PERCEPTIONS OF RISK FOR THE DELVELOPMENT OF TYPE 2 DIABETES IN AFRICAN-AMERICAN WOMEN WITH GESTATIONAL DIABETES

by

Janine Bieda

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Doctoral Committee:

Professor Joanne M. Pohl, Chair
Professor Robert M. Anderson
Professor Marjorie C. Treadwell
Assistant Professor Lisa Kane Low

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Chapter I

Introduction

Statement of the Problem

Type 2 diabetes is the seventh leading cause of death in the United States. Out of the 23.5 million people affected by this disease in our country alone, approximately one-half are women (Center for Disease Control [CDC], 2007). Its association with significant medical complications is alarming. The risk of heart disease, the most common complication of diabetes, is more serious among women than men. Among people with diabetes who have experienced a heart attack, women have lower survival rates and poorer outcomes than men. Women with diabetes have a shorter life expectancy and are also more likely to have a physical limitation and health-related reduction in quality of life than women without diabetes. “People with diabetes endure the complications of the disease, anxiety, finger sticks, and the regimented lifestyle associated with diabetes – 24 hours a day, 365 days a year, with no vacations or Sundays off (Alva, 1998, p.C29).” The cost of type 2 diabetes is not only physical and psychological, but also economic. In addition to the excessive out-of-pocket financial burden of health care, the societal cost of diabetes in the United States continues to escalate rapidly. This cost is estimated to be $174 billion per year, with $116 billion in direct medical expenditures and $58 billion in indirect costs associated with lost workdays, premature death, and permanent disability (CDC, 2007).

Type 2 diabetes accounts for approximately 90-95% of all diagnosed cases of diabetes. In addition to a family history of diabetes, ethnicity and obesity are primary risk factors (American Diabetes Association [ADA], 2004). According to prevalence statistics provided by the Center for Disease Control (2007), African-American men and women are 1.8 times more likely to have type 2 diabetes than non-Hispanic white men and women. African-American women in particular have the highest risk for developing type 2 diabetes. One reason for the increased prevalence of type 2 diabetes in African-American women is related to obesity. The proportion of black women who are obese is 80% higher than the proportion of black men who are obese, and 69% higher than the proportion of obese white women (Tilghman, 2003). An additional risk factor for type 2 diabetes affecting African-American women is gestational diabetes. Research demonstrates that 17-63% of women with gestational diabetes will develop subsequent type 2 diabetes within 5-16 years after delivery (Kim, Newton, and Knopp, 2002). While overall prevalence statistics for gestational diabetes in women is 1-14%, the prevalence for gestational diabetes increases in direct proportion to the prevalence of type 2 diabetes in a given population making African-American women at greater risk for gestational diabetes (Dabelea, Snell-Bergeon, Hartsfield, and Bischoff, 2005).

Because obesity is the most significant environmental determinant of type 2 diabetes in this country, research related to lifestyle interventions designed to achieve weight reduction is well documented (Diabetes Prevention Program Research Group, 2002; Lindstrom et al., 2003). Critical components of diabetes prevention include both dietary modification and regular exercise. Throughout the literature concerning the prevention of type 2 diabetes, gestational diabetic women are identified as a target group

for primary diabetes prevention. The American Diabetes Association (2004) suggests that the diagnosis of gestational diabetes be recognized as an opportunity to develop research designed to prevent subsequent type 2 diabetes. However, much of the literature concerning the prevention of type 2 diabetes has focused on non-Hispanic white men and non-pregnant women. With the exception of one pharmacological trial, no randomized trials to date have studied any interventions specifically intended for women with a history of gestational diabetes regardless of ethnicity. Research designed to reduce the risk of subsequent type 2 diabetes in African-American women with gestational diabetes will make a significant contribution to our knowledge about reducing the physical, psychological, and economic burden of diabetes in our country.

Background and Significance

Obesity is the most significant and controllable risk factor for type 2 diabetes and is of primary importance in the following study concerning type 2 diabetes prevention in African American women. Two of the most significant prospective, randomized investigations demonstrating the association between lifestyle modifications and a reduction in the incidence of type 2 diabetes are the Finnish Diabetes Prevention Study (Lindstrom et al., 2003) and the Diabetes Prevention Program (Diabetes Prevention Program Research Group, 2002). Both studies revealed that a program of dietary and exercise intervention reduces the incidence of type 2 diabetes by 58%. However, the Finnish Diabetes Prevention Study did not take into account the effect of gender or ethnicity. While the Diabetes Prevention Program did take these independent variables into consideration, it did not evaluate the effect of prior gestational diabetes in women. No non-pharmacological investigations to date have been conducted to study the

prevention of type 2 diabetes in previously gestational diabetic women. This fact is unfortunate since the risk for developing type 2 diabetes is so high in this population (Kim et al., 2002). The diagnostic criteria for gestational diabetes were created based upon their predictive value for subsequent type 2 diabetes demonstrating the strength of association between these two diagnoses (O'Sullivan and Mahan, 1964).

Obesity in women has been studied in medical literature. Women are twice as likely as men to gain a significant amount of weight over a period of ten years (Gore, Brown, and Smith-West, 2003). In addition, African-American women are 40% more likely than white women to gain weight over this same time period. Studies suggest that postpartum weight retention is the most likely cause for weight gain in both black and white women (Gore et al., 2003; Kieffer et al., 2001). However, few randomized, controlled trials studying postpartum weight loss programs exist. Only three of these trials include African-American women (Leermakers, Anglin, and Wing 1998; Lovelady, Garner, Moreno and Williams, 2000; McCrory, Nommsen-Rivers, Mole, Lonnerdal, and Dewey, 1999). This lack of attention to the prevention of obesity and type 2 diabetes for African-American women in the literature may impact risk perceptions in this population. Only two studies have focused on gestational diabetic women's perceptions of risk for the development of future chronic diabetes. One study by Feig, Chen, and Naylor (1998) assessed health perception and diabetes risk appraisal but did not account for the effect of race or ethnicity. Jefferson, Melkus, and Spollett (2000) did consider the effect of race and determined that while most African-American women in the sample were aware of their risk, only 26% received information from their health care provider, few routinely

practiced preventive behaviors, and approximately one-half did not believe they could develop type 2 diabetes.

Research concerned with the psychosocial factors related to diabetes prevention in mothers with a history of gestational diabetes is also lacking. In one study by Smith, Cheung, Bauman, Zehle, and McLean (2005), barriers to type 2 diabetes prevention behaviors included lack of time, lack of social support, and fatigue. This study once again did not assess the effect of race or ethnicity. In fact, literature concentrating on psychosocial barriers to type 2 diabetes prevention in African-American mothers with gestational diabetes is completely absent. The only available relevant literature regarding this subject concerns barriers to obesity prevention in African-American women (Wilcox, Richter, Henderson, Greaney, and Ainsworth, 2002). Identified barriers included dietary cultural norms, stress, lack of time, lack of transportation, relationship difficulties, family responsibilities, safety issues, lack of social support, and expense.

In summary, African-American mothers with a history of gestational diabetes are at a significant risk for the development of subsequent type 2 diabetes. The delay or prevention of type 2 diabetes is critical due to the devastating complications associated with the disease. While diabetes prevention research has demonstrated the effectiveness of dietary and exercise modification for the reduction of obesity in both men and women, it has not studied its benefit specifically in African-American women with a history of gestational diabetes. In addition, no research has been devoted to African-American women's perceptions of risk for the development of subsequent type 2 diabetes after gestational diabetes. If knowledge of chronic diabetes risk and prevention is lacking in this population of women, then the potential barriers to preventive behaviors will also be

ignored. New research dedicated to the prevention of type 2 diabetes in African-American women with a history of gestational diabetes is needed. Ultimately, the purpose of this investigator's current study is to assist in the identification of potential solutions to the high prevalence of type 2 diabetes in this population of women.

Goals for Research

In an effort to begin a program of research dedicated o the prevention of type 2 diabetes in African-American women with a history of gestational diabetes, the goal of this current investigation was to study mothers' knowledge of type 2 diabetes risk as well as their intentions to participate in preventive behaviors. Specifically, the target population for this research study was African-American mothers with gestational diabetes in a current pregnancy. Qualitative interviews were conducted to gain an understanding of mothers' knowledge of the following: causes of gestational diabetes, risk for subsequent type 2 diabetes after gestational diabetes, causes of type 2 diabetes, and type 2 diabetes preventive behaviors. In addition, mothers' sources of this knowledge, perceived barriers and enablers to preventive behaviors, and intentions to participate in diabetes prevention were investigated. The Theory of Planned Behavior was identified as the most appropriate framework to guide the organization and interpretation of the results of this study.

Relevance to Certified Nurse-Midwives

Preventive interventional research involving mothers with gestational diabetes has been difficult due to mothers' lack of knowledge regarding their risk as well as inadequate postpartum follow-up. Kieffer et al. (2001) remind health care providers that

they have a unique opportunity to educate mothers at risk for obesity and type 2 diabetes during their prenatal care experience. As providers dedicated to the improvement of women's health, certified nurse-midwives have the ability to effect change concerning African-American women's knowledge of the prevention of type 2 diabetes during pregnancies complicated by gestational diabetes. Although nurse-midwives most commonly provide care for essentially uncomplicated pregnancies, they routinely screen, diagnose, and provide postpartum follow-up for women with gestational diabetes. Nurse-midwives may co-manage diabetic pregnancies in collaboration with physicians depending on institutional policies. In addition, women seek midwifery care outside of pregnancy for primary and gynecologic health services. This provides nurse-midwives with the valuable opportunity to continue diabetes screening and prevention education for women across their lifespan.

Research Questions

1. What are the risk perceptions for the future development of type 2 diabetes in African-American women with gestational diabetes during pregnancy?
    - If their risk for subsequent type 2 diabetes is known, how was this knowledge gained?
2. What do African-American women with gestational diabetes know about delaying or preventing type 2 diabetes?
    - How and where did they gain this knowledge?
3. What are the intentions of African-American women with gestational diabetes to participate in type 2 diabetes preventive behaviors?
    - What barriers and/or enablers would affect their intentions to prevent type 2 diabetes?
4. How and when can health care providers help African-American women with gestational diabetes realize their risk for type 2 diabetes and learn about preventive behaviors?

Chapter II

Review of the Literature

Introduction to Diabetes

The American Diabetes Association and the National Institute of Diabetes and Digestive and Kidney Diseases formed a joint workgroup to discuss approaches toward the prevention of type 2 diabetes (ADA, 2004). This workgroup identified five conditions that should be met in order to justify initiating a program to prevent types of diseases. First, the disease to be prevented should impose a significant burden on those affected by the disease. Second, the etiology and natural history of the disease should be understood well enough to identify parameters that measure its progression to disease. Third, there should be an acceptable and predictive test available to identify a pre-disease state. Fourth, there should be a safe and cost-effective method to delay or prevent the disease. Fifth, the effort to identify individuals at-risk for the development of the disease should not be overly burdensome.

In the following chapter, a review of the literature demonstrates how each of these five conditions have been met in order to justify this investigator's initiation of research devoted to the prevention of type 2 diabetes in African-American women with gestational diabetes. The burden of type 2 and gestational diabetes is presented through a description of the prevalence, management, associated complications and risks, and psychological

impact of both diseases. In addition to the classification of diabetes, the etiologies of type 2 and gestational diabetes are described as are their screening and diagnostic methods. The identification of gestational diabetic women as an easily identifiable at-risk population for the subsequent development of type 2 diabetes is highlighted. Finally, lifestyle interventions designed to reduce obesity and delay and/or prevent the onset of type 2 diabetes are discussed with a special focus on the health beliefs of African-American women.

Classification

Diabetes mellitus is not one, but a group of metabolic syndromes characterized by hyperglycemia, and caused by abnormalities in insulin secretion, insulin action, or both (ADA, 2004). Symptoms commonly associated with the initial diagnosis of diabetes mellitus include polyuria, polydipsia, polyphagia, unexplained weight loss, blurred vision, extreme fatigue, numbness in the hands or feet, sores that are slow to heal, excessively dry skin, nausea and vomiting, abdominal pain, and susceptibility to infections. In addition, significant long-term vascular and neurologic complications may develop as a result of chronic hyperglycemia regardless of its pathogenesis. Although hyperglycemia characterizes all diabetic syndromes, the etiology and pathogenesis of each syndrome is unique, making the classification system for diabetes mellitus an important component of its diagnosis and subsequent treatment.

Prior to 1979, no universally accepted classification system for diabetes mellitus existed. This was primarily due to the lack of knowledge concerning the etiology and pathogenesis of each of its individual syndromes. Diabetes was classified only according

to the time of initial diagnosis and type of pharmacologic treatment prescribed. Juvenile-onset diabetes and adult-onset diabetes are examples of the terminology utilized in the past. It wasn't until an expert panel from the National Diabetes Data Group devised a comprehensive classification system that diabetes was first recognized as a heterogeneous group of diseases. The five categories of diabetes mellitus proposed by the National Diabetes Data Group included insulin-dependent diabetes, non-insulin-dependent diabetes, gestational diabetes, malnutrition-related diabetes, and other types of diabetes (Borg and Sherwin, 2000). However, these categories were limited by the medical knowledge available at the time making it necessary to revise the classification of diabetes mellitus as scientific research advanced.

The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus was established by the American Diabetes Association in 1995. In an effort to more clearly define each diabetic syndrome, the Expert Committee used etiology and pathogenesis to determine the classification rather than the treatment method. For example, the terms insulin-dependent and non-insulin-dependent diabetes were eliminated and replaced with the categories type 1 and type 2 diabetes. This reclassification of diabetes mellitus has improved its comprehensibility as well as increased clinical treatment effectiveness.

The current etiologic classification of clinical diabetes mellitus includes four subclasses (ADA, 2004). The first of these subclasses is type 1 diabetes. Type 1 diabetes is characterized by B-cell destruction leading to absolute insulin deficiency. In most cases, inadequate insulin secretion requires the use of exogenous insulin to prevent metabolic ketoacidosis. Type 1 diabetes is differentiated into two subcategories. In the

first subcategory named immune-mediated diabetes, the destruction of B-cells is the result of autoimmune processes triggered by genetic predisposition and/or environmental factors. Idiopathic diabetes is the second subcategory of type 1 diabetes describing diabetes with no evidence of autoimmunity or known etiology. While the majority of patients with either subcategory of type 1 diabetes are diagnosed as children or young adults, the disease onset may occur at any age.

Type 2 diabetes is the second subclass of diabetes mellitus. This diabetic syndrome is characterized by relative rather than absolute insulin deficiency in association with insulin resistance. The pathogenesis of type 2 diabetes is not yet clearly understood due to the complex interrelationship between insulin deficiency and insulin secretion abnormalities. Often individuals with type 2 diabetes do not require exogenous insulin to survive. Although a strong genetic predisposition exists and autoimmune B-cell destruction does not occur, specific etiologies for type 2 diabetes remain unidentified. However, type 2 diabetes is known to be associated with increased age, obesity, and lack of physical exercise.

The third and largest subclass of diabetes mellitus recognizes eight subcategories for other types of diabetes. Each of these subcategories includes diabetic syndromes associated with various diseases, drugs, infections, or genetic defects. The eight subcategories are classified as follows:

1. Genetic defects of B-cell function--maturity onset diabetes of the young, point mutations in mitochondrial DNA, others
2. Genetic defects in insulin action--Type A insulin resistance, leprechaunism, Rabson-Mendenhall syndrome, lipoatrophic diabetes, others

3. Diseases of the exocrine pancreas--pancreatitis, trauma/pancreatectomy, neoplasia, cystic fibrosis, hemochromatosis, fibrocalculous, pancreatopathy, others

4. Endocrinopathies--acromegaly, Cushing's syndrome, glucagonoma, pheochromocytoma, hyperthyroidism, somatostatinoma, aldosteronoma, others

5. Drug or chemical induced--vacor, pentamidine, nicotinic acid, glucocorticoids, thyroid hormone, diazoxide, B-adrenergic agonists, thiazides, dilantin, interferon, others

6. Infections--congenital rubella, cytomegalovirus, others

7. Uncommon forms of immune mediated diabetes--"Stiff-man" syndrome, anti-insulin receptor antibodies, others

8. Other genetic syndromes associated with diabetes--Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Wolfram's syndrome, Friedreich's ataxia, Huntington's chorea, Lawrence Moon Beidel syndrome, myotonic dystrophy, porphyria, Prader Willi syndrome, others

Although this subclass of diabetes mellitus includes a large number of diabetic syndromes, it accounts for only a small percentage of the diabetic population.

The fourth subclass of diabetes mellitus is gestational diabetes. Gestational diabetes is defined as carbohydrate intolerance of varying degrees of severity with onset or first recognition during pregnancy (ADA, 2004). This definition applies regardless of treatment modality. In addition, it does not exclude the possibility that unrecognized diabetes may have been present prior to pregnancy, developed concomitantly during pregnancy, or may persist postpartum. This definition was initially created at the Second International Workshop-Conference on Gestational Diabetes Mellitus in 1985 and reconfirmed at the Third and Fourth International Workshop-Conferences on Gestational Diabetes Mellitus in 1991 and 1997. The definition of gestational diabetes does not include diabetes diagnosed before pregnancy referred to as pregestational diabetes. The Priscilla White classification system categorizes both gestational and pregestational

diabetes during pregnancy according to age of onset, duration of disease, and presence of vascular complications. This classification system is designed to provide a prognosis for pregnancy. Gestational diabetes is classified as A1 (diet only) or A2 (insulin) disease (Lucas, 2001).

The terms impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) were also recognized by the Expert Committee of the American Diabetes Association. These terms refer to intermediate abnormal metabolic states where glycemic levels are too high to be considered normal and too low to be considered diabetes mellitus. Although not associated with symptoms or long-term microvascular and neurologic complications, they indicate a relatively high risk for the future development of overt diabetes as well as cardiovascular disease. Impaired glucose tolerance and impaired fasting glucose are also associated with the metabolic syndrome referred to as syndrome X. Syndrome X is a condition of accelerated atherosclerosis caused by the combination of hyperinsulinemia, mild glucose intolerance, dislipidemia, and elevated blood pressure (ADA, 2004).

Prevalence of Type 2 Diabetes

Diabetes is perceived as a public health threat not only because of its association with significant medical complications, but also because of its alarming rise in prevalence. On a global scale, it is estimated that the number of people with diabetes will have grown from 151 million in the year 2000, to 221 million by the year 2010, and to 300 million by 2025 (Amos, McCarty, and Zimmer, 1997). The prevalence of diabetes in the United States alone is 23.5 million, representing 10% of the total population aged 20

years or older. Out of these 23.5 million people, 12.0 million are men and 11.5 million are women. At the state level, it is estimated that over 7.7% of both men and women in Michigan currently live with this disease. Type 2 diabetes accounts for approximately 90% to 95% of all diagnosed cases globally, nationally, and within the state of Michigan (CDC, 2007).

Prevalence statistics for type 2 diabetes in people aged 20 years or older vary by ethnicity. The prevalence of diabetes for African-Americans, Hispanic/Latino Americans, American-Indians, Asian-Americans, and Pacific Islander-Americans is significantly higher than for non-Hispanic white Americans. For example, 14.9 million, or 9.8% of all non-Hispanic white men and women are currently diabetic. In comparison, the prevalence of diabetes in non-Hispanic black men and women is 3.7 million, or 14.7%, making them 1.8 times more likely to live with the disease than white men and women. Statistics provided by the Center for Disease Control also report that in 2005, the prevalence of type 2 diabetes was higher for African-Americans than non-Hispanic white Americans and in particular, highest for African-American women. Specifically, the prevalence for diabetes was 5.4% for white males, 8% for black males, 4.7% for white females, and 8.3% for black females (CDC, 2007).

Prevalence of Gestational Diabetes

During pregnancy, the prevalence of pregestational diabetes is one-percent for American women as a whole (American College of Obstetrics and Gynecology [ACOG], 2005). In comparison, the prevalence of gestational diabetes ranges from 1% to 14%, with 2% to 5% being the most common statistic. It is estimated that 90% of diabetes in

pregnancy is gestational; making this complication one of the most common prenatal diagnoses (ACOG, 2001). One reason for the significant variation in prevalence statistics is that just as in type 2 diabetes, the prevalence of gestational diabetes differs by ethnicity. In fact, the prevalence of gestational diabetes varies in direct proportion to the prevalence of type 2 diabetes in a given population or ethnic group. Higher prevalence statistics have been documented for Native-American, Asian-American, African-American, and Hispanic/Latino- American populations than among non-Hispanic white populations. The prevalence of gestational diabetes is greater in African-American mothers than in non-Hispanic white mothers. In addition, the prevalence statistics increased for both groups over time. From 1994 to 2002, the prevalence of gestational diabetes in African-American women grew from 3.8% to 5.5% while the prevalence of gestational diabetes in the non-Hispanic white women grew from 1.7% to 3.1% (Dabelea et al., 2005).

Another proposed reason for the variation in prevalence statistics for gestational diabetes involves the lack of homogeneity in the screening methods used in previous studies as well as historical changes over time in recommended diagnostic glucose values. For example, in a study by Ferrara, Hedderson, Quesenberry and Selby (2002), both the National Diabetes Data Group and Carpenter and Coustan plasma glucose thresholds for the three hour glucose tolerance test were compared in a multi-ethnic population. The results of this study demonstrated a 50% increase in the prevalence of gestational diabetes when the Carpenter and Coustan (1982) values were utilized. In addition, screening methods as well as their diagnostic criteria do not take into account race-specific test thresholds. Research concerning race-specific guidelines for the

diagnosis of gestational diabetes is currently limited by the lack of agreement at the international level concerning testing methodology. Finally, the very definition of gestational diabetes is “any degree of glucose intolerance with onset or first recognition during pregnancy” (ADA, 2004). This definition makes it difficult to distinguish between preexisting but undiagnosed diabetes, and diabetes that is truly caused by pregnancy itself.

Type 2 Diabetes Mellitus

Etiology

The etiology of type 2 diabetes is multi-factorial and involves both genetic and environmental components. One primary risk factor is a family history of diabetes. Research literature provides a considerable amount of evidence demonstrating that the familial aggregation of diabetes is caused by an inherited defect in genes that predispose type 2 diabetes. Much of the evidence for genetic susceptibility has come from studies of concordance in monozygotic versus dizygotic twins. While controlling for the effect of environmental factors, the concordance of type 2 diabetes in identical twins is 90% (Barnett, Eff, Leslie and Pyke, 1981). Further evidence of genetic susceptibility as an independent risk factor includes the significant difference in prevalence of type 2 diabetes among different ethnic populations living within the same geographical area. Even when confounding variables are controlled, type 2 diabetes remains more prevalent in Native-American, Asian-American, African-American, and Hispanic/Latino-American ethnicities (Zimmer, 1982).

In addition to family history and ethnicity, another leading risk factor for type 2 diabetes is obesity. Obesity is defined as a body mass index (BMI) of greater than 30 affecting 34% of the population within the United States (CDC, 2007). It is the most significant environmental determinant in the manifestation of type 2 diabetes for people of all ethnicities. Specifically, the relative risk of developing type 2 diabetes is 3.72% for overweight men and 3.82% for overweight women under the age of 55 (Must et al., 1999). The growing prevalence of type 2 diabetes directly parallels the spread of obesity with almost one-half of obese men and women developing the disease. In general, the more weight gained, the higher the risk of type 2 diabetes. Even women who are within the recommended values of BMI increase their risk of type 2 diabetes with weight gain. Perusse et al. (2001) reported that gaining a few kilograms increased women's risk two-fold, gaining greater than eight kilograms increased their risk three-fold, and gaining greater than 20 kilograms had a relative risk of twelve.

Obesity is a risk factor for type 2 diabetes because of its association with insulin resistance as well as hyperinsulinemia. Both insulin resistance and hyperinsulinemia may be mediated by higher levels of free fatty acids and/or signaling proteins secreted by adipose tissue (Boden, 2001). The greater influx of free fatty acids from adipose tissue into the liver could act as a regulator of insulin levels, decreasing its breakdown and allowing for higher systemic levels. Subsequently, insulin resistance develops. In addition, the distribution and amount of body fat are also important. Android obesity, or abdominal body fat, is more strongly associated with insulin resistance and consequent type 2 diabetes than gynecoid obesity, or fat stored on the hips and thighs. This finding may be explained by differences in metabolism or in the secretion of signaling proteins.

Another risk factor for the development of type 2 diabetes is visceral fat. In comparison to subcutaneous upper body fat, visceral fat is considered to be more detrimental due to its direct effect on the liver through the release of free fatty acids into the portal vein (Frayn, 2000). BMI has been shown to be an unpredictable risk factor for type 2 diabetes throughout the literature.

The relationship between obesity, insulin resistance, and ethnicity has been the subject of a number of investigations. Haffner et al. (1996) found that in comparison to obese non-Hispanic white study participants, obese African-American participants demonstrated greater insulin resistance. Other studies concerning insulin sensitivity have shown that African-Americans may be less insulin sensitive even when variables such as BMI, waist-to-hip ratio, physical inactivity, and diet are controlled. In a study by Osei, Galliard, and Schuster (1997), only 40% of African-American study participants were found to be insulin sensitive. Osei, Galliard, and Schuster (1998) also concluded that type 2 diabetes in African-Americans was associated with a significant reduction in beta-cell function as well as decreased insulin sensitivity.

In particular, the prevalence of obesity is high among African-Americans and highest among African-American women. The proportion of black women who are obese is 80% higher than the proportion of black men who are obese, and 69% higher than the proportion of white women who are obese (Tilghman, 2003). It has been hypothesized that abdominal obesity may be one of the most significant risk factors for type 2 diabetes in African-American women. According to Okosun (2000), abdominal obesity accounts for 12.1% of ethnic differences in type 2 diabetes between white and black women. However, Pi-Sunyer (1990) report that abdominal obesity in non-diabetic African-

American women is not associated with decreased insulin sensitivity or hyperinsulinemia when compared to black women with lower body obesity. This contrasts metabolic findings in white women with upper versus lower body obesity demonstrating the need for further research concerning glucose and insulin metabolism in African-American women.

Low socioeconomic status (SES) has been associated with higher rates of type 2 diabetes and its long-term complications. Proposed reasons for the negative effect of low SES on diabetes include obesity, physical inactivity, lack of resources, lack of access to health care, and delay in seeking medical attention. A commonly held assumption is that low SES expressly affects the incidence of type 2 diabetes in minority groups. The National Health and Nutritional Examinations Surveys (NHANES) I and II examined SES and rates of both diagnosed and undiagnosed diabetes in a large sample of the U.S. population with particular attention to African-Americans. SES was measured by income, education, occupation, or a combination of these variables. The results were in agreement with prior studies that have revealed an increased prevalence of type 2 diabetes in African-Americans. However, the inter-relationships between obesity, SES, gender and other variables were complex and nonlinear (Lipton, Liao, Cao, Cooper and McGee, 1993). These results contradict the assumption that low SES particularly affects the incidence of type 2 diabetes in minority populations. In another study dedicated to SES and the risk of type 2 diabetes in African-Americans, a higher rate of obesity and undiagnosed diabetes was discovered despite greater educational and income levels as well as better access to health care and recreational facilities. The final conclusion was that regardless of SES, African-Americans may be at a higher risk for type 2 diabetes due

to genetic predisposition and other unknown environmental determinants (Gaillard, Schuster, Bossetti, Green and Osei, 1997).

While prior studies have concluded that SES may not contribute to type 2 diabetes risk, most have not offered gender-specific analyses. This fact is alarming in light of the higher prevalence of type 2 diabetes in African-American women. Alternatively, Robbins, Vaccarino, Zhang, and Kasl (2000) did examine gender differences in a study analyzing statistics from the Third National Health and Nutrition Examination Survey (NHANES III). Study results indicated that income is the most significant SES variable in explaining the excess prevalence of type 2 diabetes among African-American women, but not in men. Robbins et al. also point out that obesity is an important risk factor for type 2 diabetes associated with both African-American ethnicity and low SES in women, but not in men. Overall, the results of this analysis suggest that the higher prevalence of type 2 diabetes in black females reflects the economic disadvantage experienced by African-American women in particular.

Diagnosis

The American Diabetes Association (2004) recommends screening for type 2 diabetes based on clinical judgment and patient preference. Currently, there is a lack of data to support universal screening. There are no existing randomized clinical trials documenting the effectiveness of screening programs in decreasing morbidity and mortality. Also, controversy exists regarding the cost-effectiveness of screening and whether current screening is systematic and ongoing. Screening should be considered by health care providers, at three year intervals, if one or more of the following risk factors

is present: first degree relative with diabetes, overweight or obesity (BMI 25 or greater), higher-risk ethnicity, age 45 or greater, previously identified IFG or IGT, habitual inactivity, history of gestational diabetes, hypertension, high cholesterol, polycystic ovarian syndrome, or history of vascular disease. Diagnostic testing is suggested for patients presenting with potential complications of diabetes as well as symptoms of significantly elevated hyperglycemia.

The preferred screening test for type 2 diabetes is the fasting plasma glucose (FPG) because it is convenient and relatively inexpensive to perform (ADA, 2004). Normoglycemia is defined as plasma glucose levels less than 100 mg/dl. A FPG of 100 mg/dl or greater but less than 126 mg/dl is indicative of possible impaired fasting glucose and should be repeated on another day to confirm the diagnosis. Alternatively, a two hour oral glucose tolerance test (OGTT) could be performed on a second day to confirm diagnosis if a high suspicion of diabetes exists. Normoglycemia for the two hour OGTT is plasma glucose less than 140 mg/dl. Confirmation of impaired glucose tolerance occurs when plasma glucose is 140 mg/dl or greater but less than 200 mg/dl on two separate days. The diagnosis of type 2 diabetes is made when either the FPG is 126 mg/dl or greater and/or the two hour OGTT is 200 mg/dl or greater on two different days.

Although not perfectly correlated, the FPG and two hour OGTT threshold criteria were established due to their association with diabetic microvascular complications. The criteria have been retained in an effort to avoid disruption of the large body of clinical and epidemiological data that has already been collected. It is also important to note that the World Health Organization maintains the two hour OGTT as the reference diagnostic test for diabetes. The FPG is used only when circumstances prevent the use of the OGTT.

This is due to evidence that the FPG may have an inadequate sensitivity in high-risk populations. However, both the FPG and two hour OGTT criteria have not been adjusted for differences in sex, ethnicity, age, or weight (ADA, 2004). Further investigation is needed to improve test sensitivity for these variables.

Associated Complications

Type 2 diabetes is the seventh leading cause of death in the United States and usually considered part of the "metabolic syndrome", which is associated with other risk factors present early in the disease process. These other risk factors contribute to the long-term complications of diabetes and include obesity, hypertension, dyslipidemia, a prothrombotic state, and insulin resistance (Bate and Jerums, 2003). In general, the complications arising from type 2 diabetes are classified as either macrovascular or microvascular disease. The major causes of morbidity and mortality in type 2 diabetes are macrovascular complications, or cardiovascular disease, including coronary heart disease and stroke. Cardiovascular events occur twice as frequently as microvascular events in type 2 diabetes and are seventy-times more likely to be fatal (Meigs, 2003). The pathogenesis of cardiovascular disease involves hyperglycemia and its promotion of the reaction of glucose with components of the arterial wall to form advanced glucation products. These products cross-link with collagen, thereby increasing arterial stiffness. When dyslipidemia is present, low-density lipoprotein cholesterol promotes atherogenesis. Hypertension also contributes to the development and progression of vascular disease. Because of the close association between dyslipidemia, hypertension, and type 2 diabetes, strict control of glucose alone cannot be expected to prevent clinical cardiovascular disease.

Women without diabetes have a lower risk of cardiovascular disease than non-diabetic men. In contrast, women with type 2 diabetes have a greater risk of morbidity and mortality from cardiovascular disease than diabetic men. In addition, once women with type 2 diabetes develop cardiovascular disease, their outcomes are significantly worse (CDC, 2005). Liao et al. (2003) found that this elevated risk transcends ethnicity in both Caucasian and African-American populations. The differences between men and women across ethnic groups suggest that there are unique aspects of cardiovascular disease among women with type 2 diabetes. For example, one proposed explanation is that type 2 diabetes removes the theoretical protective benefits of estrogen on cardiovascular risk. Other explanations include lower levels of high-density lipoproteins, a greater association with hypertension, and a higher incidence of obesity in women with type 2 diabetes than men (Brandenburg, Lindenfeld, Reusch, and Regensteiner, 2003).

The major mechanism of microvascular disease is prolonged hyperglycemia. Co-existing hypertension is also a significant exacerbating factor. Microvascular complications from diabetes include nephropathy, peripheral neuropathy, and retinopathy. Diabetic nephropathy is the most common cause of end-stage renal disease accounting for 40% of new cases in the United States. Approximately 20-30% of diabetics have evidence of overt nephropathy, defined as persistent clinically detectable proteinuria in association with hypertension and reduced glomerular filtration rate (ADA, 2004). Peripheral neuropathy is also a major cause of morbidity for people with diabetes due to its association with foot ulcers and consequent lower-limb amputations. Diabetic retinopathy is the leading cause of blindness in adults. At diagnosis, up to a third of patients have retinopathy, increasing to two-thirds within twenty years. Vision loss due to

diabetic retinopathy results from several mechanisms. Central vision may be impaired by macular edema or capillary non-perfusion. New blood vessels from proliferative diabetic retinopathy and contraction of the accompanying fibrous tissue can distort the retina and lead to tractional retinal detachment. In addition, the new blood vessels may bleed causing preretinal or vitreous hemorrhage (Fong et al., 2004).

Almost all microvascular complications from type 2 diabetes have a higher morbidity and mortality rate in ethnic populations (Carter, Pugh, and Monterrosa, 1996). For example, diabetic nephropathy with end-stage renal disease is 3.2 to 6.6 times more likely to occur in African-Americans than in non-Hispanic white Americans. This relative risk is reduced to 2.6 after adjustment for the increased underlying prevalence of the disease. When confounding variables such as blood pressure, income, and age are controlled, African-Americans still have a 63% higher risk for developing end-stage renal disease. Rates for peripheral vascular disease and amputations are higher for African-Americans than non-Hispanic white Americans. However, little information exists regarding the prevalence of neuropathy among minority populations in general. African-American adults with type 2 diabetes also have a higher prevalence of retinopathy than non-Hispanic white adults. In fact, age-standardized rates for blindness due to diabetes are doubled in non-white populations.

Although African-Americans with type 2 diabetes have been found to have worse glycemic control and a greater incidence of hypertension leading to diabetic complications than white Americans, few studies have compared risk factors for complications among minority groups (Carter et al., 1996). Limited access to health care has been proposed as a reason for increased complications in ethnic groups. However,

once again little data exists to confirm this assumption. In addition, while the diabetes-specific mortality rates for African-Americans are higher than for white Americans, it is difficult to conclude whether the higher mortality rate is secondary only to higher prevalence rates of type 2 diabetes or to other factors. Future research efforts need control for the prevalence of type 2 diabetes when studying ethnic populations.

Chronic Management

The management of type 2 diabetes is directed at eliminating symptoms of the disease as well as preventing the development or progression of complications. According to the American Diabetes Association (2004), the effective management of diabetes begins with a coordinated health care team. Such collaborative teams may include physicians, nurse-practitioners, physician assistants, nurses, dieticians, pharmacists, and mental health professionals. Most importantly, patients and their families are central to the formation of a therapeutic alliance with these health care providers. It is crucial that individuals with diabetes assume an active role along with their health care team in the management of their disease. Therefore, personalized diabetic education is the primary component of any comprehensive self-management plan. When designing an individualized plan, consideration should be given to each person's age, gender, ethnicity, physical activity, dietary pattern, social support system, economic situation, personality, work and/or school schedule, and presence of complications from diabetes or other medical conditions (ADA, 2004).

Diabetic self-management includes glycemic control, exercise, nutrition therapy, and pharmacologic therapy. Out of all the components of diabetes care, blood glucose

monitoring is the most fundamental. Prospective randomized clinical trials such as the Diabetes Control and Complications Trial have demonstrated that glycemic control is associated with decreased rates of retinopathy, neuropathy, and nephropathy (The Diabetes Control and Complication Research Group, 1993). Specifically, the American Diabetes Association (2004) recommends the glycemic goals of an average A1C less than 7.0%, preprandial plasma glucose from 90-130 mg/dl, and postprandial plasma glucose less than 140 mg/dl. However, no data exists that identifies the optimal level of control for individual patients. Factors such as the risk of severe hypoglycemia, weight gain, and other adverse effects must be taken into consideration when setting personalized target glucose levels. In addition, the schedule of blood glucose testing requires individualized attention. While the most effective frequency and timing of self-monitored blood glucose for type 2 diabetics is not known, testing should be customized to avoid both hypoglycemic and hyperglycemic episodes.

Since type 2 diabetes is associated with the "metabolic syndrome", advances in its management specifically target insulin resistance, obesity, dyslipidemia, and hypertension. Exercise therapy has been proven to substantially reduce the effect of these risk factors as well as improve glycemic control in individuals with type 2 diabetes. The American Diabetes Association (2004) recommends that before beginning an exercise program, a detailed medical evaluation should be done to screen for the presence of micro and macrovascular complications. Any significant complications can impede physical activity or worsen with exercise. The identification of areas of concern will allow the design of a personalized program that can reduce this risk. In addition, type 2 diabetics must be aware of the potential for exercise to cause hypoglycemic reactions.

Therefore, careful glucose monitoring and access to a carbohydrate supplement are suggested during exercise sessions. The recommended exercise program for individuals with type 2 diabetes includes aerobic exercise for twenty to forty-five minutes at least three days per week appropriate to each person's lifestyle and general physical condition.

Nutrition therapy is also a cornerstone of type 2 diabetes self-management. The American Diabetes Association (2004) has proposed four goals of medical nutrition therapy for diabetes. The first is to attain and maintain optimal metabolic outcomes. These outcomes include glycemic control to prevent or decrease the risk of diabetic complications, a lipid and lipoprotein profile that reduces macrovascular disease, and blood pressure levels that prevent the risk of vascular degeneration. The second is to modify nutrient intake and lifestyle as appropriate for the prevention and treatment of obesity, dyslipidemia, cardiovascular disease, hypertension, and nephropathy. The third is to improve health through healthy food choices and physical activity. Finally, the fourth is to address individual nutritional needs taking into consideration personal and cultural preferences while respecting the individual's wishes and willingness to change. An effective dietary program requires an individualized approach, with consideration given to personal lifestyle, eating habits, and management goals. Because of the complexity of nutrition issues, a registered dietician frequently provides nutritional education and consultation.

Current pharmacologic therapies available for type 2 diabetes include a variety of oral medications as well as insulin. All of these agents have tissue-specific actions that improve glycemia. They can be used as monotherapy or in combination to take advantage of the different mechanisms of action to reverse the multifactorial pathophysiology of

beta-cell dysfunction, insulin resistance, increased hepatic glucose production, and decreased peripheral glucose utilization. The choice of a particular oral agent may be suggested by specific conditions such as obesity, or dictated by problems such as hypoglycemia, weight gain, and adverse effects on liver profiles, hepatotoxicity, gastrointestinal symptoms, and poor compliance (Gaal and De Leeuw, 2001). Insulin is indicated if glycemic control remains or becomes suboptimal when taking oral combination therapy. With currently available insulin preparations and administrative devices, an effective insulin regimen is attainable.

Psychological Impact

Type 2 diabetes is a chronic and progressive disease that causes significant morbidity and mortality. A series of psychological crises have been identified in the literature beginning at diagnosis. The initial recognition of diabetes can cause a sense of shock, loss, and period of bereavement (Jacobson, 1996). This is when the person diagnosed with diabetes as well as their families become aware of the challenges and lifestyle changes associated with the disease. In addition, the management of diabetes requires a complex daily regimen of blood sugar testing, diet, exercise, and pharmacologic therapies. Compliance with these treatment methods can cause significant psychological stress (Peyrot and McMurry, 1985). Negative health care beliefs and coping styles based on negative emotions are also identified as contributors to this stress (Pibernik-Okanovic, Roglic, Prasek, and Metelko, 1996). Furthermore, Rubin and Peyrot (1992) suggest that high levels of psychological stress are associated with poor glycemic control in adults. This poor glycemic control can then lead to subsequent medical

complications from type 2 diabetes causing significant emotional trauma (Talbot and Nouwen, 2000).

Individuals with type 2 diabetes have twice the risk of developing depression than individuals without diabetes (Egede and Zheng, 2003). Psychosocial factors that have been identified in the etiology of depression associated with diabetes include lower socioeconomic status, being unmarried, perceived poor physical health, lack of social support, perceived loss of control, duration of illness, poor glycemic control, and the presence of multiple complications. In turn, this depression may contribute to poor adherence to dietary recommendations, hyperglycemia, poor metabolic control, diabetic complications, poor adherence to weight loss interventions, decreased quality of life, and increased health care use and costs. Listrom et al. (1992) propose three hypotheses concerning the relationship of diabetes to depression. First, depression may be a response to the psychological stress caused by the disease. Second, depression may be related to the biochemical changes caused by diabetes and its treatment. Third, a combination of both conditions may exist concurrently.

The prevalence of diabetes related depression is estimated to be as high as 30% for non-Hispanic white and African-American populations. Fitzgerald et al. (2000) reported study results suggesting that attitudes toward diabetes are similar in both populations. However, African-Americans with diabetes may be less likely to seek treatment for their depression. Egede (2002) conducted a qualitative investigation concerning the beliefs and attitudes of African-Americans with type 2 diabetes toward depression. Results indicated that while participants acknowledged that depression could be severe and warrant treatment, their perceived susceptibility to depression and ability to

access treatment was decreased. Barriers to health care included a lack of knowledge about the etiology of depression, shame, stigma associated with depression, distrust of physicians, denial, fear of addiction, and cost of medication. Bell (1991) identified higher levels of stress and lower levels of family functioning as psychosocial variables that may also impact perceived barriers to care in African-Americans with diabetes. In an investigation by Groot, Auslander, Williams, Sherraden, and Haire-Joshu (2003), a higher rate of depression was found in obese African-American women with type 2 diabetes. Specifically, 40% of study participants reported clinically significant levels of depression. Several risk factors for depression in this population were identified. In addition to obesity itself as a risk factor, a lack of home ownership, non-work status, poor appraisal of one's recent financial status, low self-esteem, and greater numbers of life events were found to be significant. This study demonstrates that economic and social factors must be considered as sources of stress impacting depressive symptoms in African-American women with diabetes.

Gestational Diabetes

Etiology

As in type 2 diabetes, gestational diabetes is associated with both insulin resistance and impaired insulin secretion. Specifically, the development of insulin resistance during pregnancy is affected by an increase in the reproductive hormones estrogen, progesterone, cortisol, human placental lactogen, and prolactin (Yamashita, 2000). While this resistance is usually compensated for by a significant increase in insulin secretion, women with gestational diabetes have a decreased beta-cell reserve

resulting in significant carbohydrate intolerance. This intolerance primarily occurs in the last half of pregnancy and worsens progressively until it often resolves rapidly postpartum.

In addition to insulin resistance and impaired glucose tolerance, type 2 diabetes and gestational diabetes also share similar risk factors such as genetic susceptibility, obesity, and ethnic prevalence as previously discussed in this chapter. Specifically, risk factors for gestational diabetes include family history of a first degree relative with diabetes, obesity, increased weight gain during pregnancy, ethnicity, advanced age, previous gestational diabetes, and history of prior adverse pregnancy outcomes such as stillbirth, macrosomia, or cesarean section. What have rarely been discussed in the literature are the associations of these risk factors with gestational diabetes in African-American women specifically. Roseman (1991) recognized the need for this research and subsequently conducted a study that focused on the epidemiology of gestational diabetes in an African-American population. The frequencies of risk factors as well as their inter-correlations were compared to those of white women as presented in the literature. Significant relationships between age, obesity, weight gain during pregnancy, and a strong family history of diabetes were found. Results of the study indicate that there is an overall similarity between African-American and white women concerning the frequency and correlations between risk factors for gestational diabetes.

In another study by Osei et al. (1998), results demonstrated an additional genetic risk factor for gestational diabetes in African-American women. Study participants with a strong family history of diabetes in addition to prior gestational diabetes were found to have an additional defect in early phase beta-cell secretion. This defect was not present in

African-American women with a parental history of diabetes alone. Recurrence rates also suggest an additional risk factor for gestational diabetes in African-American women. Gestational diabetes has a 30-69% recurrence rate across ethnicities (MacNeil, Dodds, Hamilton, Armson, and VandenHof, 2001). Obesity, insulin use in the index pregnancy, and increased weight gain between pregnancies has been identified as common risk factors for recurrent gestational diabetes. While recurrence rates of <50% are primarily reported in white populations, recurrence rates >50% are most often reported in African-American populations demonstrating an increased ethnic risk for African–American mothers in particular (Nohira, 2006).

Diagnosis

The American Diabetes Association (2004) recommends that a risk assessment for gestational diabetes be done at the first prenatal visit. Women at high risk for the development of gestational diabetes have marked obesity, glucosuria, a personal history of prior gestational diabetes, or a first-degree relative with diabetes. These women should be screened as soon as possible during their pregnancy. If their first screening test is negative, they are then screened again between 24 and 28 weeks of gestation. Women at average risk should only be screened at 24 to 28 weeks of gestation. While the American Diabetes Association states that women at low-risk for gestational diabetes require no glucose testing, the American College of Obstetrics and Gynecology advocates universal screening but also recognizes that screening low-risk women may not be worthwhile (ACOG, 2001). Women considered at low-risk for gestational diabetes meet all of the following characteristics: age less than 25, normal weight prior to pregnancy, ethnicity with low prevalence of gestational diabetes, no known first-degree relatives with

diabetes, no history of an abnormal glucose tolerance testing, and no history of poor pregnancy outcome.

The initial screening test most commonly used in the United States is the one hour, 50-gram oral glucose tolerance test. Both the American Diabetes Association (2004) and the American College of Obstetrics and Gynecologists (2001) recognize two optional threshold values. The screening cutoff value of 140mg/dl has a sensitivity of 80%, while the value of 130 mg/dl has a sensitivity of 90%. However, while the prevalence of gestational diabetes shows significant variation between ethnicities, these screening thresholds do not take this variable into account. Esakoff, Cheng, and Caughey (2005) suggests that race-specific glucose screening test thresholds should be used to achieve the best balance between sensitivity and specificity in each ethnic group. For example, it is suggested that the optimal screening cut off for an African-American population is 135 mg/dl. Health care providers serving higher risk populations may choose to utilize the lower threshold value for greater sensitivity, whereas others serving women of lower risk populations may prefer the higher threshold value with a lesser sensitivity (Nahum and Huffaker, 1993). If a result of the screening test is equal to or above the threshold cut off value, a diagnostic test specific for pregnancy called the three hour 100-gram glucose tolerance test should be performed. Alternatively, the World Health Organization advocates a one-step approach using the two hour 75-gram glucose tolerance test eliminating the need for an initial screening test (Avery, 2000). However, this test is not as well validated for the identification of at-risk mothers and infants as the three-hour glucose tolerance test.

Historically, the diagnostic values utilized for the tree-hour glucose tolerance test have changed. In 1964, O'Sullivan and Mahan selected diagnostic threshold values according to the calculated means and standard deviations that best predicted the future development of diabetes mellitus in women with a history of gestational diabetes (O'Sullivan and Mahan, 1964). The diagnostic criterion of two abnormal values out of four was selected to avoid misclassification due to laboratory error. In addition, the original O'Sullivan and Mahan thresholds were measured by using the Somogy-Nelson technique on whole blood. Eventually, laboratories converted to using more modern plasma assays. In 1979, the National Diabetes Data Group (1979) recommended new criteria based upon these developments. Then again in 1998, the Fourth International Workshop Conference on Gestational Diabetes Mellitus and the American Diabetes Association adopted the criteria proposed by Carpenter and Coustan (1982). The lower thresholds of the Carpenter and Coustan criteria reflect corrective changes due to more recent enzymatic changes in glucose analysis. The utilization of their criteria increases the percentage of women diagnosed with gestational diabetes from 4% to 7%. This change translates into an increase of gestational diabetic women to over 50% in predominately white populations (Carr, 2001). Threshold values are 95 mg/dl fasting, 180 mg/dl at one hour, 155 mg/dl at two hours, and 140 mg/dl at three hours. Two abnormal values out of the four continue to be considered diagnostic for gestational diabetes.

Maternal-Fetal Complications

The American College of Obstetrics and Gynecology (2001) recognizes that mothers with gestational diabetes are more likely to develop hypertensive disorders such as preeclampsia than mothers without gestational diabetes during pregnancy. They warn

that a portion of this additional risk may be caused by underlying risk factors for gestational diabetes such as advanced maternal age and obesity. Also, gestational diabetic mothers are at an increased risk of developing subsequent type 2 diabetes. Several studies have shown that women with a prior history of gestational diabetes have a 17-63% risk of future diabetes within 5-16 years of the pregnancy (Carr, 2001). Fetal complications include an increased risk of intrauterine fetal death during the last four to eight weeks of pregnancy if significant fasting hyperglycemia is present. Although uncomplicated gestational diabetes with less severe hyperglycemia has not been associated with increased fetal mortality, gestational diabetes with any degree of hyperglycemia has been associated with macrosomia. However, because the risk factors for gestational diabetes such as obesity are also risk factors for macrosomia, the role of maternal hyperglycemia for this complication remains controversial (ACOG, 2001). Additional fetal complications include operative delivery, shoulder dystocia, birth trauma, hypoglycemia, hyperbilirubinemia, polycythemia, hypocalcemia, respiratory distress syndrome, and cardiac septal hypertrophy (Uvena-Celebrezze and Catalano, 2000). An increased risk of fetal anomalies is usually only present in women with severe hyperglycemia or undiagnosed diabetes mellitus in pregnancy (Schaefer-Graf et al., 2000). Later in life, the offspring of mothers with gestational diabetes are at risk for obesity, glucose intolerance, and type 2 diabetes developing in late adolescence and young adulthood (ADA, 2004). These risks are thought to be linked to fetal islet cell function during intrauterine development rather than increased weight at birth (ADA, 1998).

Health Care Regimen

The primary goal for the management of pregnancies complicated by gestational diabetes is to achieve and maintain euglycemia. To obtain this goal, the treatment regimen must include a combination of diet, exercise, glucose monitoring, fetal surveillance, and insulin therapy if needed. Since gestational diabetes is a disease of carbohydrate intolerance, nutrition therapy is designed to minimize carbohydrate intake. The American Diabetes Association (2004) advocates individualized nutrition counseling by a registered dietician. Adequate calories and nutrition must meet the needs of pregnancy, avoid ketosis, and be consistent with established blood glucose goals. The restriction of carbohydrates to 35-40% of calories has been shown to decrease hyperglycemia and improve maternal and fetal outcomes.

In addition to diet, exercise is recommended as a component of the gestational diabetic health care regimen (ACOG, 2001). The goal of exercise is to control weight gain and improve glucose metabolism. The literature regarding exercise in gestational diabetic pregnancies is limited however. Jovanovic-Peterson and Peterson (1989) demonstrated that upper-extremity exercise can significantly lower glucose levels. In contrast, Bung, Artal, Khodiguian, and Kjos (1991) found no improvement in mean blood glucose levels for a sample of women performing moderate cycle exercise three times per week. No significant increase in maternal or neonatal complications could be identified in either study. Despite the need for further research related to exercise in pregnancies complicated by gestational diabetes, the American Diabetes Association (2004) continues to support a program of moderate exercise as a valuable treatment modality.

Although self-blood glucose monitoring is recommended for the management of gestational diabetes, the optimal frequency, timing, and testing thresholds for intervention have not been established (ACOG, 2001). The necessity of daily testing for class A1 or diet-controlled, gestational diabetic mothers has not been proven because most studies concerning home glucose management in pregnancy have focused on pregestational diabetes or gestational diabetes requiring insulin therapy. However, Langer et al. (1994) and Solomon et al. (1997) have reported that frequent testing at least four times per day reduces the incidence of primary cesarean section and macrosomia. In addition, Veciana et al. (1995) found postprandial monitoring to be more effective than preprandial monitoring in reducing the incidence of macrosomia, cesarean delivery due to shoulder dystocia, and neonatal hypoglycemia. Current American College of Obstetrics and Gynecology (2001) practice guidelines suggest a target preprandial testing value of <95 mg/dl and a two hour postprandial testing value of <120 mg/dl. Insulin therapy should be initiated if glucose values exceed these thresholds (class A2 gestational diabetes). No clear recommendation exists for how long to attempt dietary management alone before initiating insulin therapy.

Although no consensus currently exists in the literature, antepartum fetal surveillance is not recommended until forty weeks of gestation if a class A1 gestational diabetic pregnancy remains uncomplicated. In poorly controlled gestational diabetes, class A2 gestational diabetes, or in pregnancies complicated by a history of stillbirth or chronic hypertension, fetal assessment should be started at 32 weeks of gestation. Fetal assessment options include the non-stress test, contraction stress test, or biophysical profile (ACOG, 2001). Ultrasound can also be used as a fetal assessment tool during the

third trimester to determine the usefulness of insulin. Buchanan et al. (1998) determined that from 29-31 weeks of gestation, a fetal abdominal circumference measurement of greater than or equal to 75% may be utilized as a clinical indicator for insulin therapy to decrease the risk of macrosomia. However, ultrasonography used to determine macrosomia prior to delivery has been shown to be unreliable. Therefore, elective cesarean section due to suspected macrosomia should only be considered with an estimated fetal weight of 4500 grams or greater. An elective cesarean section may also be considered with an estimated fetal weight of 4000 to 4500 grams in the presence of additional risk factors such as past delivery history and labor progress (ACOG).

Psychological Impact

A review of the literature reveals little research designed to study the experience of gestational diabetes for expectant mothers. Specifically, only five studies investigate psychological issues related to this complication of pregnancy (Langer and Langer, 1994; Persily, 1996; Sjorgren, Robeus, and Hansson, 1994; Spirito et al., 1989; Zigrossi, 1988). Of these five studies, two conclude that gestational diabetes has no significant psychological impact on pregnant mothers (Langer and Langer, 1994; Spirito et al., 1989). The first of these studies by Spirito et al. (1989) compared 68 women with gestational diabetes to 50 non-diabetic pregnant women matched for gestational age. The primary goals of this non-experimental research were to empirically evaluate the psychological impact of the diagnosis of gestational diabetes on pregnant mothers using the Profile of Moods Status Form, as well as to examine the relationship of mental status on glycemic control. Results of the study demonstrated that significant cross-sectional differences between gestational diabetic women and a non-diabetic control group

(measured several weeks after diagnosis) could not be found. In addition, no significant psychological differences could be detected between gestational diabetic participants requiring insulin therapy and those being treated by insulin alone. Langer and Langer (1994) conducted the second study to conclude that gestational diabetes does not significantly impact the psychological health of pregnant diabetic women. Participants included 206 women with gestational diabetes and 95 non-pregnant controls. This non-experimental study once again utilized the Profile of Mood Status Scale to measure psychological status at 37-38 weeks gestation and monitored daily glucose control. The results of this study indicated that the diagnosis of gestational diabetes did not adversely contribute to the mental health of pregnant mothers regardless of treatment modality. However, in contrast to the Spirito et al. (1989) study, women with poorer glycemic control were more likely to suffer greater anxiety, hostility, fatigue, and lack of confidence than gestational diabetic women with good metabolic control. This finding did suggest a relationship between the psychological state of gestational diabetic women and blood sugar levels.

Of the five studies in the literature focusing on the psychological impact of gestational diabetes, three found a significant relationship between the diagnosis of gestational diabetes and women's mental health (Persily, 1996; Sjorgren, Robeus, and Hansson, 1994; Zigrossi, 1988). The first of these studies, initiated by Sjorgren, Robeus, and Hansson (1994), was aimed at determining whether gestational diabetes influenced women's attitudes towards pregnancy, childbirth and their own health. A second goal was to compare the psychological effect of insulin therapy to diet therapy alone. The study included 113 participants with gestational diabetes and 226 controls. A 64-item

retrospective questionnaire was administered which included questions concerning psychosocial conditions, emotional experience, and health of the mother and child. Results of the study demonstrated that women with gestational diabetes experienced difficulty in accepting their diagnosis, feelings of poorer well being, greater psychological and physical fatigue, fewer positive memories of childbirth, and more worry about health status. No significant differences were found between women requiring insulin therapy and those being treated by diet alone. The second study to suggest a relationship between psychological well-being and gestational diabetes was published by Persily (1996). This investigator's objective was to research the relationship between mothers' perceptions of the impact of the gestational diabetes and treatment adherence. Study participants included 29 newly diagnosed gestational diabetic women. The quantitative tool used to measure subjective stress one week after diagnosis was the Impact of Event Scale. Ongoing treatment adherence was defined and measured as the percentage of recommended blood glucose monitoring episodes, incidence of hypoglycemia and hyperglycemia, number of obstetric appointments kept, and dietary adherence. The final conclusion of the study is that women with gestational diabetes who perceived their diagnosis to have a great impact on their lives would be less adherent to management recommendations that could potentially influence metabolic control.

The third study to suggest that the diagnosis and management of gestational diabetes is stressful during pregnancy was conducted by Zigrossi (1988). Study participants included 20 mothers with gestational diabetes and 18 women with chronic diabetes. The degree of stress experienced from the following nine procedures was evaluated by survey: diabetic diet, insulin administration, blood testing, ultrasound, non-

stress tests, amniocentesis, urine testing, 24-hour urine collection, and physician visits. Results of the study demonstrated that blood testing, amniocentesis, and insulin administration were more stressful to gestational than to chronic diabetic mothers. Ultrasound and non-stress tests were the least stressful to both groups. The study supported the investigator's contention that gestational diabetic women find the diabetic regimen more stressful than chronic diabetic women during pregnancy. Fear of the unknown and anxiety related to new procedures were suggested as possible explanations for this study's findings.

The noticeably small quantity of literature published that specifically addresses the psychological impact of gestational diabetes is most likely due to its perception as a temporary complication of pregnancy. However, while gestational diabetes often resolves by six weeks postpartum and is not commonly associated with the same potential for long-term health problems as in adults with chronic diabetes, the risk of serious fetal complications cannot be overlooked. In addition, gestational diabetes is a significant risk factor for overt diabetes later in life, increasing women's probability of complications associated with chronic diabetes over time.

In addition to limitations in the quantity of research devoted to the psychological effects of gestational diabetes, limitations in the quality of these studies are also apparent. First, the research tools utilized in four of the studies were not conceptually designed to measure the psychological effects specific to the diagnosis of gestational diabetes. Each of the studies used scales that measured general emotional states not targeted at the unique psychological experiences that women with gestational diabetes may report. Consequently, the validity of research concerning gestational diabetes currently found in

the literature is questionable. Second, little consideration was given to the impact of significant variables such as socioeconomic status, social support, ethnicity, and gender. While all of the studies indicated demographic ethnicity statistics with the exception of Zigrossi (1988), none evaluated their results based upon ethnicity as a contributing factor. The lack of attention given to external variables may ignore the complexity of the experience of gestational diabetes for women leading to incomplete and inaccurate research.

Gestational Diabetes and the Subsequent Risk of Type 2 Diabetes

Incidence

Mothers with a prior history of gestational diabetes are at high risk for the development of future diabetes. In fact, the diagnostic criteria for gestational diabetes originally developed by O'Sullivan and Mahan (1964) was based upon its predictive value for subsequent diabetes. Their research revealed a 50% incidence of type 2 diabetes after a pregnancy complicated with gestational diabetes in a cohort of women followed for 28 years. In a systematic review of the literature conducted by Kim, Newton and Knopp (2002), studies report an incidence rate of 17-63% within 5-16 years after delivery. The progression to type 2 diabetes appears to rise most steeply in the first five years after delivery with a plateau at ten years. The variation in incidence rates between studies is largely be explained by differences in ethnicity, length of follow-up, participant retention rates, and differences in the diagnostic criteria utilized.

Screening

The American Diabetes Association (2004) specifically recommends that glucose tolerance be reevaluated in mothers six to twelve weeks postpartum. In the absence of

overt symptoms of diabetes, either a fasting glucose or a two hour 75-gram oral glucose tolerance test should be performed. If the results of these tests are normal, subsequent testing should be done at a minimum of every three years. If impaired fasting glucose or impaired glucose tolerance is found without establishing a diagnosis of type 2 diabetes, annual testing is needed. In contrast, the American College of Obstetricians and Gynecologists (2001) recognizes the risk of type 2 diabetes after gestational diabetes but does not make a clear recommendation for postpartum testing.

Although 75% of ACOG members report that they routinely perform postpartum glucose testing in mothers with prior gestational diabetes, one study revealed that actual practice patterns may vary from self-reported survey data. Smirnakis et al. (2005) examined postpartum glucose testing by providers at two large academic medical centers. There results indicated that only 37% of eligible women received postpartum diabetes screening tests as recommended by the American Diabetes Association. Lack of access to postpartum care is an unlikely explanation since 94% of these women had Pap testing within eight weeks of their deliveries. In addition, no effect was attributed to education level, primary language, insurance status, median income, race, or ethnicity. However, several barriers to postpartum diabetes testing were proposed. These included conflicting testing recommendations by professional organizations, confusion over obstetric provider versus primary care provider responsibilities for postpartum follow-up, lack of patient awareness regarding the increased risk for the development of type 2 diabetes, and finally, mothers' inability to focus on their own health due to increased family obligations. Further research is needed to determine barriers to postpartum glucose

screening for mothers with gestational diabetes as well as to devise interventions to improve participation in testing procedures.

Risk Factors

Several risk factors have been identified for the development of type 2 diabetes in women after a prior history of gestational diabetes (Dornhost and Rossi, 1998). First, the degree of hyperglycemia during pregnancy and immediately postpartum is predictive. The risk of type 2 diabetes grows with the increased severity of diagnostic fasting blood sugar and glucose tolerance test results. This risk also increases the earlier the diagnosis is made. Second, the need for insulin therapy during pregnancy has been identified as a risk factor. The greater the carbohydrate intolerance, the more likely exogenous insulin will become a necessary treatment. Third, obesity during the index pregnancy is associated with increased risk. Specifically, the degree of postpartum abdominal obesity has been identified as a major determinant of reduced insulin sensitivity. Fourth, mothers with gestational diabetes who have a first-degree relative with diabetes mellitus are at an increased risk of subsequent type 2 diabetes themselves. Age and parity at the time of the index pregnancy are not associated with an increased risk of type 2 diabetes. However, increasing age and parity are associated with greater abdominal fat distribution which has been identified as a risk factor. While the recurrence rate for gestational diabetes is 30-69%, the association between multiple pregnancies complicated by gestational diabetes and the risk of subsequent type 2 diabetes remains unclear in the literature (Kim et al., 2002). In contrast, Henry and Beisher (1991) did report that women with recurrent gestational diabetes developed subsequent diabetes at a rate of 30%, while women with

only one pregnancy complicated by gestational diabetes developed subsequent diabetes at a rate of only three percent.

Another risk factor that remains unclear in the literature is ethnicity. It is well documented that African-American women are at a higher risk than non-Hispanic white women for gestational diabetes as well as type 2 diabetes. However, conflict exists between studies concerning ethnic risk comparisons for the rate of progression to type 2 diabetes after gestational diabetes. In a review of the literature, Kim et al. (2002) concluded that once diagnosed with gestational diabetes, women of non-Hispanic white, black, Latin, and Asian ethnicities appear to progress to type 2 diabetes at similar rates. In contrast, Dornhost and Rossi (1998) report that the progression to overt diabetes following a gestational diabetic pregnancy is significantly more rapid among women of ethnic groups with a high prevalence of type 2 diabetes. The prevalence was 50% within five years for the ethnic population and 10% within ten years for the white population. Once again, proposed reasons for these discrepancies in the literature are inconsistent diagnostic criteria as well as variable participant retention rates between studies.

Prevention of Type 2 Diabetes

Lifestyle Interventions to Prevent Obesity

As previously mentioned in this chapter, obesity is the most significant environmental determinant in the manifestation of type 2 diabetes. According to Gore et al. (2003), women are twice as likely as men to undergo a major weight gain over a 10 year period of time. In particular, women age 25-34 are twice as likely to develop significant weight gain as men or older women. African-American women are at an even

greater risk because they are 40% more likely than white women to gain weight during this early adulthood period. Gore et al. found that pregnancy associated weight gain contributes to the total weight gain in young adult women for both African-American and white populations. However, African-American women retain twice the amount of weight as white women postpartum. The primary risk factors identified for postpartum weight retention include excessive gestational weight gain and obesity prior to pregnancy (Buchanan et al., 1998; Metzger, Cho, Roston and Radvasny, 1993). In an investigation conducted within a large Detroit health system, Kieffer et al. (2001) studied the prevalence of prepregnancy obesity and excessive weight gained during pregnancy in a cohort of 552 African-American and 653 Latina women. Approximately 53% of African-American women and 38% of Latina women gained greater than 35 pounds during pregnancy, while 47% of African-American and 37% of Latina women were overweight or obese prior to pregnancy. These results demonstrate how both African-American and Latina women are at a significant risk for postpartum weight retention and its associated complications.

This evidence suggests that counseling women on the risk of postpartum weight gain and the benefits of weight maintenance or weight loss may be an important intervention for the prevention of type 2 diabetes. Gore et al. (2003) suggest that behavioral weight loss interventions during the postpartum period may capitalize on a time when women have a higher motivation to lose weight. In the postpartum period, women have reported greater dissatisfaction with their weight and a stronger desire to improve their shape than during pregnancy. However, few controlled trials exist which are dedicated to postpartum behavioral weight loss programs. Of these trials, only three

include African-American women (Leermakers et al. 1998; Lovelady et al. 2000; McCrory et al. 1999). All three trials successfully led to postpartum weight loss through a combination of diet and exercise behavior modification.

The research literature regarding lifestyle interventions to decrease the incidence of type 2 diabetes in men and non-pregnant or postpartum women at risk for type 2 diabetes is well documented. In general, dietary recommendations to avoid or delay the onset of type 2 diabetes through weight reduction include a reduction in dietary fat to no more than 30% of total calories while increasing dietary fiber and complex carbohydrates to greater than 50% of total calories (Dornhost and Rossi, 1998). In addition, physical activity must accompany these dietary modifications. Exercise contributes to weight loss through its beneficial effects on insulin sensitivity and its ability to decrease abdominal fat mass. In a cross-sectional study by Irwin et al. (2000), moderate intensity physical activity for 30 minutes daily was associated with a 6.6% lower fasting insulin level among African-American, Native-American, and Caucasian women. These results reinforce the significance of exercise in the prevention of type 2 diabetes since elevated fasting insulin levels are a strong predictor of this disease. While previous studies primarily investigated individual dietary and lifestyle factors related to type 2 diabetes, Hu et al. (2001) examined simultaneous dietary and lifestyle factors for their association with the development of type 2 diabetes in 84,943 female nurses from 1980 to 1986. Longitudinal study results showed that obesity was the single most important determinant of type 2 diabetes. The combination of several lifestyle factors such as maintaining a body-mass index of 25 or lower, eating a diet high in fiber and polyunsaturated fat and low in saturated and trans fat, exercising regularly, abstaining from smoking and

moderate alcohol consumption was associated with a 90% lower incidence of type 2 diabetes than women without these factors.

Finnish Diabetes Prevention Study

The Finnish Diabetes Prevention Study (FDPS) is important because it was the first randomized controlled research trial designed to test the feasibility and efficacy of lifestyle modification in participants at high risk for type 2 diabetes (Lindstrom et al., 2003). In this longitudinal study, individuals at high risk for the development of type 2 diabetes were those diagnosed with impaired glucose tolerance by a 7-gram oral glucose tolerance test. The randomization of 522 participants started in 1993 and completed in 1998. Of these participants, 172 were men and 350 were women with a mean age of 55 and a mean body-mass index of 31. Each participant was randomized to either an intervention group or a usual care group. The goal of the intervention group was to prepare participants with the necessary knowledge and skills to achieve gradual and permanent behavioral change. This behavioral change was defined as a reduction in dietary total and saturated fat, an increase in dietary fiber, weight reduction, and increased physical activity. Dietary intervention included a series of consultations with a nutritionist, voluntary group sessions, expert lectures, low-fat cooking classes, visits to local supermarkets, and between-visit phone calls and letters. The recommended weight loss was not more than 0.5 to 1 kg per week. Exercise intervention consisted of endurance and moderate intensity resistance exercise taught by nutritionists at the dietary counseling sessions and reinforced by study physicians at annual study visits. The usual care control group participants were also given the message to reduce weight, make dietary changes, and increase physical activity. However, the counseling and distribution

of written materials occurred only once at a baseline visit and was not individualized. An oral glucose tolerance test was performed annually with the diagnosis of diabetes confirmed with a second test. The mean duration of follow-up was 3.2 years.

Results of the FDPS show a cumulative incidence of diabetes after four years of 11% in the intervention group and 23% in the control group. During the trial, the risk of diabetes was reduced by 58% in the intervention group. This significant reduction in the incidence of diabetes was directly associated with the number and magnitude of lifestyle changes (Tuomilehto et al., 2001). No statistics were reported concerning the effect of sex or ethnicity as independent variables. In a subsequent study, Uusitupa et al. (2003) determined that the lifestyle interventions utilized in the FDPS reduced the incidence of type 2 diabetes through an increase in insulin sensitivity rather than insulin secretion.

Diabetes Prevention Program

The Diabetes Prevention Program Research Group (2002) conducted another longitudinal, randomized clinical trial involving 3,234 adults in the United States who were at high risk for the development of type 2 diabetes. The primary goal of the Diabetes Prevention Program (DPP) was the comparison of the efficacy and safety of three interventions to prevent or delay the onset of type 2 diabetes. The first intervention group was given an intensive lifestyle modification program. This program consisted of a goal-based behavioral intervention designed to achieve a weight loss of 7% and at least 150 minutes of moderate exercise per week. Key features of the program included lifestyle coaches to deliver the intervention, frequent contact with study participants, strategies to tailor the interventions to each individual participant, and educational

materials to address the needs of an ethnically diverse population. The second intervention group received standard lifestyle recommendations plus 850 mg of metformin twice daily. The third group was given standard lifestyle recommendations plus placebo tablets twice daily. Secondary goals assessed the difference between these three treatment groups in the development of cardiovascular disease, glycemic changes, beta-cell function, insulin sensitivity, obesity, physical activity, diet, quality of life, and adverse events. Other research objectives were to determine the consistency of the effects of the three interventions by demographic, behavioral, clinical, and psychosocial attributes (Diabetes Prevention Program Research Group, 1999).

Eligible participants were selected if the results of a 75-gram oral glucose tolerance test demonstrated both impaired fasting glucose and impaired glucose tolerance. A goal for recruitment was that at least half the study sample included women and half included individuals from African-American, Hispanic, American-Indian, Asian-American, and Pacific Islander ethnic minority groups. Out of the 3234 participants overall, 45% belonged to an ethnic minority group and 67% were women. More specifically, 52.9% of the women were white and 21.9% were African-American (Diabetes Prevention Program Research Group, 2000). Recruitment began in 1996 and was completed in 2002. The mean duration of follow-up was 2.8 years. Results indicated that lifestyle intervention can reduce the overall incidence of type 2 diabetes by 58% while Metformin can reduce the overall incidence of type 2 diabetes by 31%. The conclusion of the DPP was that as compared with placebo, lifestyle intervention is more effective than Metformin (Diabetes Prevention Program Research Group, 2002).

The DPP also recognized and documented exercise self-efficacy, dietary self-efficacy, weight loss self-efficacy, weight stage of change, perceived stress, and emotional eating as significant factors associated with baseline BMI. Since results of the DPP conclusively demonstrate that lifestyle intervention significantly reduces the rate of type 2 diabetes, it is critical to consider the extent to which psychological and behavioral factors contribute to weight loss success (Delahanty et al., 2002). In addition, the DPP included statistics relevant to the effect of lifestyle modification for both women and ethnic minority groups. This is in contrast to the Finnish Diabetes Prevention Study results. While lifestyle intervention was most effective for all subgroups of the population, reductions in the incidence of type 2 diabetes were 51% for white women and 61% for African-American women in particular (Diabetes Prevention Program Research Group, 2002). However, while the DPP included statistics for women of several ethnicities as opposed to the Finnish Diabetes Prevention Study, neither specified a previous history of gestational diabetes as a significant risk factor for the development of type 2 diabetes. As a result, the potential effect of lifestyle intervention specifically for women with a history of gestational diabetes was not studied demonstrating the need for research dedicated to this population.

Lifestyle Modification after Gestational Diabetes

Throughout the literature concerning the prevention of type 2 diabetes, women with gestational diabetes are identified as an ideal group for primary diabetic prevention. The American Diabetes Association (2004) recommends that the diagnosis of gestational diabetes be used as an opportunity to develop interventional strategies that can be tested in clinical trials aimed at delaying or preventing subsequent type 2 diabetes.

Unfortunately, no trials to date have studied any interventions specifically designed for women with a history of gestational diabetes with the exception of one pharmacological trial that was discontinued due to drug hepatotoxicity (Kim et al., 2002). This lack of research is particularly concerning because obesity has also been identified as an important risk factor for the development of type 2 diabetes in women with a history of gestational diabetes. As early as 1982, O'Sullivan demonstrated that 47% of women with a history of gestational diabetes who were obese or gained weight after the index pregnancy subsequently developed decreased glucose tolerance within 16 years.

Preventive interventional research involving mothers with gestational diabetes has been difficult due to mothers' lack of knowledge regarding their risk for type 2 diabetes and inadequate postpartum follow-up. According to Dornhost and Rossi (1998), the prevention of type 2 diabetes following a diabetic pregnancy should start with comprehensible education that is culturally relevant and acknowledges barriers to care. This education should include the importance of long-term glucose surveillance, subjective signs and symptoms of diabetes, as well as the potential benefits of lifestyle modification involving diet and exercise. While they recommend that this education occur during prenatal care to encourage postpartum follow-up, they also recognize that guidelines must be established which clearly define who is responsible for postpartum screening and follow-up. Kieffer et al. (2001) suggest that prenatal care providers have a unique opportunity to educate gestational diabetic women who are at risk for obesity and subsequent type 2 diabetes. This opportunity exists due to women's repeated contact with the health care system during and immediately following pregnancy.

Type 2 Diabetes Risk and Prevention Beliefs in African-American Women with Gestational Diabetes

Perception of Risk for the Development of Type 2 Diabetes

A review of the literature reveals little research dedicated to the assessment of perceptions of risk for the development of type 2 diabetes in individuals with significant risk factors. Farmer, Levyt, and Turnert (1999) conducted a study to describe what first-degree relatives of individuals with type 2 diabetes thought about their risk of developing type 2 diabetes. The investigation included 481 men and women who were siblings of type 2 diabetic family members. Study participants were given a well-being questionnaire used to assess general health, anxiety, and depression. In addition, they completed a diabetes knowledge questionnaire used to assess awareness of the risk of developing diabetes and its potential complications. Logistic regression analyses were used to assess factors predicting perceptions of diabetes risk. Results demonstrated that 38% perceived themselves to be at an increased risk of developing diabetes and 34% thought diabetes was a serious health problem. Predictors for an increased perception of type 2 diabetes risk were female sex, age 34 to 54 rather than 54 to 74, and having a parent with a history of diabetes. BMI did not affect risk perceptions. The effect of race or ethnicity was not considered in this study. An additional limitation of the study is that it did not clarify what the study participants considered to be a risk factor. This precluded the study from discovering if study participants were aware of gestational diabetes as a potential risk factor for type 2 diabetes.

In another study focused on perceptions of type 2 diabetes risk and prevention, 576 male and female telephone survey respondents were asked three questions: 1. “Do

you think you are at risk for diabetes?" 2. "Do you think that you can prevent getting diabetes?" 3. "Has a doctor or other health professional ever told you that you may be at risk for developing diabetes?" (Harwell et al., 2001). Risk factors considered in the study included age greater than 45, family history of diabetes, history of gestational diabetes, being overweight, history of high blood pressure, and history of high cholesterol. Study participants were an average age of 60 years old. Thirty-eight percent reported a family history of diabetes, 0.8% had a history of gestational diabetes, 49% had a BMI greater than 25, 0.26% had a history of high blood pressure, and 28% had a history of high cholesterol. Twenty-two percent considered themselves to be at risk for diabetes, 60% thought they could prevent diabetes, and 10% reported receiving medical advice regarding their risk. A family history of diabetes was most strongly associated with risk perception and least strongly associated with the belief that diabetes could be prevented. Individuals aged 45-64 years were the most likely to believe that diabetes could be prevented. Participants who were female, overweight, had a family history of diabetes, or had a history of high cholesterol were more likely to have received medical advice about prevention. Of interest in this study was the finding that women with gestational diabetes were less likely to perceive risk, believe that diabetes could be prevented, and have received medical advice regarding risk reduction. Although a prior history of gestational diabetes was recognized in this investigation, a limitation was that it was conducted in a predominantly white population. Specific demographic statistics regarding race or ethnicity were not calculated or reported.

Feig et al. (1998) specifically conducted a study to determine the long-term effects of a history of gestational diabetes on self-perceived health status in a cohort of 65

women three to five years after diagnosis. Gestational diabetic participants and 106 controls were matched for age, date of delivery, race, and family history of diabetes. All respondents completed the Postpartum Health Questionnaire which included questions assessing health perception, diabetes risk appraisal and diabetes prevention behaviors. Sixty-four percent of participants with a history of gestational diabetes reported receiving information about their risk of developing type 2 diabetes and 58% were given information about prevention. Forty percent of these women believed that it was possible that they may develop type 2 diabetes in the future and only 15% believed that diabetes was a serious disease. While race was included as a demographic variable in this investigation, it was not evaluated for its potential influence on study findings.

In the prior three studies reviewed, the effect of race and ethnicity is not explained. One investigation found in the literature did focus on the health-promoting practices of young black women at risk for type 2 diabetes. Risk was defined as a personal history of gestational diabetes or a family history of type 2 diabetes (Jefferson, Melkus, and Spollett, 2000). The study sample was comprised of 30 educated black women ages 25 to 44 with a mean BMI of 31. Participants completed the Health Promoting Lifestyle Profile II (HPLP), a 52-item instrument that measures the frequency of health-promoting behaviors using a 4-point Likert scale. Because no valid and reliable instrument has been developed to assess knowledge of diabetes prevention, an interview was also conducted composed of open-ended, Likert-type, and dichotomous questions. Results of the study reported that most participants were aware that diet and exercise modification could prevent or delay the onset of diabetes despite only 26% receiving risk information from medical providers. However, it was also found that these health

promoting behaviors were not routinely practiced. Specifically, the experience of prior gestational diabetes was an insignificant variable in regard to routine preventative behaviors. Identified barriers to health-promotion were lack of time, exercise equipment, and/or exercise partner. Only 47% of the women believed that they were likely to develop diabetes in the future. The study also revealed that participants were eager to discuss health promotion and expressed a desire to improve their lifestyles by requesting more information, support, and reinforcement. A frequent comment was that they needed to know about existing diabetes education programs.

Despite the importance of preventing type 2 diabetes, the literature regarding risk perception in both at-risk men and women is lacking. In addition, the effect of race and ethnicity is ignored in all but the above study. The studies reviewed in this chapter reveal a low overall risk perception for type 2 diabetes with statistics ranging from 22-47%. One study reported that only 60% of participants thought they could prevent the disease. Medical advice regarding the risk or prevention of type 2 diabetes was not often given with statistics ranging between 10-64%. According to Harwell (2001), women with a history of gestational diabetes in particular were less likely to perceive risk, believe in prevention, or receive medical advice to reduce their risk. In contrast, women who were overweight and had a family history of diabetes or a history of high cholesterol were most likely to receive health information for risk reduction. The factors most strongly associated with increased risk perception were female sex, younger adult age, and a family history of diabetes. However, a family history of diabetes was also the factor least strongly associated with positive prevention beliefs.

Psychosocial Factors Related to Type 2 Diabetes Preventive Behaviors

Research concerned with psychosocial factors affecting preventive behaviors in gestational diabetic women is significantly limited. In one cross-sectional analysis of 226 Australian mothers with a history of gestational diabetes, Smith, Cheung, Bauman, Zehle, and McLean (2005) examined psychological and social variables affecting postpartum physical activity. The goal of the investigation was to inform future diabetes prevention interventions designed specifically for women with prior gestational diabetes. Self-efficacy, social support, and barriers to physical activity were measured by Likert-style scales. Independent variables considered in the study were age, language spoken, education, number of children, and BMI. Results reported that women had the highest feelings of self-efficacy related to exercise when on vacation or in a negative mood. Verbal encouragement, assistance with child care, help with household chores, and being accompanied during physical activity were considered to be the most effective types of social support for exercise. Barriers to physical activity were lack of child care, lack of time, unsuitable neighborhoods, and fatigue. Factors most strongly associated with sufficient exercise were a college education, high self-efficacy, and significant social support. Study results were limited in their generalizabilty due to the fact that race and ethnicity were not included as independent variables.

Research concerning psychosocial factors related to type 2 diabetes prevention in African-American mothers with prior gestational diabetes is absent. However, a review of the literature does reveal psychosocial research concerning barriers to obesity prevention in African-American women. Throughout this literature, the following barriers have been reported: family norms regarding dietary patterns, the belief that

obesity is hereditary and cannot be overcome, stress, lack of time, the physical changes caused by pregnancy and menopause, depression, relationship difficulties, family responsibilities, lack of transportation, lack of motivation, lack of self-control, lack of social support, lack of financial resources, male preferences for female body shape, and safety issues (Allan, 1998; Railey, 2000; Walcott-McQuigg, 1995; Walcott-McQuigg, Sullivan, Dan and Logan, 1995). Wilcox, Richter, Henderson, Greaney, and Ainsworth (2002) used qualitative focus groups to examine perceptions of physical activity and personal barriers and enablers in African-American women. Forty-two African-American women participated in six focus groups lasting 90 to 120 minutes. Most study participants were between the ages of 19 and 51 years, unemployed, high school graduates, and overweight with a mean BMI of 29. The facilitator used a 10 question moderator's guide that included perceptions of physical activity; perceived characteristics of physically active and inactive African-American women; personal, cultural, environmental, and policy influences on physical activity; and suggested worksite and community interventions for increasing physical activity in African-American women. Study results reported that participants believed that personal characteristics were associated with barriers and enablers to physical activity, and that these characteristics included health-related and psychological factors. Health-related factors were described as the following: health problems or injuries limiting activity; improvements in health due to the beneficial effects of physical exercise such as a decrease in the risk of diabetes, hypertension, and stroke; and better eating habits when participating in active exercise. Psychological factors included: improvements in attitude due to the impact of exercise on well-being; improved appearance; lack of time related to competing priorities; feelings of stress,

fatigue, and lack of motivation as deterrents to exercise; and a lack of knowledge regarding what constitutes physical activity. Overall, the study findings confirmed the physical and mental benefits of physical activity as a motivating influence. However, it was also clear that the family remains the center of meanings, activities, and satisfaction for most women. The investigators concluded that physical activity promotion efforts must be sensitive to the family demands and obligations of African-American women.

An additional study conducted by Satterfield et al. (2003) was designed to confirm the feasibility and effectiveness of interventions to specifically delay or prevent the onset of type 2 diabetes in a multi-cultural population. Study participants included 235 men and women from five racial and ethnic groups at-risk for the development of diabetes. In addition, both formal and informal community leaders were present. The racial and ethnic groups included were African-American, Caucasian, Chinese, Hispanic or Latino, and American-Indian. At-risk individuals were defined as being obese or having a family history of type 2 diabetes. Gestational diabetes was not identified as a risk factor. Twenty-seven focus groups were conducted in five geographic locations across the United States. Participants' knowledge, attitudes, and beliefs about diabetes and factors that would facilitate or inhibit preventive behaviors at both individual and community levels were discussed. Through the qualitative technique of constant comparison, five themes common across all groups were identified.

The first theme involved the following attributions for diabetes: lack of exercise, obesity, American lifestyle, stress, and a family history of diabetes. The second theme concerned reactions to recent findings confirming the benefit of lifestyle interventions to prevent diabetes. Reactions included hopefulness and the feeling that these interventions

reflected common sense and were modest, but may not be easy to follow. The third theme reflected how knowledge of the potential to prevent type 2 diabetes was a motivator for action. Identified within this theme was the role of realistic fear, necessity of social support, need for consistency with cultural values, and the importance of teaching children healthy lifestyles. The fourth theme involved barriers to change such as lack of time, fast food and sedentary entertainment, high cost of nutritional food, lack of family support, lack of diabetes awareness, and the fact that diabetes is not a priority in some communities. The fifth theme concerned how people want to be told they have prediabetes. Explanations should be simple and hopeful. Knowledge of prediabetes was thought to be empowering because of the potential for prevention. The strength of this study was its ability to address and cross cultural lines. A limitation of this study was its inability to compare and contrast the opinions of male versus female participants. In addition, it did not include the perceptions of mothers with a prior history of gestational diabetes.

Further research concerning African-American women's beliefs about barriers and enablers to type 2 diabetes prevention is much needed. Specifically, an original investigation that studies the psychosocial factors involved in African-American women's perceptions of risk and intentions to prevent type 2 diabetes after pregnancies complicated by gestational diabetes is lacking. While some research exists that addresses barriers to type 2 diabetes and obesity prevention in African-American women, none focus on the experience of African-American women with gestational diabetes. Common barriers to preventive behaviors identified in prior literature include lack of time, lack of child care, fatigue, stress, family responsibilities, lack of transportation, lack of social

support, lack of motivation, and a lack of diabetes knowledge. New research dedicated to the unique perspective of this group of women at-risk for type 2 diabetes would be a valuable addition to our understanding of diabetes prevention.

Chapter III

Review and Comparison of Two Psychological Theories

Introduction to Social-Psychological Theory Concerning Health Beliefs and the Intent to Participate in Preventive Health Behaviors

Social cognition is concerned with how individuals make sense of social situations. “The approach focuses on individual cognitions or thoughts as processes which intervene between observable stimuli and responses in specific real world situations (Conner and Norman, 1996, p. 5).” Social cognition models help to describe cognitions and their interrelationships as they affect human behavior. Two Types of social cognition models have been utilized in social psychology to explain health behavior and treatment response (Conner, 1993). The first type of social cognition model is the attribution model. This kind of model is concerned with an individual’s causal explanation of a health related event such as the diagnosis of a serious illness. The second type of social cognition model is designed to look at an individual’s cognitions in an effort to predict future health behavior and behavior change. According to Conner and Norman, there are several potential advantages to using social cognition models in health psychology. They provide a theoretical basis for the selection, measurement, and evaluation of variables in order to predict behaviors and their outcomes. In addition, they increase our understanding of health which allows us to develop safe and effective interventions to modify cognitions leading to positive health behaviors.

The Health Belief Model and the Theory of Reasoned Action/Theory of Planned Behavior are two social cognition models commonly used to explain and predict health behavior. In order to determine the most appropriate theoretical model to guide research concerning perceptions of risk and beliefs about type 2 diabetes prevention in African-American women with gestational diabetes, this chapter will present the following: 1. a review of each model's origins, conceptual definitions, and relationship between concepts: 2. a comparison and critical evaluation of each model's assumptions and limitations: 3. a summary of each model's utilization in diabetic research: and 4. a discussion of the rationale for selecting the Theory of Planned Behavior as the most compatible theory for the purposes of this investigator's research goals.

Health Belief Model

Origin of the Health Belief Model

The Health Belief Model (HBM) was developed in the early 1950s by Hochbaum, Kegeles, Leventhal, and Rosenstock (Rosenstock, 1974). This group of U.S. Public Health Service investigators created the HBM in response to a widespread problem concerning the reluctance of people to participate in preventive health care behaviors or screening tests for the early detection of asymptomatic diseases. These diseases included tuberculosis, cervical cancer, dental disease, rheumatic fever, polio, and influenza. Patient symptoms, compliance with health care regimens, and physician-patient communication were not the focus of public health concern during this period in health care. These historical factors are important because they explain why the HBM was initially designed to target preventive health behaviors in particular (Rosenstock, 1974). Preventive health

behavior as defined by Kasl and Cobb (1966) as “any activity undertaken by a person who believes himself to be healthy for the purpose of preventing disease or detecting disease in an asymptomatic stage” (p. 246). Later, the HBM was extended to explain illness behavior (Kirscht, 1974), sick-role behavior (Becker, 1974), chronic illness behavior (Kasl, 1966), and the at-risk role (Batic, 1969). Illness behavior is defined as “any activity undertaken by a person who feels ill, for the purpose of defining the state of his health and or discovering suitable remedy” and sick-role behavior is defined as “the activity undertaken by those who consider themselves ill for the purpose of getting well” (Kasl and Cobb, p. 246). Chronic illness behavior is defined as health behaviors demonstrated by individuals with chronic disease to reduce risk and maintain health. The at-risk role differs from the sick role in that: 1 the individual has health-related responsibilities and no rights such as exemption from social responsibilities: 2. the at-risk role is not formally recognized by society: 3. the at-risk role is not time limited and must be practiced continuously: 4. the at-risk role is not always supported by medical professionals: and 5. the at-risk individual is held responsible for their role in health-related behaviors (Mikhail, 1981).

The HBM was influenced by the social psychological theory of Kurt Lewin (Rosenstock, 1974). According to Lewin (1935), individuals exist in a life space composed of regions. Some regions are positively valued (positive valence), some regions are negatively valued (negative valence), and others are relatively neutral. Disease is considered to be a region of negative valence which can exert a force that moves an individual away from the region unless this would cause the individual to enter a region of greater negative valence. A person’s daily activities are thought of as a

process of being pulled by positive forces and being repelled by negative forces. The origin of the HBM is attributed to a special case of Kurt Lewin's theory referred to as goal setting in the level-of-aspiration situation. Level of aspiration refers to the degree of difficulty in attaining a set goal. "The choice between different levels of difficulty is made on the basis of the relative valences of these levels for success or failure and the subjective probability of success at each level. Success that is highly improbable will not be chosen over reasonably probable success even though the improbable success is much more highly valued (Mikhail, 1981, p. 66)." Lewin also theorized that behavior depends on two variables. The first is the value of an outcome to an individual. The second is the individual's belief that a specific action will result in that outcome. Later, these value-expectancy variables were conceptualized into the context of health related behavior as follows: 1. the desire to avoid illness: and 2. the belief that a specific action will avoid illness (Janz and Becker, 1984).

Phenomenological Orientation

The HBM was developed from a phenomenological orientation. This orientation assumes that it is the world of the perceiver that determines what he or she will do rather than the objective environment. The objective environment influences the perceiver only in how it comes to be represented in the mind of the individual (Rosenstock, 1974). With a phenomenological orientation, individuals act upon what they believe to exist rather than on the viewpoints of medical professionals (Mikhail, 1981). In addition, the HBM focuses on the current dynamics confronting behaving individuals rather than on their past experiences. History plays a role only as it is represented in an individual's current dynamics (Rosenstock, 1974).

Variables/Construct Definitions

"Concepts are labels, categories, or selected properties of objects to be studied: they are the bricks from which theories are constructed (Davidhizar, 1983, p. 470)." Concepts used to order phenomena are called variables, while abstract variables are referred to as constructs. Rosenstock (1974) identifies the following six variables and constructs to determine the likelihood of health behaviors in the HBM: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and modifying factors.

1. Perceived Susceptibility—an individual's subjective perception of the risk for contracting an illness or condition.

2. Perceived Severity—feelings concerning the seriousness of contracting an illness or of leaving it untreated. This includes both medical and social consequences. The combination of perceived susceptibility and perceived severity is labeled as perceived threat.

3. Perceived Benefits—the health action's efficacy in preventing or reducing the susceptibility and/or severity of an illness or condition.

4. Perceived Barriers—physical, psychological, social, and financial impediments or costs to initiating and continuing a health action.

5. Cues to Action—internal or external stimuli that must occur in order to trigger appropriate health behavior by making an individual aware of his or her feelings about a health threat.

6. Modifying Factors—demographic (age, race, ethnicity, sex), socio-psychological (personality, social class, peer group pressure), and structural (disease knowledge, prior contact with the disease) variables which influence perceptions and perceived benefits of a health action.

Later, health motivation was introduced into the HBM by Becker et al. (1974). Health motivation refers to an individual's level of interest in health behaviors. The constructs of perceived susceptibility, perceived severity, perceived benefits, perceived

barriers, and cues to action are thought to explain an individual's motivation to achieve a positive state of health and avoid a state of illness (Mikhail, 1981). In addition, Rosenstock, Strecher, and Becker (1988) suggested the addition of self-efficacy as a separate construct within the HBM. Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Bandura clearly distinguishes these efficacy expectations from outcome expectations. Outcome expectations are defined as an individual's estimate that a certain behavior will lead to a specific outcome. The HBM most likely did not incorporate self-efficacy as an initial construct because it was designed to address simple preventive health behaviors such as immunizations. When the focus of health behavior requires long-term changes such as diet and exercise modification, individuals must have confidence that they can successfully change prior lifestyle habits (Janz and Becker, 1984).

Relationship of Constructs

The HBM organizes an individual's motivation to participate in a health behavior into three categories: individual perceptions, modifying behaviors, and likelihood of action. The relationship of the variables and constructs within the HBM are summarized in Figure 1. According to Rosenstock (1974), the likelihood that an individual will take action relative to a health condition is determined by his or her psychological readiness to take that action as well as his or her perception of the benefits of that action in comparison to the barriers to that action. An individual's state of readiness to take action is dependent upon the perceived threat of the health condition, or the perceived susceptibility to illness as well as the anticipated severity of the illness. However, "even

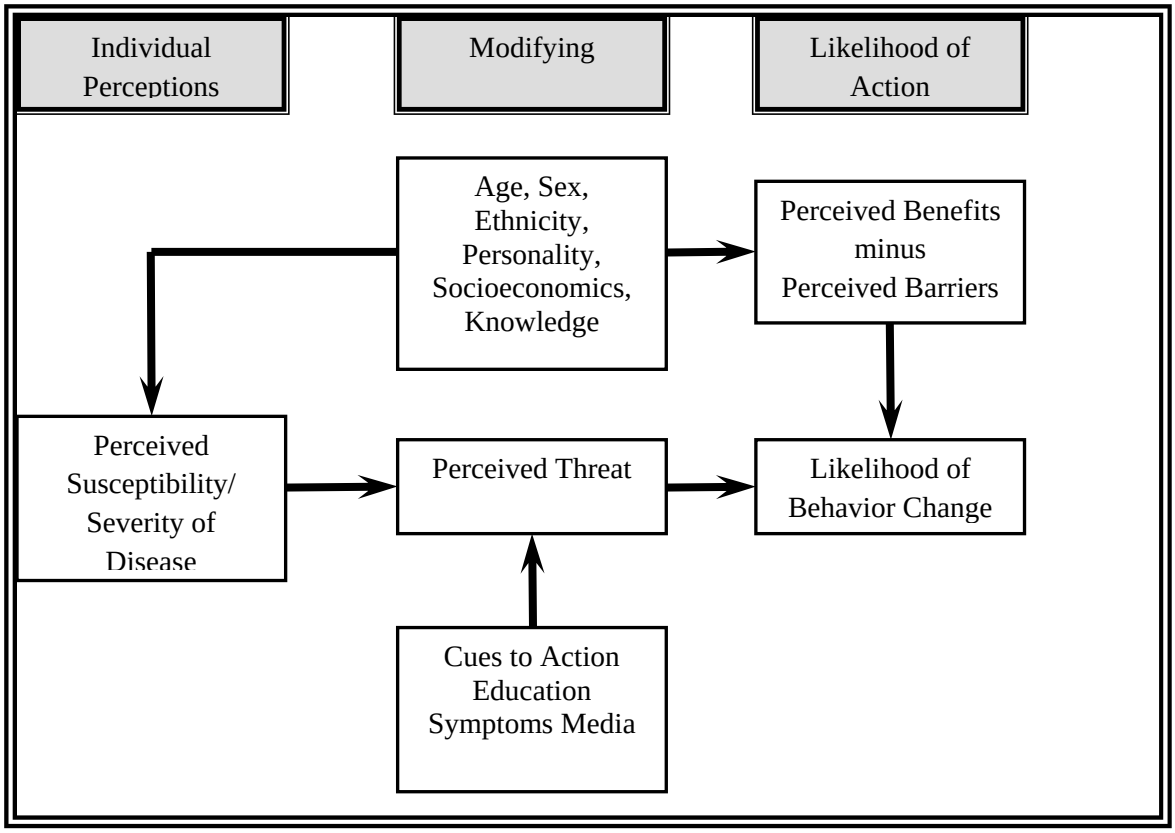
if an individual is ready to act, the likelihood of taking action will depend on beliefs about the probable effectiveness of the action in reducing the health threat and about the difficulties that must be encountered if such action is taken" (Mikhail, 1981, p. 67). If an individual's level of readiness to act is high and perceived barriers are low, the health behavior is likely to occur. Conversely, if an individual's level of readiness to act is low and the perceived barriers are strong, the health behavior is not likely to occur. It becomes even more difficult if an individual's readiness to act is high but the perceived barriers to that action are also high. Reactions to this situation may include increased fear and anxiety or psychological withdrawal by participating in activities which do not reduce the threat (Davidhizar, 1983).

Modifying factors such as internal or external stimuli or cues to action must occur to trigger the health behavior. An individual's level of readiness to take action is thought to be influenced by the intensity of these cues to action. Low psychological readiness requires strong stimuli while high psychological readiness requires less intense stimuli (Mikhail, 1981). Demographic (age, race, ethnicity, sex), socio-psychological (personality, social class, peer group pressure), and structural (disease knowledge, prior contact with the disease) variables are modifying factors that condition an individual's perceptions and perceived benefits of a preventive health action (Davidhizar, 1983).

Figure 1

Figure 1

Health Belief Model Relationship of Constructs



Note: Rosenstock, 1974. Historical Origins of the Health Belief Model. *The Health Belief Model and Personal Health Behavior*, 1-8.

Theory of Reasoned Action/Theory of Planned Behavior

Origin of the Theory of Reasoned Action/ Theory of Planned Behavior

The Theory of Reasoned Action (TRA) is a social cognition theory focusing on constructs concerned with the beliefs, attitudes, norms, and intentions that determine the likelihood of performing a specific behavior. The TRA was first introduced into the field of social psychology by Fishbein in 1967. During the early 1970s, the TRA was revised and expanded by Fishbein and Ajzen (1975). The TRA was originally developed in an effort to understand the relationship between attitudes, intentions, and behavior. Prior to this time, research found a relatively low association between attitudes and behavior (Montano and Kasprzyk, 1991). Fishbein was able to demonstrate the difference between an individual's attitude toward an object and one's attitude toward a behavior with respect to the object. He determined that attitude toward a behavior is a much better predictor of the behavior than attitude toward the target at which the behavior is directed (Fishbein and Ajzen, 1975). In addition, the primary focus of the TRA is an individual's intention to act in a certain way. Intention is considered to be the immediate determinate of consequent behavior. According to Poss (2001), if intention is measured accurately and there is correspondence between the measures of intention and behavior, intention will provide the best predictor of behavior. The foremost goal of the TRA is to predict and understand directly observable behaviors that are under the volitional control of an individual. However, an individual may not perceive a given behavior to be under his or her control due to limitations in opportunities, resources, or skills (Armitage and Conner, 2001). Consequently, the Theory of Planned Behavior (TPB) was created as an expansion

of the TRA to predict behaviors that are not under the complete volitional control of an individual (Ajzen, 1988; Ajzen, 1991).

Construct Definitions

The major TRA constructs identified by Fishbein and Ajzen (1975) include behavioral intention, attitude, and subjective norm. Other key constructs are behavioral beliefs, evaluations of behavioral outcomes, normative beliefs, and motivation to comply. The TPB adds additional constructs called perceived behavioral control, control beliefs, and perceived power.

1. Behavioral Intention—perceived likelihood of performing the behavior.
2. Attitude—overall positive or negative evaluation of the behavior.
3. Behavioral Belief—belief that behavioral performance is associated with certain attributes or outcomes.
4. Evaluation—value attached to a behavioral outcome or attribute.
5. Subjective Norm—belief about whether most people approve or disapprove of the behavior.
6. Normative Belief—belief about whether each referent approves or disapproves of the behavior.
7. Motivation to Comply—motivation to do what each referent thinks.
8. Perceived Behavioral Control—overall measure of perceived control over the behavior.
9. Control Belief—perceived likelihood of occurrence of each facilitating or constraining condition.
10. Perceived Power—perceived effect of each condition in making behavioral performance difficult or easy.

Relationship of Constructs

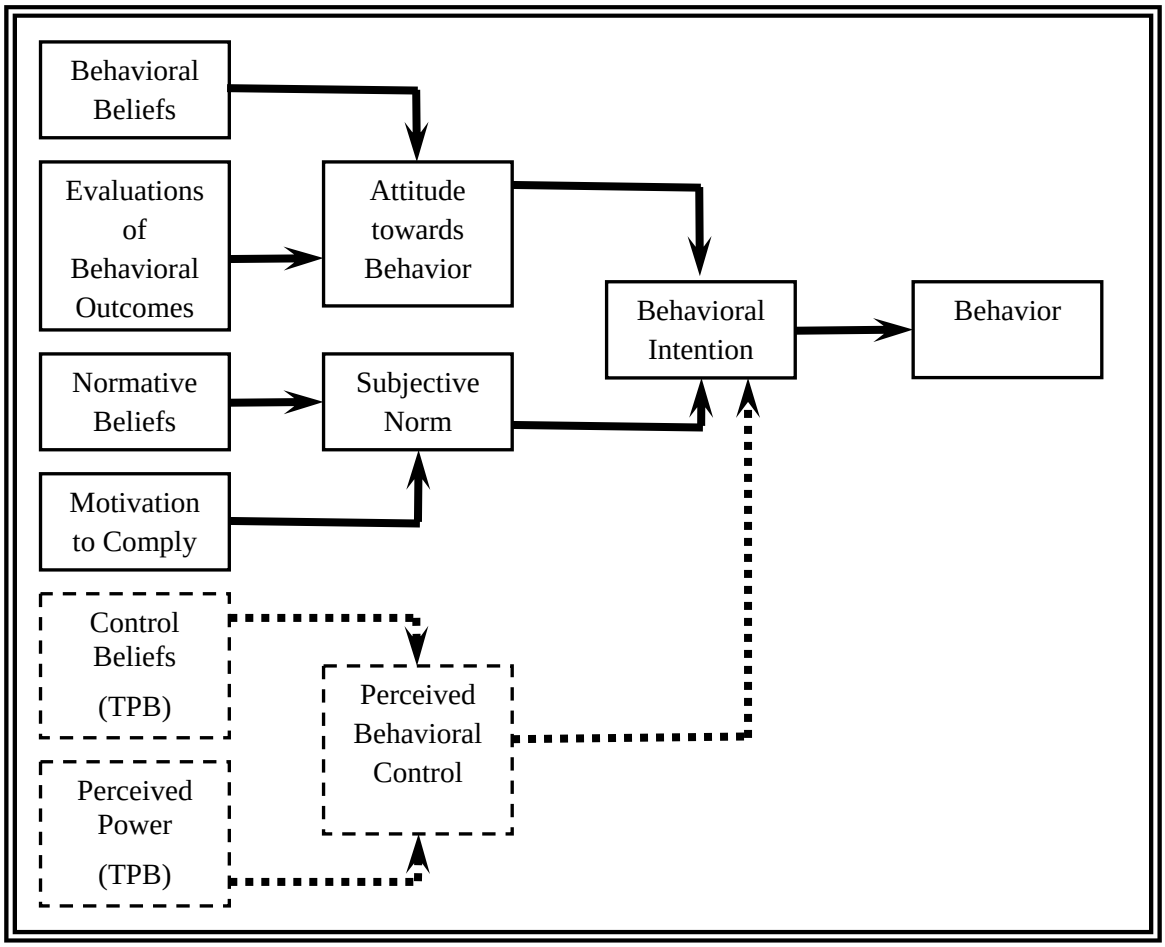
The relationship of constructs within the TRA and TPB are summarized in Figure 2. Each Model assumes a causal chain linking relationships between constructs. According to both Models, the most important determinate of behavior is behavioral intention to act. Behavioral intention is an individual's perceived likelihood of performing a behavior. An individual's behavioral intention is directly determined by his or her attitude toward performing the behavior as well as the subjective norm associated with the behavior. In turn, an individual's attitude toward a behavior is determined by both the belief that an outcome will occur (behavioral belief) as well as an evaluation of the benefit of that outcome. For example, a positive attitude toward a behavior will result if an individual possesses strong beliefs that a given behavior will bring in a highly valued outcome. A person's subjective norm is determined by both the belief that referent individuals approve or disapprove of a behavior (normative belief) as well as the motivation to comply with these referent individuals. For example, a positive subjective norm is created when an individual is motivated to meet expectations set by referents who believe that a given behavior should be performed (Montano and Kasprzyk, 1991).

While both the TRA and the TPB assume that the most important determinate of behavior is behavioral intention, the predictive success of the Models are dependent on an individual's ability to exert control over a given behavior. In situations where an individual has less control over the performance of a behavior, the TRA may not prove to be helpful. Consequently, Ajzen and Madden (1986) added an additional construct to the TRA called perceived behavioral control. The addition of this construct created the TPB. The TPB is not a separate theory from the TRA, but rather an extension of it.

Figure 2

Figure 2

Theory of Reasoned Action/Theory of Planned Behavior Relationship of Constructs



(The dashed lines indicate constructs exclusive to the Theory of Planned Behavior.)

Note: Montano and Kasprzyk, 2002. The Theory of Reasoned Action and the Theory of Planned Behavior. *Health Behavior and Health Education,* 67.

The TPB includes an additional construct that is concerned with an individual's perceived control over the performance of a behavior.

According to the TPB, an individual who perceives that he or she has a high degree of control over the performance of a behavior will make a greater effort to achieve behavioral change. Conversely, an individual who perceives that he or she does not have a significant degree of control over the performance of a behavior will make little or no effort towards behavioral change (Montano and Kasprzyk, 2002). Along with attitude and subjective norm, perceived behavioral control in the TPB is an independent predictor of behavioral intention. In turn, perceived behavioral control is determined by an individual's belief in facilitators and barriers to a given behavior (control belief) as well as the perceived effect of conditions making behavior difficult or easy (perceived power). For example, high perceived control over a behavioral change will occur if an individual has a strong belief in the presence of conditions that encourage the behavior (Montano and Kasprzyk, 2002).

Critical Evaluation and Comparison of the Health Belief Model and the Theory of Reasoned Action/Theory of Planned Behavior

Assumptions

The HBM makes four major assumptions (Davidhizar, 1983; Mikhail, 1981). The first of these assumptions is related to its phenomenological orientation. According to this orientation, it is the subjective perspective of an individual that predicts behavior rather than the objective environment. The second assumption of the HBM is that a causative relationship exists between health beliefs and health behaviors. In order for behavioral change to take place, an individual must feel threatened by a current or potential health

problem, believe that a behavior will be beneficial and result in a valued health outcome, and feel that one can perform the necessary change in behavior. However, it is possible that health beliefs may develop along with the health behavior rather than before it as a result of health care interventions. The third assumption is that health is highly valued by most people. The fourth assumption is that generalizations can be made to the population based upon research concerning the behavior of individuals.

The TRA and TPB also make several major assumptions (Montano and Kasprzyk, 2002; Young, Lierman, Powell-Cope, Kasprzyk, and Benoliel, 1991). First, they assume that all individuals are rational actors who process information and are motivated to act on it. Second, both the TRA and the TPB assume that personal behaviors are under volitional control. However, as previously described, the TPB takes into consideration an individual's perception of behavioral control. Third, both Models assume that all behaviors are directly determined by behavioral intentions. Fourth, the TRA and the TPB are similar to the HBM in that they assume a causative relationship between an individual's beliefs and subsequent behavior.

Limitations

Both the HBM and the TRA/TPB have a variety of limitations. For example, critics of the HBM have identified a lack of uniformity across studies in testing the Model. Two reasons exist for this lack of uniformity (Mikhail, 1981; Ogden, 2003; Poss, 2001). First, although the HBM provides definitions for its major constructs, agreement in the literature regarding the meaning of these constructs has not yet been achieved. This causes difficulties for the operationalization of constructs. Second, the relationships

between constructs within the HBM are not completely understood. The exact nature of construct relationships as well as the amount of influence independent constructs exert on dependent constructs remain unclear. Ultimately, the reliability and validity of developed instruments becomes difficult to establish (Champion, 1984). Another limitation of the HBM is that it does not account for normative or cultural factors when predicting health-related behaviors. Because the Model lacks normative and culturally specific constructs, its ability to explain health behavior in different cultural settings has been questioned. An additional criticism is that the HBM accounts for only as much of the variance in health behaviors as can be explained by health beliefs that are obvious to the individual. Demographic variables, personality factors, social support, and prior health experiences are recognized only as influences on the major constructs and not as an explicit part of the Model (Poss, 2001: Salazar, 1991).

Similarly, the TRA and the TPB assume that demographic and environmental factors help to explain the likelihood of a behavior through model constructs rather than independently (Montano and Kasprzyk, 2002; Poss, 2001). “These are considered to be potentially important but are not incorporated into the core of the theory. Instead, they are termed external variables that may influence a person’s beliefs but affect behavior only via the major variables that are included in the TRA (Poss, 2001, p. 6).” Consequently, demographic and environmental factors are not recognized directly within these Models potentially disguising the magnitude of their effect on an individual’s intention to perform a behavior. Another criticism of the TRA and the TPB is their focus on intention rather than the explanation of behavior. As suggested by Lauver (1992), the goal of most health care researchers is the explanation of health behaviors. This may limit the

usefulness of the TRA and the TPB for research not primarily focused on an individual's performance of a behavior of interest.

Summary of Model Utilization in Diabetic Research

The HBM has been used extensively in the literature to study health behaviors related to screening, prevention, illness, and compliance with medical interventions (Mikhail, 1981; Poss, 2001; Salazar, 1991). "The HBM has been used both to explain change and maintenance of health-related behaviors and as a guiding framework for health behavior interventions. It has been expanded, broken down into components, compared to other frameworks, and analyzed using a wide array of multivariate analytic techniques (Janz, Champion, and Strecher, 2002, p. 45)." In 1984, Janz and Becker published a comprehensive review of 46 investigations related to the HBM including twenty-nine studies published from 1974-1984 and 17 studies published prior to 1974. Of these 46 studies, 18 were prospective and 28 were retrospective. Twenty-four reviewed preventive health behaviors, 19 examined sick-role behaviors, and 3 were related to clinic utilization. The authors constructed a significance ratio which divided the number of positive, statistically significant findings for each HBM construct by the total number of studies reporting significance levels for the construct. The results of the review provided strong empirical support for the HBM with significance ratios for the prospective findings at or above those obtained from retrospective studies. In addition, the review identified perceived barriers as the most powerful predictor of health behavior. However, the strength of predictors varied by type of behavior. Perceived susceptibility was a stronger predictor of participation in preventive behaviors, while perceived benefits were a stronger predictor of health behaviors for individuals with known medical diagnoses.

Perceived severity demonstrated low significance, especially as it related to preventive health behaviors.

Janz and Becker's (1984) review included three studies concerning diabetes. The focus of all three studies was on compliance with the diabetic medical regimen. The first study by Alonga (1980) concentrated on one HBM construct, perceived severity. In this retrospective study, 50 obese type 2 diabetic adults were classified as compliant or noncompliant according to criteria related to prior weight loss and glucose control. Severity was measured by a "perception of severity of disease index" from the Standardized Compliance Questionnaire. Results demonstrated a significant difference between compliant and noncompliant participants with compliant participants viewing their disease as more serious than noncompliant participants. However, because the sample size was small (n=50) and the study was retrospective and not randomized, the generalizabilty of results was limited. The second retrospective study reviewed by Janz and Becker was conducted by Bloom-Cerkoney and Hart (1980). In this study, 30 insulin-dependent diabetics were interviewed six to twelve months after attending diabetic education classes. Each construct of the HBM was measured by items from the Standardized Compliance Questionnaire. A total compliance score measured the degree of adherence to a diabetic regimen including insulin administration, urine testing, diet, hypoglycemia management, and foot care. Results demonstrated a positive association for all of the HBM constructs with perceived severity reaching statistical significance. Once again, generalizabilty was limited by the small sample size (n=30) of this investigation in addition to its retrospective, non-randomized design. The third diabetic study reviewed by Janz and Becker was conducted by Harris, Skyler, and Linn (1982).

This retrospective study included 50 type 2 diabetic men interviewed for recall information regarding medication use, dietary compliance, urine testing, exercise, and foot care. In addition, four physiological measures from blood and urine were obtained. Behavioral and physiological measures were rated on four-point Likert-style scale. Direct, positive correlations were obtained between: perceived susceptibility and dietary compliance; perceived benefits and exercise; perceived barriers and medication use; perceived susceptibility and both hemoglobin and urine glucose; and perceived severity and fasting glucose. Limitations of the study included a small sample size (n=50) and retrospective, non-randomized design.

Since Janz and Becker's review published in 1984, research using the HBM to study diabetes has continued to concentrate primarily on compliance with the diabetic medical regimen rather than the prevention of type 2 diabetes (Coates and Boore, 1998; Swift, Armstrong, Beerman, Campbell, and Pond-Smith, 1995: Wooldridge, Wallston, Graber, Brown, and Davidson, 1992). In addition, these investigations rarely consider the effect of type 2 diabetes on African-American women. None have studied diabetes in women during pregnancy or in women with gestational diabetes in particular. One study that did apply the HBM to African-American women with type 2 diabetes focused on the health beliefs of women who exercised on a regular basis in comparison to women who did not exercise regularly (Koch, 2002). The study also compared glycemic control between women in these two groups. This non-experimental, non-randomized investigation utilized a retrospective, comparative design. A 32-item HBM diabetes scale was administered to a convenience sample of 31 African-American women over the age of 50 with type 2 diabetes. A1C results were retrieved through chart review. Study results

demonstrated a direct relationship between the perceived benefits and barriers to adherence and regular aerobic exercise. Participants who exercised regularly reported fewer barriers to exercise and perceived greater benefits from adhering to a regular exercise regimen than those participants who did not exercise regularly. No difference between groups was observed regarding perceived susceptibility to diabetic complications and perceived severity of the chronic diabetic disease process. Women who exercised three or more times per week had greater metabolic control as evidenced by lower A1C results. Study limitations included a small sample size (n=31) and a retrospective, non-randomized design. The scale utilized in this study was adapted from a tool previously used to study health beliefs in women. Two doctorally prepared nurse researchers revised the tool to specifically evaluate the relationship between health beliefs and adherence to exercise. An additional study limitation was that the HBM diabetes scale was not also revised to address the cultural beliefs of African-American women.

The objective of the following investigation related to diabetes prevention was to determine whether perceived risk and other health beliefs held by individuals at high risk for the development of type 2 diabetes predicted weight loss and behavior change during a behavioral weight loss program (Polley, 1997). The study recruited 154 men and women with the following inclusion criteria: 40-55 years of age, 30-100% overweight, and a family history of diabetes in a first-degree relative. Participants were randomized into either a self-help group or one of three behavioral change groups involving exercise, diet, or a combination of diet and exercise. All groups were followed prospectively for two years. A questionnaire was designed to assess beliefs about developing diabetes in

individuals who did not yet have the disease. Health beliefs identified within the questionnaire were based upon HBM constructs. The effects of these beliefs on adherence, dietary intake, and weight loss were examined by cross-sectional analyses. Results demonstrated that none of the health beliefs studied predicted adherence, dietary intake, or weight loss at any point in the program. Participants who perceived themselves at highest risk for developing diabetes had a stronger family history and were more likely to be women. These participants also rated diabetes as a more serious disease but were less likely to believe that weight loss would lower their risk. The conclusion of this study was that the perceived risk of developing diabetes did not predict performance in a behavioral weight loss program. This investigation is believed to be the first prospective, randomized study to examine health beliefs and their relationship to preventive weight loss in individuals at high risk for type 2 diabetes. However, the study also has limitations. Because the study did not utilize a standardized tool to measure health beliefs, its generalizabilty is limited. In addition, while the study addressed differences between male and female participants, it did not consider the effect of ethnicity. It also did not recognize a prior history of gestational diabetes as a significant risk factor for type 2 diabetes in female study participants.

The TRA and the TPB have been used successfully to predict and explain a variety of health behaviors and intentions. These include smoking, contraceptive use, mammography, exercise, seatbelt use, drinking, breastfeeding, substance use, sexually transmitted infection prevention, and health care utilization (Albarracin, Johnson, Fishbein, and Muelledeile, 2001; Blanchard et al., 2003; Blue, 1995; Fisher, Fisher, and Rye, 1995; Gullatte, 2006; Jemmott and Jemmott, 1991; Kloeblen, 1989; Manfredi,

Lacey, Warnecke, and Petraitis, 1998; Montano and Kasprzyk, 1991; Park, Yoo, and Chang, 2002; Pender and Pender, 1986; Trafinow, 1996). However, the utilization of these theories in diabetic research is significantly limited. No investigations related to the prevention of type 2 diabetes can be found in the literature regardless of ethnicity. In addition, no investigations related to diabetes in pregnancy are available using either of the two theories. A review of the literature revealed only one study which analyzed the usefulness of the TRA in explaining and changing diabetes related self-care behavior (De Weerdt, Visser, Kok, and Van Der Veen, 1990). The goal of the investigation was to determine how diabetes education can most effectively influence the following four self-care behaviors: blood glucose monitoring, diet adherence, exercise regularity, and insulin adjustment. A total of 558 insulin-dependent diabetic men and women between the ages of 18 and 65 were randomly recruited from 15 hospitals across the Netherlands. Four separate questionnaires were constructed to assess study participant's attitudes, normative beliefs, and intentions toward the four self-care behaviors. The results of this cross-sectional investigation demonstrated that attitude was the most important determinant of self-care behavior. In addition, an adequate level of knowledge regarding diabetes care was needed for a positive attitude. The study concluded that diabetes education should first focus on improving patients' level of self-care knowledge and then on positive attitudes towards diabetes self-care.

While diabetes prevention research using the TRA or TPB is lacking in the scientific literature, many studies have been conducted using either theory to explain and predict exercise behavior. As discussed in chapter two, exercise is considered a critical component of type 2 diabetes prevention. Blue (1995) conducted a critical review of

research using either of the two theories to determine the usefulness of model constructs in explaining exercise behavior. Twenty-three studies were found with 16 studies using the TRA and 7 studies using the TPB. Most investigations used cross-sectional survey designs with the exception of one study which used a quasi-experimental design. Results from the studies demonstrated that behavioral belief was positively correlated with attitude, while normative belief was positively correlated with subjective norm. In all studies, attitude was predictive of intention. Most studies did not demonstrate a significant correlation between subjective norm and behavioral intention. When the intention and behavior components of the model were measured, intention was significantly predictive of exercise behavior in all but one study. Overall, this review provided evidence for predictive utility of both theories. However, the TPB was proposed as the most promising framework for the study of exercise because it includes beliefs about control of factors that would facilitate or inhibit performing exercise. The author also discusses a methodological issue concerning the generalizabilty of study results in other populations. Because most of the studies were conducted with samples of middle-class, healthy, young to middle age adults, future studies are necessary to examine the cognitive determinants specified by the theories with respect to differences in a person's age, ethnicity, health, occupational group, and socioeconomic status.

Rationale for the Selection of the Theory of Planned Behavior

"The usefulness of a theory may be measured by its ability to provide clear directions and guidance for practice and research. A useful theory should enable the practitioner to exert control over the phenomena of interest by manipulating or influencing the major variables that are part of the theory. To be useful for research, the

theory should be able to stimulate thinking and provide guidelines for the ongoing process of scientific research (Mikhail, 1981, p. 72)." The HBM, TRA, and TPB all provide a logical framework for explaining, predicting, and facilitating behavioral change. As discussed in this chapter, all have also been systematically tested and applied to a variety of preventive and illness-related behaviors. However, they have had limited use in research concerning the prevention of type 2 diabetes in African-American women, and no use in research concerning diabetes in pregnancy. While the intent of this chapter is not to prove that one model is superior to another, the most appropriate model is selected for its applicability to the study of perceptions of risk and preventive health beliefs for type 2 diabetes in African-American women with gestational diabetes. Specifically, model constructs must be conceptualized and applied within a socio-cultural context relevant to African-American women.

Two constructs within the HBM make assumptions about the health care and cultural realities of African-American women (Ashing-Giwa, 1999). First, the perceived barriers construct seems to negate the very real psychosocial experience of African-American women in our country. Second, the perceived susceptibility construct may also not be relevant to this population of women who often are unaware of their risk for type 2 diabetes due to inadequate information from health care providers. In Janz and Becker's (1984) comprehensive review of the literature using the HBM, perceived barriers was identified as the strongest predictor of health behavior while perceived susceptibility was demonstrated to be the strongest predictor of preventive behavior. Because the HBM makes assumptions regarding these two constructs when applied to the socio-cultural

context of African-American women, it may not be the best choice for use as a framework for this investigator's goals for research.

As discussed previously in this chapter, the TRA and the TPB have both been used effectively in the literature concerning African-American women and a variety of health care behaviors unrelated to diabetes. The TRA/TPB emphasis on normative beliefs adds a culturally based perspective on behavior which is not present in the HBM constructs. However, the TRA and the TPB also make two assumptions which may not be consistent with the cultural experience of African-American women (Ashing-Giwa, 1999). They both assume that most behaviors are under an individual's volitional control. Once again, some health related behaviors are not under complete volitional control for African-American women due to health care access barriers and poverty. Another assumption which may be invalid for African-American women from a low socio-economic background is that intention directly determines behavior. Ashing-Giwa recommends that studies using the TRA or the TPB with African-American women should consider measuring actual participation rather than intention. This is due to the economic and systemic barriers experienced by women from this community which may not allow participation in health care behaviors even if intent is present.

Overall, the TPB provides the most appropriate framework for guiding this investigator's goals for research due to its appreciation of the impact of culture through normative beliefs. In addition, the TPB considers the additional effect of control beliefs. This construct may help to explain what preventive health behaviors African-American women consider easy or difficult to practice. While Ashing-Giwa (1999) recommends measuring behavior rather than intention, this investigator believes that awareness of the

beliefs and norms influencing African-American women's intent to participate in type 2 diabetes prevention is important. Certified nurse-midwives can use their knowledge of these beliefs as a framework for designing relevant intervention programs in an attempt to encourage type 2 diabetes preventive behaviors in African-American women with gestational diabetes.

Chapter IV

Methodology

Qualitative Design

Specific Aims

The purpose of this research investigation was to gain knowledge about perceptions of risk for the development of type 2 diabetes in African-American women with gestational diabetes. In addition, this study was designed to discover psychosocial factors affecting their intentions to participate in preventive behaviors. A qualitative design was chosen as the most appropriate research method for the purposes of this investigation for several reasons. First, qualitative research methods generally allow study participants the opportunity for greater personal explanation than quantitative methods. Enabling women with gestational diabetes to describe their illness experiences and beliefs respects their individuality and communicates a sense of interest in the unique perspectives they have to offer scientists within the discipline of nursing. In addition, Kennedy and Lowe (2001) assert that qualitative research is reflective and interpretive allowing the voices of both the participant and researcher to become part of the process. "The data provide rich verbal descriptions and make the phenomenon come to life through the interpretation of the researcher (p. 93)." Second, qualitative research is particularly valuable for studying a phenomenon about which little is known (Field and

Morse, 1985). As previously discussed in chapter two, a review of the literature reveals little research dedicated to perceptions of risk for the development of type 2 diabetes behaviors in African-American women with gestational diabetes (Farmer et al., 1999: Feig et al., 1998: Harwell et al., 2001: Jefferson et al., 2000). Research concerning psychosocial factors related to type 2 diabetes prevention is absent (Allen, 1998: Railey, 2000: Satterfield et al., 2003: Smith et al., 2005: Walcott-McQuigg, 1995: Walcott-McQuigg et al., 1995: Wilcox et al., 2002). Because of these limitations in prior research, no valid and reliable quantitative instruments have been developed to assess knowledge of diabetes risk or psychosocial barriers to preventive behaviors in this population of women. All well-established scales used in diabetic research to measure diabetes knowledge, psychological adjustment, health beliefs, perceived control, empowerment, and barriers to self-care are designed for individuals with chronic diabetes (Anderson, Funnell, Fitzgerald, and Marrero, 2000: Beeney, Dunn, and Welch, 1994: Bradley, 1994: Glasgow, 1994: Lewis and Bradley, 1994: Welch, Dunn and Beeney, 1994). Qualitative research is an effective way to begin a culturally relevant research program dedicated to the prevention of type 2 diabetes in African-American women with a history of gestational diabetes. Once a conceptual framework is verified from the themes identified by study participants, quantitative tools specific to this population of women can be created and tested. The development of quantitative research instruments will enable researchers to determine the generalizability of qualitative research results. It is anticipated that future efforts to conduct descriptive as well as interventional studies with gestational diabetic women at risk for subsequent type 2 diabetes will benefit significantly from the development of quantitative data collection.

The qualitative method selected for this study was a cross-sectional, face-to-face, semi-structured interview. The utilization of a semi-structured format allowed this investigator to focus interview questions on each participant's knowledge of gestational diabetes, type 2 diabetes risk, and intention to participate in preventive behaviors. The flexibility of this style of interview also allowed participants to discuss their opinions and intentions freely. According to Polit and Hungler (1999), semi-structured interviews are most effective when a new topic of research is being explored. "In such situations, this approach may allow an investigator to ascertain what the basic issues or problems are, how sensitive or controversial the topic is, how easy it is to secure respondents' cooperation in discussing the issues, how individuals conceptualize and talk about the problems, and what range of opinions or behaviors exist that are relevant to the problem (Polit and Hungler, 1999. p. 334)." A brief structured questionnaire was also administered to participants in an effort to collect background and demographic data important to the interpretation of each interview. Interviews were cross-sectional because many potential participants were dependent upon public transportation contributing to a high rate of missed appointments and episodic care. In order to ensure the completion of data collection, research appointments were arranged the same day each participant presented for prenatal care.

Procedure

Sample

The target population for this study was urban African-American women with gestational diabetes in a current pregnancy. Study participants were recruited from one of

two high risk prenatal clinics at the Detroit Medical Center located in Detroit, Michigan. These high risk clinics provide specialized prenatal care to mothers with serious medical conditions. The first clinic site was the University Health Center (UHC) high risk clinic conducted on Monday and Thursday each week. Out of the approximately 50 mothers seen each day, 10-20% are considered high risk due to gestational diabetes. The total patient population at the UHC prenatal clinic is 85% African-American with 90% of mothers having Medicaid insurance. Medical care is provided by maternal-fetal medicine physicians, fellows, and residents. Diabetic education is provided by an on-site nurse educator and a dietician at the time of diagnosis. The second clinic site was a high risk clinic conducted every Friday in the Center for Advanced Obstetrical Care and Research at Hutzel Hospital. This high risk clinic provides care to a similar population and number of women as described for the UHC clinic. Medical care is provided by maternal-fetal medicine physicians, fellows, residents, and certified nurse-midwives. Diabetes education is provided by the Outpatient Diabetes Education Program at Harper Hospital shortly after diagnosis.

Eligible study participants met the following inclusion criteria: 1. African-American ethnicity; 2. able to read and speak English; 3. age >= 18 years; 4. current diagnosis of gestational diabetes; 5. attendance at one or more gestational diabetes patient education sessions. Gestational diabetes education was a requirement for participation to ensure that study participants were familiar with the lifestyle modifications associated with their diagnosis. Exclusion criteria included the following: 1. multiple gestations; 2. any additional high risk medical condition with the exception of hypertension. Mothers with concurrent high risk medical conditions were excluded from participation due to the

potential confounding effect of multiple health problems. Hypertension was not considered an exclusion in this study because of its high frequency of occurrence in gestational diabetic pregnancies.

Recruitment

At both clinic locations, all gestational diabetic women were asked briefly about their interest in participating in a research study concerning gestational diabetes by the medical assistant taking vital signs during their routine prenatal appointment. Their diagnosis of gestational diabetes was obtained by self-report. Each potential participant was also offered a flyer describing the study as well as eligibility requirements (Appendix A). Mothers expressing an interest in participation were then introduced to this investigator or one of two supervised research assistants to schedule a time during their visit to conduct the interview. Out of the thirty-one mothers introduced to the study, all stated an interest in participation. Each mother's participation in the study was planned for a time that did not interfere with prenatal care, either before or after her scheduled appointment. This investigator had no clinical role related to study participants. Both research assistants were students from Wayne State University experienced in the informed consent process as well as qualitative interviewing techniques.

Eligibility requirements were verified according to the study's inclusion and exclusion criteria. When questioned specifically about their diagnosis of gestational diabetes, three mothers were uncertain if they had gestational diabetes or type 2 diabetes. These mothers were asked to consult their physician about their actual diagnosis prior to enrollment into the study. It was determined that all three had type 2 diabetes and were

excluded from participation. Two additional mothers with a diagnosis of gestational diabetes reported a possible history of type 2 diabetes before their current pregnancy. The physicians staffing the clinic were unaware of this information. In both cases, the mothers admitted to being told they had type 2 diabetes in the past but discontinued their medication, diet, and medical care because they did not really believe they had the disease. They did not previously disclose this information to their current medical providers. Both were excluded from participation. The remaining 26 participants met eligibility requirements.

Informed Consent and Protection of Human Subjects

Approval for the study and consent forms was received from both the University of Michigan Health Sciences Institutional Review Board and the Wayne State University Human Investigations Committee. Informed consent was obtained from study participants by this investigator or research assistant in a private office prior to each interview. Adequate time was allowed for participant questions regarding the informed consent process and written consent forms (Appendix B). In addition to the purpose of the study and study procedures, the following information was discussed with each participant: potential risks and benefits, costs, compensation, voluntary participation/withdrawal, and confidentiality. There were no known physical, social, economic, or legal risks associated with this research study. Potential psychological risks were minimal because the interview questions did not require discussion of sensitive information. If any participant indicated psychological stress related to their risk of subsequent type 2 diabetes, this investigator was prepared as a skilled clinician with experience in handling difficult situations. In addition, participants at the UHC would

have been offered on-site resources from clinic staff. These resources included social work, nursing education, dietary counseling, or high risk physician care. Participants at the Center for Advanced Obstetrical Care and Research would have been offered a referral to the Outpatient Diabetes Education Program, social work services, or high-risk physician care. No study participants indicated distress over the content of the interviews.

A benefit of participation in this study was its potential to increase awareness of type 2 diabetes risk as well as knowledge about preventive behaviors. Participation in these preventive behaviors could then delay or prevent future chronic diabetes. While education regarding type 2 diabetes risk and prevention was not offered during interviews, study participants were offered written educational materials after the completion of these interviews. The educational materials provided were sponsored by the National Diabetes Education Program for public distribution. They included a pamphlet concerning the risk of type 2 diabetes after a pregnancy complicated by gestational diabetes as well as a pamphlet describing 50 ways to prevent diabetes for African-American individuals (Appendix C.).

In appreciation of each participant's time and contribution to research, a $20 gift card from Target was given for completing the interview. If a participant chose not to complete the interview, a $10 gift card was planned. However, all study participants completed the interview in its entirety. Funding assistance for participant compensation was provided by the University of Michigan Department of Medical Education. All participants were made aware that their participation was voluntary. None of the participants chose to withdraw from the study or declined to answer any questions.

Data Collection

After informed consent was obtained, participants were then asked to complete a short written questionnaire to obtain demographic information as well as information regarding a prior history of gestational diabetes, confirmation of non-chronic diabetes, gestational age, prenatal care attendance, diabetes education experience, and family history of diabetes (Appendix D). The questionnaire took participants approximately 10 minutes to complete. After completion of the questionnaire, one participant was found to have chronic diabetes rather than gestational diabetes and was excluded from the study.

Once the questionnaire was completed, a private semi-structured interview was conducted using a seventeen-question interview guide (Appendix E). Twenty-five interviews were completed due to the availability of gestational diabetic women at both clinic sites as well as data saturation. Twelve interviews were obtained at the University Health Center clinic site and thirteen interviews were conducted at the Center for Advanced Obstetrical Care and Research. All interviews were audio-taped using two voice recorders started at different times to ensure that data is captured without error. Written memos were kept during and after the interviews to record general impressions and significant objective observations. Each interview took approximately 20-30 minutes. All interviews were evaluated on an ongoing basis in an effort to improve the clarity and flow of the interview guide. Tapes were also reviewed between sessions to make sure the content of the interviews remained consistent with the purpose of the study. Audiotapes were transcribed by this investigator.

Confidentiality

The confidentiality of study participants was protected verbally during the recruitment and interview process by the use of first names only. Once participants agreed to participate, both the demographic questionnaire and audiotape cassette were labeled with an interview number from 1 to 25 depending on the sequential order of each interview. Each participant's name obtained during the informed consent process was assigned one of these interview numbers by this investigator. A list of participant names and their assigned interview numbers was kept by this investigator in a locked file drawer. All questionnaires and audio-taped interviews were also kept by this investigator in a separate locked file drawer. No other researcher, assistant, or faculty member had access to or knowledge of the full names of study participants. In addition to the audiotapes, all study forms, participant questionnaires, transcripts, and linkage code information will be shredded or destroyed after the completion of this dissertation project.

During the recorded interviews, participants were asked to use only first names when referring to themselves or family members and friends. All interviews were conducted in a private office. Only study participants' interview numbers were indicated on transcripts. Interview numbers instead of participant names have been referenced as necessary during data analysis and reporting of study results within this dissertation. Excerpts from transcripts included in the dissertation do not indicate any form of participant identification. No medical chart review was conducted.

Demographic Questionnaire

The demographic questionnaire was developed for the following two reasons. First, it verified a current diagnosis of gestational diabetes rather than a history of gestational diabetes in a prior pregnancy, type 1 diabetes, or type 2 diabetes. Due to this investigator's past experience as a clinical provider, it was anticipated that some participants would not be certain of their specific type of diabetes. As previously mentioned, the questionnaire revealed a history of type 2 diabetes in one participant stating that she was gestational diabetic during enrollment. The questionnaire also verified that participants received diabetic education and dietary counseling prior to the interview. Education about gestational diabetes and its management was a requirement for participation since the purpose of the study was to learn about mothers' perceptions of risk for future diabetes. If participants did not receive information about gestational diabetes prior to the interview, they may not have been able to discuss their experience of the disease and knowledge of its management and associated complications.

The questionnaire was also developed to collect information needed to understand the content of individual interviews. The gestational age of each pregnancy, number of prenatal visits attended, and history of a prior pregnancy complicated by gestational diabetes indicated the participant's duration of contact with the healthcare system and amount of experience managing the disease. A family history of diabetes was also a potential indicator of each participant's knowledge of diabetes. Demographic information collected included the following: age, level of education, current employment, type of medical insurance, marital status, and number of children.

Qualitative Interview Guide

An interview guide was used by this investigator and both research assistants to maintain consistency between interviewers. This seventeen-question interview guide is included in Appendix E. Both the participant questionnaire and interview guide were evaluated by an expert reviewer and pilot tested prior to use with study participants. An expert in diabetes research evaluated the study flyer, demographic questionnaire, and interview questions for clarity and relevancy. Three additional members of this investigator's dissertation committee also reviewed all study materials. The demographic questionnaire and interview were administered to a voluntary postpartum African-American gestational diabetic mother at Hutzel Hospital to assess the adequacy of the data collection plan and clarity of both the questionnaire and interview guide before the study began.

Data Assessment

The following four criteria were used for establishing trustworthiness of the interview data: credibility, dependability, confirmability, and transferability (Lincoln and Guba, 1985). First, credibility was achieved by persistent observation, investigator triangulation, peer debriefing, member checking, and researcher credibility. During each interview, this investigator focused on the responses of the participant to make sure the content was consistent with the purpose of the study. In addition, each recorded interview conducted by a research assistant was reviewed by this investigator immediately after its completion. Investigator triangulation was accomplished by having another certified nurse-midwife experienced in qualitative research techniques analyze five interviews in

an effort to reduce potential bias in the interpretation of the transcripts. She reviewed the transcripts for consistency with the overall aims of the study, content validity, and inter-rater reliability of coding categories. In addition, she participated in a peer debriefing session to critique this investigator's overall process of inquiry. A member check occurred after each interview completed by this investigator in an effort to review my initial interpretation of each study participant's responses. The credibility of this researcher is based upon my experience as a clinical nurse-midwife working with African-American women, qualitative research assistant, doctoral student, and personal familiarity with diabetes as a chronic disease.

Second, dependability of the data was assessed by inquiry audits. Periodically throughout the data collection process, transcribed interviews and questionnaires were evaluated by an expert in data transcription for overall consistency and quality. Third, confirmability was established by an audit trail. This process involved the review of all transcripts, questionnaires, objective interview notes, and a draft of the analysis chapter of this dissertation by the certified nurse-midwife experienced in qualitative research techniques. Fourth, transferability is demonstrated by this investigator's description of the research setting and processes observed during the study. This description will enable other researchers and providers to apply study results to other contexts. A recognized threat to the internal validity of this study was participant reactivity to the interview process itself as well as the interviewer (Polit and Hungler, 1999). While reactive effects are difficult to control, research assistants from the same cultural background as study participants conducted seven of the twenty-five interviews in an effort to reduce potential reactivity to this investigator.

Data Analysis

The data analysis strategy utilized in this study was the content analysis style (Polit and Hungler, 1999). This qualitative content analysis began with a thorough reading of transcripts followed by the organization of their content according to each interview guide question number. All computer organization was done using Microsoft Word. Once responses to each question were compiled during this preliminary process, a categorization scheme was developed from the identification of underlying concepts. These concepts were grouped together into categories to facilitate the process of coding. All categories were labeled using color-coded Post-It Notes. Throughout the coding process, this investigator kept memos of ideas and conceptual schemes which helped to identify assumptions as well as emerging themes. Thematic analysis led to the development of themes revealed both within and across categories of data. All demographic data obtained from the participant questionnaires are presented as descriptive statistics in the following chapter.

Chapter V

Results and Analyses

Demographic Results

As described previously, all potential participants introduced to the study during recruitment expressed interest in participation. However, out of these 31 candidates, only 25 met eligibility requirements (80.7%). A more detailed investigation of each of the other six mothers' diagnoses revealed a history of type 2 diabetes. Four of these six mothers were unaware of the difference between gestational and type 2 diabetes. The two remaining mothers did not disclose their prior history of type 2 diabetes to their obstetricians. Consequently, they were incorrectly diagnosed with gestational diabetes. Each participant meeting eligibility requirements completed the entire demographic questionnaire as well as the semi-structured interview.

General demographic information collected by the participant questionnaire included: maternal age, level of education, current employment, type of medical insurance and number of children. Descriptive frequencies for these demographic variables are presented in Table 1. The average participant's age in years was 25 (Range = 19-40). Educational level was well represented across the categories from "not graduated from high school" to the completion of "some college". The majority of participants were unemployed (76%, n = 19) and covered by Medicaid insurance for their

Table 1

Table 1

Participant Demographic Variables

		n	%
Age in Years (range 19- 40 years)	< = 20	1	4
	21- 30	18	72
	31- 40	6	24
Total		25	100
Level of Education	Did not graduate High School	6	24
	GED	5	20
	High School Graduate	7	28
	Completed Some College	7	28
	College Graduate	0	0
	Completed Graduate School	0	0
Total		25	100
Employment Status	Unemployed	19	76
	Employed	6	24
Total		25	100
Type of Medical Insurance	Medicaid	24	96
	Private	0	0
	Unknown	0	0
	Other	1	4
	None	0	0
Total		25	100

		n	%
Marital Status	Single	18	72
	Significant Relationship	2	8
	Married	5	20
	Divorced	0	0
	Widowed	0	0
Total		25	100
Number of Children Prior to Current Pregnancy	0	6	24
	1	6	24
	2	8	32
	3	1	4
	4	3	12
	5	1	4
Total		25	100

prenatal care (96%, n = 24). Of those participants with a current job, the positions listed included cashier, medical assistant, and casino dealer. Most participants were single (72%, n = 18) with an average number of 1.7 children living at home (Range = 0-5).

In an effort to understand the content of individual interviews, the participant questionnaire also collected information related to each mothers experience with the diagnosis of gestational diabetes. These variables included: gestational age of pregnancy, number of prenatal care visits attended, number of weeks since diabetes education/dietary counseling, number of prior pregnancies complicated by gestational diabetes, and family history of chronic diabetes. Table 2 presents the descriptive frequencies of these variables.

The mean gestational age at the time of the interviews was 29.3 weeks (Range = 21-39). The majority of participants (80%, n = 20) attended six or more prenatal care visits (Range = 3-17). While the number of weeks since diabetes education or dietary classes ranged from one to twelve, the mean number of weeks was 6.3. The number of prior pregnancies complicated by gestational diabetes ranged from zero to two. Most participants (76%, n = 19) had no prior pregnancies complicated by gestational diabetes. Three mothers (12%) had one prior gestational diabetic pregnancy, and another three mothers (12%) had two prior gestational diabetic pregnancies. In addition, most participants had experience with a family member with chronic diabetes (72%, n = 18). These relationships included mother, father, brother, sister, grandmother, grandfather, aunt, uncle, and cousin.

Table 2

Table 2

Experience with the Diagnosis of Gestational Diabetes

		n	%
Gestational Age in Weeks (range 21- 39 years)	20 – 28	8	32
	29 – 36	10	40
	37 – 40	7	28
Total		25	100
Number of Prior Pregnancies with Gestational Diabetes	0	19	80
	1	3	20
	2	3	0
Total		25	100
Number of Weeks Since Diabetes Education/Dietary Counseling	1 – 4	10	29
	5 – 8	6	47
	9 – 12	9	24
Total		25	100
Number of Prenatal Visits (current pregnancy)	1 – 5	5	20
	6 – 10	10	40
	> 10	10	40
Total		25	100
Family History of Chronic Diabetes	No	7	28
	Yes	18	72
Total		25	100

Qualitative Results

Coding Categories

The Theory of Planned Behavior was initially used to inform the development of interview questions. In turn, qualitative results from all twenty-five interviews were then organized into coding categories congruent with the constructs of the TPB. These coding categories were also developed from individual concepts identified during the process of content analysis. Table 3 provides a list of all coding categories with examples of their corresponding concepts extracted from study transcripts. This table also organizes the coding categories according to the constructs of the TPB. Appendix F provides a detailed description of identified concepts through examples of participant responses. Transcript reference numbers are indicated at the end of each example. A comprehensive discussion concerning the relationship of study results to the TPB is included in Chapter VI of this dissertation.

Emotional Responses to the Diagnosis of Gestational Diabetes

The first study question included in the interview guide asked participants to share how they felt when they were initially diagnosed with gestational diabetes in their current pregnancy. It was designed as an introductory question to allow participants to discuss a subject that was familiar to them. In addition, it was asked to determine if the diagnosis of gestational diabetes triggered a significant emotional reaction. The most common response was fear (36%, n = 9) of the diagnosis. The primary reason indicated as the cause of this fear was the lifestyle changes that would become necessary to care for their gestational diabetes.

> "I felt kind of afraid…I've never had it. And um…just everything is a big change. You know I have to stop eating sweets and be careful…you know things like…it was kinda scary to me cuz' it was kinda hard at first." (#1)

Other responses to their initial diagnosis included being upset (28%, n = 7), worried (12%, n = 3), sad (12%, n = 3), or nervous (8%, n = 2). The most frequently stated reason for being upset or distraught was the feeling that they had chronic diabetes. "I felt I had diabetes-like I wasn't goin' to get rid of it" (#6). Additional reasons for being upset were that they didn't want to take insulin or experience the complications they witnessed other family members experience. "I don't want to be a diabetic. I don't want to shoot myself with insulin…my uncle had it, he shoot himself with insulin and you know, I don't want to do that…he had his feet amputated" (#7). Mothers who were worried about having gestational diabetes expressed concern over the effect of the diagnosis on their baby. "Uh, well, worried the baby gonna be too big or come out deformed, stuff like that" (#12). Reasons stated for feeling sad at the time of diagnosis were similar to the reasons given for being upset. These included having to take medication and cope with similar experiences as other family members with chronic diabetes. "I thought I was gonna have to be like my mom and my sister, havin' to take that nasty medicine and stuff all the time" (#24). Nervous reactions to the diagnosis were reported due to a lack of information about gestational diabetes. "I was nervous because I didn't understand, like what is gestational diabetes? It was something I had never heard of" (#25).

Two mothers, who had gestational diabetes in previous pregnancies, expressed opposite initial reactions. The first mother stated that she was not upset when she was diagnosed in her first pregnancy, but cried when she was diagnosed during her current pregnancy. She was scared because her prior experience with the diagnosis made her

aware of its potential associated complications. “So, I didn’t know much about diabetes then. It didn’t hit me as hard as it is hitting me this time…because I am going through so many complications now” (#20). The second mother found her current diagnosis of gestational diabetes mush easier to accept than her first diagnosis because she was familiar with how to follow her diet. One mother reported no reaction to her diagnosis and provided no explanation.

Causes of Gestational Diabetes

The second question included in the interview guide asked mothers if they knew what caused their gestational diabetes. The purpose of this question was to gain an understanding of each participant’s knowledge of the diagnosis in an effort to help determine if they were aware of their future risk factors for developing type 2 diabetes. Twenty-eight percent of study participants (n = 7) stated that they did not know what caused gestational diabetes. An additional three participants (12%) initially stated that they did not know, but went on to discuss causes throughout the remainder of their interviews. Sixty percent (n = 15) of mothers reported one or some combination of the following four causes: diet, lack of exercise, family history, and age.

Diet was the most frequent response (64%, n = 16). Specifically, participants discussed diets high in calories, carbohydrates, and sugar.

> “The way that I eat, and um, with what the dietician was telling me, I thought that I was intakin’ a lot of food. Instead of me eatin’ small portion amount, I know I was probably eatin’ like three meals at one time.” (#6)

The second most frequent response was a lack of physical exercise (20%, n = 5).

> “The lack of exercise and you know, puttin’ on weight, eating, being pregnant in general, and not havin’ that, that activity and kind of function to fall back on may

> have contributed to it. Because you, you're not burning off the calories, your body is storing a lot more fat." (#14)

All participants reporting a lack of physical exercise also mentioned a poor diet. Four mothers (16%) believed that a family history of chronic diabetes could cause gestational diabetes. "It could…they say it sometimes when it runs on your side of the family-your mother's side, that you may have it when you're pregnant Sometimes you might have it after you're pregnant" (#17). Finally, increased age was mentioned as a risk factor for gestational diabetes by two respondents (8%). "I mean, well, I guess when you're older you can-you're more-um, prone to have more problems in the pregnancy than someone that's younger" (#15).

Sources of Gestational Diabetes Knowledge

Study participants revealed four sources of knowledge concerning gestational diabetes. The most frequently identified source (72%, n = 18) was the experiences of other diabetic family members. While the family members' experiences were usually associated with chronic and not gestational diabetes, participants often did not make the distinction between classifications of diabetes. For example, the following participant talks about the advice she received from her mother and sister who both have type 1 diabetes.

> "My momma been having it ever since she was like nine years old…and my sister. They tell me what I can do, what I can't do. You know, how to control it. They tell me I can't eat certain foods like, you know, sweet foods, like put sugar on food and stuff like that." (#12)

Only one participant had a family member give her information specifically about gestational diabetes. "My mom said that, you know, you develop it when you're

pregnant. So, hopefully it will go away and I won't have to deal with it anymore…I hope" (#2).

Health care professionals were also frequently (64%, n = 16) mentioned as an important source of information about gestational diabetes. Eleven mothers found their dietician to be very helpful and influential. "The dietician, she really taught me a lot you know. I talked to her…she told me how to break down everything and all that. So, they really do a good job" (#3). Nurses and physicians were infrequently (n = 5) mentioned. In fact, when one participant was asked if gestational diabetes was explained to her by her doctors or nurses, she responded that it was not. "I really didn't get too much education on it from the doctors" (#22). However, when given literature about gestational diabetes from their physician, three out of five mothers responded that they had not read it yet. "She gave me some forms and um…I haven't had a chance to read them" (#23). The two mothers that did read the literature given to them by their physician also obtained additional literature independently. "I read. They gave me the gestational diabetes books and then I picked up one of my own. So, I did one of each" (#24). Of the five mothers with a previous gestational diabetic pregnancy, three talked about how their past experience was beneficial to their understanding of their current diagnosis. "This time, this time I was like oh wow, here we go again! But I was more prepared because I know now. You know…what it is-well basically what it does and how it goes (#25)."

Effects of Gestational Diabetes Later in Life

In an effort to determine if study participants were aware if their risk for type 2 diabetes, all mothers were asked how they thought gestational diabetes may affect them either postpartum or later in life. If they believed that having the diagnosis would affect them in the future, they were also asked how they obtained the information. The majority of mothers (84%, n = 21) stated an awareness of their risk for developing subsequent type 2 diabetes. Of the twenty-one mothers knowledgeable about their risk, twelve received this information from their health care providers. "I learned it from…I really learned it from here (clinic) and some of the information they gave me to read. I read it on the pamphlets" (#11). Eight participants received this information from the dietician either verbally or through written materials. Only four of these twelve participants obtained their information from doctors or nurses. The remaining nine mothers knew about their risk of type 2 diabetes based upon family history. While only one participant was directly told by a family member that she had an increased risk of type 2 diabetes due to her current diagnosis, eight mothers inferred that having gestational diabetes as well as a family history of type 2 diabetes elevated their risk.

> "I think it is more so…you know, I think it can come back. Cuz' it's too many people in our family for one…and it's too strong! It's like my bloodline is diabetes, anyway so…just looking at the family history, like my mom. It became very prominent to where you could tell she had it…after her last child…was her fifth child, you could tell." (#10)

Of the remaining four participants who did not know about their risk of subsequent type 2 diabetes, one was not sure of her risk and three believed that they could not become diabetic in the future. No explanations for these beliefs were offered. All four mothers

stated that they had not received information about future type 2 diabetes from health care providers or any other source.

When asked about the effect of gestational diabetes later in life, one additional response was given by 36% (n = 9) of study participants knowledgeable about their risk for type 2 diabetes. These mothers talked about the need to take care of themselves in the future to reduce their likelihood of becoming diabetic. “I will be used to it…all that stuff they make me do. I’ll probably do that for the rest of my life…watching my weight and doing more exercising. Cuz’ there’s a chance that it will come back” (#3). All nine mothers stated that they learned about reducing their risk of subsequent type 2 diabetes from health care providers during prenatal visits.

Causes of Type 2 Diabetes

When asked about the cause of type 2 diabetes, the majority of study participants (40%, n = 10) responded that they did not know.

> “No, I don’t really know what causes type 2 diabetes. But I do know some if the symptoms. People that have you know, problems with their feet, and circulation and um, you know, problems with their digestive system and how their body is breaking down their food. I just don’t want to deal with that.” (#14)

Of the mothers that did provide causes for type 2 diabetes, the following five risk factors were identified: diet, heredity, lack of exercise, race, and history of gestational diabetes. Approximately one-third (32%, n = 8) of these mothers initially replied that they did not know what caused type 2 diabetes. However, they revealed an understanding of risk factors later during the interviews when asked if certain groups of people were more likely to get type 2 diabetes. For example, heredity, or family history, was cited as a risk factor by five participants (20%). “No, not at all. I just know that it’s hereditary, cuz’ it’s

on both sides of my family, that's about it. What causes it, I don't know" (#24). Another five participants (20%) described diet as a significant cause. Specifically, not being able to eat right due to the influence of others or frequently eating out due to time constraints. "Mostly people I say that be out a lot, that can't eat at home…gonna be the main ones…cuz' you got to constantly eat while you're going, right?" (#9). A lack of physical exercise was mentioned by two participants (8%). An additional two participants cited race as a risk factor. "I really think it could be anybody, but they claim it's mostly black people…African-Americans" (#1). Finally, only one mother talked about gestational diabetes as a risk factor for future type 2 diabetes. This is an interesting finding since most participants (84%, n = 21) identified gestational diabetes as a significant risk factor for type 2 diabetes earlier during their interviews.

Sources of Type 2 Diabetes Knowledge

When participants spoke of their knowledge of type 2 diabetes, they most commonly (60%, n = 15) referenced other family members as the source of this knowledge. The influence of family members' experiences with type 2 diabetes can be seen in the following excerpt:

> "Well, I know a little from my grandmother—she was a diabetic all her life basically, before she passed away. I know if you don't take care of yourself you can slip into a diabetic coma and there's the insulin...if she ate too much and didn't eat enough…and I have an uncle that's also like that." (#3)

Mothers consistently reported the associated complications and difficult medical regimen of chronic diabetes when speaking about their family.

> "Um, that's when you still have to take the insulin…type 2…I know that you gotta control it, and if it goes too low, then you could um, go into a diabetic sleep. If it goes too high, you can get sick. I have experienced it with my grandfather…I

> know that when it stays too high, if you get a cut or break a limb, you don't heal as well and you could die from it." (#10)

The remaining participants (40%, n = 10) stated a lack of knowledge about type 2 diabetes and consequently did not reference a source of knowledge.

Personal Risk Factors for Type 2 Diabetes.

Question ten of the interview guide asked participants if they believed they had a chance of developing type 2 diabetes later in life. While earlier responses during the interviews revealed that 84% (n = 21) of mothers knew that gestational diabetes increased their risk, question ten was designed to determine if they believed they had additional risk factors. Participant responses confirmed their understanding of several causes for type 2 diabetes as well as a belief in their own personal risk. In fact, most mothers (88%, n = 22) stated that they were at an increased risk for developing type 2 diabetes in the future. Similar to the responses included in category five, the following five personal risk factors were described: diet, lack of physical exercise, family history, race, and previous gestational diabetes. Of the three respondents who did not believe they were at risk, one provided no explanation and two stated that they would not develop type 2 diabetes because they were going to actively prevent it. "I am going to drink a lot of water and keep on my diet to prevent it" (#7).

Prevention of Type 2 Diabetes

Questions eleven though thirteen of the interview guide is focused on prevention of type 2 diabetes. Specifically, they ask participants if they believe type 2 diabetes can be prevented as well as how they received information regarding prevention. Most mothers (60%, n = 15) stated that they thought type 2 diabetes could indeed be prevented.

When asked how they thought it could be prevented, participants consistently answered that diet (40%, n = 6), exercise (7%, n = 1), or a combination of diet and exercise (53%, n = 8) was necessary. Of interest is the fact that for the first time throughout the interviews, participants mentioned talking to friends, reading magazines, using the internet, and watching television as important sources of this information (33%, n = 5). "I have a friend that is type 2…she started back exercising and she lost her weight. Now they about to take her off her insulin. So yes, it can be prevented" (#3). "Um from you know, from just informational sources about it. Magazines, people talkin' about having diabetes and what they can do to lower their risk of getting it…the internet" (#15). The remaining ten respondents cited family (33%, n = 5) and prenatal providers (33%, n = 5) as their educational resource.

Of the participants (24%, n = 4) who did not think type 2 diabetes could be prevented, all stated that a positive family history, or genetics, was the reason.

> "I think if it was meant to be, it was meant to be….if it's generic—genetic, you know in your genes or whatever…you might have it, you might not…it might pass along, skip you, go to your child or whatever, you know. That's how I feel about it." (#1)

The remaining six participants (24%) were not sure if it was possible to prevent type 2 diabetes. Each of these mothers stated that they either received no information regarding prevention, or that they did not read the literature they were given at prenatal visits. "I think I do have information on it. Like I said, I haven't read over it, but I do believe I do" (#2).

The Importance of Type 2 Diabetes Prevention

When each participant was asked if they considered it important to reduce their risk of type 2 diabetes, one of the following responses was given by all mothers: “yes”, “very important”, or “I would never give up”. One respondent summed it up this way:

> “It would be really important to me because again, just how active my life is. I really don’t have the time to try to manage something like that. If I could prevent it ahead of time, I could go ahead and try to prevent it. But, for it to be a problem in the middle of my life, um, and try to take—juggle that with everything else, it would be really important for me to try to prevent it ahead of time, than to try to manage it later.” (#14)

Six mothers went on to offer explanations about why reducing their risk of type 2 diabetes would be important to them. Each participant spoke of their desire to avoid diabetic complications as well as having to manage the disease on a daily basis.

> “It’s real, real important! Just be seeing what my mom’s goin’ through. You know, just by seein’ firsthand what you can go through. You can die from it you know! I don’t want to put myself—injectin’ you know, and getting’ boils, and just goin’ through that, is just horrible! Just looking at her goin’ through it is horrible! So, she tell me every day, “don’t do it”, you now, try your best not to.” (#16)

Two mothers also spoke of their concern for their children if they were to develop type 2 diabetes. “I mean that it would be something that would prevent me from doing things with my kids…with my daughter that’s here now…and my daughter that’s coming” (#18).

Barriers and Enablers to Preventive Behaviors

Overall, participants described five barriers and four enablers to preventive behaviors. The most frequently talked about barrier to type 2 diabetes prevention was a lack of time due to both child care and work responsibilities. Out of 30 responses concerning barriers to prevention, 15 (50%) were related to time constraint issues. “My

kids cuz' they all small…they take a lot of time. I got a three year old, one and a half year old, and now I'm about to have another one. Um, work…that's another time commitment" (#11). Three mothers mentioned that this lack of time caused them to eat at fast-food restaurants too often.

> "Like when you workin' and you pick up something that's on the go…so it's easier to go grab that McDonald's and go for the chips and candy when you're going to work. That's easier than taking the healthier cooked meal to work." (#17)

Another 23% of responses (n = 7) described what their children and others eat around them as a barrier to eating healthy. They find the temptation difficult to overcome.

> "Other people eating stuff in your presence, You know, when you are used to eating stuff, then you tend to want it, you know, and you can't get satisfied off the things that you eat because of the fact that you know, you're smelling all fried chicken and , you know…" (#10)

The third most frequently cited barrier to preventive behavior was financial concerns about buying healthy food (13%, n = 4). "It is hard when you don't have money. I am a coupon clipper…and I try to budget as much as I can when it comes down to the kids…I still buy 'em they little snacks sometimes" (#20). Lack of transportation was a concern for two participants because they would be unable to get to a gym to exercise. Two additional participants stated that a significant barrier to type 2 diabetes prevention was a lack of information regarding how to cook and exercise appropriately. "What would help me is if someone gave me a menu to cook…a menu to tell me what to eat, and you know what I'm saying. I would stick to that…I believe it would really help me to learn" (#20).

The most frequently described enabler to preventive behavior was the support of family, friends, and the mother's significant other. Out of 27 responses regarding enablers to type 2 diabetes prevention, 21 (78%) were related to social support. This

social support was viewed as a source of motivation by study participants. “People around you, they can be doing the same thing you doing everyday! And it helps you when you around somebody that’s right there and helping you to do the things you want to do. Yah, it you know, motivates you” (#8). Another example of the value placed on the support of family and friends is apparent in the following response.

> “You know, pretty much the support of my peers or relatives or people I see every day. Not just buying greasy food and cookin’ stuff like that. It’s pretty much by encouraging me to go to the gym, go play ball, or you know, go outside and do activities instead of just sitting in the house watching TV or on the computer.”(#16)

Participant responses regarding social support centered around help with following a healthy diet.

> “My mom cuz’ she won’t even let me eat chicken no more…fried chicken! She just slap it out of my hand, and you know, they eat all the good stuff that I can smell cookin’, and they say “I don’t need it”, so…I think if I was focused on it, that my mother, you know, my family, would not let me eat like that.” (#10)

Being able to prepare one’s own food at home was mentioned in two (7%) of the 27 responses. In this way, mothers stated they would be able to ensure a healthy diet despite what others around them were eating.

> “I can cook my own food. Again, I’m not in an environment where I don’t have a choice of what I want to eat. I can cook my own food if what I feel is being prepared…the people around me are eating something that I don’t feel necessarily comfortable eating.” (#14)

Children were mentioned as a significant motivating factor in two (7%) of the 27 responses. Specifically, two mothers expressed concern over the future of their children if they did not take care of themselves. “My children and my future would help me to, you know, deal with the situation, because I don’t want them to have to deal with it. I don’t want it to have to affect them” (#6). Health care providers were also briefly described as

potential motivators in two (7%) out of 27 responses. Participants requested that dieticians as well as physicians provide more information at prenatal visits regarding healthy lifestyle changes to help to reduce the risk of future type 2 diabetes.

Likelihood of Participation in Preventive Behaviors

Question fourteen of the interview guide asked mothers if they believed they would participate in diet and exercise behaviors to reduce their risk of future type 2 diabetes. They were also asked how likely they would be to try on a scale of one to ten, one being "not likely" and ten being "very likely". The majority of mothers stated that they would be very likely to try. On a scale of one to ten, 19 out of 25 participants (76%) responded with the number ten. One mother provided the following reason for her response. "I would say ten because eventually you could die from it if you don't control it" (#17). Another mother stated, "Because I'm gonna do anything that is going to allow me to have a better life and be more healthy to stay alive" (#15).

Four mothers (16%) responded with the number eight. No reason was provided for this specific number. However, all four mothers stated that the prevention of type 2 diabetes was "very important". Of the remaining two mothers (8%), both answered with the number five. According to one of these participants, "I'd be half in between and half off…because I would have to think if I wanted to do it anymore. But I'd rather be thinking about my health too" (#19). The other participant provided no explanation for her response.

Table 3

Table 3

List of Coding Categories, Theory of Planned Behavior Constructs and Examples

Coding Categories	Theory of Planned Behavior	Examples
1. Emotional Responses to the Diagnosis of Gestational Diabetes	Motivation to Comply	Fearful Upset Worried Nervous
2. Causes of Gestational Diabetes	Motivation to Comply	Unknown Diet Lack of Exercise Family History Age
3. Sources of Gestational Diabetes Knowledge	Motivation to Comply and Normative Beliefs	Family Experience Education from Health Professionals Self-Education Prior Gestational Diabetes
4. The Effects of Gestational Diabetes Later in Life	Motivation to Comply	None Risks of Type 2 Diabetes Need to Take Care of Yourself

Coding Categories	Theory of Planned Behavior	Examples
5. Causes of Type 2 Diabetes	Motivation to Comply	Unknown Diet Lack of Exercise Heredity Race/Ethnicity Gestational Diabetes
6. Sources of Type 2 Diabetes	Motivation to Comply and Normative Beliefs	Family History Lack of Information
7. Personal Risk Factors for Type 2 Diabetes	Motivation to Comply	Diet/Exercise Family History Gestational Diabetes Race/Ethnicity
8. Prevention of Type 2 Diabetes	Behavioral Beliefs	Diet/Exercise Unable to Prevent due to Genetics/Heredity Unknown
9. The Importance of Type 2 Diabetes Prevention	Evaluation	Very Important

Coding Categories	Theory of Planned Behavior	Examples
10. Barriers and Enablers to Preventive Behavior	Control Belief and Perceived Power	Time Constraints Influence of others on Dietary Habits Financial Burden Lack of Information about Lifestyle Changes Social Support Control over Food Preparation Future of Children Education from Health Care Providers
11. Likelihood of Participation in Preventive Behaviors	Behavioral Intention	High Likelihood Moderate Likelihood

Thematic Analysis

Data collection and analysis processes revealed four salient themes apparent both within and across coding categories. The four themes that emerged include: 1. the family as a primary source of knowledge, support, and motivation: 2. gestational diabetic mothers' overall knowledge of diabetes and its prevention: and 3. the importance of type 2 diabetes prevention.

Family as the Primary Source of Knowledge, Support, and Motivation

The most prominent of all themes was the family as a primary source of knowledge, support, and motivation. Each coding category consistently identified participant references to family members. Early during the interview process, mothers talked about their emotional reaction to the diagnosis of gestational diabetes. They reported being "upset" and "sad" because they did not want to experience the same lifestyle limitations and physical complications as other diabetic family members. Of interest is the fact that all references to family members diagnosed with diabetes were negative. These negative comments included: not being able to eat desirable foods, having to inject insulin, suffering from difficult health problems such as amputation, and eventually dying from associated complications of the disease. In addition, mothers assumed that these negative outcomes could also happen to them due to their diagnosis of gestational diabetes. Little differentiation was made between the diagnoses of gestational and type 2 diabetes. Although most mothers (84%, n = 21) knew of their risk for the development of type 2 diabetes later in life, they described their current experience of gestational diabetes as if they had type 2 diabetes like their relatives. Mothers' general knowledge of diabetes was most commonly gained from their families. Seventy-two

percent of study participants identified the life experiences of diabetic family members as their source of information about gestational diabetes while 60% reported the life experiences of diabetic family members as their source of information about type 2 diabetes.

While family related issues such as time constraints due to child care and unhealthy family eating habits were mentioned as barriers to diabetes prevention, the most frequently described enabler was family support (78%). Specifically, encouragement from family members to follow a healthy diet and maintain a consistent exercise routine was mentioned as the most important motivating influence for study participants. Another significant motivating influence was the perceived effect of diabetes on the future of their children. For example, gestational diabetes caused mothers worry about potential dangers to the developing fetus. Type 2 diabetes caused them anxiety over how its associated lifestyle changes and medical complications could affect the quality of their children's lives.

Gestational Diabetic Mothers' Knowledge of Diabetes and its Prevention

Another theme apparent both within and across coding categories was the level of knowledge most participants possessed concerning diabetes and its prevention. While mothers did not differentiate between their knowledge of gestational and type 2 diabetes, most revealed an understanding of the following: causes of gestational diabetes (72%, n = 18), risk for subsequent type 2 diabetes (84%, n = 21), causes of type 2 diabetes (60%, n = 15), personal risk factors for type 2 diabetes (88%, n = 22), and type 2 diabetes preventive behaviors (60%, n = 15). A significant finding was that when asked about the causes of gestational diabetes, three mothers responded that they had no idea. However,

as the interviews progressed, they went on to describe several risk factors. Similarly, eight mothers believed that they were not aware of the causes for type 2 diabetes but then went on to discuss risk factors when asked if certain groups of people were more likely to develop type 2 diabetes. This finding demonstrates that mothers may underestimate their knowledge of certain health conditions when asked direct questions.

As described by the first theme, sources of this knowledge of diabetes came primarily from the life experiences of diabetic family members. Another significant source was prenatal health care providers. Health care professionals were recognized as important sources of information concerning risk factors for gestational diabetes by 64% of study participants. When asked about their sources of knowledge for the causes of type 2 diabetes, fifteen participants identified only the family as an educational resource. The remaining ten participants claimed a lack of type 2 diabetes knowledge. However, as described above, this knowledge about risk factors for type 2 diabetes was revealed indirectly throughout the interview process. For example, when asked about their subsequent risk of type 2 diabetes after a pregnancy complicated by gestational diabetes, twelve mothers stated that they received information about this risk from health care providers during prenatal visits. However, only one mother identified a history of gestational diabetes as a risk factor for future type2 diabetes when asked about potential causes of type 2 diabetes several questions later.

Nine participants reported receiving education regarding type 2 diabetes prevention from health care professionals when asked about the future effects of gestational diabetes. Only five participants cited health care providers as the source this information when asked directly about their education concerning type 2 diabetes

prevention. Interestingly, discussion regarding preventive behaviors revealed additional sources of this information for the first time during the course of the interviews. Friends, magazines, and the internet were mentioned by five participants. In addition, the Discovery Channel was specifically discussed by two of these five mothers.

Importance of Type 2 Diabetes Prevention

The third theme that emerged from the data was each participant's strong desire to avoid and prevent subsequent type 2 diabetes. This theme was apparent throughout the interview process beginning with mothers' emotional reactions to the initial diagnosis of gestational diabetes. As described earlier, most mothers reacted negatively to the diagnosis due to associating it with the lifestyle changes and medical complications of chronic diabetes. When asked about their knowledge of the causes of type 2 diabetes as well as their own personal risk factors, participants consistently reported the challenging life experiences of family members struggling to cope with the disease. Included in their responses were comments about how they did not want to have to live with the same responsibilities and potential medical problems.

In an effort to avoid the burden of type 2 diabetes, participants unanimously stated that prevention was very important to them. In addition, they talked about how preventive behaviors were important for their children as well since they expressed concern over exposing their children to the ramifications of chronic illness. Consequently, mothers' intentions to participate in preventive behaviors were high. These intentions were consistently high despite identified behaviors. Overall, mothers perceived that the benefits of preventive behaviors to avoid type 2 diabetes outweighed the challenges of maintaining a healthy lifestyle.

Chapter VI

Discussion

Research Goals

The purpose of this investigation was to answer research questions concerning risk perceptions for the development of type 2 diabetes in African-American mothers with gestational diabetes as well as their knowledge of diabetes prevention. An additional goal for research was to discover the extent and source of this knowledge. Finally, understanding mothers' intentions to participate in preventive behaviors despite potential barriers was another important goal of this investigation. Ultimately, answers to these research questions were intended to inform health care providers in an effort to improve prenatal education designed to reduce the incidence of type 2 diabetes in this population of women. As will be described in this chapter, study results inform our understanding of an area of research that to date has been very limited. The Theory of Planned Behavior was used as the conceptual framework to organize and interpret study results and will be discussed in this chapter in terms of its usefulness in guiding this research.

As discussed in the review of the literature, research dedicated to perceptions of risk for the development of type 2 diabetes in individuals with significant risk factors such as gestational diabetes is limited. Of the few studies published, findings revealed

that a minority of women believed they would develop type 2 diabetes and few women received risk information. In comparison to the findings of three previous studies (Feig et al., 1998; Harwell et al., 2001; Jefferson et al., 2000), results from this investigation regarding risk perceptions were significantly different. For example, 22-47% of study participants in these prior studies perceived themselves to be at risk for type 2 diabetes while 84% of mothers in this study were aware of their risk. Interestingly, the only prior study to publish a descriptive statistic concerning beliefs about diabetes prevention also reported that 60% of participants thought diabetes could be prevented (Harwell et al.). Additional findings from the study reported here are consistent with the results of Harwell et al. in that a positive family history of diabetes influenced participants to believe that their risk of future diabetes was increased while their chances of preventing diabetes were decreased.

Participants in this study reported family and health care professionals as the most common sources of information about diabetes. In particular, family was reported to be the primary source of information for both gestational diabetes and type 2 diabetes. Health care professionals were described as the primary source of information about the subsequent risk of type 2 diabetes after a pregnancy complicated by gestational diabetes in more than half of the participants interviewed. Education about type 2 diabetes prevention was evenly distributed between family (33%), health care providers (33%), and the media (33%). Unfortunately, all three prior studies only reported statistics for risk and prevention information provided by medical professionals. The studies found that medical staff provided less information about risk factors for type 2 diabetes (10-26%) and more information about preventive behaviors (58%) than health care professionals

described by participants in this study. No prior research was found that studied gestational diabetic women's intentions to participate in type 2 diabetes preventive behaviors. Results of this study revealed that participants' intentions to participate in preventive behaviors were high. This intention was very strong even if the mother was not aware of diabetes prevention prior to her interview. In addition, previous research concerning psychosocial factors related to type 2 diabetes prevention in African-American mothers with prior gestational diabetes is absent. While six previous studies have investigated psychosocial factors associated with type 2 diabetes preventive behaviors, one focused on women with gestational diabetes but did not include African-American women (Smith et al., 2005), and five focused on African-American women and obesity prevention (Allan, 1998: Railey, 2000; Walcott-McQuigg, 1995; Walcott-McQuigg et al., 1995; Wilcox et al., 2002). These five studies did not recognize prior gestational diabetes as a significant risk factor.

Barriers to preventive behaviors described by these six previous studies included the following: lack of child care, lack of time, unsuitable neighborhoods, fatigue, stress, health problems, lack of motivation, lack of knowledge, relationship difficulties, lack of self-control, safety issues, lack of social support, financial burdens, family norms, and family responsibilities. Identified enablers to preventive behaviors included high self-efficacy and social support through verbal encouragement, assistance with child care, help with household chores, and accompaniment during physical exercise. In addition, one study stressed the fact that the family remains the center of meanings, activities, and satisfaction for most women (Wilcox et al., 2002). Wilcox et al. concluded that exercise

promotion efforts must be sensitive to the family demands and obligations of African-American women.

Results from the current study supported the findings of the above investigations. For example, perceived barriers to preventive behaviors were lack of time due to child care, work commitments, unhealthy eating habits due to time constraints, unhealthy eating habits due to the influence of others, lack of self-control, financial difficulties, lack of transportation to exercise facilities, and lack of knowledge regarding appropriate diet and exercise behaviors. The most frequently described enablers to preventive behaviors were social support through verbal encouragement, accompaniment during exercise, and assistance with following a healthy diet. Additional perceived enablers included being able to cook for oneself, receiving education about preventive behaviors from health care professionals, and being motivated to remain healthy for their children. Results of this investigation also supported the conclusion of Wilcox et al. (2002) which described family as the single most important part of each mother's life. Family significantly influenced their knowledge of diabetes, motivation to prevent diabetes, and ability to successfully participate in preventive behaviors. In particular, mothers stressed the importance of doing whatever is necessary to protect their children both during and after pregnancy by preventing complications from gestational diabetes as well as type 2 diabetes. In order to provide care and conduct research that is sensitive to the priorities and concerns of African-American women at risk for type 2 diabetes, health care professionals must give careful consideration to the meaning of family.

Relationship of Study Results to the Theory of Planned Behavior

The TPB was selected as the most appropriate framework to guide this investigator's goals for research concerning African-American women with gestational diabetes due to its recognition of the impact of culture through normative beliefs. In addition, it was selected because it considers the importance of control beliefs which help explain the effect of barriers and enablers on mothers' intentions to participate in preventive behaviors. While the TPB has not been utilized in any prior studies related to diabetes during pregnancy or the prevention of type 2 diabetes, it proved to be a useful tool in guiding this researcher with the organization and interpretation of results obtained during this investigation. As previously shown in Table 3, coding categories are organized according to corresponding constructs of the TPB. The TPB assumes a causal chain linking relationships between these constructs.

According to the TPB, the most important determinant of mothers' active participation in behaviors designed to prevent subsequent type 2 diabetes after a pregnancy complicated by gestational diabetes is behavioral intention. Study participants consistently reported a strong intent to follow a healthy diet and exercise program. This intent was directly determined by both their attitudes towards these preventive behaviors as well as their subjective norms, or beliefs about whether most people approve or disapprove of the lifestyle changes required for type 2 diabetes prevention. Study participants' attitudes towards preventive behaviors were determined by both their behavioral beliefs that diet and exercise can in fact prevent future diabetes as well as their evaluation of the importance of diabetes prevention. Most mothers believed they could prevent type 2 diabetes with diet, exercise, or a combination of both diet and exercise. In

addition, all mothers reported that diabetes prevention would be important to them in order to avoid associated complications, burdensome medical responsibilities, and the effect a chronic illness would have on the lives of their children. Study participants' subjective norms concerning preventive behaviors were evident from both normative beliefs about the opinions of family members and medical staff as well as their motivations to comply, or reasons to follow the advice of family, health care providers, friends, or the media. As previously described, mothers identified the family as their primary source of knowledge, support, and motivation. Throughout the interview process, frequent references to family members confirmed the magnitude of their influence. Health care professionals, especially dieticians, were also influential through the education provided to participants regarding subsequent type 2 diabetes risk and encouragement to maintain a healthy lifestyle. Mothers' motivations to comply with preventive behaviors came from their desire to avoid diabetic complications and medical management responsibilities as evidenced by their initial emotional reactions to the diagnosis of gestational diabetes and negative descriptions of the experiences of family members with diabetes. Of the few participants stating reasons not to comply with preventive behaviors, the belief that type 2 diabetes is unavoidable due to genetic predisposition was most commonly mentioned.

Along with attitudes and subjective norms, perceived behavioral control is an independent predictor of intentions to participate in diabetes prevention within the TPB. Mothers' perceptions of control over the performance of type 2 diabetes preventive behaviors are in turn determined by both the belief that barriers and enablers are likely to occur as well as the perceived power each constraining or facilitating condition will have

over their ability to maintain healthy lifestyle habits. Study results revealed five barriers and four enablers to future diabetes prevention. However, only 30 total responses were given when all 25 participants were asked about conditions or people that may make it difficult to participate in preventive behaviors. Similarly, only 27 total responses were given when asked about supportive conditions or people. Each participant offered only one, or at best two responses for this interview question. This relative low volume of identified barriers/enablers to diabetes prevention is difficult to interpret in relation to the constructs of the TPB. One possible explanation is that mothers did not have a strong belief that these barriers/enablers were likely to occur. Another explanation is that they did not believe barrier/enablers would significantly affect their intentions to prevent future diabetes.

Limitations

A potential threat to the internal validity of the study was participant reactivity to the ethnicity of the interviewer. While two African-American research assistants experienced in qualitative research techniques participated in the interview process to reduce this reactivity, they conducted only seven of the twenty-five interviews. This Caucasian investigator conducted the remaining eighteen interviews. One reason that research assistants conducted fewer interviews than this investigator was due to scheduling constraints. In addition, it was important to conduct several interviews personally to most effectively evaluate the clarity of the interview guide as well as the content, consistency, and overall quality of the interview process. However, after each recorded interview conducted by research assistants was reviewed by this investigator immediately after its completion, it became apparent that the interviews did not produce

the same amount and quality of data. The intonation of participant voices indicated a greater interest in the interview itself when conducted by this investigator. Also, interviews conducted by this investigator encouraged responses that were richer in content and more responsive to interview guided questions in their entirety. This could be attributed to this investigator's clinical experience and knowledge of pregnancy and diabetes. Participant reactivity to the ethnicity of this interviewer may have been reduced by this experience.

Another limitation of this study was a result of this investigator's assumptions when constructing the interview guide. Specifically, two assumptions were revealed during the interview process. The first assumption was that a significant number of participants would be unaware of their risk for subsequent type 2 diabetes later in life. This assumption was made for the following two reasons. As discussed previously, little research dedicated to the assessment of perceptions of risk for the development of type 2 diabetes is available. Of the research that has been dedicated to perceptions of risk, results have demonstrated that less than 50% of participants considered themselves to be at risk (Feig et al., 1998; Harwell et al., 2002; Jefferson et al., 2000). In addition, this investigator's clinical experience suggests that mothers may not be knowledgeable of their risk. When asked during a clinical visit if they know about type 2 diabetes and their future risk, mothers have frequently reported that they do not.

However, this study has demonstrated that an initial response denying knowledge of diabetes risk and prevention may not reflect mothers' true level of knowledge. Extended discussion revealed that mothers actually knew more about diabetes than they originally thought due to their past experiences with family members and contact with

health care providers. Because the assumption of a potential lack of knowledge was made prior to data collection, the interview guide was designed to ask semi-structured rather than more open-ended questions. In retrospect, giving participants a greater opportunity to answer the interview questions in a less structured format may have encouraged more descriptive data. One potential way to have gained the information required to correct this first assumption would have been to conduct a small focus group prior to data collection. While the interview guide was successfully pilot tested by a postpartum patient, testing the interview guide with a small group of gestational diabetic mothers may have identified participants' general level of knowledge regarding type 2 diabetes risk and prevention more effectively.

The second assumption was that a greater number of significant barriers to preventive behaviors would be described by mothers. Consequently, their intentions to participate may not have been as high as study results reported. This assumption was made based upon results of previous research. Although prior research is absent concerning the impact of psychosocial factors on type 2 diabetes prevention for African-American women with gestational diabetes, a limited amount of information exists related to obesity prevention in African-American women (Allan, 1998: Railey, 2000; Walcott-McQuigg, 1995; Walcott-McQuigg et al., 1995; Wilcox et al., 2002). While results from the current study are consistent with barriers identified in these previous investigations, the interview process was somewhat difficult when participants were asked about what would encourage or discourage their participation in preventive behaviors. As discussed earlier, mothers consistently offered few responses to questions related to this subject making it necessary to attempt to elicit more detailed responses. An

alternative explanation for this difficulty was participant reactivity to the interviewer or the interview process itself. Mothers may have wanted to provide answers they thought were socially appropriate or acceptable. The pressure to "do the right thing" may have made them reluctant to admit what would prevent them from following a healthy diet and exercise program. In addition, their intentions to participate in preventive behaviors may have been influenced by interviewer reactivity for similar reasons.

The interview process revealed a third limitation of the study. One variable not considered when designing the demographic questionnaire and interview guide was the treatment method prescribed for each participant during pregnancy. Treatment methods for gestational diabetes include the following combinations: diet, diet and oral medication, or diet and insulin. Throughout the interviews, participants discussed their fear of having to take insulin like other members of their family. This appeared to be a significant factor when describing their emotional reaction to the diagnosis of gestational diabetes as well as their intention to participate in behaviors to prevent future type 2 diabetes. An important influence on participant' responses may have been their current method of treatment. However, only three mothers mentioned how heir diabetes was being controlled making it difficult to evaluate study results according to treatment method.

Future Goals for Research

This qualitative study was designed to serve as the foundation for a culturally relevant program of research dedicated to the prevention of type 2 diabetes in African-American women with a history of gestational diabetes. The categories and themes

identified in this research investigation can be used to inform future qualitative studies as well as the development of a quantitative assessment tool measuring type 2 diabetes risk and prevention knowledge. While the TPB was used in this investigation for the purpose of guiding data organization and interpretation, future studies can be designed to test the relationships between TPB constructs in an effort to evaluate the validity of the model for this phenomenon of interest. In addition, due to limitations in prior research concerning African-American mothers' at risk for type 2 diabetes after gestational diabetes, no valid and reliable quantitative instruments have been developed to assess knowledge of this risk or psychosocial barriers to preventive behaviors. The creation and testing of such an instrument will ultimately lead to data with increased generalizability and precision.

A criticism of the TPB is that it focuses on intention rather than the explanation of behavior. Lauver (1992) suggests that this may limit the usefulness of the TPB since the goal of most health care professionals is the behavior itself, not the intention behind the performance of the behavior. This investigator continues to believe that knowledge of the beliefs and norms influencing African-American women's intent to participate in type 2 diabetes prevention is extremely important. As proposed by the TPB, intention may ultimately predict behavior. A goal for future research could potentially include the measurement of actual diet and exercise modifications made by African-American women intending to participate in diabetes preventive behaviors after a pregnancy complicated by gestational diabetes.

Another significant goal for future research is to investigate the effectiveness of type 2 diabetes risk and prevention education by health care providers. While health care professionals were frequently identified as a source of knowledge about gestational

diabetes and type 2 diabetes risk, dieticians were most commonly cited as the staff members to deliver this information. In addition, mothers commented that they found dieticians to be very helpful in the way they presented information. Physicians and nurses were mentioned infrequently. When these physicians and nurses were discussed, it was often in association with the pamphlets they were given but had not yet read. While the primary responsibility of the dieticians from both clinics was to educate mothers about their diagnosis, participants perceived that they should have received more information from their physicians and nurses.

Of interest is the fact that after the tape recorder was turned off and interviews were officially ended, several mothers expressed a desire to share further suggestions for ways to improve the quality of prenatal education about gestational diabetes and type 2 diabetes prevention. In addition, their entire demeanor changed when offering these ideas. Most mothers appeared excited, smiled, and thanked this investigator for listening and wanting to help prevent chronic diabetes. Because this change in demeanor occurred immediately after the tape recorder was turned off, it is suspected that audio taping may have limited participant responses during these face-to-face interviews. A suggestion for future investigations would be to provide time during the interview process free from audio or video taping. This may promote a more relaxed environment for participants to share their ideas and health-related experiences. Written notes could subsequently be recorded after the completion of interviews.

The most common suggestion was that physicians and nurses should give verbal information during prenatal visits as well as written materials to reference after visits. When simply given written pamphlets or brochures, mothers admitted to forgetting to

read them when they returned home. They also preferred hearing this information from their health care provider directly while also being shown where the information is located in hand-outs. This seemed to convey a greater sense of caring and concern from providers. One idea involved offering an instructional exercise class while waiting for prenatal care. Another suggestion was to give mothers sample menus to follow at home as well as menus from popular fast-food restaurants indicating the healthiest choices to make when ordering. The idea most consistent with the results of this study was to include family members in educational classes and health care visits. By encouraging family participation, mothers may increase the support they receive a home to follow the recommendations of health care professionals. It is this investigator's belief that this would also be an excellent opportunity to educate all family members about type 2 diabetes risk factors and preventive behaviors. Mothers with gestational diabetes could be the primary source of diabetes prevention knowledge for their entire family.

Appendix A

Gestational Diabetes Study Flyer

Gestational Diabetes Study

This research study is being done by a University of Michigan PhD nursing student. The purpose of this study is to learn about the experiences of African-American women who have been diagnosed with gestational diabetes.

To take part in this study…..

- ✓ You must be 18 years or older.
- ✓ You must be a female African-American.
- ✓ You must be able to read and speak English.
- ✓ You must have received diabetes education.
- ✓ You must have NO major medical problems except for high blood pressure.

What does this mean for me?

- ➢ All information learned from you will be kept CONFIDENTIAL.
- ➢ You may take part in this research either before or after your scheduled appointment.
- ➢ The study involves filling out a questionnaire and taking part in a private tape-recorded interview.
- ➢ This entire study will take less than one hour.
- ➢ You will receive a ***$20*** gift card to ***TARGET*** as a thank you for your time and participation in this research study!

Please let a member of the clinic staff know today
if you would like to learn more about
being in this study!

Appendix B

Informed Consent

Research Informed Consent

Title of Study: *Perceptions of Risk for the Development of Type 2 Diabetes in African-American Women with Gestational Diabetes*

Principal Investigator (PI): Janine Bieda, M.S. C.N.M.

University of Michigan, Doctoral Nursing Student

(313) 577-0054

When we say "you" in this consent form, we mean you or your child; "we" means the researchers and other staff.

Purpose

You are being asked to be in a research study of perceptions of risk for the development of type 2 diabetes because you have gestational diabetes in your current pregnancy. This study is being conducted at Wayne State University, University Health Center, and the Center for Advanced Obstetrical Care and Research. The estimated number of study participants to be enrolled at Wayne State University, University Health Center, and the Center for Advanced Obstetrical Care and Research is about 25-30. **Please read this form and ask any questions you may have before agreeing to be in the study.**

In this research study about African-American women who have gestational diabetes, awareness of type 2 diabetes risk as well as knowledge of type 2 diabetes prevention will be explored. In addition, this study will investigate factors that may encourage or discourage African-American women with gestational diabetes to participate in preventive behaviors after they deliver.

Study Procedures

If you agree to take part in this research study, you will be asked to fill out a brief written questionnaire and participate in one face-to-face interview. Both the questionnaire and interview should take about 45 minutes to complete. We will audiotape the interview to make sure that our conversation is recorded accurately.

The discussion topics will include your current experience with gestational diabetes as well as your knowledge about type 2 diabetes and its prevention. We will also talk about what would encourage or discourage you from participating in preventive behaviors in the future. You may choose not to answer a question on the questionnaire or during the interview for any reason. Your identity will be protected by the use of a code number on the questionnaire and interview audiotape. We will use only your first name during the interview.

Benefits

As a participant in this research study, there may be no direct benefit for you; however, information from this study may benefit other people now or in the future.

Risks

By taking part in this study, you may experience the following risks: Answering questions or talking with others about gestational diabetes and type 2 diabetes can be difficult emotionally. You may choose not to answer any interview question and you can stop your participation in the research at any time. The interviewer will have a list of support referrals, if you are interested in more information about clinic and/or community resources.

There may also be risks involved from taking part in this study that are not known to researchers at this time.

Study Costs

Participation in this study will be of no cost to you.

Compensation

For taking part in this research study, you will be paid for your time and inconvenience. You will receive a $20 gift card to Target for full participation in the study. If you stop before the interview is completed, you will receive a $10 gift card.

Confidentiality

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. You will be identified in the research records by a code number. Information that identifies you personally will not be released without your written permission. However, the Human Investigation Committee (HIC) at Wayne State University, or federal agencies with appropriate regulatory oversight [e.g., Food and Drug Administration (FDA), Office for Human Research Protections (OHRP), Office of Civil Rights (OCR), etc.) may review your records.

When the results of this research are published or discussed in conferences, no information will be included that would reveal your identity.

If photographs, videos, or audiotape recordings of you will be used for research or educational purposes, your identity will be protected or disguised. After the interview is completed, you have the right to review and/or edit the tapes. All audiotapes of interviews will be identified by a code number and kept by this investigator in a locked file drawer. No other researcher, student, or faculty member will have access to these tapes. Audiotapes will be destroyed after a word-for-word written copy of the interview has been created (transcript). All study forms, participant questionnaires, transcripts, and code information will be shredded after the completion of this study.

Voluntary Participation/Withdrawal

Taking part in this study is voluntary. You have the right to choose not to take part in this study. You are free to only answer questions that you want to answer. You are free to withdraw from participation in this study at any time. Your decisions will not change any present or future relationship with Wayne State University or its affiliates, or other services you are entitled to receive.

The PI may stop your participation in this study without your consent. The PI will make the decision and let you know if it is not possible for you to continue. The decision that is made is to protect your health and safety, or because you did not follow the instructions to take part in the study

Questions

If you have any questions about this study now or in the future, you may contact Janine Bieda, C.N.M. or one of her research team members at the following phone number (313) 577-0054. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

Consent to Participate in a Research Study

To voluntarily agree to take part in this study, you must sign on the line below. If you choose to take part in this study you may withdraw at any time. You are not giving up any of your legal rights by signing this form. Your signature below indicates that you have read, or had read to you, this entire consent form, including the risks and benefits, and have had all of your questions answered. You will be given a copy of this consent form.

_____
_____

Signature of participant / Legally authorized representative**

Date

_____
_____

Printed name of participant / Legally authorized representative**

Time

_____
_____

Signature of witness** Date

_____
_____

Printed of witness** Time

_____
_____

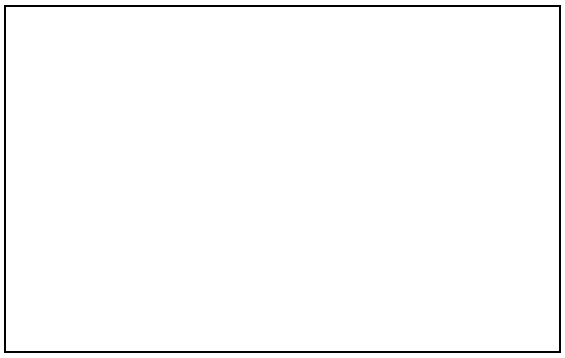
Signature of person obtaining consent Date

_____
_____

Printed name of person obtaining consent Time

*Remove LAR reference if you don't intend to consent participants that have or may have a LAR.

**Use when participant has had this consent form read to them (i.e., illiterate, legally blind, translated into foreign language).



_____

_____

Signature of translator Date

_____

_____

Printed name of translator Time

Appendix C

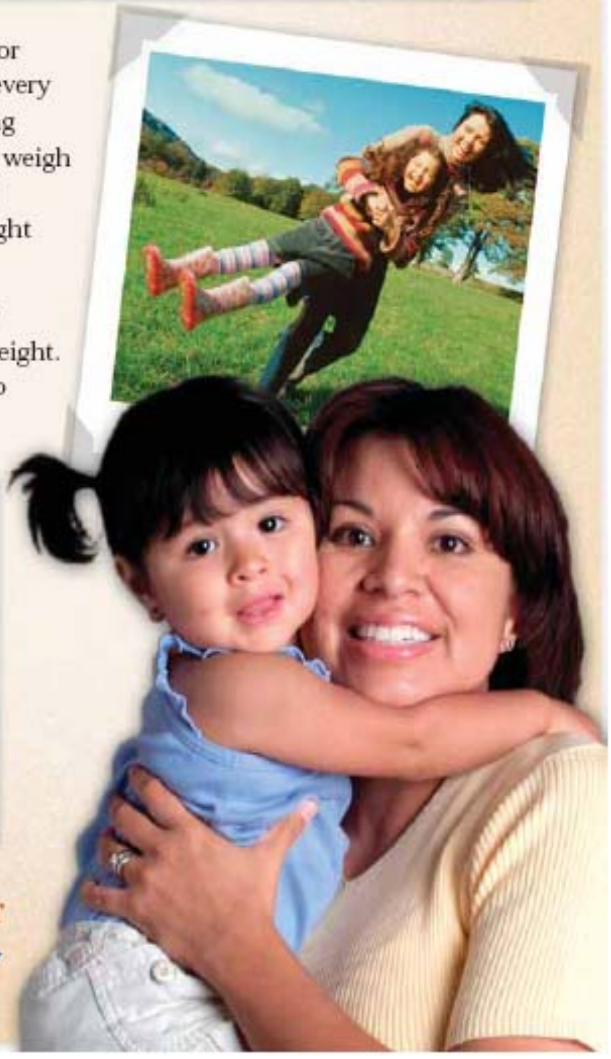
Educational Pamphlets

It's never too early... to Prevent Diabetes

If you had gestational diabetes when you were pregnant, you and your child have a lifelong risk for getting diabetes.

Because of this risk, you need to be tested for diabetes **after your baby is born,** then every one to two years. Reduce your risk by taking small steps for you and your family. If you weigh too much, you can prevent or delay type 2 diabetes if you lose a small amount of weight and become more active.

Your children can lower their risk for type 2 diabetes if they don't become overweight. Serve them healthy foods and help them to be more active.



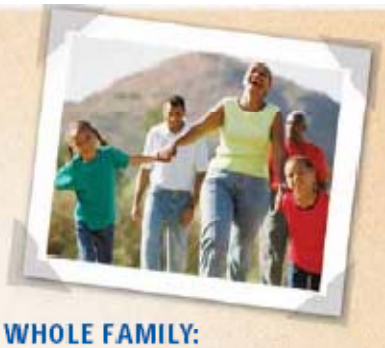
What is Gestational (jes-TAY-shon-al) Diabetes?

It is a type of diabetes that occurs when women are pregnant. Having it raises their risk for getting diabetes, mostly type 2, for the rest of their lives. African American, Hispanic/Latina, American Indian, and Alaska Native women have the highest risk.

A Lifetime of Small Steps for A Healthy Family

National Diabetes Education Program www.ndep.nih.gov

Action Steps



FOR YOU:

1. Ask your doctor if you had gestational diabetes. If so, let your future health care providers know.

2. Get tested for diabetes 6 to 12 weeks after your baby is born, then every 1 to 2 years.

3. Breastfeed your baby. It may lower your child's risk for type 2 diabetes.

4. Talk to your doctor if you plan to become pregnant again in the future.

5. Try to reach your pre-pregnancy weight 6 to 12 months after your baby is born. Then, if you still weigh too much, work to lose at least 5 to 7 percent (10 to 14 pounds if you weigh 200 pounds) of your body weight slowly, over time, and keep it off.

6. Make healthy food choices such as fruits and vegetables, fish, lean meats, dry beans and peas, whole grains, and low-fat or skim milk and cheese. Choose water to drink.

7. Eat smaller portions of healthy foods to help you reach and stay at a healthy weight.

8. Be active at least 30 minutes, 5 days per week to help burn calories and lose weight.

FOR THE WHOLE FAMILY:

1. Ask your child's doctor for an eating plan to help your child grow properly and stay at a healthy weight. Tell your child's doctor that you had gestational diabetes. Tell your child about his or her risk for diabetes.

2. Help your children make healthy food choices and help them to be active at least 60 minutes a day.

3. Follow a healthy lifestyle together as a family. Help family members stay at a healthy weight by making healthy food choices and moving more.

4. Limit TV, video, and computer game time to an hour or two a day.

The National Diabetes Education Program (NDEP) offers materials that can help you and your family make healthy food choices to prevent or delay type 2 diabetes. You can order a booklet for adults at risk called ***Your GAME PLAN to Prevent type 2 Diabetes***, and a tip sheet for children at risk called ***Lower Your Risk for type 2 Diabetes.***

To get your free copies go to **www.ndep.nih.gov** or call **1-800-438-5383.**

small steps big rewards Prevent type 2 Diabetes

The U.S. Department of Health and Human Services' National Diabetes Education Program is jointly sponsored by the National Institutes of Health and the Centers for Disease Control and Prevention with the support of more than 200 partner organizations.

Francine Kaufman, M.D., Head, Center for Diabetes, Endocrinology and Metabolism at Childrens Hospital, Los Angeles,CA, reviewed this material for accuracy.

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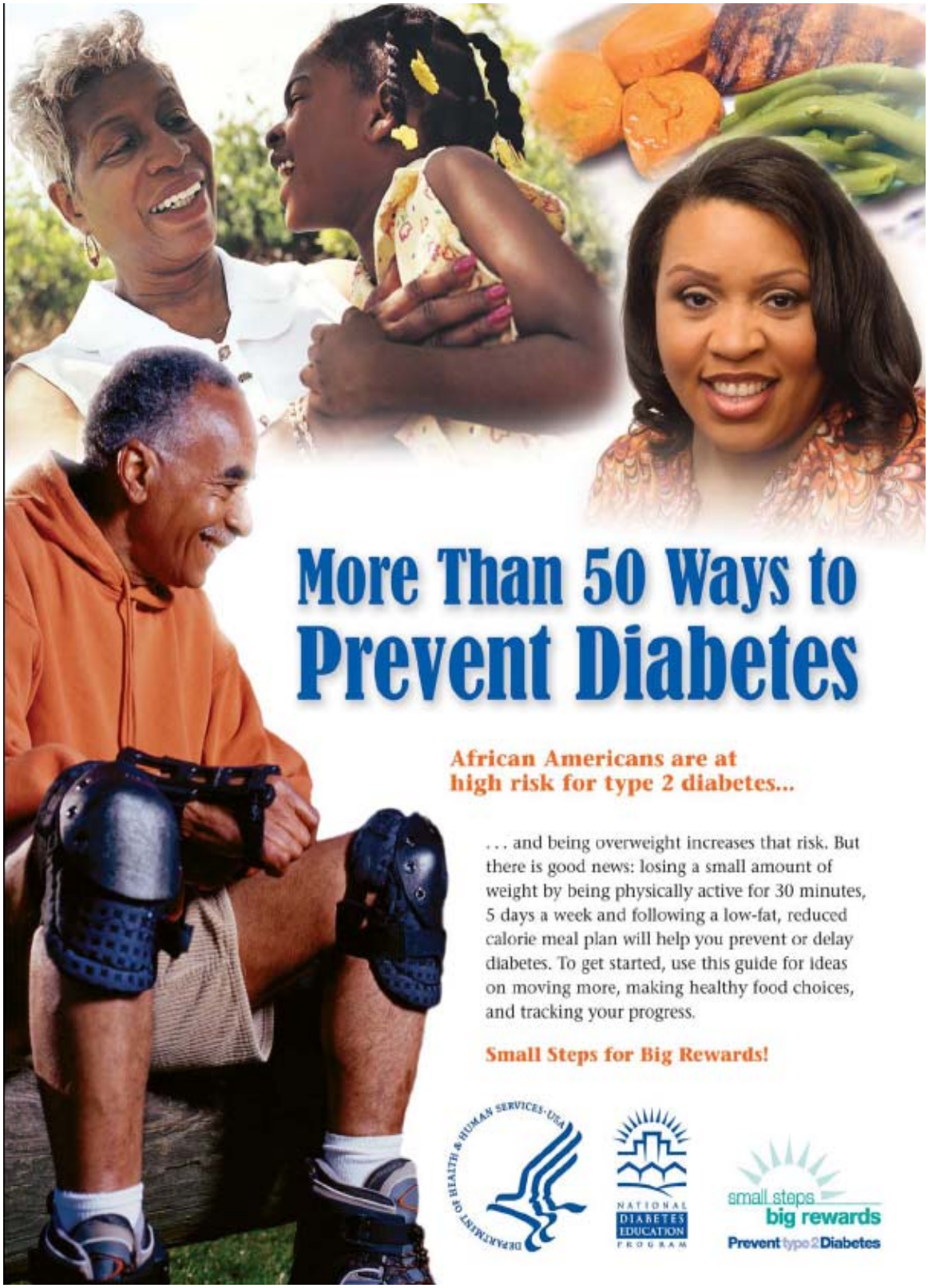
More Than 50 Ways to
Prevent Diabetes
African Americans are at high risk for type 2 diabetes...
. . . and being overweight increases that risk. But there is good news: losing a small amount of weight by being physically active for 30 minutes, 5 days a week and following a low-fat, reduced calorie meal plan will help you prevent or delay diabetes. To get started, use this guide for ideas on moving more, making healthy food choices, and tracking your progress.
Small Steps for Big Rewards!
DEPARTMENT OF HEALTH & HUMAN SERVICES · USA
NATIONAL DIABETES EDUCATION PROGRAM
small steps big rewards
Prevent type 2 Diabetes

MY DAILY AND WEEKLY GOALS

	FAT GRAMS	CALORIES	MINUTES OF ACTIVITY
DAILY			
WEEKLY			

MY DAILY AND WEEKLY TOTALS

	FAT GRAMS	CALORIES	MINUTES OF ACTIVITY	WEIGHT
MONDAY				
TUESDAY				
WEDNESDAY				
THURSDAY				
FRIDAY				
SATURDAY				
SUNDAY				
WEEKLY TOTALS				POUNDS LOST

FOLD HERE

small steps, big rewards
Prevent type 2 Diabetes

MY GAME PLAN
FOOD AND ACTIVITY TRACKER

NAME

DATE

FROM TO

MY GAME PLAN THIS WEEK...

FOR CUTTING FAT GRAMS:

FOR CUTTING CALORIES:

FOR GETTING MORE PHYSICAL ACTIVITY:

NIHS' NDEP is jointly sponsored by NIH and CDC with the support of more than 200 partner organizations.

SAMPLE ENTRY:

DAILY FOOD AND DRINK TRACKER

TIME	AMOUNT/NAME/DESCRIPTION	FAT GRAMS	CALORIES
8:00 AM	1/2 cup oatmeal	1	73
	1 cup 2% milk	5	121

TO MAKE MORE WEEKLY TRACKERS Make one (1) copy of the top half and seven (7) copies of the bottom half of this page. Trim the pages and staple in the upper left-hand corner. Fold to fit in your pocket or purse.

CUT HERE

DAY

DAILY FOOD AND DRINK TRACKER

TIME	AMOUNT/NAME/DESCRIPTION	FAT GRAMS	CALORIES

FOLD HERE

DAILY FOOD AND DRINK TRACKER (CONTINUED)

TIME	AMOUNT/NAME/DESCRIPTION	FAT GRAMS	CALORIES
	TOTALS		

DAILY PHYSICAL ACTIVITY

TYPE OF ACTIVITY	MINUTES
TOTAL	

Take the first step today. If you're overweight, you may be at high risk for diabetes. Talk to your health care team today.

Call 1-800-438-5383 and get your free GAME PLAN to Prevent type 2 Diabetes or visit

www.ndep.nih.gov

The U.S. Department of Health and Human Services' National Diabetes Education Program (NDEP) is jointly sponsored by the National Institutes of Health (NIH) and the Centers for Disease Control and Prevention (CDC) with the support of more than 200 partner organizations.
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Appendix D
Participant Questionnaire

Gestational Diabetes Participant Questionnaire

A Research Study

Date: _____

Participant Number: _____

Age in Years: _____

1. Do you currently have gestational diabetes?

   YES ____NO ____

2. Were you diagnosed with gestational diabetes with THIS pregnancy?

   YES ____NO ____

3. From the list below, check the number of times you have been diagnosed with gestational diabetes in the past:

   ☐ 0 ☐ 1 ☐ 2

   ☐ 3 ☐ 4 ☐ OTHER

4. Were you ever diagnosed with diabetes when you were not pregnant?

   YES ____NO ____

5. Have you received diabetes education in either a class or on a one-to-one basis?

   YES ____NO ____ If YES, how many weeks ago? ____

6. Have you worked with a dietician due to gestational diabetes during THIS pregnancy?

   YES ____NO ____ If YES, how many weeks ago? ____

7. What is your due date? Month _____ Day _____

8. From the list below, check the number of times you have attended prenatal visits during THIS pregnancy?

☐ 1	☐ 2	☐ 3
☐ 4	☐ 5	☐ 6
☐ 7	☐ 8	☐ 9
☐ 10	☐ If more than 10, list number of visits _____	

9. From the list below, check your current level of education:

☐ Have not graduated High School	☐ Some college
☐ Received GED	☐ College Graduate
☐ Graduated from High School	☐ Completed Graduate School

10. Do you currently work outside of your home?

YES ____ NO ____ If YES, what is your current job? _____

11. From the list below, check the type of medical insurance you currently use:

☐ Medicaid	☐ Medicaid HMO	☐ Private
☐ Other	☐ None	☐ Unknown

12. From the list below, check your current marital status:

☐ Single	☐ Significant Relationship
☐ Married	☐ Divorced
☐ Widowed	

13. Do you have other children?

YES ____ NO ____

If YES for question 13, how many children are living with you? _____

14. Do you have any family member(s) (either living or deceased) diagnosed with diabetes?

YES ____ NO ____

If you answered YES, please list below the family members (living or deceased) who have been diagnosed with diabetes:

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR TIME!

Appendix E

Interview Guide

Interview Guide

Date of Data Collection: _____

Interview/Participant Code Number: _____

Interviewer Initials: _____

The following questions are planned during each interview. It is anticipated that additional questions may evolve from the participants' responses and will elaborate on unanticipated content discovered during the interview process. All interviews will start by thanking participants for their time and contributions to the study.

1. When during your pregnancy were you told that you have gestational diabetes? How did you feel when you were first told?

   _____
   _____
   _____

2. Tell me what you think may have caused your gestational diabetes.

   _____
   _____
   _____

3. What does having gestational diabetes mean for your pregnancy?

   _____
   _____
   _____

4. How will having gestational diabetes affect you after you deliver? Later in life?

_____
_____
_____

5. If known, how did you learn this information?

_____
_____
_____

6. If not known, do you remember receiving any information about this subject?

_____
_____
_____

7. Tell me what you would say about having gestational diabetes to another mother who has just been diagnosed.

_____
_____
_____

8. Tell me what you know about chronic or type 2 diabetes (or “having sugar” when someone is not pregnant).

_____
_____
_____

9. Do you know what causes type 2 diabetes? Are some people more likely to get diabetes? If so, what groups of people?

_____
_____
_____

10. Do you believe you have a chance of getting type 2 diabetes? Why or why not? Have any particular people or situations contributed to what you think about getting type 2 diabetes?

_____
_____
_____

11. Do you believe type 2 diabetes can be prevented?

_____
_____
_____

12. If so, how can it be prevented? How did you learn about this information?

_____
_____
_____

13. If not, why do you think it can't be prevented? Do you remember receiving any information about diabetes prevention?

_____
_____
_____

14. If you knew you could reduce your chances of getting type 2 diabetes with diet and exercise, would you try? On a scale of 1 to 10, how likely would you be to try? How important would it be for you reduce your chances of getting type 2 diabetes?

_____
_____
_____

15. Who or what kinds of things would help you to eat right and exercise to prevent diabetes? Why? Who or what would make it difficult? Why?

_____
_____
_____

16. Is there anything else you would like to share about gestational diabetes or type 2 diabetes? Do you have any questions?

_____
_____
_____

17. Would you like more information about gestational diabetes or type 2 diabetes prevention?

_____
_____
_____

Appendix F

List of Coding Categories, Theory of Planned Behavior Constructs and Examples

Coding Categories	Theory of Planned Behavior	Examples
1. Emotional Responses to the Diagnosis of Gestational Diabetes	Motivation to Comply	FEARFUL "I felt kind of afraid…I've never had it. And um…just everything is a big change. You know I have to stop eating sweets and be careful…you know things like…it was kinda scary to me cuz' it was kinda hard at first." (#1) UPSET "I was distraught…I was upset…because I had to take insulin." (#3) WORRIED "Worrying about the effects, and how it will affect the baby. And um, is it possible to, um, get rid of it or, you know, handle it, control it?" (#6)
2. Causes of Gestational Diabetes	Motivation to Comply	UNKNOWN "I really don't know…I don't know what it was caused by." (#2) DIET "I guess eatin' all this fattening and sugary food." (#4) LACK OF EXERCISE "The lack of exercise and you know, putting on weight, eating, being pregnant in general and not havin' that, that activity and function to kind of fall back on may have contributed to it." (#14) FAMILY HISTORY "Uh, I think it was just family history; I think maybe I already had it." (#10) AGE "and age factor – maybe age." (#15)

Coding Categories	Theory of Planned Behavior	Examples
3. Sources of Gestational Diabetes Knowledge	Motivation to Comply and Normative Beliefs	FAMILY EXPERIENCE "I thought that I was gonna have to be like my mom and my sister, havin' to take that nasty medicine and stuff all the time." (#24) EDUCATION FROM HEALTH PROFESSIONALS "When she (nutritionist) explained it a little better and it was just helping me with my eating habits, I felt a little better." (#18) SELF-EDUCATION "I read a lot of information…I learned a lot reading." (#24) PRIOR GESTATIONAL DIABETES "This time, this time I was like 'oh wow', here we go again! But, I was more prepared because I know now. You know…what it is – well basically what it does and how it goes." (#25)
4. The Effects of Gestational Diabetes Later in Life	Motivation to Comply	NONE "…and most of the time it goes away." (#2) RISK OF TYPE 2 DIABETES "There's a possibility for me to get type 2 diabetes." (#7) NEED TO TAKE CARE OF YOURSELF "I would tell her that it is very important – that it's a serious matter and she needs to do exactly what the doctor and the dietician tells her to do. Cuz' is she doesn't, she can pay for it later on in life." (#3)

Coding Categories	Theory of Planned Behavior	Examples
5. Causes of Type 2 Diabetes	Motivation to Comply	UNKNOWN "No. I don't know. I don't know…I haven't read anything about that yet." (#3) DIET "And mostly people I say, that be out a lot, that can't eat at home – gonna be the main ones, cuz' you constantly eat while you're going right? And fast food is not good!" (#9) LACK OF EXERCISE "People who are obese; people who don't exercise and again are not managing their body healthily." (#11) HEREDITY "I believe African-American. Um, as a race." (#6) RACE/ETHNICITY "People who are obese; people who don't exercise and again are not managing their body healthily." (#11) GESTATIONAL DIABETES "I heard people who get it gestation like, when they're pregnant – and then it just lapse, it pregnancy." (#14)

Coding Categories	Theory of Planned Behavior	Examples
6. Sources of Type 2 Diabetes Knowledge	Motivation to Comply and Normative Beliefs	FAMILY HISTORY "Well, I know a little from my grandmother – she was a diabetic all her life basically, before she passed away. I know if you don't take care of yourself you can slip into a diabetic coma and there's the insulin…if she ate too much and didn't eat enough…and I have an uncle that's also like that…" (#3) LACK OF INFORMATION "Um, I don't know anything about that." (#13) WORRIED "Worrying about the effects, and how it will affect the baby. And um, is it possible to, um, get rid of it or, you know, handle it, control it?" (#6)
7. Personal Risk Factors for Type 2 Diabetes	Motivation to Comply	DIET/EXERCISE "Um, not following a diet…uh, no balanced meals, not eating right, not exercising…stuff like that." (#1) FAMILY HISTORY "I think so because of the fact that my family history…I been fighting against all these years." (#10) GESTATIONAL DIABETES "I'm afraid that I will, I don't know why I feel that way, but I am scared because I got diabetes twice during my pregnancy…so you know I'm scared; scared about having it." (#20) RACE/ETHNICITY "By me being black, I mean I know that's a big – that's a big, um." (#22)

Coding Categories	Theory of Planned Behavior	Examples
8. Prevention of Type 2 Diabetes	Behavioral Beliefs	DIET/EXERCISE "Yes I do…I have a friend that is type 2…ah, she started back exercising, and she lost her weight, and now they about to take her off her insulin. So, yes it can be prevented." (#3) UNABLE TO PREVENT DUE TO GENETICS/HEREDITY "I think, if it was meant to be, it was meant to be. If its generic – genetic you know, in your genes or whatever…you might have it, you might now." (#1)
9. The Importance of Type 2 Diabetes Prevention	Evaluation	VERY IMPORTANT "It would be really important to me because again, just how active my life is. I really don't have time to manage something like that. If I could prevent it ahead of time, I could go ahead and try to prevent it. But, for it to be a problem in the middle of my life, um, and then try to take – juggle that with everything else, it would be very important for me to try to prevent it ahead of time." (#14)

Coding Categories	Theory of Planned Behavior	Examples
10. Barriers and Enablers to Preventive Behaviors	Control Belief and Perceived Power	TIME CONSTRAINTS "I was gonna say my kids…they take a lot of time." (#5) INFLUENCE OF OTHERS ON DIETARY HABITS "Just other people's eating stuff in your presence, you know when you are used to eating stuff, then you tend to want it, you know, and you can't get satisfied off the things that you eat because of the fact that you know, you're smelling all fried chicken." (#10) FINANCIAL BURDEN "It is very hard. I try to budget as much as I can. I am a coupon clipper…" (#20) LACK OF TRANSPORTATION "Well you know you have obstacles, you know as far as um, transportation – I don't have transportation." (#15) LACK OF INFORMATION ABOUT LIFESTYLE CHANGES "What would help me is if someone gave me a menu to cook…a menu to tell me what to eat, and you know what I'm saying. I would stick to that…I believe it would really help me to learn." (#20) SOCIAL SUPPORT "Yes, people you be around. You know, they can be doing the same thing you are doing every day – and it helps you…it motivates you." (#8)

Coding Categories	Theory of Planned Behavior	Examples
Continued: 10. Barriers and Enablers to Preventive Behavior	Control Belief and Perceived Power	CONTROL OVER FOOD PREPARATION "I can cook my own food – if I feel what is being prepared is you know, the people around me are eating something that I don't feel necessarily comfortable eating…" (#14) FUTURE OF CHILDREN "My children would help me because I don't want them to have to deal with it." (#6) PROVIDERS "The doctors I guess…maybe educating a little more." (#22)
11. Likelihood of Participation in Preventive Behavior	Behavioral Intention	HIGH LIKELIHOOD (>8) "Because I'm gonna do anything that is going to allow me to have a better life and be more healthy to stay alive." (#15) MODERATE LIKELIHOOD (5-7) "Cuz' I'd be half in and half…I would have to think if I wanted to do it anymore. But I'd rather be thinking about my health too!" (#19)

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