

Alaska's Diabetes Burden

2004-2006



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Executive Summary

Findings

In Alaska, diabetes is increasingly common

From 2000-2002 to 2004-2006, the number of adult Alaskans with diabetes increased by 48%, from 16,631 to 24,555 individuals.

Diabetes is deadly

Diabetes has been the seventh leading cause of death in Alaska since 1996.

Diabetes is expensive

In 2007, the direct and indirect costs of diabetes among adult Alaskans amounted to \$370 million.

Alaskans are at risk

In 2004-2006, one in ten Alaskans 55-64 said they had diagnosed prediabetes, a condition that substantially increases their chance for developing diabetes and/or heart disease.

Diabetes and disability can go together

In 2004-2006, more than one in ten Alaskans with diabetes had a disability (10.9%), but only three in 100 Alaskans without diabetes had a disability (3.2%).

Recommendations

Prevent diabetes

- Reduce barriers to healthy behaviors for all Alaskans.

Prevent diabetes complications and co-morbidities

- Coordinate public education campaigns and health care practices to jointly address diabetes and cardiovascular disease and their risk factors.
- Extend the reach and enhance sustainability of the Chronic Disease Self-Management Program (known as Living Well Alaska).
- Encourage employers to cover diabetes self-management education and Living Well Alaska in the health insurance they provide; encourage insurance agencies, including Alaska Medicaid, to implement reimbursement systems for diabetes self-management education.

Make diabetes self-management affordable for Alaskans with diabetes

- Improve access to low-cost diabetes supplies, medications and health care for low-income Alaskans.

Help providers increase their effectiveness in providing recommended diabetes preventive care

- Promote cost-effective, comprehensive chronic disease care models, such as the Planned Care Model (formerly the Chronic Care Model).

Advocate for changing systems and/or policies

- Work to expand the Alaska diabetes health care services system to address increasing demand, paying particular attention to regions with the greatest increases in diabetes prevalence and to assuring access for high risk or vulnerable populations.

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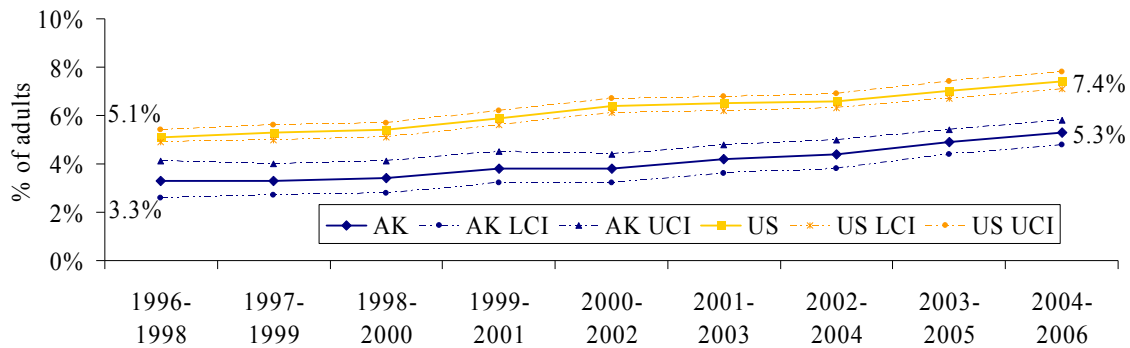
How many adult Alaskans have diabetes?

In Alaska and in the US, the prevalence of diabetes continues to increase.

Observed prevalence

In 2004-2006, the observed prevalence percentage of diabetes in Alaska was 5.3%*, which was significantly higher than it had been in 2000-2002, when it was 3.8%.

Figure 1. Observed diabetes prevalence with 95% confidence intervals among adults (≥ 18) in Alaska and US, 1995-2006 AK BRFSS in moving three-year averages and 1997-2005 National Health Interview Survey (NHIS)¹ shown at the three-year midpoint

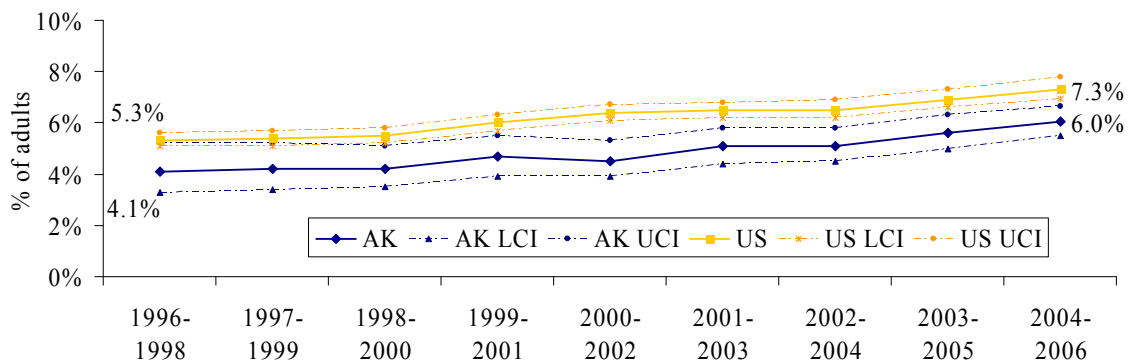


Between 2000-2002 and 2004-2006, the observed prevalence of diabetes in Alaska increased by 39%; during this period, single-year prevalence increased in the US by 16%.

Age-adjusted prevalence

The Alaska age-adjusted diabetes prevalence percentage in 2004-2006 was significantly higher than it was in 2000-2002. The Alaska age-adjusted diabetes prevalence percentage continues to be significantly lower than the US percentage.

Figure 2. Age-adjusted diabetes prevalence with 95% confidence intervals among adults in Alaska and the US, 1995-2006 AK BRFSS in moving three-year averages and 1997-2005, NHIS¹ shown at the three-year midpoint



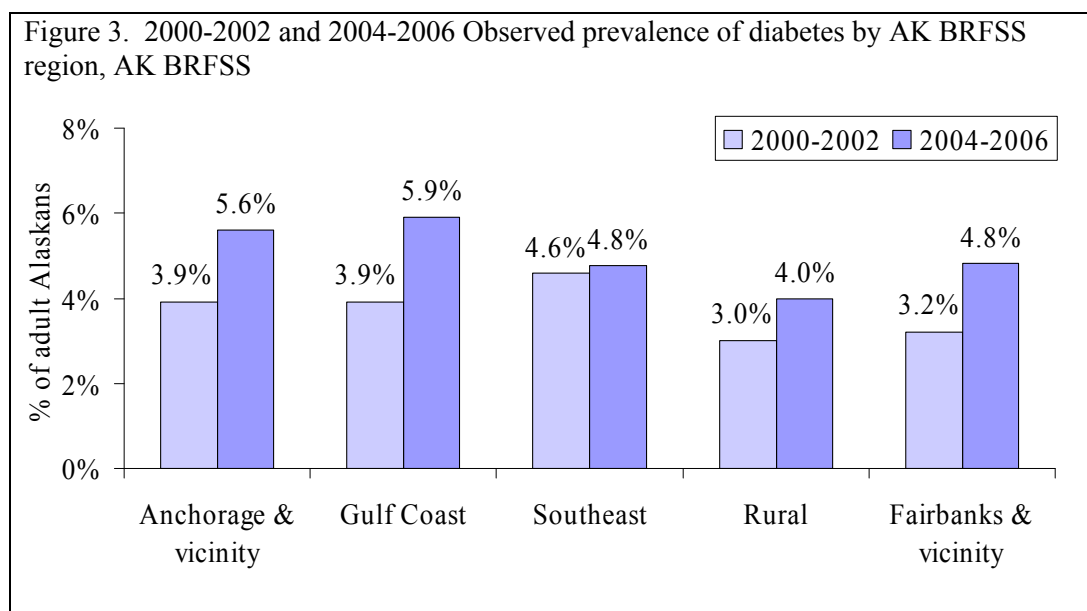
* Appendix A contains information about data sources used in this report. A document containing tables with 95% confidence intervals for the AK BRFSS data presented in this report is posted in <http://www.hss.state.ak.us/dph/chronic/diabetes/burden/>

Between 2000-2002 and 2004-2006, the age-adjusted prevalence of diabetes increased by 34%; during this period, single year prevalence increased in the US by 14%.

The higher percentage of change in Alaska's diabetes prevalence suggests that the significant difference between Alaska and US diabetes prevalence will disappear in the near future.

Regional comparisons

There were no significant differences in the prevalence of diabetes between AK Behavioral Risk Factor Surveillance System (BRFSS) regions, nor between 2000-2002 and 2002-2004 percentages for any region. (Figure 3)



In 2004-2006 in Alaska

- Diabetes prevalence was significantly higher than it was in 2000-2002.
- The 2000-2002 to 2004-2006 increase in Alaska diabetes prevalence was much more substantial than it was nationally.
- The 2000-2002 to 2004-2006 increase in diabetes prevalence reached statistical significance in the AK BRFSS Fairbanks and vicinity and Gulf Coast regions.

Implications/Discussion

There are a number of factors that may have contributed to Alaska's increasing prevalence of diagnosed diabetes. These include:

- Population changes – growth in the 65 or over age group is faster in Alaska than in most states.
- Diabetes screening practices – the percentage of Alaskans with *undiagnosed* diabetes could be lower than elsewhere in the US, and/or could have been higher in 2000-2002 than it was in 2004-2006.
- Increased risk – Alaska has high and rising rates of overweight and obesity, which increases diabetes risk.
- Increased awareness – adults who understand why it is important to know their diabetes status are more likely to have had a blood glucose test recently, to remember the results of this test, and to report them accurately; Alaska may have a different percentage of diabetes-aware adults than the US and/or that percentage may have changed.
- Increased disease – a higher percentage of Alaskans may have had diabetes in 2004-2006 than in 2000-2002.

Recommendations

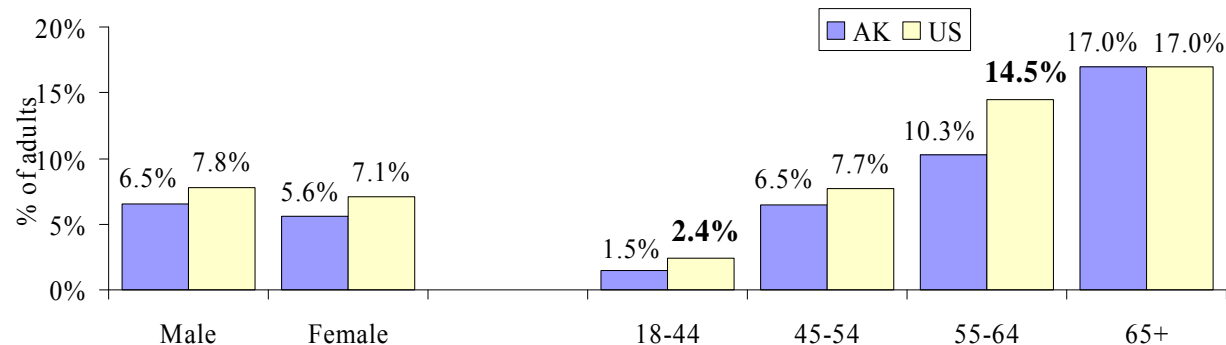
- Increase access to comprehensive biometric screening, especially for vulnerable or high risk populations.
- Increase public awareness of the importance of knowing one's own diabetes status.
- Expand the Alaska diabetes health care services system to address increasing demand, paying particular attention to regions with the greatest increases in diabetes prevalence and to assuring access for high risk or vulnerable populations.

More on Diabetes prevalence in Alaska and the United States

Sex

The percentage of all Alaska women that had diabetes was smaller than this percentage of all Alaska men, which was also true among US adults. The prevalence of diabetes was also significantly lower among Alaska women than US women. (Figure 4)

Figure 4. 2004-2006 Alaska and 2005 US age-adjusted prevalence of diabetes and by sex and observed diabetes prevalence by age group, AK BRFSS and NHIS¹



Note: Percentages in bold indicate a statistically significant difference between AK and US rates.

Age

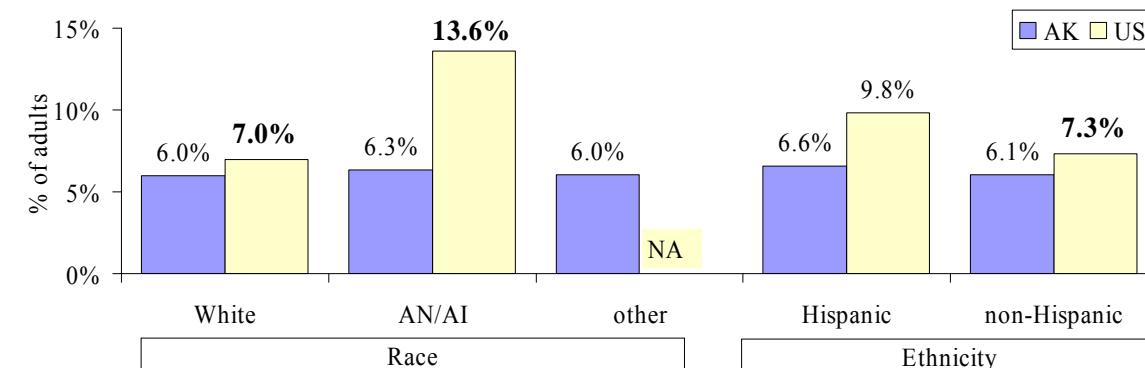
Diabetes is an age-related disease; risk increases dramatically with maturity. Alaska diabetes prevalence was the same as the US prevalence for the 65 or older age group, although it was significantly lower than US percentages in the three 18-64 age groups. (Figure 4)

From 2000-2002 to 2004-2006, there was a statistically significant increase in diabetes prevalence among Alaskans 65 or over (from 11.4% to 17.0%), but not in the younger age groups. (data not shown)

Race and ethnicity

There were no significant differences in diabetes prevalence among Alaskans by race or ethnicity. (Figure 5)

Figure 5. 2004-2006 Alaska and 2005 US age-adjusted prevalence of diabetes by race and ethnicity, AK BRFSS and NHIS²



Notes: a) Percentages in bold indicate a statistically significant difference between the US and AK rates. b) "Other" includes Asian, Pacific Islander and Black/African American; "Hispanic" includes Alaskans of any race.

The AK BRFSS diabetes prevalence among American Indians/Alaska Natives (6.3%) was significantly lower than the age-adjusted 13.6% for US American Indian/Alaska Native percentage from the 2005 National Health Interview Survey (NHIS).² It was higher than the Alaska-specific percentage reported by the Alaska Native Tribal Health Consortium Diabetes Program for 2004 (4.3%).³ (Table 1)

Hispanic Alaskans had a substantially lower prevalence than the 9.8% reported for the US Hispanic population by the 2005 NHIS, although the difference was not statistically significant.²

Diabetes Prevalence in Alaska Native People 1985-2004⁴

Based on case counts from the Alaska Native Medical Center Diabetes Registry, the number of Alaska Native people with diabetes has quintupled from 610 in 1985 to 2,923 in 2004. Cases were ascertained through a computerized medical record system and active reporting by clinicians. Cases were verified by chart review. Denominators came from Indian Health Service estimated populations.

During this period, the age-adjusted prevalence percentage of diabetes among Alaska Natives has increased from 1.7% to 4.3%. Prevalence by geographic region ranged between 2.2/100 to 9.95/100. The prevalence varied between major ethnic groups. (Table 1)

| Table 1. 1985 and 2004 Age-adjusted diabetes prevalence among Alaska Natives by major ethnic group, AK Native Diabetes Registry | | | |
|---|-----------------|-----------------|------------------|
| Major Ethnic Group | Prevalence 1985 | Prevalence 2004 | Percent Increase |
| Eskimo | 1.0% | 3.0% | 213% |
| Indian | 2.4% | 4.9% | 103% |
| Aleut | 3.0% | 7.8% | 159% |
| All Alaska Native | 1.7% | 4.3% | 148% |

In comparison, the prevalence of diabetes all races U.S. for 2004 was 5.1/100.⁵

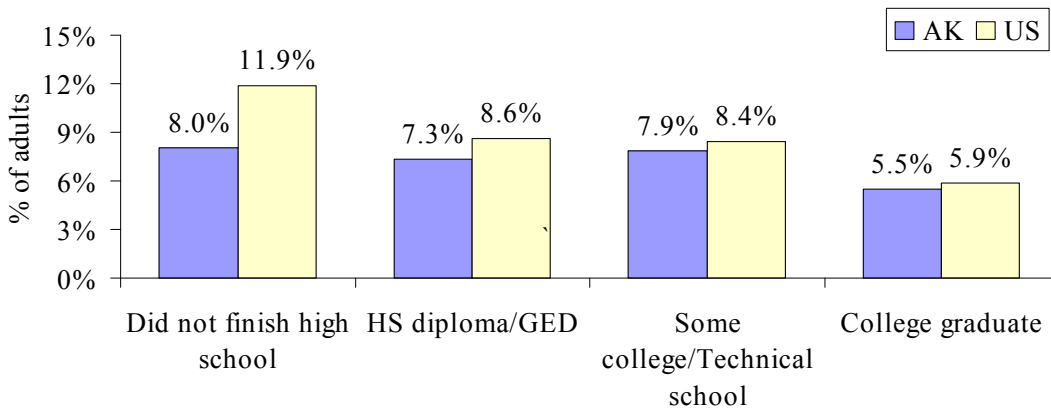
While the prevalence of diabetes among Alaska Native people is less than all races U.S., the percentage increase in diabetes prevalence between 1985 and 2004 was 148%, compared to 79% for U.S. all races.

(Contributed by the AK Native Diabetes Program)

Education

In Alaska, diabetes prevalence did not significantly differ between educational attainment categories. At each level of educational attainment, Alaska and US diabetes prevalence did not differ. (Figure 6)

Figure 6. 2004-2006 Alaska and 2005 US age-adjusted prevalence of diabetes by educational attainment, AK BRFSS and NHIS²

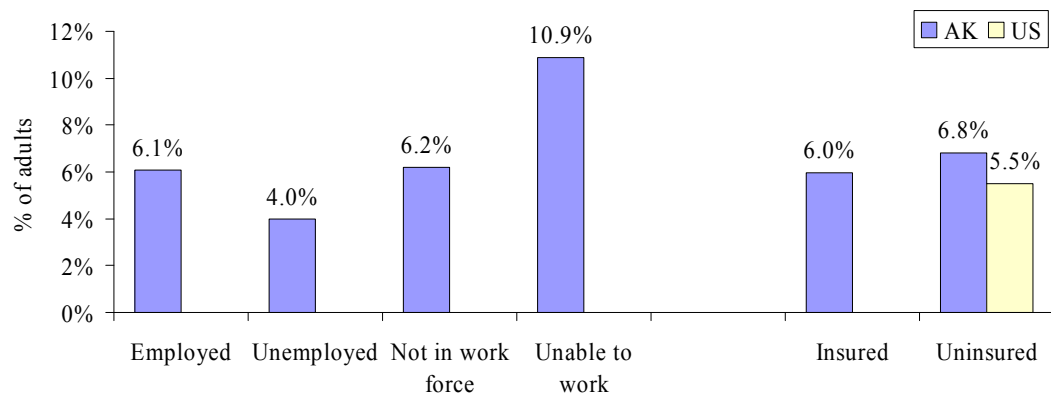


Nationwide, diabetes prevalence was statistically significantly higher for those without a high school diploma or GED than the other categories, and statistically significantly lower among those who were college graduates.

Work status and health insurance

Nearly 11% of Alaskans who were unable to work had diabetes, a significantly higher prevalence percentage than among Alaskans in any other employment category. (Figure 7)

Figure 7. 2004-2006 Alaska and 2005 US age-adjusted diabetes prevalence by workforce status and insurance status, AK BRFSS and NHIS²



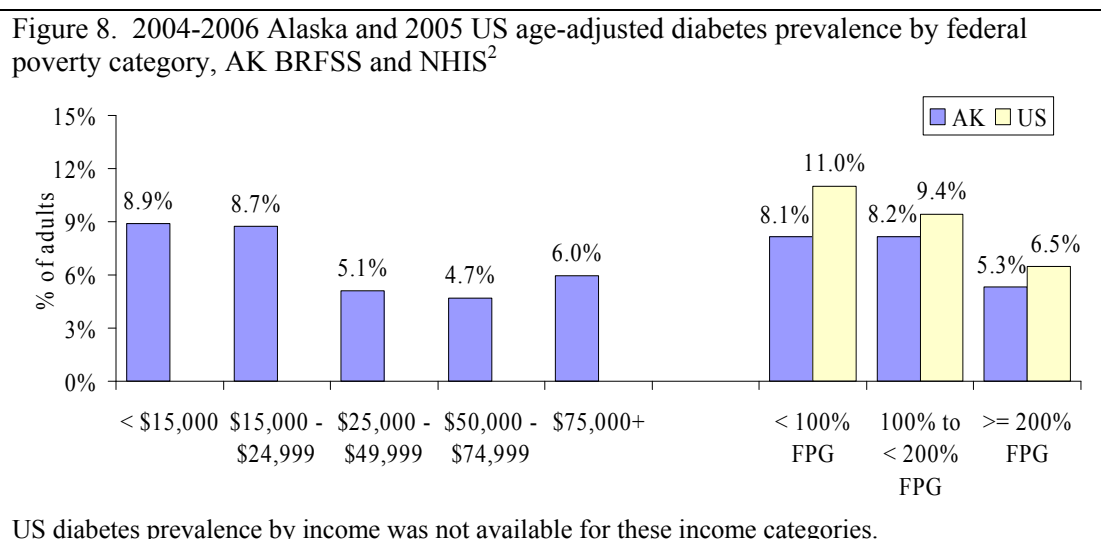
Note: "Not in workforce" includes retired, students and not working outside the home.

The BRFSS question concerning health insurance is: "Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as

Medicare, Native Health Service or Indian Health Service?” The difference in diabetes prevalence between uninsured adults in Alaska and the US was not statistically significant.

Income and poverty status

Diabetes prevalence for Alaskans in the less than \$25,000 income groups was significantly higher than it was for those in the \$25,000 - \$74,999 income groups. About 9% of Alaskans with incomes less than \$15,000 or \$15,000 - \$24,999 had diabetes, while 5% to 6% of Alaskans in the higher income groups had diabetes.



While the income categories reflect an individual’s resources, Federal Poverty Guideline (FPG) categories are based on households; their calculation incorporates the numbers of adults and children in the household and a cost of living adjustment for Alaska. In 2006, the Alaska Federal Poverty Guideline (FPG) was \$12,250 for a one-person household with a \$4,250 increment for each additional household member.⁶

There was a statistically significant association between diabetes prevalence and FPG category for the US, but not Alaska. Diabetes prevalence was lower among those in the above 200% FPG category than for those with less than 200% FPG. Differences between Alaska and US diabetes prevalence by FPG category were not significant. (Figure 8)

Between 1985 and 2004, diabetes prevalence among Alaska Natives increased 148%.

In 2004-2006, Alaska diabetes prevalence was significantly lower than US prevalence among

- Women
- The 18-44 and 55-64 age groups
- American Indians/Alaska Natives

Implications/Discussion

Alaska has a small population and a relatively small percentage of adults with diabetes; these characteristics interfere with identifying statistically significant differences between Alaska and US diabetes prevalence.

- Although they were not statistically significant differences, Alaska percentages were notably lower than US diabetes prevalence in these sub-groups:
 - Hispanics,
 - Less than a high school diploma, and
 - Less than 100% Federal Poverty Guideline.
- A contributor to diabetes prevalence differences among population subgroups could be access to care and/or blood glucose screening.

Diabetes prevalence was negatively correlated with income and educational levels.

- Diabetes prevalence was statistically significantly higher among Alaskans with an annual income less than \$25,000 than those with a higher income, and among Alaskans who were unable to work than those in the other employment categories.

Recommendations

- Work to assure access to biometric screening (including blood tests and height, weight and blood pressure measurement) particularly for high risk population groups that have a lower-than-expected diabetes prevalence percentage, such as Hispanics.
- Investigate the feasibility of interventions designed to keep Alaskans with diabetes in the workforce as one way of supporting/improving their economic status and general well-being.

Describing Alaskans with diabetes

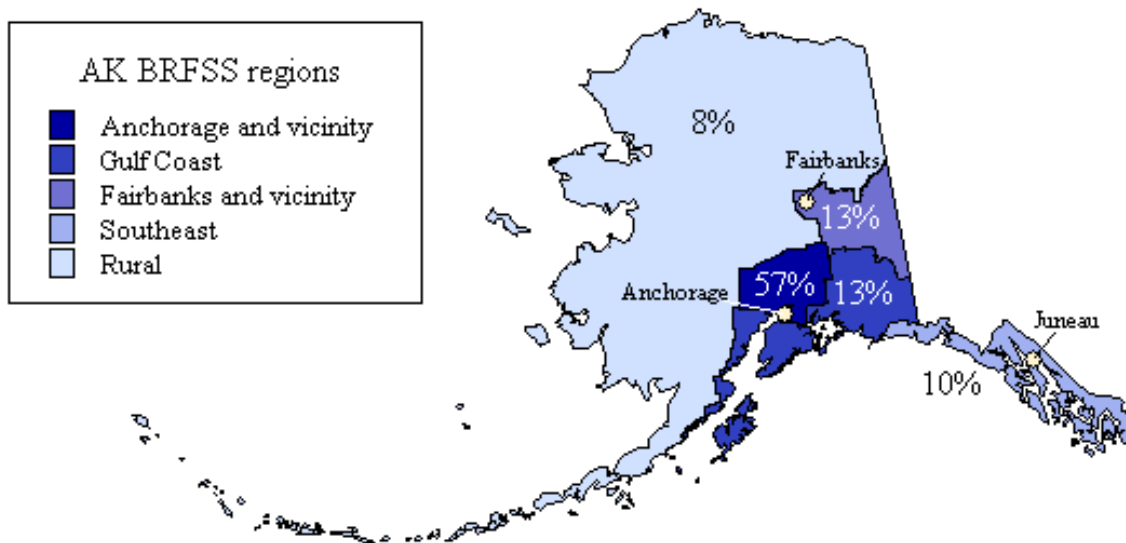
The earlier sections showed how the burden of diabetes was distributed among all Alaskans using percentages of the entire population or sub-population that had diabetes.

This section is about Alaskans who have diabetes. It presents the percentages of Alaskans with diabetes that have various characteristics. Parallel information is often presented for Alaskans without diabetes as one way of showing how Alaskans with diabetes may differ from the general population.

Regional distribution of Alaskans with diabetes

In 2004-2006, 57% of adult Alaskans with diabetes lived in the Anchorage and vicinity AK BRFSS region, which includes the Municipality of Anchorage and the Matanuska-Susitna Borough. (Figure 9)

Figure 9. 2004-2006 Observed distribution of Alaskans among AK BRFSS regions, AK BRFSS

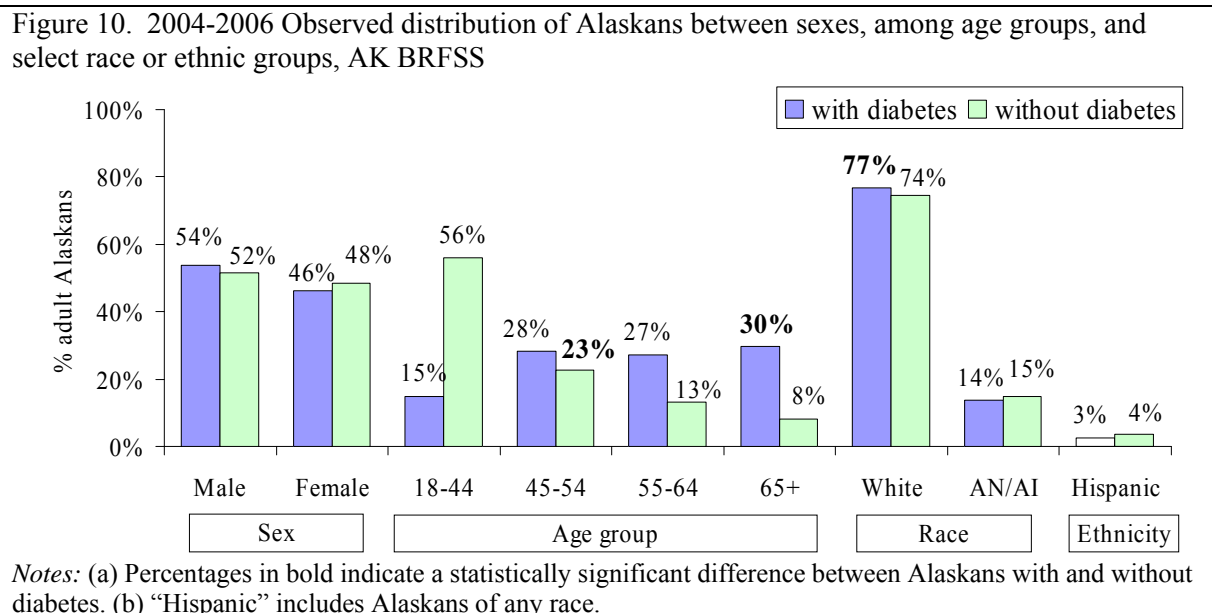


The percentage of Alaskans with diabetes that was Anchorage region residents was slightly larger than this percentage of Alaskans without diabetes. (Table 2)

| Table 2. 2004-2006 Percentages of Alaskans with and without diabetes by AK BRFSS region, AK BRFSS | | | | | |
|---|------------------------|------------------------|------------|-----------|-------|
| | Anchorage and vicinity | Fairbanks and vicinity | Gulf Coast | Southeast | Rural |
| With diabetes | 57% | 13% | 13% | 10% | 8% |
| Without diabetes | 53% | 14% | 12% | 11% | 10% |

Sex, age, race and ethnicity

The age-group distributions of Alaskans with and without diabetes differed significantly; more than half of adult Alaskans with diabetes were between 45 and 64 (55%) as were just over one-third of those without the disease (36%). (Figure 10)



Very similar percentages of Alaskans with and without diabetes were male, female, White, American Indian / Alaska Native (AI/AN) or Hispanic.

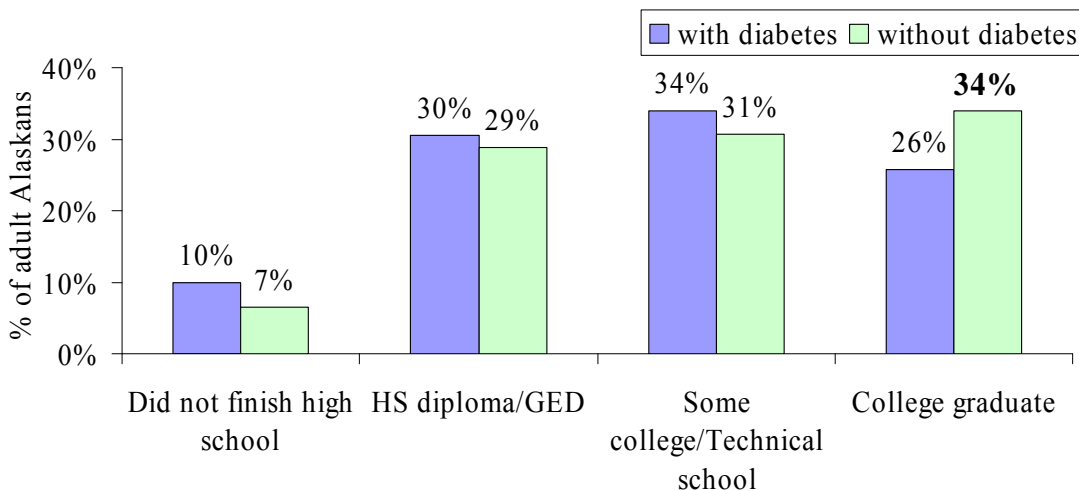
There was a larger range in the percentage of all adults who were seniors (≥ 65) between regions for Alaskans with diabetes than those without. While more than one-third (37%) of the Fairbanks and vicinity regional residents with diabetes were seniors, merely 22% of Gulf Coast residents with diabetes were at least 65 years of age. Among adults without diabetes, the senior percentage ranged from 7% (Southeast and Rural regions) to 10% (Fairbanks and vicinity region). The concentration of Alaskans in the Anchorage and vicinity region meant that at least half of Alaska seniors with and without diabetes lived in this region. (Table 3)

| Table 3. 2004-2006 Percentages of Alaskans (≥ 18) that were seniors (≥ 65) and estimated numbers of seniors by diabetes status and AK BRFSS region, AK BRFSS | | | | | |
|--|------------------------|------------|------------------------|-----------|-------|
| | Anchorage and vicinity | Gulf coast | Fairbanks and vicinity | Southeast | Rural |
| Alaskans with diabetes | | | | | |
| Percent of region adults ≥ 65 | 30% | 22% | 29% | 37% | 30% |
| Estimated number ≥ 65 | 4,190 | 709 | 901 | 926 | 546 |
| Alaskans without diabetes | | | | | |
| Percent of region adults ≥ 65 | 8% | 9% | 7% | 10% | 7% |
| Estimated number ≥ 65 | 18,329 | 4,760 | 4,530 | 5,054 | 3,109 |

Educational attainment

Among Alaskans with diabetes, 40% had a high school diploma/GED or less. The percentage with a college degree (26%) was significantly lower than this percentage among Alaskans without diabetes (34%). (Figure 11)

Figure 11. 2004-2006 Observed distribution of Alaskans among educational attainment categories by diabetes status, AK BRFSS

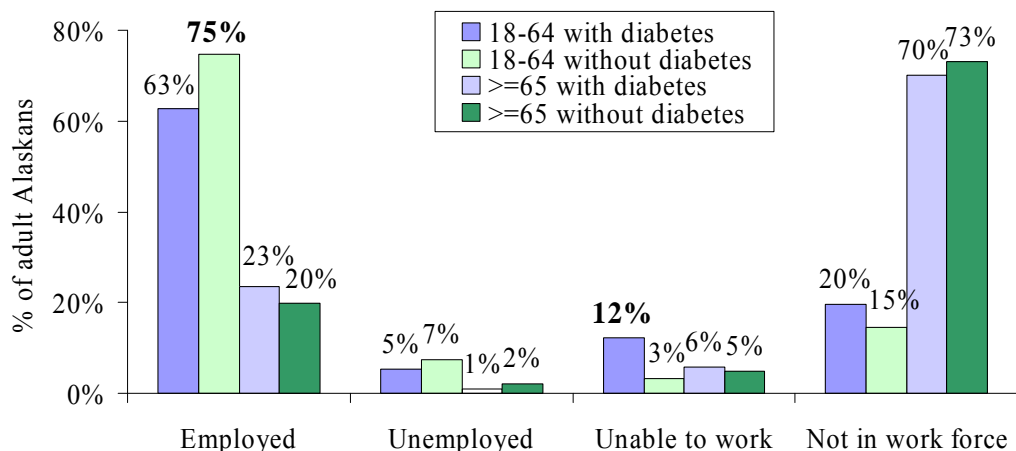


Note: Percentages in bold indicate a statistically significant difference between Alaskans with and without diabetes.

Employment status

In 2004-2006, 10% of Alaskans with diabetes were unable to work, which was more than three times this percentage of Alaskans without diabetes (3%). Working age Alaskans (18-64) with diabetes were significantly less likely to be employed and significantly more likely to be unable to work than those without diabetes. The distribution among the work status categories was similar between Alaskans with and without diabetes in the 65 or over age group. (Figure 12)

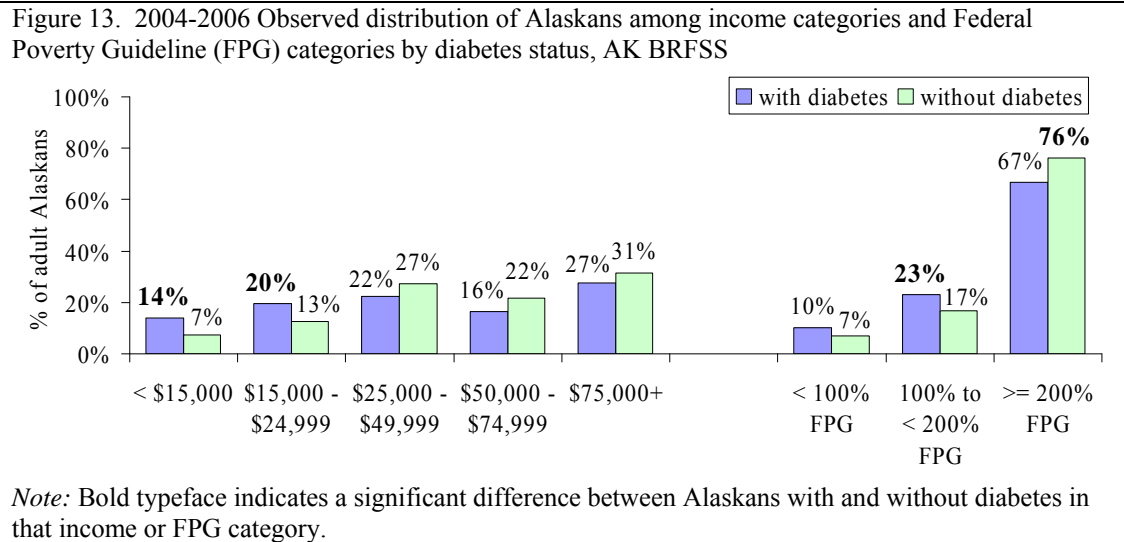
Figure 12. 2004-2006 Observed distribution of Alaskans among workforce status categories by age group and diabetes status, AK BRFSS



Note: Percentages in bold indicates a significant difference between Alaskans with and without diabetes in that age group and employment status category.

Income and poverty

More than one-third (34%) of adult Alaskans with diabetes had an income less than \$25,000. Differences between the percentages of Alaskans with and without diabetes in the under \$25,000 annual income categories were statistically significant. (Figure 13)



One-third (33%) of Alaskans with diabetes lived in a household below the 200% Federal Poverty Guideline (FPG). Differences between the percentages of Alaskans with and without diabetes in the near poverty (100%-200% FPG) and the middle or high income ($\geq 200\%$ FPG) categories were statistically significant.

Food security

The US Department of Agriculture (USDA) developed the food security measure to learn about household access to adequate food. Having food security means that all members of a household have access to enough food at all times for an active, healthy life. Food security includes at a minimum:

- The ready availability of nutritionally adequate and safe foods.
- Assured ability to acquire acceptable foods in socially acceptable ways (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies).⁷

Low food security means that household members do not have constant access to acceptable food obtained in socially acceptable ways. Very low food security means that the food intake of one or more adults was reduced and their eating patterns were disrupted at times during the year because the household lacked money and other resources.

The USDA participates in the annual Current Population Survey to assess state and national food security levels. In 2004-2006, 5.1% of all Alaska households, as did 3.9% of US households had very low food security.⁸

The 2006 BRFSS included food security questions; results indicate that the percentage of Alaskans with diabetes that had very low food security (7%) was nearly twice as big as this percentage of Alaskans without diabetes (4%). Although substantial, this difference was not statistically significant. (Table 4, next page)

Three of the six BRFSS questions used to assess food security may have particular importance for people with diabetes. Alaskans with diabetes were twice as likely to report that they often could not afford to eat a balanced meal as were Alaskans without the disease. Also, while 9% of Alaskans with diabetes reported reducing meal size or skipping meals, only 6% of Alaskans without the disease reported the same thing. Although substantial, these differences were not statistically significant. (Table 4)

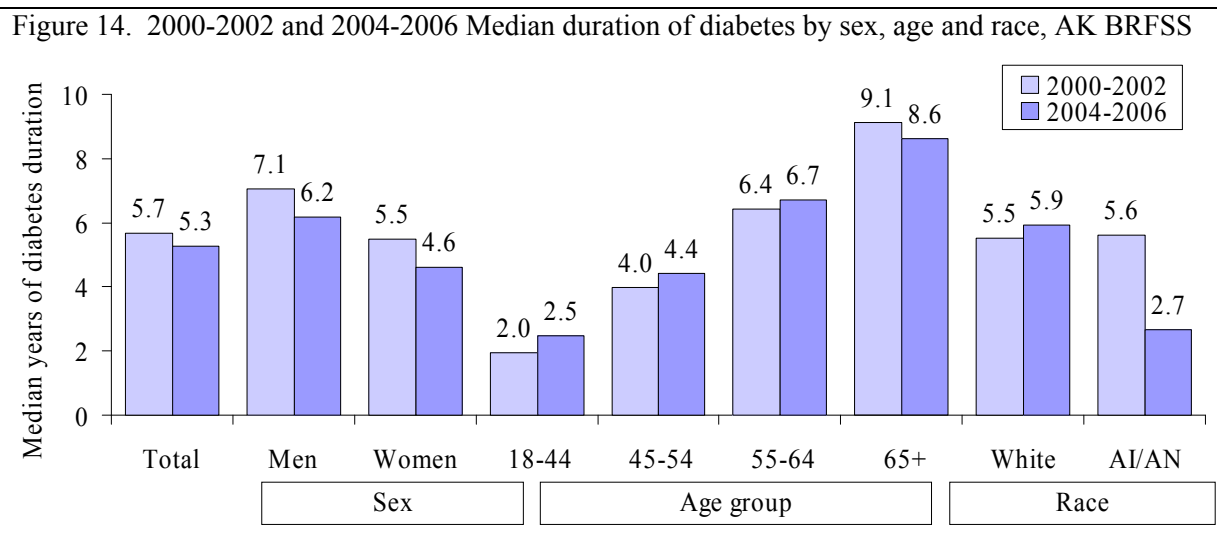
| Table 4. 2006 Observed food insecurity question responses Alaskans by diabetes status, AK BRFSS | | |
|---|---------------|------------------|
| | With diabetes | Without diabetes |
| Food security category | | |
| Food secure | 85% | 89% |
| Low food security | 8% | 7% |
| Very low food security | 7% | 4% |
| BRFSS question (<i>selected response</i>) | | |
| “(I/we) couldn’t afford to eat balanced meals” Was that often, sometimes or never true for (you/your household) in the last 12 months? (<i>Often</i>) | 7% | 3% |
| In the last 12 months, did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn’t enough money for food? (<i>Yes</i>) | 9% | 6% |
| In the last 12 months, were you ever hungry but didn’t eat because you couldn’t afford enough food? (<i>Yes</i>) | 4% | 5% |

Diabetes duration

Between 2000-2002 and 2004-2006, the percentage of Alaskans with diabetes that had been diagnosed within the previous two years increased from 24% to 29% while the percentage that had been diagnosed more than 20 years previously diminished by a similar percentage (17% to 13%).[†] (Data not shown)

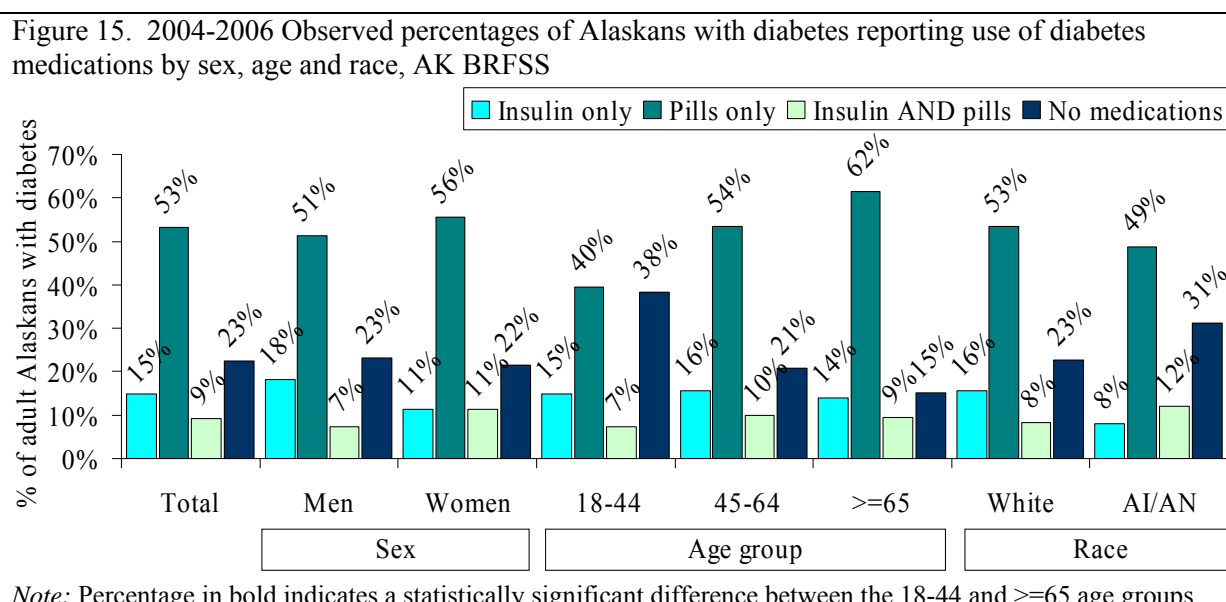
[†] Diabetes duration is calculated by subtracting self-reported age at diagnosis from current age.

Among Alaskans with diabetes, the 2004-2006 median years since diagnosis was slightly, but not significantly, lower than in 2000-2002.[‡] Although 2004-2006 median among American Indian / Alaska Natives (AI/AN) was half of the 2000-2002 median, this difference was not significant. (Figure 14)



Diabetes medications

Just over three-fourths (78%, observed percent) of Alaskans with diabetes reported taking insulin and/or pills for their diabetes. This is a lower percentage than the 84% reported by US adults in 2005. (Figure 15)



[‡] The median years of diabetes duration is used because it is less influenced by extreme values than the mean; instead, it emphasizes change in the middle values. Example: between 1997 and 2005, the mean duration of disease did not change in the US (10.8 and 11.0 years in 1997 and 2005 respectively), but the median diminished from 7.1 to 6.3 years. [<http://www.cdc.gov/diabetes/statistics/duration/fig2.htm> (printed 7/15/08)]

In 2004-2006, 38% of Alaskans with diabetes in the 18-44 age group reported taking *no* diabetes medication, which was significantly larger than the 15% reported by those ≥ 65 .

The number of individuals with diabetes that take medications for their disease is influenced by a number of factors including population composition, access to affordable medicines, and diabetes-related health care recommendations.

Between 2000-2002 and 2004-2006, the estimated number of Alaskans with diabetes increased by 48%. For men, American Indian/Alaska Natives and the 18-44 age group, a smaller proportion were taking diabetes medications in 2004-2006 than in 2000-2002, but the estimated total numbers of Alaskans in these sub-groups had increased so much that the number taking any diabetes medication had increased. The smallest numeric increases were among women and American Indians/Alaska Natives. (Table 5)

| Table 5. 2000-2002 and 2004-2006 Estimated number of Alaskans with diabetes, observed percentages and estimated numbers of Alaskans (AK BRFSS) and US adults (NHIS 2001 and 2005 ⁹) taking any diabetes medication, and change in these percentages and numbers | | | | | | |
|---|-------------|-----------|----------|-------------------|-----------|----------|
| | Percentages | | | Estimated numbers | | |
| | 2000-2002 | 2004-2006 | % change | 2000-2002 | 2004-2006 | % change |
| Alaskans with diabetes | | | | 16,631 | 24,555 | 47.6% |
| Alaskans with diabetes who were taking any diabetes medication | | | | | | |
| Men | 79% | 77% | -3.2% | 6,241 | 10,164 | 62.9% |
| Women | 76% | 78% | 3.6% | 6,632 | 8,848 | 33.4% |
| 18-44 | 66% | 62% | -6.4% | 1,775 | 2,655 | 49.5% |
| 45-64 | 78% | 79% | 1.8% | 7,440 | 10,637 | 43.0% |
| ≥ 65 | 83% | 85% | 1.8% | 3,559 | 5,650 | 58.8% |
| White | 75% | 77% | 3.6% | 9,273 | 14,193 | 53.1% |
| AI/AN | 78% | 69% | -11.6% | 2,044 | 2,247 | 10.0% |
| Total | 77% | 78% | 0.1% | 12,872 | 19,003 | 47.6% |
| US adults with diabetes who were taking any diabetes medication | | | | | | |
| US | 84.9% | 84.4% | -0.6% | 10,800 | 13,600 | 25.9% |
| <i>Note:</i> The estimated number of US adults taking any diabetes medications is in thousands. | | | | | | |

Between 2001 and 2005, the percentage of US adults with diabetes who were taking any diabetes medication changed minimally, while the estimated number increased by 26%.

In 2004-2006, among Alaskans with diabetes:

- 55% were in the 45 – 64 age group.
- 73% were White.
- 49% had a high school diploma or less; 26% had a college degree.
- 10% were unable to work.
- 33% lived in a household with an income less than 200% of the Federal Poverty Guideline.
- 7% reported that they had often been unable to afford to eat balanced meals during previous year.
- 29% had received their diabetes diagnosis within the previous two years.
- 78% were taking oral diabetes medication or insulin to help control their disease.

Implications/Discussion

This group description of Alaskans with diabetes suggests that they are more likely to be economically distressed than other Alaskans. These vulnerable individuals may have limited resources for following diabetes self-care recommendations.

The increasing percentage of Alaskans with diabetes that was recently diagnosed presents an opportunity. Alaskans with a diabetes diagnosis in the previous two years may:

- Have better access to diabetes self-management education than other Alaskans with diabetes, since many insurance plans limit coverage for this service to individuals who have been recently diagnosed.
- Be more open to changing their lifestyle to incorporate diabetes self-management and healthy behaviors than Alaskans who have more experience with the disease.
- Be in a better position to avoid developing diabetes complications than Alaskans who have had diabetes longer.

In 2006, the American Diabetes Association and the European Society for the Study of Diabetes issued a consensus statement that presented a treatment algorithm including Metformin and other therapeutic measures for controlling blood sugar levels in people with diabetes.¹⁰ This recommendation should influence the percentage of Alaskans with diabetes that has at least one diabetes medication prescription. It may also increase the number of Alaskans with diabetes that needs assistance in obtaining affordable medications.

Recommendations

Work with advocates and safety-net health care providers to monitor and improve:

- Access to affordable diabetes medications, and
- The percentage of Alaskans with diabetes that takes their medications as recommended.

Educational efforts should:

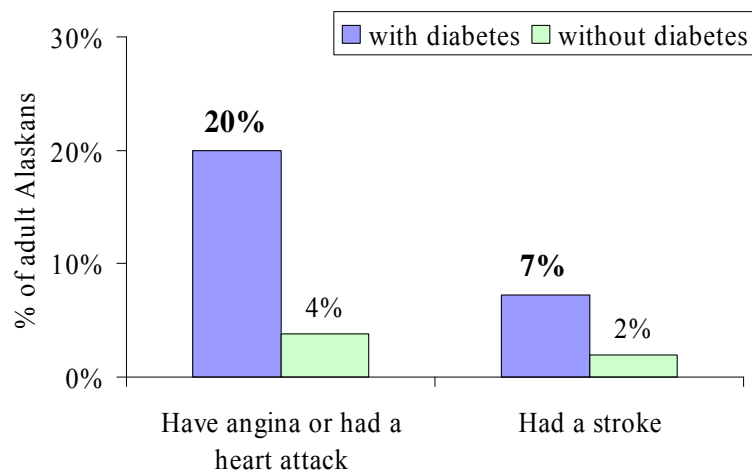
- Feature messages that use simple, straight-forward language and a variety of media,
- Consider messages directed specifically toward Alaskans with diabetes based on their duration of disease (e.g. diagnosed in past 2 years, diagnosed 2 - 4 years ago, diagnosed 5 or more years ago), and
- Consider separate strategies for different age groups and social roles (e.g., young adults (18-44) might need a different communications approach than elders (≥ 65) or family members).

Diabetes complications or co-morbidities

Cardiovascular disease

Among Alaskans with cardiovascular disease (i.e., have diagnosed angina/coronary heart disease or had a diagnosed heart attack), 23% also had diabetes. Among those who reported having had a stroke, 18% had diabetes.

Figure 16. 2005-2006 Observed percentage with heart disease or stroke among Alaskans by diabetes status, AK BRFSS



Note: Percentages in bold indicate a statistically significant difference between Alaskans with and without diabetes.

Among Alaskans with diabetes, 20% of Alaskans had cardiovascular disease and 7% had had a stroke. These percentages are substantially and statistically significantly higher than the percentages of Alaskans without diabetes.

Information from the 2004-2006 Alaska Hospital Inpatient Discharge Database (AHIDD) shows that Alaskan discharges of all ages with a diabetes diagnosis were significantly more likely to have a primary diagnosis of major heart disease[§] or ischemic heart disease^{**} than discharges without a diabetes diagnosis. The association between discharges with diagnoses of diabetes and stroke^{††} was less consistent. (Table 6)

Table 6. 2004-2006 Percentages with major heart disease, ischemic heart disease or stroke as the first-listed diagnosis of Alaska hospital discharges with and without diabetes as any diagnosis by age group, AHIDD

| Age group | Major cardiovascular disease | | Ischemic heart disease | | Stroke | |
|-----------|------------------------------|------------------|------------------------|------------------|---------------|------------------|
| | With diabetes | Without diabetes | With diabetes | Without diabetes | With diabetes | Without diabetes |
| 0-44 | 7.1% | 1.3% | 3.0% | 0.2% | 0.7% | 0.2% |
| 45-64 | 23.4% | 16.0% | 10.4% | 7.3% | 2.8% | 1.7% |
| 65-74 | 29.7% | 24.0% | 10.7% | 8.8% | 4.2% | 3.7% |
| 75+ | 29.0% | 24.9% | 7.2% | 5.9% | 4.2% | 4.4% |

Note: **Bold** type indicates a statistically significant difference between discharges with and without diabetes.

[§] Major heart disease ICD-9 codes include 390-434.91 and 436-448: rheumatic fever and heart disease, hypertensive disease, ischemic heart disease, diseases of pulmonary circulation, cerebrovascular disease (excluding transient cerebral ischemia), and diseases of the arteries, arterioles and capillaries.

^{**} Ischemic heart disease ICD-9 codes include 410-414 and 429.2.

^{††} Stroke ICD 9 codes include 430-434.91 and 436-438.9_.

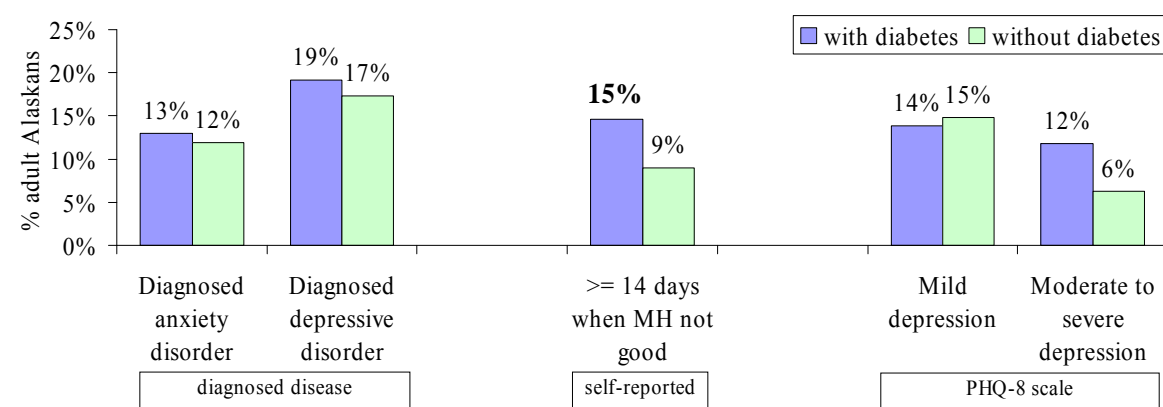
The hospital discharge rates per 10,000 general population for diabetes and cardiovascular disease were substantially higher than they were in 2002-2004, and than comparable 2003 US rates from the National Hospital Discharge Survey (NHDS). (Table 7)

| Table 7. Alaska 2004-2006 and 2002-2004 and US 2003 Age-adjusted hospital discharge rates per 10,000 general population for a diabetes diagnosis and major cardiovascular disease, heart disease or stroke, AHIDD and NHDS ¹¹ | | | |
|--|--------------|--------------|---------|
| Discharge category | AK 2004-2006 | AK 2002-2004 | US 2003 |
| Major cardiovascular disease | 96.3 | 25.1 | 50.6 |
| Ischemic heart disease | 32.5 | 9.8 | 18.6 |
| Stroke | 13.1 | 3.6 | 6.4 |

Depression

The 2006 AK BRFSS included questions on diagnosed depression and anxiety, and on the number of days when mental health was not good. There were no differences between the proportions of Alaskans with and without diabetes who reported having had diagnosed anxiety disorders or depressive disorders. (Figure 17)

Figure 17. 2004-2006 Observed percentages of Alaskans reporting at least 14 days in the previous 30 when their mental health was not good, that they had a diagnosed anxiety disorder or that they had a diagnosed depressive disorder by diabetes status, AK BRFSS



Notes: a) Percentage in bold indicates a statistically significant difference between Alaskans with and without diabetes. b) The anxiety and depression disorder questions were asked only in 2006.

In 2004-2006, Alaskans with diabetes were significantly more likely to have reported at least 14 days in the previous 30 when their mental health was not good.

The 2006 AK BRFSS also included the Patient Health Questionnaire-8, which is a depression screening tool.¹² Although the percentage of Alaskans with diabetes that was moderately to severely depressed based on this tool was noticeably higher than this percentage of Alaskans without diabetes, the difference was not statistically significant.

Eye disease

One-third (32%) of adult Alaskans with diabetes reported that they had vision problems in the 1999 Alaska State Diabetes Survey (ASDS), including 10% with retinopathy. More recently (2004-2006 AK BRFSS), 26% of Alaskans with diabetes said they had been told that diabetes had affected their vision or that they had retinopathy.

Concurring with a possible trend in Alaska, National Health Interview Survey (NHIS) results suggest that diabetes-related vision damage is decreasing among Americans with diabetes, from 23.7% in 1997 to 19.1% in 2003.¹³

Kidney disease

In 1999, 10% of Alaska adults with diabetes reported that they had diagnosed diabetic nephropathy in the AK State Diabetes Survey. About one-tenth of the Alaskans with diabetes and nephropathy were undergoing dialysis or had received a kidney transplant.

Diabetes is the most common cause of end-stage renal disease (ESRD) in Alaska, accounting for nearly half (49%) of the new cases of ESRD and 43% of the ongoing cases among Alaskans on dialysis in 2004-2006.¹⁴ Nationwide, diabetes accounted for 42% of all new ESRD cases and 42% of all prevalent cases in the US in 2004.¹⁵

Between 2000-2002 and 2004-2006, the number of new ESRD cases among Alaskans with diabetes increased 23%, while the number of ongoing cases increased 29%. (Table 8)

| Table 8. 2000-2002 and 2004-2006 average number of new and ongoing cases and percentage change in End-Stage Renal Disease among Alaskans with diabetes, Northwest Renal Network | | | |
|---|-----------|-----------|----------|
| | 2000-2002 | 2004-2006 | % change |
| New (incident) cases | 39.7 | 48.7 | 23% |
| Ongoing (prevalent) cases | 103.0 | 132.7 | 29% |

Lower extremity disease

In 1999, 40% of Alaskans with diabetes reported having current nerve damage symptoms. In 2004-2006, 11% said they had ever had sores or irritations that took four or more weeks to heal. (Table 9)

| Table 9. 1999 and 2004-2006 Age-adjusted percentages with lower extremity disease indicators among Alaska adults with diabetes, ASDS and AK BRFSS | | |
|---|-----------|-----------|
| | 1999 | 2004-2006 |
| Do you currently have burning or tingling in your hands or feet? | 40% | Not asked |
| Has a doctor or health care provider ever told you you have nerve damage? | 23% | |
| Have you ever had any sores or irritations on your feet that took more than 4 weeks to heal? | Not asked | 11% |
| Have you ever had to have a leg, foot or toe amputated? | 2% | Not asked |

In the US, 11.8% of adults with diabetes reported that they had ever had foot sores that hadn't healed in 2000-2002.¹⁶

Although 11.0% of all Alaska hospital discharges for 2004-2006 had diabetes as any diagnosis, a diabetes diagnosis was associated with 51.7% of hospital discharges for any lower extremity condition, 45.6% of the peripheral arterial disease discharges, and 89.0% of the neuropathy discharges.

Diabetes status-specific hospital discharge rates per 1,000 population for these diagnosis groups were substantially higher for discharges with diabetes as a secondary diagnosis than for those with no mention of diabetes. (Table 10)

| Table 10. 2004-2006 Age-adjusted hospital rates per 10,000 adult population for discharges with neuropathy, peripheral arterial disease, foot ulcer or lower extremity amputation by presence or absence of a diabetes diagnosis, AHIDD | | |
|--|-------------------------|----------------------------|
| | With diabetes diagnosis | Without diabetes diagnosis |
| Neuropathy ICD-9 codes: 337.1, 357.2, 355, 358.1, 713.5, 094.0, 250.6 | 20.53 | .13 |
| Peripheral Arterial Disease ICD-9 codes: 250.7, 440.2, 442.3, 443.8-443.9, 444.2 | 7.13 | .67 |
| First-listed diagnosis of ulcer-inflammation-infection ICD-9 codes: 454-454.99, 707.1-707.99, 680.6-680.79, 681.1-681.19, 682.6-682.79, 711.05-711.07, 730.05-730.07, 730.15-730.17, 730.25-730.27, 730.35-730.37, 730.85-730.87, 730.95-730.97, 785.4-785.49 | 3.95 | .41 |
| Non-traumatic lower extremity amputation ICD-9 procedure codes: 8410-8419 | 2.16 | .05 |
| <i>Note:</i> Bold type indicates a statistically significant difference between discharge rates with and without diabetes diagnosis. | | |

Among Alaskans with diabetes:

- In 2004-2006, 20% reported having diagnosed heart disease, and 7% had had a stroke.
- In 2002-2004, 26% reported having vision that had been affected by their diabetes.
- In 2006, 19% had diagnosed depression.

Implications/Discussion

Risk for diabetes complications increases in frequency and severity with diabetes duration. Many Alaskans with diabetes were diagnosed relatively recently, which may have moderated the current impact of diabetes complications in Alaska.

The impact of diabetes complications in Alaska could inflate in the future. More than half of Alaskans with diabetes were in the 45-54 and 55-64 age groups; these individuals will live with diabetes for the rest of their lives, increasing the likelihood that they will develop a diabetes complication. Their youth could enhance the potential for preventing or delaying diabetes complications, however, if it eased adoption of healthy habits and recommended self-care measures among Alaskans with diabetes.

Recommendations

Work to reduce the frequency and severity of diabetes complications is imperative. This work should focus on:

- Assuring access to health care and diabetes self-management supplies for Alaskans with diabetes,
- Assuring that all health care providers consistently follow the preventive health care recommendations for people with diabetes,
- Providing effective diabetes self-management training and support for Alaskans with diabetes and their families, and
- Supporting healthy behaviors for all Alaskans.

Diabetes-related risks

Factors that increase risk of developing diabetes

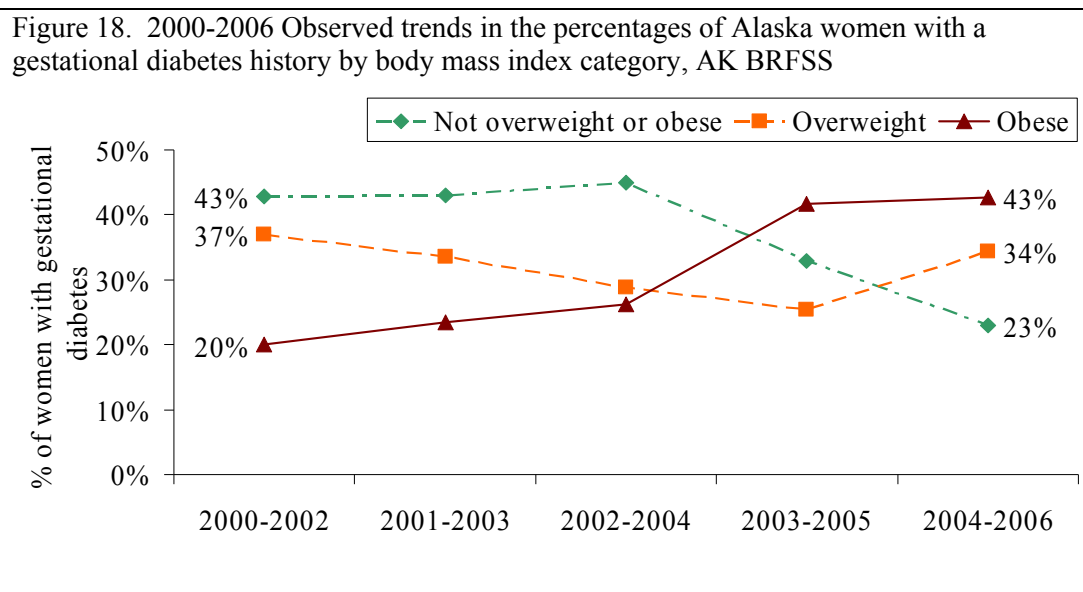
- Prediabetes

Four percent (4.4%) of Alaskans said they had been diagnosed with prediabetes. The percentages with prediabetes were similar between Alaska men (4.2%) and women (4.6%) and between Alaska Whites (3.9%) and American Indian/Alaska Natives (4.6%). Only 1.0% of Hispanics said they had diagnosed prediabetes. There were substantial differences between age groups, with 11.3% of Alaskans 55-64 having prediabetes but only 3.1%-3.3% of Alaskans in the 18-44, 45-54 and 65 or over age groups having this diagnosis.

These results were substantially lower than the 26% of US adults that were found to have impaired fasting glucose by the National Health and Nutrition Examination Survey (NHANES) in 2000-2002.¹⁷ The NHANES methodology involves biometric testing, which means that its results are more accurate than self-reported responses. Although the AK BRFSS data are Alaska-specific, they were self-reported, which may have generated a lower percentage than the NHANES data.

- History of Gestational Diabetes

AK BRFSS results indicate that from 2000-2002 to 2004-2006 obesity was increasingly common among Alaska women who did not have diabetes but did have a history of gestational diabetes.^{##} Among Alaska women with a history of gestational diabetes, the 2000-2002 proportion that were normal weight (43%) was twice the proportion who were obese (20%). By 2004-2006, these results were reversed; the proportion that was obese (43%) was twice the proportion that was normal weight (23%). (Figure 18)



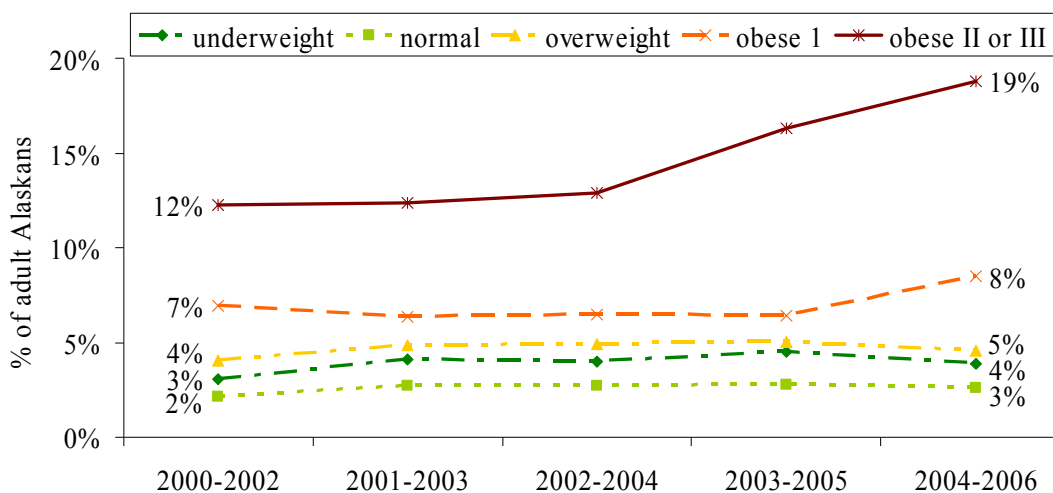
^{##} BRFSS respondents with a history of gestational diabetes are a mutually exclusive group from the respondents with diagnosed diabetes. This discussion only reflects the group of women who said they had gestational diabetes associated with a pregnancy that happened at some time before they were interviewed and did not have diabetes at the time of the interview.

Factors that increase risk of developing diabetes and diabetes complications

- Overweight and obesity

The prevalence of diabetes among Alaskans with a body mass index in the obese II or III category (e.g., BMI greater or equal to 35) is much higher than diabetes prevalence among Alaskans in the normal weight category (BMI between 18.5 and 25), and has increased more substantially than in any other BMI category. In 2004-2006, 19% of Alaskans in the BMI ≥ 35 category had diabetes. (Figure 19)

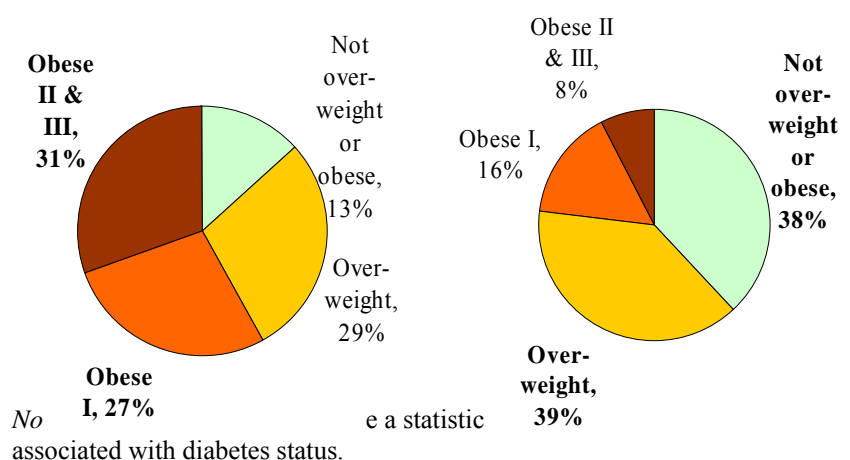
Figure 19. 2000-2006 Age-adjusted trends in the prevalence of diabetes among Alaskans by body mass index category, AK BRFSS



Note: Underweight = BMI < 18.5; normal weight = BMI 18.5 to < 25; overweight = BMI 25 to < 30; Obese category I = BMI 30 to < 35; Obese categories II and III = BMI ≥ 35

In 2004-2006, there were statistically significant differences throughout the distribution of Alaskans with and without diabetes among the BMI categories. Nine of ten (87%) of Alaskans with diabetes were obese or overweight, as were less than two-thirds (62%) of Alaskans without diabetes.

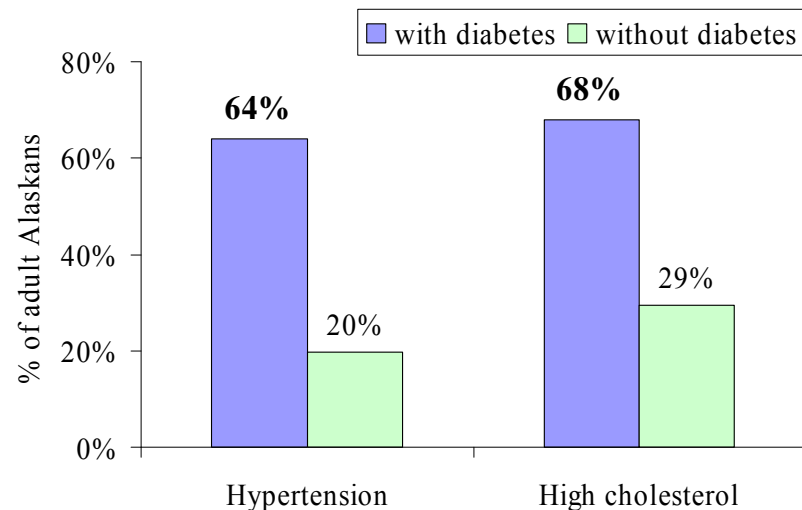
Figure 20. 2004-2006 Observed distribution of Alaskans among body mass index categories by diabetes status, AK BRFSS



- Hypertension and high cholesterol

Diabetes prevalence among Alaskans with hypertension was 15% and 14% among Alaskans with high cholesterol.

Figure 21. 2003 and 2005 Observed percentages of Alaskans reporting that they had ever been told they had high blood pressure or high cholesterol, AK BRFSS



Note: Percentages in bold indicate a significantly higher percentage for Alaskans with diabetes.

Among Alaskans with diabetes, 64% had high blood pressure and 68% had high cholesterol. These percentages were significantly higher than the percentages among Alaskans without diabetes.

Among adults with diabetes, the age-adjusted percentages with high blood pressure or with high cholesterol did not differ significantly between Alaska in 2003-2005 and the US in 2003.

Behaviors that affect diabetes-related health risks

Hypertension, high cholesterol, gestational diabetes, prediabetes, and overweight or obesity is each associated with an increased risk of developing diabetes. In turn, certain behaviors influence their prevalence, including diet, exercise, tobacco use and alcohol consumption.

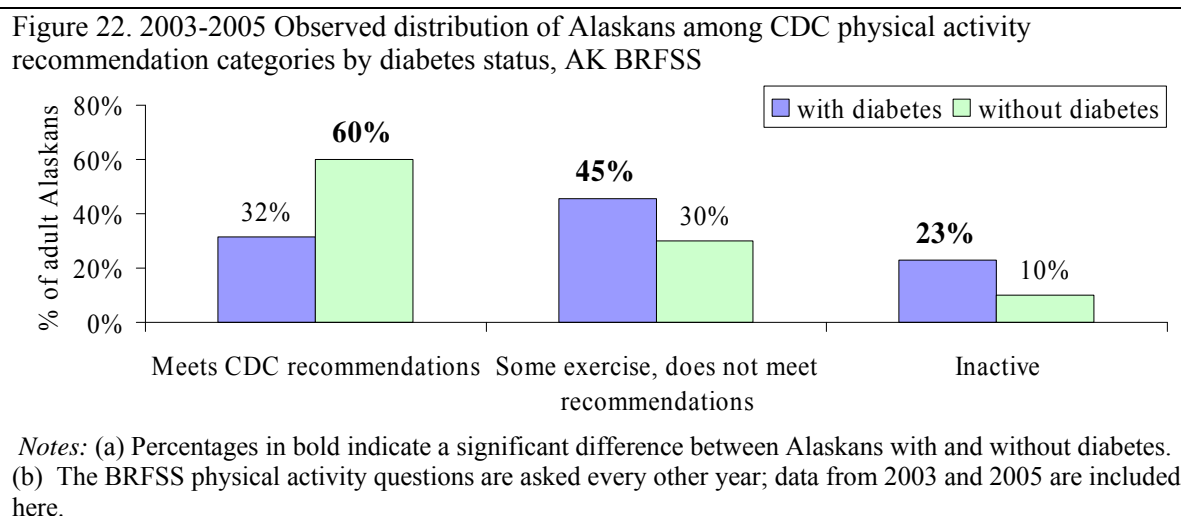
Alaskans with and without diabetes reported similar fruit and vegetable consumption patterns. On average between 2003 and 2005, 26% of Alaskans with diabetes and 23% of those without diabetes reported that they consumed five or more servings of fruit or vegetables.

In 2004-2006, diabetes prevalence was twice as common among Alaskans who said they had not exercised in their leisure time (8%) as among Alaskans who had exercised (4%). This difference was statistically significant. (Data not shown) The age-adjusted percentage of non-exercisers among adults with diabetes was lower in Alaska in 2004-2006 (27%) than in the US in 2004 (37%)¹⁸, but the difference was not significant.

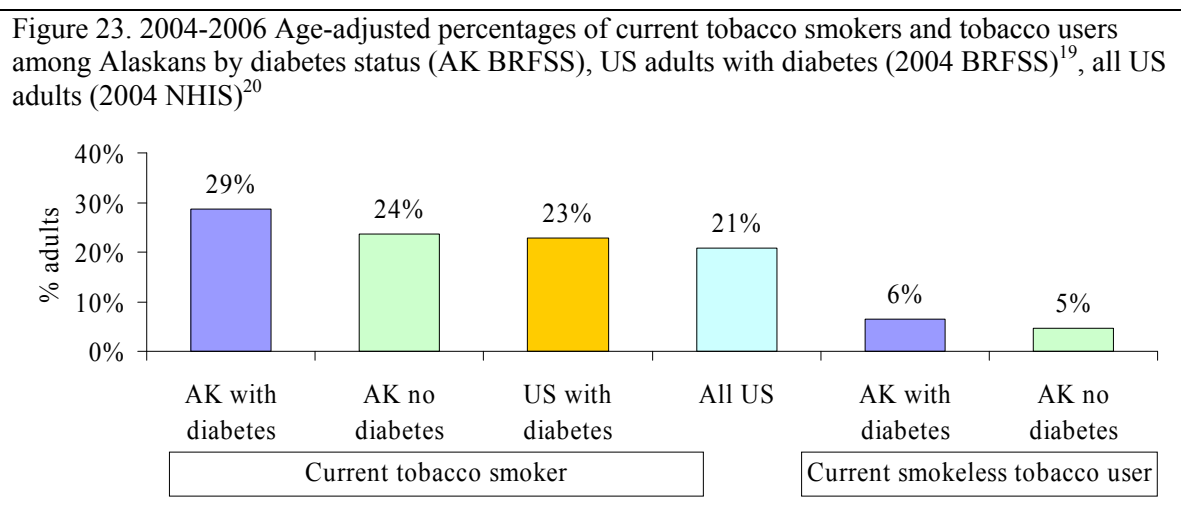
Leisure time exercise does not incorporate work-related physical activity. A different BRFSS measure corresponds to physical activity recommendations by the Centers for Disease Control and Prevention (CDC), which are not limited to leisure time. The CDC recommends that adults either undertake vigorous physical activity for at least 20 minutes a day on at least three days a

week and/or moderate physical activity for at least 30 minutes a day on at least five days a week.^{§§}

In 2003-2005, diabetes prevalence among Alaskans who were physically inactive (10%) was five times the rate among those who met the CDC recommendations (2%). During this period, only 32% of Alaskans with diabetes met the CDC recommendations, compared with nearly 60% of Alaskans without diabetes. (Figure 22)



Current tobacco use did not differ significantly by diabetes status in Alaska; the percentages of current smokers among adults with diabetes in Alaska and the US were also similar.^{19,20} (Figure 23)



^{§§} In October 2008, the CDC changed the emphasis of their physical activity recommendation. Now, the objective is to increase the percentage of Americans that are physically active at least 150 minutes/week.

Among Alaskans with diabetes, the percentages of former smokers (37%) and never smokers (43%) were significantly different than these percentages among Alaskans without diabetes. (Table 11)

| Table 11. 2004-2006 Observed cigarette smoking status by diabetes status, AK BRFSS | | |
|--|---------------|------------------|
| | With diabetes | Without diabetes |
| Current smoker | 20% | 25% |
| Former smoker | 37% | 25% |
| Never smoked | 43% | 50% |
| Bold typeface indicates a significant difference associated with diabetes status. | | |

The BRFSS collects information on alcohol consumption using sex-specific measures. (Table 12)

| Table 12. BRFSS alcohol consumption definitions by sex | | |
|--|--------------------------------------|--------------------------------------|
| | Men | Women |
| Heavy drinking | At least two drinks per day | At least one drink per day |
| Binge drinking | At least five drinks on one occasion | At least four drinks on one occasion |

The age-adjusted percentage of Alaskans with diabetes with a binge drinking risk (12%) was substantially lower than for Alaskans without diabetes (17%). Although the percentage with a heavy drinking risk was also lower among Alaskans with diabetes (2%) than without (5%), neither difference was statistically significant. (Data not shown)

Conditions that might affect behavior

Having asthma or arthritis may present an additional barrier to some health behaviors, such as exercise. Although these diseases do not have a known physiological relationship with diabetes, they share some risk factors.

In 2004-2006, 8% of Alaskans with diagnosed asthma also had diabetes but 18% of Alaskans with diabetes also had asthma. (Data not shown)

In 2003-2005, 10% Alaskans with diagnosed arthritis also had diabetes, but 51% of Alaskans with diabetes also had diagnosed arthritis. (Data not shown)

In 2004-2006:

- 11% of Alaskans in the 55-64 age range had prediabetes, which put them at very high risk of developing diabetes and heart disease. Another 10% of this age group already had diabetes.
- The percentage of obese Alaska women who have a history of gestational diabetes doubled between 2000-2002 and 2004-2006.
- 64% of Alaskans with diabetes had high blood pressure
- 68% of Alaskans with diabetes had high cholesterol
- 9.6% of obese Alaskans had diabetes; 56% of Alaskans with diabetes were obese.
- 23% of Alaskans with diabetes were physically inactive.
- 20% of Alaskans with diabetes were current tobacco smokers.
- 18% Alaskans with diabetes also had diagnosed asthma.
- 51% of Alaskans with diabetes also had diagnosed arthritis.

Implications/Discussion

The AK BRFSS diabetes, prediabetes and gestational diabetes results are interdependent because they were generated from the same question. The BMI trend among Alaska women with a history of gestational diabetes may reflect a combination of increasing trends in diabetes prevalence and obesity.

The percentages of Alaskans with prediabetes or diabetes are very similar in the 55-64 age group (21.6%) and the 65 or over age group (20.3%), but prediabetes is more common in the 55-64 age group while diabetes is more common for those 65 or over.

The AK BRFSS screening questions about high blood pressure and high cholesterol ask about ever having received the diagnosis. In 2003 and 2005, when the data presented here were collected, the BRFSS did not include questions about the degree to which these conditions were under control.

Behaviors such as tobacco use, alcohol abuse, and exercise frequency are associated with socioeconomic status. Differences in these behaviors between Alaskans with and without diabetes could reflect differences in socio-economic status between the two groups. The increased percentage of former tobacco smokers among Alaskans with diabetes could also correspond to an enhanced awareness of the personal health risk associated with continued tobacco use among Alaskans with diabetes and/or other factors.

Recommendations

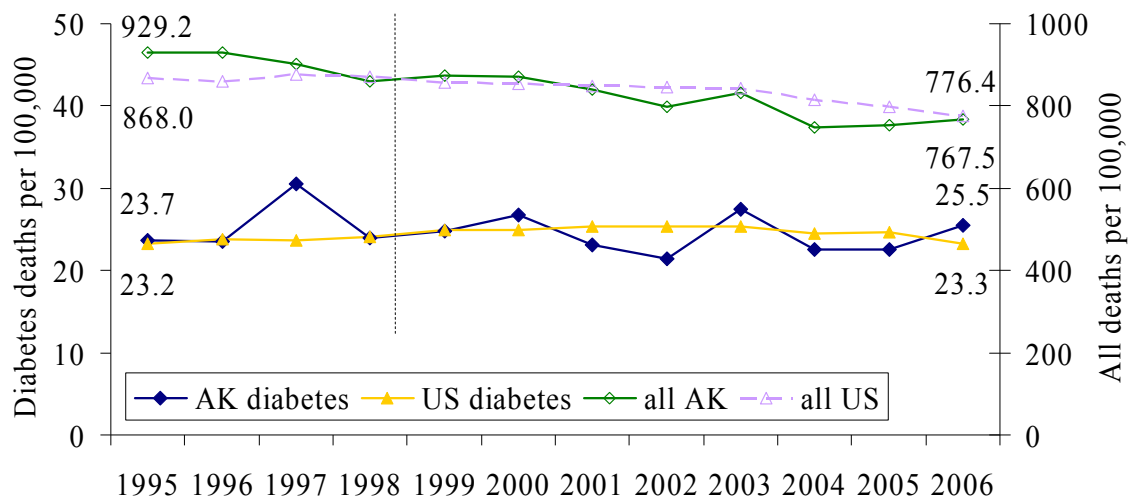
Use a variety of strategies to help Alaskans at high risk delay or prevent developing diabetes:

- Collaborate with other programs and health care providers to implement policies and programs that support physical activity, healthy eating, tobacco cessation and prevention, and alcohol abstinence or moderation.
- Assure that physical activity promotion for Alaskans with diabetes recognizes the likelihood that participants will have physical limitations associated with arthritis, asthma, obesity and/or disability.
- Coordinate public education campaigns and health care practices to jointly address diabetes and cardiovascular disease and their risk factors.

Diabetes-related mortality

Between 1999 and 2006, diabetes was the seventh leading cause of death in Alaska, according to the AK Bureau of Vital Statistics (AK BVS).²¹ It was the sixth leading cause of death in the US until 2006, when it was edged out of sixth and became the seventh leading cause for the US, according to the National Center for Health Statistics.²² (Figure 24)

Figure 24. 1995-2006 Age-adjusted diabetes and all causes mortality rates per 100,000 population in Alaska and the US, AK BVS²¹ and US NCHS^{22,23}



Note: In 1999, the cause of death coding reference changed from ICD-9 to ICD-10. The National Center for Health Statistics has determined that between these references, the compatibility ratio for diabetes is 1.01 (SE .0011). This means that the ICD-10 identifies about 1% more deaths as caused by diabetes by than the ICD-9.

Between 1995 and 2006, the age adjusted mortality rate per 100,000 for diabetes as a leading cause of death was similar in Alaska and the US, even though the estimated prevalence of diabetes among Alaskans was significantly lower than in the US, and the Alaska all-causes mortality rate diminished much more dramatically than did the US rate.^{***}

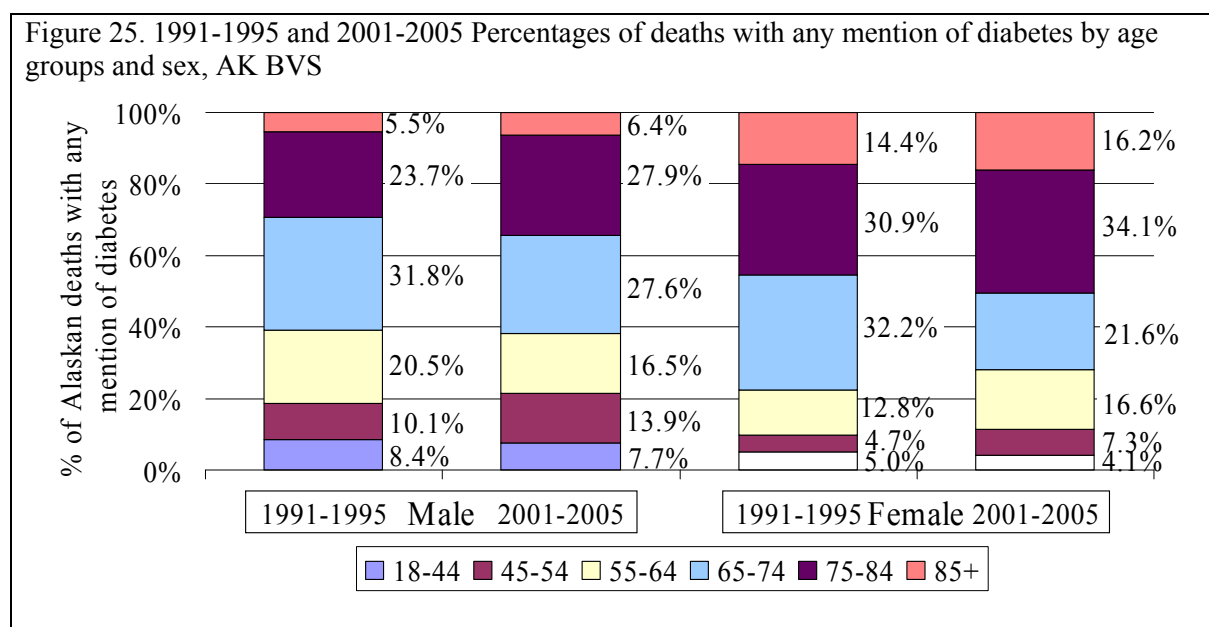
In the rest of this section, two five-year periods that were a decade apart are used to show how diabetes-related mortality may have changed in various sub-groups of Alaskans.

^{***} The mortality rates and percentages of deaths reported in this section are calculated from death certificate information, which has consistently been shown to be seriously flawed. A recent Translating Research Into Action for Diabetes (TRIAD) report on death certificates for known decedents in their study population, which only includes people with diabetes, found that 10% of these death certificates identified diabetes as the underlying cause of death and 39% had diabetes recorded anywhere on the death certificate. [McEwen LN, Kim C, et al. Diabetes reporting as a cause of death: results from the Translating Research into Action for Diabetes (TRIAD) study. *Diabetes Care* May 2007; 30(5): 247-53.] These results are very consistent with earlier assessments of death certificates and diabetes. Longer duration of diabetes, a smaller number of co-morbidities and insulin treatment each increased the likelihood that diabetes would be mentioned on a death certificate. Differences in regional and temporal mortality rates could reflect many circumstances other than diabetes status; examples include physician choices when completing certificates, training to modify physician choices, and differences or changes in the amount of information physicians have available when they are completing a certificate.

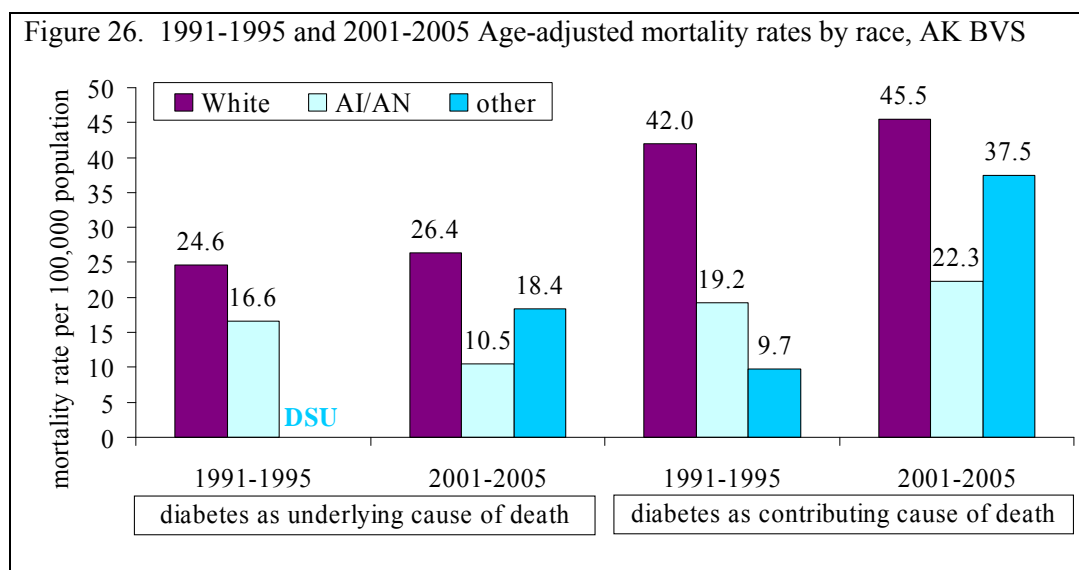
From 1991-1995 to 2001-2005, the age-adjusted, any cause diabetes mortality rate per 100,000 population among Alaska men increased while it was stable among women. Also, the number of death certificates for Alaska men with diabetes as any cause increased by 88.7%, while it increased by 67.5% for women. (Table 13)

| Table 13. 1991-1995 and 2001-2005 Numbers and age-adjusted mortality rates per 100,000 population for deaths with diabetes as a leading cause, as a contributing cause, or as any mentioned cause and percentage change from 1991-1995 to 2001-2005, AK BVS | | | | | | | |
|---|------------------|-----------|--------------------|-----------|-------------|-----------|----------|
| | Underlying cause | | Contributing cause | | Any mention | | |
| | 1991-1995 | 2001-2005 | 1991-1995 | 2001-2005 | 1991-1995 | 2001-2005 | % change |
| Male | | | | | | | |
| Number of deaths | 137 | 258 | 209 | 395 | 346 | 653 | 88.7% |
| Mortality rate | 20.8 | 22.5 | 32.1 | 40.1 | 52.9 | 62.6 | 18.3% |
| Female | | | | | | | |
| Number of deaths | 130 | 196 | 190 | 340 | 320 | 536 | 67.5% |
| Mortality rate | 26.7 | 24.1 | 42.5 | 44.6 | 69.3 | 68.6 | -0.9% |

For the 2001-2005 period, Alaska women with diabetes lived longer than their male counterparts. More than one-third (38%) of the Alaska men with any mention of diabetes on their death certificate died before they were 65 years of age. Half (50%) of the women with diabetes as any mention on their death certificate had lived to at least the age of 75. (Figure 25)



Between 1991-1995 and 2001-2005, the mortality rate for diabetes as an underlying cause of death increased slightly for Whites, but diminished by about one-third for American Indian / Alaska Natives (AI/AN). White and AI/AN mortality rates for diabetes as a contributing cause of death both increased slightly. (Figure 26)



Among Alaska death certificates with any mention of diabetes, the AI/AN percentage diminished from 17% in 1991-1995 to 11% in 2001-2005 (data not shown).

Heart disease, cancer and cerebrovascular disease are the most frequent underlying causes of death on Alaska death certificates that listed diabetes as a contributing cause of death. (Table 14)

| Cause of death | 1991-1995 | | | 2001-2005 | | |
|------------------------------------|------------------|---|------------------|------------------|---|------------------|
| | Number of deaths | Age-adjusted mortality rate per 100,000 | Percent of total | Number of deaths | Age-adjusted mortality rate per 100,000 | Percent of total |
| Diabetes | 267 | 23.9 | 43.5% | 454 | 23.5 | 41.7% |
| Diseases of heart | 170 | 15.3 | 27.7% | 285 | 16.3 | 26.2% |
| Cancer | 72 | 6.0 | 11.7% | 135 | 7.9 | 12.4% |
| Cerebrovascular diseases | 30 | 3.7 | 4.9% | 60 | 4.0 | 5.5% |
| Chronic lower respiratory diseases | 20 | 1.9 | 3.3% | 31 | 1.8 | 2.8% |
| All deaths | 614 | 56.1 | 100.0% | 1,089 | 60.6 | 100.0% |

Diabetes: ICD-9 = 250, ICD-10 = E10-E14
Diseases of the heart: ICD-9 = 390-398, 402, 404, 410-429, ICD-10 = I00-09, I11, I13, I20-51
Cancer: ICD-9 = 140-208, ICD-10 = C00-C97
Cerebrovascular diseases: ICD-9 = 430-434, 436-438, ICD-10 = I60-I69
Chronic lower respiratory diseases: ICD-9 = 430-434, 436-438; ICD-10 = J40-J47

Having diabetes or a history of coronary heart disease substantially increases the risk of premature death; having both magnifies mortality risks. Among people with diabetes, men and women have similar coronary heart disease mortality rates, even though among people without diabetes, women have a lower coronary heart disease mortality risk than men.²⁴

Between 1991-1995 and 2001-2005, the Alaska age-adjusted mortality rate for deaths with cardiovascular disease as the underlying cause and diabetes as a contributing cause increased slightly from 20.0 to 21.3 per 100,000 general population. In Alaska between 1991-1995 and 2001-2005, age-adjusted rates per 100,000 population for deaths with cardiovascular disease as the underlying cause and diabetes as a contributing cause increased for men (24%) but decreased for women (-6.6%). During this period, the rates of deaths with ischemic heart disease as the underlying cause and diabetes as a contributing cause also increased for men (+37%) but diminished for women (-14%). (Table 15)

| Table 15. 1991-1995 and 2001-2005 Age-adjusted mortality rates for cardiovascular disease or ischemic heart disease as the underlying cause and diabetes as a contributing cause, percentage change from 1991-1995 to 2001-2005 by sex, AK BVS | | | | | | |
|--|---|-------|----------------|---|-------|----------------|
| | Cardiovascular disease mortality rate per 100,000 | | | Ischemic heart disease mortality rate per 100,000 | | |
| | 91-95 | 01-05 | Percent change | 91-95 | 01-05 | Percent change |
| Men | 15.9 | 19.7 | 24.2% | 8.1 | 11.1 | 37.3% |
| Women | 24.1 | 22.5 | -6.6% | 11.7 | 10.0 | -14.0% |
| All | 20.0 | 21.3 | 6.5% | 9.9 | 10.7 | 8.5% |

Between 1991-1995 and 2001-2005, the numbers of Alaska deaths with cardiovascular disease or ischemic heart disease as the underlying cause and diabetes as a contributing cause increased by about half among Whites and at least three-fourths among American Indian/Alaska Natives (AI/AN). Race-specific changes in the age-adjusted mortality rates for cardiovascular disease / diabetes and ischemic heart disease / diabetes were very similar; both decreased slightly for Whites (5%), but increased for AI/AN (31% and 28%, respectively). (Table 16)

| Table 16. 1991-1995 and 2001-2005 Numbers of Alaska deaths (all ages) with cardiovascular disease or ischemic heart disease as the underlying cause and diabetes as a contributing cause, age-adjusted mortality rates for these deaths, percentage change from 1991-1995 to 2001-2005 by selected race, AK BVS | | | | | | |
|---|------------------|-------|----------------|---|-------|----------------|
| | Number of deaths | | | Age-adjusted mortality rate per 100,000 | | |
| | 91-95 | 01-05 | Percent change | 91-95 | 01-05 | Percent change |
| Cardiovascular disease mortality | | | | | | |
| White | 176 | 265 | 50.6% | 23.7 | 22.5 | -5.2% |
| AI/AN | 27 | 50 | 85.2% | 8.5 | 11.1 | 30.9% |
| Ischemic heart disease mortality | | | | | | |
| White | 100 | 148 | 48.0% | 12.2 | 11.5 | -5.2% |
| AI/AN | 13 | 23 | 76.9% | 3.7 | 4.8 | 27.9% |

Nationally in 2004 for the over 65 age group, heart disease was also listed on 68% of the death certificates that had any mention of diabetes.²⁵ Among 2001-2005 death certificates for Alaskans who were 65 or over, cardiovascular disease was the underlying cause of death on 51% of death certificates for those with diabetes as a contributing cause, and 54% of the death certificates for those that did not mention diabetes. (Data not shown)

Diabetes has been the seventh leading cause of death in Alaska since 1996.

Among Alaskans with diabetes as any mention on their death certificates in 2001-2005

- About half of the women had lived to be at least 75 years of age, but only one-third of the men had lived that long.
- Diseases of the heart were the underlying cause for about one-fourth of the deaths.
- In the ten years between 1991-1995 and 2001-2005, the age-adjusted mortality rate for deaths with cardiovascular disease as the underlying cause and diabetes as a contributing cause increased by 37% for men, but diminished by 14% for women.
- In the ten years between 1991-1995 and 2001-2005, the age-adjusted mortality rate for deaths with cardiovascular disease as the underlying cause and diabetes as a contributing cause increased by 31% for American Indian/Alaska Natives, but diminished by 5% for Whites.

Implications/Discussion

A number of factors influence diabetes mortality rates, including:

- The likelihood that the person completing a death certificate has access to a complete, accurate the health and personal history of the deceased.
- Variation between people completing death certificates and over time in their preferences and training.
- The number of people with diagnosed and undiagnosed diabetes.

These and other factors could change over time and affect different sub-populations to varying degrees. The apparent conundrum about why Alaska would have a similar diabetes mortality rate despite having lower diabetes prevalence could be at least partly explained by differences in these factors. These factors could also have influenced the 1991-1995 to 2001-2005 change in American Indian/Alaska Native mortality rates for diabetes as the underlying case and diabetes as a contributing cause of death.

Recommendations

Recognize that the lifespan of Alaskans with diabetes seems to be shorter for men than women in program planning and public education efforts.

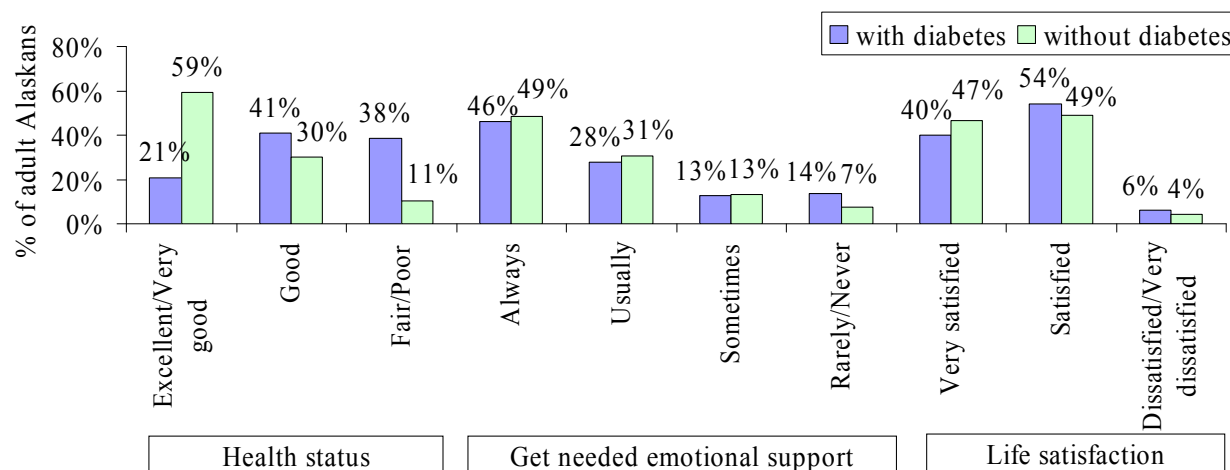
Work to reduce the impact of cardiovascular disease on men and Alaska Natives with diabetes.

Alaskans and the toll of diabetes

Quality of life

The percentage of Alaskans with diabetes who said they were in excellent health (21%) was about one-third of this percentage of Alaskans without diabetes (59%); distribution among the health status categories was statistically significantly associated with diabetes status. (Figure 27)

Figure 27. 2004-2006 Observed distribution of Alaskans among health status, access to emotional support and life satisfaction categories by diabetes status, AK BRFSS

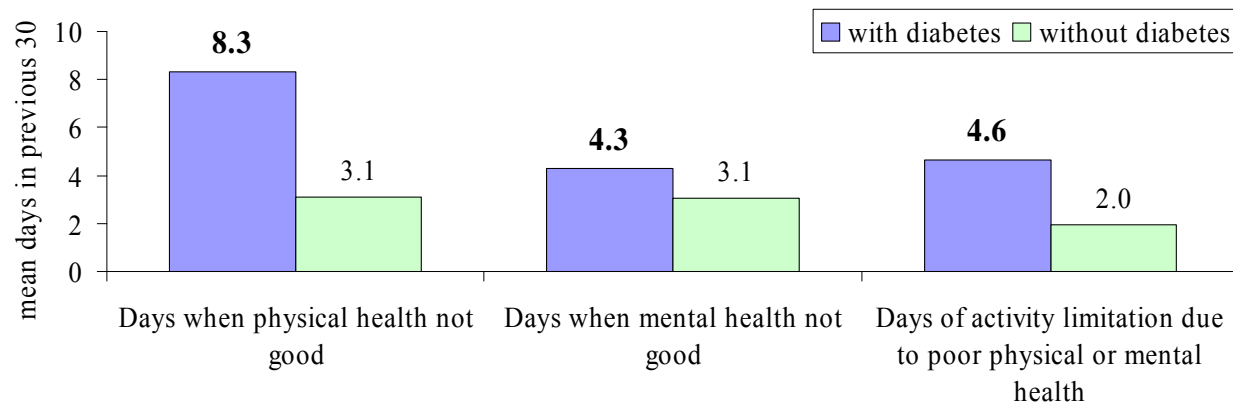


Note: a) Percentages in bold indicate a significant difference in associated with diabetes status. b) The emotional support and life satisfaction questions were only asked in the 2005 and 2006 surveys.

The percentage of Alaskans with diabetes that said they rarely or never receive needed support (14%) was twice this percentage among those without diabetes (7%).

Alaskans with diabetes had twice the average number of days when their physical health was not good as Alaskans without the disease. All of the averaged numbers of days affected by poor health reported by adult Alaskans with diabetes were significantly higher than the averaged numbers of days of poor health that were reported by Alaskans without diabetes. (Figure 28)

Figure 28. 2004-2006 Observed mean days in the previous 30 days when health was not good or activities were limited by poor physical or mental health by diabetes status, AK BRFSS



Note: Numbers in bold indicate that the mean was significantly higher for Alaskans with diabetes.

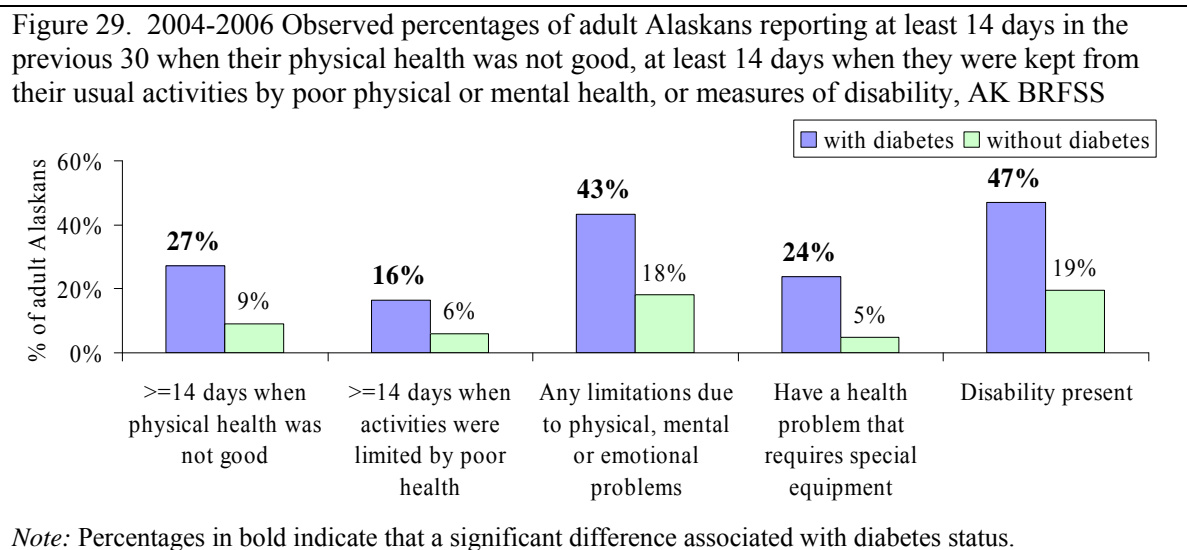
Disability

BRFSS uses two questions to identify people with a disability:

- Are you limited in any way in any activities because of physical, mental, or emotional problems?
- Do you now have any health problems that require you to use special equipment, such as a cane, a wheelchair, a special bed or a special telephone?

The disabled group includes all who gave a positive response to either or both questions.

Nearly half (47%) of Alaskans with diabetes had a disability, or almost two and a half times the percentage of those without the disease (19%). (Figure 29)



From another perspective, 11% of Alaskans with a disability had diabetes.

Financial liability

A recent report estimated that 20.8% of Alaskans less than 65 years of age were from insured families that would spend more than 10% of their 2008 pre-tax income on health care costs, including insurance premiums, co-pays and out-of-pocket expenditures. About one-fourth of them (4.9% of Alaskans < 65) were from families that will spend more than 25% of their pre-tax 2008 income on health care costs.²⁶ Alaskans with diabetes would likely be over-represented among families with high health care costs. Other reports indicate that the increasing cost of medications corresponds to increasing numbers of people who do not fill their prescriptions or who do not take the medications as prescribed, which can lead to increased medical services use associated with the greater risk of complications and emergencies.²⁷

Time

Diabetes self-management consumes considerable personal time. The American Diabetes Association recommends that diabetes self-care include five daily activities: self-monitoring of blood glucose (SMBG), foot checks, medication management, exercise and dietary management. A group of certified diabetes educators has estimated that it would take two hours every day to follow all of the self-care recommendations.²⁸

A survey of individuals with diabetes found that most of them did not follow all of the recommendations for diabetes self-management every day. On average, they spent nearly an hour a day on three activities: foot care, exercise and food shopping/preparation.²⁹

Time spent by Alaskans with diabetes can be extrapolated using the estimated numbers of minutes needed for each self-care task²⁹ and AK BRFSS results. The estimated number of hours spent (36% of the total if all Alaskans with diabetes followed all four recommendations) may be one reflection of the challenges Alaskans with diabetes face in following these recommendations. (Table 17)

| Table 17. 2004-2006 Estimated time needed for recommended diabetes self-care tasks, percentages of Alaskans with diabetes reporting that they follow self-care recommendations, estimated hours spent based on percentages following the recommendations, and estimated hours needed for all Alaskans with diabetes had followed them by recommendation, AK BRFSS | | | | |
|---|--|---|---|--|
| | Estimated daily minutes needed ²⁹ | % of Alaskans with diabetes who followed the recommendation | Estimated hours spent by Alaskans with diabetes | |
| | | | Actual (a) | If all had followed recommendation (b) |
| At least 5 fruit and/or vegetable servings | 48 | 28% | 5,559 | 19,644 |
| Check feet | 13 | 67% | 3,565 | 5,320 |
| Physical activity | 32 | 33% | 4,357 | 13,096 |
| Self-monitor blood glucose at least once | 3 | 60% | 733 | 1,228 |
| Total hours | | | 6,590 | 39,288 |
| Actual ÷ If all had followed recommendation (a ÷ b) | | | 36% | |
| * Includes shopping and meal preparation. | | | | |

In 2004-2006, when compared to Alaskans without diabetes, Alaskans with diabetes:

- Were one-third as likely to say they were in excellent or very good health.
- Were twice as likely to say that they rarely or never received needed emotional support.
- Had about two and a half times as many days when their physical health was not good, and more than twice as many days when their activities were limited due to poor physical and/or mental health.
- Were more than twice as likely to meet the BRFSS criteria for having a disability.

Implications/Discussion

The relationships between the health status, social support and disability variables in this section and having diabetes may be multi-directional (i.e., diabetes could contribute to the cause and/or the effect measured in each case). Also, diabetes could be one of several factors that underlie each result. Effective methods for achieving positive change in these measures might focus on:

- Keeping Alaskans with diabetes as free of complications and co-morbidities as possible,
- Reducing the impact of diabetes complications and co-morbidities on Alaskans with diabetes by assuring access to community supports and health care, and
- Working to identify other factors that influence both diabetes-related risks and quality of life and reduce their negative impact.

Each Alaskan with diabetes must balance the cost and benefit of spending money on diabetes-related health care and supplies and of using their time on self-management measures.

Generally, these decisions weigh present-time costs against future benefits; following recommended health care and self-management practices today will reduce the likelihood of future problems. When resources are limited, the inclination may be to spend funds or time on urgent needs such as food, shelter and transportation, particularly among individuals with few apparent diabetes-related health problems. The substantial public health benefit of keeping these individuals complication-free supports societal efforts to reduce costs to individuals.

Recommendations

Further investigate social and environmental factors that have a negative effect on the quality of life of Alaskans with diabetes:

- Use qualitative and quantitative methods, and
- Develop and implement strategies to reduce their burden.

Encourage health care providers to ask patients with diabetes about possible barriers to following self-management recommendations

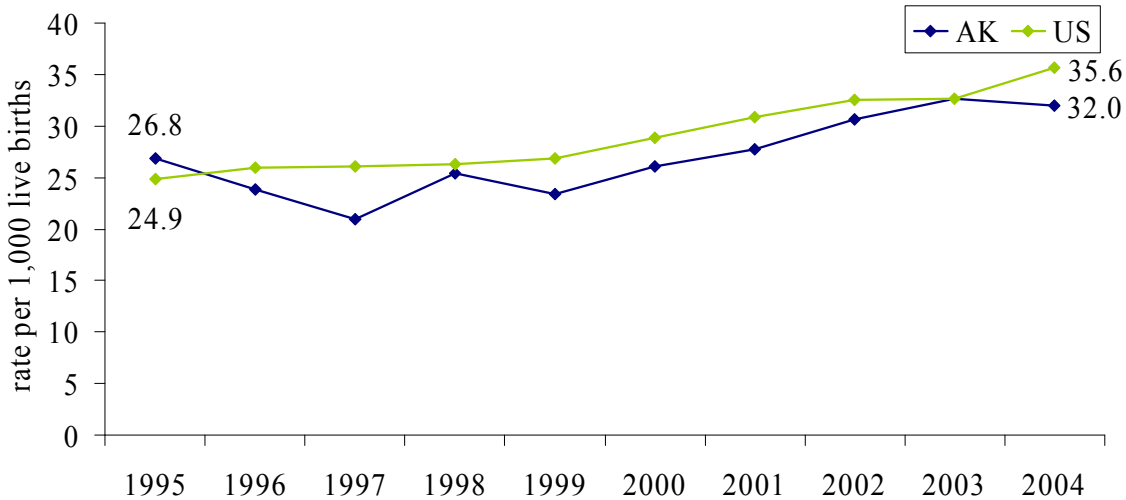
- Identify and distribute information about resources to reduce barriers to self-management.

Develop and implement communications campaigns to encourage family members and communities to support self-management by Alaskans with diabetes.

Diabetes and Alaska pregnancies

Alaska births affected by pre-existing or gestational diabetes increased 19% between 1995 and 2004, while the US rate increased 43%.^{†††} (Figure 30)

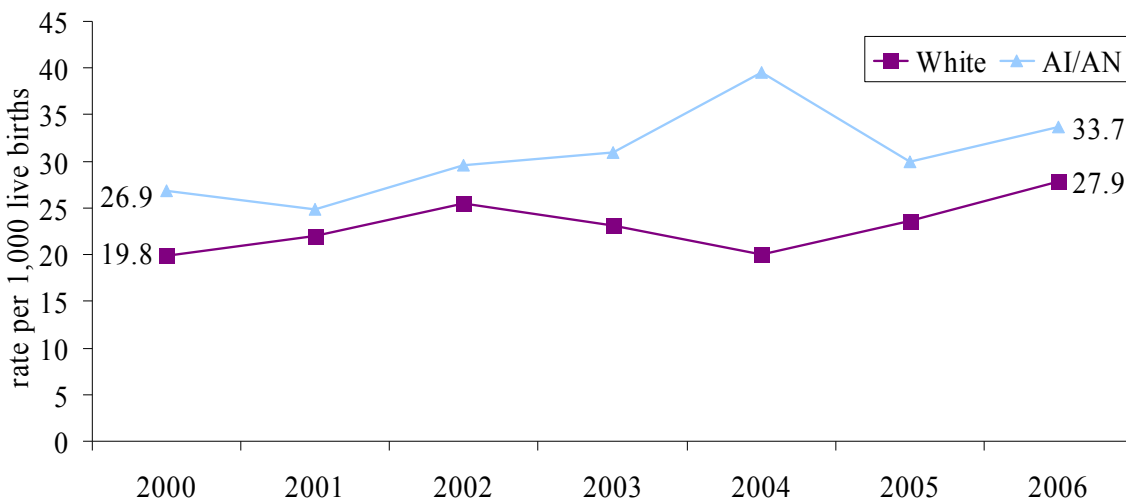
Figure 30. 1995-2004 Alaska and US births affected by diabetes per 1,000 live births, 1995-2004, CDC Wonder On-line Database



Note: Birth certificate data reporting standards changed in 2003.

Based on birth certificate information from the AK Bureau of Vital Statistics (AK BVS)³⁰, the birth rate for pregnancies affected by gestational diabetes increased 25% for American Indian/Alaska Natives (AI/AN) and 40% for Whites between 2000 and 2006. (Figure 31)

Figure 31. 2000-2006 Gestational diabetes birth rates per 1,000 live births by race, AK BVS



^{†††} As with death certificates, certain variables including pre-existing and gestational diabetes, are likely to be under-reported on birth certificates. (See for example: S Northam, TR Knapp. The reliability and validity of birth certificates. *Obstet Gynecol Neonatal Nurs* Jan-Feb 2006; 35(1); 3-12. (abstract))

During this period, the total number of births increased 10% for Alaska Natives and 8% for Whites.

In 2006, the American Indian/Alaska Native (AI/AN) gestational diabetes birth rate per 1,000 live births was somewhat higher than it was for Whites. (Table 18)

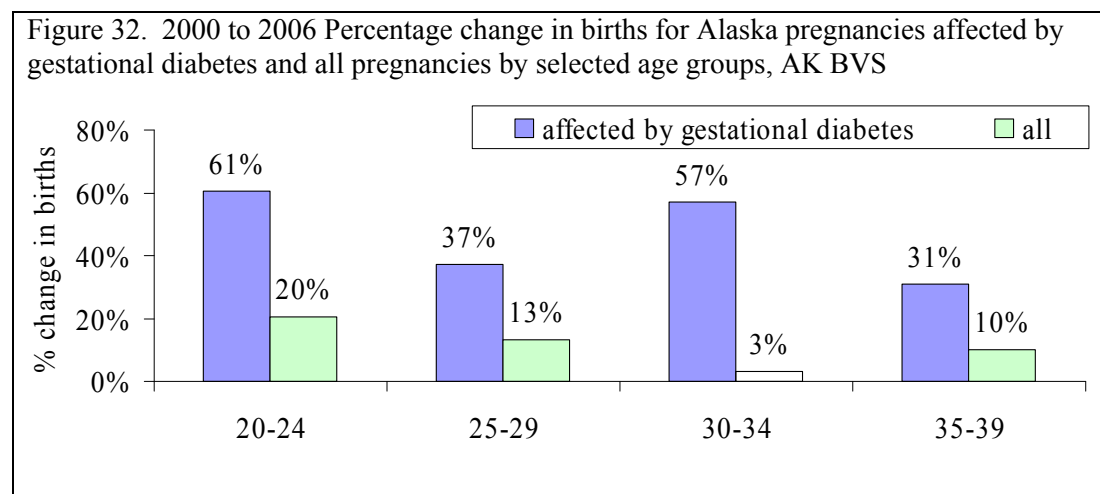
| Table 18. 2006 Pre-existing, gestational or any diabetes births per 1,000 live births by race, AK BVS | | | |
|--|--------------------|---------------------|---------------------|
| | Pre-existing | Gestational | Any diabetes*** |
| White | 4.0 | 27.9 | 32.7 |
| AK Native/American Indian | 3.0 ^{†††} | 33.7 | 37.4 |
| Asian/Pacific Islander | DSU | 35.6 | 42.5 |
| African American | DSU | 18.7 ^{†††} | 25.8 ^{†††} |
| Total | 3.9 | 29.1 | 33.8 |
| *** These rates do not add because nine births were reported with both pre-existing and gestational diabetes. Although they were excluded from the type-specific columns, these births are included in the totals. ††† Between six and 20 births were affected by diabetes; these rates may be statistically unreliable. Note: DSU means <u>D</u> ata <u>S</u> tatistically <u>U</u> nreliable. Data were suppressed because there were fewer than six births affected by pre-existing diabetes in 2006. | | | |

American Indian/Alaska Natives had a slightly higher rate of births affected by any diabetes than Whites, while Whites had a higher percentage of adults with diagnosed diabetes than did AI/AN. Based on the AK BRFSS, the observed 2004-2006 diabetes prevalence among all adult Alaskans was higher for Whites (5.4%) than it was for Alaska Natives/American Indians (4.9%; not a statistically significant difference).

In 2006, Alaska rates per 1,000 live births for births affected by pre-existing and gestational diabetes increased with maternal age. (Table 19)

| Table 19. 2006 Pre-existing, gestational and any diabetes birth rates per 1,000 live births by age group, AK BVS | | | |
|--|--------------------|--------------------|--------------------|
| | Pre-existing | Gestational | Any diabetes*** |
| 15-19 | DSU | 6.4 ^{†††} | 6.4 ^{†††} |
| 20-24 | 1.2 ^{†††} | 16.3 | 18.4 |
| 25-29 | 5.2 ^{†††} | 26.4 | 32.6 |
| 30-34 | 4.8 ^{†††} | 43.4 | 49.1 |
| 35-39 | 8.5 ^{†††} | 50.4 | 59.8 |
| 40-44 | 7.4 ^{†††} | 99.6 | 107.0 |
| *** These rates do not add because 78 births were reported during this period with both pre-existing and gestational diabetes. Although they were excluded from the requisite columns, these births are included in the seven-year totals. ††† Between six and 20 births were affected by diabetes; please note that these rates may be statistically unreliable. Note: DSU means <u>D</u> ata <u>S</u> tatistically <u>U</u> nreliable: there were fewer than 6 births in this group. | | | |

From 2000 to 2006, the age-group specific percentage increases in the number of births were three times greater for births affected by gestational diabetes for all births. In the 30-34 age group, the percentage increase in births affected by gestational diabetes was almost ten times the increase in all births. (Figure 32)



Costs for about half of all Alaska deliveries are paid by Alaska Medicaid. Although 7.3% of Medicaid recipients with a pregnancy-related claim had gestational or pre-existing diabetes, they consumed 12.6% of the Medicaid pregnancy-related expenditures in SFY 2006, or about \$6.5 million.

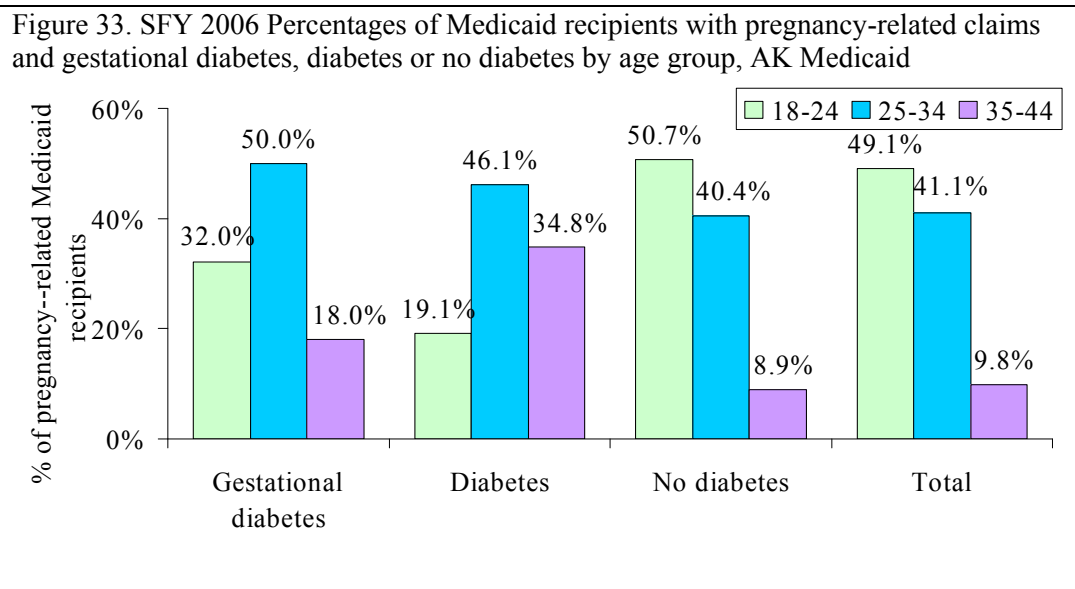
The per capita cost of care for recipients with gestational diabetes was \$8,787, or 78% higher than the per capita cost of care for recipients without diabetes; for recipients with pre-existing diabetes, the per capita cost of care was more than twice as high as those with diabetes. (Table 20)

| | No diabetes | Gestational diabetes | Pre-existing diabetes |
|--|-------------|----------------------|-----------------------|
| Recipients with a pregnancy-related claim | 9,085 | 603 | 117 |
| Per capita cost of pregnancy care** | \$4,932 | \$8,787 | \$10,204 |
| Pregnancy-related percent of all expenditures for these women | 64.8% | 74.0% | 53.5% |
| Difference from No diabetes group in per capita cost of pregnancy care | | +78.2% | +106.9% |

** These per capita costs were for the mother only. Health care costs for the newborns were not included.

SFY 06 Alaska Medicaid expenditures would have been about \$2.3 million lower if the recipients with gestational diabetes had had normal pregnancies.

Among Medicaid recipients with pregnancy-related claims, women in the 25-34 age group, and particularly in the 35-44 age group, were over-represented in the gestational diabetes and diabetes groups. (Figure 33)



Diabetes in pregnant Alaskans...

- In 2006, the rates of births affected by diabetes were highest among women of Asian/Pacific Islander descent or women in the 40-44 age group.
- Between 2000 and 2006, the number of births affected by gestational diabetes increased three times as much as did the total number of births; in the 30-34 age group, the number of births affected by gestational diabetes increased by 57%, while the number of all births increased by 3%.
- Although 7.3% of Medicaid recipients with a pregnancy-related claim had gestational or pre-existing diabetes, they consumed 12.6% of Medicaid pregnancy-related expenditures.
- On average, Alaska Medicaid paid 75% more for obstetric care for recipients with gestational diabetes than for recipients without diabetes, or an additional \$3,755 per pregnancy.

Implications/Discussion

Diabetes during pregnancy increases the health risks for the mother and the fetus.

- Women with gestational diabetes have a much higher risk of developing diabetes than other women.
- Women with pre-existing diabetes may face additional challenges in maintaining a normal blood sugar level.
- Infants born to women with gestational or pre-existing diabetes are more likely to be large for gestational age, with implications for delivery-related problems.
- Infants born to women with gestational diabetes are at increased risk themselves of developing diabetes.
- Infants born to women with uncontrolled pre-existing diabetes are more likely to have a congenital birth defect.

Recommendations

Cost-effective strategies for reducing the impact of gestational diabetes include:

- Preventing development of gestational diabetes by identifying women at risk before or early in their pregnancy and providing appropriate counseling and assistance, and
- Providing post-partum care for women with gestational diabetes which includes diabetes screening, counseling on their health risk profile, and assistance in reducing their health risks.

Cost-effective strategies for reducing the impact of pre-existing diabetes on pregnancies include:

- Encouraging women with diabetes of child-bearing age to obtain preconception counseling, and
- Encouraging women with diabetes of child-bearing age to follow self-care and health-care recommendations, particularly related to maintaining normal blood sugar levels.

Diabetes and Alaska children

A national estimate of diabetes prevalence found that 0.079% of US children aged nine or younger have diagnosed diabetes, as do 0.280% in the 10 - 19 age group.^{31,32} These rates suggest that about 390 - 400 Alaska children and youth (≤ 19) had diabetes in 2006, based on population estimates from the AK Department of Labor and Workforce Development (AK DoL).³³ (Table 21)

| Table 21. 2006 Alaska population, diabetes prevalence and calculated number of Alaska children with diabetes by age group and race, AK DoL and SEARCH for Diabetes in Youth Study Group** | | | | | | | |
|---|-----------------------|---------|----------------------------------|-----------------------|---------|------------------------------------|-------------------------------|
| | 0 – 9 age group | | | 10 – 19 age group | | | AK ≤ 19 with DM |
| | AK popula- tion | US rate | Estimated AK 0 - 9 with DM | AK popula- tion | US rate | Estimated AK 10 - 19 with DM | |
| White | 68,910 | 0.106% | 73.0 | 74,119 | 0.318% | 235.7 | 308.7 |
| American Indian/Alaska Native | 24,363 | 0.023% | 5.6 | 24,170 | 0.228% | 55.1 | 60.7 |
| African American | 5,669 | 0.061% | 3.5 | 5,047 | 0.322% | 16.3 | 19.7 |
| Asian/Pacific Islander | 6,677 | 0.029% | 1.9 | 6,531 | 0.134% | 8.8 | 10.7 |
| Total | 105,619 | 0.079% | 83.4 | 109,867 | 0.280% | 307.6 | 391.1 |
| ** Estimated numbers of Alaskans may not add due to rounding and differences between the AK and US population distributions. | | | | | | | |

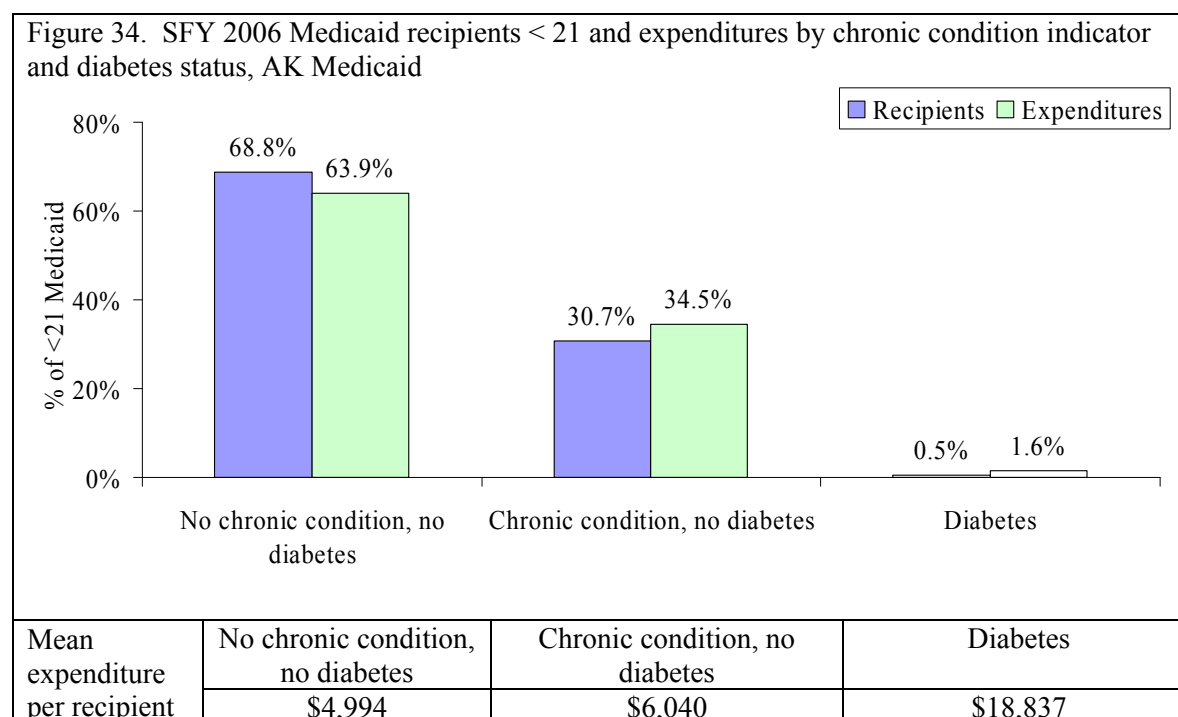
Type 1 is the most common form of diabetes among children and youth, although 90% to 95% of adults have type 2 diabetes. The incidence of type 1 diabetes peaks in the 5 – 9 and 10 – 14 age groups, while the incidence rate for type 2 diagnosis increases with age.³⁴

Nationally, non-Hispanic White children and youth have the highest type 1 diabetes incidence and prevalence, but lower type 2 diabetes rates than other race/ethnicities.^{31,34} If the race-specific rates are applied to the Alaska population, one result is that although about two-thirds of the general population 19 or younger is White (66%), about three-fourths of the estimated number of children and youth with diabetes is White (77%). Also, about 80% of Alaska children and youth with diabetes are in the 10 – 19 age group, even though this age group is about half of all children and youth 19 or younger in the general population. Boys and girls are about evenly distributed in both the general population and among children and youth with diabetes.

As in adults, risk for type 2 diabetes in children and youth is linked to being overweight, having a family member with type 2 diabetes, having low HDL cholesterol, having insulin resistance, and being a member of a high risk ethnic or racial group.³⁵ Youth Risk Behavior Survey results indicate that the percentages of Alaska and US youth that were overweight were essentially the same, although Alaska youth were slightly less likely to be obese. (See <http://www.hss.state.ak.us/dph/chronic/school/YRBSresults.htm> for YRBS results.)

Children and adolescents with diabetes have higher health care costs than children without a chronic disease, but generally use fewer health care resources than children with other chronic diseases.^{36,37}

Among AK Medicaid recipients, children and youth with diabetes represented a very small fraction of the 0-20 age group (0.5%); diabetes was very infrequent even among those with a chronic condition indicator.^{***} Nonetheless, Alaska Medicaid spent about \$6.6 million in SFY 2006 on care for recipients with diabetes who were 20 or younger. The SFY 2006 per capita cost for Medicaid recipients 20 or younger with diabetes was more than three times the per capita cost for those who had a chronic condition indicator. (Figure 34)



In SFY 06, 42% of Medicaid recipients aged 20 or younger with diabetes had an emergency department visit. Only one-half had a dental claim, despite complete coverage for oral health care.

Also, although only 16% of recipients with diabetes had an inpatient hospital claim, these claims consumed 25% of all Medicaid funds spent on children and youth with diabetes; inpatient hospital care for Medicaid recipients < 21 with diabetes was \$18,700 per person higher than it was for those without diabetes.

^{***} The US Agency for Healthcare Research and Quality (ARHQ) chronic condition indicator identifies individuals with a diagnosis that either (a) places limitations on self-care, independent living, and social interactions and/or (b) results in the need for ongoing intervention with medical products, services, and special equipment are included in the chronic conditions group.

Based on the AK Hospital Inpatient Discharge Database, an annual average of \$909,000 was spent in 2004-2006 on inpatient hospital care for Alaska children and youth under 18 years of age for 65.2 discharges with diabetes as a primary diagnosis. An additional average \$593,049 was spent on 25.3 discharges with diabetes as any secondary diagnosis. Discharges with any mention of a diabetes diagnosis represented 0.7% of all discharges and 1.0% of the expenditures for this age group. (Table 22)

| Table 22. 2004-2006 Numbers of hospital discharges and associated expenditures, percentages of all hospital discharges and expenditures, rate of discharges per 10,000 general population and average cost per discharge for Alaska children and youth <18 years of age by diabetes diagnosis, AHIDD | | | | |
|---|-------------------------|-------------|------------------------|---------------|
| | With diabetes diagnosis | | No mention of diabetes | Total |
| | Primary* | Secondary** | | |
| Discharges | 210 | 79 | 40,511 | 40,800 |
| Percentage of discharges | 0.5% | 0.2% | 99.3% | |
| Rate/10,000 general population | 3.6 | 1.4 | 694.6 | 699.5 |
| Expenditures | \$2,852,304 | \$2,035,728 | \$468,286,754 | \$473,174,786 |
| Average cost/discharge | \$13,582 | \$25,769 | \$11,559 | \$11,597 |
| Percentage of expenditures | 0.6% | 0.4% | 99.0% | |
| * Primary includes discharges with concurrent primary and secondary diabetes diagnoses. | | | | |
| ** Any mention includes diabetes as a primary and/or secondary diagnosis. | | | | |
| Notes: (a) Based on estimates from the Alaska Department of Labor and Workforce statistics, there was an annual average of 194,414 Alaskans < 18 2004-2006. (b) The Alaska Hospital Inpatient Discharge Database includes administrative data from most Alaska hospitals (70%) including all of the Anchorage facilities. Discharges from the hospitals included in the database represent about 88% of all discharges in Alaska. | | | | |

A notable difference in inpatient hospital discharges with any mention of diabetes between children and adults was that diabetes was the primary diagnosis for nearly three-fourths (72%) of the discharges of Alaskans under 18, but less than one-tenth (8%) of the adult discharges.

Reflecting the estimated preponderance of Whites among Alaska children with diabetes, although about two-thirds of all Alaskans under 18 were White (66.2%), 81% of the expenditures and 73% of the discharges with diabetes as a primary diagnosis in this age group were of White children and youth. Reflecting smaller numbers of children with diabetes, Alaska Native/American Indian (AI/AN) and Black/African American children had higher hospital discharge rates with diabetes as any secondary diagnosis than Whites. (Table 23)

| Table 23. Among 2004-2006 hospital inpatient discharges of Alaskans < 18, percentages of total expenditures and of total discharges with diabetes as a primary diagnosis, with diabetes as any secondary diagnosis and rates per 10,000 general Alaska population < 18 by race, AHIDD and AK DoL | | | | |
|--|-------|-------|------------------|------------------------|
| | White | AI/AN | African American | Asian/Pacific Islander |
| % All Alaskans <18 | 66.2% | 22.3% | 4.9% | 4.9% |
| Primary diagnosis* | | | | |
| % All expenditures on < 18 recipients | 81.4% | 9.1% | 7.4% | 1.4% |
| % All discharges of < 18 recipients | 73.1% | 18.3% | 5.1% | 2.0% |
| Rate/100,000 general population | 3.7 | 28 | 3.5 | 1.2 |
| Secondary diagnosis** | | | | |
| % All expenditures on < 18 recipients | 51.0% | 32.5% | 13.9% | 0.4% |
| % All discharges of < 18 recipients | 59.2% | 25.0% | 9.2% | 1.3% |
| Rate/100,000 general population | 1.2 | 1.5 | 2.5 | 0.3 |
| * Primary includes discharges with concurrent primary and secondary diabetes diagnoses. | | | | |
| ** Any mention includes diabetes as a primary and/or secondary diagnosis. | | | | |
| Notes: (a) Based on estimates from the Alaska Department of Labor and Workforce Statistics, 2004-2006 annual averages for Alaskans < 18 were: Whites, 128,641; AI/AN, 43,419; African Americans, 9,481; and Asian/Pacific Islanders, 11,560. (b) The Alaska Hospital Inpatient Discharge Database includes administrative data from most Alaska hospitals (70%) including all of the Anchorage facilities. Discharges from the hospitals included in the database represent about 88% of all discharges in Alaska. | | | | |

The Diabetes Short Term Complications Prevention Quality Indicator (PQI)^{§§§} showed that, in 2006, 17.8% of the hospital discharges of Alaskans with diabetes under 21 years of age could have been avoided if appropriate outpatient care had been received or early intervention had occurred. Costs associated with these discharges amounted to more than \$300,000.

^{§§§} Please see page 53 for more information about the Prevention Quality Indicators, which were developed by the US Agency for Healthcare Research and Quality.

AK children and youth with diabetes

- Estimates using US rates suggest that there were about 400 children or youth had type 1 or type 2 diabetes in 2006; nearly all of them had type 1. Three-fourths of the children or youth with diabetes were White.
- In SFY 06, AK Medicaid spent nearly \$6.6 million on care for recipients 0-20 with diabetes. This was \$13,843 per person more than was spent on care for recipients with neither this disease nor the chronic condition indicator.
- 42% of AK Medicaid recipients with diabetes < 21 had an emergency department claim during SFY 06.
- Inpatient hospital care for Medicaid recipients < 21 with diabetes cost \$18,700 per person more than it did for those without diabetes.
- In 2004-2006, more than \$900,000 was spent each year on inpatient hospital care for Alaskans < 18 with diabetes, or about 1% of all inpatient hospital expenditures for this age group.

Implications/Discussion

Increasing numbers of children and teens are being diagnosed with type 2 diabetes in the US, reflecting the increasing numbers of children who are overweight or obese. Although there are few Alaska children with diabetes, the 2003 Youth Risk Behavior Survey found that one-fourth of Alaska high school students had a body mass index (BMI) greater than the 85th percentile by age and sex³⁸; putting these teens at risk of diabetes because of being overweight or obese. ****

There could be dramatic consequences of type 2 diabetes among children and youth. Over a lifetime, these individuals have a high risk of disability and being unable to work. If they remained on Alaska Medicaid and if their health care continued to cost about \$19,000 per year, Medicaid expenditures on their behalf would surpass \$800,000 per person by the time they were 65 years of age.

Recommendations

Join with other state, regional and local agencies in work to reduce diabetes risk among Alaska children by promoting healthy eating and exercise habits:

- Assist schools and communities in the development and implementation of policies that reduce barriers and increase opportunities for healthy behaviors, and
- Work with statewide and community coalitions to implement child-oriented health promotion campaigns.

**** In 2007 Youth Risk Behavior Survey results, these percentages had increased to 11.1% in the 95th percentile and 16.2% in the 85th to 95th percentile. (<http://www.hss.state.ak.us/dph/chronic/school/pubs/YRBS-Weight-Nutrition.ppt> printed 2/3/09)

Economics of diabetes in Alaska

Total health care expenditures and indirect costs

In 2008, the American Diabetes Association (ADA) published estimates of the total 2007 per capita cost of diabetes in the United States, including direct medical expenditures and indirect costs such as lost productivity, disability and premature mortality.³⁹ This analysis found that medical care for Americans with diabetes cost \$116.2 billion, with an additional \$58.2 billion in indirect costs associated with lost productivity, disability and premature death. Alaska's part of these costs amounted to at least \$418 million in 2007. (Table 24)

| Table 24. 2007 Estimated direct health care costs and indirect costs of diabetes in Alaska, American Diabetes Association ⁴⁰ and Dall, et al. ³⁹ | | |
|--|---------------|-------------------|
| | Alaska | US |
| Direct medical costs | \$287,300,000 | \$116,257,000,000 |
| Indirect costs | \$131,500,000 | \$58,200,000,000 |
| Total | \$418,800,000 | \$174,457,000,000 |
| Estimated population with diabetes* | 24,555 | 17,486,000 |
| * Alaska adult population with diabetes estimate from 2004-2006 AK BRFSS, US population estimate from Dall et al. | | |

Economic analyses have consistently found that medical care for Americans with diabetes costs about two and a half times as much as care for those without the disease.^{39,41} The ADA found the average cost per person of medical care for Americans with diabetes was \$11,744, while it was \$5,095 for those without diabetes.

About half of the excess medical cost of diabetes care was for inpatient hospital care, while about one-fourth was for outpatient medications and supplies, and one-tenth was for health care provider visits.

Medicaid

In SFY 2006^{††††}, Alaska Medicaid spent about \$138,225,000 on care for recipients of all ages with diabetes, or 14.2% of all Medicaid expenditures.^{††††} That year, about 21% of adult Alaskans with diabetes was also an Alaska Medicaid recipient. (Table 25)

| Table 25. 2004-2006 Estimated number of Alaskans with diabetes, SFY 06 adult Medicaid recipients with diabetes, and the percentage of Alaskans with diabetes that were AK Medicaid recipients by age group, AK BRFSS and AK Medicaid | | | |
|--|--------|-------|--------|
| | 21-64 | ≥ 65 | Total |
| Estimated number of Alaskans with diabetes | 16,810 | 7,276 | 24,086 |
| Number of Medicaid recipients with diabetes | 3,192 | 2,015 | 5,207 |
| Medicaid recipients percentage of all Alaskans with diabetes | 19.0% | 27.7% | 21.6% |

^{††††} The Alaska State Fiscal Year (SFY) runs from July 1 through June 30; for example, SFY 06 refers to the period July 1, 2005 through June 30, 2006.

^{††††} Medicaid recipients with diabetes were identified based on having at least two Medicaid claims with a diabetes diagnosis during the previous two years or a claim for diabetes therapy (i.e., insulin).

Between SFY 2001 and SFY 2006, per capita Medicaid spending increased 59% for recipients with and without diabetes.

Between 2001 and 2006, per capita Medicaid expenditures for recipients with and without diabetes increased more than inflation. According to the Consumer Price Index⁴², the average cost of all goods and services in the US increased by 13.83% between 2001 and 2006; the medical cost-specific increase was 25.87%. Using these percentages as a range, if per capita expenditures had matched inflation, they would have been between \$18,088 and \$20,001 for recipients with diabetes and between \$8,810 and \$9,742 for those without diabetes.

Medicaid expenditures for recipients with diabetes were higher than for recipients without and the difference associated with diabetes varied between health care services categories. Per capita pharmacy, personal care assistance and inpatient hospital expenditures for recipients with diabetes were all more than \$2,000 higher than for those without the disease. Compounding the higher costs in these categories, 96% of Medicaid recipients with diabetes had at least one pharmacy claim, 22% had at least one inpatient hospital claim and 26% had at least one personal care assistance claim. (Table 26)

Table 26. SFY 06 Percentages of adult AK Medicaid recipients (≥ 21) with diabetes and at least one claim and per capita expenditures for AK Medicaid recipients with and without diabetes by health care service category, AK Medicaid

| Health care service category | % with diabetes and ≥ 1 claim | per capita expenditures | |
|------------------------------------|------------------------------------|-------------------------|------------------|
| | | with diabetes | without diabetes |
| Dental | 13.6% | \$463 | \$465 |
| Durable medical equipment/Supplies | 58.2% | \$1,001 | \$1,284 |
| Emergency department | 42.2% | \$210 | \$203 |
| Home and community-based waiver | 19.6% | \$17,346 | \$31,653 |
| Health clinic | 31.6% | \$1,166 | \$1,225 |
| Home health/hospice | 2.8% | \$2,734 | \$2,918 |
| Inpatient hospital | 22.0% | \$10,360 | \$7,487 |
| Inpatient psychiatric hospital | 0.1% | \$946 | \$2,326 |
| Lab/X-ray | 26% | \$156 | \$160 |
| Nursing home | 6.6% | \$56,609 | \$61,456 |
| Outpatient hospital | 70.7% | \$2,300 | \$1,569 |
| Outpatient mental health | 13.6% | \$4,416 | \$4,014 |
| Personal care assistance | 25.6% | \$22,698 | \$20,202 |
| Pharmacy | 96.0% | \$4,465 | \$2,070 |
| Physician/Practitioner | 88.4% | \$1,785 | \$1,347 |
| Therapy/Rehabilitation | 12.8% | \$1,031 | \$873 |
| Transportation | 31.3% | \$2,046 | \$1,960 |
| Vision | 33.2% | \$128 | \$124 |
| Other Services | 0.2% | \$135 | \$403 |
| Total | | \$25,280 | \$12,323 |

Note: The per capita expenditures were calculated using the numbers of recipients with or without diabetes who had at least one claim in that health care service category. The sum of each column does not equal the Total.

Overall diabetes prevalence among SFY 2006 Alaska Medicaid recipients (12.8%) was more than twice the diabetes prevalence among all adult Alaskans in 2004-2006 (5.3%); in the 65 and over age group, diabetes prevalence among Medicaid recipients (25.9%) was more than a third greater than it was among seniors in the general population in 2004-2006 (17.0%).

Although diabetes prevalence has always been much higher among Alaska Medicaid recipients than in the general population, between SFY 2001 and SFY 2006 it increased more slowly among Medicaid recipients than it did in the general population. Among adult Alaska Medicaid recipients, diabetes prevalence increased by 15% from 2000-2002 to 2004-2006 while it increased 40% in the general population. (Table 27)

| Table 27. 2001 and 2006 Diabetes prevalence among AK Medicaid recipients and all Alaskans, and percentage change in prevalence, AK Medicaid and AK BRFSS | | | | | | |
|--|---------------------|--------|----------|----------|---------|----------|
| | Medicaid recipients | | | Alaskans | | |
| | 2001 | 2006 | % change | 00-02 | 04-06 | % change |
| 21 – 64 | 8.7% | 9.7% | 11.5% | 3.2% | 4.3% | 34.4% |
| ≥ 65 | 21.5% | 25.9% | 20.6% | 11.4% | 17.0% | 49.1% |
| % with diabetes of all adults ≥ 21 | 11.1% | 12.8% | 15.3% | 4.0% | 5.5% | 37.5% |
| Number of adults ≥ 21 | 34,368 | 40,529 | 17.9% | 440,700 | 466,409 | 5.8% |

A group of privately insured Alaskans

One of the largest private health insurance companies active in Alaska agreed to share diabetes-related information on a one-time basis. In 2003, 2,229 (2.9%) of the 81,216 people insured by this company had diabetes. The proportion among covered adults (≥ 18) was slightly higher, at 3.5%.

This company spent \$3,512,406 on diabetes-related care in Alaska in 2003. Unlike the Medicaid pattern of escalating cost with age, the per capita cost for recipients over 65 years of age was not appreciably different from the average cost for adult beneficiaries in the 35 to 64 age groups. (Table 28)

| Table 28. Observed diabetes prevalence in a group of privately insured Alaskans (2003) and all Alaskans (2002-2004), 2003 per capita cost of diabetes care for a group of privately insured Alaskans with diabetes, a private health insurance company and AK BRFSS | | | |
|---|---------------------------------------|--------------|--|
| Age Group | Diabetes prevalence | | Per capita cost of diabetes care for a group of privately insured Alaskans with diabetes |
| | A group of privately insured Alaskans | All Alaskans | |
| 0-17 | 0.3% | n/a | \$3,162 |
| 18-24 | 1.7% | 0.7% | \$1,580 |
| 25-34 | | 1.4% | |
| 35-44 | 2.0% | 1.8% | \$1,458 |
| 45-54 | 4.4% | 6.8% | \$1,619 |
| 55-64 | 8.6% | | \$1,452 |
| 65+ | 12.6% | 13.6% | \$1,696 |

There were, however, substantial differences in annual medical costs if the recipient used insulin. (Table 29)

| Table 29. 2003 Per capita total, medical and pharmaceutical costs by insulin use for diabetes care of Alaskans insured by a private company | | | |
|---|---------|---------------|---------------------|
| | Total | Medical Costs | Pharmaceutical cost |
| Takes Insulin | \$4,140 | \$2,986 | \$1,154 |
| Does Not Take Insulin | \$1,300 | \$682 | \$618 |

Veteran's Administration

In 2005, 11.6% of the veterans served by the Veterans Administration (VA) clinic in Anchorage had diabetes, or about twice the diabetes prevalence among all Alaskan adults. The VA's 2005 per capita cost of caring for all Anchorage veterans was \$2,166, but it was four times greater (\$9,053) for veterans with diabetes. From another perspective, 48.4% of the VA's total 2005 clinical care expenditures in Anchorage was for veterans with diabetes.⁴³

AK Hospital Inpatient Discharge Database^{§§§§}

More than \$182.5 million was spent on inpatient hospital care for Alaskans with diabetes in 2004-2006, according to the Alaska Hospital Inpatient Discharge Database (AHIDD). A diabetes diagnosis was associated with 12.4% of the discharges and 20% of the inpatient hospital costs in 2004-2006. Between 2002-2004 and 2004-2006, the percentage increase in the cost of discharges with any diabetes diagnosis was nearly three times the percentage increase in the cost of all inpatient hospital discharges. (Table 30)

| Table 30. 2002-2004 and 2004-2006 Numbers and costs of inpatient hospital discharges with any diabetes diagnosis, of all hospital discharges, percentages of all discharges or costs associated with a diabetes diagnosis, and percentage change from 2002-2004 to 2004-2006 in these numbers and costs, AHIDD | | | | | | |
|--|------------------------|---------------|----------------|-----------------|-----------------------|---------|
| | Any diabetes diagnosis | | All discharges | | % Any diabetes of all | |
| | Number | Cost | Number | Cost | Number | Cost |
| 2002-2004 | 4,703 | \$103,498,646 | 48,885 | \$848,651,264 | 10.6% | 13.9% |
| 2004-2006 | 5,684 | \$182,531,178 | 51,415 | \$1,093,527,059 | 12.4% | 20.0% |
| % change | + 20.9% | + 76.4% | + 5.2% | + 28.9% | + 17.0% | + 43.9% |

Of the 2004-2006 hospital discharges of Alaskans ≥ 18 , 1.2% had diabetes as the primary diagnosis and 13.6% had diabetes among the secondary diagnoses. (Table 31, next page)

^{§§§§} The Alaska Hospital Inpatient Discharge Database includes administrative data from most Alaska hospitals (70%) including all of the Anchorage facilities. Discharges from the hospitals included in the database represent about 88% of all discharges in Alaska.

Table 31. 2004-2006 Inpatient hospital discharges of Alaskans ≥ 18 , discharge costs and average cost per discharge by diabetes as the primary diagnosis, any secondary diagnosis or no diabetes diagnosis, AHIDD

| | Total | With a diabetes diagnosis | | No diabetes diagnosis |
|----------------------------|---------------|---------------------------|---------------|-----------------------|
| | | Primary* | Secondary | |
| Total Discharges | 37,815 | 437 | 5,151 | 32,228 |
| % of total discharges | | 1.2% | 13.6% | 85.2% |
| Total Charges | \$935,802,130 | \$10,407,199 | \$170,494,635 | \$754,900,296 |
| % of total charges | | 1.1% | 18.2% | 80.7% |
| Average Cost Per Discharge | \$24,747 | \$23,815 | \$33,101 | \$23,424 |

In 2004-2006, discharges with any diabetes diagnosis were slightly more expensive than other discharges (e.g., for the 18-44 age group, discharges with any diabetes diagnosis represented 4.2% of all discharges and 4.8% of expenditures for their discharges). Discharges with diabetes as any secondary diagnosis were more expensive than discharges with diabetes as a primary diagnosis.

Adult Alaskans in the 18-44 age group had the smallest number of discharges of all of the age groups, and their discharges were least likely to have any mention of a diabetes diagnosis. While the average cost of discharges with any diabetes diagnosis was more than \$10,000 higher than those without a diabetes diagnosis for the 18-44 age group, there was no difference in the 75 or over age group. (Table 32)

Table 32. 2004-2006 Alaska hospital discharges and expenditures by age group and diabetes diagnosis group, AHIDD

| | 18-44 | 45-64 | 65-74 | 75+ |
|---|----------|----------|----------|----------|
| Number of discharges | 729 | 2,525 | 1,416 | 1,266 |
| % with any diabetes diagnosis | 4.2% | 20.1% | 28.7% | 24.6% |
| Percentage of total expenditures | | | | |
| Diabetes as primary diagnosis* | 1.1% | 1.3% | 1.3% | 0.7% |
| Diabetes as secondary diagnosis | 3.7% | 20.8% | 28.3% | 22.9% |
| Any mention of diabetes** | 4.8% | 22.1% | 29.5% | 23.6% |
| Average cost per discharge | | | | |
| Diabetes as primary diagnosis* | \$17,230 | \$25,608 | \$30,460 | \$24,273 |
| Diabetes as secondary diagnosis | \$26,172 | \$35,324 | \$35,314 | \$29,792 |
| Any mention of diabetes** | \$23,657 | \$34,579 | \$35,083 | \$29,613 |
| No mention of diabetes | \$13,284 | \$30,590 | \$34,815 | \$30,853 |
| * Primary includes discharges with concurrent primary and secondary diabetes diagnoses. | | | | |
| ** Any mention includes diabetes as a primary and/or secondary diagnosis. | | | | |

The age group-specific discharge rate for diabetes as a primary diagnosis diminished slightly for the 65 or over age group from 18.7 per 1,000 adult population in 2002-2004 to 15.6 in 2004-2006. (Data not shown)

The 2002-2004 Alaska discharge rate for diabetes as a primary diagnosis among adults 45-64 was 14.4 per 1,000 adults with diabetes; in 2003 in the US, this rate was 34.5.⁴⁴

Alaska men and women had similar age-adjusted discharge rates with diabetes as a primary diagnosis, but Alaska women had a much higher rate for discharges with diabetes as any secondary diagnosis. (Table 33)

| Table 33. 2004-2006 Age-adjusted Alaska hospital discharge rates per 1,000 adult population (18+) with diabetes by sex, AHIDD | | | |
|--|--------------------------------------|-----------|---------------|
| | Discharges with a diabetes diagnosis | | |
| | Primary* | Secondary | Any Mention** |
| Male | 36.8 | 155.1 | 191.9 |
| Female | 32.3 | 214.2 | 246.4 |
| Total | 34.5 | 185.3 | 219.7 |
| * Primary includes discharges with concurrent primary and secondary diabetes diagnoses. | | | |
| ** Any mention includes diabetes as a primary and/or secondary diagnosis. | | | |
| Note: The Alaska 2004-2006 BRFSS surveys provide estimates of an average of 13,430 adult males with diabetes and 11,364 adult females with diabetes. | | | |

Although the age-adjusted discharge rate for diabetes as a primary diagnosis were similar between Whites and American Indian/Alaska Natives, Whites had a slightly lower discharge rate for diabetes as any secondary diagnosis than did American Indian/Alaska Natives. Alaskans who were neither White nor American Indian/Alaska Native had higher diabetes-associated discharge rates, particularly for diabetes as a secondary diagnosis. (Table 34)

| Table 34. 2004-2006 Age-adjusted Alaska hospital discharge rates per 1,000 adult population (18+) with diabetes by race, AHIDD | | | |
|---|-------------------------|-----------|---------------|
| | With Diabetes Diagnosis | | |
| | Primary* | Secondary | Any Mention** |
| White | 32.3 | 161.4 | 193.7 |
| American Indian/Alaska Native | 32.2 | 184.1 | 216.3 |
| Other | 40.9 | 261.4 | 302.3 |
| * Primary includes discharges with concurrent primary and secondary diabetes diagnoses. | | | |
| ** Any mention includes diabetes as a primary and/or secondary diagnosis. | | | |
| Notes: (a) The Alaska 2004-2006 BRFSS results estimate an average of 18,822 Whites with diabetes; 3,352 American Indian/Alaska Natives with diabetes; and 2,382 Alaskans of other races (Black/African Americans, Asians, Pacific Islanders, and others) with diabetes. (b) The Alaska Hospital Inpatient Discharge Database includes administrative data from most Alaska hospitals (70%) including all of the Anchorage facilities. Discharges from the hospitals included in the database represent about 88% of all discharges in Alaska. | | | |

Among hospital discharges that had diabetes as any mentioned diagnosis, one-fourth of Alaska discharges had a first-listed circulatory system diagnosis (25.5%). (Table 35)

| Table 35. Distribution of first-listed diagnoses among hospital discharges for adults age 18 and older, Alaska 2004-2006 discharges with and without diabetes as any listed diagnosis and US 2003 discharges with diabetes as any listed diagnosis, AHIDD and NHDS ⁴⁵ | | | | |
|--|--------------|-------------------|-------------|--------------------|
| ICD-9 diagnosis code group | ICD-9 codes | Alaska Discharges | | NHDS with diabetes |
| | | with diabetes | no diabetes | |
| Circulatory system - includes cardiovascular disease | 390 - 459.9 | 25.5% | 11.7% | 31.3% |
| Respiratory system - includes pneumonia and flu | 460 - 519.9 | 10.1% | 6.1% | 10.5% |
| Digestive system | 520 - 579.9 | 9.6% | 9.9% | 9.3% |
| Diabetes | 250 - 259.9 | 8.0% | | 10.9% |
| Injury and poisoning | 800 - 999.9 | 7.9% | 10.3% | 6.6% |
| Musculoskeletal and connective tissue - includes most foot ulcer, inflammation and infection codes | 710 - 739.9 | 6.3% | 6.9% | 5.2% |
| Genitourinary system - includes kidney disease | 580 - 629.9 | 5.5% | 5.4% | 5.2% |
| Pregnancy, childbirth, puerperium | 630 - 676.94 | 1.6% | 26.2% | 0.4% |
| Other | | 25.6% | 23.4% | 20.8% |

Prevention Quality Indicators

The US Agency for Health Care Quality Research (AHRQ) developed sixteen Prevention Quality Indicators (PQI) to assess the impact of hospitalizations a) that could have been prevented through good outpatient care, or b) for complications that could have been avoided or kept from becoming serious if early intervention had occurred.^{*****} Four of the PQI focus on diabetes. (Table 36)

| Table 36. Brief definitions of US Agency for Healthcare Research and Quality diabetes-related Prevention Quality Indicators | |
|---|--|
| Indicator | Definition |
| Diabetes Short-Term Complications | Short-term complications include diabetic ketoacidosis, hyperosmolarity and coma. |
| Diabetes Long-Term Complications | Long-term complications include renal, eye, neurological and circulatory disorders. Long-term complications occur at some time in the majority of patients with diabetes to some degree. |
| Uncontrolled Diabetes | This measure is designed to be used with (results added to) the short-term complications measure to create a Healthy People 2010 indicator. |
| Lower Extremity Amputation | The lower extremity amputation rate is the number of admissions for lower-extremity amputation in patients with diabetes per 100,000 population. |

***** Please see http://www.qualityindicators.ahrq.gov/pqi_overview.htm for more information.

Based on the PQI, Alaska inpatient hospital costs for avoidable diabetes care amounted to more than \$16.3 million in calendar year 2006. Avoidable costs represented about 4.5% of all diabetes-related hospital inpatient charges that year. (Table 37)

| Table 37. CY 06 Prevention Quality Indicators by numbers and percentages of all diabetes-related hospital inpatient discharges and charges, AHIDD | | | | |
|---|------------|---------|--------------|---------|
| | Discharges | | Charges | |
| | Number | Percent | Dollars | Percent |
| Diabetes Short-Term Complications | 180 | 2.7% | \$3,358,318 | 0.9% |
| Diabetes Long-Term Complications | 293 | 4.3% | \$8,288,398 | 2.3% |
| Uncontrolled Diabetes | 19 | 0.3% | \$153,310 | 0.0% |
| Lower Extremity Amputation | 87 | 1.3% | \$4,531,821 | 1.2% |
| Total | 579 | 8.6% | \$16,331,846 | 4.5% |

In SFY 06, more than one-half (54%) of all hospital inpatient claims for Alaska Medicaid recipients with diabetes was for preventable complications or uncontrolled diabetes. Alaska Medicaid spent about \$950,000 on preventable diabetes hospital inpatient care, or about 7.0% of all hospital inpatient claims for Medicaid recipients with diabetes in state fiscal year 2006. (Table 38)

| Table 38. SFY 06 Prevention Quality Indicators by numbers, expenditures and percentages of Alaska Medicaid hospital inpatient claims for recipients with diabetes, AK Medicaid | | | | |
|--|--------|---------|--------------|---------|
| | Claims | | Expenditures | |
| | Number | Percent | Dollars | Percent |
| Diabetes Short-Term Complications | 59 | 15.4% | \$374,677 | 2.8% |
| Diabetes Long-Term Complications | 106 | 27.6% | \$461,354 | 3.4% |
| Uncontrolled Diabetes | 32 | 8.3% | \$19,427 | 0.1% |
| Lower Extremity Amputation | 11 | 2.9% | \$92,829 | 0.7% |
| Total | 208 | 54.2% | \$948,287 | 7.0% |

Diabetes costs in Alaska

- In 2007, health care expenditures amounted to about \$290 million for adults with diabetes and there were about \$82 million in indirect costs, such as reduced productivity, disability and premature mortality, for a total of about \$370 million.
- In SFY 06, Alaska Medicaid spent about \$138 million on care for recipients with diabetes; about 13% of all adult AK Medicaid recipients had diabetes.
- In 2003, a private health insurance company spent \$3.5 million on health care for its Alaska beneficiaries with diabetes.
- In 2005, 48% of clinical care expenditures by the Veteran's Administration (VA) clinic in Anchorage was for veterans with diabetes, who represented about 12% of all veterans served by that clinic.
- In 2004-2006, over \$182.5 million was spent annually on inpatient hospital care for Alaskans with diabetes, or about 20% of all inpatient hospital expenditures.
- In 2004-2006, the amount spent on inpatient hospital care for Alaskans with diabetes was a 76% increase over the amount spent in 2002-2004.
- In CY 06, Alaska inpatient hospital bills for avoidable diabetes care amounted to more than \$16.3 million.
- In SFY 06, more than half (54.2%) of all Medicaid hospital inpatient claims for recipients with diabetes were for preventable complications or uncontrolled diabetes.

Implications/Discussion

Alaska Medicaid expenditures in state fiscal year (SFY) 2006 represent about 48% of the 2007 estimated cost of direct diabetes care in Alaska, a much higher percentage than the estimated 21% of Alaskans with diabetes were enrolled in Medicaid during SFY 2006. This comparison suggests that:

- The total cost of diabetes care in Alaska was much higher than the 2007 estimate (national costs were the foundation of the Alaska estimate), and/or
- Care for Alaska Medicaid recipients with diabetes was much more expensive than care for Alaskans with diabetes who were not enrolled in Medicaid.

Over time, the Alaska cost of medical care has continued to be higher than US averages, unlike other spending categories.⁴⁶ According to Kaiser Family Foundation estimates, Alaska had the fifth highest per capita health care spending in the country in 2004 (\$6,450 in Alaska vs. \$5,283 in the US); Alaska per capita spending on inpatient hospital care and physician and clinical services was at least one-third higher than it was in the US.⁴⁷

Other than averting progression to diabetes, one effective way to control health care costs associated with diabetes would be to eliminate the need for spending on preventable complications or uncontrolled diabetes. Achieving this result depends on disease self-management by Alaskans with diabetes, access to affordable health care services for Alaskans with diabetes, and the timely provision of recommended health care services to Alaskans with diabetes by providers.

Recommendations

Increase access to diabetes self-management education for Alaskans with diabetes by:

- Providing health insurance coverage for diabetes self-management education on an ongoing basis (e.g., immediately after the diabetes diagnosis and periodically thereafter), and
- Supporting the Chronic Disease Self-Management Program (also known as Living Well Alaska).

Increase access to affordable diabetes health care services by:

- Encouraging employers to incorporate coverage for diabetes supplies and services in the health insurance they provide, and
- Encouraging health care providers to reduce the cost of diabetes care by adopting cost-effective, comprehensive chronic disease care models, such as what is now called the Planned Care Model (formerly the Chronic Care Model).

Assure timely provision of health care services by:

- Encouraging providers to use electronic medical record systems and employ them to flag patients with diabetes and provide reminders to providers and patients about visit periodicity and recommended care that should happen during a patient visit, and
- Promoting a team approach to diabetes care, with appropriate roles and responsibilities assigned to team members including pharmacists and primary care clinic receptionists, nurses and medical assistants.

Unmet need for preventive diabetes care

Health care provider visits

The BRFSS includes two questions about contact with health care providers. One (“About how long has it been since you last visited a doctor for a routine checkup?”) is asked of everyone, and the other (“About how many times in the past 12 months have you seen a doctor, nurse, or other health care professional for your diabetes?”) is asked only of people who say they have diabetes.

Adult Alaskans with diabetes were statistically significantly more likely than those without diabetes to have had their most recent check-up within the previous year. The diabetes-associated difference among Alaska men was statistically significant. (Data not shown) Nearly one-fourth of Alaskans with diabetes (23%) had not had a checkup within the previous year. (Table 39)

| Table 39. 2004-2006 Observed of percentages of adult Alaskans by time since last check-up and times seen a health care provider for diabetes during the past year by diabetes status, AK BRFSS | | |
|--|---------------|------------------|
| | with diabetes | without diabetes |
| Time since last check-up | | |
| Within past year | 77% | 57% |
| More than a year | 20% | 42% |
| Never | 3% | 2% |
| Times seen health care provider for diabetes in past year | | |
| At least 5 | 20% | n/a |
| 3 or 4 | 35% | |
| Twice | 18% | |
| Once | 17% | |
| Zero | 10% | |
| Percentages in bold indicate a statistically significant difference associated with diabetes status. | | |

More than two-thirds of adult Alaskans with diabetes (69% of men; 77% of women) reported that they had visited their health care provider for diabetes care at least twice during the previous year. But 10% of Alaskans with diabetes said they had not seen a doctor, nurse or other health care professional for their diabetes during the previous year. (Table 31)

Nearly one-third (30%) of Alaskans with diabetes who said that their last check-up was more than a year earlier also said they had not had a visit with their health care provider for their diabetes in the previous year (data not shown).

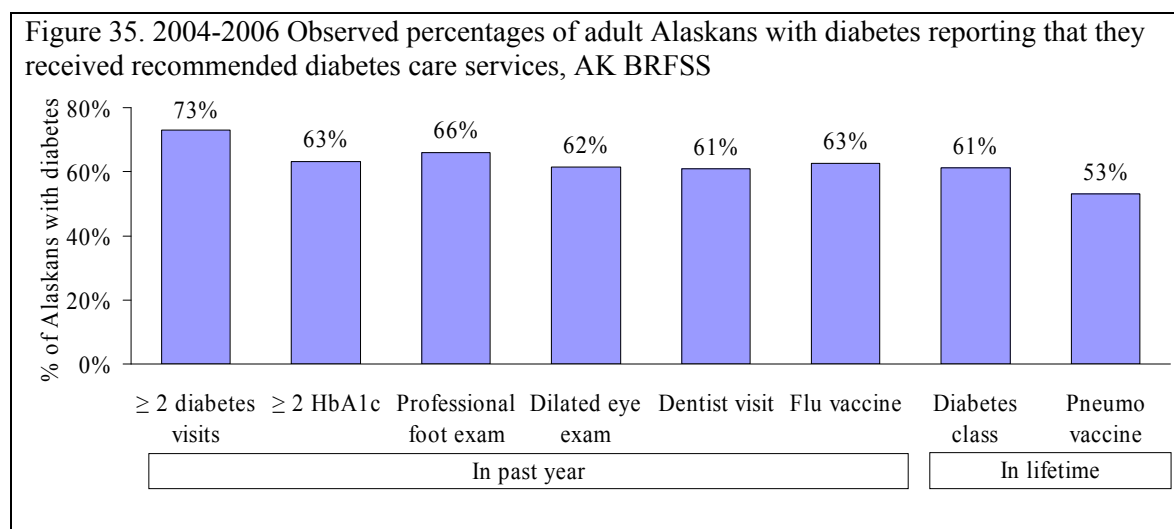
The American Diabetes Association and the Alaska Diabetes Prevention and Control Program recommend that all adults with diabetes have at least these preventive health care services every year:

- 1) Two glycosylated hemoglobin (HbA1c) tests
- 2) Dilated eye examination
- 3) Professional foot examination
- 4) Dental examination
- 5) Influenza vaccination
- 6) Fasting lipid panel
- 7) Kidney function test (serum creatinine, urine microalbumin, and/or glomerular filtration rate)

Other recommended services for adults with diabetes include:

- 1) Attending at least one diabetes management class
- 2) Pneumococcal disease vaccination every six years

Based on the recommended frequency of HbA1c testing, most adults with diabetes need at least two health care provider visits annually for diabetes care. Although 73% of adult Alaskans with diabetes reported that they had visited a health care provider for their diabetes at least twice during the previous year, only 63% to 66% of them said they had received certain diabetes preventive care services that should occur annually. (Figure 35)



Data are not available related to fasting lipid panel or kidney function testing.

These percentages correspond to unmet needs for care including 8,300 foot exams, 9,400 dilated eye exams, 12,300 HbA1c tests and 9,600 dentist visits. (Table 40)

| Table 40. 2004-2006 Observed percentages and estimated numbers of adult Alaskans with diabetes who received recommended care and unmet need for preventive care services, AK BRFSS | | | |
|--|--------------------|--|------------------------------|
| Recommended services | % received service | Estimated number that received service | Needed services not provided |
| Annual foot exam | 66.0% | 16,206 | 8,349 exams |
| Annual dilated eye exam | 61.5% | 15,101 | 9,454 exams |
| At least two HbA1c tests | | | |
| Alaskans reporting zero tests | 13.6% | 3,339 | 6,679 tests |
| Alaskans reporting one test | 23.2% | 5,697 | 5,697 tests |
| Alaskans reporting at least two tests | 63.2% | 15,519 | |
| Annual Flu shot | 62.6% | 15,371 | 9,184 shots |
| Annual dentist visit | 60.9% | 14,954 | 9,601 visits |
| | | | |
| Ever had at least one pneumococcal shot | 53.0% | 13,014 | 11,541 shots |
| Ever took a diabetes management class | 61.3% | 15,052 | 9,503 class slots |
| Numbers of individuals receiving services and unmet needs were calculated using the estimated number of Alaskans with diabetes in 2004-2006: 24,555. | | | |

Reported recommended care by AK BRFSS region

There was slight variation between the AK BRFSS regions in the percentages reporting that they had received at least two HbA1c tests, a professional foot exam or a dilated eye exam. The differences were not statistically significant, but Rural region residents were more likely to report that their feet had been examined and Gulf Coast region residents were less likely to report having received at least two HbA1c tests, than residents of the other regions. (Table 41)

| Table 41. 2004-2006 Observed percentages of adult Alaskans with diabetes reporting that they had received at least two A1c tests, a professional foot exam and/or a dilated eye exam during the previous year by AK BRFSS region, AK BRFSS | | | | | |
|--|------------------------|------------|-----------|-------|------------------------|
| | Anchorage and vicinity | Gulf coast | Southeast | Rural | Fairbanks and vicinity |
| ≥ 2 HbA1c | 63% | 57% | 69% | DSU | 66% |
| Professional foot exam | 65% | 66% | 68% | 76% | 65% |
| Dilated eye exam | 59% | 62% | 67% | DSU | 69% |
| DSU = data statistically unreliable due to a very small number of responses or a large confidence interval. | | | | | |

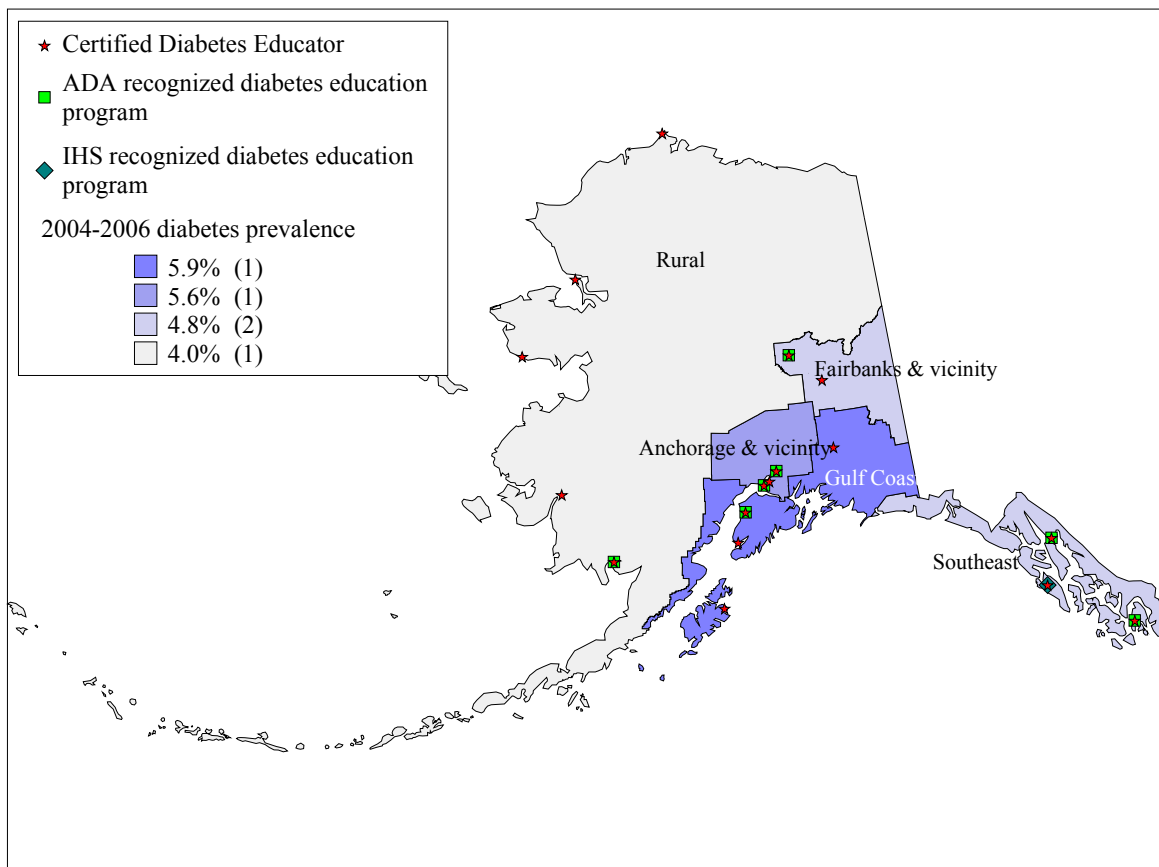
Region-specific dental visit and immunization percentages are not available due to small numbers.

Access to diabetes education

Access to diabetes education was unevenly distributed across the state and within the AK BRFSS regions. Each region presents a unique set of access to education challenges, reflecting its particular population, services system and geography.

Medicare only pays for diabetes self-management education if it is provided by a program that has been recognized by the American Diabetes Association (ADA) or the Indian Health Service (IHS). The American Association of Diabetes Educators (AADE) is an authority on diabetes education quality; it has identified seven behaviors that diabetes self-management education should include and certifies diabetes educators that are trained to provide these elements. ADA and IHS diabetes education program recognition does not require that a certified diabetes educator (CDE) be on staff, but all of the recognized programs in Alaska employ at least one. (Figure 36)

Figure 36. Alaska map with villages, towns or cities that have at least one Certified Diabetes Educator and/or a recognized diabetes education program and 2004-2006 diabetes prevalence by AK BRFSS region⁴⁸



Distribution of ADA or IHS recognized diabetes education programs (recognized programs) and Certified Diabetes Educators (CDEs) among AK BRFSS regions

| | Anchorage & vicinity | Gulf Coast | South-east | Rural | Fairbanks & vicinity | Statewide |
|---------------------|----------------------|------------|------------|-------|----------------------|-----------|
| Recognized programs | 2 | 1 | 3 | 1 | 1 | 8 |
| CDEs | 17 | 6 | 8 | 6 | 6 | 43 |

The ratio of CDEs to community populations with diabetes offers a different perspective on access to diabetes education than is provided by the AK BRFSS. Although the Anchorage and vicinity region has the largest number of CDEs, it also has the largest number of adults with diabetes and has a large ratio. The Rural region is huge and sparsely populated; it has a small ratio partly because the hub communities where CDEs live are relatively small and have small numbers of residents with diabetes even if the local diabetes prevalence was high. (Table 42)

| Table 42. 2004-2006 Percentages of Alaskans with diabetes reporting ever having taken a diabetes class; communities (village, town or city) with at least one CDE resident, estimated 2006 numbers of adult residents in these communities and CDE to residents with diabetes ratio by AK BRFSS region, AK BRFSS, AADE and AK DoL population estimates ^{49,50} | | | | | | |
|---|----------------------|------------|-------------|-------|----------------------|--------|
| | Anchorage & vicinity | Gulf Coast | South -east | Rural | Fairbanks & vicinity | Total |
| AK BRFSS % of adults reporting ever having taken a diabetes class | 66% | 50% | 62% | DSU | 59% | 61% |
| Communities with at least one CDE | | | | | | |
| Number of CDEs (<i>a</i>) | 17 | 6 | 8 | 6 | 6 | 43 |
| Estimated number of adult residents with diabetes (<i>b</i>) | 11,150 | 700 | 1,695 | 353 | 977 | 14,875 |
| Ratio ($1:[b \div a]$) | 1:656 | 1:117 | 1:212 | 1:59 | 1:163 | 1:346 |
| DSU = Data Statistically Unreliable due to a very small number of responses or a large confidence interval. | | | | | | |

Access to diabetes education is much more complex than simply living in the same community as a recognized program and/or CDE. For instance, some CDEs travel to other villages or cities to extend the reach of their programs. In urban communities, access may be complicated by transportation difficulties. Diabetes education is also available from sources other than CDEs or recognized diabetes education programs (please see Appendix B for descriptions of all diabetes education provider types in Alaska).

Regardless of the strength of association between living in the same community as a CDE and access to diabetes education, living in a community without a trained diabetes educator would increase the difficulty of obtaining this service. In addition to recognized programs and CDEs, some Community Health Aide/Practitioners (CHA/Ps) have been specifically trained to provide diabetes education after having completed the advanced training in diabetes course offered by the Alaska Native Diabetes Program. Thirty-four villages and cities have a resident advance-trained CHA/P. Of the 48 communities with either a CDE or CHA/P with advanced training, 32 had only an advance trained CHA/P, 14 had only a CDE and two had both. Reflecting the nature of the CHA/P program, there was a 2% difference between the percentage of Alaskans with diabetes living in a community without a resident CDE (39%), and the percentage of Alaskans living in a community with neither a CDE nor a CHA/P with advanced training (37%). (Table 43, next page)

Table 43. 2006 Estimated Alaska population with diabetes living in a community (village, town or city) that does not have a resident CDE or did not have a CHA/P with advanced training, AK BRFSS, AK Native Diabetes Program and AK DoL population estimates⁴⁹

| | Anchorage & vicinity | Gulf Coast | South -east | Rural | Fairbanks & vicinity | Total |
|---|-------------------------|---------------|----------------|-------|-------------------------|--------|
| Adults with diabetes in region (a) | 13,923 | 3,209 | 2,475 | 1,851 | 3,096 | 24,555 |
| No resident CDE | | | | | | |
| Adult residents with diabetes in communities with no CDE (b) | 2,773 | 2,510 | 780 | 1,498 | 2,119 | 9,680 |
| Population percentage without a CDE (b ÷ a) | 20% | 78% | 32% | 81% | 68% | 39% |
| CHA/P with advanced training | | | | | | |
| Communities with a CHA/P with advanced training | 0 | 3 | 2 | 28 | 1 | 34 |
| Adult residents with diabetes in communities with an advance trained CHA/P | 0 | 19 | 68 | 617 | 2 | 707 |
| No resident CDE or advance trained CHA/P | | | | | | |
| Adult residents with diabetes in communities with neither a resident CDE nor an advance trained CHA/P (c) | 2,773 | 2,491 | 712 | 1,097 | 2,117 | 9,189 |
| Population percentage with neither a resident CDE nor an advance trained CHA/P (c ÷ a) | 20% | 78% | 29% | 59% | 68% | 37% |

Diabetes care in Alaska

- One-tenth (10%) of Alaskans with diabetes said they had not seen a doctor, nurse or other health care professional for their diabetes during the previous year.
- Although 73% of adult Alaskans with diabetes reported seeing a health care provider at least twice in the previous year for their diabetes, only 61% to 66% reported receiving diabetes preventive care services that should be received at least once annually.
- Among the AK BRFSS regions, the percentages of residents of the Gulf Coast region that reported having received recommended diabetes preventive care were lower than the percentages from the other regions.
- 37% of adult Alaskans with diabetes live in a community without a resident Certified Diabetes Educator or an American Diabetes Association- or Indian Health Services-recognized diabetes education program.

Implications/Discussion

The check-up question was asked at a different time in the BRFSS survey than the diabetes-specific health care provider visit question. The AK BRFSS respondents with diabetes who said they had a check-up in the previous year did not always report having seen their provider for diabetes care during that time, and vice versa. For example, 15% of Alaskans with diabetes who said they had seen a health care provider for their diabetes several times in the previous year also said that it had been more than a year since their last check-up (data not shown). These combined results suggest two areas of concern:

- Some Alaskans with diabetes may be receiving excellent diabetes health care management services, but missing other preventive care recommendations such as regular cancer screenings.
- There is a small, difficult to reach group of Alaskans with diabetes that had no preventive health care services; this group may be particularly vulnerable to diabetes-related complications.

The unmet needs described in this section represent an additional economic burden to Alaska. Although providing these services would have meant an additional outlay of funds, the consequence of *not* providing them could result in greater future expenditures, such as the \$16.3 million spent on inpatient care identified using the Prevention Quality Indicators.

These unmet needs also reflect the challenges for Alaskans with diabetes and Alaska health care providers associated with following diabetes health care recommendations. Both groups constantly balance the need to attend to their diabetes against other urgent, daily demands.

Recommendations

Support measures by health care providers to reduce the likelihood of missed opportunities, such as:

- Using electronic medical record systems and employing them to generate specific reminders of care needed during visits with patients with diabetes.
- Instituting various strategies to remind patients to return for recommended health care services, such as semi-annual HbA1c tests.

Work to increase access to diabetes self-management education:

- Assist in the Advanced Diabetes Training for Community Health Aide/Practitioners.
- Work with recognized diabetes education programs to extend their reach.
- Support efforts by tribal organizations and community hospitals to achieve recognition for their diabetes education programs.

Promote awareness of the need for diabetes self-management among Alaskans with diabetes, their families, and their communities:

- Work to increase access to chronic disease self management training (known as Living Well Alaska).

Appendix A: Data source descriptions

Alaska Behavioral Risk Factor Surveillance System (AK BRFSS) has collected information since 1991. It uses a random sample procedure in which all Alaskan households with a phone have specific likelihood of being selected. Since 1998, the sample has been stratified into five geographic regions, with roughly equal numbers of interviews conducted in each region. This means that residents in less populous areas (such as Rural Alaska) are somewhat more likely to be included in the sample than residents of areas with a larger population (such as Anchorage). After being collected, data are weighted to assure a balanced representation of various subgroups and to reflect the total population of the each area.

The diabetes screening question has been included in the BRFSS core since AK BRFSS started collecting data. It is:

Have you ever been told by a doctor that you have diabetes?

Responses are: yes; yes, but female only told during pregnancy; no; no, pre-diabetes or borderline diabetes; don't know/not sure; refused.

The AK BRFSS has included an additional set of diabetes questions each year since 1995. They are:

1. How old were you when you were told you have diabetes?
2. Are you now taking insulin?
3. Are you now taking diabetes pills?
4. About how often do you check your blood for glucose or sugar? Include times when checked by a family member or friend, but do not include times when checked by a health professional.
5. About how often do you check your feet for any sores or irritations? Include times when checked by a family member or friend, but do not include times when checked by a health professional.
6. Have you ever had any sores or irritations on your feet that took more than four weeks to heal?
7. About how many times in the past 12 months have you seen a doctor, nurse or other health professional for your diabetes?
8. A test for hemoglobin "A one C" measures the average level of blood sugar over the past three months. About how many times in the past 12 months has a doctor, nurse or other health professional checked you for hemoglobin "A one c"?
9. About how many times in the past 12 months has a health professional checked your feet for any sores or irritations?
10. When was the last time you had an eye exam in which the pupils were dilated? This would have made you temporarily sensitive to bright light.
11. Has a doctor ever told you that diabetes has affected your eyes or that you had retinopathy?
12. Have you ever taken a course or class in how to manage your diabetes yourself?

In 2004, Alaska added a survey that is closely modeled on the BRFSS methodology and survey instrument to enrich information on tobacco-related attitudes and behaviors and to address other issues that the regular BRFSS does not incorporate. This Modified BRFSS includes both the diabetes screening question and the optional subset of diabetes questions

that may be used in the regular survey. Consequently, information from individuals with diabetes doubled when the modified survey was implemented, with related improvements in data reliability. The AK BRFSS website is

<http://www.hss.state.ak.us/dph/chronic/hsl/brfss/default.htm>. The CDC BRFSS website is: <http://www.cdc.gov/brfss/>.

Limitations: The one main limitation of any telephone survey is that those people without phones cannot be reached and are not represented. In Alaska, about 97% of households have phones; about 98% of all U.S. households have phones (2000 US Census, Summary File 4). The percentage of households with a telephone varies by region in Alaska. In general, persons of low socioeconomic status are less likely than persons of higher socioeconomic status to have phones and are undersampled. However, national BRFSS results correspond well with findings from other surveys conducted in person.

The reliability of a prevalence estimate depends on the actual, unweighted number of respondents in a category or demographic subgroup (not a weighted number). Interpreting and reporting weighted numbers that are based on a small, unweighted number of respondents can be misleading. The degree of precision increases if the sample size is larger and decreases if the sample size is smaller. Prevalence estimates are not usually reported for those categories in which there were less than 50 respondents and are rounded to the nearest whole percent when the denominator is less than 500. Since subdividing single-year AK BRFSS diabetes results would often produce categories with fewer than 50 respondents, diabetes data are generally reported as three-year annual averages.

With surveys based on self-reported information, the potential for bias must be kept in mind when interpreting results. Survey response rates may also affect the potential for bias in the data. The impact of bias associated with self-report varies with the question. About 30% of US adults with diabetes do not know they have this disease, which means that differences between Alaskans with and without diabetes are underestimated in BRFSS results.⁵¹ Although self-reported demographics (age, for example) have been determined to be quite accurate, other responses are less so. In particular, among the measures particularly relevant to diabetes, HbA1c, high cholesterol, high blood pressure, and height and weight responses seem to be particularly prone to under- or over-reporting.

Alaska Birth Certificates are one set of vital records maintained by AK Bureau of Vital Statistics (AK BVS) under AK Statute Section 18.50.010. In 1994, the AK BVS implemented an Electronic Birth Certificate system, which allows hospital and clinic staff to record all birth certificate information directly into the AK BVS database. Checks during and after data entry assure data accuracy. In 2003, nearly 97% of all births in Alaska were recorded using this system. When an Alaska resident gives birth in another state, that state's registrar sends AK BVS a copy of the birth certificate.

In addition to details on the birth, the infant and his or her parents, birth certificates include information on the mother's prior pregnancy history, conditions affecting the pregnancy, complications affecting the pregnancy, and abnormal conditions or congenital anomalies of the infant. Diabetes and congenital diabetes are included in the list of medical conditions

affecting the pregnancy. The AK BVS website is <http://www.hss.state.ak.us/dph/bvs/default.htm>.

Birth rates are usually reported per 1,000 live births. When the analysis is focused on women with diabetes or gestational diabetes, the rate may be per 1,000 births to women with one or both of those conditions.

Limitations: The accuracy of birth certificate data varies considerably by item. Mothers' risk factors are among the data that have been found to be particularly problematic.⁵² If available, hospital discharge data are more accurate resources for gestational and other types of diabetes.⁵³

Alaska Death Certificates are another set of vital records maintained by the AK Bureau of Vital Statistics (AK BVS) under AK Statute Section 18.50.010. Death certificates are filed with the local recording office, then forwarded to AK BVS for registration. If an Alaskan resident dies in another state, that state's registrar sends AK BVS a copy of the death certificate.

In addition to details on the time and manner of death, death certificates include the immediate cause of death and up to three underlying causes of death, contributing causes of death, and demographic information about the decedent. Together, the immediate and underlying causes of death describe the disease or injury sequence leading directly to death. All other significant diseases or conditions that contributed to the death, but were not an underlying cause, are entered separately as contributing causes. Diabetes could be entered on a death certificate as either an underlying cause or a contributing cause of death. The term "any mention" of diabetes refers to any listing of diabetes as either an underlying or contributing cause of death.

Starting in 1991, the AK BVS added contributing causes of death to its reports and analyses, which earlier had only included the underlying cause of death. The AK BVS website is <http://www.hss.state.ak.us/dph/bvs/default.htm>.

Mortality rates are usually reported per 100,000 population.

Limitations: Relatively common causes of concern when using vital records as a resource for public health information include (1) incomplete death certificate forms, (2) identified diagnoses may be inaccurate or incomplete, (3) race or ethnicity may be incorrectly entered, and (4) different interpretations of underlying and contributing cause of death by people completing death certificates.⁵⁴ In addition, there are specific problems when using death certificate data as a source of information about diabetes. These include:

- Under-reporting of diabetes on death certificates. Among deceased participants in the Translating Research Into Action for Diabetes study, 39% had the disease identified on their death certificates and 10% had it as an underlying cause of death.⁵⁵
- Distinctions between type 1 and type 2 diabetes are often not specified.

Alaska Department of Labor and Workforce Development, Research and Analysis Section (AK DoL) has population estimates and projections and Alaska census data from the US Census Bureau. AK DoL estimates start with the annual total Alaska population estimate from the US Census Bureau; the populations of places, boroughs and census areas are then calculated using a formula based on the 2000 Census, Permanent Fund Dividend applications, an annual AK DoL survey of group housing facilities, and the estimated size of the military and military dependant population that did not file for a Permanent Fund Dividend. AK DoL population estimates are independent from year to year and are available in age, sex, and region-specific tables. The AK DoL website is <http://almis.labor.state.ak.us/>.

AK DoL population estimates are used to calculate the number of people affected by a certain condition or as the denominator when computing rates.

Limitations: (1) AK DoL and US Census Bureau population estimates include full-time Alaska residents. Temporary residents, such as seasonal workers, have a substantial impact on some communities but are not included. (2) Population estimates are made once a year; the timing of boundary changes for boroughs or cities may preclude its incorporation in that year's population estimate.

Alaska Hospital Discharge Dataset (AHDD) involves data provided through an agreement between the Alaska Department of Health and Social Services and the Alaska State Hospital and Nursing Home Association (ASHNHA). The dataset includes hospitalizations from 70% of Alaska hospitals, or about 88% of all hospitalizations in Alaska. It starts with 2001.

Each hospital admission may have several diagnoses, each identified using an ICD-9 code. The immediate reason for the hospitalization is usually listed as the patient's primary diagnosis. Some diseases, such as diabetes, substantially contribute to the need for some hospitalizations but are more frequently listed as a subsequent than a primary diagnosis. An analysis of discharge data that used only primary diagnoses would miss these discharges and would underestimate the impact of diabetes. Consequently, analyses often look for discharges in which diabetes was either the primary diagnosis or any subsequent diagnosis.

Hospital discharge rates are usually expressed per 10,000 general population, although some diabetes-specific analyses use per 1,000 people with diabetes. One challenge in using a diabetes-specific denominator is that hospital discharge data often includes children, but there is no state-specific means for identifying the prevalence among Alaskans under 18.

Limitations: (1) As with the National Hospital Discharge Survey (NHDS), the unit of analysis for the AHDD is discharges, not individuals. Multiple admissions of the same individual for the same or similar reasons may be counted more than once. (2) Excluded from the Alaska hospital discharge database are data from eight of the state's smaller hospitals, which represents about 12% of Alaska's hospitalizations.

Alaska Medicaid (AK Medicaid) has a huge database containing individual and provider enrollment data and all of the claims submitted for reimbursement by AK Medicaid. Medicaid is a joint state-federal program which is the third-party payer for enrolled Alaskans. Alaskans may be enrolled without using a Medicaid-funded service; to avoid results skewed by this non-user group, the analysis denominator is recipients, or people who have had at least one claim for Medicaid-funded care. Medicaid recipients with diabetes are identified by a) having two or more claims with a diabetes diagnosis within two years, or b) receiving diabetes therapy.⁵⁶

In addition to total Alaska enrollment and recipient numbers and total expenditures, AK Medicaid results are presented as percentages of the Medicaid population, average per capita cost of care or average per capita reimbursement claims submitted for care.

Limitations: (1) This database only includes care that was reimbursed by Medicaid. If one group of recipients is more or less likely than another to have intermittent Medicaid coverage and have health care that is not reimbursed by Medicaid, differences between the groups will be skewed. (2) The population enrolled in Medicaid reflects the various eligibility categories; it is much easier to gain enrollment for children (< 18) and pregnant women than other Alaskans. It is very difficult for non-disabled adults without dependant children to gain eligibility if they don't have concurrent Medicare enrollment. Consequently, AK Medicaid has less information about the kinds and quality of care provided to reasonably healthy working-age adult Alaskans. (3) The primary purpose of the information in this database is health care payment. It is organized and monitored for accuracy from that perspective, which means that diagnoses or procedures that have higher reimbursement rates are likely to be favored. Most claims are submitted electronically, with provider clerks doing the data entry. Consequently, there is substantial variation in the completeness, style and accuracy of diagnosis and procedure coding.

Alaska Native Diabetes Program Diabetes Registry is populated by case reports from regional diabetes coordinators, chart and lab reviews from ICD-9 codes, and data entry by the registry team. The latest registry data may not be available immediately. This data is available to tribal health programs, and in certain circumstances, to other programs. Contact the epidemiologist at 729-1124 discuss data requests. The AK Native Diabetes Program website is <http://www.anmc.org/services/diabetes/>

Prevalence results are usually presented per 1,000 people (age-adjusted). Examples of data available include yearly prevalence, increase in prevalence, ESRD, and amputation rates.

Limitations: While every effort is made to keep the registry complete, it is possible that we miss people who get care completely outside the tribal/I.H.S. health care system.

Alaska Statewide Diabetes Survey (ASDS) was conducted in the fall of 1999. Respondents were 501 adults 18 and older with diabetes in Anchorage, Fairbanks, the Kenai Peninsula, the Mat-Su Valley, Juneau and Ketchikan. The 50-question survey asked about demographics, lifestyle, diabetes complications, and disease management.

Adults with diabetes were identified through random digit dialing using all prefixes in the six areas surveyed. A total of 26,700 calls were made, which includes 8,800 disconnected numbers, 324 busy signals, 1,400 voicemails, and 3,100 calls to numbers where there was no answer. Among the households which qualified because of having an adult with diabetes, there was a 70% response rate. Among the qualified households who also spoke English, the response rate was even higher.

Limitations: As with other phone surveys, the data are limited because they are self-reported and therefore dependent on the accuracy and memory of the respondent. Because the sample did not include individuals without access to a phone or who were not English-speaking, the results can only be generalized to English-speaking Alaskans with diabetes who had a phone during the survey period.

National Health Interview Survey (NHIS) is an annual household survey of approximately 120,000 US residents conducted by the National Center for Health Statistics. The NHIS provides information on the health of the US population, including the prevalence and incidence of disease and the utilization of health care services. There are two important differences between the NHIS and the BRFSS; 1) the NHIS uses a national sample which means that its results more accurately reflect the entire US population than BRFSS results, and 2) the NHIS collects information throughout the age-span, while BRFSS is usually limited to adults (≥ 18). Each year a one-sixth sub-sample of NHIS respondents are asked whether any family member has had diabetes in the past 12 months. The NHIS website is <http://www.cdc.gov/nchs/nhis.htm>.

Limitations: As with the BRFSS, the usual limitations associated with phone surveys are compounded for questions concerning chronic diseases, because many respondents have a condition that hasn't yet been diagnosed. For example, about 30% of US adults with diabetes do not know they have this disease.¹

Northwest Renal Network (NWRN) is a private, not-for-profit corporation dedicated to the promotion of optimal dialysis and transplant care for kidney patients in Alaska, Idaho, Montana, Oregon, and Washington. It collects and analyzes data on patients enrolled in the Medicare End-Stage Renal Disease program and monitors the quality of care given to dialysis and transplant patients in the Pacific Northwest. NWRN also tracks the total number of people in the Northwest who are on dialysis or who have had a kidney transplant. Summary statistics and annual reports are available through their website <http://www.nwrenalnetwork.org/ARS.htm>.

Limitations: Because of extensive and multiple data reliability procedures, the NWRN believes their data to be nearly 100% accurate. There may be a small margin of error due to patient transience and re-location. NWRN and US Renal Data System (USRDS) data cannot be compared because the USRDS is limited to dialysis patients receiving outpatient services from Medicare-approved dialysis facilities, and NWRN data are not.

Private health insurance providers may be willing to share information about Alaskans covered by employer-purchased health insurance plans. The AK Diabetes Program negotiated with one of the largest providers in Alaska to obtain summary statistics on the cost and quality of diabetes-related care that had been used by Alaskans enrolled in one of its plans.

Limitations: (1) The memorandum of agreement between the AK Diabetes Program and private health insurance provider is limited to measures of diabetes-related care, and insurance company provided this information to the AK Diabetes Program in summary tables. Consequently, subgroup or other secondary analysis is not possible. (2) Data are necessarily limited to individuals who are enrolled in a health plan at the time of service. If someone received a diabetes-related service just before or after being enrolled, this data source cannot track it. (3) The population covered by the private insurer is generally either employed or closely related to someone who is employed. Consequently, it is skewed toward adult Alaskans who have not retired.

Appendix B: Descriptions of all diabetes educator types in Alaska

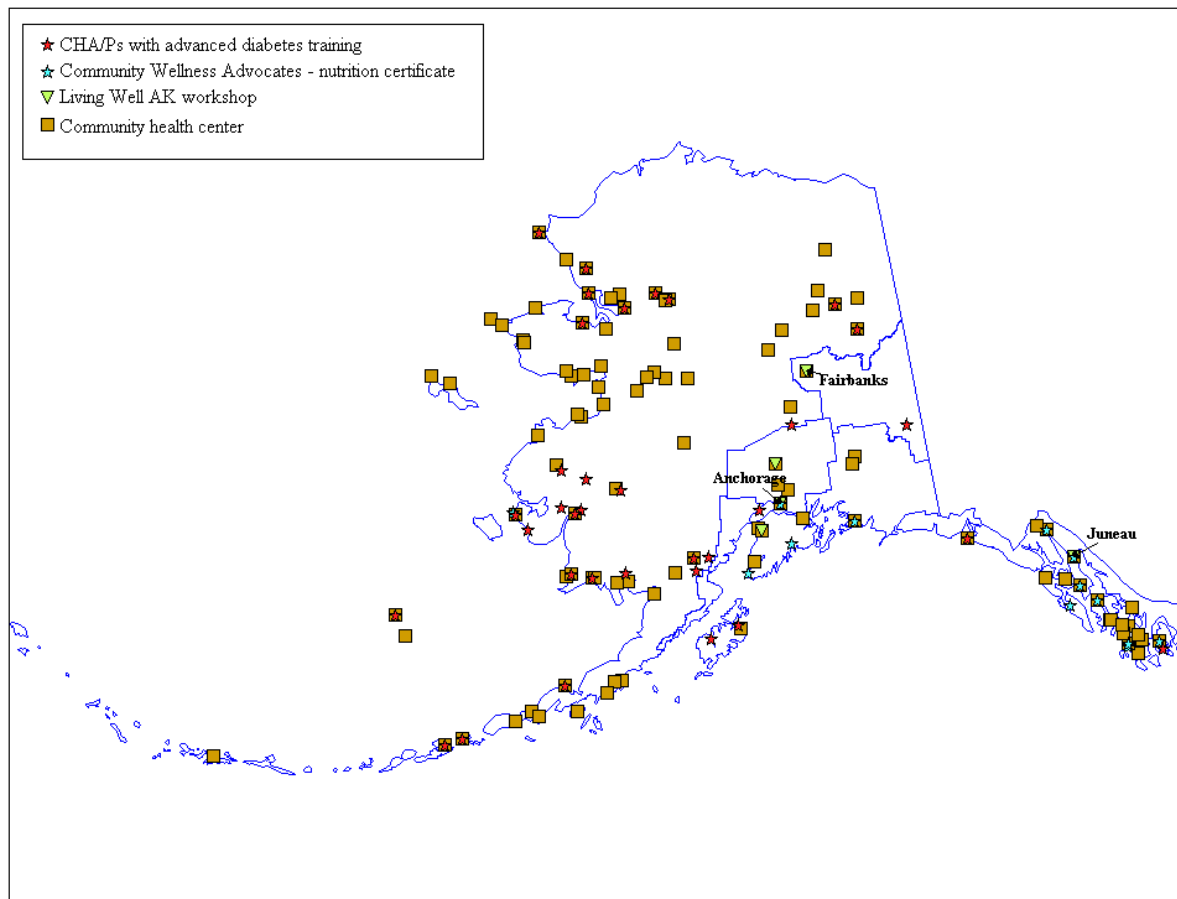
Alternative diabetes education providers are located in communities with about two-thirds of Alaska adults with diabetes. In places where they overlap, these providers may extend the reach of CDEs and the ADA diabetes education programs. Alternative diabetes educators are also in communities where about one in twelve adult Alaskans with diabetes live and which do not have a resident CDE or ADA recognized program. (Table B)

| Table B. Certification requirements and numbers of providers available by type of diabetes self-management education resource | | |
|---|---|---|
| Educator type | Requirements | Number in AK |
| Certified Diabetes Educator (CDE) | <p>These professionals who are specifically trained to help individuals with diabetes manage their disease.</p> <ul style="list-style-type: none"> • May have a variety of backgrounds, including nursing, pharmacy, medicine, podiatry, physical therapy, nutrition, exercise physiology, social work, or health education. • Must have at least two calendar years experience in diabetes patient and self-management education. • Must have worked at least 1,000 hours in diabetes patient and self-management education. | 39 (based on 2008 AADE and information collected in 4/08) |
| ADA recognized diabetes education program | <p>These programs are the only entities that are qualified to be reimbursed by the Medicare program for providing diabetes education. In addition to providing diabetes self-management education that meets specific content requirements, these programs must have and keep in place during the three-year certification period:</p> <ul style="list-style-type: none"> • A single sponsoring organization • An advisory group consisting of at least a health professional, a community member and a person affected by diabetes. • An identified target population or service area focus. • A designated program coordinator responsible for planning, implementing and evaluating the DSME. • Qualified personnel responsible for the delivery of education. • A program performance improvement process • A process for tracking at least two outcomes of program success <ul style="list-style-type: none"> - Patient-defined goals and measure of goal attainment - Attainment of a metabolic, clinical, quality of life, or process outcome. | 7 |
| IHS Integrated Diabetes Education Recognition Program | <p>This program for diabetes education programs in the Indian Health System is quite similar to the ADA program. Unlike the ADA: (a) IHS does not have an application fee, (b) IHS requires that at least one of the program's instructional staff either have a CDE or recent didactic training, and (c) IHS requires that programs maintain a diabetes registry.</p> | 1 |

| | | |
|--|---|--|
| Community health center (CHC) | These health care clinics receive funding from the US Health Resources and Services Administration (HRSA) to provide health care to people who would otherwise have very limited access to care due to poverty, geographic isolation, and/or limited numbers of providers. Starting in 1998, HRSA has worked to improve the quality of diabetes care provided by CHCs. Starting in 2008, HRSA institutionalized the reporting system that was a key component of the quality improvement work; now all CHCs are required to include certain care quality measures in their reports. Theoretically all centers should be providing diabetes education to their patients, but the reporting requirement is so recent that data are not yet available for monitoring the quality of care provided in Alaska. | 74 (plus ? new sites in 2008) |
| Community Health Aide/Practitioner (CHA/P) with diabetes specialty certificate | These community-based health care providers work for a Tribal health program and complete four training sessions (a total of about 16 weeks) with intermediate on-the-job training toward achieving a Community Health Practitioner certificate. The Alaska Native Diabetes Program offers advanced training in diabetes care to CHA/Ps; diabetes education skills are taught during this course. | 28 |
| Community Wellness Advocate - core program - nutrition tract | These community-based health promotion advocates have completed a three-part core curriculum in health promotion that is offered jointly by the University of Alaska Southeast and the South East Alaska Regional Health Consortium. An additional specialty tract in Nutrition is available to people who complete the core curriculum. This training, especially the nutrition tract, provides an excellent foundation for peer-to-peer diabetes education efforts. | 28 CWA with core training 18 CWA with nutrition specialty certificate |
| Living Well Alaska | Living Well Alaska is the program name for Chronic Disease Self-Management Program (CDSMP) activities in Alaska. The CDSMP was developed by Kate Lorig of Stanford University; it has an excellent track record for increasing the likelihood that participants will adopt healthier behaviors and improve their health status. The CDSMP is a six-session course, with each session lasting about 2 hours; although the class leaders must complete a certified training program, it is designed to be led by community members. Living Well Alaska courses do not meet the seven diabetes self-management education criteria of the AADE or ADA, but participants gain valuable skills in setting health-related goals which are a key outcome of diabetes self-management training. | 5 communities (all of which have a community health center) |

The much higher numbers of alternative diabetes education providers could substantially increase access to diabetes education, particularly because many communities would have more than one type of provider. (Figure B)

Figure B. Community-based alternative resources for diabetes education



End notes

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