

ENVIRONMENTAL INFLUENCES ON ADHERENCE TO SELF-MANAGEMENT BEHAVIORS
AND GLYCEMIC CONTROL IN AFRICAN AMERICAN PATIENTS WITH TYPE 2 DIABETES
MELLITUS

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ABSTRACT

Diabetes mellitus is a chronic illness effecting approximately 20.8 million individuals in the United States. Minorities are adversely affected, with age-adjusted prevalence 1.7 times higher in African Americans than Caucasians. Type 2 diabetes is significantly affected by behavioral and environmental risk factors, including the presence of co-occurring diseases (i.e., hypertension, hyperlipidemia), obesity, age, and lack of physical activity, and each of these risk factors is more prevalent among African Americans. The treatment of diabetes is largely self-managed, with patients and their families handling 95% of their own care. Adherence to the multi-component diabetic treatment regimen requires daily care, often occurring in more than one environment. While many studies have attempted to address the impact of social support on the self-management behavior of diabetics, few have tried to assess both intra-individual and environmental influences of support on the adherence. There is a paucity of research concerning the diabetic self-care treatment regimen and social support in an African American population, or addressing the disproportionate effect of environmental influences on African Americans. The current study sought to address this gap in the literature by using the Chronic Illness Resources Survey, a measure of multilevel support resources, to assess environmental influences of social support on African American patients' adherence to self-management behaviors. The current study also sought to address common methodological concerns, including the addition of glycemic control (HbA1c) as an outcome measure and control for social desirability.

REVIEW OF LITERATURE

Diabetes Mellitus

Diabetes mellitus is a group of metabolic disease symptoms characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003). Diabetes and diabetes-related complications account for significant mortality and morbidity annually in the United States. Approximately 20.8 million individuals (nearly 7% of the population) in the United States have diabetes. An estimated 14.6 million have been diagnosed with diabetes; unfortunately, 6.2 million people (or nearly one-third) are unaware that they have the disease (American Diabetes Association, 2006e; Cowie et al., 2006). Diabetes was the sixth leading cause of death listed on U.S. death certificates in 2002. Yet diabetes is likely to be underreported as a cause of death, with a recent study demonstrating that death certificates underestimate the prevalence of diabetes (American Diabetes Association, 2006e; McEwen et al., 2006). The direct (i.e., medical care and services) and indirect (i.e., short-term and permanent disability and premature death) costs of diabetes on the public and private health sector constitute a tremendous burden on society. One out of every ten health care dollars spent in the United States is spent on diabetes and its complications. The direct costs of diabetes are estimated to be near \$92 billion annually, nearly 11% of the U.S. health care expenditure (American Diabetes Association, 2006c). Finally, diabetes-related hospitalizations totaled 16.9 million days, and outpatient visits to treat persons with diabetes totaled 62.6 million in 2002 (American Diabetes Association, 2006c).

Diabetes is divided into three primary classifications: type 1 (formerly insulin-dependent diabetes mellitus), type 2 (formerly non-insulin dependent diabetes mellitus), and diabetes associated with a specific medical condition (e.g., pregnancy). Type 1 diabetes is characterized by the absolute deficiency of endogenous insulin secretion. The onset of type 1 diabetes is usually abrupt, with marked polyuria, polydipsia, polyphagia, weight loss, and fatigue. Type 1 diabetes can occur at any age,

however, it occurs most commonly during the middle of the first decade of life and during adolescence (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003).

The cause of type 2 diabetes is a combination of resistance to insulin action and an inadequate compensatory insulin response. Unlike patients with type 1 diabetes, those with type 2 diabetes mellitus have some endogenous insulin secretion (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003). In type 2 diabetes, patients may fall within a range of impaired glucose tolerance, thus, the clinical presentation and disease course of type 2 diabetes varies greatly between patients (American Diabetes Association, 2006d). This classification of diabetes frequently goes undiagnosed because hyperglycemia develops gradually and, at earlier stages, is often not severe enough for the patient to notice symptoms (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003; Harris, 1989). Type 2 diabetes can occur at any age, with the majority of patients being diagnosed after age 40. However, clinically-based reports and regional studies suggest that type 2 diabetes is being diagnosed more frequently in children and adolescents, particularly in minority populations (American Diabetes Association, 2000, 2006e). The majority of patients with type 2 diabetes are obese, which further contributes to insulin resistance (Cox & Gonder-Frederick, 1992; Lillioja et al., 1985; Virtanen et al., 2005).

Behavioral and environmental factors appear to make a significant contribution to the development of type 2 diabetes. The risk of developing type 2 diabetes increases with age, obesity, and lack of physical activity (Harris, 1998; Sullivan, Morrato, Ghushchyan, Wyatt, & Hill, 2005; Zimmet, 1992). It occurs more frequently in women with a history of gestational diabetes and in individuals with hyperlipidemia or hypertension (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2003). With the exception of age, these environmental and behavioral risk factors are more prevalent among minorities, particularly African Americans (Harris, 1998; Miller et al., 2004b; Shai et al., 2006).

Components of Diabetes Self-Care Treatment

As a result of its major impact on public health and health care expenditures, diabetes treatment has been a major goal of nationwide disease management programs, and much attention has been given to the dissemination of treatment guidelines and specific components of treatment. The goals of diabetes treatment are good metabolic control, minimization of complications due to diabetes, control of co-occurring diseases (i.e, hypertension, hyperlipidemia), and good quality of life (American Diabetes Association, 2006d). Treatment for diabetes mellitus involves restoring blood glucose to or near normal levels in all patients. The American Diabetes Association (ADA) recommends a treatment target for diabetes that includes a glycosylated hemoglobin (HbA1c) level < 7% and a fasting plasma glucose (FPG) of < 120 mg/dl. Treatment for type 2 diabetes is designed to maximize the effect of endogenous insulin by decreasing insulin resistance.

Significant patient involvement is necessary to achieve treatment goals, and diabetes care is almost always carried out by patients and their families (Toljamo & Hentinen, 2001). To maintain adequate glycemic control, patients typically follow a self-care regimen involving frequent self-monitoring of blood glucose (SMBG), dietary modifications, exercise, education, and medication administration. In addition, a majority of diabetes self-care treatment regimens include activities toward the goal of reducing diabetes mellitus-related complications (e.g., foot and eye care) and behaviors targeting the reduction of cardiovascular risk factors (e.g., high fat diet, sedentary lifestyle, smoking) (American Diabetes Association, 2006d).

Dietary Modifications and Physical Activity. Lifestyle modifications in the form of dietary change and the initiation of physical activity are essential components of diabetes self-management, and are often a first-line therapy for persons newly diagnosed with type 2 diabetes (UKPDS, 1995). Diets with moderate caloric restriction (e.g., 250-500 calories less than daily intake), a reduction in saturated fats, increase in fiber and vegetable consumption, and an increase in physical activity have been recommended for patients with diabetes (American Diabetes Association, 2006b; Franz, 1997). A

specific aim of dietary modification is a reduction in body weight, because weight loss through proper diet and exercise results in improved glycemic control and reductions in cardiovascular risk factors (e.g., blood pressure, plasma lipid levels) and overall mortality (Wing et al., 2001; Wing, Venditti, Jakicic, Polley, & Lang, 1998). Several studies have shown that specific dietary modifications, such as the increased consumption of whole grains and reduced saturated fat intake, along with weight loss and increased physical activity, may delay or prevent the onset of type 2 diabetes in high risk patients (van Dam, 2003; Wing et al., 2001).

Self-monitoring of Blood Glucose. Another important component to diabetes self-management is the self-monitoring of blood glucose (SMBG) levels. Glycemic stability can be checked using a lancet and a calibrated blood glucose monitor or by regular urine checks (American Diabetes Association, 2006a). New self-calibrating, continuous blood-glucose monitoring systems that avoid regular blood sampling from the fingertip are currently being tested for use in diabetes self-management (Kilo et al., 2006). Regardless of method, if used properly, SMBG gives an acceptably accurate reflection of immediate plasma glucose levels. Results of SMBG are used to assess the efficacy of therapy as well as provide information regarding necessary adjustments to nutritional therapy and medication. The ADA (American Diabetes Association, 2006a) recommends daily blood glucose monitoring by patients on insulin therapy to prevent hypoglycemia or other related complications. Study results vary, but in general, the evidence supports a positive effect of regular SMBG for improving glycemia, particularly in individuals treated with insulin. While frequency of SMBG may range from 1 to 4 checks per day, the clinical recommendation is for regular monitoring with frequency depending on disease severity, treatment plan, instability of glycemia, and the overall functioning of the patient (Saudek, Derr, & Kalyani, 2006).

In addition to SMBG, the measurement of HbA1c, a target indicator suggested by the ADA, provides a stable and longer-term measurement of glycemic status. HbA1c measures reflect a time-weighted mean over the previous 120 days, and most accurately reflect the previous 3-4 months of

metabolic control (Saudek et al., 2006). The ADA recommends routine HbA1c testing two times per year in patients maintaining adequate control, and more frequently among patients who have not maintained control or who have changed their therapeutic regimen (American Diabetes Association, 2006d; Saudek et al., 2006). The main value of HbA1c is its use as a predictor of diabetes complications and the proven effect of improved control of HbA1c on complication risk (Saudek et al., 2006). A reasonable target value for HbA1c is less than 7%, and the ADA recommends that therapy be reevaluated when HbA1c exceeds 8%.

Medication. While modifications to diet and exercise are an initial and conservative treatment for type 2 diabetes, many patients require pharmacologic intervention to maintain glycemic control (Riddle, 1999). The medications for people with type 2 diabetes are classified into those that increase endogenous insulin secretion, those that enhance the effectiveness of insulin, or those that improve the sensitivity of peripheral tissues to insulin. Medications come in the form of pills or injectable insulin, although inhalable insulin and newer synthetic hormones (e.g., pramlintide) are currently being tested for approval in the United States.

Diabetes self-management is obviously a multi-component regimen, with patients possessing a great deal of influence on their own glycemic control, overall health, and quality of life. Indeed, lack of participation in a variety of self-care behaviors contributes to poor glucose control, leading to greater incidence of complications, morbidity, and mortality (UKPDS, 1995, 1998a, 1998b). While other components are also important to the reduction in diabetes-related complications (i.e., foot and eye care, smoking cessation), the current study focused on the self-management behaviors described above (i.e., diet, physical activity, SMBG, and medication), which have been shown to be most directly related to glycemic control (UKPDS, 1995, 1998a, 1998b).

Adherence to Diabetes Self-Care Regimen

To achieve the therapeutic goals of diabetes management, adherence to self-care is crucial because most of diabetes care is carried out by patients and their families (Toljamo & Hentinen, 2001).

Self-care management is necessary for improved physical functioning and reduction in diabetes-related complications, and day-to-day lifestyle modifications as described above are needed to optimize glycemic control. While medical management is a component of almost all treatment plans, patients may handle up to 95% of their own care of this chronic disease (Anderson et al., 1993). Therefore, promoting adherence to active self-care is a major goal in diabetes education. Self-care in diabetes may involve complex changes in basic behaviors or adherence to complicated, multi-component regimens (Day, Bodmer, & Dunn, 1996). Active self-care often consists of performing home blood glucose monitoring and adjusting other treatment components to compensate for results, variation of nutrition in response to daily needs, insulin dose adjustments to meet actual needs, and regular exercise (de Weerd, Visser, Kok, & van der Veen, 1990). Furthermore, patients must be responsible for making necessary adjustments to their medication and dietary needs in the event of illness. It is inevitable that successful self-care and optimal balance require motivation, support, and encouragement by family, friends, and health care professionals (Day et al., 1996).

Assessment of Adherence. The assessment of adherence to diabetes self-care is often difficult, whether due to changing operational definitions, lack of patient behavior observations, or social desirability bias in patients' reporting of their self-care behaviors (Hentinen & Kyngas, 1992). In past decades, the conceptualization of adherence has shifted from a focus on patient's personality features, attributing low adherence to a maladaptive personality style, to the procedural delivery of medical treatment and the patient's beliefs and commitment to engaging in health-related behaviors (Glasgow & Anderson, 1999). By the nature of self-care diabetes treatment, such procedural delivery is often not observable by health care professionals. For example, patients who do not record the timing of their insulin administration or the results of SMBG, regardless of their participation in these behaviors, cannot be adequately assessed for treatment adherence. Furthermore, observations of the outcomes of adherence (e.g., adequate glycemic control) are often difficult to obtain in the form of blood or urine samples (Hentinen & Kyngas, 1992). One of the most reliable measures of a patient's stability of

glycemic control, HbA1c, is typically recommended only twice per year. Lastly, patients with low adherence may report an excessively positive review of their own behaviors (Gordis, 1981).

Previous findings concerning self-management and adherence to self-care among patients with diabetes vary greatly. A literature review by Hentinen (Hentinen & Kyngas, 1992) showed that adherence rates may range from 30 to 80%, depending on the interventions and research methods used in the studies. In general, patients with diabetes vary in their adherence to individual components of treatment. Some research has questioned whether response to treatment is a reliable criterion for adherence to regimen, due to the multi-component nature of treatment and other factors (Hentinen & Kyngas, 1992). Adherence to one therapeutic recommendation does not indicate adherence to others (Botelho, 2002), and each treatment component is associated with unique barriers to adherence.

Barriers to Adherence. The Diabetes Prevention Program, an NIH-sponsored, multi-site, randomized controlled trial comparing lifestyle modification intervention and pharmacologic treatment of diabetes, found that modification of lifestyle features (i.e., eating habits and physical activity) were more effective than medication in reducing the incidence of type 2 diabetes (Knowler et al., 2002). According to some studies, patients with diabetes have more difficulties in adhering to a suitable diet and exercise regimen than to insulin medication (Ary, Toobert, Wilson, & Glasgow, 1986; Glasgow, Hampson, Strycker, & Ruggiero, 1997; Hentinen & Kyngas, 1992; Vijan et al., 2005). While there is some evidence to show a positive linear relationship for knowledge of the diabetes-specific diet and adherence to that diet (Watson & DuFord, 1992), knowledge alone does not constitute the major health dilemma of dietary change. In a study by Ary and colleagues (Ary et al., 1986), subjects reported environmental factors as the most challenging to their dietary adherence. Open-ended questions revealed that the most common reasons for dietary nonadherence were the situational factors of eating out at restaurants and inappropriate food offers from others (Ary et al., 1986).

In contrast, the findings concerning self-monitoring of blood glucose are controversial. Some researchers (Peveler, Davies, Mayou, Fairburn, & Mann, 1993) have demonstrated that patients with

diabetes control their blood glucose regularly. Others have reported regular self-monitoring of blood glucose to be uncommon among patients with diabetes (Evans et al., 1999; Richmond, 1993). Evans and colleagues (Evans et al., 1999) calculated adherence to SMBG via dispensing and recording six-month use of lancets for blood glucose monitors, whereas Richmond (Richmond, 1993) administered self-report questionnaires.

Social Support and Diabetes

Social support is important for patients with chronic disease, particularly those with diseases requiring multi-component therapy, as with diabetes mellitus. As noted above, patients with diabetes may self-manage up to 95% of their own care (Anderson et al., 1993). Successful adherence to the diabetes treatment regimen translates to daily care, often occurring in more than one environment and with the knowledge (and possibly intervention) of individuals other than the patient alone: immediate family members, friends, co-workers, health care staff, and more.

Models of Social Support. As a concept and a construct, social support has been used extensively both in theoretical and research literature since its introduction about thirty years ago; however, operational definitions are generally not consistent. Other constructs have been subsumed under the general concept of social support without clear delineation (Hupcey, 1998). Specifically, ‘social networks’ have been included in several operational definitions of social support, although this is generally now considered an allied concept (Hupcey, 1998). Social networks refers more to the structure, number, and composition of an individual’s interpersonal ties rather than the quality or type of assistance being offered by the parts of the network (Vrabec, 1997).

Conceptual reviews of social support by Hupcey (Hupcey, 1998) and Vrabec (Vrabec, 1997) refer to three aspects common to past theoretical and operational definitions of social support found in literature: (a) structural aspects of the support networks, (b) functional types of assistance available, perceived, or actually received, and (c) the nature of the support. Functional support is one of the most common definitions applied to the measurement of social support, and its dimensions include

emotional, instrumental, informational, companionship, and validation support (Wills & Shinar, 2000). The nature of the support reflects a patient's satisfaction with the support received, the degree of reciprocity between network components and the individual, and whether network interaction is perceived as present, helpful, and/or conflicting (Hupcey, 1998).

Inconsistencies and inadequacies in the definitions of social support are numerous, and many definitions are not abstract enough to include all instances in which social support may occur (Hupcey, 1998). Existing research on support and health outcomes has several limitations related to these inadequacies of the social support construct (Glasgow, Strycker, Toobert, & Eakin, 2000; Hupcey, 1998; Martin & Brantley, 2004). For example, most studies have used only a single measure of support or a single support source (e.g., spouse or co-worker), or failed to relate support measures to conceptual models. One prolific scientist in this area points to researchers using a limited range of health outcomes and failure to control for potential confounding covariates (such as demographics and social desirability bias) as additional limitations within the social support and disease management literature (Glasgow et al., 2000).

Adherence and Social Support. Although social support and adherence to self-care medical regimens (e.g., pregnancy, epilepsy, HIV) have been studied (Cameron, Wells, & Hobfoll, 1996; C. DiIorio, Hennessy, & Manteuffel, 1996; Colleen DiIorio et al., 2006; Vincke & Bolton, 2002), less attention has been given to the relationship between adherence to self-care and perceived social support or to the need for social support among patients with diabetes. Some studies of people with diabetes claim that social support can actually promote adherence to self-care, and through adherence patients may achieve better metabolic control (Tillotson & Smith, 1996; Wang & Fenske, 1996). Shafer (Schafer, McCaul, & Glasgow, 1986) reported that greater levels of non-supportive family behavior were related to lower regimen adherence. Contrary to these findings, Murphy and colleagues (Murphy, Williamson, & Nease, 1994) found that social support from a family member did not result in better metabolic control. The conflicting research literature may be due to inconsistencies in

operational definitions of social support applied, or a limited view of the type or functions of support investigated. Another explanation is that although social support promotes adherence to self-care, adherence to the self-care regimen does not automatically lead to better metabolic control (Toljamo & Hentinen, 2001).

Environmental Influences. Diabetes management and regimen-related behaviors are influenced not only by intra-individual factors but also by the system that surrounds the individual. The Standards for Medical Care in Diabetes purports that the management plan for patients with diabetes should be individualized based not on the patient, but on the patient and his or her environment (American Diabetes Association, 2006d). Recently, the community context of individuals with diabetes has received much attention, partly because of the disparity in health status between ethnic and Caucasian groups in the United States (Ruggiero et al., 1997). Another more recent development in the research literature is an emphasis away from physician-only guidance and in the direction of the multidisciplinary health care team approach towards disease management. Many studies advocate the application of intensive intervention using a team approach towards optimizing patient adherence and, as an expected outcome, balanced glycemic control (Knowler et al., 2002; Koenigsberg, Bartlett, & Cramer, 2004). Such health care teams are in practice, with physician, nurses, dietitians, diabetes educators, and sometimes psychologists being part of the diabetes health care team. With such evidence for the importance of a wider system of care for the patient with diabetes, it is imperative to understand environmental influences in addition to traditional social support.

The ecologic or biopsychosocial model of disease management is one that extends the boundaries of traditional social support to more adequately explain the paradigm of disease and behavior as a function of several factors, including biologic, psychosocial, developmental, sociocultural, and ecologic factors (Auslander & Corn, 1996). Three social contexts, (a) the family, (b) health care system, and (c) the community, are believed to have considerable impact on individuals

with diabetes (Auslander & Corn, 1996). These contexts are in addition to those traditional implications of the biomedical model, which emphasizes individual influences on diabetes management (Engel, 1977).

This model, further developed from a purely theoretical definition toward research initiatives by Glasgow and colleagues (Glasgow & Anderson, 1999; Glasgow et al., 2000), attempts to address disease self-management from a multi-level “pyramid” model of social-environmental support (Glasgow et al., 2000). Similar to more traditional social support definitions, this ecological model includes support from both family and friends. It also incorporates the theory that chronically ill patients tend to be influenced additionally by distal sources of support (Hupcey, 2001), including workplace, media, public policy, community, and neighborhood (Glasgow et al., 2000). The sources of support are further divided into formal (or institutional) and informal (or interpersonal) networks. Institutional sources include media, public policy, work environment, and an individual’s multidisciplinary health care team. Interpersonal sources include the community and regional environment, neighborhood, family, and friends. An advantage of Glasgow’s application of the ecological model is an attempt to capture comparative and combined influences of different levels of support and the effects of more passive interventions, including public policy and environmental factors, in addition to more traditional active support behaviors (Glasgow et al., 2000).

Another important advantage of the ecological model is its implications for a better understanding of the environmental factors that may contribute to racial disparity in chronic illness, particularly diabetes. Both the National Diabetes Data Group (NDDG) and the National Health and Nutrition Examination Survey (NHANES) show a higher incidence of diabetes in African Americans than Caucasians (Harris, Hadden, Knowler, & Bennett, 1987; Roseman, 1985). In 1985, NDDG showed that 1 in 4 African American women over the age of 55 had diabetes (Roseman, 1985), and a 2004 published study of diabetes-related health disparities demonstrated the age-adjusted prevalence of the illness is 1.7 times higher in African Americans than Caucasians (Miller et al., 2004a).

Environmental and community factors are, in some part, believed to contribute to poorer health status and higher diabetes prevalence within minority communities, particularly African Americans. Generally lower SES levels among minority groups contributes to this disparity, with fewer financial and educational resources, less emphasis on preventive care, and often lower quality of medical services available to this population (Auslander & Corn, 1996). However, low SES levels is not the sole contributor, with evidence suggesting that environmental factors associated with poverty may have a negative impact on health status (Kaplan, 1994). Community factors such as overcrowding, pollution, neighborhood crime, inadequate housing, and unhealthy low-wage work environments may all contribute to overall poorer health (Auslander & Corn, 1996).

Some research evidence suggests that African American patients with diabetes may be disproportionately affected by some environmental contexts. There is evidence for African Americans to rely more than Caucasian individuals in informal social networks in the management of their diabetes (Ford, Tilley, & McDonald, 1998). Within the context of the health care system, one published study demonstrates that for African American patients, relative to Caucasian patients, physicians' assessments of diabetes management are significantly farther away from patients' self-assessments (Lutfey & Ketcham, 2005). Lastly, the published data of Ford and colleagues showed that social support was significantly associated with improved diabetes management among African Americans (Ford et al., 1998).

SUMMARY AND STUDY RATIONALE

The current study applied a cross-sectional design to assess the environmental influences on social support and adherence in a sample of low-income, African American patients with diabetes. Given the increased prevalence among minorities and the relative contribution of environmental and behavioral factors in the onset and exacerbation of type 2 diabetes, the present study focused only on individuals with this classification of the disease. The study focused on African American participants (1) because of the paucity of research concerning the diabetes self-care treatment regimen and social support in this population; (2) African American patients have also been shown to be disproportionately affected by various environmental influences; (3) the Chronic Illness Resources Survey, a measure of the multi-level model of socio-environmental support, was validated in a 96% Caucasian sample (Glasgow et al., 2000), and no published reports have administered this questionnaire in a minority sample.

The current study sought to address some of the methodological concerns common to this research area. As Glasgow and colleagues (Glasgow et al., 1997; Glasgow et al., 2000; Glasgow, Toobert, Barrera, & Strycker, 2005) point to a limited use of outcome variables related to self-care, outcome measures in this study included both measures of self-reported adherence and glycemic control. Self-reported adherence was measured using the Summary of Diabetes Self-Care Activities measure, which is the most widely used self-report instrument for measuring diabetes self-management in adults (Toobert, Hampson, & Glasgow, 2000). Glycemic control was obtained in the form of glycosylated hemoglobin (i.e., HbA1c) measures taken from medical chart reviews. Lastly, as self-reported adherence to components of the diabetes self-care regimen may be confounded by socially desirable responding (Gordis, 1981), the current study also measured and statistically controlled for social desirability.

Given the findings and limitations of previous research, the primary aim of this study was to determine whether perceived support from various environmental and community sources is positively

related with adherence to the diabetes self-care therapeutic regimen and glycemic control among low income African Americans. Secondary aims included understanding the relative contributions of the ecological and traditional models of social support to the prediction of adherence behaviors and glycemic control, and the validation of the Chronic Illness Resources Survey in this population. In the current study, the following research questions and hypotheses were addressed.

Primary Hypotheses

The primary research questions of the current project were: How is self-reported support from environmental social resources for illness-related behaviors related to adherence to self-management behaviors in patients with diabetes? How is self-reported support from environmental social resources for illness-related behaviors related to glycemic control in patients with diabetes? The ecological model of social support has not previously been measured in the low SES, African American population, but research evidence suggests that African Americans, although disproportionately affected by some environmental contexts, demonstrate improved diabetes management associated with their level of social support (Ford et al., 1998). Research also suggests that different components of diabetes self-management are independent (Johnson, 1992; Toljamo & Hentinen, 2001; Toobert et al., 2000), as adherence to one therapeutic recommendation does not indicate adherence to others (Botelho, 2002), and each treatment component is associated with unique barriers to adherence. Thus, the diabetes self-management behaviors were investigated separately from each other and from glycemic control. Therefore, the primary research questions of this study were modified into two primary hypotheses:

1. Higher levels of self-reported social resources for illness-related behaviors will be related to greater self-reported adherence to diabetes self-care treatment behaviors (i.e., diet, physical activity, blood glucose testing, medication-taking).
2. Higher levels of self-reported social resources for illness-related behaviors will be related to better glycemic control (i.e., glycosylated hemoglobin).

Secondary Hypotheses

The third research question posed by this project was: Does the ecological model provide additional information to the understanding of how the traditional model of social support predicts patients' adherence to diabetes self-management behaviors and/or glycemic control? While the ecological model is similar to traditional social support definitions, it also incorporates more distal sources of support (Hupcey, 2001), and attempts to capture both comparative and combined influences of different levels of support (Glasgow et al., 2000). Thus, a secondary hypothesis of this study stated that the ecological model, as measured by the CIRS subscales, would contribute additional variance beyond that contributed by a more traditional model of social support, as measured by the ISEL-12:

3. The ecological model of social resources will add additional variance, beyond the variance explained a traditional model of social support, to the prediction of patients' adherence to self-management behaviors and glycemic control.

A final research question presented by the current study is: Can the Chronic Illness Resources Survey (CIRS) be used as a reliable and valid measure of multilevel environmental influences of social support for illness-related behaviors in an African American, low SES population? This question was indeed a secondary aim of the project, as evidence for the impact of environmental risk factors (Harris, 1998; Miller et al., 2004b; Shai et al., 2006) and environmental resources on diabetes and chronic illness prevalence is already reported in the research literature for minorities, particularly African Americans (Auslander & Corn, 1996; Kaplan, 1994). The current project sought to fill the gap in the literature by reporting reliability coefficients and internal validity analysis for the CIRS in this population, and the final hypothesis was:

4. The Chronic Illness Resources Survey (CIRS) will demonstrate comparable reliability and internal validity in the low income, African American sample to its previous application in a primarily Caucasian sample.

METHODS

Participants

One hundred fifty-nine participants were recruited from the waiting rooms of medicine and primary care clinics at Earl K. Long Medical Center. Earl K. Long is a teaching hospital affiliated with the Louisiana State University Health Sciences Center, and it serves a predominantly low-income, uninsured population.

The inclusion criteria required that participants be African American outpatients with previously diagnosed type 2 diabetes mellitus attending routine medical appointments. African American participants were selected due to the paucity of research concerning diabetes self-care treatment regimen and social support in this population. Patients were excluded from the study if they were not African American (as classified in the medical chart), not current patients at Earl K. Long Medical Center, under 18 years of age, or could not orally comprehend material at a ninth grade level as indicated by their performance on the Woodcock Johnson Oral Comprehension subtest. They were also excluded if they carried a current diagnosis of a major mental illness (schizophrenia, bipolar disorder) or mental retardation as identified by medical chart review.

One hundred ninety-six patients were approached for participation (see Figure 1). Of these patients, 30 indicated that they did not want to consent to participate. Reasons for refusal included: not wanting the medical chart to be reviewed (5), not feeling well enough to answer questions (3), not having the time to answer questions (13), not wanting to participate with no other reason given (8), or concern about emotional risk of answering survey questions (1).

Seven patients were excluded from participation because they reported that they were not Earl K. Long patients (4), had diabetes mellitus type 1 (2), or were diagnosed as having pre-diabetes and not diabetes mellitus type 2 (1). No people were excluded for not being listed as African American in their medical chart, for not meeting the age or oral comprehension requirements, or for having a current diagnosis of major mental illness.

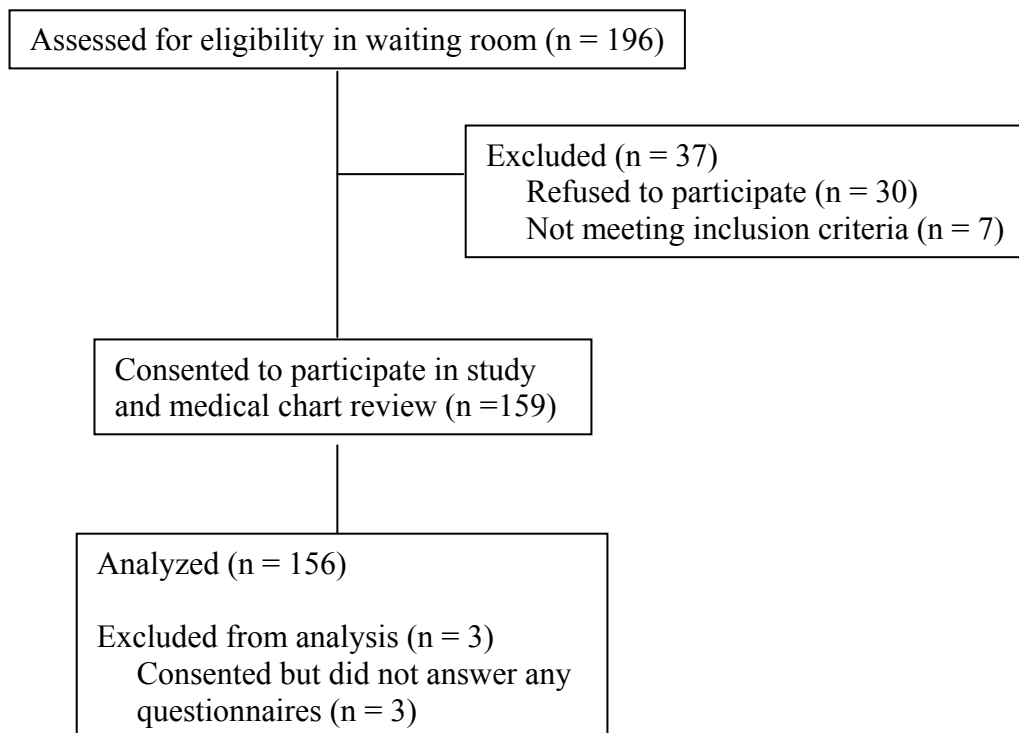


Figure 1. Participant flow through study

Measures

Demographic Questionnaire. A demographic questionnaire was administered to obtain the following information: hospital number, date of birth, BMI data, marital status, highest level of education completed, employment status, monthly household income, number of months since type 2 diabetes mellitus diagnosis, diabetes medications, and other chronic illness diagnoses (see Appendix A).

Chronic Illness Resources Survey (CIRS). The CIRS (Glasgow et al., 2000) is a 64-item scale for assessing multilevel environmental influences of social support, predicting successful behavior change, and detecting social-ecological intervention effects. This measure provides a profile of an individual's support for disease management-related behaviors, ranging from proximal support (e.g., family and friends) to more distal factors (e.g., neighborhood or community) (see Appendix B). Respondents rate the extent to which each of the items was used over the past 3 months on a 1 (not at all) to 5 (a great deal) Likert scale. The CIRS has a total score and seven source subscales: personal,

family and friends, physician/health care team, neighborhood/community, organizations, work, media and policy. The subscales have demonstrated good internal consistency and stability, with test-retest correlations ranging from 0.55 to 0.66 for subscales and 0.70 for the total score. Internal consistency for the overall scale is $\alpha = 0.82$. Previous research with primarily Caucasian populations has demonstrated that social desirability is not correlated with the CIRS.

Summary of Diabetes Self-Care Activities Measure (SDSCA). The SDSCA measure (Toobert et al., 2000) is an 11-item self-report questionnaire of diabetes self management that includes items assessing the following aspects of the diabetes regimen: general diet, specific diet, exercise, blood glucose testing, and medication-taking (see Appendix C). The SDSCA is the most widely used self-report instrument for measuring diabetes self-management in adults. Items assessing adherence to specific behaviors are scored based on reported levels of self-care over a consecutive 7-day period. Items assessing knowledge of self-care recommendations are scored based on which treatment behaviors the respondent reports having been advised to do by his or her health care team. The authors of the scale present the normative data from seven different studies, demonstrating that the SDSCA has high inter-item correlations within scales (mean = 0.47), with the exception of specific diet. Test-retest correlations are moderate (mean = 0.40). The SDSCA does not yield a total adherence score because previous research has shown that the different components of self-care treatment do not correlate highly with each other, and it is therefore necessary to assess each component separately (Johnson, 1992).

Marlowe-Crowne Social Desirability Scale. Because previous research has asserted that self-report of adherence to recommended self-care behaviors may be influenced by socially desirability bias (Gordis, 1981), a short form version of the Marlowe-Crowne Social Desirability scale (John J. Ray, 1984) was used to screen for socially desirable responding (see Appendix D). The measure has well documented validity and reliability (α 's = 0.74 to 0.77) (John J. Ray, 1981, 1984; J. J. Ray & Lovejoy, 1984).

Interpersonal Support Evaluation Checklist (ISEL-12). Perceived availability of social resources was assessed using the short form of Cohen and colleagues' Interpersonal Support Evaluation Checklist (Cohen & Hoberman, 1983; Cohen, Mermelstein, Kamarck, & Hoberman, 1985). The 12-item, self-report measure is a list of statements regarding available social support to which participants are asked to indicate whether each is "definitely true," "probably true," "probably false," or "definitely false" (see Appendix E). The standard form of the ISEL is 40 items and was designed to assess the perceived availability of four separate functions of social support: tangible, belonging, self-esteem, and appraisal. The brief, 12-item version was used in the present study, and it measures three of these functions: tangible, belonging, and appraisal. The authors of the measure report that internal reliability ranged from $\alpha = .88$ to $.90$ for the total score, and the ISEL-12 subscales range from $\alpha = .71$ to $.84$.

Woodcock-Johnson III Oral Comprehension. The Oral Comprehension section of the Woodcock-Johnson III – Test of Achievement (Woodcock, McGrew, & Mather, 2001) was used to determine if participants have the ability to comprehend questions that will be read to them. Oral comprehension is measured by the ability to comprehend a short passage and subsequently supply the missing word using syntactic and semantic cues. The test begins with simple analogies and associations and progresses to more complex passages. Oral Comprehension has a median reliability of $.89$ in adults. For the purposes of the present study, participants had to demonstrate at least a ninth grade oral comprehension level, as some of the other scales used have an approximate ninth grade reading level.

Medical Chart Reviews. Study personnel conducted brief medical chart review to obtain ethnicity, diabetes and chronic illness status, HbA1c measurements, diabetes medications, and body mass index (BMI), calculated as weight in kilograms over height in meters squared (see Appendix F).

Procedure

Data collection was conducted in the Medicine, Family Practice, and Foot Care clinics at Earl K. Long Medical Center. Patients with type 2 diabetes mellitus were recruited from the diabetes education classes, diabetes specialty clinic on Mondays at the Medicine Clinic, and waiting rooms at the respective clinics. Patients who met inclusion and exclusion criteria were informed of the nature of the study, the time commitment, and compensation for study completion. Interested participants were escorted to an exam room or more confidential area within the clinic and informed consent was obtained (see Appendix G), with a copy of the informed consent provided to each participant. Participants were instructed that the study aimed to examine the relationship between the environmental influences of social support and diabetes self-care. Inclusion and exclusion criteria were discussed with participants and they were informed that if they fail to meet the inclusion criteria, their participation would be terminated. Study personnel also explained the limits of confidentiality to participants. They were asked if their medical chart could be reviewed for height, weight, HbA1c test results, and diabetes and chronic illness status. Participants consenting to this review signed an additional authorization form for the use and disclosure of protected health information for research purposes. Finally, participants were informed that they had the right to withdraw from the study at any time without affecting the healthcare they receive at Earl K. Long Medical Center.

Following informed consent, participants were given a brief measure of oral comprehension to ensure that they are able to comprehend material at a ninth grade level. Study personnel then completed the demographic questionnaire and measures of chronic illness resources and diabetes self-care behaviors. Due to the low literacy rate at this charity hospital, measures were read to the participants. All participants were given the contact information of the primary investigator for any questions or concerns that could arise following participation in the study. Participants were given ample time for questions regarding social support and diabetes self-care. Those patients who requested more information regarding specific diabetes self-management behaviors or treatment were referred to

one of two Certified Diabetes Educators at Earl K. Long. Participants were given a diabetes care incentive package (containing glucose tablets, Eucerin Intensive Repair® lotion samples, tissue packs, anti-bacterial hand wipes, and sugar-free candies) as compensation for participation in the study and escorted back to the clinic waiting room. The retail value of the packages was \$5, commensurate with compensation offered by similar studies at this hospital. Finally, the primary investigator conducted a brief medical chart review to obtain ethnicity, gender, diabetes and chronic illness status, HbA1c measurements, diabetes medications, and body mass index (BMI), calculated as weight in kilograms over height in meters squared.

HbA1c measures available within the four months prior to, or ordered at the visit of, each participant's recruitment were obtained for statistical analyses. This time restriction was due to the nature of the self-report questionnaires being used, which asked respondents for their perceptions of social support within the past three months (Cohen & Hoberman, 1983; Cohen et al., 1985; Glasgow et al., 2000), and the reliability of HbA1c measures as a valid indicator of an individual's glycemic control for only the past 3-4 months.

Power Analyses

Prior to the commencement of the study, power analyses were conducted in three steps, with alpha set at 0.05, 2-tailed for all analyses. To analyze the effects of the set of seven predictor variables (i.e., environmental sources of support) on adherence to each of the five diabetes self-management behaviors and glycemic control, the current study estimated that the effect size of the ecological model would be large by Cohen's convention, or $d = .08$ ($R^2 = .14$). This effect size was chosen because it has been reported by the authors of the scale that the variance accounted for by the CIRS total score, in a study of dietary and physical activity intervention with female patients with diabetes, ranged from $R^2 = .14$ to $.29$ (Glasgow et al., 2005). This analysis yielded a sample size of 96 participants needed for an 80% chance of detecting 14% of the variance predicted by the set of seven CIRS subscales.

Secondly, as the literature regarding the ecological theory of social support did not provide an empirical basis for the relationship of individual environmental sources on adherence or glycemic control, the current study aimed to determine if any of the seven predictor variables individually contributes significant, unique incremental variance. This analysis yielded a sample size of 143 participants needed for an 80% chance of detecting a unique incremental variance of % of any individual predictor variable in the regression model, holding constant the cumulative $R^2 = .14$ for the entire set of predictors.

Lastly, analyses were conducted to determine the power needed for the hierarchical regression analyses to determine additional variance contributed by the CIRS in addition to that provided by the ISEL-12. Previous social support research demonstrates that traditional models typically contribute a small to moderate amount ($R^2 = .05$) of variance in the prediction of adherence or HbA1c measures (Tillotson & Smith, 1996; Wang & Fenske, 1996), thus the current project would not assume that the cumulative variance supplied by the combination of all social support measures would yield larger than what is predicted in the simultaneous regression analyses, $R^2 = .14$. The current study expected that the ISEL-12, entered in the first step of the regression model, would contribute $R^2 = .05$. Therefore, a sample size of 146 participants would be necessary for an 80% chance of detecting 9% of additional variance explained by the CIRS, entered in the second step of the hierarchical regression model. Due to the large number of predictor variables in the hierarchical regression model, there is not enough power to investigate individual contributions of the seven environmental sources.

Given the power analysis results varied between $N = 96-146$, the sample size proposed for use in the current study is $N = 150$. This criterion was met, and a total of 156 participants were used in the final analyses.

RESULTS

Sample Characteristics and Descriptive Statistics

One hundred fifty-nine patients were recruited for participation. Three participants did not respond to questions after completing the informed consent, thus as no relevant data was available. These participants were excluded, and final analyses included 156 participants. Sample characteristics are summarized in Tables 1 and 2. The sample was entirely African American, predominantly female (76%), low income (58% with a monthly household income < \$1000), with a mean age of 52.8 years. Sixty-nine percent of the sample reported being not married, indicating their status as either single, divorced, or widowed. A majority of the sample (67.9%) reported not working, indicating their employment status as unemployed, retired, or disabled.

Table 1

Demographic Characteristics of Participants

	M	SD
Age (years)	52.82	10.01
Years of Education	11.67	1.97
BMI	35.26	8.63

Medical charts were reviewed for height, weight, diabetes diagnosis, current diabetes medications, and the presence of chronic disease and diabetes-related complications for all participants. Health-related sample characteristics are summarized in Table 3. The average body mass index (BMI), calculated as weight in kilograms over height in meters squared, was 35.26 ($SD = 8.63$). BMI data was available for 152 participants. Individuals who were overweight (BMI between 25 and 29.9) made up 19.1% of the sample and 70.4% were obese (BMI of 30 and higher). All included participants carried a current diagnosis of diabetes mellitus type 2. Almost all participants (96.2%) were receiving pharmacologic intervention as part of their diabetes care. The sample had high rates of co-occurring chronic diseases, with 84.6% of the sample diagnosed with hypertension and 32.1% diagnosed with hyperlipidemia.

Table 2

Sample Characteristics

	N	%
Gender		
Male	38	24.4%
Female	118	75.6%
Marital Status		
Single	68	43.6%
Married	39	25.0%
Separated	10	6.4%
Divorced	20	12.8%
Widowed	18	11.5%
Monthly Household Income		
< \$1000	90	57.7%
\$1000-\$2000	59	37.8%
> \$2000	7	4.5%
Employment Status		
Full-time	43	27.6%
Part-time	7	4.5%
Unemployed	43	27.6%
Retired	17	10.9%
Disabled	46	29.5%

Table 3

Health-Related Sample Characteristics

	N	%
BMI Category		
Underweight (<18.5)	0	0%
Normal (18.5-25)	16	10.5%
Overweight (25-30)	29	19.1%
Obese (>30)	107	70.4%
Diabetes Medications		
Pills Only	84	53.8%
Insulin Only	28	17.9%
Combination Therapy	38	24.4%
None	6	3.8%
Medical Diagnoses		
Chronic Renal Failure	5	3.2%
Congestive Heart Failure	8	5.1%
Coronary Artery Disease	12	7.7%
Hypertension	132	84.6%
Hyperlipidemia	50	32.1%

Missing Data

Twenty-five participants (15.9% of the sample) did not have a glycosylated hemoglobin (i.e., HbA1c) blood test resulted within the timeframe proposed at the outset of the study (120 days). This percentage is very low, as anecdotal estimates from Earl K. Long diabetes clinic physicians estimated that as many as 60% of patients could have an outdated or missing test result. Efforts were made to alert physicians to their patients' consent to participate in the research study and the importance of a recent HbA1c value. Small cards were given to consented participants to bring into their medical appointment (Appendix G). Missing data was minimized on self-report measures because the questionnaires were administered orally by study personnel to all participants.

Expectation maximization (EM) methods were conducted using EQS 6.1 software (Multivariate Software, Inc.) to impute the missing values for HbA1c. EM methods are especially effective for randomly missing data, when amounts of missing data are small (Tabachnick & Fidell, 2007). EM works by forming a covariance matrix with an assumed distribution for the partially missing data and “basing inferences about missing values on the likelihood under that distribution” (Tabachnick & Fidell, 2007). This method was chosen to handle missing data because other methods (i.e., mean substitution, regression, casewise deletion) can significantly reduce variance and/or power. Furthermore, the amount of missing data imputed in the current study was small and no significant differences were apparent between the portions of the sample with and without valid HbA1c values on demographic indices ($p > .05$ for independent sample t -tests).

Missing data on all self-reported measures was negligible in all areas except for the work subscale of the CIRS. Almost 70% of the study sample reported being unemployed, thus they did not complete items 58-64 of the CIRS (per questionnaire instructions). Thus, so few participants supplied useful data for this subscale that it was not used in analyses.

Correlations of Predictor and Criterion Variables

Preliminary analyses were conducted to determine if there were intercorrelations amongst the set of predictors (i.e., the six environmental resource subscales of the CIRS) and within the set of outcome variables (i.e., the five adherence behaviors and HbA1c values). High correlations ($R \geq 0.7$) amongst the CIRS subscales could indicate a common factor of environmental support. Pearson r correlations are displayed in Table 4. While scales were moderately correlated with each other, values were not high enough to suggest a single common factor, and it would be inappropriate to collapse the scales into one factor of environmental support, as consistent with previous literature (Glasgow et al., 2000). Correlations within the set of adherence behaviors and HbA1c values are displayed in Table 5. Consistent with previous literature that suggests these outcomes are independent and should be investigated separately (Johnson, 1992; Toljamo & Hentinen, 2001; Toobert et al., 2000), only minimal correlations were found. No significant correlations were found between HbA1c and any adherence behavior. Also, no significant correlations were found between social desirability and the outcome variables.

Table 4

Correlations of CIRS Subscales

	Family/Friends	Personal	Neighborhood	Media/Policy	Organizations
Physician/ Health Care Team	.36*	.27*	.27*	.20*	.28*
Family/Friends		.36*	.51*	.29*	.35*
Personal			.54*	.38*	.40*
Neighborhood				.49*	.54*
Media/Policy					.46*

* Correlation is significant at the 0.01 level (2-tailed).

Table 5

Correlations of Adherence Behaviors and HbA1c

	Specific Diet	Glucose Test	Physical Activity	Medication Taking	HbA1c
General Diet	.17*	.15	.23*	.22*	-.03
Specific Diet		.00	.05	.07	.05
Glucose Test			-.03	-.01	.13
Physical Activity				.21*	.06
Medication Taking					-.11

* Correlation is significant at the 0.05 level (2-tailed)

Intercorrelations of the predictor and criterion variables with demographic indices were also computed prior to regression calculations, as displayed in Tables 6 and 7. Modest correlations were found between age and the CIRS personal subscale, general diet adherence, and medication taking. A small negative correlation was found between age and HbA1c. Lastly, a modest correlation was found between reported years of education and the CIRS neighborhood/community subscale.

Table 6

Correlations of CIRS Subscales and Demographic Indices

	Age	BMI	Years of Education	Gender
Physician/Health Care Team	.06	-.06	-.02	-.03
Family/Friends	.00	.07	-.09	.03
Personal	.26*	-.08	.02	-.14
Neighborhood	.09	-.06	-.21*	-.06
Media/Policy Organizations	.08	-.09	-.02	-.03
	-.02	-.05	-.06	-.11

* Correlation is significant at the 0.01 level (2-tailed).

Table 7

Correlations of Adherence Behaviors, HbA1c, and Demographic Indices

	Age	BMI	Years of Education	Gender
General Diet	.29*	-.05	.08	-.08
Specific Diet	.08	-.07	.13	.01
Glucose Test	.09	-.09	-.10	-.09
Physical Activity	.07	-.00	.06	-.16
Medication	.31*	-.10	-.15	.11
HbA1c	-.19*	.07	-.12	-.15

* Correlation is significant at the 0.01 level (2-tailed).

Primary Hypotheses

Simultaneous multiple regression analyses were used to identify predictors of self-reported adherence to five diabetes self-care treatment behaviors (Hypothesis 1) and glycemic control (Hypothesis 2). Six of the seven environmental social support sources of the Chronic Illness Resources Survey (i.e., personal, family and friends, physician/health care team, neighborhood/community, organizations, media and policy) were used as criterion variables. Results of the regression for the prediction of adherence to self-care behaviors are summarized in Table 8. R for regression was significantly different from zero for general diet [$F(6,149) = 6.81, p < .01$], specific diet [$F(6,149) = 3.77, p < .01$], blood glucose testing [$F(6,149) = 5.70, p < .01$], and medication taking [$F(6,149) = 2.95, p < .01$], but not physical activity. Results of regression for the prediction of glycemic control showed no significant values, $F(6,149) = 1.31, p = .26$.

Table 8

Hypothesis 1: Simultaneous Regression Analyses

	R^2	β	p
General Diet	.21**		.00
Physician		.23**	.00
Family/Friends		-.09	.28
Personal		.35**	.00
Neighborhood		-.08	.44
Media/Policy		.01	.90
Organizations		.12	.17
Specific Diet	.13**		.00
Physician		.26**	.00
Family/Friends		.01	.89
Personal		.22*	.02
Neighborhood		-.10	.38
Media/Policy		.08	.37
Organizations		-.06	.55
Blood Glucose Testing	.19**		.00
Physician		.00	.95
Family/Friends		-.07	.42
Personal		-.03	.70
Neighborhood		.34**	.00
Media/Policy		.10	.27
Organizations		.12	.20
Physical Activity	.07		.10
Physician		.18	.04
Family/Friends		-.02	.83
Personal		.07	.49
Neighborhood		.08	.49
Media/Policy		.09	.33
Organizations		-.07	.50
Medication Taking	.11**		.01
Physician		.23**	.01
Family/Friends		-.00	.98
Personal		.22*	.02
Neighborhood		.01	.93
Media/Policy		-.04	.68
Organizations		-.06	.54

* $p \leq .05$ * $p \leq .001$

Inspection of R^2 indicates that the total model of the CIRS predicted approximately 18% of the variability within adherence to general diet ($R^2 = .21$, adjusted $R^2 = .18$). Further inspection of individual betas showed that this relationship was attributable to the physician/health care team ($\beta = .23$, $p < .01$) and personal ($\beta = .35$, $p < .01$) subscales, as no other subscales accounted for a significant portion of the variance. $R^2 = .13$ for adherence to specific diet, with the adjusted $R^2 = .10$, indicating approximately 10% of the variability for this behavior attributable to the CIRS model. Individual betas showed that this relationship was also attributable to the physician/health care team ($\beta = .26$, $p < .01$) and personal ($\beta = .22$, $p < .05$) subscales. The CIRS model predicted approximately 15% of the variance in adherence to blood glucose testing, ($R^2 = .19$, adjusted $R^2 = .15$), with the variability attributable to only the neighborhood/community subscale ($\beta = .34$, $p < .01$). Lastly, total model of the CIRS predicted approximately 7% of the variability within adherence to medication taking ($R^2 = .11$, adjusted $R^2 = .07$). Individual betas showed that this relationship was again attributable to the physician/health care team ($\beta = .23$, $p < .01$) and personal ($\beta = .22$, $p < .05$) subscales.

Secondary Hypotheses

The analyses proposed to test hypothesis 3, that the ecological model of social support would add additional variance beyond that explained by a traditional model of social support (i.e., ISEL-12), were hierarchical multiple regression analyses. Intercorrelations of the ISEL-12 total score with the five adherence behaviors and glycemic control were conducted prior to regression calculations. None of these correlations was significant, suggesting that the ISEL-12 would not be predictive of any variability in the outcome variables if entered into the first step of the hierarchical regressions. Hierarchical regressions, with ISEL-12 in the first step and the six CIRS subscales in the second step, were consistent with the correlation results. In all regressions, the ISEL-12 scores were not significant, whereas the CIRS subscales did predict similar amounts of variance (accounting for the loss of an additional degree of freedom) as reported for hypotheses 1 and 2.

To test hypothesis 4, that the Chronic Illness Resources Survey will demonstrate comparable reliability and internal validity in the present sample to its previous use in a primarily Caucasian sample, Cronbach's α was computed for the total scale. Previous reports by the authors indicated $\alpha = .82$ for the overall scale (Glasgow et al., 2000; Glasgow et al., 2005). Results of the present study indicated $\alpha = .73$ for the overall scale, without the work subscale included. The validity of the CIRS was explored through its factor structure. Exploratory factor analysis with oblique rotation generated a six-factor structure corresponding to six subscales of personal, family and friends, physician/health care team, neighborhood/community, organizations, media and policy. Almost all items loaded on the appropriate subscales, except for one item that loaded in another scale. These analyses suggest that the CIRS demonstrated comparable reliability and internal validity in the low income, African American sample.

DISCUSSION

The results of the present study support the use of the ecological model of social support as a predictor of adherence to self-management behaviors, but not glycemic control, in a sample of African American patients with type 2 diabetes mellitus. Specifically, patients who indicated higher levels of support from their physician and health care team and from personal sources (e.g., self-reward, goal-setting, prayer and meditation use) also reported greater levels of adherence to their general diet, specific diet, and medication-taking. Patients who reported higher levels of support from their neighborhood and community also reported better adherence to the self-monitoring of blood glucose. These results are consistent with Glasgow's assertions that social support influences originate from both institutional and interpersonal networks (Glasgow et al., 2000). The present study did not find an association between social support and adherence to regular physical activity or between social support and a target indicator of glycemic status (i.e., HbA1c tests).

The current study attempted to assess the impact of environmental and community factors, beyond more traditional definitions of support from interpersonal networks, on diabetes self-management. While passive sources of support such as media, public policy, and organizations did not contribute to adherence, sources from both formal (institutional) and informal (interpersonal) networks were influential. The institutional network that attributed significant support in the current study was the physician and health care team. Indeed, diabetes self-care is a multi-component regimen, and the American Diabetes Association (ADA, 2000) asserts guidelines for the use of a multi-disciplinary team to educate patients about the various components of their diabetes treatment plan, including the physician, registered nurse/Certified Diabetes Educator, registered dietician, behaviorist, and others. Furthermore, the treatment of diabetes as a chronic illness often requires regular medical visits and education classes for both the disease features and its complications, so the recommendations and advice of the medical team would be expected to be an integral part of a patient's self-management.

Patients also indicate that personal sources of support are positively related to their adherence. The questions on this subscale of the CIRS specifically measure patients' participation in rewarding their own positive behavior, goal-setting for diabetes management, the use of prayer and meditation, participation in positive activities, and time management. One explanation of this finding could be that this subscale is assessing an underlying factor of self-efficacy for diabetes care. Thus, patients participating in supportive behaviors consistent with positive feelings of capability for self-care are also likely to be more adherent to their treatment. Similarly, self-reported spirituality, religiosity, and participation in prayer has been previously shown to be positively related to disease adjustment and coping in a sample of African-American women with type 2 diabetes (Samuel-Hodge, et al., 2000).

Previous research (Chin et al., 2004) has shown that in community health centers with similar populations to that used the current study, assessing for and including patients' disease management goals in their medical records was a positive indicator of diabetes patient outcomes. Items in the personal subscale of the CIRS assess not only the act of setting goals, but the review of disease management goals and self-reward for accomplishments. These supportive behaviors are important for the encouragement of longer-term care, rather than short-term adherence. This finding may suggest that participation in a supportive behavior like goal-setting, which encourages regular evaluation of treatment progress, is an important factor in the diabetes self-care regimen. Indeed, experts in the psychosocial factors of successful diabetes treatment currently call for public policy reform to include measures of patients' disease management goals as part of standard diabetes care (Glasgow, et al. 2002, 2007).

Interestingly, social support was found to be predictive of several adherence behaviors but not glycemic control as measured by HbA1c. The diabetes self-management behaviors of focus in this study were selected because these were previously demonstrated to be most directly related to glycemic control (UKPDS, 1995, 1998a, 1998b). However, social support had no impact on patients' measures of glycosolated hemoglobin. Several reasons are suggested for this finding. First, the results

may be due to the nature of self-report utilized for measurement of both adherence behaviors and social support, despite the lack of demonstrated social desirability impact on these measures.

As an outcome variable, HbA1c variance is typically limited, due to the nature of its measurement. HbA1c measures reflect a time-weighted mean over the previous 120 days, and most accurately reflect the previous 3-4 months of metabolic control (Saudek et al., 2006). A reasonable target value for HbA1c is less than 7%, and the ADA recommends that therapy be reevaluated when HbA1c exceeds 8%. Thus, the expected variability of patients under treatment for diabetes mellitus should not be great. Previous research has even suggested that HbA1c measures, although a gold standard for the stable and longer-term measurement of glycemic status, may be difficult for use in research because of its limited variability (Saudek et al., 2006). However, at the outset of the present study, anecdotal evidence regarding the variability of HbA1c measures in the study sample indicated that this would not be a limiting factor. Indeed, the range of HbA1c measures used in the current study was 4.48% to 14.90%. The mean was 8.5% (SD = 2.48), indicating that the sample participants' average glycemic control was near the ADA recommended cut-offs. Despite preliminary attempts to transform variables to have distributions useful for analyses, the results using HbA1c as an outcome were not successful, indicating that other factors are likely contributing to the differing results.

A final finding of the current study is that the Chronic Illness Resources Survey demonstrates comparable reliability and internal validity in this primarily low income, African American sample to its previous use in a primarily Caucasian sample. Reliability for the six presently included subscales was measured to be similar to the previously reported measure for the total scale. This value would likely be even more similar if the final subscale, sources of support in the work environment, was included. Item loadings even further indicate the comparability of the scale, as out of fifty-seven items, only one loaded out of scale, yet not significantly enough to warrant further analyses. Arguably, these results strengthen the interpretation of earlier findings based on the good psychometric properties of the scale used for measurement of the main construct.

The generalizability of these findings is affected by the limitations of the study design, particularly the use of self report measures and the small homogeneous sample. Adherence to diabetes self-management behaviors was measured with a self-report questionnaire, the SDSCA. While the SDSCA is the most widely used instrument for measuring diabetes self-management in adults, the use of self-report exclusively for these behaviors requires that the current findings be considered with caution. The measurement of social support, using the CIRS, was also assessed via self-report.

The sample was homogeneous as it consisted of only African American patients. The sample was also predominantly female and largely low income patients at a charity hospital in Southern Louisiana. Recruitment was limited to only two outpatient clinics of the same hospital, and results may have differed if participants were recruited from other clinics or hospitals in the region. Furthermore, a majority of the study sample was overweight and obese, with a large proportion also having comorbid chronic illnesses. This may limit generalizability of findings to only those patients whose illness status is more severe or are in need of seeking hospital services more readily. This is also a sample of people shown to be generally physically inactive and not working, suggesting that our sample may simply have limited social contacts. Thus, participants may not have been able to accurately evaluate their levels of social support in areas outside of the home and medical settings.

Despite these limitations, the results obtained in the current study indicate that environmental sources of social support are important factors in patients' adherence to diabetes self-management behaviors. The findings of the current study suggest the need for support from a multidisciplinary health care team and the setting and review of disease management goals as standards of care for effective diabetes treatment in a predominantly low income African American medical population.

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APPENDIX A
DEMOGRAPHIC QUESTIONNAIRE

Demographic Questionnaire

EKL #: _____

Date of Birth: _____

Age: _____

Height: _____

Weight: _____

Marital Status (circle one):

- (1) single (2) married (3) separated (4) divorced

Years of Education: _____

Employment (circle one):

- (1) full-time (2) part-time (3) unemployed (4) retired (5) disabled

Monthly household income (circle one):

- (1) < \$1000 (2) \$1000-2000 (3) >\$2000

Date diagnosed with diabetes: _____

Age at diagnosis: _____

Approximate duration of diabetes mellitus: _____

Diabetes medications: _____

Other illness diagnoses: _____

APPENDIX B
CHRONIC ILLNESS RESOURCES SURVEY

Chronic Illness Resources Survey (CIRS)

Managing a chronic illness (such as diabetes) can be time-consuming and challenging. It can involve taking medicine daily, exercising, following a specific diet, regular doctor visits, and coping with the impact of the illness upon you and those with whom you interact. The following questions ask about a variety of different resources that people may use to manage their illness. For each item, select the number that best indicates your experience over the past 3 months.

Doctor and Health Care Team

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
1. Has your doctor, nurse, or dietitian clearly explained what you needed to do to manage your illness?	1	2	3	4	5
2. Has your doctor, nurse, or dietitian provided support between visits such as phone calls, reminder letters, or newsletters?	1	2	3	4	5
3. Has your doctor, nurse, or dietitian involved you as an equal partner in making decisions about illness management goals and strategies?	1	2	3	4	5
4. Has your doctor, nurse, or dietitian listened carefully to what you had to say about your illness?	1	2	3	4	5
5. Has your doctor, nurse, or dietitian answered your questions and addressed your concerns during office visits?	1	2	3	4	5
6. Has your doctor, nurse, or dietitian thoroughly explained the results of tests you had done (e.g., HbA1c, cholesterol, blood pressure, etc.)?	1	2	3	4	5
7. How important are your <i>doctor, nurse, and dietitian</i> resources to you in managing your illness?	1	2	3	4	5

Family and Friends

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
8. Have family or friends exercised with you?	1	2	3	4	5
9. Have family or friends listened carefully to what you had to say about your illness?	1	2	3	4	5

10. Have your family or friends encouraged you to do the things you needed to do for your illness?	1	2	3	4	5
11. Have family or friends selected or requested healthy food choices when you ate with them?	1	2	3	4	5
12. Have you shared healthy low-fat recipes with friends or family members?	1	2	3	4	5
13. Have family or friends helped you to remember to take your medicine?	1	2	3	4	5
14. Family or friends bought food or prepared food for you that were especially healthy or recommended?	1	2	3	4	5
15. How important is <i>family and friend</i> support in managing your illness?	1	2	3	4	5

Personal (helpful thing you did for yourself)

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
16. Have you taken time for yourself to do things you enjoyed?	1	2	3	4	5
17. Have you congratulated or rewarded yourself for the things you did to manage your illness?	1	2	3	4	5
18. Have you focused on the things you did well to manage your illness instead of those you did not?	1	2	3	4	5
19. Have you told others how they can help in managing your illness?	1	2	3	4	5
20. Have you thought about or reviewed how you were doing in accomplishing your disease management goals?	1	2	3	4	5
21. Have you used prayer or meditation to provide guidance in managing your illness?	1	2	3	4	5
22. Have you arranged your schedule so that you could more easily do the things you needed to do for your illness?	1	2	3	4	5
23. How important are <i>personal</i> things, like those above, that you do for yourself, in managing your illness?	1	2	3	4	5

Neighborhood

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
24. Have you walked or exercised outdoors in your neighborhood?	1	2	3	4	5
25. Have you talked to neighbors or others who have experience living with a chronic illness?	1	2	3	4	5
26. Have you and your neighbors gotten together for activities such as barbecues, block, or holiday parties?	1	2	3	4	5
27. Have grocery stores where you shopped had a good supply of fresh fruits and vegetables?	1	2	3	4	5
28. Have you walked or done other exercise activities with neighbors?	1	2	3	4	5
29. Have you shared recipes or discussed healthy eating ideas with neighbors?	1	2	3	4	5
30. How important are <i>neighborhood</i> resources in managing your illness?	1	2	3	4	5

Community

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
31. Have you gone to a pharmacy that had good information about your illness?	1	2	3	4	5
32. Have you noticed healthy low-fat foods at stores where you frequently shop?	1	2	3	4	5
33. Has your community made an effort to organize groups and organizations of people with chronic illness in civic activities?	1	2	3	4	5
34. Have you found that people in the community accepted you and others who have chronic illnesses?	1	2	3	4	5
35. Have you eaten at a restaurant that offered a variety of tasty, low-fat food choices?	1	2	3	4	5

36. Have you used public transportation to get somewhere you were going?	1	2	3	4	5
37. Have you gone to parks for picnics, walks, or other outings?	1	2	3	4	5
38. How important is <i>community environment</i> to you in managing your illness?	1	2	3	4	5

Media and Policy

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
39. Have you had health insurance that covered alternative therapies such as chiropractors and naturopaths?	1	2	3	4	5
40. Have you read articles in newspapers or magazines about people who were successfully managing a chronic illness?	1	2	3	4	5
41. Have you had health insurance that covered most of the costs of your medical needs including medicine?	1	2	3	4	5
42. Have you seen billboards or other advertisements that encouraged not smoking, low-fat eating, or regular exercise?	1	2	3	4	5
43. Have you listened to television or radio programs that focused on health or lifestyle issues?	1	2	3	4	5
44. Have you heard things on the news that encouraged you to take good care of your health?	1	2	3	4	5
45. Have you used the Internet or World Wide Web to share information about your illness?	1	2	3	4	5
46. Have you seen TV programs or heard radio programs that realistically portrayed what it's like living with a chronic illness?	1	2	3	4	5
47. Have you seen TV programs or heard radio programs that provided good information on your illness?	1	2	3	4	5
48. How important are <i>media and policy</i> resources (like those above) to you in managing your illness?	1	2	3	4	5

Community Organizations

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
49. Have you called a national or local health organization for information about your illness (such as an 800 number)?	1	2	3	4	5
50. Have people at your church (or other organization to which you belong) shown understanding and support for your illness management efforts?	1	2	3	4	5
51. Have you participated in walks or other activities for health organizations (such as Heart, Lung, or Diabetes associations)?	1	2	3	4	5
52. Have you attended free or low-cost meetings (for example, Weight Watchers, church groups, hospital programs) that supported you in managing your illness?	1	2	3	4	5
53. Have you volunteered your time for local organizations or causes?	1	2	3	4	5
54. Have you attended wellness programs or fitness facilities?	1	2	3	4	5
55. Have you called or visited a local health organization or hospital to look up information, view a video, or check out written materials?	1	2	3	4	5
56. Have you used community resources to help manage your illness such as senior centers, community centers, or mall walking programs?	1	2	3	4	5
57. How important are <i>community and health organizations</i> (church, etc.) to you in managing your illness?	1	2	3	4	5

Work (If not currently employed, please skip items 58-64)

Over the past 3 months, to what extent:	Not at all	A little	A moderate amount	Quite a bit	A great deal
58. Have you had a flexible work schedule that you could adjust to meet your needs?	1	2	3	4	5
59. Has your work offered wellness programs or fitness facilities?	1	2	3	4	5
60. Has your workplace had rules or policies that made it easier for you to manage your illness (such as no smoking rules or time off work to exercise)?	1	2	3	4	5

61. Have your coworkers covered for you when you needed to do something to manage your illness or when not feeling well?	1	2	3	4	5
62. Have you had control over your job in terms of making decisions and setting priorities?	1	2	3	4	5
63. Has your employer paid time off work for health care or fitness activities?	1	2	3	4	5
64. How important are <i>worksite support and resources</i> to you in managing your illness?	1	2	3	4	5

APPENDIX C

SUMMARY OF DIABETES SELF-CARE ACTIVITIES MEASURE

The Summary of Diabetes Self-Care Activities

Instructions: The questions below ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

Diet

- | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. How many of the last SEVEN DAYS have you followed a healthful eating plan? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Exercise

- | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Blood Sugar Testing

- | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7. On how many of the last SEVEN DAYS did you test your blood sugar? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Medications

- | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|
| 9. On how many of the last SEVEN DAYS did you take your recommended diabetes medications? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. On how many of the last SEVEN DAYS did you take your recommended insulin injections? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills? | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

APPENDIX D

MARLOWE-CROWNE SOCIAL DESIRABILITY SCALE

Marlowe-Crowne Scale

Instructions: For each of the following questions, please circle “Yes”, “No”, or “Not Sure”.

- | | | | |
|---|-----|----|----------|
| 1. Have there been occasions when you took advantage of someone? | Yes | No | Not Sure |
| 2. Have you sometimes taken unfair advantage of another person? | Yes | No | Not Sure |
| 3. Are you always willing to admit when you make a mistake? | Yes | No | Not Sure |
| 4. Are you quick to admit making a mistake? | Yes | No | Not Sure |
| 5. Do you sometimes try to get even rather than forgive and forget? | Yes | No | Not Sure |
| 6. Do you sometimes feel resentful when you don't get your own way? | Yes | No | Not Sure |
| 7. Are you always courteous, even to people who are disagreeable? | Yes | No | Not Sure |
| 8. Are you always a good listener, no matter whom you are talking to? | Yes | No | Not Sure |

APPENDIX E
INTERPERSONAL SUPPORT EVALUATION CHECKLIST

ISEL-12

Instructions: This scale is made up of a list of statements each of which may or may not be true about you. For each statement, circle "definitely true" if you are sure it is true about you and "probably true" if you think it is true but are not absolutely certain. You should circle "definitely false" if you are sure the statement is false and "probably false" if you think it is false but are not absolutely certain.

	Definitely False	Probably False	Probably True	Definitel y True
1. If I wanted to go on a trip for a day, I would have a hard time finding someone to go with me.	1	2	3	4
2. I feel that there is no one I can share my most private worries and fears with.	1	2	3	4
3. If I were sick, I could easily find someone to help me with my daily chores.	1	2	3	4
4. There is someone I can turn to for advice about handling problems with my family.	1	2	3	4
5. If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me.	1	2	3	4
6. When I need suggestions on how to deal with a personal problem, I know someone I can turn to.	1	2	3	4
7. I don't often get invited to do things with others.	1	2	3	4
8. If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment (the plants, pets, garden, etc.).	1	2	3	4
9. If I wanted to have lunch with someone, I could easily find someone to join me.	1	2	3	4
10. If I was stranded 10 miles from home, there is someone I could call who could come and get me.	1	2	3	4
11. If a family crisis arose, it would be difficult to find someone who could give me good advice about how to handle it.	1	2	3	4
12. If I needed some help in moving to a new house or apartment, I would have a hard time finding someone to help me.	1	2	3	4

APPENDIX F
MEDICAL CHART REVIEW FORM

Medical Chart Review Form

EKL #: _____

Diabetes Mellitus Type: I II

Date of Recruitment: _____

Date Valid HbA1c: _____

Date of Birth: _____

Age: _____

Height: _____ Weight: _____

Date Taken: _____

HbA1c Measures	Date Taken

HbA1c Measures	Date Taken

Diabetes medications:

Sulfonylureas

- Amaryl (Glimepiride)
- DiaBeta, Glynase, or Micronase (Glyburide)
- Glucotrol – regular, XL, or ER (Glipizide)

Biguanides

- Glucophage or Glucophage XR (Metformin)

Thiazolidinediones

- Actos (Pioglitazone)
- Avandia (Rosiglitazone)

Alpha-glucosidase inhibitors

- Glyset (Meglitol)
- Precose (Acarbose)

Oral combination therapy

- Avandamet (Rosiglitazone-Metformin)
- Glucovance (Glyburide-Metformin)

Rapid-Acting Insulin

- Humalog (Lispro)
- Novolog (Aspart) – injections or pen

Short-Acting Insulin

- Humulin or Novolin R

Intermediate-Acting Insulin

- Humulin or Novolin N (NPH)
- Novolin or Novolin L

Long-Acting Insulin

- Ultralente (Humulin U)
- Lantus (Glargine)

Premixed Insulin

- Humalog 75/25 mix
- Humulin 70/30 mix
- Novolin 70/30 mix
- Novolog 70/30 mix

Other illness diagnoses/complications:

- chronic renal failure
- congestive heart failure
- coronary artery disease
- hypertension
- hyperlipidemia

- retinopathy
- neuropathy
- amputation
- history of heart attack/stroke
- other: _____

APPENDIX G
INFORMED CONSENT

**LOUISIANA STATE UNIVERSITY HEALTH SCIENCES CENTER IN NEW ORLEANS:
INFORMED CONSENT FORM**

1. STUDY TITLE:

Environmental Influences on Adherence to Self-Management Behaviors and Glycemic Control in African American Patients with Type 2 Diabetes Mellitus

2. PERFORMANCE SITES:

Earl K. Long Medical Center, Baton Rouge, LA

3. NAMES AND TELEPHONE NUMBERS OF INVESTIGATORS:

Principle Investigator:	Phillip J. Brantley, Ph.D.	(225) 763-3046
Co-Investigators:	Jolene Johnson, M.D.	(225) 358-1311
	Brooke L. Barbera, B.A.	(225) 358-1105

4. PURPOSE OF THE STUDY:

The purpose of the study is to better understand the type of social support African American patients with type 2 diabetes mellitus receive from their family, friends, health care team, community, neighborhood, work place, and others. This study is interested in understanding how this self-reported social support is related to participants' adherence to self-management treatment behaviors (i.e., diet, physical activity, medication-taking, and blood glucose monitoring) and glycemic control.

5. DESCRIPTION OF THE STUDY:

Dr. Brantley will be directing this study. Dr. Johnson will also be providing medical supervision. The researchers of this study will recruit approximately 250 patients with type 2 diabetes mellitus over the age of 18 at the medicine clinics of Earl K. Long Medical Center. Study personnel will identify potential participants prior to their scheduled medical appointments and/or class meetings. If you meet inclusion criteria listed above and agree to participate, you can expect the following to occur during the course of this study:

- All questionnaires will be read to you. You will complete the questionnaires in an exam room or confidential area of the clinic, with a research assistant.
- The first measure is a brief questionnaire to ensure that you can understand the questions you will be asked and the additional questionnaires that will be read to you.
- The remaining measures will be a demographic questionnaire and measures of your social resources related to your diabetes care.
- You will be given enough time to ask questions about social support and/or your diabetes self-care. If you request more information regarding your specific diabetic treatment regimen, you will be referred to your physician or a Certified Diabetes Educator at Earl K. Long.
- Study personnel will conduct a brief review of your medical chart to obtain diabetic and chronic illness status, HbA1c measurements, names of diabetic medications, height and weight.
- Your participation in this study takes place at the time of your visit only, and there will be no follow-up after you complete the questionnaires.
- You will be paid five dollars for your participation in this study.

6. BENEFITS TO SUBJECT:

We cannot promise any benefits from your being in the study. However, possible benefits include achieving a better understanding of the factors related to your diabetes care.

7. RISKS TO SUBJECT:

There is an emotional risk for participants in this study. It is possible for some participants to become distressed by the self-realization of unsafe health behaviors. If you should become distressed while filling out the questionnaires, please tell the research assistant or contact the investigators of the study as listed on this form. You will be given a referral to the Adult Psychology department at Earl K. Long Medical Center.

There is also a mild risk to confidentiality. Every attempt will be made to protect your confidentiality (e.g., you will complete the study in an examination room, only individuals involved with the study will have access to collected data, all data spreadsheets will be kept on a password protected file, all patient information will be kept in a locked room in the Adult Clinical Psychology/Raymond Potter Building, and all references to participants' names will be destroyed after publishing the study).

8. ALTERNATIVES TO PARTICIPATION IN THE STUDY:

You have the choice at any time not to participate in this research study. If you choose not to participate, you may stop at any time without consequence, and your medical care will not be affected or disrupted.

9. SUBJECT REMOVAL:

There are no circumstances for which a participant would be removed.

10. SUBJECT'S RIGHT TO REFUSE TO PARTICIPATE OR WITHDRAW:

Participation is voluntary. Refusal to participate will involve no penalty or loss of benefits to which the participant is otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. Should significant new findings develop during the course of the research, which may relate to your willingness to continue participation, that information will be provided to you.

11. SUBJECT'S RIGHT TO PRIVACY/HEALTH INSURANCE PORTABILITY AND ACCOUNTABILITY ACT (HIPPA)

Records that you give us permission to keep and that identify you, will be kept as confidential as required by law. Federal Privacy Regulations provide safeguards for privacy, security, and authorized access. The results of this study may be published. The privacy of participants will be protected and participants will not be identified in any way in published results. The research team will make every effort to keep your information confidential. For example, your identity will be kept confidential by not writing your name on any of the materials, destroying all references to participants' names after publishing the study, and not allowing access to data by any persons other than those running the study.

12. RELEASE OF INFORMATION

The medical records related to the study are available to the LSUHSC IRB. While every effort will be made to maintain privacy, absolute confidentiality cannot be guaranteed. Records will be kept private to the extent allowed by law.

13. FINANCIAL INFORMATION:

- A) There will be \$5 payment for participating in this study.
- B) There will be no costs for participating in this study.

14. SIGNATURES:

This study has been discussed with me and all of my questions have been answered. Additional questions regarding the study should be directed to investigators listed on the first page of this consent form. If I have questions about participants' rights, or other concerns, I can contact the Chancellor of LSU Health Sciences Center at (504) 568-4801. I agree with the terms above, acknowledge I have been given a copy of the consent form, and agree to participate in this study. I understand that I have not waived any of my legal rights by signing this form.

Signature of the Subject **Date**

Signature of the Witness **Date**

The study subject has indicated to me that the subject is unable to read. I certify that I have read this consent form to the subject and explained that by completing the signature line above the subject has agreed to participate.

Signature of the Reader **Date**

Signature of the Person Administering Consent **Date**

Signature of the Principle Investigator **Date**

VITA

Brooke Barbera received a Bachelor of Arts degree at Newcomb College of Tulane University in New Orleans, Louisiana, in May 2003. Her undergraduate experience was a liberal arts education with an emphasis in psychology and classical studies. Brooke is currently a third year student in the clinical psychology doctorate program at Louisiana State University & Agricultural and Mechanical College. Her major professor at LSU is Dr. Phillip Brantley.