

Appendix I

THE EPIDEMIC OF TYPE 2 DIABETES

Diabetes is a serious problem for American Indians and Alaska Natives (AI/ANs), who suffer from the highest rates of diabetes in the world. Virtually unknown 60 years ago, diabetes and its complications are now major contributors to morbidity and mortality in every AI/AN community. The Balanced Budget Act of 1997 and the Consolidated Appropriations Act of 2001 provided much-needed funding for the Indian health system to address this epidemic.

A. The Epidemic of Type 2 Diabetes

Demographics of American Indians and Alaska Natives

AI/ANs are often lumped into one group, but the needs and issues of each community and region are variable. The federal government recognizes more than 560 tribes, and approximately 40% of the 2.5 million AI/ANs live on federal and state reservations or in Alaska Native villages.¹ Although most tribal communities are located in rural areas, each community has unique characteristics that affect the health care that its members receive. For example, some tribes have large hospitals with a team of doctors and specialists, whereas other tribes have a small clinic staffed by only a mid-level practitioner or community health aide. Some tribes are located near an urban center making access to specialty care relatively easy for patients, whereas other tribes are located in remote rural areas where accessing even basic health care is difficult.

More than 60% of the 2.5 million AI/ANs currently live in urban areas.² During the 1950s, government policies and programs, as well as economic conditions, resulted in the relocation of many AI/ANs to urban centers.³ Urban Indians are not always able to escape poverty, inadequate education, alcoholism, and drug dependence, which often make life difficult in some tribal communities. Furthermore, many urban Indians move frequently and often do not have a regular source of medical care.⁴

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Although rural and urban Indians have variable needs and issues, they often share the problem of inadequate access to health care and the burden of poor living conditions. These factors have contributed to the poor health status of AI/ANs, regardless of their residence on reservations or in urban centers.

Emergence of the Diabetes Epidemic in AI/ANs

Diabetes is a relatively new problem for AI/ANs, and is the consequence of drastic lifestyle and cultural changes that have occurred since World War II. Prior to World War II, reports of diabetes were rare in the AI/AN population. Throughout the 1950s and 1960s, the reports of diabetes among AI/ANs were increasing. By the late 1970s, it became evident that an epidemic of diabetes had emerged in the AI/AN population.⁵

Much of our information about the nature and impact of diabetes in AI/AN communities comes from ongoing cooperative studies with the Pima Indians of Arizona that have been funded by the National Institutes of Health for over 25 years. The Pima Indians have the highest rates of diabetes in the world. More than half of adult Pima Indians have diabetes, and the mortality rate due to diabetes is more than 10 times greater than that of Caucasians. The Pima Indian studies and data from other tribes show that the major factors contributing to diabetes in AI/ANs are obesity, family history, and high levels of insulin in the blood, which results in a forerunner of diabetes called insulin resistance.⁶

Diabetes Prevalence

Of all U.S. racial and ethnic groups, AI/ANs have the highest rates of diabetes prevalence. In fact, AI/ANs now have the highest published prevalence of diabetes in the world. In 2000, 15.1% of AI/ANs aged 20 years or older had diagnosed diabetes, compared to 7.8% for non-Hispanic whites.⁷ In some tribes, notably the Pima Indians of Arizona, over half of the adults have diabetes.⁸ However, the American Diabetes Association estimates that the actual prevalence of the disease may still be one-third higher in many communities because of undiagnosed cases.⁹

Diabetes is increasing in prevalence among all AI/AN communities and age groups. IHS studies show that between 1997 and 2001, the prevalence of diabetes increased 33% in all major regions served by the agency. Among adults, AI/AN adults between the ages of 20–34 years experienced the highest increase in diabetes prevalence (an increase of 52% from 1997 to 2001).

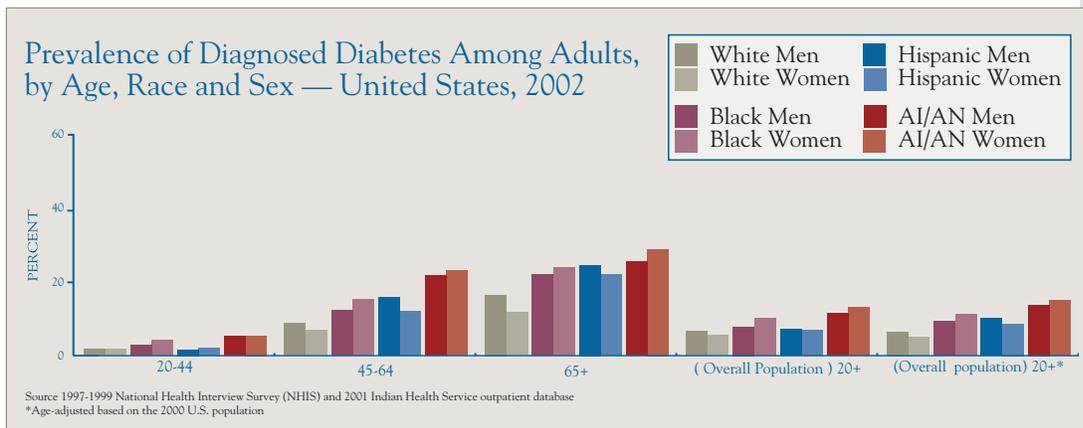
Most alarming is the increase in diabetes prevalence in children and adolescents. Type 2 diabetes was previously thought to be a disease of adults

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and was considered exceedingly rare in children and adolescents. Among all age groups, the highest increase in prevalence has occurred among AI/AN adolescents aged 15–19 years, with a 106% increase from 1990 to 2001.¹⁰ Because these young people have acquired diabetes at such an early age, they will experience more years of disease burden and a higher probability of developing serious diabetes-related complications—complications that will threaten life expectancy, reduce quality of life for themselves and their families, and lower productivity during the prime years of their lives.

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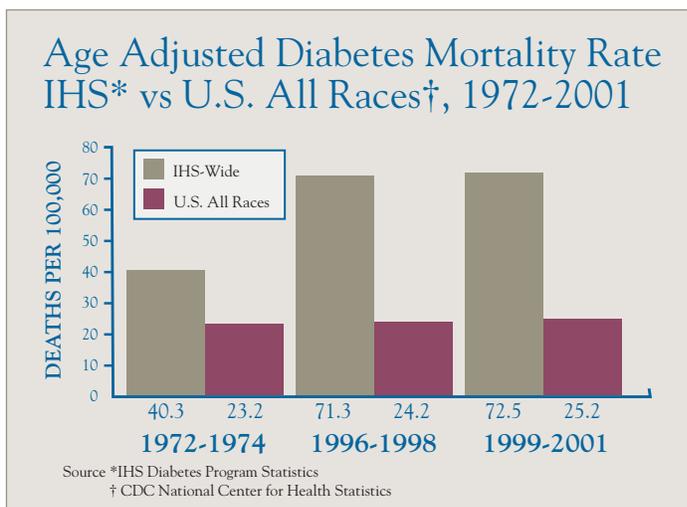


The IHS can now more accurately compare the prevalence of diabetes among AI/ANs compared to other racial and ethnic groups.

Diabetes Mortality

Diabetes mortality is reportedly three times higher in the AI/AN population than in the general U.S. population. Most experts agree, however, that true diabetes mortality is underestimated in national statistics for two reasons. First, many decedents with diabetes do not have diabetes listed on their death certificates. Second, AI/AN heritage is not always apparent on death certificates. For these two reasons, the actual death rate attributable to diabetes among AI/ANs is believed to be 4.3 times higher than in the general U.S. population.¹¹

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Complications of Diabetes

The problem of diabetes is made more complex by the fact that it leads to disabling and life-threatening complications that affect virtually every system of the body. Because AI/ANs have higher rates of diabetes, they also suffer from higher rates of long-term diabetes complications. AI/ANs also develop these complications sooner since they develop diabetes earlier in their life compared to the general U.S. population.

The chronically high levels of blood sugar that are associated with diabetes cause severe damage to the blood vessels—from the tiny blood vessels found in the eyes or kidneys to the major blood vessels that nourish the heart, brain, and extremities. Over time, the tissues nourished by these blood vessels are permanently damaged, resulting in diverse and numerous complications:¹²

- **Kidney disease**, or diabetic nephropathy, which can lead to kidney failure.
- **Diabetic eye disease**, or retinopathy, which can lead to blindness.
- **Heart** (cardiovascular) **disease**, including heart attack and heart failure.
- **Stroke** (cerebrovascular disease).
- Damage to the **nervous system**, or **neuropathy**. Peripheral neuropathy causes pain and loss of sensation, contributing to increased risk of limb infection, ulceration, and amputation. Autonomic neuropathy may lead to heart arrhythmias, poor blood pressure control, digestive dysfunction, and sexual dysfunction.
- **Dental** and oral complications, such as mucosal infections, periodontitis, salivary gland dysfunction leading to difficulty swallowing and speaking, and neuropathies such as burning tongue or mouth.
- **Pregnancy** complications for both mother and baby.

Complications that are classified as *microvascular complications* damage the small blood vessels of the body that nourish organs like the kidneys and eyes.

Microvascular complications are serious, debilitating, and often deadly. For example, from 1975 to 1984, kidney disease, or diabetic nephropathy, was the leading cause of non-traumatic death among the Pima Indians of Arizona. Rates of diabetes-related kidney failure in Southwest AI/ANs are six times higher than in the general U.S. population. Although more than three dozen reservation-based dialysis centers have been established, many AI/ANs living on reservations or in remote areas still travel great distances (e.g., more than one hour in each direction) to receive treatment. They are also less likely than Caucasians to receive a kidney transplant. Similarly, AI/ANs suffer

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disproportionately from diabetic eye disease. Some tribes have rates of diabetic eye disease that reach nearly 50%.¹³

Complications that are classified as *macrovascular complications* are responsible for the majority of diabetes-related deaths. These complications lead to cardiovascular disease, strokes, and limb and foot amputations, and they can shorten the average lifespan by up to 15 years.¹⁴ Cardiovascular disease, which refers to diseases involving the heart or blood vessels, is the leading cause of death for AI/ANs, and the rates are increasing.¹⁵ Even if other risk factors are not present, diabetes is a strong independent risk factor for cardiovascular disease. In AI/ANs, diabetes is the strongest risk factor for cardiovascular disease.¹⁶

Obesity

Overweight and obesity are found worldwide, and the prevalence of these conditions in the U.S. ranks high along with other developed nations.¹⁷ Obesity prevalence is particularly high in AI/ANs. In 1991, obesity prevalence was 13.8% for AI/AN males over the age of 18 years (compared to 9.1% for U.S. all races), and was 16.6% for AI/AN females over the age of 18 years (compared to 8.2% for U.S. all races).¹⁸ Obesity (Body Mass Index > 30) is a major risk factor for diabetes.

Over the last century, many AI/ANs have transitioned from traditional subsistence food sources and the activities required to hunt and harvest them to a “modern” or “western” lifestyle.¹⁹ Federal food programs, such as Food Distribution Programs on Indian Reservations (FDPIR) and food stamps, designed to decrease food insecurity (i.e., hunger), have contributed to the move away from traditional diets. Even today, access to quality foods, such as fresh fruits and vegetables, is limited or available only at a great distance due to the remoteness of many AI/AN communities. In addition, during these modern times, television and the media have influenced food choices. American households throughout the U.S., including AI/AN households, have increased their consumption of store-bought, convenience and prepared foods, as well as fast foods. The adoption of this westernized lifestyle has resulted in an increase in diets that are high in calories and fat and a decrease in physical activity. This combination of environmental factors and genetic susceptibility has resulted in high obesity rates in indigenous peoples throughout North America, as well as other indigenous populations throughout the world.²⁰

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B. Scientific Evidence for the Prevention of Diabetes

Recent studies indicate that it is possible to prevent or delay type 2 diabetes. These studies have brought hope to AI/AN communities that the epidemic of diabetes can be reversed.

Results of the Diabetes Prevention Program

In 2001, the results of the Diabetes Prevention Program demonstrated that the onset of diabetes can be prevented or delayed. The Diabetes Prevention Program was a randomized, controlled trial funded by the NIH. The goal of the study was to determine if diabetes could be prevented in overweight people who are at high-risk for developing diabetes. Overall, 3,234 overweight participants who had impaired glucose tolerance, now called pre-diabetes, were included in the study. Forty-five percent of the participants were from ethnic minority groups, including 171 AI/ANs. The study found that diet and exercise resulting in a 5% to 7% weight loss lowered the incidence of diabetes by 58%.

Participants lost weight by reducing fat and calories in their diets and by exercising (most participants chose walking) at least 30 minutes a day, five days a week. The same study found that taking the oral diabetes drug, metformin (Glucophage®), reduces diabetes risk by 31%. Because the participants had pre-diabetes when they began the Diabetes Prevention Program, the study showed that modest lifestyle changes through improved diet and increased exercise can effectively turn back the clock, returning individuals to healthy levels of blood sugar and preventing diabetes.²¹

Results of Other Diabetes Prevention Studies

Several other studies conducted in the U.S. and other countries indicate that lifestyle and medical interventions can effectively prevent diabetes:

- The Diabetes Control and Complications Trial²², Kumamoto Study²³, and United Kingdom Prospective Diabetes Study²⁴ indicate that prompt and intensive medical treatment can reduce the onset of diabetes related complications.
- The United Kingdom Prospective Diabetes Study found that lower A1C levels resulted in a lower incidence of retinopathy, nephropathy, amputations, cataracts, congestive heart failure, myocardial infarctions, and stroke.²⁵

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- The Da Qing Impaired Glucose Tolerance and Diabetes Study found that people with impaired glucose tolerance who underwent a lifestyle intervention consisting of diet and exercise reduced their risk of diabetes.²⁶
- The Finnish Diabetes Prevention Study found that lifestyle changes aimed at reducing weight and fat intake, while increasing fiber intake and physical activity, resulted in a 58% reduction in the risk of developing diabetes in individuals with impaired glucose tolerance.²⁷
- Researchers at the National Institute of Diabetes and Digestive and Kidney Diseases investigating the association between breastfeeding and diabetes in the Pima Indians found that exclusive breastfeeding for the first two months of life is associated with a significantly lower rate of subsequent diabetes.²⁸
- The Nurses' Health Study followed nearly 85,000 female nurses from 1980 to 1996 to examine the combined effects of dietary and lifestyle factors on the risk of developing diabetes in females. The study found that the vast majority of cases of diabetes could be prevented by the adoption of a healthy lifestyle that included exercise, a healthy diet, and abstinence from smoking and alcohol use.²⁹ A related study examined the role of moderate-intensity activities, such as walking, in reducing the risk of developing diabetes. The study found that a faster walking pace was associated with decreased risk of developing diabetes. The data suggest that greater physical activity level is associated with a substantial reduction in risk of diabetes, including physical activity of moderate intensity and duration.³⁰

Despite the alarming trends and formidable challenges of combating diabetes, the results of the Diabetes Prevention Program and other prevention studies have given our nation hope that we can effectively combat diabetes. Science once told us we could **treat** diabetes, but now science says that we can **prevent** diabetes.

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“Diabetes is a big problem on the reservation. If we can do something to help the children so that they take care of themselves without even thinking, that’s our goal.”

Lori Lossie (Eastern Band of Cherokee)