THE MICHIGAN DIABETES PREVENTION AND CONTROL PROGRAM (MDPCP)

Michigan's Diabetes Burden and Diabetes Program – Overview 2008

The Michigan Diabetes Prevention and Control Program (MDPCP) is a partnership between the Centers for Disease Control and Prevention (CDC) and the Michigan Department of Community Health. The MDPCP has a system to monitor the burden of diabetes in Michigan. This system tracks the number of people with diabetes (PWD), their related health conditions and use of health services. These data help health care providers and policy makers to understand the scope of the disease and how best to intervene to reduce its burden. Diabetes surveillance performed by MDPCP currently emphasizes four major issues:

- **The alarming growth in diabetes prevalence is linked to similar trends in modifiable risk factors.**
- **Black, American Indian, and Hispanic groups experience disparities in diabetes-related prevalence, morbidity and mortality.**
- **Many people with diabetes are at increased risk of complications as a result of their diabetes not being managed well.**
- **The costs of diabetes care are increasing even as improvements in diabetes care have led to decreased rates for diabetes-related complications and mortality.**

In response to the worsening public health burden of diabetes, MDPCP is working to enhance prevention and control strategies aimed at reducing diabetes related morbidity, mortality and disparities in Michigan residents.

Diabetes and Prediabetes

Diabetes is a chronic disease defined by blood sugar (glucose) levels that are higher than normal. Major disease classifications for diabetes include:

Type 1 diabetes (T1DM) is an auto-immune disease where the body's immune system destroys the insulin-producing beta cells in the pancreas. T1DM accounts for 5-10% of all diabetes and develops most often in children and young adults with a genetic predisposition. People with T1DM must inject themselves with insulin and follow a careful diet and exercise plan.(1)

Type 2 diabetes (T2DM) is characterized by insulin resistance and relative insulin deficiency. T2DM accounts for 90-95% of all diabetes. The disease is strongly genetic in origin but lifestyle factors such as excess weight, physical inactivity, high blood pressure and poor diet are major risk factors for its development. Overweight individuals over age 45 are most likely to develop T2DM, but there is an increasing trend of T2DM in overweight children and adolescents. Symptoms may not appear for many years after significant complications may have already developed. T2DM may be treated by dietary changes, exercise, oral medication or insulin.(1)

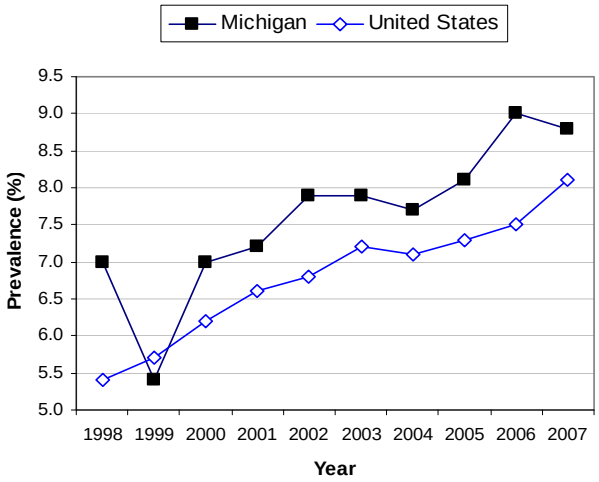
Gestational Diabetes Mellitus (GDM) develops in pregnant women who have not previously had diabetes but who have high blood sugar levels during pregnancy which may disappear when the pregnancy is over. GDM occurs during about 4% of all pregnancies.(1) Higher prevalence is seen in Black, American Indian, Asian/Pacific Islander, and Hispanic groups and in women who are obese or have a family history of diabetes.(2) For women who develop GDM, the risk of developing T2DM is 3.5 times greater than for the general population. Nearly 19% of women who develop GDM are likely to develop T2DM within 9 years. (3)

Prediabetes occurs when a person's blood sugar levels are higher than normal but not high enough for a diagnosis of diabetes. People with prediabetes often lack symptoms and may not know they have it. Nearly a quarter of all adults aged 20 years and older have prediabetes.(4) Studies have shown that people with prediabetes can prevent or delay development of T2DM through lifestyle changes that include weight loss, exercise and a healthy diet.(1)

Prevalence

Michigan's increase in diabetes prevalence parallels national trends during the previous decade.(5)

Trends in Prevalence of Diabetes for Adults in Michigan and the United States,1998-2007(5)



Michigan ranks 15th highest for T2DM prevalence among all states in the nation.(5) During 2005-2007, Michigan had an estimated 648,100 adults or 8.5% of total adult population with diagnosed diabetes (T1DM or T2DM). Another 279,100 adults had undiagnosed diabetes. Altogether, an estimated 927,200

adults or 12.2% of Michigan's total adult population had diabetes.[6,7]

An even greater proportion of Michigan's population has prediabetes. In 2004, the estimated prevalence of prediabetes was 27.3% or 2,066,900 adults aged 18-85 years. Three-quarters of these adults were aged 40-85 years.[8]

Diabetes prevalence varies across demographic factors. Males experience higher rates than females. Diabetes prevalence increases with older age and is highest among individuals aged 65-74 years.[6]

Demographic characteristics for Michigan adults with diabetes, MiBRFS, years 2005-2007 combined [6, 9]

Demographic Characteristic	Crude %	Age-Adjusted %
Gender		
Male	9.0	-
Female	8.1	-
Age		
18 – 24	1.0	-
25 – 34	1.5	-
35 – 44	4.8	-
45 – 54	8.2	-
55 – 64	16.4	-
65 – 74	21.1	-
75 +	18.4	-
Race/Ethnicity		
White, Non-Hispanic	7.8	7.3
Black, Non-Hispanic	12.7	13.9
Asian or Other Pacific Islander, Non-Hispanic	4.2	11.3
American Indian / Alaskan Native, Non-Hispanic	10.7	12.2
Multi-Racial, Non-Hispanic	11.1	11.6
Hispanic	8.7	12.2
Household Income		
< $20,000	14.9	-
$20,000 - $34,999	11.1	-
$35,000 - $49,999	7.9	-
$50,000 - $74,999	6.8	-
$75,000 +	4.6	-

The burden of diabetes varies widely by racial/ethnic groups. In 2007, the estimated number of Michigan adults with diabetes by racial/ethnic group was 477,300 White Non-Hispanics, 121,800 Black Non-Hispanics, 7,700 Asian or Other Pacific Islanders, 5,200 American Indian or Alaskan Natives, and 22,500 Hispanics.[6,7]

Disparities for risk for diabetes are also experienced between racial/ethnic groups. However, if the population is younger, on average, than the other groups then the actual observed rates (Crude prevalence) may mask the true effect of a race/ethnicity. Age-adjusted prevalence reveals that the highest rate of diabetes is experienced by Black Non-Hispanics (13.9%) followed by Hispanics (12.2%), American Indian / Alaskan Natives (12.2%), Multi-Racial Non-Hispanics (11.6%), Asian or Other Pacific Islanders (11.3%), and White Non-Hispanics (7.3%). These rates show that similar disparities are experienced by all of the non-White groups.[6,9]

Finally, as household income increases the prevalence of diabetes decreases. For households with incomes less than $20,000 the diabetes prevalence rate was more than three fold higher than households with incomes of at least $75,000.[6]

In 2005, 12,926 women or 10.4% of all live births experienced diabetes during their most recent pregnancy in Michigan. The majority of these women (76.9%) had GDM while the remaining portion (23.1%) reported having pre-gestational diabetes.[10]

Mortality

Diabetes ranked as the 6th leading cause of death in Michigan in 2006 accounting for 2,823 deaths (3.3% of all deaths), and as a contributory cause for another 5,812 deaths.[11] In 2004, Michigan's age-adjusted diabetes death rate was 28.4 per 100,000 people as compared to 24.5 for the U.S.[12] In 2006, Michigan's age-adjusted diabetes death rates were 29.0 for white males, 21.3 for white females, 47.8 for black males, and 36.5 for black females (deaths per 100,000 population).[12]

Complications

Diabetes disrupts normal blood circulation and nerve function. Over time, these changes can damage the heart, blood vessels, eyes, and kidneys and lead to disabling and life threatening conditions. A person with diabetes may not know damage is taking place. Complications are most likely to occur in someone who has lived with poorly treated diabetes for many years. This makes early diagnosis and treatment of diabetes a key to successful disease management.

Heart Disease and Stroke. Diabetes is a major risk factor for vascular disease. PWD have heart disease death rates about two to four times higher than people without diabetes.[1] More than 65% of PWD die from heart disease or stroke.[1] In Michigan in 2007, a previous medical history of heart attack, angina, coronary heart disease, or stroke occurred in 28.8% of adults with diabetes versus 7.2% of adults without diabetes.[5]

High Blood Pressure. Nationally from 2003 to 2004, 75% of adults with self-reported diabetes had high blood pressure or used prescription medications for hyper-tension.[13] In 2007, 66.7% of Michigan adults with diabetes had ever been told that they have high blood pressure.[6]

Kidney Disease. Diabetes is the leading cause of kidney failure.[1] In 2006, 42.0% of the 3,931 Michigan residents newly diagnosed with chronic end-stage renal disease had a primary diagnosis of diabetes.[14] There were 12,039 end-stage renal disease dialysis patients living in Michigan, and 41.5% of them had a primary diagnosis of diabetes.[14] Of the nearly 1,000 kidney transplants performed in Michigan in 2006; 34.6% of these recipients had a primary diagnosis of diabetes.[14]

Visual Impairment. According to national estimates, diabetes is the leading cause of new cases of blindness in adults 20-74 years of age.[1] In Michigan in 2007, 20.1% of adults with diabetes had been told by a doctor that diabetes affected their eyes or they had retinopathy.[6]

Neuropathies. Nationwide, about 60-70% of PWD have mild to severe forms of nervous system damage.[15] The results of such damage include impaired sensation or pain in the feet or hands, slowed digestion of food in the stomach, carpal tunnel syndrome, erectile dysfunction, or other nerve problems.[13] Almost 30% of PWD aged 40 years or older have impaired sensation in the feet.[13] While severe forms of diabetic nerve disease are a major contributing cause of lower-extremity amputations.[13] In Michigan in 2007, an estimated 388,860 to 453,670 adults with diabetes had mild to severe forms of neuropathic complications.[15]

Amputations. Nationally more than 60% of non-traumatic lower-limb amputations occur in PWD.[1] In Michigan, some form of lower-limb amputation occurred in 2,737 diabetes-related hospital discharges in 2006.[16]

Dental Disease. Periodontal or gum disease is more common in PWD.[13] In 2006, periodontal disease occurred in an estimated 4.5% of Michigan adults with diabetes and only 3.0% of those without diabetes.[6]

Complications of Pregnancy. Poorly controlled diabetes during pregnancy is associated with a variety of adverse pregnancy outcomes such as birth defects, high birth weight, Cesarean section, and neonatal respiratory distress syndrome.[10] Among women with T1DM, poorly controlled diabetes before conception and during the first trimester of pregnancy causes major birth defects in 5-10% of pregnancies and spontaneous abortions in 15-20% of pregnancies.[13] In Michigan for years 2004-2005 combined, the rate of Cesarean section was 40.1% for women with either pre-gestational diabetes or GDM versus 26.4% for women not experiencing diabetes during pregnancy.[10]

Other Complications. Uncontrolled diabetes often leads to biochemical imbalances that can cause acute life-threatening events, such as diabetic ketoacidosis or hyperosmolar nonketotic coma.[13] PWD are more susceptible and have worse prognoses for many illnesses (e.g., influenza and pneumococcal infection).[13] PWD aged 60 years or older are two to three times more likely to report an inability to walk a quarter of a mile, climb stairs, do housework, or use a mobility aid compared with persons without diabetes in the same age group.[13] Michigan adults with diabetes reported more limitations in activities (13.0%) than did adults without diabetes (5.5%) in 2007.[6]

Hospitalizations

PWD have higher hospitalization rates than the general population.[17] This burden is primarily due to uncontrolled diabetes.[17] Most of these preventable hospitalizations occur among children and young adults who account for approximately 40% of events. Blacks experience a rate of preventable hospitalizations that is more than double the rate for Whites.[17] In 2006, 20% of all Michigan hospital discharges mentioned diabetes; even though people with diagnosed diabetes represent less than 10% of the population.[16] Diabetes was the primary diagnosis in 16,637 hospital discharges.[16]

Risk Factors

Being overweight or obese is the single most important modifiable risk for T2DM.[1] Between 1995 and 2007, the prevalence of adult obesity (BMI>30.0) has increased nationwide from 15.9% to 26.3%; and for Michigan from 18.2% to 28.2%.[18] In 2007, Michigan was ranked 13th worst for adult obesity, tied with Missouri, Delaware and Alaska at 28.2%.[5]

In 2007, the percentage of adults in the general population who met recommendations for physical activity was 49.5% nationwide and 50.7% for Michigan.[5] In Michigan between 2001 and 2007, the proportion of the population who meet these guidelines increased from 45.6% to 50.7%.[5]

Among PWD risk of developing complications is strongly influenced by lifestyle, related medical conditions, and use of health services.

Prevalence (%) of diabetes-related health indicators among Michigan adults with diabetes, MiBRFS 2005 and 2007[6]

Indicators	2005	2007
No Health Coverage (Ages 18 to <65)	11.9	11.4
General Health, Fair or Poor	47.6	44.2
Current Smoker	15.1	12.4
High Blood Pressure	66.1	67.5
High Cholesterol	62.4	63.0
Overweight (BMI 25 to <30)	31.0	29.7
Obese (BMI ≥30)	55.0	55.9
No Leisure-Time Physical Activity	35.6	36.3
Eat Less than 5 fruits & vegetables per day	74.2	78.0
Poor physical health (14-30 days of last month)	26.2	25.8
Poor mental health (14-30 days of last month)	15.1	12.9
Disabled (Limited in any way or uses special equipment)	43.7	48.0

Costs

The burden of diabetes impacts multiple sectors of society through higher insurance premiums, reduced earnings through productivity loss, and reduced overall quality of life for PWD and their families and friends.[19] The total cost of diabetes for people in Michigan is estimated at $6.5 billion in 2007. This estimate includes direct medical costs of $4.3 billion attributed to diabetes, and indirect costs valued at $2.2 billion.[20]

Prevention and Control

Prevention. T2DM is preventable and progression to diabetes among those with prediabetes is not inevitable. Results from large clinical trials indicate that middle-aged overweight individuals or individuals with prediabetes can significantly reduce their risk of developing T2DM by achieving a modest weight loss and other lifestyle changes.[1,4] Increasing physical activity, and a diet low in animal fat, total calories and high in complex carbohydrates are recommended to reduce weight and decrease the risk of diabetes. Adults and children at any age can benefit from these positive lifestyle changes.[1]

The MDPCP supports programs to prevent development of diabetes associated with excessive weight gain. Michigan's *Diabetes Outreach Networks* conduct educational interventions and community-based wellness activities to help Michigan residents make positive lifestyle changes and to maintain a healthy weight. Strategies to prevent and control diabetes must be culturally sensitive and population specific.[21,22] National Kidney Foundation of Michigan programs such as *Healthy Hair* and *Dodge the Punch* were designed to be culturally sensitive to Black women and men. Early detection of diabetes or prediabetes for low income women occurs through screening as part of the *WISEWOMAN program* and for all adults in the *Northern Michigan Diabetes Initiative*.

Diabetes Management. Among people with diagnosed diabetes proper disease management can reduce risk of developing complications. This includes behavior change and clinical monitoring. For PWD, delaying the onset of diabetes complications involves keeping (1) blood sugar (HbA1C) at <7%, (2) blood pressure less than 130/80 mmHg, (3) LDL (bad) cholesterol below 100 mg/dL, (5) HDL (healthy) cholesterol above 40 mg/dL for men and 50 mg/dL for women, and (5) triglycerides below 150 mg/dL. Other important clinical activities include receiving annual foot and eye exams, and annual influenza and pneumococcal vaccinations to prevent or control complications.[23,24]

Health People 2010 monitors use of these services to assess progress in prevention and control of diabetes.[25] Michigan has met the *Healthy People 2010* goal for HbA1c tests. More than 70% of Michigan adults with diabetes had at least two HbA1c tests annually, which is significantly higher than the goal of 50%. Michigan is making progress for the other key clinical services and immunizations as well.

Diabetes management indicators for Michigan adults ages ≥18 years with diabetes, MiBRFS 2001-2007[6]

	Year			*HP2010*
Management Objective	**2001**	**2005**	**2007**	*Goals*
2 HbA1c Tests Annually	59.2	67.3	71.7	*50*
Annual Foot Exam	68.0	67.3	72.0	*75*
Annual Dilated Eye Exam	65.2	68.5	70.7	*75*
	2003-2004	**2005**	**2007**	
Annual Influenza Vaccination	53.2	48.6	52.8	*60*
Pneumococcal Vaccination	50.7	51.8	59.8	*60*

MDPCP and its partners seek to prevent diabetes and its complications, eliminate diabetes health disparities, maximize organizational/fiscal capacity and promote systems change through a variety of programs and partnerships including: the evidence-based programs of six regional *Diabetes Outreach Networks*; 90 certified Diabetes Self-Management Training Programs; the statewide Diabetes Partners in Action Coalition; the National Kidney Foundation of Michigan; major universities and many others. Individual programs range from detection of prediabetes and community interventions in YMCA, WISEWOMAN, beauty salon/barber shop settings to early diagnosis/treatment of PWD and quality improvement of health care. Programs are supported through state and federal funds. For more information on MDPCP activities, please visit www.michigan.gov/diabetes and www.diabetesinmichigan.org**.**

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