# Diabetes in Oklahoma

## Surveillance Report

2008

Diabetes Prevention and Control Program

Chronic Disease Service

Oklahoma State Department of Health

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Oklahoma Diabetes Center, University of Oklahoma Health Science Center


## DISCLAIMER


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**The analyses, interpretations, conclusions, or opinions expressed in this report do not necessarily reflect the views of CDC, OSDH, or any organization provided data to this report.**

# EXECUTIVE SUMMARY

This report provides information and data about the mortality and morbidity of diabetes in Oklahoma, and compared to the Healthy People 2010 objectives where applicable. This report also provides information about prevalence of diabetes related risk behaviors, hospitalizations, and the cost.

## Prevalence of diabetes in adult Oklahomans

- The prevalence of diabetes has been steadily increasing during the past 10 years, both in Oklahoma and the US.
- Among adult Oklahomans (18 years and over), approximately 277,500 people reported being diagnosed with diabetes by health professionals. Included those un-diagnosed, the total number of adults who have diabetes is about 390,900 (14.4%) in Oklahoma.
- Among Not-Hispanic populations, American Indians and multiracial reported significantly higher prevalence of diabetes than Whites.
- Diabetes is more common among people with older age.
- Adults with lower annual household incomes or fewer years of educations tend to report higher prevalence of diabetes.
- Adults living in northeastern and southwestern Oklahoma tend to report higher prevalence of diabetes.

## Prevalence of diabetes in Oklahoman children

- According to the estimates from CDC, there were about 2,300 people aged 20 years or younger in Oklahoma had physician-diagnosed diabetes for the year 2007, including type 1 and type 2.
- Based SEARCH program, there are 1,900 youth <20 years of age in Oklahoma had diabetes, including more than 200 cases of type II diabetes.

## Diabetes mortality

- In 2005, the age-adjusted mortality rate of diabetes in Oklahoma ranked the 4$^{th}$ highest in the nation.
- Diabetes mortality has slightly increased, especially in males, and among people 45 years old and over.
- Diabetes mortality among Not-Hispanic American Indians and Not-Hispanic African Americans were much higher than that in Not-Hispanic Whites.
- Age-adjusted mortality rates were higher in western and southwest Oklahoma

## Diabetes mobility and co-mobility

- Among adults with diabetes, 31.6% reported that they had diagnosed cardiovascular diseases, much more than that of 8.0% among adults not being diagnosed with diabetes.
- About 71.2% adults with diabetes had diagnosed high blood pressure, much more than that of 26.9% among adults not being diagnosed with diabetes.
- 21.4% of the people with diabetes reported that their diabetes has affected their eyes or that they had retinopathy.
- The incidence of End Stage Renal Disease (ESRD) in Oklahoma has risen 16.7% from 2000 to 2007. During the same time, the prevalence of ESRD in Oklahoma increased 27.3%.
- Males had higher prevalence of ESRD than females, and African Americans and American Indians had much higher incidence and prevalence of ESRD than Whites.
- In Oklahoma, about half of newly diagnosed ESRD cases had diabetes as the primary diagnosis, which accounted for over 600 persons every year.
- In calendar year 2006, about one in every 100 hospitalizations with diabetes as any diagnosis had chronic kidney disease (CKD).
- Male has significantly higher prevalence of CKD than females. African Americans and American Indians had significantly higher prevalence of CKD than Whites.

## Diabetes hospitalization

- In calendar year 2007, there were 6,515 hospital admissions with diabetes as the principle diagnosis in Oklahoma.
- In the 2007, Oklahoma had the hospitalization rate with diabetes as the principle diagnosis of 1.8/1,000 population.
- African Americans had much higher hospitalization rate with diabetes as the principle diagnosis than other racial groups.
- Although most of hospital admission cases due to diabetes were residents of Oklahoma County and Tulsa County, people living in southern and southwest of the state were more likely to have higher hospitalization rates related to diabetes.
- The total charge of hospitalizations with diabetes as the principle diagnosis was $126.1 millions in 2007.
- The total length of stay for diabetes hospitalizations was 32,090 days in 2007, with the median of 3 days.
- About 60% of hospital admissions with diabetes as the principle diagnosis were admitted from the emergency room and another 19.3% admitted with urgent care.

## Diabetes complication prevention

- According to 2004 and 2006 BRFSS, Oklahomans with diabetes fall short of the Healthy People 2010 goals in annual foot exams by a health professional, annual dilated eye exams, annual dental exam, and diabetes education.
- American Indian adults with diabetes reported significantly higher proportion of having foot examination by health professional, having diabetes education class than White adults with diabetes.
- Adults with diabetes aged 18-44 years old reported significantly lower proportions of daily self foot exams, influenza vaccination in the past year, and ever-received pneumococcal vaccination compared with adults with diabetes in other age groups.
- Adults with diabetes who had annual household incomes less than $15,000 reported significantly lower proportions of having dilated eye exam in the past year, visited dentist in the past year, and having leisure time physical activity in the past month than those with annual household incomes $50,000 and over.
- Adults with diabetes who had college graduate reported significantly higher proportions of HbA1c check, cholesterol check, or visited dentist in the past year, compared with those with high school graduation.
- Adults with diabetes who had health care coverage reported significantly higher proportion of most complication prevention activities than those without coverage.
- According to 2005-2007 BRFSS, 62.1% of Oklahoma adults with diabetes reported that they received influenza vaccines within the last 12 months.
- According to 2003-2005 BRFSS, 56.5% of Oklahoma adults with diabetes reported that they ever received pneumococcal vaccines.

## Economic impact of diabetes

- The medical cost of diabetes in Oklahoma was estimated as $3.28 billion.
- Diabetes is responsible for $1.86 billion in excess expenditures for persons with diabetes.

## Diabetes risk factor and prevention

- According to 2006-2007 BRFSS, about 27,200 Oklahoma adults (1.0%) have pre-diabetes.
- About 29.6% of Oklahoma adults reported that they did not participate any leisure-time physical activity during the past 30 days.
- The proportions of people did not participate any type of physical activity remained unchanged during the past six years, both in Oklahoma and nationwide.
- The prevalence of diabetes was more than doubled among Oklahoma adults who reported with BMI>=30.
- The prevalence of obesity among adult population are increasing, both in Oklahoma and nationwide, during the past six years.

- Only 16.3% of adults in Oklahoma took fruits and vegetables five or more times a day, much lower than the national average (24.3%).
- According to the 2007 YRBS data, about half of students reported that they did not meet the recommended level of physical activity.
- There were 14.7% Oklahoma Students were overweight, with another 15.2% students being at risk of becoming overweight.

## Gestational Diabetes

- According to 2005-2007 PRAMS data, about one out of every ten Oklahoma women (10.2%) who recently delivered a baby had gestational diabetes mellitus (GDM), and additional 2.3% of women had diabetes before their pregnancy.
- Women with pre-pregnancy BMI >29 reported a significantly higher prevalence of GDM than those with pre-pregnancy BMI <26.
- Women with diabetes during pregnancy were less likely to have pregnancy weight gain under the recommended amount and were more likely to have higher prevalence of hypertension.
- The baby delivered by women with diabetes during pregnancy were more likely to have birth weight of 4,000 grams or more, or spend 3 or more days in the hospital, or be admitted to the ICU.

## Diabetes among Medicaid beneficiaries

- There were 34,429 Medicaid beneficiaries had claims in calendar year (CY) 2007 with diabetes as the primary diagnosis in Oklahoma.
- Female beneficiaries had higher prevalence of diabetes than males, with diabetes as the primary diagnosis, and as any diagnosis.
- Beneficiaries with older ages tend to have higher prevalence of diabetes.
- The total amount paid by OHCA for claims with a Primary Diagnosis of Diabetes was $88.7 millions in calendar year 2007.

# HEALTHY PEOPLE 2010 OBJECTIVES CONCERNING DIABETES AND OKLAHOMA'S ACHIEVEMENT

## HP 2010 Objective 5. Diabetes

**Goal:** Through prevention programs, reduce the disease and economic burden of diabetes, and improve the quality of life for all persons who have or are at risk for diabetes.

**5-1. Increase the proportion of persons with diabetes who receive formal diabetes education.**
**Target:** 60 percent.
**Baseline:** 45 percent of persons aged 18 years and older with diabetes received formal diabetes education in 1998 (age adjusted to the year 2000 standard population)

**5-2. Prevent diabetes.**
**Target:** 3.8 new cases per 1,000 population per year.
**Baseline:** 5.5 new cases of diabetes per 1,000 population aged 18 to 84 years (3-year average) occurred in 1997–99 (age adjusted to the year 2000 standard population).

**5-3. Reduce the overall rate of diabetes that is clinically diagnosed.**
**Target:** 25 overall cases per 1,000 population.
**Baseline:** 40 overall cases (including new and existing cases) of diabetes per 1,000 population occurred in 1997 (age adjusted to the year 2000 standard population).

**5-4. Increase the proportion of adults with diabetes whose condition has been diagnosed.**
**Target:** 78 percent.
**Baseline:** 64 percent of adults aged 20 years and older with diabetes had been diagnosed in 1988–94 (age adjusted to the year 2000 standard population).

**5-5. Reduce the diabetes death rate.**
**Target:** 46 deaths per 100,000 population.
**Baseline:** 77 deaths per 100,000 population were related to diabetes in 1999[2] (age adjusted to the year 2000 standard population).

**5-6. Reduce diabetes related deaths among persons with diabetes.**
**Target:** 7.8 deaths per 1,000 persons with diabetes.
**Baseline:** 8.8 deaths per 1,000 persons with diabetes listed anywhere on the death certificate occurred in 1999[1] (age adjusted to the year 2000 standard population).

**5-7. Reduce deaths from cardiovascular disease in persons with diabetes.**
Target: 299[1] deaths per 100,000 persons with diabetes.
Baseline: 332[2] deaths from cardiovascular disease per 100,000 persons with diabetes occurred in 1999[2] (age adjusted to the year 2000 standard population).

**5-8. *(Objective proposed for deletion due to lack of data source)*(Developmental) Decrease the proportion of pregnant women with gestational diabetes.**

**5-9. *(Objective proposed for deletion due to lack of data source)*(Developmental) Reduce the frequency of foot ulcers in persons with diabetes.**

**5-10. Reduce the rate of lower extremity amputations in persons with diabetes.**
**Target:** 2.9 lower extremity amputations per 1,000 persons with diabetes per year.
**Baseline:** 6.6 lower extremity amputations per 1,000 persons with diabetes occurred in 1997–99[2] (age adjusted to the year 2000 standard population).

**5-11. Increase the proportion of adults with diabetes who obtain an annual urinary microalbumin measurement.**
**Target:** 14 percent.
**Baseline:** 12 percent of adults aged 65 years and older with diabetes obtained an annual urinary microalbumin measurement in 2000.

**5-12. Increase the proportion of adults with diabetes who have a glycosylated hemoglobin measurement at least once a year.**
**Target:** 65 percent.
**Baseline:** 59 percent of adults aged 18 years and older with diabetes had a glycosylated hemoglobin measurement at least once a year (mean of data from 39 States in 2000[2]; age adjusted to the year 2000 standard population).

**5-13. Increase the proportion of adults with diabetes who have an annual dilated eye examination.**
Target: 76 percent.
Baseline: 49[2] percent of adults aged 18 years and older with diabetes had an annual dilated eye examination in 1998 (age adjusted to the year 2000 standard population).

**5-14. Increase the proportion of adults with diabetes who have at least an annual foot examination.**
Target: 91 percent.
Baseline: 68 percent of adults aged 18 years and older with diabetes had at least one annual foot examination (mean value of data from 39 States in 1998; age adjusted to the year 2000 standard population).

**5-15. Increase the proportion of persons with diabetes who have at least an annual dental examination.**
Target: 71[1] percent.
Baseline: 56[2] percent of persons aged 2 years and older with diagnosed diabetes saw a dentist at least once within the preceding 12 months in 1997 (age adjusted to the year 2000 standard population).

**5-16. Increase the proportion of adults with diabetes who take aspirin at least 15 times per month.**
Target: 30 percent.
Baseline: 20 percent of adults aged 40 years and older with diabetes took aspirin at least 15 times per month in 1988–94 (age adjusted to the year 2000 standard population).

**5-17. Increase the proportion of adults with diabetes who perform self-blood-glucose-monitoring at least once daily.**
Target: 61[1] percent.
Baseline: 43[2] percent of adults aged 18 years and older with diabetes performed self-blood-glucose-monitoring at least once daily (mean of data from 39 States in 1998; age adjusted to the year 2000 standard population).

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# INTRODUCTION

## What is diabetes?

Diabetes is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both[1]. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels[2]. Diabetes can lead to serious complications and premature death, but people with diabetes can take steps to control the disease and lower the risk of complications[1].

## Types of diabetes

The classification of diabetes mellitus includes four clinical classes[1].

**Type 1 diabetes** was previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. Type 1 diabetes develops when the body's immune system destroys pancreatic beta cells, the only cells in the body that make the hormone insulin that regulates blood glucose. To survive, people with type 1 diabetes must have insulin delivered by injection or a pump. This form of diabetes usually strikes children and young adults, although disease onset can occur at any age. Type 1 diabetes accounts for 5% to 10% of all diagnosed cases of diabetes. Risk factors for type 1 diabetes may be autoimmune, genetic, or environmental. There is no known way to prevent type 1 diabetes. Several clinical trials of methods of the prevention of type 1 diabetes are currently in progress or are being planned.

**Type 2 diabetes** was previously called non insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes accounts for about 90% to 95% of all diagnosed cases of diabetes. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce it. Type 2 diabetes is associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity. African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Native Hawaiians or Other Pacific Islanders are at particularly high risk for type 2 diabetes and its complications. Clinically-based reports and regional studies suggest that type 2 diabetes in children and adolescents, although still rare, is being diagnosed more frequently, particularly in American Indians, African Americans, and Hispanic/Latino Americans.

**Gestational diabetes** is a form of glucose intolerance diagnosed in some women during pregnancy. Gestational diabetes occurs more frequently among African Americans, Hispanic/Latino Americans, and American Indians. It is also more common among obese women and women with a family history of diabetes. During pregnancy, gestational diabetes requires treatment to normalize maternal blood glucose levels to avoid complications in the infant. After pregnancy, 5% to 10% of women with gestational diabetes are found to have type 2 diabetes. Women who have had gestational diabetes have a 20% to 50% chance of developing diabetes in the next 5-10 years.

**Other types** of diabetes result from specific genetic conditions (such as maturity-onset diabetes of youth), surgery, drugs, malnutrition, infections, and other illnesses. Such types of diabetes account for 1% to 5% of all diagnosed cases.

## Symptoms and complication of diabetes

Symptoms of marked hyperglycemia include polyuria, polydipsia, weight loss, sometimes with polyphagia, and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany chronic hyperglycemia. Acute, life-threatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the nonketotic hyperosmolar syndrome[2].

Long-term complications of diabetes include retinopathy with potential loss of vision; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcers, amputations, and Charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction. Patients with diabetes have an increased incidence of atherosclerotic cardiovascular, peripheral arterial, and cerebrovascular disease. Hypertension and abnormalities of lipoprotein metabolism are often found in people with diabetes. In addition, persons with diabetes are believed to be more prone to infection)[2].

This report will discuss the prevalence, mortality, complications and complication prevention behaviors, economic impact, and Diabetes among special populations. The major types of diabetes that will be discussed in this report are type 2 and gestational diabetes.

## References


1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2008; 31: (Supplement 1): S55-S60.
2. Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2005. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2005.

# DATA SOURCES

## BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS)

The Behavioral Risk Factor Surveillance System (BRFSS), which administered and supported by the Centers for Disease Control and Prevention (CDC), is a state-based system of health surveys that generate information about health risk behaviors, clinical preventive practices, and health care access and use primarily related to chronic diseases and injury. BRFSS is a state-based, ongoing, random-digit-dialed (RDD) telephone survey of the non-institutionalized civilian population 18 years of age and older.

For each year of BRFSS diabetes data, one prevalence measure was constructed. In addition, eight questions are available as optional modules. Respondents were considered to have diabetes if they answered "yes" to the question "Has a doctor ever told you that you have diabetes?" Women who indicated that they only had diabetes during pregnancy were not considered to have diabetes.

There are several limitations of diabetes prevalence from BRFSS data. 1) BRFSS is a telephone survey. It's estimated that 5% of Oklahomans do not have residential phone service. Statistical sample weights can't completely eliminate the bias. 2) BRFSS data is self-reported survey and the responses could not be verified. 3) About one-third of persons with diabetes do not aware they have it because their diabetes has never been diagnosed[1]. The self-reported BRFSS data may underestimate the true prevalence of diabetes. For further information about BRFSS, please visit http://www.cdc.gov/brfss/index.htm.

Oklahoma 2007 BRFSS data includes two diabetes prevalence questions in the core. The diabetes modules were used in 2004 and 2006 survey.

## HOSPITALIZATION DATA

Diabetes related hospital discharge data is currently available through 2006. The Oklahoma Health Care Information Act mandates the collection of inpatient hospitalization data from licensed facilities within the state. The Oklahoma Health Care Information Center, housed at the Oklahoma State Department of Health, is responsible for the collection, processing, and dissemination of this data. One limitation of this data is that it reflects encounters rather than individuals. Another limitation is that data from Indian Health Service hospitals, military and veteran hospitals are not collected.

## MEDICAID

Medicaid is the federal and state entitlement program that provides funding for medical benefits to low-income individuals who have inadequate or no health insurance coverage. Medicaid guarantees coverage for basic health and long-term care services based upon income and/or resources. The Oklahoma Health Care Authority (OHCA) is the primary entity in the State of Oklahoma charged with controlling costs of State-purchased health care. The mission of (OHCA) is to purchase state and federally funded health care in the most efficient and comprehensive manner possible and to study and recommend strategies for optimizing the accessibility and quality of health care.

In Oklahoma, a prearranged fee (capitated payment) is paid to the SoonerCare Primary Care Provider/Case Manager (PCP/CM) monthly for primary and preventive care. Other services not included in the capitated benefit package are paid as fee-for-service. Under fee-for-service, payments are made directly to the providers once an allowable service has been provided and billed.

The statistical results of Medicaid claim data were obtained through an inter-agency data sharing agreement between OSDH and OHCA. The data is currently available through 2007.

## MORTALITY DATA

Diabetes mortality data for the US were from CDC WONDER (Wide-ranging OnLine Data for Epidemiologic Research, http://wonder.cdc.gov/), which contains mortality and population counts for the years through 2005. Data for Oklahoma diabetes mortality were form Oklahoma Vital Records, the official registration point and repository for certificates for all birth and death events that occur in the state of Oklahoma. The latest available data was through 2006. Oklahoma data was made available from the interactive web-based inquiries through OK2SHARE, the Oklahoma State Department of Health (OSDH) internet databases at http://www.health.state.ok.us/ok2share/ .

Underling causes of deaths reported to Oklahoma Vital Record with ICD-9 code 250-250.9 before 1999 and ICD-10 code E10-E14 on 1999 and after were considered as diabetes mortality cases. The comparability ratio for diabetes mellitus deaths indicates that less than 1 percent of the increase is due to the change from ICD-9 to ICD-10 (see http://wonder.cdc.gov/ for details). Age-adjusted mortality rates (based on US 2000 standard population) were either obtained from the CDC WONDER or OK2SHARE.

There were some limitations with diabetes mortality data. First, diabetes mortality rates are underreported since persons with diabetes may die of complications. Studies have found that only about 35% to 40% of decedents with diabetes had it listed anywhere on the death certificate and only about 10% to 15% had it listed as the underlying cause of death. Because only 60% of decedents with diabetes have diabetes recorded as a cause of death, death certificate data cannot be used to examine overall mortality among

persons with diabetes. Furthermore, decedents with diabetes recorded as a cause of death are not representative of decedents known to have diabetes.

An additional limitation is the misclassification of American Indians on death certificates, particularly in Oklahoma where the American Indian population represents 8.5% of the state Non-Hispanic population. According to a report by the National Center for Health Statistics, all cause death rates for Native Americans are 21% lower than they should be due to misclassification on death certificates and underreporting in the census. To eliminate the misclassification, Oklahoma Vital Records has been making continuing efforts to have a linkage between Oklahoma death data and Indian Health Services (IHS) administrative records in Albuquerque, New Mexico. These administrative records include all patients seen at any Indian Health Services or reporting Tribal Health Service Facility throughout the United States – including all areas offices. The IHS linked mortality data were through 2003.

## PREGNANCY RISK ASSESSMENT MONITORING SYSTEM (PRAMS)

The Pregnancy Risk Assessment Monitoring System (PRAMS) is an ongoing, statewide study that collects information about a woman's behaviors and experiences before, during and after pregnancy. Oklahoma PRAMS is funded by the Centers for Disease Control and Prevention (CDC), the Title V Maternal and Child Health Block Grant and the Oklahoma State Department of Health. Oklahoma PRAMS has been surveying new mothers since 1988.

The purpose of PRAMS is to discover why some babies are born healthy and why others are not, in an effort to increase the numbers of babies in Oklahoma who are born healthy. The information is used to help guide programs and health policy in Oklahoma and to help make better use of limited resources. Oklahoma currently collects PRAMS data on the following topics: health insurance, prenatal care, breastfeeding, diabetes before and during pregnancy, maternal smoking and secondhand smoke exposure, alcohol use, social support and family planning.

Each month Oklahoma PRAMS randomly selects between 200 and 250 women with a recent delivery from Oklahoma birth certificates using a stratified systematic sampling approach based on infant birth weight. Mothers are sent as many as three mail questionnaires, with follow-up phone interviews for women who do not respond to the mailed surveys. Analysis weights are applied to adjust for selection probability and non-response.

Beginning in 2004, Oklahoma adopted the PRAMS Phase V questionnaire in which the subject of diabetes has been split into two questions, "Did you have any of these problems during your most recent pregnancy? a. High blood sugar (diabetes) that started before this pregnancy b. High blood sugar (diabetes) that started during this pregnancy"

There are several limitations to this data. First, some data (such as height and pre-pregnancy weight, diabetes) were self-reported. Second, the data in this report have not been adjusted for potential confounders. For example, the association between diabetes and weight gain during pregnancy is most likely confounded by pre-pregnancy BMI.

## YOUTH RISK BEHAVIOR SURVEY

The Youth Risk Behavior Survey (YRBS) was developed in 1990 to monitor priority health risk behaviors that contribute markedly to the leading causes of death, disability, and social problems among youth and adults in the United States. These behaviors, often established during childhood and early adolescence, include: tobacco use, unhealthy dietary behaviors, inadequate physical activity, alcohol and other drug use, sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases, including HIV infection, and behaviors that contribute to unintentional injuries and violence.

CDC randomly selected a certain number of schools and a certain number of classrooms from the list of all public schools in Oklahoma. The YRBS program contacted the schools and asked for their participation and a list of all second hour classrooms. The classrooms, which would conduct the survey, were randomly selected from that list. After the classrooms are selected and the school has agreed to participate, each county health department that has a school in the sample was asked to pick a person to help. Those people were trained on how to administer the survey and the state YRBS program also provide staff to assist. The county health department staff worked with the school to arrange a date for the survey, and on that date, they administered the survey in the selected classrooms and collected the survey booklets. After every school had finished, the survey booklets were sent back to the CDC for data entry.

In addition of providing the finalized dataset to YRBS staff in OSDH, CDC also has the web-based query to obtain comprehensive result based on YRBS survey at http://apps.nccd.cdc.gov/yrbss. The latest available data was the 2007 data.

## END STAGE RENAL DISEASE

Data from End Stage Renal Disease Network 13 (ESRD) was used to obtain information on ESRD prevalence and incidence among persons with diabetes.

ESRD Network 13 provides patient services and outreach programs for people with End Stage Renal Disease. Some of the functions of these services include resolving patient grievances and providing educational and informational materials to assist patients in improving their outcomes.

ESRD Network 13 website is to serve the Arkansas, Louisiana and Oklahoma ESRD communities. It provides useful information on ESRD to the general public as well as professional caregivers and ESRD patients.

# PREVALENCE OF DIABETES

The prevalence of diagnosed diabetes was calculated using data from the Behavioral Risk Factor Surveillance System (BRFSS). Undiagnosed diabetes was determined by applying the physician-diagnosed to undiagnosed diabetes of 71% to 29% ratio [1,2]. For county-specific prevalence estimates, a 3-year average was used to improve the precision. For prevalence of demographic factors, 2-year average were used.

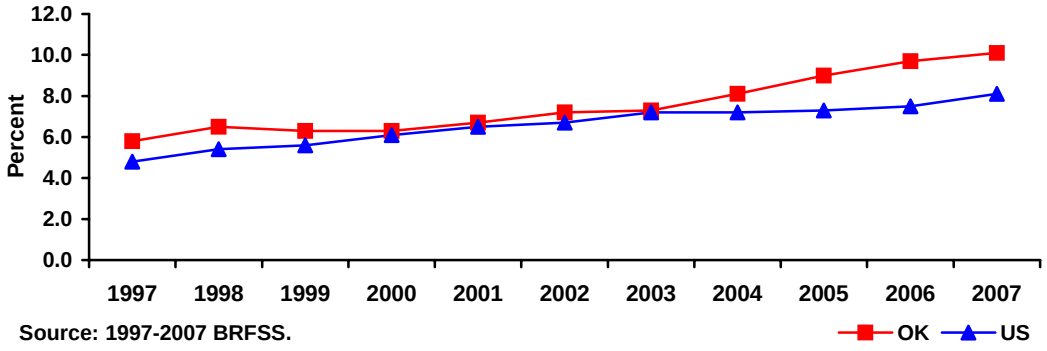
## PREVALENCE OF DIABETES IN ADULT OKLAHOMANS

In the year 2007, among adult Oklahomans (18 years and over), 10.2% (approximately 277,500) reported that they were diagnosed with diabetes by health professionals (Oklahoma BRFSS 2007). After age adjustment, the prevalence was 9.7%.

Because about one-third of persons with diabetes do not aware they have it. It's been estimated that another 4.2% adults (approximately 113,400) with undiagnosed diabetes. Therefore, the total number of adults who have diabetes is 14.4%, or about 390,900 persons in Oklahoma.

The prevalence of diabetes has been steadily increasing during the past 10 years, both in Oklahoma and the US (Figure 1). Except for 2007 (2-year average), a 3-year average was used for Oklahoma data in the trend estimates.

**Figure 1. Trends of Average Prevalence of Diagnosed Diabetes in Oklahoma**




Source: 1997-2007 BRFSS.

## Prevalence of diabetes by demographic factors

Overall, men in Oklahoma have slightly higher prevalence of diabetes than women have (Table 1). When look at the prevalence within each racial/ethnic group, women in Non-Hispanic African Americans and Non-Hispanic American Indian reported slightly higher prevalence of diabetes than men did, while men in the rest racial/ethnic groups reported slightly higher prevalence than women did (data not shown).

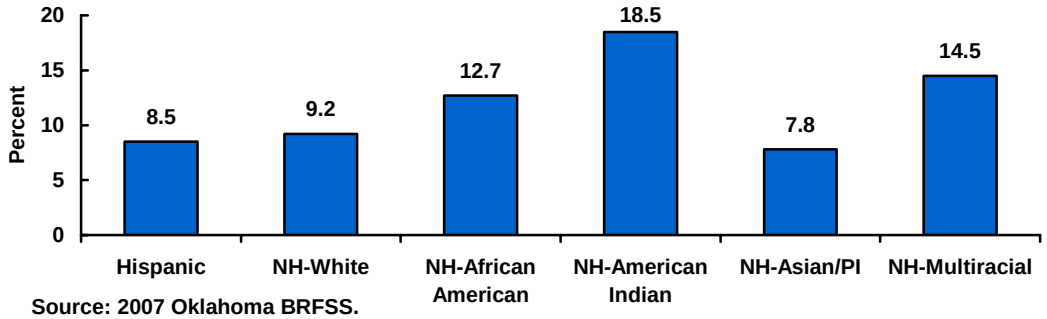
**Table 1. Oklahoma Prevalence and Estimated Number of People with Diabetes, 2007**

| | Prevalence (%) | 95% CI | 2007 Population 18 years and over | Estimated Diagnosed | Estimated Undiagnosed | Estimated Total |
|---|---|---|---|---|---|---|
| Total | 10.2 | 9.4-11.0 | 2,717,800 | 277,500 | 113,400 | 390,900 |
| Gender | | | | | | |
| Males | 10.6 | 9.3-11.9 | 1,325,800 | 140,500 | 57,400 | 197,900 |
| Females | 9.8 | 8.9-10.8 | 1,392,000 | 137,000 | 56,000 | 193,000 |
| Race/ethnicity | | | | | | |
| NH-White | 9.2 | 8.4-10.1 | 2,035,900 | 188,000 | 76,800 | 264,800 |
| NH-African American | 12.7 | 9.3-16.1 | 192,900 | 24,500 | 10,000 | 34,500 |
| NH-American Indians | 18.5 | 14.0-23.0 | 192,200 | 35,500 | 14,500 | 50,000 |
| NH-Asian/Pacific Islander | 7.8 | 1.2-14.5 | 49,500 | 3,900 | 1,600 | 5,500 |
| NH-Multiracial | 14.5 | 11.9-17.1 | 85,600 | 8,800 | 3,600 | 12,300 |
| Hispanic | 8.5 | 5.0-12.0 | 161,800 | 13,800 | 5,600 | 19,400 |
| Age | | | | | | |
| 18-24 years old | 2.1 | 0.2-4.0 | 371,780 | 7,700 | 3,200 | 10,900 |
| 25-34 years old | 3.1 | 1.6-4.6 | 492,774 | 15,300 | 6,200 | 21,500 |
| 35-44 years old | 5.0 | 3.6-6.4 | 466,818 | 23,400 | 9,600 | 33,000 |
| 45-54 years old | 11.2 | 9.1-13.3 | 508,404 | 56,800 | 23,200 | 80,000 |
| 55-64 years old | 18.2 | 15.7-20.6 | 397,893 | 72,300 | 29,500 | 101,800 |
| 65 years old and older | 20.7 | 18.8-22.6 | 480,140 | 99,600 | 40,700 | 140,300 |

Source: 2007 Oklahoma BRFSS. NH: Not-Hispanic.
Number of people rounded to nearest 100. No age-adjustment.

Among Not-Hispanic populations, American Indians and multiracial reported significantly higher prevalence of diabetes than Whites (Figure 2, Table 1).

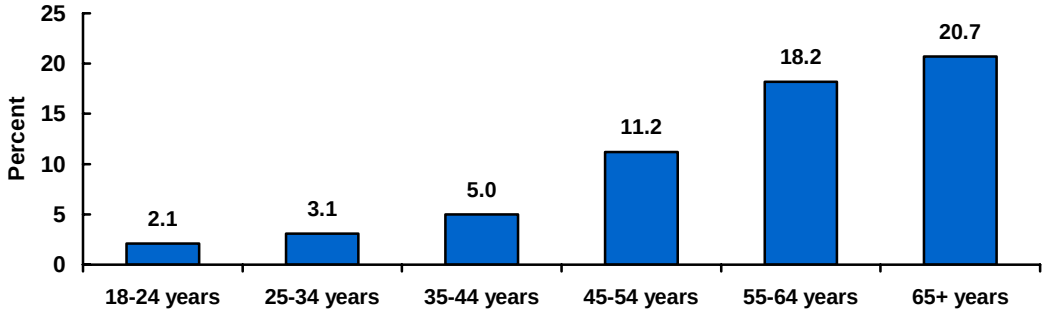
**Figure 2. Oklahoma Diagnosed Diabetes Prevalence by Race/Ethnicity**




**Source: 2007 Oklahoma BRFSS.**
**NH: Not-Hispanic.**

Diabetes is more common among people with older age. Prevalence of diabetes increased from 2.1% in young people18-24 years old to 20.7% among people 65 and over (Figure 3). About one in every five Oklahoma seniors (65 years and over) have been diagnosed with diabetes.

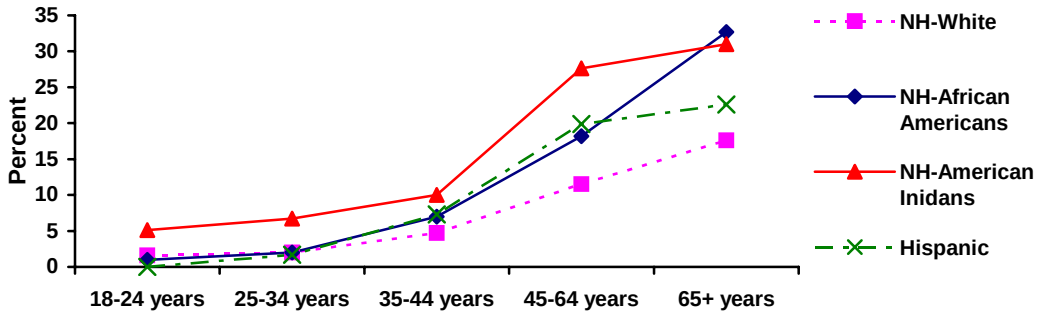
**Figure 3. Prevalence of Diagnosed Diabetes in Oklahoma, by Age**




**Source: 2007 Oklahoma BRFSS.**

The racial/ethnic differences also exist in each age group, especially when people are getting older, prevalence of diabetes in minority groups tend to be higher than Not-Hispanic Whites (Figure 4).

**Figure 4. Prevalence of Diagnosed Diabetes in Oklahoma, by Age and race/ethnicity**




**Source: 2005-2007 Oklahoma BRFSS.**

The Hispanic population has relatively large proportions of young people. Therefore, without age-adjustment, a slightly lower prevalence of diabetes was reported. After age adjustment, Hispanic population has significantly higher prevalence of diabetes than Not-Hispanic Whites ($p<0.05$, Table 2).

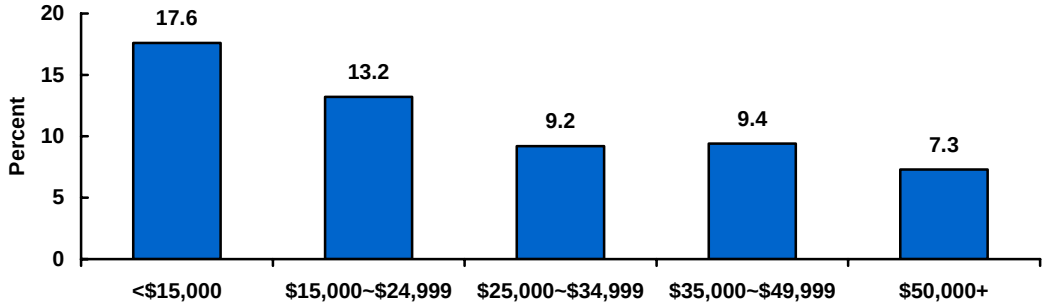
**Table 2. Age-adjusted Prevalence of Diabetes in Adult Oklahomans, 2005-2007**

| | Prevalence (%) | 95% CI | Age-adjusted Prevalence (%) | 95% CI |
|---|---|---|---|---|
| NH-White | 8.7 | 8.3-9.2 | 8.0 | 7.6-8.4 |
| NH-African American | 12.6 | 10.4-14.8 | 13.0 | 10.9-15.0 |
| NH-American Indians | 17.0 | 14.7-19.4 | 17.5 | 15.2-19.7 |
| NH-Multiracial | 13.9 | 11.7-16.0 | 11.5 | 9.7-13.3 |
| Hispanic | 6.6 | 4.9-8.3 | 11.3 | 8.6-14.0 |

Source: 2005-2007 Oklahoma BRFSS. NH: Not-Hispanic.
Age-adjusted to 2000 US Standard Population.

Adults with lower annual household incomes tend to report higher prevalence of diabetes. Oklahoma adults with annual household incomes less than $15,000 reported significantly higher prevalence of diabetes than adults with annual household incomes $25,000 and over ($p<0.05$, Figure 5). Further more, adults with annual household incomes $15,000~$24,999 reported significantly higher prevalence of diabetes than those with household incomes of $50,000 and over ($p<0.05$, Figure 5).

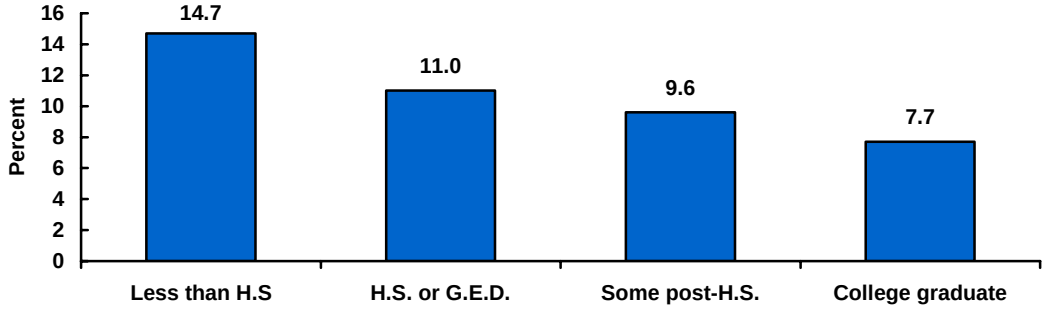
**Figure 5. Oklahoma Diagnosed Diabetes Prevalence by Household Incomes**




**Source: 2007 Oklahoma BRFSS.**

Adults with more years of educations tend to report lower prevalence of diabetes. Compared with Oklahoma adults with college degree or higher educations, those adults with high school graduation or less than high schools reported significantly higher prevalence of diabetes ($p<0.05$, Figure 6).

**Figure 6. Oklahoma Diagnosed Diabetes Prevalence by Education**




**Source: 2007 Oklahoma BRFSS.**

The prevalence of diabetes in 2006-2007 among sub-state planning districts was higher in the northeast and southwest portion of the state (Figure 7).

**Figure 7. Oklahoma Diagnosed Diabetes Prevalence by Region, BRFSS 2006-2007**

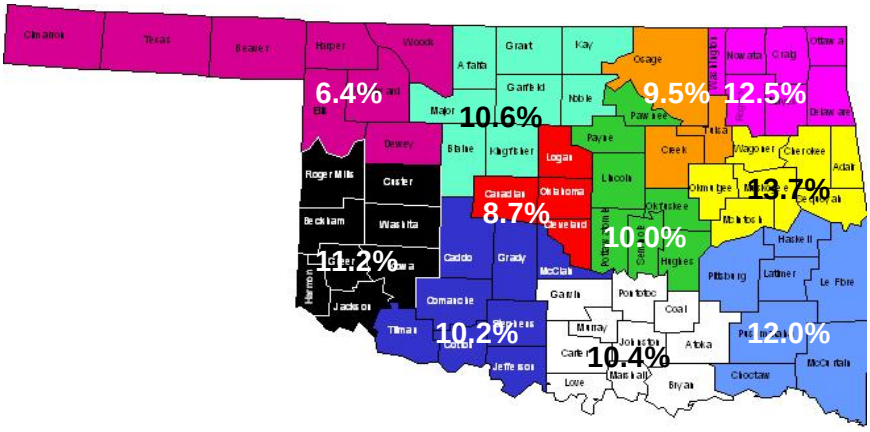



**Figure 8. Oklahoma Diagnosed Diabetes Prevalence by County, BRFSS 2005-2007**

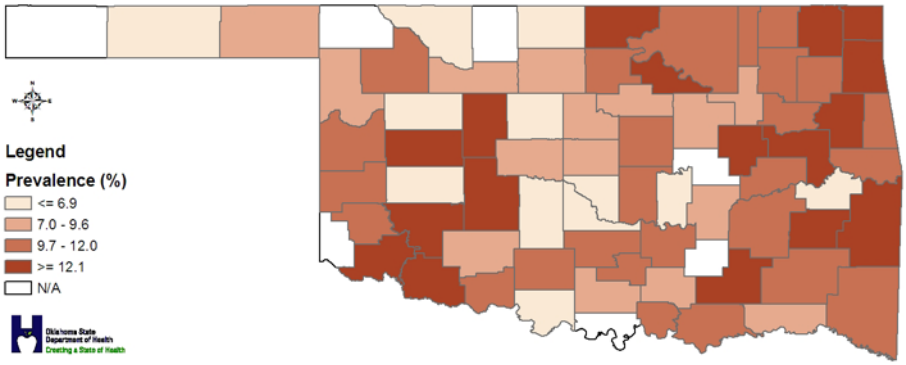


Table 3 and Figure 8 provides the estimated county-specific prevalence of diabetes. In order to provide as much as more counties with stable estimates, a three-year (2005-2007) average was used. According to the BRFSS survey, county-specific estimate will not be available if the respondents in the county less than 50, or the half of the confidence interval >10 to ensure the stable results.

**Table 3. Oklahoma Diabetes Prevalence Estimates by County, 2005-2007***

| County | Prevalence (%) | County | Prevalence (%) | County | Prevalence (%) |
|---|---|---|---|---|---|
| Adair | 9.2 | Grant | N/A | Nowata | 9.4 |
| Alfalfa | N/A | Greer | N/A | Okfuskee | N/A |
| Atoka | N/A | Harmon | N/A | Oklahoma | 8.7 |
| Beaver | 9.9 | Harper | N/A | Okmulgee | 13.6 |
| Beckham | 11.5 | Haskell | 6.9 | Osage | 10.2 |
| Blaine | 11.9 | Hughes | 8.5 | Ottawa | 13.9 |
| Bryan | 10.3 | Jackson | 10.4 | Pawnee | 13.2 |
| Caddo | 14.6 | Jefferson | N/A | Payne | 8.1 |
| Canadian | 8.3 | Johnston | 8.4 | Pittsburg | 9.6 |
| Carter | 10.5 | Kay | 13.3 | Pontotoc | 9.5 |
| Cherokee | 13.7 | Kingfisher | 8.3 | Pottawatomie | 9.4 |
| Choctaw | 6.1 | Kiowa | 11.4 | Pushmataha | 12.0 |
| Cimarron | N/A | Latimer | 11.8 | Roger Mills | N/A |
| Cleveland | 6.7 | Le Flore | 16.8 | Rogers | 11.1 |
| Coal | N/A | Lincoln | 12.9 | Seminole | 6.8 |
| Comanche | 10.1 | Logan | 10.5 | Sequoyah | 12.5 |
| Cotton | N/A | Love | 13.0 | Stephens | 12.3 |
| Craig | 13.0 | McClain | 6.0 | Texas | 2.4 |
| Creek | 8.7 | McCurtain | 10.3 | Tillman | N/A |
| Custer | 10.7 | McIntosh | 11.0 | Tulsa | 9.1 |
| Delaware | 14.8 | Major | 6.3 | Wagoner | 11.1 |
| Dewey | N/A | Marshall | 12.4 | Washington | 8.0 |
| Ellis | N/A | Mayes | 12.8 | Washita | 7.5 |
| Garfield | 9.9 | Murray | 10.2 | Woods | 6.5 |
| Garvin | 10.4 | Muskogee | 13.7 | Woodward | 10.3 |
| Grady | 6.5 | Noble | 10.3 | | |

*: Estimate not available if the respondents in the county less than 50, or the half of the confidence interval >10 to ensure the stable results.

# DIABETES AMONG CHILDREN

Diabetes in children and adolescents is now acknowledged to be a complex disorder with heterogeneity in its pathogenesis, clinical presentation, and clinical outcome. People with diabetes diagnosed before age 20 have a life expectancy that is 15-27 years shorter than people without diabetes.

Until recently, childhood diabetes was almost entirely considered to be type 1.There are more reports of children with the diabetes that has clinical characteristics of type 2 diabetes and the incidence is increasing at an alarming rate. Further more, there are no gold standard definitions for differentiating the types of diabetes in children and youth and information about the clinical course and evolution is limited.

There are different ways to estimate the number of children and adolescents with diabetes in Oklahoma.

.

## CDC's Estimates

According to the estimates from CDC, there were about 176,500 people aged 20 years or younger have diabetes in 2005. This group represents 0.22 percent of all people in this age group.

Apply this estimate to the number of people aged 20 years or younger in Oklahoma, there were about 2,300 had physician-diagnosed diabetes for the year 2007, including type 1 and type 2.

About one in every 400 to 600 children and adolescents has type 1 diabetes[2]. The number for diagnosed type 1 diabetes among people aged 18 years or younger was about from 1,500 to 2,300 for the year 2007 in Oklahoma.

## SEARCH for Diabetes in Youth

SEARCH is a multi-center study funded by the CDC and National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). The study focuses on children and youth in the U.S. who have diabetes. The study goals are to (1) identify the number of children and youth under age 20 who have diabetes, (2) study how type 1 diabetes and type 2 diabetes differ, including how they differ by age and race/ethnicity, (3) learn more about the complications of diabetes in children and youth, (4) investigate the different types of care and medical treatment that these children and youth receive, and (5) learn more about how diabetes affects the everyday lives of children and youth who have diabetes.

Based on results from SEARCH program, the estimated prevalence of diabetes, there are 1,900 youth <20 years of age in Oklahoma had diabetes, including more than 200 cases of type II diabetes. Type II diabetes accounted for about 12% of all youth with diabetes in Oklahoma (about one in every eight).

Among children 0-9 years old with diabetes (about 420 children), 96% of them had Type I diabetes. Not-Hispanic White accounted for 85% of children 0-9 years old with diabetes.

Among youth 10-19 years old with diabetes (about 1470 children and adolescents), about 81% of them had Type I diabetes. Minority youth aged 10-19 years with diabetes had significantly higher proportions of type II diabetes, compared with not-Hispanic White.

- Only 6% of Not-Hispanic White youth 10-19 years old with diabetes had type II diabetes.
- Among Not-Hispanic American Indian youth 10-19 years old with diabetes, 76% had type II diabetes.
- Among Not-Hispanic African Americans youth 10-19 years old with diabetes, 32.6% had type II diabetes.
- Among Hispanic youth 10-19 years old with diabetes, 22% had type II diabetes.

## References


1. National Center of Health Statistics. Health, United States, 2004. With Chartbook on Trends in the Health of Americans. Hyattsville, Maryland: 2004.
2. Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2005. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2005.
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4. SEARCH for Diabetes in Youth Study Group. The Burden of Diabetes Mellitus among US Youth: Prevalence Estimates from the SEARCH for Diabetes in Youth Study. Pediatrics 2006;118(4):1510-18.
5. The Writing Group for the SEARCH for Diabetes in Youth Study Group. Incidence of Diabetes in Youth in the United States. JAMA. 2007;297(24):2716-2724

# DIABETES MORTALITY

Diabetes mortality data for the US were from CDC WONDER. Data for Oklahoma diabetes mortality were form Oklahoma Vital Records. Underling causes of deaths reported with ICD-9 code 250-250.9 before 1999 and ICD-10 code E10-E14 on 1999 and after were considered as diabetes mortality cases.

## DIABETES AS THE LEADING CAUSE OF DEATH

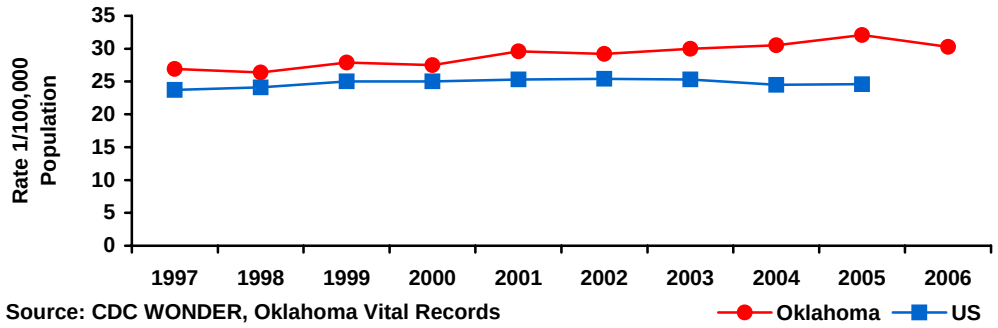
Diabetes was the sixth leading cause of death in the U.S. for 2005. This ranking is based on the 75,119 death certificates in which diabetes was listed as the underlying cause of death, which is 3.0% of all deaths (1). Diabetes is also the sixth leading cause of death in Oklahoma according to 1,217 death cases with it as the underlying cause of death in 2005 (3.8% of all deaths) (2).

## MORTALITY OF DIABETES AS THE UNDERLYING CAUSE OF DEATH

In 2006, the age-adjusted mortality rate of diabetes in Oklahoma was 30.3/100,000 population (Figure 9).

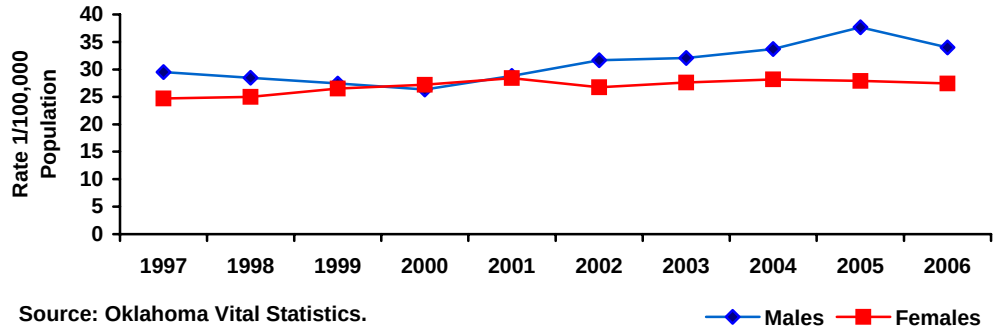
The current available national data was for 2005. The age-adjusted mortality rate of diabetes in Oklahoma was 32.1/100,000 population, higher than that in the U.S. of 24.6/100,000 population and ranked the 4th highest in the nation (only lower than Louisiana, West Virginia, and District of Columbia). The mortality of diabetes in the US has been unchanged during past decade, while it increased at the same time in Oklahoma (Figure 9).

**Figure 9. Oklahoma and US Diabetes Age-Adjusted Mortality Rates, 1997 -2006**




Diabetes mortality in males increased during the past decade, especially in the recent years. Meanwhile, mortality for females kept unchanged. Differences in mortality rates between males and females became noticeable (figure 10).

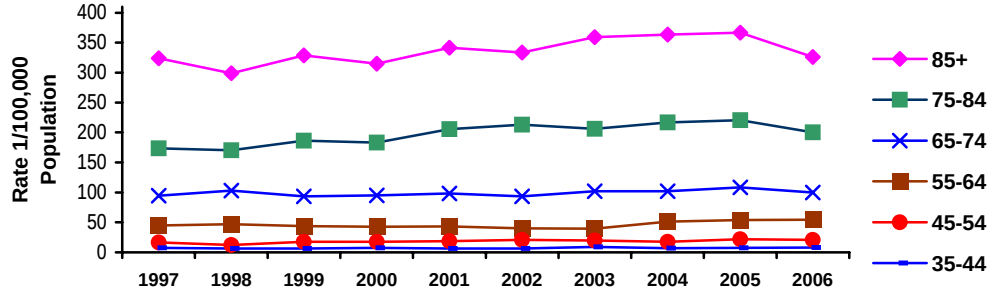
**Figure 10. Oklahoma Age-adjusted Diabetes Mortality Rates by Gender, 1997-2006**




Source: Oklahoma Vital Statistics.

Diabetes mortality rates were much higher among people with older age. The mortality rates have increased among all age groups above 45 years old (Figure 11).

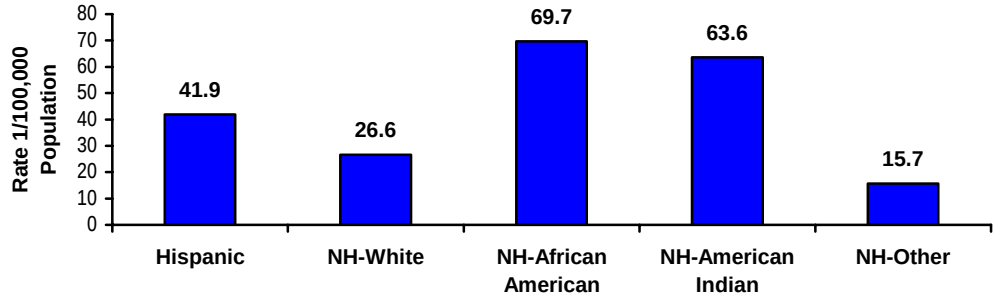
**Figure 11. Oklahoma Diabetes Mortality Rates by Age Group, 1997-2006**




Source: Oklahoma Vital Statistics

Figure 12 indicated that Not-Hispanic African Americans and American Indians had higher diabetes mortality than other racial/ethnic groups.

**Figure 12. Oklahoma Age-adjusted Diabetes Mortality Rates by Race/ethnicity, 2006**




Source: Oklahoma Vital Statistics

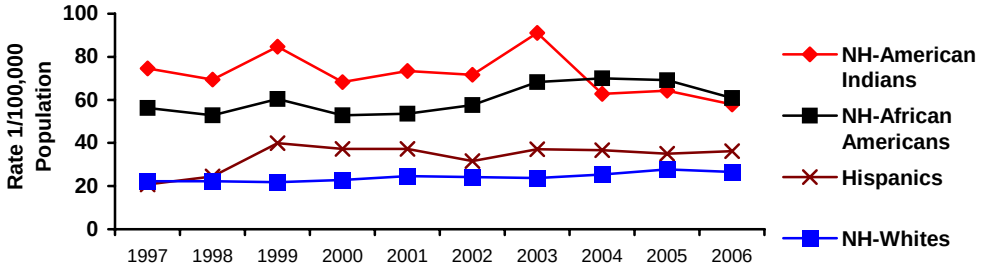
Figure 13 presented the trend of age-adjusted diabetes mortality by race/ethnicity, which use "IHS linked racial categories" (see Data Source for details) for year 2003 and before to reduce the misclassifications of American Indians. This caused the mortality rates for Not-Hispanic American Indians in 2004-2006,

which the IHS linked data are not available, look like “decreased”. For the mortality in Hispanics, three-year average rates were used (besides 1998, 1999, and 2006 were using two-years average rates instead) to obtain stable estimates.

During the past decade, the age-adjusted diabetes mortality rates remained mostly unchanged for some racial/ethnic groups. Diabetes mortality among Not-Hispanic American Indians and Not-Hispanic African Americans were much higher than that in Not-Hispanic Whites (Figure 13).

Unlike in other racial/ethnic groups, the diabetes mortality in Hispanics increased during the late 1990’s, and kept unchanged after 1999. It is unclear whether this trend was due to the rapidly increasing Hispanic population (31.2% increase from 2000 to 2005, compared with 1.1% increase for Not-Hispanic populations in Oklahoma), or because Hispanic population have less proportions of elderly (3.3% of Hispanic people were 65 years and over, compared with 14.0% of in Not-Hispanic populations).

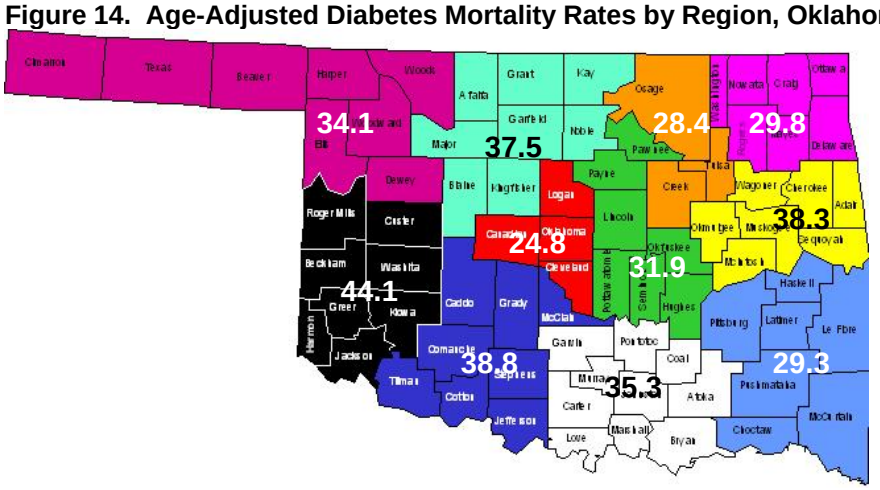
**Figure 13. Oklahoma Age-adjusted Diabetes Mortality Rates by Race/ethnicity, 1997-2006**




Source: Oklahoma Vital Statistics. IHS linked race for 1994-2003.
NH: Not-Hispanic. Rates for Hispanic were combined years.

Age-adjusted mortality rates were higher in western and southwest Oklahoma (Figures 14, 15).

**Figure 14. Age-Adjusted Diabetes Mortality Rates by Region, Oklahoma, 2005-2006**




Source: Oklahoma Vital Records. Rates are in 1/100,000 population.

**Figure 15. Age-Adjusted Diabetes Mortality Rates by County, Oklahoma 2004-2006**

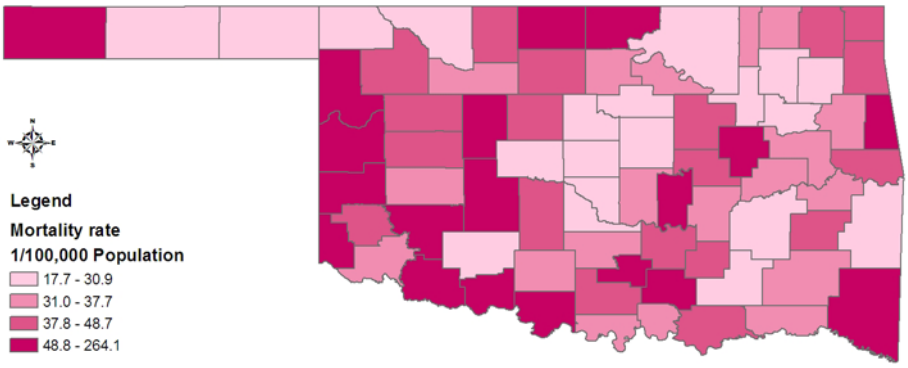



**Table 4. Age-adjusted Diabetes Mortality Rates by County, Oklahoma 2004-2006***

| County | Mortality | County | Mortality | County | Mortality |
|---|---|---|---|---|---|
| Adair | 86.0 | Grant | 42.1 | Nowata | 25.4 |
| Alfalfa | 26.7 | Greer | 27.3 | Okfuskee | 38.2 |
| Atoka | 26.2 | Harmon | 151.1 | Oklahoma | 26.3 |
| Beaver | 22.5 | Harper | 14.3 | Okmulgee | 52.1 |
| Beckham | 43.9 | Haskell | 26 | Osage | 21.0 |
| Blaine | 51.7 | Hughes | 27.1 | Ottawa | 32.2 |
| Bryan | 39.9 | Jackson | 34.4 | Pawnee | 32.0 |
| Caddo | 61.0 | Jefferson | 62.5 | Payne | 18.9 |
| Canadian | 27.2 | Johnston | 57..0 | Pittsburg | 16.6 |
| Carter | 37.2 | Kay | 41.0 | Pontotoc | 40.0 |
| Cherokee | 36.6 | Kingfisher | 31.9 | Pottawatomie | 34.1 |
| Choctaw | 28.3 | Kiowa | 40.6 | Pushmataha | 26.8 |
| Cimarron | 44.7 | Latimer | 37.7 | Roger Mills | 58.5 |
| Cleveland | 25.5 | Le Flore | 23.5 | Rogers | 29.9 |
| Coal | 32.8 | Lincoln | 18.9 | Seminole | 51.9 |
| Comanche | 35.5 | Logan | 21.7 | Sequoyah | 36.0 |
| Cotton | 38.5 | Love | 22.8 | Stephens | 26.1 |
| Craig | 34.8 | McClain | 21.1 | Texas | 36.8 |
| Creek | 37.6 | McCurtain | 52.3 | Tillman | 100.6 |
| Custer | 42.8 | McIntosh | 24.9 | Tulsa | 27.2 |
| Delaware | 30.8 | Major | 20.8 | Wagoner | 36.8 |
| Dewey | 30.1 | Marshall | 25.0 | Washington | 25.7 |
| Ellis | 56.1 | Mayes | 23.6 | Washita | 22.5 |
| Garfield | 32.3 | Murray | 56.7 | Woods | 16.1 |
| Garvin | 27.4 | Muskogee | 27.1 | Woodward | 38.4 |
| Grady | 40.8 | Noble | 26.5 | | |

*: Rates in 1/100,000. Age adjusted to 2000 US standard population.

# YEARS OF POTENTIAL LIFE LOST DUE TO DIABETES

The Years of Potential Life Lost (YPLL) is an estimation of the average years a person would have lived if he or she had not died prematurely.

This measure is used to help quantify social and economic loss owing to premature death, and it has been promoted to emphasize specific causes of death affecting younger age groups.

YPLL inherently incorporates age at death, and its calculation mathematically weights the total deaths by applying values to death at each age.

**Table 5. Years of Potential Life Lost due to Diabetes, 2006**

| | Number of death | Before the age of 65 | Before the age of 75 | Before the age of 85 |
|---|---|---|---|---|
| **Total** | 1,165 | 4,580 | 9,654 | 17,676 |
| **Gender** | | | | |
| Males | 558 | 2,524 | 5,271 | 9,433 |
| Females | 607 | 2,056 | 4,383 | 8,243 |
| **Race/Ethnicity** | | | | |
| NH-White | 875 | 2,995 | 6,533 | 12,286 |
| NH-Black | 118 | 671 | 1,313 | 2,259 |
| NH-American Indian | 134 | 803 | 1,511 | 2,533 |
| Hispanic | 19 | 56 | 180 | 346 |

## References


1. CDC WONDER
2. OK2SHARE
3. Anderson RN, et. al. Comparability of cause of death between ICD-9 and ICD-10 preliminary estimates. National Vital Statistics Reports, 2001; 49.
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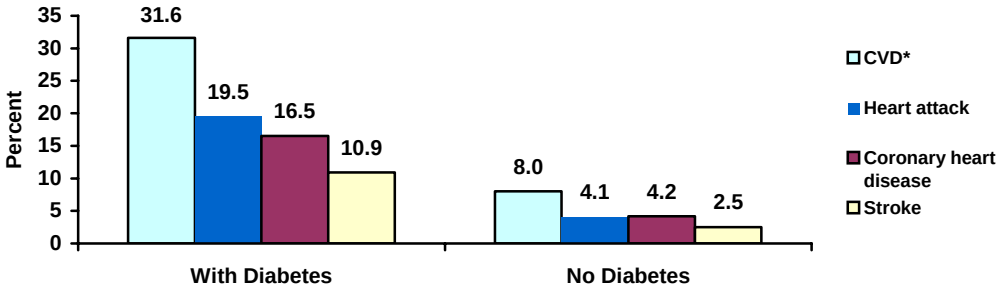
# DIABETES CO-MORBIDITIES

Some of the complications of diabetes are CVD, retinopathy, nephropathy, and peripheral neuropathy. The conditions coexisting with diabetes could be risk factors for cardiovascular disease (CVD), and diabetes itself. In addition, persons with diabetes are more prone to infections.

## CARDIOVASCULAR DISEASES IN PEOPLE WITH DIABETES

CVD is the major cause of morbidity and mortality for individuals with diabetes and is the largest contributor to the direct and indirect costs of diabetes. According to the 2007 Oklahoma BRFSS, adults ever been told having diabetes reported significantly more diagnosed cardiovascular diseases, compared to adults have not been diagnosed with diabetes ($p<0.05$, Figure 16).

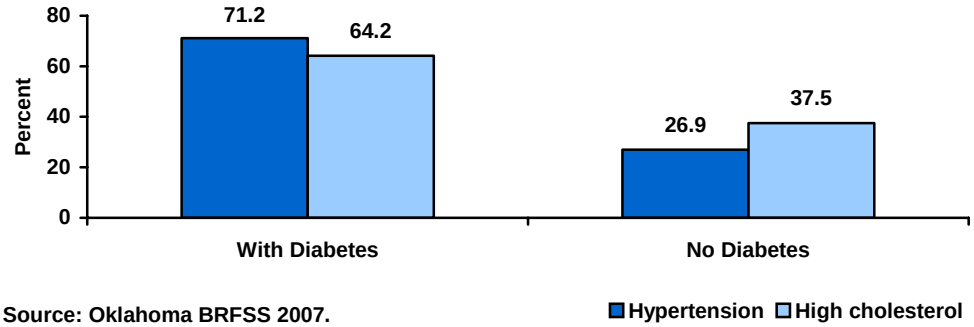
**Figure 16. Prevalence of Cardiovascular Diseases by Diabetes Status Among Adults in Oklahoma**




**Source: Oklahoma BRFSS 2007.**
***CVD: Include any of the three diseases.**

Adults with diagnosed diabetes reported significantly higher prevalence of hypertension and high cholesterol, compared with adults not being diagnosed with diabetes ($p<0.05$, Figure 17).

**Figure 17. Prevalence of Hypertension, High Cholesterol Among Oklahoma Adults, by Diabetes Status**




**Source: Oklahoma BRFSS 2007.**

# RETINOPATHY IN PEOPLE WITH DIABETES

According to BRFSS data, 21.4% of the adults with diabetes reported that they have been told by doctor that diabetes has affected their eyes or that they had retinopathy (Table 6).

Among adults with diabetes in Oklahoma:

- Those aged 55 years and over reported significantly higher prevalence of retinopathy than those younger than 45 years of age.
- Those with high school graduate or less reported significantly higher prevalence of retinopathy than those with college degrees.
- Those with annual household incomes less than $25,000 reported significantly higher prevalence of retinopathy than those with household incomes $35,000 and over.

**Table 6. Retinopathy Among Oklahoma Adults with Diabetes, BRFSS 2003, 2004, 2006**

| | Percent | 95% CI |
|---|---|---|
| **Total** | 21.4 | 19.4-23.4 |
| **Gender** | | |
| Males | 22.1 | 19.0-25.3 |
| Females | 20.7 | 18.2-23.1 |
| **Race/Ethnicity*** | | |
| NH-White | 19.2 | 17.0-21.3 |
| NH-African American | 26.1 | 17.9-34.2 |
| NH-American Indian | 27.7 | 20.9-34.5 |
| NH-Multiracial | 24.6 | 15.9-33.3 |
| Hispanic | 21.6 | 11.5-31.7 |
| **Age (years)** | | |
| 18-44 | 12.2 | 6.8-17.6 |
| 45-54 | 20.3 | 14.4-26.3 |
| 55-64 | 22.1 | 17.6-26.7 |
| 65+ | 21.0 | 17.6-24.4 |
| **Education** | | |
| < High School | 22.5 | 16.6-28.4 |
| HS Diploma/GED | 22.1 | 18.0-26.3 |
| Some College | 18.8 | 14.6-22.9 |
| College Degree | 13.5 | 9.3-17.7 |
| **Household Income** | | |
| <$15,000 | 22.2 | 16.9-27.4 |
| $15,000-24,999 | 23.8 | 18.4-29.2 |
| $25,000-34,999 | 20.5 | 14.3-26.8 |
| $35,000-49,999 | 20.5 | 13.9-27.2 |
| $50,000+ | 11.1 | 6.7-15.5 |

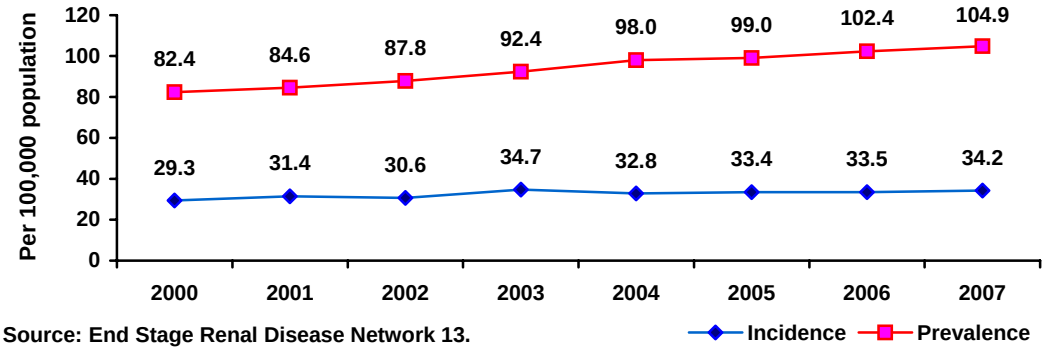
*: NH: Not-Hispanic.

# END STAGE RENAL DISEASE (ESRD) IN PEOPLE WITH DIABETES

ESRD Network 13 website is to serve the Arkansas, Louisiana and Oklahoma ESRD communities. It provides useful information on ESRD to the general public as well as professional caregivers and ESRD patients.

According to ESRD Network 13 Annual report (2007), the incidence of ESRD in Oklahoma has risen 16.7% from 29.3/100,000 populations in 2000 to 34.2/100,000 populations in 2007. And the prevalence of ESRD in Oklahoma increased 27.3%, from 82.4/100,000 populations in 2000 to 104.9/100,000 populations in 2006 (Figure 18).

**Figure 18. Incidence and Prevalence of ESRD in Oklahoma, 2000-2007**




Source: End Stage Renal Disease Network 13.

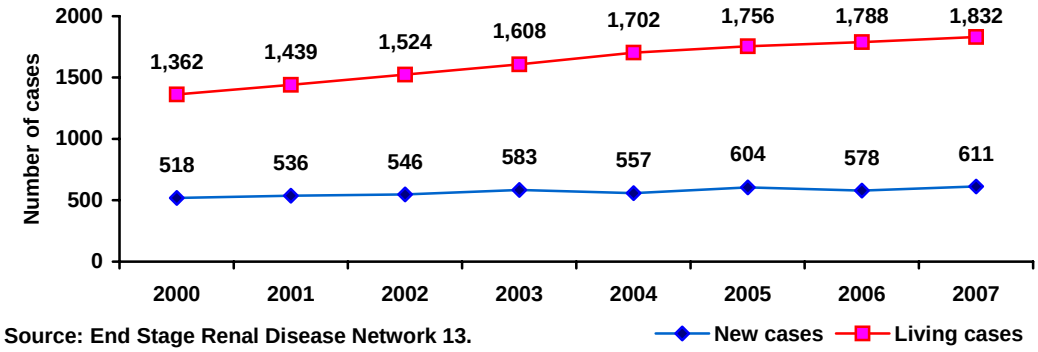
Males had higher prevalence of ESRD than females, and African Americans and American Indians had much higher incidence and prevalence of ESRD than Whites (Table 7).

**Table 7. Incidence and Prevalence of ESRD in Oklahoma, by Gender and Race, 2007**

| | New cases | Incidence (1/100,000 population) | Living cases | Prevalence (1/100,000 population) |
|---|---|---|---|---|
| **Total** | 1,238 | 34.2 | 3,793 | 104.9 |
| **Gender** | | | | |
| **Males** | 693 | 38.8 | 2,083 | 116.5 |
| **Females** | 545 | 29.8 | 1,710 | 93.5 |
| **Race** | | | | |
| **White** | 851 | 30.0 | 2,256 | 79.6 |
| **African American** | 206 | 71.8 | 905 | 315.5 |
| **American Indian** | 157 | 54.9 | 573 | 200.5 |
| **Other** | 24 | 11.4 | 59 | 27.9 |

In Oklahoma, about half of newly diagnosed ESRD each year had diabetes as the primary diagnosis, that accounted for nearly 600 persons. The number of living ESRD dialysis patients increased lately, while the number of newly diagnosed ESRD dialysis patients remains unchanged (Figure 19).

**Figure 19. Number of Incident and Prevalent Cases of ESRD with Diabetes as the Primary Diagnosis in Oklahoma, 2000-2007**




Source: End Stage Renal Disease Network 13.

## CHRONIC KIDNEY DISEASE (CKD) IN PEOPLE WITH DIABETES

In calendar year 2006, about one in every 100 hospitalizations with diabetes as any diagnosis had chronic kidney disease (CKD, ICD-9 code 585) as any diagnosis. That is 1,009 hospitalizations. The charges of hospitalization with CKD and diabetes as any diagnosis were totaled to $52.2 millions, with the median of $35,408. Male has significantly higher prevalence of CKD than females ($p<0.05$). African Americans and American Indians had significantly higher prevalence of CKD than Whites, while American Indians also had significantly higher prevalence than African Americans ($p<0.05$, Table 8).

**Table 8. Prevalence of Chronic Kidney Disease among Oklahoma Hospitalizations With Diabetes As Any Diagnosis, 2006**

| | Number | Percent | 95%CI |
|---|---|---|---|
| **Total** | 1,009 | 1.04 | 0.98-1.10 |
| **Gender** | | | |
| **Males** | 607 | 1.41 | 1.30-1.52 |
| **Females** | 402 | 0.75 | 0.67-0.82 |
| **Race** | | | |
| **White** | 672 | 0.87 | 0.80-0.93 |
| **African Americans** | 157 | 1.65 | 1.40-1.91 |
| **American Indians** | 150 | 2.35 | 1.97-2.72 |
| **Other** | 30 | 0.81 | 0.52-1.10 |
| **Age** | | | |
| **25-34 years** | 20 | 0.76 | 0.43-1.09 |
| **35-44 years** | 67 | 1.13 | 0.86-1.40 |
| **45-54 years** | 196 | 1.43 | 1.23-1.63 |
| **55-64 years** | 295 | 1.47 | 1.31-1.64 |
| **65-74 years** | 217 | 0.90 | 0.78-1.02 |
| **75-84 years** | 167 | 0.79 | 0.67-0.91 |
| **85+ years** | 44 | 0.57 | 0.40-0.74 |

# DIABETES HOSPITAL ADMISSIONS

## HOSPITAL DISCHARGES WITH DIABETES AS THE PRINCIPLE DIAGNOSIS

In calendar year 2007, there were 6,515 hospital discharges with diabetes as the principle diagnosis in Oklahoma. Females had similar number of admissions with males (Table 9). Whites accounted for more than 70% of all admissions with diabetes as the principle diagnosis, and followed by African Americans (Table 9). The number of hospital admissions with diabetes as the principle diagnosis increased with age to the highest in the 45-54 years old age group, then the number decreased with age (Table 9, Figure 22).

**Table 9. Oklahoma Hospitalizations With Diabetes As Principle Diagnosis, 2007**

| | Admissions | Percent* |
|---|---|---|
| Total | 6,515 | 100.0 |
| Gender | | |
| Males | 3,122 | 47.9 |
| Females | 3,393 | 52.1 |
| Race | | |
| White | 4,698 | 72.1 |
| African Americans | 1,020 | 15.7 |
| American Indians | 512 | 7.9 |
| Other | 285 | 4.4 |
| Age | | |
| 0-4 years | 17 | 0.3 |
| 5-14 years | 234 | 3.6 |
| 15-24 years | 648 | 9.9 |
| 25-34 years | 610 | 9.4 |
| 35-44 years | 860 | 13.2 |
| 45-54 years | 1189 | 18.3 |
| 55-64 years | 1092 | 16.8 |
| 65-74 years | 924 | 14.2 |
| 75-84 years | 691 | 10.6 |
| 85+ years | 250 | 3.8 |

*: Numbers do not necessarily sum to totals because of rounding.

In the 2007, Oklahoma had the hospitalization rate with diabetes as the principle diagnosis of 1.8/1,000 population. Males and females had similar rates (Figure 20).

**Figure 20. Oklahoma Hospitalizations With Diabetes As Principle Diagnosis, by Gender, 2007**

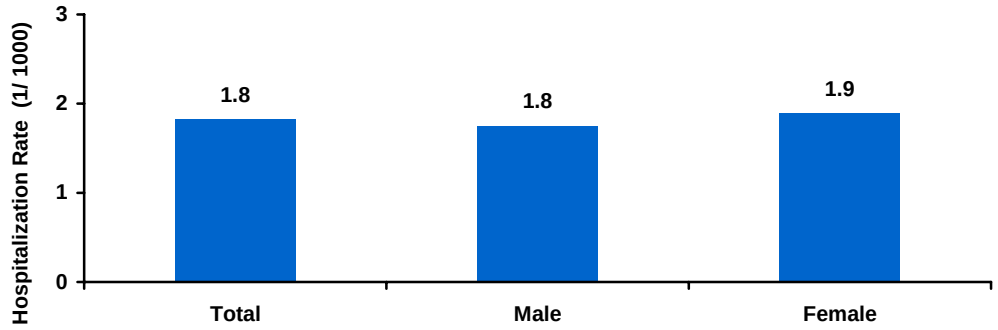
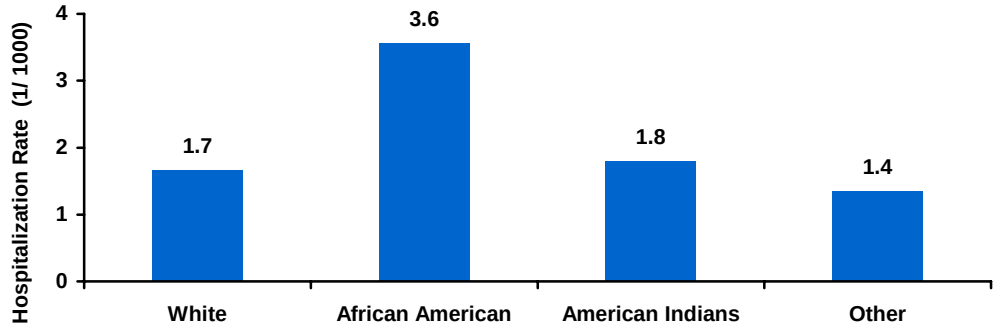
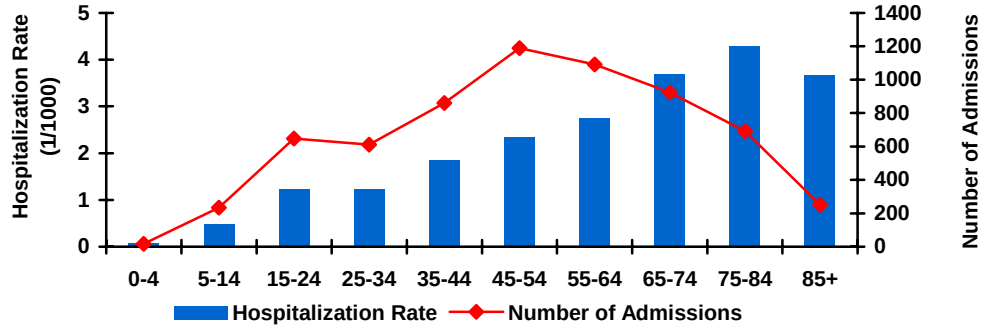



**Figure 21. Oklahoma Hospitalizations With Diabetes As Principle Diagnosis, by Races, 2007**




African Americans had much higher rate than other racial groups (Figure 21). The hospitalization rate with diabetes as the principle diagnosis increased with age and the rate was much higher in those aged 75 years and over (Figure 22).

**Figure 22. Oklahoma Hospitalizations With Diabetes As Principle Diagnosis by age, 2007**



Among those hospital admissions with diabetes as principal diagnoses in 2007, diabetes with other specified manifestations (ICD-9 code 250.8) and diabetes with ketoacidosis (ICD-9 code 250.1) were the most common diagnoses (Table 10).

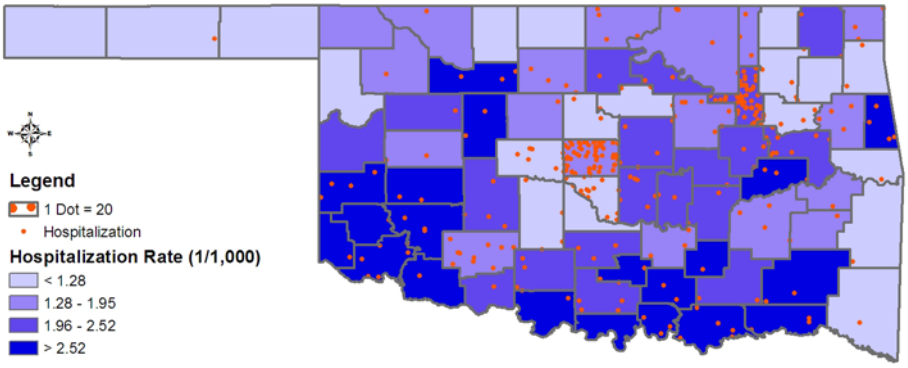
**Table 10. Oklahoma Hospital Discharges With Diabetes As the Principle Diagnosis, 2007**

| Principle Diagnosis (ICD-9 code) | Number | Percent of Total Discharges* |
|---|---|---|
| Diabetes without mention of complications (250.0) | 952 | 14.6 |
| Diabetes with ketoacidosis (250.1) | 2,025 | 31.1 |
| Diabetes with hyperosmolarity (250.2) | 126 | 1.9 |
| Diabetes with other coma (250.3) | 48 | 0.7 |
| Diabetes with renal manifestations (250.4) | 211 | 3.2 |
| Diabetes with ophthalmic manifestations (250.5) | 16 | 0.3 |
| Diabetes with neurological manifestations (250.6) | 778 | 11.9 |
| Diabetes with peripheral circulatory disease (250.7) | 395 | 6.1 |
| Diabetes with other specified manifestations (250.8) | 1,919 | 29.5 |
| Diabetes with unspecified complication (250.9) | 45 | 0.7 |
| Total | 6,515 | 100.0 |

*: Numbers do not necessarily sum to totals because of rounding.

Although most of hospital admission cases due to diabetes were residents of Oklahoma County and Tulsa County, people living in southern, and southwest of the state were more likely to have higher hospitalization rates related to diabetes (Figure 23).

**Figure 23. Oklahoma Hospital Admissions With Diabetes As the Principle Diagnosis, by County, 2007**



The total charge of hospitalizations with diabetes as the principle diagnosis was $126.1 millions for the calendar year 2007. Females had similar average charges with males ($11,352 vs. $11,297, respectfully). The average charge in each racial group was similar to each other (Figure 24). The 55-64 years old age group had the highest average charges (Figure 25).

**Figure 24. Average Charges of Hospitalization with Diabetes As the Principal Diagnosis, by Races, Oklahoma 2007**

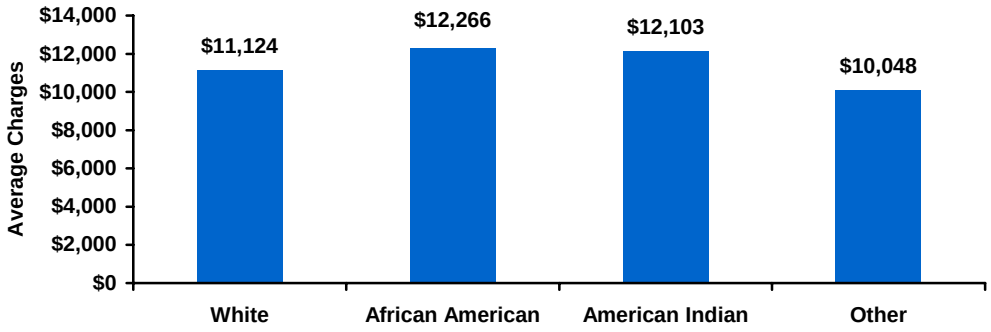
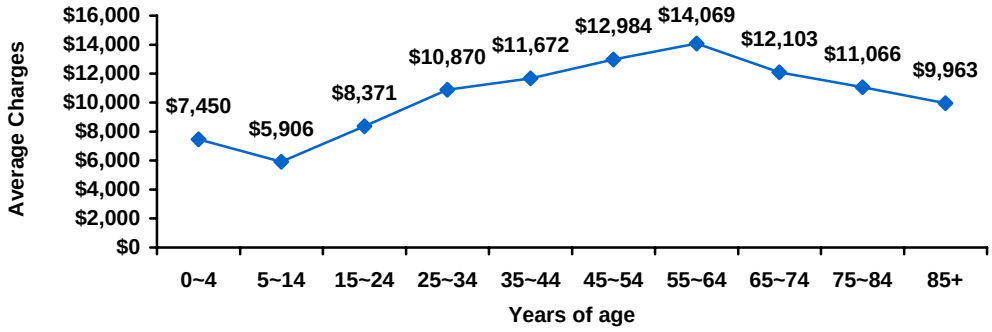



**Figure 25. Average Charges of Hospitalization with Diabetes As the Principal Diagnosis by Age, Oklahoma 2007**

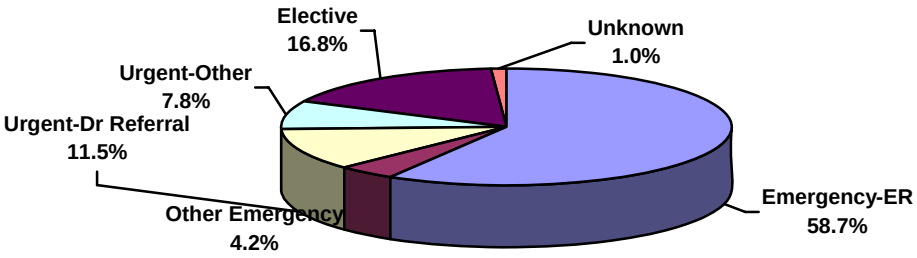



The total length of stay for hospitalizations with diabetes as principal diagnoses was 32,090 days in 2007, with the median of 3 days. Females had similar average length of stay with males. The average of length of stay increased slightly with age, and patients aged 55 years and over stayed longer than young patients.

Among patients hospitalized with diabetes as principal diagnoses in 2007:

- More than half (62.7%) of them were admitted from the emergency room and another 19.3% admitted with urgent care (Figure 26).
- 68.2% were discharged to home or self-care, and another 23.0% were transferred to be under care of other facilities.
- The most common secondary diagnosis was diseases of endocrine, nutritional and metabolic diseases, and immunity disorders (22.1%), followed by the diseases of circulatory system (15.5%).

**Figure 26. Oklahoma Hospital Admissions with Diabetes as the Principal Diagnosis, Source and Type of Admissions, 2007**




## HOSPITAL ADMISSIONS WITH DIABETES AS ANY DIAGNOSIS

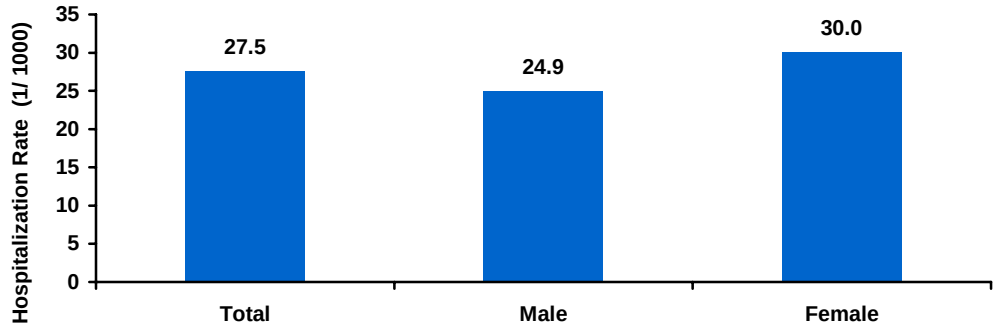
In the year 2007, there were 99,404 hospital admissions with diabetes as any diagnosis, accounted for 19.2% of total admissions of that year. Females had slightly higher number of admissions, as well as hospitalization rate than males (Table 11, Figure 27).

**Table 11. Oklahoma Hospitalizations With Diabetes As Any Diagnosis, 2007**

| | Admissions | Percent* |
|---|---|---|
| Total | 99,404 | 100.0 |
| Gender | | |
| Males | 44,491 | 44.8 |
| Females | 54,913 | 55.2 |
| Race | | |
| White | 79,555 | 80.0 |
| African Americans | 9,508 | 9.6 |
| American Indians | 6,460 | 6.5 |
| Other | 3,881 | 3.9 |
| Age | | |
| 0-4 years | 26 | 0.03 |
| 5-14 years | 296 | 0.30 |
| 15-24 years | 1,252 | 1.26 |
| 25-34 years | 2,523 | 2.54 |
| 35-44 years | 6,262 | 6.30 |
| 45-54 years | 14,114 | 14.20 |
| 55-64 years | 20,950 | 21.07 |
| 65-74 years | 24,664 | 24.81 |
| 75-84 years | 21,437 | 21.56 |
| 85+ years | 7,881 | 7.93 |

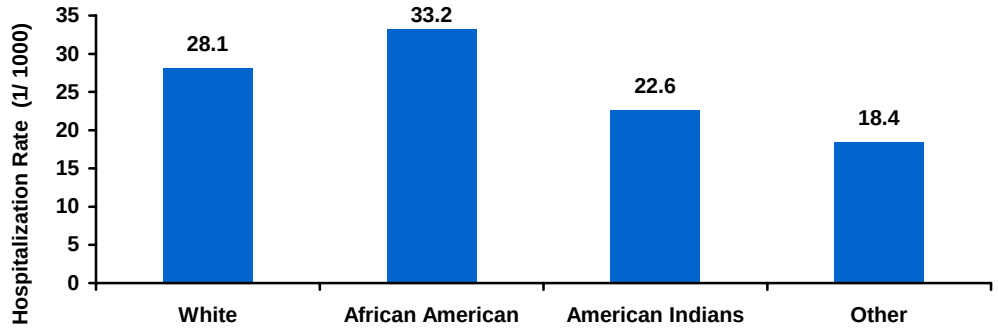
*: Numbers do not necessarily sum to totals because of rounding.

**Figure 27. Oklahoma Hospitalizations Rates with Diabetes As Any Diagnosis, by Gender, 2007**



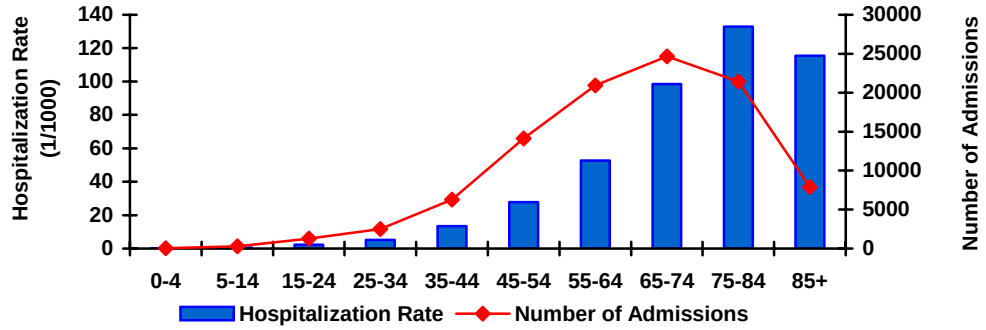

African Americans had higher hospitalization rate than other racial groups for diabetes as any diagnosis (Figure 28), although only accounted for 9.6% of the total number of hospital admissions with diabetes as any diagnosis.

**Figure 28. Oklahoma Hospitalizations Rates with Diabetes As Any Diagnosis, by Races, 2007**




Hospitalization rate for admissions with diabetes as any diagnosis increased with age (Figure 29), and three out of every four admissions were patients aged 55 years and over.

**Figure 29. Oklahoma Hospitalizations With Diabetes As Any Diagnosis by age, 2007**



For the hospitalizations with diabetes as any diagnosis, the charges were totaled to $2.84 billions, with the median of $16,435 in calendar year 2007. Males had similar average charges ($17,091 vs. $15,938, respectfully). Like the average charges of admissions with diabetes as primary diagnosis, the average charges between racial groups were close to each other.

Among hospital admissions with diabetes as any diagnosis, one out of every four (24.8%) had a primary diagnosis of disease of circulatory system, and another 11.5% had a primary diagnosis with disease of respiratory system. Table 12 presents some of the primary diagnosis of hospitalizations with diabetes as any diagnosis.

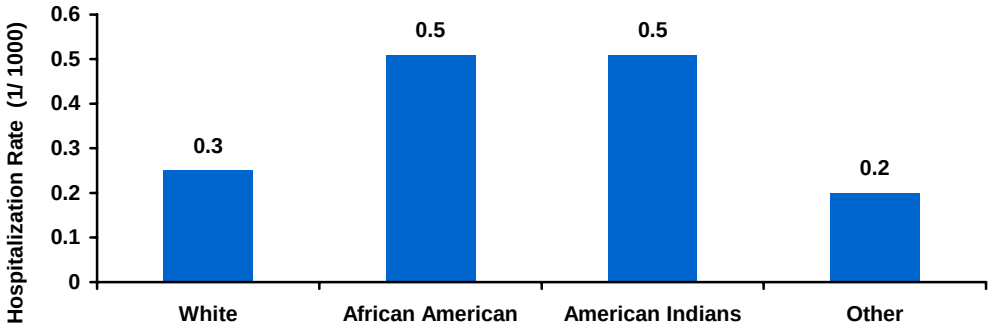
**Table 12. Selected Hospital Discharges with Diabetes as any Diagnosis, 2007**

| Primary Diagnosis (ICD-9 code) | Number | Percent |
|---|---|---|
| Major cardiovascular diseases (390.0-448.99) | 23,496 | 23.6 |
| Influenza (487.0-487.8) | 19 | 0.02 |
| Pneumonia (480.0-486) | 4,865 | 4.9 |
| Chronic Kidney Disease (585) | 145 | 0.1 |
| Amputation *(841) | 926 | 0.9 |

*: Procedure code.

There were 1.030 hospital admissions in 2007 with diabetes and chronic kidney diseases as any diagnosis. About 90% of them were people 45 year and over, and males were 61.2%. Minority populations have relatively higher prevalence (Figure 30).

**Figure 30. Oklahoma Hospitalizations Rates with Diabetes and Chronic Kidney Diseases As Any Diagnosis, by Races, 2007**



# COMPLICATION PREVENTION

Cardiovascular disease (CVD) is the major complication and the leading cause of premature death among people with diabetes. Adults with diabetes are two to four times likely to have heart disease or suffer a stroke than people without diabetes.

The most important preventative step to prevent diabetes complications is the control of blood glucose levels. In addition to HbA1C tests, other preventative practices include the following: daily blood glucose test, influenza and pneumococcal vaccinations, annual dilated eye exams, foot examinations (for sores/sensitivity loss, etc.) by health professionals or patients themselves, annual microalbuminia screenings, annual lipid screenings, and aspirin therapy if needed.

## SELF-REPORTED COMPLICATION PREVENTIONS

Information about complication preventions among adults with diabetes was made available through the diabetes module in BRFSS. To provide stable estimates for those indicators, 2004 and 2006 data, in which the diabetes module was used for that year, were used. For results by racial/ethnic groups, 2003, 2004 and 2006 BRFSS survey data were used.

According to results from 2004 and 2006 BRFSS data, Oklahoma adults with diabetes fall short on four of the Healthy People 2010 goals: annual foot exams by a health professional, annual dilated eye exams, annual dental exam, and diabetes education (Table 13).

**Table 13. Complication Preventive Activities Among Adults with Diabetes in Oklahoma**

| Preventative Care Measure | Males | Females | Total | HP 2010 |
|---|---|---|---|---|
| Professional foot exam in the past year | 65.7 (61.2-70.2) | 65.7 (62.1-69.4) | 66.2 (63.3-69.1) | 75% |
| Daily self foot exams | 71.4 (67.2-75.6) | 72.7 (69.2-76.2) | 72.1 (69.3-74.8) | NA |
| Check blood sugar daily | 56.6 (52.0-61.2) | 68.3 (64.7-71.8) | 62.5 (59.6-65.4) | 60% |
| A1C checked twice or more in the past year | 71.7 (67.3-76.1) | 71.0 (67.1-74.9) | 71.3 (68.4-74.3) | 50% |
| Dilated eye exam in the past year | 70.3 (66.0-74.6) | 65.7 (62.0-69.3) | 68.0 (65.2-70.8) | 75% |
| Cholesterol checked in the past year | 84.9 (80.0-89.9) | 76.5 (71.5-81.5) | 80.7 (77.2-84.3) | NA |
| Ever taken classes to manage diabetes | 55.5 (50.9-60.0) | 58.8 (55.1-62.5) | 57.1 (54.2-60.1) | 60% |
| Flu vaccine in the past year | 63.2 (58.7-67.7) | 62.4 (58.7-66.2) | 62.8 (59.9-65.7) | 60% |
| Pneumococcal vaccine | 60.3 (55.7-64.9) | 61.1 (57.3-64.9) | 60.7 (57.7-63.7) | 60% |
| Visited dentist in the past year | 48.1 (43.6-52.7) | 47.9 (44.1-51.6) | 48.0 (45.1-50.9) | 71% |
| At least every other day aspirin therapy | 56.8 (50.1-63.4) | 45.9 (40.3-51.5) | 51.4 (47.0-55.8) | 30% |
| Leisure time physical activity in the past month | 61.5 (57.0-65.9) | 54.1 (50.3-57.8) | 57.7 (54.8-60.7) | NA |
| Current smokers | 17.9 (14.1-21.6) | 20.1 (17.0-23.2) | 19.0 (16.6-21.4) | NA |

*: Percent (95% confidence Interval). Data source: Oklahoma BRFSS 2004, 2006.

American Indian adults with diabetes reported significantly higher proportion of having foot examination by health professional, having diabetes education class than White adults with diabetes. Compared with African American and White adults with diabetes American Indian adults with diabetes reported significantly higher proportion of having Dilated eye exam in the past year ($p<0.05$, Table 14).

**Table 14. Complication Preventive Activities Among Adults with Diabetes in Oklahoma, by Race**

| Preventative Care Measure | Whites | African Americans | American Indians |
|---|---|---|---|
| Professional foot exam in the past year | 63.5 (60.8-66.3) | 73.2 (64.6-81.7) | 80.4 (74.3-86.5) |
| Daily self foot exams | 72.4 (69.8-75.0) | 77.4 (69.2-85.6) | 76.5 (70.0-83.0) |
| Check blood sugar daily | 63.1 (60.4-65.8) | 67.5 (58.8-76.1) | 64.9 (57.7-72.1) |
| A1C checked twice or more in the past year | 70.2 (66.8-73.6) | 71.3 (59.5-83.1) | 78.6 (70.2-87.1) |
| Dilated eye exam in the past year | 66.6 (63.9-69.3) | 64.1 (55.6-72.7) | 81.7 (75.9-87.4) |
| Cholesterol checked in the past year | 82.1 (79.4-84.8) | 82.9 (75.6-90.2) | 73.9 (65.1-82.7) |
| Ever taken classes to manage diabetes | 55.4 (52.6-58.2) | 53.3 (44.2-62.5) | 64.4 (57.1-71.6) |
| Flu vaccine in the past year | 64.0 (61.3-66.8) | 62.2 (53.1-71.2) | 66.8 (59.5-74.0) |
| Pneumococcal vaccine | 60.8 (57.9-63.6) | 58.8 (49.8-67.8) | 64.4 (57.0-71.7) |
| Visited dentist in the past year | 46.8 (42.2-51.5) | N/A | N/A |
| At least every other day aspirin therapy | 52.5 (47.5-57.6) | N/A | N/A |
| Leisure time physical activity in the past month | 58.1 (55.3-60.9) | 59.3 (50.4-68.2) | 53.0 (45.5-60.5) |
| Current smoking | 18.1 (15.8-20.3) | 19.1 (11.8-26.3) | 29.7 (22.7-36.8) |

*: Percent (95% confidence Interval). Data source: Oklahoma BRFSS 2003, 2004, and 2006.

Adults with diabetes aged 18-44 years old reported significantly lower proportions of daily self foot exams, influenza vaccination in the past year, and ever-received pneumococcal vaccination compared with adults with diabetes in other age groups ($p<0.05$, Table 15).

Compared with adults with diabetes aged 45-64 years old, seniors (65 years and older) with diabetes in Oklahoma reported significantly higher proportion of having dilated eye exam, influenza vaccination in the past year, ever-received pneumococcal vaccination, and at least every other day aspirin therapy. On the other hand, seniors with diabetes reported significantly lower proportion of current smoking than those adults with diabetes aged 45-64 years old ($p<0.05$, Table 15).

**Table 15. Complication Preventive Activities Among Adults with Diabetes in Oklahoma, by Age**

| Preventative Care Measure | 18-44 years | 45-64 years | 65 years + |
|---|---|---|---|
| Professional foot exam in the past year | 60.6 (51.6-69.7) | 65.3 (61.0-69.5) | 70.1 (66.2-74.0) |
| Daily self foot exams | 60.2 (51.3-69.1) | 74.7 (70.9-78.5) | 73.8 (70.0-77.6) |
| Check blood sugar daily | 64.5 (55.4-73.6) | 59.6 (55.3-64.0) | 65.5 (61.6-69.5) |
| A1C checked twice or more in the past year | 67.8 (59.2-76.5) | 72.1 (67.9-76.3) | 72.0 (67.5-76.4) |
| Dilated eye exam in the past year | 54.4 (45.2-63.6) | 65.7 (61.6-69.9) | 76.9 (73.5-80.3) |
| Cholesterol checked in the past year | N/A | 82.1 (76.9-87.3) | 84.1 (80.0-88.1) |
| Ever taken classes to manage diabetes | 51.4 (42.3-60.5) | 61.6 (57.3-65.9) | 53.7 (49.5-57.8) |
| Flu vaccine in the past year | 41.6 (32.7-50.6) | 58.8 (54.4-63.1) | 77.5 (74.0-81.0) |
| Pneumococcal vaccine | 39.4 (30.4-48.4) | 52.9 (48.5-57.4) | 80.5 (77.2-83.8) |
| Visited dentist in the past year | 26.7 (18.9-34.4) | 24.9 (21.1-28.8) | 24.4 (20.8-27.9) |
| At least every other day aspirin therapy | N/A | 48.5 (42.1-55.0) | 62.4 (56.6-68.2) |
| Leisure time physical activity in the past month | 59.3 (50.5-68.1) | 56.9 (52.6-61.3) | 57.9 (53.8-62.1) |
| Current smoking | 32.0 (23.7-40.3) | 22.8 (19.0-26.5) | 8.3 (5.9-10.6) |

*: Percent (95% confidence Interval). Data source: Oklahoma BRFSS 2002-2004.

Adults with diabetes who had annual household incomes less than $15,000 reported significantly lower proportions of having dilated eye exam in the past year, visited dentist in the past year, and having leisure time physical activity in the past month than those with annual household incomes $50,000 and over ($p<0.05$, Table 16).

Adults with diabetes who had higher annual household incomes were more likely to report higher proportions of checking A1c at least twice in the past year, having dilated eye exam in the past year, visited dentist in the past year, ever taken classes to manage diabetes, and leisure time physical activities, while with less percentages of current smoking (Table 16).

**Table 16. Complication Preventive Activities Among Adults with Diabetes in Oklahoma, by Annual Household Incomes**

| Preventative Care Measure | <$15,000 | $15,000 ~ $24,999 | $25,000 ~ $34,999 | $35,000 ~ $49,999 | $50,000 + |
|---|---|---|---|---|---|
| Professional foot exam in the past year | 59.0 (51.9-66.1) | 66.5 (60.5-72.5) | 68.7 (61.4-76.0) | 73.5 (65.9-81.0) | 64.4 (57.7-71.1) |
| Daily self foot exams | 74.1 (68.2-80.0) | 71.2 (65.3-77.1) | 72.4 (65.1-79.6) | 70.4 (62.8-77.9) | 70.3 (63.7-76.9) |
| Check blood sugar daily | 61.4 (54.5-68.3) | 64.6 (58.5-70.7) | 62.2 (54.5-69.9) | 64.8 (56.9-72.7) | 55.8 (48.8-62.7) |
| A1C checked twice or more in the past year | 62.8 (55.1-70.6) | 63.4 (56.7-70.1) | 78.8 (72.0-85.6) | 78.2 (71.5-84.9) | 76.1 (70.1-82.0) |
| Dilated eye exam in the past year | 54.8 (47.8-61.9) | 67.8 (62.0-73.6) | 66.4 (58.8-74.1) | 68.5 (60.5-76.5) | 79.5 (74.2-84.9) |
| Cholesterol checked in the past year | 77.8 (69.6-85.9) | 75.2 (66.6-83.9) | 84.6 (75.5-93.7) | 87.5 (79.9-95.1) | 90.2 (84.2-96.1) |
| Ever taken classes to manage diabetes | 47.2 (40.4-54.0) | 53.9 (47.7-60.1) | 64.5 (57.0-71.9) | 66.0 (58.2-73.9) | 63.4 (56.6-70.2) |
| Flu vaccine in the past year | 58.6 (51.9-65.3) | 61.8 (55.5-68.1) | 64.1 (56.3-71.9) | 67.5 (59.6-75.3) | 64.4 (57.7-71.2) |
| Pneumococcal vaccine | 60.3 (53.2-67.3) | 63.6 (57.3-69.9) | 63.2 (55.2-71.2) | 62.1 (54.1-70.2) | 52.1 (44.9-59.3) |
| Visited dentist in the past year | 12.7 (8.3-17.1) | 20.3 (15.2-25.3) | 27.6 (20.3-34.8) | 27.3 (20.5-34.0) | 40.9 (34.1-47.8) |
| At least every other day aspirin therapy | 55.7 (46.4-65.1) | 57.0 (47.8-66.2) | N/A | N/A | N/A |
| Leisure time physical activity in the past month | 40.8 (34.0-47.5) | 54.2 (48.0-60.4) | 67.2 (59.9-74.5) | 63.6 (55.5-71.6) | 71.1 (64.5-77.6) |
| Current smoking | 30.9 (24.6-37.3) | 18.7 (13.7-23.7) | 13.1 (7.6-18.6) | 18.0 (11.4-24.7) | 15.2 (9.6-20.7) |

*: Percent (95% confidence Interval). Data source: Oklahoma BRFSS 2004, 2006.

Adults with diabetes who had college graduate reported significantly higher proportions of HbA1c check, cholesterol check, or visited dentist in the past year, compared with those with high school graduation ($p<0.05$, Table 17). They also reported significantly higher percentages of leisure time physical activity than those without college degrees ($p<0.05$, Table 17).

**Table 17. Complication Preventive Activities Among Adults with Diabetes in Oklahoma, by Education Level**

| Preventative Care Measure | Not High School Graduate | High School Graduate | Some Post-High School | College Graduate |
|---|---|---|---|---|
| Professional foot exam in the past year | 57.7 (50.1-65.4) | 65.5 (60.5-70.4) | 69.3 (64.4-74.2) | 68.6 (62.5-74.8) |
| Daily self foot exams | 69.3 (62.4-76.3) | 73.4 (68.8-78.0) | 76.3 (71.8-80.8) | 66.1 (59.5-72.6) |
| Check blood sugar daily | 62.8 (55.4-70.2) | 61.9 (56.9-66.8) | 65.7 (60.7-70.7) | 58.3 (51.5-65.0) |
| A1C checked twice or more in the past year | 64.3 (56.0-72.7) | 67.7 (62.3-73.0) | 73.0 (68.0-78.0) | 80.9 (75.8-86.1) |
| Dilated eye exam in the past year | 62.2 (54.7-69.7) | 69.1 (64.6-73.7) | 65.3 (60.0-70.5) | 76.5 (70.9-82.1) |
| Cholesterol checked in the past year | N/A | 78.1 (71.9-84.2) | 84.7 (78.7-90.7) | 90.7 (85.4-96.0) |
| Ever taken classes to manage diabetes | 40.0(33.0-47.1) | 58.2(53.2-63.1) | 63.7(58.6-68.9) | 63.4(56.8-70.0) |
| Flu vaccine in the past year | 62.3 (55.1-69.6) | 61.0 (55.9-66.0) | 62.6 (57.3-67.9) | 67.2 (60.7-73.6) |
| Pneumococcal vaccine | 61.9 (54.5-69.4) | 60.4 (55.3-65.5) | 61.7 (56.4-67.1) | 58.2 (51.2-65.1) |
| Visited dentist in the past year | 13.1 (7.9-18.4) | 24.0 (19.7-28.3) | 28.3 (23.4-33.1) | 34.9 (28.5-41.2) |
| At least every other day aspirin therapy | N/A | 49.2 (41.9-56.6) | 49.6 (41.7-57.6) | 56.1 (46.3-65.9) |
| Leisure time physical activity in the past month | 48.9 (41.6-56.3) | 53.7 (48.7-58.6) | 59.8 (54.6-65.1) | 71.8 (65.6-78.0) |
| Current smoking | 20.0 (14.1-25.9) | 20.3 (15.9-24.6) | 22.0 (17.3-26.6) | 10.8 (6.8-14.8) |

*: Percent (95% confidence Interval). Data source: Oklahoma BRFSS 2004, 2006.

Besides the daily self foot exams, ever taken class of diabetes education, and leisure time physical activity, adults with diabetes who had health care coverage reported significantly higher proportion of all other complication prevention activities and less current smoking than those without coverage ($p<0.05$, Table 18).

**Table 18. Complication Preventive Activities Among Adults with Diabetes in Oklahoma, by Health Coverage Status**

| Preventative Care Measure | With Coverage | No Coverage |
|---|---|---|
| Professional foot exam in the past year | 67.9 (65.0-70.8) | 50.3 (40.4-60.2) |
| Daily self foot exams | 72.1 (69.2-74.9) | 72.5 (63.8-81.3) |
| Check blood sugar daily | 64.3 (61.3-67.3) | 50.2 (40.3-60.2) |
| A1C checked twice or more in the past year | 75.1 (72.2-78.0) | 44.6 (34.4-54.7) |
| Dilated eye exam in the past year | 70.9 (68.1-73.7) | 47.3 (37.5-57.2) |
| Cholesterol checked in the past year | 84.5 (81.2-87.7) | N/A |
| Ever taken classes to manage diabetes | 57.7 (54.7-60.8) | 52.4 (42.4-62.4) |
| Flu vaccine in the past year | 65.9 (62.9-68.9) | 40.7 (30.8-50.5) |
| Pneumococcal vaccine | 64.0 (61.0-67.1) | 37.1 (27.7-46.6) |
| Visited dentist in the past year | 26.6 (23.9-29.4) | 13.6 (6.7-20.6) |
| At least every other day aspirin therapy | 53.1 (48.6-57.6) | N/A |
| Leisure time physical activity in the past month | 58.1 (55.1-61.2) | 54.3 (44.5-64.2) |
| Current smoking | 16.9 (14.5-19.3) | 34.0 (24.7-43.3) |

*: Percent (95% confidence Interval). Data source: Oklahoma BRFSS 2004, 2006.

There is no significant difference found in the complication preventive activities between adults with diabetes who lived within, or not in the Metropolitan Statistical Areas (MSA). While Oklahoma adults with diabetes who lived in the metropolitan areas reported slightly higher proportions of professional foot exam in the past year, and leisure time physical activity, adults with diabetes who did not live in the MSA reported slightly higher proportions of preventive activities (Table 19).

**Table 19. Complication Preventive Activities Among Adults with Diabetes in Oklahoma, by Metropolitan Statistical Areas (MSA)**

| Preventative Care Measure | Within MSA | Not in MSA |
|---|---|---|
| Professional foot exam in the past year | 66.7 (61.8-71.7) | 62.9 (56.7-69.2) |
| Daily self foot exams | 67.0 (62.0-72.0) | 75.8 (70.4-81.2) |
| Check blood sugar daily | 60.3 (55.1-65.4) | 68.0 (62.1-73.9) |
| A1C checked twice or more in the past year | 70.5 (65.4-75.5) | 73.2 (66.8-79.6) |
| Dilated eye exam in the past year | 68.5 (63.8-73.3) | 68.7 (62.6-74.7) |
| Ever taken classes to manage diabetes | 53.4 (48.3-58.5) | 60.7 (54.6-66.9) |
| Flu vaccine in the past year | 59.3 (54.2-64.4) | 59.4 (52.9-65.8) |
| Pneumococcal vaccine | 53.9 (48.8-59.1) | 62.1 (55.9-68.3) |
| Visited dentist in the past year | 43.7 (38.6-48.7) | 46.5 (40.1-52.9) |
| Leisure time physical activity in the past month | 60.9 (55.9-65.9) | 48.6 (42.1-55.0) |
| Current smoking | 18.2 (14.1-22.3) | 25.2 (19.2-31.3) |

*: Percent (95% confidence Interval). Data source: Oklahoma BRFSS 2006.

## HEDIS INDOATORS OF DIABETES COMPLICATION PREVENTIVE CARES IN OKLAHOMA

The National Committee for Quality Assurance (NCQA) is a private nonprofit organization dedicated to improving health care quality. NCQA's Health Plan Report Card is based on a rigorous evaluation of clinical quality, member satisfaction and a comprehensive assessment of key systems and processes, and has results on health plans that care for commercially insured individuals and Medicare and Medicaid beneficiaries.

Table 20 provided diabetes preventive care measures for three commercial/HMO insurance plans in Oklahoma: Aetna Health Inc. (Oklahoma), GlobalHealth Inc., and PacifiCare of Oklahoma, Inc., (obtained from the NCQA Health Plan Report Card, http://hprc.ncqa.org/ on April 2008).

Table 21 presented HEDIS indicators of two Medicare HMO providers in Oklahoma (GlobalHealth Inc. and PacifiCare of Oklahoma, Inc.) from the NCQA Health Plan Report Card.

**Table 20. Comprehensive Care Among Commercial/HMO Health Plans Beneficiaries with Diabetes in Oklahoma**

| Preventative Care Measures | Description | HEDIS rates | | | | |
|---|---|---|---|---|---|---|
| | | Aetna Health Inc. (Oklahoma) | GlobalHealth, Inc. | PacifiCare of Oklahoma, Inc. | Top 10% nationally | Top 50% in region |
| Hemoglobin A1c Testing for people with diabetes | People with diabetes age 18-75 who had an hemoglobin A1c Test during past year | 86.8% | 85.6% | 87.7% | 92.9% | 85.4% |
| Eye exam for people with diabetes | People with diabetes age 18-75 who had retinal eye exam during past two years | 53.7% | 46.2% | 45.2% | 71.2% | 44.3% |
| Cholesterol screening for people with diabetes | People with diabetes age 18-75 who had cholesterol screening during past year | 82.5% | 74.2% | 79.1% | 88.0% | 81.3% |
| Nephropathy Monitoring for people with diabetes | People with diabetes age 18-75 who had an screening for nephropathy during past year | 79.2% | 76.9% | 82.1% | 87.3% | 76.9% |

Source: NCQA Health Plan Report Card.

**Table 21. Comprehensive Care Among Medicare Beneficiaries with Diabetes in Oklahoma**

| Preventative Care Measures | Description | HEDIS rates | | | |
|---|---|---|---|---|---|
| | | GlobalHealth, Inc. | PacifiCare of Oklahoma, Inc. | Top 10% nationally | Top 50% in region |
| Hemoglobin A1c Testing for people with diabetes | Medicare beneficiaries with diabetes who had an hemoglobin A1c Test during past year | 89.1% | 90.7% | 94.0% | 91.0% |
| Eye exam for people with diabetes | Medicare beneficiaries with diabetes who had retinal eye exam during past two years | 63.3% | 58.4% | 82.0% | 53.0% |
| Cholesterol screening for people with diabetes | Medicare beneficiaries with diabetes who had cholesterol screening during past year | 80.8% | 83.6% | 93.0% | 86.0% |
| Nephropathy Monitoring for people with diabetes | Medicare beneficiaries with diabetes who had an screening for nephropathy during past year | 75.9% | 85.3% | 75.0% | 56.0% |

Source: NCQA Health Plan Report Card.

# INFLUENZA AND PNEUMOCOCCAL VACCINE

According to 2005-2007 BRFSS, 62.1% of Oklahoma adults with diabetes reported that they received influenza vaccines within the last 12 months, and 56.5% of Oklahoma adults with diabetes reported that they have ever received pneumococcal vaccines (Table 22).

Among people with diabetes, those had older ages or had health coverage, reported significantly higher prevalence of receiving these vaccines. Meanwhile, compared with other minority groups, Not-Hispanic African Americans reported significantly lower percentages to receive pneumococcal vaccines ($p<0.05$, Table 22).

It is interesting to see that adults with diabetes who had annual household income $50,000 and over reported significantly lower proportions of receiving pneumococcal vaccines ($p<0.05$, Table 22).

**Table 22. Proportions of Oklahoma Adult with Diabetes Receiving Influenza and Pneumococcal Vaccine: 2005-2007 BRFSS**

| | Influenza Vaccine | | Pneumococcal Vaccine | |
|---|---|---|---|---|
| | **Percent** | **95% CI** | **Percent** | **95% CI** |
| **Total** | 62.1 | 59.8-64.4 | 56.5 | 54.1-58.9 |
| **Gender** | | | | |
| Males | 61.4 | 57.8-65.0 | 56.0 | 52.3-59.6 |
| Females | 62.8 | 59.9-65.8 | 57.0 | 54.0-60.1 |
| **Race/Ethnicity*** | | | | |
| NH-White | 62.9 | 60.3-65.6 | 57.1 | 54.3-59.8 |
| NH-African Americans | 52.2 | 43.1-61.2 | 45.7 | 36.7-54.8 |
| NH-American Indian | 71.2 | 64.5-78.0 | 63.2 | 55.8-70.5 |
| NH-Multiracial | 64.3 | 56.0-72.7 | 65.9 | 58.2-73.6 |
| Hispanic | N/A | ---- | N/A | ---- |
| **Age (years)** | | | | |
| 18-44 | 43.3 | 35.9-50.6 | 30.9 | 24.1-37.7 |
| 45-54 | 50.0 | 44.4-55.7 | 43.2 | 37.5-48.8 |
| 55-64 | 58.6 | 54.3-63.0 | 52.3 | 47.9-56.6 |
| 65+ | 80.0 | 77.5-82.5 | 78.8 | 76.3-81.3 |
| **Education** | | | | |
| < High School | 62.1 | 56.9-67.4 | 60.9 | 55.7-66.1 |
| HS Diploma/GED | 59.8 | 55.6-63.9 | 53.4 | 49.2-57.6 |
| Some College | 62.3 | 58.1-66.6 | 58.3 | 54.0-62.7 |
| College Degree | 66.6 | 61.6-71.6 | 56.1 | 50.9-61.2 |
| **Income** | | | | |
| <$15,000 | 54.9 | 49.6-60.2 | 54.8 | 49.5-60.1 |
| $15,000-24,999 | 65.1 | 60.2-70.0 | 64.2 | 59.4-69.0 |
| $ 25,000-34,999 | 65.8 | 59.7-72.0 | 58.3 | 51.7-64.8 |
| $35,000-49,999 | 59.1 | 52.5-65.7 | 55.2 | 48.5-61.8 |
| $50,000+ | 63.6 | 58.5-68.8 | 47.2 | 41.7-52.6 |
| **Health Coverage** | | | | |
| Yes | 65.4 | 63.0-67.8 | 59.8 | 57.3-62.2 |
| No | 39.3 | 32.1-46.5 | 34.0 | 27.1-40.8 |

*: NH: Not-Hispanic.

# ECONOMIC IMPACT OF DIABETES

## ECONOMIC IMPACT OF DIABETES IN THE US

According to American Diabetes Association (ADA), the total medical cost of diabetes in the United States increased to $174 billion in 2007. People with diabetes incurred approximately $205 billion in expenditures, reflecting $1 of every $5 health care dollars.

### Direct cost in the US

Costs attributed to diabetes totaled $116 billion, or 57% of total medical costs incurred by people with diabetes. That is about $1 of every $10 health care dollars. The largest components of direct medical expenditures of diabetes are hospital inpatient care (50% of total cost), diabetes medication and supplies (12%), retail prescriptions to treat complications of diabetes (11%), and physician office visits (9%).

- In 2007, $58.3 billion was spent for inpatient hospital care for people with diabetes.
- In 2007, people with diabetes incurred 40.7 million hospital inpatient days, in which, 24.3 million days are attributed to diabetes.
- Over half (56%) of all health care expenditures attributed to diabetes are for health resources used by the population age 65 years and older

People with diagnosed diabetes incur average expenditures of $11,744 per year, which are 2.3 times higher than expenditures for this same population would be in the absence of diabetes ($5,095), suggesting that diabetes is responsible for $6,649 in excess expenditures per year per person with diabetes.

### Indirect cost in the US

The national cost of lost productivity associated with diabetes in 2007 is estimated at $58.2 billion. This includes diabetes-attributed absenteeism from work (15 million days), reduced productivity while at work (120 million days), reduced productivity for those not in the labor force (6 million days), inability to work because of disability (445,000 people, 107 million days), and premature mortality (284,000 deaths).

# ECONOMIC IMPACT OF DIABETES IN OKLAHOMA

## ADA's estimates

ADA estimated the total cost of diabetes for people in Oklahoma in 2006 is estimated at $1,865,000,000. This estimate includes excess medical costs of $1,270,000,000 attributed to diabetes, and lost productivity valued at $595,000,000.

Diabetes prevalence information is a key component of calculating diabetes costs. ADA's estimates are based on the National Health Interview Survey (NHIS) 2004-2006 data. The NHIS data indicated that approximately 199,000 (5.6%) Oklahoma residents have been diagnosed with diabetes in 2006, which was much lower than the estimates from BRFSS (8.9%, approximately 240,800) for that year.

## DPCP estimates

Considering the NHIS is not a survey designed for state level estimation, especially for states like Oklahoma, which has small sample size, we used the state-based BRFSS data to estimate the health expenditure of diabetes.

Applying the national per capita annual costs of health expenditure for people with diabetes ($11,744 in 2007) to the estimated number of people with diagnosed diabetes in Oklahoma (totally 279,400 in 2007, including 277,500 adults and 1,900 children under 18 years of age), the health expenditures of diabetes in Oklahoma was estimated at 3.28 billion. Diabetes is responsible for $1.86 billion in excess expenditures for persons with diabetes.

According to Oklahoma hospital discharge data, there were 6,515 hospital admissions with diabetes as a primary diagnosis in 2007, with the total charges of $126.1 million. These numbers do not include people discharged from federal facilities. The total lengths of stays for those admissions were 32,090 days.

Reference:

1. American Diabetes Association. Economic costs of Diabetes in the US in 2007. Diabetes Care 31:1-20, 2008.

# DIABETES RISK FACTORS AND PREVENTION

Risk factors of devoloping diabetes including the followings:

- Family history of diabetes
- Low activity level
- Poor diet
- Excess body weight (especially around the waist)
- Age greater than 45 years
- High blood pressure
- High blood levels of triglycerides (a type of fat molecule)
- HDL cholesterol of less than 35
- Impaired glucose tolerance
- Diabetes during a previous pregnancy, or a baby weighing more than 9 pounds
- Certian ethnicities -- African-Americans, Hispanic-Americans, and Native Americans all have high rates of diabetes

Maintaining an ideal body weight and an active lifestyle may prevent the onset of type 2 diabetes. By losing a modest amount of weight by getting 30 minutes of physical activity 5 days a week and eating healthier, people with pre-diabetes can delay or prevent the onset of the disease.

The National Diabetes Education Program (NDEP) is a federally funded program sponsored by the U.S. Department of Health and Human Services' National Institutes of Health and the Centers for Disease Control and Prevention and includes over 200 partners at the federal, state, and local levels, working together to reduce the morbidity and mortality associated with diabetes. Diabetes prevention and control information could be found at NDEP website (http://ndep.nih.gov).

## PREVALENCE OF PRE-DIABETES

Prediabetes is a condition in which individuals have blood glucose levels higher than normal but not high enough to be classified as diabetes. People with prediabetes have impaired fasting glucose (IFG) or impaired glucose tolerance (IGT). Some people have both IFG and IGT. IFG is a condition in which the fasting blood sugar level is 100 to 125 milligrams per deciliter (mg/dL) after an overnight fast. This level is higher than normal but not high enough to be classified as diabetes. IGT is a condition in which the blood sugar level is 140 to 199 mg/dL after a 2-hour oral glucose tolerance test. This level is higher than normal but not high enough to be classified as diabetes.

People with prediabetes have an increased risk of developing type 2 diabetes, heart disease, and stroke. Recent research has shown that some long-term damage to the body, especially the heart and circulatory system, may already be occurring during prediabetes. Prediabetes is a serious medical condition that can be treated. People with prediabetes can expect to benefit from much of the same advice for good nutrition and physical activity. They may even be able to return their blood glucose levels to the normal range.

## Estimates from national data

National Diabetes Fact Sheet (2007) indicated that in 2003–2006, 25.9% of U.S. adults aged 20 years or older had IFG. Applying this percentage to the entire U.S. population in 2007, suggesting that at least 57 million American adults had prediabetes in 2007.

Apply the national prevalence (25.9%) to Oklahoma population 20 year s and over, there were about 678,300 adults had prediabetes in 2007.

## Estimates from BRFSS

According to 2006-2007 BRFSS, about 1.0% of Oklahoma adults (27,200 people) have been told by health professional that they had prediabetes (or borderline diabetes). People aged 65 years and older reported significantly higher prevalence of prediabetes and people younger than 45 years of age ($p<0.05$, Table 23).

**Table 23. Prevalence of Pre-diabetes in Oklahoma Adults, BRFSS 2006-2007**

| | Prevalence (%) | 95% CI |
|---|---|---|
| **Total** | 1.0 | 0.8-1.2 |
| **Gender** | | |
| Males | 1.0 | 0.7-1.3 |
| Females | 1.0 | 0.8-1.3 |
| **Race/Ethnicity*** | | |
| NH-White | 1.0 | 0.7-1.2 |
| NH-Black | 0.5 | 0.1-0.8 |
| NH-American Indian | 1.2 | 0.3-2.1 |
| Hispanic | 0.9 | 0.2-1.5 |
| **Age (years)** | | |
| 18-24 | 0.5 | 0.0-1.1 |
| 25-34 | 0.3 | 0.1-0.5 |
| 35-44 | 0.8 | 0.4-1.3 |
| 45-54 | 1.0 | 0.6-1.4 |
| 55-64 | 1.7 | 1.1-2.2 |
| 65+ | 1.9 | 1.4-2.3 |

The huge difference between estimates from national data and Oklahoma BRFSS suggests the potential tremendous amount of undiagnosed or under-diagnosed prediabetes.

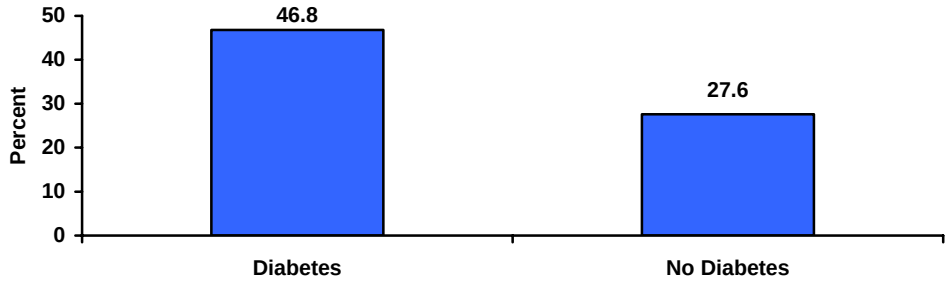
# DIABETES RISK FACTORS IN ADULTS

While research showed that some medications might delay the development of diabetes, diet and exercise worked better. Just 30 minutes a day of moderate physical activity, coupled with a 5-10% reduction in body weight, produced a 58% reduction in diabetes.

## Physical activity

About 29.6% of Oklahoma adults reported that they did not participate any leisure-time physical activity during the past 30 days (95%CI: 28.2-31.0). Among persons with diabetes, 46.8% reported they had no leisure-time physical activity in the last month (95%CI: 42.8-50.9), significantly higher than that among adults without diabetes (27.6%, 95%CI: 26.3-29.0) ($p<0.05$, Figure 31).

**Figure 31. Adults in Oklahoma Had No Leisure-Time Physical Activity, by Diabetes Status**

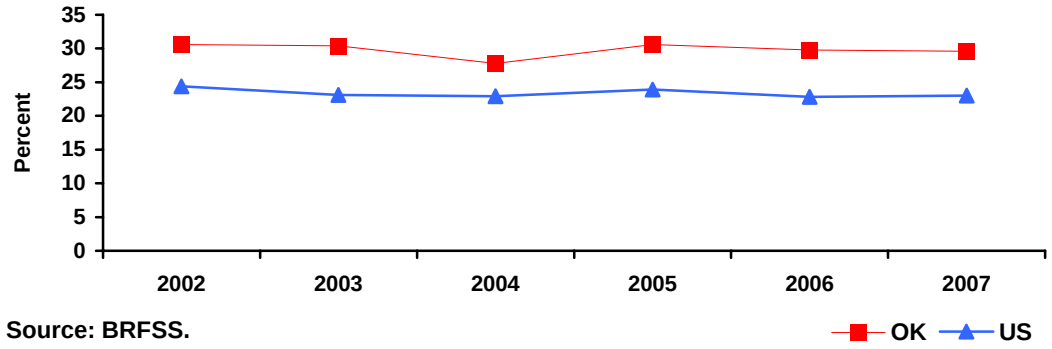



**Source: Oklahoma BRFSS 2007.**

Oklahoma adults who participated in leisure-time physical activity reported significantly lower prevalence of diabetes, compared with those who did not have any leisure-time physical activity (7.7% vs. 16.2%, $p<0.05$).

The proportions of people did not participate any type of physical activity remained unchanged during the past six years, both in Oklahoma and nationwide (Figure 32). BRFSS data indicated that more people in Oklahoma did not participate in physical activity than that in the US (Table 24).

**Figure 32. Adults Reported No Leisure-time Physical Activity, Oklahoma and US**




Source: BRFSS.

**Table 24. Adults Not Participating in Any Physical Activities During the Past Month, Oklahoma & US, BRFSS 2007**

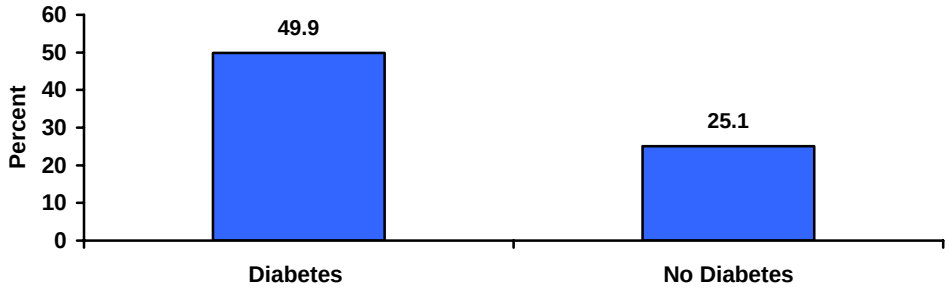
| | Oklahoma | | Nationwide |
|---|---|---|---|
| | **Percent** | **95% CI*** | **Percent** |
| **Total** | 29.6 | 28.2-31.0 | 23.0 |
| **Gender** | | | |
| Male | 27.8 | 25.6-30.0 | 20.7 |
| Female | 31.4 | 29.8-33.0 | 25.1 |
| **Age** | | | |
| 18-24 | 23.7 | 18.0-29.4 | 17.2 |
| 25-34 | 22.6 | 19.3-25.9 | 18.7 |
| 35-44 | 26.2 | 23.3-29.1 | 19.3 |
| 45-54 | 28.3 | 25.6-31.0 | 22.9 |
| 55-64 | 36.9 | 34.0-39.8 | 25.8 |
| 65+ | 40.0 | 37.6-42.4 | 32.5 |
| **Race/ethnicity**** | | | |
| NH-White | 28.3 | 26.9-29.7 | 20.7 |
| NH-African American | 34.2 | 28.7-39.7 | 30.1 |
| NH-American Indian | 32.1 | 26.8-37.4 | N/A |
| NH-Multiracial | 28.9 | 23.0-34.8 | 17.3 |
| Hispanic | 36.6 | 30.1-43.1 | 33.8 |
| **Income** | | | |
| <$15,000 | 44.8 | 40.5-49.1 | 42.4 |
| $15,000-24,999 | 41.0 | 37.3-44.7 | 35.8 |
| $25,000-34,999 | 36.1 | 31.8-40.4 | 27.9 |
| $35,000-49,000 | 27.0 | 23.7-30.3 | 22.6 |
| $50,000+ | 17.4 | 15.4-19.4 | 13.9 |
| **Education** | | | |
| Less than High School | 46.7 | 42.4-51.0 | 42.7 |
| H.S. or G.E.D. | 36.0 | 33.5-38.5 | 30.2 |
| Some post-H.S. | 27.5 | 25.0-30.0 | 21.5 |
| College graduate | 15.6 | 13.8-17.4 | 13.0 |

* CI: Confidence interval. ** NH: Not-Hispanic.

## Obesity

Data from the Oklahoma 2007 BRFSS indicated nearly half of persons with diabetes reported they were obese (BMI>=30) (49.9%, 95%CI: 45.8-53.9). Meanwhile, only about one quarter of persons without diabetes reported that they were obese (25.1%, 95%CI: 23.7-26.4). The prevalence of obesity was significantly higher among persons with diabetes ($p<0.05$, Figure 33). Because the BRFSS is cross-sectional survey, the data could not determine which came first, diabetes or obesity.

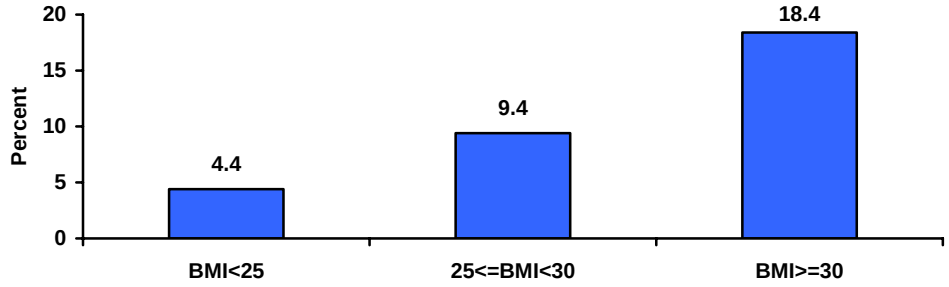
**Figure 33. Prevalence of Obesity Among Adults in Oklahoma, by Diabetes Status, BRFSS 2007**




**Source: Oklahoma BRFSS 2007.**

On the other hand, diabetes is more common among persons with higher BMI values. The prevalence of diabetes was significantly higher among Oklahoma adults who reported with BMI>=30 (18.4%, 95%CI: 16.4-20.5) than those with 25>=BMI>30 (9.4%, 95%CI: 8.1-10.6), while adults who reported BMI<25 had the lowest prevalence of diabetes (4.4%, 95%CI: 3.5-5.3) ($p<0.05$, Figure 34).

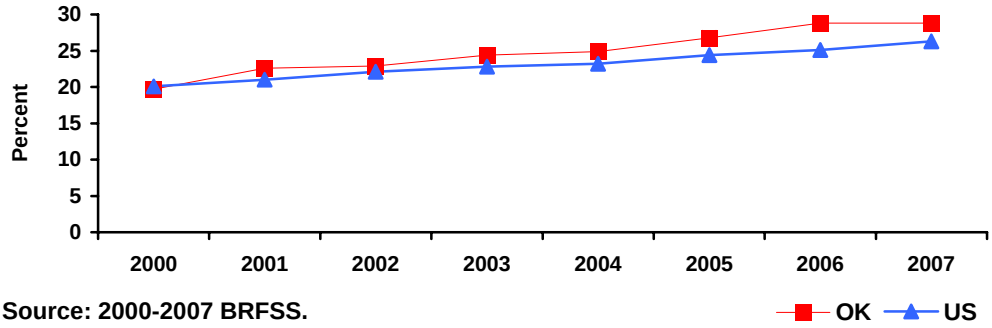
**Figure 34. Prevalence of Diabetes Among Adults in Oklahoma, by Obesity Status, BRFSS 2007**




**Source: Oklahoma BRFSS 2007.**

The prevalence of obesity among adult population are increasing, both in Oklahoma and nationwide, during the past six years (Figure 35).

**Figure 35. Prevalence of Obesity (BMI>=30) Among Adults in Oklahoma and US, 2000-2007**




**Source: 2000-2007 BRFSS.**

Table 25 provided the prevalence of obesity by demographic and socio-economic status among adults in Oklahoma.

**Table 25. Prevalence of Obesity (BMI>=30) in Adults, Oklahoma & US, BRFSS 2007**

| | Oklahoma | | Nationwide |
|---|---|---|---|
| | **Percent** | **95% CI*** | **Percent** |
| **Total** | 28.8 | 27.4-30.2 | 26.3 |
| **Gender** | | | |
| Male | 28.9 | 26.7-31.1 | 27.0 |
| Female | 28.6 | 27.0-30.2 | 25.9 |
| **Age** | | | |
| 18-24 | 19.9 | 14.6-25.2 | 16.2 |
| 25-34 | 27.9 | 24.4-31.4 | 26.0 |
| 35-44 | 29.5 | 26.4-32.6 | 28.8 |
| 45-54 | 32.4 | 29.5-35.3 | 29.4 |
| 55-64 | 36.5 | 33.6-39.4 | 32.0 |
| 65+ | 24.4 | 22.2-26.6 | 23.0 |
| **Race/ethnicity**** | | | |
| NH-White | 27.5 | 25.9-29.1 | 25.6 |
| NH-African American | 28.8 | 23.9-33.7 | 36.7 |
| NH-American Indian | 36.3 | 30.8-41.9 | N/A |
| NH-Multiracial | 34.3 | 28.2-40.4 | 26.3 |
| Hispanic | 32.3 | 25.4-39.2 | 26.6 |
| **Income** | | | |
| <$15,000 | 34.6 | 30.3-38.9 | 32.4 |
| $15,000-24,999 | 30.9 | 27.4-34.4 | 30.9 |
| $25,000-34,999 | 30.8 | 26.7-34.9 | 28.8 |
| $35,000-49,000 | 29.2 | 25.9-32.5 | 28.0 |
| $50,000+ | 26.3 | 24.1-28.5 | 24.2 |
| **Education** | | | |
| Less than High School | 34.0 | 29.9-38.1 | 29.7 |
| H.S. or G.E.D. | 29.5 | 27.0-32.0 | 29.1 |
| Some post-H.S. | 30.6 | 28.1-33.1 | 28.8 |
| College graduate | 23.3 | 20.9-25.7 | 21.4 |

* CI: Confidence interval. ** NH: Not-Hispanic.

## Consumption of fruits and vegetables

Only 16.3% of adults in Oklahoma took fruits and vegetables five or more times a day, much lower than the national average. More Oklahoma women met the recommendation of consumed fruits and vegetables five or more times a day (Table 26).

**Table 26. Adults Who Have Consumed Fruits and Vegetables Five or More Times per Day, Oklahoma and US, BRFSS 2007**

| | Oklahoma | | Nationwide |
|---|---|---|---|
| | **Percent** | **95% CI*** | **Percent** |
| **Total** | 16.3 | 15.3-17.3 | 24.3 |
| **Gender** | | | |
| Male | 12.7 | 11.1-14.3 | 19.4 |
| Female | 19.7 | 18.3-21.1 | 28.7 |
| **Age** | | | |
| 18-24 | 18.4 | 13.3-23.5 | 22.9 |
| 25-34 | 14.0 | 11.3-16.7 | 23.5 |
| 35-44 | 13.9 | 11.7-16.1 | 22.3 |
| 45-54 | 16.3 | 14.1-18.5 | 23.2 |
| 55-64 | 15.8 | 13.6-18.0 | 24.9 |
| 65+ | 20.4 | 18.6-22.2 | 28.7 |
| **Race/ethnicity**** | | | |
| NH-White | 16.5 | 15.3-17.7 | 24.5 |
| NH-African American | 15.4 | 11.5-19.3 | 23.3 |
| NH-American Inidan | 15.6 | 11.4-19.8 | N/A |
| NH-Multiracial | 19.4 | 14.5-24.3 | 20.0 |
| Hispanic | 13.4 | 9.3-17.5 | 22.6 |
| **Income** | | | |
| <$15,000 | 16.0 | 12.7-19.3 | 20.7 |
| $15,000-24,999 | 13.9 | 11.5-16.3 | 21.7 |
| $25,000-34,999 | 12.8 | 10.3-15.3 | 22.6 |
| $35,000-49,000 | 14.5 | 12.0-17.0 | 23.0 |
| $50,000+ | 18.9 | 17.1-20.7 | 26.2 |
| **Education** | | | |
| Less than High School | 12.6 | 9.9-15.3 | 18.2 |
| H.S. or G.E.D. | 14.9 | 12.9-16.9 | 20.1 |
| Some post-H.S. | 14.9 | 12.9-16.9 | 24.3 |
| College graduate | 21.5 | 19.3-23.7 | 29.8 |

* CI: Confidence interval. ** NH: Not-Hispanic.

# DIABETES RISK FACTORS IN CHILDREN AND ADOLESCENTS

## Physical activity

The 2007 Oklahoma YRBS data indicated that 49.6% of students were physically active doing any kind of physical activity that increased their heart rate and made them breathe hard some of the time for a total of at least 60 minutes per day on five or more days of the week before the survey. Males reported significantly higher proportions to meet the recommendations than females, both in Oklahoma and US. Oklahoma students reported significantly higher percentages of meeting the recommended levels of physical activity compare with the national average (Table 27).

**Table 27. Percentage of Students Who Met Recommended Levels of Physical Activity*, Oklahoma & US, YRFS 2007**

| | Oklahoma | | United States | |
|---|---|---|---|---|
| | **Percent** | **95% CI** | **Percent** | **95% CI** |
| **Total** | 49.6 | 47.1-52.1 | 34.7 | 32.5-37.0 |
| **Gender** | | | | |
| Male | 62.4 | 58.4-66.2 | 43.7 | 41.1-46.4 |
| Female | 36.1 | 32.3-40.2 | 25.6 | 22.8-28.6 |
| **Grade** | | | | |
| 9 | 50.3 | 46.0-54.7 | 38.1 | 35.3-41.0 |
| 10 | 48.8 | 42.2-55.4 | 34.8 | 32.2-37.6 |
| 11 | 51.3 | 45.8-56.8 | 34.8 | 31.9-37.7 |
| 12 | 47.1 | 40.4-53.9 | 29.5 | 26.4-32.9 |
| **Race** | | | | |
| White | 51.1 | 48.0-54.2 | 37.0 | 33.9-40.3 |
| African American | 50.2 | 42.5-58.0 | 31.1 | 29.3-32.9 |
| Hispanic | 42.6 | 36.6-48.8 | 30.2 | 27.6-33.0 |
| Other | 46.8 | 40.8-53.0 | 32.4 | 28.1-37.1 |

*: Met recommended level of physical activity means the students were physically active at least 60 minutes per day on five or more of the 7 days before the survey.

## Obesity

There were 14.7% Oklahoma Students reported that they were overweight (at or above the 95th percentile for BMI by sex and age), with another 15.2% students reported being at risk of becoming overweight (at or above 85% percentile but below the 95th percentile for BMI by sex and age), according to 2007 YRBS. More males reported they were obese than females did (Figure 28).

**Table 28. Percentage of Students Who Were Obese (i.e., >= 95th percentile for BMI, by age and sex), Oklahoma & US, BRFSS 2007**

| | | Oklahoma | | Nationwide | |
|---|---|---|---|---|---|
| | | **Percent** | **95% CI*** | **Percent** | **95% CI*** |
| **Total** | | 14.7 | 12.9-16.7 | 13.0 | 11.9-14.1 |
| **Gender** | | | | | |
| | Male | 19.2 | 16.2-22.7 | 16.3 | 15.1-17.5 |
| | Female | 9.8 | 8.1-11.9 | 9.6 | 8.3-11.0 |
| **Grade** | | | | | |
| | 9 | 16.9 | 13.1-21.5 | 13.8 | 12.5-15.2 |
| | 10 | 13.2 | 9.5-18.2 | 13.2 | 11.5-15.0 |
| | 11 | 15.0 | 12.1-18.4 | 12.7 | 11.3-14.4 |
| | 12 | 13.2 | 10.3-16.8 | 12.0 | 10.5-13.7 |
| **Race** | | | | | |
| | White | 13.5 | 11.5-15.9 | 10.8 | 9.3-12.4 |
| | African American | 12.0 | 7.1-19.3 | 18.3 | 16.2-20.7 |
| | Hispanic | 17.9 | 12.1-25.7 | 16.6 | 14.7-18.7 |
| | Other | 18.5 | 14.2-23.8 | 11.4 | 9.0-14.3 |

# DIABETES DURING PREGNANCY

Women with diabetes prior to pregnancy (type 1 or type 2) and women with diabetes induced by or recognized during pregnancy (gestational diabetes) make up the population of women who have diabetes during pregnancy.

Gestational diabetes mellitus (GDM) is a type of diabetes that only pregnant women get. Gestational diabetes develops in 2% to 5% of all pregnancies but usually disappears when a pregnancy is over. If not treated, it can cause problems for mothers and babies.

Any woman can develop gestational diabetes, but some women are at greater risk than others. Risk factors for gestational diabetes include:

- **Age.** Women older than age 25 are more likely to develop gestational diabetes.
- **Family or personal history.** The risk of developing gestational diabetes increases if the women have pre-diabetes or a close family member has type 2 diabetes. Women are also more likely to develop gestational diabetes if they had it during a previous pregnancy, delivered a baby who weighed more than 9 pounds, or if had an unexplained stillbirth.
- **Weight.** Women are more likely to develop gestational diabetes if they're overweight before pregnancy.
- **Race.** For reasons that aren't clear, women who are black, Hispanic, American Indian or Asian are more likely to develop gestational diabetes than are other women.

Women with diabetes during pregnancy can have significant health problems during their pregnancy, during delivery, and later on in life. For women with GDM, there is a 25%-45% increase in risk of GDM in future pregnancies. The infant of the mother with untreated or poorly controlled diabetes during pregnancy has increased risks of neonatal problems and macrosomia as a newborn, and is at risk for obesity and type 2 diabetes as a child or adult.

The data on diabetes during pregnancy came from the Oklahoma Pregnancy Risk Assessment Monitoring System (PRAMS) (see data sources and methods for details).

## MATERNAL DIABETES AND RISK FACTORS

According to 2005-2007 PRAMS data, about one out of every ten Oklahoma women (10.2%) with a recent live birth had gestational diabetes mellitus (GDM), and an additional 2.3% of women reported that they had diabetes before their pregnancy.

Women with older age tend to report higher prevalence of GDM than younger women (Table 29). American Indian reported a slightly higher prevalence of GDM than African American and White women ($p>0.05$), and Hispanic women reported higher prevalence of GDM than Non-Hispanic women ($p>0.05$). Women with a pre-pregnancy BMI >29 reported a significantly higher prevalence of GDM than those with pre-pregnancy BMI <26 ($p<0.05$, Table 29).

Although not significant, women with lower incomes were more likely to have GDM.

**Table 29. Prevalence of Gestational Diabetes by Characteristics, Oklahoma PRAMS 2005-2007**

| Maternal Characteristics | Prevalence (%) | 95% CI |
|---|---|---|
| **Overall** | 10.2 | 9.0-11.5 |
| **Age** (years) | | |
| <20 | 4.7 | 2.8-8.1 |
| 20-24 | 8.4 | 6.5-10.9 |
| 25-29 | 10.0 | 8.0-12.6 |
| 30-34 | 11.9 | 9.0-15.7 |
| 35+ | 14.4 | 10.1-20.1 |
| **Race** (include all ethnicities) | | |
| White | 9.5 | 8.1-11.0 |
| Black | 9.8 | 6.0-16.6 |
| American Indians | 11.3 | 8.0-15.7 |
| Other | 4.6 | 1.1-17.5 |
| **Ethnicity** (include all races) | | |
| Non-Hispanic | 8.9 | 7.7-10.3 |
| Hispanic | 13.6 | 9.8-185 |
| **Education** | | |
| <9 years | 15.4 | 9.1-25.0 |
| 9-11 years | 9.3 | 6.5-13.1 |
| 12 years | 10.8 | 8.8-13.2 |
| 13-15 years | 7.9 | 6.0-10.5 |
| 16+ years | 7.9 | 5.7-10.8 |
| **Income** | | |
| <$15,000 | 11.9 | 9.1-15.4 |
| $15,000-$19,999 | 12.4 | 8.9-17.0 |
| $20,000-$24,999 | 11.8 | 7.8-17.5 |
| $25,000-$34,999 | 8.5 | 5.4-13.1 |
| $35,000-$49,999 | 6.0 | 3.7-9.4 |
| $50,000+ | 9.6 | 6.4-14.2 |
| **Pre-pregnancy BMI** | | |
| <19.8 | 9.1 | 6.5-12.7 |
| 19.8-25.9 | 6.0 | 4.7-7.7 |
| 26.0-29.0 | 9.7 | 6.7-13.9 |
| >29.0 | 16.8 | 13.8-20.3 |
| **Marital status** | | |
| Married | 9.8 | 8.3-1.4 |
| Other | 9.1 | 7.3-11.4 |

# MATERNAL DIABETES AND ADVERSE OUTCOMES

In this section, when talking about women with diabetes during pregnancy" we refer to women with either pre-pregnancy diabetes or GDM.

Compared with their counterpart, women with diabetes during pregnancy were:

- Less likely to have pregnancy weight gain under the recommended amount ($p<0.05$, after adjusting by age and pre-pregnancy BMI according to guidelines of Institute of Medicine (IOM))
- More likely to have higher prevalence of hypertension ($p<0.05$)

The baby delivered by women with diabetes during pregnancy were:

- More likely to have birth weight of 4,000 grams or more ($p<0.05$)
- More likely to spend 3 or more days in the hospital ($p<0.05$)
- More likely to be admitted to the ICU ($p<0.05$)

**Table 30. Adverse Outcomes by Diabetes Status, Oklahoma PRAMS 2005-2007**

| Outcome | Diabetes* | | No Diabetes | |
|---|---|---|---|---|
| | Prevalence (%) | 95% CI | Prevalence (%) | 95% CI |
| Pregnancy weight gain # | | | | |
| Under recommended | 33.5 | 28.0-39.6 | 27.0 | 25.0-29.1 |
| Within recommended | 21.5 | 16.8-26.9 | 30.8 | 28.7-33.0 |
| Over recommended | 45.0 | 39.0-51.2 | 42.2 | 40.0-44.5 |
| Hypertension | 26.7 | 21.8-32.3 | 12.1 | 10.8-13.6 |
| Delivery complications | 30.3 | 25.1-36.0 | 27.6 | 25.7-29.6 |
| Nights in hospital after delivery | | | | |
| 1 day or less | 10.6 | 7.3-15.2 | 16.0 | 14.4-17.8 |
| 2 days | 44.1 | 38.1-50.2 | 49.2 | 46.9-51.5 |
| 3 or more days | 45.3 | 39.3-51.4 | 34.8 | 32.7-37.0 |
| Infant birth weight (g) | | | | |
| <1,500 | 1.3 | 1.2-1.5 | 1.3 | 1.3-1.3 |
| 1,500-2,499 | 6.6 | 5.7-7.8 | 6.0 | 5.8-6.1 |
| 2,500-3,999 | 81.7 | 79.2-84.0 | 86.0 | 85.7-86.3 |
| 4,000+ | 10.2 | 8.7-11.9 | 6.7 | 6.5-6.9 |
| Baby with abnormal condition | 11.2 | 8.1-15.3 | 8.4 | 7.4-9.6 |
| Days of baby in hospital | | | | |
| <=2 days | 47.0 | 41.0-53.1 | 58.7 | 56.5-60.9 |
| 3-5 days | 42.3 | 36.4-48.5 | 33.5 | 31.4-35.7 |
| >=6 days | 10.6 | 7.9-14.2 | 7.8 | 6.9-8.8 |
| Baby admitted to ICU | 15.4 | 11.8-19.9 | 9.4 | 8.4-10.5 |

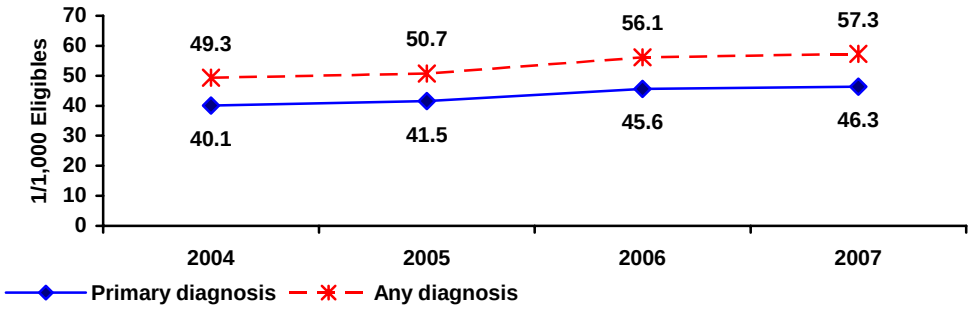
*: Diabetes includes pre-pregnancy diabetes and GDM.
#: Adjusted for gestational age and pre-pregnancy BMI according to IOM guideline.

# DIABETES AMONG MEDICAID BEBEFICIRIES

Statistical results of Medicaid beneficiaries were obtained from the Medicaid administrative data, which managed by Oklahoma Health Care Authority (OHCA). The data included paid claims (encounters) only and for recipients eligible at any time during the defined year. The numerator of prevalence was the number of eligible Medicaid recipients with ICD-9 diagnosis code 250-250.99. The denominator of prevalence was the number of total number of people that were Medicaid eligible at any point during that calendar year.

There were 34,429 Medicaid beneficiaries had claims in calendar year (CY) 2007 with diabetes as the primary diagnosis in Oklahoma. The prevalence of diabetes as the primary diagnosis was slightly increasing during the past years (Figure 36).

**Figure 36. Prevalence of Paid Claims with Diabetes Among Medicaid Beneficiaries, CY2007**




Female beneficiaries had higher prevalence of diabetes than males, with diabetes as the primary diagnosis, and as any diagnosis. Beneficiaries with older ages tend to have higher prevalence of diabetes (Table 31).

The total amount paid by OHCA for claims with a Primary Diagnosis of Diabetes increased from $81.5 million in CY 2006 to $88.7 million in CY 2007, which was a 9% increase. These amounts did not include the cost of pharmacy claims.

**Table 31. Prevalence of Paid Claims with Diabetes among Medicaid Beneficiaries, CY2007**

| | Diabetes as primary diagnosis (1/1,000) | Diabetes as any diagnosis (1/1,000) |
|---|---|---|
| Total | 46.3 | 57.3 |
| Gender | | |
| Male | 32.6 | 40.7 |
| Female | 56.5 | 69.6 |
| Race/Ethnicity* | | |
| White NH | 52.3 | 65.1 |
| African American NH | 43.7 | 53.6 |
| American Indian NH | 16.5 | 19.8 |
| Other NH | 45.2 | 54.9 |
| Hispanic | 18.1 | 22.2 |
| Age (years)** | | |
| <10 | 1.4 | 1.7 |
| 10-19 | 6.0 | 7.3 |
| 20-29 | 20.2 | 26.3 |
| 30-39 | 69.8 | 86.9 |
| 40-49 | 145.0 | 176.5 |
| 50-59 | 237.2 | 284.1 |
| 60-69 | 288.3 | 342.7 |
| 70-79 | 257.7 | 321.3 |
| 80+ | 151.3 | 207.3 |
| Planning Districts | | |
| ACOG | 36.7 | 46.8 |
| ASCOG | 48.8 | 59.6 |
| COEDD | 53.7 | 65.5 |
| EODD | 58.2 | 70.7 |
| GGEDA | 51.2 | 62.4 |
| INCOG | 39.1 | 48.5 |
| KEDDO | 63.2 | 75.4 |
| NODA | 43.2 | 54.5 |
| OEDA | 31.7 | 40.5 |
| SODA | 51.7 | 65.1 |
| SWODA | 62.4 | 74.9 |

*NH: Non-Hispanic, Hispanic may be of any race. **Age as of the end of the calendar year.

# DIABETES AMONG MEDICARE BEBEFICIRIES

Medicare outpatient data was obtained from the Oklahoma Foundation for Medical Quality (OFMQ). The outpatient data consists of baseline and follow-up results after interventions recommended by OFMQ quality improvement staff were implemented.

The study consisted of a random sample of patients seen by over 300 voluntarily-enrolled providers from nearly 200 clinics in Oklahoma. All of the recommended interventions were aimed at improving rates of diabetes standards of preventive care. The results are based on a random sample of 12 - 15 patient charts per provider enrolled in the study. The outpatient data consists of baseline and follow-up results following an intervention from an OFMQ outpatient diabetes management study, which was comprised of a random sample of patients at 26 volunteering clinics. The intervention was aimed at improving the standards of care. The results are based on a random sample of 12-15 patients per clinic. A limitation of this data is that because the physicians were volunteers, they were more likely to be better at following the standards of care for treating patients with diabetes.

## HOSPITALIZATIONS

According to 2001 Medicare Part A data, there were 1,844 (1.24%) hospitalizations with diabetes as the principal diagnosis. The total hospital charges for these hospitalizations were over $22 million and the Medicare reimbursement amount was over $9 million.

## COMPLICATION PREVENTION

Data from the OFMQ Outpatient Study are shown in Table 32. The rates of all measures increased from baseline to follow-up, with the largest increase being in the rate of referral for retinal exam.

**Table 32. Complication Prevention Among Medicare Beneficiaries at Baseline and Follow-up**

| Preventive Care Measures | Baseline Rate (2000-2001) | Follow-up Rate (2001-2002) |
|---|---|---|
| Foot exam | 71% | 81% |
| Referred for retinal exam | 44% | 55% |
| Retinal exam documented (% of referred) | 47% | 54% |
| Lipid profile | 68% | 76% |
| HbA1c | 90% | 94% |
| Influenza vaccination | 70% | 78% |
| Pneumococcal vaccination | 50% | 58% |

Source: OFMQ Outpatient Study, 2000-2002

# APPEDIX

## APPEDIX I: GLOSSARY

**Body Mass Index (BMI)**: BMI is a number calculated from a person's weight and height. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems. See http://www.cdc.gov/nccdphp/dnpa/bmi/index.htm for details.

**CI:** Confidence interval, a statistical range with a specified probability that a given parameter lies within the range.

**Hospitalization Rates:** The number of hospital discharges/episodes in a given year(s) divided by the population in a given region. This is usually expressed per 1000,

**Mortality rate:** a measure of the number of deaths (in general, or due to a specific cause) in some population, scaled to the size of that population, per unit time.

**Prevalence:** The proportion of the population with a particular condition or characteristic. To calculate prevalence you need to sum the number of individuals with a certain condition/characteristic and divide by the number of people in the population of interest over a specified time.

**Significance:** Statistical significance is the probability that percentages or mean scores observed in the sample are truly different from each other. One way to determine statistical significance is to check whether the confidence intervals around the percentages or scores overlap.

# APPEDIX II: POPULATION OF OKLAHOMA

The following facts were obtained from the State Population Estimation 2007 (US Census Bureau):

| | | |
|---|---|---|
| **Total** | 3,617,316 | |
| Males | 1,787,488 | 49.41% |
| Females | 1,829,828 | 50.59% |
| **Race/ethnicity** | | |
| Hispanic | 261,635 | 7.23% |
| Non-Hispanic | 3,355,681 | 92.77% |
| White along | 2,597,918 | 77.42% |
| Black along | 278,417 | 8.30% |
| Native American along | 277,276 | 8.26% |
| Asian/Pacific Islander along | 63,658 | 1.90% |
| Two or more races | 138,412 | 4.12% |
| **Age** | | |
| Under 18 years old | 899,507 | 24.87% |
| 18-24 years old | 371,780 | 10.28% |
| 25-34 years old | 492,774 | 13.62% |
| 35-44 years old | 466,818 | 12.91% |
| 45-54 years old | 508,404 | 14.05% |
| 55-64 years old | 397,893 | 11.00% |
| 65 years old and older | 480,140 | 13.27% |

| | Population 18 years and over |
|---|---|
| Total | 2,717,809 |
| Males | 1,325,797 |
| Females | 1,392,012 |
| NH-White | 2,035,900 |
| NH-African American | 192,853 |
| NH-American Indians | 192,193 |
| NH-Asian/PI | 49,465 |
| NH-Multiracial | 85,575 |
| Hispanic | 161,823 |

For more information about Diabetes Prevention and Control in Oklahoma, contact

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