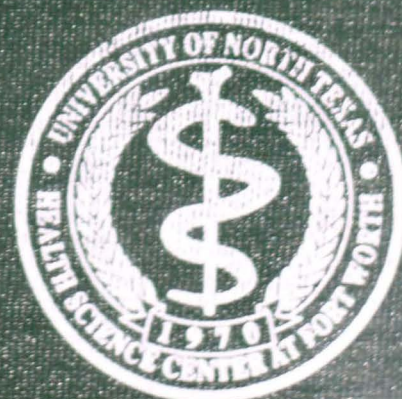




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Tomer, Vikas, Prevalance of obesity and associated factors for diabetes in United States – 2005, Master of Public Health (Biostatistics), May 2007, 37 pp, 9 tables

Diabetes is one of the major public health problems in United States. The purpose of this research is to explore whether there is a relationship between obesity and diabetes and to understand the effects of some other associated factors on diabetes in the United States in the year 2005.

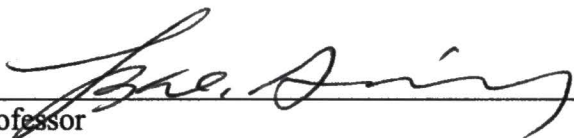
The data studied is from the Behavioral Risk Factor Surveillance System (BRFSS) 2005. A univariate analysis for frequency distribution was used to evaluate and edit the data. Binary logistic regression was used to assess the association of diabetes and the variables through crude and adjusted odd ratio.

The result of the study showed significant association between diabetes and obesity and the associated factors among US adults. The prevalence of diabetes has been found to be highest among African Americans followed by Hispanics and Others. Our results indicate that being an obese non-Hispanic black with low income level over the age of 65 years is indicative of being at the highest risk for diabetes. Therefore, for preventive measures to decrease the risk of being overweight and obesity healthy eating habits and regular exercise are recommended. As, income level increases, there is a significant decrease in the diabetes population. The strongest predictor of all appears to be obesity followed by age. Age, gender, income level, race and BMI all had significant effect on diabetes.

**PREVALENCE OF OBESITY AND ASSOCIATED FACTORS
FOR DIABETES IN UNITED STATES – 2005**

Vikas Tomer

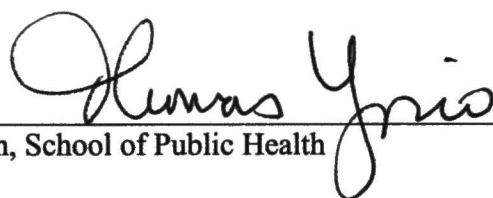
APPROVED:


Major Professor


Committee Member


Committee Member


Department Chair


Dean, School of Public Health

**PREVALENCE OF OBESITY AND ASSOCIATED FACTORS FOR DIABETES IN
UNITED STATES – 2005**

THESIS

Presented to the School of Public Health

**University of North Texas
Health Science Center at Fort Worth**

In Partial Fulfillment of the Requirements

For the Degree of

Master of Public Health

By

Vikas Tomer

Fort Worth, Texas

April 2007

ACKNOWLEDGEMENT

*** This thesis could not have been written without Dr. Sejong Bae who not only served as my advisor but also encouraged and challenged me throughout my academic program. It would not have been possible to accomplish my project without his support and guidance. In addition, I greatly appreciate Dr. Karan Singh and Dr. Ragbir Sandhu whose expertise knowledge helped me in finishing and writing my thesis. I also want to thank Diane Wynn, M.Ed., director of student and academic services, whose advice and understanding contributed to my success. Special appreciation goes to my wife, Tanushree Tomer, for her daily support and encouragement.

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CHAPTER 1

INTRODUCTION

Diabetes is one of the major public health problems in United States and it is increasing at high pace. Diabetes is a chronic health condition where the body of a person is unable to produce or it produces very little insulin and glucose (break down sugar) in the blood. Insulin lowers blood levels which allow it to enter the body cells and be converted to glycogen which is further utilized for energy. Insulin is also needed to synthesize protein and store fats. There are three types of diabetes, Type I, Type II and gestational diabetes. Previously Type I diabetes was known as “insulin-dependent diabetes mellitus” or as “juvenile diabetes” and it is often found in children and adolescent. In Type I diabetes the cells that make insulin are destroyed contributing to severe lack of insulin in the body. It is still not clear why this happens but possible reasons for Type I diabetes are:

- (i) Infection with a specific virus or bacteria
- (ii) Exposure to food-borne chemical toxins
- (iii) Exposure as a very young infant to cow's milk, where an as yet unidentified component in the milk triggers the autoimmune reaction in the body.

However these are not proven hypotheses. ¹ Type II diabetes was previously known as “non-insulin-dependent diabetes mellitus” (NIDDM) or “adult-onset diabetes”. Type II

diabetes occurs because cell in the body that normally respond to the action of insulin fail to stimulate by it. This is known as insulin resistance and in this response more insulin is produced than needed and this over-production of insulin contributes manufacturing of the cells in the pancreas. Thus, there is insufficient insulin as the available insulin may be abnormal and doesn't work properly. Type II diabetes can also occur due to certain medicines, an illness or a disease that damages the pancreas and affects its ability to produce insulin for example pancreatitis.¹ Type II diabetes commonly affects 90-95% of people and it normally occurs after the age of 40 years.

Gestational diabetes is a form of diabetes that may develop during pregnancy in women who do not have diabetes otherwise. It affects about 4 percent of all pregnant women and involves an increased risk of development of diabetes for both mother and child.² Gestational diabetes often appears in the third trimester and can often be controlled by diet and exercise and it disappears once the baby is born and that's the main reason why we are not including gestational diabetes in this study.

The risk factor for Type II diabetes include old age, obesity, history of diabetes in the family, history of gestational diabetes and physical inactivity. Other factors may be race or ethnicity, health insurance, level of educated, employment. These are some of factors we would like to test if they are risk factors.³ Note that African American and Hispanic are particularly at high risk for Type II diabetes as compared to other race. On the other hand Type I diabetes unlike Type II diabetes includes primarily autoimmune, genetic and environmental factors as well as factors that are less established.

From the recent reports the prevalence of diabetes is increasing not only in United States but also worldwide significantly. Almost 21 million people in United States are suffering from diabetes and if we go world wide then we can say that seven percent of the people is suffering from diabetes and another 41 million people are suffering from what we call pre-diabetes, a condition that increases the risk for Type II Diabetes. Some studies have shown that obesity has increased in United States in 2005 as compared to in 1995 in all states. Diabetes is the sixth leading cause of death in United States. Recent reports show that prevalence of diabetes has increased significantly in the United States in the past few decades at alarming rate, across all ages' gender and ethnic group over the past 30 years or so. One study showed that the medical expenditure on diabetes in each state ranged from 87 millions dollars in smaller states such as Wyoming to 7.7 billions dollars in bigger states such as California.⁴

The high economic costs, resulting from numerous and severe complication of this disease, as well as the social burden associated with diabetes mellitus makes diabetes an important disease to study.⁴ The Center of Disease Control (CDC) Diabetes Surveillance System collects and analyses data on diabetes and its complications. More than 45 millions people in United States do not have health insurance or potentially limited access to physician and they don't have access to health care services.⁵

Regular physical activity not only improves life in many ways and reduces risk of having heart disease, reduces risk for having diabetes, hypertension, and overall mortality but it also reduces symptoms of depression. We can say that once life style is associated with his or her health and with obesity.⁶ Physical activities are associated

with neighborhood environment such as sidewalks etc, perceived trustworthiness of neighbors and perceptions of neighborhood safety.

The purpose of this research is to explore whether there is a relationship between the epidemics of obesity and some other associated factors such as age, gender, height, weight, race, education, employment status, yearly income, daily physical activity, marital status and health insurance with diabetes in the United States in 2005.

CHAPTER 2

LITERATURE REVIEW

If you look at the studies done in the past you will find that most of them identify obesity as a major significant risk factor for hypertension, dyslipidemia, type II diabetes, coronary heart disease, stroke and certain cancers. Both national level data from National Health and Nutrition Examination Survey (NHANES) and state level data from the Behavioral Risk Factors Surveillance System (BRFSS) indicate that the prevalence of obesity among adults had increased in the past decade.⁷

Table 1: Have you been ever told by a doctor that you have diabetes, based on BRFSS 2005? ²⁰

	Yes	No
Nationwide (State, DC and territories)	7.3 %	90.9 %
Nationwide (State, DC)	7.3 %	91.2 %

In table 1, Behavioral Risk Factors Surveillance System Prevalence Data 2005 shows that 7.3 percent of the people that participated in the survey have diabetes as compared to 90.9 percent. Another study done by Indiana University in 2005 reported that 8.5 percent of the respondents have diabetes as compared to 7.9 percent in 2001.¹⁴ It is hard to believe but total estimated costs of diabetes in United States is 134 billion dollars for both direct and indirect medical costs out of which 92 billion dollars were direct costs associated with diabetes and 42 billions dollars were indirect costs which includes expenditure on disability, work loss and premature mortality.¹⁵ In order to assess the prevalence of obesity among adults, data from Behavioral Risk Factors Surveillance System (BRFSS) surveys was analyzed from 1995, 2000 and 2005. And the results show that 23.9 % of United States adult were obese in 2005 and it also shows that prevalence

of obesity has increased in all the states in United States during the period 1995-2005.⁷

Not many people believe but an increase of 15 pounds weight, increases a person's risk of having a diabetes by 50 % and in turn if a person loses 11 pounds than his risk of having diabetes also reduces by 50 %. It's simple math but still people are not listening and are not trying to lose the weight.⁸ Its also depends on how you lose weight, study shows that losing weight by going on diet had no effect on quality of life.⁹

In this study we have divided the sample size into three categories on the basis of time spent on physical activity. First is the lowest category which is inactive when there is no reported physical activity of any kind. Second category is the middle category which is also insufficient category when people have some activity but does not meet the criteria for meeting the recommendations. And the last category is highest category when the person meets either of the two criteria¹¹:

- 1) When a person does moderate intensity of activity at least 5 days a week for at least 30 minutes per day for 10 minutes or more at a time.
- 2) When a person does vigorous-intensity of activity at least 3 days a week for at least 20 minutes at a time.

Table 2a: Adults with 30+ minutes of moderate activity five or more days per week, based on BRFSS 2005?¹⁹

	Yes	No
Nationwide (State, DC and territories)	51.3 %	48.7 %
Nationwide (State, DC)	50.9 %	49.1 %

As shown in table 2a and table 2b, Behavioral Risk Factors Surveillance System, Prevalence Data 2005 shows that only 51.3 percent of the adults in United States that participated in the survey spend 30 minutes or more in doing some kind of moderate

physical activity and only 27.4 percent of the adults indulge in some kind of vigorous physical activity for 20 minutes or more for three or more days per week.

Table 2b: Adults with 20+ minutes of vigorous activity for three or more days per week, based on BRFSS 2005? ¹⁹

	Yes	No
Nationwide (State, DC and territories)	27.4 %	72.6 %
Nationwide (State, DC)	27.5 %	72.5 %

Exercise is the best way to reduce the weight, getting back in shape and to reduce the risk on having diabetes.⁹ Regular physical activity helps in improving quality of life and also helps in reducing the risk of having heart disease, hypertension, and diabetes. A person who does not indulge in regular physical activity and lives a sedentary life style has more chances of getting obese and having diabetes.¹⁰ Despite all the benefits of physical activities it has been reported that 23.1 % of the Americans do not engage themselves in any kind of physical activity.¹⁰

In addition to the factors mentioned above we have also included some socio-economic status, marital status and access to health care facilities (Health Insurance). Socio-economic status was measured by the level of education considering:

1. If the level of education is high school or less.
2. If the person went to attend some college.
3. If the person had graduated from the college.

Income and employment status, also a measure of socio-economic status was divided in three categories depending upon how much a person earns. If a person earn less than 25,000 dollars than he falls in first category, if his income level is between

25,000 to 49,999 dollars than he falls in second category and if he earns more than 50,000 dollars than he falls in the third category.^{11, 12}

And categories for employment status were also divided into 3 categories:- first if the person is employed for wages or self-employed, second if he or she is a student, a homemaker or retired and third if he person is out of work for more than 1 year or less than 1 year or unable to work.

Diabetes increases with age and men are more likely to have diabetes than women. This statement has been proven by Center for Disease Control and Prevention's National Diabetes Fact Sheet of 2005 as shown below in table 3.

Table 3: Diabetes Prevalence among US Adults selected by characteristics and in different age groups, Behavioral Risk Factor Surveillance System 2005.¹⁶

Variable	Percentage
Sex	
Male	10.50 %
Female	8.50 %
Age Group	
20-39	2.0 %
40-59	10.0 %
60 +	20.90 %

20.6 million or 9.6 % of all people who are above 20 years of age have diabetes and 10.3 million or 20.9 % of all people who are above 60 years of age have diabetes.¹³ Out of which 10.9 million or 10.5 % of all the men aged 20 years or older have diabetes and 9.7 millions or 8.8 % of all the women aged 20 years of above have diabetes.¹³

Another important finding is the increased risk for both obesity and diabetes in African American and Hispanics. It is unclear whether ethnicity is a separate factor for diabetes or merely becomes important due to the high risk of obesity. American Indian or

Alaska Natives have been reported to have highest tendency to have diabetes followed by Non-Hispanic blacks, Hispanic or Latino Americans and Non-Hispanic Whites (Table 4)

Table 4: Estimated age-adjusted total prevalence of diabetes in people aged 20 years or older, by race/ethnicity—United States, 2005 ¹⁵

Race	Percent
American Indians/Alaska Natives	17.9 %
Non-Hispanic Blacks	15.0 %
Hispanic/Latino Americans	13.5 %
Non-Hispanic Whites	8.0 %

Compared to their white counterparts, middle-aged African Americans are at greater risk of developing type 2 diabetes and have higher blood pressure prior to developing diabetes. As shown above in Table 4 prevalence of diabetes is twice in African Americans (15.0%) as compared to the whites (8.0%). Racial differences in obesity and socioeconomic status do not appear to explain fully the higher prevalence of diabetes among African-Americans. African-American race seems to be a strong, independent risk factor for diabetes, especially among individuals of low socioeconomic status.²¹

It is generally considered that higher incidence in diabetes in these minority groups are due to the concurrent high incidence of obesity. However, the intrinsic factors in ethnicity are yet to be explored. It is also noted that education levels profoundly affects prevalence of obesity and diabetes. There is a 40 % decrease in the prevalence of obesity and 60% decrease of diabetes among those people with college degrees or higher level of education as compared to those who have less than a high school education. (Table 5)²²

Table 5: Diabetes Prevalence among US Adults, by selected characteristics, Behavioral Risk Factor Surveillance System, 2000.²²

Education Level	Diabetes %
Less than High School	12.9
High School	7.6
Some college	6.7
* College degree and Higher	5.2

People who have a low socioeconomic status have poorer health than those who have higher socioeconomic status and they are less likely to have adequate access to care or to receive high-quality clinical and prevention care services. A research study shows that most individual with diabetes are covered by some kind of private insurance or through Medicare. And the people who are uninsured are more likely to be African American or Hispanic and reported to have a low economic status. And an uninsured person is less likely to monitor glucose level in blood on daily basis than an insured person.²³

CHAPTER 3

METHODOLOGY

The Behavioral Risk Factor Surveillance System (BRFSS) is the world's largest and on going cross-sectional survey system of health through telephonic interviews conducted by the state health departments with the technical and methodological assistance from Center of Disease Control and Prevention. It tracks health condition and risk behaviors in the United States every year since 1984.

Data Collection Procedure

Telephonic health survey is conducted by 50 state health departments and in the District of Columbia, Puerto Rico, Guam and U.S. Virgin Islands with help of Center of Disease Control and Prevention. Behavioral Risk Factor Surveillance System provides state specific information about issues such as diabetes, asthma, health care access, alcohol use, hypertension, obesity, cancer screening, nutrition and physical activity, tobacco and many more. The states then forward the response to the CDC where monthly data is aggregated for each state. The data are then returned to the states and published on the BRFSS website. For many states BRFSS is the only source that is available for accurate data on health related behaviors. Federal, state and local officials and researchers work together and gather information to track health risks, identify emerging and ongoing problems and than try to prevent them by providing proper treatment and cure.

Questionnaires in this survey are designed by a working group of state coordinator and Center of Disease Control staff. The questionnaire consists mainly questions regarding

behaviors that lead to increase in risk for one or more of the leading causes of death in United States.²⁰ The objective are to collect uniform, state-specific data on preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases in the adult population. BRFSS uses multistage design based on random-digital dialing methods to select a representative sample from each state's non-institutionalized civilian residents aged 18 years or older and the participants are not compensated. The reward for participating in the survey is that these efforts will help population of United States to be healthier and question help shape public health policy in towns, states and over the whole nation. A total of 20.8 million people in United States have diabetes and that is about 7.0 percent of the whole population in United States.¹⁶

For this study these variables were used:- Sex, Age, Level of Education, Income Category, Employment, Health Plan, Marital Status, Body Mass Index, Time spent in doing Physical Activities:- Vigorous or Moderate in a week.

These questions were used to create their demographics. Respondents were asked the following questions:

- "What is your age?" participants greater than 18 years were only included in the study.
- "Are you Hispanic/Latino, White, Black or other?" "Which one would you say best represents your race?"
- "What is the level of education have you graduated or not from any college?"
- "What is your total annual house hold income?"

- Self reported weight and height were used to calculate the BMI. The height and weight were assessed by asking respondents, “About how much do you weigh without shoes and about how tall are you without shoes?”
- “Have you ever been told by the doctor that you have diabetes?” The answer was coded as “yes” or “no”. Respondents who answered, “Yes” to gestational diabetes were coded as “no”.

Generally obesity is the focus of attention, since it is related to higher risk of chronic diseases. Although to most people the term obesity and overweight means the same and have been often used synonymously but they are not same. There is a distinction between obesity and overweight and they are not at all equivalent. In this study we have classified weight based on Body Mass Index (BMI) levels. Weight has been self reported in pounds and height has been self reported in kilograms.

“Overweight” indicates excess weight with respect to height. Person with BMI less than 18.5 is considered underweight, BMI of 18.5-24.99 is considered normal and an individual with a BMI between 25 to 29.99 is considered overweight. Whereas “obesity” indicates excessive body fat and individuals with a body mass index of 30 or more or individuals who are at least 30 lbs over the recommended weight for a person’s height.¹⁷

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Gender is grouped into two categories, male and female. Race is grouped into four categories and the categories are Hispanic, White, Black and all the rest are in others categories. Education is classified into 3 categories, less than high school, attended some college and if you have graduated from college.

Income is grouped into 3 categories and criteria for the division depends upon their income they fall into first category if their income is less than \$25,000, second category if they make between \$25,001 and \$49,999 dollars and will be in last one if they make more than \$50,000.

Finally, age is grouped into 6 categories, 18-24, 25-34, 35-44, 45-54, 55-64 and greater than 65 years.

CHAPTER 4

RESULTS

.In this study, a research question regarding obesity as a risk factor for diabetes will be considered. The question is: -

“What effect do sex, age, race, level of education, income category, employment, health plan means have any kind of insurance marital status, physical activity and obesity have on diabetes independently and in combination?”

In our analysis of the 356,112 adults that participated, we have included only those participants for whom we had complete information. Data analysis was carried out by using the statistical packages Statistical Package for the Social Sciences (SPSS) 14.0 and Statistical Analysis Software (SAS) 9.1.

Table 6 summarizes the descriptive analysis of gender, age, race, level of education, income level, employment status, health insurance, marital status, body mass index, reported physical activity and diabetes from the Behavioral Risk Factors Surveillance System 2005 data. Of the 356,112 adults participants (48.50 %) were males and (51.50 %) were females. Race was divided into four category with Non-Hispanic Whites (69.50 %) comprising the largest ethnic group followed by Hispanic (15.00 %), African American (9.50 %) and other category (6.20 %). Education is grouped into three categories with most of the participants falling into first category (42.50 %) i.e. less than high school educated, followed by (31.40 %) who have

graduated from college and (26.10%) who have attended college . The participant's income level has been divided into three categories. (28.40 %) of the participants make less than 25,000 dollars in a year, (28.80 %) of participants make between 25,000 and 50,000 dollars and (42.80 %) make over 50,000 dollars in a year. Approximately sixty five percent (64.70 %) of the participants were employed, (30.10 %) were unemployed and (5.20 %) were either retired or were students at the time of participation. Body Mass Index was also taken into consideration with (38.70 %) of the participants having normal weight, (36.80 %) have overweight and (24.50 %) were Obese. Physical activity was major factor in predicting diabetes in our model, with (78.50 %) reported to be inactive or indulging in insufficient physical activity in their daily life and (21.50 %) of the participants meet the recommended guidelines for physical activity.

Table 6: Frequency Distribution of Sex, age, Demographic information, Education, Income, Employment, Health plan, marital status, BMI, physical activity and diabetes – 2005 BRFSS Survey

Variable	Percentage
Sex	
Male	48.50 %
Female	51.50 %
Demographic	
Hispanic	15.0 %
White	69.30 %
Black	9.50 %
Other	6.20 %
Level of education	
Less than high school	42.50 %
Attended college	26.10 %
Graduated from college	31.40 %
Income Category	
Less than \$25,000	28.40 %
Between \$25,0001 - \$49,999	28.80 %
More than \$50,000	42.80 %
Employment	
Employed	64.70 %
Unemployed	30.10 %
Student or retired	5.20 %
Health Plan	
Yes	84.0 %
No	16.0 %
Marital Status	
Married	59.60 %
Divorced, widowed or living Separately	40.40 %
BMI	
Normal	38.70 %
Overweight	36.80 %
Obese	24.70 %
Diabetes	
Yes	7.80 %
No	92.20 %
Physical Activity	
Inactive or Insufficient	78.50 %
Meet recommendation	21.50 %
Age	
18-35	33.50 %

36-45	19.80 %
46-55	18.20 %
56-65	12.90 %
66 and above	15.60 %

• Table 7 summarizes prevalence of diabetes with sex, age, demographic information, education, income, employment, health plan, marital status, BMI, physical activity as independent variable.

About 10.50 % of the males were diabetic and 8.50 % of the females were diabetic. It also shows that diabetes increases with age and is also statistically significant. It is observed that the prevalence of diabetes almost doubles from 8.65 % in the age group 35 to 44 to 15.64 % in the age group 45 to 64. In the older age group the prevalence of diabetes is 17.89 % as compared to 1.58 % in the age group 18 to 34.

Among racial groups, about 15.00 % of the blacks, 13.50% of Hispanic and 8.00% of whites are diabetic and it is also shown that race has been significantly associated with the prevalence of diabetes.

As the education is increased, there is a significant decrease in the prevalence of diabetes. There is a 46% decrease in the percentage of prevalence of diabetes in people who are less than high school educated as compared to individuals who have graduated from college. This may be due to increased awareness about effects of obesity and diabetes among highly educated group.

Income also shows a kind of linear pattern and the association is statistically significant ($P < 0.001$) with respect to prevalence of diabetes. 11.83% of the individuals

whose income is less than \$25,000 are diabetic and diabetes is least prevalent among the individuals who earn more than \$50,000.

Prevalence of diabetes is 4.63% in people who are employed and the percentage of people who are diabetic increases to 15.85% for students or retired individuals with diabetes.

BMI has also shown significant linear association with diabetes similar to age ($P < 0.001$). The prevalence of diabetes is 15.72% in obese individuals as compared to 3.35% in normal individuals.

Physical Activity has statistically significant association with diabetes. More active an individual is, less are the chances for him being diabetic. Approximately fifteen percent (14.78%) of the people who are inactive are diabetic as compared to 3.58% individuals who meet the recommendations for physical activity.

Table 7: Logistic regression with diabetes as dependent variable

Variable	Yes	Std. Error	P-value
Sex			
Male	10.50	0.14	0.0397
Female	8.50	0.11	
Age			
18-34	1.58	0.09	0.0001
35-44	4.35	0.17	
45-54	8.65	0.22	
55-64	15.74	0.29	
65 or older	17.89	0.28	
Demographic			
Hispanic	13.5	0.35	0.0227
White	8.0	0.41	
Black	15.0	1.66	
Other	17.9	0.96	
Level of education			
Less than high school	9.72	0.15	0.0001
Attended college	7.60	0.17	
Graduated from college	5.24	0.12	
Income Category			
Less than \$25,000	11.83	0.22	0.0001
Between \$25,0001 - \$49,999	7.56	0.167	
More than \$50,000	4.86	0.11	
Employment			
Employed	4.63	0.00	0.0001
Unemployed	11.72	0.17	
Student or retired	15.85	0.40	
Health Plan			
Yes	8.26	0.09	0.3062
No	5.32	0.23	
Marital Status			
Married	7.85	0.12	0.3062
Divorced, widowed or living Separately	7.67	0.13	
BMI			
Normal	3.35	0.09	0.0001
Overweight	7.00	0.15	
Obese	15.72	0.24	
Physical Activity			
Inactive	14.78	0.32	0.0001

Insufficient	7.30	0.10	
Meet Recommendation	3.58	0.17	

Logistic regression was used for the analysis purpose with diabetes as dependent variable and sex, age, demographic information, education, income, employment, health plan, marital status, BMI, and physical activity as covariates.

Table 8 shows the crude analysis of the data with Odds ratios and their confidence intervals and Table 9 shows the adjusted odd ratio and their confidence interval.

The crude analysis shows that females are 22% less likely to have diabetes when compared to males (OR=0.78, CI: 0.66, 0.92) and the adjusted (OR=0.95, CI: 0.85, 0.99) which shows that females are 5 % less likely to become diabetic than males.

Crude ratios for racial groups show that Hispanics are 1.67 times more likely to have diabetes as compared to whites and only this group is significant as compared to other groups (CI: 1.55, 1.75) after adjusting for other variables Hispanic group is no longer significant but African Americans are and they are 1.5 times more likely to have diabetes than white Americans (CI: 1.06, 2.31).

People aged 65 years or more are 94% more likely to have diabetes as compared to younger population in the age group 18-35 and age has a significant effect on diabetes for all the age groups and adjusted odd ratio for all the age groups are also significant.

Individuals who have done some college are 1.31 times more likely to have diabetes as compared to graduates from some college and this category is statistically significant also (CI: 1.02, 1.69) .When individuals studying in less than high school are compared with college graduates than significance cannot be associated with diabetes and when adjusted for other factors education is a significant predictor for diabetes. The

results show that individuals who are less than high school educated are 1.19 times (CI: 1.02, 1.35) and individual who have some college degree are 1.26 times (CI: 1.12, 1.37) more likely to have diabetes than who have graduated from college.

• In case of employment, students and retired individuals are 1.85 times more likely to have diabetes as compared to employed individuals and this category seems to have a significant effect also on diabetes (CI: 1.44, 2.36) and after adjustment both not working and students or retired persons are more likely to have diabetes than employed individuals and both the categories are statically significant.

Obese people are 4.05 times more likely to have diabetes as compared to people with normal weight (CI: 3.10, 5.28). While overweight people are only 1.77 times more likely to become diabetic when compared to people with normal weight (CI: 1.37, 2.38). It is the strongest predictor in our study. BMI has shown significant association with diabetes in both the groups and they remain significant even after adjustment.

Income becomes a significant factor after adjusting for other factors. Individuals having income between 24 to 50 thousand dollars are 1.69 times (CI: 1.50, 1.81) and who have income less than 25 thousand dollars are 1.23 times (CI: 1.13, 1.48) more likely to have diabetes than who earn more than 50 thousand dollars.

Physical activity can improve the quality of life to a great extent. Inactive individuals are 1.61 times more likely to have diabetes as compared to individuals who meet the recommendations of physical activity and they showed significant effect on diabetes (CI: 1.13, 2.26) and adjusted analysis also shows this category to be significant.

Table 8: Crude Odd Ratio

Effect	Point Estimate	95% Wald Confidence Limits	
Sex			
Female Vs Male	0.78	0.66	0.92
Race			
African American Vs White	1.11	0.78	1.60
Hispanics Vs White	1.67	1.55	1.75
Other Vs White	1.42	0.98	1.85
Age			
18-35 Vs 65 +	0.06	0.04	0.85
36-45 Vs 65 +	0.16	0.03	0.23
46-55 Vs 65 +	0.34	0.25	0.45
56-65 Vs 65 +	0.71	0.54	0.95
Education			
Less than or high school Vs Graduated from College	1.20	0.95	1.52
Some College Vs Graduated from college	1.31	1.02	1.69
Employment			
Not Working Vs Employed	1.08	0.85	1.37
Student or Retired Vs Employed	1.85	1.44	2.36
Body Mass Index			
Obese Vs Normal	4.05	3.10	5.28
Overweight Vs Normal	1.77	1.37	2.30
Income			
24K to 50K Vs greater than 50K	1.04	0.80	1.33
Less than 25K Vs greater than 50K	1.29	0.98	1.69
Marital Status			
Yes Vs No	0.90	0.75	1.07
Physical Activity			
Inactive Vs Meet recommendation	1.61	1.13	2.26
Insufficient Vs Meet recommendation	1.19	0.91	1.57

Table 9: Adjusted Odd Ratio

Effect	Point Estimate	95% Wald Confidence Limits	
Sex			
Female Vs Male	0.95	0.85	0.99
Age			
18-34 Vs 65 or older	0.09	0.02	0.26
35-44 Vs 65 or older	0.23	0.13	0.33
45-54 Vs 65 or older	0.43	0.23	0.62
55-64 Vs 65 or older	0.83	0.61	0.96
Race			
African American Vs White	1.57	1.06	2.31
Hispanics Vs White	1.08	0.97	1.21
Other Vs White	1.09	0.82	1.29
Education			
Less than or high school Vs Graduated from College	1.19	1.02	1.35
Some College Vs Graduated from college	1.26	1.12	1.37
Employment			
Not Working Vs Employed	2.74	2.59	2.89
Student or Retired Vs Employed	3.88	3.61	4.18
Body Mass Index			
Obese Vs Normal	5.38	5.03	5.76
Overweight Vs Normal	2.17	2.02	2.34
Income			
24K to 50K Vs greater than 50K	1.69	1.50	1.81
Less than 25K Vs greater than 50K	1.23	1.13	1.48
Marital Status			
Yes Vs No	1.06	0.90	1.23
Physical Activity			
Inactive VS Meet recommendation	1.37	1.23	1.43
Health Plan			
No Vs Yes	1.22	1.13	1.38

CHAPTER 5

The prevalence of diabetes has been found to be highest among African Americans followed by Hispanics and Others. Whites have been found to have lower prevalence of diabetes which strengthens the results of previous studies that have reported higher prevalence of diabetes in minority population. The major factor for higher incidence of diabetes in the minority groups is obesity. There is not a large difference in the prevalence of diabetes in males and female but males tend to have slightly more chances of having diabetes than female and our study indicates it.

Generally, obesity is the focus of attention, since it is related to higher risk for many major chronic diseases. It has already been proved in many previous studies that obesity is a major risk factor for diabetes. One of the findings of this study is that the obesity is not only cause of diabetes but some other factors also play some role. The results of the present study have shown that there is significant increase in the prevalence of diabetes among obese individuals when compared to individuals who are categorized as overweight. This is a significant finding that implies that obese individuals are more likely to become diabetic when compared to those who are overweight.

In this study education, employment and household income levels have been used to quantify a person's socio-economic status (SES). It is observed that as the income level increases there is a decrease in the prevalence of diabetes.

A person with higher income and socioeconomic status has more privileges such as better living condition, access to health care and good insurance plan as compared to individuals with low income level.

CONCLUSION:

Several findings of this study are similar to those of other studies on risk factors for diabetes. Health problem seems to be more prevalent in minority and elderly obese with low income level. Our findings are consistent with other reports which show males as being higher risk for diabetes. Our results indicate that being an obese non-Hispanic black with low income level over the age of 65 years is indicative of being at the highest risk for diabetes. Therefore, for preventive measures to decrease the risk of being overweight and obesity healthy eating habits and regular exercise are recommended. Persons who have low socioeconomic status have poorer health than other persons and are less likely to have adequate access to care or to receive high-quality clinical and preventive care services. So, income level has a significant effect on diabetes. As the income level increases, there is a significant decrease in the diabetes population. The strongest predictor of all appears to be obesity followed by age. Age, gender, income level, race and BMI all had significant effect on diabetes.

LIMITATIONS:

The study is limited by several different factors. The BRFSS underestimates the true prevalence of diabetes. As BRFSS is a telephonic survey, and it may be bias as

people have no telephones. Especially, the lower socioeconomic groups typically have lower telephone coverage. As the data is based on self reported survey, which can be subjected to recall bias. Also, the survey is based on non-institutionalized populations and excludes persons residing else where for example nursing homes or long term care facilities.

The data available on the Behavioral Risk Factors Surveillance System (BRFSS) website is only in Statistical Analysis Software (SAS) format, therefore a person without the knowledge SAS analysis or conversion of SAS file into SPSS, will not be able to access the data. There were significant limitations in the use of the SPSS. Data should be available in some other formats also. As always, time limitations should always be considered when developing study designs

BIBLIOGRAPHY

1. Diana W. Guthrie, R.N., Ph.D., and Richard A. Guthrie. (n. d.) Los Angeles Chinese Learning Center. Retrieved on March 18, 2007 <http://chinese-school.netfirms.com/diabetes-causes.html>
2. Report of the expert committee on the diagnosis and classification of diabetes mellitus. (January 2003). Diabetes Care. Retrieved December 15, 2006 from http://care.diabetesjournals.org.proxy.hsc.unt.edu/cgi/content/full/26/suppl_1/s5 26, S5-S20
3. Ferrannini E, Nannipiere M, Williams K, Gonzalales C, Haffener SM, Stern MP. (January 2004). Mode of onset of type 2 diabetes from normal or impaired glucose tolerance (pathophysiology). Diabetes. 53, 160-165. Retrieved December 15, 2006 from <http://diabetes.diabetesjournals.org.proxy.hsc.unt.edu/cgi/content/full/53/1/160> 53,160-165.
4. Dall T, Nikolov P, Hogan P.(March 2003). Economic costs of diabetes in the US in 2002. Diabetes Care. 26, 917-923. Retrieved December 20, 2006 from PubMed Database <http://care.diabetesjournals.org.proxy.hsc.unt.edu/cgi/content/full/26/3/917> 26, 917-932.

5. Ross JS, Bradley EH, Busch SH. (May 2006). Use of health care services by lower-income and higher-income uninsured adults. JAMA. Retrieved December 22 , 2006 from <http://jama.amaassn.org.proxy.hsc.unt.edu/cgi/content/full/295/17/2027>
295, 2027-2036
6. Vest, J. Valadez, A. (Sept 2005). Perceptions of neighborhood characteristics and leisure-time physical inactivity--Austin/Travis County, Texas, 2004. Center for Disease Control and Prevention (CDC). Morbidity and Mortality Weekly Report. Retrieved December 17, 2006 from
http://www.findarticles.com/p/articles/mi_m0906/is_37_54/ai_n15693244
7. State-specific prevalence of obesity among adults--United States, September, 2005. Morbidity and Mortality Weekly Report. Retrieved March 19,2007 from
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5536a1.htm>
8. Daniels J. (January 2006). Obesity: America's Epidemic: What goes up does not always come down. Is there a solution? Retrieved March 19, 2007 from
<http://gateway.ut.ovid.com.proxy.hsc.unt.edu/gw2/ovidweb.cgi?T=JS&PAGE=fulltext&D=ovft&AN=00000446-200601000-00028&NEWS=N&CSC=Y&CHANNEL=PubMed> 106(1), 40-49
9. Smith DW and Mcfall SL. (December 2005). The relationship of diet and exercise for weight control and the quality of life gap associated with diabetes. Retrieved on December 2006 from
http://www.sciencedirect.com.proxy.hsc.unt.edu/science?_ob=ArticleURL&_udi=B6T8V-4HMOV7NS-

6&_user=100452&_coverDate=12%2F31%2F2005&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000007818&_version=1&_urlVersion=0&_userid=100452&md5=ede2896ab30b2241bd954fb091da1235, 59(6), 385-392.

10. Perceptions of neighborhood characteristics and leisure-time physical inactivity--

Austin/Travis County, Texas, 2004. September 2005 from

<http://www.cdc.gov.proxy.hsc.unt.edu/mmwr/preview/mmwrhtml/mm5437a4.htm>, 54(37), 926-928

11. Scoring criteria for the 2001 Behavioral Risk Factors Surveillance System (BRFSS)

physical activity module and the short, interviewer-administered international Physical Activity Questioner (IPAQ). Retrieved on September 2006 from Medicine and Science in Sports and Exercise Journal.

12. David W. Smith "The population perspective on quality of life among Americans with diabetes". November 21, 2003.

<http://web.ebscohost.com.proxy.hsc.unt.edu/ehost/detail?vid=1&hid=120&sid=37fc2edd-27e2-413d-8c6f-e28bb7b24d90%40sessionmgr107>, 13(8), 1391-400.

13. Centers for Disease Control and Prevention's National Diabetes Fact Sheet of 2005.

Retrieved on September 2006 from

<http://www.cdc.gov/diabetes/pubs/estimates05.htm>

14. Increasing rates of diabetes among U.S. Adults Retrieved on September 2006 from

<http://www.news-medical.net/?id=19085>, July 26, 2006

15. National Diabetes Fact Sheet United States, 2005 CDC Diabetes Retrieved on

September 2006 from <http://www.cdc.gov/diabetes/pubs/estimates05.htm>

16. BRFSS Technical Information Data, Retrieved on September 2006 from
http://www.cdc.gov/brfss/technical_infodata/surveydata/2005.htm
17. Overweight Vs Obesity Retrieved on September 2006 from
<http://www.phentermine.com/overweightvsobesity.htm>
18. BRFSS 2005 Code Book Retrieved on September 2006 from
http://www.cdc.gov/brfss/technical_infodata/surveydata/2006.htm
19. Behavioral Risk Factors Surveillance System, Prevalence Data 2005 Retrieved on
September 2006 from
<http://apps.nccd.cdc.gov/brfss/list.asp?cat=EX&yr=2005&qkey=4347&state=All>
20. Behavioral Risk Factors Surveillance System, Prevalence Data 2005 Retrieved on
September 2006 from
<http://apps.nccd.cdc.gov/brfss/list.asp?cat=DB&yr=2005&qkey=1363&state=All>
21. Brancati FL, Whelton P, Kuller LH, Klag MJ. Diabetes mellitus, race and
socioeconomic status. A population based study. January 1996. Retrieved on
February 26 from
http://www.sciencedirect.com.proxy.hsc.unt.edu/science?_ob=ArticleURL&_udi=B6T44-3Y45XBC-D&_user=100452&_coverDate=01%2F31%2F1996&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000007818&_version=1&_urlVersion=0&_userid=100452&md5=ccbcbdb27e8680db865961829b84794e 6(1):67-73.

22. Mokad AH, Bowman BA, Ford ES. The continuing Epidemics of obesity and diabetes in the United States (2001) Retrieved on March 28 from <http://jama.ama-assn.org.proxy.hsc.unt.edu/cgi/content/full/286/10/1195>, 286(10), 1195-2000
23. Karin M. Nelson, Michael K. Chapko, Gayle Reiber, Edward J. Boyko (2005). Health Service Research. (April 2005). Retrieved on March 26 from <http://www.blackwell-synergy.com/links/doi/10.1111/j.1475-6773.2005.0d362.x/abs/>, 40(2), 361-372.

