes, you will not be able to participate in this study, and you also need to contact your primary care provider and share your blood analysis results with him/her.

POTENTIAL BENEFITS:

The information will be used to develop educational programs for older adult African American women regarding diabetes risk. We also expect that you will personally benefit from receiving the nutrition and health

information provided as a part of this program. In addition, you will receive a copy of your dietary intake results and the results of your blood analysis at no charge to you. You will also be able to keep the pedometer that you will be given to help you continue to keep track of your walking activities.

COMPENSATION/TREATMENT FOR INJURY:

You understand that, in the event of injury resulting from this investigation, neither financial compensation nor free medical treatment is provided for such an injury. You will receive a gift card for completing each part of the study (baseline, 8 weeks, 12 weeks).

CONSENT:

By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project.

The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482. Questions regarding the research itself will be answered by Dr. Martha Taylor or her assistant, Carinthia Cherry by calling 336-256-0326 or 336-256-1382. Any new information that develops during

the project will be provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are agreeing to participate in the project described to you by Carinthia Cherry or Dr. Martha Taylor.

Subject's Signature

Witness to Signature

APPENDIX D: CONSENT FORM
(USUAL CARE GROUP)

The University of North Carolina at Greensboro

CONSENT TO ACT AS A HUMAN SUBJECT

Long Form
(Usual Care Church)

Project Title: Project D.R.E.A.M. (Diabetes Risk: Educating African American Matriarchs)

Project Director: Martha Taylor, Ph.D., Associate Professor

Project Coordinator: Carinthia Cherry, Graduate Assistant

Participant's Name: _____

Date of Consent: _____

DESCRIPTION AND EXPLANATION OF PROCEDURES:

Project D.R.E.A.M. is a research study to educate older adult, African American women about nutrition and lifestyle factors that influence their risk for developing diabetes. This information will help nutrition and health educators develop programs for older adult, African American women to improve their nutritional health and quality of life and reduce their risk for developing diabetes. The study will take place over the course of 12 weeks. Women attending two different churches are participating in this study. At your church, participants are receiving education materials to help reduce diabetes risk, but they will not attend weekly classes to discuss these materials. If we find that having the weekly classes is more effective, your church will be offered that program later. Everything else is the same for participants at both churches. Eligibility will be based on the following: attends the church assigned as the usual care church; African American;

female aged 45 years and older; and not currently diagnosed with diabetes. Additional eligibility requirements will include no major illness that would prohibit making dietary changes or participation in regular physical activity; willing to receive nutrition and lifestyle education program materials; willing to answer questions about diet and health; and willing to provide a small blood sample on three different occasions. A total of 30 participants will be enrolled.

You will participate in a face-to-face interview at the beginning of the study (approximately 1 hour). During this interview you will complete a general health questionnaire with questions about your current family and health situation and receive education materials. You will also receive two mailed newsletters with general health information. You will be asked to give a small blood sample, approximately 2 tablespoons, taken by a trained professional. These samples will be drawn on three separate occasions over a 12-week period (at the beginning of the study, week 8, and week 12). You will complete three 24-hr dietary recalls that will take 45-60 minutes each. You will receive results at no cost and are encouraged to share them with your personal physician. You will also be contacted for a follow-up interview (week 12) and a gift card will be given for each stage of the study that is completed (\$10 pretest; \$20 posttest; \$30 follow-up). Total time commitment is approximately 5-6 hours for the entire study.

RISKS AND DISCOMFORTS:

To the best of our knowledge, participation in this research activity poses no physical, psychological, or social harm to you. A short questionnaire will also be completed as a screening tool to determine your ability to participate in physical activity. If you answer YES to any one question, you will not be allowed to participate in this study without written permission from your primary care provider. Your name will appear on the blood analysis results. This information is considered protected health information and will require your signature on a separate release form. All of the information you give us will be identified by a code number rather than your name. You may refuse to answer any questions on the questionnaires. Taking blood samples can hurt. You may have some bruising around the place on your arm where the needle was placed. However, the people who take your blood are trained in how to do this to reduce the discomfort and bruising. Proper precautions for drawing blood from older adults taking anticoagulant drugs such as Coumadin® and Plavix® will be followed to prevent excess bleeding after the needle is removed. If blood analysis indicates you have diabetes, you will not be able to participate in this study, and you also need to contact your primary care provider and share your blood analysis results with him/her.

POTENTIAL BENEFITS:

The information will be used to develop educational programs for older adult African American women regarding diabetes risk. We also expect that you will personally benefit from receiving the nutrition and health

information provide as a part of this program. In addition, you will receive a copy of your dietary intake results and the results of your blood analysis at no charge to you. You will also be able to keep the pedometer you will be given to help you continue to keep track of your walking activities.

COMPENSATION/TREATMENT FOR INJURY:

You understand that, in the event of injury resulting from this investigation, neither financial compensation nor free medical treatment is provided for such an injury. You will receive a gift card for completing each part of the study (baseline, 8 weeks, 12 weeks).

CONSENT:

By signing this consent form, you agree that you understand the procedures and any risks and benefits involved in this research. You are free to refuse to participate or to withdraw your consent to participate in this research at any time without penalty or prejudice; your participation is entirely voluntary. Your privacy will be protected because you will not be identified by name as a participant in this project. The University of North Carolina at Greensboro Institutional Review Board, which ensures that research involving people follows federal regulations, has approved the research and this consent form. Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482. Questions regarding the research itself will be answered by Dr. Martha Taylor or her assistant, Carinthia Cherry by calling 336-256-0326 or 336-256-1382. Any new information that develops during the project will be

provided to you if the information might affect your willingness to continue participation in the project.

By signing this form, you are agreeing to participate in the project described to you by Carinthia Cherry or Dr. Martha Taylor.

Subject's Signature

Witness to Signature

APPENDIX E: GENERAL HEALTH QUESTIONNAIRE

ID Number: _____

Date: _____

Project D.R.E.A.M.
(Diabetes Risk- Educating African American Matriarchs)

Department of Nutrition
UNC – Greensboro

Welcome to our session. We are very glad that you are willing to help us with this our project. My name is _____ and I represent the University of North Carolina at Greensboro. Assisting me is _____, also from the University of North Carolina at Greensboro. We will ask you a few questions about yourself and current health related information. We should be able to complete this session in 30 minutes or less.

Before we begin, let me remind you of some ground rules. This is strictly a research project to help us better understand the nutritional status of older adults in Guilford County. Please answer the questions based on your own situation. There are no right or wrong answers. We are interested only in your own situation. Everything will be kept strictly confidential; your name will not be associated with any of the information we assemble.

Do you have any questions now? If you have any questions about our project or our questionnaire, please ask me whenever you want.

I. Sociodemographics

- 1a. Age: _____ years
- 2a. How many years of school did you complete?
1. $\leq 8^{\text{th}}$ grade
 2. some high school
 3. high school or GED
 4. vocational training (beauty school; truck driver, etc.)
 5. associate degree (2 years)
 6. B.S. degree (4 years) or above
- 3a. What is your household monthly income? _____
- 4a. How many people live in your household? _____
- 5a. What is your marital status?
1. married
 2. widowed/divorced/separated/single

II. General Health

(Use the calibrated scale and measuring equipment to obtain measures of weight and height)

- 1a. Height: _____ cm (+/- 0.1)
_____ cm (+/- 0.1) [Average: _____ cm]
- 2a. Weight: _____ kg (+/- 0.1)
_____ kg (+/- 0.1) [Average: _____ kg]
- 3a. Waist circumference: _____ cm (+/- 0.1)
_____ cm (+/- 0.1) [Average: _____ cm]
- 4a. Hip circumference: _____ cm (+/- 0.1)
_____ cm (+/- 0.1) [Average: _____ cm]
- 5a. Sagittal Diameter: _____ cm (+/- 0.5)
_____ cm (+/- 0.5) [Average: _____ cm]
- 6a. What is your amount of moderate or vigorous activity (such as brisk walking, jogging, biking, aerobics, or yard work) you do in addition to your normal routine, **most days**?
1. < 30 minutes
 2. 30-60 minutes

3. > 60 minutes

7a. Has your appetite changed during the past 6 months?

1. No 2. Yes

7b. If yes, has it:

1. Decreased 2. Increased

8a. Have you lost weight over the past 6 months?

1. No 2. Yes

8b. If yes, were you trying to lose weight?

1. No 2. Yes

9a. Do you smoke? 1. No 2. Yes

9b. If yes, how many cigarettes, packs, cigars, pipes, etc., per week? _____

III. Health Status

1a. Which of the following health conditions do you have or have had?

(Circle all the conditions that apply)

1. Coronary heart disease or acute myocardial infarction (heart attack, coronary heart disease, heart bypass surgery or angioplasty, angina)
2. Chronic obstructive pulmonary disease (chronic bronchitis, emphysema)
3. Chronic heart failure (heart failure, enlarged heart, fluid in lungs)
4. Stroke
5. Asthma
6. High blood pressure or hypertension
7. Diabetes
8. Arthritis
9. Cancer
10. Cataracts
11. Hearing trouble/using a hearing aid
12. Hip Fracture
13. Other _____

1b. Does your spouse or someone in your immediate household have diabetes?

1. No 2. Yes

1c. If yes, who?

2a. How do you think your own health status compares with others at your same age?

1. Excellent
2. Good
3. Fair
4. Poor

3a. Are you currently taking any prescription drugs?

1. Yes
2. No

3b. If yes, what are they and how often do you take them?

4a. Are you currently taking any non-prescription drugs? (aspirin, allergy medicine, other over-the-counter drugs, etc.)

1. Yes
2. No

4b. If yes, what are they and how often do you take them?

5a. Do you have enough money to buy the foods you need most of the time?

1. Yes
2. No

6a. In the past 6 months, have you skipped one or more meals because you had no food in the house or you thought that soon you might not have enough food?

1. Yes

2. No

7a. In the past 6 months, have you had to choose between buying food and paying bills or buying something else that you needed?

1. Yes

2. No

IV. Other

1a. Have you ever or are you currently participating in any nutrition or lifestyle education program?

1. Yes

2. No

1b. If yes, when, where, and who provided the program?

Thank you very much for your time and patience. We have finished today's questions. Do you have any questions? Once again thanks for your time and cooperation.

APPENDIX F: STAGES OF CHANGE ASSESSMENT

Stages of Change for Healthy Eating

Interviewer: *First read all five statements aloud once, then read through the statements again, and ask participant to stop when they hear the statement that best represents their situation.*

Please indicate the statement that best represents your current situation.

1. I do not eat a healthy diet, and I do not plan to change in the next 6 months.
2. I am thinking about changing my diet, and I will begin in the next 6 months.
3. I am planning to change my diet in the next 30 days.
4. I am eating a healthy diet, and I made these changes in the past 6 months.
5. I am eating a healthy diet, and I made these changes more than 6 months ago.

1 = Precontemplation
2 = Contemplation
3 = Preparation
4 = Action
5 = Maintenance

Nothwehr F, Snetselaar L, Yang J, and Wu H. (2006) Stage of Change for Healthful Eating and Use of Behavioral Strategies. *J Am Diet Assoc.* 106(7):1035-1041.

APPENDIX G: FOOD HABITS QUESTIONNAIRE

Food Habit Factors Questionnaire

1. I try to limit my intake of high-sugar foods (eg, desserts, sugar-containing beverages and cereals).
1 = Yes 2= No
2. I try to limit my food portions (ie, restricting the amount of food consumed at one time).
1 = Yes 2= No
3. I eat desserts occasionally (ie, limiting the size and frequency of desserts).
1 = Yes 2= No
4. I try to reduce my intake of high-fat foods (eg, limiting snack foods, whole milk, pizza, chocolate, and fried foods).
1 = Yes 2= No
5. I try to choose low-fat menu selections (eg, broiled or baked, salads, vegetables, and low-fat dressing).
1 = Yes 2= No
6. I try to eat low-fat foods for breakfast (eg, cold cereal, oatmeal, whole wheat bread, fruit, hard cooked eggs).
1 = Yes 2= No
7. I try to limit the number of times that I eat at buffets, fast-food, and large chain restaurants (ie, restaurants featuring large portion sizes of food, high-fat foods, and limited selection of vegetables).
1 = Yes 2= No
8. When eating out, I try to limit my high-fat and high-carbohydrate menu selections (eg, fried foods, high-fat meats, sauces, pasta, bread, and gravy).
1 = Yes 2= No
9. When eating out, I try to limit my intake of high-fat sources of protein (eg, red meat, fried meat, seafood, fish, and processed meat).
1 = Yes 2= No
10. I try to eat regularly (eg, three meals per day, not skipping meals, and making time to eat).
1 = Yes 2= No

11. I try to eat low-fat foods for lunch (eg, vegetables, salads, fruit, tuna, chicken, low-fat lunch meats, and fat-free cheeses and dressings).

1 = Yes

2= No

12. I plan my meals (eg, use a shopping list, plan weekly menus, take meals to work or on trips).

1 = Yes

2= No

13. I try to eat two vegetables for dinner (eg, two or more vegetables or a combination of one vegetable and salad at the main meal of the day).

1 = Yes

2= No

14. I try to eat large amounts of vegetables (eg, vegetables at lunch and dinner, two portions of vegetables at a meal, eating only vegetables as a meal).

1 = Yes

2= No

15. I try to limit certain carbohydrates (eg, bread, pasta, rice, crackers, or potatoes).

1 = Yes

2= No

Adapted from: Savoca MR, Miller CK, Ludwig DA. (2004) Food habits are related to glycemic control among people with type 2 diabetes mellitus. J Am Diet Assoc. 104(4):560-566.

APPENDIX H: PHYSICAL ACTIVITY RECALL

The Seven-Day Activity Recall

ID#: _____

Date: _____

First, I would like to ask you some general questions about your work.

1. *Were you employed in the last seven days?* _____No (skip to Q#4)
_____Yes
2. *How many days of the last seven did you work?* _____days
3. *How many total hours did you work in the last seven days?* _____hours last week
- 4-5. *What two days do you consider your weekend days?* _____

Now, we would like to know about your physical activity during the past 7 days. But first, let me ask you about your sleep habits.

6. *On the average, how many hours did you sleep each night during the last five nights (Sunday-Thursday)?* _____hours
7. *On the average, how many hours did you sleep each night last Friday and Saturday nights?* _____hours

Now, I am going to ask you about your physical activity during the past 7 days, that is, the last 5 weekdays, and the last weekend, Saturday and Sunday. We are not going to talk about light activities such as slow walking, light housework, or un strenuous sports such as bowling, archery, or softball. Please look at this list which shows some examples of what we consider moderate, hard, and very hard activities. (*Interviewer: hand subject card and allow time for the subject to read it over.*) People engage in many other types of activities, and if you are not sure where one of your activities fits, please ask me about it.

8. First, let's consider moderate activities. What activities did you do and how many total hours did you spend during the last 5 weekdays doing these moderate activities or others like them? _____ hours
Please tell me to the nearest half hour.
9. Last Saturday and Sunday (or "days off" *if Saturday and Sunday are not days off*), how many hours did you spend on moderate activities and what did you do? _____ hours
(*Probe: Can you think of any other sports, job, or household activities that would fit into this category?*)
10. Now, let's look at hard activities. What activities did you do and how many total hours did you spend during the last 5 weekdays doing these hard activities or others like them? Please tell me to the nearest half hour. _____ hours
11. Last Saturday and Sunday (or "days off" *if Saturday and Sunday are not days off*), how many hours did you spend on hard activities and what did you do? (*Probe: Can you think of any other sports, job, or household activities that would fit into this category?*) _____ hours
12. Now, let's look at very hard activities. What activities did you do and how many total hours did you spend during the last 5 weekdays doing these very hard activities or others like them? Please tell me to the nearest half hour. _____ hours
13. Last Saturday and Sunday (or "days off" *if Saturday and Sunday are not days off*), how many hours did you spend on very hard activities and what did you do? (*Probe: Can you think of any other sports, job, or household activities that would fit into this category?*) _____ hours
14. Compared with your physical activity over the past 3 months, was last week's physical activity more, less, or about the same? _____ More
_____ Less
_____ About the same

Interviewer: Please list any activities reported by the subject which you don't know how to classify. Flag this record for review and completion.

Activity (brief description)
day off

Hours: workday

Hours: weekend or

Examples of Activities in Each Category

Moderate activity produces feelings similar to those accompanying brisk or fast walking.

Hard activity produces feelings that are between the feelings that go with moderate and very hard activities.

Very hard activity produces feelings similar to those of running and jogging.

Moderate Activity

Occupational tasks:

- 1) delivering mail or patrolling on foot
- 2) house painting; and
- 3) truck driving (making deliveries, lifting and carrying light objects).

Household activities:

- 1) raking the lawn;
- 2) sweeping and mopping;
- 3) mowing the lawn with a power mower; and
- 4) cleaning windows.

Sports activities (actual playing time):

- 1) volleyball;
- 2) Ping-Pong;
- 3) brisk walking for pleasure or to work (3 miles/hour) or 20 minutes each time;
- 4) golf, walking and pulling clubs; and
- 5) calisthenics or aerobic exercises.

Hard Activity

Occupational tasks:

- 1) heavy carpentry;
- 2) construction work, doing physical labor.

Household activities:

- 1) scrubbing floors.

Sports activities (actual playing time):

- 1) tennis doubles;
- 2) disco, square, or folk dancing.

Very Hard Activity

Occupational tasks:

- 1) very hard physical labor, digging or chopping with heavy tools; and
- 2) carrying heavy loads such as bricks or lumber.

Sports activities (actual playing time):

- 1) jogging or swimming;
- 2) singles tennis;
- 3) racquetball; and
- 4) soccer

Sallis JF, Haskell WL, Wood PD, et al. (1985) Physical activity assessment methodology in the Five-City Project. *American Journal of Epidemiology* 121(1):91-106.

APPENDIX I: PROGRAM EVALUATION - INTERVENTION

Program Evaluation
Project D.R.E.A.M~UNCG

1. What did you most enjoy?

2. What did you like least about the program?

Wk	Excellent	Good	Fair	Poor	Comments	Handout 1-5*
1						
2						
3						
4						
5						
6						
7						

* Please rate the handouts on a scale of 1-5, 1 being poor and 5 being excellent.

3. What suggestions do you have for us in order to improve future classes?

Thank you again for your participation in our study. The D.R.E.A.M team!!!! ☺

APPENDIX J: PROGRAM EVALUATION – USUAL CARE

Program Evaluation



UNCG
Department of Nutrition
Project D.R.E.A.M

1. Did you read the handouts? YES NO
 2. If yes, how many did you read? ALL MOST SOME / A FEW
 3. Please rate the handouts you received:

Wk	Title	Excellent	Good	Neutral	Fair	Poor	Comments
1	Welcome & let's get walking (3 handouts)						
2	Fats & Food Labels (3 handouts)						
3	Portion Control & Eating out (8 handouts)						
4	My Pyramid (7 handouts)						
5	Meal Planning (7 handouts)						
6	Recipe Modifications (3 handouts)						

Thank you for your time and help!

APPENDIX K: SUPPLEMENTAL TABLES

Table 13. Body Composition (Mean \pm SE) for Project D.R.E.A.M. Participants ^a		Usual Care	Intervention
		N = 21	N = 20
Baseline			
Weight (kg)		85.0 \pm 4.78	88.0 \pm 4.02
Waist Circumference (cm)		98.1 \pm 3.50	99.5 \pm 2.56
Sagittal Diameter (cm)		27.8 \pm 1.46	28.4 \pm .870
Endpoint (8 weeks)			
Weight (kg)		85.3 \pm 4.63	87.1 \pm 4.06
Waist Circumference (cm)		97.1 \pm 3.54	98.4 \pm 2.49
Sagittal Diameter (cm)		26.4 \pm 1.16	28.3 \pm .857
Follow-up (12 weeks)			
Weight (kg)		85.3 \pm 4.68	87.3 \pm 4.08
Waist Circumference (cm)		96.6 \pm 3.52	98.0 \pm 2.51
Sagittal Diameter (cm)		26.8 \pm 1.15	28.2 \pm .827
p-value repeated ANOVA (between groups)			
Weight (kg)	0.959		
Waist Circumference (cm)	0.655		
Sagittal Diameter (cm)	0.864		

^aD.R.E.A.M. = Diabetes Risk: Educating African American Matriarchs

Table 14. Clinical Indicators (Mean \pm SE) for Project D.R.E.A.M. Participants ^a		Usual Care	Intervention
		N = 21	N = 20
Baseline			
Total Cholesterol (mg/dL)		184.76 \pm 7.44	183.15 \pm 13.20
LDL (mg/dL)		107.43 \pm 6.19	113.20 \pm 10.12
Triglycerides (mg/dL)		85.00 \pm 9.68	96.40 \pm 11.16
Endpoint (8 weeks)			
Total Cholesterol (mg/dL)		182.52 \pm 7.05	180.15 \pm 13.16
LDL (mg/dL)		106.33 \pm 6.21	111.40 \pm 9.93
Triglycerides (mg/dL)		75.95 \pm 7.83	100.25 \pm 11.79
Follow-up (12 weeks)			
Total Cholesterol (mg/dL)		188.60 \pm 8.25	182.70 \pm 13.54
LDL (mg/dL)		112.40 \pm 7.20	111.20 \pm 10.26
Triglycerides (mg/dL)		77.40 \pm 7.91	107.05 \pm 14.63
p-value repeated ANOVA (between groups)			
Total Cholesterol (mg/dL)	0.598		
LDL (mg/dL)	0.964		
Triglycerides (mg/dL)	0.779		

^aD.R.E.A.M. = Diabetes Risk: Educating African American Matriarchs

Table 15. Meal Patterns for Project D.R.E.A.M. Participants ^a						
	BASELINE		ENDPOINT (8 weeks)		FOLLOW-UP (12 weeks)	
	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20	Usual Care N = 21	Intervention N = 20
Breakfast	20	20	18	19	20	19
Lunch	17	16	17	14	19	13
Dinner	21	16	18	17	18	16
Snack I	15	12	9	11	11	12
Snack II	1	2	7	2	6	4
Snack III	-	1	2	-	2	-

^aD.R.E.A.M. = Diabetes Risk: Educating African American Matriarchs