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# Diabetes Mortality in Alaska, 1994-2003

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## Summary

Between 1994 and 2003, 734 Alaska death certificates were issued that listed diabetes as the underlying cause of death. An additional 1,200 death certificates listed diabetes as a contributing cause of death. The corresponding mortality rates are 24.3 deaths per 100,000 Alaskans with diabetes as the underlying cause of death and 67.9 deaths per 100,000 with diabetes as a contributing cause of death.

In the U.S., the overall age-adjusted mortality rate in persons with type 2 diabetes is approximately twice that of persons who do not have diabetes.[1] Mortality rates among persons with type 1 diabetes are even higher. For childhood onset cases of type 1 diabetes, studies report that more than 15% will die by age 40. At age 40, the annual mortality rate for those with type 1 diabetes is 20 times that of the general population.[2]

Diabetes is a serious and deadly disease, but lifestyle modification and medical therapy offer effective interventions. As the prevalence of diabetes and it risk factors increase, diabetes prevention and treatment become increasingly important for preventing increased mortality.

## Methodology

The source of mortality data is death certificates, collected and compiled by the Alaska Bureau of Vital Statistics (AKBVS). The specific data in this report are from the AKBVS analysis of death certificates for diabetes as a cause of death. Death certificate data in this report are restricted to Alaska residents, and include the deaths of Alaska residents whose deaths occurred while they were in other states.

Historically, cause-of-death statistics have been based solely on the underlying cause of death, which is defined as the disease or injury that initiates the chain of morbid events leading directly to death.[3] In 1991, the Alaska Bureau of Vital Statistics began tracking multiple causes of death, both underlying and contributing. The contributing cause of death is defined as all other significant diseases or conditions that contributed to death, but did not result in the underlying cause of death.[3]

Diabetes is underestimated on death certificates, overall, and as the underlying cause of death. Mortality attributable to diabetes is underreported for a number of reasons including: lack of knowledge of the diagnosis, and/or failure to attribute death to diabetes on the part of the physician or other person completing the death certificate. This reluctance to record diabetes as the underlying cause of death may be reinforced by the design of the death certificate, which does not allow physicians, and others, to record multiple underlying causes of death.[4] For these reasons, the marker "any mention" of diabetes may be a better indicator of the impact of diabetes on mortality rates.[4] The term "any mention" of diabetes refers to any listing of diabetes as either the underlying or contributing cause of death.[3] However, diabetes as the underlying cause is used by the National Center for Health Statistics in national estimates of diabetes mortality.

The mortality rates reported are per 100,000 population, and are age-adjusted to the U.S. 2000 standard population. The estimates for the population of Alaska were obtained from the Alaska Department of Labor and Workforce Development, Section of Research and Analysis. The age-adjusted national rates were calculated using the CDC WONDER Compressed Mortality Database.[5]

## Diabetes as a Cause of Death

Diabetes was the seventh leading underlying cause of death in Alaska in 2003,[6] and the sixth leading underlying cause of death in the U.S.[7] (Table 1).

According to Alaska death certificate data, there were 238 diabetes-related deaths (any mention) in 2002, which would rank as the fourth leading cause of death in the state by number. Although the category "diabetes-related death" cannot be ranked as an underlying cause of death, the high number of diabetes-related deaths demonstrates that diabetes contributes to many deaths.

## Trends in Diabetes Mortality by Year

Between 1992 and 2003, the average annual mortality rate from diabetes as the underlying cause of death did not change significantly (Figure 1). There was an apparent increasing trend in diabetes as any mention on the death certificate which was significant ($p<0.025$). This apparent increase is likely the result of many factors including improved reporting and data collection techniques, as well as an actual increase in the number of deaths involving diabetes.

In Figure 2, the mortality rates of diabetes as the underlying cause of death in Alaska are compared to the national mortality rates. Overall, both rates increased over time in a similar manner. However, diabetes mortality rates in Alaska showed more annual variation, which is due to the relatively small number of deaths in the state.

## Diabetes Mortality by Gender

The average annual mortality rates for diabetes as the underlying cause of death between 1994 and 2003 among men and women in Alaska were almost identical, with 25.5 and 23.0 deaths per 100,000 population, respectively (Figure 3). The average annual mortality rate for diabetes any mention by gender was also higher among men than among women (72.8/100,000 versus 63.4 / 100,000 population), and this difference was statistically significant ($p<.001$).

Nationally, mortality rates for diabetes as the underlying cause of death between 1999 and 2001 were also higher among males than females, (27.9 vs. 23.0 per 100,000).[5]

Nationally, African American women have the highest diabetes mortality rates (underlying cause of death), with rates twice that of the U.S. overall.[8]

## Diabetes Mortality by Age

Chronic disease mortality typically increases with age. Alaskan death certificate data from 1994 to 2003 indicate that the majority (70%) of decedents with any mention of diabetes on their death certificates were age 65 or older at time of death (Figure 4).

Considering just diabetes-related deaths, men tend to die at a younger age than women. Among all of the male decedents with any mention of diabetes on the death certificate, 36% were under age 65, compared to only 25% of women. The age distributions of male and female decedents with any mention of diabetes on their death certificate were statistically different ($p<0.001$).

The mean age of female decedents in Alaska with any mention of diabetes on their death certificate between 1994 and 2003 was 71.9 years, and the mean age male decedents with diabetes mentioned on their death certificate between 1994 and 2003 was 66.4 years.

A similar pattern is seen nationally. Between 1999 and 2001 in the U.S., 75% of decedents with diabetes as the underlying cause of death, were age 65 or older. Among female decedents with diabetes as the underlying cause of death, 20% were younger than 65 years of age, and among males, 30% were younger than 65.[5]

## Diabetes Mortality by Race

In Alaska, the racial/ethnic groups with the highest average annual mortality rates from diabetes as the underlying cause of death, or from diabetes any mention, were African-Americans and Hispanics (Figure 5). Whites had the third highest rate, and mortality rates from diabetes among Alaska Natives and Asian/Pacific Islanders were substantially lower. Mortality rates in these two racial groups are historically underreported, however, which may partially account for the lower rates.

In the U.S., the highest mortality rates from diabetes as the underlying cause, by race or ethnic group, were among African-Americans and American Indians/Alaskan Natives.[9] The national diabetes mortality rate for African-Americans was 41.2 deaths per 100,000 population, and the national diabetes mortality rate for American Indians/Alaska Natives was 36.5 deaths per 100,000 population (rates age-adjusted to the 1980 U.S. population).[9]

A 2003 article on diabetes among Alaska Natives documented the mortality rate from diabetes among Alaska Natives to be 12.3 per 100,000 population between 1994 and 1998.[10] The authors reported that the mortality rate from diabetes as the underlying cause of death among Alaska Natives was very close to the rate among Caucasian Alaskans, but that the rate among Alaska Natives had increased more dramatically (by 262% between 1979 and 1998) than the rate among Caucasians in Alaska.[10] The analyses of death certificate data in this report indicate that mortality rates from diabetes of Alaska Natives and Whites in the state are still almost identical to each other.

Nationally, the U.S. Centers for Disease Control and Prevention (CDC) have attempted to calculate diabetes death rates using the population with diabetes as the denominator. Those results indicate that much of the difference between races in diabetes mortality, particularly differences between African-Americans and Caucasians, can be attributed to higher diabetes prevalence in the African-American population.[9]

## Leading Causes of Death for People with Diabetes

In Alaska, the leading underlying causes of death among decedents with diabetes listed as a contributing cause of death were heart disease, neoplasm and cerebrovascular disease (Table 2). The majority (41.5%) of deaths were attributed to heart disease.

For the overall population in the U.S., the leading underlying cause of death listed for those with any mention of diabetes on their death certificates was cardiovascular disease, primarily ischemic heart disease (Cardiovascular disease defined as ICD 10 codes E10-E14).[1]

Lab-verified diabetes cases from the Alaska Native Tribal Health Consortium Diabetes Registry have also been studied. A review of deaths among Alaska Native diabetes cases between 1986 and 1993 found that the leading underlying causes of death in that group were cardiac disease, cancer and diabetes.[11]

## Data Limitations

The use of death certificate data to ascertain cause of death has many limitations.[1] These include:

- Incomplete death certificate forms,
- Inaccurate information regarding diagnosis,
- Incorrect race/ethnicity recorded on the death certificate, and
- Variation in interpretation of causation and contribution of specific diseases.

There are also specific problems analyzing diabetes as a cause of death in death certificate data.[1] These include the following:

- Diabetes is under-reported on death certificates.
- The National Mortality Follow-back Survey found that diabetes was underreported on death certificates. Among decedents known to have diabetes, only 40% of their death certificates listed diabetes as a contributing cause of death and only 10% listed it as the underlying cause.[8]
- Distinctions between type 1 and type 2 diabetes-related deaths are often not specified.
- The role of diabetes in mortality is often unrecognized by those filling out the death certificate.

Other considerations include:

- In 1999, there was a change in disease coding systems nationally, from the International Classification of Disease 9th edition (ICD-9) coding system to the 10th edition (ICD-10) coding system. In some subpopulations, the number of deaths changed because of a change in definition, or a change in regard to the rules of coding. The actual number of diabetes deaths was only minimally affected by the change in coding systems.[12]
- In this report, ten years of Alaska death certificate data were pooled to find average annual mortality rates. It was necessary to pool that many years of data because of the relatively small numbers of decedents with diabetes mentioned on their death certificate in Alaska annually. Such pooling of data limits the ability to meaningfully track trends over time.

## Future Trends

In the past twenty years, there has been an increase in mortality from diabetes. Some unknown portion of the increase in detected diabetes mortality rates is likely due to increased diagnosis and improved reporting on death certificates. According to the Behavioral Risk Factor Surveillance System, prevalence of diabetes has slightly increased in the past 10 years in Alaska. It is likely, however, that there will be a substantial increase in prevalence of diabetes in the future.[13] This increase is predicted because the population is aging, certain at-risk racial/ethnic group subpopulations continue to grow in Alaska, and the rate of overweight and obesity in Alaska is increasing.[13] The predicted increase in diabetes prevalence will likely cause an increase in mortality from diabetes.

**Table 1: Leading Causes of Death in Alaska: 2003**

| Rank | Cause of Death | Deaths | Alaska Age-Adjusted Mortality Rate per 100,000 population | US Age-Adjusted Mortality Rate per 100,000 population |
|---|---|---|---|---|
| 1 | Malignant Neoplasm | 731 | 187.4 | 189.3 |
| 2 | Disease of the Heart | 675 | 194.3 | 232.1 |
| 3 | Unintentional Injury | 319 | 55.1 | 36.1 |
| 4 | Cerebrovascular Disease | 183 | 60.1 | 53.6 |
| 5 | Chronic Lower Respiratory Diseases | 148 | 46.5 | 43.2 |
| 6 | Intentional Self-Harm (Suicide) | 124 | 20.6 | 10.5 |
| **7** | **Diabetes Mellitus** | **102** | **27.5** | **25.2** |
| 8 | Influenza and Pneumonia | 59 | 20.1 | 21.9 |
| 9 | Chronic Liver Disease and Cirrhosis | 57 | 10.4 | 9.2 |
| 10 | Alzheimer's Disease | 66 | 22.1 | 21.4 |

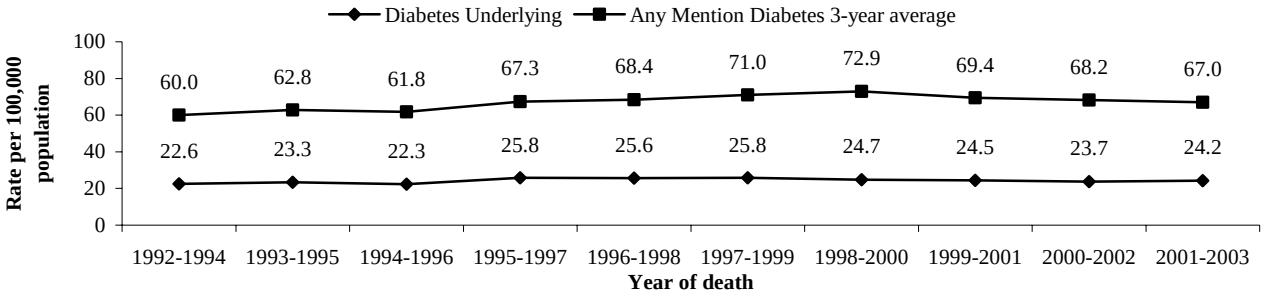
Rate per 100,000 population, age-adjusted to the 2000 U.S. population
Alaska Bureau of Vital Statistics, accessed 9-28-2005 http://www.hss.state.ak.us/dph/bvs/death_statistics/leading_cause_year/2003_top_causes.pdf
National Vital Statistics Report, vol. 53, no. 15, Preliminary Data for 2003, accessed 9-28-2005
http://www.cdc.gov/nchs/data/nvsr/nvsr53/nvsr53_15.pdf

**Table 2: Leading Underlying Causes of Death for People with Diabetes Listed as a Contributing Cause of Death on the Death Certificate: Alaska, 1994-2003**

| Cause of Death (ICD-9 code; ICD-10 code) | Number of Deaths | Age-adjusted Mortality Rate Rate per 100,000 population (n=1200) | Percent of total |
|---|---|---|---|
| **Heart Disease** (390-398, 402, 404, 410-429; I00-09, I11, I13, I20-I51) | 498 | 17.6 | 41.5% |
| **Malignant Neoplasm** (140-208; C00-C97) | 213 | 7.4 | 17.8% |
| **Cerebrovascular Disease** (430-434, 436-438; I60-I69) | 109 | 4.7 | 9.1% |
| **Chronic Lower Respiratory Disease** (490-494, 496; J40-J47) | 54 | 2.0 | 4.5% |
| **Influenza & Pneumonia** (480-487; J10-J18) | 29 | 1.3 | 2.4% |
| **All Other Causes** | 297 | 10.6 | 24.8% |

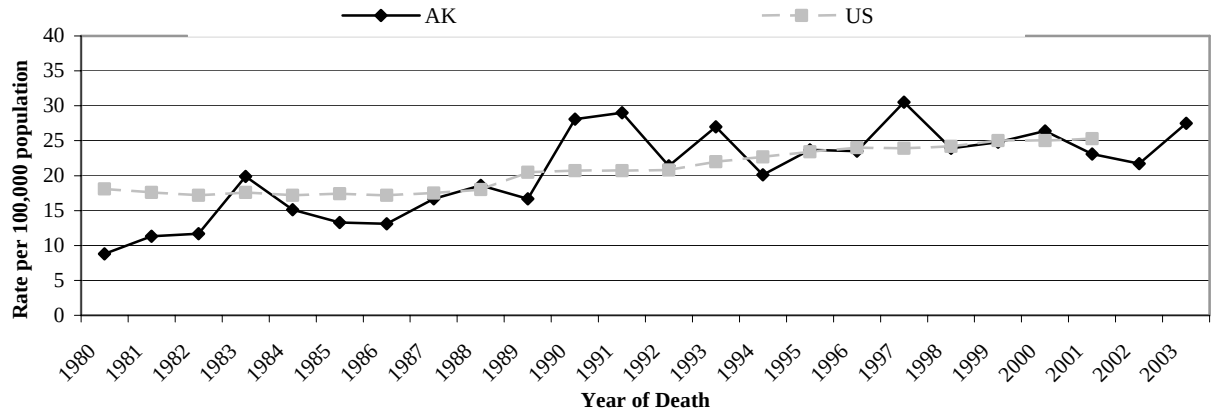
Source: Alaska Department of Health and Social Services, Division of Public Health, Bureau of Vital Statistics
Note: Rates age-adjusted to U.S. 2000 standard population, ICD-9 250.0-250.9 and ICD-10 E10-E14

**Figure 1: Diabetes Mortality Rates in Alaska 1992-2003: Diabetes Listed as the Underlying Cause of Death and Any Mention of Diabetes Listed on the Death Certificate, per 100,000 population**



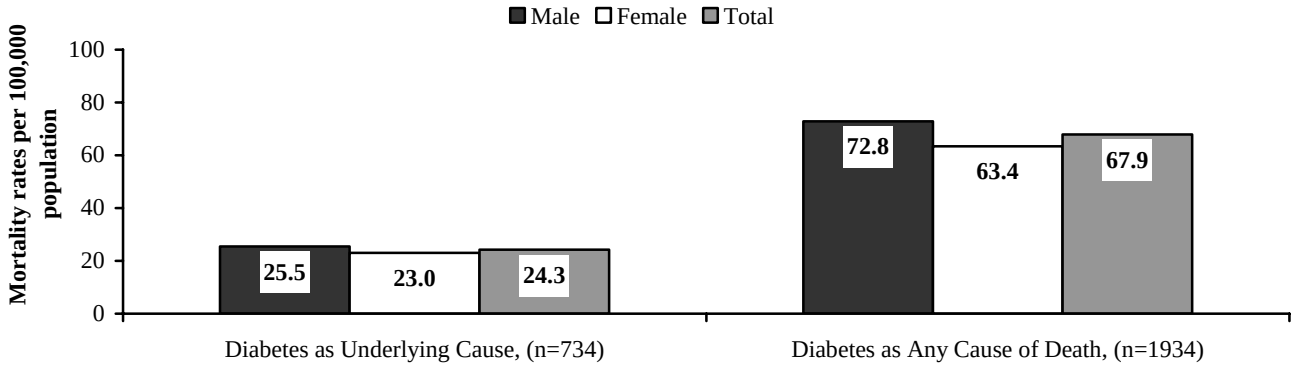

Source: Alaska Department of Health and Social Services, Division of Public Health, Bureau of Vital Statistics, 1992-2003
Note: Rates age-adjusted to U.S. 2000 standard population, ICD-9 250.0-250.9 and ICD-10 E10-E14

**Figure 2: Diabetes Mortality Rates in Alaska and the U.S. 1980-2003: Diabetes Listed as the Underlying Cause of Death, per 100,000 population**



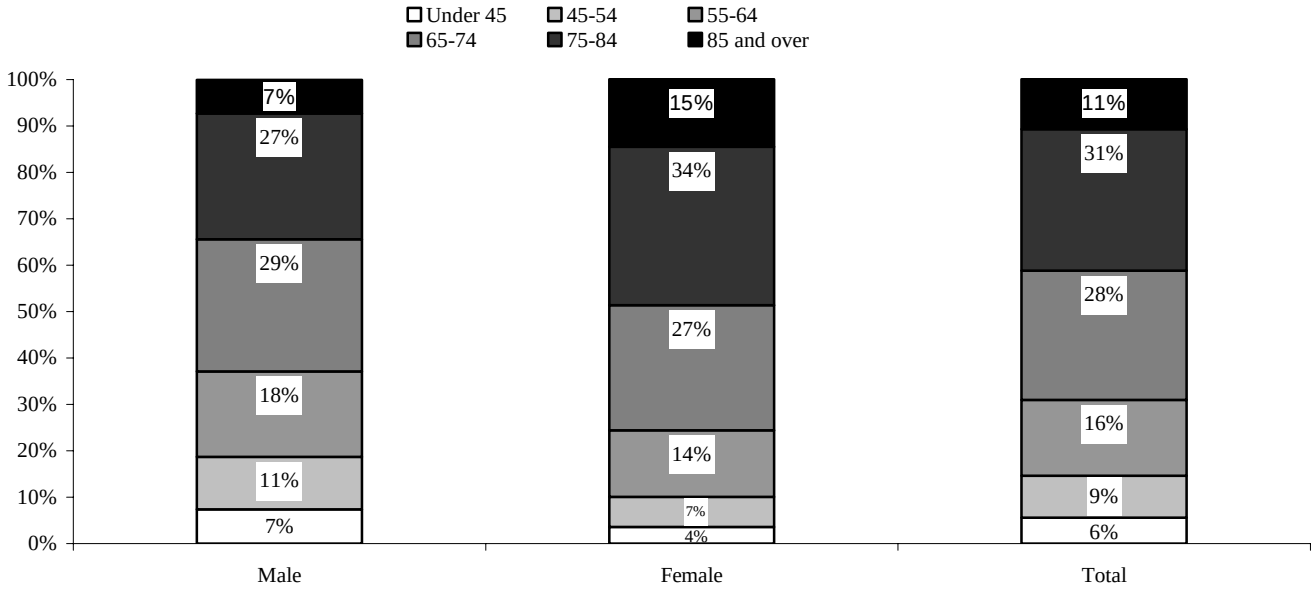

Source: Alaska data - Alaska Department of Health and Social Services, Division of Public Health, Bureau of Vital Statistics
U.S. data – Office of Analysis and Epidemiology, National Center for Health Statistics, Centers for Disease Control. Compressed Mortality Database 1979-1998 and 1999-2001. Accessed February 6, 2005. http://wonder.cdc.gov/mortsql.shtml
Note: Rates age-adjusted to U.S. 2000 population, ICD-9 250.0-250.9 (1979-1998) and ICD-10 E10-E14 (1999-2001)

**Figure 3: Age-Adjusted Diabetes Mortality Rates By Gender in Alaska, 1994-2003**



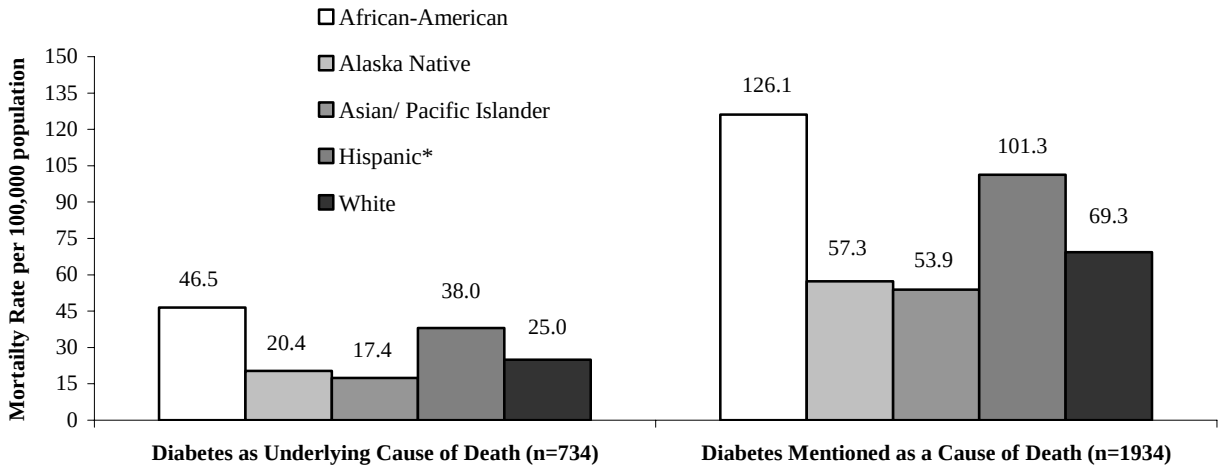

Source: Alaska Department of Health and Social Services, Division of Public Health, Bureau of Vital Statistics
Note: Rates age-adjusted to U.S. 2000 population, ICD-9 250.0-250.9 and ICD-10 E10-E14

**Figure 4: Percentage of Deaths with Any Mention of Diabetes in Indivudal Age Groups by Gender, in Alaska, 1994-2003**




Source: Alaska Department of Health and Social Services, Division of Public Health, Bureau of Vital Statistics
Note: Rates age-adjusted to U.S. 2000 population, ICD-9 250.0-250.9 and ICD-10 E10-E14

**Figure 5: Age Adjusted Diabetes Mortality Rates by Race/Ethnicity in Alaska per, 1994-2003**




Source: Alaska Department of Health and Social Services, Division of Public Health, Bureau of Vital Statistics
Note: Rates age-adjusted to U.S. 2000 population, ICD-9 250.0-250.9 and ICD-10 E10-E14
*Hispanic can be of any race

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**An electronic copy of this report, past reports, as well as the *State of Alaska Diabetes Control Plan,* can be downloaded from http://www.epi.hss.state.ak.us/cd/diabetes.stm.**

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# Bulletin

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