DEPRESSION IN DIABETIC AND NON-DIABETIC INDIVIDUALS: PHYSICAL ACTIVITY, NUTRITION, AND DIET

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About 8.3% of individuals diagnosed with diabetes mellitus (DM) are diagnosed with comorbid depression, a higher rate than the general adult population. This project examined the differences of depression symptoms experienced between diabetic and matched non-diabetic individuals and the relationship of daily activity and nutrition behaviors with depression between these groups. The 2005-2006 National Health and Nutrition Examination Survey (NHANES) was utilized to assess: depression symptoms, diabetic glycemic control as measured by glycoginated hemoglobin (HbA1c), amount of physical activity, percentage of macronutrients, daily frequencies of foods consumed, and the use of nutritional food labels to make food choices. A sample of diabetic (n = 451) and non-diabetic individuals (n = 451) were matched to on age, gender, ethnicity, and education. The diabetic individuals experienced greater depression on both continuous and ordinal diagnostic variables. Counter to expectation, there was no relationship observed between depression and HbA1c in diabetic individuals, r = .04, p > .05.
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CHAPTER 1

DEPRESSION IN DIABETIC AND NON-DIABETIC INDIVIDUALS: PHYSICAL ACTIVITY, NUTRITION, AND DIET

This introduction section is organized in the following manner; first, an overview of diabetes mellitus (DM) is presented with attention to the U.S. population and note of ethnic and racial differences in the prevalence of the disease. Next, an overview of DM management and associated factors are briefly covered to put DM in a disease treatment context. This is followed by discussions more specific to the constructs examined in this project as they relate to DM; nutrition and diet, physical activity, and medication therapy. An overview of depression and chronic illness precedes a more specific review of depression and DM. The next subsections discuss connections between depression, nutrition and diet behaviors, physical activity, medication therapy, and DM. Finally, based on the literature, predictions and research questions are reviewed that concern nutrition, diet behaviors, and physical activity and their relationship with DM and depression.

Overview of Diabetes Mellitus in the United States Population

Diabetes mellitus (DM) is a disease characterized by the body’s inability to regulate blood glucose levels due to either the inability to produce insulin or presence of insulin resistance (Center for Disease Control and Prevention [CDC], 2008). The body’s inability to produce essentially any insulin is termed Type 1 DM, formerly known as juvenile diabetes or insulin dependent diabetes mellitus (IDDM) (CDC, 2008). The loss of ability to produce insulin in Type 1 DM may occur as an autoimmune reaction in which the body’s immune system destroys the beta cells (β-cells) of the islets of
Langerhans in the pancreas, the only cells in the body with the capability to produce insulin. Insulin injections are requisite for the survival of individuals diagnosed with Type 1 DM. There is evidence that, though genetics may play a role in the development of Type 1 DM, environmental stressors and viral triggers may also lead to the destruction of the pancreatic β-cells (Mazze, Strock, Simonson, & Bergenstal, 2004).

The body’s progressive resistance to insulin uptake and/or the pancreas’ decrease in insulin output is termed Type 2 DM, formerly known as adult-onset diabetes or noninsulin-dependent diabetes mellitus (NIDDM) (CDC, 2008). Insulin resistance in Type 2 DM is multifaceted, characterized by the inability of muscle cells to metabolize insulin. This could be due to a decreased amount of insulin receptors, increased glycogen production in the liver, and/or the degeneration of β-cells (Mazze et al., 2004). A staged approach is usually used to manage Type 2 DM, which begins with management of body weight, diet, and physical activity, and an assessment of the progression of the disease, which may or may not include medical interventions (Mazze et al., 2004). If Type 2 DM is not well managed or if disease progression is severe at time of diagnosis, a combination of oral medications and insulin injections or solely insulin injections may ultimately be required.

Diagnostic tests of DM include the fasting blood glucose test, the oral glucose tolerance test (OGTT), and a measure of glycogenated hemoglobin. The fasting blood glucose test measures blood glucose after at least an 8-hour period without food or drink, with the exception of water. If fasting blood glucose levels are greater than or equal to 126 milligrams per deciliter (mg/dL) a diagnosis of DM is given. A more sensitive measure of blood glucose levels is the OGTT (CDC, 2008). The OGTT is
similar to the fasting blood glucose test in that there is an 8-hour fasting period; however, this measure is different in that blood glucose levels are measured at increments totaling 2 hours after consuming a controlled glucose beverage with a known glycemic index profile. A diagnosis of DM is given when, after two administrations of the OGTT, the timed blood glucose levels are greater than or equal to 200 mg/dL at each measure (CDC, 2008). In applied medical settings, a more common method of diagnosis is a measure of glycogenated hemoglobin, also called hemoglobin A1c (HbA1c). Glucose attaches itself to the hemoglobin of red blood cells. The amount of glucose attached to red blood cells increases with the amount of glucose present in the blood stream. HbA1c is reported as a percentage and is interpreted as a measurement of average blood glucose levels over the previous 60 to 90 days. Expected percentages for individuals without DM are equal to or less than 6.5% mg/dL and a diagnosis of DM is given when HbA1c levels are greater than 6.0% or 6.5%, depending on the criteria used. Because HbA1c is an average measure of blood glucose levels over a 60 to 90 day period, it is also used as a measure of glycemic control in diabetic individuals. Good glycemic control for individuals with DM is understood to mean an HbA1c level of 7% or less (CDC, 2008; Mazze et al., 2004).

Several complications and comorbid diseases are associated with both Type 1 and Type 2 DM including cardiovascular disease, hypertension, renal disease, and nerve degeneration. Cardiovascular disease and hypertension are among the highest prevalence of comorbid diagnoses in individuals diagnosed with DM, with about 2.3% of the United States population diagnosed with both DM and cardiovascular disease (Alexander, Landsman, & Teutsh, 2000; Mazze et al., 2004). Utilizing data from the
Framingham Heart study, Kennal and McGee’s (1979) research suggested the development of DM increased the risk of the development of cardiovascular disease. These estimates of cardiovascular disease were higher, about 14.8% of the population, when individuals diagnosed with metabolic syndrome (a confluence of individual disease states including Type 2 DM, abdominal obesity, elevated blood pressure and an elevated lipids blood profile), were taken into account (Alexander, Landsman, Teutsch, & Haffner, 2003; Alberti, Zimmet, & Shaw, 2005). These numbers are a serious public health concern when considering the mortality rate of individuals diagnosed with DM is 2 to 4 times higher than for individuals not diagnosed with DM (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2007).

While DM-related cardiovascular disease attributes to greater risk of mortality in individuals diagnosed with DM, 44% of new cases of renal disease in 2005 were due to DM. Renal disease, or diabetic nephropathy, affects 1 million individuals diagnosed with DM. The greatest prevalence of diabetic nephropathy is experienced by individuals diagnosed with Type 1 DM, with about 40% of these individuals diagnosed with renal disease. About 10% of individuals with Type 2 DM are diagnosed with renal disease (Mazze et al., 2004). Duration of DM diagnosis is a significant risk factor for development of renal disease, which increases significantly after 5 years (Mazze et al., 2004). The risk of nephropathy is elevated when additional risk factors are present, such as consistently high HbA$_{1c}$ levels, increased blood lipids, smoking, and hypertension.

Other DM complications include eye complications and the degeneration of nerve endings, which can lead to injury, sores, infection, and ultimately amputation (Mazze et
According to NIDDK 2007 statistics, 60 to 70% of individuals diagnosed with DM experience some type of nerve damage. DM is also a leading cause of blindness and accounts for between 12,000 to 24,000 new cases of blindness each year (NIDDK, 2007).

Considering the complications the seriousness of a diagnosis of DM cannot be ignored, especially in light of the fact that the number of new cases of Type 2 DM is expected to increase rapidly in the coming years. Narayan, Boyle, Geiss, Saaddine, and Thompson (2006) estimate that the number of diagnosed cases of DM will increase 193% in the 45-year period between 2005 and 2050. This indicates that by 2050 the number of individuals diagnosed with DM will increase from 16.3 million in 2005 to 48.3 million cases. This estimate of the future prevalence presented by Narayan et al. in 2006, has already increased from the numbers presented in earlier research in 2001 which estimated the prevalence would be 29 million in 2050 (Boyle et al., 2001). Thus we can see even the same researchers had to dramatically increase their estimate of the prevalence of DM in 2050 in the 5 year period between 2001 and 2006. The 2007 NIDDK statistics estimated the prevalence of both diagnosed and undiagnosed cases of DM to be about 23.5 million. This includes an estimated 17.9 million diagnosed cases (American Diabetes Association [ADA], 2007), an increase of 1.6 million from the previous 16.3 million cases estimated by Boyle et al. in 2005. Thus, the estimate of future prevalence of DM in the U.S. appears to be a moving target with ever-increasing estimates.

There appears to be no, or perhaps only slight, gender differences in the number of diagnosed cases of DM, with estimates ranging from 11.2-13.7 % for men and 10.2-
11.4% for women (Acton, Burrows, Geiss, & Thompson, 2003; Danaei, Friedman, Oza, Murray & Ezzati, 2009; CDC, 2007). However, there are clear racial/ethnic differences in the number of diagnosed cases of DM. In 1998, Harris et al. found that an estimated prevalence of DM is 7% of European-Americans, 12% of African Americans, and 14% of Hispanic individuals. However, more current research suggests a shift in the prevalence of DM between racial/ethnic groups with estimates of the prevalence of DM in about 6.6% of European-Americans, 11.8% of African-Americans, and 10.4% of Hispanic individuals (CDC, 2008). Whatever the exact racial/ethnic diabetic health disparities, these are important findings when considering that African American and Hispanic populations have higher incidences of renal disease, eye complications, and amputations related to DM (Harris et al., 1998, Lavery, van Houtum, Ashry, Armstrong, & Pugh, 1999; Mazze et al., 2004).

**DM Disease Management and Associated Factors**

Careful self-management of DM can reduce the complications that contribute to morbidity, disability, and mortality (Hill-Briggs, 2003; Warren, Crews, & Schulte, 2001). Treatment of DM requires monitoring of blood glucose levels, diet, exercise, and proper and consistent administration of medications. A brief overview is first provided here of DM management techniques, then following this section, a review of the management subareas of (1) nutrition and diet, (2) physical activity, and (3) medication therapy, as these disease management areas are constructs used in the current study.

Individuals diagnosed with DM are considered to have adequate glycemic control when HbA1c levels are equal to or less than 7% mg/dL. HbA1c levels higher than 7% mg/dL are associated with an increase in DM complications such as eye complications,
renal disease, hypertension, cardiovascular disease, deterioration of nerve endings, and death (Groeneveld, Petri, Hermans & Springer, 1999; Klein, 1995; Standl et al., 1996; Stratton et al., 2000). Harris, Eastman, Cowie, Flegal, and Eberhardt (1999) found that 37.1% of individuals diagnosed with Type 2 DM have HbA1c levels of over 8% mg/dL, a number that is considered poor glycemic control. This high prevalence of poor glycemic control is a major concern because of the increased risk of complications associated with greater HbA1c levels.

Treatment of DM involves a staged process that begins at diagnosis. Data is collected to better understand the necessary treatment goals unique to Type 1 and Type 2 DM (Mazze et al., 2004). For example, treatment goals for individuals diagnosed with Type 1 DM may include monitoring proteins found in urine, because of the association of proteins in the urine and development of renal disease, as well as monitoring and regulation of blood glucose levels. Common goals for individuals diagnosed with Type 2 DM may include control of HbA1c levels, adherence to diet regimens, and an increase of physical activity levels. For individuals diagnosed with either Type 1 or Type 2 DM, it is important to assess for comorbid diseases and diabetic complications. Depending on the progression of the disease at diagnosis, initial treatment for Type 2 DM may consist of medical nutrition therapy (MNT) and an increase of physical activity (Mazze et al., 2004). If adequate glycemic control is not achieved, or in the case of severe progression, adjustments may need to be made to the MNT plan and psychical activity therapy plan. Implementation of medication therapy may also be necessary depending on the progression of the disease (Mazze et al., 2004). Because blood glucose can have unpredictable reactions to food intake, it is
also important to consistently measure blood glucose levels, which can also serve as instant feedback about the diet/exercise regimen (Mazze et al., 2004). However, most individuals with Type 2 DM infrequently measure blood glucose. About 65% of individuals who manage their DM with oral agents, and 80% of individuals who manage their DM with diet alone either never or infrequently test their blood glucose levels (Harris, 2001).

The Role of Nutrition and Diet in DM Management

Nutrition and diet behaviors are the first areas of treatment discussed in this document. Nutrition is discussed and then an overview of diet behaviors in relation to food choices, will be presented, specifically the utilization of nutrition labels in food decisions. Nutrition plays an important role in the management of DM. If adhering to the staged process for glycemic control, it is first recommended to attempt to achieve weight loss through diet and exercise (Mazze et al., 2004). Medical nutrition therapy (MNT) focuses on food selection, preparation, and activity adjustments to account for caloric intake. These practices are implemented to assist in the achievement of the goals for glycemic control (Powers, 1996). The normal food choices of the individual are assessed and then decisions are made about how much the individual is willing to change his/her diet. For individuals diagnosed with Type 2 DM, there is considerable focus on lifestyle change especially diet choices, that can reduce the amount of intra-abdominal. This is important because loss of intra-abdominal fat has been associated with reduction of insulin resistance (Nieves et al., 2003). Lifestyle changes are usually the main focus for individuals diagnosed with Type 2 DM and MNT may assist in effectively and realistically controlling the diet regimen and decreasing inter-abdominal
Research suggests implementation of MNT improves glycemic control with some estimates of a 1-2% decrease in HbA1c levels (Franz et al., 2002; Franz, et al., 1995; Warren, Crews, & Schulte., 2001; Pastors, Warshaw, Daly, Franz, & Kulkarni, 2002). This decrease is important because the achievement of HbA1c goals has been associated with prevention of complications associated with DM. MNT has also been shown to benefit the unique dietary needs of individuals diagnosed with Type 1 DM, which includes a consistent diet and well planned carbohydrate intake (Llorente & Malphurs, 2007).

As for specific dietary recommendation, if obesity is not a concern, the diet should consist of a range of about 45-60% calories from carbohydrates and fat intake should be between 25-35% of the daily caloric intake. Carbohydrates consumed should come from foods that are more slowly digested thus decreasing spikes in blood glucose levels (McKeown et al., 2004). These foods include whole grains, vegetables, and fruits. Total fats consumed should come from sources that are high in monounsaturated fats, i.e. olive oils, fish, nuts, and avocados. Due to complications associated with proteins found in the urine, total amount of protein consumed in the diet should be limited and should not account for more than 10-20% of the daily caloric intake (Waugh & Robertson, 2000; Robertson, Waugh, & Robertson, 2007). Individuals diagnosed with DM are encouraged to consider food choices that are within the ranges recommended, carefully.

Research suggests fiber and carbohydrate content of the diet has the greatest association with improvement of blood glucose and HbA1c levels in terms of nutritional intervention (Anderson, Randles, Kendall, & Jenkins, 2004). However, the source of the
carbohydrates consumed is important. Simpson, Mann, Eaton, Carter and Hockaday (1979) found that carbohydrates that are refined and do not come from vegetables, whole grains, etc. produce higher spikes of blood glucose after meals. The lowest blood glucose spikes and better insulin responses are related to the carbohydrates from fruits, i.e. fructose, than carbohydrates from other sources (Wolever, Jenkins, Jenkins, & Josee, 1991). Thus, a higher intake of carbohydrates from fruits, vegetables, and whole grains is encouraged to maintain better glycemic control.

There is also a relationship between the types of carbohydrates consumed and blood lipid levels. Foods high in simple carbohydrates and low in soluble and insoluble fibers may not only raise blood glucose levels, but lower higher density lipoproteins (HDL), or “good” cholesterol, as well (Brand-Miller & Holt, 2003). In regards to the types of fats consumed, research indicates that a diet higher in monounsaturated fats improves blood glucose levels and raises HDL levels with no affect or increase in low density lipoproteins (LDL) or “bad” cholesterol levels (Sheard et al., 2004). However, there is evidence that to achieve benefits of a high monounsaturated fat diet consumption must be within the recommended range and benefits are lost if the amount of monounsaturated fat dips below 10 to 20% of total caloric intake (Mann et al., 2004).

In regards to diet behaviors, there has been conflicting research on the utilization of food nutrition labels and the consumption of types of foods, as well as the relationship between the utilization of food nutrition labels and glycemic control in individuals diagnosed with DM. Some research suggests that food nutrition labels have no association with food choices (Borgmeier & Westenhoefer, 2009; Kral, Roe, & Rolls, 2002). However, Lin, Lee, and Yen (2004) found that food nutrition labels were
associated with healthier food choices. In addition, utilization of food nutrition labels to make food choices was associated with higher fruit and vegetable consumption and lower fat intake in non-diabetic individuals (Satia, Galanko, & Neuhouser, 2005; Neuhouser, Kristal, & Patterson, 1999). Fitzgerald, Damio, Segura-Perez, and Perez-Escamilla (2008) found a similar relationship between healthy food intake in both diabetic and non-diabetic individuals. Kessler and Wunderlich (1999) found a high percentage (91%) of their sample of diabetic individuals utilized food nutrition labels to make food choices as compared to 71% of the general sample. Kessler and Wunderlich hypothesized this large percentage of diabetic individuals that utilized the nutrition labels was due to the greater emphasis on diet in this population. Though there is conflicting research on the food choices made by individuals that utilize food nutrition labels, there is evidence the use of nutrition labels improves dietary intake.

**The Role of Physical Activity in DM Management**

The next area of discussion in the treatment of DM is physical activity. In the United States, a sedentary lifestyle has become increasingly common. Mokdad, Marks, Stroup, and Gerberding (2004) estimate that physical inactivity, paired with poor diet, are the second leading cause of death in the U.S. According to Mokdad et al. (2004) an estimated 400,000 deaths in the United States can be attributed to these two factors, which may account for 16.6% of the mortality rate in 2000. Deaths due to poor diet and inactivity were second to tobacco use, however attributed to more deaths than alcohol use (Mokdad et al., 2004). Specific to diabetic individuals, an increase in physical activity has been related to a decrease in mortality due to DM complications (Tanasescu, Leitzmann, Rimm, & Hu, 2003).
Research indicates physical activity aids glycemic control in diabetic individuals in two ways. First, physical activity reduces blood glucose levels through utilization of glucose in the muscle tissues (Christ et al., 2002). Second, physical activity aids to increase glucose sensitization by reducing the amount of fat in the abdominal region (Sallis & Owen, 1999). Previous research indicates that increased insulin uptake can range from about 24-29 hours to 3-7 days after engaging in physical activity (Nassis et al., 2005; Rodnick, Holloszy, & Mondon, 1990; Short et al., 2003). Recommendations for diabetic individuals are at least 150 minutes of physical activity per week, which computes to 21 minutes per day (Finkelstein, 2008).

However, there are conflicting findings on whether physical activity actually improves glycemic control and differences have been observed in benefits experienced between individuals diagnosed with Type 1 DM and Type 2 DM. Previous research indicates that physical activity was not associated with better glycemic control in individuals diagnosed with Type 1 DM, but was associated with better glycemic control in Type 2 DM (Miller & Dunstan, 2004). This difference may be due to the differences in the epidemiology between Type 1 and Type 2 DM. For example, a large number of individuals with Type 2 DM are resistant to insulin because of intra-abdominal fat and have decreased glucose sensitization, which may be assisted by increased activity level (Nieves et al., 2003). The lack of relationship between physical activity and glucose control in individuals diagnosed with Type 1 DM may be due to these individuals inability to produce insulin. Because insulin resistance is usually not a concern with individuals diagnosed with Type 1 DM, physical activity may not be a main factor in glycemic control. However, the importance of physical activity for individuals diagnosed
with Type 1 DM should not be ignored because of other health benefits associated with a consistent exercise regimen.

When discussing increasing the physical activity of persons diagnosed with DM, it is important to understand the mechanisms of medications and food to protect against development of hypoglycemia. Level of strain and duration of exercise are important factors when a new exercise program is considered. Carbohydrates should be carefully monitored and previous research recommends that carbohydrates should be consumed before, during, and after physical activity help protect against the development of hypoglycemia (Dyson, 2003). Lighter exercises, like walking, may not require change in management. However, as activity level increases, and exercise becomes more strenuous, adjustments to diet and medications may be necessary (Dyson, 2003). When engaging in physical activity, individuals diagnosed with DM should be aware that damage to soft tissues could occur, especially in the feet and joints (Graham & Lasko-McCarthey, 1990).

Medication Therapy in DM Management

The final area of discussion of the treatment of DM is medication therapy. The most prevalent treatment for DM is with oral medications, with the majority (57%) of individuals diagnosed with DM treated with oral medications only. An estimated 14% of individuals diagnosed with DM are treated with insulin only, 13% treated with a combination of insulin and oral agents and about 16% of individuals diagnosed with DM are not treated with medications (CDC, 2008). The highest majority of diabetic individuals treated with oral medications only, could be attributed to the majority of
individuals diagnosed with Type 2 DM, which can be treated with oral medications, insulin, or both.

Several types of oral agents are utilized for treatment of individuals diagnosed with Type 2 DM. For individuals with Type 2 DM, oral agents may be used alone, or in combination with insulin injections for management depending on the progression of the disease (Mazze et al., 2004). Oral agents have different mechanisms of action. The most common oral agents perform one or more of the following; suppression of the output of glucose into the blood stream and increase sensitivity of insulin uptake into muscle and fat tissues, delay the absorption of glucose by reducing the ability of the small intestine to break down carbohydrates, and/or the increase insulin production (Mazze et al., 2004). These medications are also used in conjunction with individuals who are diagnosed with Type 1 DM if insulin resistance is also present. Individuals diagnosed with Type 1 DM are usually treated with insulin injections only. Injected insulin is classified by the action time; rapid, short (regular), intermediate, prolonged intermediate and long acting insulin (Mazze et al., 2004).

Combination therapy for Type 2 DM is considered when multiple methods of action are necessary to achieve desired glycemic control, for instance an individual may suffer from insulin resistance in the muscle and fat tissues as well as decreased ability to produce adequate insulin. The introduction of a second oral agent is usually implemented when the initially prescribed medication reaches its maximum effective dose (Mazze et al., 2004). A single medication may only lower HbA1c levels from .5-2% mg/dL and a combination of medications is associated with a decrease in HbA1c levels 3-4% mg/dL (Mazze et al., 2004).
There is evidence that side effects of hypoglycemic medications include weight gain. These medications increase the production of insulin, which in turn can increase the conversion of glucose into fat cells resulting in weight gain (Mazze et al., 2004). Metformin is a medication option that can assist in maintenance or lowering of current weight as well as LDL levels (Mazze et al., 2004; Lee & Morley, 1998; Yki-Jarvinen, Nikkila, & Makimattila, 1999). Metformin primarily decreases the formation of glucogen which translates to decreased glucose output as well as the increase uptake of insulin, however, this relationship diminishes or is no longer evident when taken in combination with other medications (Mazze et al., 2004). If Type 2 DM is severe at diagnosis or the disease has progressed, a combination of oral medications and insulin is considered.

**Depression and Chronic Illness Management**

Now that nutrition and diet, physical activity, and medication therapy have been reviewed, the next relevant construct is depression, which is reviewed relative to all chronic illness management and then in relation to DM management. This discussion includes both the presence of Diagnostic and Statistical Manual Fourth Edition Text Revised (DSM-IV-TR) Major Depressive Disorder (MDD), as an extreme and a lower level criteria recognized by the CDC as indicative of depression, and the entire range of depressive affect. Depression can also be thought to exist on a continuum and with the fluctuation of symptoms in relation to life stressors and situational factors.

MDD is characterized by dysphoric mood or a marked decrease in pleasure or interest in normally pleasurable activities (American Psychiatric Association [APA], 2000). In addition to either mood symptoms or loss of pleasure, an individual must experience four additional symptoms including abnormal sleeping habits, psychomotor
retardation/agitation, increased/decreased appetite or weight, guilt, and thoughts of suicide for at least a 2-week period. Pratt & Brody (2008) utilized the NHANES 2005-2006 data and the CDC criteria for depression, and observed that rates of clinical depression are higher in individuals between the ages of 40 and 59, women, lower socioeconomic status and non-Hispanic black individuals. Pratt & Brody (2008) also reported that 80% of individuals with depression symptoms expressed some type of impairment in their daily lives and 27% reported extreme impairment at work and in daily life. These are important statistics when the relationship between depression and chronic illness is discussed. In a meta-analysis of depression and chronic illness experienced by older individuals, Huang, Dong, Lu, Yue, and Liu (2010) found that stroke, poor hearing, poor vision, cardiac disease, and chronic lung disease may be risk factors for depression.

The presence of depressive symptoms have been shown to have inverse associations with decreased quality of life, increased risk of chronic disease, greater utilizations of health care, missed days at work, and greater disabilities and complications due to chronic illness (Egede, Zheng, & Simpson, 2002; Teh, Zaslavsky, Reynolds, & Cleary, 2010). Similar findings suggest the presence of MDD and depression symptoms are associated with decreased adherence to prescription medications and may inhibit the achievement of treatment goals (Piette, Richardson, & Valenstien, 2004). Depression also has an adverse association with quality of life in individuals diagnosed with chronic illness (Faller et al., 2009). This relationship is clinically important especially in individuals diagnosed with chronic illnesses, such as DM, because physical activity is such an important part of treatment.
Overview of DM and Depression

The rate of depression among individuals diagnosed with DM is estimated to be two to four times the rate found in adults in the United States who are not diagnosed with DM (Anderson, Freedland, Clouse, & Lustman, 2001; Arehart-Treichel, 2010; Egede et al., 2002; Gavard, Lustman, & Clouse, 1993; Lustman & Gavard, 1995). An estimated 8.3% of individuals with DM were also diagnosed with major depression and 31% with clinically relevant depression (Anderson et al., 2001; Li, Ford, Strine, & Mokdad, 2007). Severity of depression is also found to be related to decreased physical and mental functioning, and higher health care costs (Ciechanowski, Katon, Russo, & Hirsch, 2003). This section reviews the relationship between DM and depression and subsequent sections focus on the relationships between depression and DM in regards to nutrition and diet, physical activity and medication therapy.

Anderson et al. (2001) found that diabetic individuals are 2 times more likely to experience clinically relevant depression than non-diabetic individuals, and diabetic women were 1.8 times more likely to be diagnosed with comorbid MDD than are diabetic men. These numbers are important because comorbid depression is associated with an increased risk of DM complications as well as a two-fold increase in the risk of mortality (Anderson et al., 2001; Lin et al., 2010; Lustman et al., 2000; Nichols & Brown, 2003; Katon et al., 2009). Individuals diagnosed with comorbid depression and DM are also at higher risk of developing DM related complications, including eye complications, renal disease, and sexual dysfunction (de Groot, Anderson, Freedland, Clouse, & Lustman, 2001; Penninx, Leveille, Ferrucci, van Eijk, & Guralnik, 1999). This increase in DM complications may be due to depression's
association with a decrease in self-management behaviors such as diet and exercise regimens, which, as stated earlier, are an integral component to treatment of DM (Christ et al., 2002; Ciechanowski et al., 2003; Llorente & Malphurs, 2007; Pastors et al., 2002; Sallis & Owen, 1999; Warren et al., 2001). Individuals suffering from mental illness and DM were more likely to engage in behaviors that increase risk of DM complications such as unhealthy eating habits, decreased likelihood of engaging in physical activity, non adherence to hypoglycemic, cholesterol and antihypertensive medications, and increased likelihood to smoke (Ciechanowski et al., 2003; Kreyenbuhl et al., 2006; Lin et al., 2004).

There is also a relationship between depression and the quality of care received by individuals diagnosed with DM. Goldberg et al. (2007) found that individuals diagnosed with Type 2 DM and comorbid severe mental illness, including depression, bipolar disorder, and schizophrenia, receive poorer quality of care; including a decrease in the likelihood of receiving DM education. Individuals with severe mental illness and DM were also shown to be at increased risk of developing cardiovascular disease (Kreyenbuhl et al., 2001). This may be due to the decreased likelihood individuals with severe mental illness will be prescribed medications to control blood lipids and cholesterol (Kreyenbuhl et al., 2001).

Previous research indicates a relationship between depression and worse glycemic control, and that a diagnosis of Type 1 or Type 2 DM did not change this relationship (Lustman et al., 2000; Mazze, Lucido, & Shamoon, 1984). Egede, Ellis, and Grubaugh (2009) observed that a diagnosis of MDD is not necessary for individuals diagnosed with DM to experience DM-related complications. Egede et al.’s (2009)
research indicated that the presence of subclinical depressive symptoms could contribute to decreased glycemic control. Egede et al. (2009) theorize depression symptoms such as an increase/decrease in appetite, fatigue, and decrease in motivation may play a role in the non-adherence to recommendations, and thus have an adverse affect on glycemic control.

There is conflicting research on the relationship between depression and glycemic control. For example, Nabi et al. (2010) indicated that lower glycemic control and decreased physical activity was associated with “diabetes distress” and not MDD. Talbot and Nouwen (2000) also found evidence that indicates depressive symptoms may be perpetuated by the stresses of Type 2 DM and not MDD symptoms. However, van Tilburg, Georgiades, and Surwit (2001) observed a relationship between MDD and poor glycemic control in individuals with Type 1 DM, but not Type 2 DM. Additional research has suggested that depression does play a role in poor glycemic control and was found to be associated with increase HbA1c levels in both individuals diagnosed with Type 1 DM and individuals diagnosed with Type 2 DM (Ciechanowski et al., 2003; Lustman et al., 2000).

**Nutrition and Diet Behaviors, Depression, and DM**

As stated earlier, depression has a negative relationship on adherence to diet regimens (Ciechanowski et al., 2003). Pagoto et al. (2009) found that in a sample of pre-diabetic Latino individuals, depression scores were inversely related to scores on the Alternative Healthy Eating Index, an assessment of recommended foods for individuals diagnosed with DM. In this study, as depression symptoms increased, individuals were less likely to consume recommended foods. Jacka et al. (2010)
observed a relationship between the type of foods consumed and depression symptoms experienced. In this study, individuals who had a diet comprised of unprocessed foods such as fruits, vegetables, and grains, were less likely to be diagnosed with depression and anxiety disorders while individuals with diets higher in processed foods were associated with a higher likelihood of diagnosis of these disorders. There is evidence of a relationship between depression and the types of foods consumed; however, little research has been conducted on the directional nature of this relationship.

There is some evidence that a decrease in diet adherence in individuals diagnosed with DM may be due to psychotropic medications used to treat depression, but outcomes of this research are conflicting. Pagoto et al. (2009) found that depression scores were not related to greater caloric intake. However, Gothelf et al. (2002) concluded that psychotropic medications may not contribute to an increased quantity of food intake but increase the intake of higher calorie foods and beverages that contain significant amounts of sugar. This is important since these foods are associated with weight gain and increased risk of developing Type 2 DM (Schulze et al., 2010). In addition, Haupt and Newcomer (2002) observed that weight gain associated with psychotropic medications may be due to increased sedentary behaviors, increased caloric intake, and increased cravings for carbohydrate rich foods.

In regards to food nutrition label use, a search of the literature did not produce research that directly addressed the relationship of depression and food nutrition label use. However, there is evidence that individuals who were more likely to utilize food nutrition labels had a greater sense of self-efficacy than individuals who did not utilize food nutrition labels (Satia et al., 2005). In addition, Antonuk and Block (2006) found
that individuals that diet may be more likely to base food choices from the information found on food nutrition labels. This suggests that individuals who attend to their food choices, such as persons diagnosed with DM, and individuals that have a higher self-efficacy, are more likely to use nutrition labels to make healthier food choices. This is some indication that food nutrition label use could be impaired when an individual is experiencing a decrease in perceived self-efficacy due to a depressive episode (Cherrington, Wallston, & Rothman, 2010).

*Physical Activity, Depression, and DM*

Research indicates that physical activity has beneficial effects in reducing the risk of cardiovascular disease, DM, as well as the risk of complications and death related to DM (Gregg, Gerzoff, Caspersen, Williamson, & Narayan, 2003). In addition, individuals diagnosed with severe mental illnesses, such as MDD, were less likely to engage in physical activity. and education level and degree of social support potentially moderating this relationship (Daumit et al., 2005).

There is evidence that withdrawal and avoidance symptoms of depression may contribute to a decrease in physical activity (Martinsen, Strand, Paulson, & Kaggestad, 1989). Though previous research has shown a reduction of depression symptoms experienced with increase in physical activity, there is some evidence that physical activity is beneficial as an intervention for depression may be short-term (Salmon, 2001). Although research is conflicted, and Dilorenzo et al. (1999) indicated that participants in a 12-week exercise program experienced improved mood up to a 1-year follow-up, and evidence suggests exercise regimens may be comparable to psychotherapeutic interventions (Freemont, & Craighead, 1987). Research also
indicates an increase of depression symptoms in individuals who engage in less physical activity (Meyer & Broocks, 2000; Paluska & Schwenk, 2000).

Interventions that utilize physical activity have been shown to improve glycemic control and the quality of life experienced by diabetic individuals significantly (Conn et al., 2007; Conn, Hafdahl, & Brown, 2009). The reduction of physical activity in individuals with comorbid depression is important when discussing individuals with DM. Even though research conflicts on the benefits of physical activity in glycemic control, physical activity has been shown to have positive association in the prevention and treatment of hypertension, which is a common risk factor for DM complications such as cardiovascular disease, renal disease, eye complications, and neuropathy.

Medication, Depression, and DM

As stated earlier, a negative relationship exists between depression and adherence to medical regimens in general (Dimatteo, Lepper, & Croghan, 2000). An increase in severity of mental illness is also associated with a decrease in adherence to medical management, which leads to poorer outcomes in treatment (Dimatteo et al., 2000). Lin et al. (2004) found that individuals diagnosed with comorbid Type 2 DM and depression missed taking oral agents on average 18 more days (80 days for depressed individuals versus 62 days in non-depressed individuals) in year period than individuals without comorbid depression. A meta-analysis by Gonzalez et al. (2007) observed that the presence of depression symptoms could be related to medical adherence without the presence of diagnosable MDD. This suggests that individuals who experience subclinical depression still engage in behaviors with a relationship to treatment outcomes.
Hypotheses

Treatment of DM compared to most every other disease state is highly self-managed involving many life-style factors, with these factors strongly influencing the prevention of complications and contribute to positive health outcomes. Previous research (Anderson et al., 2001; Arehart-Treichel, 2010; Egede, 2002; Gavard et al., 1993; Lustman & Gavard, 1995) suggests that individuals diagnosed with DM experience significantly higher levels of depression than non-diabetic did individuals, which was evaluated at the onset of this study. According to the literature (Christ et al., 2002; Ciechanowski et al., 2003; Dimatteo et al., 2000; Franz et al., 2002; Franz et al., 1995; Llorente & Malphurs, 2007; Meyer & Broocks, 2000; Paluska & Schwenk, 2000; Sallis & Owen, 1999; Pastors et al., 2002; Warren et al., 2001), depression is related to poorer nutrition and diet choices, decrease in physical activity, and non-adherence to medications, which in turn may contribute to poorer glycemic control.

The current study examined the differences in depression symptoms experienced by individuals with and without a diagnosis of DM. The relationship between depression and nutrition, diet behaviors, and physical activity was explored in these two groups. Also, the relationship of these health behaviors and the symptoms of depression experienced by individuals who manage DM with oral agents only, oral agents, insulin only and neither insulin nor oral agents was explored. Different cross-sectional conceptual models of these relationships were evaluated. This information is intended to assist in better understanding the role that health behaviors play in the depression symptoms experienced by diabetic individuals.
Hypotheses and Data Analysis Plan

Based on the above literature, the following was hypothesized:

1. A greater number of diabetic individuals will meet criteria for depression than non-diabetic individuals as determined by *DSM-IV-TR* of Major Depressive Disorder.

2. A greater number of diabetic individuals will meet criteria for depression than non-diabetic individuals as determined by the CDC criteria for depression.

3. Diabetic individuals have a significantly higher continuous scale depression score than non-diabetic individuals.

4. Nutrition has positive relationship with glycemic control.

5. Diet behaviors have a positive relationship with glycemic control.

6. Physical activity has a positive relationship with glycemic control.

7. Depression has a negative relationship with glycemic control.

8. The observed differences in depression symptoms between diabetic and non-diabetic individuals decrease when controlling for nutrition, diet behaviors, and daily physical activity.

9. Nutrition accounts for a significant amount of the variance in glycemic control in diabetic individuals after controlling for depression.

10. Diet behaviors account for a significant amount of the variance in glycemic control in diabetic individuals after controlling for depression.
11. Physical activity accounts for a significant amount of the variance in glycemic control in diabetic individuals after controlling for depression.

12. Nutrition is a moderator between depression and glycemic control.

13. Diet behaviors are a moderator between depression and glycemic control.

14. Physical activity is a moderator between depression and glycemic control.

15. Physical activity is a mediator between the relationship of depression and glycemic control.

16. Diet behaviors are a mediator between the relationship of depression and glycemic control.

17. Nutrition is a mediator between the relationship of depression and glycemic control.
CHAPTER 2

METHOD

Participants and Procedures

National Health and Nutrition Examination Survey

This study utilized the National Health and Nutrition Examination Survey 2005-2006 (NHANES) database. The NHANES is a national multi-stage survey of 15 counties across the United States, and the NHANES 2005-2006 surveyed and examined 10,348 individuals. The data obtained from the survey is designed to be representative of the United States population. To ensure representation of minority individuals, persons 60 years of age and older, African American, and Hispanic populations are sufficiently represented in the sample, these groups are over-sampled at the rate of 100% using a cluster sampling procedure, thus allowing for subgroup analyses using these groups. Data collected is made available to researchers to assess various trends including but not limited to demographic, socioeconomic status, health, and nutrition. As the current study was not designed to mirror the U.S. population, sampling weights are not used.

The survey and data collection was conducted by the National Center for Health Statistics (NCHS), an affiliation of the CDC. Trained personnel, including health professionals, administer surveys that assess health, nutrition, and various diseases including DM and obesity. Examinations are also conducted that assess physiological measurements, such as physical fitness and physical functioning. Because it is publicly available and blinded, Health and Human Services does not consider this dataset to be human subjects’ data, thus analysis was not subject to Institutional Review Board
review. This was confirmed through personal communication with P. Kaminksi (personal communication, June 2010).

**Exclusionary Criteria**

For this project, we compared individuals who reported a doctor’s diagnosis of DM and individuals who reported they had no doctor’s diagnosis of DM. Five-hundred and twenty-one individuals in the NHANES 2005-2006 dataset reported a doctor’s diagnosis of DM. Of the 521 diabetic individuals, 10 individuals under the age of 18 were excluded from our sample to create an adult sample. Because there were no 18-year-old individuals that indicated a diagnosis of DM, the youngest age included in the diabetic sample was 19 years of age. Additionally, because of the rarity of achieving an age of 85 or older, individuals 85 and older are all coded 85 years of age in all NHANES datasets to blind the data. Because of the variability in this oldest age category, the decision was made to exclude individuals who were coded 85 years of age, thus our sample had an age range of 19 to 84 years of age. These age restrictions resulted in an additional 23 individuals being excluded from the diabetic sample.

For similar reasons, Hispanic individuals who reported their race/ethnicity to be other than “Mexican American” were included in the “Other Hispanic” category. This category includes but not limited to Cuban Americans, Puerto Rican Americans, and Costa Rican Americans. In addition, individuals who reported their race/ethnicity to be other than European American, African American, or Hispanic, were included in the “Other Race Including Multi-Racial” category. Because of the variability in the groups “Other Hispanic” and “Other Race Including Multi-Racial” and the difficulty to generalize these categories, an additional 35 individuals were excluded from the DM sample. One
individual who responded, “I don’t know” to the question that assessed level of education was also excluded. The dataset was then examined for out of ranges values. When the daily activity variable was examined, one individual reported over 24 hours of activity per day. Because this number seemed implausible, this individual was excluded from our analyses. The final sample size of diabetic individuals was \( n = 451 \).

A comparison sample was compiled of 451 individuals who did not report they had been diagnosed with DM. Because, HbA\(_{1c}\) level is used to assess for DM, HbA\(_{1c}\) levels were examined to ensure these individuals correctly reported their DM status. Individuals with an HbA\(_{1c}\) level of greater than 6.5% were excluded from possibility of inclusion in the comparison group. Diabetic individuals were then matched with non-diabetic individuals on age and gender. Although race/ethnicity and education could not be matched completely, they were matched as closely as possible and analyses performed to ensure the group differences of these variables between diabetic and non-diabetic individuals were not significant and that the groups were in fact highly similar (i.e., \( p \) values approaching 1.0) (Tables 1 and 2). These statistics are reported in the results section of this document. After defining the diabetic group and the comparison group a total sample size of 902 individuals was achieved.

Measures

Assessment of DM and Glycemic Control

Diabetes Questionnaire

The NHANES diabetes questionnaire consists of 29 items that assess for DM and pre-DM. Item DIQ.010 (Appendix A) “Have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes” was used to determine the
diabetic sample. Questions that assess type of DM management i.e. use of insulin, oral hypoglycemic medications, both medications or no use of medications for disease management (items DIQ.050 & DIQ.070).

Glycemic Control

Glycemic control for the diabetic sample was assessed by measuring the glycogenated hemoglobin (HbA1c) in the blood and was reported as a percentage. Highest HbA1c level for individuals who have not been diagnosed with DM is 6.5% mg/dL. For individuals diagnosed with DM, adequate glycemic control is considered to be achieved when HbA1c levels are no greater than 7% mg/dL. The NHANES 2005-2006 assessed HbA1c levels for 6493 participants in the lab portion of data collection. Of individuals that reported a doctor's diagnosis of DM, HbA1c levels were assessed for 462 individuals. This data was used to assess the glycemic control of diabetic individuals as well as to ensure a comparison group that correctly reported their non-diabetic status (i.e., excluding both incorrect reports of non-diabetic status and exclusion of yet undiagnosed diabetic individuals in the non-diabetic comparison group).

Assessment of Nutrition and Diet Behavior Construct

This potential composite was formed from three measures, the Dietary Behaviors Questionnaire (DBQ), an averaged Twenty-four Hour Food Recall (24 Hour Diet Recall), and the Food Frequency Questionnaire (FFQ). A correlation was calculated which indicated these three variables were significantly related, however, did not appear to be assessing the same construct (Table 5). Because these constructs could be considered related and unique constructs, the scores on these measures were transformed into a Z-score as described in Vogt (2005) and then the mean of these transformed variables
was used as a single composite score. The relationship between these variables was assessed and positive relationships were found between the FFQ and the 24 Hour Diet Recall. An inverse relationship was observed between the DBQ and both the FFQ and the 24 Hour Diet Recall. Because of the inverse relationship with the FFQ and 24 Hour Diet Recall, the questions used to assess for diet behaviors had to be reverse scored so that the relationships were in the same direction. Table 5 illustrates these relationships.

Diet Behaviors Questionnaire (DBQ)

The DBQ is an interview that assesses various diet behaviors. This project focused on the questions that assessed the individual’s use of nutrition labels for food selection. Participants were shown an example of a nutrition facts panel and asked how often they use the label when they decide to buy a food product. Participants answer on a 6-point likert-type scale 1 = always, 2 = most of the time, 3 = sometimes, 4 = rarely, 5 = never, 6 = never seen. Refusals to answer and unknowns were coded 77 and 99 respectively and were treated as missing values in these analyses.

Individuals who endorsed a 6, “never seen,” the nutrition food labels were given skip criteria in the questionnaire and thus were excluded from the analyses. If the individual reported that they had seen the nutrition food labels but never used them (answered 5), they were given skip criteria after the first four questions (DBQ750 to DBQ780) and were given skip criteria, however, because they had seen the nutrition labels they were still included in the analyses. Individuals who endorsed “always,” “most of the time,” “sometimes,” or “rarely” using nutrition labels to any of the first four questions completed the entire questionnaire. This information was used to assess for use the individual’s use of food labels to choose foods based on caloric content, amount
sugar, carbohydrates, and fats, etc. in the food. For the 15 questions which assess these behaviors a mean score was then computed with 5 = *always uses food labels* and 1 = *never uses food labels* (see Appendix B).

The Cronbach’s alpha internal consistency reliability coefficient for the overall sample was .95 indicating good overall alpha reliability. The Cronbach’s alpha coefficient was also assessed for the diabetic individuals ($\alpha = .95$) and non-diabetic individuals ($\alpha = .95$) individually, and was determined to have good internal consistency for both groups.

**Twenty-four (24) Hour Diet Recall**

The 24 Hour diet recall is a detailed interview of the individual’s consumption of foods and beverages over the previous 24 hours (due to the length of this measure, see Appendix C for a few exemplar pages). This data is collected twice, once during the examination and then again over the telephone 3 to 10 days later on a different day of the week as the initial interview. Percentages were calculated for each day to estimate the amount of macro and micronutrients consumed. The percentages from caloric intake of monounsaturated fat, carbohydrates, and proteins as well as the ratio of grams of fiber per 1000 calories were utilized for this project (Nelson, Reiber, & Boyko, 2002). Percentages were also examined to estimate how closely individuals follow the dietary recommendations for individuals diagnosed with DM.

**Food Frequency Questionnaire (FFQ)**

The FFQ was developed by the National Institutes of Health, National Cancer Institute to assess for frequency of food consumption (Subar, Dodd, Guenther, & Kipnis, 2006). The questionnaire consists of 151 items intended to measure the frequency of
types of foods eaten during the previous 12 months (due to the length of this measure, see Appendix D for a few exemplar pages). Portion size is not collected during the FFQ and thus daily frequency of consumption, not daily servings, were computed. For example, if an individual’s data shows carrots were consumed 0.5 times per day, this could be conceptualized to mean that carrots were eaten every other day on average. In accordance to Nelson et al.’s (2002) analysis of the NHANES III data, food categories were created. In personal correspondence, syntax was obtained to develop the food categories (K. M. Nelson, personal communication, June 2010). Because of increased specificity of the FFQ between the NHANES III and the NHANES 2005-2006, foods were added to these categories. The previous computations created a fruit category, a vegetables category. For these analyses an additional category was created comprised of whole grains using the USDA MyPyramid food equivalents database as a guideline for foods to include in this variable (Bowman, Friday & Moshfegh, 2008).

The fruit and vegetables categories consisted of vegetables and fruits including fruit and vegetable juices; however fruit drinks, such as Hi-C fruit punch and juice cocktails, were not included. The whole grains category included variables that the USDA food pyramid food equivalents database considered whole grain such as whole wheat/whole grain breads, whole grain rice, and oats.

Assessment of Physical Activity

Physical Activity Questionnaire (PAQ)

The physical activity questionnaire includes questions that assess for daily physical activity, leisure activities, and sedentary activities (see Appendix E). Participants are asked to respond to items that assess moderate and vigorous leisure
activity, amount of time spent performing household chores, and the duration of time
spent bicycling. The questionnaire assesses for number of times in the past 30 days
various activities were engaged in as well as the amount of time spent participating in
these activities. Individuals who did not give at least one activity, or reported duration of
less than 10 minutes, were coded as "no" and thus were coded missing in the final
dataset for leisure activity, household chores, and time spent bicycling. In these
analyses, missing data points were recoded to 0 minutes spent active daily.

Assessment of Depression

Depression Screener Questionnaire (DPQ)

The Depression Screener Questionnaire (DPQ) consists of 9 questions from the
Patient Health Questionnaire (PHQ-9), which is based on the Diagnostic and Statistics
criteria for Major Depressive Disorder (MDD). Participants answered nine items that
assess for MDD symptoms on a 4-point likert-type scale used to assess frequency of
symptoms, 0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every
day (Items DPQ.010 thru DPQ.090 in Appendix F which also shows the questions and
common stem). A code of 7 was assigned if the individual refused to answer and a
code of 9 given if the individual did not know. A review of the frequencies of this answer
code revealed that no individuals refused to answer the questions and 56 answers of
“don’t know” were given in the questionnaire. A decision was made to include
individuals that answered “I don’t know” to 4 or fewer questions was made because
questions with the most answers of “I don’t know” were to more ambiguous questions
such as “moving or speaking slowly or too fast”. Non-diabetic individuals who
answered, “don’t know” to 4 or more of the questions were excluded from the possibility of inclusion in the non-diabetic comparison group. Individuals in the diabetic group did not meet the exclusion criteria of 4 or less of the questions answered with “don’t know.” For analyses, this measure was first used to assess for the CDC cutoff criteria for depression and then again for a mean and DSM-IV-TR criteria of MDD (APA, 2000).

According to Kroenke et al. (2001), the PHQ-9 has good internal consistency with medical populations, with a Cronbach’s alpha coefficient reported of .89 in a primary care population and .86 in an ob-gyn population. In the current study, the reliability of the 9-item questionnaire was assessed for the overall sample and then separately for the diabetic population and the non-diabetic population. The Cronbach’s alpha coefficient for the overall sample was .83. The Cronbach’s alpha coefficient for the diabetic individuals was .84 and for the non-diabetic individuals the Cronbach’s alpha coefficient was .81.

This measure was used to formulate a diagnosis of MDD following Diagnostic and Statistics Manual, Fourth Edition, Text Revised (DSM-IV-TR) criteria. Because DSM-IV-TR criteria for MDD includes that symptoms must be apparent for two weeks, this construct is thus an instantaneous rate of individuals that meet DSM-IV-TR criteria, compared to DSM-IV-TR criteria, which further comments that an episode is present even if it had ended less than 2 months ago. Criteria used to calculate this formulation included individuals that indicated experiencing dysphoric mood or loss of pleasure “nearly every day,” (3) and an additional four symptoms that they experienced “nearly every day” (3). An additional question on impairment experienced due to symptoms is included in the NHANES 2005-2006 version of the questionnaire and is answered on a
Likert-type scale that $0 = \textit{not at all difficult}$ to $3 = \textit{extremely difficult}$ (see Appendix F, Item DPQ.100). An endorsement of moderate to severe impairment was also required for a diagnosis of MDD. When the impairment question was included in analysis of reliability, the internal consistency lowered, however was still considered to be acceptable to good, with a Cronbach's alpha coefficient of .81 for the overall sample, .82 for diabetic individuals, and .77 for non-diabetic individuals.

For analyses, this measure was used in three distinct ways. First, to assess for the CDC cutoff criteria for depression, which was noted by Pratt and Brody (2008) to be clinically relevant depression. Next, a mean was computed and was used as a continuous construct for depression. Finally, it was used to assess for \textit{DSM-IV-TR} criteria of MDD (APA, 2000). In previous research a sum of the PHQ-9 was used to create a categorical variable with a cut score of 10 to equal clinical depression (Kroenke et al., 2001; Pratt & Brody, 2008). The analyses of Kroenke et al. (2001) indicate the proposed cut score of 10 to have adequate specificity for depression, thus this cut score is utilized by the CDC to identify individuals who meet criteria for clinically relevant depression as defined by frequency of symptoms and likelihood of impairment (Pratt & Brody, 2008). To better include individuals in our analyses who answered, “I don’t know” to questions, a mean cut score was used in place of the sum cut score. The mean cut score was obtained by comparing mean scores of the PHQ-9 to the sum scores. In addition, the 9 questions that address depressive symptoms were meaned and then a cut score of 1.10 will be used to determine a cut-score for depression.
CHAPTER 3

RESULTS

An a priori analysis of power was run to determine if the study had adequate power to find an effect if indeed there is an effect. The analysis was run in g-power, which estimated the power to be 0.80, adequate power to detect an effect.

Descriptive and Exploratory Statistics

Demographics

The mean age of the overall sample was 60.83 (SD = 13.35) with a range of 19 years of age to 84 years of age. Although, the sample could not be matched perfectly for ethnicity and education variables between the diabetic individuals and non-diabetic individuals, Chi-square tests of independence and a Kruskal–Wallis one-way analysis of variance, indicated there were no significant differences in the proportion of race/ethnicity and education between groups, and in fact, groups were highly similar. For a more detailed examination of racial/ethnic and educational differences between the diabetic and non-diabetic groups, please refer to Tables 1 and 2.
Table 1

Comparison of Racial/ethnic Distribution by DM Status

<table>
<thead>
<tr>
<th></th>
<th>Diabetic Individuals</th>
<th>Non-Diabetic Individuals</th>
<th>Total</th>
<th>( \chi^2 )</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican American</td>
<td>112 (12.4%)</td>
<td>112 (12.4%)</td>
<td>224 (24.8%)</td>
<td>1.52</td>
<td>.47</td>
</tr>
<tr>
<td>European American</td>
<td>174 (19.3%)</td>
<td>190 (21.1%)</td>
<td>364 (40.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>165 (18.3%)</td>
<td>149 (16.5%)</td>
<td>314 (34.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>451 (50.0%)</td>
<td>451 (50.0%)</td>
<td>902 (100.0%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2

Comparison of Education Distribution by DM Status

<table>
<thead>
<tr>
<th></th>
<th>Diabetic Individuals</th>
<th>Non-Diabetic Individuals</th>
<th>Total</th>
<th>( \chi^2 )</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 9th Grade</td>
<td>90 (10.0%)</td>
<td>91 (10.1%)</td>
<td>181 (20.1%)</td>
<td>0.17</td>
<td>.68</td>
</tr>
<tr>
<td>9-12th Grade (No Diploma)</td>
<td>86 (9.5%)</td>
<td>79 (8.8%)</td>
<td>165 (18.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School Diploma or</td>
<td>120 (13.3%)</td>
<td>118 (13.1%)</td>
<td>238 (26.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equivalent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some College or AA Degree</td>
<td>101 (11.2%)</td>
<td>107 (11.9%)</td>
<td>208 (23.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College Graduate or Above</td>
<td>54 (6.0%)</td>
<td>56 (6.2%)</td>
<td>110 (12.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>451 (50.0%)</td>
<td>451 (50.0%)</td>
<td>902 (100.0%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Diabetes Medical Management

Type of diabetes medical management was assessed and detailed in Table 3. Regrettably, the diabetes questionnaire did not assess whether the 60 individuals who indicated they did not use either insulin or oral medications to manage their disease, attempted to control their DM with diet and/or exercise alone or did not engage in any kind of DM disease management behaviors.
Table 3

Diabetes Management

<table>
<thead>
<tr>
<th>Diabetes Management</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both Insulin and Oral Medications</td>
<td>67 (14.9%)</td>
</tr>
<tr>
<td>Neither Insulin nor Oral Medications</td>
<td>60 (13.3%)</td>
</tr>
<tr>
<td>Insulin Only</td>
<td>74 (16.4%)</td>
</tr>
<tr>
<td>Oral Medications Only</td>
<td>250 (55.4%)</td>
</tr>
<tr>
<td>Total Diabetic Group</td>
<td>451 (100.0%)</td>
</tr>
</tbody>
</table>

Nutrition

In the diabetic sample, the percentage of calories from the macronutrients protein, carbohydrates, and total fats was assessed to gain an understanding of how closely to the recommended range diabetic individuals consumed these macronutrients (Table 4). Almost half of the sample was outside the recommended range of consumption for fat and carbohydrates. As for protein consumption, the majority of individuals were within the recommended range.

Table 4

Disparity from Recommended Daily Intake

<table>
<thead>
<tr>
<th>Macronutrient (Recommended %)</th>
<th>% of Sample Within Range</th>
<th>% of Sample Below Range</th>
<th>% of Sample Above Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates (45-60%)</td>
<td>51.3% (n = 210)</td>
<td>41.9% (n = 172)</td>
<td>6.3% (n = 26)</td>
</tr>
<tr>
<td>Total Fat (25-35%)</td>
<td>45.6% (n = 187)</td>
<td>9.5% (n = 39)</td>
<td>44.9% (n = 184)</td>
</tr>
<tr>
<td>Protein (10-20%)</td>
<td>79.5% (n = 326)</td>
<td>2.4% (n = 10)</td>
<td>18.1% (n = 74)</td>
</tr>
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Atheoretical Association of Study Constructs

To initially explore associations between study constructs and better understand the groups, lower triangular correlation matrices were constructed between continuous variables and are presented in Tables 5, 6, and 7. As these associations are generally atheoretical in nature, and most are of small magnitude, they may be spurious in nature. These are presented here to add information about relationships between pairs of these variables in the study samples.

In the overall sample, combining diabetic and non-diabetic groups, a small significant relationship was observed between higher depression (as measured by the PHQ-9) and higher HbA$_{1c}$ levels as well as higher depression and fewer minutes spent active daily (measured by the PHQ-9) (see Table 5). However, the relationship between depression and physical activity was the only significant relationship that was evident in the overall sample as well as when the diabetic and non-diabetic groups were assessed individually (Tables 6 and 7). In the diabetic group, significant relationships were observed between an increase in depression and a decrease in the amount of monounsaturated fats consumed and an increase in the amount of carbohydrates consumed (Table 6).

In addition to depression scores, higher HbA$_{1c}$ was related to several nutrition variables in the overall sample including; an increase total fats, monounsaturated fats, and proteins consumed as well as a decreased carbohydrates consumed (Table 5). There were small significant relationships observed between an increase in HbA$_{1c}$ levels and the increased frequency of vegetables consumed in both diabetic and non-
diabetic groups. Additionally, higher HbA1c levels in the diabetic group were associated with the decreased frequency of fruits consumed daily.

There were several significant relationships associated with use of nutrition labels for information (as measured by the Diet Behaviors Questionnaire) in the overall sample and the non-diabetic group (Tables 5 and 6). Small significant relationships were observed between increased utilization of nutrition labels and increased physical activity, frequency of fruits, vegetables, and whole grains, fiber, and protein consumed daily. Only the positive association between diet behaviors and the frequency of whole grains and consumption of fiber was still evident in the diabetic group. Additionally, when the diabetic group was assessed individually, an increase in diet behaviors was associated with a decrease in the amount of total fats and monounsaturated consumed daily which was not evident in the non-diabetic group (Tables 6 and 7).
### Table 5

**Correlations between Continuous Variables in the Overall Sample**

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**Note.** n=625, because of the use of listwise deletion to ensure the same individuals are being assessed for all variables the overall n was less than the matched sample of 902.

*: Correlation was significant at .05 level.

**: Correlation was significant at < .01 level.

a. Composite score of transformed FFQ variables.

b. Composite score of transformed 24 Hour Diet Recall variables.

c. Composite score of at least 2 of 3 variables: FFQ Total, 24 Hour Diet Recall, and/or Diet Behavior Mean (Reverse Score).
## Table 6

**Correlations between Continuous Variables in Diabetic Individuals**

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*Note. n=273, because of the use of listwise deletion to ensure the same individuals are being assessed for all variables the n for the diabetic individuals was less than previously stated, n = 451.*

*: Correlation was significant at .05 level.

**: Correlation was significant at < .01 level.

<sup>a</sup>: Composite score of transformed FFQ variables.

<sup>b</sup>: Composite score of transformed 24 Hour Diet Recall variables.

<sup>c</sup>: Composite score of at least 2 of 3 variables: FFQ Total, 24 Hour Diet Recall, and/or Diet Behavior Mean (Reverse Score).
## Table 7

**Correlations between Continuous Variables in Non-Diabetic Individuals**

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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Percent of Calories from Monounsaturated Fats</td>
<td>-.08</td>
<td>-.03</td>
<td>.03</td>
<td>.06</td>
<td>-.11*</td>
<td>-.12*</td>
<td>-.07</td>
<td>-.07</td>
<td>.58**</td>
<td>.89**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Grams of Fiber per 1000 Calories</td>
<td>.26**</td>
<td>-.01</td>
<td>.01</td>
<td>.06</td>
<td>.30**</td>
<td>.29**</td>
<td>.23**</td>
<td>.19**</td>
<td>.57**</td>
<td>-.25**</td>
<td>-.18**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Percent of Calories from Carbohydrates</td>
<td>.11**</td>
<td>.02</td>
<td>.04</td>
<td>-.08</td>
<td>.10</td>
<td>.15**</td>
<td>.02</td>
<td>.05</td>
<td>-.23**</td>
<td>-.70**</td>
<td>-.65**</td>
<td>.30**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Percent of Calories from Protein</td>
<td>.10</td>
<td>.02</td>
<td>.02</td>
<td>.12*</td>
<td>.08</td>
<td>-.02</td>
<td>.09</td>
<td>.12*</td>
<td>.41**</td>
<td>-.01</td>
<td>.01</td>
<td>.15**</td>
<td>-.41**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Diet Behavior Mean (Reversed Score)</td>
<td>-.01</td>
<td>.05</td>
<td>-.05</td>
<td>.05</td>
<td>.27**</td>
<td>.25**</td>
<td>.23**</td>
<td>.16**</td>
<td>.16**</td>
<td>-.05</td>
<td>-.02</td>
<td>.21**</td>
<td>.02</td>
<td>.13**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Mean Nutrition Score(c)</td>
<td>.20**</td>
<td>-.02</td>
<td>.08</td>
<td>.14**</td>
<td>.80**</td>
<td>.64**</td>
<td>.65**</td>
<td>.58**</td>
<td>.65**</td>
<td>.17**</td>
<td>.21**</td>
<td>.54**</td>
<td>-.05</td>
<td>.30**</td>
<td>.55**</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** \(n=352\), because of the use of listwise deletion to ensure the same individuals are being assessed for all variables the \(n\) for the non-diabetic individuals was less than previously stated, \(n=451\).

*: Correlation was significant at .05 level.
**: Correlation was significant at <.01 level.

\(a\): Composite score of transformed FFQ variables.

\(b\): Composite score of transformed 24 Hour Diet Recall variables.

\(c\): Composite score of at least 2 of 3 variables: FFQ Total, 24 Hour Diet Recall, and/or Diet Behavior Mean (Reverse Score).
Group Differences

As expected, differences of depression scores and HbA1c levels were observed between the diabetic and non-diabetic groups (Table 8). In addition, the diabetic group had a greater 24 Hour Diet Recall total and consumed a greater amount of fiber, calories obtained from total fats, monounsaturated fats, and proteins. The diabetic group also consumed fewer calories from carbohydrates than the non-diabetic group and showed greater utilization of information from nutrition labels. Additionally, the diabetic group trended toward engaging in less daily activity than the non-diabetic group.
Table 8

Comparison of Continuous Variables by Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Diabetic Individuals</th>
<th>Non-Diabetic Individuals</th>
<th>Group Comparisons</th>
<th>Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Age</td>
<td>45</td>
<td>60.83</td>
<td>13.3</td>
<td>5</td>
</tr>
<tr>
<td>Depression Score</td>
<td>39</td>
<td>0.43</td>
<td>0.53</td>
<td>5</td>
</tr>
<tr>
<td>HbA1c</td>
<td>40</td>
<td>7.43</td>
<td>1.90</td>
<td>5</td>
</tr>
<tr>
<td>Minutes Spent Active Daily</td>
<td>45</td>
<td>40.43</td>
<td>69.5</td>
<td>1</td>
</tr>
<tr>
<td>Food Frequency Questionnaire Totala</td>
<td>31</td>
<td>150.8</td>
<td>27.8</td>
<td>1</td>
</tr>
<tr>
<td>Frequency of Vegetables</td>
<td>31</td>
<td>3.99</td>
<td>3.42</td>
<td>1</td>
</tr>
<tr>
<td>Frequency of Whole Grains Consumed</td>
<td>31</td>
<td>0.94</td>
<td>0.80</td>
<td>1</td>
</tr>
<tr>
<td>Frequency of Fruit Consumed</td>
<td>31</td>
<td>2.28</td>
<td>2.40</td>
<td>1</td>
</tr>
<tr>
<td>24 Hour Diet Recall Totalb</td>
<td>41</td>
<td>255.3</td>
<td>15.2</td>
<td>7</td>
</tr>
<tr>
<td>% Calories from Total Fat</td>
<td>41</td>
<td>35.95</td>
<td>7.84</td>
<td>0</td>
</tr>
<tr>
<td>% Calories from Monounsaturated Fat</td>
<td>41</td>
<td>13.12</td>
<td>3.37</td>
<td>0</td>
</tr>
<tr>
<td>Grams of Fiber per 1000 Calories</td>
<td>41</td>
<td>9.40</td>
<td>3.88</td>
<td>0</td>
</tr>
<tr>
<td>% Calories from Carbohydrates</td>
<td>41</td>
<td>47.01</td>
<td>9.01</td>
<td>0</td>
</tr>
<tr>
<td>% Calories from Protein</td>
<td>41</td>
<td>17.50</td>
<td>4.30</td>
<td>0</td>
</tr>
<tr>
<td>Diet Behavior Mean (Reverse Score)</td>
<td>42</td>
<td>2.96</td>
<td>1.31</td>
<td>2</td>
</tr>
<tr>
<td>Mean Nutrition Scorec</td>
<td>40</td>
<td>155.0</td>
<td>15.2</td>
<td>4</td>
</tr>
</tbody>
</table>

a. Composite score of transformed FFQ variables.
b. Composite score of transformed 24 Hour Diet Recall variables.
c. Composite score of at least 2 of 3 variables: FFQ Total, 24 Hour Diet Recall, and/or Diet Behavior Mean (Reverse Score).

Depression

In the overall sample, only four individuals met DSM-IV-TR criteria for Major Depressive Disorder, all of whom were in the diabetic group. As indicated in Table 9, chi-square test for independence indicated an association between DM status and meeting DSM-IV-TR criteria for MDD, $\chi^2 (1, n = 902) = 4.02, p = .05, \phi = -.07.$
Although the phi statistic was small, these findings can still be interpreted as highly clinically relevant.

Table 9

*DSM-IV-TR Criteria for Depression*

<table>
<thead>
<tr>
<th></th>
<th>Diabetic Individuals</th>
<th>Non-Diabetic Individuals</th>
<th>Total</th>
<th>$\chi^2$</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does Not Meet Criteria</td>
<td>447 (49.6%)</td>
<td>451 (50.0%)</td>
<td>898 (99.6%)</td>
<td>4.02</td>
<td>.05</td>
</tr>
<tr>
<td>Meets Criteria</td>
<td>4 (0.4%)</td>
<td>0 (0.0%)</td>
<td>4 (0.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>451 (50.0%)</td>
<td>451 (50.0%)</td>
<td>902 (100.0%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sixty-eight individuals met CDC criteria for depression with 47 of those individuals also being in the diabetic group. A chi-square test for independence indicated a significant association between DM status and meeting CDC criteria for depression, $\chi^2 (1, n = 902) = 10.75$, $p < 0.01$, phi = -.11 (Table 10). Again, although the phi statistic was relatively small, these findings can still be interpreted as highly clinically relevant.

Table 10

*CDC Criteria for Depression*

<table>
<thead>
<tr>
<th></th>
<th>Diabetic Individuals</th>
<th>Non-Diabetic Individuals</th>
<th>Total</th>
<th>$\chi^2$</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does Not Meet Criteria</td>
<td>404 (44.8%)</td>
<td>430 (47.7%)</td>
<td>834 (92.5%)</td>
<td>10.75</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Meets Criteria</td>
<td>47 (5.2%)</td>
<td>21 (2.3%)</td>
<td>68 (7.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>451 (50.0%)</td>
<td>451 (50.0%)</td>
<td>902 (100.0%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As expected, similar to the general population, gender differences were observed in depression scores; women experienced significantly higher depression than did men. Although diabetic women experienced the highest scores on the PHQ-9 \( m = 0.53 \), the interaction between gender and DM status did not reach significance, but there did appear to be a trend (Table 11). Levene’s Test of Equality of Error Variances was significant which indicates the assumption of homogeneity of variances was violated, \( F (1, 825) = 36.40, p < .01 \). When daily activity and nutrition behaviors were included as covariates and the analyses were repeated, no new information was observed.

Table 11

*Depression Differences between Diabetes Status and Gender*

<table>
<thead>
<tr>
<th>DM Status</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic Individuals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>202</td>
<td>0.33</td>
<td>0.47</td>
</tr>
<tr>
<td>Female</td>
<td>193</td>
<td>0.53</td>
<td>0.56</td>
</tr>
<tr>
<td>Total</td>
<td>395</td>
<td>0.43</td>
<td>0.53</td>
</tr>
<tr>
<td>Non-Diabetic Individuals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>217</td>
<td>0.21</td>
<td>0.37</td>
</tr>
<tr>
<td>Female</td>
<td>215</td>
<td>0.29</td>
<td>0.38</td>
</tr>
<tr>
<td>Total</td>
<td>432</td>
<td>0.25</td>
<td>0.38</td>
</tr>
<tr>
<td>Total</td>
<td>827</td>
<td>0.33</td>
<td>0.46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>F</th>
<th>P-Value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM Status</td>
<td>31.77</td>
<td>&lt; .01</td>
<td>.04</td>
</tr>
<tr>
<td>Gender</td>
<td>19.60</td>
<td>&lt; .01</td>
<td>.02</td>
</tr>
<tr>
<td>Interaction</td>
<td>3.43</td>
<td>.06</td>
<td>.00</td>
</tr>
</tbody>
</table>

A Two-way between-groups analysis of variance revealed no significant differences of depression scores observed between racial/ethnic groups (Table 12). Levine’s test of equality of error variances indicated that this assumption was violated, \( F (5, 821) = 11.58, p < .01 \).
Table 12

*Depression Differences between DM Status and Race/Ethnicity*

<table>
<thead>
<tr>
<th>DM Status</th>
<th>Race/Ethnicity</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic Individuals</td>
<td>Mexican American</td>
<td>99</td>
<td>0.40</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>European American</td>
<td>154</td>
<td>0.40</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>African American</td>
<td>142</td>
<td>0.48</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>395</td>
<td>0.43</td>
<td>0.53</td>
</tr>
<tr>
<td>Non-Diabetic Individuals</td>
<td>Mexican American</td>
<td>104</td>
<td>0.23</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>European American</td>
<td>186</td>
<td>0.23</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>African American</td>
<td>142</td>
<td>0.30</td>
<td>0.47</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>432</td>
<td>0.25</td>
<td>0.38</td>
</tr>
<tr>
<td>Total</td>
<td>Mexican American</td>
<td>203</td>
<td>0.31</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>European American</td>
<td>340</td>
<td>0.31</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>African American</td>
<td>284</td>
<td>0.39</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>827</td>
<td>0.34</td>
<td>0.46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>F</th>
<th>p-Value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM Status</td>
<td>28.06</td>
<td>&lt; .01</td>
<td>.03</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>2.41</td>
<td>.09</td>
<td>.01</td>
</tr>
<tr>
<td>Interaction</td>
<td>0.00</td>
<td>1.00</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note: Post hoc group comparisons did not reveal group differences.

In a One-way ANOVA (Table 13) no significant differences were observed in depression scores between type of management utilized by diabetic individuals, neither insulin nor oral medications, both insulin and oral medications, oral medications only, and insulin only. A second One-way ANOVA was performed with HbA1c as a covariate, however, again no differences were observed. Preliminary checks were conducted to ensure that there was no violation of the assumptions of normality, linearity, and homogeneity of variances.
Table 13

*Depression between DM Management*

<table>
<thead>
<tr>
<th>DM Management</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>f</th>
<th>p-value</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both Insulin and Oral Medications</td>
<td>59</td>
<td>0.45</td>
<td>0.64</td>
<td>0.73</td>
<td>.54</td>
<td>.01</td>
</tr>
<tr>
<td>No Management</td>
<td>53</td>
<td>0.48</td>
<td>0.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulin Only</td>
<td>66</td>
<td>0.48</td>
<td>0.47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Medications Only</td>
<td>217</td>
<td>0.39</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Diabetic Individuals</td>
<td>395</td>
<td>0.43</td>
<td>0.53</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note:* Post hoc group comparisons did not reveal group differences.

**Tests of Hypotheses**

The above analyses were atheoretical assessments of the relationships between variables as well as potential differences in depression between diabetic and non-diabetic groups, gender, and racial/ethnic groups. The following analyses were used to assess the remaining proposed hypotheses.

*Logistic Regression*

Direct logistic regression was performed to assess physical activity and nutrition’s likelihood to predict that diabetic and non-diabetic individuals would meet CDC criteria for depression. Both models for the diabetic and non-diabetic groups were significant, diabetic individuals $\chi^2 (2, N = 402) = 16.18, p < .01$, and non-diabetic individuals $\chi^2 (2, N = 430) = 20.92, p < .01$. The amount of time spent active daily was the only significant variable in the model with an odds ratio of .98 and .95 respectively. However, these odds ratios, although significant, are very close to 1.00, which suggests this significant result was due to the large sample size. Thus, this result was judged to have no clinical meaningfulness.
The above group analyses were repeated only in the diabetic group because only four of the diabetic individuals met the criteria for MDD. Although the model was again significant, \( \chi^2 (2, N = 402) = 9.70, p = .01 \), again the size of the odds ratios are small and again the small significant result for time spent active daily was not clinically relevant.

**Multiple Regression, Mediation, and Moderation**

A One-Way ANCOVA indicated that the differences in depression scores between diabetic and non-diabetic individuals was not changed when nutrition behaviors and daily activity was statistically controlled, \( F (3, 791) = 23.70, p < .01 \). Levine’s test of equality of error variances indicated that this assumption was violated, \( F (1,793) = 23.93, p < .01 \).

Although there was no relationship observed between depression and HbA1c levels, hierarchical multiple regression was used to assess the ability of nutrition behaviors and daily activity to predict HbA1c levels when depression scores are controlled for, in diabetic individual.\(^1\) No new information was observed when depression was statistically controlled.

Because a relationship was observed between age and HbA1c, in the overall sample and for the diabetic group (Table 6), hierarchical multiple regression was used to control for age and assess the ability of depression to predict HbA1c glycemic control.

\(^1\) As an exploratory test, the differences in depression scores were also assessed between diabetic and non-diabetic individuals who met CDC criteria for depression to determine if either group experienced greater depression scores. No significant differences were observed, \( F (1, 66) = .133, p = .72 \).
After age was controlled for, no new information was observed when depression was input as a predictor of the variance of HbA1c levels, $F$ change $(1, 375) = .01, p = .93$.

A cross-products model was performed to assess for possible moderation of depression on HbA1c, with daily activity as the moderator. The daily activity and depression variables were centered and an interaction variable was computed. Hierarchical regression was then performed with HbA1c as the dependent variable and the centered variables for daily activity and depression as the independent variables in the first step, $F (2, 375) = .25, p = .78$. Centered variables and the interaction variable were then entered as the independent variables in the second step, $F (3, 374) = .37, p = .78$. These analyses did not indicate the presence of moderation and thus did not appear to be clinically relevant.

A similar cross-products model was performed to assess for possible moderation of depression on HbA1c, with nutrition behaviors as the moderator. First, the nutrition behaviors construct was assessed as a moderator of the relationship between depression and HbA1c levels. The nutrition behaviors construct and depression variables were centered and an interaction variable was computed. Hierarchical regression was then performed with HbA1c as the dependent variable and the centered variables for nutrition behaviors and depression as the independent variables in the first step, $F (2, 360) = .05, p = .95$. The centered variables and the interaction variable were then entered as the independent variables in the second step, $F (3, 359) = .07, p = .98$. These analyses did not indicate the presence of moderation and thus did not appear to be clinically relevant.
The Baron and Kenny (1986) method was followed to assess for the possible mediation of the relationship of depression and HbA$_1$c using daily activity and nutrition behaviors as the mediator variables. First, multiple regression was used to assess the amount of variance in HbA$_1$c accounted for by depression, however, this model was not significant, $F (1, 376) = 0.03$, $p = .87$. Although the model was not significant, the Baron and Kenny (1986) method was still utilized to examine the possible presence of suppressors, because depression was observed to account for a significant amount of the variance in daily physical activity, $F (1, 393) = 12.00$, $p < .01$. A third multiple regression model with depression and physical activity as the independent variables and HbA$_1$c as the dependent variable was performed, however, did not indicate the possibility of suppressors, $F (2, 375) = 0.25$, $p = .78$.

The Baron and Kenny (1986) method was again used to assess for mediation of depression and HbA$_1$c, with the nutrition behaviors construct as the mediator. Again, these models did not indicate depression accounted for a significant amount of the variance in nutrition behaviors, $F (1, 367) = 1.14$, $p = .29$. The third multiple regression model, with depression and nutrition behaviors as the independent variables and HbA$_1$c, did not indicate the presence of mediation or suppressors, $F (2, 360) = 0.05$, $p = .95$. 
CHAPTER 4

DISCUSSION

Discussion of Hypotheses

As expected, in our matched sample, a greater number of diabetic individuals met criteria for major depressive disorder (MDD) and the Centers for Disease Control and Prevention (CDC) criteria for depression. In fact, only four individuals in our sample met Diagnostic and Statistics Manual, Fourth Edition, Text Revised (DSM-IV-TR) criteria for MDD, all of whom were also in the diabetic group. These findings are in keeping with the literature that diabetic individuals present a greater prevalence of clinically relevant depression and are more likely to meet the stricter DSM-IV-TR criteria of MDD (Anderson et al 2001; de Groot et al, 2001; Egede & Zheng, 2003; Gavard, et al., 1993).

Contrary to previous research (Christ et al., 2002; Nassis et al., 2005, Rodnick et al., 1990, Short et al., 2003), there was no observed relationship between physical activity and glycemic control in the diabetic group. This was interesting because the mean amount of reported daily activity in the diabetic individuals in this study, 40 minutes, was about twice as high as the recommended daily amount, 21 minutes (Finkelstein, 2008). However, the current study did not assess the intensity of the daily physical activity, which may play a factor in the ability to regulate blood glucose levels. There has also been some indication in the literature that there may be some difficulty in observing a relationship between diabetic glycemic control and physical activity outside of a research intervention (Miller & Dunstan, 2004) and the current study was a normative baseline level of activity for diabetic individuals.
The relationship between physical activity and glycemic control may also be contingent upon whether the individual was diagnosed with Type 1 or Type 2 DM (Miller & Dunstan, 2004; Ligtenberg et al., 1999). Because the prevalence of Type 1 diagnoses is only 10% of the population diagnosed with DM, type of diagnosis may not have been much of a factor in the current study, as likely 90% had Type 2 DM, although the study questionnaire did not ask to differentiate.

In addition, as predicted, there was an observed relationship between better glycemic control and the increase frequency of fruits and vegetables consumed. This is in line with the research of Wolever, Jenkins, Jenkins, and Josee (1991) that found that lower blood glucose spikes were associated with the consumption of carbohydrates from fruits and other sources of unrefined carbohydrates.

Contrary to the proposed hypotheses differences in depression symptoms between diabetic and non-diabetic individuals did not decrease when controlling for nutrition, diet behaviors, and daily physical activity. Thus, there were no findings to support the notion that variability in daily activity and nutrition behaviors was associated with the greater amount of depression experienced by diabetic individuals. In addition, contrary to the proposed hypotheses nutrition, diet behaviors and physical activity did not account for any variability in glycemic control when depression was controlled. This finding can be attributed to the lack of relationship observed between daily activity and glycemic control and depression and glycemic control.

In addition, contrary to the proposed hypotheses and previous research (Egede et al., 2009; Lustman et al. 2000; Mazze et al., 1984), there was no observed relationship between glycemic control and depression scores in diabetic individuals and
nutrition behaviors, diet behaviors, and physical activity did not appear to moderate or mediate the relationship. However, because the relationship between depression and glycemic control was not observed in this study as it had in previous research (Lustman et al., 2000; Mazze et al., 1984), these current findings should be interpreted with caution. In their meta-analysis of the relationship of depression on glycemic control, Lustmen et al., (2000) noted that larger effect sizes for this relationship appeared to be associated with more structured and standardized interviews rather than self-report measures. The PHQ-9 was computer administered, which indicates the use of professionally administered standardized interview measures of depression may be more sensitive and thus more likely to demonstrate the relationship between depression and glycemic control. As with professionally administered standardized clinical interviews, this may be because of the ability of clinicians to clarify more ambiguous interview questions.

Additional Findings

Although there were no differences between diabetic and non-diabetic individuals in the frequency of fruits, vegetables, and whole grains consumed, there were differences observed between diabetic and non-diabetic individuals in the amount of calories from the macronutrients and the amount of fiber consumed. This finding may indicate that diabetic individuals consumed a greater amount of calories from total fats, monounsaturated fats, and proteins as well as a greater amount of fiber per 1000 calories consumed. The analyses also indicated that diabetic individuals consumed fewer calories from carbohydrates than did non-diabetic individuals.
About half of diabetic individuals consumed the recommended amount of calories from fats and carbohydrates and a little over two thirds of these individuals consumed the recommended amount of calories from proteins. This is encouraging because diet is considered a critical component of proper DM care, especially the consumption of proteins, because of the increased risk of kidney damage (Robertson et al., 2007; Waugh & Robertson, 2000). The majority of individuals that were outside the range of recommended consumption were considered to be in the “above” range category for the consumption of fats and proteins, and for the “below” range category for carbohydrates. However, the larger number of individuals that are not within the recommended amount of calories consumed from carbohydrates and fats is cause for concern because of health problems that can occur due to under consumption of carbohydrates and overconsumption of fats such as hypoglycemia (Garg, Grundy, & Koffler, 1992) and increased risk of comorbid obesity (Bray & Popkin, 1998). Although the majority of individuals were within the recommended range of protein consumption, the fact that 18% of diabetic individuals were above the recommended range is also a concern because greater consumption of proteins increases the risk of the development of renal disease (Robertson et al., 2007; Waugh & Robertson, 2000).

Another interesting finding is that differences in depression were not observed relative to the type of management, whether oral medications, insulin, both, or no medical management was used. Type of DM management can be used as a rough surrogate of assessment of the progression of Type 2 DM (Mazze et al., 2004), for example, Type 2 diabetic individuals could be assumed to have highly progressed DM if they utilize both insulin and oral medications. This finding indicates that individuals,
whose disease is more progressed, may not experience greater depression. Because
of the expected prevalence of Type 1 diabetic individuals to make up about 10% of the
diabetic group in these analyses, this finding may be obscured by the unknown mixture
of individuals with Type 1 and Type 2 in the insulin dependent diabetic individuals in this
sample. Future research may utilize longitudinal data to better assess this finding.

Diabetic individuals also report paying greater attention to nutrition labels when
making food choices than non-diabetic individuals. This is in support of the literature
that indicated diabetic individuals utilize food nutrition labels more than non-diabetic
individuals (Antonuk & Block, 2006; Kessler & Wunderlich, 1999). The analyses
indicate that diabetic individuals utilize nutrition labels to assess the fat and fiber content
of the foods they choose. The association of food nutrition labels and fats is in keeping
with the research of Neuhouser et al. (1999) and Satia et al. (2005); however, to the
knowledge of the researcher, the association of the increase in fiber content of food
choices with the increase of utilization of food nutrition labels has not been assessed in
the literature. One hypothesis for the decrease of fat intake with the increased utilization
of food nutrition labels could be due to the fact that most diabetic individuals are
diagnosed with Type 2 DM, and it’s comorbidity with obesity, greater emphasis is put on
the amount of fats consumed in the diet because of attempts to reduce weight by
restricting fat intake. However, there is a suggestion that although diabetic individuals
pay attention to the amount of fats they are consuming, they may not be paying
attention to the amount of “good” fats and just attending to the total amount of fat in the
foods. Even though the relationship between utilization of nutrition labels exists, as
stated earlier, almost half of diabetic individuals consume greater amounts of fats than
recommended. Also, the lack of relationship between the utilization of nutrition labels and the consumption of carbohydrates and proteins is cause for concern. This may indicate that too great of emphasis is being placed on weight loss and monitoring of fats in diabetic individuals and not enough emphasis on the monitoring of “good” fats, and monitoring of proteins and carbohydrates.

Clinical Implications

Although the directional relationship between diabetic glycemic control and depression has not been determined, it is hypothesized to be potentially bidirectional (Lustman et al., 2000). This bidirectional relationship has great clinical implications due to the increase in complications that is associated both with the disease and comorbid depression (Anderson et al., 2001; Ciechanowski et al., 2003; Lin et al., 2010; Lustman et al., 2000; Nichols & Brown, 2003). Also, there is cause for concern that diabetic individuals not only experience greater depressive symptoms but, as was found here, are also more likely to meet the CDC criteria, and even stricter, DSM-IV-TR criteria, both a highly clinically relevant benchmark. This indicates that health care providers should be especially vigilant to assess for depression experienced by diabetic individuals.

In regards to health behaviors, although daily activity was not associated with better HbA1c glycemic control, the benefits of daily activity in individuals diagnosed with DM should not be discounted. For example, increased daily activity was associated with decreased depression scores in both diabetic and non-diabetic individuals. Although there cannot be determination of the direction of this relationship in these
current analyses, this finding indicates that an increase in daily activity may be an
important point of intervention in diabetic individuals with comorbid depression.

In addition, increased emphasis on utilization of nutrition labels may increase the
quality of food choices of diabetic individuals. Diabetic individuals attended to the total
amount of fat in their food choices and not the types of fats that may be more beneficial,
such as monounsaturated fats. This indicates there could be some benefit to education
on the types of fats that are beneficial. In addition, education on the usage of food
nutrition labels may assist in increasing the types of nutrients that diabetic individuals
attend to and could assist in the monitoring of the amount of proteins and carbohydrates
in addition to fats present in foods.

Advantages and Limitations of this Study

Some advantages of the current study include the use of the NHANES 2005-
2006 database, which is nationally collected and represents a population probably
dataset. In addition, the diabetic group in this research closely reflected national
statistics of individuals diagnosed with DM as well as CDC of medication usage in
diabetic individuals (CDC, 2008). The mean age of diabetic individuals in the current
sample was approximately 60 years. This also closely matched NIDDK estimates that
about half of individuals diagnosed with DM are 60 years of age and older.

The mean of HbA$_{1c}$ levels falls slightly above the recommended level for
adequate control, 7.43% mg/dL. As expected, about one-third of the diabetic individuals
had an HbA$_{1c}$ level of 8% mg/dL or greater. This is another indicator that our sample
closely matched previous research findings (Harris et al., 1999). Also, in keeping with
the literature, differences in depression were found between men and women
(Anderson et al., 2001). However, because the entire NHANES 2005-2006 dataset was not used, a limitation of the current research includes the inability to determine if the diabetic sample reflected racial/ethnic prevalence differences observed in previous research.

Although the NHANES 2005-2006 data set is of high quality, the strength of the relationships found between the variables may indicate the size of the sample played a role in these findings. In addition, because this particular questionnaire cannot determine the source of carbohydrates, whether from healthier sources such as whole grains, vegetables, and fruits or from sources, which are considered to be less healthy, such as refined grains, deserts, and sodas, there is a limitation on the way the relationship between depression and carbohydrates can be determined good or bad. Such limitations as this are often present in large archival datasets.

Another limitation is the diabetes questionnaire did not assess whether individuals who were not engaging in medical management using insulin or oral medications to control their disease were doing nothing or were attempting to, or were able to, gain control or a relatively borderline diabetic diagnosis with diet, weight management and exercise. Because of this limitation, no interpretations can be made as to whether there were differences in depression between individuals who may or may not attempt to control their disease with diet and exercise alone.

Conclusions

Diabetic individuals exhibited several differences from non-diabetic individuals in their nutrition behaviors, including the utilization of nutrition labels to make food choices and the consumption of various macronutrients. However, there did not appear to be
any relationship between these behaviors, daily activity, and the greater depression symptoms experienced by diabetic individuals. This is not to say that these health behaviors are not important. They should still be thoroughly assessed by health care providers when caring for diabetic individuals.
APPENDIX A

DIABETES QUESTIONNAIRE
DIABETES – DIQ
Target Group: SPs 1+

DIQ.010 {Other than during pregnancy, {have you/has SP} [(Have you/Has SP)] ever been told by a doctor or other health professional that {you have/(he/she/SP) has} diabetes or sugar diabetes?

CAPI INSTRUCTION:
IF SP AGE < 15, DISPLAY "HAS SP" FOR THE FIRST DISPLAY AND "SP HAS" FOR THE SECOND DISPLAY.
IF SP IS FEMALE AND AGE >= 20, DISPLAY "OTHER THAN DURING PREGNANCY, {HAVE YOU/HAS SP}"

YES ............................................................... 1
NO ................................................................. 2 (BOX 4)
BORDERLINE OR PREDIABETES ....................... 3 (BOX 4)
REFUSED ..................................................... 7 (BOX 4)
DON'T KNOW ................................................ 9 (BOX 4)

DIQ.040 How old {was SP/were you} when a doctor or other health professional first told {you/him/her} that {you/he/she} had diabetes or sugar diabetes?

|___|___|
Enter age in years

LESS THAN 1 YEAR ........................................ 666
REFUSED ..................................................... 777
DON'T KNOW ............................................... 999

BOX 6

CHECK ITEM DIQ.219:
IF AGE AT SCREENING MINUS AGE RECORDED AT DIQ.040 > 2, GO TO BOX 4.
OTHERWISE, CONTINUE.

DIQ.220 Was {your/his/her} diabetes diagnosed …

3 months ago or less, ................................. 1
More than 3 months ago but not more
than 6 months ago, ................................. 2
More than 6 months ago but not more
than 9 months ago, ................................. 3
More than 9 months ago but not more
than 12 months ago, or ............................ 4
More than 12 months ago? .......................... 5
REFUSED ..................................................... 7
DON'T KNOW ............................................. 9
CHECK ITEM DIQ.159:
IF AGE < 12, GO TO DIQ.050.
IF AGE >=12 AND DIQ.010 = 1 (YES), GO TO DIQ.190.
IF AGE >=12 AND DIQ.010 = 3, GO TO DIQ.170.
OTHERWISE, CONTINUE.

DIQ.160 {Have you/Has SP} ever been told by a doctor or other health professional that {you have/SP has} any of the following: prediabetes, impaired fasting glucose, impaired glucose tolerance, borderline diabetes or that {your/her/his} blood sugar is higher than normal but not high enough to be called diabetes or sugar diabetes?

CAPI INSTRUCTION:
HELP SCREEN: PREDIABETES, IMPAIRED FASTING GLUCOSE, IMPAIRED GLUCOSE TOLERANCE, OR BORDERLINE DIABETES OCCURS WHEN BLOOD SUGAR (GLUCOSE) LEVELS ARE HIGHER THAN NORMAL BUT NOT HIGH ENOUGH TO BE DIABETES.

YES ............................................................... 1
NO .................................................................... 2
REFUSED .......................................................... 7
DON'T KNOW .................................................. 9

HAND CARD DIQ1
Prediabetes
Impaired fasting glucose
Impaired glucose tolerance
Borderline diabetes

DIQ.170 {Have you/Has SP} ever been told by a doctor or other health professional that {you have/s/he has} health conditions or a medical or family history that increases {your/his/her} risk for diabetes?

YES ............................................................... 1
NO ................................................................. 2
REFUSED .......................................................... 7
DON'T KNOW .................................................. 9

DIQ.180 {Have you/Has SP} had a blood test for high blood sugar or diabetes within the past three years?

INTERVIEWER INSTRUCTION: DO NOT INCLUDE URINE TESTS

YES ............................................................... 1
NO ................................................................. 2
REFUSED .......................................................... 7
DON'T KNOW .................................................. 9
DIQ.190 To lower {your/his/her} risk for certain diseases, during the past 12 months { have you/has s/he} ever been told by a doctor or health professional to:

CAPI INSTRUCTION:
HELP SCREEN: CONT ROLLING YOUR WEIGH T MIGHT BE RECOMMENDED TO HELP PREVENT HIGH BLOOD PRESSURE, DIABETES, HIGH CHOLESTEROL AND OTHER CONDITIONS.

RESPONSES: YES = 1, NO = 2, REFUSED = 7, DON'T KNOW = 9

a. control {your/his/her} weight or lose weight? 

b. increase {your/his/her} physical activity or exercise?

c. reduce the amount of fat or calories in {your/his/her} diet?

DIQ.200 To lower {your/his/her} risk for certain diseases, {are you/is s/he} now doing any of the following:

CAPI INSTRUCTION:
HELP SCREEN: CONT ROLLING YOUR WEIGH T MIGHT BE RECOMMENDED TO HELP PREVENT HIGH BLOOD PRESSURE, DIABETES, HIGH CHOLESTEROL AND OTHER CONDITIONS.

RESPONSES: YES = 1, NO = 2, REFUSED = 7, DON'T KNOW = 9

a. controlling {your/his/her} weight or losing weight?

b. increasing {your/his/her} physical activity or exercise?

c. reducing the amount of fat or calories in {your/his/her} diet?

DIQ.050 {Is SP/Are you) now taking insulin?

YES ............................................................... 1
NO ............................................................. 2 (BOX 0)
REFUSED ..................................................... 7 (BOX 0)
DON'T KNOW ............................................... 9 (BOX 0)
For how long {have you/has SP} been taking insulin?

|___|___|___|
Enter number (of months or years)

Less than 1 month ......................... 666
Refused ........................................ 777
Don't know ................................. 999

Enter unit

Months ........................................ 1
Years .......................................... 2

DIQ.065: Check item DIQ.065:
If DIQ.010 = 1 (Yes) or DIQ.160 = 1 (Yes), continue.
Otherwise, go to end of section.

DIQ.070: Is SP/Are you now taking diabetic pills to lower {{his/her}/your} blood sugar? These are sometimes called oral agents or oral hypoglycemic agents.

Yes .............................................. 1
No .................................................. 2
Refused ......................................... 7
Don't know ................................. 9

BOX 1
Omitted

BOX 8
Check item DIQ.229:
If DIQ.160 = 1 (Yes), go to end of section.
Otherwise, continue.
DIQ.230 When was the last time (you/SP) saw a diabetes nurse educator or dietitian or nutritionist for (your/his/her) diabetes? Do not include doctors or other health professionals.

INTERVIEWER INSTRUCTION: CODE 5 FOR NEVER. IF RESPONDENT ANSWERS “TODAY” OR A PERIOD LESS THAN A MONTH, CODE 1 – THE 0-12 MONTH CATEGORY.

0-12 MONTHS: 1
13-24 MONTHS: 2
>2 TO 5 YEARS: 3
>5 YEARS: 4
NEVER: 5
REFUSED: 7
DON’T KNOW: 9

DIQ.240 Is there one doctor or other health professional (you usually see/SP usually sees) for (your/his/her) diabetes? Do not include specialists to whom (you have/SP has) been referred such as diabetes educators, dieticians or foot and eye doctors.

YES: 1
NO: 2 (DIQ.260)
REFUSED: 7 (DIQ.260)
DON’T KNOW: 9 (DIQ.260)

DIQ.250 How many times (have you/has SP) seen this doctor or other health professional in the past 12 months?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
ENTER NUMBER OF TIMES

CAPI INSTRUCTION:
HARD EDIT: DO NOT ALLOW 0.

NONE: 2
REFUSED: 7777
DON’T KNOW: 9999

CHECK ITEM DIQ.369:
IF DIQ.250 = 2 (NONE), CONTINUE. OTHERWISE, GO TO BOX 10.

BOX 9

DIQ.370 INTERVIEWER: YOU HAVE ENTERED “NONE” FOR THE NUMBER OF TIMES IN THE PAST 12 MONTHS THAT THE SP HAS SEEN THEIR USUAL DOCTOR OR OTHER HEALTH PROFESSIONAL. THIS IS AN UNLIKELY RESPONSE. IS THIS CORRECT?

YES: 1
NO: 2 (DIQ.250)
CHECK ITEM DIQ.379:
IF DIQ.250 = 100 OR MORE, CONTINUE.
OTHERWISE, GO TO DIQ.260.

INTerviewer: you have entered a value that is outside the expected range for the number of times in the past 12 months that the SP has seen their usual doctor or other health professional. This is an unlikely response. is this correct?

Yes ................................................................. 1
No ................................................................. 2 (DIQ.250)

DIQ.260
How often do you check your/does SP check his/her blood for glucose or sugar? Include times when checked by a family member or friend, but do not include times when checked by a doctor or other health professional.

INTERVIEWER INSTRUCTION: DO NOT INCLUDE URINE TESTS.

|___|___|___|
Enter number of times

CAPI INSTRUCTION: SOFT EDIT 30 OR MORE PER WEEK.

never ....................................................... 2
UNABLE TO DO ACTIVITY (BLIND) ............. 3
REFUSED .................................................. 7777
DON’T KNOW ............................................ 9999

Enter unit

PER DAY ...................................................... 1
PER WEEK .................................................. 2
PER MONTH ............................................... 3
PER YEAR .................................................. 4
Glycosylated hemoglobin or the “A one C” test measures the average level of blood sugar over the past 3 months, and usually ranges between 5 and 14. During the past 12 months, how many times has a doctor or other health professional checked (you/SP) for glycosylated hemoglobin or “A one C”?

ENTER NUMBER OF TIMES

CAPI INSTRUCTION: SOFT EDIT MORE THAN 13 TIMES.

NOT TESTED IN LAST 12 MONTHS........... 2 (DIQ.300)
NEVER HEARD OF A ONE C TEST........... 3 (DIQ.300)
DON’T KNOW HOW MANY TIMES .......... 4
REFUSED .............................................. 7777

What was (your/SP’s) last “A one C” level?

ENTER VALUE

REFUSED .............................................. 777
DON’T KNOW ........................................... 999

What does (your/SP’s) doctor or other health professional say (your/his/her) “A one C” level should be? (Pick the lowest level recommended by your health care professional.)

HAND CARD DIQ2

6 OR LESS............................................. 1
7 OR LESS............................................. 2
8 OR LESS............................................. 3
9 OR LESS............................................. 4
10 OR LESS........................................... 5
PROVIDER DID NOT SPECIFY GOAL........ 6
REFUSED .............................................. 77
DON’T KNOW ........................................... 99

BOX 10A

CHECK ITEM DIQ.295:
IF AGE <12, GO TO END OF SECTION.
OTHERWISE, CONTINUE.
Blood pressure is usually given as one number over another. What was your/SP’s most recent blood pressure in numbers?

CAPI INSTRUCTION:
SYSTOLIC VALUE HARD EDIT: 48-300, SOFT EDIT 80-200. DIASTOLIC VALUE HARD EDIT: 0-300, SOFT EDIT 0-150.

|___|___|___| OVER |___|___|___|
SYSTOLIC DIASTOLIC
ENTER VALUES

REFUSED .................................................. 7777
DON’T KNOW ............................................ 9999

What does your/SP’s doctor or other health professional say your/his/her blood pressure should be?

CAPI INSTRUCTION:
SYSTOLIC VALUE HARD EDIT: 48-300, SOFT EDIT 80-200. DIASTOLIC VALUE HARD EDIT: 0-300, SOFT EDIT 0-150.

|___|___|___| OVER |___|___|___|
SYSTOLIC DIASTOLIC
ENTER VALUES

INTERVIEWER INSTRUCTION. IF RANGE GIVEN, RECORD UPPER VALUE OF RANGE.

PROVIDER DID NOT SPECIFY GOAL......... 2
REFUSED .................................................. 7777
DON’T KNOW ............................................ 9999

One part of total serum cholesterol in your/SP’s blood is a bad cholesterol, called LDL, which builds up and clogs your/his/her arteries. What was your/his/her most recent LDL cholesterol number?

|___|___|___|
ENTER VALUE

CAPI INSTRUCTION:

NEVER HEARD OF LDL ......................... 2 (DIQ.335)
NEVER HAD CHOLESTEROL TEST .......... 3 (DIQ.335)
REFUSED .................................................. 7777
DON’T KNOW ............................................ 9999
DIQ.330  What does {your/SP’s} doctor or other health professional say {your/his/her} LDL cholesterol should be?

|___|___|
ENTER VALUE.

INTERVIEWER INSTRUCTION: IF RANGE GIVEN, RECORD UPPER VALUE OF RANGE.

CAPI INSTRUCTION:

PROVIDER DID NOT SPECIFY GOAL........  2
REFUSED .................................................. 7777
DON’T KNOW ............................................. 9999

DIQ.335  INTERVIEWER INSTRUCTION ONLY:
DOES THE SP HAVE BOTH FEET AMPUTATED?

YES .......................................................... 1 (DIQ.360)
NO ........................................................... 2

DIQ.340  During the past 12 months, about how many times has a doctor or other health professional checked {your/SP’s} feet for any sores or irritations?

|___|___|
ENTER NUMBER OF TIMES

CAPI INSTRUCTION:
HARD EDIT: DO NOT ALLOW 0.

NONE ........................................................ 2
REFUSED .................................................. 7777
DON’T KNOW/NOT SURE ......................... 9999

DIQ.350  How often {do you check your feet/does SP check (his/her) feet} for sores or irritations? Include times when checked by a family member or friend, but do not include times when checked by a doctor or other health professional.

|___|___|
ENTER NUMBER OF TIMES

NONE ........................................................ 2
REFUSED .................................................. 7777
DON’T KNOW ............................................. 9999

ENTER UNIT

PER DAY ..................................................... 1
PER WEEK .................................................. 2
PER MONTH ............................................... 3
PER YEAR .................................................. 4
When was the last time (you/SP) had an eye exam in which the pupils were dilated? This would have made (you/SP) temporarily sensitive to bright light.

- LESS THAN 1 MONTH ........................................... 1
- 1-12 MONTHS ................................................ 2
- 13-24 MONTHS ................................................ 3
- GREATER THAN 2 YEARS ..................................... 4
- NEVER ........................................................... 5
- REFUSED .......................................................... 7
- DON'T KNOW .................................................. 9

Has a doctor ever told (you/SP) that diabetes has affected (your/his/her) eyes or that (you/s/he) had retinopathy?

- YES ........................................................................ 1
- NO ......................................................................... 2
- REFUSED .................................................................. 7
- DON'T KNOW ...................................................... 9
APPENDIX B

DIET BEHAVIOR QUESTIONNAIRE
This is a composite questionnaire to accompany the data release. This questionnaire consists of the Diet Behavior Questionnaire (DBQ) instrument that was asked of all ages and a question (DBQ.091) that was asked of 12-15 year olds in the Weight History Questionnaire (WHQ) instrument.

For the complete WHQ instrument administered to 8-15 year olds, please refer to the following link at: http://www.cdc.gov/nchs/about/major/nhanes/nhanes2005-2006/questexam05_06.htm.
2005-06 Questionnaire

DIET BEHAVIOR AND NUTRITION - DBQ
Target Group: SPs Birth + (Questions grouped by age categories)

<table>
<thead>
<tr>
<th>BOX 1</th>
</tr>
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<tbody>
<tr>
<td>CHECK ITEM DBQ.005:</td>
</tr>
<tr>
<td>IF SP AGE &lt;= 6, CONTINUE.</td>
</tr>
<tr>
<td>OTHERWISE, GO TO BOX 2.</td>
</tr>
</tbody>
</table>

DBQ.010  Now I'm going to ask you some general questions about (SP's) eating habits.

Was (SP) ever breastfed or fed breastmilk?

| YES ............................................................... 1 |
| NO ................................................................. 2 (DBQ.040) |
| REFUSED ..................................................... 7 (DBQ.040) |
| DONT KNOW ................................................ 9 (DBQ.040) |

DBQ.020  How old was (SP) when (he/she) was first fed something other than breastmilk or water?

INCLUDE FORMULA, JUICE, SOLID FOODS

<table>
<thead>
<tr>
<th>ENTER AGE IN DAYS, WEEKS, MONTHS OR YEARS</th>
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<tbody>
<tr>
<td>NEVER .......................................................... 2 (BOX 2)</td>
</tr>
<tr>
<td>REFUSED ..................................................... 777 (BOX 2)</td>
</tr>
<tr>
<td>DONT KNOW ................................................ 999 (BOX 2)</td>
</tr>
</tbody>
</table>

ENTER UNIT

| DAYS ............................................................. 1 |
| WEEKS ......................................................... 2 |
| MONTHS ....................................................... 3 |
| YEARS .......................................................... 4 |
| REFUSED ..................................................... 7 |
| DONT KNOW ................................................ 9 |

DBQ.030  How old was (SP) when (he/she) completely stopped breastfeeding or being fed breastmilk?

<table>
<thead>
<tr>
<th>ENTER AGE IN DAYS, WEEKS, MONTHS OR YEARS</th>
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<tbody>
<tr>
<td>STILL BREASTFEEDING ........................ 6666</td>
</tr>
<tr>
<td>REFUSED ..................................................... 7777</td>
</tr>
<tr>
<td>DONT KNOW ................................................ 9999</td>
</tr>
</tbody>
</table>

ENTER UNIT

| DAYS ............................................................. 1 |
| WEEKS ......................................................... 2 |
| MONTHS ....................................................... 3 |
| YEARS .......................................................... 4 |
| REFUSED ..................................................... 7 |
| DONT KNOW ................................................ 9 |
DBQ.040  How old was (SP) when (he/she) was first fed formula on a daily basis?

INCLUDE CHILDREN RECEIVING FORMULA AND THOSE RECEIVING FORMULA AND BREASTMILK AT THE SAME TIME

<p>| | | | |</p>
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</table>

ENTER AGE IN DAYS, WEEKS, MONTHS OR YEARS

NEVER ON A DAILY BASIS..................  2 (DBQ.060)
REFUSED ............................................... 7777
DON'T KNOW ....................................... 9999

ENTER UNIT

DAYS............................................................. 1
WEEKS ......................................................... 2
MONTHS....................................................... 3
YEARS .......................................................... 4
REFUSED..................................................... 7
DON'T KNOW ............................................... 9

DBQ.050  How old was (SP) when (he/she) completely stopped drinking formula?

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ENTER AGE IN DAYS, WEEKS, MONTHS OR YEARS

STILL DRINKING FORMULA..............  6666
REFUSED ............................................... 7777
DON'T KNOW ....................................... 9999

ENTER UNIT

DAYS............................................................. 1
WEEKS ......................................................... 2
MONTHS....................................................... 3
YEARS .......................................................... 4
REFUSED..................................................... 7
DON'T KNOW ............................................... 9
DBQ.060  How old was (SP) when (he/she) was first fed milk on a daily basis?

INCLUDE LACTAID AS MILK
DO NOT INCLUDE BREASTMILK OR FORMULA

ENTER AGE IN DAYS, WEEKS, MONTHS OR YEARS
NEVER ON A DAILY BASIS......................... 2 (DBQ.080)
REFUSED ........................................... 7777
DON'T KNOW ................................. 9999

ENTER UNIT
DAYS............................................................. 1
WEEKS ......................................................... 2
MONTHS..................................................... 3
YEARS .......................................................... 4
REFUSED .................................................... 7
DON'T KNOW ................................. 9

DBQ.072  What type of milk was (SP) first fed on a daily basis? Was it . . .

CODE ALL THAT APPLY

whole or regular, ............................................. 10
2% fat or reduced-fat milk.......................... 11
1% fat or low-fat milk (includes 0.5% fat milk or
"low-fat milk" not further specified), .......... 12
fat-free, skim or nonfat milk or .................. 13
another type? ............................................ 30
REFUSED .................................................. 77
DON'T KNOW ............................................. 99

DBQ.080  How old was (SP) when (he/she) started eating solid foods [such as strained foods like baby food or any other non-liquid foods] on a daily basis?

ENTER AGE IN DAYS, WEEKS, MONTHS OR YEARS
NEVER ON A DAILY BASIS......................... 2
REFUSED ............................................. 7777
DON'T KNOW ................................. 9999

ENTER UNIT
DAYS............................................................. 1
WEEKS ......................................................... 2
MONTHS..................................................... 3
YEARS .......................................................... 4
REFUSED .................................................... 7
DON'T KNOW ................................. 9
Next I have some questions about (your/SP's) eating habits.

In general, how healthy is (your/his/her) overall diet? Would you say . . .

- excellent, ....................................................... 1
- very good, ...................................................... 2
- good, ............................................................. 3
- fair, or ............................................................ 4
- poor? ............................................................. 5
- REFUSED ..................................................... 7
- DON'T KNOW ............................................... 9
(Next I have some questions about {SP’s} eating habits.)

(First/Next) I’m going to ask a few questions about milk products. Do not include their use in cooking.

In the past 30 days, how often did {you/SP} have milk to drink or on {your/his/her} cereal? Please include chocolate and other flavored milks as well as hot cocoa made with milk. Do not count small amounts of milk added to coffee or tea. Would you say . . .

HAND CARD DBQ1

CAPI INSTRUCTION:
THIS SHOULD NOT BE A GATE QUESTION ANYMORE.
CAPI DISPLAY INSTRUCTIONS: IF SP AGE 7-15 YEARS OLD, DISPLAY “(Next I have some questions about {SP’s} eating habits.) First, I’m going to ask about milk products. Do not include their use in cooking.
IF SP AGE <= 6 OR >= 16 YEARS OLD. DISPLAY “Next I’m going to ask a few questions about milk products. Do not include their use in cooking.”

never, ............................................................ 0 (BOX 6)
rarely – less than once a week, ..................... 1
sometimes – once a week or more, but
  less than once a day, or .............................. 2
often – once a day or more? .......................... 3
VARIED ......................................................... 4
REFUSED ..................................................... 7 (BOX 6)
DON’T KNOW ............................................... 9 (BOX 6)

DBQ.222 What type of milk was it? Was it usually . . .

IF RESPONDENT CANNOT PROVIDE USUAL TYPE, CODE ALL THAT APPLY

whole or regular, ........................................... 10
2% fat or reduced-fat milk .............................. 11
1% fat or low-fat milk (includes 0.5% fat milk or
  “low-fat milk” not further specified) .......... 12
  fat-free, skim or nonfat milk or .......... 13
another type? ............................................. 30
REFUSED ..................................................... 77
DON’T KNOW ............................................... 99

CHECK ITEM DBQ.225:
IF SP AGE => 20, CONTINUE.
OTHERWISE, GO TO BOX 9.
The next question is about regular milk use.

A regular milk drinker is someone who uses any type of milk at least 5 times a week. Using this definition, which statement best describes you?

HAND CARD DBQ2

1. I've been a regular milk drinker for most or all of my life, including my childhood;

2. I've never been a regular milk drinker;

3. My milk drinking has varied over my life – sometimes I've been a regular milk drinker and sometimes I haven't;

4. REFUSED;

5. DON'T KNOW.
Now, I’m going to ask you how often {you/SP} drank milk at different times in {your/his/her} life.

How often did {you/SP} drink any type of milk, including milk added to cereal, when {you were/s/he was} . . .

HAND CARD DBQ3

IF NECESSARY, PROBE FOR USUAL OR MOST COMMON AMOUNT FOR THIS TIME PERIOD

CAPI INSTRUCTION: THESE (A-C) SHOULD NOT BE GATE QUESTIONS ANYMORE.

a. a child between the ages of 5 and 12 years old? Would you say . . .

never, ............................................................ 0
rarely – less than once a week, ..................... 1
sometimes – once a week or more, but
less than once a day, or......................... 2
often – once a day or more?..................... 3
VARIED ......................................................... 4
REFUSED ..................................................... 7
DON’T KNOW ............................................... 9

b. a teenager between the ages of 13 and 17 years old? Would you say . . .

never, ............................................................ 0
rarely – less than once a week, ..................... 1
sometimes – once a week or more, but
less than once a day, or......................... 2
often – once a day or more?..................... 3
VARIED ......................................................... 4
REFUSED ..................................................... 7
DON’T KNOW ............................................... 9

c. a young adult between the ages of 18 and 35 years old? Would you say . . .

never, ............................................................ 0
rarely – less than once a week, ..................... 1
sometimes – once a week or more, but
less than once a day, or......................... 2
often – once a day or more?..................... 3
VARIED ......................................................... 4
REFUSED ..................................................... 7
DON’T KNOW ............................................... 9

BOX 8A

CHECK ITEM DBQ.265A:
IF SP AGE >= 60, CONTINUE.
OTHERWISE, GO TO BOX 11.
DBQ.301 The next questions are about meals provided by community or government programs.

In the past 12 months, did (you/SP) receive any meals delivered to (your/his/her) home from community programs, “Meals on Wheels”, or any other programs?

YES ............................................................... 1
NO ................................................................. 2
REFUSED .......................................................... 7
DON’T KNOW .................................................. 9

DBQ.330 In the past 12 months, did (you/SP) go to a community program or senior center to eat prepared meals?

INCLUDE ADULT DAY CARE

YES ............................................................... 1
NO ................................................................. 2
REFUSED .......................................................... 7
DON’T KNOW .................................................. 9

BOX 8B
CHECK ITEM DBQ.335:
GO TO BOX 11.

BOX 9
CHECK ITEM DBQ.355:
IF SP AGE 4-19, CONTINUE.
OTHERWISE, GO TO BOX 10.

DBQ.360 During the school year, (do you/does SP) attend a kindergarten, grade school, junior or high school?

YES ............................................................... 1
NO ................................................................. 2 (BOX 10)
REFUSED .......................................................... 7 (BOX 10)
DON’T KNOW .................................................. 9 (BOX 10)

DBQ.370 Does (your/SP’s) school serve school lunches? These are complete lunches that cost the same every day.

YES ............................................................... 1
NO ................................................................. 2 (DBQ.400)
REFUSED .......................................................... 7 (DBQ.400)
DON’T KNOW .................................................. 9 (DBQ.400)
During the school year, about how many times a week (do you/does SP) usually get a complete school lunch?

ENTER NUMBER OF TIMES

NONE ............................................................ 2 (DBQ.400)
REFUSED ..................................................... 7 (DBQ 400)
DON'T KNOW ............................................... 9 (DBQ.400)

(Do you/Does SP) get these lunches free, at a reduced price, or (do you/does he/she) pay full price?

FREE ............................................................. 1
REDUCED PRICE ........................................... 2
FULL PRICE ................................................... 3
REFUSED ..................................................... 7
DON'T KNOW ............................................... 9

Does {your/SP's} school serve a complete breakfast that costs the same every day?

YES ............................................................... 1
NO ................................................................. 2 (BOX 9A)
REFUSED ..................................................... 7 (BOX 9A)
DON'T KNOW ............................................... 9 (BOX 9A)

During the school year, about how many times a week (do you/does SP) usually get a complete breakfast at school?

ENTER NUMBER OF TIMES

NONE ............................................................ 2 (BOX 9A)
REFUSED ..................................................... 7 (BOX 9A)
DON'T KNOW ............................................... 9 (BOX 9A)

(Do you/Does SP) get these breakfasts free, at a reduced price, or (do you/does he/she) pay full price?

FREE ............................................................. 1
REDUCED PRICE ........................................... 2
FULL PRICE ................................................... 3
REFUSED ..................................................... 7
DON'T KNOW ............................................... 9

CHECK ITEM DBQ.422:
IF DBQ.390 = CODE 1 OR CODE 2 OR DBQ.421 = CODE 1 OR CODE 2, CONTINUE.
OTHERWISE, GO TO BOX 10.
(Do you/Does SP) get a free or reduced price meal at any summer program (you/he/she) attends?

YES ...............................................................  1
NO .................................................................  2
DID NOT ATTEND SUMMER PROGRAM ....  3
REFUSED .....................................................  7
DON’T KNOW ...............................................  9

BOX 10

CHECK ITEM DBQ.425A:
IF SP AGE >= 6, GO TO BOX 11.
OTHERWISE, CONTINUE.

Next are a few questions about the WIC program.

Did (SP) receive benefits from WIC, that is, the Women, Infants, and Children program, in the past 12 months?

YES ...............................................................  1
NO ...........................................................................  2 (BOX 11)
REFUSED .....................................................  7 (BOX 11)
DON’T KNOW ...............................................  9 (BOX 11)

BOX 10A

CHECK ITEM DBQ.701:
IF SP AGE > 5, GO TO FSQ.671.
OTHERWISE, CONTINUE.

Is (SP) now receiving benefits from the WIC program?

YES ...............................................................  1
NO ...........................................................................  2
REFUSED .....................................................  7
DON’T KNOW ...............................................  9
How long {did SP receive/has SP been receiving} benefits from the WIC program?

CAPI INSTRUCTION:
HARD EDIT: NUMBER SHOULD NOT BE HIGHER THAN SP’S AGE.

<table>
<thead>
<tr>
<th></th>
<th>ENTER NUMBER (OF MONTHS OR YEARS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REFUSED ......................................................... 77</td>
</tr>
<tr>
<td></td>
<td>DON’T KNOW ..................................................... 99</td>
</tr>
</tbody>
</table>

ENTER UNIT

<table>
<thead>
<tr>
<th></th>
<th>MOUNTS .........................................................</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>YEARS ..........................................................</td>
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<tr>
<td></td>
<td>REFUSED .....................................................</td>
</tr>
<tr>
<td></td>
<td>DON’T KNOW .....................................................</td>
</tr>
</tbody>
</table>

BOX 11

CHECK ITEM DBQ.709:
IF SP AGE < 1 OR SP AGE 12-15, GO TO END OF SECTION.
OTHERWISE, CONTINUE.

Next, I’m going to ask you about meals. By meal, I mean breakfast, lunch and dinner. On average, how many meals per week {do you/does SP} get that were not prepared at home? Please include meals from both dine-in and carry out restaurants, restaurants that deliver food to your home, cafeterias, fast-food places, food courts, food stands, meals prepared at a grocery store, and meals from vending machines.

{Please do not include meals provided as part of the school lunch or school breakfast./ Please do not include meals provided as part of the community programs you reported earlier.}

CAPI INSTRUCTION:
IF DBQ381G=1 OR DBQ.411G=1, DISPLAY {Please do not include meals provided as part of the school lunch or school breakfast.}
IF DBQ.301=1 OR DBQ.330=1, DISPLAY {Please do not include meals provided as part of the community programs you reported earlier.}

<table>
<thead>
<tr>
<th></th>
<th>ENTER NUMBER PER WEEK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NEVER .......................... 2</td>
</tr>
<tr>
<td></td>
<td>LESS THAN WEEKLY ............. 666</td>
</tr>
<tr>
<td></td>
<td>REFUSED ......................... 777</td>
</tr>
<tr>
<td></td>
<td>DON’T KNOW ..................... 999</td>
</tr>
</tbody>
</table>
CHECK ITEM DBQ.719:
IF SP AGE <= 15 OR IF SP AGE => 16 AND PROXY INTERVIEW, GO TO END OF
SECTION.
OTHERWISE, CONTINUE.

DBQ.720 Have you heard of “The Dietary Guidelines for Americans”?

YES ............................................................... 1
NO ................................................................. 2
REFUSED ..................................................... 7
DON’T KNOW .............................................. 9

DBQ.730 [Have you heard of] “The Food Guide Pyramid”?

YES ............................................................... 1
NO ................................................................. 2
REFUSED ..................................................... 7
DON’T KNOW .............................................. 9


YES ............................................................... 1
NO ................................................................. 2
REFUSED ..................................................... 7
DON’T KNOW .............................................. 9

DBQ.750 Here is an example of a food label. [HAND CARD DBQ4]

This part of the food label is called the “Nutrition Facts” panel. How often do you use the Nutrition Facts panel when deciding to buy a food product?

Would you say always, most of the time, sometimes, rarely, or never?

HAND CARD DBQ5

ALWAYS ....................................................... 1
MOST OF THE TIME .................................... 2
SOMETIMES ............................................. 3
RARELY .................................................. 4
NEVER ..................................................... 5
NEVER SEEN ............................................ 6
REFUSED .................................................. 7
DON’T KNOW .......................................... 99
DBQ.760  How about the list of ingredients?
[How often do you use the list of ingredients when deciding to buy a food product? Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ5

ALWAYS ....................................................... 1
MOST OF THE TIME ..................................... 2
SOMETIMES ............................................. 3
RARELY .................................................... 4
NEVER ..................................................... 5
NEVER SEEN .......................................... 6
REFUSED ................................................... 77
DON’T KNOW ............................................ 99

DBQ.770  How about the information on the size of a serving?
[How often do you use information on the size of a serving when deciding to buy a food product? Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ5

ALWAYS ....................................................... 1
MOST OF THE TIME ..................................... 2
SOMETIMES ............................................. 3
RARELY .................................................... 4
NEVER ..................................................... 5
NEVER SEEN .......................................... 6
REFUSED ................................................... 77
DON’T KNOW ............................................ 99

DBQ.780  Some food packages contain health claims about the benefits of nutrients or foods like the examples on this card. [HAND CARD DBQ6] How often do you use this kind of health claim when deciding to buy a product?

Would you say always, most of the time, sometimes, rarely, or never?

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ..................................... 2
SOMETIMES ............................................. 3
RARELY .................................................... 4
NEVER ..................................................... 5
NEVER SEEN .......................................... 6
REFUSED ................................................... 77
DON’T KNOW ............................................ 99
BOX 13

CHECK ITEM DBQ.789:
IF (DBQ.750 = 1-4) OR (DBQ.760 = 1-4) OR (DBQ.770 = 1-4) OR (DBQ.780 = 1-4),
CONTINUE.
OTHERWISE, GO TO DBQ.890.

DBQ.790  When you use the food label to decide about a food product, how often do you look for information about calories? Would you say always, most of the time, sometimes, rarely, or never?

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ..................................... 2
SOMETIMES .............................................. 3
RARELY ..................................................... 4
NEVER ..................................................... 5
REFUSED .................................................. 7
DON'T KNOW .......................................... 9

DBQ.800  [When you use the food label to decide about a food product, how often do you look for information about] calories from fat? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ..................................... 2
SOMETIMES .............................................. 3
RARELY ..................................................... 4
NEVER ..................................................... 5
REFUSED .................................................. 7
DON'T KNOW .......................................... 9

DBQ.810  [When you use the food label to decide about a food product, how often do you look for information about] total fat? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ..................................... 2
SOMETIMES .............................................. 3
RARELY ..................................................... 4
NEVER ..................................................... 5
REFUSED .................................................. 7
DON'T KNOW .......................................... 9
DBQ.820  [When you use the food label to decide about a food product, how often do you look for information about trans fat? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ....................................... 2
SOMETIMES ................................................. 3
RARELY ........................................................ 4
NEVER .......................................................... 5
REFUSED ...................................................... 7
DON'T KNOW .................................................. 9

DBQ.830  [When you use the food label to decide about a food product, how often do you look for information about saturated fat? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ....................................... 2
SOMETIMES ................................................. 3
RARELY ........................................................ 4
NEVER .......................................................... 5
REFUSED ...................................................... 7
DON'T KNOW .................................................. 9

DBQ.840  [When you use the food label to decide about a food product, how often do you look for information about cholesterol? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ....................................... 2
SOMETIMES ................................................. 3
RARELY ........................................................ 4
NEVER .......................................................... 5
REFUSED ...................................................... 7
DON'T KNOW .................................................. 9

DBQ.850  [When you use the food label to decide about a food product, how often do you look for information about sodium? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1
MOST OF THE TIME ....................................... 2
SOMETIMES ................................................. 3
RARELY ........................................................ 4
NEVER .......................................................... 5
REFUSED ...................................................... 7
DON'T KNOW .................................................. 9
DBQ.860  [When you use the food label to decide about a food product, how often do you look for information about] carbohydrates? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1  
MOST OF THE TIME ..................................... 2  
SOMETIMES ............................................... 3  
RARELY ...................................................... 4  
NEVER ....................................................... 5  
REFUSED .................................................... 7  
DON'T KNOW ............................................... 9

DBQ.870  [When you use the food label to decide about a food product, how often do you look for information about] fiber? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1  
MOST OF THE TIME ..................................... 2  
SOMETIMES ............................................... 3  
RARELY ...................................................... 4  
NEVER ....................................................... 5  
REFUSED .................................................... 7  
DON'T KNOW ............................................... 9

DBQ.880  [When you use the food label to decide about a food product, how often do you look for information about] sugars? [Would you say always, most of the time, sometimes, rarely, or never?]

HAND CARD DBQ7

ALWAYS ....................................................... 1  
MOST OF THE TIME ..................................... 2  
SOMETIMES ............................................... 3  
RARELY ...................................................... 4  
NEVER ....................................................... 5  
REFUSED .................................................... 7  
DON'T KNOW ............................................... 9
Would you say you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, or strongly disagree with the following statement: “Some people are born to be fat and some thin; there is not much you can do to change this”?

HAND CARD DBQ8

- STRONGLY AGREE ..................................... 1
- SOMewhat AGREE .................................... 2
- NEITHER AGREE NOR DISAGREE ............. 3
- SOMewhat DISAGREE .............................. 4
- STRONGLY DISAGREE ............................... 5
- REFUSED ..................................................... 7
- DON'T KNOW ............................................... 9
WEIGHT HISTORY – WHQ

Note:
The eating-out question (DBQ.091) was asked as part of the Weight History (WHQ) section administered in the Mobile Exam Center (MEC) to participants 12-15 years old. Please refer to the following link at: http://www.cdc.gov/nchs/about/major/nhanes/nhanes2005-2006/questexam05_06.htm for the complete MEC Weight History (ages 8-15) questionnaire.

BOX 2
CHECK ITEM WHQ.709:
■ IF SP AGE >= 12, CONTINUE.
■ OTHERWISE, GO TO END OF SECTION.

DBQ.091 G/Q
Next, I’m going to ask you about meals. By meal, I mean breakfast, lunch and dinner. On average, how many meals per week do you get that were not prepared at home? Please include meals from both dine-in and carry out restaurants, restaurants that deliver food to your home, cafeterias, fast-food places, food courts, food stands, meals prepared at a grocery store, and meals from vending machines. Please do not include meals provided as part of the school lunch or school breakfast.

ENTER NUMBER PER WEEK

|___|___|

Never............................................................. 00
Less than weekly .......................................... 66
REFUSED ..................................................... 77
DON'T KNOW ............................................... 99
APPENDIX C

TWENTY-FOUR HOUR DIET RECALL
In addition to NHANES I, NHANES II, Hispanic HANES, and NHANES III, several other HANES projects have been underway since 1982. These projects have been a part of the HANES Epidemiological Follow-up Survey, a multiphase project that has been conducting follow-up interviews with the NHANES I survey population in order to provide a longitudinal picture of the health of the U.S. population.

1.2 Goals of the Survey

NHANES 2005, the current version of the survey, was designed to continue the collection of information about the health and diet of people in the United States. These data are used to fulfill specific goals. The overall goals of NHANES 2005 are to:

- Estimate the number and percent of persons in the U.S. population and designated subgroups with selected diseases and risk factors;
- Monitor trends in the prevalence, awareness, treatment, and control of selected diseases;
- Monitor trends in risk behaviors and environmental exposures;
- Analyze risk factors for selected diseases;
- Study the relationship between diet, nutrition, and health;
- Explore emerging public health issues and new technologies; and
- Establish a national probability sample of genetic material for future genetic testing.

1.3 NHANES Data Accomplishments

NHANES data have been used to influence policy and improve the health of the U.S. population in many ways since the survey series was established. For the past 40 years, the U.S. Public Health Service has been interviewing and examining tens of thousands of Americans. Currently, teams of doctors, nutritionists, and health technologists are conducting the National Health and Nutrition Examination Survey (NHANES) in communities across the United States. Information from the survey will be updated annually.
4. GENERAL INTERVIEWING TECHNIQUES

4.1 Before Beginning the Interview

Before beginning the interview, take some time to make sure you are thoroughly prepared. Thoroughly review your manual and other materials provided to you during training until you fully understand all aspects of your job. Practice doing the interview until you are comfortable using the automated system and probing. This practice will help in building your confidence so that you can deal with any situations you may encounter when you begin interviewing. Your ability to work comfortably will help keep your respondents interested in the interview and will help your interviews to go smoothly. Respondents will quickly lose interest if you are constantly stopping, losing track of your place, and stumbling over questions or probes.

Check to make sure that you have sufficient quantities of all necessary materials, and that your materials are organized in an orderly way. Materials that are to be handed to respondents should be easily accessible to avoid any awkward fumbling or searching.

The first thing a respondent will notice about you is your appearance. In general, you should aim at an appearance that is neat, suitable, and inconspicuous. Avoid extremes of any kind. Keep in mind that it is better to be a little underdressed than overdressed, and that, regardless of what clothes you wear, cleanliness and neatness are always very important.

4.2 Activities and Resources Helpful to Your Interview

4.2.1 Getting Oriented to a New Community

Every community is different. The dietary interviewers make more adjustments to a new community than other exam team members because the information they collect reflects the customs of a community and its inhabitants. Regional food customs, variations in food preparation methods, terminology, and even foods may be unfamiliar at first. In time, you will learn that a “whoopie pie” reported in the Pennsylvania Dutch community is a cream-filled dessert cake and that “SOS” is another term for chipped beef on toast. Local newspapers and interviewer training materials will help you to learn
APPENDIX D

FOOD FREQUENCY QUESTIONNAIRE
More than one member of your household may have received a questionnaire. Please make sure this is your booklet before answering any questions.

GENERAL INSTRUCTIONS

- Answer each question as best you can. Estimate if you are not sure. A guess is better than leaving a blank.
- Use only a No. 2 pencil.
- Be certain to completely blacken in each of the answers.
- Erase completely if you make any changes.
- Do not make any stray marks on this form.
- If you blacken NEVER or NO for a question, please follow any arrows or instructions that direct you to the next question.
1. Over the past 12 months, how often did you drink tomato juice or vegetable juice?

- NEVER
- 1 time per month or less
- 2–3 times per month
- 1–2 times per week
- 3–4 times per week
- 5–6 times per week

2. How often did you drink orange juice or grapefruit juice?

- NEVER
- 1 time per month or less
- 2–3 times per month
- 1–2 times per week
- 3–4 times per week
- 5–6 times per week

3. How often did you drink apple juice?

- NEVER
- 1 time per month or less
- 2–3 times per month
- 1–2 times per week
- 3–4 times per week
- 5–6 times per week

4. How often did you drink grape juice?

- NEVER
- 1 time per month or less
- 2–3 times per month
- 1–2 times per week
- 3–4 times per week
- 5–6 times per week

5. How often did you drink other 100% fruit juice or 100% fruit juice mixtures (such as pineapple, prune, or others)?

- NEVER
- 1 time per month or less
- 2–3 times per month
- 1–2 times per week
- 3–4 times per week
- 5–6 times per week

6. How often did you drink other fruit drinks (such as cranberry cocktail, Hi-C, lemonade, or Kool-Aid, diet or regular)?

- NEVER (GO TO QUESTION 7)
- 1 time per month or less
- 2–3 times per month
- 1–2 times per week
- 3–4 times per week
- 5–6 times per week

6a. How often were your fruit drinks diet or sugar-free drinks?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

7. How often did you drink milk as a beverage (NOT in coffee, NOT in cereal)? (Please include chocolate milk and hot chocolate.)

- NEVER (GO TO QUESTION 8)
- 1 time per month or less
- 2–3 times per month
- 1–2 times per week
- 3–4 times per week
- 5–6 times per week

7a. What kind of milk did you usually drink?

- Whole milk
- 2% fat milk
- 1% fat milk
- Skim, nonfat, or 1/2% fat milk
- Soy milk
- Rice milk
- Raw, unpasteurized milk
- Other

Question 8 appears on the next page.
Over the past 12 months...

78. How often did you eat beef mixtures such as beef stew, beef pot pie, beef and noodles, or beef and vegetables?
   - NEVER
   - 1–6 times per year
   - 7–11 times per year
   - 1 time per month
   - 2–3 times per month
   - 1 time per week
   - 2 or more times per day

79. How often did you eat roast beef or pot roast? (Please do not include roast beef or pot roast in sandwiches.)
   - NEVER
   - 1–6 times per year
   - 7–11 times per year
   - 1 time per month
   - 2–3 times per month
   - 1 time per week
   - 2 times per week
   - 3–4 times per week
   - 5–6 times per week
   - 1 time per day
   - 2 or more times per day

80. How often did you eat steak (beef)? (Do not include steak in sandwiches)
   - NEVER (GO TO QUESTION 81)
   - 1–6 times per year
   - 7–11 times per year
   - 1 time per month
   - 2–3 times per month
   - 1 time per week
   - 2 times per week
   - 3–4 times per week
   - 5–6 times per week
   - 1 time per day
   - 2 or more times per day

80a. How often was the steak you ate lean steak?
   - Almost never or never
   - About \( \frac{1}{4} \) of the time
   - About \( \frac{1}{2} \) of the time
   - About \( \frac{3}{4} \) of the time
   - Almost always or always

81. How often did you eat pork or beef spareribs?
   - NEVER
   - 1–6 times per year
   - 7–11 times per year
   - 1 time per month
   - 2–3 times per month
   - 1 time per week
   - 2 times per week
   - 3–4 times per week
   - 5–6 times per week
   - 1 time per day
   - 2 or more times per day

82. How often did you eat roast turkey, turkey cutlets, or turkey nuggets (including in sandwiches)?
   - NEVER
   - 1–6 times per year
   - 7–11 times per year
   - 1 time per month
   - 2–3 times per month
   - 1 time per week
   - 2 times per week
   - 3–4 times per week
   - 5–6 times per week
   - 1 time per day
   - 2 or more times per day

83. How often did you eat chicken as part of salads, sandwiches, casseroles, stews, or other mixtures?
   - NEVER
   - 1–6 times per year
   - 7–11 times per year
   - 1 time per month
   - 2–3 times per month
   - 1 time per week
   - 2 times per week
   - 3–4 times per week
   - 5–6 times per week
   - 1 time per day
   - 2 or more times per day

84. How often did you eat baked, broiled, roasted, stewed, or fried chicken (including nuggets)? (Please do not include chicken in mixtures.)
   - NEVER (GO TO QUESTION 85)
   - 1–6 times per year
   - 7–11 times per year
   - 1 time per month
   - 2–3 times per month
   - 1 time per week
   - 2 times per week
   - 3–4 times per week
   - 5–6 times per week
   - 1 time per day
   - 2 or more times per day

84a. How often was the chicken you ate fried chicken (including deep fried) or chicken nuggets?
   - Almost never or never
   - About \( \frac{1}{4} \) of the time
   - About \( \frac{1}{2} \) of the time
   - About \( \frac{3}{4} \) of the time
   - Almost always or always

84b. How often was the chicken you ate WHITE meat?
   - Almost never or never
   - About \( \frac{1}{4} \) of the time
   - About \( \frac{1}{2} \) of the time
   - About \( \frac{3}{4} \) of the time
   - Almost always or always

Question 85 appears on the next page.
APPENDIX E

PHYSICAL ACTIVITY QUESTIONNAIRE
CHECK ITEM PAQ.005:
IF SP AGE >= 16, CONTINUE.
OTHERWISE, GO TO BOX 6.

PAQ.020 The next series of questions are about physical activities that {you/SP} {have/has} done over the past 30 days. First I will ask about activities that are related to transportation. Then I'll ask about {your/his/her} daily activities, and finally, about physical activities that {you do/he/she does} in {your/his/her} leisure time.

Over the past 30 days, {have/has} {you/SP} walked or bicycled as part of getting to and from work, or school, or to do errands?

CODE ‘UNABLE TO DO’ ONLY IF RESPONDENT VOLUNTEERS

YES ............................................................ 1
NO ...........................................................  2 (PAQ.100)
UNABLE TO DO ACTIVITY...........................  3 (PAQ.100)
REFUSED ....................................................  7 (PAQ.100)
DON'T KNOW ..............................................  9 (PAQ.100)

PAQ.050 [Over the past 30 days], how often did {you/SP} do this? [Walk or bicycle as part of getting to and from work, or school, or to do errands.]

PROBE: How many times per day, per week, or per month did {you/s/he} do these activities?

ENTER NUMBER OF TIMES (PER DAY, WEEK OR MONTH)

REFUSED .................................................... 777 (PAQ.100)
DON'T KNOW ..............................................  999 (PAQ.100)

ENTER UNIT

DAY ...........................................................  1
WEEK ..........................................................  2
MONTH ..........................................................  3
REFUSED ....................................................  7 (PAQ.100)
DON'T KNOW ..............................................  9 (PAQ.100)
PAQ.080  On those days when {you/SP} walked or bicy cled, about how long did {you/s/he} spend altogether doing this?

[____] [____]
ENTER NUMBER (OF MINUTES OR HOURS)

REFUSED ..................................................... 777
DON'T KNOW ............................................... 999

ENTER UNIT

MINUTES ...................................................... 1
HOURS ......................................................... 2
REFUSED ..................................................... 7
DON'T KNOW ............................................... 9

PAQ.100  Over the past 30 days, did {you/SP} do any tasks in or around {your/his/her} home or yard for at least 10 minutes that required moderate or greater physical effort? By moderate physical effort I mean, tasks that caused light sweating or a slight to moderate increase in {your/his/her} heart rate or breathing. such as raking leaves, mowing the lawn or heavy cleaning.

CODE 'UNABLE TO DO' ONLY IF RESPONDENT VOLUNTEERS

YES ............................................................... 1
NO ................................................................. 2 (PAQ.180)
UNABLE TO DO ACTIVITY ................. 3 (PAQ.180)
REFUSED ..................................................... 7 (PAQ.180)
DON'T KNOW ............................................... 9 (PAQ.180)

PAQ.120  [Over the past 30 days], how often did {you/SP} do these tasks in or around {your/his/her} home or yard, that is tasks requiring at least moderate effort? [Such as raking leaves, mowing the lawn or heavy cleaning]

PROBE: How many times per day, per week, or per month did {you/s/he} do these activities?

[____] [____] [____]
ENTER NUMBER OF TIMES (PER DAY, WEEK OR MONTH)

REFUSED .....................................................777 (PAQ.180)
DON'T KNOW ...............................................999 (PAQ.180)

ENTER UNIT

DAY ............................................................... 1
WEEK ........................................................... 2
MONTH .......................................................... 3
REFUSED ..................................................... 7 (PAQ.180)
DON'T KNOW ............................................... 9 (PAQ.180)
PAQ.160 About how long did {you/SP} do these tasks each time?

IF MORE THAN 1 TASK, ASK FOR TASK DONE MOST OFTEN

______  ________  ________
ENTER NUMBER (OF MINUTES OR HOURS)

REFUSED ..................................................... 777
DON'T KNOW ............................................... 999

ENTER UNIT

MINUTES ...................................................... 1
HOURS ......................................................... 2
REFUSED .....................................................  7
DON'T KNOW ...............................................

PAQ.180 Please tell me which of these four sentences best describes {your/SP’s} usual daily activities? [Daily activities may include {your/his/her} work, housework if {you are/s/he is} a homemaker, going to and attending classes if {you are/s/he is} a student, and what {you/s/he} normally {do/does} throughout a typical day if {you are/he/she is} a retiree or unemployed] . . .

HAND CARD PAQ1

{You sit/He/She sits} during the day and
{do/does} not walk about very much; ..........  1
{You stand or walk/He/She stands or walks} about quite a lot during the day, but
{do/does} not have to carry or lift things very often; ........................................  2
{You lift or carry/He/She lifts or carries} light loads, or {have/has} to climb stairs or
hills often; or ..................................................  3
{You do/He/She does} heavy work or {carry/ carries} heavy loads..............................  4
REFUSED .....................................................  7
DON'T KNOW .............................................  9
The next questions are about physical activities including exercise, sports, and physically active hobbies that (you/SP) may have done in (your/his/her) leisure time or at school over the past 30 days.

First I will ask you about vigorous activities that cause heavy sweating or large increases in breathing or heart rate. Then I will ask you about moderate activities that cause only light sweating or a slight to moderate increase in breathing or heart rate.

Over the past 30 days, did (you/SP) do any vigorous activities for at least 10 minutes that caused heavy sweating, or large increases in breathing or heart rate? Some examples are running, lap swimming, aerobics classes or fast bicycling. Here are some other examples of these types of activities. Please do not include house work or yard work that you have already told me about.

HAND CARD PAQ2

CODE ‘UNABLE TO DO’ ONLY IF RESPONDENT VOLUNTEERS

YES .......................................................... 1
NO .......................................................... 2 (PAQ.326)
UNABLE TO DO ACTIVITY ......................... 3 (PAQ.326)
REFUSED .................................................. 7 (PAQ.326)
DON'T KNOW ........................................... 9 (PAQ.326)
[Over the past 30 days], what vigorous activities did {you/SP} do?

CODE ALL THAT APPLY

AEROBICS (HIGH IMPACT, E.G., STEP, TAEBO) ..................................................... 10
BASKETBALL ................................................ 12
BICYCLING ................................................... 13
FOOTBALL .................................................... 17
HIKING .......................................................... 20
HOCKEY ......................................................... 21
JOGGING .......................................................... 23
KAYAKING .................................................... 24
RACQUETBALL ............................................ 26
ROLLERBLADING .......................................... 27
ROWING ........................................................ 28
RUNNING ...................................................... 29
SKATING ........................................................ 31
SKIING – CROSS COUNTRY (INCLUDING NORDIC TRACK) ...................................... 32
SKIING – DOWNHILL ................................... 33
SOCCER ....................................................... 34
STAIR CLIMBING .......................................... 36
SWIMMING ................................................... 38
TENNIS ....................................................... 39
TREADMILL .................................................. 40
VOLLEYBALL ................................................ 41
BOXING ....................................................... 50
MARTIAL ARTS (KARATE, JUDO) ............... 53
WRESTLING .................................................. 54
OTHER (SPECIFY) __________________... 71
OTHER (SPECIFY) __________________... 72
OTHER (SPECIFY) __________________... 73
REFUSED ...................................................... 77 (PAQ.326)
DON'T KNOW ............................................. 99 (PAQ.326)

BOX 1B

LOOP 1:
ASK PAQ.281 AND PAQ.300 FOR EACH ACTIVITY ENTERED IN PAQ.221.
PAQ.281

[Over the past 30 days], how often did {you/SP} {ACTIVITY}?  
PROBE: How many times per day, per week, or per month?

CAPI INSTRUCTION:

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ENTER NUMBER OF TIMES (PER DAY, WEEK OR MONTH)

REFUSED ................................................. 777
DON'T KNOW ............................................. 999

ENTER UNIT

DAY .......................................................... 1
WEEK .......................................................... 2
MONTH .......................................................... 3
REFUSED ..................................................... 7
DON'T KNOW ................................................. 9

PAQ.300

[Over the past 30 days], on average about how long did {you/SP} {ACTIVITY} each time?

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</table>
ENTER NUMBER (OF MINUTES OR HOURS)

REFUSED ..................................................... 777
DON'T KNOW .................................................. 999

ENTER UNIT

MINUTES ...................................................... 1
HOURS .......................................................... 2
REFUSED ..................................................... 7
DON'T KNOW ................................................. 9

BOX 2

END LOOP 1:  
ASK PAQ.281 AND PAQ.300 FOR NEXT ACTIVITY.  
IF NO NEXT ACTIVITY, CONTINUE WITH PAQ.326.
[Over the past 30 days], did {you/SP} do moderate activities for at least 10 minutes that cause only light sweating or a slight to moderate increase in breathing or heart rate? Some examples are brisk walking, bicycling for pleasure, golf, or dancing. Here are some other examples of these types of activities. Please do not include house work or yard work that you have already told me about.

HAND CARD PAQ3

CODE ‘UNABLE TO DO’ ONLY IF RESPONDENT VOLUNTEERS

YES .......................................................... 1
NO ............................................................ 2 (PAQ.441)
UNABLE TO DO ACTIVITY........................... 3 (PAQ.441)
REFUSED ................................................... 7 (PAQ.441)
DON'T KNOW ............................................... 9 (PAQ.441)

[Over the past 30 days], what moderate activity or activities did {you/SP} do?

CODE ALL THAT APPLY

AEROBICS (LOW IMPACT)............................ 10
BASEBALL ............................................... 11
BASKETBALL .......................................... 12
BICYCLING ............................................ 13
BOWLING ............................................... 14
DANCE ............................................... 15
FISHING ............................................ 16
FOOTBALL ........................................... 17
GOLF ............................................... 19
HIKING ............................................... 20
HOCKEY ............................................... 21
HUNTING ........................................... 22
JOGGING ............................................ 23
KAYAKING ........................................... 24
ROLLERBLADING .................................... 27
ROWING ............................................. 28
SKATING ........................................... 31
SKIING – DOWNHILL ............................... 33
SOCCER ............................................. 34
SOFTBALL .......................................... 35
STAIR CLIMBING .................................... 36
STRETCHING ......................................... 37
SWIMMING .......................................... 38
TENNIS .............................................. 39
TREADMILL .......................................... 40
VOLLEYBALL ......................................... 41
WALKING ........................................... 42
WEIGHT LIFTING .................................... 43
FRISBEE ............................................ 51
HORSEBACK RIDING ................................. 52
MARTIAL ARTS (KARATE, JUDO) ............. 53
YOGA .................................................. 55
OTHER (SPECIFY) .................................. 71
OTHER (SPECIFY) .................................. 72
OTHER (SPECIFY) .................................. 73
REFUSED ............................................. 77 (PAQ.441)
DON'T KNOW ......................................... 99 (PAQ.441)
BOX 3

LOOP 2:
ASK PAQ.401 AND PAQ.420 FOR EACH ACTIVITY ENTERED IN PAQ.341.

PAQ.401 [Over the past 30 days], how often did {you/SP} {ACTIVITY}?
Q/U PROBE: How many times per day, per week, or per month?

CAPI INSTRUCTION:

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</table>
ENTER NUMBER OF TIMES (PER DAY, WEEK OR MONTH)

REFUSED ..................................................... 777
DON'T KNOW ............................................... 999

ENTER UNIT

DAY ............................................................... 1
WEEK ............................................................ 2
MONTH ......................................................... 3
REFUSED ..................................................... 7
DON'T KNOW .............................................. 9

PAQ.420 [Over the past 30 days], on average about how long did {you/SP} {ACTIVITY} each time?
Q/U

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</table>
ENTER NUMBER (OF MINUTES OR HOURS)

REFUSED ..................................................... 777
DON'T KNOW ............................................... 999

ENTER UNIT

MINUTES ...................................................... 1
HOURS ......................................................... 2
REFUSED ..................................................... 7
DON'T KNOW .............................................. 9
END LOOP 2:
ASK PAQ.401 AND PAQ.420 FOR NEXT ACTIVITY.
IF NO NEXT ACTIVITY, CONTINUE WITH PAQ.441.

PAQ.441 Over the past 30 days, did you do any physical activities specifically designed to strengthen your muscles such as lifting weights, push-ups or sit-ups? Include all such activities even if you have mentioned them before.

CODE 'UNABLE TO DO' ONLY IF RESPONDENT VOLUNTEERS

YES ......................................................... 1
NO ............................................................ 2 (PAQ.500)
UNABLE TO DO ACTIVITY ...................... 3 (PAQ.500)
REFUSED .................................................. 7 (PAQ.500)
DON'T KNOW ........................................... 9 (PAQ.500)

PAQ.460 [Over the past 30 days], how often did you do these physical activities? [Activities designed to strengthen your muscles such as lifting weights, push-ups or sit-ups.]

| | | |
ENTER NUMBER OF TIMES (PER DAY, WEEK OR MONTH)

REFUSED ................................................... 777
DON'T KNOW ............................................. 999

ENTER UNIT

PER DAY ..................................................... 1
PER WEEK .................................................. 2
PER MONTH ............................................... 3
REFUSED ................................................... 7
DON'T KNOW ............................................. 9

PAQ.500 How does the amount of activity that you reported for the past 30 days compare with your physical activity for the past 12 months? Over the past 30 days, were you...

more active, ............................................. 1
less active, or ............................................ 2
about the same? ........................................ 3
REFUSED .................................................. 7
DON'T KNOW ............................................. 9

PAQ.520 Compared with most men/boys/women/girls (your/SP's) age, would you say that you are...?

more active, ............................................. 1
less active, or ............................................ 2
about the same? ........................................ 3
REFUSED .................................................. 7
DON'T KNOW ............................................. 9
BOX 5

CHECK ITEM PAQ.530:
IF SP AGE >= 30, CONTINUE WITH PAQ.540.
OTHERWISE, GO TO BOX 6.

PAQ.540 Compared with {yourself/himself/herself} 10 years ago, would you say that {you are/SP is} . . .

- more active now, ........................................... 1
- less active now, or ......................................... 2
- about the same? ........................................ 3
- REFUSED ..................................................... 7
- DON'T KNOW ............................................. 9

BOX 6

CHECK ITEM PAQ.550A:
IF SP AGE = 2-11, CONTINUE.
IF SP AGE = >16, GO TO PAQ.591.
OTHERWISE, GO TO END OF SECTION.

PAQ.560 Now I'd like to ask you some questions about {SP's} activities.

How many times per week {does SP} play or exercise enough to make {him/her} sweat and breathe hard?

IF NEVER, ENTER 0
IF LESS THAN ONCE PER WEEK, ENTER 1

ENTER NUMBER OF TIMES

- REFUSED ..................................................... 77
- DON'T KNOW ............................................. 99
Now I will ask you about TV watching and computer use.

Over the past 30 days, on average how many hours per day did you sit and watch TV or videos (outside of work)? Would you say . . .

- less than 1 hour, ............................................ 0
- 1 hour, ........................................................... 1
- 2 hours, .......................................................... 2
- 3 hours, ........................................................... 3
- 4 hours, or ......................................................... 4
- 5 hours or more, or ........................................ 5
- none/you do/SP does not watch TV or videos ........................................................ 8
- REFUSED ..................................................... 77
- DON’T KNOW ............................................... 99

CAPI INSTRUCTION:
{outside of work} {you do/SP does not watch TV or videos outside of work} = SP AGE =>16
{none} = SP AGE = 2-11

Over the past 30 days, on average how many hours per day did you use a computer or play computer games (outside of work)? Would you say . . .

- less than 1 hour, ............................................ 0
- 1 hour, ........................................................... 1
- 2 hours, .......................................................... 2
- 3 hours, ........................................................... 3
- 4 hours, or ......................................................... 4
- 5 hours or more, or ........................................ 5
- none/you do/SP does not use a computer outside of work) ........................................ 8
- REFUSED ..................................................... 77
- DON’T KNOW ............................................... 99

CAPI INSTRUCTION:
{outside of work} {you do/SP does not use a computer outside of work} = SP AGE =>16
{none} = SP AGE = 2-11
APPENDIX F

DEPRESSION SCREENER
DEPRESSION SCREEN – DPQ
Target Group: SPs 12+

05BOX 1

CHECK ITEM 05DPQ.001:
- IF INTERVIEW DONE ONLY WITH SURVEY PARTICIPANT (CODED ‘1’ IN RIQ.005), CONTINUE.
- OTHERWISE, GO TO NEXT SECTION.

05DPQ.010 Over the last 2 weeks, how often have you been bothered by the following problems:

little interest or pleasure in doing things? Would you say . . .

HANDCARD DPQ1

Not at all, .......................................................... 0
several days, ................................................... 1
more than half the days, or............................ 2
nearly every day? ............................................. 3
REFUSED ..................................................... 7
DON’T KNOW ................................................. 9

05DPQ.020 [Over the last 2 weeks, how often have you been bothered by the following problems:]

feeling down, depressed, or hopeless?

HANDCARD DPQ1

NOT AT ALL .................................................. 0
SEVERAL DAYS ........................................... 1
MORE THAN HALF THE DAYS ............... 2
NEARLY EVERY DAY ............................. 3
REFUSED ..................................................... 7
DON’T KNOW ............................................... 9

05DPQ.030 [Over the last 2 weeks, how often have you been bothered by the following problems:]

trouble falling or staying asleep, or sleeping too much?

HANDCARD DPQ1

NOT AT ALL .................................................. 0
SEVERAL DAYS ........................................... 1
MORE THAN HALF THE DAYS ............... 2
NEARLY EVERY DAY ............................. 3
REFUSED ..................................................... 7
DON’T KNOW ............................................... 9
05DPQ.040 [Over the last 2 weeks, how often have you been bothered by the following problems:]

feeling tired or having little energy?

HANDCARD DPQ1

NOT AT ALL .................................................. 0
SEVERAL DAYS ........................................... 1
MORE THAN HALF THE DAYS .................... 2
NEARLY EVERY DAY ................................... 3
REFUSED ..................................................... 7
DON'T KNOW ............................................... 9

05DPQ.050 [Over the last 2 weeks, how often have you been bothered by the following problems:]

poor appetite or overeating?

HANDCARD DPQ1

NOT AT ALL .................................................. 0
SEVERAL DAYS ........................................... 1
MORE THAN HALF THE DAYS .................... 2
NEARLY EVERY DAY ................................... 3
REFUSED ..................................................... 7
DON'T KNOW ............................................... 9

05DPQ.060 [Over the last 2 weeks, how often have you been bothered by the following problems:]

feeling bad about yourself – or that you are a failure or have let yourself or your family down?

HANDCARD DPQ1

NOT AT ALL .................................................. 0
SEVERAL DAYS ........................................... 1
MORE THAN HALF THE DAYS .................... 2
NEARLY EVERY DAY ................................... 3
REFUSED ..................................................... 7
DON'T KNOW ............................................... 9

05DPQ.070 [Over the last 2 weeks, how often have you been bothered by the following problems:]

trouble concentrating on things, such as reading the newspaper or watching TV?

HANDCARD DPQ1

NOT AT ALL .................................................. 0
SEVERAL DAYS ........................................... 1
MORE THAN HALF THE DAYS .................... 2
NEARLY EVERY DAY ................................... 3
REFUSED ..................................................... 7
DON'T KNOW ............................................... 9
05DPQ.080  [Over the last 2 weeks, how often have you been bothered by the following problems:]  

moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual?

HANDCARD DPQ1

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<td>NOT AT ALL..................................</td>
<td>0</td>
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<tr>
<td>SEVERAL DAYS................................</td>
<td>1</td>
</tr>
<tr>
<td>MORE THAN HALF THE DAYS..................</td>
<td>2</td>
</tr>
<tr>
<td>NEARLY EVERY DAY...........................</td>
<td>3</td>
</tr>
<tr>
<td>REFUSED.....................................</td>
<td>7</td>
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<tr>
<td>DON’T KNOW..................................</td>
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</table>

05DPQ.090  Over the last 2 weeks, how often have you been bothered by the following problem:

Thoughts that you would be better off dead or of hurting yourself in some way?

INTERVIEWER INSTRUCTION: IF DPQ.090 CODED 1, 2, OR 3, PLEASE COMPLETE MENTAL HEALTH OBSERVATION FOR PHYSICIAN REVIEW AT CONCLUSION OF INTERVIEW.

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<td>NOT AT ALL..................................</td>
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<tr>
<td>SEVERAL DAYS................................</td>
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<tr>
<td>MORE THAN HALF THE DAYS..................</td>
<td>2</td>
</tr>
<tr>
<td>NEARLY EVERY DAY...........................</td>
<td>3</td>
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<tr>
<td>REFUSED.....................................</td>
<td>7</td>
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<tr>
<td>DON’T KNOW..................................</td>
<td>9</td>
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05BOX 2  
CHECK ITEM 05DPQ.095:
- IF RESPONSE TO ANY OF QUESTIONS 05DPQ.010 – 05DPQ.090 = 1, 2, OR 3, GO TO 05DPQ.100.
- OTHERWISE, GO TO NEXT SECTION.

05DPQ.100  How difficult have these problems made it for you to do your work, take care of things at home, or get along with people?

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<td>Not at all difficult,</td>
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<td>Somewhat difficult,</td>
<td>1</td>
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<tr>
<td>Very difficult,</td>
<td>2</td>
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<tr>
<td>Extremely difficult?</td>
<td>3</td>
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<tr>
<td>REFUSED</td>
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<tr>
<td>DON’T KNOW</td>
<td>9</td>
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</table>
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