

7.3 Diabetes

According to the Centers for Disease Control, diabetes is a disease in which blood glucose levels are above normal.¹ Most of the food we eat is turned into glucose, or sugar, for our bodies to use for energy.² The pancreas, an organ that lies near the stomach, makes a hormone called insulin to help glucose get into the cells of our bodies.³ When you have diabetes, your body either doesn't make enough insulin or can't use its own insulin as well as it should. This causes sugar to build up in your blood.⁴

Diabetes can cause serious health complications including blindness, lower-extremity amputations, increased risk for heart disease, stroke, end-stage renal disease, nervous system damage, periodontal disease, and increased susceptibility to pneumonia and influenza.⁵ Risk factors associated with diabetes include obesity, poor diet, physical inactivity, and high blood pressure.⁶ For Kalamazoo County statistics related to these risk factors, please refer to *Section 4: Lifestyles* and *Section 7.2: Cardiovascular Disease* of the Kalamazoo County Health Surveillance Data Book.⁷

Diabetes is the sixth leading cause of death in Kalamazoo County, Michigan, and in the United States.^{8,9} In Kalamazoo County in 2009, there were 87 deaths for which the underlying cause of death was diabetes mellitus (a rate of 35.0 deaths per 100,000 population). This represented 4.4% of all deaths in 2009. There were a total of 253 deaths that were diabetes-related (including the 87 deaths for which the main cause was diabetes mellitus), which represented 12.7% of all deaths in Kalamazoo County in 2009.¹⁰

¹ Centers for Disease Control and Prevention Diabetes Program: Diabetes Basics, 2006 Centers for Disease Control and Prevention, accessed at <http://www.cdc.gov/diabetes/faq/basics.htm>

² Centers for Disease Control and Prevention Diabetes Program: Diabetes Basics, 2006 Centers for Disease Control and Prevention, accessed at <http://www.cdc.gov/diabetes/faq/basics.htm>

³ Centers for Disease Control and Prevention Diabetes Program: Diabetes Basics, 2006 Centers for Disease Control and Prevention, accessed at <http://www.cdc.gov/diabetes/faq/basics.htm>

⁴ Centers for Disease Control and Prevention Diabetes Program: Diabetes Basics, 2006 Centers for Disease Control and Prevention, accessed at <http://www.cdc.gov/diabetes/faq/basics.htm>

⁵ Centers for Disease Control and Prevention Diabetes Program: Diabetes Basics, 2006 Centers for Disease Control and Prevention, accessed at <http://www.cdc.gov/diabetes/faq/basics.htm>

⁶ National Institutes of Health (NIH). 2003. Am I at risk for type 2 diabetes? Taking steps to lower the risk of getting diabetes. NIH, DHHS, Publication No. 04-4805. www.ndep.nih.gov/diabetes/pubs/GP_AmIatRisk.pdf.

⁷ Kalamazoo County Health Surveillance Data Book, online at <http://www.kalcounty.com/hcs/Section4Intro.htm> and <http://www.kalcounty.com/hcs/Section7Intro.htm>

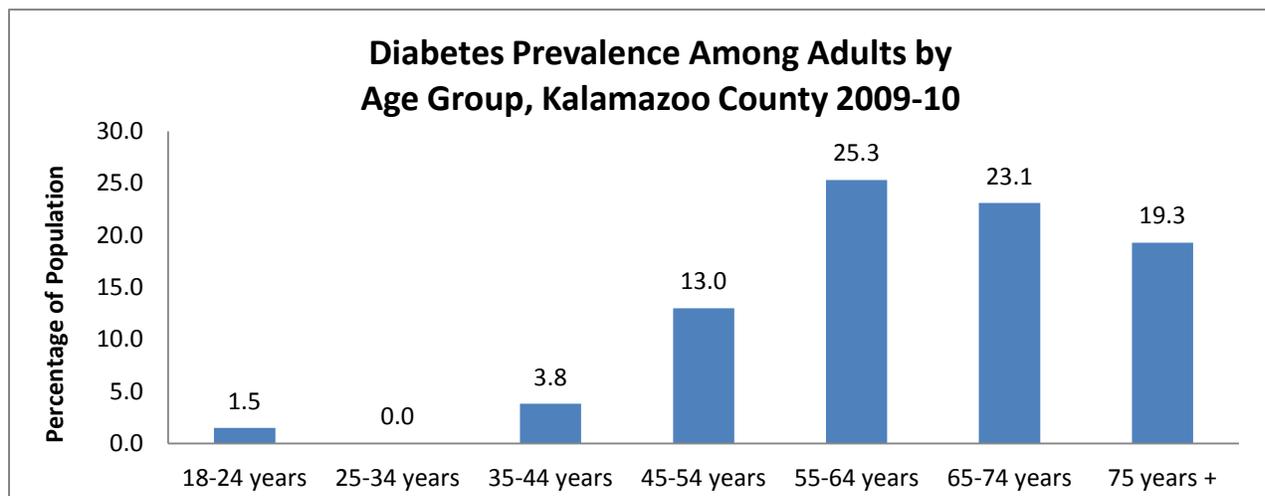
⁸ Centers for Disease Control and Prevention, National Center for Health Statistics, Deaths: Final Data for 2007, accessed at <http://www.cdc.gov/nchs/fastats/deaths.htm>

⁹ Michigan Department of Community Health, Division for Vital Records and Health Data Development, Resident Death File. For more information about leading causes of death in Kalamazoo County, please refer to *Section 3: Life Expectancy and Leading Causes of Death* of the Kalamazoo County Health Surveillance Data Book.

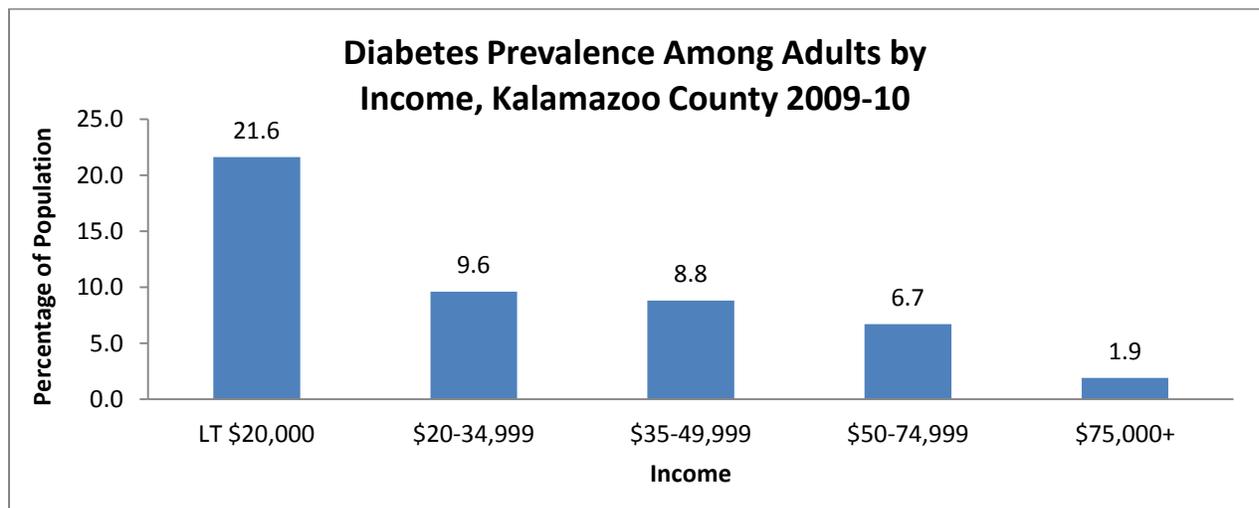
¹⁰ Michigan Department of Community Health, Division for Vital Records and Health Data Development, Resident Death File; diabetes-related deaths include those for which the main underlying cause of death was determined to be diabetes mellitus or diabetes mellitus was listed as a related cause of the death, even if it was not the main cause.

7.3.1 Diabetes Prevalence

In Kalamazoo County in 2009-10, 8.2% of adults had ever been told they had diabetes.¹¹ The percentage of Michigan adults who reported they had ever been told they had diabetes was 9.4% in 2009-10 (this was not statistically different from the percentage in Kalamazoo County in 2009-10).¹² From 2004-05 to 2009-10, the percentage of adults in Kalamazoo County who reported they had been diagnosed with diabetes increased, but the change was not statistically significant (from 6.5% in 2004-05).¹³ Diabetes prevalence increased through the 55-64 year old age group, and then decreased in older age groups. Diabetes diagnoses were less prevalent among adults in higher income brackets than adults in lower income brackets in Kalamazoo County in 2009-10.



Source: Kalamazoo County 2009 Behavioral Risk Factor Survey



Source: Kalamazoo County 2009-10 Behavioral Risk Factor Survey

¹¹ Kalamazoo County 2009-10 Behavioral Risk Factor Survey

¹² Michigan 2009-10 Behavioral Risk Factor Survey, accessed online at http://www.michigan.gov/documents/mdch/2009_MiBRFS_Annual_Report_12.21.10_340958_7.PDF

¹³ Kalamazoo County 2004-05 Behavioral Risk Factor Survey

Diabetes Prevalence, Kalamazoo County 2009-10

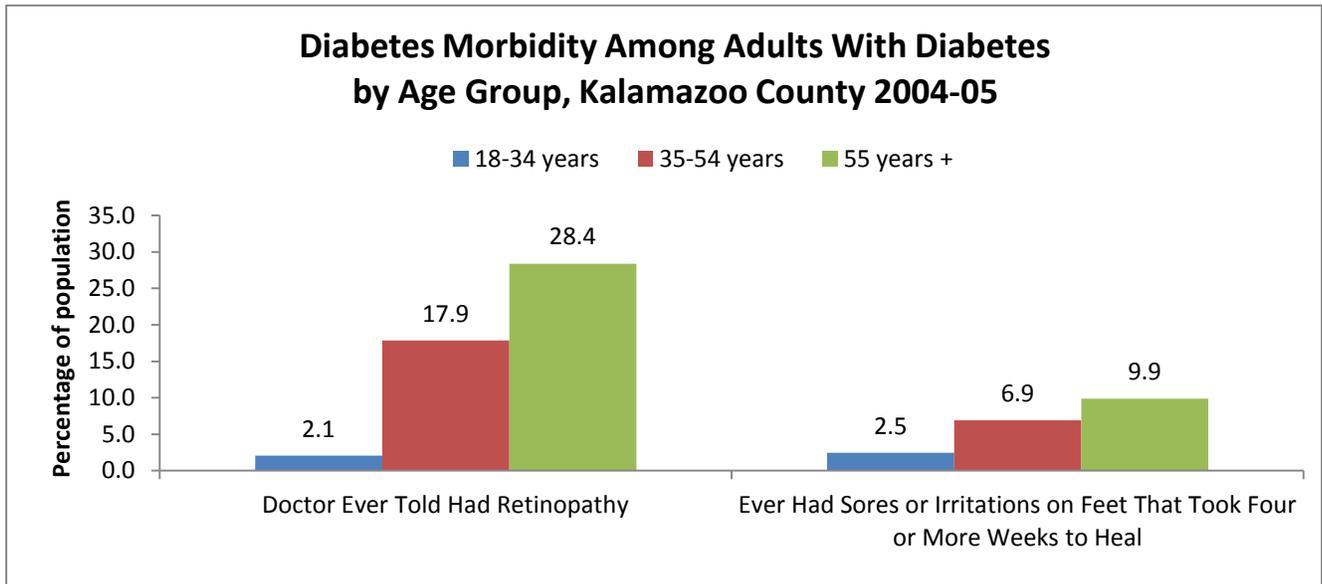
Demographic Characteristics	Ever Told by a Doctor You Had Diabetes ^a	
	%	95% C.I.
Total	8.2	(5.8 - 11.6)
Age		
18-24 years	1.5	(0.2 - 10.6)
25-34 years	0.0	*
35-44 years	3.8	(1.5 - 9.3)
45-54 years	13.0	(7.5 - 21.6)
55-64 years	25.3	(15.2 - 39.0)
65-74 years	23.1	(15.3 - 33.3)
75 years +	19.3	(11.5 - 30.6)
Gender		
Male	6.5	(3.7 - 11.1)
Female	10.0	(6.4 - 15.4)
Race		
White	7.6	(5.0 - 11.4)
Black	12.9	(6.2 - 25.0)
Education		
Less than HS	10.5	(3.0 - 30.8)
HS Graduate	7.9	(4.3 - 14.0)
Some college	10.0	(5.7 - 16.8)
College graduate	4.8	(2.8 - 8.1)
Income		
LT \$20,000	21.6	(11.6 - 36.7)
\$20-34,999	9.6	(5.7 - 15.7)
\$35-49,999	8.8	(3.6 - 20.2)
\$50-74,999	6.7	(3.1 - 13.9)
\$75,000+	1.9	(0.5 - 6.8)
City/Out-County		
City of Kalamazoo	10.4	(6.0 - 17.6)
Rest of County	7.1	(4.0 - 12.1)
Within City of Kalamazoo		
White in City	9.1	(3.9 - 19.8)
Black in City	15.5	(7.2 - 30.0)

^a The proportion who reported that they were ever told by a doctor that they have diabetes. Women who had diabetes during pregnancy were excluded from this estimate.

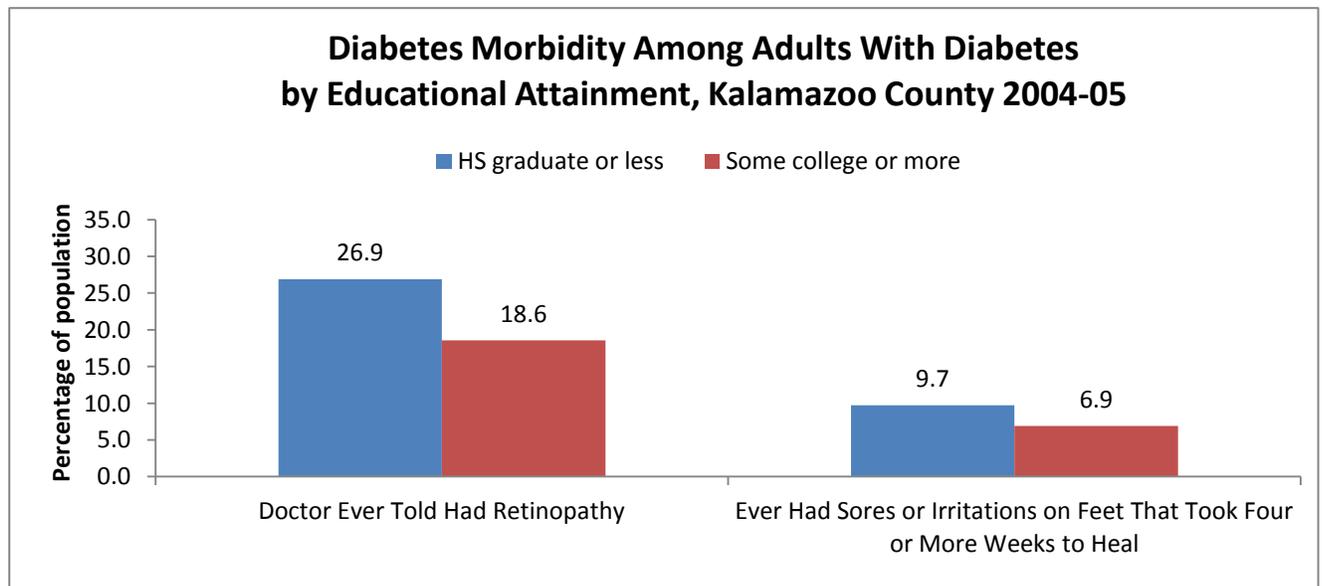
*Confidence interval exceeds possible limits

Source: Kalamazoo County 2009-10 Behavioral Risk Factor Survey

Of those reporting they had been told they had diabetes in Kalamazoo County in 2004-05 (the most recent year this morbidity data was collected), 22.5% had ever been told they had retinopathy and 8.3% had ever had foot sores or irritations on their feet that took four or more weeks to heal. Among those with diabetes, the prevalence of retinopathy and foot sores increased with age and was higher among those with lower educational attainment.¹⁴



Source: Kalamazoo County 2004-05 Behavioral Risk Factor Survey



Source: Kalamazoo County 2004-05 Behavioral Risk Factor Survey

¹⁴ Kalamazoo County 2004-05 Behavioral Risk Factor Survey

Prevalence of Diabetes Morbidity, Kalamazoo County 2004-05

Demographic Characteristics	Doctor Ever Told Had Retinopathy		Ever Had Sores or Irritations on Feet That Took Four or More Weeks to Heal	
	%	95% C.I.	%	95% C.I.
Total	22.5	(12.3 - 32.7)	8.3	(1.5 - 15.0)
Age				
18-34 years	2.1	*	2.5	*
35-54 years	17.9	*	6.9	*
55 years +	28.4	(15.6 - 41.1)	9.9	(1.0 - 18.7)
Gender				
Male	19.1	(4.2 - 33.9)	15.7	(0.8 - 30.6)
Female	25.3	(11.6 - 38.9)	2.4	(0.2 - 4.6)
Race				
White	22.9	(11.3 - 34.6)	8.8	(0.8 - 16.8)
Black	24.2	(0.8 - 47.6)	6.8	*
Education				
HS graduate or less	26.9	(12.6 - 41.2)	9.7	*
Some college or more	18.6	(4.1 - 33.0)	6.9	*
Income				
LT \$35,000	27.8	(12.9 - 42.8)	10.0	(0.1 - 19.8)
\$35,000+	20.4	(1.7 - 39.0)	6.6	*
City/Out-County				
City of Kalamazoo	17.3	(4.0 - 30.6)	6.5	(0.0 - 13.0)
Rest of County	26.0	(11.6 - 40.4)	9.4	*
Within City of Kalamazoo				
White in City	15.2	*	6.6	*
Black in City	21.5	*	6.7	*

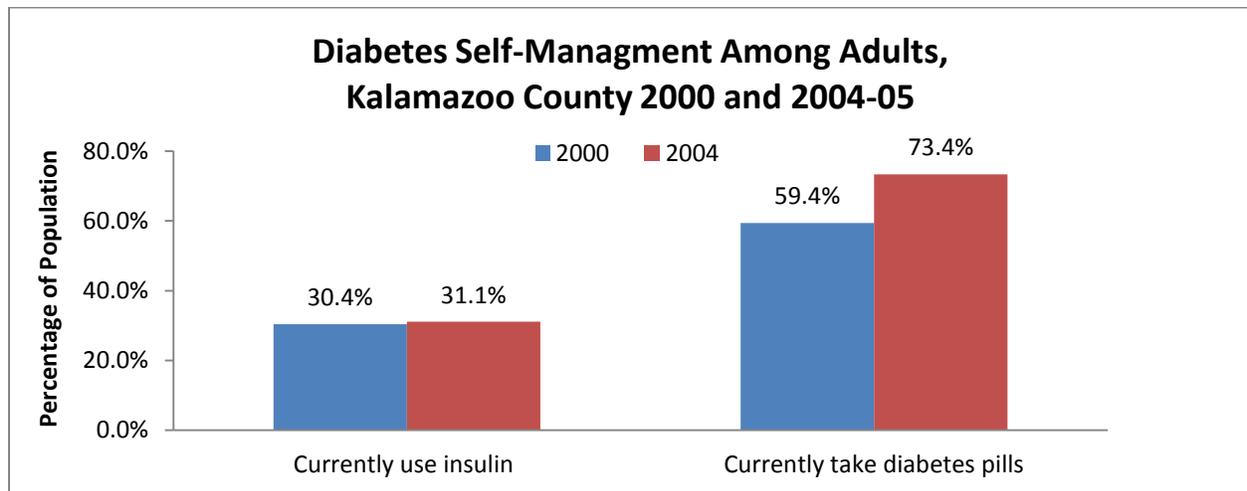
^aAmong respondents who had ever been told by a doctor that they had diabetes, excluding women who had diabetes during pregnancy.

*Confidence interval exceeds possible limits

Source: Kalamazoo County 2004-05 Behavioral Risk Factor Survey

7.3.2 Diabetes Management

Among adults with diabetes in Kalamazoo County, in 2004-05 almost one third were currently using insulin to manage their disease (31.1%) and 73.4% were taking diabetes pills. The percentage of Kalamazoo County adults using insulin was similar between 2000 and 2004-05; the percentage of adults who were using pills to manage their disease increased slightly from 2000 to 2004-05.¹⁵ The percentage of adults who have taken a diabetes self-management class was similar in 2000 (62.4%), 2004-05 (63.2%) and 2009-10 (64.2%).¹⁶



Source: Kalamazoo County 2000 and 2004-05 Behavioral Risk Factor Surveys

In 2009-10, the average age at diagnosis increased to 48.2 years among Kalamazoo County adults.¹⁷ This was slightly higher than the average age at diagnosis in 2004-05 (46.9 years).¹⁸

¹⁵ Kalamazoo County 2004-05 Behavioral Risk Factor Survey; Kalamazoo County 2000 Behavioral Risk Factor Survey

¹⁶ Kalamazoo County 2009-10 Behavioral Risk Factor Survey

¹⁷ Kalamazoo County 2009-10 Behavioral Risk Factor Survey

¹⁸ Kalamazoo County 2004-05 Behavioral Risk Factor Survey

Diabetes Self-Management, Kalamazoo County 2004-05

Demographic Characteristics	Currently Taking Insulin Injections ^a		Currently Taking Diabetes Pills ^a	
	%	95% C.I.	%	95% C.I.
Total	31.1	(18.6 - 43.6)	73.4	(61.8 - 85.0)
Age				
18-34 years	14.6	*	85.4	*
35-54 years	27.5	(2.0 - 53.0)	74.6	(51.8 - 97.4)
55 years +	35.6	(22.2 - 49.0)	71.2	(58.2 - 84.1)
Gender				
Male	39.8	(16.7 - 62.8)	79.6	(63.2 - 96.1)
Female	24.4	(12.2 - 36.6)	68.6	(53.2 - 83.9)
Race				
White Non-Hispanic	32.2	(18.0 - 46.4)	70.6	(57.2 - 84.1)
Black Non-Hispanic	30	(2.4 - 57.6)	86.1	(72.9 - 99.3)
Education				
HS graduate or less	25.7	(11.5 - 39.8)	64.2	(46.2 - 82.2)
Some college or more	36.1	(16.4 - 55.8)	81.7	(68.9 - 94.5)
Income				
LT \$35,000	25.9	(12.5 - 39.4)	77.3	(62.2 - 92.3)
\$35,000+	40.3	(12.2 - 68.4)	72.1	(51.2 - 93.0)
City/Out-County				
City of Kalamazoo	31.1	(13.9 - 48.3)	67.7	(47.7 - 87.7)
Rest of County	31.2	(13.8 - 48.5)	77.1	(63.4 - 90.9)
Within City of Kalamazoo				
White in City	31.0	(9.4 - 52.5)	55.9	(29.8 - 82.0)
Black in City	31.3	(2.1 - 60.4)	89.2	(78.9 - 99.5)

^aAmong respondents who had ever been told by a doctor that they had diabetes, excluding women who had diabetes during pregnancy.

*Confidence interval exceeds possible limits

Source: Kalamazoo County 2004-05 Behavioral Risk Factor Survey

Initial Diabetes Diagnosis and Diabetes Self-Management, Kalamazoo County 2009-10

Demographic Characteristics	Age When First Told by a Doctor You Had Diabetes (Average Age) ^a		Have Taken a Class on How to Manage Your Diabetes ^a	
	Age (years)	95% C.I.	%	95% C.I.
Total	48.2	(44.0 - 52.5)	64.2	(48.4 - 77.5)
Age				
18-34 years	0.0	(0.0 - 0.0)	0.0	(0.0 - 0.0)
35-54 years	43.3	(41.0 - 45.7)	60.6	(35.9 - 80.8)
55 years +	52.9	(45.9 - 59.9)	67.7	(48.2 - 82.6)
Gender				
Male	48.3	(45.5 - 51.1)	85.2	(69.8 - 93.5)
Female	48.2	(41.6 - 54.8)	51.4	(30.8 - 71.6)
Race				
White Non-Hispanic	47.5	(42.2 - 52.7)	65.2	(46.2 - 80.3)
Black Non-Hispanic	48.8	(44.8 - 52.8)	55.2	(26.3 - 81.0)
Education				
HS graduate or less	54.0	(48.6 - 59.3)	67.4	(42.3 - 85.4)
Some college or more	45.0	(40.7 - 49.3)	62.4	(42.2 - 79.1)
Income				
LT \$35,000	51.8	(46.7 - 56.9)	59.1	(35.9 - 78.8)
\$35,000+	42.5	(34.5 - 50.5)	59.6	(32.9 - 81.7)
City/Out-County				
City of Kalamazoo	46.9	(42.9 - 51.0)	67.4	(42.8 - 85.1)
Rest of County	49.2	(42.0 - 56.3)	68.9	(44.4 - 86.0)
Within City of Kalamazoo				
White in City	45.3	(39.9 - 50.7)	80.0	(46.8 - 94.8)
Black in City	48.4	(43.8 - 52.9)	50.3	(20.7 - 79.7)

^aAmong respondents who had ever been told by a doctor that they had diabetes, excluding women who had diabetes during pregnancy.

*Confidence interval exceeds possible limits

Source: Kalamazoo County 2009-10 Behavioral Risk Factor Survey

The National Institutes of Health and the Centers for Disease Control and Prevention recommend that people with diabetes see their health care providers at least twice a year.¹⁹ Routine visits where management of the disease is monitored help to reduce morbidity due to diabetes.

In 2004-05 (the most recent period for which this data is available), Kalamazoo County adults with diabetes had an average of 5.0 visits with a health professional in the previous year (a high number of visits may reflect greater morbidity for an individual).²⁰ On average, adults with diabetes had their feet checked by a health care professional 3.1 times in the previous year, and had their A1C checked 3.0 times.²¹ Three quarters of diabetic adults (75.5%) had had an eye exam in which their pupils were dilated in the previous year.

Professional Health Care for Diabetes, Kalamazoo County 2004-05

Demographic Characteristics	Average Number of Times Saw a Health Professional About Diabetes in Past Year		Average Number of Times Health Profession Checked Feet for Sores in the Past Year		Had an Eye Exam in Which Pupils Were Dilated in Past Year		Average Number of Times a Health Professional Checked for "A1C" in Past Year	
	Number	95% C.I.	Number	95% C.I.	%	95% C.I.	Number	95% C.I.
Total	5.0	(2.6 - 7.3)	3.1	(1.3 - 4.9)	75.5	(63.6 - 87.4)	3.0	(2.4 - 3.5)
Age								
18-34 years	4.1	(3.6 - 4.6)	2.1	*	54.9	*	3.0	(3.0 - 3.1)
35-54 years	4.9	(0.6 - 9.2)	2.1	(0.9 - 3.2)	66.6	(42.0 - 91.3)	2.9	(1.9 - 4.0)
55 years +	5.1	(2.0 - 8.2)	4.0	(0.7 - 7.2)	84.2	(74.4 - 94.0)	3.0	(2.4 - 3.6)
Gender								
Male	6.6	(1.2 - 11.9)	4.4	(0.3 - 8.4)	82.2	(66.0 - 98.4)	2.9	(1.8 - 3.9)
Female	3.7	(2.8 - 4.7)	2.1	(1.4 - 2.8)	70.3	(54.2 - 86.4)	3.1	(2.6 - 3.5)
Race								
White	5.4	(2.7 - 8.2)	3.2	(1.0 - 5.4)	72.1	(58.3 - 85.9)	3.0	(2.5 - 3.6)
Black	2.8	(0.3 - 5.2)	3.1	(1.3 - 4.8)	90.4	(81.3 - 99.6)	2.7	(1.1 - 4.4)
Education								
HS graduate or less	5.2	(1.8 - 8.5)	2.6	(1.6 - 3.6)	72.5	(54.8 - 90.2)	3.3	(2.3 - 4.3)
Some college or more	4.8	(1.4 - 8.2)	3.5	(0.2 - 6.7)	78.3	(62.6 - 94.0)	2.7	(2.1 - 3.4)
Income								
LT \$35,000	4.6	(1.7 - 7.5)	2.4	(1.5 - 3.2)	74.6	(58.1 - 91.1)	2.8	(2.0 - 3.5)
\$35,000+	6.3	(0.8 - 11.9)	4.6	*	70.2	(47.1 - 93.2)	3.2	(2.6 - 3.7)
City/Out-County								
City of Kalamazoo	3.5	(1.9 - 5.2)	2.2	(1.3 - 3.2)	74.4	(55.0 - 93.7)	3.1	(1.9 - 4.2)
Rest of County	5.8	(2.2 - 9.4)	3.7	(0.7 - 6.6)	76.3	(61.2 - 91.3)	2.9	(2.3 - 3.5)
Within City of Kalamazoo								
White in City	4.0	(2.0 - 6.0)	2.9	(1.1 - 4.8)	64.9	(38.2 - 91.5)	3.5	(2.2 - 4.8)
Black in City	2.7	(0.1 - 5.2)	3.0	(1.2 - 4.9)	90.1	(80.3 - 99.8)	2.7	(1.0 - 4.3)

^a Among respondents who had ever been told by a doctor that they had diabetes, excluding women who had diabetes during pregnancy.

*Confidence interval exceeds possible limits

Source: Kalamazoo County 2004-05 Behavioral Risk Factor Survey

¹⁹ National Diabetes Education Program, National Institutes of Health accessed online at <http://www.ndep.nih.gov/diabetes/control/4Steps.htm#Step4>

²⁰ Kalamazoo County 2004-05 Behavioral Risk Factor Survey

²¹ An A1C test is a blood glucose test that shows what blood glucose levels have been over the last three months. The A1C goal for most people is below 7. High blood glucose levels can be harmful to the heart and blood vessels, kidneys, feet, and eyes.

7.3.3 Diabetes Hospitalizations

All Hospitalizations

Hospitalizations are defined as inpatient hospital stays completed during a specified year. The number of hospitalizations is often greater than the number of persons hospitalized since some persons are hospitalized more than once during a year.²²

In Kalamazoo County in 2009, 1.4% of all hospitalizations were due to diabetes mellitus (393). The rate of hospitalizations due to diabetes mellitus in Kalamazoo County increased in 2009 from the average rate between 2004 and 2008, but the rate remained lower than the rate in Michigan.²³

Hospitalizations and Rates per 10,000 Population for Diabetes Mellitus and All Causes, Kalamazoo County and Michigan 2004-2008 vs. 2009

Disease	Area	Hospitalizations		Rate per 10,000	
		Average number 2004-2008	2009	Average annual rate 2004-2008 (+/- 95% CI)	2009 (+/- 95% CI)
Diabetes Mellitus	Kalamazoo County	355	393	14.6 ± 0.7	15.8 ± 1.6
	Michigan	16,875	17,812	16.7 ± 0.1	17.9 ± 0.3
All Hospitalizations	Kalamazoo County	28,422	28,528	1,171.3 ± 6.1	1,148.4 ± 13.3
	Michigan	1,326,194	1,318,741	1,315.6 ± 1.0	1,322.7 ± 2.3

Source: Michigan Department of Community Health, Division for Vital Records and Health Data Development, Michigan Resident Inpatient Files

²² Michigan Department of Community Health, Division for Vital Records and Health Data Development accessed online at <http://www.mdch.state.mi.us/pha/osr/chi/hospdx/frame.html>

²³ Michigan Department of Community Health, Division for Vital Records and Health Data Development, Michigan Resident Inpatient Files accessed online at <http://www.mdch.state.mi.us/pha/osr/CHI/HOSPDx/FRAME.HTML>

Ambulatory Care Sensitive Hospitalizations

The Michigan Department of Community Health defines ambulatory care sensitive (ACS) hospitalizations as those hospitalizations “for conditions where timely and effective ambulatory care can decrease hospitalizations by preventing the onset of an illness or condition, controlling an acute episode of an illness or managing a chronic disease or condition.” A hospitalization is further defined as a continuous stay of one or more days; therefore a patient who was hospitalized on more than one separate occasion during the time period would be counted as more than one hospitalization.²⁴

Ambulatory care sensitive hospitalizations may reflect a lack of or failure of prevention efforts, a primary care resource shortage, poor performance of primary health care delivery systems, or other factors that create barriers to obtaining timely and effective care.²⁵ In 2009, 18.6% of all hospitalizations in Kalamazoo County were categorized as ACS hospitalizations (20.8% of all hospitalizations in Michigan were ACS hospitalizations).²⁶

Ambulatory care sensitive hospitalizations related to diabetes are any hospitalization with or without complications such ketoacidosis, hyperosmolarity, coma or hypoglycemia/hypoglycemic shock, but exclude hospitalizations related to diabetes with renal, ophthalmic or neurological manifestations or hospitalizations related to peripheral circulatory disorders with diabetic origins.

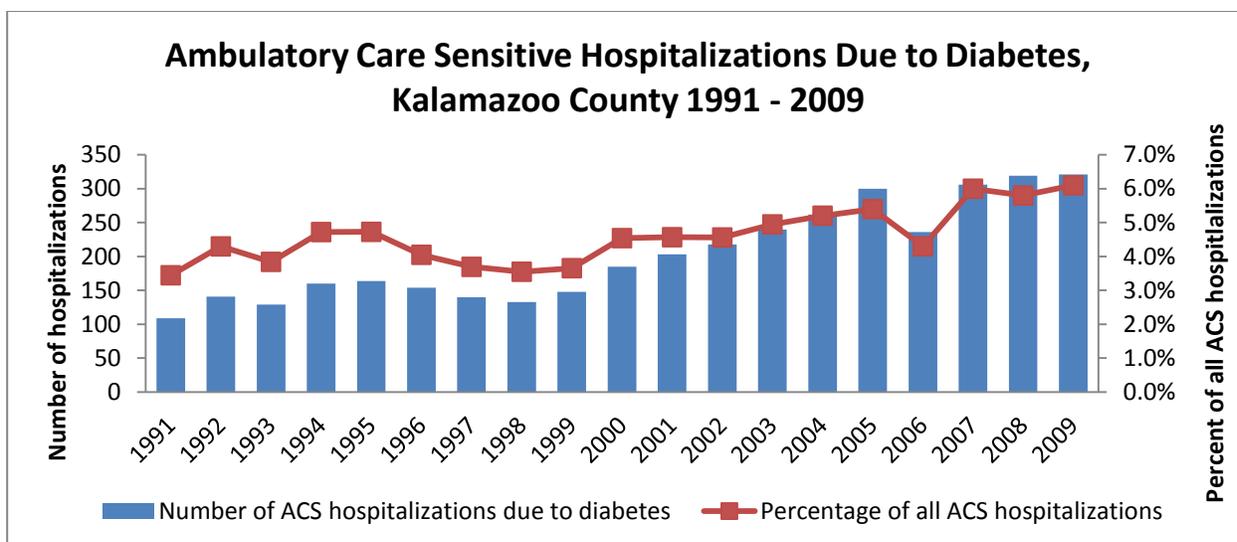
In 2009, there were 321 ACS hospitalizations due to diabetes in Kalamazoo County, ranking it as the fifth most common cause of ACS hospitalization (6.1% of all ACS hospitalizations). In 2009, diabetes was the cause of 4.8% of the ACS hospitalizations in Michigan and was the seventh most common cause of ACS hospitalization. Among ACS hospitalizations that were for chronic conditions, diabetes was responsible for 16.0% of hospitalizations in Kalamazoo County in 2009.²⁷

²⁴ Michigan Department of Community Health, Division for Vital Records and Health Data Development, accessed online at <http://www.mdch.state.mi.us/pha/osr/chi/hosp/frame.html>

²⁵ Michigan Department of Community Health, Division for Vital Records and Health Data Development, accessed online at <http://www.mdch.state.mi.us/pha/osr/chi/hosp/frame.html>

²⁶ Michigan Department of Community Health, Division for Vital Records and Health Statistics, Michigan Resident Inpatient Files.

²⁷ Michigan Department of Community Health, Division for Vital Records and Health Statistics, Michigan Resident Inpatient Files.



Source: Michigan Department of Community Health, Division for Vital Records and Health Statistics, Michigan Resident Inpatient Files

Ambulatory Care Sensitive (ACS) Hospitalizations due to Diabetes in Kalamazoo County and Michigan

Year	Number	Percent of ACS hospitalizations	
	Kalamazoo County	Kalamazoo County	Percent in Michigan
1991	109	3.4%	4.5%
1992	141	4.3%	4.4%
1993	129	3.8%	4.1%
1994	160	4.7%	4.5%
1995	164	4.7%	4.5%
1996	154	4.0%	4.5%
1997	140	3.7%	4.5%
1998	133	3.5%	4.4%
1999	148	3.7%	4.5%
2000	185	4.5%	4.6%
2001	203	4.6%	4.7%
2002	218	4.6%	4.7%
2003	240	4.9%	4.5%
2004	262	5.2%	4.6%
2005	300	5.4%	4.4%
2006	236	4.3%	4.5%
2007	306	6.0%	4.6%
2008	319	5.8%	4.7%
2009	321	6.1%	4.9%

Source: Michigan Department of Community Health, Division for Vital Records and Health Statistics, Michigan Resident Inpatient Files