

FOCUS

A PUBLICATION OF THE

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March 2007

Diabetes-Related Mortality in Missouri

Diabetes mellitus was the seventh leading cause of death in Missouri in 2005 as 1,549 Missourians had this listed as their underlying cause of death. An additional 3,372 deceased had diabetes listed as a contributing factor to their death for a total 4,921 diabetes-related deaths or 9 percent of all Missouri resident deaths (N=54,324). Diabetes-related mortality has been increasing in recent years and this article explores these increases by various demographic characteristics and risk factors.

Diabetes is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. Diabetes can lead to serious complications and premature death. There are two major types of diabetes. Type 1 usually appears suddenly in children and young adults and progresses rapidly. Because the pancreas produces little or no insulin, people with this type of diabetes must take daily injections of insulin and monitor their diet to stay alive. This accounts for 5 to 10 percent of all diagnosed cases of

diabetes. Type 2 is slower to develop and usually occurs in adults over 40 who are overweight. It accounts for 90 to 95 percent of diagnosed cases. Because it is associated with obesity and inactivity, it is believed that many of these cases could be prevented if people maintained a desirable body weight and kept physically active. It can be controlled through diet and exercise, although insulin injections or oral medications may be needed to control blood-sugar levels. According to the Centers for Disease Control and Prevention (CDC)¹, it is estimated that risk of death among people with diabetes is about twice that of people without diabetes of similar age.

Tables 1 and 2 present diabetes and diabetes-related mortality by age for two five year-periods, 1991-1995 and 2001-2005. Diabetes (underlying cause) mortality increased by 21.5 percent from 20.9 per 100,000 population in 1991-1995 to 25.4 in 2001-2005. All of these rates were age-adjusted to the U.S. 2000 standard population. Total diabetes-related

Table 1
Diabetes Mortality per 100,000 Population by Age: Missouri 1991-1995 and 2001-2005*

| | 1991-1995 | | 2001-2005 | | Percent Change in Rate 1991-95 to 2001-05 |
|-------|-----------|-------|-----------|-------|--|
| | Deaths | Rate | Deaths | Rate | |
| <35 | 97 | 0.7 | 68 | 0.5 | -30.6 |
| 35-44 | 163 | 4.1 | 234 | 5.5 | 34.1 |
| 45-54 | 309 | 10.5 | 573 | 14.2 | 35.2 |
| 55-64 | 760 | 33.7 | 1,093 | 38.3 | 13.6 |
| 65-74 | 1,607 | 79.6 | 1,691 | 86.7 | 8.9 |
| 75-84 | 1,774 | 143.2 | 2,487 | 182.6 | 27.5 |
| 85+ | 1,104 | 246.9 | 1,651 | 329.9 | 33.6 |
| Total | 5,814 | 20.9 | 7,798 | 25.4 | 21.5 |

*Based on records with diabetes listed as the underlying cause of death.

Note: Totals are adjusted to the U.S. 2000 standard population.

Source: Missouri resident death certificates.

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Table 2**Diabetes-Related Mortality per 100,000 Population by Age: Missouri 1991-1995 and 2001-2005***

| | 1991-1995 | | 2001-2005 | | Percent Change in Rate 1991-95 to 2001-05 |
|-------|-----------|-------|-----------|--------|--|
| | Deaths | Rate | Deaths | Rate | |
| <35 | 156 | 1.0 | 131 | 1.0 | 1.1 |
| 35-44 | 329 | 8.2 | 485 | 11.3 | 37.8 |
| 45-54 | 860 | 29.3 | 1,493 | 37.0 | 26.3 |
| 55-64 | 2,352 | 104.3 | 3,201 | 112.2 | 7.6 |
| 65-74 | 5,419 | 268.4 | 5,464 | 280.0 | 4.3 |
| 75-84 | 6,473 | 522.4 | 8,216 | 603.3 | 15.5 |
| 85+ | 3,945 | 882.3 | 5,222 | 1043.3 | 18.2 |
| Total | 19,534 | 69.8 | 24,214 | 78.8 | 12.9 |

*Based on records with diabetes listed as a contributing cause of death.

Note: Totals are adjusted to the U.S. 2000 standard population.

Source: Missouri resident death certificates.

mortality was more than three times the underlying rate and it increased by 12.9 percent during the same time frames from 69.8 to 78.8 per 100,000 population. The patterns by age were similar for diabetes as both an underlying and a contributing condition. Diabetes mortality increases dramatically with age, doubling and tripling with each 10-year increase in age. The largest mortality increases occurred for persons aged 35-54 for both diabetes and diabetes-related deaths. Large increases also occurred for persons 75 and older. Smaller increases occurred for persons 55-74. The smallest increase occurred for persons under 35. In fact, diabetes mortality as an underlying cause decreased for persons less than 35, indicating possibly better control of persons with Type 1 diabetes.

Table 3 shows that diabetes-related mortality increased for all major race and sex groups from 1991-1995 to 2001-2005. For both five-year groupings, males had higher (about 25-35 percent) diabetes-related death rates than females and African-Americans had higher (about double) death rates than whites. Males and African-Americans also had larger increases than their counterparts. For 2001-2005, African-American males had the highest diabetes-related death rate of 158.4 per 100,000 population followed by African-American females (130.9), white males (87.7) and white females who had the lowest rate of 63.3 per 100,000 population.

The Behavioral Risk Factor Surveillance System asks, "Have you ever been told by a doctor that you have diabe-

Table 3**Diabetes-Related Mortality per 100,000 Population by Sex and Race: Missouri 1991-1995 and 2001-2005***

| | 1991-1995 | | 2001-2005 | | Percent Change in Rate 1991-95 to 2001-05 |
|--------------------------|-----------|-------|-----------|-------|--|
| | Deaths | Rate | Deaths | Rate | |
| Males | 8,609 | 78.9 | 11,578 | 92.6 | 17.4 |
| Females | 10,925 | 63.5 | 12,636 | 68.9 | 8.5 |
| Whites | 16,899 | 65.3 | 20,698 | 73.5 | 12.6 |
| African-Americans | 2,546 | 123.4 | 3,354 | 142.5 | 15.5 |
| White Males | 7,550 | 75.3 | 10,031 | 87.7 | 16.5 |
| White Females | 9,349 | 58.4 | 10,668 | 63.3 | 8.4 |
| African-American Males | 1,019 | 125.0 | 1,478 | 158.4 | 26.7 |
| African-American Females | 1,527 | 121.5 | 1,876 | 130.9 | 7.7 |
| Total | 19,534 | 69.8 | 24,214 | 78.8 | 12.9 |

*Based on records with diabetes listed as a contributing cause of death.

Note: All rates are adjusted to the U.S. 2000 standard population.

Source: Missouri resident death certificates.

(Focus continued)

tes?” For the time period 2000-2004, about 7 percent of the Missouri population age 18 and over included in the sample answered yes to this question. Based on the answer to this question, Missouri diabetes prevalence rates for 2000-2004 by race, sex and age presented in Table 4 show very similar patterns to the death rates. Males have a slightly higher prevalence rate than females (7.2 vs. 6.7 percent, respectively) and African-Americans have a higher rate than whites (9.5 vs. 6.8 percent, respectively). Diabetes prevalence also increases

with age from 1.0 percent for those aged 18-29 to 15.1 percent for persons aged 65 or more. These prevalence differentials by sex, race and age are a little less than the mortality differentials.

Table 4 also shows the relationship between body mass index and diabetes. About 3 percent of underweight and normal weight adults have diabetes compared to 6.4 percent of overweight and 14.2 percent of obese adults.

| | |
|--------------------------|------|
| Whites | 6.8 |
| African-American | 9.5 |
| Males | 7.2 |
| Females | 6.7 |
| White Males | 6.9 |
| White Females | 6.6 |
| African-American Males | 10.6 |
| African-American Females | 8.8 |
| 18 to 29 | 1.0 |
| 30 to 34 | 1.7 |
| 35 to 39 | 2.9 |
| 40 to 49 | 4.9 |
| 50 to 64 | 11.6 |
| 65 and older | 15.1 |
| Underweight | 3.7 |
| Normal weight | 2.9 |
| Overweight | 6.4 |
| Obese | 14.2 |
| Total | 7.0 |

Source: Missouri Behavioral Risk Factor Surveillance System

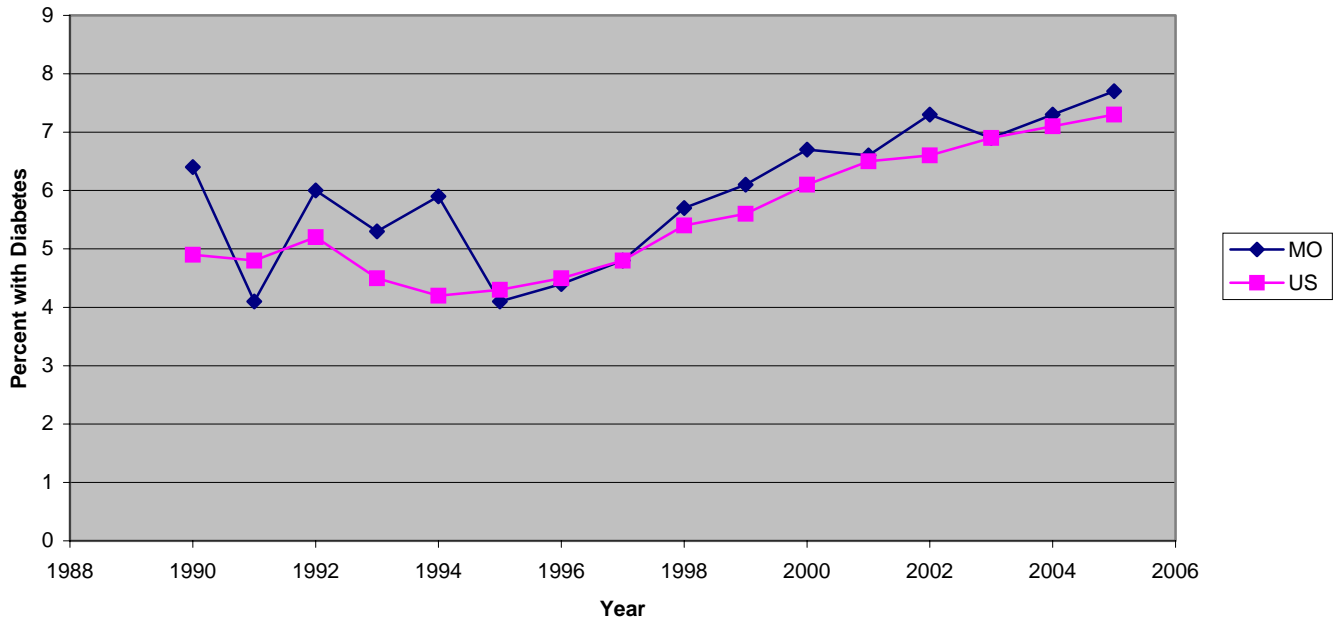
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Figure 1 shows that diabetes prevalence has increased fairly steadily since 1995 rising from 4.1 percent that year to 7.7 percent in 2005. United States diabetes prevalence also increased steadily from 4.3 percent in 1995 to 7.3 percent in 2005. This increase in diabetes prevalence corresponds closely with increases in obesity among Missouri adults from 18.9 percent in 1995 to 26.9 percent in 2005, and nationally

Table 5 is consistent with information from the CDC¹ that adults with diabetes have heart disease death rates 2 to 4 times higher than adults without diabetes and similarly the risk of stroke is 2 to 4 times higher among people with diabetes. Despite the relationship between diabetes and heart disease and stroke, the increases in diabetes-related mortality have not been enough to counteract other factors influencing

Figure 1: Trends in Diabetes Prevalence: Missouri and U.S. 1990-2005



from 18.5 percent in 1995 to 24.4 percent in 2005. The higher diabetes prevalence in Missouri is not significantly different from the United States, but the higher Missouri obesity rate is significant.

In Table 5, we examine the leading causes of death in which diabetes is a contributing factor using 2001-2005 death data. The leading cause is heart disease as 44.2 percent diabetes-related deaths have heart disease as the underlying cause compared with 29.1 percent of total deaths. Dividing the two percents results in a ratio of 1.52 for heart disease. Ratios above 1.00 indicate causes for which diabetes increases the risk more than the average death. Other causes with ratios greater than 1.00 include septicemia (blood poisoning), stroke, kidney disease and chronic pulmonary disease. Causes with ratios less than 1.00, such as cancer, indicate causes for which diabetes is not a major contributor.

heart disease and stroke mortality as they have continued to decrease in recent years. Diabetes is also the leading cause of kidney failure. Other major complications of diabetes not reflected in mortality statistics include blindness, nervous system disorders, and lower-limb amputations.

A note of caution must be issued with regard to the cause of death data. These data can be affected by different practices related to diagnostic recording on the death certificate by different physicians in various parts of the state. This might lead to over- or under-reporting of diabetes-related deaths. For example, a slight change in the death certificate in 1989 led to a 30 percent increase in diabetes deaths in Missouri in 1989². In 2001 Missouri began using a more electronic version of cause of death classification, and this may have resulted in changes in diabetes-related deaths, although there appeared to be no major changes in 2001 death results. How-

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Table 5**Diabetes-Related Deaths by Underlying Cause Compared with Total Deaths: Missouri 2001-2005**

| | Diabetes-Related | | Total Deaths | | Ratio of Diabetes percent to Total Death percent |
|------------------------|------------------|---------|--------------|---------|---|
| | Number | Percent | Number | Percent | |
| Heart | 7,260 | 44.2 | 79,587 | 29.1 | 1.52 |
| Cancer | 2,613 | 15.9 | 61,658 | 22.5 | 0.71 |
| Stroke | 1,341 | 8.2 | 18,023 | 6.6 | 1.24 |
| Chronic Pulmonary | 935 | 5.7 | 14,461 | 5.3 | 1.08 |
| Pneumonia & Influenza | 367 | 2.2 | 7,791 | 2.8 | 0.78 |
| Kidney Disease | 364 | 2.2 | 5,375 | 2.0 | 1.13 |
| Alzheimer's Disease | 344 | 2.1 | 6,611 | 2.4 | 0.87 |
| Unintentional Injuries | 331 | 2.0 | 13,103 | 4.8 | 0.42 |
| Septicemia | 292 | 1.8 | 3,612 | 1.3 | 1.35 |
| Other | 2,569 | 15.6 | 55,524 | 20.3 | 0.77 |
| Total | 16,416 | 100.0 | 273,543 | 100.0 | 1.00 |

Note: Excluded from the diabetes-related are deaths in which diabetes is the underlying cause.

ever despite these cautions, the consistency of the mortality data with the prevalence data would tend to indicate that there has indeed been an increase in diabetes-related mortality in Missouri in recent years.

In summary,

- Diabetes-related mortality in Missouri increased by about 13 percent from 1991-1995 to 2001-2005.
- This increase occurred among nearly all age, race and sex groups except persons less than age 35.
- Diabetes-related mortality was highest among African-American males; followed by African-American females, white males and white females.
- Diabetes prevalence nearly doubled among Missourians from 1995 to 2005.
- Diabetes increases the risk for heart disease, stroke, septicemia, kidney disease, and chronic pulmonary disease mortality.

The increase in diabetes prevalence and mortality appears to be real and closely correlated with the general increase in

obesity both in Missouri and nationally. Reducing obesity is the best way to prevent diabetes. Those who already have diabetes should work closely with their health care providers to find the best way to control it.

For those who would like more information about diabetes, please visit the Missouri Diabetes Prevention and Control Program at www.dhss.mo.gov/diabetes.

References:

- (1) Centers for Disease Control and Prevention. National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2005. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2005.
- (2) Missouri Monthly Vital Statistics. Increased Diabetes Mortality Associated with Change in Death Certificates. January 1994 Vol. 27 No. 11.