

# Burden of Diabetes in Iowa

1991-2009

Full Report

Diabetes prevalence and diabetes-related hospitalizations  
and deaths among Iowans

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*The mission of the Iowa Diabetes Prevention and Control Program is to reduce the prevalence of type 2 diabetes and to lessen the health consequences and the personal and social economic burden of diabetes among those Iowans diabetes.*

May 2010

## Acknowledgments

The Iowa Diabetes Prevention and Control Program and the Center for Health Statistics of the Iowa Department of Public Health owes the successful completion of the *Burden of Diabetes in Iowa: 1991-2009* report to the combined efforts of many, but especially of the Centers for Disease Control and Prevention (CDC), Division of Diabetes Translation which funds the Iowa Diabetes Prevention and Control Program.

### ***How to obtain copies of this report:***

This report and a slide show based on this report and the *1991-2009 BRFSS Tables Supplement* to this report are all available online for printing and downloading. Visit the Web site of the Iowa Diabetes Prevention and Control Program, Bureau of Chronic Disease Prevention and Management, Iowa Department of Public Health: <http://www.idph.state.ia.us/hpcdp/diabetes.asp>.

### ***How to copy individual tables and charts from this report:***

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# TABLE OF CONTENTS: BURDEN OF DIABETES IN IOWA

	<u>Report</u>		<u>BRFSS Tables Supplement</u>
	Page	Figure	
EXECUTIVE SUMMARY	I		
INTRODUCTION/BACKGROUND	Intro.1		
STATE-LEVEL ESTIMATES			
ADULT			
DIABETES PREVALENCE:			
OVERALL TRENDS	1.1	1.1–1.3	1-1
BY SEX, AGE AND RACE	2.1	2.1–2.6	2.1 - 2.4
BY INCOME AND EDUCATION	3.1	3.1–3.2	3.1
BY OTHER CHRONIC CONDITIONS (OBESITY, HEART DIS. PHYSICAL/MENTAL HEALTH)	4.1	4.1–4.2, 5.1	4.1, 4.2
BY RISKY BEHAVIORS: DIET, SMOKING, EXERCISE	5.1	5.1	5.1 - 5.4
ADULTS WITH DIABETES:			
PREVENTIVE CARE AND SELF-CARE	6.1	-	6.1
PREVALENCE OF OTHER CHRONIC CONDITIONS, AT-RISK-BEHAVIORS	6.3	--	6.2 - 6.8
CHILD AND YOUTH DIABETES PREVALENCE	7.1	7.1	
HOSPITALIZATIONS FROM DIABETES	8.1	8.1–8.5	
MORTALITY FROM DIABETES	9.1	9.1–9.7	
COUNTY-LEVEL DIABETES PREVALENCE ESTIMATES	10.1		
DATABASES USED	11.1		
REFERENCES,	12.1		
CREDITS, WHERE TO FIND THIS REPORT ONLINE	13.1		

# Executive Summary

## Prevalence, Inpatient and Mortality Data

In Iowa during the past 20 years, the prevalence rate of diagnosed diabetes increased dramatically among adults: Between 1991 and 2009 the crude diabetes prevalence rate rose by 84%, from 3.8% to 7.0%. Between these years, the age-adjusted adult diagnosed diabetes prevalence rate increased by 64%, rising from 3.7% to 6.4%.

During the 18 years 1991-93 through 2006-08, the *number of Iowa adults with diagnosed diabetes more than doubled*, increasing from 78,000 to 162,000.

While the Iowa Behavioral Risk Factor Surveillance System (BRFSS), upon which the numbers cited above are based, provides reliable state-level self-reported data on adults with diagnosed diabetes, it is unable to provide estimates of undiagnosed diabetes. National estimates put the prevalence of undiagnosed adult diabetes at about 5%, raising the estimated adult diabetes prevalence rate in Iowa to 12% (280,000 adults) (Cowie, 2009).

Another 5% of all Iowa adults are estimated to have diagnosed pre-diabetes, while 25% of all Iowa adults, based on national estimates from the 2005-06 National Health and Nutrition and Examination Survey (NHANES), likely have *undiagnosed* pre-diabetes. (Cowie, 2009)

***All told, as many as 42% of adults age 18 and older in Iowa (950,000 adults) have either diagnosed or undiagnosed diabetes or pre-diabetes.***

- Diabetes is among the most common chronic conditions of childhood, and rates for children and youth, like rates for adults, are on the rise. Minority young people are especially at high risk of developing diabetes. Iowa prevalence data for childhood diabetes are lacking. However, based on national estimates of the rate of diagnosed childhood diabetes, it is estimated that between 0.4% and 0.5% (one in every 200 to 500 children and youth age 17 years and younger) or 2,800 to 3,600 Iowa children and youth have diabetes.

In line with increasing diabetes prevalence, diabetes-related deaths, as recorded on Iowa death certificates, are also on the rise. Between 1979 and 2006, Iowa's age-adjusted mortality rate from diabetes increased 42%, rising from 15.4/100,000 to 21.9/100,000 population. (A death from diabetes means diabetes was listed as the primary/most

important cause of death.) Diabetes is among the 10 leading causes of death for all age groups 10 years of age and older in Iowa.

Diabetes is among the 10 leading causes of death as reported on Iowa certificates of death, despite that fact that for most people with diabetes do not have their diabetes listed on their death certificate as either the primary or a contributing (secondary) cause of death. Of Iowa decedents with diabetes, it is estimated, based on national studies that only about 10% to 15% have diabetes listed as their primary cause of death and only 35% to 40% have diabetes listed as either the primary or a secondary cause of death. In other words, diabetes-related deaths, like cases of diabetes in the Iowa population, are under recognized and underreported. (CDC, 2008)

Persons with diabetes are at increased risk not only of shortened lives, but also of developing circulatory diseases (including stroke, hypertension, heart attack, other coronary artery disease, and peripheral artery disease). Persons with diabetes also are at increased risk of diabetic retinopathy (vascular eye disease) and poor general physical and mental health compared to those who do not have diabetes.

Some of the increase in diabetes prevalence and diabetes-related mortality is related to the aging of Iowa's population, since diabetes rates rise substantially with age. However, much of the increase in diabetes and diabetes-related morbidity can be attributed to other risk factors that are also on the increase, such as lack of adequate exercise, diets poor in fruits, vegetables and fiber and increased rates of overweight and obesity.

Obesity is the factor most closely associated with having an increased risk for diabetes in Iowa's adult population. Iowa adults who are obese are 400% more likely than normal weight adults to have diabetes. Iowa adults who are overweight are 66% more likely more likely to have diabetes than are normal weight adults. Iowa adults who do not exercise at levels recommended by CDC are about 29% more likely to have diabetes than adults who do exercise at recommended levels.

Our built environment, which often makes sufficient regular daily physical activity optional at best, the ready availability and promotion of inexpensive, highly processed low-fiber, high fat, high sugar and high sodium foods, as well as personal lifestyle choices and our aging population have all contributed to Iowa's dramatic increase in diabetes prevalence.

Recent national, state and local level policy changes that support: healthier ways of living; better evidence-driven health care, and, better diabetes self-management by persons with diabetes all hold the promise of helping to turn around this growing upward trend in the prevalence of diabetes. At present, however, diabetes remains a widespread, costly, debilitating, and, oftentimes, deadly disease in need of our attention and resources if its rates are to decrease rather than continue to grow in magnitude.

# Introduction and Background

## Background

For the past 10 years, the Iowa Department of Public Health (IDPH) has administered the Iowa Diabetes Prevention and Control Program through a cooperative agreement with the Division of Diabetes Translation, Center for Disease Control and Prevention (CDC). In fiscal year 2009-2010, the Iowa diabetes program received about \$200,000 in CDC funding

The Iowa Diabetes Prevention and Control Program provides educational opportunities for health care providers via the Iowa Communications Network interactive fiber optic system. The program also certifies diabetes outpatient education programs in Iowa based on minimum criteria for quality programs published in *641 Iowa Administrative Code*, Chapter 9.

In addition, the Iowa diabetes program and all CDC funded state diabetes programs produce periodic reports on the burden of diabetes in their states. This is the first such report of the Iowa program.

Information in this report relies largely on three databases: the Iowa Behavioral Risk Factor Surveillance System (**BRFSS**) database, the Iowa State Inpatient Database (**SID**) and the Iowa vital records/vital statistics **mortality** data files.

### Behavioral Risk Factor Surveillance System (BRFSS):

The BRFSS is a phone-based annual health survey of Iowa adults conducted by the Iowa Department of Public Health. This report provides diabetes prevalence estimates (percent of adults who self-report ever having been diagnosed with diabetes) and information about diabetes risk factors and diabetes-related services use based on 1990-2009 BRFSS survey data.

Due to the need to limit the length of the BRFSS survey, not all questions that relate to diabetes are asked in the BRFSS every year. In this report, gaps between the years of data reported for specific measures largely reflect the fact that data were not collected during those years.

To reduce random variability in the estimated Iowa diabetes rates presented here, most BRFSS data are provided as multi-year averages. Using multi-year averages increases the stability of estimated state rates through increasing the size of the BRFSS sample to that of the years that were pooled together.

Both estimated crude and age-adjusted rates for Iowa are included in this report. Most of the state-level adult diabetes-related trends presented in this report are based on previously unpublished BRFSS data. An age-adjusted rate is obtained by weighting age-specific rates to a

standard year 2000 U.S. population age-distribution and then summing those weighted age-specific rates. Age-adjusting eliminates differences in rates between populations being compared that are attributable solely to differences in the age distribution of the compared populations.

For county level BRFSS prevalence estimates, go to the CDC Web site:

[http://apps.nccd.cdc.gov/DDT\\_STRS2/NationalDiabetesPrevalenceEstimates.aspx](http://apps.nccd.cdc.gov/DDT_STRS2/NationalDiabetesPrevalenceEstimates.aspx).

State Inpatient Database (SID):

Iowa SID data found here previously appeared in the *Iowa Chronic Disease Report*. State-level counts and crude and adjusted rates of inpatient hospitalization are included.

County-level rates of hospitalization are referenced, but not provided in this report. For Iowa county-level rates of hospitalization from diabetes, go to:

<http://www.idph.state.ia.us/chnahip/default.asp>.

Mortality Records: CDC Wonder and the CDC Web-based Injury Statistics Query and Reporting System (WISQARS):

With several exceptions, where diabetes-related death counts for the years 2007 and 2008 were taken from the 2007 and 2008 *Vital Statistics of Iowa* report, all Iowa death counts and crude and adjusted rates for the years 1979-2007 in this report are from the CDC Wonder compressed mortality Web site and the CDC WISQARS Web site.

These two Web sites rely on death statistics provided to the CDC by each state health department. Iowa death data found on these sites come from the Iowa Department of Public Health.

The Web site addresses for Wonder and WISQARS are: <http://wonder.cdc.gov/mortSQL.html> and <http://www.cdc.gov/injury/wisqars/index.html>. Detailed county-level diabetes-related death data are available at the Wonder, but not the WISQARS, Web site.

## Diabetes, pre-diabetes defined

Having diabetes mellitus (diabetes) means that the level of sugar (blood sugar or glucose) in one's blood is too high.

The body produces insulin to help move blood sugar from the blood and into the body's cells where the cells use sugar for energy. Blood sugar levels become too high either when the pancreas (an organ near the stomach) stops making insulin altogether (type 1 diabetes) or when the body becomes unable to use the often more-than-adequate amounts of insulin that it makes (type 2 diabetes). In type 2 diabetes, the ability to produce but not to use insulin is called 'insulin resistance'. (Becker, 2004)

Pre-diabetes is a condition in which blood glucose levels are higher than normal but are not high enough for a diagnosis of diabetes. As for diabetes, pre-diabetes increases the risk of developing diabetes and cardiovascular disease. About half of people with pre-diabetes go on to develop diabetes within 10 years of first developing pre-diabetes. Persons with pre-diabetes who take steps to lower their blood sugar levels greatly reduce their chances of developing diabetes. Steps to reduce blood sugar levels include eating healthfully, exercising regularly and maintaining body weight at recommended levels.

The eight-hour fasting plasma glucose (FPG) test is the preferred test for diagnosing both diabetes and pre-diabetes because of its convenience and low cost. However, the two-hour oral glucose tolerance test (OGTT or GT) in which people drink a sugary beverage of glucose dissolved in water after fasting is also frequently used to diagnosis diabetes. A diagnosis of diabetes can be made if one has an:<sup>1</sup>

- FPG level of 126 mg glucose/dL or above, confirmed by repeat testing on a different day;
- OGTT level of 200 mg glucose/dL or higher 2 hours after drinking the sugary beverage.

A diagnosis of pre-diabetes can be made if one has an:

- FPG level of 100-125 mg glucose/dL, confirmed by repeat testing on a different day; (An FPG test result in this range is referred to as impaired fasting glucose (IFG) ); or,<sup>2</sup>
- OGTT level of 140-199 mg glucose/dL 2 hours after drinking the sugary beverage (an OGTT in this referred range is also referred to as impaired glucose tolerance (IGT)).

For people without diabetes, normal, non-fasting blood sugar levels usually range between 70 and 120 mg/dL and may be at the higher values of this range after meals. (NIH,2010)

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<sup>1</sup> Recently, the A1c test has been suggested as a means of diagnosing diabetes and pre-diabetes: The American Diabetes Association has set an A1c of 5.7%-6.4% for pre-diabetes and an A1c level of 6.5% or greater as diagnostic of diabetes.

<sup>2</sup> CDC and the American Diabetes Association set 100 mg/dL as the lower limit for establishing a diagnosis of IFG pre-diabetes. CDC formerly used 110mg/dL as the lower limit for defining IFG pre-diabetes.



## Diabetes types, causes and symptoms

Among adults, most cases of diabetes are type 2 and the chance of an adult having type 2 diabetes increases greatly with age. Type 2 diabetes accounts for 90%-95% of all diabetes cases.

Among children and youth, type 1 diabetes is more common than type 2. Type 1 diabetes accounts for 5-10% of all cases of diabetes in Iowa.

Persons with type 1 diabetes must take insulin shots, since their bodies make no insulin.

Persons with type 2 diabetes can largely control their diabetes through diet, maintaining normal body weight, exercise and oral medications. Risk factors for type 2 diabetes include older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance (pre-diabetes), physical inactivity, and race/ethnicity. African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Pacific Islanders are at particularly high risk for type 2 diabetes. (CDC, 2010)

Both type 1 and type 2 diabetes run in families. But the causes of type 1 diabetes are less well understood than are the causes of type 2 diabetes. Environmental and autoimmune factors, perhaps triggered by viral infections, appear to play important roles in the onset of type 1 diabetes. (CDC, 2010)

Symptoms common in persons who have developed newly developed untreated type 1 diabetes include: frequent urination, extreme thirst, hunger, fatigue and irritability and unusual weight loss.

Common symptoms in persons with uncontrolled type 2 diabetes include those of the symptoms listed for type 1 and frequent infections, including skin, gum and bladder infections, blurred vision, wounds that are slow to heal and numbness or tingling in the hands or feet. Some persons with type 2 diabetes may experience few symptoms. (ADA, 2010)

*Gestational diabetes*, another common form of diabetes, is diagnosed only 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. Immediately after pregnancy, 5% to 10% of women with gestational diabetes are found to have diabetes, usually type 2. Women who have had gestational diabetes have a 40% to 60% chance of developing diabetes in the next 5 -10 years.' (CDC, 2008)

'Other less common types of diabetes result from specific genetic conditions, such as maturity-onset diabetes of youth, surgery, medications, infections, pancreatic disease, and other illnesses. Such types of diabetes account for 1% to 5% of all diagnosed cases.' (CDC, 2008)

# Overall Adult Diabetes Prevalence in Iowa 1991-2009: Behavioral Risk Factor Surveillance System (BRFSS) Data

## Adult diagnosed diabetes prevalence dramatically increases between 1991-2009.<sup>3</sup>

Between 1991-93 and 2006-08, the crude prevalence rate of diagnosed diabetes among Iowa adults rose by 84%, from 3.8% to 7.0%. The age-adjusted diagnosed adult diabetes prevalence rate during this time increased by 64% rising from 3.7% to 6.4%.<sup>4</sup>

The 84% increase of the crude rate of diagnosed diabetes in Iowa adults was not matched by increases of similar magnitude in the crude prevalence rates of other diagnosed chronic diseases as seen in estimates from the Iowa BRFSS.

While hypertension (27% prevalence in 2006-08) and obesity/overweight (66% prevalence rate in 2006-08) are both more common conditions than diabetes, the crude prevalence rate of hypertension and obesity/overweight each increased by only 32% between 1991-93 and 2006-08.

The adult crude cardiovascular disease prevalence rate (ever had diagnosed angina or coronary (ischemic) heart disease) remained steady at 4.2% between 1996-97 and 2006-08 (data not available before 1996). The crude prevalence rate of arthritis among Iowa adults increased 16% between 2000 and 2007 (27% prevalence in 2007--data not available before 2000). Between 1997-99 and 2006-08, the rate of diagnosed adult diabetes prevalence in Iowa increased 40%.

The number of Iowa adults with diagnosed diabetes more than doubled, increasing from 78,000 to 162,000 during the 18 years 1991-93 through 2006-08.<sup>5</sup>

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<sup>3</sup> All BRFSS-derived rates and counts for diabetes and other chronic conditions are based on self-reports of ever having been diagnosed by a health care provider with the condition.

<sup>4</sup> Age-adjusting takes into account differences in the age-distribution of Iowa adults across time. The fact that Iowa's population is aging and that the risk of having diabetes increases with age, makes age adjusting important to revealing what factors, other than age, may be at play in the increase in diabetes prevalence across time.

BRFSS survey questions do not distinguish between type 1 (insulin dependent) and type 2 (non-insulin dependent) diabetes. In adults type 2 diabetes accounts for 90% to 95% of all diabetes cases.

<sup>5</sup> Since diabetes prevalence increases with age and Iowa's median age is increasing, the count of persons with diabetes more than doubled while the prevalence rate of diabetes rose 84%.

## **Iowa adult diabetes prevalence rates are comparable to or slightly lower than U.S. rates.**

BRFSS survey data show that Iowa's crude rate of diagnosed adult diabetes prevalence has remained about the same as or slightly below the national median rate of diagnosed diabetes for every year 1996 through 2009.

In 2009, the national median crude diabetes prevalence rate was 8.3% while the Iowa crude rate was 7.6%.

## **About 5% of all Iowa adults may have diabetes that has not been diagnosed or treated—i.e., about 40% of all adult diabetes cases are likely undiagnosed.**

Estimates of Iowa adults with undiagnosed diabetes are unable to be made using the BRFSS since it collects, via phone interviews, only self-reported diagnoses and other health information of which respondents are aware.

National estimates from the National Health and Nutrition Examination Survey (NHANES) 2005-2006, which relies on both personal interviews and clinical blood tests places the proportion of adults age 20 years and over with undiagnosed diabetes in the U.S. at 5.1%. (Cowie, 2009)

**For Iowa, this would mean that 12% of adults (280,000) have either diagnosed (7%) or undiagnosed (5%) diabetes. If national rates of undiagnosed diabetes apply to Iowa, then 40% of all adults with diabetes (118,000) have not been diagnosed by a health care provider.**

## **As many as 100,000 Iowa adults have diagnosed pre-diabetes.**

Since, 2005, the Iowa BRFSS has collected information about diagnosed pre-diabetes and in 2008 began collecting pre-diabetes prevalence information in two separate questions.<sup>6</sup> Estimates of diagnosed pre-diabetes prevalence based on the new 2008 pre-diabetes question are much higher those estimates based on the previous method and are believed to be the more accurate.

Based on the 2008 BRFSS survey, 4.7% of all Iowa adults age 18 and older have diagnosed pre-diabetes or about 100,000 adults.<sup>7</sup>

## **As many as 570,000 adults have undiagnosed pre-diabetes-in addition to the 100,000 adults with diagnosed pre-diabetes.**

As for diabetes, much pre-diabetes among Iowa adults remains undiagnosed. The 2005-2006 NHANES estimated prevalence rate of diagnosed and undiagnosed diabetes among adults was 29.5%. If this national rate of pre-diabetes applies to Iowa adults, almost 670,000 of all Iowa adults have diagnosed (100,000) or undiagnosed (570,000) pre-diabetes--That is, about 25% of Iowa adults likely have undiagnosed pre-diabetes, while about 5% have diagnosed pre-diabetes.

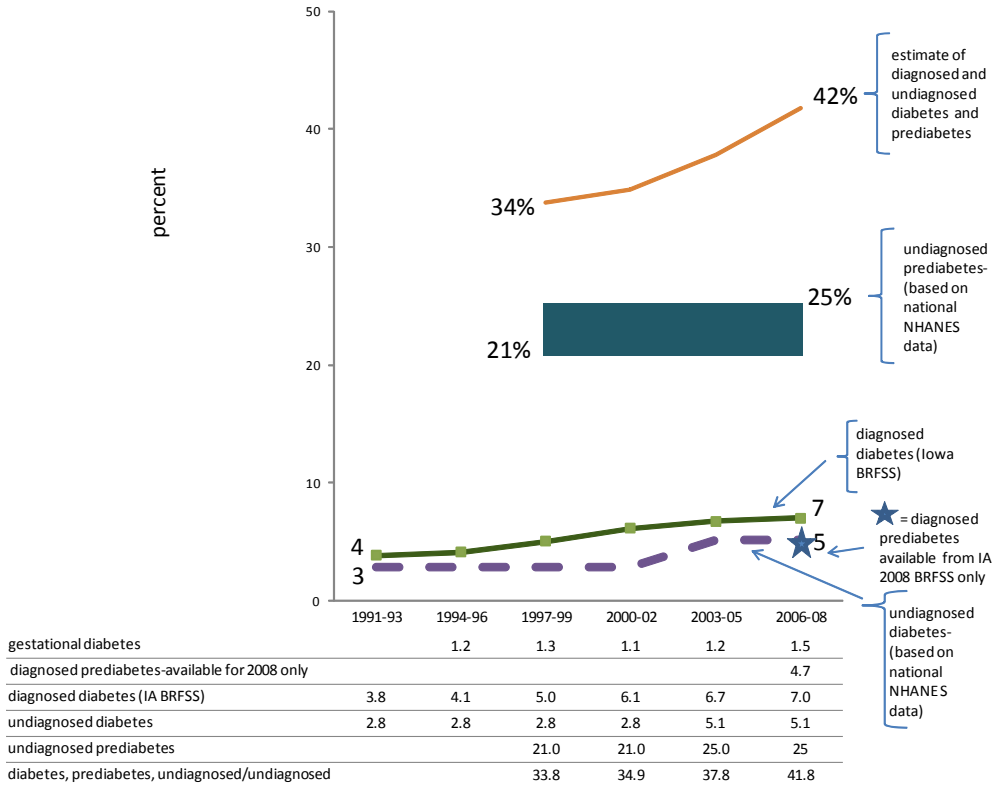
**All told, about 42% of adults age 18 and older in Iowa (950,000 adults) are estimated to have either diagnosed or undiagnosed diabetes or pre-diabetes.**

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<sup>6</sup> Between 2005-2007, the BRFSS surveys collected information about pre-diabetes through an answer option to the question asking about ever having been diagnosed with diabetes (One answer option was 'never diagnosed with diabetes, but I have been diagnosed with pre-diabetes. In 2008, the BRFSS survey began collecting information on diagnosed pre-diabetes through a separate question.

<sup>7</sup> NHANES 2005-06 estimates of pre-diabetes nationally, which are based on glucose blood tests, not self-reports of diagnosed pre-diabetes, puts the proportion of adults age 20 and older in the U.S. with diagnosed or undiagnosed pre-diabetes (impaired fasting glucose-a glucose level of 100 mg/dL to <126mg/dL plasma or per an oral glucose tolerance test a glucose level of 140 mg/dL to 199 mg/dL) at **29.5%**, (Cowie, 2009). These NHANES estimates of pre-diabetes are based on clinical lab values, not self reports. The 2006 National Health Interview Survey, which like the BRFSS relies solely on self-reports of diagnosed diabetes places the diagnosed diabetes prevalence rate in adults 18 and older at 4%, similar to the 4.5% rate found for Iowa adults using BRFSS. CDC (National Diabetes Fact Sheet, 2007) in citing NHANES 2003-06 data estimates the *diagnosed and undiagnosed* pre-diabetes prevalence rate in adults age 20 and older nationally to be slightly lower, 25.9%, meaning about 872,000 Iowa adults would have diagnosed or undiagnosed pre-diabetes.

**Figure 1.1**  
**Trends in prevalence of adult diagnosed and undiagnosed diabetes and pre-diabetes, Iowa**



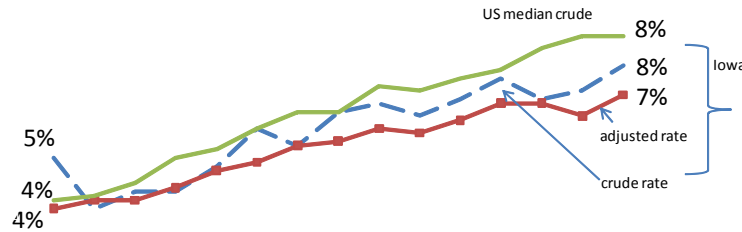
An estimated 42% of all adults age 18 and older in Iowa (950,000 adults) have diabetes or pre-diabetes:  
 Diagnosed diabetes (7%);  
 undiagnosed diabetes (12%);  
 diagnosed pre-diabetes (5%);  
 and undiagnosed pre-diabetes (25%), (2006-08).

Estimated average annual crude prevalence rate of diagnosed and undiagnosed diabetes/prediabetes per 100 adults ages 18 years and older (percent of adults with diabetes/prediabetes), Iowa, 1991-2008. Diagnosed pre-diabetes estimates are based on a separate question about pre-diabetes that was asked in the Iowa BRFSS in 2008 for the first time. Undiagnosed diabetes and pre-diabetes rates are based on national-level data from the NHANES database, 1988-94 and 2005-06.

Sources: *Diabetes Care*, 2006, 2009 (Cowie et al, data from the National Health and Nutrition Examination (NHANES) survey), CDC BRFSS Web site, CDC MMWR 9/5/2003, Iowa BRFSS, IA Dept. of Public Health

*(For additional information about adult diabetes in Iowa overall, also see table 1.1 of the BRFSS tables supplement to this report, IDPH diabetes program Web site.)*

**Figure 1.2**  
Trends in adult diabetes prevalence, Iowa vs. U.S



	1995	1996	1997	1997	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Iowa crude rate	5.4	4.2	4.6	4.6	5.2	6.1	5.7	6.5	6.7	6.4	6.8	7.3	6.8	7.0	7.6
Iowa adjusted rate	4.2	4.4	4.4	4.7	5.1	5.3	5.7	5.8	6.1	6.0	6.3	6.7	6.7	6.4	6.9
U.S. median crude rate	4.4	4.5	4.8	5.4	5.6	6.1	6.5	6.5	7.1	7.0	7.3	7.5	8.0	8.3	8.3

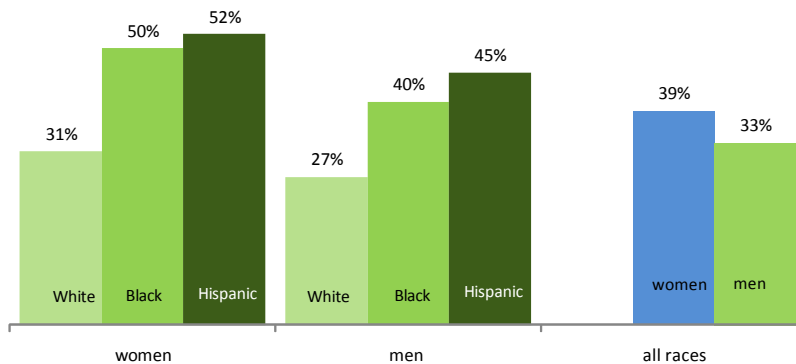
Estimated annual crude and age-adjusted prevalence rate of diabetes per 100 adults age 18 and older, (percent of adults who self-report ever having been diagnosed with non-gestational diabetes), Iowa, 1995-2009. U.S. rates are the median of all state crude rates using BRFSS data.

Sources: CDC Division of Diabetes Translation Web site and CDC BRFSS Web site (national data)  
Iowa BRFSS, IA Dept. Public Health

Iowa's crude rate of diagnosed adult diabetes prevalence has remained about the same as or slightly below the national median rate of adult diagnosed diabetes for every year 1995 through 2009.

In 2009, the national median crude diagnosed diabetes prevalence rate was 8.3% while the Iowa crude rate was 7.6%. Iowa's adjusted rate of diagnosed adult diabetes prevalence was 6.9% in 2009.

**Figure 1.3**  
Lifetime risk of developing diabetes in the U.S.



By race and sex, estimated lifetime risk at birth of developing diabetes among persons born in the U.S. in 2000 (chance of developing diabetes at sometime during one's life).

Source: *National Diabetes Factsheet 2007*, CDC, (from Narayan et al., JAMA, 2003)  
Chart prepared by IA Dept. of Public Health

Nationally, the lifetime risk of developing diabetes was higher for women than for men (39% vs. 33%) in 2000.

For women of all races the risk of developing diabetes was higher than men of the same race.

Compared to White men and women, Black and Hispanic men and women are at greater risk of developing diabetes.

## **Adult Diagnosed Diabetes Prevalence by Sex, Age and Race (BRFSS)<sup>8</sup>**

### **Adult diagnosed diabetes prevalence by sex: Men are at higher risk.**

Between 1991-93 and 2006-08, the crude prevalence rate of diabetes among Iowa men age 18 years and older increased 116%, jumping from 3.4% to 7.4%. Adjusted rates show a similar increase of 97% (from 3.6% to 7.1%).

During this time, the crude diabetes prevalence rate among Iowa women increased by 62%, rising from 4.1% to 6.7%. Adjusted rates for women show an increase of 55% during this time, rising from 3.8% to 5.9%.

Since 1997-99 for every three-year period examined, diabetes prevalence rates among Iowa men exceeded those of Iowa women. In 2006-08, the crude diabetes prevalence rate for men in Iowa was about 10% higher than the rate for women (7.4% vs. 6.7%). The age-adjusted rate for men was about 20% higher than the age-adjusted rate for women (7.1% vs. 5.9%). (BRFSS adjusted rates for Iowa men also show that men are at increased risk of overweight/obesity, cardiovascular disease, hypertension and other chronic conditions compared to women.)

Similar to Iowa sex-specific rates, since at least 2000 nationally, the BRFSS median diabetes prevalence rate for men has exceeded or been the same as that of women. (CDC BRFSS Web site)

On average, an estimated 82,041 men and 79,693 women age 18 and older in Iowa had diagnosed diabetes during 2006-08.

### **Adult diagnosed diabetes prevalence by age: Risk increases 55 fold with age.**

For all age groups of Iowa adults, for all years from 1991-93 through 2006-08, the prevalence rate of diabetes increased dramatically.

In 2006-08, the prevalence rate for Iowans age 65 and older (16.8%) was 55 times that of Iowans 18-24 years of age (0.3%). In 2006-08, an estimated 700 Iowans 18-24 years of age had diabetes, while 74,000 Iowans 65 years and older were diabetic.

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<sup>8</sup> All BRFSS-based rates and counts of diabetes refer to diagnosed diabetes.

## **Adult diagnosed diabetes prevalence sex/age: Both older men and older women are at very high risk.**

During all years 1991-93 through 2006-08, the dramatic difference in diagnosed diabetes prevalence rates among adults as they age was found not only overall but among both sexes. In 2006-08, the diabetes prevalence rate in Iowa men 65 years and older (18.7%) was 88 times that of men 18-24 years of age (0.2%). The diabetes prevalence rate in Iowa women 65 years of age and older was 51 times that of young women 18-24 years of age (0.3%).

*(For additional information about Iowa adult diabetes by sex and age, see tables 2.1 – 2.2 of the BRFSS tables supplement to this report, IDPH diabetes program Web site.)*

## **Adult diabetes prevalence by race/ethnicity: Overall Minorities have higher risk than Caucasians: African-American adult risk of having diabetes was more than double that of Caucasian adults.**

Due to small sample size, estimates of race and Hispanic-specific ethnicity diabetes prevalence rates demonstrate significant variability, even when three years of data are combined. Comparing 10-year annual average age-adjusted rates, decreases some of this variability and rates for 1990-1999 and 1999-2008 are compared in Tables 2.3 -2.4, *Burden of Diabetes in Iowa 1991-2009, BRFSS Tables Supplement*.

During 1999-2008 among Iowa adults, the age-adjusted diabetes prevalence rate among African-American adults was 13.1%, while for Caucasian adults the adjusted rate was 6.3%. The age-adjusted rate of diabetes among Hispanic adults in Iowa was 7.6% and among Other Minorities 5.7% during 1999-2008.

The Iowa BRFSS sample size, even combining 10 years of data, is too small to further breakdown the group of Other Minorities. And, only single years of national BRFSS data by race are available through the CDC BRFSS Web site, which also provides for a sample size too small to break down further Other Minorities.

National estimates from the 2007 National Health Interview survey place age-adjusted overall race/ethnicity rates of diagnosed diabetes at: Caucasian (6.4%), African-American (12.5%), Hispanic (11.1%), Native American/Alaskan Naive (17.2%), Pacific Islanders/Native Hawaiians (20.6%) and Other Asian (8.9%).



While Caucasians are at lower risk of having diabetes compared to African-Americans, Hispanics, and Other Minorities, Caucasians men and women account for about 95% of all cases of diagnosed diabetes (an estimated 151,500 of 162,000 cases of diabetes in 2006-08).

## **Adult diabetes prevalence by sex and race: Age-adjusted rates show African-American women and men are at double the risk of diabetes.**

During 1999-2008, sex and race-specific crude (not age-adjusted) diabetes prevalence rates were especially high for African-American women in Iowa (12.1%) —almost double or more than double those crude rates of women of other races (rate ranges 4.5% - 6.5%) and much higher than crude prevalence rates for every race of men (rate ranges 3.3% - 8.6%). (Figure 2.3)

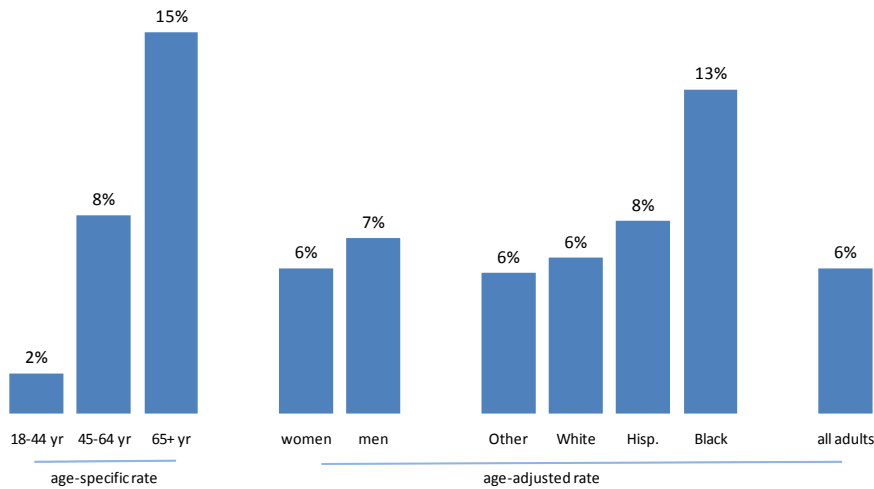
Age-adjusted sex and race-specific diabetes prevalence rates show that when differences in the age distribution of racial groups were accounted for, both African American men and women in Iowa had rates of diabetes double or more those of same-sex Caucasian and Other race men and women. (Figure 2.4)

Age-adjusted rates for Hispanic men and women were also high relative to same-sex Caucasian and Other Minority group rates.

Other race men and women: While Caucasian men and women were at lower risk of having diabetes compared to African-Americans and Hispanics, Caucasian men (76,200) and women (75,300) account for about 95% of all cases of diabetes (151,500 of 161,700 cases of diabetes) in Iowa during 2006-08.

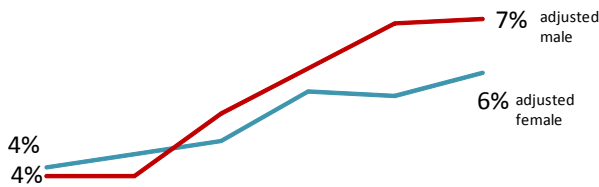
*(For additional information about Iowa adult diabetes prevalence by race and sex, see tables 2.2 – 2.4 of the BRFSS tables supplement to this report on the IDPH diabetes program Web site.)*

**Figure 2.1**  
**Adult diabetes prevalence, by age, sex and race**



Estimated three year average annual prevalence rate of diabetes per 100 adults age 18 and older (percent of adults who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), by age, by sex, race/ethnicity (sex and race rates are age-adjusted), Iowa, 2006-08.  
 Source: Iowa BRFSS, IA Dept. of Public Health

**Figure 2.2**  
**Adult diagnosed diabetes prevalence by sex and year**



	1991-93	1994-96	1997-99	2000-02	2003-05	2006-08
crude female	4.1	4.6	5.0	6.1	6.2	6.7
crude male	3.4	3.6	5.1	6.1	7.4	7.4
adjusted female	3.8	4.1	4.4	5.5	5.4	5.9
adjusted male	3.6	3.6	5.0	6.0	7.0	7.1

Estimated average annual crude and age-adjusted, sex-specific prevalence rate of diabetes per 100 adults ages 18 years and older (percent of men and women who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), Iowa, 1991-2008.

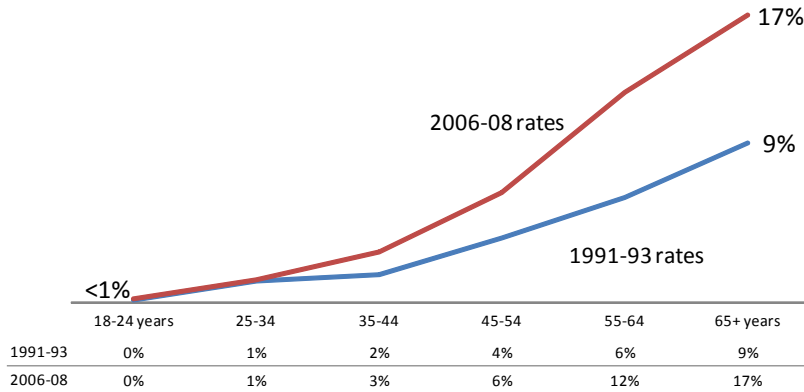
Sources: Iowa BRFSS, IA Dept. of Public Health

Since 1997-99, diabetes prevalence rates among Iowa men have exceeded those of Iowa women.

In 2006-08, the *crude* diabetes prevalence rate for men in Iowa was about 10% higher than the rate for women. (7.4% vs. 6.7%)

When *age-adjusted* sex-specific rates are compared, men were found to have a rate 20% higher than women (7.1% among Iowa men vs. 5.9% among Iowa women, 2006-08).

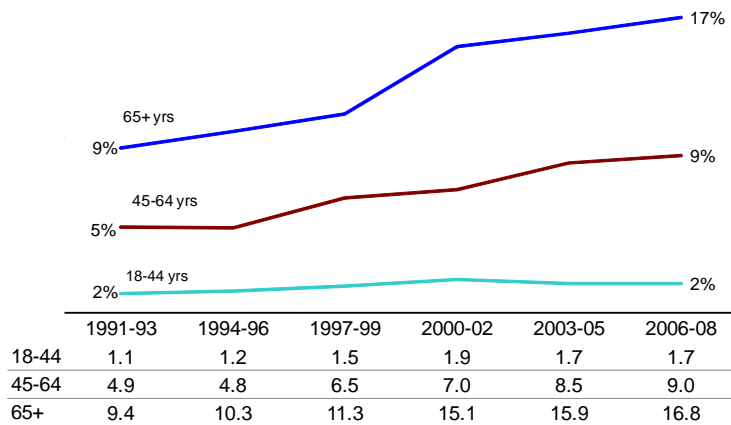
**Figure 2.3**  
**Adult diabetes prevalence by age**  
**1991-93 vs. 2006-08, Iowa**



In 2006-08, the prevalence rate for Iowans age 65 and older (17%) was 55 times that of Iowans 18-24 years of age (0.3%) and 80% higher than the prevalence rate of adults 65 years and older in 1991-93 (9%).

Estimated three-year average annual prevalence rate of diabetes per 100 adults age 18 and older by age (percent of adults who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), by age, Iowa, 1991-93 vs. 2006-2008 rates.  
 Source: Iowa BRFSS, IA Dept. of Public Health

**Figure 2.4**  
**Trends in adult diabetes prevalence by age, Iowa**

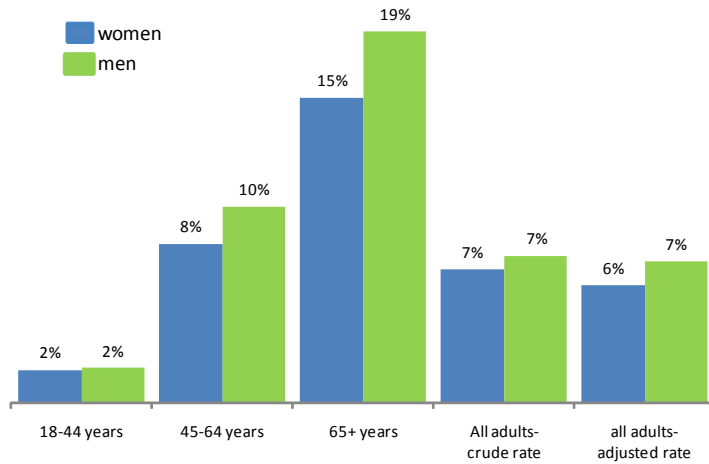


In 2006-08, the prevalence rate for Iowans age 65 and older (17%) was 80% higher than their rate in 1991-93 (9%).

The diabetes prevalence rate for Iowans 45-46 years of age also almost doubled during these 17 years, rising from 5% to 9%.

Estimated three-year average annual age-specific prevalence rate of diabetes per 100 adults age 18 years and older (percent of adults by age who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), Iowa, 1991-2008.  
 Source: Iowa BRFSS, IA Dept. of Public Health

**Figure 2.5**  
**Adult diabetes prevalence by sex and age, Iowa**



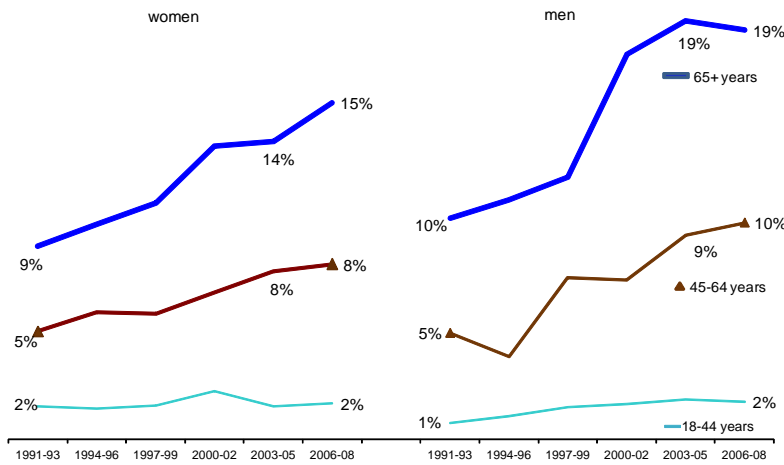
Estimated three year average annual age/sex-specific prevalence rate of diabetes per 100 Iowa adults age 18 and older (percent of adults by age and sex who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), Iowa, 2006-08;  
 Source: Iowa BRFSS, IA Dept. of Public Health

During all years 1991-93 through 2006-08, the dramatic increase in diabetes prevalence rates among adults as they age was found not only overall but among both sexes.

For all age groups, diabetes was more prevalent in men than women.

The diabetes prevalence rate in Iowa men 65 years and older (18.7%) was 9 times that of men 18-44 years of age (rate 1.7%) in 2006-08.

**Figure 2.6**  
**Trends in adult diabetes prevalence by age and sex, Iowa**

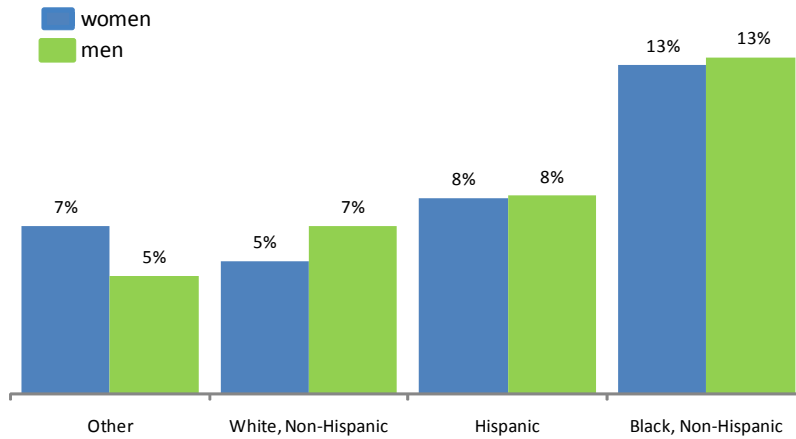


Three year average annual age-specific rate of diabetes per 100 adults age 18 and older (percent of adults who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), Iowa, 1991-2008.  
 Source: Iowa BRFSS, IA Dept. of Public Health

The diabetes prevalence rate in Iowa women 65 years of age and older (15.4%) was also 9 times that of women 18-44 years of age (1.5%) in 2006-08.

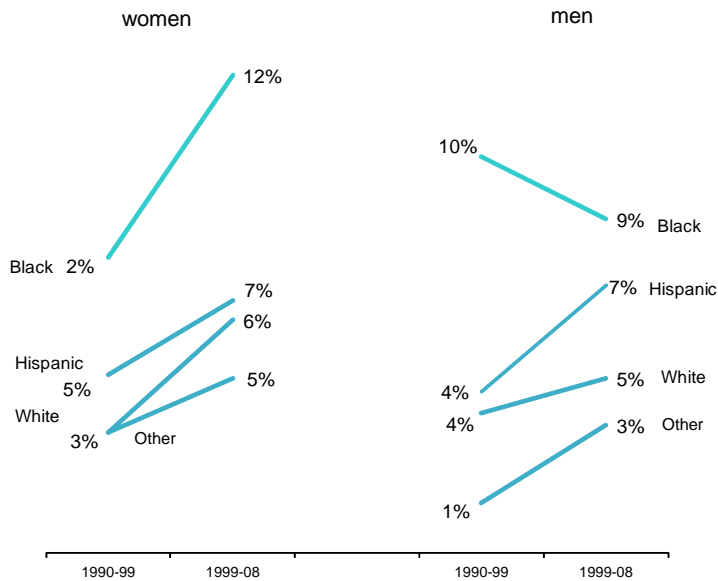
Among all age groups of Iowa adults, diabetes was more prevalent, diagnosed diabetes is more likely to be found in men than in women, although among men and women 18-44 years of age, that difference was less than one percentage point.

**Figure 2.7**  
**Adult diabetes prevalence, by race and sex, Iowa**



Ten-year average annual age-adjusted diabetes prevalence rate per 100 adults, by race and Hispanic ethnicity, Iowa BRFSS, 1999-2008

**Figure 2.8**  
**Adult diabetes prevalence by race and sex (crude rate), 1990-99 vs. 1999-2000, Iowa**



Estimated ten-year average crude rate of diabetes per 100 adults age 18 and older (percent with of adults who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), by race and sex, Iowa, 1990-99 vs. 1999-2008.  
 Source: Iowa BRFSS, IA Dept. of Public Health

# Adult Diabetes Prevalence in Iowa by Education and Income Level: (BRFSS) Data

## Adult diabetes prevalence: Higher income and education are protective factors.

Diabetes prevalence is strongly associated not only with increasing age and being Hispanic, African-American or Other Minority, but also with being poor and having less education.

Both crude and age-adjusted rates demonstrate a strong association between lower educational attainment and lower income and the risk of an Iowa adult having diabetes.

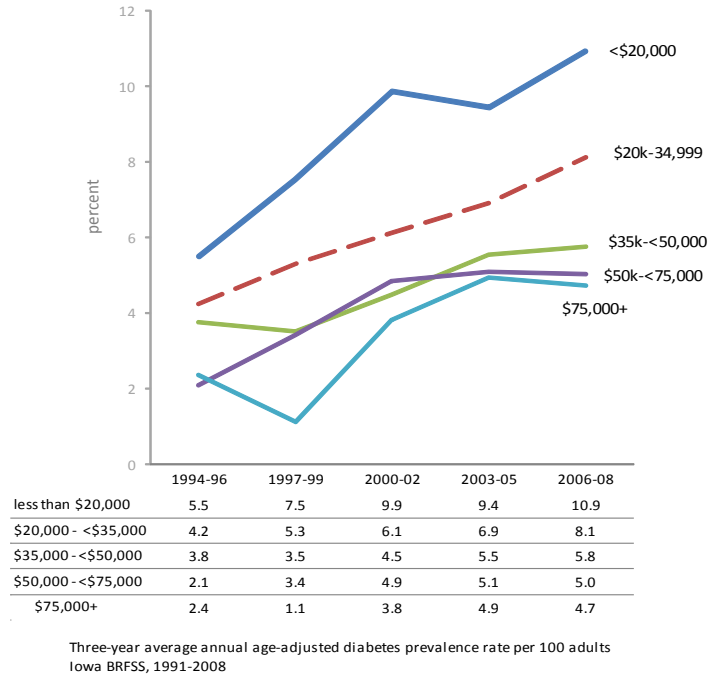
Age-adjusted income-specific rates of diabetes for 2006-08 show that having a household income of less than \$20,000 puts one at more than double the risk of having diabetes compared to someone with a household income of \$75,000 or more (10.9% vs. 4.7%). (Figure 2.5)

Likewise, having less than a high school education puts adults at 74% greater risk of having diabetes compared to adults with a college degree or higher educational attainment (5% vs. 8.7% age-adjusted rates) in 2006-08. (Figure 2.6)

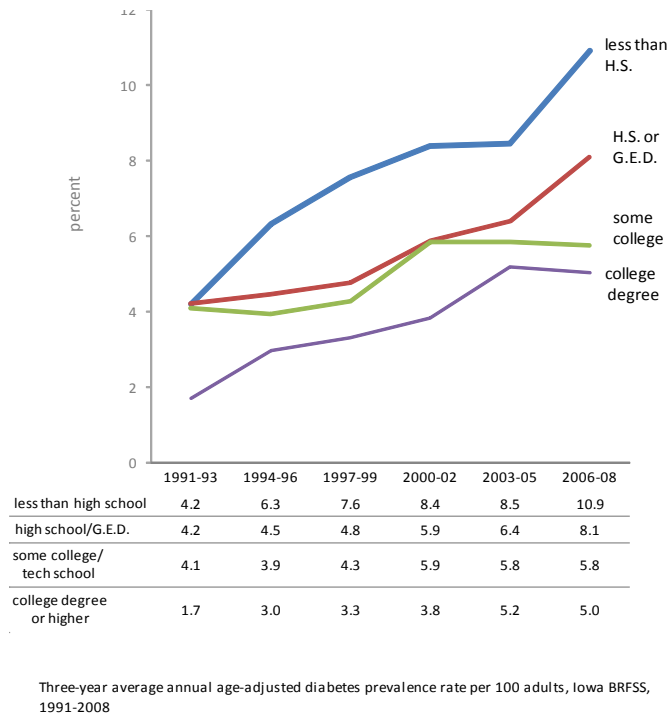
Crude rates show similar increased risk among Iowa adults who have the least income and education.

*(For additional information about Iowa adult diabetes prevalence by income and education, see table 3.1 of the BRFSS tables supplement to this report on the IDPH diabetes program Web site.)*

**Figure 3.1**  
**Adult diabetes prevalence by household income, Iowa**



**Figure 3.2**  
**Adult diabetes prevalence by educational attainment, Iowa**



## Among Adults with Chronic Conditions Diabetes Prevalence (BRFSS)

### Adults who are overweight/obese are more than three times as likely as normal weight adults to have diabetes.

Between 1991-93 and 2006-08, among obese adults, diabetes prevalence increased 70% (rising from 7% to 13%). Among overweight adults, diabetes prevalence increased 37%, (rising from 4% to 6%), while among adults of normal weight, the diabetes prevalence increased about 20% (rising from 2.5% to 3.2%)

*During this time, the age-adjusted rate of diabetes prevalence rose 84%, from 6.9% to 12.7% among the obese. Among normal weight adults, the age-adjusted rate of diabetes increased 26% (rising from 2.5% to 3.2%) and among overweight adults, diabetes prevalence increased 34% (rising from 3.5% to 4.7%) between 1991-93 and 2006-08.*

The age-adjusted rate of diabetes among the obese was more than three times that of normal weight Iowa adults in 2006-08.

As for the age-adjusted rates of diabetes, crude rates of diabetes show Iowa adults who are obese have the highest rates of diabetes and the greatest percent increase in their rate of diabetes since 1991-93.

*(For additional information about Iowa adult diabetes prevalence by body weight status, see table 5.1 of the BRFSS tables supplement to this report, found on the IDPH diabetes program Web site.)*

### Adult diabetes prevalence: Having cardiovascular disease doubles chances of having diabetes.

In 2006-08, Iowa adults with high blood pressure, high cholesterol and coronary heart disease had at least double the age-adjusted risk of having diabetes compared to those without these conditions. Among adults with high blood pressure, 12% had diabetes vs. 6% of those without high blood pressure. Among adults who have ever had high cholesterol, 11% had diabetes vs. 5% of those who had never had high cholesterol levels. Among adults who had ever been diagnosed with coronary heart disease, 17% had diabetes vs. 6% of those who did not have coronary heart disease. (Figure 5.1, age-adjusted rates)

*(For additional information about Iowa adult diabetes prevalence by cardiovascular health status, see table 4.1 of the BRFSS tables supplement to this report found on the IDPH diabetes program Web site.)*



## **Adult diabetes prevalence: Poor overall health and poor mental health are associated with increased risk of Iowa adults having diabetes.**

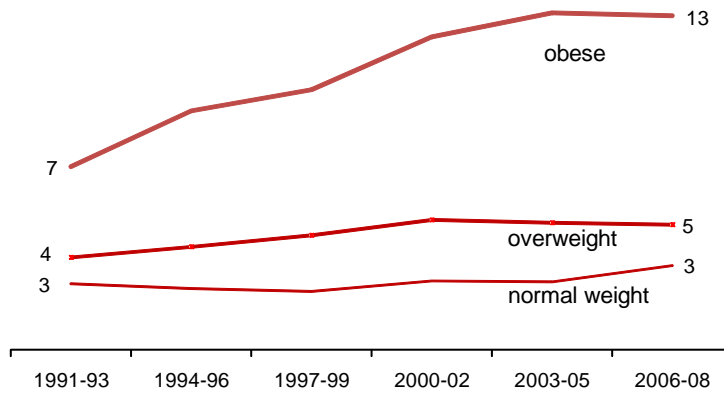
In 2006-08, Iowa adults with activity limitations (11% age-adjusted diabetes prevalence) compared to those who did not have activity limitations (5% age-adjusted diabetes prevalence rate) were three times more likely to report having diabetes.

Adults who reported their overall health as being poor or fair were more than three times as likely as who described their health as good or excellent to have diabetes in 2006-08 (16% vs. 5% age-adjusted diabetes prevalence rate).

Adults with a history of diagnosed depression, anxiety or other mental illness or poor current mental health also had a greater chance of having diabetes compared to those who had no history of depression or poor mental health, but not as great of a risk of being diabetic as those with activity limitations and cardiovascular conditions. In 2006, of adults who reported *no* poor mental health days in the past 30 days, the age-adjusted prevalence rate of diabetes was 6%; while 11% of those who had eleven or more days of poor mental health in the past 30 days had diabetes (age-adjusted prevalence rates).

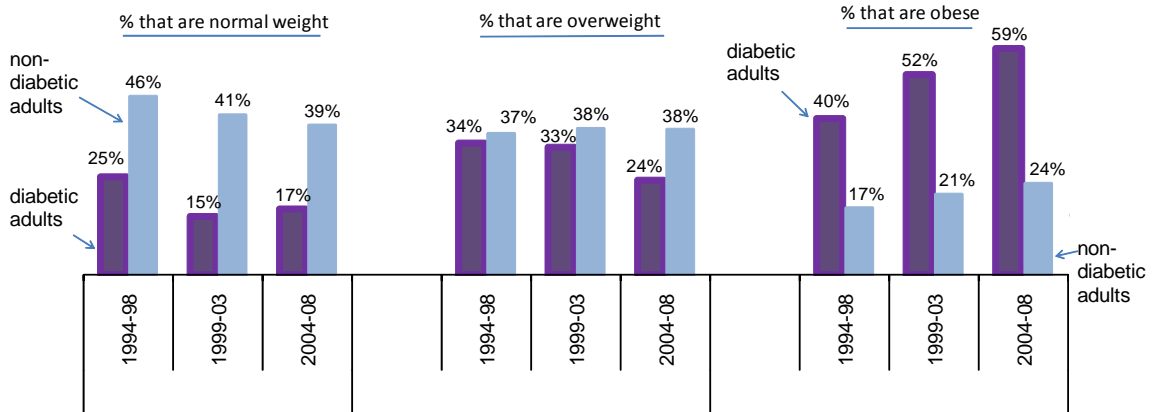
*(For additional information about Iowa adult diabetes prevalence by overall mental and physical health status, see table 4.2 of the BRFSS tables supplement to this report found on the IDPH diabetes program Web site.)*

**Figure 4.1**  
**Adult diabetes prevalence by body weight, Iowa**



Three-year average annual age-adjusted rate of diabetes per 100 adults (percent of adults who self-report ever having been diagnosed with diabetes, exclusive of gestational diabetes), by body weight (body mass index (BMI) status), Iowa 1991-2008

**Figure 4.2**  
**Among diabetic and non-diabetic adults, trends in percent that are normal weight, overweight and obese, Iowa**



Five-year average annual age-adjusted percent of adults who are diabetic versus non diabetic that are normal weight, overweight and obese, 1994-2008. Source: Iowa BRFSS, Iowa BRFSS, IA Dept. of Public

## Diabetes prevalence by risk factors: Caveats

While BRFSS data point to many of the risk factors described in this section as being associated with an increased risk of having diabetes, it is not known with certainty from the data collected by the BRFSS survey if these conditions were the consequence or the cause of the reported adults diabetes. In many cases, the health conditions and behaviors described as risk factors in this report (e.g., lack of exercise, obesity) may be both a contributor to and a consequence of having diabetes.

## **Among Adults who do not Use Tobacco, who Eat Healthfully and who Exercise Regularly- Diabetes Prevalence (BRFSS)**

### **Adult diabetes prevalence: Exercise is associated with lowered risk of diabetes.**

During 2006-08, adults who exercised at recommended levels (moderate exercise for 30 minutes three or more times a week) were about 43% less likely to have diabetes than were those who did not exercise at the recommended levels: The adjusted rate of diabetes among those who exercised at recommended levels was 5.6%, while among adults who failed to exercise at the recommended the adjusted diabetes prevalence rate was 9.0%.

Differences in crude rates of diabetes among those who did and did not exercise were also substantial (half as likely to have diabetes if adults exercised at recommended levels). (Figure 5.1)

*(For additional information about Iowa adult diabetes prevalence by physical activity and activity limitations status, table 5.3 of the BRFSS tables supplement to this report on the IDPH diabetes program Web site.)*

### **Adult diabetes prevalence: Age-adjusted rates of diabetes equal among smokers and nonsmokers**

In 2006-08, the crude rate of diabetes prevalence among those who smoked was 36% lower than among nonsmokers (4.8% vs. 7.6%) However, after age-adjusting these crude rates, (young adults are more likely to smoke and less likely to have diabetes than older adults) adult Iowans who smoked cigarettes were seen to have about the same rate of diabetes as those adults who did not smoke: Age-adjusted rates of diabetes were 5.5% for smokers and 6% for nonsmokers in 2006-08. (Figure 5.1)

*(For additional information about Iowa adult diabetes prevalence by smoking status, see table 5.4 of the BRFSS tables supplement to this report on the IDPH diabetes program Web site.)*

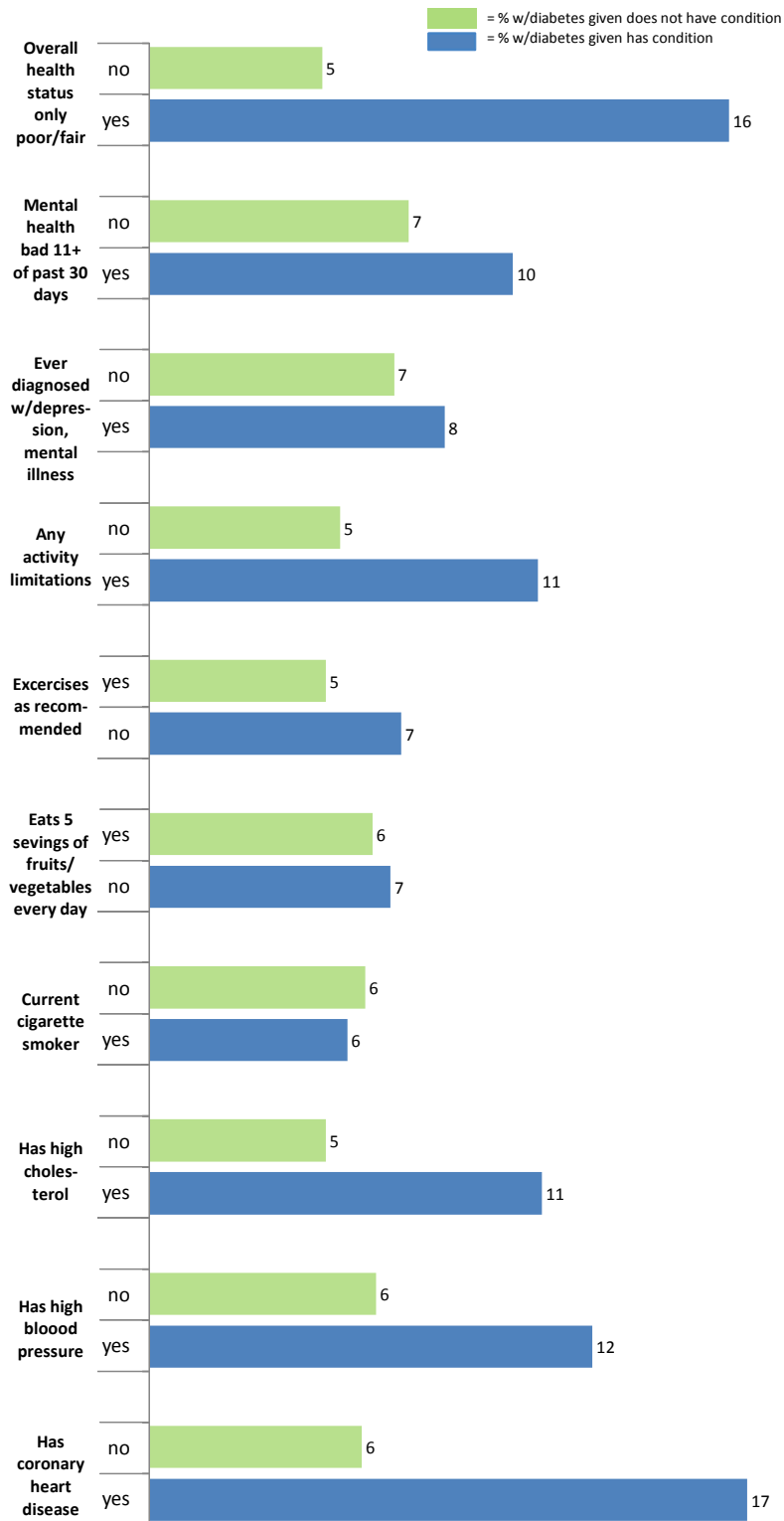
## **Adult diabetes prevalence: Eating five or more fruits and vegetables per day not associated with not lower risk of diabetes.**

Persons who ate the CDC recommended five or more servings of fruit and vegetables per day had an almost equal chance of having diabetes (6.7%) as those who did not eat the recommended five or more servings per day (6.2%) when rates are age adjusted.

Unadjusted rates showed that those who ate five or more fruits and vegetables a day were about 30% more likely to have diabetes than those who did not eat five servings a day. In part, this may be explained by the BRFSS data that show that older adults are more likely to eat five servings of fruits and vegetables per day and are also at greatest risk of having diabetes. It may be that those who eat five or more servings of fruit and vegetables each day eat more in general and over eat foods that increase the likelihood of obesity which, in turn, puts them at risk of developing diabetes.

Diets high in fiber, including fiber from fruits and vegetables, have been shown to be protective from a number of chronic conditions, including diabetes. Vegetables high in fiber have been found to be particularly protective against diabetes. (Figure 5.1)

*(For additional information about Iowa adult diabetes prevalence by fruit and vegetable consumption status, see table 5.2 of the BRFSS tables supplement to this report found on the IDPH diabetes program Web site.)*



**Figure 5.1**  
**Adult diabetes prevalence among adults w/chronic disease, and with risk behaviors for diabetes, (age, adjusted rates) Iowa BRFSS, 2006-08 (or most recent period available)**

## Among Iowa Adults with Diabetes: Health Services Received (BRFSS)

### Adults with diabetes are increasingly likely to receive preventive care.

Compared to 1997-99, Iowa adults with diabetes in 2006-08 were:

- 44% more likely to check their blood sugar at least daily (45.6% vs. 65.8%, crude rate);
- 44% more likely to have had their A1c blood levels checked four or more times in the past 12 months (24.4% vs. 35% crude rate);
- 7% more likely to have had a dilated eye exam in the past 12 months (72.1% vs. 77.1%, crude rate);
- 3% more likely to have visited a physician for diabetes care or services at least once in the past 12 months (86.8% vs. 89.4%, crude rate);
- 13% more likely to have had at least one foot exam in the past 12 months (65.7% vs. 73.9% ,crude rate);
- 4% less likely to be using insulin (30.1% vs. 28.9%, crude rate).

### Since 2000, there has been little or no increased in the proportion of adults with diabetes that check themselves for foot sores or have taken a diabetes self-management course

In 2006-08, 63% of adults with diabetes checked their feet for sores *at least daily*— 10% less than in 2000-02. In 2006-08, about 10% *never* checked their feet for sores, about the same percentage as in 2000-02.

In 2006-08, 62% of adults with diabetes had taken a course in diabetes self-management compared to 60% in 2000-02.

*(For additional information about diabetes-related preventive health care received and self-care among diabetic adults, see table 6.1 of the BRFSS tables supplement to this report found on the IDPH diabetes program Web site.)*

## **Among Iowa Adults with Diabetes: Prevalence of Chronic conditions (BRFSS)**

### **Adult obesity and overweight prevalence increase among adults with and without diabetes, but adults with diabetes continue to be much more likely to be obese than are other adults.**

Being overweight or obese is closely associated with an increased risk of developing diabetes, and, for at least the past two decades, both the Iowa and U.S. adult population have been steadily growing more overweight and obese.

In 1991-93, the crude rate of obesity/overweight among the Iowa adult population overall was 47%, while in 2006-08 the crude rate of obesity/overweight in the Iowa adult population was 62%, an increase of 32%. (Age-adjusted rates of obesity/overweight in the general Iowa adult population also show a rate of increase during these years—rising from 55% in 1994-98 to 63% in 2004-08).

In 1994-1998, 75% of diabetics were obese/overweight. In 2004-08, the age-adjusted rate of obesity/overweight among adults with diabetes was 83% —an increase of 11%.

In 2004-08, the age-adjusted rate of obesity/overweight among adults with diabetes was 36% greater than among Iowa adults without diabetes (83% vs. 61%).

Comparing crude prevalence rates of obesity and overweight among diabetic adults, compared to 1997-99, in 2006-08, Iowa adults with diabetes were:

- 17% more likely to be obese (45% vs. 53%, crude rate);
- 16% less likely to be overweight, but not obese (39% vs. 32%, crude rate);
- 12% less likely to be normal weight (19% vs. 17%, crude rate).

*(For additional information about body weight status among diabetic adults, see table 6.4 of the BRFSS tables supplement to this report found on the IDPH diabetes program Web site.)*

## **Crude rate of diabetes-related eye disease and foot sores show little change.**

Compared to 2000-02, Iowa adults with diabetes in 2006-08 were:

- 11% more likely to have ever been diagnosed with diabetes-related eye disease (19% vs. 21%, crude rate);
- about equally likely to have had foot sores that last 4 weeks or longer (9% vs. 9%, crude rate).

*(For additional information about eye disease and foot sores among diabetic adults, see table 6.2 of the BRFSS tables supplement to this report found on the IDPH diabetes program Web site.)*

## **Cardiovascular disease among adults with diabetes has dropped.**

Compared to 1996-97, Iowa adults with diabetes in 2006-08 were:

- 11% less likely to have ever had a heart attack (18% vs. 16%, crude rate);
- 21% less likely to have ever had a stroke (12% vs. 10%, crude rate).

## **Diabetics fare worse in rates of hypertension and high cholesterol.**

Compared to 1997-99, Iowa adults with diabetes in 2007 were:

- 11% more likely to have hypertension (58% vs. 65%, crude rate);
- 50% more likely to have ever had high cholesterol (41% vs. 62% crude rate).

## **Adults with diabetes are about equally likely to have poor health or mental health now vs. 1997-99.**

In 2006-08, 61% of Iowa adults with diabetes rated their health as poor or fair, about the same percent as in 1997-99 (59%).

Between 1997-99 and 2006-08, the proportion of Iowa adults with diabetes who reported that their mental health was poor or bad on four or more of the past 30 days declined slightly—from 30% in 1997-99 to 28% in 2006-08.



## **Smoking prevalence increases among adults with diabetes.**

Compared to 1997-99, Iowa adults with diabetes in 2006-08 were about 6% more likely to smoke cigarettes (13% vs. 13.7%, crude rate).

## **Physical activity levels: Among adults with diabetes, physical activity levels have changed little since 2005.**

Compared to 2001, Iowa adults with diabetes in 2007 were equally likely to have exercised at the recommended levels during the past 30 days (34.2% vs. 34.4%, crude rate).

*(For additional information about chronic conditions and at-risk behaviors- cardiovascular disease, hypertension and smoking status, among diabetic adults, see tables 6.3, and 6.5 - 6.8 of the BRFSS tables supplement to this report found on the IDPH diabetes program Web site.)*

# Diabetes Prevalence among Children and Youth

## Diabetes prevalence

Statewide, Iowa-specific data on childhood diabetes prevalence are not available.

Based on national estimates of the rate of ever having been diagnosed with diabetes, between 0.4% and 0.5% (one in every 200 to 500 children and adolescents) or between 2,800 and 3,600 of the 713,000 children and youth in Iowa ages 17 years and younger have diagnosed diabetes. (NHANES, 1999-2000, CDC, 2003 National Diabetes Fact Sheet, Child and Adolescent Health Measurement Initiative (NSCH, 2007))

Diabetes is one of the most common chronic conditions among persons less than 20 years of age, and, as for adults, is on the rise among young people. Both type 1 diabetes (estimated prevalence 0.38% to 0.48%, n=2,700-3,400 Iowa children and youth 0-17 years of age), which cannot be prevented, and type 2 diabetes (estimated prevalence 0.02%, n= 100 -200 Iowa children and youth 0-17 years of age), which can largely be prevented through exercise, proper diet and maintenance of normal body weight, are on the rise in young people.

Type 2 diabetes is extremely rare among young people less than 10 years of age but a growing concern for youth 10-19 years of age, as the rate of childhood overweight and obesity increase. In 2007, 27% of Iowa youth ages 10-17 years were estimated to be overweight or obese. Only about 35% of young Iowans reported that they exercise vigorously 3 or fewer days per week. (NSCH, 2007)

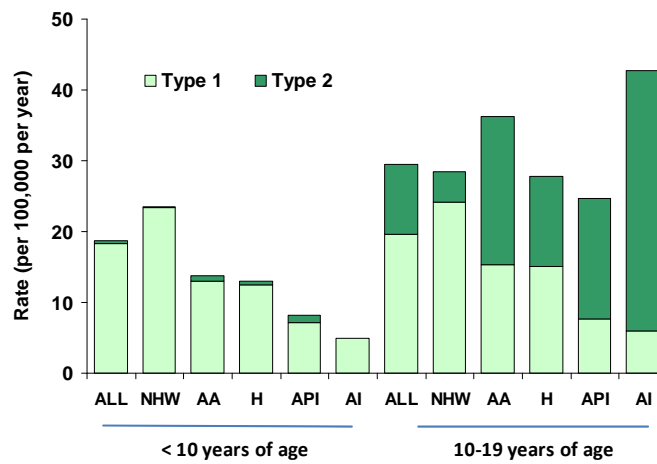
Among some minorities nationally, type 2 diabetes is equal in prevalence or more common than type 1 diabetes among youth less than 20 years of age. Among American Indian or Asian/Pacific Islanders, type 2 is equal to type 1 in incidence. Among Hispanic and African-American young people ages 10-19 years of age, rates of type 2 diabetes also exceed that of type 1 diabetes. In other words, Non-Hispanic Caucasian young people have rates of type 2 diabetes far lower than the rates for racial/ethnic minority subgroups of young people. (*Search for Diabetes in Youth* data, CDC, 2008)

The *Search for Diabetes in Youth* study found that nutritional intake in adolescents with diabetes is poor and that only 10% of youth with diabetes achieved dietary recommendations for fat intake. About 50% of youth with diabetes had cholesterol levels above the optimal level. And, those among youth with diabetes, those with the highest cholesterol levels were also most likely to have poorly controlled diabetes. (*Archives Pediatric and Adolescent Medicine*, 2007)

The *Search* study also found that about 9% of adolescents with diabetes have moderate or severely depressed mood symptoms, with more girls than boys being affected. Being depressed was associated with poor diabetes control and higher rates of emergency room visits. (*Pediatrics*, 2006);

The prevalence, not only of elevated cholesterol, but of multiple cardiovascular disease (CVD) risk factors is high in children and adolescents with diabetes. (*Diabetes Care*, 2006)

**Figure 7.1**  
**Rate of new cases of type 1 and type 2 diabetes among youth**  
**aged <20 years, by race/ethnicity, 2002–03, U.S.**



CDC. *National Diabetes Factsheet*, 2007.  
 Source: SEARCH for Diabetes in Youth Study  
 NHW=Non-Hispanic Whites; AA=African Americans; H=Hispanics; API=Asians/Pacific Islanders;  
 AI=American Indians

# Diabetes-Related Hospitalizations among Iowans (Iowa State Inpatient Database (SID))

## Diabetes-related hospitalizations in 2006 overall and by age and sex: Counts of hospitalizations rise for all but young Iowans.

In 2006:

- Diabetes accounted for 1% of all primary discharge diagnoses among Iowans hospitalized as inpatients (3,581 of 345,072).
- Iowans less than 18 years of age accounted for 7%, Iowans 18-44 accounted for 27%, Iowans 45-64 for 34% and Iowans age 65 and older for 33% of diabetes discharges.
- Overall, 57% of diabetes discharges were of males.
- Both the crude and adjusted rates of discharge from diabetes were higher for males than for females (crude rate: 11.6/10,000 for males vs. 10.5/10,000 for females. adjusted rate (13.5/10,000 for males vs. 9.3/10,000 for females). The adjusted rate of discharge from diabetes was 45% higher in males compared to females. (Figure diabetes 8.1)
- Between 1995 and 2006, the count of discharges from diabetes was up slightly for Iowans 18-44 years, 45-64 years and 75 years and older and down for Iowans 0-17 years of age and 65-74 years of age.

(Figures 8.1, 8.2)

## Trends in diabetes-related hospitalizations by sex: Males are more likely to be hospitalized

Age-adjusted rates of inpatient discharges from diabetes were higher for males than for females for all 12 years 1995-2006.

Between 1995 and 2006, the age-adjusted rate of hospitalization for diabetes decreased about 10% for females, while increasing about 17% for males. However, since 2001, with the exception of an uptick in the rate of discharges from diabetes for males in 2006, the age-

adjusted rate of hospitalization from diabetes has declined steadily for both males and females. (Figure diabetes 8.4)

## Trends in diabetes-related hospitalizations by age and sex: Older men are most likely to be hospitalized from diabetes.

For most years 1995-2006, for all adult age groups, rates of hospitalization from diabetes for males exceeded that for females.

The difference in rates between the sexes was most pronounced among those age 75 years and older, with rates in 2006 being about 60% greater among men 75 and older than among women of that age. (Figures diabetes 8.4 and 8.5)

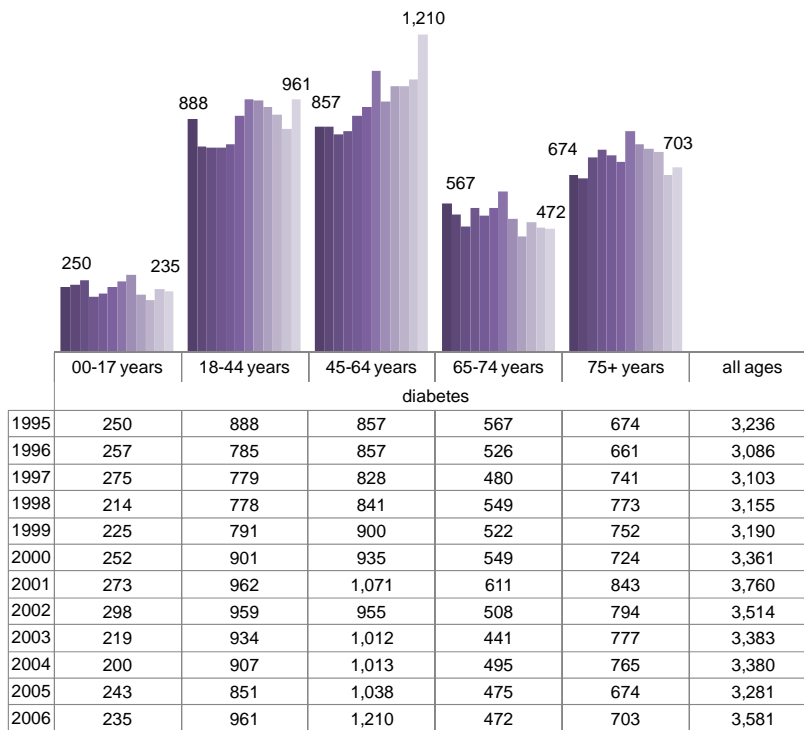
**Figure 8.1**  
**By age and by gender, percent of inpatient hospitalizations from diabetes, Iowa residents, 2006**

Diabetes	Age						Gender			
	0-17	18-44	45-64	65-74	75+	all ages	female	male	both f & m	
percent	7%	27%	34%	13%	20%	100%	43%	57%	100%	
number	235	961	1,210	472	703	3,581	1,555	2,026	3581*	
crude rate/10,000	3.3	9	15.8	23	30.5	12.0	10.5	11.6	12.0	
age-adjusted rate/10,000							11.3	9.3	13.5	11.3
<b>By Age and Gender: Number and Percent, All Discharges, All Causes, 2006</b>										
percent	16%	21%	20%	14%	29%	100%	59%	41%	100%	
number	54,504	73,773	67,376	47,975	101,444	345,072	*Diabetes comprises 1% of all discharges.			

Source: Iowa SID, IDPH. Notes: Only principal discharge diagnosis included. Classifications based on single-digit clinical classification software codes: diabetes (49-50). (Age-adjusted rates weight age-specific rates in order to eliminate differences in the overall crude rate of hospitalization across time that might be caused solely by Iowa's population growing slightly older or younger over time.)

**Figure 8.2**

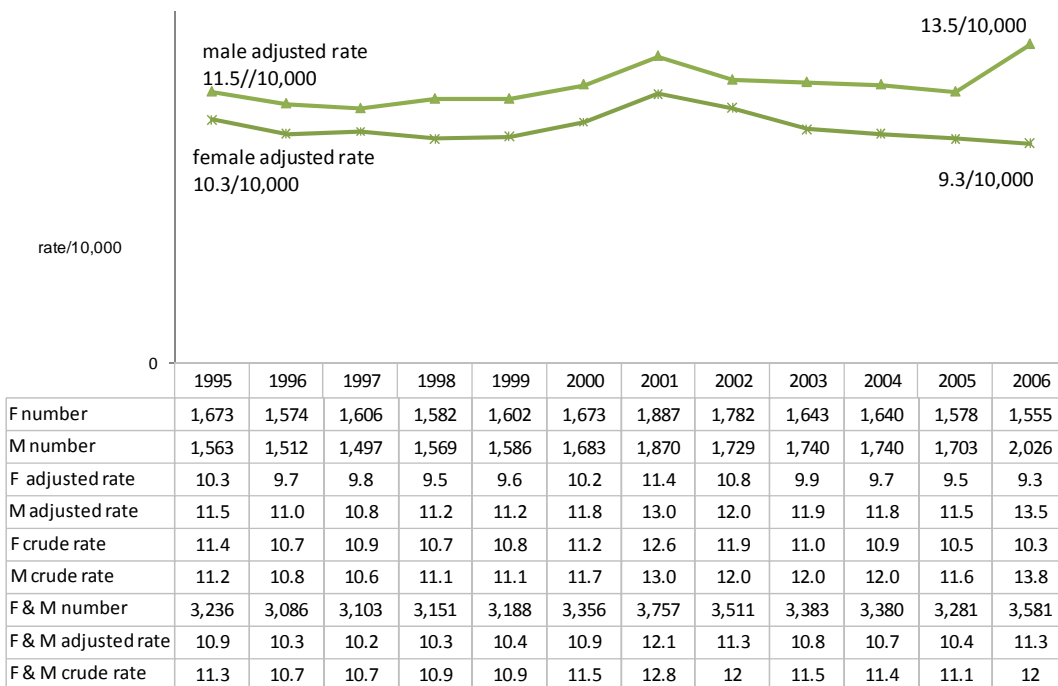
**Trends by age in the number of inpatient hospitalizations from diabetes, principal discharge diagnosis, Iowa residents, 1995--2006**



Source: Iowa SID, IDPH. Notes: Only principal discharge diagnosis included. Classifications based on single-digit clinical classification software (CCS) codes: diabetes (49-50).

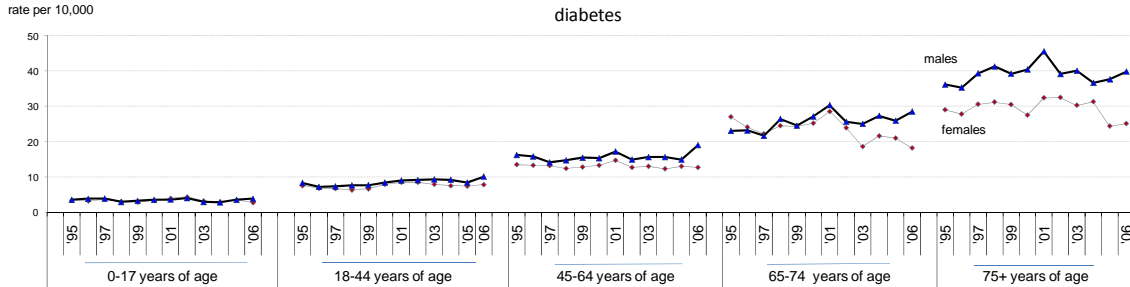
**Figure 8.3**

**By sex, trends in counts and age-adjusted rate of inpatient hospitalization from diabetes, 1995-2006**



Source: Iowa SID, IDPH. Notes: Only principal discharge diagnosis included. Classifications based on single-digit clinical classification software (CCS) codes: diabetes. (Age-adjusted rates weight age-specific rates in order to eliminate differences in the overall crude rate of hospitalization that might be caused solely by Iowa's population growing slightly older or younger over time.)

**Figure 8.4**  
**By sex, trends in age-specific rates of inpatient hospitalization from diabetes, 1995-2006**



Source: Iowa SID, IDPH. Notes: Only principal discharge diagnosis included. Classifications based on single-digit clinical classification software code: diabetes (49-50).

**Figure 8.5**  
**By sex, trends in age-specific counts and rates of inpatient hospitalization from diabetes, 1995-2006**

Diabetes, Principal Discharge Diagnosis by Age, Gender and Year													
Year	Crude age-specific rate/10,000										Age-adjusted rate (all ages)		
	00-17 yr		18-44 yrs		45-64 yr		65-74 yr		75+ yr		F	M	F&M
	F	M	F	M	F	M	F	M	F	M			
1995	3	4	8	8	14	16	27	23	29	36	10	11	11
1996	3	4	7	7	13	16	24	23	28	35	10	11	10
1997	4	4	7	7	13	14	22	22	31	39	10	11	10
1998	3	3	6	8	12	15	25	26	31	41	10	11	10
1999	3	3	7	8	13	15	24	25	31	39	10	11	10
2000	3	4	8	8	13	15	25	27	28	40	10	12	11
2001	4	4	9	9	15	17	29	30	32	46	11	13	12
2002	4	4	9	9	13	15	24	26	33	39	11	12	11
2003	3	3	8	9	13	16	19	25	30	40	10	12	11
2004	3	3	8	9	12	16	22	27	31	37	10	12	11
2005	3	4	7	8	13	15	21	26	24	38	10	11	10
2006	3	4	8	10	13	19	18	29	25	40	9	13	11

Year	Number by age												
	00-17 yr		18-44 yrs		45-64 yr		65-74 yr		75+ yr		All Ages		
	F	M	F	M	F	M	F	M	F	M	F	M	F&M
1995	120	130	418	470	397	460	333	234	405	269	1,673	1,563	3,236
1996	113	144	377	408	398	459	294	232	392	269	1,574	1,512	3,086
1997	128	147	370	409	406	422	266	214	436	305	1,606	1,497	3,103
1998	106	108	349	428	389	451	290	258	448	324	1,582	1,569	3,155
1999	105	120	362	429	413	487	284	237	438	313	1,602	1,586	3,190
2000	119	132	430	468	439	496	289	260	396	327	1,673	1,683	3,361
2001	139	133	459	501	497	574	323	288	469	374	1,887	1,870	3,760
2002	150	148	455	502	441	513	267	241	469	325	1,782	1,729	3,514
2003	111	108	423	511	462	550	207	234	440	337	1,643	1,740	3,383
2004	99	101	398	509	450	563	239	256	454	311	1,640	1,740	3,380
2005	117	126	391	460	485	553	231	244	354	320	1,578	1,703	3,281
2006	95	140	409	552	488	722	200	272	363	340	1,555	2,026	3,581

## **Diabetes-Related Mortality among Iowans (CDC and IDPH Iowa Mortality Records)**

### **Diabetes is among the 10 leading causes of death for all age groups 10 years and older.**

In line with increasing diabetes prevalence, diabetes-related deaths, as recorded on Iowa certificates of death, are also on the rise.

Diabetes consistently ranks among the ten leading causes of death in Iowa. During the 2000-2007 period, diabetes was the eighth leading cause of death, behind heart disease, cancer, strokes, chronic obstructive pulmonary disease, unintentional injury, Alzheimer's disease, and influenza and pneumonia. (Leading cause of death is defined as the condition listed as the primary (underlying) cause of death on the death certificate.)

Among all age groups 10-14 year through 65 years and older, diabetes ranks among the 10 leading causes of death. (Figure 9.1)

While diabetes overall and among most age groups is among the 10 leading causes of death as reported on Iowa certificates of death, for many Iowa decedents who had diabetes no mention of diabetes is found on their death certificates.

Of Iowa decedents with diabetes, it is estimated, based on national studies, that only about 10% to 15% have diabetes listed as their primary cause of death and only 35% to 40% have diabetes listed anywhere on their death certificate --as either the primary or a secondary cause of death.

Among all those Iowa residents who died between 2000 and 2006 (27,709 per year), diabetes was listed the primary cause of death for 3% of residents (719 resident deaths per year).

When both listed secondary and the primary cause of death are considered, diabetes contributed to 10% (2,666) deaths per year during these years.

In addition to these 2,666 Iowans with diabetes who are recognized as having their diabetes contribute to their dying, roughly another 4,000 Iowa decedents who have diabetes (60% to 65% of the estimated 6,700 Iowans with diabetes who die every year) do not have diabetes listed as either the primary or as a contributing cause of death on their death certificates.



## **Overall mortality rate from diabetes rise 42% in the 26 years through 2006.**

The age-adjusted mortality rate from diabetes (diabetes listed as primary cause of death on death certificate) increased steadily during the past three decades and was 42% greater in 2006 (21.9/100,000 Iowans) than in 1979 (15.4/100,000 Iowans). The national age-adjusted rate of death from diabetes increased 33% during this time, rising from 17.5/100,000 in 1979 to 23.3/100,000 in 2006.

Iowa age-adjusted death rates from diabetes remained below the national age-adjusted rate for all years 1979-2006 and was 6% (21.9/100,000) below the age-adjusted U.S. rate of death from diabetes (23.3/100,000) in 2006.

## **Age-adjusted diabetes-related mortality rates among Iowa males are higher than rates for females for all years 1979 and later.**

While crude death rates from diabetes for females were higher than the crude rate for males for all years 1979 and later, adjusted rates for males were the opposite.

In 2005-06, the average annual age-adjusted rate of death from diabetes for Iowa resident females was 18.4/100,000 while for males the adjusted rate was 24.3/100,000, 24% higher.

The crude mortality rate from diabetes was 27.1/100,000 population for Iowa female residents in 2005-06 and 24.5/100,000 population for males, 10% higher in females, explained, in part at least, by the fact that Iowa women live to be older than Iowa men and diabetes prevalence and death rates increase with age.

## **Crude and adjusted rates of death for both sexes increase steadily from 1979-80 through 2005-06.**

Both crude and age-adjusted mortality rates from diabetes rose for both sexes between 1979-80 and 2005-06. Crude diabetes rates from males rose 87% from 13.1/100,000 to 24.5/100,000, while crude rates for females rose 61% from 16.8/100,000 to 27.1/100,000 population.

Age-adjusted death rates from diabetes rose 56% for males from 17.9/100,000 to 27.9/100,000 and 19% for females from 17.6/100,000 to 20.9/100,000 during this time.

**The age-adjusted mortality rate from diabetes among African-American Iowans is higher than that of other race groups: The African-American rates was 1.5 times greater than among Caucasian Iowans and 1.3 times greater than among Other Non-Hispanic Minority races during 1999-2006 period.**

Both the crude and age-adjusted rate of death from diabetes rose for all racial/ethnic groups in Iowa between 1979-89 and 1999-2006. And, in 1999-2006, the crude rate of death from diabetes was slightly higher among non-Hispanic Caucasians (24.7/100,000) than non-Hispanic African-Americans (23.3/100,000).

However, the age adjusted rate for African-Americans was significantly higher than for all other racial and ethnic groups for all three time periods 1979-99, 1990-98 and 1999-2006. In 1999-2006, the age-adjusted death rate from diabetes (50.1/100,000) was 150% higher among African-Americans than was the rate for non-Hispanic Caucasians (19.7/100,000); 130% higher than the age-adjusted death rate for Non-Hispanic Other Races (21.9/100,000); and 170% higher than the age-adjusted death rate for Hispanics (18.9/100,000).

Because of the historically relatively small number of Minorities in Iowa relative to the number of Caucasians, for all of the years 1979-2006, 95% or more of all diabetes-related deaths were of Caucasian Iowans (756 of 786 deaths per year during 2006-2007).

**Figure 9.1-Average annual count of deaths  
by primary cause of death, death certificates of Iowa residents, 2000-2007**

Leading Causes of Death, Iowa

Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	All Ages
	Congenital Anomalies	Unintentional Injury	Unintentional Injury	Unintentional Injury	Unintentional Injury	Unintentional Injury	Malignant Neoplasm	Malignant Neoplasm	Malignant Neoplasm	Heart Disease	Heart Disease
1	54	15	14	15	138	91	134	476	947	6,626	7,702
	SIDS	Congenital Anomalies	Malignant Neoplasm	Malignant Neoplasm	Suicide	Suicide	Unintentional Injury	Heart Disease	Heart Disease	Malignant Neoplasm	Malignant Neoplasm
2	29	4	6	6	53	48	117	337	587	4,792	6,415
	Short Gestation	Malignant Neoplasms	Congenital Anomalies	Suicide	Malignant Neoplasm	Malignant Neoplasm	Heart Disease	Unintentional Injury	Chronic Low. Resp.Dis.	Cerebrovascular	Cerebrovascular
3	24	4	2	3	18	34	115	129	129	1,849	1,997
	Maternal Pregnancy Comp.	Homicide	Homicide	Congenital Anomalies	Homicide	Heart Disease	Suicide	Suicide	Unintentional Injury	Chronic Low. Resp.Dis.	Chronic Low. Resp.Dis.
4	16	3	1	2	12	23	68	68	90	1,429	1,610
	Placenta Cord Membranes	Perinatal Period	Benign Neoplasms	Heart Disease	Heart Disease	Homicide	Liver Disease	Liver Disease	Diabetes	Alzheimer's Disease	Unintentional Injury
5	9	1	1	2	9	9	17	48	81	966	1,141
	Unintentional Injury	Heart Disease	Chronic Low. Resp.Dis.	Homicide	Congenital Anomalies	Diabetes	Cerebrovascular	Cerebrovascular	Cerebrovascular	Influenza & Pneumonia	Alzheimer's Disease
6	6	1	1	1	4	5	17	46	80	825	974
	Bacterial Sepsis	Influenza & Pneumonia	Heart Disease	Chronic Low. Resp.Dis.	Influenza & Pneumonia	Influenza Pneumonia	Diabetes	Diabetes	Liver Disease	Diabetes	Influenza & Pneumonia
7	6	1	1	1	3	5	14	38	45	584	887
	Respiratory Distress	Cerebrovascular	Cerebrovascular	Septicemia	Chronic Low. Resp.Dis.	Stroke	Homicide	Chronic Low. Resp.Dis.	Suicide	Unintentional Injury	Diabetes
8	5	1	1	1	3	4	13	36	36	526	725
	Neonatal Hemorrhage	Acute Bronchitis	Influenza & Pneumonia	Diabetes	Diabetes	Congenital Anomalies	Chronic Low. Resp.Dis.	Influenza & Pneumonia	Influenza & Pneumonia	Parkinson's Disease	Suicide
9	5	<1	<1	<1	2	3	9	17	27	246	324
	Intrauterine Hypoxia	Chronic Low. Resp.Dis.	Perinatal Period	Influenza & Pneumonia	Stroke	Chronic Low. Resp.Dis.	HIV	Septicemia	Septicemia	Pneumonitis	Pneumonitis
10	4	0	0	0	1	3	9	15	22	245	262
	Atelectasis	Nutritional Deficiencies	Septicemia	Anemias	Meningococcal Infection	HIV	Influenza & Pneumonia	Viral Hepatitis	Nephritis	Atherosclerosis	Nephritis
11	4	<1	<1	<1	1	2	8	13	17	240	256
	Circulatory System Disease	Anemias	Pneumonitis	Cerebrovascular	Septicemia	Complicated Pregnancy	Congenital Anomalies	Congenital Anomalies	Aortic Aneurysm	Nephritis	Atherosclerosis
12	4	<1	<1	<1	1	2	7	9	14	227	252
	Homicide	Benign Neoplasms	Suicide	Acute Bronchitis	Complicated Pregnancy	Liver Disease	Septicemia	Homicide	Benign Neoplasms	Hypertension	Parkinson's Disease
13	2	<1	<1	<1	1	2	4	7	9	214	249
	Septicemia	Diseases Of Appendix	Acute Bronchitis	Alzheimer's Disease	Benign Neoplasms	Septicemia	Nephritis	Nephritis	Congenital Anomalies	Septicemia	Septicemia
14	2	<1	<1	<1	1	2	3	7	9	193	239
	Interstitial Emphysema	Liver Disease	Anemias	Meningitis	Meningitis	Pneumonitis	Viral Hepatitis	Aortic Aneurysm	Pneumonitis	Aortic Aneurysm	Hypertension
15	2	<1	<1	<1	1	1	3	6	8	173	227
# deaths in top 15	171	29	26	30	247	232	535	1,252	2,101	19,133	23,260
# all deaths	214	41	32	36	277	271	633	1,442	2,368	22,322	27,636
# deaths from diabetes	<1	<1	<1	<1	2	5	14	38	81	584	725
% of all deaths w/diabetes as primary cause	<1%	<1%	<1%	<1%	<1%	2%	2%	3%	3%	3%	3%

By age, 15 leading causes of death ranked by average annual number of deaths, Iowa residents, 2000-2007

All average annual counts rounded to nearest whole number. Sources: CDC WISQARS website: <http://www.cdc.gov/ncipc/wisqars/default.htm> (rankings); CDC Wonder website: <http://www.cdc.wonder> (total death counts 2000-06); IDPH: Vital Statistics of Iowa, 2007 (total death counts 2007).

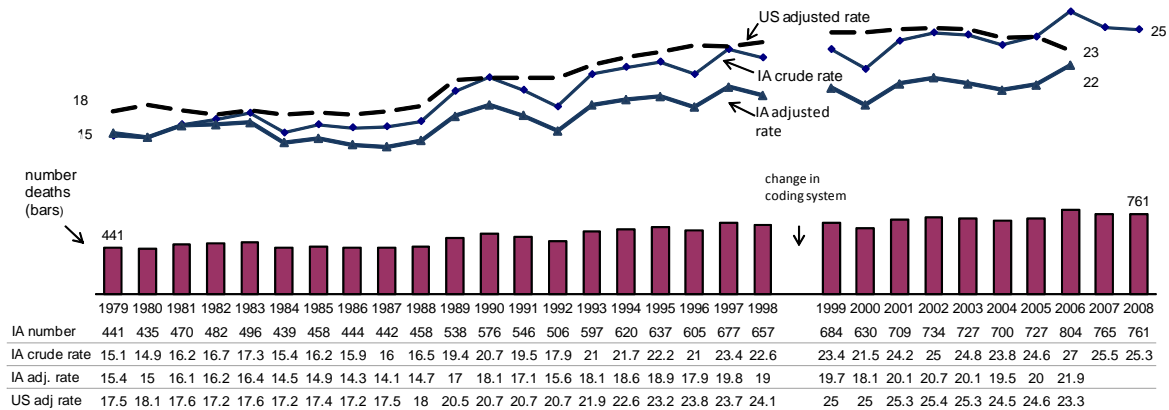
**Figure 9.2**  
**Percent of all deaths for which diabetes was the primary or a secondary cause of death, Iowa**

Percent of deaths	Age group										
	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	All Ages
from diabetes (diabetes was primary cause)	<1%	<1%	<1%	<1%	<1%	2%	2%	3%	3%	3%	3%
from or with diabetes (diabetes was primary or secondary cause of death)	<1	<1	<1	<1	1%	3%	6%	7%	11%	10%	10%
Number of deaths											
from diabetes	0	0	0	0	1	5	14	37	79	581	719
from or with diabetes	<1	<1	<1	<1	3	8	35	107	259	2,252	2,666
all causes of death	212	41	33	36	281	269	635	1,431	2,334	22,437	27,709

By age, average annual number and percent of deaths for which diabetes was listed as the primary cause of death or as either the primary or a secondary cause of death and count of deaths that had diabetes listed as a primary or secondary cause, Iowa residents, 2000-2006. Source: <http://www.cdc.wonder> (compressed mortality data)

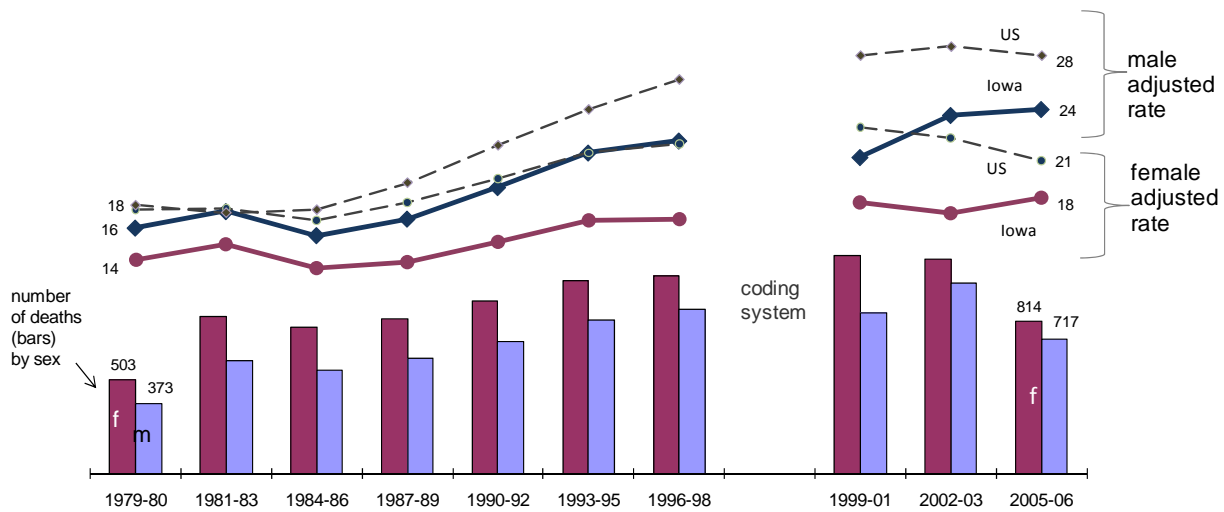
All average annual counts >1 rounded to nearest whole number.

**Figure 9.3**  
**Trends in crude and age-adjusted mortality rates from diabetes, Iowa and U.S.**

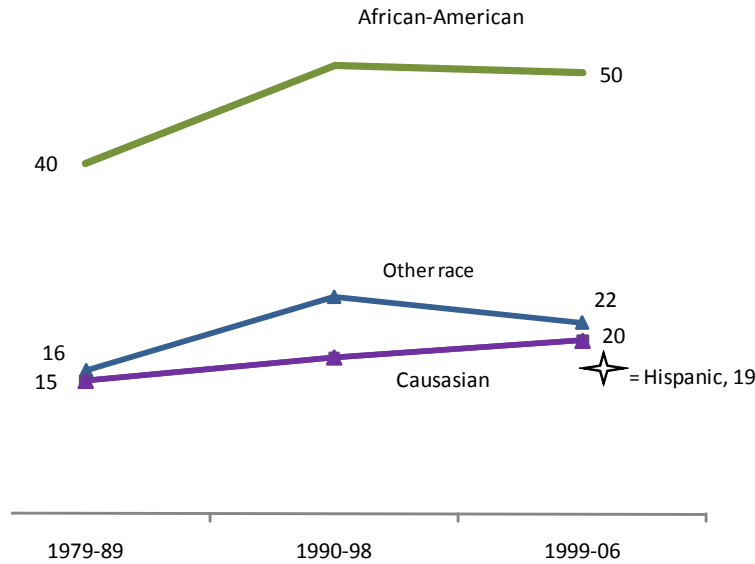


Iowa resident deaths from diabetes (diabetes was the primary (underlying) cause of death), rates and counts, 1979-2008. All rates are per 100,000 population. National cause of death coding system changed from ICD9 to ICD10 beginning with 1999. Source: <http://www.cdc.wonder> (compressed mortality data)

**Figure 9.4**  
Trends in crude and age-adjusted mortality rates from diabetes by sex, Iowa



**Figure 9.5**  
Trends in age-adjusted mortality rates from diabetes, by race and ethnicity, Iowa



Iowa resident deaths from diabetes (diabetes was the primary (underlying) cause of death), rates and counts, 1979-2006. All rates are per 100,000 population.

National cause of death coding system changed from ICD9 to ICD10 beginning with 1999. Source: <http://www.cdc.wonder> (compressed mortality data)

**Figure 9.6**

**Trends in crude and age-adjusted mortality rates from diabetes, by sex, Iowa**

Year	Iowa						US Adjusted rate	
	Number		Crude rate		Adjusted rate/100,000		f	m
	female (f)	male (m)	f	m	f	m		
1979-80	503	373	16.8	13.1	14.3	16.4	17.6	17.9
1981-83	841	607	18.9	14.4	15.3	17.5	17.7	17.4
1984-86	785	556	18	13.5	13.7	15.9	16.9	17.6
1987-89	824	614	19.2	15.3	14.1	17	18.1	19.4
1990-92	921	707	21.3	17.4	15.5	19.1	19.7	21.9
1993-95	1,033	821	23.5	19.7	16.9	21.4	21.4	24.3
1996-98	1,059	880	23.9	20.8	17	22.2	22	26.3
1999-01	1,162	861	26	20	18.1	21.1	23.1	27.9
2002-03	1,143	1,018	25.5	23.5	17.4	23.9	22.4	28.5
2005-06	814	717	27.1	24.5	18.4	24.3	20.9	27.9

Iowa resident deaths from diabetes (diabetes the primary (underlying) cause), average annual number and rate per 100,000 population, 1979-2006.

ICD9 codes used for 1979-98: 250-250.99. ICD10 codes used 1999+: E10-E14

Source: <http://www.cdc.wonder> (compressed mortality data)

**Figure 9.7**

**Trends in crude and age-adjusted mortality rates from diabetes by race and ethnicity, Iowa**

Year	Adjusted rate				Crude rate			
	Hispanic any race	Other, non-Hisp.	African Amer. non-Hisp.	Caucasian non-Hisp.	Hispanic any race	Other non-Hisp.	African Amer. non-Hisp.	Caucasian non-Hisp.
1979-89	na	16.3	39.9	15.1	na	4.6	21.3	16.3
1990-98	na	24.6	51	17.8	na	4.6	26	21.3
1999-06	18.9	21.7	50.1	19.7	5	7.3	23.3	24.7

Iowa resident deaths from diabetes (diabetes the primary (underlying) cause), average annual number and rate per 100,000 population, 1979-2006. Source: <http://www.cdc.wonder> (compressed mortality data)

**County-Level data and maps are available for:**

*Estimates of diabetes prevalence from BRFSS-*  
CDC Division of Diabetes Translation Web site

([http://apps.nccd.cdc.gov/DDT\\_STRS2/NationalDiabetesPrevalenceEstimates.aspx](http://apps.nccd.cdc.gov/DDT_STRS2/NationalDiabetesPrevalenceEstimates.aspx))

--County-level maps and spreadsheets with county-level prevalence rate and count estimate for years 2004 forward are available.

*Hospitalizations from diabetes from Iowa State Inpatient Database:*

IDPH Community Health Needs Assessment Web site

(<http://www.idph.state.ia.us/chnahip/default.asp>)--

Crude and adjusted rates of hospitalization for selected conditions, 1995-2006, are available.

*Deaths from diabetes from national vital statistics database-*

Compressed Mortality Data, CDC Wonder Web site

Underlying (primary cause of death-1979 forward:

(<http://wonder.cdc.gov/mortSQL.html>)

Underlying or contributing (multiple) cause of death-1999 forward:

(<http://wonder.cdc.gov/mcd.html>)

County-level charts, maps, spreadsheets of diabetes-related death counts, crude and adjusted death rates by: year, age, sex, race, ethnicity, cause of death and region are available.

## ***Databases Used in this Report***

### ***Iowa Behavioral Risk Factor Surveillance System (BRFSS) database***

Established in 1988, the Iowa Behavioral Risk Factor Surveillance System (BRFSS) is a Center for Disease Control funded annual household interview survey in which self-reported information about the burden of chronic diseases and their risk factors is collected for the non-institutionalized adult population ages 18 years and older in each state. In Iowa, the Iowa Department of Public Health manages the survey in which about 6,000 households participate each year.

Due to the small BRFSS sample size, in most instances, county or regional level prevalence rates and counts can be difficult to estimate accurately. CDC has published count-level estimates that are referenced in the County-Level Data section of this report. The Iowa BRFSS program also has published estimates, which do not always match CDC's.

In 1988, the Iowa BRFSS began to include a core question covering diabetes prevalence. Since 1996 various optional national 'diabetes module' questions have been included in the Iowa BRFSS. Not all module questions are asked every year. These diabetes module questions cover preventive diabetes care, self-management, insulin and other diabetes medications use and health sequelae of diabetes.

The IDPH has published a number of reports covering other health issues based on BRFSS data. These reports are available at: <http://www.idph.state.ia.us/brfss/default.asp>. The CDC BRFSS web site, which houses BRFSS questionnaires, datasets, reports and background on methodologies, is: <http://www.cdc.gov/brfss/>.

### ***Iowa State Inpatient Database***

Under Iowa Administrative Code, hospitals are specifically required to report inpatient, outpatient and ambulatory care information to the Iowa Hospital Association which in turn is to provide these data to the Iowa Department of Public Health (IDPH). The IDPH has received data from the IHA from its State Inpatient Database (SID) since 1994.

The SID contains selected data elements for each inpatient discharged from non-Federal acute care Iowa hospitals. Long-term care mental health facilities are excluded. The SID does not include discharges of Iowans who are treated solely in out-of-state hospitals for their diabetes, an estimated 4% to 8% of all hospitalizations. Counties near Omaha, the Mayo Clinic in Rochester, Minnesota, Rock Island/Moline and Sioux Falls, South Dakota have rates of hospitalization that are underestimated. The SID and outpatient data sets also lack several basic demographic variables (income, education and ethnicity) and are missing data from the race field in about 20 percent of all admissions.



Another drawback to using the SID is that it contains few personal identifiers. Without personal identifiers, readmission of a person with asthma at either the same or a different hospital becomes hard to identify. As a result, estimating counts of people with asthma who were hospitalized, as opposed to counts of admissions for asthma, becomes difficult. Thus, those parts of the report describing hospitalizations are not measures of asthma prevalence but of overall inpatient services usage.

Between 1995 and 2006, the SID lists one admitting diagnosis and up to nine discharge diagnoses for each inpatient admission. All discharges counts and rates in this report are of discharges with a primary discharge diagnosis of asthma.

### *Iowa Vital Records: Mortality Database*

Data in this report came from two Center for Disease Control and Prevention (CDC) online web-based data systems of national and state mortality data: WISQARS (Web-Based Injury Query and Reporting System: (<http://www.cdc.gov/NCIPC/WISQARS/>)) and CDC Wonder (<http://wonder.cdc.gov/mortSQL.html>) and from the Iowa Department of Public Health, Center for Health Statistics.

WISQARS provides national and state-counts and percents for the level leading causes of death and for the leading causes of years of potential life lost. Data by race, gender, ethnicity and year were available from that site. Mortality data are compiled by the National Center for Health Statistics (NCHS), a branch of CDC. Annually all states, including Iowa, send their state's mortality data from the past year to the NCHS.

CDC WONDER, the second web-based mortality data system used in this report, houses data for the years 1979-2005 at the time of this report's publication. The number of deaths, crude death rates and age-adjusted death rates can be obtained by place of residence (total U.S., state, county, metropolitan district), age group, race (white, black, and other), gender, year of death, for the underlying (primary) cause-of-death (4-digit ICD code or group of codes).

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