

The Prevalence of Diabetes and Related Services in Missouri and Missouri's Progress Towards Meeting the Healthy People 2010 Goals

by Catherine A. Chmidling, MS, Joseph A. Vradenburg, PhD & Jo Anderson, BS

Missouri has generally not met the HP 2010 goals for preventative diabetes care, falling short of these goals by an average of seven percentage points.

Abstract

Since 1988, diabetes in Missouri increased by almost 50%. We examined diabetes' prevalence and associations with socio-demographic, risk factor, and comorbidity variables in Missouri. Additionally, we examined Missouri's progress towards Healthy People 2010 diabetes-related goals and prevalence of risk factor counseling. Analysis indicates diabetes is an increasing public health problem in Missouri. To stem increases in the prevalence of diabetes and its costs, delivery of, and access to, preventative care and counseling should be improved.

Introduction

Type 2 diabetes, formerly known as adult-onset diabetes, typically occurs in individuals over age 30, and represents 90-95% of diagnosed diabetes cases. In recent years, Type 2 diabetes has begun to occur more frequently in children and adolescents, accounting for 8-45% of new cases.¹ This rise is attributed to increased obesity and lack of physical activity in these age groups. Missouri's diabetes-related mortality, where diabetes is either a primary or underlying cause of death, is projected to be 55.2 deaths per 100,000 individuals for 2010.² In 2001, the estimated costs for diabetes

in direct medical care, lost workdays, restricted activity days, permanent disability, and mortality were approximately \$2.1 billion.³

The Missouri Diabetes Prevention and Control Program (MDPCP) receives annual funding from the Centers for Disease Control and Prevention (CDC). MDPCP's goals are to provide and promote education, policies, and programs to health professionals and community-based organizations that reduce the impact of diabetes. These goals are in accordance with the goals of Healthy People 2010 and CDC's National Diabetes Objectives.⁴ The MDPCP also aims to reduce health disparities for high-risk populations, with respect to diabetes prevention and control and develop programs for the promotion of wellness, nutrition, physical activity, and weight and blood pressure control.

Methods Study Population

This study referenced 1988-2002 Missouri Behavioral Risk Factor Surveillance System (MO-BRFSS) data, but focuses on data from 2000, 2001, 2002. The 2000-2002 MO-BRFSS databases contained over 4,000 completed telephone interviews each conducted with individuals aged 18 years and older. MO-BRFSS used a random-digit-dialed sampling technique that

Catherine A. Chmidling, MS;
Joseph A. Vradenburg, PhD;
Jo Anderson, BS are staff-Missouri
Diabetes Prevention and Control
Program, Missouri Department of
Health and Senior Services

selected households and individuals within households for participation.⁵⁻⁷ MO-BRFSS used the Mitofsky-Waksberg method of sampling.⁸ A computer-assisted telephone interviewing software program minimized data entry errors and automatically skipped questions not applicable to the respondent. Using Missouri's postcensal population estimates, the MO-BRFSS data were weighted by sex, age, and race to represent the state population and compensate for unequal selection probability due to complex sampling design. Disadvantages of the BRFSS include the exclusion of respondents from households without a telephone, the absence of which may be correlated with certain risk behaviors, institutionalized individuals (such as those in hospitals and nursing homes), and reliance on self-reporting of personal characteristics and behaviors.

Diabetes and Related Variables

In each year, all respondents were asked, "Have you ever been told by a doctor that you have diabetes?" In 2000, respondents who answered 'yes' (excluding women reporting gestational diabetes) were asked how often they checked their blood glucose, how many times in the past year has a health professional checked their hemoglobin A1c (A1C) and feet, the last time they had a dilated eye exam, and if they had ever taken a diabetes self-management class. In 2001, respondents were asked if they had a flu shot in the past year, and ever received a pneumonia vaccination, as well as the last time they visited a dentist. In 2002, respondents were asked all of these questions, excluding diabetes self-management.

Socio-demographic, Risk Factor, and Co-Morbidity Variables

Socio-demographic variables were sex, race/ethnicity, age, income, and

employment (Table 1). A composite variable was constructed for race/ethnicity and defined as white non-Hispanic, African American non-Hispanic, Hispanic/Latino, and other non-Hispanic. Age, annual household income, and employment status were analyzed as categorical variables. Risk factor variables were leisure-time physical activity (LTPA) and weight status, while co-morbidity variables focused on cardiovascular disease (Table 1). LTPA – a composite variable – was derived from the respondents' participation in any of 21 physically active hobbies, sports, or exercises, where for each activity the respondents' frequency, duration, and relative intensity of participation were assessed. We classified respondents as inactive and active. Weight status – another composite variable using Body Mass Index – was divided into under/normal weight (BMI \leq 25.0), overweight (BMI = 25.0-29.9), and obese (BMI \geq 30.0 and greater). Prior or current diagnosed cardiovascular disease or stroke was a composite variable combining myocardial infarction, coronary heart disease, and stroke; while high cholesterol was a composite variable combining cholesterol screening and diagnosis. Blood pressure was analyzed as a categorical variable.

Preventative Counseling Variables

In 2000 and 2002, respondents were asked if a health professional advised them about reducing their weight in the past year. In 2002, respondents were asked how long it had been since a health professional counseled them regarding their eating habits and exercise.

Analytical Methods

Using the sample weights to generate weighted data for analysis, we computed prevalence estimates of physician-diagnosed diabetes by levels of socio-demographic, risk factor, and co-morbidity variables. Additionally, we

computed overall prevalence estimates for diabetes-related services. Respondents with missing or inappropriate data were excluded from analysis. Using 95% confidence intervals, we assessed the relation of diabetes with selected socio-demographic, risk factor, and co-morbidity variables. We used the SUDAAN statistical package to account for complex sampling design.

Results

Socio-demographics In 2002, 7.3% of Missouri's adult population (an estimated 306,464 individuals) reported physician-diagnosed diabetes. Since 1988, the prevalence of diabetes has increased by 49%. The American Diabetes Association (ADA) estimates that one-third of all people with diabetes have not yet been diagnosed by a physician.³ As a result, in 2002 approximately 11% of Missouri adults may have had diabetes.⁹ Pooling the 2000-2002 data, the prevalence of physician-diagnosed diabetes was significantly higher among those individuals with lower levels of annual household income, and those who were unable to work or retired (Table 1).

Fixed Risk Factors

The prevalence of diabetes was significantly higher among non-Hispanic African Americans and non-significantly higher among Hispanics/Latinos than among non-Hispanic whites (Table 1). Nationally, diabetes is significantly higher among Hispanics/Latinos, but the small Hispanic/Latino sample size for the MO-BRFSS (90 individuals of the 4631 who stated their race in the 2002 survey) diminishes the reliability of estimates of statistical significance. From 25-34 to 55-64 years, the prevalence of diabetes increases significantly with age (Table 1).

Modifiable Risk Factors and Co-Morbidities

The prevalence of diabetes was

Table 1

Variable	Classification	Physician-Diagnosed Diabetes		
		Prevalence	95% Confidence Interval	Data Years
Total		6.9	6.27-7.42	2000-2002
Sex	<i>male</i>	7.2	6.30-8.15	2000-2002
	<i>female</i>	6.5	5.79-7.21	2000-2002
Race/Ethnic Group	<i>white/nh</i>	6.5	5.86-7.06	2000-2002
	<i>African American/nh</i>	10.4	7.69-13.12	2000-2002
	<i>Hispanic/Latino</i>	10.0	5.04-14.96	2000-2002
	<i>other/nh</i>	5.5	3.06-7.90	2000-2002
Age Group	<i>18-24</i>	1.1	0.26-1.86	2000-2002
	<i>25-34</i>	1.6	0.85-2.27	2000-2002
	<i>35-44</i>	3.4	2.53-4.27	2000-2002
	<i>45-54</i>	7.3	5.90-8.64	2000-2002
	<i>55-64</i>	13.4	11.05-15.66	2000-2002
	<i>65-74</i>	14.9	12.54-17.18	2000-2002
	<i>75-84</i>	15.4	12.07-18.63	2000-2002
	<i>85+</i>	8.8	4.31-13.30	2000-2002
Annual Household Income	<i>< \$15,000</i>	11.9	10.10-13.66	2000-2002
	<i>\$15-25,000</i>	9.2	7.63-10.70	2000-2002
	<i>\$25-50,000</i>	5.8	4.71-6.98	2000-2002
	<i>> \$50,000</i>	3.5	2.64-4.29	2000-2002
Employment Status	<i>employed</i>	4.0	3.38-4.55	2000-2002
	<i>unemployed</i>	6.1	2.72-9.41	2000-2002
	<i>unable to work</i>	23.8	19.67-27.93	2000-2002
	<i>retired</i>	15.2	13.35-17.14	2000-2002
	<i>other</i>	2.8	1.77-3.75	2000-2002
Leisure-Time Physical Activity	<i>active</i>	5.6	4.97-6.24	2000-2002
	<i>inactive</i>	10.1	8.85-11.37	2000-2002
Weight Status	<i>under/normal</i>	3.0	2.39-3.63	2000-2002
	<i>overweight</i>	6.3	5.31-7.22	2000-2002
	<i>obese</i>	14.1	12.45-15.83	2000-2002
Cardiovascular Disease and Stroke	<i>diagnosed</i>	26.0	20.25-31.76	2001
	<i>not diagnosed</i>	4.9	3.93-5.81	2001
High Blood Pressure	<i>ever diagnosed</i>	15.6	12.67-18.47	2001
	<i>not diagnosed</i>	3.3	2.54-4.14	2001
High Cholesterol	<i>not checked</i>	1.1	0.48-1.70	2001
	<i>ever diagnosed</i>	13.4	10.57-16.21	2001
	<i>not diagnosed</i>	6.1	4.70-7.49	2001

significantly higher among individuals who were physically inactive and overweight or obese (Table 1). Additionally, the prevalence of diabetes was significantly higher among individuals with prior or existing cardiovascular disease or stroke, high blood pressure, and high cholesterol (Table 1).

Healthy People 2010 Objectives

The overall goal of the Healthy People 2010 (HP 2010) initiative is to, "...reduce the ... burden of diabetes, and improve the quality of life for all persons who have or are at risk for diabetes." Included in the HP 2010

goals targeting diabetes and diabetes preventative care are goals to increase the proportion of adults with diabetes who: have an A1C measurement at least once a year to 50%, perform self-blood-glucose-monitoring at least once daily to 60%, have an annual dilated eye examination, at least an annual foot examination, and

at least an annual dental examination to 75%, and receive formal diabetes education to 60%.¹⁰

Other HP 2010 objectives relevant to diabetes care include increasing annual influenza vaccination and ever receiving a pneumococcal vaccination to 60% for high-risk persons aged 18-64, and 90% among persons 65+ years and in long-term care or nursing homes.¹¹ In this analysis, high-risk persons aged 18-64 are defined as those with physician-diagnosed diabetes.

Missouri has already exceeded the published HP 2010 goal (50%) concerning annual A1C measurement. However, this targeted goal may have been based on faulty estimates and is in the process of being revised – probably upward. Diabetes specialists place particular emphasis on the A1C test as an effective health indicator, as A1C levels >7.0% are associated with increased risk of hyperglycemic and cardiovascular complications.¹² The ADA recommends A1C testing every 3 months for patients with poor glycemic control, and every 6 months for patients with stable glycemic control.¹³ The American Association of Clinical Endocrinologists recommends A1C testing every 3 months,¹⁴ while the National Institutes of Health (NIH) recommend testing at least every 6 months for patients with diabetes.¹⁵

For the remaining four goals, Missouri was below the HP 2010 goals by an average of 10 percentage points. Missouri was 6 percentage points below the daily self-blood-glucose-monitoring goal (60%), 7-11 percentage points below the annual eye, foot, and dental exam goals (75% each), and 16 percentage points below the formal diabetes-education goal (60%). The proportion of targeted Missourians receiving the appropriate influenza and pneumonia vaccinations was well below the HP 2010 goals

(60%, 90% for vulnerable persons) by an average of 23 percentage points.

Preventative Counseling – Risk Factors

Three-fifths (60.8%) of Missouri adults with physician-diagnosed diabetes have not been counseled by a health professional about their weight in the past year, while approximately one-quarter (25.1%) have never been counseled about their eating habits or exercise. The prevalence of weight management and diet counseling, and having been counseled specifically to lose weight, were better among obese individuals with diabetes (weight loss counseling: 53.3%; diet counseling: 58.8%) than those without diabetes, but with one or more risk factors (weight loss counseling: 27.8%; diet counseling: 26.5%). Unfortunately, the prevalence of overall exercise counseling was worse among physically inactive individuals with diabetes.

Discussion

An estimated one in 14 adult Missourians have physician-diagnosed diabetes, but the total number of case of diabetes may be higher. Diabetes is generally more common among racial/ethnic minorities and individuals with a comparatively low income. Over the past 15 years, the prevalence of diabetes has increased by approximately 50%. Over the past nine years the hospitalization rate for diabetes has increased by 51%, while over the past eight years, total charges for diabetes hospital stays increased by 89%. Individuals aged 65+ years, a growing segment of the state population, incur one-half of medical costs. The estimated annual costs for diabetes exceed \$2 billion.

One-half of Missouri adults without physician-diagnosed diabetes have one or more of the risk factors

associated with the development of diabetes. These data, coupled with the increasing prevalence of obesity, suggests the prevalence of diabetes will continue to increase, with concomitant increases in health and medical costs.

Diabetes incidence can be reduced and diabetes-related complications prevented or delayed with effective changes in lifestyle and treatment.^{4,16} Changes in lifestyle behaviors that may increase the risk of developing diabetes and diabetes-related complications include eating a healthier diet, exercising, and losing weight.¹⁶⁻²⁰ A recent study found that the incidence of diabetes among at-risk populations was, through lifestyle change alone, reduced by 58%. Lifestyle change consisted of adopting a healthy low-calorie, low-fat diet, 150 minutes of moderate exercise per week, and a weight loss goal of 7% of body weight.¹⁶ Additionally, diabetes-related complications (such as blindness, kidney failure, amputation, and cardiovascular disease) can be prevented or delayed with effective treatment(s).⁴

Increasing exercise and losing weight are especially important, as physical inactivity and obesity are more common among Missouri adults with diabetes. However, approximately one-quarter to over one-half of Missouri adults with physician-diagnosed diabetes have either never or not recently been counseled by a health professional about exercise, eating habits, and healthy weight. Additionally, one-half or more of Missouri adults at-risk for developing diabetes have not received counseling.

Effective treatments include preventative care such as annual A1C testing, annual eye, dental, and foot exams, and appropriate immunizations.^{4,10,11} Missouri has generally not met the HP 2010 goals

for preventative diabetes care, falling short of these goals by an average of seven percentage points.

Conclusions

Diabetes is an increasing public health problem in Missouri. If unchecked, the prevalence of diabetes and its associated costs, including diabetes-related mortality, will continue to increase, diminishing Missourians' quality of life, and perhaps threatening the financial integrity of our health care system. The MDPCP engages in activities designed to reduce the impact of diabetes by promoting preventative care and overall wellness, especially among high-risk populations such as racial/ethnic minorities and lower income groups. These activities are in accordance with the CDC's National Diabetes Objectives.

The prevalence of preventative diabetes care (such as A1C testing, eye, dental and foot exams, etc.) and counseling should be improved. Given the association of diabetes with physical inactivity, obesity, cardiovascular disease, hypertension, and high cholesterol; wellness programs should emphasize improving the modifiable risk factors for diabetes and diabetes-related complications, such as level of exercise, dietary habits, and weight management. In addition to individuals with diabetes, wellness programs and preventative counseling should also target those at-risk for developing diabetes.

Diabetes is never completely reversible. Once diabetes manifests itself, it will be a health issue for the remainder of an affected individual's life. Ultimately, the only way to reduce the impact of diabetes is to prevent new cases of diabetes by promoting a healthier lifestyle and improving pre-diagnosis care and counseling for those at-risk. Through its activities and partnerships, the MDPCP seeks to accomplish these goals.

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