

State of Diabetes  
**Complications**  
in  
America

A COMPREHENSIVE REPORT ISSUED BY THE  
AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS



IN PARTNERSHIP WITH:

Amputee Coalition of America  
Mended Hearts  
National Federation of the Blind  
National Kidney Foundation



## Executive Summary

### MORE PEOPLE IN AMERICA LIVE WITH DIABETES THAN EVER BEFORE.

Type 2 diabetes accounts for 90 to 95 percent of all diagnosed diabetes cases and affects more than 18 million people in the United States. Type 2 diabetes is a chronic, progressive disease that occurs when the body either does not produce enough insulin or does not respond properly to its natural insulin. As a result, sugar builds up in the blood and over time, unmanaged diabetes can lead to a variety of other serious health problems.

The *State of Diabetes Complications in America* report examines the prevalence and costs of health problems related to type 2 diabetes. These problems include heart disease, stroke, kidney disease, eye damage and foot problems that can lead to amputations. This first-of-its-kind report of national health and economic data specific to diabetes-related complications shows that these health problems are occurring at alarming rates, and furthermore, that they are putting a significant economic burden on the U.S.

The *State of Diabetes Complications in America* report is part of the American Association of Clinical Endocrinologists' (AACE) ongoing *State of Diabetes in America* awareness campaign. The report was developed as a follow-up to a 2005 AACE report which showed that two out of three Americans with type 2 diabetes analyzed in a study had elevated blood sugar levels, which can lead to diabetes complications. The new report, *State of Diabetes Complications in America*, is being issued by AACE, in partnership with a diabetes complications consortium, which includes the Amputee Coalition of America, Mended Hearts, the National Federation of the Blind and the National Kidney Foundation. The consortium was formed to provide helpful information to people with type 2 diabetes about how to reduce the risk of health complications associated with the disease, as well as support and encouragement to people who have experienced these serious health problems. GlaxoSmithKline provided funding and other support to AACE and the groups in the consortium for the *State of Diabetes Complications in America* campaign.

The *State of Diabetes Complications in America* report synthesizes data from two large national studies. Data on the prevalence of diabetes-related complications were taken from the National Health and Nutrition Examination Survey (NHANES) 1999-2004 and combined with economic data from the Medical Expenditure Panel Survey (MEPS) 2000, 2002 and 2004. By examining both studies together, the *State of Diabetes Complications in America* report gives a comprehensive overview of the impact of diabetes-related complications in the U.S.

## Impact of Diabetes Complications on the Nation

Health problems such as heart disease, stroke, kidney disease, eye damage and foot problems that can lead to amputations are far more prevalent in people with type 2 diabetes than in the general population. On a national level, an estimated three out of five people with diabetes (57.9 percent) have one or more of the complications associated with diabetes. These health problems are taking a heavy toll on the U.S. financially. As a nation, we spent an estimated **\$22.9 billion** in 2006 on direct medical costs related to diabetes complications, such as physician/healthcare professional visits, hospital stays, other medical services and equipment and prescribed medicines. This estimate does not include costs attributed to lost employment or productivity, premature death and disability.

## Impact of Diabetes Complications on People

On an individual level, the numbers are just as disturbing. Estimated annual healthcare costs for a person with diabetes and its related complications are about **three times** that of the average American without diagnosed diabetes. Total yearly expenditures for a person with type 2 diabetes complications are almost **\$10,000**, of which nearly **\$1,600** is paid out-of-pocket for healthcare costs not reimbursed by insurance, such as co-payments and deductibles. These are significant numbers when you consider that according to the National Health Interview Survey, an estimated 40 percent of adults with diabetes reported a family income of less than \$35,000 per year in 2005.

## Good Diabetes Management

The risk of developing the serious health complications associated with type 2 diabetes often can be reduced. People with type 2 diabetes should work with their healthcare professional to develop a personal diabetes management plan. A good plan includes healthy eating and regular physical activity, but these lifestyle changes alone may not be enough to lower blood sugar adequately. Many people with type 2 diabetes also may need one or more medicines. Some medicines work together in different ways to control blood sugar levels. People should track how their diabetes plan is working by monitoring their blood sugar regularly. Sometimes lifestyle or medicine changes need to be made. Blood sugar monitoring should be done with a blood glucose meter and by getting an A1c test every three months. AACE's A1c target goal is 6.5 percent or lower. Reaching the target is important since every one percent increase above six percent significantly elevates a person's risk of serious complications.

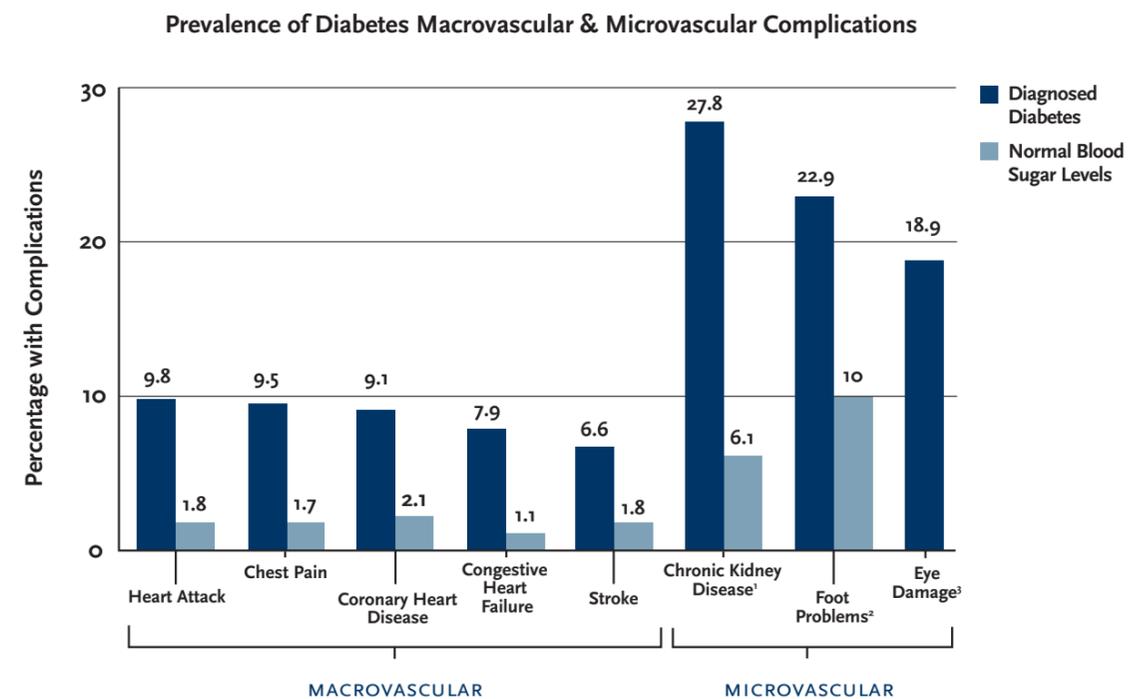
The following charts, graphs and illustrations delve deeper into the enormous economic and health burden caused by diabetes. The report also breaks out numbers by gender, race and age to show the impact diabetes complications have on these different populations.

Through the *State of Diabetes Complications in America* campaign, AACE, in partnership with the Amputee Coalition of America, Mended Hearts, the National Federation of the Blind and the National Kidney Foundation hope to call attention to the issue of diabetes-related complications and bring about change in the way type 2 diabetes is managed in the U.S.

## Prevalence of Complications in People with Type 2 Diabetes vs. People with Normal Blood Sugar Levels

Chart 1 shows the estimated prevalence of various health complications in people with diagnosed type 2 diabetes compared to people with normal blood sugar levels, using data from NHANES 1999-2004. The data suggest a striking difference between the two groups. It also shows which complications are more common in people with diabetes. Macrovascular complications (related to the heart and large blood vessels) included in this analysis are heart attack, chest pain, coronary heart disease, congestive heart failure and stroke. Microvascular complications (related to small blood vessels) included in this analysis are chronic kidney disease, eye damage and foot problems that can lead to amputations. While type 2 diabetes is closely tied to the development of these health problems, it's possible that some people may have developed them independent of their diabetes, due to family history or other underlying medical conditions.

Chart 1.



<sup>1</sup> In NHANES, "chronic kidney disease" refers to people with microalbuminuria (albumin:creatinine ratio >30 ug/mg).

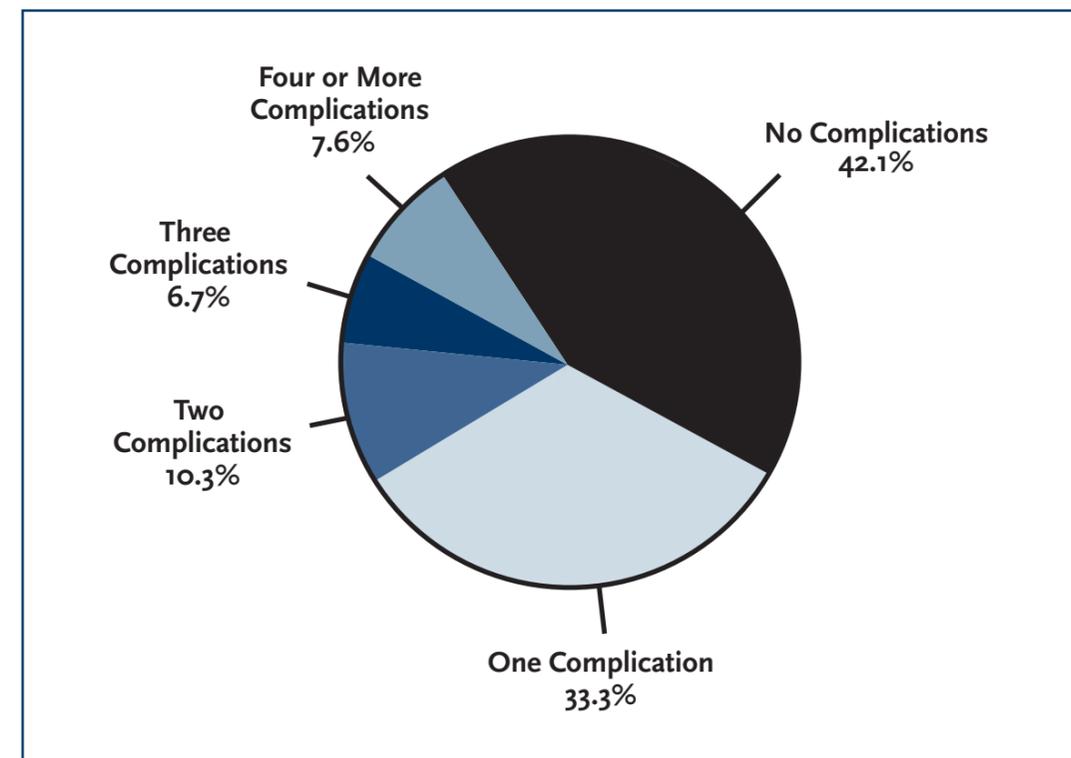
<sup>2</sup> In the NHANES analysis, "foot problems" includes foot/toe amputations, foot lesions and numbness in the feet.

<sup>3</sup> "Eye damage" includes a positive response by NHANES participants to the question, "Have you been told diabetes has affected your eyes/had retinopathy?" Retinopathy is damage to the eye's retina. In NHANES, people without diagnosed diabetes were not asked this question; therefore, prevalence information for non-diabetics is not available.

## Prevalence of Multiple Complications Among People with Type 2 Diabetes

Many people with type 2 diabetes develop more than one health complication as seen in Chart 2, which also uses data from NHANES 1999-2004. An estimated three out of five people (57.9 percent) with diagnosed diabetes have one or more complications. Specifically, an estimated one out of three people (33.3 percent) has one complication; one out of ten (10.3 percent) has two complications; one out of 15 (6.7 percent) has three complications and one out of 13 (7.6 percent) has four or more complications. The complications included in this analysis are heart attack, stroke, coronary heart disease, congestive heart failure, chest pain, chronic kidney disease, eye damage and foot problems that can lead to amputations.

Chart 2.

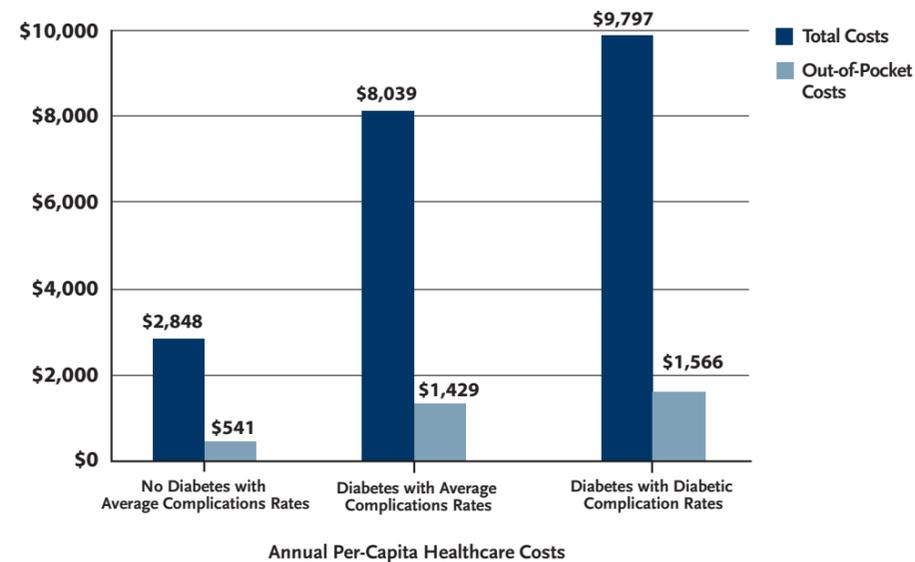


## Annual Healthcare Costs for People with Type 2 Diabetes and Related Complications

Chart 3, which uses data from the 2000, 2002 and 2004 Medical Expenditure Panel Survey (MEPS), provides insight into how diabetes-related complications increase annual healthcare costs. The complications included in the analysis are heart attack, stroke, coronary heart disease, congestive heart failure, chronic kidney disease<sup>4</sup>, eye damage<sup>5</sup>, and foot problems that can lead to amputations<sup>6</sup>. A regression model is used to estimate annual per-capita healthcare costs among the following groups of people: (1) population of diabetics (along with their associated demographics, and rates of diabetes-related complications and diabetes-unrelated comorbidities); (2) population of diabetics (along with their associated demographics and rates of diabetes-unrelated comorbidities, but experiencing rates of diabetes-related complications as the average American without diagnosed diabetes); and (3) the average American without diagnosed diabetes. The total expenditures<sup>7</sup> and out-of-pocket costs<sup>8</sup> are provided for all groups.

Healthcare costs are about three times higher for those with diabetes and related complications as compared to the average American without diagnosed diabetes.\*

Chart 3.\*

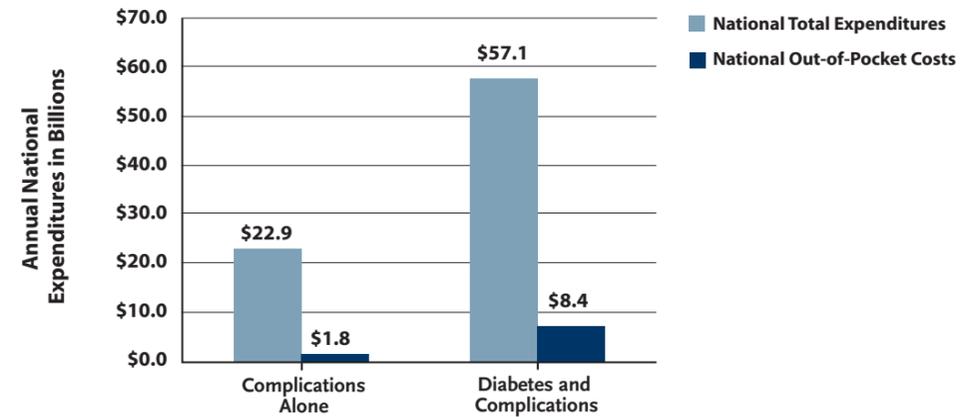


<sup>4</sup> In the MEPS analysis, costs for chronic kidney disease do not include the institutionalized population. Costs do include dialysis patients.  
<sup>5</sup> In the MEPS analysis, "eye damage" includes retinopathy, cataracts, glaucoma and blindness.  
<sup>6</sup> In the MEPS analysis, "foot problems" does not include costs for foot/toe amputations as these could not be identified in the MEPS public-use database. Additionally, costs for prosthetics are not included.  
<sup>7</sup> Total expenditures refer to what is paid for healthcare services. More specifically, expenditures in MEPS are defined as the sum of direct payments for care provided during the year, including out-of-pocket payments and payments by private insurance, Medicaid, Medicare, and other sources. They include direct costs such as office-based visits to physicians (or medical providers supervised by physicians), hospital-based events (e.g., inpatient stays, emergency room visits and outpatient department visits), payments for non-physician visits such as dental and vision services, other medical equipment and services, home healthcare and prescribed medicines.  
<sup>8</sup> Out-of-pocket costs refer to expenses incurred by the patient or the patient's family that were not reimbursed by any insurance, such as co-payments and deductibles.  
 \* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Annual National Costs of Type 2 Diabetes and Related Complications

Using MEPS data, Chart 4 illustrates how much money is spent annually for direct medical costs related to diabetes and diabetes complications in the U.S. As a nation, we spend \$22.9 billion in total expenditures (\$1.8 billion in out-of-pocket costs) on the health complications of diabetes alone.\* We spend \$57.1 billion (\$8.4 billion out-of-pocket) on both diabetes and its complications.\* This does not include costs attributed to lost employment or productivity, premature death and disability.

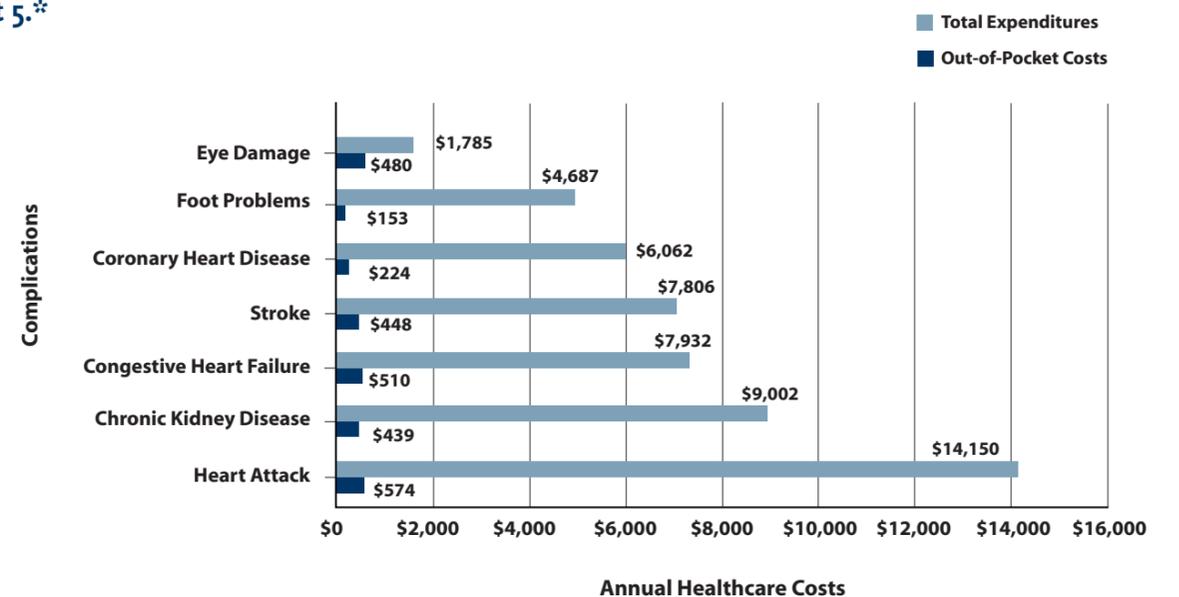
Chart 4.\*



## Individual Costs by Complication

Chart 5 shows the per capita costs for each diabetes-related complication per year, also using MEPS data. Total expenditures and out-of-pocket costs are provided.

Chart 5.\*



\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Report Methodology

The *State of Diabetes Complications in America* report synthesizes data from two large national studies to examine the issue of diabetes-related complications in the U.S. To assess the prevalence of complications, data were taken from the National Health and Nutrition Examination Survey (NHANES) 1999-2004, a nationally representative survey of non-institutionalized U.S. civilians. NHANES is a major program of the National Center for Health Statistics (NCHS), which is part of the Centers for Disease Control and Prevention (CDC). NHANES collects detailed medical information from roughly 5,000 people each year. For the report, the NHANES data are combined with economic information from the 2000, 2002 and 2004 Medical Expenditure Panel Survey (MEPS), which is cosponsored by the Agency for Healthcare Research and Quality and the National Center for Health Statistics. MEPS began in 1996 compiling detailed information on healthcare utilization and expenditures. Data has been collected by MEPS through 2004. Cost estimates in this report were adjusted for inflation to reflect 2006 costs. Adults over the age of 20 were included in the NHANES and MEPS analyses and no distinction could be made between type 1 and type 2 diabetes populations. However, because type 2 diabetes accounts for 90-95 percent of diagnosed diabetes cases, results from the NHANES and MEPS analyses include mostly people with type 2 diabetes. By examining both studies together, the *State of Diabetes Complications in America* report gives a comprehensive overview of the impact of diabetes-related complications in the U.S.

## Gender Breakdown: Men

**Chart 6. Prevalence of Complications in Men**

Complication	Normal Blood Sugar Levels	Diagnosed Diabetes
<b>Macrovascular</b>		
Congestive Heart Failure	1.4%	7.9%
Chest Pain	2.0%	12.2%
Heart Attack	2.5%	12.2%
Coronary Heart Disease	3.0%	11.2%
Stroke	1.5%	6.8%
<b>Microvascular</b>		
Chronic Kidney Disease	5.5%	30.4%
Foot Problems	12.1%	25.1%
Eye Damage	n/a	20.3%

**Chart 7. Prevalence of Multiple Complications in Men with Diagnosed Diabetes**

	Zero Complications	One Complication	Two Complications	Three Complications	Four or More Complications
Percent	38.7%	34.3%	10.5%	6.2%	10.3%

**Chart 8.\* Annual Per Capita Healthcare Costs for Men**

	No Diabetes with Average Complications Rates	Diabetes with Average Complications Rates	Diabetes with Diabetic Complications Rates
Total healthcare costs	\$2,093	\$6,835	\$8,519
Out-of-pocket costs	\$403	\$1,238	\$1,365

\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Gender Breakdown: Women

**Chart 9. Prevalence of Complications in Women**

Complication	Normal Blood Sugar Levels	Diagnosed Diabetes
<b>Macrovascular</b>		
Congestive Heart Failure	0.9%	7.7%
Chest Pain	1.5%	6.4%
Heart Attack	1.3%	7.1%
Coronary Heart Disease	1.4%	6.7%
Stroke	2.1%	6.3%
<b>Microvascular</b>		
Chronic Kidney Disease	6.6%	25.0%
Foot Problems	8.6%	20.3%
Eye Damage	n/a	17.5%

**Chart 10. Prevalence of Multiple Complications in Women with Diagnosed Diabetes**

	Zero Complications	One Complication	Two Complications	Three Complications	Four or More Complications
Percent	45.9%	32.1%	10.2%	7.1%	4.6%

**Chart 11.\* Annual Per Capita Healthcare Costs for Women**

	No Diabetes with Average Complications Rates	Diabetes with Average Complications Rates	Diabetes with Diabetic Complications Rates
Total healthcare costs	\$3,575	\$8,932	\$10,792
Out-of-pocket costs	\$674	\$1,577	\$1,726

\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Ethnic Breakdown: Non-Hispanic Whites

Chart 12. Prevalence of Complications in Non-Hispanic Whites

Complication	Normal Blood Sugar Levels	Diagnosed Diabetes
<b>Macrovascular</b>		
Congestive Heart Failure	1.2%	8.3%
Chest Pain	2.1%	11.6%
Heart Attack	2.0%	11.0%
Coronary Heart Disease	2.7%	9.5%
Stroke	2.1%	6.4%
<b>Microvascular</b>		
Chronic Kidney Disease	5.7%	24.5%
Foot Problems	9.9%	22.4%
Eye Damage	n/a	15.4%

Chart 13. Prevalence of Multiple Complications in Non-Hispanic Whites with Diagnosed Diabetes

	Zero Complications	One Complication	Two Complications	Three Complications	Four or More Complications
Percent	45.0%	30.9%	10.1%	6.3%	7.6%

Chart 14.\* Annual Per Capita Healthcare Costs for Non-Hispanic Whites\*

	No Diabetes with Average Complications Rates	Diabetes with Average Complications Rates	Diabetes with Diabetic Complications Rates
Total healthcare costs	\$3,665	\$8,919	\$10,896
Out-of-pocket costs	\$730	\$1,747	\$1,913

\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Ethnic Breakdown: Non-Hispanic Blacks

Chart 15. Prevalence of Complications in Non-Hispanic Blacks

Complication	Normal Blood Sugar Levels	Diagnosed Diabetes
<b>Macrovascular</b>		
Congestive Heart Failure	1.0%	12.9%
Chest Pain	0.7%	4.3%
Heart Attack	2.2%	10.2%
Coronary Heart Disease	0.7%	8.4%
Stroke	1.8%	8.5%
<b>Microvascular</b>		
Chronic Kidney Disease	8.2%	35.2%
Foot Problems	12.5%	26.9%
Eye Damage	n/a	16.8%

Chart 16. Prevalence of Multiple Complications in Non-Hispanic Blacks with Diagnosed Diabetes

	Zero Complications	One Complication	Two Complications	Three Complications	Four or More Complications
Percent	41.0%	30.4%	11.2%	9.6%	7.7%

Chart 17.\* Annual Per Capita Healthcare Costs for Non-Hispanic Blacks

	No Diabetes with Average Complications Rates	Diabetes with Average Complications Rates	Diabetes with Diabetic Complications Rates
Total healthcare costs	\$2,461	\$7,739	\$9,658
Out-of-pocket costs	\$359	\$1,128	\$1,263

\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Ethnic Breakdown: Hispanic and Mexican Americans

Chart 18. Prevalence of Complications in Hispanic and Mexican Americans

Complication	Normal Blood Sugar Levels	Diagnosed Diabetes
<b>Macrovascular</b>		
Congestive Heart Failure	0.6%	3.8%
Chest Pain	0.5%	3.2%
Heart Attack	0.4%	3.6%
Coronary Heart Disease	0.2%	6.7%
Stroke	0.5%	5.5%
<b>Microvascular</b>		
Chronic Kidney Disease	5.1%	37.6%
Foot Problems	13.0%	20.2%
Eye Damage	n/a	31.5%

Chart 19. Prevalence of Multiple Complications in Hispanic and Mexican Americans with Diagnosed Diabetes

	Zero Complications	One Complication	Two Complications	Three Complications	Four or More Complications
Percent	31.9%	44.2%	12.9%	7.7%	3.3%

Chart 20.\* Annual Per Capita Healthcare Costs for Hispanic and Mexican Americans

	No Diabetes with Average Complications Rates	Diabetes with Average Complications Rates	Diabetes with Diabetic Complications Rates
Total healthcare costs	\$1,435	\$6,559	\$7,717
Out-of-pocket costs	\$269	\$1,032	\$1,121

\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Age Breakdown: Baby Boomers (45 to 64 years old)

Chart 21. Prevalence of Complications in Baby Boomers

Complication	Normal Blood Sugar Levels	Diagnosed Diabetes
<b>Macrovascular</b>		
Congestive Heart Failure	0.9%	7.0%
Chest Pain	2.3%	10.8%
Heart Attack	2.4%	7.6%
Coronary Heart Disease	3.2%	10.1%
Stroke	2.1%	7.1%
<b>Microvascular</b>		
Chronic Kidney Disease	6.0%	27.7%
Foot Problems	7.3%	18.3%
Eye Damage	n/a	18.1%

Chart 22. Prevalence of Multiple Complications in Baby Boomers with Diagnosed Diabetes

	Zero Complications	One Complication	Two Complications	Three Complications	Four or More Complications
Percent	49.0%	26.1%	8.9%	6.8%	9.1%

Chart 23.\* Annual Per Capita Healthcare Costs for Baby Boomers

	No Diabetes with Average Complications Rates	Diabetes with Average Complications Rates	Diabetes with Diabetic Complications Rates
Total healthcare costs	\$3,304	\$7,312	\$8,690
Out-of-pocket costs	\$691	\$1,379	\$1,482

\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.

## Age Breakdown: Seniors (65 years and older)

**Chart 24. Prevalence of Complications in Seniors**

Complication	Normal Blood Sugar Levels	Diagnosed Diabetes
<b>Macrovascular</b>		
Congestive Heart Failure	4.9%	14.1%
Chest Pain	8.8%	13.9%
Heart Attack	9.0%	19.3%
Coronary Heart Disease	10.1%	12.9%
Stroke	8.3%	10.1%
<b>Microvascular</b>		
Chronic Kidney Disease	17.8%	27.8%
Foot Problems	22.3%	33.1%
Eye Damage	n/a	17.5%

**Chart 25. Prevalence of Multiple Complications in Seniors with Diagnosed Diabetes**

	Zero Complications	One Complication	Two Complications	Three Complications	Four or More Complications
<b>Percent</b>	30.4%	30.6%	18.5%	10.0%	10.6%

**Chart 26.\* Annual Per Capita Healthcare Costs for Seniors**

	No Diabetes with Average Complications Rates	Diabetes with Average Complications Rates	Diabetes with Diabetic Complications Rates
<b>Total healthcare costs</b>	\$7,275	\$10,941	\$12,470
<b>Out-of-pocket costs</b>	\$1,214	\$1,806	\$1,922

\* Cost estimates in this report were adjusted for inflation to reflect 2006 costs.



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